FISHERIES RESEARCH BOARD OF CANADA

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No. 343

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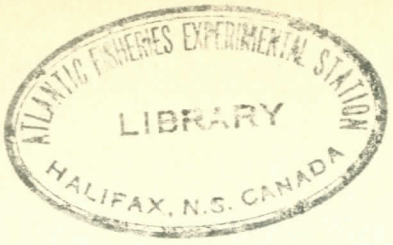

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THE SUMMER PHYTOPLANKTON IN THE REGION OF HALIFAX

by

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Introduction

In June 1932, a fisheries survey was undertaken by the Biological Board in the region of Halifax. Since plankton is the chief food of fishes, no survey can be complete without a study of the fluctuations in the abundance of the minute animals and plants composing the plankton. Collections of phytoplankton with No. 18 net have been made for several years at Prince Station 531 in Bedford Basin and at Prince Station 533 in the narrows in Halifax Harbour but the material has not been studied. These stations were included in the survey and part of the new stations occupied for hydrographic and chemical work were also used for the collection of phytoplankton. The numbers of the plankton and their location are shown on the accompanying map.

Method

Between June 18 and July 25, all collections were made by towing No. 18 net near the surface. These hauls were examined qualitatively only and the report consists of lists of the organisms found at each station under the date on which the samples were collected. The dominant species was underlined. (Tables 1-3).

Study of the hydrography during this period revealed the fact that the water showed stratification and it was deemed advisable to adopt for quantitative work the centrifuging method first used by Lohmann (1908) and perfected by Gran (1912) in order to get the distribution according to depth. Accordingly, beginning with July 25 collection of water samples from different depths was begun at all the phytoplankton stations. A vertical haul with No. 18 net from the bottom to the surface at the shallower stations and from 100 metres at the deeper stations was also necessary for recording the presence of organisms which might not be found in a small water sample used in the centrifuge. Each water sample, about 200 c.c., was preserved in neutral formalin. After the sample was well shaken, 55 c.c. was drawn off, divided into four parts and centrifuged. The sediment from each of three tubes was collected into the fourth and recentrifuged twice until the whole could be contained in a single drop and placed under a cover glass for examination. The organisms were then classified and counted. - If the sample was rich a much smaller amount had to be used in the centrifuge. The deepest sample which often contains the smallest number of cells was examined first from each station. By working upward from the

deeper levels, one could judge the proper quantity to use in the centrifuge. The report for each station at the various depths is tabulated on the basis of the number of cells per litre. (Tables 4-11)

Discussion of Results

1. The results of the June and July cruises given in the first table show that the phytoplankton consists almost entirely in early summer of dinoflagellates. Ceratium longipes dominated all the catches. Only at the inshore stations 53 and 54 near the 60 fathom and 30 fathom lines respectively were diatoms taken. This is a characteristic summer oceanic condition such as found in the Gulf of Maine by Bigelow (1926) and along the coasts of Northern Europe by Gran (1915).

2. The weekly cruise (Table 2) from station 59 to station 62 inclusive shows similar results. Only the most inshore station 62 had diatoms. Station65, situated in Eastern passage was occupied later than the others and the few hauls examined are included in the same table. It was much richer than the other stations at this time in diatoms.

3. The phytoplankton found at Station 531 in Bedford Basin and at Station 533 in Halifax Harbour in June and July resembled that outside but the peridinians were relatively less abundant. (Tables 3 and 4).

4. Table 5 shows that the diatoms were dominant in Bedford Basin on August 1. Leptocylindrus danicus had a distinct maximum at 10 metres. The large number of cells in the bottom samples would lead one to think that there had been earlier growth near the surface which had sunk to lower levels.

5. L.danicus was also the dominant diatom in Halifax Harbour at the same time (Table 6). The maximum at 10 metres was less marked and there were many more cells in the surface sample. This station is situated in a narrow channel subject to strong tidal currents and mixing to some extent as indicated by the smaller decrease in temperature with depth than at Station 531.

