SRO-936-1

BIOLOGICAL PROCESSES IN THE WATER COLUMN OF THE SOUTH ATLANTIC BIGHT

A Progress Report Submitted to

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by

SKIDAWAY INSTITUTE OF OCEANOGRAPHY

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TABLE OF CONTENTS

INTRODUCTION

This progress report presents results from the five summer cruises of the 1976 Onslow Bay Intrusion Study called OBIS (Fig. 1). This study lasted from July 12 to August 20, 1976. All five cruises were carried out with the R/V BLUE FIN.

The study was financed by the Energy Research and Development Administration in order to measure and describe biological, chemical, and physical processes co-occurring in the South Atlantic Bight.

Our general objective was and is to investigate the relationship of intrusions to phytoplankton, particulate matter, and zooplankton of the South Atlantic Bight. This would include in the synthesis the correlation of our biological data with the hydrographical results and the data on water mass movements. Current meter arrays for OBIS in Summer 1976 were deployed by Dr. L. Pietrafesa, North Carolina State University.

The analysis of the biological samples is at an advanced stage. Another 6 months, at least, will be needed to complete the analysis. The synthesis then depends on the availability of hydrographical and current meter data.

We will present results from samples obtained and analysed between May 1, 1976 and January 1, 1977. The report will include a tentative, preliminary evaluation of our results by discussing the interrelationship of certain hydrographical and biological parameters.

METHODOLOGY

Our cruises were planned to follow specific grid patterns based on eight transects where onshore-offshore stations were spaced 10 km apart. The distance between stations parallel to the shelf break was 20 km (Fig. 1). This spacing was thought to be sufficient to detect and localize intruding water masses.

The cruise period started with a hydrogrid (HYDRO I, Fig. 2.a.). The grid covered most of Onslow Bay in order to find an intrusion through differences in the vertical and horizontal temperature structure. Once an intrusion is localized this hydrogrid is followed by an intensive sampling period (biogrid) of 12 to 24 h covering at least twice every station on one of the transects in an intrusion (Fig. 2.e., BIO I). The repeated sampling of certain stations of a biogrid should allow us to detect biological and also hydrographical changes occurring within one day. A biogrid would be followed by a hydrogrid to detect mainly changes in the size, geographical location, and temperature distribution of the intrusion. Thus, hydro- and biogrids would alternate providing us with information on short term (24 hours) and long term (several days to weeks) changes of hydrographical and biological parameters within an intrusion.

Hydrogrid

A hydrogrid lasted between 24 and 48 hours depending on whether Expendable Bathythermographs (XBT) were used (only vertical temperature profile needed) or the CTD-setup was operated which was necessary when in addition to the vertical profile Niskin bottle samples had to be taken at various depths (nutrients, chlorophyll, phytoplankton, and particle volume). Chlorophyll a analysis was done IN VIVO using a Turner Design fluorometer. 100 ml were preserved in modified Lugol's solution for species composition and concentration. The concentration of particulate matter ranging from 2 to 100 μm diameter was determined using a Coulter Counter TA II with 100 and 400 μm orifice diameters.

Biogrid

A biological grid consisted usually of 5 stations on an onshore-offshore transect covering the center and the edges of an intrusion. Through intensive sampling we intended to find changes of biological parameters which could be caused by the moving intrusion. Later current meter data (Dr. Pietrafesa) would allow us to determine speed and direction of flow of the intrusion. During intensive sampling the cruise track goes back and forth, from the station nearest to the one farthest from shore, being repeated one to two times (Fig. 2.e.; BIO I). The procedure at each station was as follows: The rosette sampler with several Niskin bottles and CTD sensors was lowered from surface to near bottom to determine the vertical temperature profile which served in selecting the various depths at which sampling was to be done (intrusion, in and near the thermocline, near surface). These water samples were immediately or later analyzed for nutrients (nitrate, phosphate, silicate, ammonia), chlorophyll *in vivo* and *in vitro*, phytoplankton species composition, particulate organic carbon, and particle volume (Coulter Counter). This sampling was followed by one horizontal zooplankton tow each at 6 to 10 m depth (above thermocline) and at 2 to 5 m above the sea floor (in the intrusion).

RESULTS

The cruise tracks and the time sequence of our cruises in July/August 1976 are shown in Figure 2 and Table I, respectively.

The horizontal distributions of chlorophyll a, particle volume and temperature for the hydrogrids are presented in Figs. 3 to 5. The data for the near bottom distribution (in intrusions) indicate that high chlorophyll, high particle volume and low temperature coincide.

Highest values for chlorophyll and particle volume were almost always found near the bottom (Figs. 6 to 8, Tables II and III). Intruding waters are characterized by chlorophyll and particle volume concentrations which are between 2.5 to 6 times higher than those found in surface waters.

Particulate organic carbon (POC) was measured in three fraction: those passing 30 and 180 μm mesh and no mesh. Particulate matter passing 30 μm mesh is available to appendicularia and nauplii of *Paracalanus* and *Temora*. 180 μm mesh should retain most of the zooplankton except early naupliar stages of small copepods. POC concentrations in intrusions are up to four times higher than those in surface waters (Table IV). The POC near the surface consists mainly of small particles whereas generally over 50% of the intrusion-POC does not pass 30 μm mesh.

Zooplankton biomass was determined by drying a fraction of the sample (between 1/8 and 1/2) for at least 48 hours at 60^{o}C followed by weighing, ashing for 4 hours at 500^{o}C and again weighing.

The zooplankton biomass data show no clear trend in the vertical distribution (Table V). During Biogrids I, II and III we found at most stations higher densities near surface whereas during Biogrid IV at 9 out of 12 stations the near bottom biomass was higher.

DISCUSSION AND CONCLUSION

The important finding of the hydro- and biogrids was the relationship between temperature, chlorophyll and particle volume in bottom waters. This is most noticeable on Hydrogrids II and IV, and Biogrids I, III and IV.

The analysis of phytoplankton (Inverted Microscope) and zooplankton samples (Dissecting Microscope) so far points towards distinct plant populations associated with the intruded waters. Certain zooplankters (*Oncaea* sp. and *Corycaeus* sp.) are far more abundant in intrusions than in surface waters. Large concentrations of copepods (over 5800 *Paracalanus* x m^{-3}) were found at times in intrusions. There seems to be an important link between the quantity and quality of continental shelf primary and secondary production.

Any conclusions on the productivity and phyto- zooplankton interactions in intrusions have to wait until all our samples are analyzed. We furthermore need the current meter and hydrographic data for the synthesis of our results from the Summer 1976 cruises.

We realize that our efforts have to be continued to understand the physical-chemical-biological relationships which are important to any considerations of energy related developments on the continental shelf. We have to assess the frequency and volume of biological productivity in intrusions, characterize regional differences, and study the origin and succession of the plankton community and its impact on higher trophic levels.

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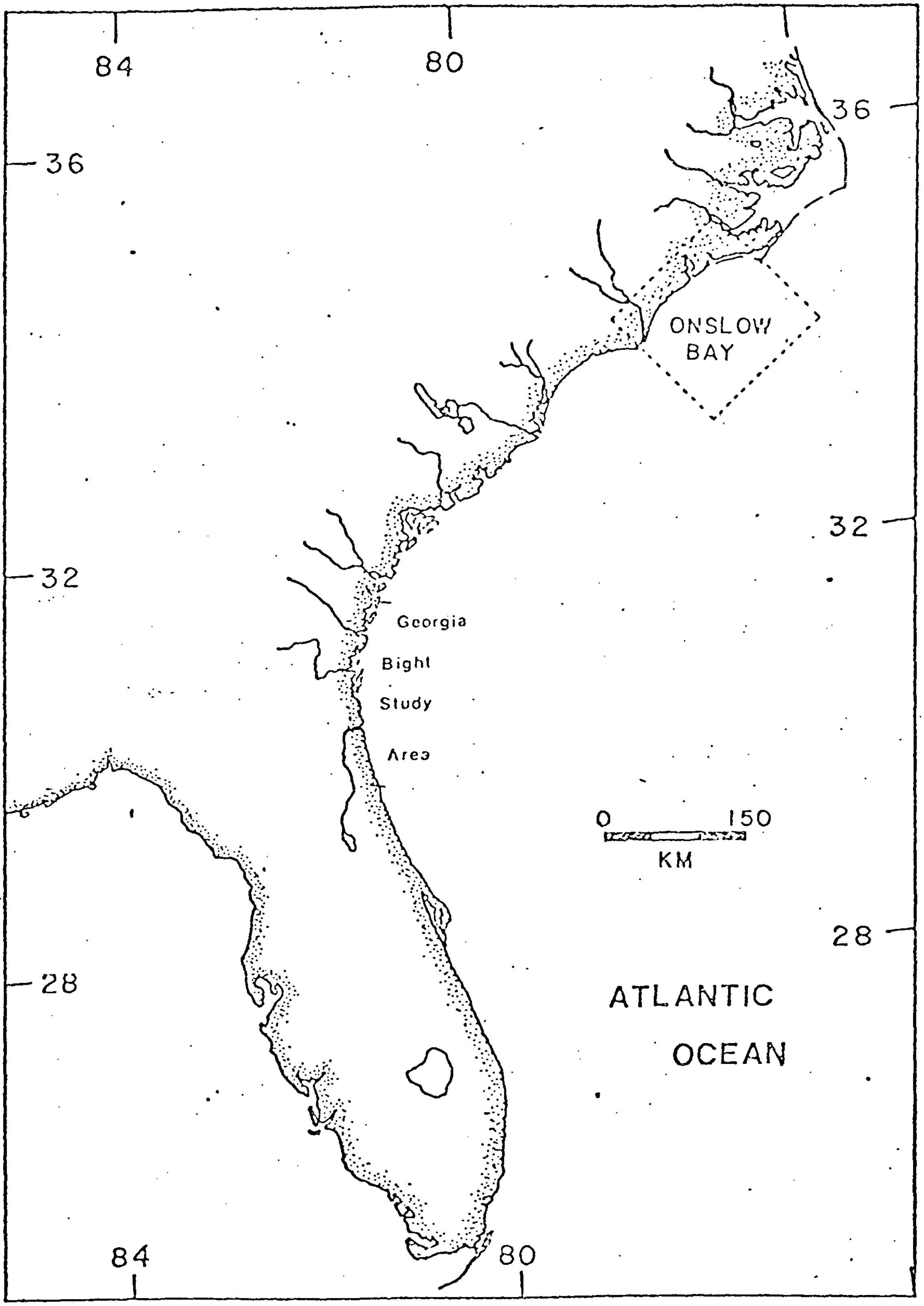

