

U. S. Program in Biology
International Indian Ocean Expedition

Report No. 1

ANTON BRUUN Cruise A

Aden - Bombay

February - March, 1963

Scientists

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Cruise Description

En route from the U. S. to Bombay, India during February - March, 1963 an unscheduled oceanographic section of 13 stations was made in the Arabian Sea between Aden and Bombay. Standard hydrographic casts were made to 1400 meters indicated depth (1000 meters at Stations 1-3) for measurement of temperature, salinity, dissolved oxygen, phosphate, nitrite, nitrate and silicate. A large, plastic sampler was used to obtain water samples from depths corresponding to 100, 50, 25, 10 and 1% of the sunlight incident to the surface. These samples were used for measurement of primary productivity (C-14 method), phytoplankton pigments, particulate carbon, nitrogen and phosphorus.

Productivity measurements were made for 24 hours at natural, in situ light intensities, using an on-deck incubator with neutral density screens to simulate the light at each depth sampled. Duplicate samples were exposed to fluorescent illumination at a constant intensity of 1000 foot candles for 4 hours.

Standard vertical net tows were made from 200 meters to the surface with an IIOE standard net (one-meter² mouth, 0.33 mm mesh opening). The displacement volume of each sample was measured. The samples will be deposited in the International Biological Centre, Cochin, India.

Vertical plankton tows were also made from 200 meters to the surface with a 1/2 m² mouth, 0.64 mm mesh opening truncated net for microplankton samples.

Oblique tows were made with a series of pressure-operated opening-closing plankton nets designed by Dr. Allan W. H. Bé (Lamont Geological Observatory). Nets were 3/4 m², 0.33 mm mesh opening. Depth intervals sampled (depth permitting) were 0-100, 100-250, 250-500, 500-1000 and 1000-2000 meters.

The fine-mesh net samples and Bé net samples will be deposited at the U. S. Sorting Center, U. S. National Museum, Smithsonian Institution, Washington, D. C.

Methods used for physical, chemical, productivity and pigment measurements are described in detail in a publication entitled "Instruction Manual for Routine Measurements for the U. S. Program in Biology, IIOE" prepared by David W. Menzel and is available at the Woods Hole Oceanographic Institution.

Bathythermograph observations were made at each station and at hourly intervals between stations. Bathymetry was recorded continuously with a precision echo sounder manufactured by Alpine Geophysical Associates, Norwood, New Jersey.

All analyses were completed and reduced data sheets prepared at sea. These data will be deposited at the U. S. National Oceanographic Data Center after they have been rechecked against original log sheets and work books. In the interest of those who will be working in the Arabian Sea before these data are available from NODC, this report containing preliminary results has been prepared.

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R/V ANTON BRUUN Cruise #A

Station: 1 Position: 12°00'N 45°55'E Date: 2-24-63
 Sonic depth: 1550 M Wind: Force 2; Direction 07 Time: 0720
 Secchi disk: 24 M IOSN std. tow: 33.0 ml/m² Ext Coeff (k): 0.07
 Primary productivity: .07 gC/m²/day

Depth	Temp.	Sal. ‰	O ₂ ml/L	PO ₄ -P μgA/L	NO ₃ -N μgA/L	NO ₂ -N μgA/L	SiO ₃ -Si μgA/L
1	25.20	36.014	4.48		3.84	0.350	U
23	25.30	36.011	4.54	0.31	6.20	0.531	0.38
47	25.18	36.008	4.54	0.34	4.22	0.343	0.90
70	24.94	35.990	4.42	0.41	11.2	1.475	0.90
94	24.62	35.973	4.08	0.56	9.67	0.269	2.14
117	22.16	35.777	1.96	1.23	20.1	0.255	8.84
141	19.72	35.577	1.51	1.69	26.2	0.265	15.2
188	16.25	35.547	0.41	2.10	28.4	0.130	22.1
282	14.15	35.622	0.64	2.14	28.8	0.372	26.7
376	13.84	35.760	0.43	2.14	31.5	0.135	29.8
470	13.67	35.922	0.41	2.14	30.7	0.167	33.1
563	13.65	36.031	0.41	2.18	33.1	0.120	35.3
657	13.16	36.087	0.41	2.35	30.5	0.196	40.9
751	12.95	36.128	0.40	2.36	34.7	0.233	45.7
845	13.54	36.495	0.48	2.15	27.8	0.431	49.2
939	13.47	36.582	0.46	2.18	26.6	0.201	51.8

Depth	Chlorophyll a (μg/L)	In situ C-14 (μgC/L/d)	C14--1000 fc (μgC/L/d)
1	0.23	0.02?	11.47?
10	0.09	1.50?	11.38?
20	0.15	0.12?	9.26?
33	0.13	2.00?	10.32?
66	0.18	0.54?	5.79?

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R/V ANTON BRUUN Cruise #A

Station: 2 Position: 12°41'N 48°00'E Date: 2-25-63

Sonic Depth: 1743M Wind: Force 2; Direction 07 Time: 0328

Secchi Disk: IOSN std. tow: 65.0 ml/m² Ext Coeff (k):

Primary productivity: 0.29 gC/m²/day

Depth	Temp.	Sal. ‰	O ₂ ml/L	PO ₄ -P μgA/L	NO ₃ -N μgA/L	NO ₂ -N μgA/L	SiO ₃ -Si μgA/L
1	25.29	35.975	4.56	0.27	0.91	0.037	1.28
23	25.31	35.965	4.61	0.24	1.03	0.230	1.15
47	25.08		4.42				
70	25.09	36.017	4.48	0.38	1.25	0.488	1.54
94	24.16	35.906	3.80	0.62	6.21	0.196	4.22
117	19.23	35.585	1.13	1.43	21.2	0.193	15.5
140	17.69	35.591	0.61	1.78	25.0	0.230	20.2
187	15.83	35.643	<0.29	2.00	25.3	0.108	24.2
281	14.80	35.628	0.40	1.97	26.3	0.137	26.3
374	13.69	35.689	0.57	2.01	26.0	0.166	31.0
468	13.75	36.061	0.64	2.12	27.0	0.142	34.7
562	12.81	35.683	0.58	1.98	28.6	0.137	34.7
655	13.92	36.270	0.48	2.07	32.3	0.139	37.9
749	13.90	36.369	0.48	2.02	28.2	0.189	40.2
842	12.98	36.345	0.47	2.11	26.6	0.157	44.7
936	12.64	36.245	0.41	2.38	27.6	0.152	51.0

Depth	Chlorophyll a (μg/L)	In Situ C-14 (μgC/L/d)	C-14-1000 ft
1	0.09	4.56	5.30
10	0.11	6.03	13.46
20	0.10	5.70	1.71
33	0.15	3.35	7.75
66	0.13	0.20	3.51

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R/V ANTON BRUUN Cruise #A

Station: 3 Position: 13°02'N 50°00'E Date: 2-25-63
 Sonic depth: 2170 M Wind: Force 2; Direction 07 Time: 1921
 Secchi disk: 24 M IOSN std. tow: 64.6 ml/m² Ext coef (k): 0.07
 Primary productivity: 0.21 gC/m²/day

Depth	Temp.	Sal. ‰	O ₂ ml/L	PO ₄ -P μgA/L	NO ₃ -N μgA/L	NO ₂ -N μgA/L	SiO ₃ -Si μgA/L
1	25.32	36.037	4.65	0.39	U	0.025	3.46
25	25.33	36.021	4.72	0.39	0.40	0.056	0.38
49	25.25	36.025	4.65	0.38	0.62	0.059	U
74	25.14	36.017	4.33	0.49	2.49	0.704	2.95
99	24.89	35.992	4.26	0.53	3.29	0.113	8.06
123	21.31	35.693	1.79	1.42	16.9	0.054	8.71
148	19.14	35.589	0.99	1.78	22.6	0.074	16.8
197	16.40	35.540	0.54	2.05	24.4	0.029	23.1
296	14.37	35.623	0.77	2.25	27.3	0.051	26.0
395	13.87	35.808	0.46	2.31	28.6	0.015	31.9
494	13.85	36.119	0.47	2.31	26.8	0.041	35.1
592	13.62	36.220	0.46	2.33	26.9	0.007	38.7
691	12.72	36.076	0.46	2.51	28.0	0.029	46.7
790	12.25	36.068	0.39	2.58	30.4	0.015	54.2
888	11.55	36.005	0.46	2.69	31.9	0.076	57.2
987	10.80	35.910	0.55	2.86	30.6	0.027	67.1
1184	8.08	35.457	0.48	3.13	33.7	0.098	90.0
1382	6.14	35.172	0.82	3.33	30.4	0.088	107.

