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NOAA Technical Memorandum NMFS-F/NEC-8



**Phytoplankton Community Structure
in Northeastern Coastal Waters
of the United States.**

I. October 1978

**U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Fisheries Center
Woods Hole, Massachusetts**

August 1981

NOAA TECHNICAL MEMORANDUM NMFS-F/NEC

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**Phytoplankton Community Structure
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of the United States.
I. October 1978**

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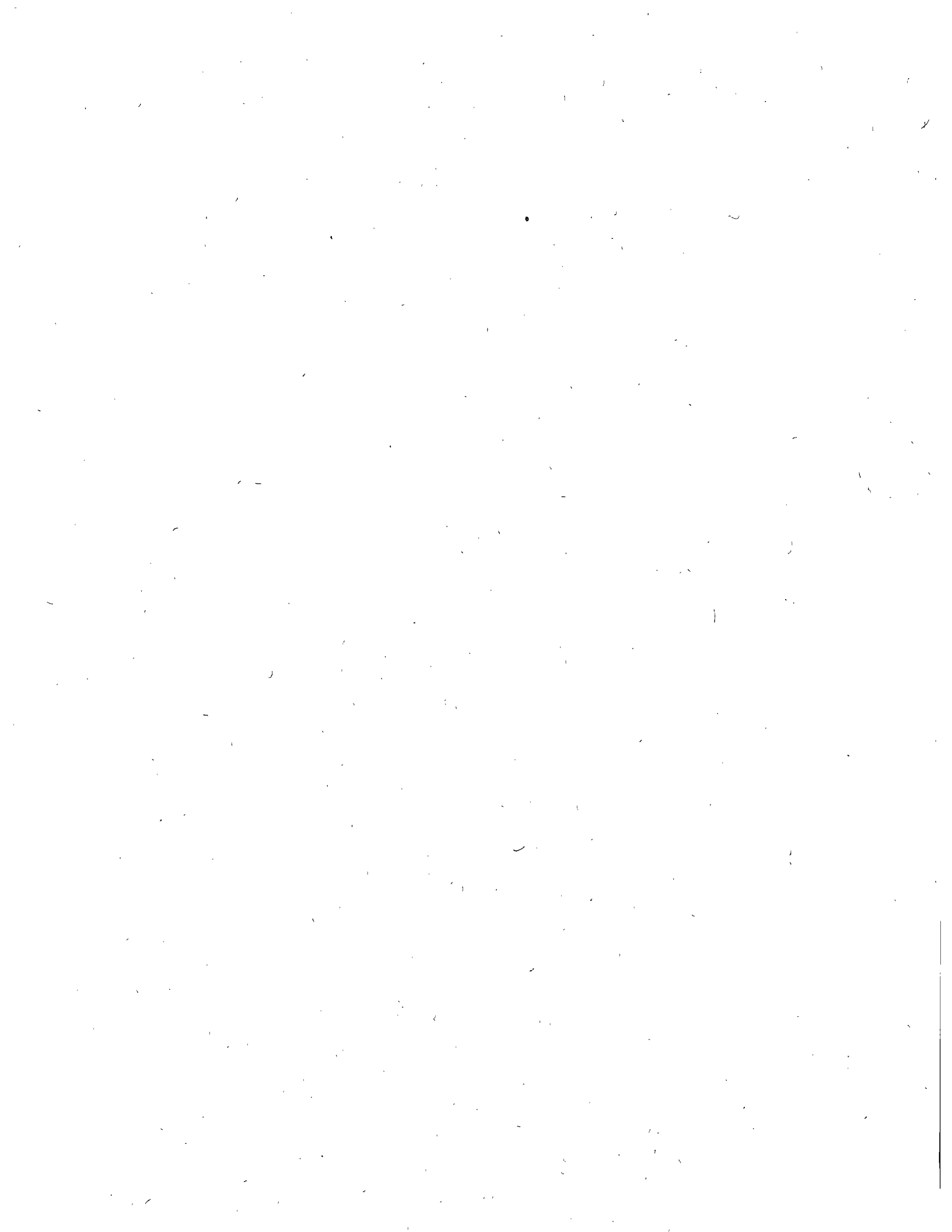
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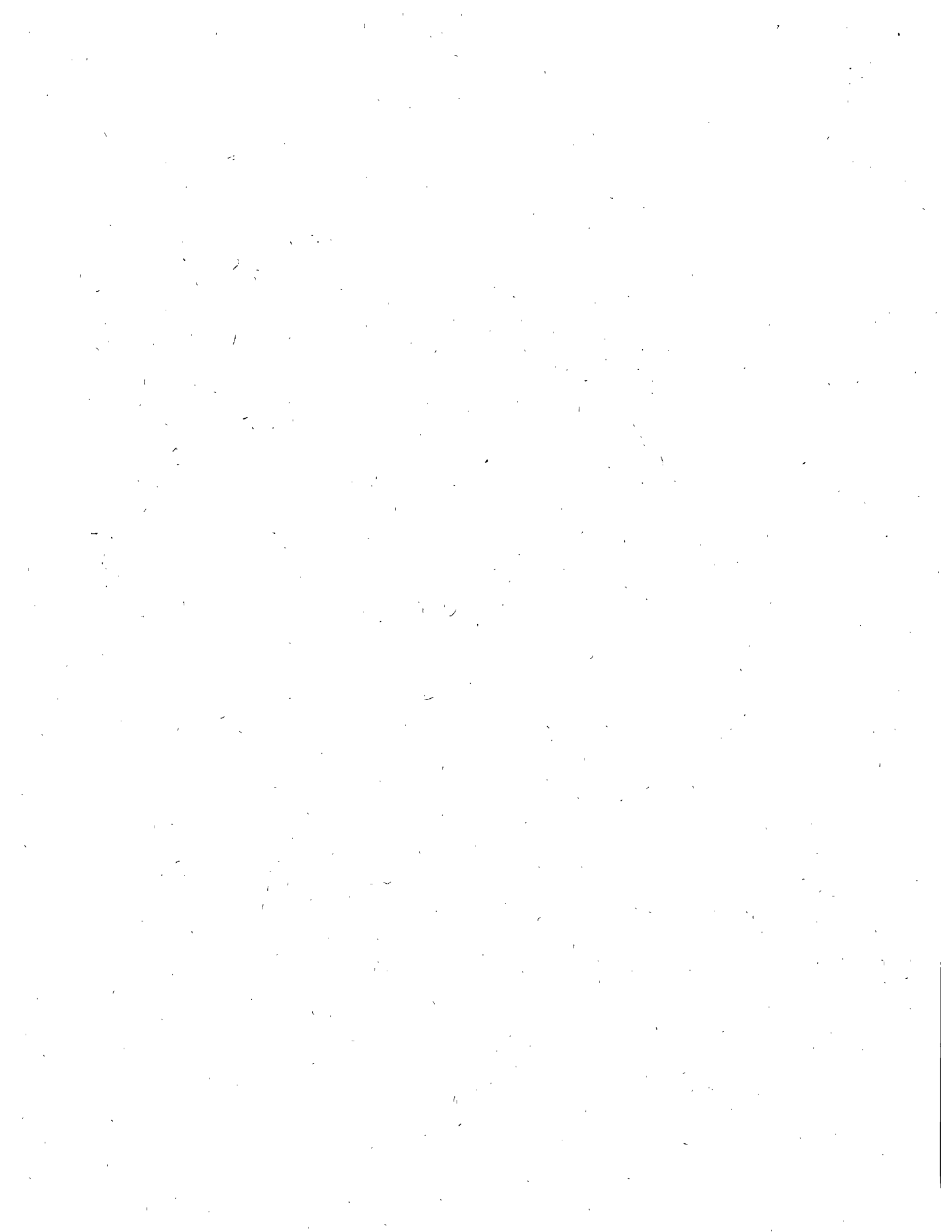
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ABSTRACT

The phytoplankton populations observed in eastern coastal waters between the Delaware Bay and Nova Scotia during an October 1978 cruise are described and discussed. A total of 368 phytoplankton species were observed with their concentrations noted for near and far shore stations. A major population maximum was recorded outside lower New York Bay dominated by the diatom *Skeletonema costatum*. The nearshore populations consisted mainly of diatoms, with ultraplanktonic components common. Composition changes and reduced concentrations occurred seaward along the transects. *Guinardia flaccida* and the dinoflagellate *Prorocentrum micans* were common throughout the area.



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INTRODUCTION

This paper is the first of a series of reports on phytoplankton community structure in northeastern United States coastal and continental shelf waters. This report presents results of collections from October 5 to November 2, 1978. Following papers will discuss data obtained from seven subsequent cruises of the National Oceanic and Atmospheric Administration (NOAA) made between November 1978 and February 1980. The series of reports will delineate seasonal and geographic changes in the phytoplankton and will provide a synoptic overview of phytoplankton species composition.

There is little information about the broad scale composition and distribution patterns of phytoplankton in the United States northeastern waters of the continental shelf. Marshall (1976) listed 609 species from the phytoplankton populations in this region between 1964 and 1973. Marshall (1978) also presented seasonal assemblages for the shelf waters north of Cape Hatteras and indicated the characteristic neritic and pelagic species. More spatially limited investigations have been conducted by Holmes (1956), in the Labrador Current and Bigelow (1922), Gran and Braarud (1935), Lillick (1938, 1940), and Hulburt and Corwin (1970) in the Gulf of Maine. In addition, the phytoplankton in waters near Woods Hole, Massachusetts and in the vicinity of Georges Bank have been described by Fish (1925), Lillick (1937), Sears (1941), Riley and Bumpus (1946), and Hulburt (1965). Smayda (1958) and Pratt (1959) reported on the phytoplankton of Narragansett Bay and Conover (1956) on those of Long Island Sound. Nuzzi (1973) studied the distribution of phytoplankton in the New York Bight in 1971, and Martin (1929) reported on the dinoflagellates in New Jersey coastal waters. Olsen and Cohn (1979) examined the total phytoplankton community of lower New York Bay and adjacent

New Jersey coastal areas. Phytoplankton composition off the Virginia coast has been reported by Mulford and Norcross (1971), Marshall et al. (1976), and Marshall and Bowker (1976). In recent years there have been major revisions in several phytoplankton taxa. These changes have modified many of the previously used taxonomic groupings, in some cases resulting in new or revised genera and the rearrangement of species in these taxa. Marshall (1980) has incorporated these modifications in a revised checklist of phytoplankton for the northeastern coastal waters which includes past results and results from seven additional cruises between 1974 and 1979.

It is the goal of this series to investigate phytoplankton dynamics over coastal and shelf waters of the northeastern United States during a 17-month period. We will assess the standing stock, community structure and identify seasonal norms of distribution, noting dominant species of particular regions. Our investigation will provide baseline information on phytoplankton composition at selected stations in or near areas of significant estuarine and coastal fishery production. Some of these stations reflect the influence of estuarine washout where phytoplankton blooms originate. Due to their brief life span, reproductive potential, and responsiveness to existing ecological conditions, phytoplankton represent an excellent community index to changes in productivity and water quality within the ecosystem. With phytoplankton as the initial autotrophic stage of major oceanic food webs, relationships between these populations and changing variables in relation to man-made perturbations or natural phenomena have significant value. Knowledge of phytoplankton species distribution and seasonal succession will aid in the understanding of relationships between phytoplankton composition and fish recruitment and abundance. To aid in detecting such change, this study is made concurrently.

with investigations on chlorophyll concentrations³, primary productivity⁴, nutrients, zooplankton and ichthyoplankton abundance. All are a part of the NOAA Northeast Monitoring Program (NEMP), designed to provide a comprehensive survey of the area.

METHODS

Collections were made at stations placed along transects that extend across the continental shelf and beyond (Fig. 1). Coordinates for these stations are given in Table 1. The inshore stations designated with a circle were analyzed at the Sandy Hook Laboratory (New Jersey); the stations designated by squares were analyzed at Old Dominion University (Virginia). Those with a combined symbol were used as control stations for intercalibration purposes. These predetermined station locations and the cruise track followed were designed for a synoptic coverage of the survey area. The area sampled includes the Middle Atlantic Bight, Nantucket Shoals, Georges Bank, and the Gulf of Maine. A total of 65 surface samples was collected for the phytoplankton analysis. The vessel used for the cruise was the Soviet research ship Belogorsk (cruise 78-03).

At each station, observations on cloud type and cover, wind, barometric pressure, wave height, and air and sea surface temperatures were recorded (Table 1). Niskin bottle casts were made to obtain water temperatures and collect water samples for phytoplankton and salinity analysis. A 500 ml surface sample, preserved with 20 ml of buffered formalin, was collected at each station and stored in polyethylene bottles for the examination of phytoplankton. After a settling period of several weeks, a siphoning procedure was followed to obtain a concentrate of 10 to 25 ml. The total concentrate

was transferred to a Zeiss 25 cm³ cylindrical settling chamber and examined with an inverted phase contrast microscope, usually using between 312 and 400 X magnification. The Shannon-Weaver index procedures were used to determine species diversity at each station (Table 1).

The National Oceanographic Data Center (NODC) Taxonomic Code⁵ was followed to list the species under their respective genera and station locations. The classifications followed are encoded in conformance with VanLandingham (1976-1979) and Hendey (1974) for the diatoms and Parke and Dixon (1976) for other categories.

RESULTS AND DISCUSSION

A total of 368 phytoplankton was identified in this study, with representation from the Bacillariophyceae (185), Pyrrophyceae (147), Haptophyceae (14), Cyanophyceae (4), Chrysophyceae (7), Cryptophyceae (5), Chlorophyceae (3), and Euglenophyceae (3). A species list is given in Table 2 with the average concentrations of the species at stations over the continental shelf. Station locations are grouped into nearshore stations, located within 35 km of the shore, and those located seaward beyond this distance which are referred to as farshore stations. Although this division was made primarily on the basis of cruise track restrictions, the intent was to group those stations more closely associated with the coastal and estuarine effluents from those farther out. The composition and concentrations of phytoplankton at each station are given in Appendix I.

A dominant phytoplankton at seven nearshore stations during this cruise was Skeletonema costatum. Highest concentrations for this species

were found outside of the lower New York Bay near Sandy Hook, New Jersey, where cell counts were 1-3 million cells/l. Small diatoms, including single cell and short chain forming and colonial types, predominated at the nearshore stations. These included Leptocylindrus danicus, Asterionella glacialis, Chaetoceros simplex, and Rhizosolenia delicatula. Prominent in the majority of the nearshore stations were unidentified ultraplankters. These were cells, round to irregularly shaped forms, green in apparent color, and 5 to 10 μm in size. The size range for the ultraplankton category in this report is based on the size classes suggested by Strickland (1960). He described plankton cells that were between 0.5 and 10 μm as ultraplankton, and those between 10 and 50 μm as nanoplankton. The presence and importance of these small fractions in the Chesapeake Bay has been noted by McCarthy et al. (1974) and VanValkenburg and Flemer (1974). Marshall⁶ also noted significant concentrations of these cells in the Chesapeake Bay plume and Virginia coastal waters, where they appeared to consist mainly of cyanophyceans. The importance of ultraplankton (nanoplankton) chlorophytes in the lower New York Bay and the New Jersey coastal area has been reported by Olsen and Cohn (1979). They found the chlorophytes (cell sizes 1.5 to 5 μm) ubiquitous in their study, but decreasing in cell density south of Sandy Hook. Malone (1977) has also identified Nannochloris atomus as a major nanoplankton component in the Raritan and lower Hudson River estuaries and in the New York Bight apex. The ultraplankton component in this study, appears to be represented by a variety of taxa, including cyanophyceans and chlorophyceans.

