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The Production of Plankton

in the coastal waters off Bergen

March — April 1922

By

H. H. GRAN

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A.S. JOHN GRIEGS BOKTRYKKERI

Since *Brandt* published his first work (1899) concerning the metabolism of the sea, the theory has been more and more accepted that the limiting factor for the production of plankton at the surface of the sea in most cases must be the quantities present of dissolved nutritive substances, primarily compounds of nitrogen and phosphorus.

Nathansohn (1906) showed that these nutritive substances, when absorbed by the phyto-plankton in the upper layers, sink down into the depths as dead or living cells or as excrements and by degrees accumulate in the deeper layers of the sea. It has been proved directly by the latest investigations of *Atkins* (1923) concerning the occurrence of phosphorus compounds in the sea that these compounds disappear from the surface layers during the course of the summer and accumulate in the deeper layers in quantities which steadily increase towards the depths.

The loss, which the surface layers are in this way constantly exposed to, can be compensated for, partly by vertical circulation and vertical movements of large masses of water (*Nathansohn* 1906) and partly by supplies from land (*Nathansohn* 1910, *Birgithe Ruud* 1926).

When there is a question of determining quantitatively the productivity of various parts of the sea at different times of the year, it is necessary to carry out quantitative investigations of the variations in the amount of plankton in connection with investigations of as many as possible of the external factors which may conceivably influence the production of plankton.

A quantitative investigation of the occurrence of plankton can with modern methods (*Lohmann* 1908, 1920, *Gran* 1912, 1915) be carried out with sufficient accuracy, even though the work demands much time, so that it is necessary to work in accordance with a wellformed plan, in order to achieve results corresponding to the work employed. But we do not obtain a general view of the real dimensions of the production until

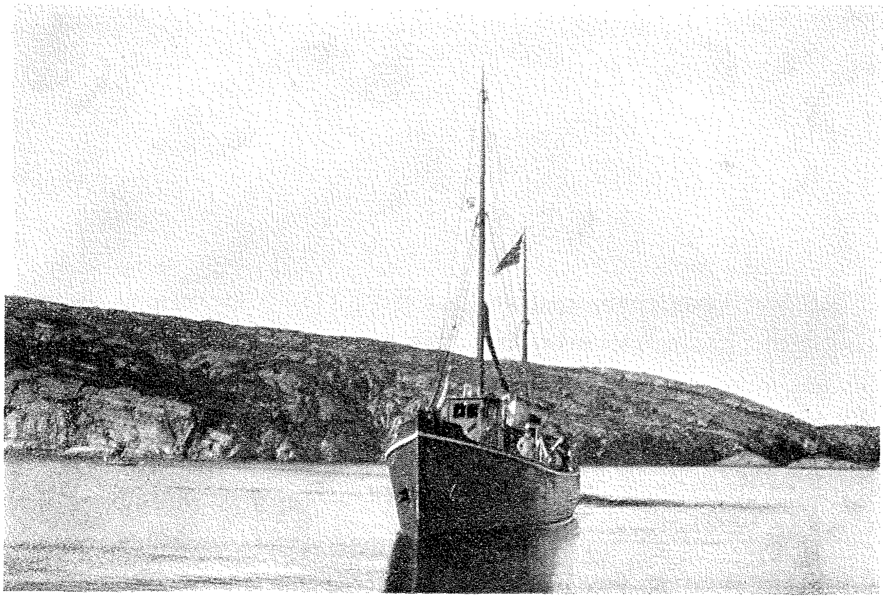

Fig. 1. *M/S Johan Hjort in the Harbour by Kaartveit.*

we are able simultaneously to investigate how the plankton Algæ influence the chemical composition of sea water, in the first instance the occurrence of oxygen (*Gaarder* 1915) and the alkalinity, (*Gaarder* 1917).

Both these factors will vary, not only with the photosynthesis of the algæ, but also with the respiration of the algæ, bacteria and animals besides with the atmospheric gas exchange; nevertheless they give at present, the best means of obtaining a minimum gauge of the productivity of any given area of the sea.