Depth	Chlorophyll a(μg/L)	In situ C ¹⁴ (μgC/L/d)	C ¹⁴ --1000 fc (μgC/L/d)
1	0.25	U	7.92
10	0.25	4.74	7.47
20	0.28	3.10	8.41
33	0.27	2.79	7.43
66	0.28	3.53	1.31

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R/V ANTON BRUUN Cruise #A

Station: 4 Position: 13°34'N 52°01'E Date: 2-26-63
 Sonic depth: 2165 M Wind: Force 2; Direction 07 Time: 1215
 Secchi disk: 24 M IOSN std. tow: 29.0 ml/m² Ext coef (k): 0.07
 Primary productivity: 0.28 gC/m²/day

Depth	Temp.	Sal. ‰	O ₂ ml/L	PO ₄ -P μgA/L	NO ₃ -N μgA/L	NO ₂ -N μgA/L	SiO ₃ -Si μgA/L
1	25.41	35.981	4.78	0.34	0.22	0.078	4.61
24	25.18	35.982	4.87	0.34	0.17	0.108	U
48	24.68	35.930	4.55	0.43	2.02	0.540	0.90
73	24.66	35.939	4.50	0.48	2.98	1.08	0.64
97	21.54	35.640	2.37	1.20	15.6	0.167	8.31
121	19.03	35.520	1.45	1.65	20.7	0.230	
145	17.59	35.509	0.95	1.75	24.4	0.198	21.0
194	15.53	35.586	0.52	2.02	26.2	0.113	23.0
290	12.13	35.208	1.79	1.75	27.3	0.179	47.6?
387	11.79	35.267	1.40	1.88	28.6	0.105	27.6
484	11.24	35.190	1.68	1.91	27.8	0.127	28.3
581	12.01	35.495	0.87	2.29	23.4	0.113	34.3
678	11.73	35.645	0.39	2.48	31.2	0.142	
774	11.24	35.636	0.40	2.54	31.9	0.127	51.9
871	10.49	35.585	0.36	2.71	34.1	0.137	62.7
968	10.01	35.562	0.46	2.74	31.4	0.115	67.8
1162	8.58	35.427	0.46	2.78	30.2	0.142	73.6
1355	6.95	35.252	0.75	3.01	30.5	0.115	97.2

Depth	Chlorophyll a (μg/L)	In situ C ¹⁴ (μgC/L/d)	C ¹⁴ --1000 fc (μgC/L/d)
1	0.13	10.53	20.32
10	0.06	10.64	35.17
20	0.10	1.11	26.07
33	0.12	2.62	21.14
66	0.22	2.79	7.43

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R/V ANTON BRUUN Cruise #A

Station: 5 Position: 14°04'N 54°11'E Date: 2-27-63

Sonic Depth: 2803 M Wind: Force 1; Direction 07 Time: 0322

Secchi disk: --- IOSN std. tow: 29.0 ml/m² Ext Coeff (k):

Primary productivity: 0.16 gC/m²/day

Depth	Temp.	Sal. ‰	O ₂ ml/L	PO ₄ -P μgA/L	NO ₃ -N μgA/L	NO ₂ -N μgA/L	SiO ₃ -Si μgA/L
1	25.32	36.017	4.42	0.31	0.45	0.081	1.79
25	25.35	36.047	4.69	0.28	0.52	0.233	6.53
50	24.56	35.954	4.54	0.37	0.58	0.223	2.30
74	23.03	35.810	3.18	0.88	1.36	0.081	6.66
99	19.16	35.486	1.34	1.64	3.61	0.049	15.1
124	17.49	35.522	0.69	1.86	5.29	0.056	19.6
149	16.54	35.527	0.73	2.02	17.8	0.032	21.9
199	15.16	35.538	0.61	2.04	24.1	0.022	24.4
298	13.72	35.550	0.56	2.14	27.0	0.044	28.0
397	12.92	35.611	0.51	2.20	31.8	0.034	32.4
496	12.78	35.777	0.51	2.24	31.4	0.081	38.4
596	12.24	35.786	0.39	2.33	31.8	0.074	43.0
695	11.16	35.625	<0.28	2.59	32.7	0.144	53.1
794	10.40	35.592	<0.28	2.59	34.3	0.093	60.2
894	9.76	35.555	0.34	2.72	37.2	0.078	67.6
993	8.75	35.425	0.56	2.76	35.2	0.064	76.5
1192	6.94	35.223	0.79	2.80	39.1	0.059	92.3
1390	5.67	35.573	1.13	2.86	39.5	0.037	105.

Depth	Chlorophyll a (μg/L)	In situ C-14 (μgC/L/d)	C-14---1000 fc (μgC/L/d)
1	0.07	1.83	13.95
10	U	4.63	10.85
20	0.03	2.11	9.55
33	0.23	2.35	23.09
66	0.06	1.75	1.39

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R/V ANTON BRUUN Cruise #A

Station: 6 Position: 14°36'N 56°00'E Date: 2-27-63

Sonic Depth: 2610 M Wind: Force 1; Direction 07 Time: 1848

IOSN std. tow: 30.0 ml/m² Primary productivity: 0.24 gC/M²/day

Depth	Temp.	Sal. ‰	O ₂ ml/L	PO ₄ -P μgA/L	NO ₃ -N μgA/L	NO ₂ -N μgA/L	SiO ₃ -Si μgA/L
1	26.29	36.132	4.68	0.31	0.19	0.096	2.43
24	25.91	36.066	4.73	0.30	4.61?	0.093	2.96
48	25.16	35.964	4.80	0.39	0.83	0.154	3.97
73	24.87	35.951	4.56	0.42	9.22	0.486	1.66
97	24.41	36.183	4.50	0.55	21.8	1.14	4.22
121	23.83	36.265	3.92	0.70	18.8	0.135	5.12
146	22.37	36.209	1.37	1.46	23.7	0.228	9.35
194	17.96	35.750	0.13	2.04	27.8	0.192	26.5
291	14.35	35.615	0.40	2.03	27.5	0.098	37.9
388	12.78	35.565	0.57	2.13	31.9	0.083	35.1
486	12.24	35.590	0.35	2.32	29.2	0.081	41.8
583	11.74	35.650	0.40	2.39	30.6	U	48.1
680	11.33	35.635	≤0.28	2.55	32.6	0.078	56.8
777	10.81	35.633	0.35	2.64	35.2	0.071	61.4
874	10.12	35.588	0.35	2.70	35.5	0.105	69.1
971	9.45	35.537	0.42	2.77	33.6	0.081	77.6
1165	7.65	35.330	0.57	2.75	34.4	0.076	92.6
1359	5.99	35.156	0.92	2.44	35.0	0.056	109.

Depth	Chlorophyll a (μg/L)	In situ C-14 (μgC/L/d)	C-14---1000 fc (μgC/L/d)
1	0.010	1.83	1.26
10	0.010	2.96	1.26
20	0.007	7.67	3.67
30	0.012	4.49	3.51
66	0.036	0.39	5.67

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R/V ANTON BRUUN Cruise #A

Station: 7 Position: 15°04'N 58°00'E Date: 2-28-63
 Sonic Depth: 4453 M Wind: Force 1; Direction 09 Time: 0914
 Secchi disk: 24 M IOSN std. tow: 195.0 ml/m² Ext Coeff (k): 0.07
 Primary productivity: 0.06 gC/m²/day

Depth	Temp.	Sal. ‰	O ₂ ml/L	PO ₄ -P μgÅ/L	NO ₃ -N μgÅ/L	NO ₂ -N μgÅ/L	SiO ₃ -Si μgÅ/L
1	25.98	36.098	4.62	0.32	0.23	0.061	--
24	25.79	36.084	4.57	0.28	0.52	0.152	1.02
49	24.37	36.036	4.37	0.52	3.58	0.608	2.43
73	23.36	36.056	3.54	0.84	7.11	0.081	--
98	22.15	35.992	2.45	1.25	22.4	0.074	--
122	20.07	35.756	1.42	1.77	23.0	0.086	15.0
146	18.42	35.683	0.59	2.05	26.4	0.071	20.0
195	16.89	35.858	0.34	2.18	25.8	0.069	25.5
292	14.38	35.652	0.46	2.29	28.2	0.047	29.4
390	12.97	35.618	0.30	2.40	30.3	0.066	35.7
488	***	36.076	3.99?	0.97?	8.84?	0.088	4.61?
585	11.81	35.046	0.35	2.48	32.1	0.064	46.8
682	11.02	35.574	0.33	2.68	34.0	0.054	54.4
780	10.59	35.584	0.34	2.68	35.5	0.061	60.8
878	9.93	35.554	0.40	2.78	35.7	0.032	68.3
975	9.08	35.461	0.50	2.76	30.1	0.088	75.9
1170	7.78	35.302	0.52	2.94	30.3	0.034	89.0
1365	6.12	35.121	0.95	2.98	39.6	0.061	106.