Figure 1. Study area

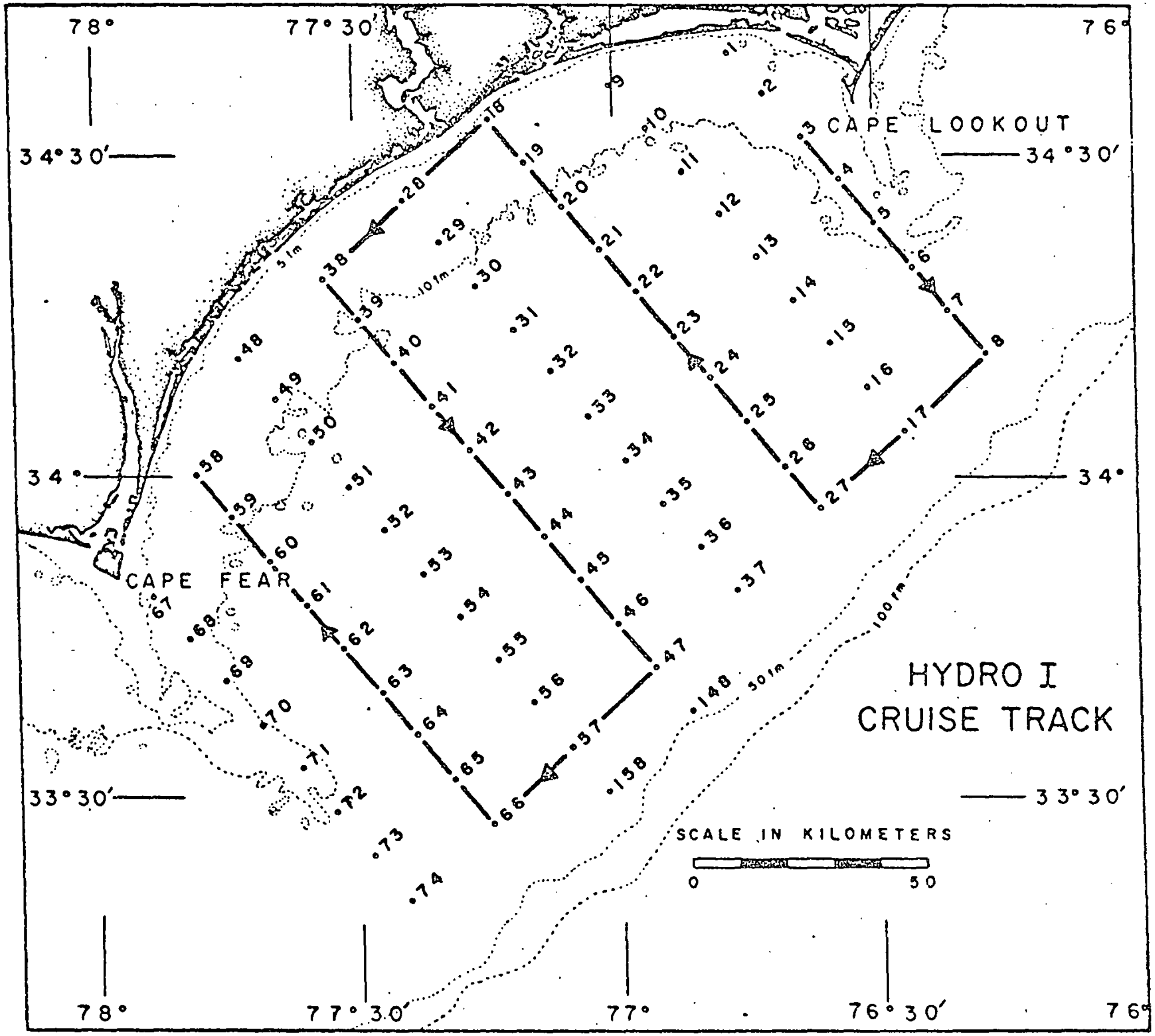

Figure 2a. Hydrogrid I Cruise Track

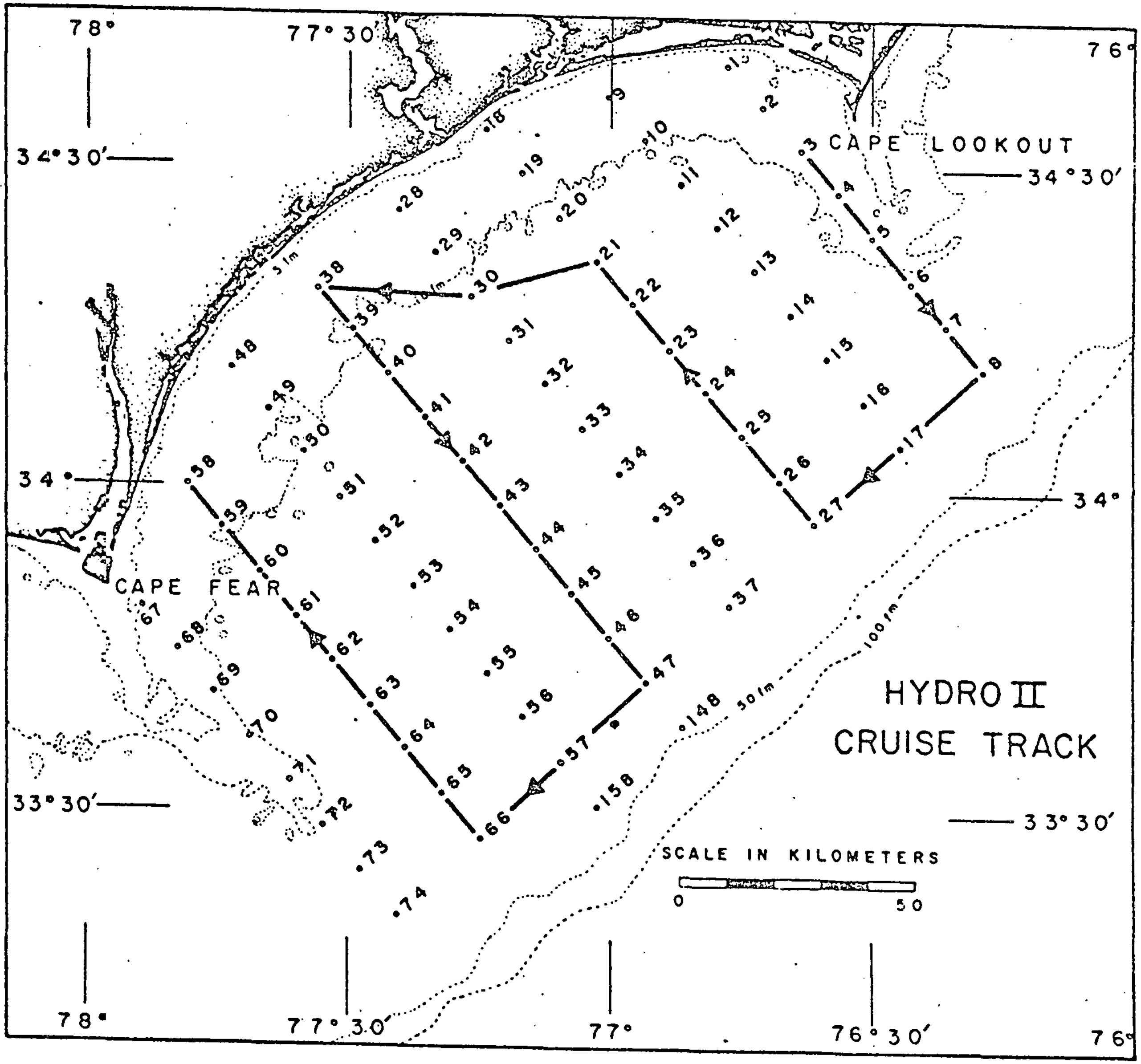

Figure 2b. Hydrogrid II Cruise Track

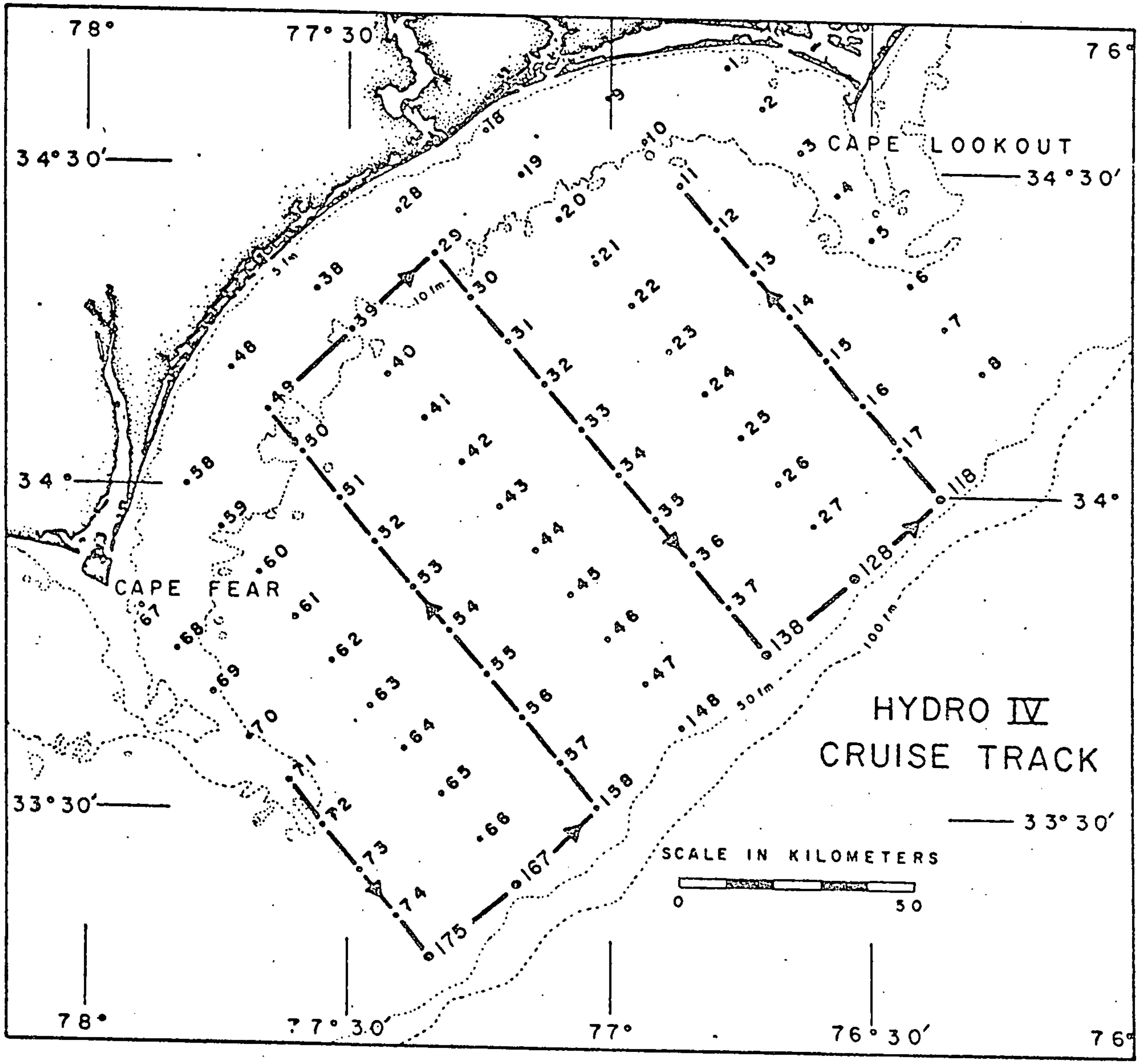

Figure 2d. Hydrogrid IV Cruise Track

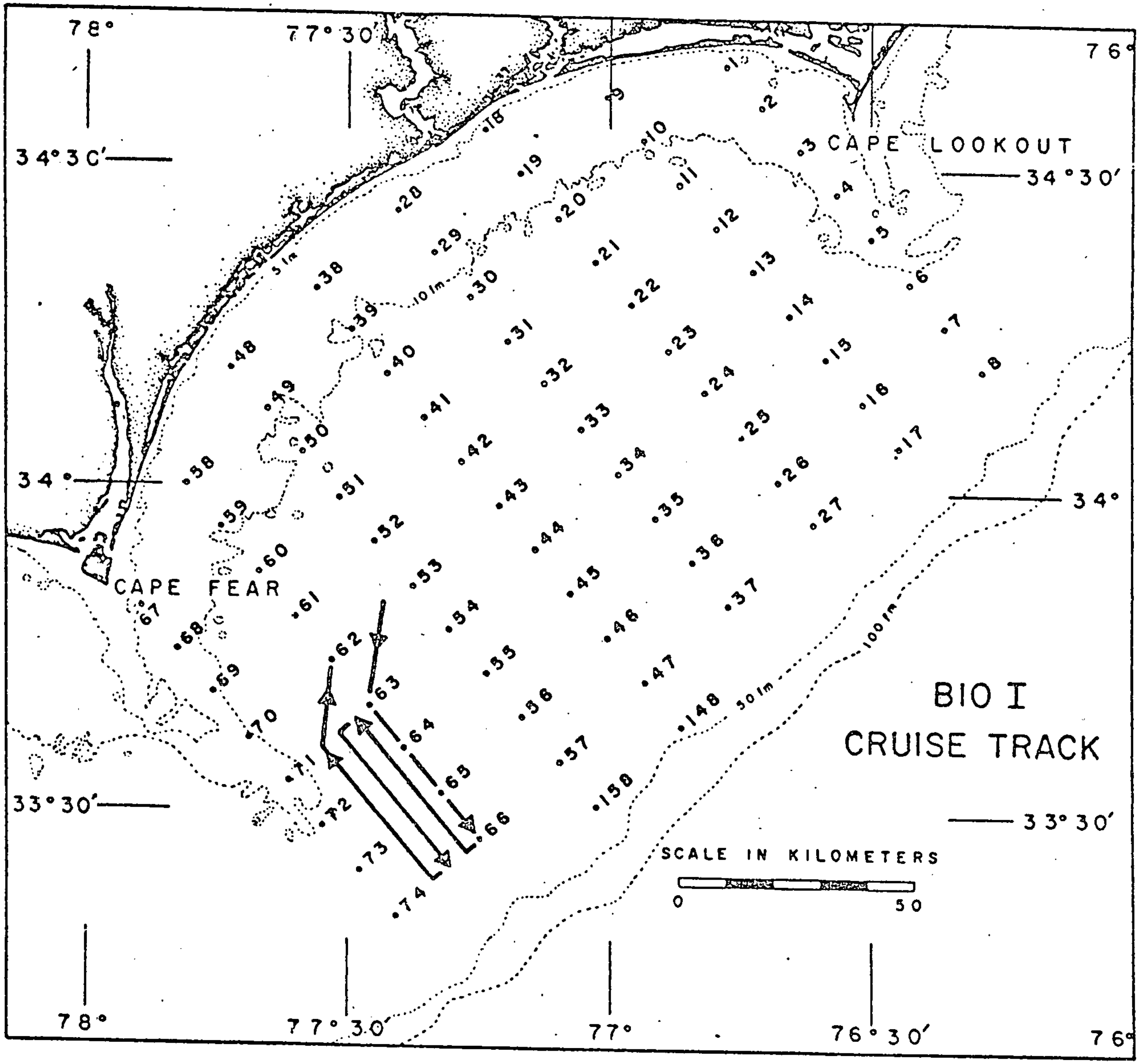

Figure 2e. Biogrid I Cruise Track

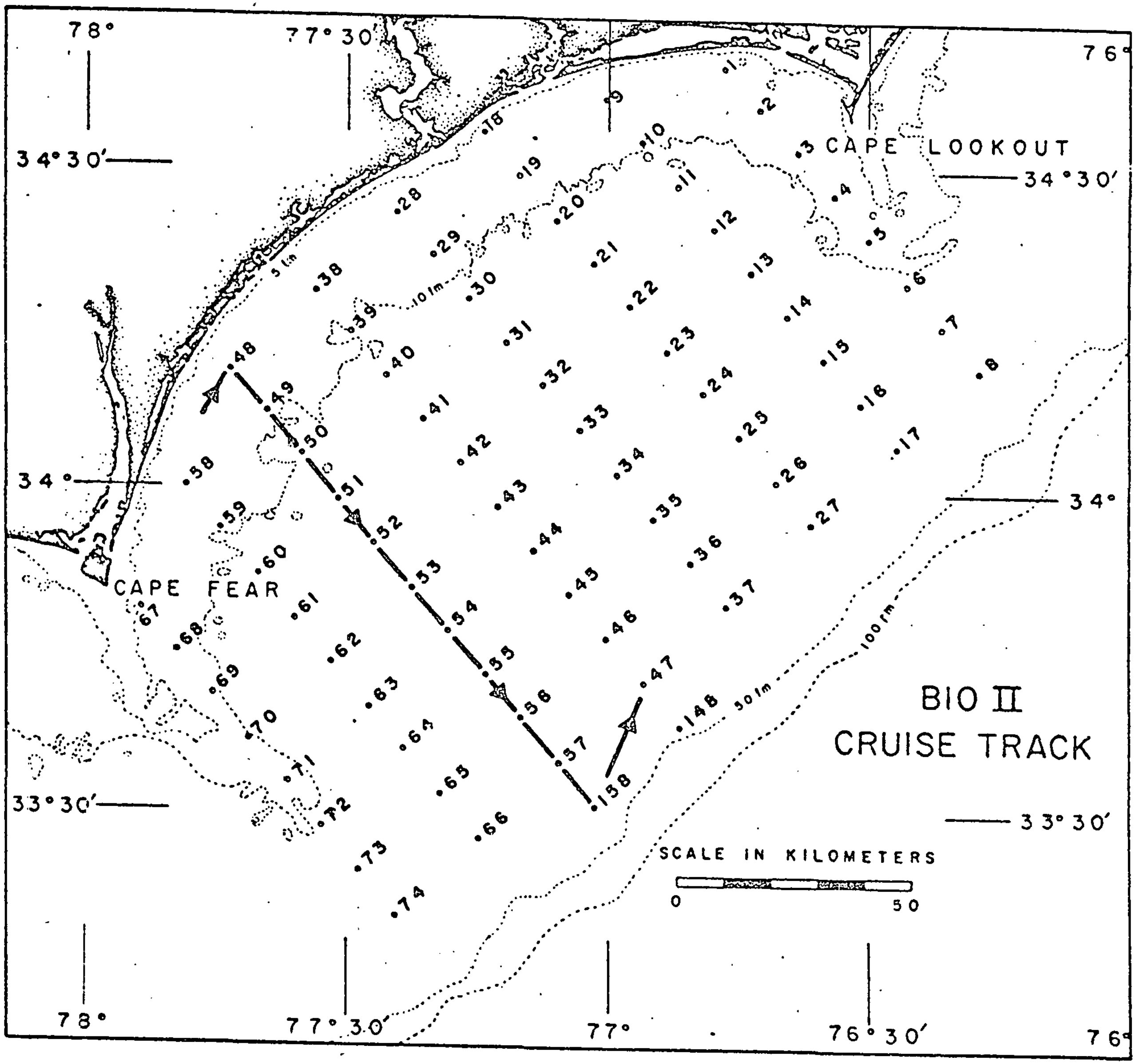

Figure 2f. Biogrid II Cruise Track

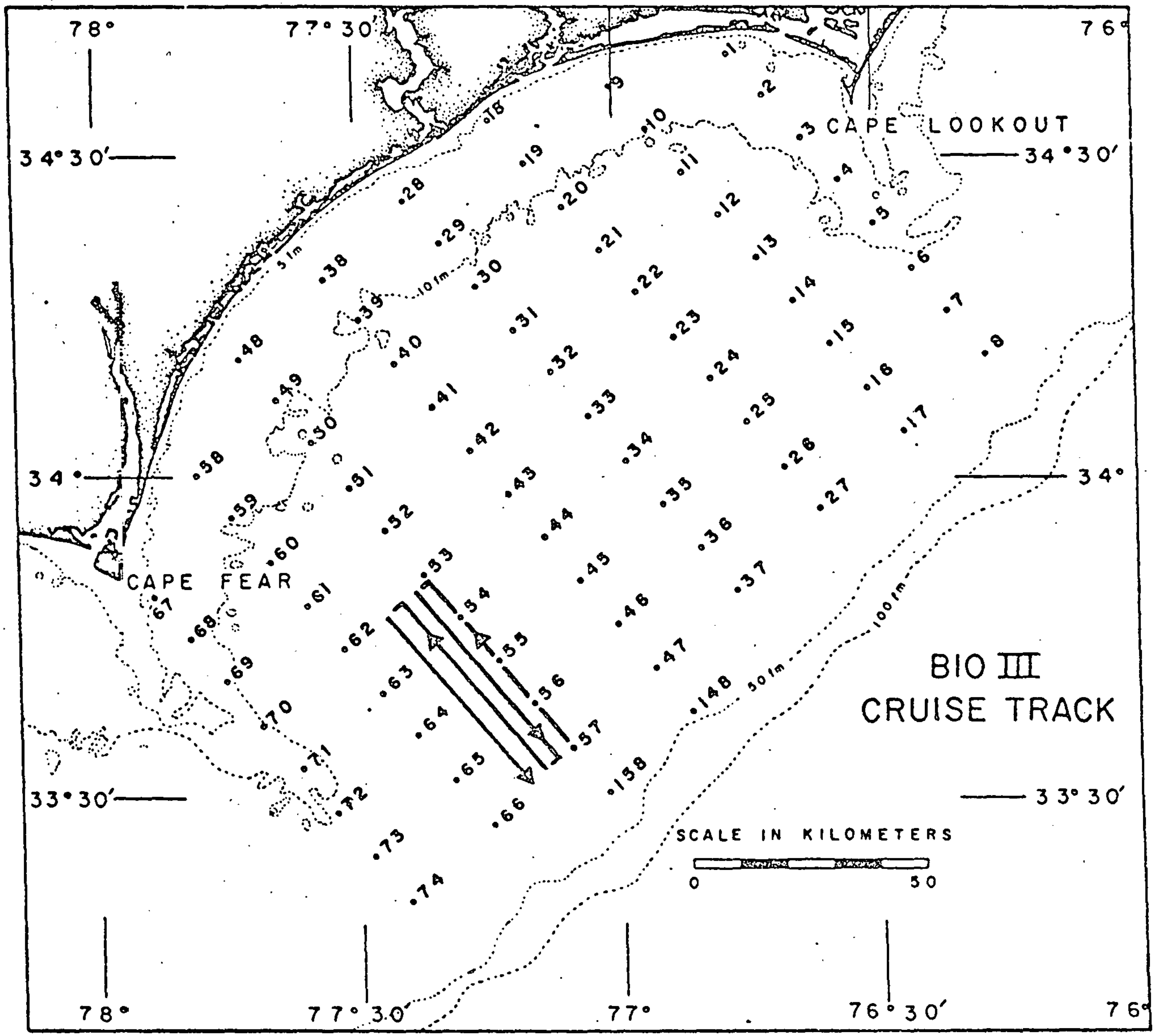

Figure 2g. Biogrid III Cruise Track

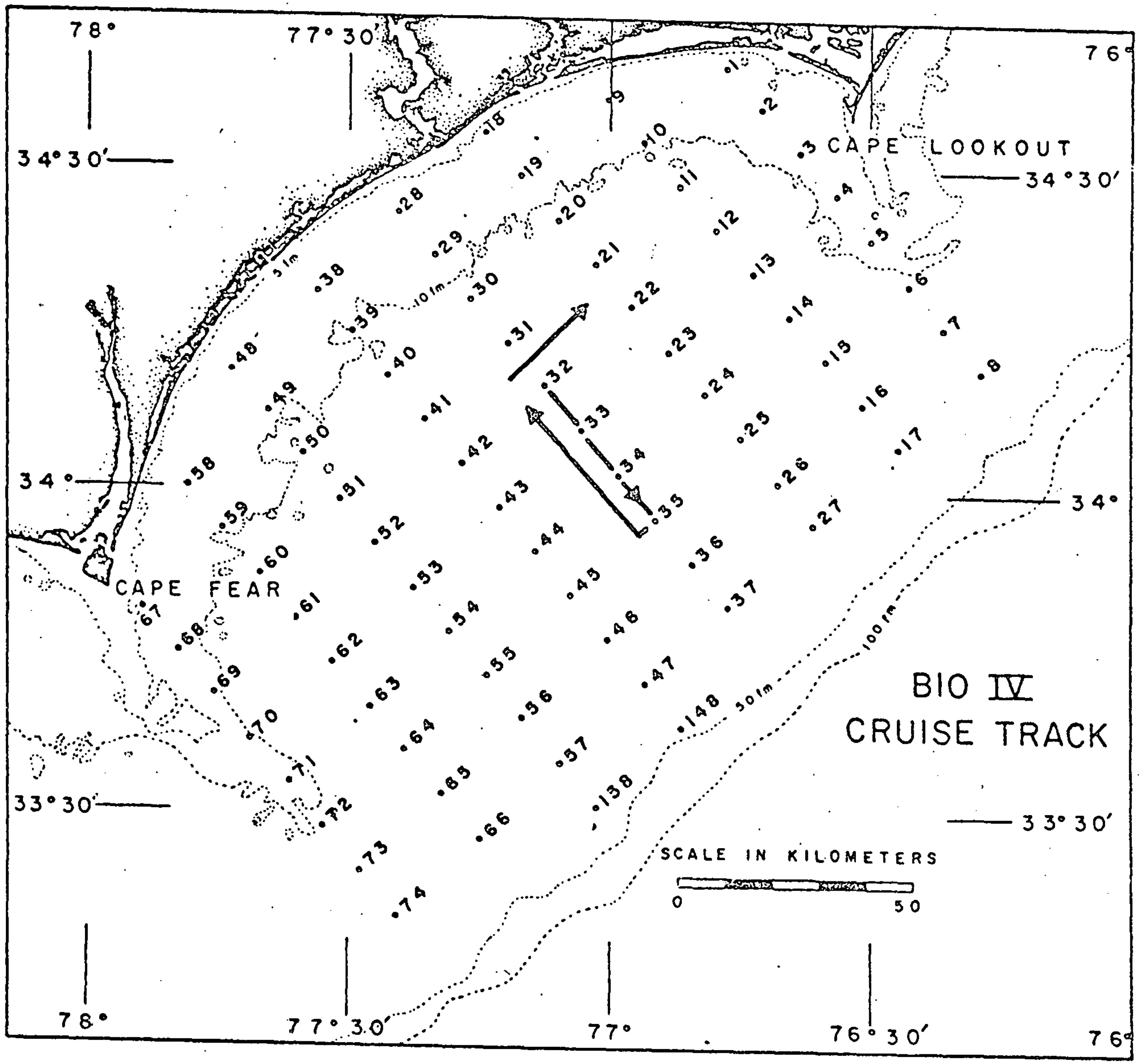

Figure 2h. Biogrid IV Cruise Track

TABLE I

TIME TABLE OF CRUISES IN SUMMER 1976

July 13-15	Hydrogrid I
July 17-18	Biogrid I
July 21-23	Hydrogrid II
July 23	Biogrid II
August 4-5	Hydrogrid III (XBT)
August 5-6	Biogrid III
August 14-15	Hydrogrid IV
August 15-16	Biogrid IV
August 18	Biogrid V