We have a comparatively favourable point of attack for such an investigation in the enormous propagation of diatoms which takes place in the course of quite a short period along the coasts of North Europe in February—April, after the season of relative rest which usually prevails in December—January. It is an advantage to the investigation that the plankton at that period of the year is almost homogeneous; zooplankton is still scarce in the surface layers and the nannoplankton forms, which cannot be investigated except by so great magnification that investigations are rendered difficult, play at that time of the year a quite subordinate part in comparison with diatoms which can be determined quantitatively with comparative ease and certainty by the

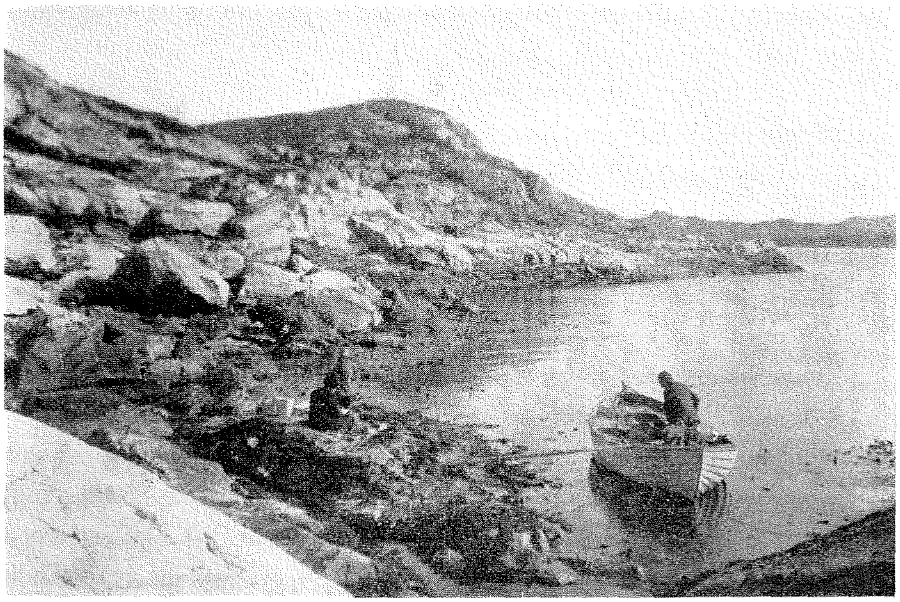

Fig. 2. The small motor-boat between the islands by Kaartveit.

centrifugal method, and which, according to all experiences, appear to be extremely evenly distributed over large areas so long as the conditions of life are homogeneous.

An investigation at this period of the year had also the special advantage that the spring production must form the basis of the nourishment of the small animals, in the first instance copepodes which again constitute the most important nourishment of the youngest stages of the species of fish which spawn in the spring along the coast of Norway, first and foremost herring and cod.

On the basis of these considerations, investigations were started in the Oslo Fjord in 1916—1917 with their basis at the Biological Station at Drøbak; the amount of plankton, oxygen, and p_H were investigated from week to week at various depths, and at the same time culture experiments were carried out. The culture experiments in particular gave data for determining the intensity of the production at various depths; but in the Fjord itself it was found that both the amount of plankton and of oxygen and p_H varied to such an extremely high degree with the movements of the surface layer in and out of the Fjord that it was difficult to follow the dependence of the production of plankton upon the changing conditions of life and to find a measure of its total value (*Gran* and *Gaarder* 1918, *Gaarder* and *Gran* 1927).

It was found to be especially desirable to carry out corresponding investigations off the west coast of Norway where the conditions in the masses of water might be assumed to be more stable, even though they are of course also in constant movement; but this difficulty would be partly eliminated if there were an opportunity of investigating the coast stream, the Baltic stream, in the whole of its extent, from the land out to its limits towards the waters of the North Sea, where the influence from the land must be assumed to be of minor importance.