Depth	Chlorophyll a (μg/L)	In situ C-14 (μgC/L/d)	C-14---1000 fc (μgC/L/d)
1	---	1.75	16.52
10	---	1.26	5.18
20	---	3.73	4.16
33	---	U	5.63
66	---	U	2.49

*** Indicated values too high to be read.

U. S. Program in Biology---International Indian Ocean Expedition

R/V ANTON BRUUN Cruise #A

Station: 8 Position: 15°35'N 60°00'E Date: 3-1-63

Sonic Depth: 4453 M Wind: Force 1; Direction 05 Time: 0440

IOSN std. tow: 27.0 ml/m² Primary productivity: 0.51 gC/m²/d

Depth	Temp.	Sal. ‰	O ₂ ml/L	PO ₄ -P μgA/L	NO ₃ -N μgA/L	NO ₂ -N μgA/L	SiO ₃ -Si μgA/L
1	25.83	36.177	4.77	0.39	0.37	0.105	0.89
25	25.82	36.167	5.00	0.29	0.49	0.074	0.77
50	25.74	36.153	4.91	0.31	0.91	0.115	0.26
75	25.31	36.083	4.83	0.38	U	0.120	0.64
100	22.34	35.780	1.51	1.52	17.0	0.169	8.96
125	19.92	35.659	0.83	1.89	23.1	0.086	14.3
150	18.19	35.587	0.70	2.02	25.3	U	18.4
199	16.12	35.613	0.46	2.23	27.1	0.117	23.8
299	14.05	35.686	0.46	2.29	23.8	0.105	27.9
399	13.22	35.694	0.36	2.47	30.4	0.098	33.6
498	12.38	35.672	0.29	2.54	28.1	--	41.4
598	11.57	35.632	0.29	2.59	34.2	0.077	47.1
698	11.02	35.621	0.40	2.73	27.6	0.083	54.2
798	10.36	35.586	0.34	2.75	39.0	0.081	60.4
897	9.55	35.493	0.36	2.86	40.4	0.096	68.7
997	8.87	35.442	0.39	2.93	38.6	0.103	76.2
1199	7.41	35.250	0.62	3.01	35.6	0.120	87.5
1396	6.06	35.115	0.98	3.04	41.5	0.093	98.7

Depth	Chlorophyll a (μg/L)	In situ C-14 (μgC/L/d)	C-14---1000 fc (μgC/L/d)
1	0.15	6.43	57.49
10	0.13	10.49	43.70
20	0.20	14.53	46.88
33	0.16	8.29	36.11
66	0.24	0.92	31.33

U. S. Program in Biology---International Indian Ocean Expedition

R/V ANTON BRUUN Cruise #A

Station: 9 Position: 16°03'N 62°00'E Date: 3-1-63

Sonic Depth: 3920 M Wind: Force 1; Direction 05 Time: 1758

Secchi disk: 24 M IOSN std. tow: 39.0 ml/m² Ext Coeff (k): 0.07

Primary Productivity: 1.18 gC/m²/d

Depth	Temp.	Sal. ‰	O ₂ ml/L	PO ₄ -P μgÅ/L	NO ₃ -N μgÅ/L	NO ₂ -N μgÅ/L	SiO ₃ -Si μgÅ/L
1	25.88	36.101	4.88	0.34	0.61	0.032	1.53
25	25.61	36.142	4.89	0.35	0.44	0.069	0.64
50	25.54	36.142	4.77	0.39	0.78	0.024	1.02
75	25.25	36.068	4.42	0.52	4.39	1.31	2.43
100	22.95	35.792	2.47	1.15	16.8	0.123	7.04
124	20.53	35.670	0.92	1.73	24.1	0.100	13.4
149	19.38	35.626	0.63	1.95	26.0	0.100	16.8
199	16.61	35.658	0.34	2.16	24.8	0.064	23.4
298	14.15	35.719	0.23	2.32	26.8	0.086	30.7
398	12.96	35.691	0.17	2.45	27.6	0.069	37.5
498	12.20	35.672	0.20	2.64	24.0	0.071	44.8
597	11.36	35.609	0.18	2.67	31.0	0.051	51.9
696	10.70	35.615	0.15	2.76	33.6	0.098	58.3
796	9.96	35.509	0.17	2.82	35.6	0.056	65.8
896	9.38	35.475	0.23	2.87	37.3	0.071	72.0
995	8.77	35.420	0.36	2.93	36.1	0.061	77.4
1194	7.07	35.219	0.49	2.98	39.8	0.066	92.5
1393	5.71	35.072	1.03	3.00	39.2	0.044	107.

Depth	Chlorophyll a (μg/L)	In situ C-14 (μgC/L/d)	C-14---1000 fc (μgC/L/d)
1	0.11	22.10	9.14
10	0.09	30.31	11.46
20	0.08	29.02	11.59
33	0.14	17.33	14.77
66	--	2.30	3.59

U. S. Program in Biology---International Indian Ocean Expedition

R/V ANTON BRUUN Cruise #A

Station: 10 Position: 16°33'N 63°57'E Date: 3-2-63
 Sonic Depth: 3675 M Wind: Force 1; Direction 05 Time: 0854
 Secchi disk: 25.5 M IOSN std. tow: 27.6 ml/m² Ext Coeff (k): 0.08

Primary productivity: 0.49 gC/m²/day

Depth	Temp.	Sal. ‰	O ₂ ml/L	PO ₄ -P μgA/L	NO ₃ -N μgA/L	NO ₂ -N μgA/L	SiO ₃ -Si μgA/L
1	25.85	36.395	4.71	0.35	0.48	0.037	1.41
25	25.85	36.447	4.86	0.36	0.25	0.037	1.41
50	25.48	36.445	4.93	0.38	0.25	0.054	--
75	24.22	36.319	3.10	0.98	--	0.147	4.35
100	20.95	35.912	0.47	1.68	--	0.142	14.5
124	18.33	35.561	0.83	1.79	25.6	0.083	18.8
149	17.47	35.662	0.29	2.07	27.6	0.105	23.1
199	15.64	35.779	0.34	2.06	26.7	0.086	26.5
299	14.12	35.709	0.30	2.15	28.7	0.103	31.1
398	13.02	35.685	0.28	2.33	30.0	0.078	37.1
498	12.18	35.648	0.29	2.42	29.8	0.108	43.1
598	11.47	35.611	0.23	2.44	35.1	0.066	50.9
697	10.87	35.565	0.26	2.57	34.3	0.098	57.2
797	10.15	35.520	0.26	2.61	35.1	0.078	63.6
896	9.72	35.510	0.29	2.63	35.2	0.093	69.0
996	8.61	35.363	0.30	2.79	36.2	0.078	82.7
1195	7.30	35.226	0.59	2.89	34.9	0.066	91.1
1394	5.78	35.076	0.85	2.87	41.1	0.064	107.

Depth	Chlorophyll a (μg/L)	In situ C-14 (μgC/L/d)	C-14---1000 fc (μgC/L/d)
1	0.07	11.56	39.25
9	0.08	16.74	44.35
17	0.10	15.65	42.15
29	0.08	5.51	56.75
58	0.24	1.92	8.85

U. S. Program in Biology---International Indian Ocean Expedition

R/V ANTON BRUUN Cruise #A

Station: 11 Position: 17°07'N 66°00'E Date: 3-3-63

Sonic Depth: 3550 M Wind: Force 1; Direction 99 Time: 0230

IOSN std. tow: 21.0 ml/m²

Depth	Temp.	Sal. ‰	O ₂ ml/L	PO ₄ -P μgA/L	NO ₂ -N μgA/L	SiO ₃ -Si μgA/L
1	25.53	36.342	4.65	0.29	0.021	0.51
25	25.12	36.346	4.91	0.31	0.015	0.51
49	24.43	36.332	3.91	0.69	0.071	1.54
74	23.92	36.327	3.96	0.71	0.034	U
99	22.77	36.147	2.26	1.22	0.081	6.01
124	20.68	35.783	0.39	1.92	0.037	18.1
148	18.90	35.761	0.13	2.26	1.62	25.7
198	16.43	35.766	0.11	2.39	3.80	26.1
297	14.82	35.670	0.09	2.43	0.110	30.2
396	12.76	35.621	0.11	2.56	0.022	35.6
494	12.19	35.634	0.08	2.65	0.049	41.4
593	11.97	35.613	0.10	2.70	U	47.4
692	11.59	35.582	0.17	2.77	0.020	53.9
791	10.26	35.536	0.18	2.80	0.039	60.9
890	9.39	35.435	0.18	2.88	0.039	70.8
989	8.52	35.337	0.29	2.98	0.032	77.8
1187	7.14	35.214	0.40	3.11	0.034	90.0
1385	5.88	35.088	0.76	3.08	0.012	102.