6. From the rest of the tables it can be seen that the off-shore phytoplankton is very poor in late July and early August at all depths except for Pontosphaera Huxleyi which has its maximum in the warm surface layers.

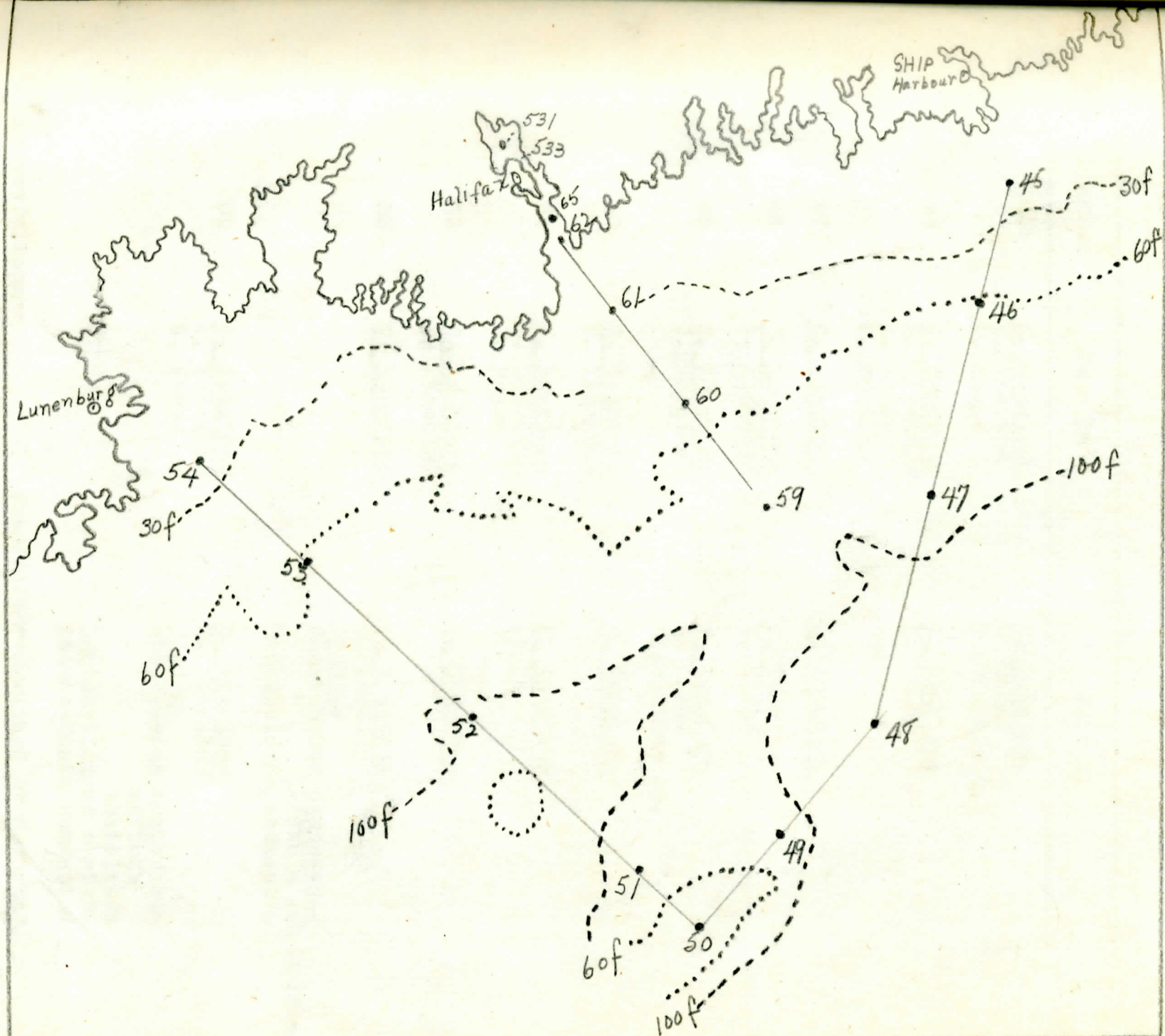
SHIP Harbour
531
533
Halifax
65
62
61
60
59
45
30f
60f
46
Lunenburg
54
30f
53
60f
47
100f
52
100f
48
49
51
50
60f
100f