A favourable opportunity presented itself when Mr. *Einar Lea* in Bergen with the new motor cutter »Johan Hjort« in March to April 1922 was to start investigations on the spawning of the spring herring and the conditions of life of the fry. Mr. *Asserson,* the Director of Fisheries was good enough to offer cooperation and gave me in every way the best conditions of work procurable, and I would therefore take this opportunity of expressing my sincerest thanks to him and to Mr. *Lea* and to thank the staff of the »Johan Hjort«, especially Captain *Berntsen* who died in 1926. The chemical investigations of the samples collected were carried out at the Geophysical Institute in Bergen; for this assistance I am greatly indebted to the Director of the Institute, Professor *B. Helland-Hansen* and his assistent Mr. *Aabraek* and I would also express my thanks to Dr. *Torbjørn Gaarder* for good advice end valuable assistance; a number of the analyses of oxygen were carried out by him personally.

The starting place for the investigations I selected as near as possible out towards the open sea on the outer side of the Island of *Sotra* off Bergen, at the fishing place *Kaartveit* which Mr. *Oscar Sund* with great kindness helped me to select. With the kindness of the Director of Fisheries I there had an opportunity of making use of a small open motor boat for my daily investigation, whilst the cruises out in the North Sea on the »Johan Hjort« were carried out at intervals of three weeks. As assistent in these investigations Professor *Johan Hjort* placed at my disposal Mr. *Hans Hansen,* laboratory assistant at the University Laboratory for marine biology, and he afforded me valuable assistance. The samples of water for the hydrographical and biological investigations were collected in water bottles of *Ekman's* or *Nansen's* model; the temperature was determined by *Richter's* water thermometer; the samples of water for chlorine and oxygen determinations were regularly sent to Bergen (two—three hours distance) by motor boat or by coast steamer. The determinations of oxygen were carried out in accordance with *Winkler's* method. Investigations in accordance with a similar plan were carried out in the years 1923—1926 on the initiative of *Oscar Sund* at Lofoten during and after the spawning of cod. The quantitative determinations of plankton were made by my assistant, Miss *Birgithe Ruud*, who published a preliminary account of the investigations of the years 1923—1925 (*Ruud* 1926). As will be seen below the two series of investigations supplement each other in a very valuable manner. It may be added that investigations carried out off Romsdal in 1926—1927 with the co-operation of Professor *Johan Hjort* and Mr. *Johan Ruud* will presumably render possible an instructive collective picture of the development of spring plankton off the coast of Norway.

A preliminary report of the present investigations was given in a paper read at the meeting of Scandinavian Natural Scientists in Gothenberg 1923 printed in Norwegian in »Samtiden« (*Gran* 1923).

I Continuous investigations within the skerries by Kaartveit.

The hydrographical conditions on the West coast of Norway were investigated by *Hjort* (1895), *Nordgaard* (1898, 1899, 1900, 1903, 1905) and from 1901 at various times by the International Marine Investigation. The quantity of oxygen and p_H were investigated by *Gaarder* (1915, 1917) the qualitative composition of the plankton by *Jørgensen* (1899).

The character of the surface layers within and outside the skerries is entirely determined by the *Baltic Current* which has there a higher salinity than in the Categat and Skagerak. As will be seen from Table 1, the salinity at the surface in March to April 1922 was homogeneous; on two occasions at a depth of 1 metre it was just below 33 ‰, otherwise it was between 33 ‰ and 34 ‰ the whole time from the surface down to a boundary which varied in depth from 30 to 50 metres as the surface layers, presumably on account of the wind, drove outwards

Tab. 1. Variations in Salinity ($^0/_{00}$) March—April 1922, by Kaartveit.