In the Gulf of Maine, a variety of phytoplankton was observed and included the diatoms Skeletonema costatum, Rhizosolenia spp., Chaetoceros spp., and Asterionella glacialis. Other dominants occurred

at several of the more central locations within this region. These were Leptocylindrus danicus and Nitzschia pungens, also found in high concentrations at Georges Bank. We found the largest cell concentrations outside lower New York Bay (station #55), where counts reached over 2 million cells/l. The two dominant diatoms were Skeletonema costatum and Asterionella glacialis. High phytoplankton concentrations and similar dominants were found at stations directly south and east of station 55. Along the transect eastward and over the shelf (stations #57-63), there was a marked decrease in the concentrations of phytoplankton, a shift in the diatom composition, and a decrease in the number of species found at the seaward stations. The species diversity was lower within the Hudson River plume waters at stations 54, 55, and 56 in contrast to higher values at the more distant stations over the shelf (Table 1). Seaward the composition included a more prominent influence by Chaetoceros spp. and Rhizosolenia spp. South of Sandy Hook (station #54), the dominant phytoplankton were Skeletonema costatum and Asterionella costatum. Further southward the cell concentrations of these species and total phytoplankton decreased. Ultraplankton comprised the most abundant such group.

A transition of species composition occurred along the transects. Phytoplankton prominent at nearshore stations, but decreasing in numbers seaward included the diatoms Skeletonema costatum, Asterionella glacialis, Chaetoceros simplex, C. sociale, Corethron criophilum, Leptocylindrus danicus, and Stephanopyxis turris. A similar trend occurred with Heterocapsa triquetra, Prorocentrum scutellum, Protoperidinium steinii, Pyramimonas grassii, Nannochloris atomus, and several Cryptomonas spp. In contrast, higher concentrations were noted offshore for the diatoms Cerataulina pelagica, Guinardia flaccida, Nitzschia pungens, Rhizosolenia imbricata, and Rhizosolenia styliformis. Other plankters in this category included

Ceratium furca, C. fusus, C. trichoceros, C. tripos v. atlanticum, Prorocentrum aporum, P. compressum, P. micans, Emiliana huxleyia, Nostoc commune, Oscillatoria erythraea, Dictyocha fibula, and Distephanus speculum. Species averaging significant concentrations throughout shelf waters included the diatoms Skeletonema costatum, Hemiaulus sinensis, Leptocylindrus danicus, Nitzschia delicatissima, N. pungens, Rhizosolenia delicatula, R. stollerfothii, and Thalassionema nitzschioides. Phytoflagellates common over the shelf included Ceratium lineatum, C. trichoceros, Dinophysis fortii, Prorocentrum micans, Pyramimonas grassii, and Emiliana huxleyi. In general, higher cell concentrations of diatoms occurred nearshore, with 81% of the total diatoms found nearshore. In the pyrrhophyceans there was a slight increase seaward, with 74% of the species recorded found nearshore in contrast to 78% at farshore stations. Offshore concentrations, however, were generally well below those nearshore. Nearshore ultraplankton contained large concentrations of Nannochloris atomus along the New York-New Jersey coastline, as well as unidentified components. These other forms were mainly between 2 and 5 μm , round to slightly irregularly shaped and appeared as isolated cells. Based on their general morphology, we believe they included several cyanophycean and chlorophycean representatives. Further investigation is underway to identify members of this small sized, but important group.

In summary, the phytoplankton of the northeastern shelf waters in October 1978 contained large concentrations of Skeletonema costatum. The nearshore waters contained a greater variety of species, with the diatoms and unidentified ultraplankton components the dominant forms present. Other common species included Asterionella glacialis, Leptocylindrus danicus, Nannochloris atomus, Chaetoceros simplex, and Rhizosolenia delicatula. In these collections the

small sized, chain forming diatoms, often characteristic of rapid growth, were prevalent. Seaward, there was a shift in the composition, with other diatoms and various phytoflagellates more characteristic of the phytoplankton assemblage.

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FOOTNOTES

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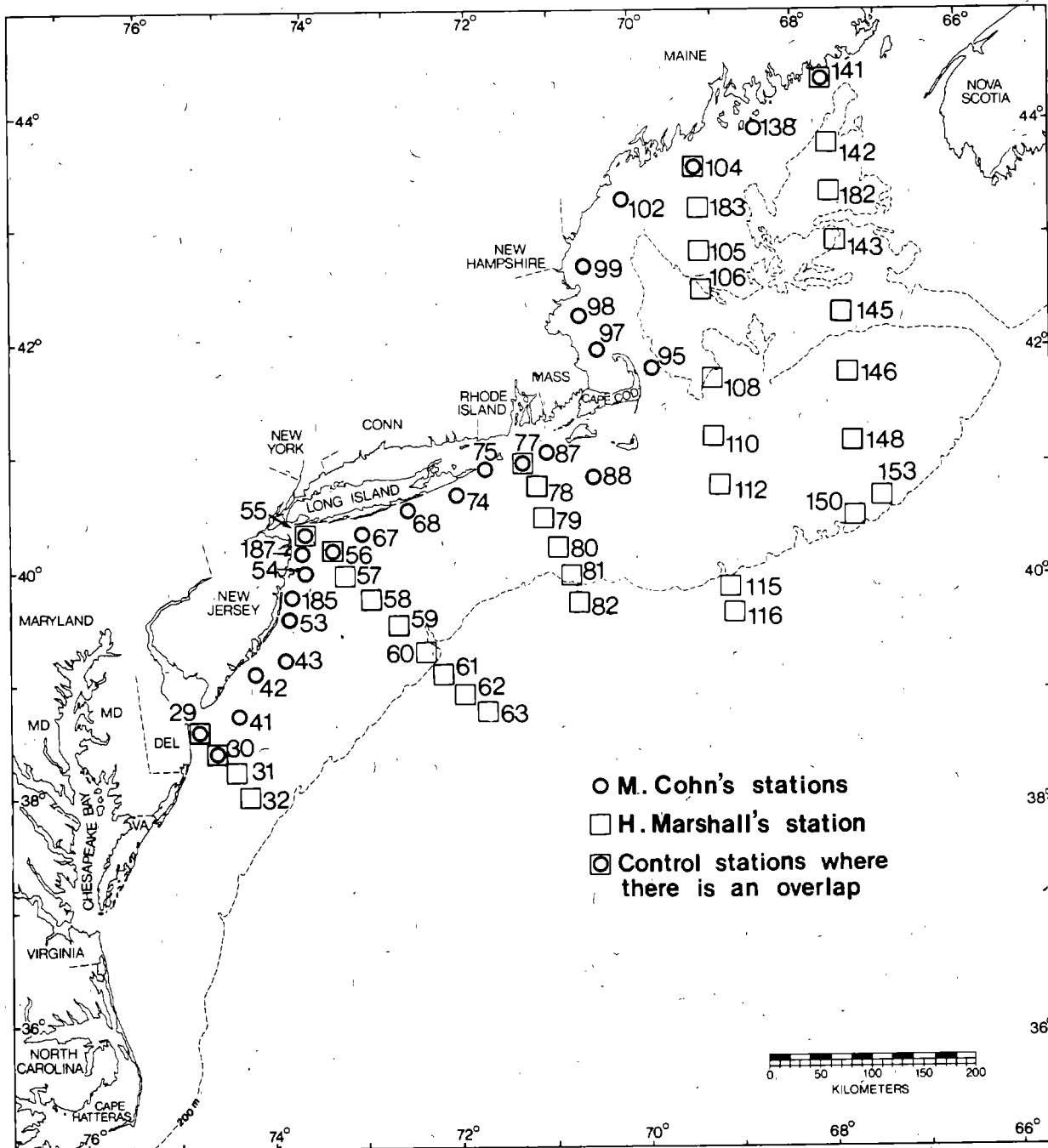


Fig. 1. Phytoplankton community structure station locations for cruise BEL-78-03.

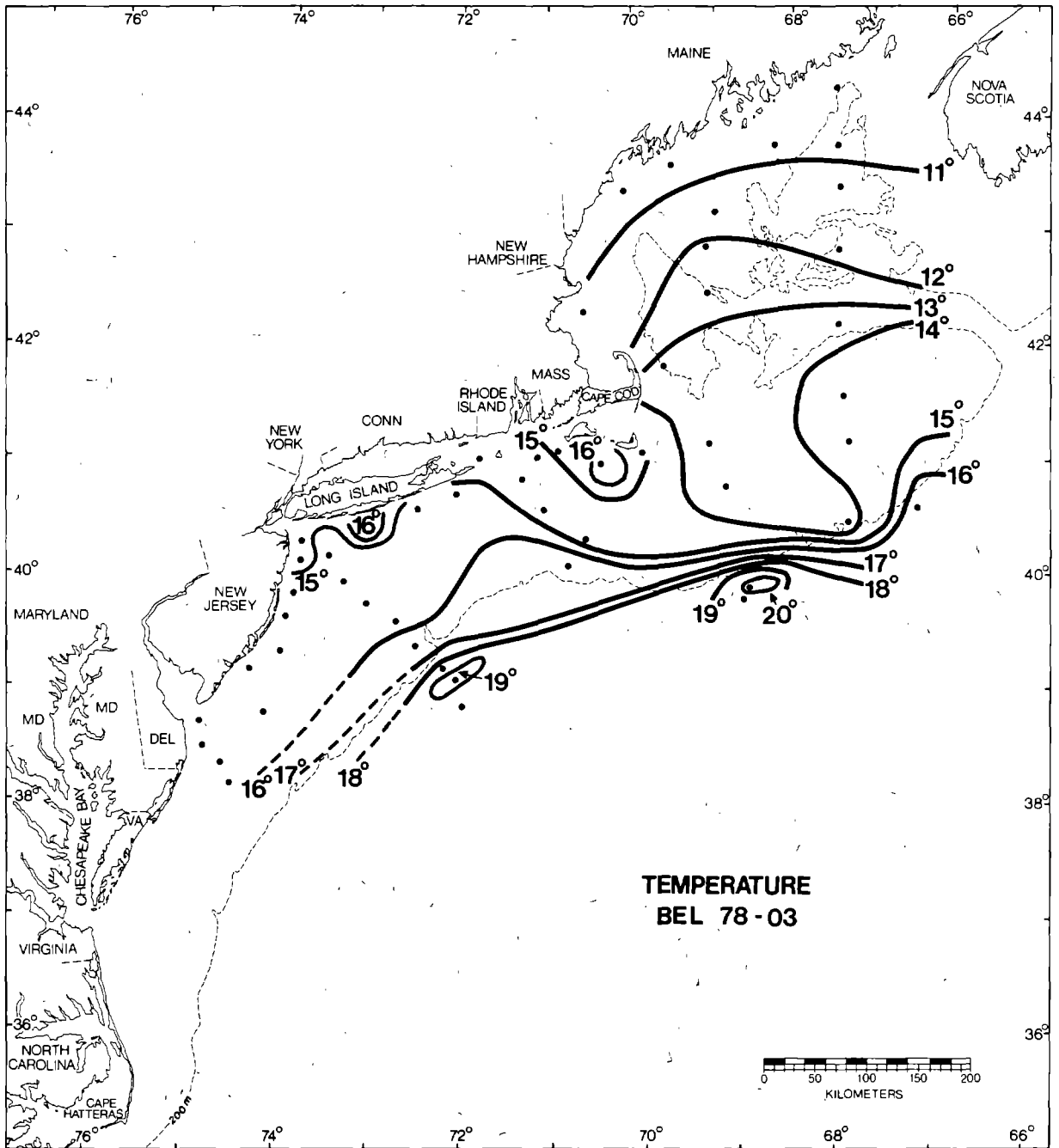


Fig. 2. Seawater surface temperatures ($^{\circ}\text{C}$) measured on cruise BEL-78-03.

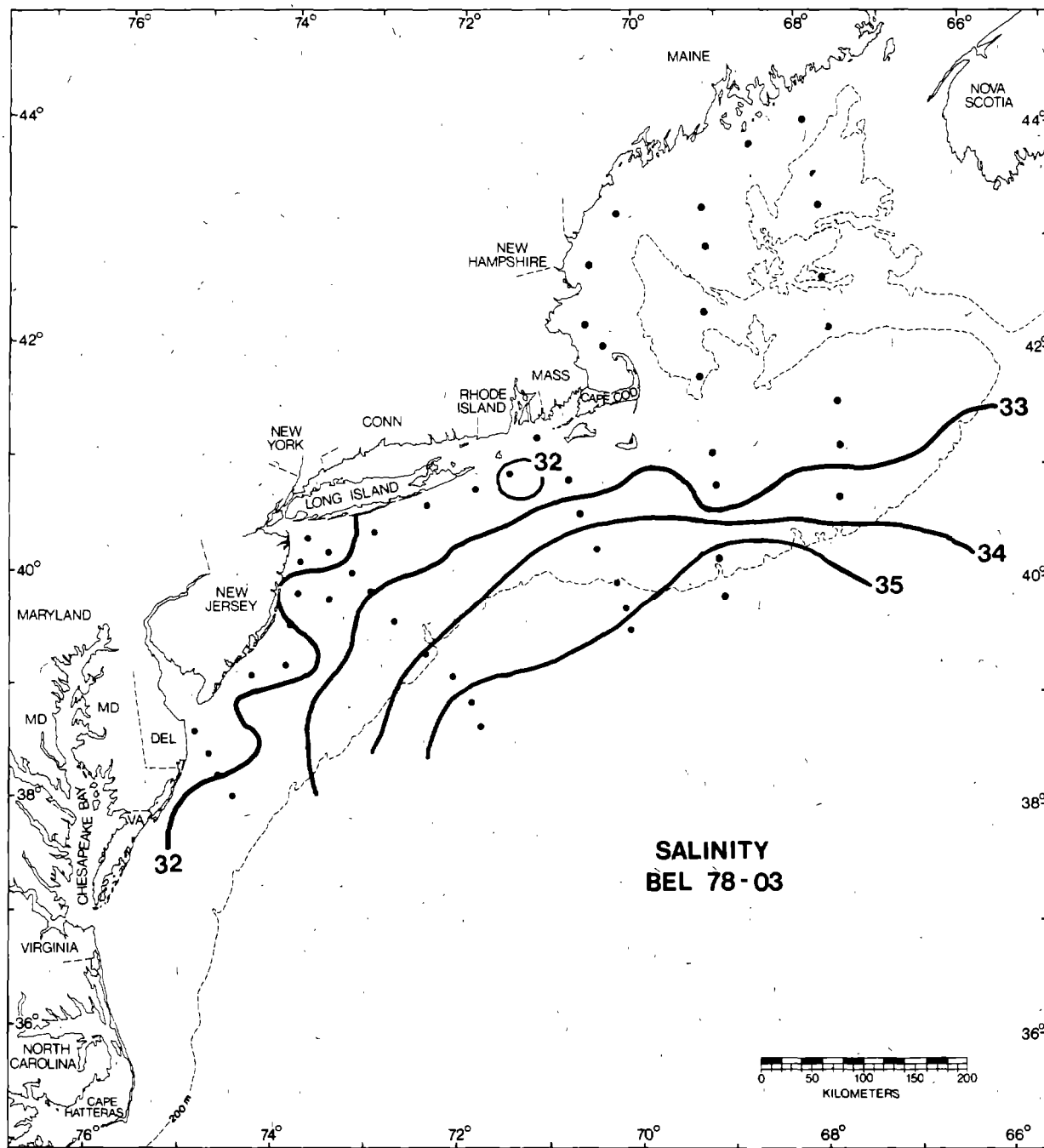


Fig. 3. Salinity (in parts per thousand) measured on cruise BEL-78-03.