Depth	Chlorophyll a (μg/L)	In situ C-14 (μgC/L/d)	C-14---1000 fc (μgC/L/d)
1	0.10	12.82	19.18
9	0.10	31.42	25.50
17	0.10	24.53	29.91
29	0.16	17.69	12.53
58	0.27	1.41	3.91

U. S. Program in Biology---International Indian Ocean Expedition

R/V ANTON BRUUN Cruise #A

Station: 12 Position: 17-36'N 68°00' E Date: 3-3-63

Sonic Depth: 3420 M Wind: Force 3; Direction 05 Time: 1544

IOSN std. tow: 15.0 ml/m²

Depth	Temp.	Sal. ‰	O ₂ ml/L	PO ₄ -P μgA/L	NO ₃ -N μgA/L	NO ₂ -N μgA/L	SiO ₂ -Si μgA/L
1	27.97	35.582	4.42	0.25	0.06	0.014	U
25	27.54	35.581	4.81	0.24	U	0.010	1.03
50	27.53	36.385	4.54	0.34	U	0.007	5.14
75	26.71	36.377	4.60	0.42	0.11	0.024	0.63
100	25.12	36.229	2.82	0.98	11.5	0.206	1.79
124	21.15	35.854	0.21	1.86	24.8	0.020	11.9
149	19.07	35.706	0.11	2.07	24.4	0.858	17.8
199	16.47	35.615	0.17	2.28	21.6	1.94	26.4
299	13.32	35.436	0.19	2.41	25.0	0.020	31.4
398	12.81	35.615	0.11	2.27	27.1	0.032	38.3
498	11.92	35.579	0.11	2.62	29.6	0.037	42.6
598	11.35	35.559	0.13	2.35	31.0	0.051	50.8
697	10.83	35.552	0.15	2.76	31.9	0.032	57.2
797	9.94	35.453	0.14	2.77	34.6	0.020	63.6
896	9.33	35.415	0.14	2.93	35.9	0.010	74.5
996	8.72	35.360	0.18	2.95	36.5	0.007	77.1
1195	7.39	35.250	0.34	3.07	38.3	0.005	81.5
1394	6.08	35.118	0.64	3.13	38.6	U	106.

Depth Chlorophyll a (μg/L) In situ C-14 (μgC/L/d) C-14---1000 fc (μgC/L/d)

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U. S. Program in Biology---International Indian Ocean Expedition

R/V ANTON BRUUN Cruise #A

Station: 13 Position: 18°10'N 70°01'E Date: 3-4-63

Sonic Depth: 2370 M Wind: Force 1; Direction 05 Time: 1018

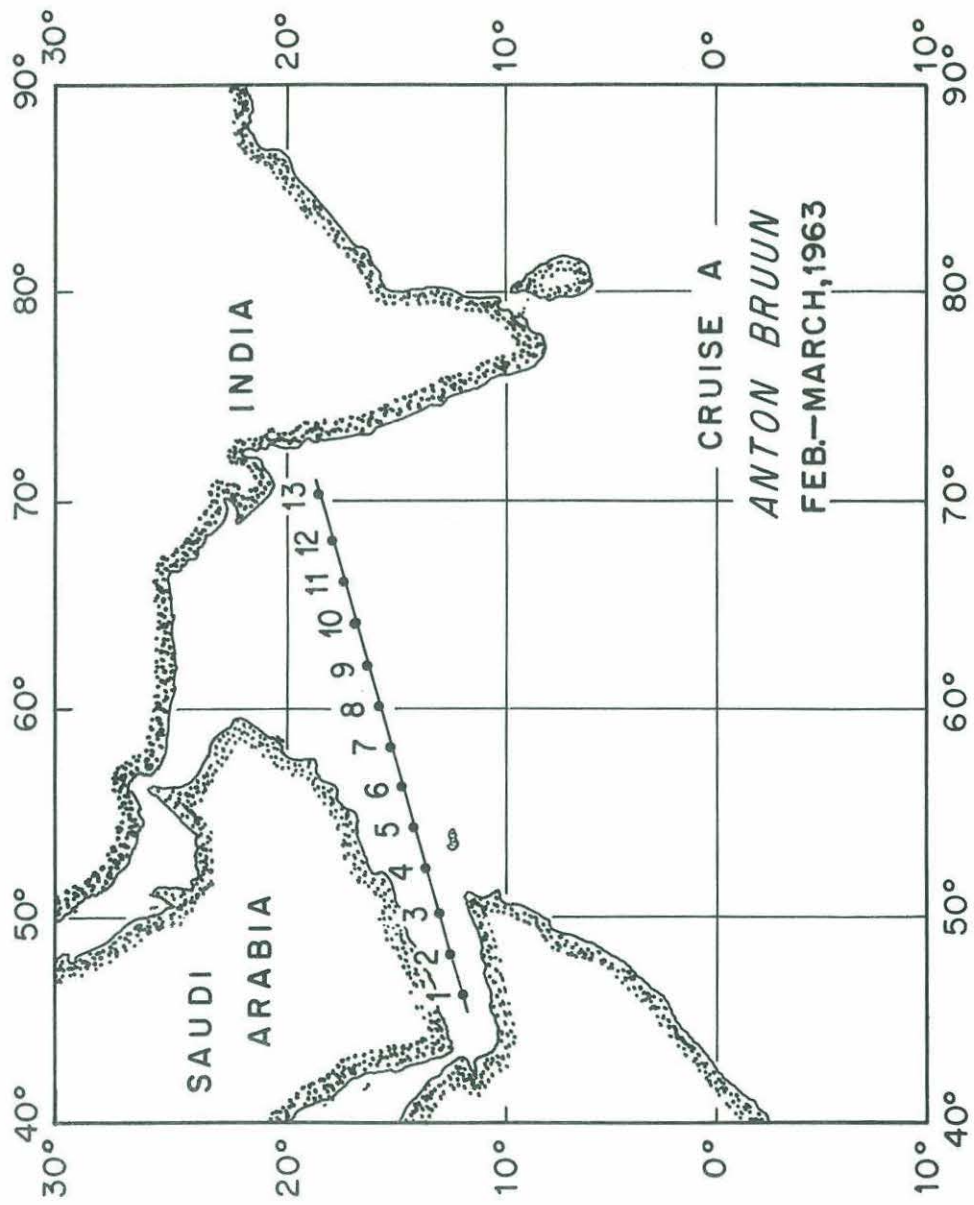
IOSN std. tow: 24.0 ml/m²

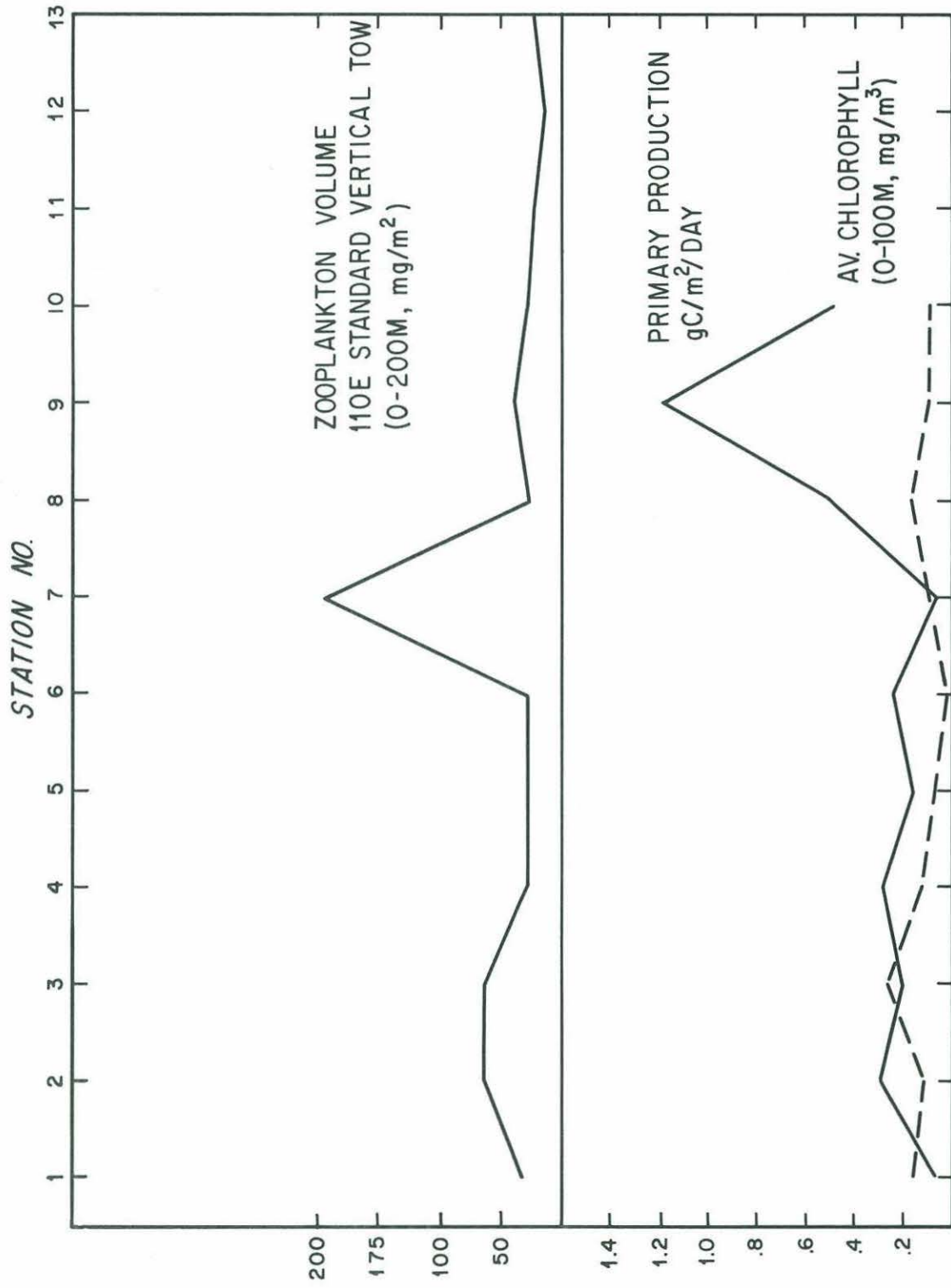
Depth	Temp.	Sal. ‰	O ₂ ml/L	PO ₄ -P μgÅ/L	NO ₃ -N μgÅ/L	NO ₂ -N μgÅ/L	SiO ₃ -Si μgÅ/L
1	27.16	35.245	4.64	0.143	0.11	0.037	5.25
24	27.21	35.468	4.60	0.244	0.33	0.059	2.69
48	27.13	36.059	4.55	0.273	0.22	0.054	0.77
72	26.94	36.147	4.48	0.272	0.17	0.034	0.77
96	26.29	36.210	3.75	0.549	3.96	0.223	1.66
119	24.91	36.202	2.76	1.07	21.6	0.083	4.74
143	22.36	35.935	0.86	1.64	23.9	0.059	10.4
191	18.89	35.472	0.13	2.09	21.3	0.766	18.9
286	14.60	35.663	0.06	2.27	22.1	2.11	43.5
382	13.28	35.650	0.11	2.37	23.9	1.77	35.3
478	12.43	35.627	0.09	2.53	26.5	0.982	40.1
573	11.81	35.608	0.10	2.66	30.5	0.338	46.3
668	11.22	35.589	0.08	2.64	33.4	0.088	52.9
764	10.44	35.534	0.10	2.82	33.5	0.037	61.8
860	9.74	35.487	0.09	2.90	36.3	0.020	68.2
957	9.04	35.423	0.10	2.98	38.8	--	75.1
1146	7.42	35.259	0.25	3.04	38.5	0.027	90.0
1337	6.06	35.116	0.57	3.09	--	0.015	105.