Depth. m.	Station 1 March 1	St. 4 March 9	St. 5 March 13	St. 7 March 17	St. 12 March 23	St. 13 March 28	St. 14 March 31	St. 18 April 19
1	33.62	33.40	33.64	32.99	33.33	33.29	33.32	32.85
5	33.82	—	33.73	33.49	33.35	—	33.36	—
10	33.89	33.89	33.75	33.53	33.36	33.31	33.39	33.40
20	33.90	33.90	33.78	33.69	33.39	33.39	33.57	33.96
30	33.97	33.90	33.82	33.76	33.49	33.56	33.76	34.07
40	34.12	33.96	—	33.79	33.72	33.91	34.13	34.16
50	34.17	33.96	33.92	34.05	34.05	34.12	34.18	34.22
75	34.23	34.19	—	34.22	34.44	34.32	34.40	34.35
100	34.31	34.33	—	34.29	34.46	34.73	34.54	34.41

Tab. 2. Variations in Temperature, March—April 1922 by Kaartveit.

Depth m.	Station 1 March 1	St. 4 March 9	St. 5 March 13	St. 7 March 17	St. 12 March 23	St. 13 March 28	St. 14 March 31	St. 18 April 19
1	4.6	4.55	4.20	4.10	4.17	4.19	4.11	4.80
5	4.5	—	4.33	4.23	4.15	—	4.10	—
10	4.5	4.63	4.34	4.29	4.16	4.33	4.06	4.96
20	4.5	4.65	4.37	4.48	4.17	4.23	4.40	5.35
30	4,6	4.69	4.43	4.44	4.28	4.31	4.64	5.40
40	4.76	4.70	—	4.69	5.53	4.68	4.94	5.47
50	4.92	4.69	4.54	4.89	5.17	5.01	5.16	5.50
75	4.95	4.93	—	5.12	5.63	5.35	5.58	5.66
100	5.1	5.04	—	5.22	6.61	5.46	5.75	5.74

from land or were pushed together. The conditions of temperature also show a similarly even distribution, Cp. Table 2. The temperature in the surface layers where the phyto-plankton is produced remains the whole time at between 4 & 5 degrees. The isotherm for 5 degrees remains in the first half of the month deeper than the isohaline for 34 $^0/_{00}$. On the 23rd it rises to about 35 metres and the 19th April right up to a little above a depth of 10 metres. It is of great importance for our investigations to ascertain that the conditions are comparatively stable the whole time. Even though it is not probable that the same masses of water remain in our area of investigation, yet in any case there are physically and chemically homogeneous masses of water which presumably have the same origin. They belong to the constant coast current which runs out

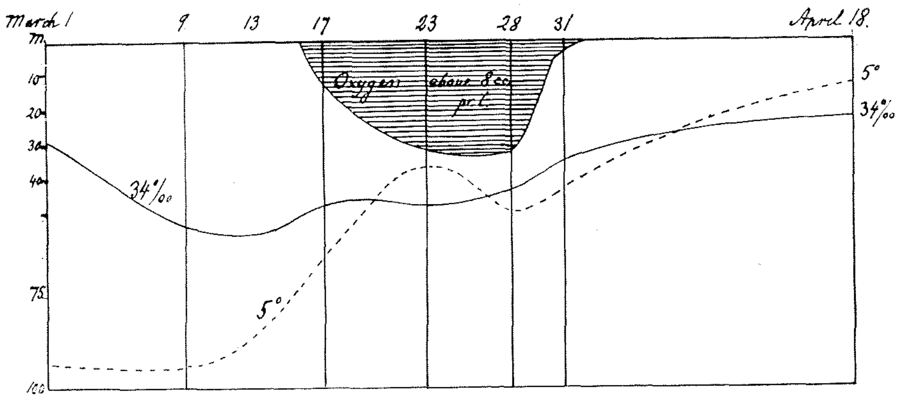

Fig. 3. Hydrograptical conditions between the islands by Kaartveit, March-April 1922.

from the Skagerak along the Norwegian coast. The month of March represents here, as in the Skagerak, the annual minimum temperature for the surface layers of the coast current. But whilst the surface temperature in the Skagerak regularly goes down to 0 degree, the current off the West coast of Norway by admixture is warmed up to 4 degrees. It may further be remarked that the salinity in the surface layers rich in plankton shows a distinct decrease between the 13th and 23rd March just at the time when the mass development of plankton diatoms takes place, as will be described below. The difference is 0.3—0.4 ‰.