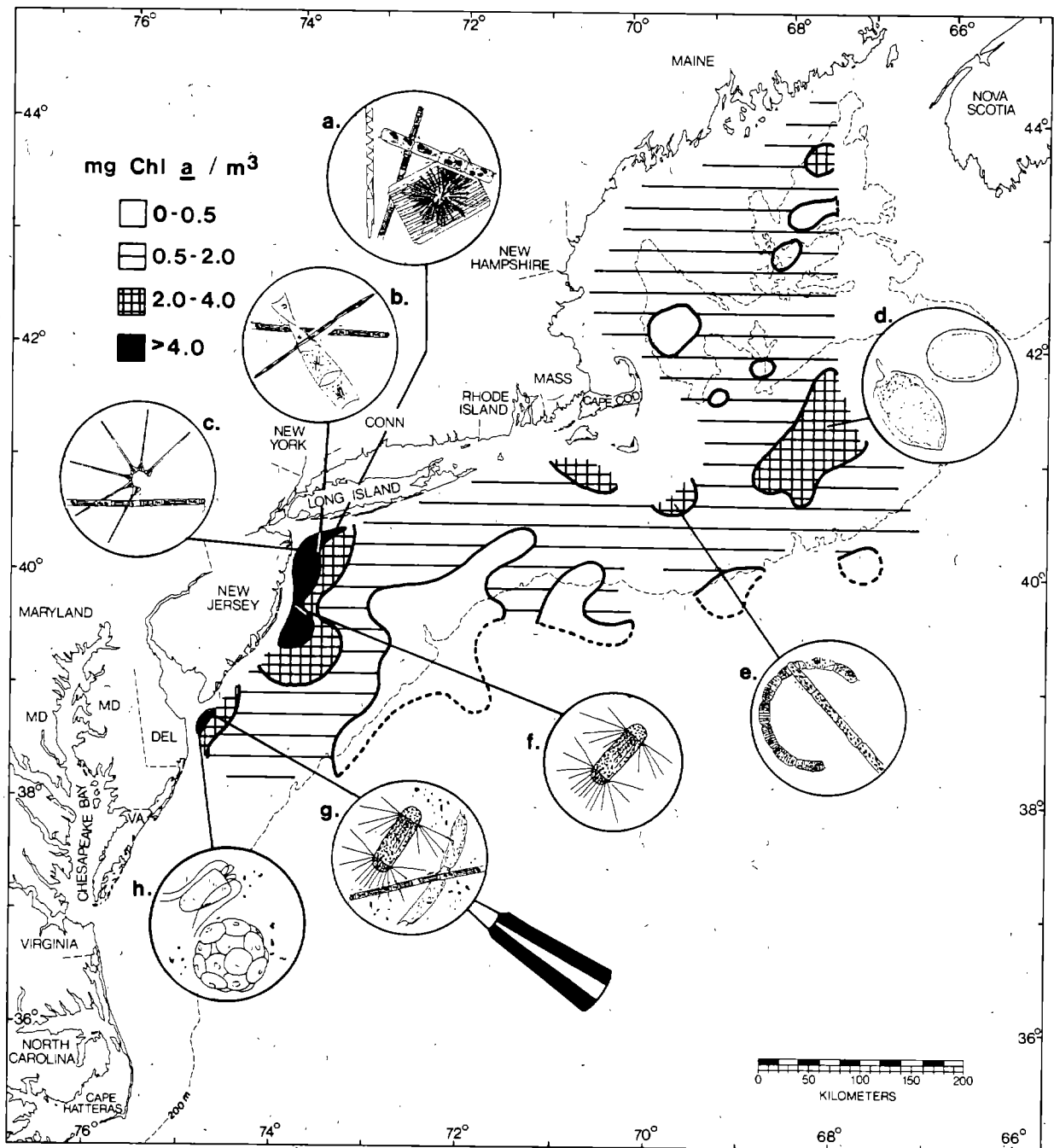


Fig. 4. Some phytoplankters identified in areas of high-chlorophyll a determined by Christine Evans, NMFS. a. Rhizosolenia spp., Skeletonema costatum, Striatella unipunctata; b. S. costatum, Nitzschia serrata, Streptotheca thamesis; c. Asterionella glacialis, S. costatum; d. Prorocentrum spp.; e. Rhizosolenia spp.; f. Corethron criophilum; g. C. criophilum, S. costatum, Hemiaulus sinensis; h. Coccolithophores, Pyramimonas sp.

Table 1. Various observations and measurements for stations on cruise Belogorsk 78-03.

Sta. #	Wind Speed (kts)	Wind Direction (°)	Air Temp. (°C)	Surf. Temp. (°C)	Wave Height (ft)	Barometric Pressure (mb)	Salinity (ppt)	Species Diversity Index	Latitude (N)	Longitude (W)
29	6	40	14.8	15.6	0.7	1028	30.96	2.356	38°44'	74°55'
30	14	40	15.2	15.7	1.5	1028	31.74	2.730	38°35'	74°48'
31	15	40	15.0	15.7	2.0	1032	32.28	2.565	38°25'	74°39'
41	6	310	15.0	15.1	0.2	1024	32.16	0.787	38°55'	74°29'
42	16	205	15.6	15.7	2.2	1017	31.70	0.462	39°10'	74°23'
43	20	195	16.8	15.9	2.0	1019	31.74	0.904	39°21'	74°06'
53	21	195	16.8	15.7	3.0	1019	32.02	0.925	39°42'	73°58'
54	8	210	13.0	15.2	0.7	1024	32.27	0.326	40°02'	73°44'
55	5	230	20.2	15.7	0.5	1011	31.36	0.912	40°26'	73°46'
56	8	220	17.8	15.5	0.7	1010	31.63	0.789	40°16'	73°36'
57	19	290	19.2	15.8	1.0	1012	32.34	1.734	40°06'	73°23'
58	26	360	12.8	15.2	2.2	1016	32.12	2.173	39°52'	73°05'
59	30	10	12.8	15.8	2.5	1016	33.55	2.891	39°39'	72°46'
60	30	360	10.4	16.8	3.5	1017	33.95	2.879	39°28'	72°33'
61	24	10	9.8	18.0	5.0	1014	35.15	2.161	39°18'	72°19'
62	17	20	10.0	19.3	4.7	1015	35.44	2.528	39°10'	72°09'
63	13	10	10.4	18.9	3.5	1022	35.52	2.075	39°02'	71°57'
67	8	230	18.6	16.1	0.6	1014	32.03	1.021	40°28'	73°13'
68	12	240	17.4	15.4	1.5	1017	32.01	1.514	40°42'	72°38'
74	17	240	16.7	15.0	1.3	1022	32.27	1.803	40°49'	72°08'
75	15	240	15.4	14.5	1.0	1022	31.68	0.463	41°03'	71°42'
77	10	340	11.2	14.5	1.2	1012	32.24	1.141	41°09'	71°15'
78	13	360	12.6	14.6	1.0	1015	32.34	2.553	40°57'	71°10'
79	8	360	14.6	14.0	1.3	1017	32.35	1.960	40°41'	71°02'
80	8	360	11.6	14.8	1.0	1019	33.48	2.616	40°21'	70°52'
81	9	360	11.8	16.3	1.0	1019	34.06	2.733	40°10'	70°46'
82	15	340	12.8	16.7	0.7	1022	34.34	2.486	39°59'	70°40'
87	21	120	16.0	15.2	3.5	1012	32.17	0.864	41°10'	71°00'
88	8	200	16.5	0.0	1.5	1010	31.93	2.771	41°04'	70°38'
95	14	300	11.4	13.1	1.5	1011	32.46	1.007	41°58'	69°50'
97	17	230	10.4	11.5	1.2	1024	32.68	0.471	42°06'	70°21'
98	8	170	11.2	11.9	0.4	1027	32.41	3.109	42°26'	70°38'
99	7	270	6.4	11.2	0.4	1031	32.46	3.185	42°48'	70°32'
102	8	5	6.0	10.6	0.5	1032	32.55	2.321	43°23'	70°16'
104	11	360	7.8	10.5	0.7	1031	32.84	1.436	43°40'	69°22'
105	12	360	6.8	12.1	0.7	1033	32.49	0.370	42°58'	69°17'
106	11	10	6.6	12.5	0.9	1030	32.38	2.237	42°35'	69°14'
108	12	290	12.4	13.9	1.5	1016	31.96	2.568	41°59'	69°12'
110	12	290	11.2	13.8	1.5	1018	32.09	2.381	41°20'	69°07'
112	18	315	10.2	13.6	2.0	1019	32.63	2.649	40°55'	69°06'
115	14	300	10.0	20.8	2.5	1027	35.59	2.921	40°04'	69°03'
116	16	290	11.6	19.8	2.5	1027	34.94	2.067	39°52'	69°00'
138	13	280	6.8	10.5	1.5	1016	32.72	0.585	43°56'	68°33'
141	20	330	6.2	10.3	2.0	1008	32.72	2.712	44°20'	67°43'
142	2	200	11.0	9.9	2.0	1008	32.99	1.251	43°49'	67°43'
143	9	240	15.4	11.9	2.5	1005	32.74	2.630	42°58'	67°42'
145	18	140	16.4	13.4	1.9	1014	32.55	2.587	42°14'	67°52'
146	20	160	17.0	14.8	1.0	1019	32.38	1.091	41°41'	67°38'
148	7	140	17.2	14.5	1.8	1021	32.29	0.997	41°16'	67°41'
150	6	190	17.0	13.8	1.0	1022	32.38	1.500	40°36'	67°41'
153	8	90	16.0	16.6	0.8	1024	33.53	1.776	40°37'	67°04'
182	9	200	15.0	11.6	2.0	1007	32.93	1.914	43°24'	67°43'
183	10	360	5.6	1.8	0.7	1031	32.61	2.304	43°16'	69°19'
185	16	200	15.8	15.6	1.0	1020	32.03	0.875	39°55'	73°53'
187	11	210	14.0	14.7	1.2	1023	31.63	1.179	40°15'	73°51'

Table 2. Phytoplankton composition observed at near and far shore stations between the Delaware Bay and the Gulf of Maine in October 1978. Numbers refer to average station concentrations in cells per liter.

	<u>Near Shore</u>	<u>Far Shore</u>
<u>Bacillariophyceae</u>		
<i>Achnanthes longipes</i> Agardh	1.2	0.8
<i>Actinoptychus</i> sp.	---	4.0
<i>Actinoptychus senarius</i> Ehrenberg	6.6	134.9
<i>Amphiprora</i> sp.	0.4	---
<i>Amphiprora surirelloides</i> Hendey	0.4	---
<i>Amphora</i> sp.	0.4	0.8
<i>Amphora arenaria</i> Donkin	4.0	---
<i>Amphora bigibba</i> Grunow	---	0.8
<i>Amphora crassa</i> Gregory	0.4	---
<i>Amphora ostrearia</i> Brebisson	0.8	---
<i>Amphora ovalis</i> Kutzing	0.4	---
<i>Anaulus mediterraneus</i> var. <i>intermedia</i> Grunow	---	6.4
<i>Asterionella glacialis</i> Castracane	3159.3	189.6
<i>Asteromphalus heptactis</i> (Brebisson) Ralfs	0.8	---
<i>Bacillaria paxillifer</i> (Muller) Hendey	12.0	---
<i>Bacteriastrum hyalinum</i> Lauder	---	1.9
<i>Bacteriastrum hyalinum</i> var. <i>princeps</i> Lauder	1.2	---
<i>Bacteriastrum varians</i> Lauder	0.4	---
<i>Bellerochea malleus</i> (Brightwell) VanHeurck	0.8	---
<i>Biddulphia</i> sp.	20.4	6.4
<i>Biddulphia alternans</i> (Bailey) VanHeurck	3.2	---
<i>Biddulphia aurita</i> (Lyngbye) Brebisson	6.4	4.8
<i>Biddulphia mobiliensis</i> (Bailey) Grunow	0.8	---
<i>Biddulphia sinensis</i> Greville	---	0.8
<i>Cerataulina pelagica</i> (Cleve) Hendey	36.4	106.9
<i>Chaetoceros</i> sp.	5.4	65.6

	<u>Near Shore</u>	<u>Far Shore</u>
<i>Chaetoceros affine</i> Lauder	28.4	14.8
<i>Chaetoceros atlanticum</i> Cleve	83.6	159.4
<i>Chaetoceros breve</i> Schutt	0.8	---
<i>Chaetoceros crinitum</i> Schutt	1.6	---
<i>Chaetoceros coarctatum</i> Lauder	7.4	31.2
<i>Chaetoceros compressum</i> Lauder	6.4	12.0
<i>Chaetoceros costatum</i> Pavillard	---	3.0
<i>Chaetoceros curvisetum</i> Cleve	18.0	10.2
<i>Chaetoceros danicum</i> Cleve	34.6	32.9
<i>Chaetoceros debile</i> Cleve	18.4	5.6
<i>Chaetoceros decipiens</i> Cleve	46.0	46.4
<i>Chaetoceros densum</i> Cleve	---	5.6
<i>Chaetoceros didymum</i> Ehrenberg	36.4	2.0
<i>Chaetoceros diversum</i> Cleve	---	0.8
<i>Chaetoceros externum</i> Gran	---	1.2
<i>Chaetoceros gracile</i> Schutt	9.3	4.1
<i>Chaetoceros pelagicum</i> Cleve	6.0	---
<i>Chaetoceros peruvianum</i> Brightwell	---	16.2
<i>Chaetoceros simplex</i> Ostenfeld	1009.6	---
<i>Chaetoceros sociale</i> Lauder	110.0	1.8
<i>Chaetoceros tortissimum</i> Gran	5.6	---
<i>Climacodium biconcavum</i> Cleve	---	105.6
<i>Climacodium frauenfeldianum</i> Grunow	---	2.2
<i>Climacosphenia moniligera</i> Ehrenberg	0.4	---
<i>Cocconeis scutellum</i> Ehrenberg	2.0	---
<i>Corethron criophilum</i> Castracane	1772.4	142.2
<i>Coscinodiscus</i> sp.	24.0	4.6
<i>Coscinodiscus asteromphalus</i> Ehrenberg	---	2.2
<i>Coscinodiscus centralis</i> Ehrenberg	2.4	20.2