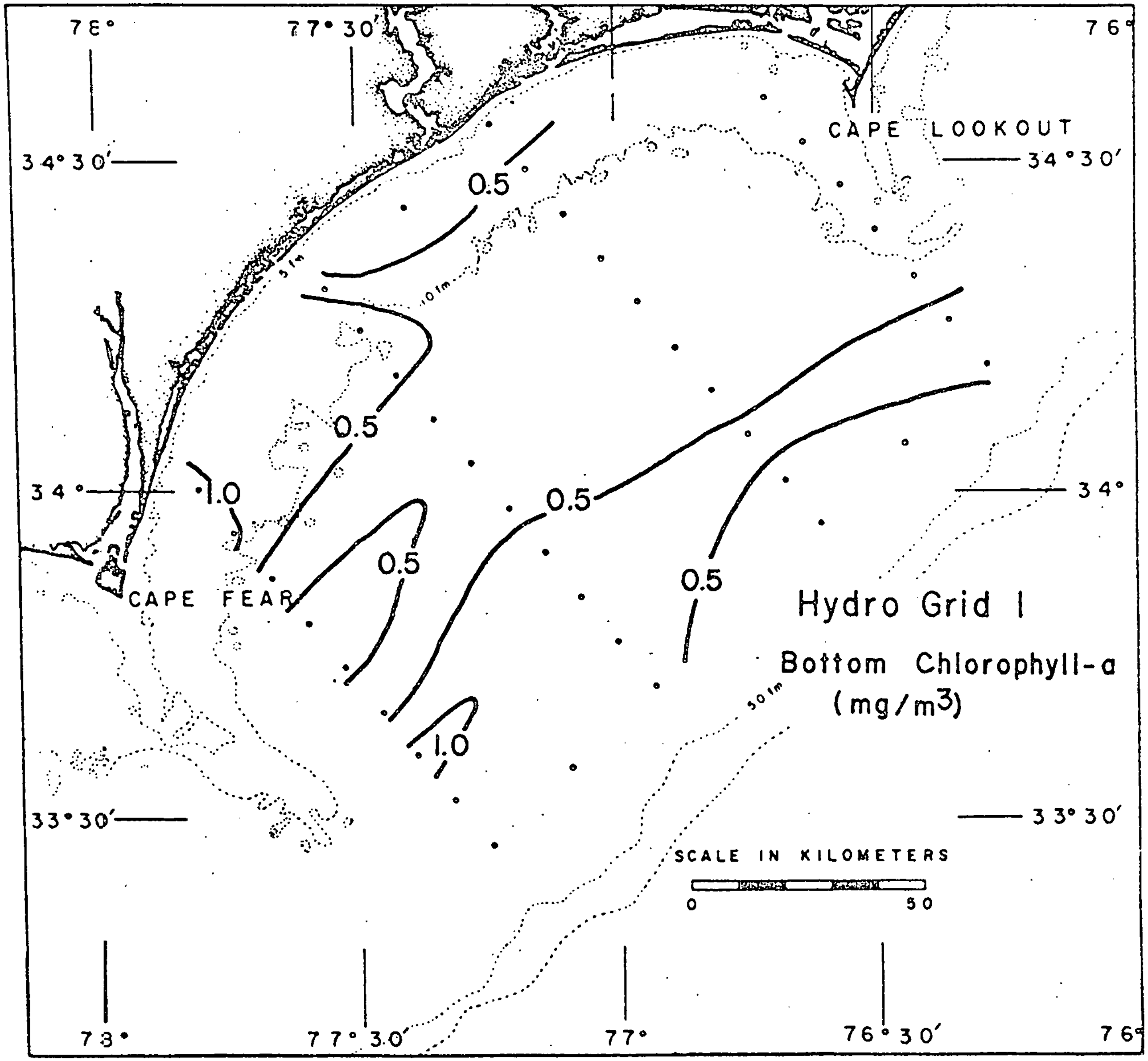

Figure 3a. Bottom Chlorophyll
(Hydrogrid I)

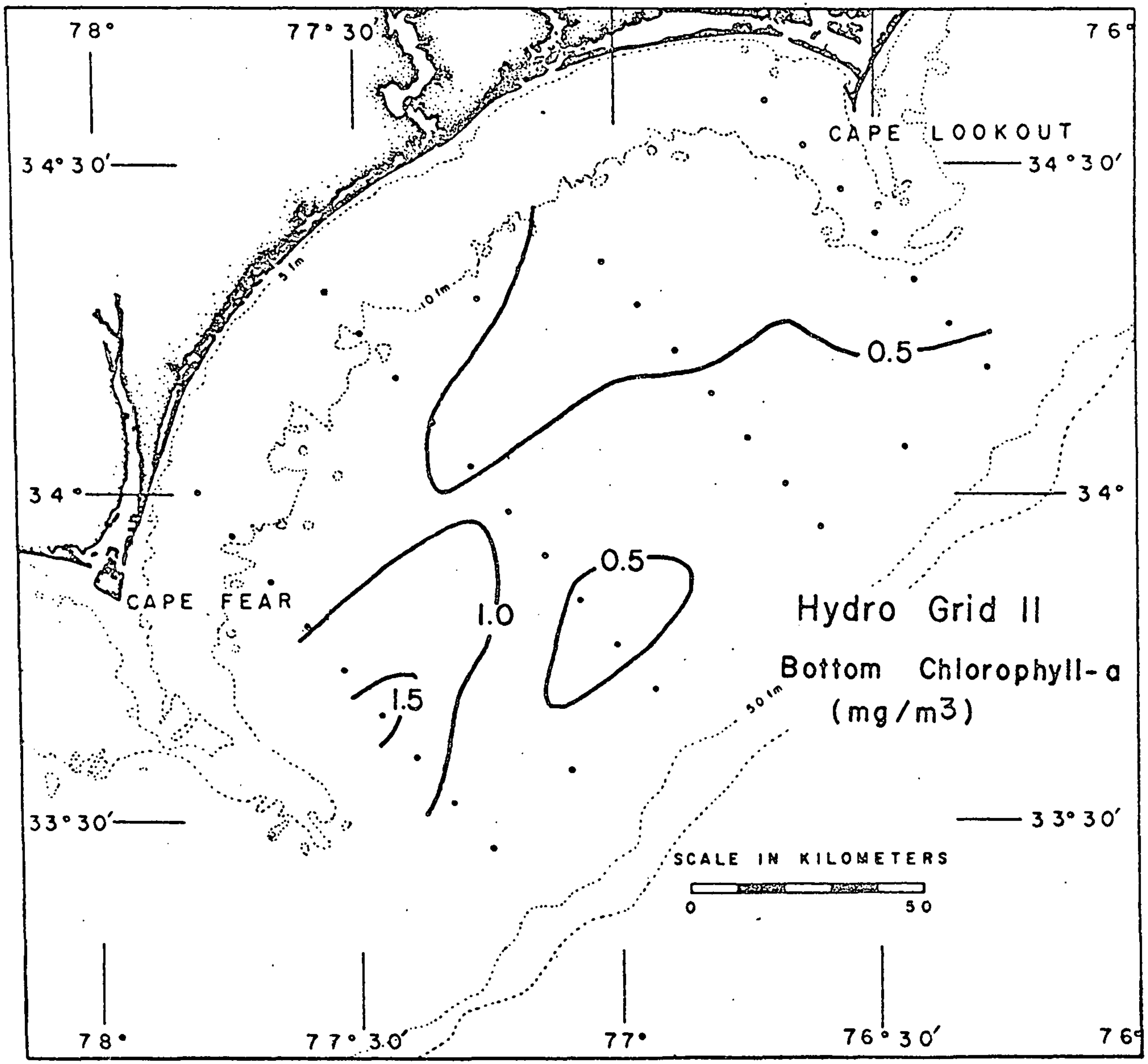

Figure 3b. Bottom Chlorophyll
(Hydrogrid II)

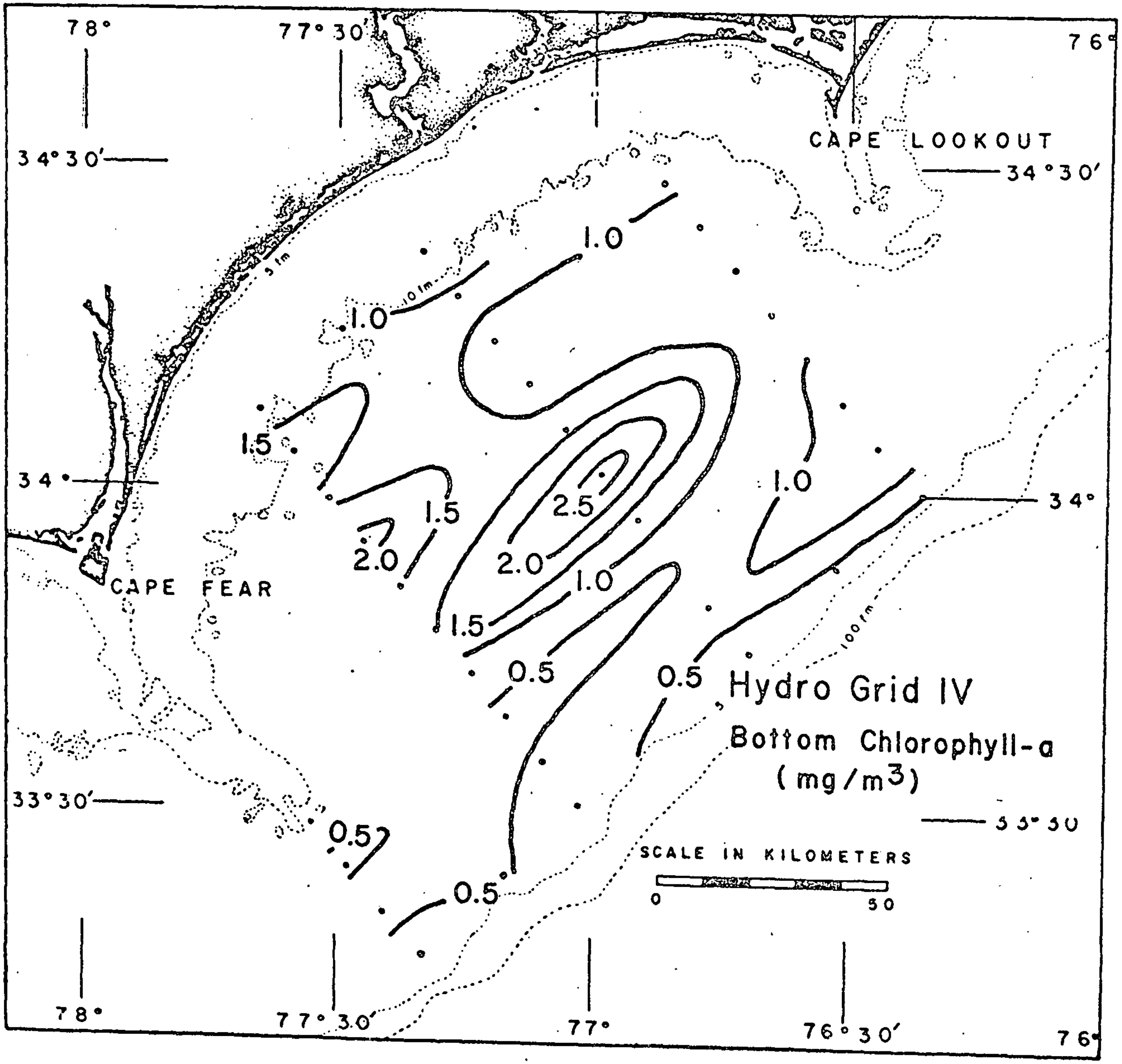

Figure 3c. Bottom Chlorophyll
(Hydrogrid IV)

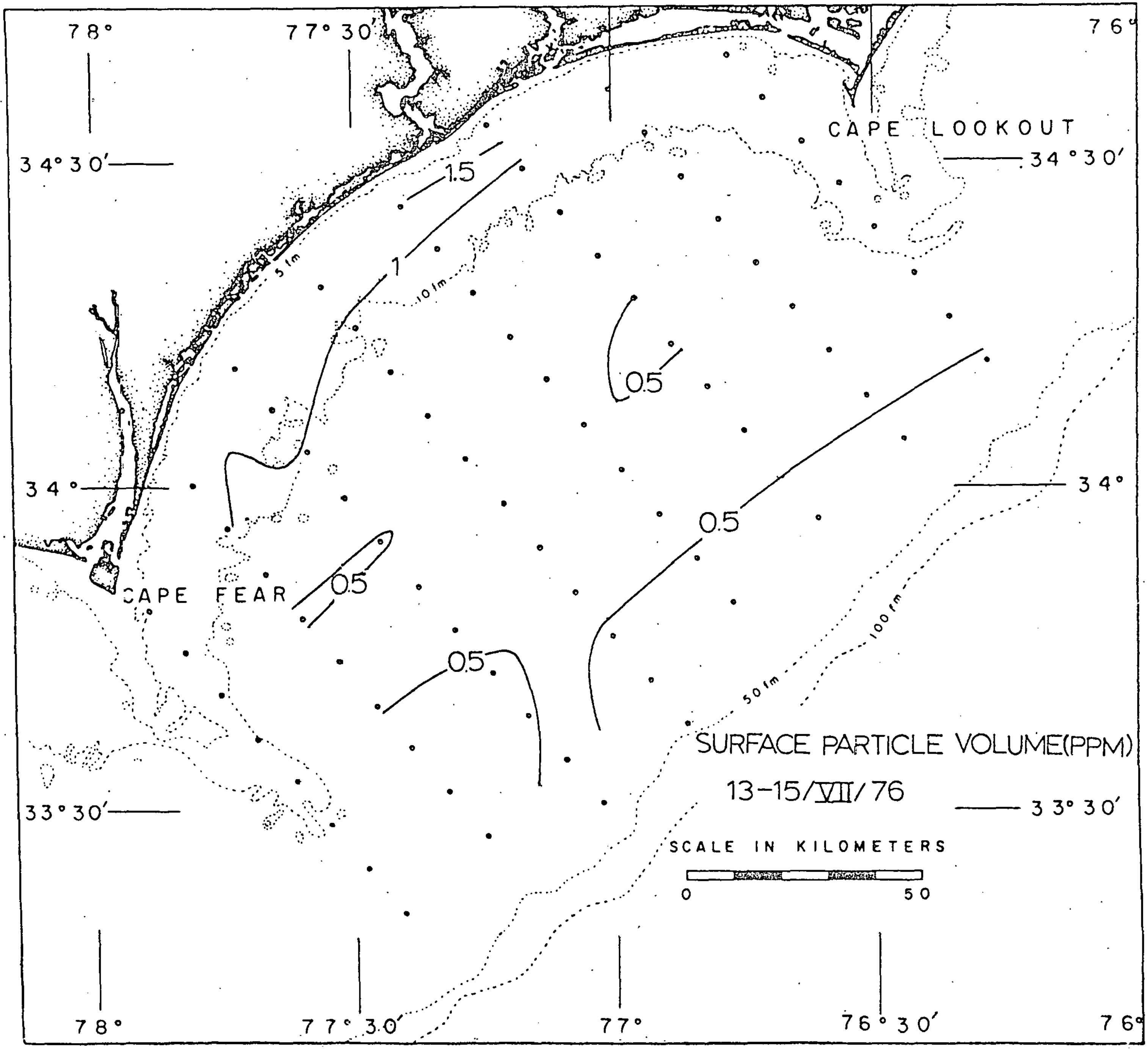

Figure 4a. Surface Particle Volume
(Hydrogrid I)

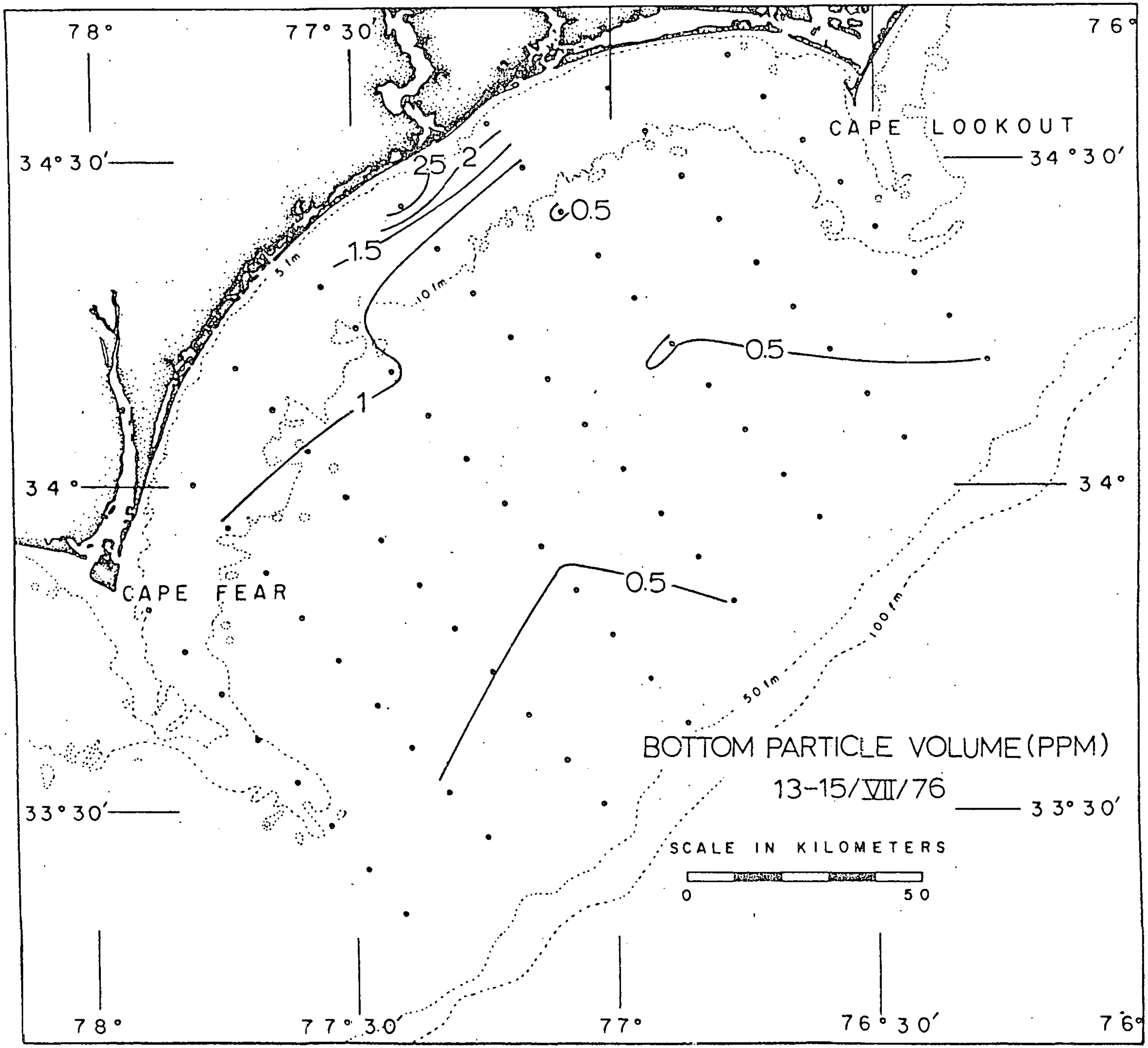

Figure 4b. Bottom Particle Volume
(Hydrogrid I)