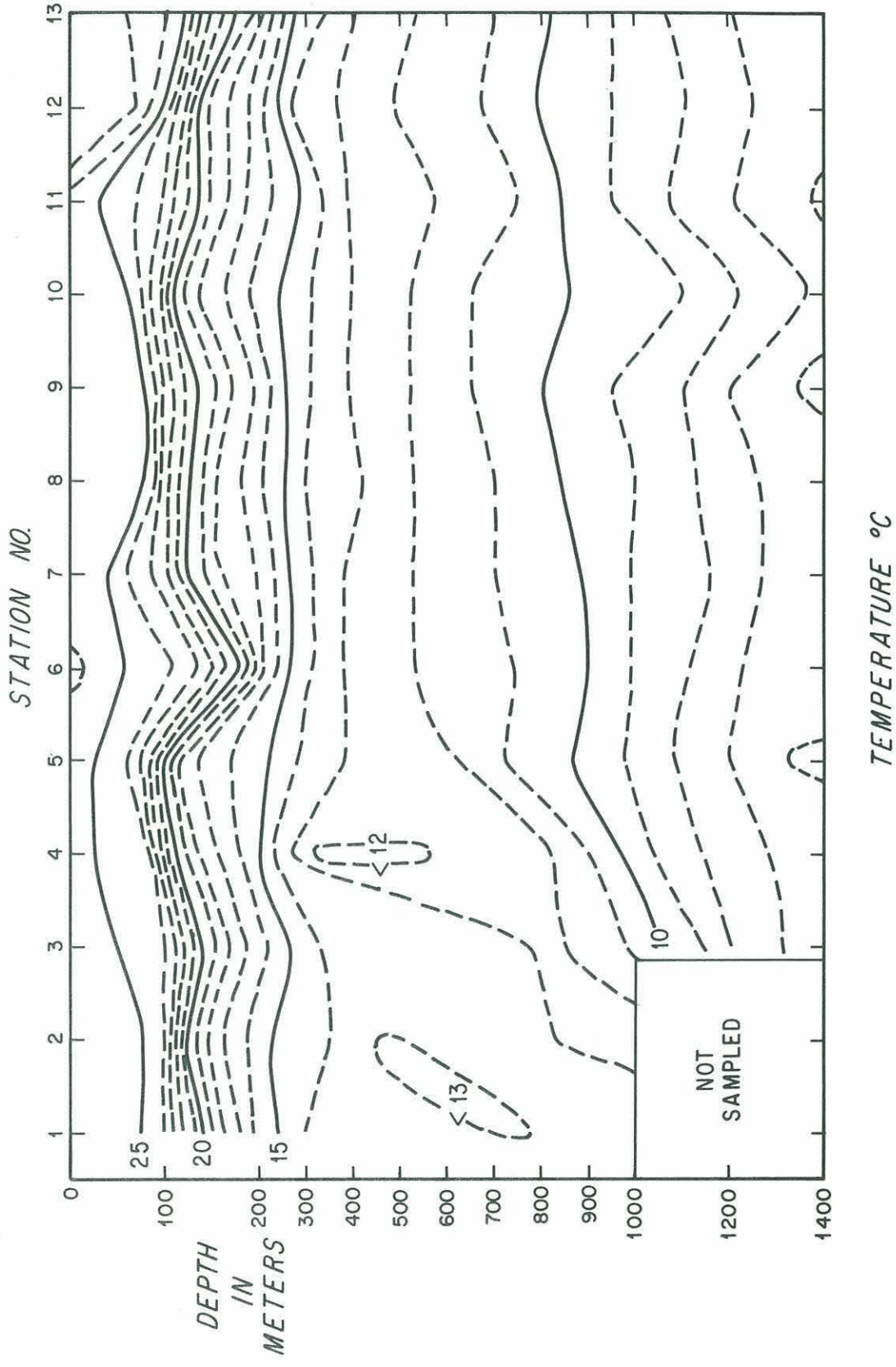
Depth Chlorophyll a (μg/L) In situ C-14 (μgC/L/d) C-14---1000 fc (μgC/L/d)

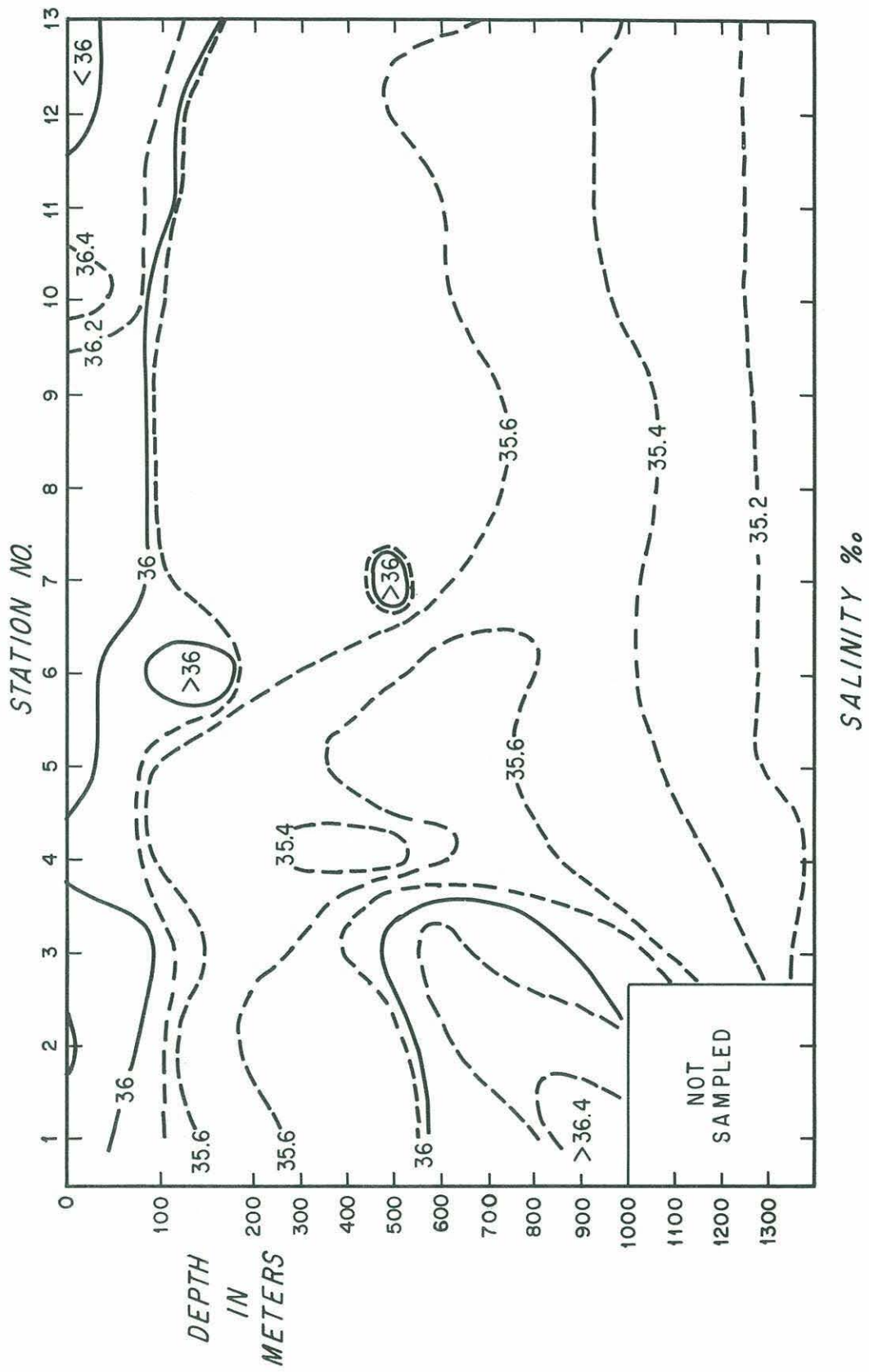
Particulate Carbon, Nitrogen and Phosphorus Analyses (µgA/L)