	<u>Near Shore</u>	<u>Far Shore</u>
<i>Coscinodiscus concinnus</i> W. Smith	1.2	11.2
<i>Coscinodiscus gigas</i> Ehrenberg	6.2	9.2
<i>Coscinodiscus granulatus</i> Grunow	4.1	23.9
<i>Coscinodiscus kuetzingii</i> Schmidt	---	0.4
<i>Coscinodiscus lineatus</i> Ehrenberg	11.4	50.1
<i>Coscinodiscus marginatus</i> Ehrenberg	12.8	2.8
<i>Coscinodiscus nitidus</i> Gregory	16.2	50.1
<i>Coscinodiscus perforatus</i> Ehrenberg	2.8	---
<i>Coscinodiscus radiatus</i> Ehrenberg	3.6	27.2
<i>Coscinodiscus stellaris</i> Roper	---	7.2
<i>Coscinodiscus sub-bulliens</i> Jorgenson	0.4	---
<i>Coscinodiscus wailesii</i> Gran and Angst	---	52.4
<i>Coscinosira polychorda</i> (Gran) Gran	3.6	33.2
<i>Cyclotella</i> sp.	0.4	---
<i>Cyclotella caspia</i> Grunow	---	4.0
<i>Cyclotella meneghiniana</i> Kutzing	10.0	---
<i>Cylindrotheca closterium</i> (Ehrenberg) Reimann and Lewin	36.2	132.0
<i>Cymatosira belgica</i> Grunow	---	0.6
<i>Dactyliosolen antarcticus</i> Castracane	0.4	---
<i>Dimerogramma</i> sp.	---	1.0
<i>Diploneis crabro</i> Ehrenberg	0.8	2.0
<i>Diploneis lineata</i> (Donkin) Cleve	0.4	---
<i>Diploneis smithii</i> (Brebisson) Cleve	0.4	---
<i>Ditylum brightwellii</i> (West) Grunow	69.8	82.0
<i>Eucampia cornuta</i> (Cleve) Grunow	1.6	---
<i>Eucampia zodiacus</i> Ehrenberg	4.8	17.0
<i>Eunotogramma</i> sp.	0.4	---
<i>Fragilaria</i> sp.	0.8	0.4
<i>Fragilaria crotonensis</i> Kitton	1.2	---

	<u>Near Shore</u>	<u>Far Shore</u>
<i>Fragilaria pinnata</i> Ehrenberg	---	5.2
<i>Grammatophora</i> sp.	---	5.6
<i>Grammatophora marina</i> (Lyngbye) Kutzing	57.0	0.2
<i>Guinardia flaccida</i> (Castracane) Peragallo	55.0	232.5
<i>Gyrosigma</i> sp.	---	0.5
<i>Gyrosigma fasciola</i> (Ehrenberg) Cleve	0.4	0.1
<i>Hemiaulus hauckii</i> Grunow	44.8	38.2
<i>Hemiaulus membranaceus</i> Cleve	31.8	20.1
<i>Hemiaulus sinensis</i> Greville	340.7	444.0
<i>Hemidiscus cuneiformis</i> Wallich	---	1.2
<i>Isthmia nervosa</i> Kutzing	1.2	---
<i>Lauderia borealis</i> Gran	14.4	---
<i>Leptocylindrus danicus</i> Cleve	39761.0	8034.7
<i>Leptocylindrus minimus</i> Gran	64.4	115.6
<i>Licmophora</i> sp.	0.4	10.2
<i>Lithodesmium undulatum</i> Ehrenberg	3.2	5.2
<i>Mastogloia</i> sp.	0.4	---
<i>Mastogloia brawii</i> Grunow	0.4	---
<i>Melosira</i> sp.	1.6	---
<i>Melosira granulata</i> (Ehrenberg) Ralfs	---	0.8
<i>Melosira hummii</i> Hustedt	1.6	---
<i>Melosira moniliformis</i> (Muller) Agardh	---	2.4
<i>Melosira nummuloides</i> (Dillwyn) Agardh	6.0	4.8
<i>Navicula</i> sp.	7.8	10.0
<i>Navicula abrupta</i> (Gregory) Cleve	0.8	---
<i>Navicula arenaria</i> Donkin	---	4.8
<i>Navicula directa</i> (Smith) Ralfs	1.2	---
<i>Navicula forcipata</i> Greville	2.0	---
<i>Navicula hennedyi</i> Smith	2.0	---

	<u>Near Shore</u>	<u>Far Shore</u>
<i>Navicula lyra</i> Ehrenberg	---	0.4
<i>Navicula pavillardii</i> Hustedt	0.4	---
<i>Navicula pelagica</i> Cleve	0.8	---
<i>Navicula salinarum</i> Grunow	4.0	---
<i>Nitzschia</i> sp.	11.6	5.2
<i>Nitzschia angularis</i> var. <i>affinis</i> (Gran) Hustedt	---	0.2
<i>Nitzschia bilobata</i> Smith	0.8	---
<i>Nitzschia delicatissima</i> Cleve	332.8	352.0
<i>Nitzschia hybridaeformis</i> Hustedt	0.8	---
<i>Nitzschia lorenziana</i> var. <i>incurva</i> Grunow	0.4	---
<i>Nitzschia microcephala</i> Grunow	0.4	---
<i>Nitzschia obtusa</i> Smith	0.4	---
<i>Nitzschia proxima</i> Hustedt	3.6	---
<i>Nitzschia pungens</i> Grunow	580.0	2295.1
<i>Nitzschia seriata</i> Cleve	347.7	106.2
<i>Nitzschia sigma</i> (Kutzing) Smith	8.4	6.4
<i>Nitzschia sigma</i> var. <i>rigida</i> Grunow	---	5.8
<i>Paralia sulcata</i> (Ehrenberg) Cleve	87.8	229.2
<i>Phaeodactylum tricornutum</i> Bohlin	2.0	8.0
<i>Pinnularia cruciformis</i> (Donkin) Cleve	0.4	---
<i>Plagiogramma staurophorum</i> (Gregory) Heilberg	---	19.0
<i>Plagiogramma vanheureka</i> Grunow	2.4	2.0
<i>Pleurosigma</i> sp.	---	13.8
<i>Pleurosigma angulatum</i> (Quekett) Smith	3.0	11.8
<i>Pleurosigma elongatum</i> Smith	0.2	2.6
<i>Pleurosigma hamuliferum</i> Grunow	---	2.2
<i>Pleurosigma nicobaricum</i> (Grunow) Grunow	4.8	2.4
<i>Pleurosigma normani</i> Ralfs	6.0	---

	<u>Near Shore</u>	<u>Far Shore</u>
<i>Pleurosigma rigidum</i> Smith	---	6.8
<i>Podosira</i> sp.	0.8	0.4
<i>Rhabdonema arcuatum</i> (Lyngbye) Kutzing	1.6	---
<i>Rhaphoneis ampiceros</i> Ehrenberg	0.4	4.4
<i>Rhizosolenia</i> sp.	3.6	100.3
<i>Rhizosolenia acuminata</i> (Peragallo) Gran	4.0	---
<i>Rhizosolenia alata</i> Brightwell	229.5	---
<i>Rhizosolenia alata</i> f. <i>gracillima</i> (Cleve) Grunow	7.1	39.4
<i>Rhizosolenia alata</i> f. <i>indica</i> (Peragallo) Gran	5.6	7.1
<i>Rhizosolenia bergonii</i> Peragallo	0.8	0.3
<i>Rhizosolenia calcar-avis</i> Schultze	15.8	21.7
<i>Rhizosolenia cylindrus</i> Cleve	---	42.9
<i>Rhizosolenia delicatula</i> Cleve	832.8	996.0
<i>Rhizosolenia fragilissima</i> Bergon	34.4	---
<i>Rhizosolenia hebetata</i> f. <i>hiemalis</i> Gran	19.2	11.8
<i>Rhizosolenia hebetata</i> f. <i>semispina</i> (Hensen) Gran	13.2	19.6
<i>Rhizosolenia imbricata</i> Brightwell	62.6	3593.5
<i>Rhizosolenia imbricata</i> var. <i>shrubsolei</i> (Cleve) VanHeurck	53.2	---
<i>Rhizosolenia setigera</i> Brightwell	18.0	80.9
<i>Rhizosolenia stolterfothii</i> Pergallo	293.5	538.2
<i>Rhizosolenia styliiformis</i> Brightwell	2.4	51.8
<i>Schroederella delicatula</i> (Peragallo) Pavillard	199.2	---
<i>Scoliopleura</i> sp.	4.8	---
<i>Skeletonema costatum</i> (Greville) Cleve	73231.0	28341.5
<i>Stephanopyxis palmeriana</i> (Greville) Grunow	12.4	34.4
<i>Stephanopyxis turris</i> (Greville) Ralfs	85.4	2.4
<i>Streptotheca thamesis</i> Shrubsole	5.2	---
<i>Striatella unipunctata</i> (Lyngbye) Agardh	645.6	---
<i>Surirella robusta</i> Ehrenberg	0.4	---

	<u>Near Shore</u>	<u>Far Shore</u>
<i>Synedra</i> sp.	1.2	87.3
<i>Synedra tabulata</i> var. <i>fasciculata</i> (Lyngbye) Hustedt	1.2	22.0
<i>Synedra undulata</i> Bailey	3.2	---
<i>Tabellaria fenestrata</i> (Lyngbye) Kutzing	---	42.4
<i>Tabellaria fenestrata</i> var. <i>asterionelloides</i> Grunow	270.8	11.0
<i>Thalassionema nitzschioides</i> Hustedt	212.4	344.0
<i>Thalassiosira aestivalis</i> Gran and Angst	4.0	13.6
<i>Thalassiosira baltica</i> (Grunow) Ostenfeld	3.6	---
<i>Thalassiosira decipiens</i> (Grunow) Jorgensen	4.4	0.8
<i>Thalassiosira eccentrica</i> (Ehrenberg) Cleve	6.8	7.8
<i>Thalassiosira gravida</i> Cleve	2.8	10.7
<i>Thalassiosira nordenskioldii</i> Cleve	40.0	148.4
<i>Thalassiosira rotula</i> Meunier	5.8	8.8
<i>Thalassiothrix longissima</i> Cleve and Grunow	2.0	14.8
<i>Thalassiothrix frauenfeldii</i> Grunow	9.2	121.2
Unknown Diatoms	0.4	0.2

Pyrrhophyceae

<i>Amphidinium</i> sp.	0.8	0.8
<i>Amphidinium acutissimum</i> Schiller	---	43.7
<i>Amphidinium acutum</i> Lohmann	---	25.0
<i>Amphidinium carterae</i> Hulburt	12.4	---
<i>Amphidinium crassum</i> Lohmann	6.8	3.2
<i>Amphidinium fusiforme</i> Martin	3.6	---
<i>Amphidinium glaucum</i> Conrad	---	2.2
<i>Amphidinium klebsii</i> Kofoid and Swezy	8.0	---
<i>Amphidinium operculatum</i> Claparede and Lachmann	0.4	---
<i>Amphidinium schroederi</i> Schiller	---	17.3

	<u>Near Shore</u>	<u>Far Shore</u>
<i>Amphidoma</i> sp.	0.4	0.2
<i>Amphidoma caudatum</i> Halldall	0.4	0.8
<i>Amphidoma steinii</i> Schiller	5.2	---
<i>Amphisolenia globifera</i> Stein	---	2.8
<i>Ceratium belone</i> Cleve	---	0.4
<i>Ceratium candelabrum</i> (Ehrenberg) Stein	---	0.8
<i>Ceratium contortum</i> (Gourret) Cleve	---	4.2
<i>Ceratium extensum</i> (Gourret) Cleve	2.3	11.2
<i>Ceratium falciformes</i> Jorgensen	0.4	---
<i>Ceratium furca</i> (Ehrenberg) Claparede and Lachmann	8.3	24.8
<i>Ceratium fusus</i> (Ehrenberg) DuJardin	7.2	25.5
<i>Ceratium geniculatum</i> (Lemmermann) Cleve	0.4	---
<i>Ceratium lineatum</i> (Ehrenberg) Cleve	33.6	43.8
<i>Ceratium longipes</i> (Bailey) Gran	0.4	---
<i>Ceratium macroceros</i> (Ehrenberg) VanHoffen	0.8	0.4
<i>Ceratium massiliense</i> (Gourret) Jorgensen	2.4	---
<i>Ceratium minutum</i> Jorgensen	5.6	29.4
<i>Ceratium pavillardii</i> Jorgensen	0.8	---
<i>Ceratium pentagonum</i> Gourret	---	0.9
<i>Ceratium ranipes</i> Cleve	1.0	---
<i>Ceratium teres</i> Kofoid	---	0.4
<i>Ceratium trichoceros</i> (Ehrenberg) Kofoid	25.7	72.1
<i>Ceratium tripos</i> (Muller) Nitzsch	1.8	2.6
<i>Ceratium tripos</i> var. <i>atlanticum</i> (Ostenfeld) Paulsen	3.4	57.9
<i>Cochlodinium</i> sp.	0.4	---
<i>Cochlodinium helicoides</i> Lebour	0.4	---
<i>Cochlodinium kofoidii</i> Kofoidii	0.4	---
<i>Cochlodinium pellucidum</i> Lohmann	0.4	---
<i>Dinophysis</i> sp.	0.4	0.6

	<u>Near Shore</u>	<u>Far Shore</u>
<i>Dinophysis acuminata</i> Claparede and Lachmann	3.6	0.2
<i>Dinophysis acuta</i> Ehrenberg	0.6	0.8
<i>Dinophysis caudata</i> Kent	1.2	2.0
<i>Dinophysis exigua</i> Kofoid and Skogsberg	---	0.2
<i>Dinophysis fortii</i> Pavillard	29.2	28.9
<i>Dinophysis hastata</i> Stein	---	0.4
<i>Dinophysis norvegica</i> Claparede and Lachmann	---	0.8
<i>Dinophysis ovum</i> Schutt	2.6	1.0
<i>Dinophysis schuettii</i> Murray and Whitting	---	0.8
<i>Dinophysis tripos</i> Gourrey	---	2.3
<i>Diplopsalis</i> sp.	2.0	---
<i>Diplopsalis lenticula</i> Bergh	2.0	---
<i>Dissodinium asymmetricum</i> (Mangin) Loeblich	---	4.0
<i>Glenodinium danicum</i> Paulsen	4.4	2.8
<i>Glenodinium foliaceum</i> Paulsen	0.4	---
<i>Glenodinium rotundatum</i> Ehrenberg	4.4	---
<i>Goniaulax</i> sp.	0.4	2.6
<i>Goniaulax birostris</i> Stein	---	0.4
<i>Goniaulax catenata</i> (Lev) Kofoid	0.8	---
<i>Goniaulax conjuncta</i> Wood	0.8	---
<i>Goniaulax diacantha</i> (Meunier) Schiller	6.8	2.0
<i>Goniaulax diegensis</i> Kofoid	4.8	4.0
<i>Goniaulax digitalis</i> (Pouchet) Kofoid	---	4.1
<i>Goniaulax excavata</i> (Braaud) Balech	3.2	1.2
<i>Goniaulax minima</i> Matzenauer	1.6	---
<i>Goniaulax minuta</i> Kofoid and Michener	0.4	1.8
<i>Goniaulax orientalis</i> Lindermann	---	0.4
<i>Goniaulax polyedra</i> Stein	0.4	2.2
<i>Goniaulax polygramma</i> Stein	1.2	0.8