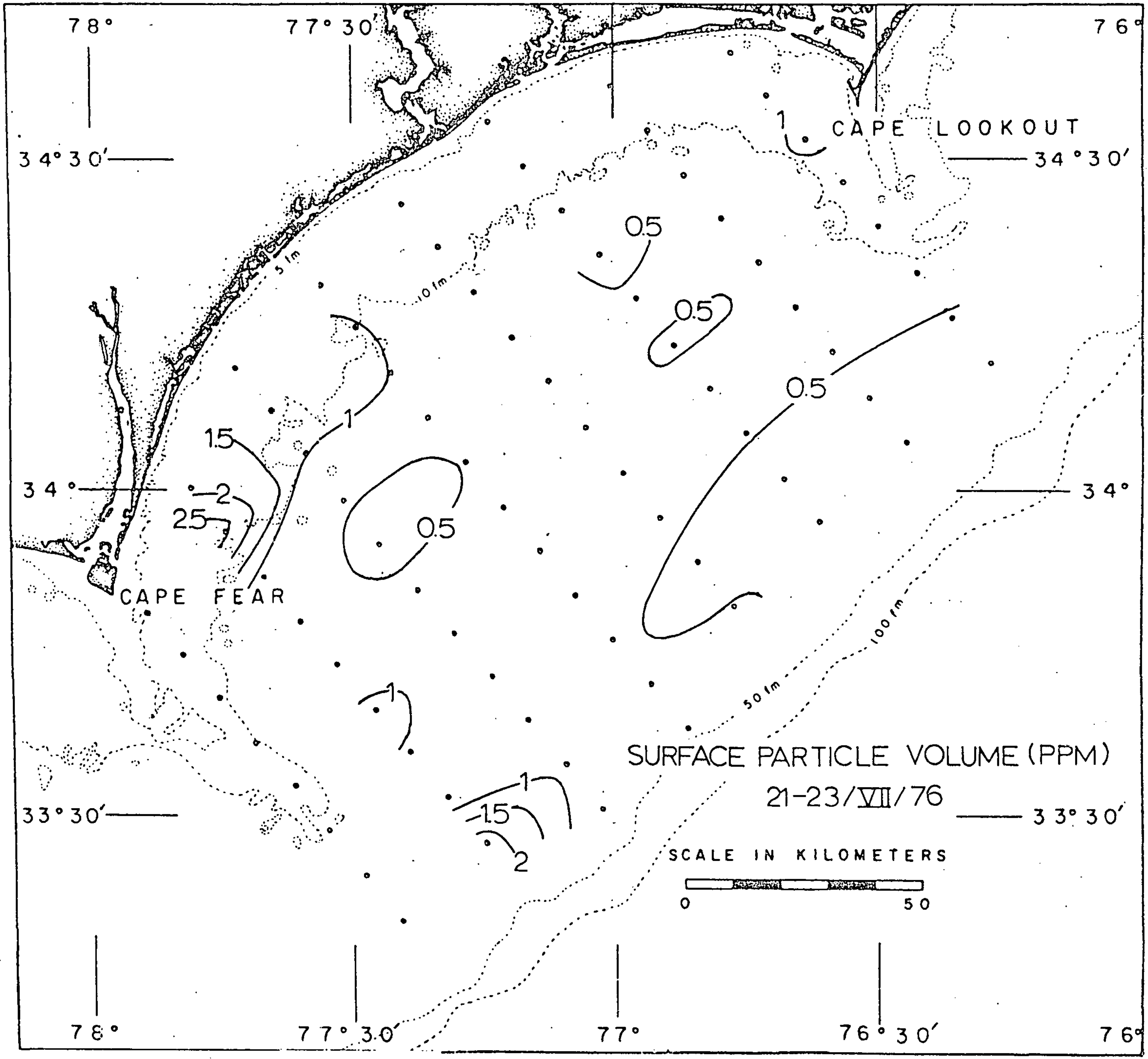

Figure 4c. Surface Particle Volume (Hydrogrid II)

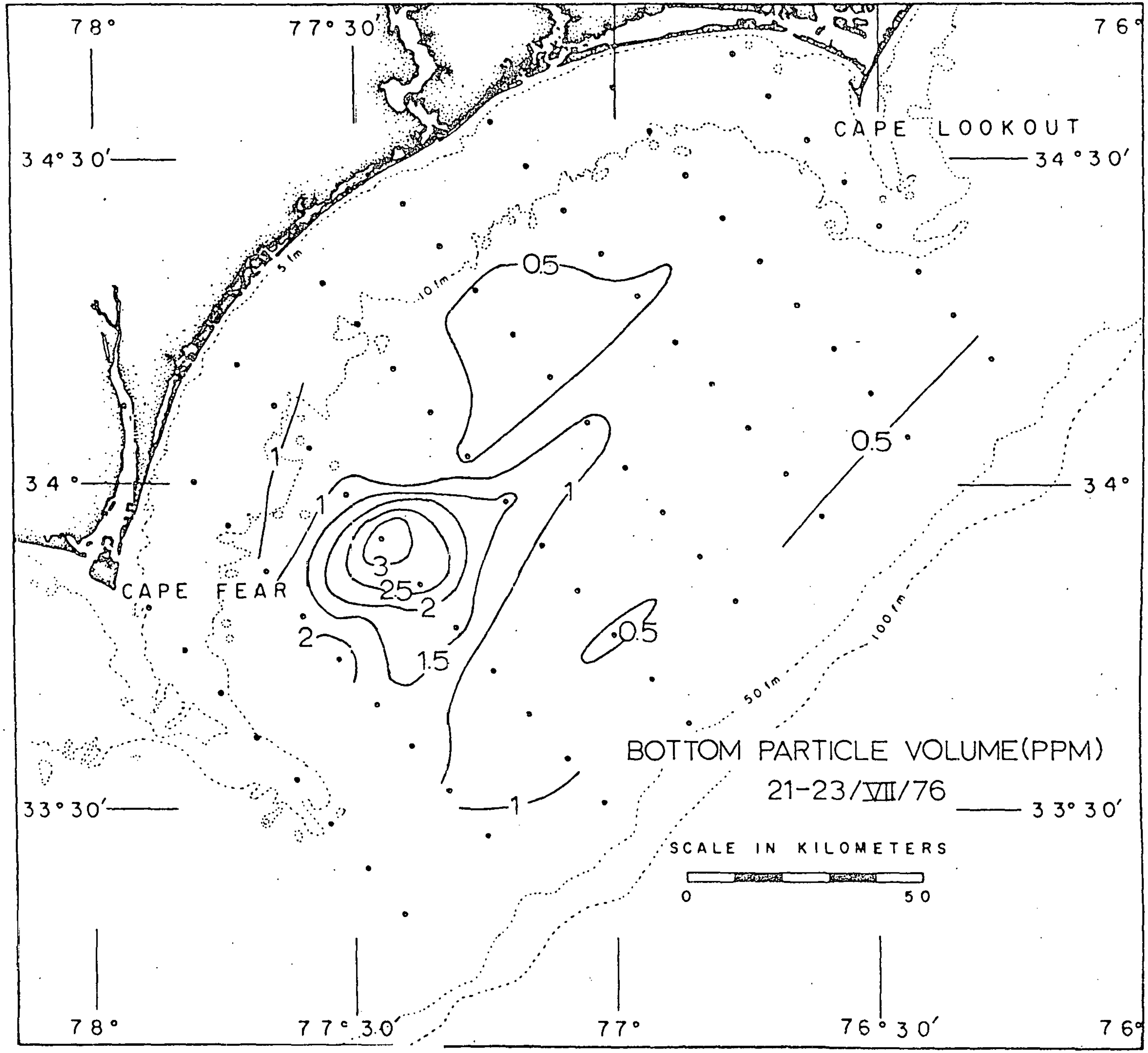

Figure 4d. Bottom Particle Volume
(Hydrogrid II)

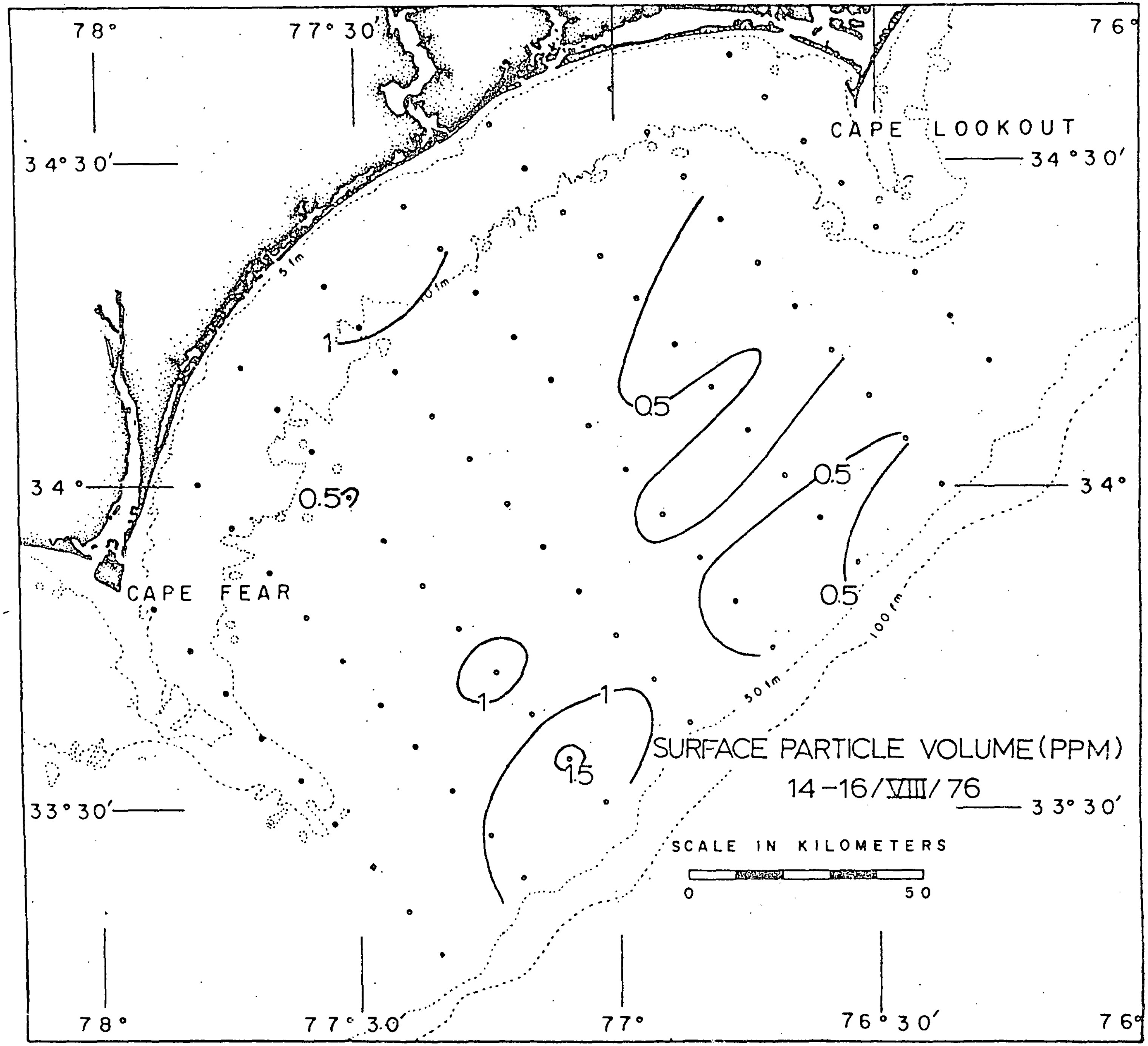

Figure 4e. Surface Particle Volume
(Hydrogrid IV)

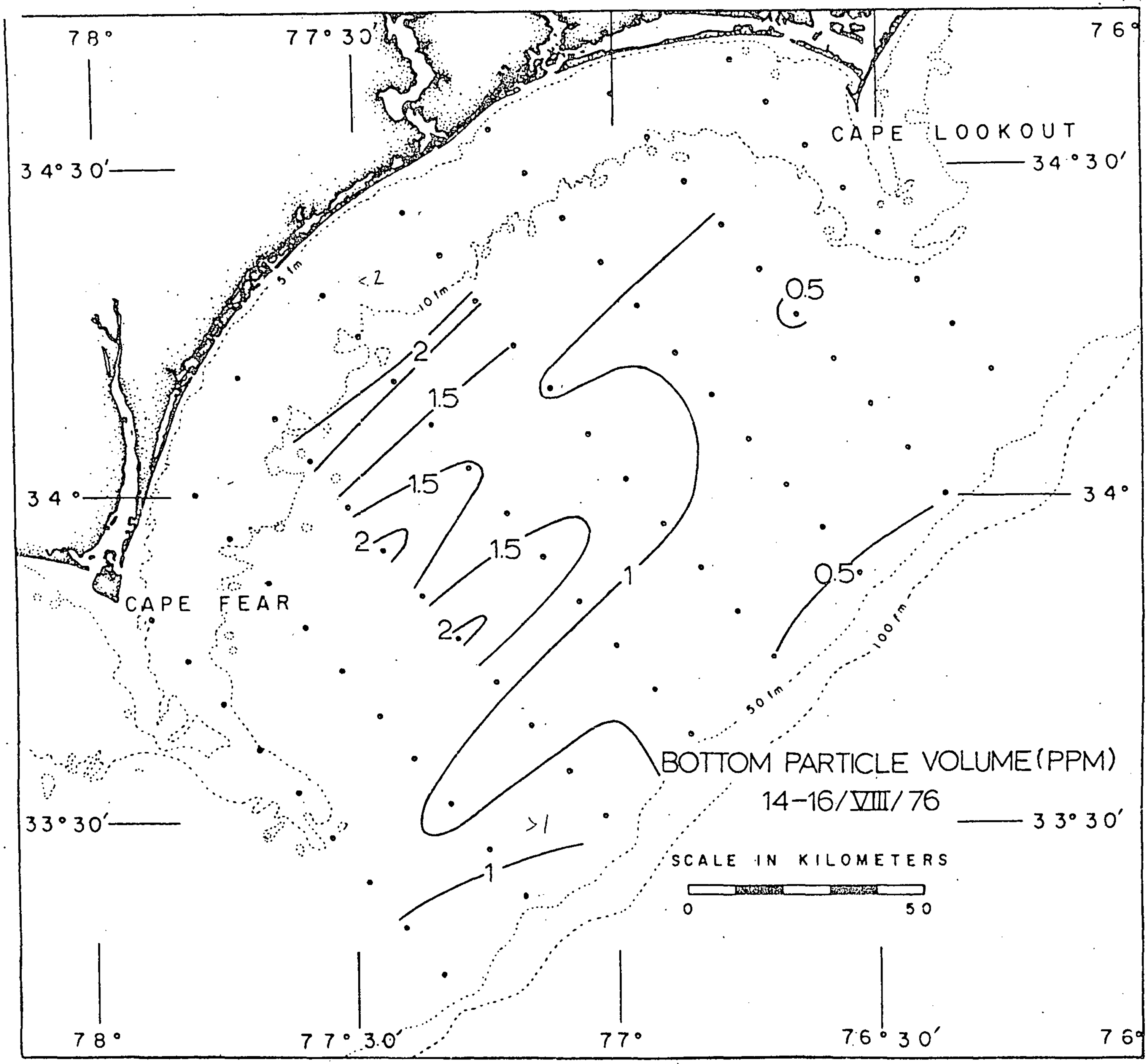

Figure 4f. Bottom Particle Volume
(Hydrogrid IV)

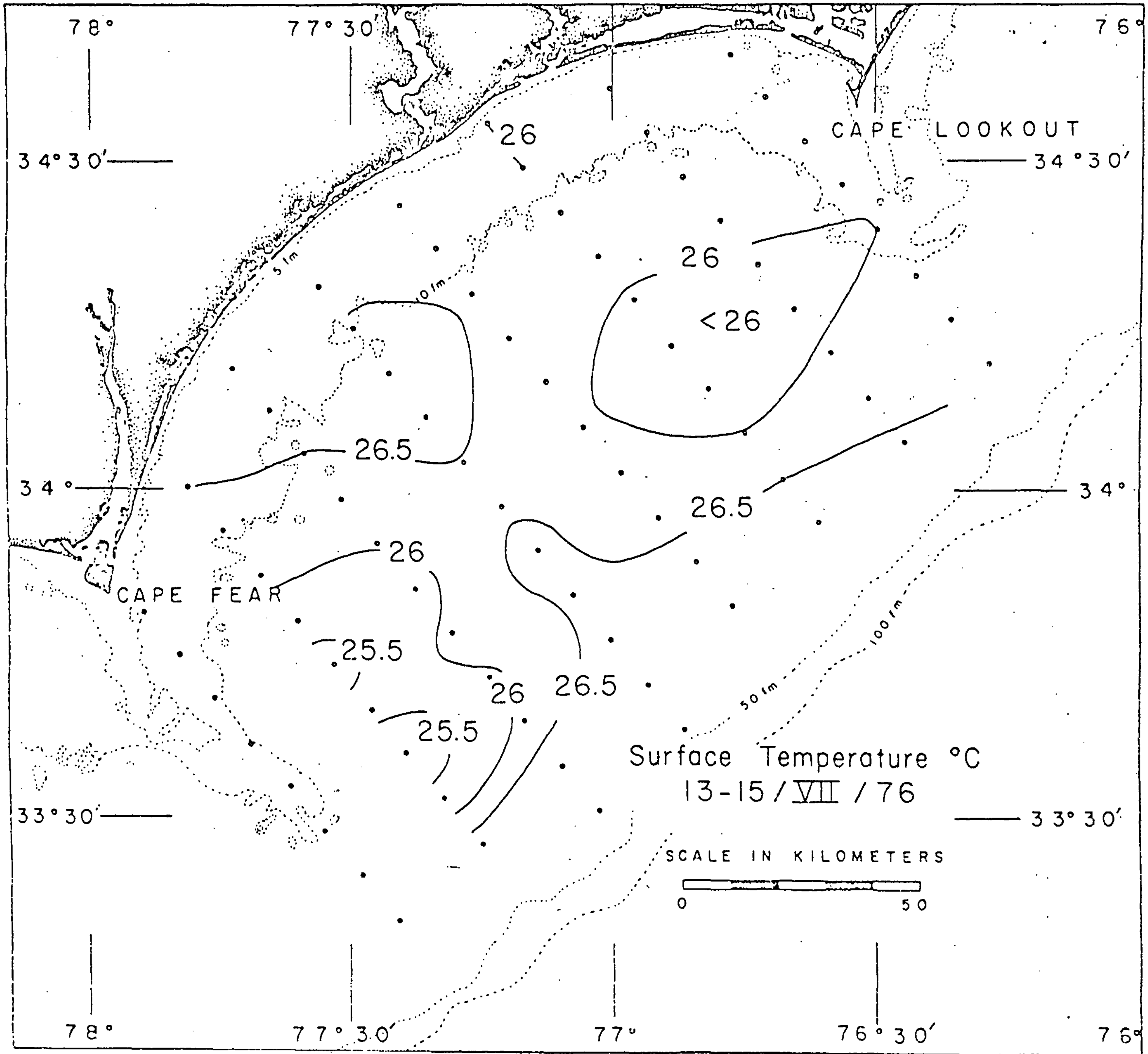

Figure 5a. Surface Temperature
(Hydrogrid I)