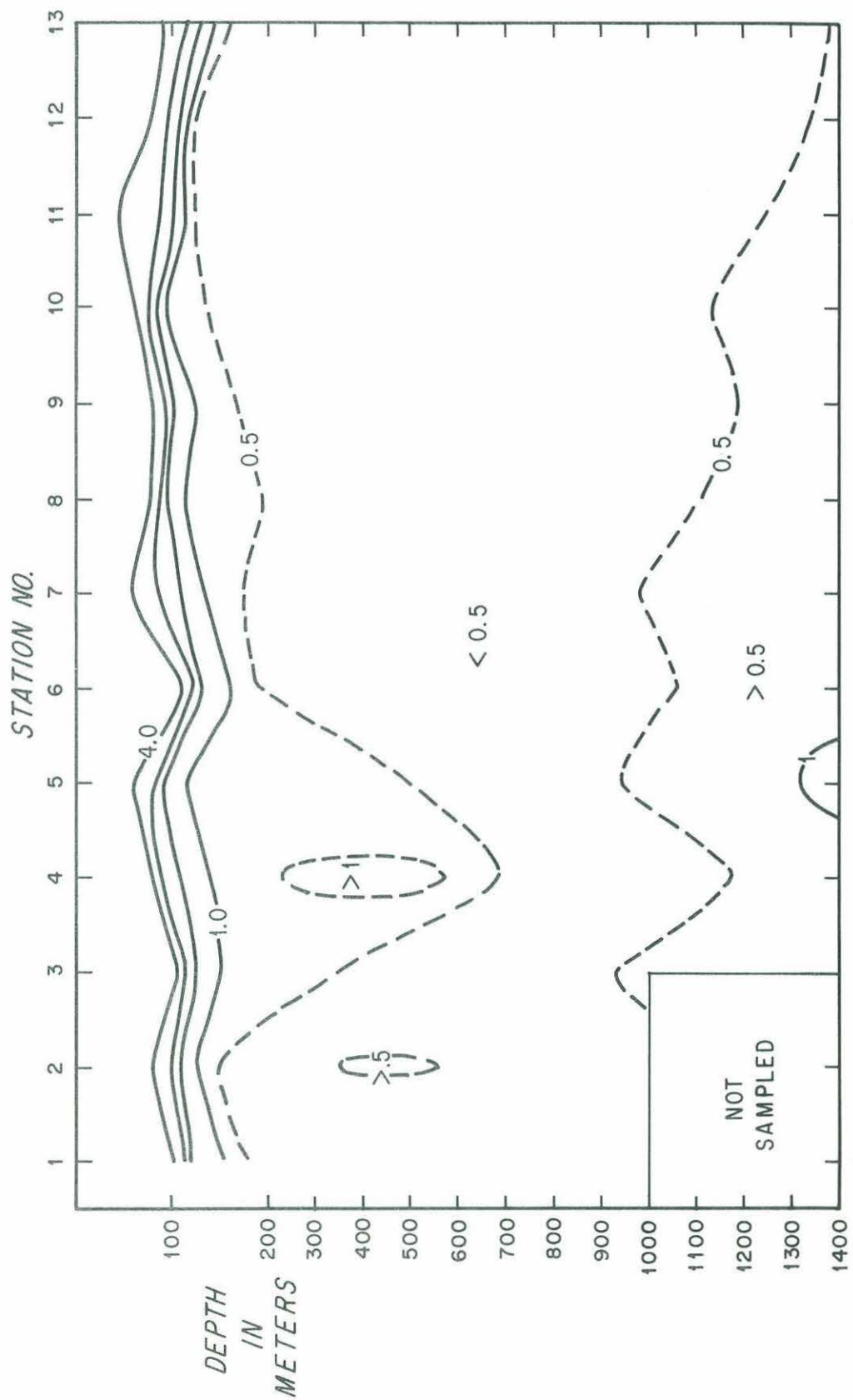
Carbon:	1	2	3	4	5	6	7	8	9	10	11	12	13
0 meters	9.0	2.8	8.2	3.8	3.6	4.2	2.6	5.4	5.2	3.7	6.1	3.8	3.8
10 meters	9.0	4.4	8.2	3.7	3.2	5.1	2.8	4.2	7.2	3.0	-	3.7	3.6
20 meters	9.4	8.1	6.0	5.2	3.4	3.4	4.4	5.8	4.8	4.2	4.2	2.9	6.1
33 meters	5.6	3.3	6.7	4.8	3.6	3.8	3.4	5.0	4.1	5.1	5.3	2.8	-
66 meters	5.7	5.5	3.4	2.8	4.0	3.3	2.8	4.6	4.3	3.2	2.5	3.7	1.8
<u>Nitrogen:</u>													
0 meters	-	1.09	1.13	0.97	0.56	.69	.52	.97	.69	.40	.85	.61	.96
10 meters	1.21	.52	1.02	.89	.61	.73	.44	.85	.52	.52	.61	.73	.64
20 meters	1.25	.77	1.09	.85	.65	.52	.81	.69	.85	.81	.77	.36	.80
33 meters	.97	.81	1.02	.77	.73	.65	.44	.57	.65	.69	.81	.52	.50
66 meters	.77	.52	.85	.56	.40	.77	.22	-	.44	.44	.48	.52	.28
<u>Phosphorus:</u>													
0 meters	.05	.05	--	.05	.05	.05	.03	.07	.07	.04	.05	.03	.05
10 meters	.05	.04	.07	.04	.05	.05	.04	.08	.05	.08	.07	.04	.04
20 meters	.05	.04	.06	.05	.04	.05	.05	.07	.05	.05	.06	.02	.04
33 meters	.06	.04	.06	.05	.06	.04	.04	.07	.06	.04	.08	.03	.03
66 meters	.05	.02	.04	.04	.02	.03	.03	.05	.03	.03	.02	.04	.03