	<u>Near Shore</u>	<u>Far Shore</u>
<i>Goniaulax scrippsae</i> Kofoid	1.6	---
<i>Goniaulax spinifera</i> (Claparede & Lachmann) Diesing	5.2	0.8
<i>Goniaulax tricantha</i> Jorgensen	0.4	1.2
<i>Goniaulax unicornis</i> Lebour	1.2	---
<i>Goniodoma</i> sp.	0.4	---
<i>Gymnodinium</i> sp.	53.5	18.2
<i>Gymnodinium arcticum</i> Wulff	---	153.4
<i>Gymnodinium grammaticum</i> (Pouchet) Kofoid and Swezy	---	0.3
<i>Gymnodinium nelsoni</i> Martin	6.0	5.2
<i>Gymnodinium punctatum</i> Pouchet	0.8	0.8
<i>Gymnodinium simplex</i> (Lohmann) Kofoid and Swezy	0.4	---
<i>Gymnodinium splendens</i> Lebour	3.2	---
<i>Gymnodinium stellatum</i> Hulburt	1.6	---
<i>Gymnodinium variabile</i> Herdman	1.0	2.6
<i>Gyrodinium</i> sp.	1.2	64.6
<i>Gyrodinium aureolum</i> Hulburt	8.4	3.2
<i>Gyrodinium aureum</i> (Conrad) Schiller	2.8	1.2
<i>Gyrodinium estuariale</i> Hulburt	0.4	---
<i>Gyrodinium glaebum</i> Hulburt	1.6	---
<i>Gyrodinium metum</i> Hulburt	0.8	---
<i>Gyrodinium pellucidum</i> (Wulff) Martin	2.4	---
<i>Gyrodinium pinque</i> (Schutt) Kofoid and Swezy	---	4.0
<i>Gyrodinium spirale</i> (Berghman) Kofoid and Swezy	2.8	---
<i>Gyrodinium uncatenum</i> Hulburt	6.4	6.8
<i>Heterocapsa triquetra</i> (Ehrenberg) Stein	20.4	4.4
<i>Katodinium asymmetricum</i> (Massart) Loeblich	1.2	---
<i>Katodinium rotundatum</i> (Lohmann) Loeblich	14.0	---

	<u>Near Shore</u>	<u>Far Shore</u>
<i>Noctiluca miliaris</i> Suriray	1.2	9.0
<i>Oxyrrhis marina</i> DuJardin	0.4	4.0
<i>Oxytoxum</i> sp.	0.4	0.3
<i>Oxytoxum constrictum</i> (Stein) Butschli	0.4	0.4
<i>Oxytoxum gladiolus</i> Stein	0.4	---
<i>Oxytoxum graate</i> Stein	0.8	---
<i>Oxytoxum milneri</i> Murray and Whitting	---	0.1
<i>Oxytoxum mitra</i> (Stein) Schiller	---	0.4
<i>Oxytoxum parvum</i> Schiller	0.4	---
<i>Oxytoxum reticulatum</i> (Stein) Butschli	0.8	---
<i>Oxytoxum szeptum</i> (Stein) Schroder	---	2.0
<i>Oxytoxum scolopax</i> Stein	0.8	2.0
<i>Oxytoxum sphaeroideum</i> Stein	1.6	---
<i>Oxytoxum turbo</i> Kofoid	---	4.3
<i>Oxytoxum viride</i> Schiller	0.4	---
<i>Podolampas palmipes</i> Stein	---	6.5
<i>Polykrikos kofoidii</i> Chatton	0.4	0.4
<i>Prorocentrum</i> sp.	---	41.0
<i>Prorocentrum aporum</i> (Schiller) Dodge	3.6	64.6
<i>Prorocentrum balticum</i> (Lohmann) Loeblich	7.6	0.4
<i>Prorocentrum compressum</i> (Bailey) Abe	13.6	325.6
<i>Prorocentrum dentatum</i> Stein	---	9.6
<i>Prorocentrum gracile</i> Schutt	---	0.4
<i>Prorocentrum lima</i> (Ehrenberg) Dodge	8.8	1.6
<i>Prorocentrum maximum</i> (Gourret) Schiller	0.4	---
<i>Prorocentrum micans</i> Ehrenberg	269.6	1321.5
<i>Prorocentrum rostratum</i> Stein	---	0.6
<i>Prorocentrum scutellum</i> Schroder	367.6	1.9

	<u>Near Shore</u>	<u>Far Shore</u>
<i>Protopteridinium</i> sp.	4.4	---
<i>Protopteridinium breve</i> (Paulsen) Balech	7.6	---
<i>Protopteridinium brevipes</i> (Paulsen) Balech	7.6	0.4
<i>Protopteridinium cerasus</i> (Paulsen) Balech	8.8	1.0
<i>Protopteridinium claudicans</i> (Paulsen) Balech	0.8	2.0
<i>Protopteridinium conicoides</i> (Paulsen) Balech	---	32.4
<i>Protopteridinium conicum</i> (Gran) Balech	0.8	---
<i>Protopteridinium depressum</i> (Bailey) Balech	2.8	---
<i>Protopteridinium excavatum</i> (Martin) Balech	7.2	---
<i>Protopteridinium globulum</i> (Stein) Balech	---	0.4
<i>Protopteridinium granii</i> (Ostenfeld) Balech	0.2	1.0
<i>Protopteridinium leonis</i> (Pavillard) Balech	1.2	---
<i>Protopteridinium nipponicum</i> (Abe) Balech	---	0.8
<i>Protopteridinium pallidum</i> (Ostenfeld) Balech	---	2.0
<i>Protopteridinium pellucidum</i> Bergh	0.4	---
<i>Protopteridinium pentagonum</i> (Gran) Balech	3.2	0.4
<i>Protopteridinium steinii</i> (Jorgensen) Balech	89.6	1.4
<i>Pyramimonas amyliifer</i> Conrad	---	26.8
<i>Pyramimonas grossii</i> Parke	568.8	59.8
<i>Pyrocystis fusiformis</i> (Wyville-Thomson) Murray	0.4	---
<i>Pyrocystis lunula</i> Schutt	---	0.4
<i>Pyrophacus horologium</i> Stein	2.4	0.4
<i>Scrippsiella trochoidea</i> (Stein) Loeblich	32.0	3.2
Unknown Pyrrhophyceans	1.2	0.4

Haptophyceae

<i>Calciosolenia murrayi</i> Gran	---	0.8
<i>Coccolithus pelagicus</i> (Wallich) Schiller	10.0	---
<i>Cyclococcolithus leptoporus</i> (Murray & Blackman) Kamptner	4.8	6.6

	<u>Near Shore</u>	<u>Far Shore</u>
<i>Discosphaera tubifer</i> (Murray & Blackman) Ostenfeld	0.8	1.4
<i>Emiliana huxleyi</i> (Lohmann) Hay and Mohler	76.4	209.2
<i>Gephyrocapsa oceanica</i> Kamptner	4.8	2.0
<i>Helicosphaera carteri</i> (Wallach) Kamptner	7.6	4.8
<i>Hymenomonas carterae</i> (Braarud & Fagerland) Braarud	1.6	---
<i>Hymenomonas roseola</i> Stein	11.6	0.4
<i>Pontosphaera syracusana</i> Lohmann	2.8	0.4
<i>Rhabdosphaera clavigera</i> Murray and Blackman	1.2	3.3
<i>Scyphosphaera apsteini</i> Lohmann	3.2	---
<i>Syracosphaera</i> sp.	---	2.0
<i>Syracosphaera pulchra</i> Lohmann	0.8	0.8
Unknown Coccolithophores	98.4	111.6
<u>Euglenophyceae</u>		
<i>Euglena</i> sp.	6.0	74.2
<i>Euglena proxima</i> Dangeard	21.2	---
<i>Eutreptia</i> sp.	0.4	---
<u>Cyanophyceae</u>		
<i>Anacystis</i> sp.	3.2	---
<i>Gomphosphaeria aponina</i> Kutzing	9.6	9.6
<i>Nostoc commune</i> Vaucher (filaments)	27.4	114.0
<i>Oscillatoria erythraea</i> (Ehrenberg) Kutzing (filaments)	6.4	170.7
<u>Chlorophyceae</u>		
<i>Arthrodesmus</i> sp.	12.8	---
<i>Chlorella</i> sp.	2.7	---
<i>Nannochloris atomus</i> Butcher	5009.7	6.4

	<u>Near Shore</u>	<u>Far Shore</u>
<u>Chrysophyceae</u>		
<i>Calycomonas ovalis</i> Wulff	10.8	3.6
<i>Calycomonas wulffii</i> Conrad and Kufferath	10.8	1.6
<i>Dietyocha fibula</i> Ehrenberg	36.0	217.8
<i>Distephanus speculum</i> (Ehrenberg) Haeckel	23.5	135.6
<i>Ebria tripartita</i> (Schumann) Lemermann	0.8	1.6
<i>Mallomonas</i> sp.	3.2	0.4
<i>Olisthodiscus luteus</i> Carter	10.0	---
Unknown Silicoflagellates	---	0.6
<u>Cryptophyceae</u>		
<i>Chilomonas</i> sp.	12.0	5.2
<i>Chroomonas salina</i> (Wislouch) Butcher	3.2	5.6
<i>Chroomonas vectensis</i> Carter	4.8	---
<i>Cryptomonas pseudobaltica</i> Butcher	40.1	10.7
<i>Cryptomonas stigmatica</i> Wislouch	9.2	1.6
Unknown, ultraplankton and nanoplankton	10019.5	381.6

	<u>Near Shore</u>	<u>Far Shore</u>
<u>Chrysophyceae</u>		
<i>Calycomonas ovalis</i> Wulff	10.8	3.6
<i>Calycomonas wulffii</i> Conrad and Kufferath	10.8	1.6
<i>Dictyocha fibula</i> Ehrenberg	36.0	217.8
<i>Distephanus speculum</i> (Ehrenberg) Haeckel	23.5	135.6
<i>Ebria tripartita</i> (Schumann) Lemermann	0.8	1.6
<i>Mallomonas</i> sp.	3.2	0.4
<i>Olisthodiscus luteus</i> Carter	10.0	---
Unknown Silicoflagellates	---	0.6
<u>Cryptophyceae</u>		
<i>Chilomonas</i> sp.	12.0	5.2
<i>Chroomonas salina</i> (Wislouch) Butcher	3.2	5.6
<i>Chroomonas vectensis</i> Carter	4.8	---
<i>Cryptomonas pseudobaltica</i> Butcher	40.1	10.7
<i>Cryptomonas stigmatica</i> Wislouch	9.2	1.6
Unknown ultraplankton	10019.5	381.6

APPENDIX I

<u>Station 29</u>	<u>Cells/ Liter</u>		<u>Cells/ Liter</u>
Nanoplankton	6600	Navicula sp.	92
Calycomonas gracilis	16	Navicula salinarum	8
Dityocha fibula	48	Navicula abrupta	16
Distephanus speculum	20	Diploneis crabro	8
Haptophyceae prymnesiales	184	Pleurosigma angulatum	40
Pontosphaera syracusana	16	Pleurosigma normani	24
Unidentified coccolithophores	136	Amphora arenaria	8
Cyclococcolithus leptoporus	88	Nitzschia sp.	232
Gephyrocapsa oceanica	8	Bacillaria paxillifer	224
Helicosphaera carteri	16	Nitzschia seriata	264
Paralia sulcata	32	Pyramimonas grossi	11376
Stephanopyxis turris	1124	Prorocentrum compressum	8
Corethron criophilum	1496	Dinophysis acuminata	8
Schroederella delicatula	248	Amphidinium crassum	40
Leptocylindrus danicus	200	Gymnodinium sp.	16
Skeletonema costatum	1272	Katodinium rotundatum	24
Cyclotella sp.	8	Protopteridinium sp.	16
Cyclotella meneghiniana	176	Protopteridinium depressum	8
Thalassiosira nordenskioldii	64	Gonyaulax diegensis	8
Lauderia borealis	216	Ceratium furca	14
Coscinodiscus nitidus	8	Ceratium macroceros	8
Coscinodiscus radiatus	8	Ceratium tripos	4
Biddulphia sp.	8	Ceratium minutum	8
Biddulphia alternans	64	Oxytoxum sp.	8
Biddulphia aurita	56	Chroomonas vectensis	40
Biddulphia mobiliensis	16	Cryptomonas stigmatica	24
Isthmia nervosa	24	Unidentified	8
Hemiaulus hauckii	24		
Hemiaulus membranaceus	80		
Hemiaulus sinensis	80		
Cerataulina pelagica	16	<u>Station 30</u>	
Chaetoceros compressum	56	Nanoplankton	6544
Chaetoceros curvisetum	160	Mallomonas sp.	8
Chaetoceros danicum	304	Dityocha fibula	52
Chaetoceros didymum	96	Unidentified coccolithophores	120
Chaetoceros sociale	320	Coccolithus pelagicus	8
Rhizosolenia alata	264	Helicosphaera carteri	8
Rhizosolenia alata f. indica	48	Melosira nummuloides	32
Rhizosolenia calcar-avis	16	Paralia sulcata	352
Rhizosolenia delicatula	32	Stephanopyxis palmeriana	96
Rhizosolenia hebetata f. hemiaulus	120	Stephanopyxis turris	160
Rhizosolenia hebetata f. semispina	264	Corethron criophilum	1088
Rhizosolenia imbricata v. shrubsolei	1064	Schroederella delicatula	208
Rhizosolenia setigera	40	Leptocylindrus danicus	712
Rhizosolenia stolterfothii	1156	Leptocylindrus minimus	8
Guinardia flaccida	8	Skeletonema costatum	456
Lithodesmium undulatum	32	Thalassiosira nordenskioldii	40
Ditylum brightwellii	104	Thalassiosira rotula	32
Unidentified pennate diatom	16	Lauderia borealis	64
Asterionella glacialis	764	Coscinodiscus concinus	16
Thalassiothrix frauenfeldii	24	Coscinodiscus lineatus	8
Thalassionema nitzschioides	32	Coscinodiscus marginatus	16
Rhaphoneis amphiceros	8	Coscinodiscus nitidus	16
Grammatophora marina	8	Coscinodiscus radiatus	32