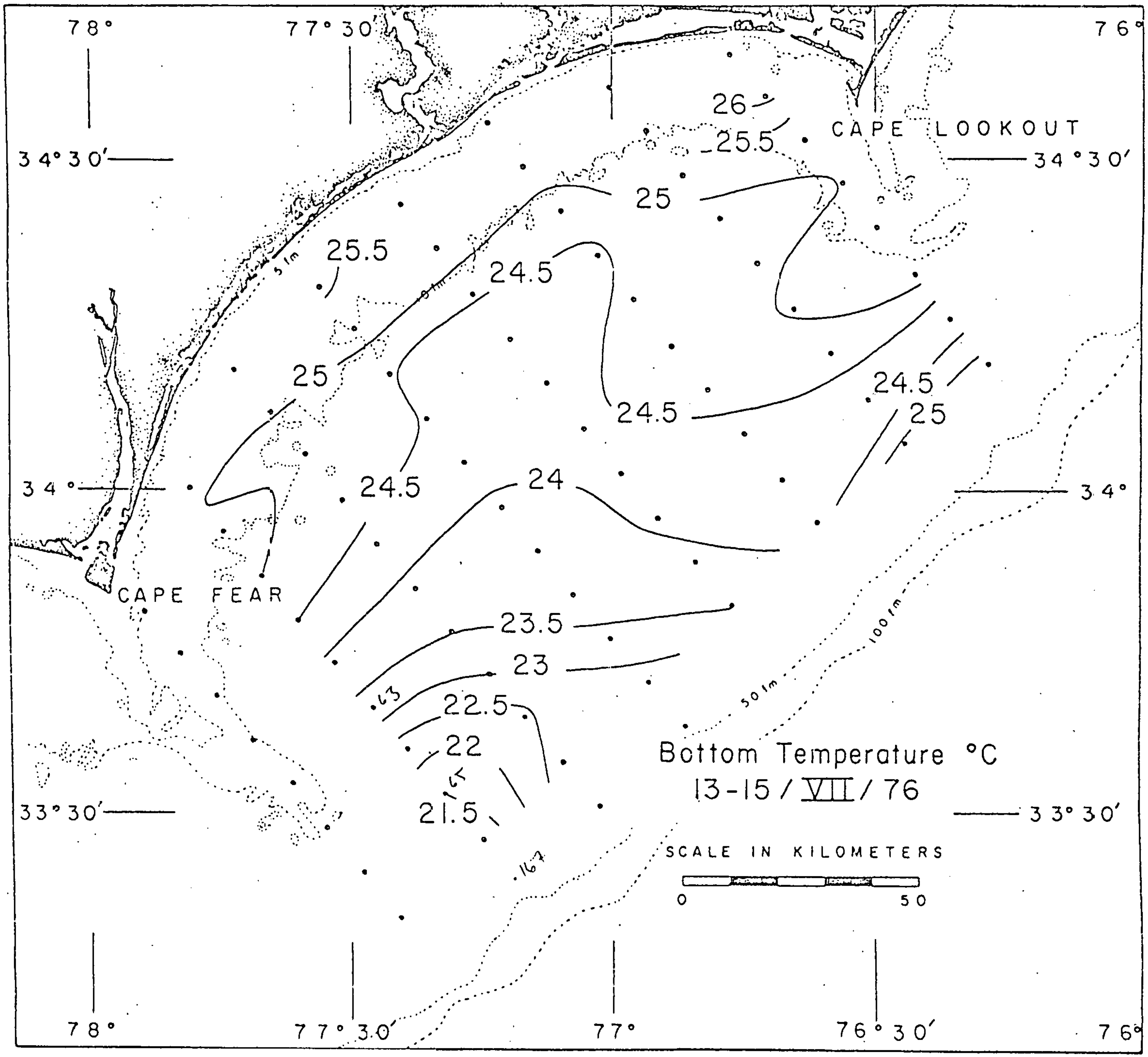

Figure 5b. Bottom Temperature
(Hydrogrid I)

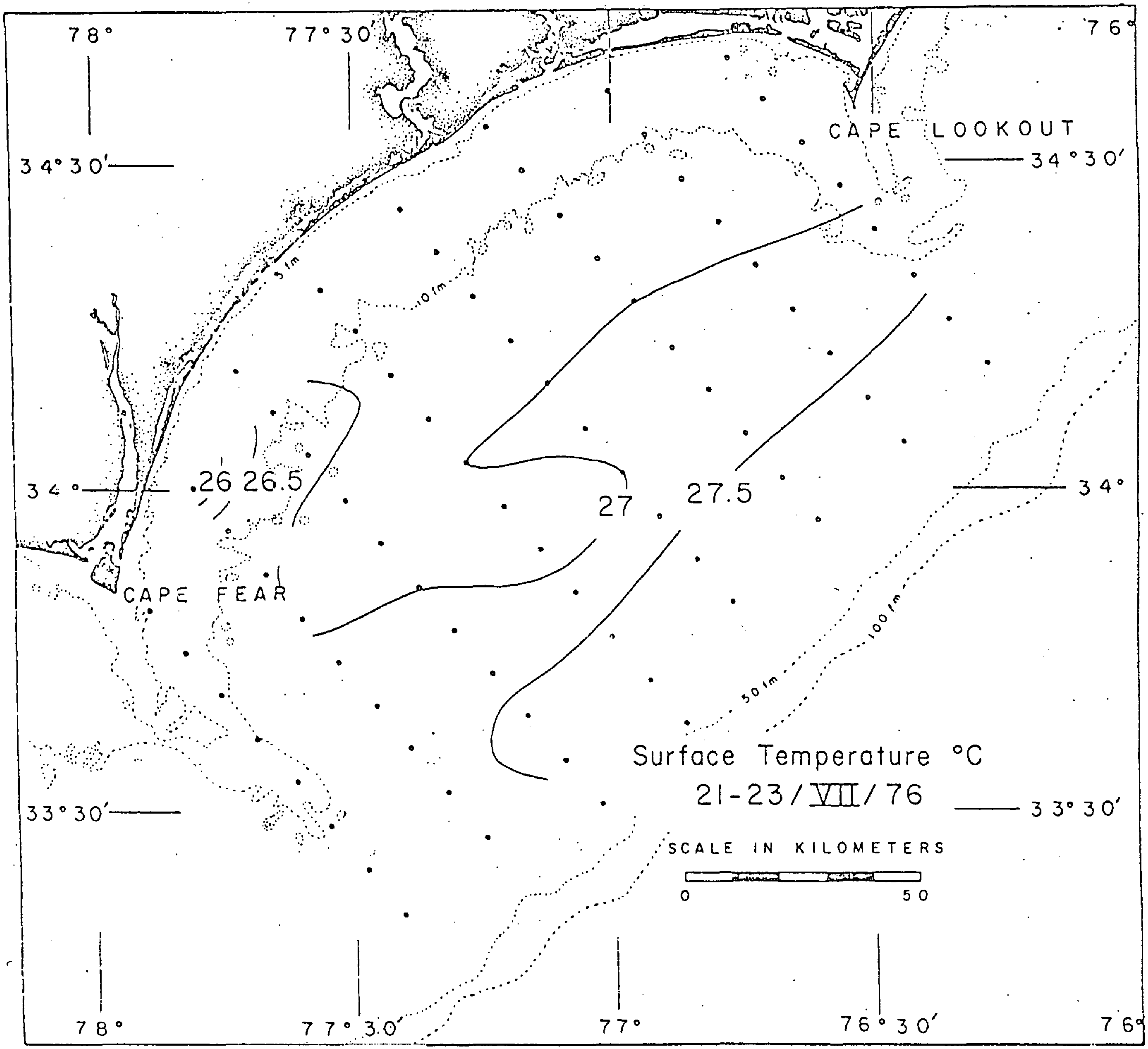

Figure 5c. Surface Temperature
(Hydrogrid II)

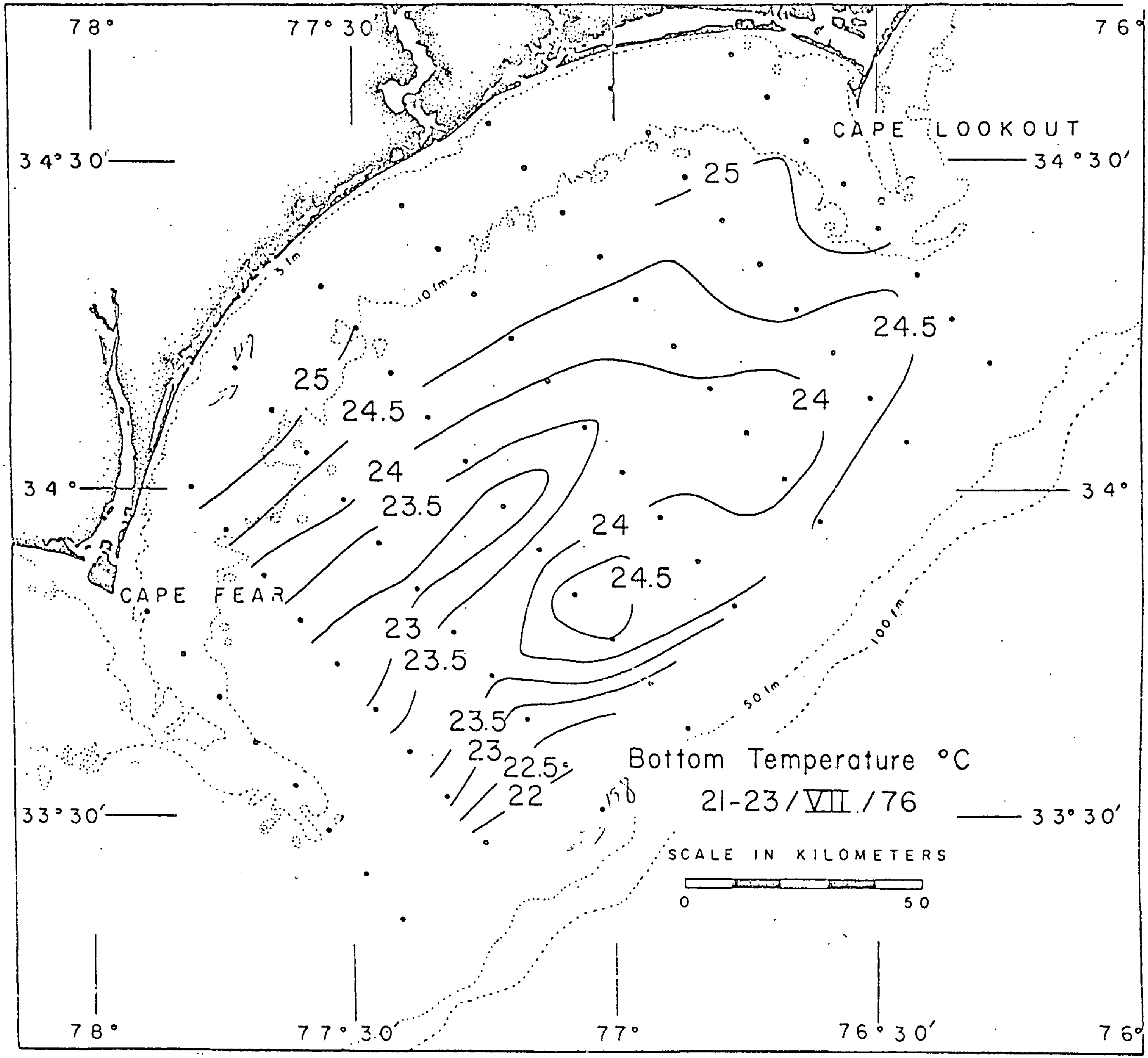

Figure 5d. Bottom Temperature (Hydrogrid II)

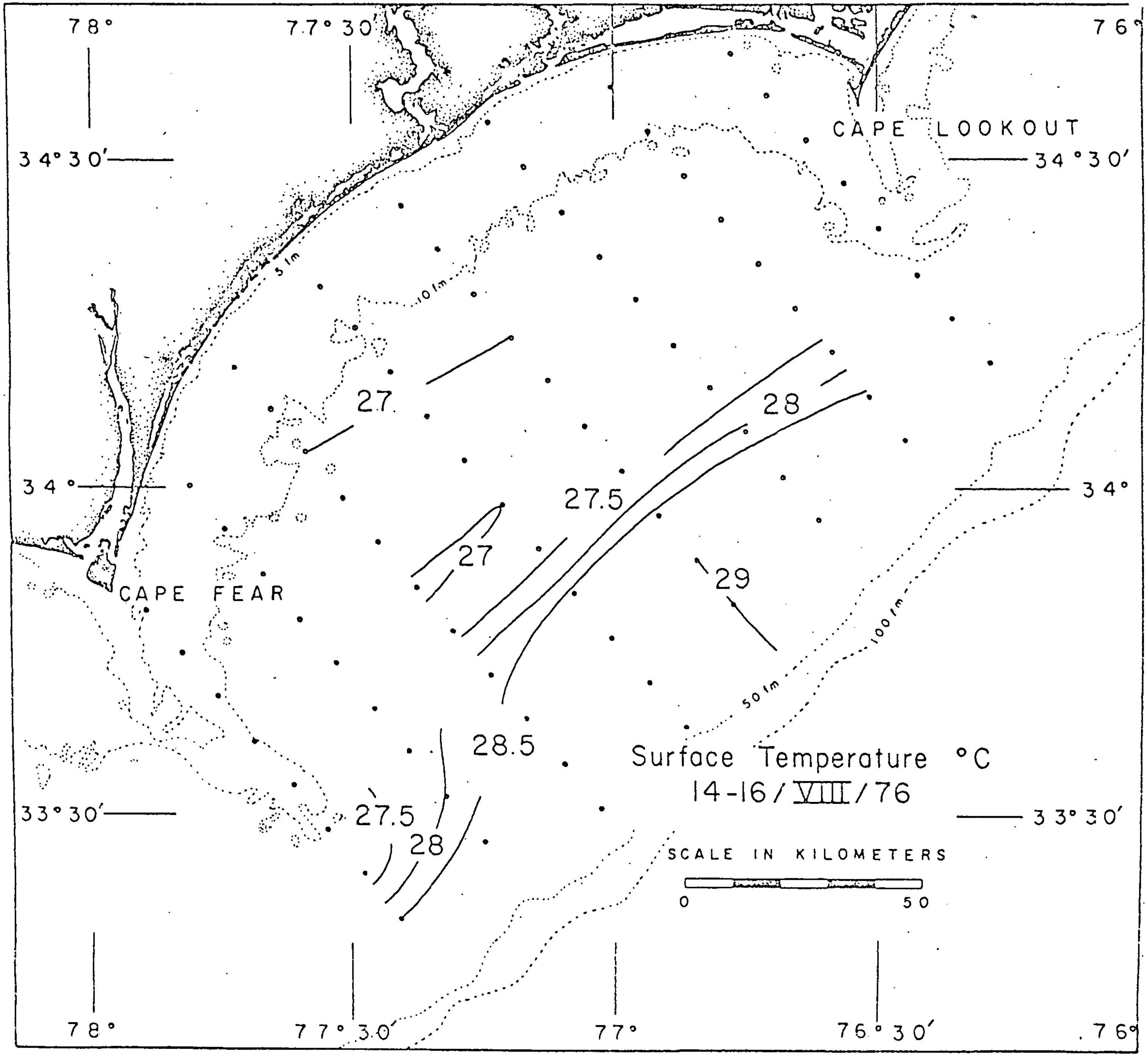

Figure 5e. Surface Temperature
(Hydrogrid IV)

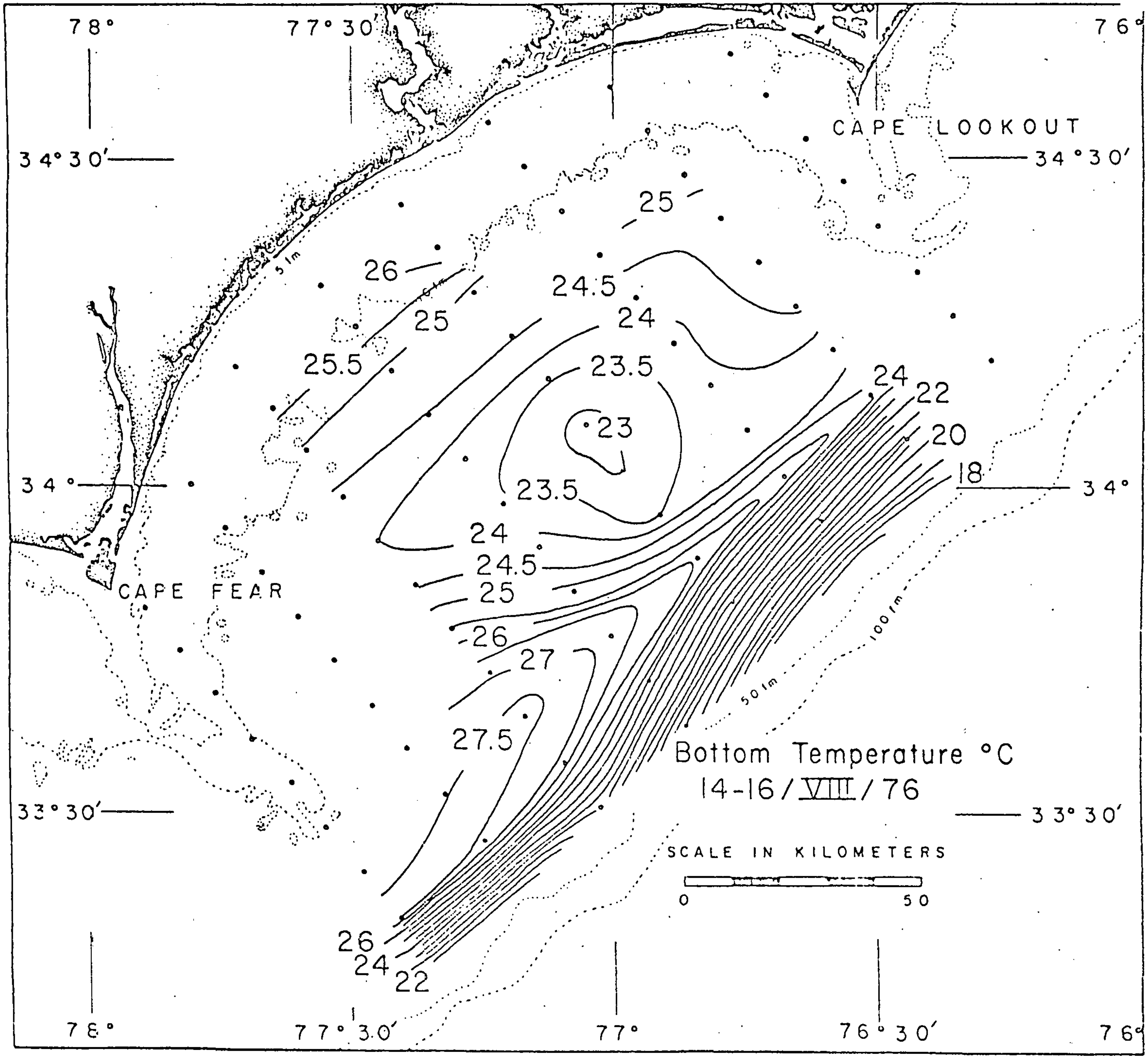

Figure 5f. Bottom Temperature
(Hydrogrid IV)