Tab. 3. Oxygen cc pr. l., March-April 1922 by Kaartveit.

Depth. m.	Station 1 March 1	St. 4 March 9	St. 5 March 13	St. 7 March 17	St. 12 March 23	St. 13 March 28	St. 14 March 31	St. 18 April 19
1	—	—	7.66	8.38	8.45	8.39	8.05	—
5	7.54	—	7.55	8.38	8.32	—	7.95	—
10	7.54	—	7.57	8.06	8.15	8.48	7.95	6.90
20	7.52	—	7.60	7.81	8.14	8.54	7.94	6.55
30	7.56	7.57	7.86	7.63	8.02	8.07	7.56	6.43
40	7.49	7.46	—	—	7.54	7.68	7.32	6.49
50	7.42	7.44	7.68	7.47	7.34	7.29	7.11	6.38
75	7.42	7.40	—	7.32	7.22	7.02	6.91	6.38
100	7.34	7.28	—	7.29	7.11	6.32	7.09	6.35

Table 3 shows the variations in the amount of oxygen. The analyses by *Winkler's* method were carried out at the Geophysical Institute in Bergen. For adjustment of the Thiosulphate solution there was employed distilled water of a known temperature shaken with air so as to be saturated. All values are surprisingly high; the values at Station 1 correspond to a saturation precentage of 104—103 from the surface to the bottom and in the surface layers at Stations 12—13 the saturation percentage is 114—116 %. The high values at Stations 12—13 are not more than should be expected according to the colossal production of diatoms. The over-saturation at Station 1 may possible be due to the circumstance that the coast current from the Skagerak has been saturated with oxygen at a temperature of about 0 degrees and has than been made warmer by mixing with salter masses of water.

Whether this be so or not, the observations show in any case a very rapid rise in the value of oxygen in the surface layers about March 15 with a continued increase until the 23rd and 28th, after which it decreases rapidly at the end of the month. On april 19 the consumption of oxygen has exceeded its production so that the water is under-saturated. The increase exactly coincides with the development of diatom plankton which has its maximum about the 23rd but is still very rich on the 28th; it was only to be expected that there would be a further increase in the quantity of oxygen on account of the photosynthesis of the diatoms, even after the latter had begun to multiply more slowly.

The minimum value of the production of oxygen in the course of 3—4 weeks in the surface layers should be 1 cc. per litre. If for the sake of certainty we only take into account the surface layers down to a depth of 10 metres, the net production should correspond to 1.4 mg. of glucose per litre or 14 g. of glucose per sq. metre of surface.

At the beginning of March the *plankton* was very scanty. The only species which regularly occurred and was not too scanty was *Skeletonema costatum*. Also *Thalassiosira gravida* was found, but very scantily. It wat not until the 13th (Station 5) that the plankton increased both qualitatively and quantitatively. On that day the surface layers of the coastal waters were deeper than usual on account of a wind blowing on the shore. There were considerable quantities of plankton diatoms right down to a depth of 50 metres, which is otherwise not the rule. According to previous culture experiments (*Gaarder* and *Gran* 1927) it can be assumed that the light at a depth of 50 metres in our latitudes in winter is not sufficient for the plankton algæ to multiply. What is found at that depth must either have sunk down through the masses of water, examples of which are often seen when the period of vegetation has lasted some time, or have been pressed down with the masses of water when the layers of water containing plankton are mechanically pressed together.

The growth continues in the following week and the phyto-plankton reaches its maximum at Station 12 on March 23. On the 28th it has already considerably decreased and the maximum is no longer found at the surface. This is a circumstance which is often met with when multiplying decreases or ceases, whilst the remainder of the earlier production sinks to the detpths (*Gran* 1915). On March 31st the development has continued in the same direction as will be seen from table 4. In this and the following tables I have inserted the observations from station 15 on April 7th although station 15 was taken 20 miles off the coast. It can to some extent supplement the unfortunately large interval of time between stations 14 and 18 (March 31st—April 19). At Station 15 there could no longer by centrifuging be found any diatoms at the surface. The maximum, mainly consisting of the small-celled *Chaetoceras sociale* were not found until a depth of 40 metres. On April 19te the diatoms had almost entirely disappeared from the surface layers.