	<u>Cells/ Liter</u>		<u>Cells/ Liter</u>
<u>Station 31 (conti.)</u>			
Pleurosigma nicobaricum	48	Licmophora sp.	200
Nitzschia pungens	144	Grammatophora sp.	112
Cylindrotheca closterium	64	Diploneis crabro	8
Pyramimonas amyliifer	16	Pleurosigma sp.	72
Prorocentrum micans	48	Nitzschia pungens	5260
Dinophysis sp.	8	Cylindrotheca closterium	24
Dinophysis norvegica	8	Euglena sp.	1442
Dinophysis caudata	16	Prorocentrum compressum	48
Dinophysis tripos	40	Dinophysis caudata	8
Dinophysis fortii	128	Dinophysis fortii	40
Protooperidinium claudicans	8	Protooperidinium claudicans	8
Protooperidinium steinii	8	Ceratium fusus	8
Gonyaulax sp.	16	Ceratium lineatum	164
Gonyaulax diegensis	16	Ceratium tripos var. atlanticum	244
Gonyaulax birostris	8	Ceratium trichoceros	504
Ceratium lineatum	24	Ceratium contortum	8
Ceratium tripos var. atlanticum	120	Ceratium extensum	16
Ceratium trichoceros	584		
Ceratium candelabrum	16		
Ceratium belone	8		
Ceratium teres	8		
Ceratium extensum	104		
<u>Station 32</u>			
Oscillatoria erythraea	24		
Dictyocha fibula	88		
Paralia sulcata	1720		
Corethron criophilum	32		
Leptocylindrus danicus	962		
Leptocylindrus minimus	1284		
Coscinodiscus asteromphalus	16		
Coscinodiscus nitidus	40		
Coscinodiscus radiatus	40		
Coscinodiscus wailesii	564		
Actinoptychus senarius	1528		
Hemiaulus hauckii	40		
Hemiaulus membranaceus	160		
Hemiaulus sinensis	2824		
Cerataulina pelagica	48		
Chaetoceros atlanticum	32		
Chaetoceros coarctatum	152		
Rhizosolenia alata	64		
Rhizosolenia alata f. gracillima	16		
Rhizosolenia alata f. indica	16		
Rhizosolenia calcar-avis	48		
Rhizosolenia hebetata f. semispina	162		
Rhizosolenia imbricata	128		
Rhizosolenia setigera	16		
Rhizosolenia stolterfothii	482		
Guinardia flaccida	264		
Ditylum brightwellii	82		
Synedra tabulata v. fasciculata	84		
		<u>Station 41</u>	
		Nanoplankton	25024
		Mallomonas sp.	8
		Dictyocha fibula	24
		Unidentified haptophyceans	24
		Pontosphaera syracusana	16
		Syracosphaera apsteini	8
		Unidentified coccolithophores	56
		Coccolithus pelagicus	16
		Discosphaera tubifera	8
		Gephyrocapsa oceanica	40
		Helicosphaera carteri	24
		Stephanopyxis turris	32
		Corethron criophilum	448
		Schroederella delicatula	24
		Leptocylindrus danicus	112
		Skeletonema costatum	1472
		Coscinodiscus marginatus	24
		Coscinodiscus perforatus	8
		Actinoptychus senarius	8
		Biddulphia sp.	8
		Hemiaulus sinensis	72
		Cerataulina pelagica	152
		Chaetoceros sp.	24
		Chaetoceros didymum	64
		Chaetoceros sociale	48
		Rhizosolenia sp.	16
		Rhizosolenia alata	16
		Rhizosolenia delicatula	400
		Rhizosolenia setigera	8
		Rhizosolenia stolterfothii	40
		Ditylum brightwellii	8
		Synedra tabulata v. fasciculata	8
		Asterionella glacialis	136

	<u>Cells/ Liter</u>		<u>Cells/ Liter</u>
<u>Station 41 (conti.)</u>			
Thalassiothrix longissima	8	Rhizosolenia stolterfothii	160
Thalassionema nitzschioides	8	Rhizosolenia styliformis	32
Navicula pelagica	16	Guinardia flaccida	48
Navicula forcipita	40	Asterionella glacialis	56
Nitzschia seriata	160	Cocconeis scutellum	8
Nitzschia proxima	16	Navicula sp.	8
Prorocentrum micans	32	Navicula salinarum	16
Prorocentrum balticum	8	Navicula hennedyii	24
Dinophysis ovum	24	Amphiprora sp.	8
Dinophysis caudata	16	Amphora ostrearia	8
Amphidinium fusiforme	40	Phaeodactylum tricorutum	8
Amphidinium klebsii	40	Nitzschia seriata	456
Gymnodinium sp.	16	Surirella robusta	8
Gyrodinium aureolum	56	Prorocentrum micans	32
Gyrodinium metum	8	Prorocentrum apora	16
Katodinium rotundatum	8	Prorocentrum lima	8
Nematodinium armatum	8	Dinophysis sp.	8
Glenodinium foliaceum	8	Dinophysis acuminata	16
Heterocapsa triquetra	8	Amphidinium operculatum	8
Protoperidinium brevipes	96	Amphidinium crassum	16
Scrippsiella trochoidea	32	Amphidinium klebsii	24
Gonyaulax spinifera	40	Gymnodinium nelsoni	8
Gonyaulax diegensis	8	Gymnodinium minutum	8
Ceratium trichoceros	32	Gyrodinium aureolum	8
		Gyrodinium uncatenum	16
		Heterocapsa triquetra	176
		Protoperidinium cerasus	24
		Protoperidinium depressum	32
		Scrippsiella trochoidea	96
		Protoperidinium breve	40
		Amphidoma steinii	16
		Gonyaulax diacantha	32
		Gonyaulax polygramma	8
		Gonyaulax unicornis	24
		Gonyaulax minima	32
		Gonyaulax excavata	8
		Ceratium fusus	8
		Ceratium trichoceros	24
		Ceratium minutum	40
		Ceratium pavillardii	16
		Oxytoxum reticulatum	16
		Oxytoxum constictum	8
		Cryptomonas stigmatica	56
		Unidentified	8
		<u>Station 43</u>	
		Nanoplankton	10200
		Calycomonas ovalis	8
		Unidentified haptophyceans	56
		Paralia sulcata	32
		Melosira hummii	16
		Stephanopyxis turris	48
		Schroederella delicatula	8
<u>Station 42</u>			
Nanoplankton	100112		
Calycomonas ovalis	24		
Unidentified coccolithophores	152		
Coccolithus pelagicus	8		
Helicosphaera carteri	24		
Paralia sulcata	48		
Stephanopyxis palmeriana	152		
Stephanopyxis turris	208		
Corethron criophilum	88		
Schroederella delicatula	3416		
Skeletonema costatum	128		
Thalassiosira decipiens	32		
Thalassiosira rotula	16		
Coscinodiscus sp.	120		
Coscinodiscus marginatus	16		
Coscinodiscus nitidus	8		
Coscinodiscus radiatus	8		
Biddulphia sp.	8		
Biddulphia alternans	40		
Streptotheca thamesis	64		
Hemiaulus sinensis	280		
Cerataulina pelagica	120		
Chaetoceros didymum	24		
Rhizosolenia alata	1336		
Rhizosolenia calcar-avis	96		
Rhizosolenia delicatula	16		
Rhizosolenia fragilissima	168		

	<u>Cells/ Liter</u>		<u>Cells/ Liter</u>
<u>Station 43 (conti.)</u>			
Skeletonema costatum	32	Rhizosolenia alata f. gracillima	32
Thalassiosira eccentrica	112	Guinardia flaccida	8
Actinoptychus senarius	8	Amphora arenaria	8
Biddulphia sp.	24	Prorocentrum lima	16
Biddulphia alternans	48	Gyrodinium aureum	16
Hemiaulus sinensis	56	Heterocapsa triquetra	8
Cerataulina pelagica	48	Protoperidinium brevipes	8
Rhizosolenia acuminata	16	Scrippsiella trochoidea	8
Rhizosolenia alata	568	Gonyaulax diacantha	8
Rhizosolenia delicatula	16	Oxytoxum graate	8
Rhizosolenia hebetata f. hemiaulus	24	Chilomonas sp.	24
Rhizosolenia setigera	72	Chroomonas vectensis	16
Guinardia flaccida	8	Cryptomonas stigmatica	16
Synedra tabulata v. fasciculata	8	Unknown	24
Thalassionema nitzschioides	80		
Rhabdonema arcuatum	16		
Achnanthes longipes	24	<u>Station 54</u>	
Navicula salinarum	8	Nanoplankton	208
Navicula pavillardii	8	Mallomonas sp.	8
Pleurosigma normani	8	Unidentified haptophyceans	8
Amphora ovalis	8	Hymenomonas roseola	8
Amphora arenaria	24	Pontosphaera syracusana	8
Bacillaria paxillifer	16	Syracosphaera pulchra	16
Nitzschia seriata	416	Unidentified coccolithophores	216
Eutreptia sp.	8	Cyclococcolithus leptoporus	8
Prorocentrum micans	40	Gephyrocapsa oceanica	8
Prorocentrum maximum	8	Helicosphaera carteri	24
Gyrodinium glaeubum	32	Rhabdosphaera claviger	16
Gyrodinium aureolum	16	Melosira moniliformis	48
Katodinium rotundatum	32	Corethron criophilum	616
Noctiluca miliaris	8	Skeletonema costatum	99472
Protoperidinium sp.	24	Thalassiosira decipiens	16
Scrippsiella trochoidea	8	Coscinodiscus kuetzingii	8
Gonyaulax diacantha	16	Coscinodiscus marginatus	16
Gonyaulax excavata	8	Coscinodiscus nitidus	8
Ceratium fusus	8	Biddulphia alternans	48
		Biddulphia sinensis	16
		Eucampia zoodiacus	32
<u>Station 53</u>			
Nanoplankton	8408	Hemiaulus sinensis	320
Mallomonas sp.	24	Chaetoceros affine	232
Calycomonas wulffii	8	Chaetoceros curvisetum	136
Olisthodiscus luteus	32	Chaetoceros debile	112
Hymenomonas roseola	8	Rhizosolenia alata	88
Syracosphaera pulchra	8	Rhizosolenia delicatula	32
Unidentified coccolithophores	16	Rhizosolenia setigera	8
Paralia sulcata	64	Guinardia flaccida	56
Corethron criophilum	5640	Lithodesmium undulatum	40
Skeletonema costatum	24	Ditylum brightwellii	48
Thalassiosira aestivalis	32	Fragilaria crotonensis	8
Coscinodiscus nitidus	16	Asterionella glacialis	2552
Hemiaulus sinensis	56	Nitzschia seriata	184
Chaetoceros affine	16	Prorocentrum micans	72
Chaetoceros compressum	48	Prorocentrum lima	32
		Unidentified dinophyceans	8

<u>Station 54 (conti.)</u>	<u>Cells/ Liter</u>		<u>Cells/ Liter</u>
Amphidinium crassum	40	Prorocentrum micans	4520
Gymnodinium nelsoni	8	Prorocentrum scutellum	7168
Gyrodinium aureum	24	Prorocentrum balticum	40
Noctiluca miliaris	8	Dinophysis ovum	8
Pyrophacus horologicum	8	Dinophysis fortii	512
Heterocapsa triquetra	16	Gymnodinium sp.	512
Protoperidinium claudicans	24	Gymnodinium nelsoni	8
Amphidoma caudatum	16	Gyrodinium aureolum	48
Gonyaulax spinifera	16	Katodinium rotundatum	8
Oxytoxum constictum	8	Protoperidinium cerasus	24
Chilomonas sp.	16	Scrippsiella trochoidea	40
Chroomonas salina	24	Protoperidinium steinii	1792
Cryptomonas stigmatica	16	Gonyaulax scrippsae	16
Unknown	8	Ceratium lineatum	512
		Ceratium macroceros	8
		Ceratium trichoceros	136
		Oxytoxum scolpax	8
		Chilomonas sp.	16
		Chroomonas vectensis	8
		Cryptomonas stigmatica	48
		Unknown	8
<u>Station 55</u>		<u>Station 56</u>	
Nanoplankton	4352	Gomphosphaeria aponina	192
Calycomonas wulffii	16	Nanoplankton	1584
Dictyocha fibula	512	Nannochloris atomus	128
Distephanus speculum	8	Calycomonas wulffii	32
Olisthodiscus luteus	40	Dictyocha fibula	132
Unidentified haptophyceans	16	Distephanus speculum	160
Unidentified coccolithophores	168	Ebria tripartita	32
Coccolithus pelagicus	24	Unidentified haptophyceans	40
Gephyrocapsa oceanica	24	Syracosphaera sp.	40
Helicosphaera carteri	8	Unidentified coccolithophores	384
Paralia sulcata	1024	Cyclococcolithus leptoporus	24
Corethron criophilum	1280	Rhabdosphaera claviger	24
Schroederella delicatula	40	Paralia sulcata	640
Leptocylindrus danicus	793600	Stephanopyxis palmeriana	192
Leptocylindrus minimus	1280	Stephanopyxis turris	48
Skeletonema costatum	1324692	Podosira sp.	8
Thalassiosira eccentrica	16	Corethron criophilum	852
Coscinodiscus nitidus	132	Leptocylindrus danicus	7072
Hemiaulus membranaceus	512	Leptocylindrus minimus	320
Hemiaulus sinensis	388	Skeletonema costatum	209328
Chaetoceros affine	40	Coscinodiscus nitidus	20
Chaetoceros atlanticum	1536	Coscinodiscus granulosus	32
Chaetoceros danicum	32	Hemidiscus cuneiformis	24
Chaetoceros sociale	1536	Eucampia zodiacus	256
Rhizosolenia sp.	24	Climacodium frauenfeldianum	32
Rhizosolenia alata	16	Climacodium biconcavum	2112
Rhizosolenia delicatula	88	Hemiaulus hauckii	468
Asterionella glacialis	51598	Hemiaulus membranaceus	112
Thalassiothrix longissima	16	Cerataulina pelagica	128
Thalassionema nitzschioides	24	Chaetoceros sp.	1056
Tabellaria fenestrata v. asterionelloides	5376	Chaetoceros affine	32
Navicula directa	16		
Phaeodactylum tricornutum	8		
Nitzschia delicatissima	6656		
Nitzschia pungens	11520		
Cylindrotheca closterium	256		
Arthrodesmus sp.	256		

	<u>Cells/ Liter</u>		<u>Cells/ Liter</u>
<u>Station 56 (conti.)</u>			
Chaetoceros curvisetum	32	Ceratium fusus	24
Chaetoceros didymum	40	Ceratium lineatum	8
Chaetoceros externum	24	Ceratium tripos var. atlanticum	96
Bacteriastrium hyalinum	8	Ceratium trichoceros	96
Rhizosolenia alata	388	Ceratium contortum	64
Rhizosolenia alata f. gracillima	64	Ceratium extensum	16
Rhizosolenia calcar-avis	24	Oxytoxum mitra	8
Rhizosolenia delicatula	389	Chilomonas sp.	32
Rhizosolenia hebetata f. hemiaulus	24	Chroomonas salina	88
Rhizosolenia imbricata	160	Cryptomonas stigmatica	16
Rhizosolenia setigera	120	Unknown	24
Rhizosolenia stolterfothii	24		
Rhizosolenia styliformis	64		
Guinardia flaccida	32	<u>Station 57</u>	
Lithodesmium undulatum	24	Oscillatoria erythraea	4
Ditylum brightwellii	80	Dictyocha fibula	70
Asterionella glacialis	592	Paralia sulcata	30
Thalassiothrix frauenfeldii	192	Leptocylindrus danicus	14
Grammatophora marina	24	Leptocylindrus minimus	6
Tabellaria fenestrata	832	Skeletonema costatum	800
Pleurosigma angulatum	128	Thalassiosira gravida	116
Pleurosigma normani	8	Coscinodiscus lineatus	6
Nitzschia delicatissima	7040	Coscinodiscus granulatus	10
Nitzschia seriata	1036	Actinopterychus senarius	8
Cylindrotheca closterium	1056	Climacodium frauenfeldianum	12
Prorocentrum sp.	800	Hemiaulus membranaceus	130
Prorocentrum micans	1384	Hemiaulus sinensis	2038
Prorocentrum scutellum	16	Chaetoceros sp.	20
Prorocentrum apora	16	Chaetoceros coarctatum	2
Prorocentrum balticum	8	Chaetoceros gracile	2
Amphisolenia globifera	8	Rhizosolenia alata	70
Dinophysis norvegica	8	Rhizosolenia alata f. gracillima	28
Dinophysis fortii	128	Rhizosolenia calcar-avis	26
Amphidinium crassum	24	Rhizosolenia delicatula	20
Amphidinium gloucum	40	Rhizosolenia imbricata	46
Gymnodinium sp.	32	Rhizosolenia stolterfothii	6
Gymnodinium nelsoni	96	Guinardia flaccida	102
Gymnodinium arcticum	64	Ditylum brightwellii	14
Gyrodinium sp.	88	Plagiogramma staurophorum	4
Gyrodinium aureolum	64	Pleurosigma angulatum	4
Gyrodinium pingue	80	Nitzschia pungens	34
Gyrodinium uncatenum	64	Cylindrotheca closterium	10
Polykrikos kofoidi	8	Prorocentrum micans	14
Noctiluca miliaria	16	Dinophysis tripos	6
Glenodinium danicum	56	Dinophysis fortii	8
Heterocapsa triquetra	24	Protoperidinium granii	10
Protoperidinium brevipes	8	Ceratium fusus	20
Protoperidinium pallidum	40	Ceratium lineatum	2
Scrippsiella trochoidea	64	Ceratium trichoceros	90
Protoperidinium pentagonum	8		
Gonyaulax sp.	32	<u>Station 58</u>	
Gonyaulax diacantha	40	Dictyocha fibula	2
Gonyaulax orientalis	8	Paralia sulcata	6
Gonyaulax polyedra	8		
Gonyaulax tricantha	24		
Gonyaulax excavata	24		