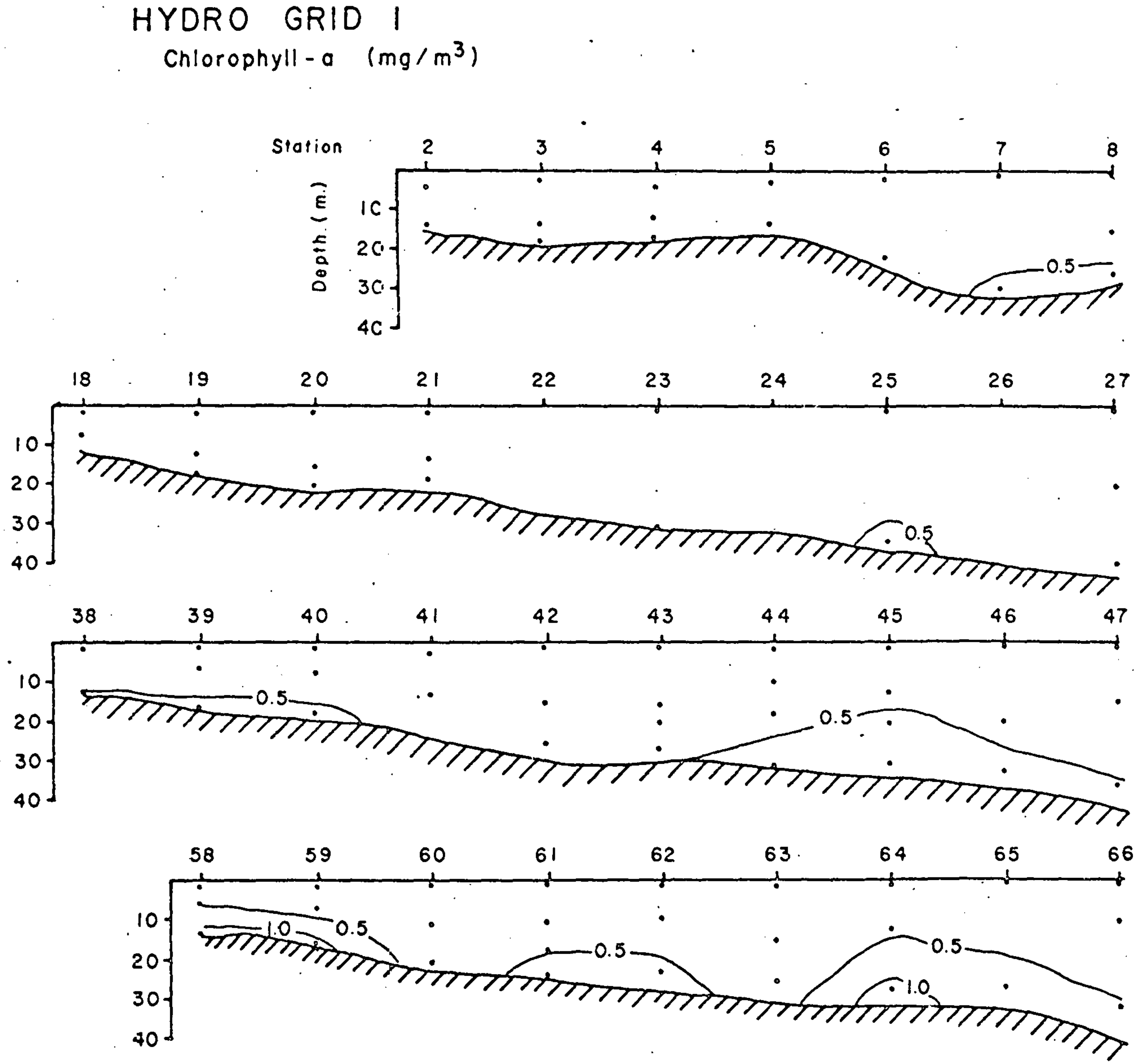

Figure 6a. Vertical Chlorophyll Distribution (Hydrogrid I)

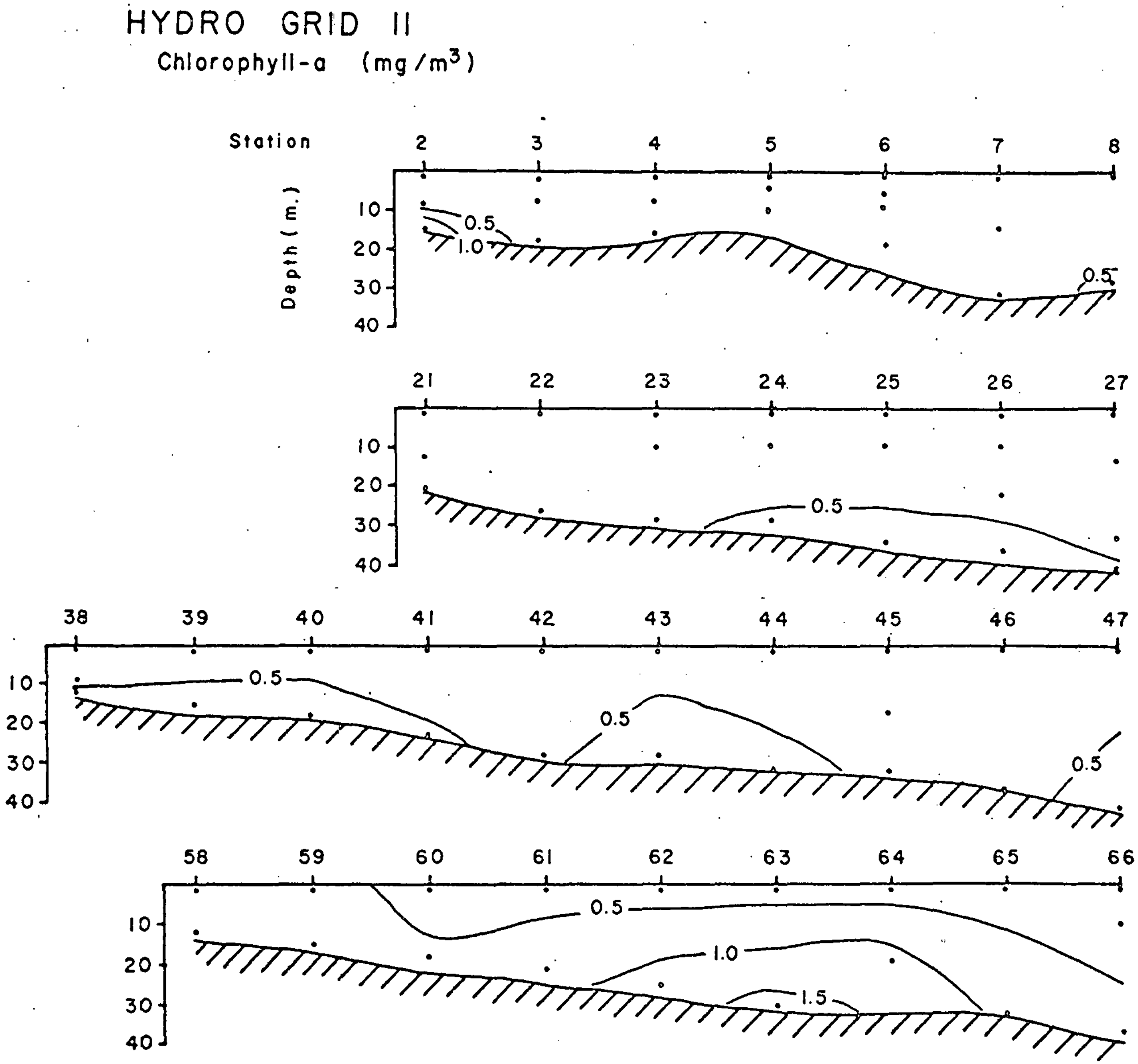

Figure 6b. Vertical Chlorophyll Distribution (Hydrogrid II)

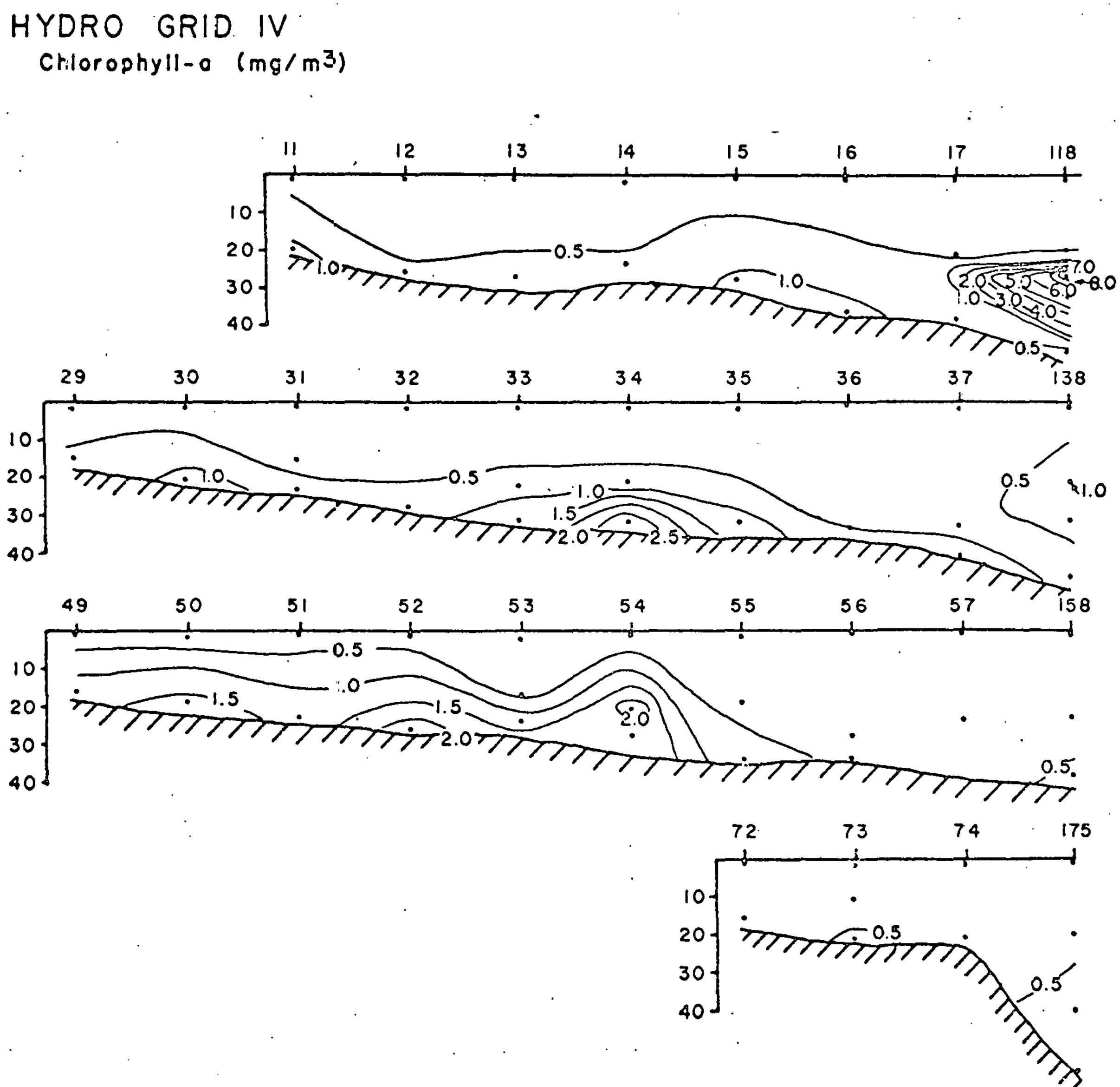

Figure 6c. Vertical Chlorophyll Distribution (Hydrogrid IV)

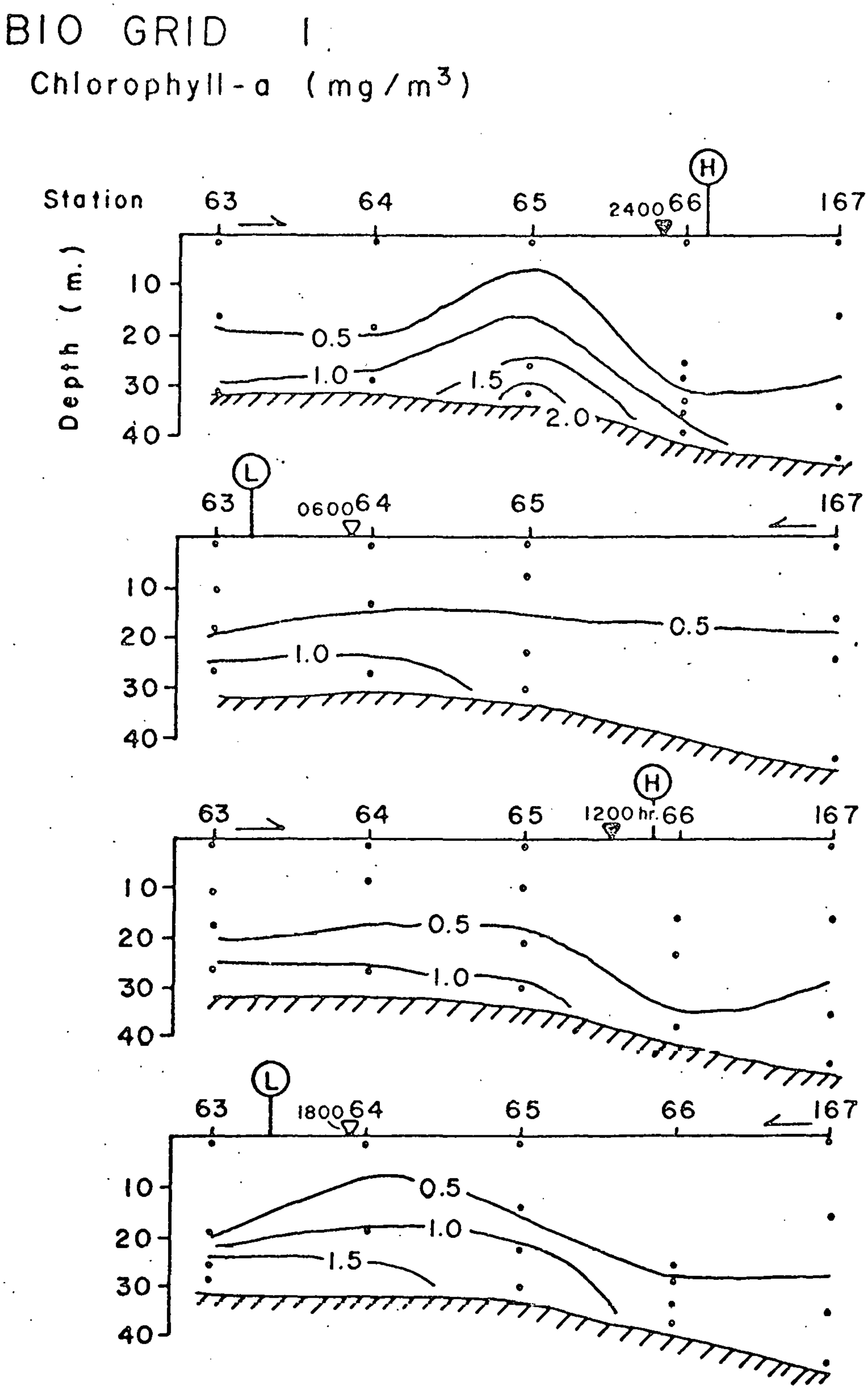

Figure 7a. Vertical Chlorophyll Distribution (Biogrid I)

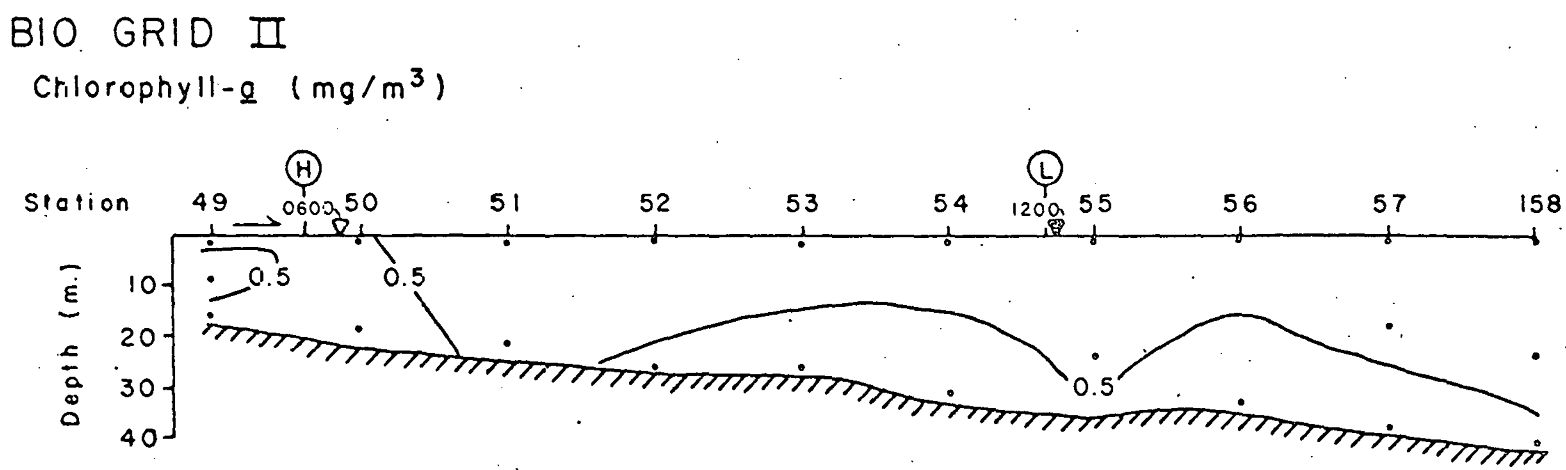

Figure 7b. Vertical Chlorophyll Distribution (Biogrid II)

BIO GRID III

Chlorophyll-a (mg/m^3)