Table 4 shows the total number of diatom cells but as there is a great difference in size between the various species and as their development may not be entirely contemporaneous, it is more instructive to trace the growth of the various species individually. We have selected those species which occur in the greatest numbers as the figures for these give the most reliable results. *Skeletonema costatum* (Table 5) begins its development before all other species. More than the others it appears to have its origin close to the shore, and this also agrees with experiences from other localities even though there are also examples of this species occurring in large quantities at a considerable distance from the land, e. g. on the ridge off Lofoten (*Ruud* 1926). In the enclosed harbour at Kaartveit, where on March 14 the plankton was much more scanty than out among the skerries (Station 6, Table 6) it dominated together with *Eutreptia Lanowii*, a characteristic coast plankton species, and comparatively small quantities of *Thalassiosira Nordenskiöldii*. Skeletonema has its maximum simultaneously with the other species on March 23, but on

Tab. 4. Diatoms, cells pr. l., all species together. By Kaartveit March-Apr. 1922.

Depth m.	St. 1 March 3	St. 4 March 9	St. 5 March 13	St. 7 March 17	St. 12 March 23	St. 13 March 28	St. 14 March 31	St. 15 Apr. 7	St. 18 Apr. 19
1	700	25 200	112 080	620 400	427 800	40 650	7 040	—	20
2	4 930		77 360	579 200	840 310		20 940	880	
15	1 630	600	86 460	382 350	340 730	51 450	28 840	380	—
20	3 330	3 840	133 520	87 320	713 810	43 950	43 260	3 450	—
30	1 080	2 920	184 200	19 280	653 320	92 350	39 680	14 330	80
40	620	3 760		17 420	114 020	72 100	24 260	318 520	—
50	1 160	760	137 700	11 740	41 130	14 780	9 950	19 700	20
75	100	1 280		5 420	1 340	7 920	3 120	7 370	—
100	740	4 740		1 890	4 910	12 830	1 870	3 640	—

Tab. 5. Skeletonema costatum cells pr. l., Kaartveit March—April 1922.

Depth m.	Station 1 March 1	St. 4 March 9	St. 5 March 13	St. 7 March 17	St. 12 March 23	St. 13 March 28	St. 14 March 31	St. 15 Apr. 7	St. 18 Apr. 19
1	540	22 160	68 360	454 000	162 000	6 400	160	—	—
5	4 000		46 480	324 600	321 800		680	—	
10	1 260	520	60 920	206 000	81 000	8 100	1 760	—	—
20	2 900	3 360	93 720	35 040	449 400	—	1 080	—	—
30	650	2 840	122 520	8 480	363 000	23 700	880	—	—
40	600	3 280		7 720	3 800	30 800	1 260	160	—
50	960	600	100 680	6 040	22 120	1 300	560	600	—
75		1 080		3 800	—	400	—	700	—
100	680	4 180		1 300	1 700	1 720	1 100	700	—

the 28th it shows a marked diminution earlier than in the case of the other species. During the brief flowering which the diatom plankton shows off Bergen in 1922, this is the only indication of a succession between the species mutually which is otherwise found where the diatoms continue to grow for any considerable time, as in the Skagerak, near the Coast of England and of France (*Herdman* and *Scott* 1909, *Mangin* 1913) or in the Gulf of St. Lawrence (*Gran* 1919). Otherwise all the species in the present instance occur and disappear simultaneously as shown in tab. 6—8.

Thalassiosira Nordenskiöldii (Table 6) is the most predominant species but up to and including March 9th it is still very scarce. On March 13th it occurs quite profusely and then quite evenly to a depth of 50 metres which must be due to a rush towards the land of the masses

Tab. 6. Thalassiosira Nordenskiöldii, cells pr. l. Kaartveit March—April 1922.