	<u>Cells/ Liter</u>
<u>Station 61 (conti.)</u>	
Tabellaria fenestrata	
asterionelloides	76
Gyrosigma sp.	10
Nitzschia pungens	3006
Cylindrotheca closterium	128
Prorocentrum micans	82
Prorocentrum apora	8
Amphidinium acutum	20
Amphidinium acutissimum	28
Ceratium fusus	12
Ceratium minutum	4
Cryptomonas pseudobaltica	8
Discosphaera tubifer	36

Station 62

Oscillatoria erythraea	26
Dictyocha fibula	70
Rhabdosphaera claviger	1
Corethron criophilum	8
Leptocylindrus danicus	58
Skeletonema costatum	42
Coscinodiscus granulatus	6
Eucampia zoodiacus	36
Chaetoceros atlanticum	150
Chaetoceros danicum	94
Chaetoceros peruvianum	24
Chaetoceros sociale	36
Bacteriastrum hyalinum	30
Rhizosolenia alata	12
Rhizosolenia alata f. indica	14
Rhizosolenia bergonii	6
Rhizosolenia calcar-avis	22
Rhizosolenia cylindrus	16
Rhizosolenia delicatula	18
Rhizosolenia hebetata f. semispina	182
Rhizosolenia imbricata	28
Rhizosolenia setigera	6
Rhizosolenia stolterfothii	648
Rhizosolenia styliformis	2
Guinardia flaccida	12
Emiliana huxleyi	740
Thalassiothrix frauenfeldii	90
Cymatosira belgica	12
Plagiogramma staurophorum	4
Tabellaria fenestrata v.	
asterionelloides	8
Gyrosigma fasciola	2
Cylindrotheca closterium	246
Pyramimonas grossi	72
Prorocentrum scutellum	2
Amphidinium acutissimum	4
Gymnodinium variable	4

	<u>Cells/ Liter</u>
Gymnodinium arcticum	4
Gyrodinium sp.	4
Noctiluca miliaris	4
Protoperidinium granii	2
Ceratium fusus	12
Ceratium pentagonum	12
Oxytoxum sp.	6
Cryptomonas pseudobaltica	18
Synedra sp.	740

Station 63

Corethron criophilum	16
Leptocylindrus danicus	144
Coscinodiscus stellaris	144
Chaetoceros sp.	64
Chaetoceros compressum	240
Rhizosolenia alata	80
Rhizosolenia alata f. indica	32
Rhizosolenia stolterfothii	180
Rhizosolenia styliformis	64
Thalassionema nitzschioides	296
Cylindrotheca closterium	8
Pyramimonas grossi	528

Station 67

Nanoplankton	48
Calycomonas wulffii	24
Distephanus speculum	24
Ebria tripartita	8
Unidentified haptophyceans	24
Hymenomonas roseola	16
Unidentified coccolithophores	128
Paralia sulcata	56
Stephanopyxis turris	32
Corethron criophilum	192
Schroederella delicatula	40
Leptocylindrus danicus	208
Skeletonema costatum	66232
Coscinodiscus nitidus	8
Hemiaulus hauckii	96
Hemiaulus sinensis	328
Cerataulina pelagica	48
Chaetoceros sp.	24
Chaetoceros affine	16
Chaetoceros decipiens	120
Bacteriastrum varians	8
Rhizosolenia alata	480
Rhizosolenia alata f. gracillima	24
Rhizosolenia bergonii	16
Rhizosolenia delicatula	14232

	<u>Cells/ Liter</u>		<u>Cells/ Liter</u>
<u>Station 67 (conti.)</u>			
Rhizosolenia fragilissima	64	Thalassiosira rotula	56
Rhizosolenia hebetata f. hemiaulus	128	Coscinosira polychorda	64
Guinardia flaccida	16	Coscinodiscus perforatus	8
Ditylum brightwellii	40	Bellerochea malleus	16
Thalassionema nitzschioides	104	Streptotheca thamesis	24
Striatella unipunctata	12760	Eucampia zoodiacus	24
Grammatophora marina	8	Hemiaulus hauckii	240
Rhabdonema arcuatum	8	Hemiaulus sinensis	16
Diploneis lineata	8	Cerataulina pelagica	112
Pinnularia cruciformis	8	Chaetoceros breve	16
Pleurosigma normani	32	Chaetoceros curvisetum	80
Amphiprora surirelloides	8	Chaetoceros danicum	248
Amphora ostrearia	8	Chaetoceros debile	72
Nitzschia seriata	336	Chaetoceros decipiens	216
Prorocentrum micans	24	Chaetoceros didymum	144
Prorocentrum scutellum	72	Chaetoceros gracile	48
Prorocentrum apora	32	Chaetoceros tortissimum	112
Amphidinium fusiforme	16	Rhizosolenia alata	600
Gymnodinium simplex	8	Rhizosolenia calcar-avis	40
Gyrodinium aureum	8	Rhizosolenia delicatula	872
Katodinium rotundatum	16	Rhizosolenia setigera	128
Glenodinium rotundatum	48	Rhizosolenia styliformis	8
Protoperidinium breve	40	Guinardia flaccida	32
Amphidoma caudatum	8	Ditylum brightwellii	96
Gonyaulax spinifera	8	Fragilaria sp.	16
Gonyaulax diacantha	32	Asterionella glacialis	144
Gonyaulax minuta	8	Thalassiothrix frauenfeldii	24
Ceratium lineatum	8	Thalassionema nitzschioides	80
Ceratium geniculatum	8	Cocconeis scutellum	8
Chilomonas sp.	16	Navicula sp.	8
Unknown	8	Navicula hennedyii	8
		Mastogloia brauni	8
		Amphora sp.	8
		Amphora crassa	8
		Nitzschia obtusa	8
		Nitzschia sigma	168
		Nitzschia microcephala	8
		Nitzschia proxima	48
		Prorocentrum micans	344
		Prorocentrum scutellum	16
		Prorocentrum balticum	8
		Prorocentrum compressum	8
		Dinophysis acuminata	8
		Amphidinium klebsii	72
		Gymnodinium nelsoni	104
		Gymnodinium stellatum	16
		Gyrodinium spirale	48
		Gyrodinium uncatenum	48
		Katodinium rotundatum	24
		Diplopsalis lenticula	24
		Glenodinium danicum	40
		Heterocapsa triquetra	32
		Protoperidinium cerasus	24
		Scrippsiella trochoidea	184
		Protoperidinium excavatum	80
<u>Station 68</u>			
Nanoplankton	14536		
Mallomonas sp.	16		
Calycomonas ovalis	16		
Dictyocha fibula	40		
Distephanus speculum	16		
Unidentified haptophyceans	8		
Pontosphaera syracusana	8		
Unidentified coccolithophores	88		
Coccolithus pelagicus	8		
Discosphaera tubifera	8		
Gephyrocapsa oceanica	8		
Helicosphaera carteri	8		
Rhabdosphaera claviger	16		
Paralia sulcata	48		
Stephanopyxis turris	88		
Corethron criophilum	224		
Skeletonema costatum	21184		
Thalassiosira aestivalis	32		
Thalassiosira decipiens	56		
Thalassiosira nordenskioldii	152		

	<u>Cells/ Liter</u>		<u>Cells/ Liter</u>
<u>Station 68 (conti.)</u>			
Protopteridinium pentagonum	40	Nitzschia proxima	8
Amphidoma steinii	32	Dinophysis acuta	8
Gonyaulax catenata	16	Amphidinium crassum	16
Gonyaulax spinifera	8	Gymnodinium sp.	32
Gonyaulax diacantha	24	Gymnodinium splendens	16
Gonyaulax diegensis	24	Gymnodinium stellatum	16
Gonyaulax polyedra	8	Gyrodinium uncatenum	8
Gonyaulax polygramma	8	Katodinium rotundatum	32
Ceratium fusus	32	Katodinium assymmetricum	24
Ceratium lineatum	16	Oxyrrhis marina	8
Ceratium tripos	8	Glenodinium danicum	16
Ceratium massiliense	8	Heterocapsa triquetra	48
Goniodoma sp.	8	Scrippsiella trochoidea	16
Oxytoxum gladiolus	8	Amphidoma steinii	8
Chroomonas salina	24	Ceratium massiliense	8
		Chilomonas sp.	64
		Chroomonas vectensis	8
		Unknown	8

Station 74

Nanoplankton	5992
Calycomonas wulffii	16
Olisthodiscus luteus	8
Unidentified haptophyceans	32
Hymenomonas carteri	16
Pontosphaera syracusana	8
Unidentified coccolithophores	168
Rhabdosphaera claviger	8
Melosira nummuloides	88
Paralia sulcata	48
Corethron criophilum	24
Dactyliosolen antarcticus	8
Skeletonema costatum	448
Cyclotella meneghiniana	24
Thalassiosira nordenskioldii	64
Lauderia borealis	8
Streptotheca thamesis	16
Hemiaulus hauckii	56
Chaetoceros sp.	16
Chaetoceros affine	32
Chaetoceros danicum	16
Bacteriastrum hyalinum v. principis	24
Rhizosolenia acuminata	48
Rhizosolenia alata	448
Rhizosolenia delicatula	504
Rhizosolenia fragilissima	80
Rhizosolenia hebetata f. hemiaulus	32
Rhizosolenia setigera	24
Rhizosolenia stolterfothii	520
Guinardia flaccida	88
Lithodesmium undulatum	16
Asterionella glacialis	176
Thalassiothrix frauenfeldii	24
Thalassionema nitzschioides	24
Nitzschia seriata	4720
Nitzschia lorenziana var. incurva	8

Station 75

Nanoplankton	7840
Calycomonas ovalis	16
Dictyocha fibula	16
Olisthodiscus luteus	24
Unidentified haptophyceans	16
Hymenomonas roseola	40
Unidentified coccolithophores	152
Coccolithus pelagicus	32
Coscinodiscus nitidus	8
Biddulphia alternans	8
Chaetoceros atlanticum	24
Rhizosolenia stolterfothii	24
Guinardia flaccida	8
Thalassionema nitzschioides	16
Euglena sp.	48
Prorocentrum apora	8
Dinophysis acuminata	8
Cochlodinium kofoidii	8
Gyrodinium aureolum	16
Protopteridinium sp.	32
Protopteridinium brevipes	24
Protopteridinium claudicans	16
Protopteridinium leonis	24
Amphidoma steinii	16
Gonyaulax diegensis	16
Chilomonas sp.	8

Station 77

Nanoplankton	15824
Nostoc commune	548
Calycomonas wulffii	16

<u>Station 77 (conti.)</u>	<u>Cells/ Liter</u>		<u>Cells/ Liter</u>
Dictyocha fibula	12	Ceratium fusus	8
Distephanus speculum	8	Ceratium tripos var. atlanticum	4
Hymenomonas roseola	40	Ceratium trichoceros	16
Hymenomonas carteri	8		
Unidentified coccolithophores	32	<u>Station 78</u>	
Coccolithus pelagicus	16	Nostoc commune	16
Paralia sulcata	12	Dictyocha fibula	36
Corethron criophilum	56	Distephanus speculum	68
Leptocylindrus danicus	260	Corethron criophilum	8
Skeletonema costatum	80	Leptocylindrus danicus	160
Coscinodiscus marginatus	32	Leptocylindrus minimus	32
Coscinodiscus nitidus	8	Thalassiosira gravida	56
Actinoptychus senarius	60	Thalassiosira eccentrica	76
Asteromphalus heptactis	8	Coscinodiscus lineatus	4
Eucampia cornuta	32	Coscinodiscus nitidus	16
Chaetoceros sp.	44	Coscinodiscus radiatus	4
Chaetoceros coarctatum	32	Chaetoceros atlanticum	60
Chaetoceros danicum	48	Chaetoceros danicum	60
Chaetoceros gracile	16	Rhizosolenia alata	200
Chaetoceros sociale	64	Rhizosolenia imbricata	380
Rhizosolenia alata	166	Rhizosolenia stolterfothii	780
Rhizosolenia alata f. gracillima	4	Guinardia flaccida	180
Rhizosolenia delicatula	184	Thalassionema nitzschioides	48
Rhizosolenia fragilissima	16	Licmophora sp.	4
Rhizosolenia hebetata f. hemiaulus	40	Tabellaria fenestrata v. asterionelloides	136
Rhizosolenia imbricata	572	Pleurosigma sp.	28
Rhizosolenia setigera	16	Cylindrotheca closterium	124
Rhizosolenia stolterfothii	698	Prorocentrum micans	8
Rhizosolenia styliformis	8	Dinophysis fortii	4
Guinardia flaccida	208	Amphidinium sp.	12
Synedra sp.	24	Noctiluca miliaris	54
Asterionella glacialis	8	Ceratium fusus	4
Thalassiothrix frauenfeldii	104	Ceratium tripos var. atlanticum	4
Thalassionema nitzschioides	72	Ceratium trichoceros	4
Striatella unipunctata	152	Cryptomonas pseudobaltica	140
Grammatophora marina	12		
Tabellaria fenestrata v. asterionelloides	32	<u>Station 79</u>	
Pleurosigma elongatum	4	Nostoc commune	2240
Pleurosigma normani	8	Dictyocha fibula	204
Phaeodactylum tricorutum	24	Distephanus speculum	140
Nitzschia bilobata	8	Paralia sulcata	48
Nitzschia seriata	48	Leptocylindrus minimus	52
Cylindrotheca closterium	140	Coscinodiscus lineatus	108
Prorocentrum micans	4	Coscinodiscus marginatus	28
Prorocentrum apora	8	Actinoptychus senarius	108
Dinophysis acuminata	8	Rhizosolenia imbricata	220
Amphidinium crassum	8	Rhizosolenia setigera	204
Gyrodinium uncatenum	8	Rhizosolenia stolterfothii	440
Katodinium rotundatum	16	Guinardia flaccida	48
Noctiluca miliaris	8		
Protoperidinium brevipes	16		
Protoperidinium cerasus	16		
Protoperidinium granii	4		