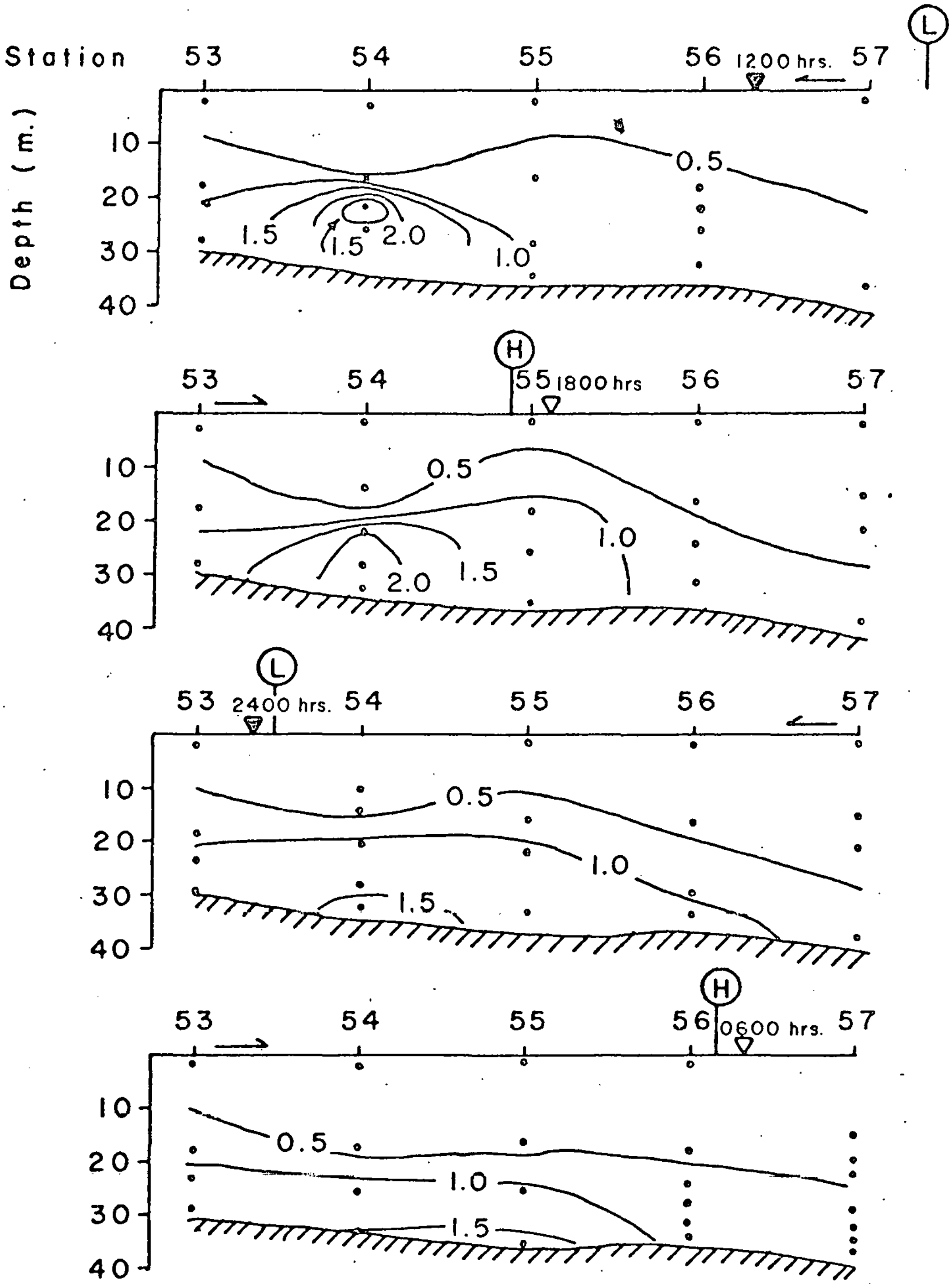

Figure 7c. Vertical Chlorophyll Distribution (Biogrid III)

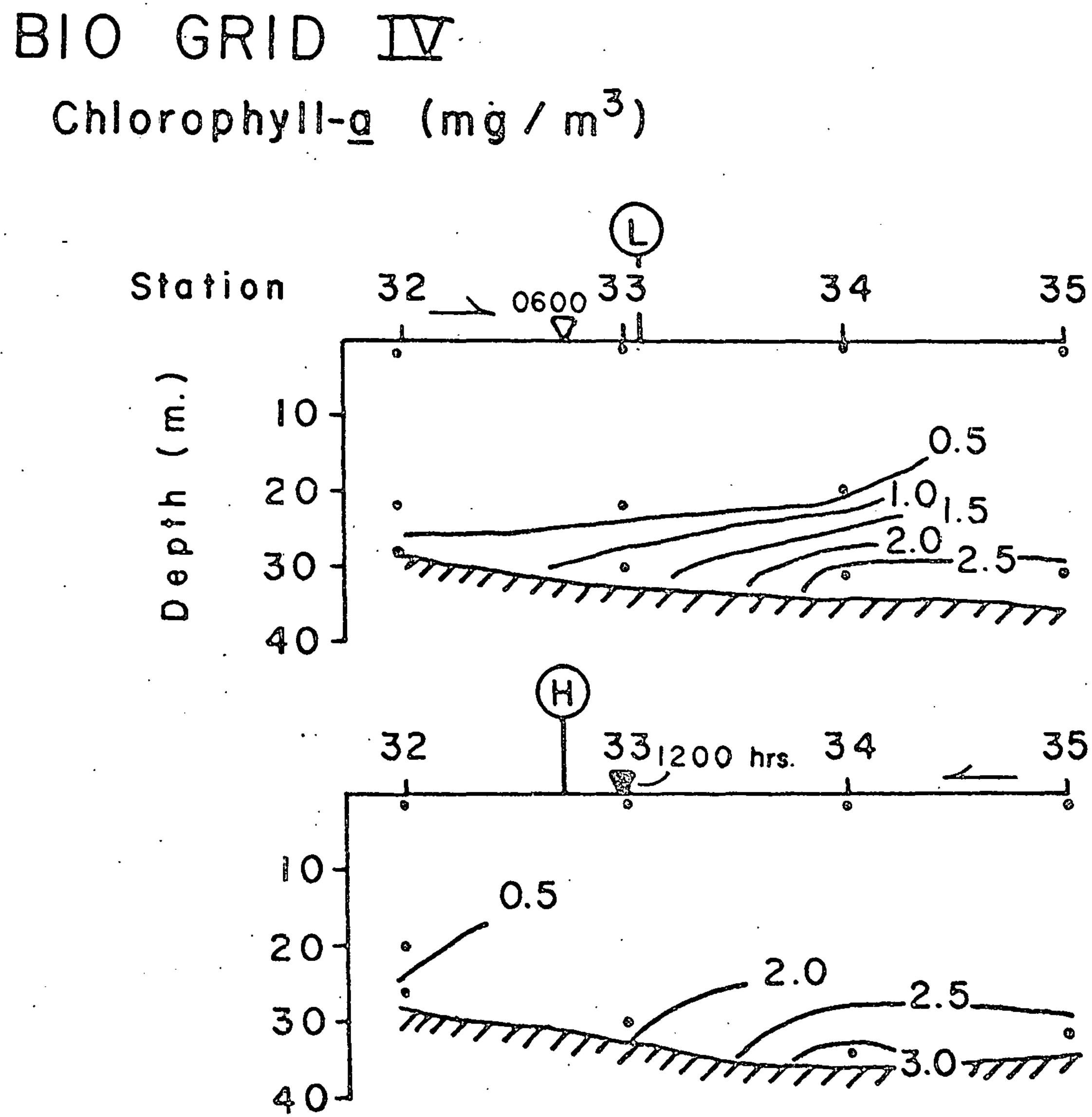

Figure 7d. Vertical Chlorophyll Distribution (Biogrid IV)

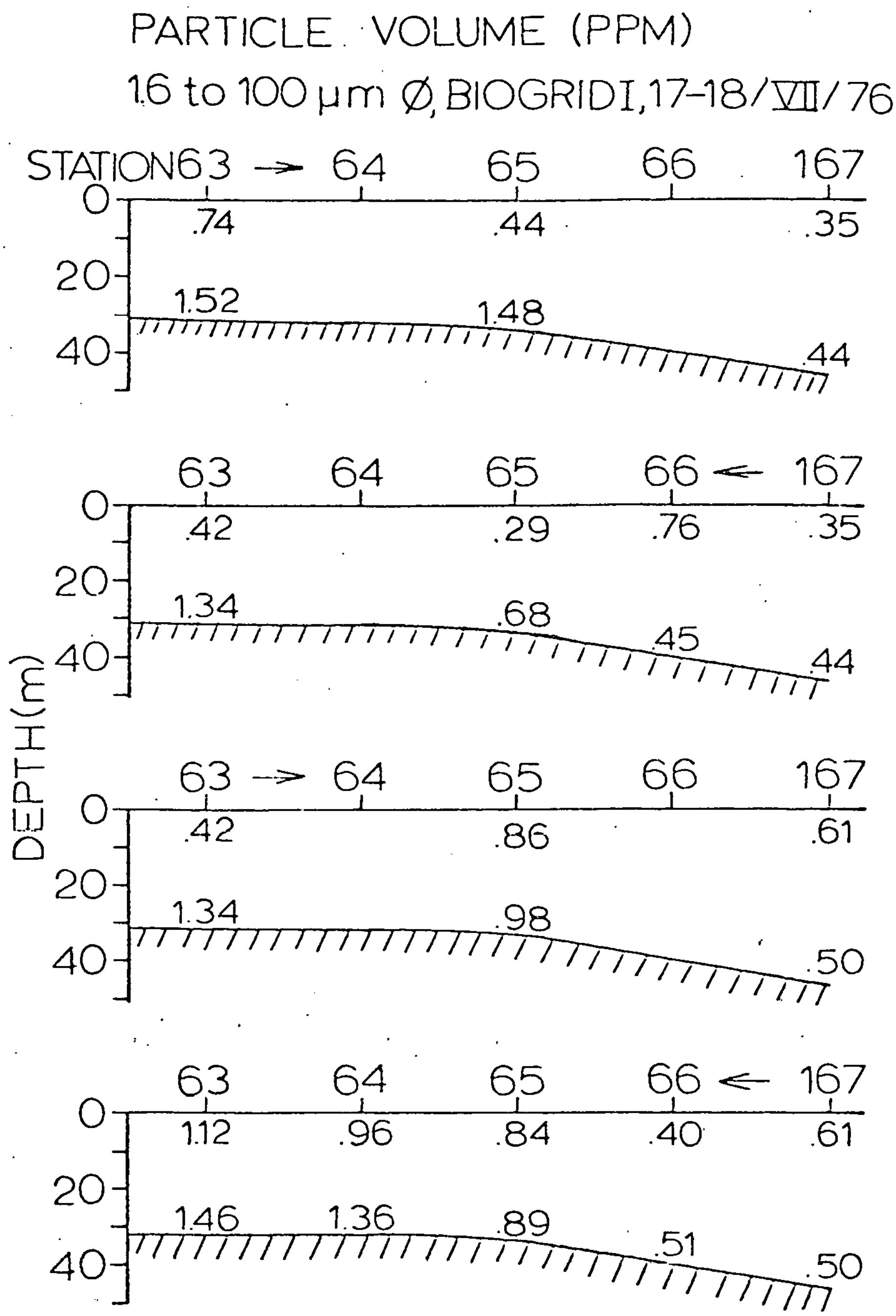

Figure 8a. Surface and Bottom
Particle Volume (Biogrid I)

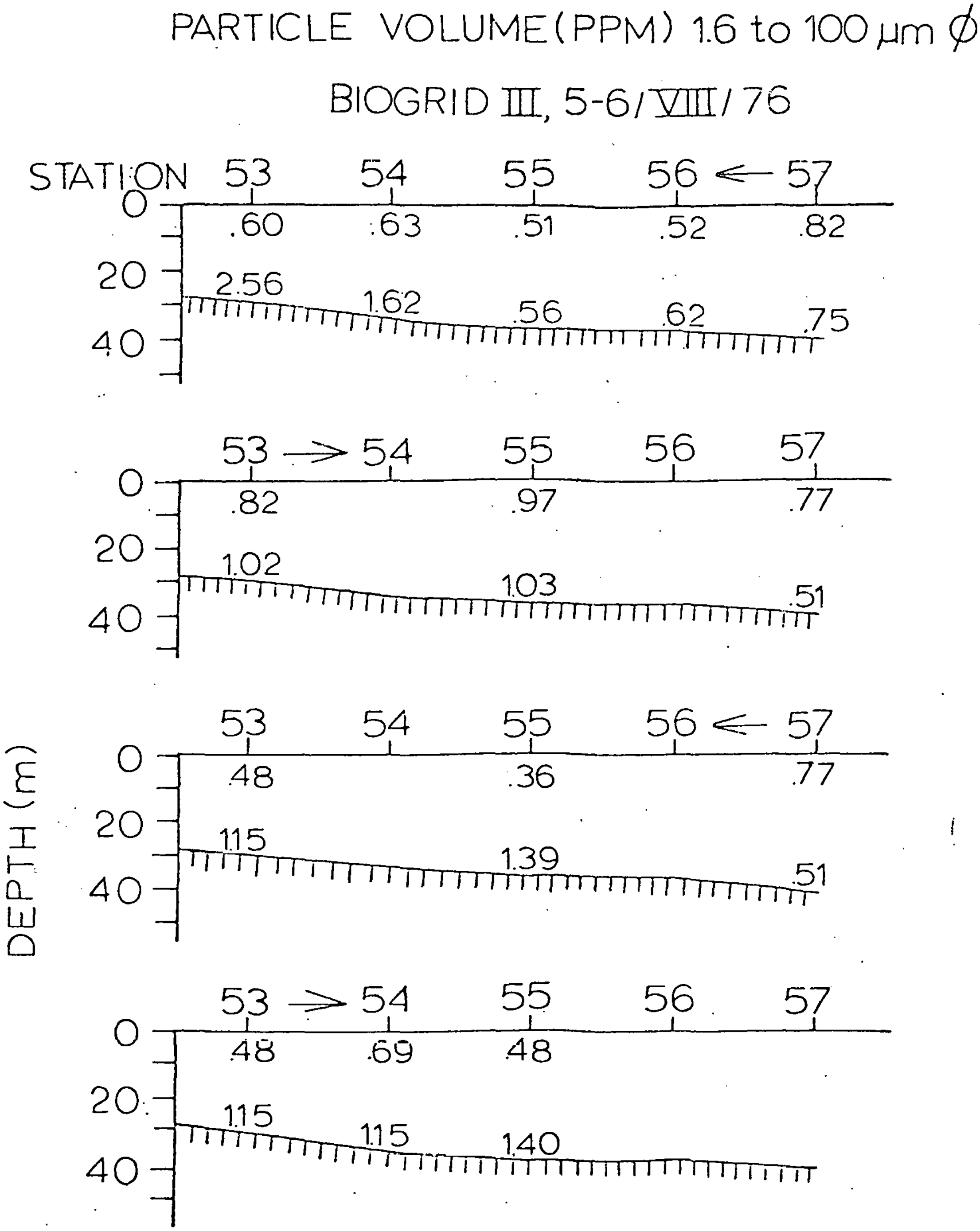

Figure 8b. Surface and Bottom
Particle Volume (Biogrid III)

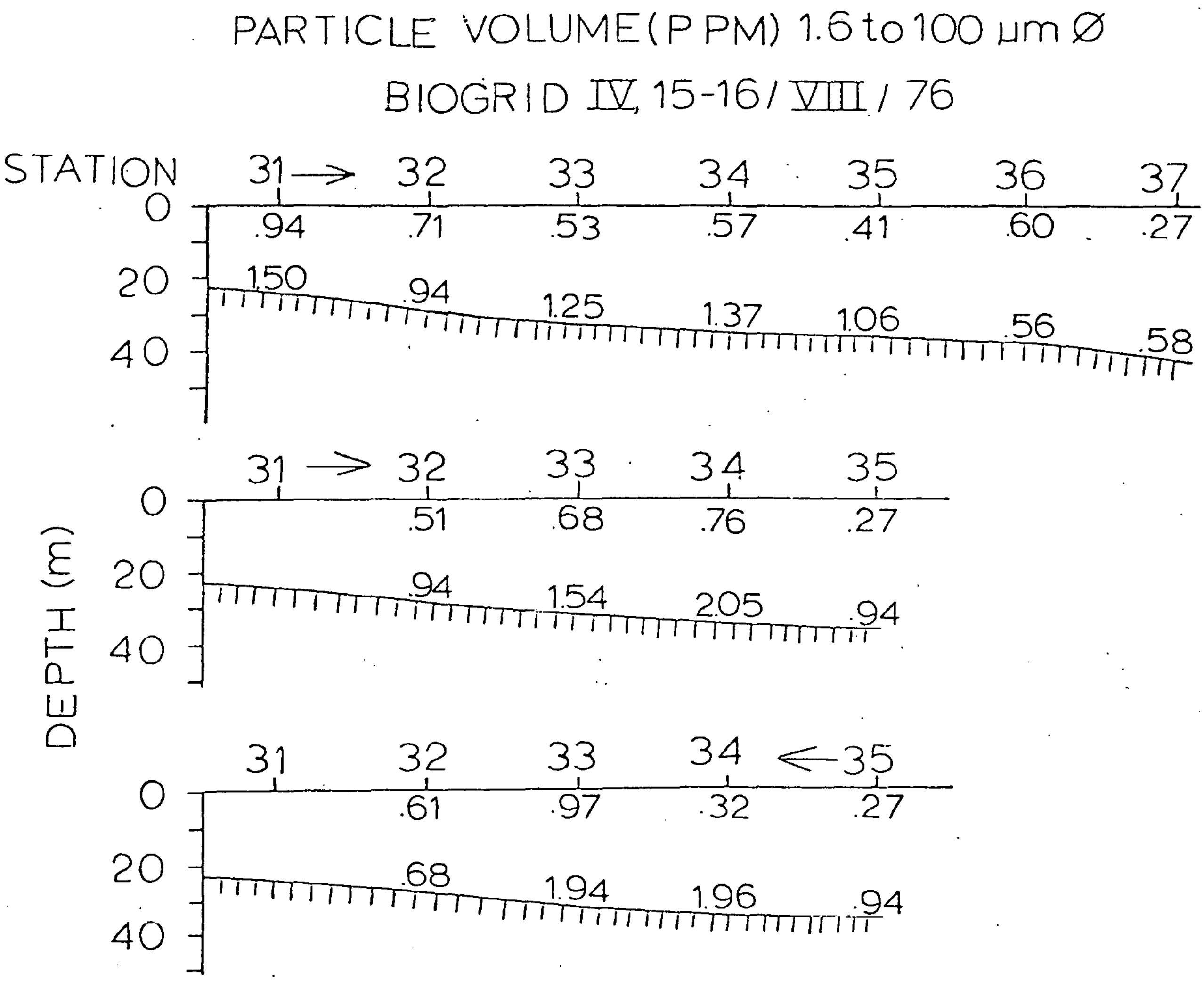

Figure 8c. Surface and Bottom
Particle Volume (Biogrid IV)

Table II. Vertical and integrated Chlorophyll concentrations (Hydrogrids)

ONSLOW BAY

HYDRO I - July 14-15, 1976

STATION	DEPTH	CHLOROPHYLL a mg/m^3	INTEGRATED CHLOROPHYLL a (mg/m^2)
2	4	.440	7.26
	13	.440	
3	2	.421	6.81
	13	.335	
	17	.366	
4	3	.286	5.22
	11	.269	
	17	.415	
5	2	.187	4.33
	13	.347	
6	1	.187	8.58
	21	.427	
7	0	.132	10.59
	28.5	.514	
8	0	.095	7.00
	15	.095	
	25	.575	
17	0	.156	6.62
	15	.095	
	32	.249	
18	1	.483	7.11
	7	.809	
19	1	.317	6.85
	12	.452	
	16	.477	
20	1	.237	6.82
	15	.366	
	20	.347	
21	1	.138	4.57
	13	.163	
	18	.341	
23	0	.058	4.51
	30	.230	

Table II. Vertical and integrated Chlorophyll concentrations (Hydrogrids)

HYDRO I - July 14-15, 1976

STATION	DEPTH	CHLOROPHYLL a mg/m^3	INTEGRATED CHLOROPHYLL a (mg/m^2)
25	0	.144	13.40
	34	.569	
27	0	.144	7.25
	20	.113	
	40	.298	
28	1	.360	7.41
	10	.852	
38	1	.237	4.81
	12	.495	
39	1	.269	6.88
	6	.310	
	16	.532	
40	1	.224	6.92
	7	.255	
	17.5	.557	
41	1	.200	9.44
	13	.237	
42	1	.169	9.19
	14.5	.249	
	24.5	.483	7.77
43	1	.144	
	14.5	.169	
	19.5	.397	
	26.2	.415	
44	1	.163	11.35
	9.5	.169	
	17.5	.366	
	31.5	.692	
45	1	.206	15.66
	12	.218	
	20	.655	
	30	.754	
46	1	.175	11.32
	20	.187	
	31	.600	