TABLE 1

MONTHLY CRUISES -- 1932

Station	June 18	July 21
45	C. longipes C.lineatum D. acuta	C. longipes C. fusus Tintinnids sp.
46	C. longipes C. lineatum D. acuta C. fusus	C. longipes C. fusus
47	C. longipes	C. longipes
48	C. longipes C. lineatum	C. longipes C. fusus
49	C. longipes C.lineatum	C. longipes C. fusus tintinnids sp.
50	C. longipes C. lineatum	C. longipes
51	C. longipes C. lineatum C. fusus	C. longipes
52	C. longipes C. lineatum	C. longipes
53	C. longipes	C. longipes C. fusus Diatoms Chaetoceros compressus " affinis and spores Rhizosolenia semispina
54	C. longipes C. lineatum C. fusus	C. longipes C. lineatum Diatoms Chaetoceros compressus affinis laciniosus Leptocylindrus danicus Rhizosolenia semispina

Abbreviations-- Underlined--dominant or abundant

C. -- Certium
D. -- Dinophysis

TABLE 2

Weekly Cruises

	Station 59	Station 60	Station 61	Station 62	Station 65
te	Peridians	Peridinians	Peridinians	Peridinians	Peridinians Date
-6	C.longipes	C.longipes	C.longipes	C.longipes	C.longipes 4-7
	C.lineatum	C.fusus	C.fusus	D.norvegica	C.lineatum
	C.fusus	D.norvegica	C.lineatum	D.acuminata	D.norvegica
			Diatoms		Diatoms
			Ch.decipiens		Ch.debilis spores
					" compressus
					L.danicus
-7	Peridinians	Peridinians	Peridinians	Peridinians	T.gravida
	C.longipes	C.longipes	C.longipes	C.longipes	Rh.adriaticum
	C.fusus	Diatoms	C.fusus	Diatoms	Lichomophora
		Ch.debilis		Ch.compressus	Ciliata
				Ciliata	Dinobryon sp.
				Tintinnids sp.	
8-7	Peridinians	Peridinians	Peridinians 19-7	Peridinians	Peridinians 11-7
	C.longipes	C.longipes	C.longipes	C.longipes	C.longipes
	C.fusus	C.lineatum		C.lineatum	Diatoms
				Diatoms	Ch.teres
				Ch.compressus	compressus
				concavicornis	decipiens
				teres sp	L.danicus
				decipiens	T.gravida
				constrictus	Ciliata
				laciniosus	Dinobryon sp.
				debilis	
				N.seriata	
				Fragilaria sp.	
6-7	Peridinians	Peridinians	Peridinians	Peridinians	Peridinians 19-7
	C.longipes	C.longipes	C.longipes	C.longipes	C.longipes
	C.lineatum		C.fusus	Diatoms	C.lineatum
				Ch.compressus	D.norvegica
				decipiens	Diatoms
				debilis	Ch.compressus
				L.danicus	decipiens
					debilis
					diadema
					laciniosus
					teres
2-8	Peridians	Peridians	Peridians	Peridians	T.gravida
	C.longipes	C.longipes	C.longipes	C.longipes	L.glacialis
	C.lineatum				L.danicus
	D.norvegica				N.seriata
	Diatoms				R.alata
	R.sempisina				R.setigera
					P.elongatum

Weekly Cruises (cont'd)