	<u>Cells/ Liter</u>		<u>Cells/ Liter</u>
<u>Station 79 (conti.)</u>			
Thalassionema nitzschioides	460	Rhizosolenia alata	100
Cylindrotheca closterium	24	Rhizosolenia alata f. gracillima	44
Prorocentrum micans	124	Rhizosolenia alata f. indica	8
Dinophysis fortii	48	Rhizosolenia calcar-avis	24
Ceratium lineatum	16	Rhizosolenia delicatula	168
Ceratium tripos var. atlanticum	104	Rhizosolenia imbricata	312
Emiliana huxleyi	220	Rhizosolenia setigera	44
		Rhizosolenia stolterfothii	200
		Rhizosolenia styliformis	4
<u>Station 80</u>			
Dictyocha fibula	216	Guinardia flaccida	288
Distephanus speculum	416	Synedra sp.	4
Unidentified coccolithophores	12	Thalassiothrix frauenfeldii	956
Thalassiosira gravida	16	Pleurosigma hamuliferum	36
Coscinodiscus nitidus	28	Nitzschia pungens	48
Coscinodiscus radiatus	80	Nitzschia angularis v. affinis	4
Coscinodiscus wailesii	28	Cylindrotheca closterium	100
Actinoptychus senarius	48	Euglena sp.	8
Chaetoceros atlanticum	44	Prorocentrum micans	24
Chaetoceros costatum	48	Prorocentrum rostratum	4
Rhizosolenia alata	268	Prorocentrum dentatum	16
Rhizosolenia delicatula	8	Amphidinium acutum	36
Rhizosolenia imbricata	328	Amphidinium acutissimum	12
Rhizosolenia setigera	12	Gymnodinium grammaticum	6
Rhizosolenia stolterfothii	388	Gymnodinium arcticum	4
Guinardia flaccida	500	Emiliana huxleyi	960
Synedra sp.	152	Protoperidinium globum	4
Thalassiothrix frauenfeldii	400	Gonyaulax polyedra	4
Plagiogramma staurophorum	16	Ceratium fusus	8
Cylindrotheca closterium	16	Ceratium tripos var. atlanticum	32
Prorocentrum micans	24	Ceratium minutum	4
Amphidinium acutum	16	Ceratium contortum	12
Gymnodinium variable	12	Oxytoxum scolpax	8
Gymnodinium arcticum	64	Cryptomonas pseudobaltica	12
Ceratium furca	8	Gyrodinium sp.	35
Ceratium tripos var. atlanticum	104		
Ceratium extensum	16	<u>Station 82</u>	
Emiliana huxleyi	500	Dictyocha fibula	70
		Distephanus speculum	100
<u>Station 81</u>			
Dictyocha fibula	132	Leptocylindrus danicus	10
Distephanus speculum	60	Coscinodiscus lineatus	32
Calciosolenia murrayi	16	Coscinodiscus nitidus	6
Unidentified coccolithophores	340	Coscinodiscus granulatus	10
Leptocylindrus minimus	28	Rhizosolenia delicatula	44
Skeletonema costatum	16	Rhizosolenia imbricata	16
Coscinodiscus sp.	16	Rhizosolenia setigera	10
Coscinodiscus nitidus	12	Guinardia flaccida	2
Coscinodiscus radiatus	40	Tabellaria fenestrata	16
Coscinodiscus wailesii	20	Cylindrotheca closterium	78
Actinoptychus senarius	76	Euglena sp.	10
Chaetoceros atlanticum	8	Prorocentrum micans	54
		Dinophysis fortii	2
		Dinophysis exigua	4
		Amphidinium acutissimum	62

	<u>Cells/ Liter</u>		<u>Cells/ Liter</u>
<u>Station 99 (conti.)</u>			
Navicula hennedyii	416	Amphidinium sp.	16
Surirella gemma	24	Gymnodinium splendens	32
Euglena sp.	96	Gyrodinium aureum	32
Prorocentrum apora	72	Katodinium rotundatum	8
Prorocentrum balticum	104	Heterocapsa triquetra	32
Dinophysis norvegica	160	Protoperidinium pentagonum	16
Amphidinium carterae	72	Gonyaulax diegensis	32
Gyrodinium spirale	648	Oxytoxum scolpax	8
Katodinium rotundatum	48	Chilomonas sp.	80
Heterocapsa triquetra	224	Cryptomonas stigmatica	16
Protoperidinium cerasus	208		
Amphidoma sp.	16		
Gonyaulax polyedra	32		
Ceratium horridum	16		
Oxytoxum scolpax	72		
Chilomonas marina	312		
Chroomonas vectensis	336		
Cryptomonas stigmatica	8		
<u>Station 102</u>		<u>Station 104</u>	
Nanoplankton	2112	Nanoplankton	7024
Mallomonas sp.	8	Calycomonas wulffii	24
Calycomonas wulffii	64	Distephanus speculum	74
Calycomonas ovalis	40	Hymenomonas roseola	24
Dictyocha fibula	8	Unidentified coccolithophores	88
Distephanus speculum	128	Melosira sp.	32
Ebria tripartita	8	Coscinodiscus sp.	32
Olisthodiscus luteus	16	Coscinodiscus centralis	16
Unidentified haptophyceans	96	Coscinodiscus lineatus	204
Hymenomonas roseola	96	Coscinodiscus marginatus	64
Unidentified coccolithophores	240	Coscinodiscus nitidus	88
Coccolithus pelagicus	56	Coscinodiscus perforatus	40
Emiliana huxleyi	1512	Coscinodiscus gigas	124
Helicosphaera carteri	40	Biddulphia sp.	40
Thalassiosira aestivalis	16	Biddulphia alternans	80
Thalassiosira nordenskioldii	216	Eunotogramma sp.	8
Thalassiosira rotula	8	Cerataulina pelagica	24
Coscosira polychorda	8	Chaetoceros danicum	4
Coscinodiscus sp.	328	Rhizosolenia acuminata	16
Coscinodiscus centralis	24	Rhizosolenia delicatula	216
Coscinodiscus marginatus	80	Guinardia flaccida	16
Rhizosolenia hebetata f. hemiaulus	32	Ditylum brightwellii	4
Rhizosolenia stolterfothii	16	Thalassionema nitzschioides	24
Guinardia flaccida	296	Grammatophora marina	16
Synedra undulata	64	Tabellaria fenestrata v.	
Thalassionema nitzschioides	3448	asterionelloides	8
Plagiogramma vanheurckii	48	Climacosphenia moniligera	8
Grammatophora marina	1064	Navicula sp.	16
Cocconeis scutellum	24	Mastogloia sp.	8
Scolioleura sp.	96	Pleurosigma angulatum	20
Euglena proxima	344	Gyrosigma fasciola	8
Prorocentrum lima	128	Amphora arenaria	8
Dinophysis acuminata	16	Nitzschia seriata	42
		Euglena sp.	56
		Euglena proxima	48
		Prorocentrum micans	112
		Prorocentrum apora	8
		Protocentrum balticum	48
		Dinophysis acuta	4
		Dinophysis ovum	4
		Amphidinium carterae	248

	<u>Cells/ Liter</u>		<u>Cells/ Liter</u>
<u>Station 104 (conti.)</u>			
Gymnodinium sp.	32	Dinophysis acuminata	4
Gymnodinium variable	20	Emiliana huxleyi	112
Katodinium rotundatum	32	Amphidinium actutum	52
Pyrophacus horologicum	48	Gyrodinium sp.	8
Glenodinium danicum	8	Ceratium tripos var. atlanticum	4
Protoperidinium sp.	8	Amphidinium sp.	4
Amphidoma steinii	16		
Gonyaulax sp.	8	<u>Station 108</u>	
Ceratium furca	120	Dictyocha fibula	152
Ceratium lineatum	64	Distephanus speculum	104
Ceratium tripos	16	Corethron criophilum	8
Ceratium tripos var. atlanticum	64	Leptocylindrus minimus	56
Ceratium ranipes	20	Coscinodiscus nitidus	8
Cryptomonas stigmatica	16	Coscinodiscus gigas	8
		Actinopterychus senarius	8
<u>Station 105</u>			
Dictyocha fibula	384	Rhizosolenia calcar-avis	16
Paralia sulcata	256	Rhizosolenia delicatula	256
Stephanopyxis palmeriana	256	Rhizosolenia imbricata	48
Skeletonema costatum	256000	Rhizosolenia setigera	400
Coscinodiscus lineatus	64	Guinardia flaccida	16
Biddulphia alternans	64	Thalassionema nitzschioides	552
Hemiaulus hauckii	256	Nitzschia pungens	392
Hemiaulus sinensis	256	Cylindrotheca closterium	16
Rhizosolenia imbricata	128	Prorocentrum micans	184
Asterionella glacialis	640	Prorocentrum apora	8
Nitzschia pungens	6464	Dinophysis fortii	8
Prorocentrum micans	2880	Amphidinium acutissimum	216
Prorocentrum compressum	6336	Gymnodinium sp.	48
Dinophysis fortii	128	Gymnodinium arcticum	24
Gymnodinium arcticum	192	Gyrodinium sp.	416
Gonyaulax diegensis	64	Noctiluca miliaris	88
Ceratium fusus	256	Protoperidinium granii	8
Ceratium trichoceros	64	Ceratium tripos var. atlanticum	32
Ceratium minutum	128	Ceratium minutum	80
Ceratium extensum	64		
Emiliana huxleyi	2814	<u>Station 110</u>	
		Dictyocha fibula	56
<u>Station 106</u>			
Corethron criophilum	4	Distephanus speculum	60
Coscinodiscus radiatus	8	Leptocylindrus danicus	24
Chaetoceros sp.	84	Thalassiosira gravida	4
Chaetoceros atlanticum	12	Coscinodiscus radiatus	8
Rhizosolenia alata	40	Chaetoceros atlanticum	24
Rhizosolenia imbricata	4	Rhizosolenia delicatula	28
Rhizosolenia setigera	116	Rhizosolenia hebetata f. semispina	16
Thalassiothrix frauenfeldii	8	Rhizosolenia imbricata	4
Grammatophora marina	16	Rhizosolenia setigera	8
Pleurosigma elongatum	4	Rhizosolenia styliformis	12
Cylindrotheca closterium	28	Guinardia flaccida	12
Prorocentrum micans	44	Nitzschia pungens	264
		Nitzschia sigma v. rigida	116
		Cylindrotheca closterium	20

	<u>Cells/ Liter</u>		<u>Cells/ Liter</u>
<u>Station 143 (conti.)</u>		<u>Station 146</u>	
Leptocylindrus danicus	32	Distephanus speculum	16
Leptocylindrus minimus	152	Paralia sulcata	80
Coscinodiscus lineatus	128	Stephanopyxis palmeriana	240
Coscinodiscus nitidus	24	Corethron criophilum	32
Chaetoceros atlanticum	8	Leptocylindrus danicus	5040
Rhizosolenia delicatula	64	Skeletonema costatum	368
Rhizosolenia imbricata	264	Thalassiosira eccentrica	48
Rhizosolenia styliformis	56	Coscinodiscus lineatus	304
Synedra sp.	8	Coscinodiscus gigas	16
Thalassiothrix frauenfeldii	16	Actinopterychus sp.	80
Plagiogramma staurophorum	16	Chaetoceros decipiens	928
Navicula sp.	8	Rhizosolenia alata f. gracillima	16
Pleurosigma angulatum	16	Rhizosolenia delicatula	80
Nitzschia pungens	472	Rhizosolenia imbricata	61984
Cylindrotheca closterium	136	Rhizosolenia stolterfothii	1936
Euglena sp.	8	Guinardia flaccida	640
Prorocentrum micans	72	Synedra tabulata v. fasciculata	96
Amphidinium acutum	64	Thalassiothrix frauenfeldii	640
Amphidinium acutissimum	136	Thalassionema nitzschioides	2160
Gyrodinium sp.	136	Navicula sp.	32
Ceratium tripos var. atlanticum	16	Diploneis crabro	32
Ceratium minutum	24	Pleurosigma angulatum	32
Cryptomona pseudobaltica	8	Prorocentrum sp.	32
		Prorocentrum micans	10976
		Dinophysis actuta	16
		Dinophysis ovum	16
		Ceratium lineatum	112
		Ceratium tripos var. atlanticum	48
<u>Station 145</u>		<u>Station 148</u>	
Dictyocha fibula	64	Dictyocha fibula	32
Distephanus speculum	40	Distephanus speculum	32
Coscinodiscus radiatus	24	Melosira granulata	16
Actinopterychus senarius	16	Paralia sulcata	320
Chaetoceros atlanticum	64	Corethron criophilum	608
Rhizosolenia alata	24	Leptocylindrus danicus	146096
Rhizosolenia delicatula	8	Leptocylindrus minimus	176
Rhizosolenia imbricata	224	Skeletonema costatum	640
Rhizosolenia setigera	144	Thalassiosira eccentrica	32
Rhizosolenia stolterfothii	8	Coscinodiscus nitidus	96
Rhizosolenia styliformis	24	Coscinodiscus radiatus	192
Thalassiothrix frauenfeldii	56	Coscinodiscus granulatus	352
Nitzschia pungens	326	Actinopterychus senarius	672
Cylindrotheca closterium	48	Cerataulina pelagica	1762
Prorocentrum micans	128	Rhizosolenia alata	96
Amphidinium schroederi	8	Rhizosolenia cylindrus	160
Amphidinium acutum	208	Rhizosolenia delicatula	1520
Gymnodinium variable	16	Rhizosolenia imbricata	5568
Gymnodinium arcticum	32		
Gyrodinium sp.	246		
Ceratium lineatum	8		
Ceratium tripos var. atlanticum	48		
Ceratium minutum	16		

<u>Station 187 (conti.)</u>	<u>Cells/ Liter</u>
Glenodinium rotundatum	24
Heterocapsa triquetra	16
Protooperidinium brevipes	8
Protooperidinium cerasus	24
Protooperidinium pellucidum	8
Scripsiella trochoidea	8
Protooperidinium excavatum	16
Gonyaulax diacantha	24
Gonyaulax polygramma	8
Gonyaulax conjuncta	16
Gonyaulax excavata	8
Ceratium fusus	8
Ceratium longipes	8
Pyrocystis fusiform	8
Unknown	16

NOTE:

The nanoplankton category was originally listed as *Nannochloris atomus*. It was later agreed that other unidentified forms were also included in this listing and that they composed approximately 50% of the counts originally attributed to *Nannochloris atomus*. To assure recognition of this species, yet not exaggerate its presence, a 30% value of the original concentration was attributed to *Nannochloris atomus*.



(continued from inside front cover)

5. *The Status of the Marine Fishery Resources of the Northeastern United States.* By Margaret M. McBride and Bradford E. Brown. December 1980. viii + 13 p., 4 figs., 3 tables.

6. *Economic and Biological Data Needs for Fisheries Management, With Particular Reference to the New England and Mid-Atlantic Areas.* By Guy D. Marchesseault, Joseph J. Mueller, and Ivar E. Strand, Jr. December 1980. vi + 10 p., 1 fig., 3 tables.

7. *Methodology for Identification and Analysis of Fishery Management Options.* By Brian J. Rothschild, Richard C. Hennemuth, Jacob J. Dykstra, Leo C. Murphy, Jr., John C. Bryson, and James D. Ackert. December 1980. vi + 10 p., 5 figs., 1 app.