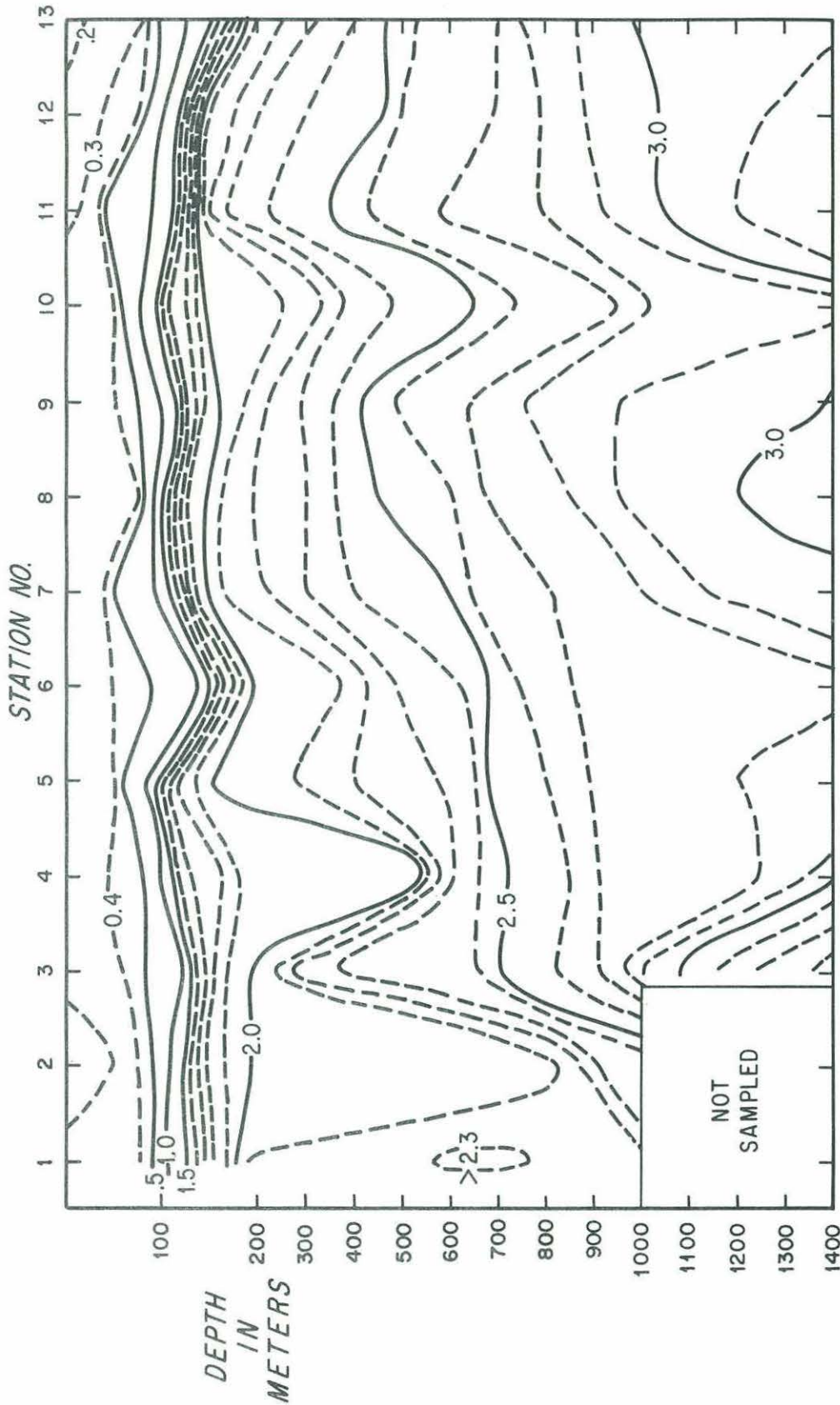




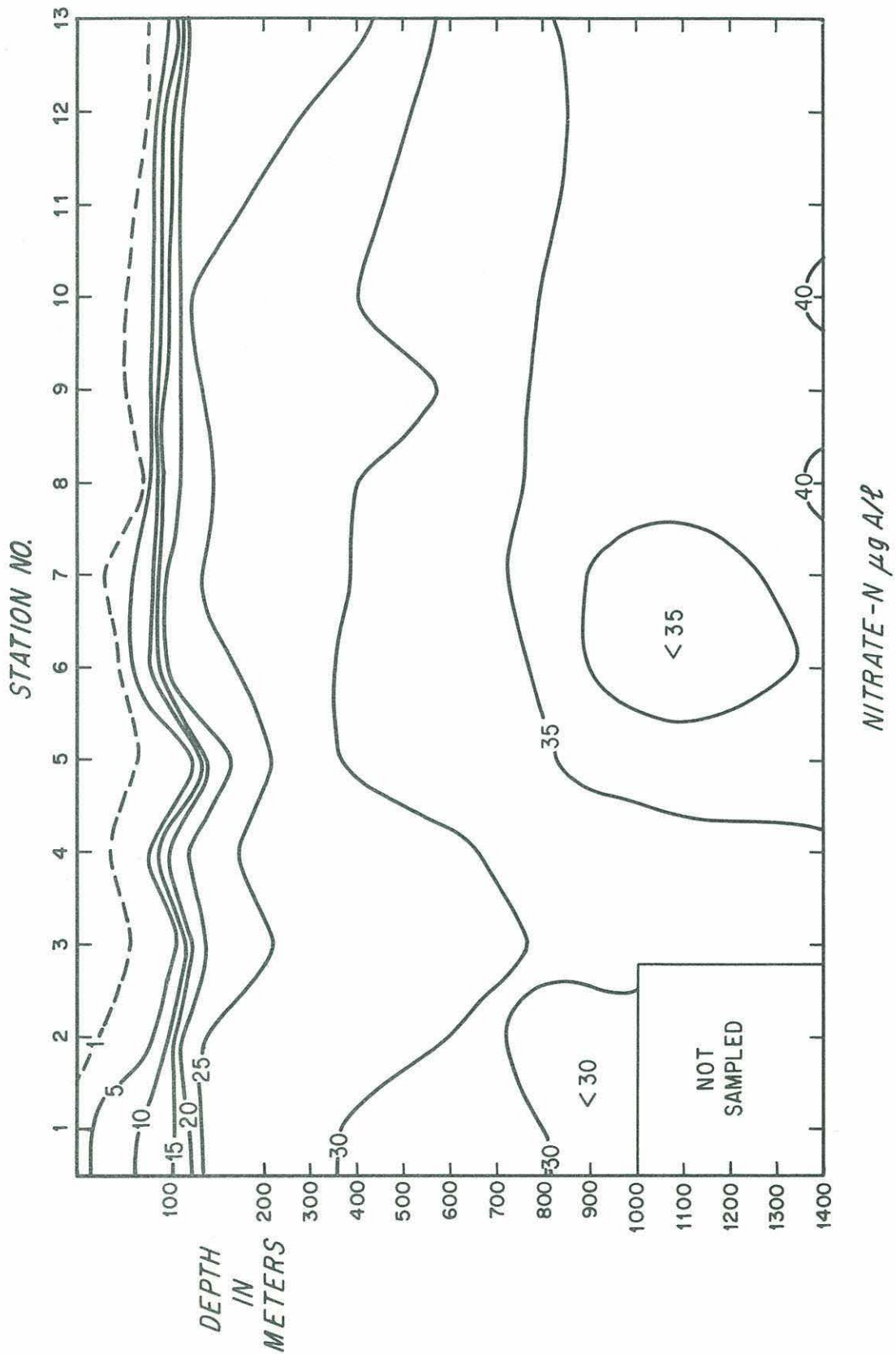


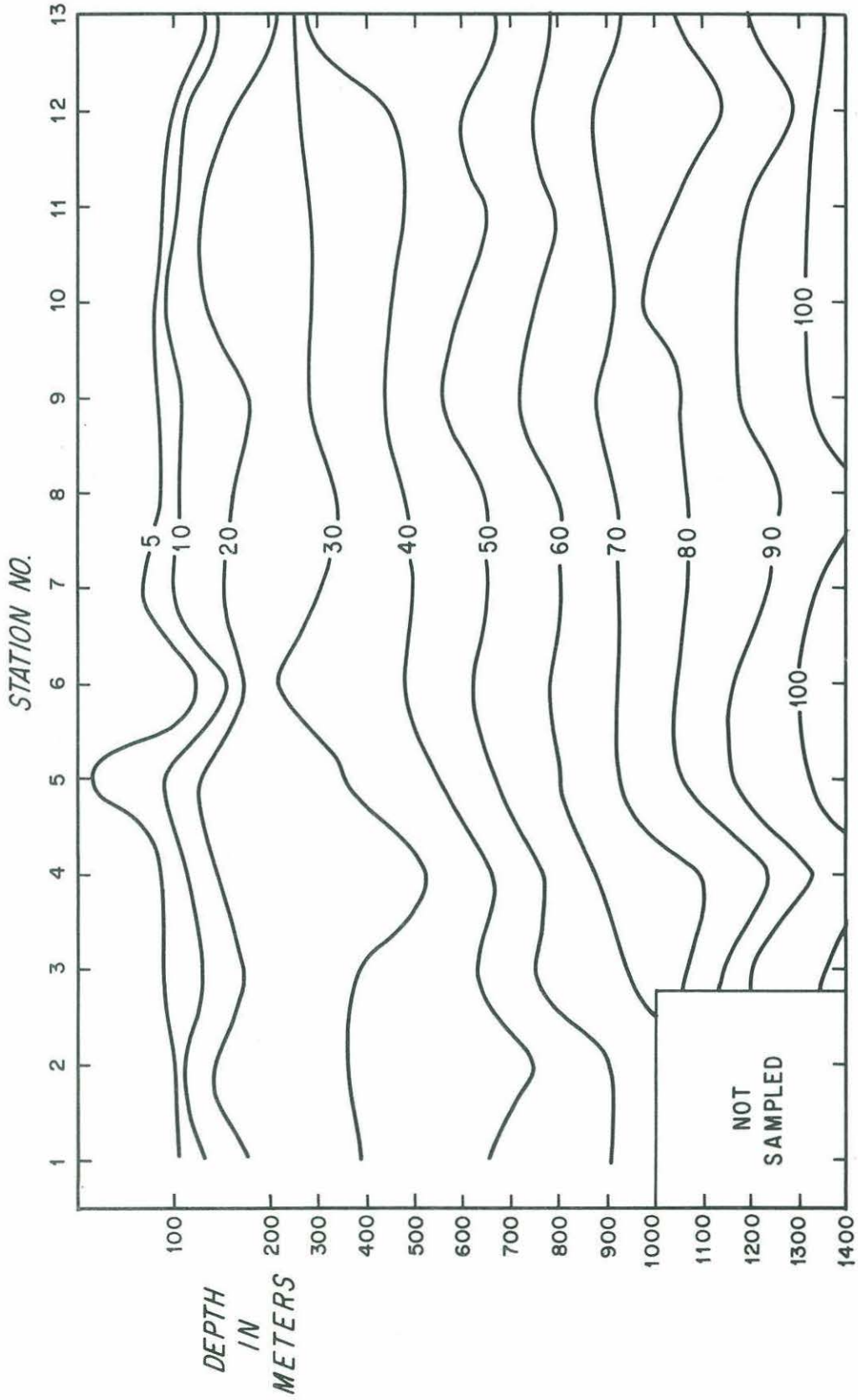


DISSOLVED OXYGEN mL/l

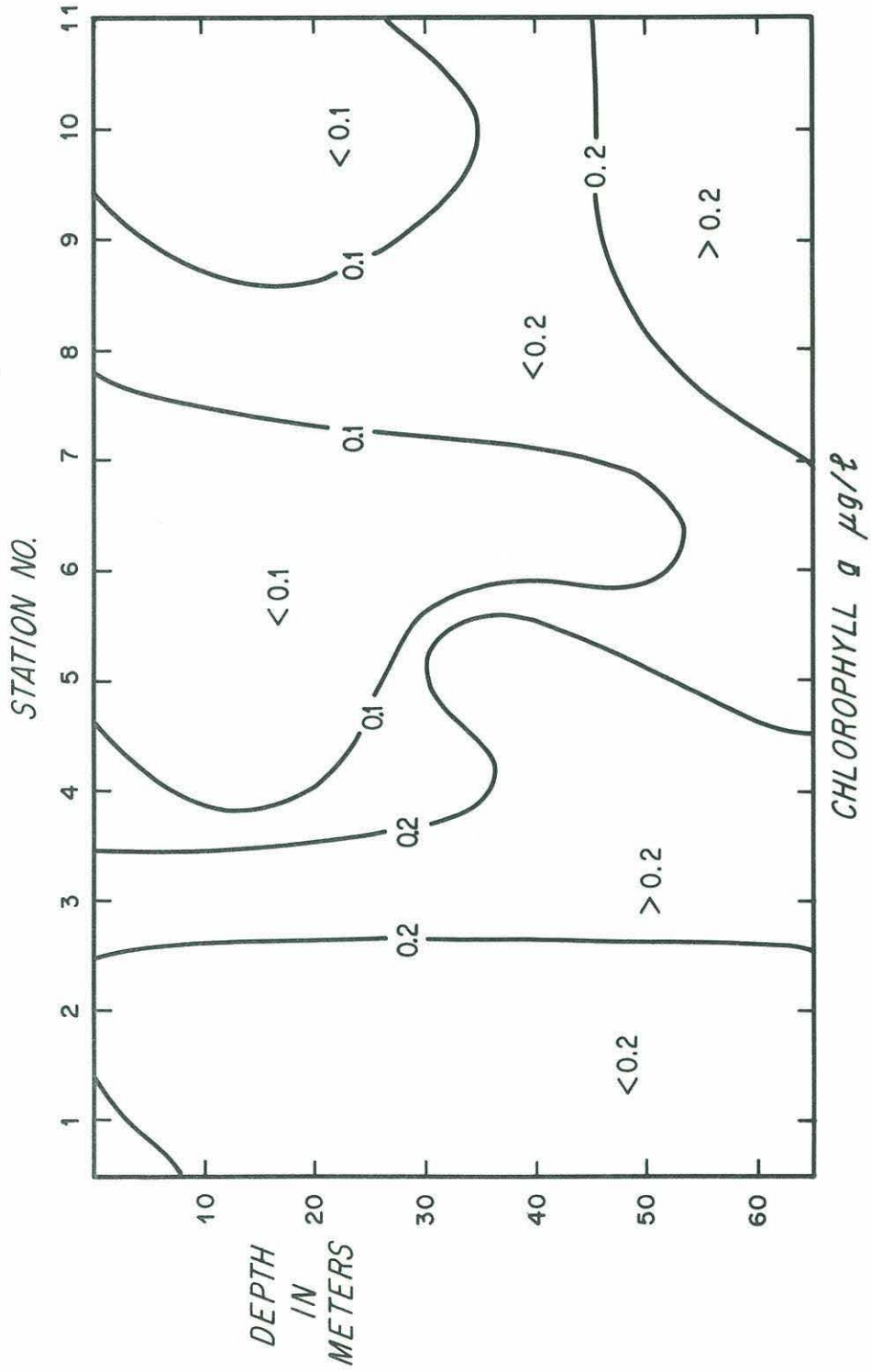