	Station 59	Station 60	Station 61	Station 62	Station 65	
9-8	Peridinians C.longipes P.Curtipes depressum Per.rotunda Gym.Lohmanni Diatoms Ch.affinis R.setigera	Peridinians C.longipes C.fusus P.curtipes depressum	Peridinians C.longipes P.depressum curtipes cyst Diatoms Ch.affinis decipiens R.setigera Ciliata H.subulata Pty.urnula	Peridinians C.longipes S.fusus P.depressum Ciliata H.subulata	Peridinians C.longipes Diatoms L.danicus Ch.compressus decipiens teres R.semispina	2-8
15-8	Peridinians C.longipes C.fusus C.tripos P.depressum Diatoms Ch.decipiens Ciliata H.subulata	Peridinians C.longipes C.fusus C.tripos P.curtipes depressum ovatum Per.rotunda D.norvegica Diatoms S.costatum Ch.affinis decipiens debilis laciniosus R.setigera shrubsolei Ciliata H.subulata Pty.obtusa	Peridinians C.longipes C.fusus C.tripos D.norvegica P.curtipes cyst depressum ovatum Per.rotunda Gym.lunula Diatoms S.costatum Ch.affinis compressus & spores decipiens debilis laciniosus teres N.seriata R.setigera fragillima shrubsolei Ciliata H.subulata Pty.obtusa	Peridinians C.longipes C.fusus D.norvegica P.depressum curtipes Pachysphaera sp. Diatoms S.costatum Ch.affinis decipiens R.setigera Halodiscus sp. Actinocyclus sp. Coscinoscira Oestrupi		

Abbreviations:

C.--Ceratium
P.--Peridinium
S.--Skeletonema
D.--Dinophysis
H.--Helicostomella
Ch.--Chaetoceros
Per.-- Peridiniopsis
N.--Nitzschia
R.--Rhizosolenia
Pty--Ptychocylis

TABLE 3.

Bedford Basin--Station 531

June 20	July 4	Aug. 1	Aug. 15
Ciliata-	Peridinians	Peridinians	Peridinians
Dinobryon sp.	C.longipes	C.longipes	C.longipes
	D.norvegica	Diatoms	D.norvegica
	Diatoms	Ch.laciniosus	Phalacroma
	Ch.compressus	compressus-sp	rotundatum
	constrictus	debilis-spores	P.depressum
	L.danicus	decipiens	curtipes
		teres	Per.rotunda
		L.glacialis	Diatoms
		T.gravida	R.fragillima
		R.shrubsolei	setigera
		sempispina	

TABLE 4.

Halifax Harbour--Station 533

June 17	June 24	June 27	July 4	Aug. 1
Peridinians	Peridinians	Peridinians	Peridinians	Diatoms
C.lineatum	C.longipes	C.longipes	C.longipes	L.danicus
D.norvegica	C.lineatum	C.lineatum	C.lineatum	Ch.teres
			D.norvegica	compressus
Ciliata	Diatoms	Ciliata	Diatoms	concavicornis
Dinobryon sp.	Ch. compressus	Dinobryon sp.	Ch.compressus	debilis
	Ciliata		debilis	decipiens
	Dinobryon sp.		L.danicus	laciniosus
			T.gravida	T.gravida
			Fragillaria sp.	R.semispina
			Ciliata	
			Dinobryon sp.	

TABLE 5.

Prince Station 531, Bedford Basin, August 1, 1932.
(number of cells per litre)

Depth--metres	0	10	25
Temperature	18.5	6.50	3.70
Salinity			
Density			
Oxygen cc			
Oxygen % sat.			
Phosphate			
COCCOLITHINEAE			
Pontosphaera Huxleyi	20?	20	
DIATOMAVEAE			
Cheatoceros compressus		80 sp.	300
concavicornis			20
debilis			40
laciniosus			260
simplex		20	
teres		20	40
Leptocylindrus danicus		2,980	1,480
Nitzschia closterium		40	
Pleurosigma sp.			20
Rhizosolenia alata			20
Skeletomema costatum			180
Thalassiosira sp.			20
Dinoflagellata			
Certium fusus	20		
longipes	20		
Dionphysis norvegica	60	60	40
Exuviella baltica	20	40	60
Gymnodinium Lohmanni			20
Peridinium conicum		20	
Prorocentrum micans	20		
CILIATA			
Helicostomella subulata	40		
	200	3,280	2,500

TABLE 6

Prince Station 533, Halifax Harbour, August 1, 1932.