Table II. Vertical and integrated Chlorophyll concentrations (Hydrogrids)

HYDRO I - July 14-15, 1976

STATION	DEPTH	CHLOROPHYLL a mg/m^3	INTEGRATED CHLOROPHYLL a (mg/m^2)
47	1	.144	11.91
	14	.132	
	36	.532	
57	0	.120	14.39
	17	.126	
	33	.791	
58	1	.446	8.03
	5	.452	
	13	1.025	
59	1	.421	10.06
	6.5	.412	
	17.5	1.025	
60	1	.267	5.10
	10.5	.249	
	20	.206	
61	1	.169	9.44
	10.5	.224	
	16.5	.440	
	23.5	.711	
62	1	.237	11.47
	9.5	.267	
	22.5	.557	
63	1	.280	9.28
	15	.317	
	25	.329	
64	1	.218	18.35
	12	.273	
	27	1.135	
65	0	.167	16.12
	27	.735	
66	0	.156	13.21
	10	.150	
	32	.538	

Table II. Vertical and integrated Chlorophyll concentrations (Hydrogrids)

ONSLOW BAY

HYDRO II - July 21-22, 1976

STATION	DEPTH	CHLOROPHYLL a mg/m^3	INTEGRATED CHLOROPHYLL a (mg/m^2)
2	1.5	.249	10.14
	8	.267	
	15	.431	
3	2	.181	4.51
	7	.206	
	17	.335	
4	1.5	.144	3.80
	7	.169	
	15.5	.329	
5	1	.163	4.10
	4	.163	
	10	.335	
6	1	.132	5.84
	4	.113	
	8	.126	
	18	.323	
7	1	.073	6.18
	13.7	.113	
	30.5	.434	
8	0	.107	7.83
	38.5	.594	
17	1	.126	13.09
	5.7	.126	
	20	.175	
	38	.754	
27	1	.120	10.63
	13	.113	
	33	.366	
	40	.569	
26	1	.107	12.09
	9.5	.132	
	22	.144	
	36	.830	
25	1	.120	13.01
	9	.113	
	34	.713	

Table II. Vertical and integrated Chlorophyll concentrations (Hydrogrids)

HYDRO II - July 21-22, 1976

STATION	DEPTH	CHLOROPHYLL a mg/m^3	INTEGRATED CHLOROPHYLL a (mg/m^2)
24	1	.144	9.99
	9	.144	
	28	.596	
23	1	.126	7.35
	10	.138	
	28	.409	
22	1	.126	7.27
	26	.403	
21	1	.113	5.13
	11	.175	
	20	.434	
30	1	.218	6.54
	10	.200	
	19	.520	
38	1	.255	4.21
	7	.224	
	12	.532	
39	1	.397	9.57
	15	.655	
40	1	.335	8.33
	17.5	.637	
41	1	.218	9.03
	21.5	.507	
42	1	.144	8.57
	27.5	.421	
43	1	.095	17.09
	27	.988	
44	1	.150	14.53
	31	.772	
45	1	.132	7.07
	17	.120	
	32	.452	
46	1	.101	5.53
	36	.200	

phyll concentrations (Hydrogrids)

HYDRO II - July 21-22, 1976

STATION	DEPTH	CHLOROPHYLL _a_ mg/m^3	INTEGRATED CHLOROPHYLL _a_ (mg/m^2)
47	1	.163	21.04
	40.5	.852	
57	1	.163	18.85
	37	.772	
66	1	.255	18.04
	10	.255	
	37	.723	
65	1	.261	19.96
	32	.969	
64	1	.360	27.98
	19	1.142	
63	1	.378	29.39
	31	1.683	
62	1	.267	24.35
	24.5	1.296	
61	1	.298	16.24
	21	.988	
60	1	.237	9.21
	18	.594	
59	1	.754	9.70
	14.5	.514	
58	1	.711	9.63
	11.7	.729	

Table II. Vertical and integrated chloro-
phyll concentrations (Hydrogrids)

ONSLOW BAY

HYDRO IV - August 14-16, 1976

STATION	DEPTH	CHLOROPHYLL a mg/m^3	INTEGRATED CHLOROPHYLL a (mg/m^2)
11	1.0	.21	14.82
	19.0	1.06	
12	1.0	.13	9.11
	25.0	.53	
13	1.0	.13	13.55
	27.0	.67	
14	2.0	.13	10.21
	23.0	.52	
15	1.0	.13	18.65
	27.0	1.02	
16	1.0	.08	22.0
	36.0	1.08	
17	1	.12	17.83
	21	.17	
	27	1.02	
	38	.75	
118	1	.27	122.09
	20	.24	
	26	8.22	
	47	.40	
128	1.5	.30	231.37
	21.7	6.28	
	32.7	7.83	
	54.0	.26	
29	1	.21	6.26
	14	.52	
30	1	.13	13.54
	20	1.10	
31	1	.12	7.33
	15	.17	
	23	.89	
32	1	.12	10.53
	27	.61	

phyll concentrations (Hydrogrids)

HYDRO IV - August 14-16, 1976

STATION	DEPTH	CHLOROPHYLL a mg/m^3	INTEGRATED CHLOROPHYLL a (mg/m^2)
33	2	.12	19.44
	22	.64	
	31	1.41	
34	1	.14	33.79
	20.5	.56	
	31.7	2.82	
35	2	.11	22.29
	32.2	1.14	
36	1.5	.50	18.50
	34.7	.50	
37	2	0	12.28
	33.5	.43	
	40.2	.79	
138	1	.07	30.07
	20.5	.99	
	31.7	.91	
	46.5	.22	
39	1	.31	12.33
	17	1.06	
49	S 1.0	.29	14.52
	B 15.0	1.22	
50	S 1.0	.24	24.53
	B 18.0	1.78	
51	S 1.5	0.16	17.90
	B 24.0	1.41	
52	1.5	0.19	32.08
	25.0	2.15	
53	2	0.09	14.23
	17	0.08	
	24	1.47	
54	2	0.19	41.73
	20.5	2.02	
	27.0	1.51	

Table II. Vertical and Integrated Chlorophyll concentrations (Hydrogrids)

HYDRO IV - August 14-16, 1976

STATION	DEPTH	CHLOROPHYLL *a* mg/m^3	INTEGRATED CHLOROPHYLL *a* (mg/m^2)
55	2	.12	15.08
	19	.37	
	34	.79	
56	1	.08	6.98
	28	.24	
	33	.44	
57	1	.08	4.51
	24	.13	
	37		
157	1	.14	12.25
	23	.15	
	38.5	.66	
167	1	.14	14.82
	23.2	.31	
	29.2	.41	
	44.5	.48	
72	1.5	.20	5.99
	16	.45	
73	1.5	.17	6.86
	10.2	.26	
	21.0	.52	
74	1.5	.09	3.05
	21.2	.19	
175	1.5	.09	28.62
	20.0	.24	
	40.0	.89	
	56.7	.66	

Table III. Vertical and integrated Chlorophyll concentrations (Biogrids)

ONSLOW BAY

BIO I - July 17, 1976

STATION	DEPTH	CHLOROPHYLL a mg/m^3	INTEGRATED CHLOROPHYLL a (mg/m^2)
63	1	0.181	15.58
	16	.280	
	22	.772	
	31	1.062	
64	1	0.181	14.79
	18	.280	
	28.5	1.123	
65	1	.206	37.99
	26	1.720	
	30.5	2.145	
66	1	0.095	14.69
	25	.132	
	28	.163	
	33	.711	
	35	.791	
	38.5	1.179	
167	1	.126	19.43
	16	.126	
	34	.729	
	44	.889	
65	1	.187	16.45
	7	.212	
	22.5	.692	
	30	.834	
64	1	.175	18.87
	13	.212	
	27	1.314	
63	1	.120	14.63
	10	.126	
	17	.261	
	26	1.123	
64	1	.175	18.87
	8	.163	
	27	1.105	

Table III. Vertical and integrated chlorophyll concentrations (Biogrids)

BIO I - July 17, 1976

STATION	DEPTH	CHLOROPHYLL *a* mg/m^3	INTEGRATED CHLOROPHYLL *a* (mg/m^2)
65	1	.237	17.20
	9.5	.249	
	21	.514	
	30	1.062	
66	15.5	.156	10.20
	23	.181	
	37.5	.532	
167	1	.175	18.17
	16	.156	
	35	.711	
	46	.637	
66	26	.267	16.38
	26.5	.427	
	29	.526	
	31.5	.575	
	33	.575	
	37	.852	
65	1	.329	23.79
	14	.354	
	22.5	1.043	
	30	1.431	
64	1	.255	24.04
	19	1.025	
63	1	.261	22.42
	19	.440	
	25	1.763	
	28	1.653	

Table III. Vertical and integrated Chlorophyll concentrations (Biogrids)

ONSLOW BAY

BIO II - July 23, 1976

STATION	DEPTH	CHLOROPHYLL a mg/m^3	INTEGRATED CHLOROPHYLL a (mg/m^2)
49	1	.501	9.26
	8.7	.255	
	16	.871	
50	1	.495	11.93
	19	.618	
51	1	.169	7.51
	21.5	.452	
52	1	.132	8.97
	26	.538	
53	2	.169	14.38
	26.5	.815	
54	1	.187	17.29
	31	.828	
55	1	.249	17.98
	13.5	.372	
	33	.791	
56	1	.187	19.26
	33	.908	
57	1	.193	16.23
	18	.212	
	38	.926	
58	1	.163	12.46
	23.5	.187	
	42	.692	

Table III. Vertical and integrated Chloro-
phyll concentrations (Biogrids)

ONSLOW BAY

BIO III - August 5-6, 1976

STATION	DEPTH	CHLOROPHYLL a mg/m^3	INTEGRATED CHLOROPHYLL a (mg/m^2)
57	1	.21	17.96
	36	.67	
56			22.16
	17	.60	
	19	.65	
	21	.87	
	25	.69	
	32	.67	
55	2	.24	24.71
	16	.75	
	28	.93	
	34	.85	
54	2	.19	34.01
	15	.37	
	18	2.15	
	20	1.32	
	25	2.02	
	30	1.59	
53	2	.16	21.07
	17	.89	
	20	.99	
	27	1.28	
54	1	.22	36.27
	13	.31	
	17	.34	
	22	2.02	
	28	2.39	
	32	2.27	
55	1	0.26	32.23
	18	1.22	
	25	0.99	
	35	1.10	
56	1	.14	17.85
	16	.30	
	23	.89	
	31	.85	

Table III. Vertical and integrated chloro- phyll concentrations (Biogrids)

BIO III - August 5-6, 1976

STATION	DEPTH	CHLOROPHYLL a mg/m³	INTEGRATED CHLOROPHYLL a (mg/m²)
57	1	1.91	21.84
	15	.13	
	21	.17	
	38	.97	
56	1	.16	18.57
	16	0.40	
	29	.87	
	32	1.06	
55	1	.24	31.69
	15	.65	
	21	1.34	
	33	1.22	
54	9	.18	27.43
	12		
	13	0.18	
	20	1.41	
	27	1.47	
	31	1.53	
53	1	.23	21.94
	17	.95	
	22	1.02	
	28	1.18	
54	2	.21	22.98
	17	.38	
	25	1.22	
	31	1.49	
55	1	.23	27.87
	16	.48	
	24	1.02	
	35	.159	
56	1	.18	17.41
	17	.38	
	23	.71	
	27	.83	
	30	.89	
	33	.77	
57			8.28
	19	.18	
	22	.32	
	28	.73	
	32	.77	
	34	.67	
	36	.73	

Table III. Vertical and integrated chlorophyll concentrations (Biogrids)

ONSLOW BAY

BIO IV - August 16, 1976

STATION	DEPTH	CHLOROPHYLL a mg/m^3	INTEGRATED CHLOROPHYLL a (mg/m^2)
32	1.5	.13	8.17
	21.0	.35	
	27.0	.52	
33	1.0	.13	14.34
	22	.32	
	30	1.28	
34	1	.13	22.44
	20	.27	
	31	2.70	
35	1	.11	48.88
	31	2.51	
34	S 1.0	.09	54.29
	B 34.0	3.13	
33	S 1.5	.10	33.25
	B 30.0	1.90	
32	S 2.0	.13	7.22
	M 20.0	.27	
	B 25.0	.52	

Table IV. Particulate Organic Carbon (μg C x L^{-1}) near Surface and Bottom

BIOGRID I

Date	Station	Depth(m)	Through 30 μm mesh	Through 180μm mesh	No mesh	Depth(m)	Through 30μm mesh	Through 180μm mesh	No mesh
17/VII/76									
2230 h	65	1	98	223	220	30.5	188	246	357
18/VII/76									
0130 h	167	1	--	--	91	40	118	264	--
0430 h	65	1	141	--	147	34	118	155	175
0730 h	63	1	102	98	--	26	146	223	220
1000 h	65	1	115	133	--	30	--	149	--
1400 h	167	1	64	126	--	41	155	257	--
1900 h	63	1	99	117	119	30	120	165	--
2240 h	65	1	--	93	119	30	106	117	120

Table IV. Particulate Organic Carbon (μg C x L^{-1})

BIOGRID II

Date	Station	Depth(m)	Through 30μm mesh	Through 180μm mesh	No mesh	Depth(m)	Through 30μm mesh	Through 180μm mesh	No mesh
23/VII/76 0530 h	49	1	151	174	185	16	103	150	189
0630 h	50	1	118	--	145	19	--	99	136
0730 h	51	1	--	90	81	23	91	--	99
0835 h	52	1	105	98	--	25	--	120	152
0950 h	53	1	85	100	--	27	126	170	164
1100 h	54	1	53	96	--	33	91	107	--
1215 h	55	2	100	101	--	34	107	113	121
1350 h	56	2	83	138	--	34	83	111	194
1500 h	57	2	93	--	91	37	83	97	102
1710 h	158	2	94	93	--	42	53	114	--

TABLE IV. Particulate Organic Carbon ($\mu g\ C \times L^{-1}$)

BIOGRID III

Date	Station	Depth(m)	Through 30µm mesh	Through 180µm mesh	No mesh	Depth(m)	Through 30µm mesh	Through 180µm mesh	No mesh
5/VIII/76									
1050 h	57	2	--	108	144	40	--	148	--
1325 h	55	2	149	194	--	35	122	145	--
1530 h	53	2	--	143	224	27	--	285	--
1755 h	55	2	192	200	--	35	--	170	195
2030 h	57	2	155	163	164	38	187	200	--
2230 h	55	2	--	172	169	35	171	243	233
6/VIII/76									
0030 h	53	2	168	201	--	27	184	247	263
0220 h	54	2	143	147	--	31	192	288	307
0340 h	55	2	111	109	147	35	123	166	180

TABLE IV. Particulate Organic Carbon (µg C x L^{-1})

BIOGRID IV

			Through				Through		
Date	Station	Depth(m)	30µm mesh	180µm mesh	No mesh	Depth(m)	30µm mesh	180µm mesh	No mesh
15/VIII/76 0100 h	51	2.5	106	116	127	23	161	329	503
0945 h	32	1.5	--	158	--	27	127	145	--
1050 h	33	1.5	--	100	--	31	101	178	194
1210 h	34	1.5	103	129	--	33	201	243	334
16/VIII/76 0505 h	32	1	89	107	130	27	130	134	139
0645 h	33	1	119	133	--	30	141	186	309
0750 h	34	1	92	109	--	31	125	279	392
0855 h	35	1.5	--	88	90	31	132	255	247
1000 h	34	1.5	95	117	116	31	124	318	370
1212 h	33	1	--	94	158	30	127	233	276
1350 h	32	1.5	--	80	90	25	105	143	--

TABLE IV. Particulate Organic Carbon (μg C x L^{-1})

BIOGRID V

Date	Station	Depth(m)	Through 30μm mesh	Through 180μm mesh	No mesh	Depth(m)	Through 30μm mesh	Through 180μm mesh	No mesh
18/VIII/76									
1335 h	31	2	144	145	192	21	140	174	176
1615 h	41	1.5	--	137	138	22	150	280	327

Table V.

Biomass of Zooplankton near Surface and near Bottom

(mg ash-free dry weight x m^{-3})

BIOGRID I

Date	Station	Depth(m)	mg x m^{-3}	Depth(m)	mg x m^{-3}
17/VII/76 1950 h	63	12	91.6	30	27.2
2245 h	65	12	49.0	30	26.7
18/VII/76 0130 h	167	10	19.6	34	25.1
0430 h	65	10	60.2	25	37.2
0715 h	63	10	58.5	25	33.0
1015 h	65	10	47.5	25	143.8
1355 h	167	10	12.6	35	37.3
1640 h	65	10	43.9	25	38.8
1900 h	63	10	45.7	22	33.6

TABLE V.
Biomass of Zooplankton near Surface and near Bottom

(mg ash-free dry weight x m^{-3})

BIOGRID II

Date	Station	Depth(m)	mg x m^{-3}	Depth(m)	mg x m^{-3}
23/VII/76 0450 h	49	6	27.0	13	43.4
0625 h	50	6	56.6	17	35.9
0730 h	51	6	50.4	18	42.8
0835 h	52	6	31.2	20	29.6
0950 h	53	6	77.1	21	19.0
1110 h	54	6	43.1	23	19.7
1240 h	55	6	45.2	26	18.1
1350 h	56	5	17.0	24	32.3
1530 h	57	5	20.3	30	18.1
1710 h	158	6	13.8	38	7.7

TABLE V.

Biomass of Zooplankton near Surface and near Bottom

(mg ash-free dry weight x m^{-3})

BIOGRID III

Date	Station	Depth(m)	mg x m^{-3}	Depth(m)	mg x m^{-3}
5/VIII/76					
1115 h	57	6	12.8	36	8.4
1335 h	55	6	21.9	32	10.8
1540 h	53	6	29.1	26	15.9
1810 h	55	6	20.3	18	26.7
2020 h	57	6	15.2	37	10.1
2245 h	55	6	32.8	32	47.2
6/VIII/76					
0055 h	53	6	43.3	26	37.6
0340 h	55	6	36.0	32	35.1

TABLE V.

Biomass of Zooplankton near Surface and near Bottom

(mg ash-free dry weight x m^{-3})

BIOGRID IV

Date	Station	Depth(m)	mg x m^{-3}	Depth(m)	mg x m^{-3}
15/VIII/76					
0120 h	51	6	24.5	22	73.5
0935 h	32	6	19.1	24	25.8
1115 h	33	6	14.9	22	37.1
1225 h	34	6	17.1	29	97.9
16/VIII/76					
0525 h	32	6	26.9	24	66.0
0640 h	33	6	43.7	27	51.7
0755 h	34	6	82.0	27	51.6
0905 h	35	6	20.9	28	120.5
1045 h	34	6	17.0	30	35.8
1100 h	34			28	47.5
1120 h	34	25 to 11 (oblique tow)			72.8
1230 h	33	6	9.4	27	19.5
1415 h	32	6	43.2	22	32.9

TABLE V.

Biomass of Zooplankton near Surface and near Bottom

(mg ash-free dry weight x m^{-3})

BIOGRID V

Date	Station	Depth(m)	mg x m^{-3}	Depth(m)	mg x m^{-3}
18/VIII/76					
1350 h	31	6	30.7	18	27.3
1540 h	41	6	21.8	20	22.7