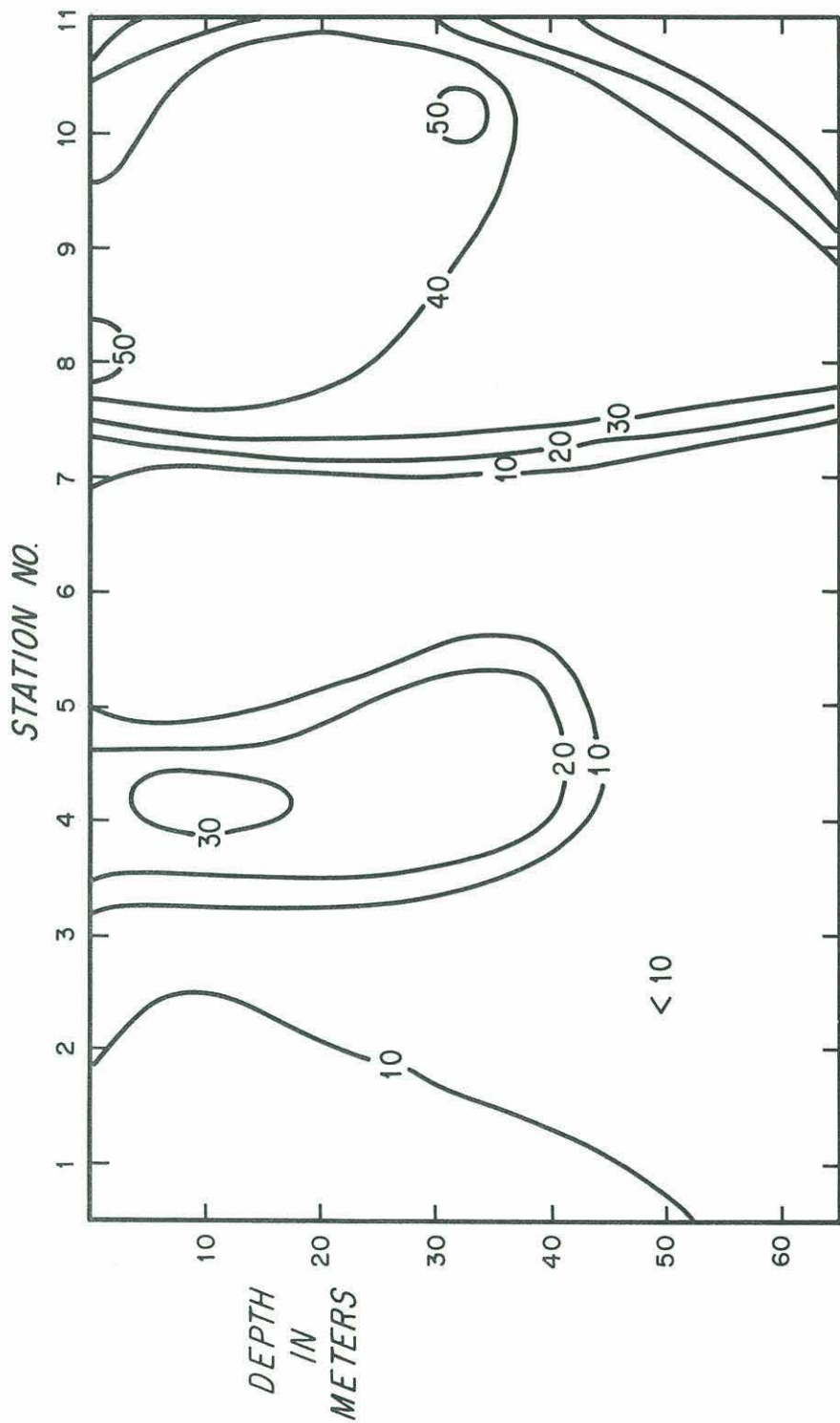
PHOSPHATE - P $\mu\text{g A/l}$





SILICATE-Si $\mu\text{g A/l}$





PRIMARY PRODUCTION $\mu\text{gC}/\text{L}/\text{DAY}$ @ 1000 f.c.