(number of cells per litre)

Depth--metres	0	10	20
Temperature	16.7	12.15	7.85
Salinity			
Density			
Oxygen cc			
Oxygen % sat.			
Phosphate			
SILICOFLAGELLATA			
Distephanus speculum			20
DIATOMACEAE			
Chaetoceros compressus			1300
concavicornis			100
debilis		80	480 sp.
decipiens		200	680
laciniosus	60		400
spores			20
teres			20
Leptocylindrus danicus	12,660	33,160	21,720
Navicula sp. 20	20	20	180
Nitzschia closterium	120	120	200
seriata		40	180
Pleurosigma sp.			140
Rhizosolenia semispina	60	40	620
Rhabdonema sp.			20
Nitzschia linearis			60
Licmophora	60		
Skeletonema costatum			100
Thalassiosira gravida		200	700
sp.			20
DINOFLAGELLATA			
Ceratium fusus 20	20		
Ceratium longipes	40		
Dinophysis norvegica		120	40
Exuviella baltica		40	120
Gymnodinium Lohmanni			80
Peridinium sp.			20
CILIATA			
Helicostomella subulata	20		
	13,080	34,020	27,220

TABLE 7.

Zoarces Station 59, Halifax Region, July 25, 1932.
(number of cells per litre)

Depth--metres	0	10	25	50	75	100
Temperature	15.0	13.02	6.16	2.28	1.85	3.67
Salinity	30.81	31.26	32.12	32.56	32.88	33.35
Density						
Oxygen cc						
Oxygen % sat.						
Phosphate						
COCCOLITHINEAE						
Pontosphaera Huxleyi	4800	4900				
DIATOMACEAE						
Coscinoscira Oestrupi					40	
Paralia sulcata						220
Pleurosigma sp.						20
Rhabdonema adriaticum						20
Thalassiosira gravida			80			20
SILICOFLAGELLATA						
Distephanus speculum				20		40
DINOFLAGELLATA						
Ceratium longipes	20			40		
Exuviella baltica	80	20				40
Glenodinium sp.		20				
	4,900	4,940	80	60	40	360

TABLE 8.

Zoarces Station 60, Halifax Region, July 25, 1932.
(number of cells per litre)

Depth--metres	0	10	25	50	75	100
Temperature	15.3	14.11	1.99	0.93	0.63	0.77
Salinity	30.72	30.95	31.62	31.91	32.14	32.34
Density						
Oxygen cc						
Oxygen % sat.						
Phosphate						
COCCOLITHINEAE						
Pontosphaera Huxleyi	2720	2,840				20
DIATOMS						
Biddulphia aurita					20	
Chaetoceros decipiens				40		
Leptocylindrus danicus		80				
Pleurosigma sp.				20		
Thalassiosira sp.				20		
SILICOFLAGELLATA						
Distephanus speculum				20		
DINOFLAGELLATA						
Ceratium longipes	120	20				
Exuviella baltica				20		
Peridinium curtipes		20				
	2,840	2,960	0	120	20	20

TABLE 9.

Zoarces Station 61, Halifax Region, July 25, 1932.
(number of cells per litre)

Depth--metres	0	10	25	50	75	100
Temperature	15.1	11.42	3.59	1.9		
Salinity	31.00	30.91	31.36	31.62		
Density						
Oxygen cc						
Oxygen % sat.						
Phosphate						
COCCOLITHINEAE						
Pontospharea Huxleyi	2,120	340				
DIATOMS						
Leptocylindrus danicus		20	80			
Pleurosigma sp.		20				
DINOFLAGELLATA						
Ceratium longipes	20			20		
Dinophisis norvegica		20				
Exuviella baltica	40	40				
Per idinium achromaticum	20					
Peridinium pallidum		20				
	2,200	460	80	20		

TABLE 10

Zoarces Station 62, Halifax Region, July 25, 1932.
(number of cells per litre)

Depth--metres	0	10	25	30
Temperature	14.5	11.07	5.5	4.25
Salinity	30.82	30.95	31.20	31.35
Density				
Oxygen cc				
Oxygen % sat.				
Phosphate				
COCCOLITHINEAE				
Pontosphaera Huxleyi		20		
DIATOMACEAE				
Biddulphia aurita				20
Chaetoceros compressus		80		
concavicornis			20	20
decipiens		40	420	
laciniosus		60	160	
Leptocylindrus danicus		180	4,760	780
Navicula sp.		20	80	40
Nitzschia closterium		20		
seriata		80	160	
Pleurosigma sp		20		20
Rhizosolenia fragillima		20	20	
semispina			20	40
setigera	20			
Thalassiosira gravida		20	100	80
decipiens?			20	
sp.			40	40
Thalassiothrix nitzschiodes			40	
SILICOFLAGELLIATA				
Distephanus speculum				20
DINOFLAGELLATA				
Certium longipes		60		
Dinophysis acuminata	40			
norvegica	20	120	20	
Exuviella baltica	20	80	80	160
Gymnodinium sp.		100		
Peridinopsis rotunda		80	20	
Duplopsalis lenticula		80		
Prorocentrum micans				20
CILIATA				
Mesodinium rubrum		120		
	100	1,200	5,960	1.240

TABLE 11.

Zoarces Station 59, Halifax Region, Aug, 1, 1932.
(number of cells per litre)

Depth--metres	0	10	25	50	75	100
Temperature	15.9	13.80	9.47	0.92	0.72	1.95
Salinity	30.79	31.42	31.87	32.54	32.68	32.97
Density						
Oxygen cc						
Oxygen % sat.						
Phosphate						
COCCOLITHINEAE						
Pontospharea Huxleyi	3,460	24,480	20			
DIATOMACEAE	80					
Chaetoceros compressus						
Navicula sp.		20				
Thalassiosira sp.		20	20			
SILICOFLAGELLATA						
Distephanus speculum					20	
DINOFLAGELLATA						
Certium longipes		20				
Dinophysis norvegica	20					
Exuviella baltica		60				
	3,560	24,600	40	0	20	

TABLE 12.

Zoarces Station 60, Halifax Region, Aug. 1, 1932.
(number of cells per litre)

Depth--metres	0	10	25	50	75
Temperature	15.9	13.69	4.41		
Salinity	30.88	30.90	31.58		
Density					
Oxygen cc					
Oxygen % sat.					
Phosphate					
COCCOLITHINEAEA					
Pontospharea Huxleyi	2,560	7,680			
SILICOFLAGELLATA					
Distephanus speculum				20	
DINOFLAGELLATA					
Ceratium longipes				20	
Dinophysis norvegica					40
	2,560	7,680	0	40	40

LITERATURE

1. Bigelow, Henry B. Plankton of the Offshore Waters of the Gulf of Maine.
   Bull. of the Bureau of Fisheries. Vol. XL Part 11 No. 968. 1926

2. Gran, H.H. Preservation of samples and Quantitative Determination of the Plankton.
   Copenhagen. Publication de Circonstance No. 62. 1912.

3. Gran, H. H. The plankton production of the North European Waters in the Spring of 1912.
   Copenhague. Bull. Planktonique pour l'année 1912. 1915.

4. Lohmann, Hans: Untersuchungen zur Feststellung des Vollständigen Gehaltes des Meers an Plankton.
   Wissenschatliche Meeresuntersuchungen. N.F. Abt. Kiel Bd. 10. 1908.