Depth m.	St. 1 March 1st	St. 4 March 9th	St. 5 March 13th	St. 7 March 17th	St. 12 March 23rd	St. 13 March 28th	St. 14 March 31th	St. 15 April 7th	St. 18 April 19th
1	—	440	32 440	131 000	225 200	23 000	3 760	—	—
5	—		24 960	222 200	373 200	—	9 480	—	
10	50	—	18 200	160 050	220 000	28 400	12 480	— (Sp. 140)	—
20	80	—	30 880	46 800	210 200	37 400	31 280	— (Sp. 1 460)	—
30	20	—	51 120	9 960	244 000	48 700	33 840	780 (Sp. 80)	20
40	—	—		8 840	103 400	32 800	21 080	7 340 (Sp. 3 260)	—
50	40	—	29 200	4 880	15 200	1 280	8 660	3 000 (Sp. 11 760)	—
75	60	—		1 400	880	7 120	2 800	40 (Sp. 3 480)	—
100	40	—		440	2 760	10 600	400	80 (Sp. 2 440)	—

Sp. = resting spores.

of water of the coast current; as described above we found a similar condition in the case of *Skeletonema.* Their occurrence at the depths of 30—50 metres is produced by mechanical and not by biological conditions. The development continues in the following week with a maximum of 373,000 on March 23rd. On the 17th March we find a density of over 100,000 per litre at a depth of 10 metres, on March 23rd down to 40 metres, but this variation in thickness of the productive surface layers will naturally also to a high degree depend on hydrographical conditions.

In the last week of the month the density is about one-tenth of the maximum; on March 31 the maximum is found at a depth of 30 metres, but diminishes distinctly at the surface. It is the characteristic phenomenon of sinking, as is known from many earlier observations (*Lohmann* 1908, *Gran* 1915, 1919).

On April 7th the species had disappeared from the surface. The maximum of vegetative cells (7,000) were then found at a depth of 40 metres, and from 50 metres downwards there were found more resting spores (maximum at 50 metres 11,760) than vegetative cells. On April

Tab. 7. Rhizosolenia semispina, cells pr. l. Kaartveit March-April 1922.

Depth m.	Station 1 March 1	St. 4 March 9	St. 5 March 13	St. 7 March 17	St. 12 March 23	St. 13 March 28	St. 14 March 31	St. 15 Apr. 7	St. 18 Apr. 19
1	—	—	400	3 100	2 800	1250	260	—	—
5	—		260	3 000	5 100		240	—	
10	—	—	180	2 050	4 800	1 150	300	60	—
20	—	—	240	980	2 000	850	900	30	—
30	—	—	320	320	2 300	1 750	1 000	30	—
40	—	—		220	1 200	1 350	900	220	—
50	—	—	300	300	580	360	230	180	—
75	—	—		20	160	140	80	90	—
100	—	—		110	90	200	130	60	—

Tab. 8. Chaetoceras laciniosum, cells pr. l. Kaartveit March—April 1922.

Depth m.	St. 1 March 1	St. 4 March 9	St. 5 March 13	St. 7 March 17	St. 12 March 23	St. 13 March 28	St. 14 March 31	St. 15 Apr. 7	St. 18 Apr. 19
1	—	—	3 480	17 400	17 600	2 200	—	—	—
5	—		3 080	12 400	87 600		280	—	
10	—	—	1 880	4 400	29 200	2 700	440	—	—
20	—	—	2 400	1 200	34 600	—	300	—	—
30	—	—	2 240	—	20 400	1 900	180	—	—
40	—	—		—	1 600	800	180	20	—
50	—	—	3 080	—	320	40	—	920	—
75	—	—		—	80	80	—	100	—
100	—	—		—	100	—	—	—	—

19th it was just possible to show the existence of spores by centrifuging of 50 ccs. samples.

The other species which I have selected as examples follow exactly the same scheme. *Rhizosolenia semispina* (Table 7) was found in quantities which with regard to the number of individuals is about one sevently fifth of the number of cells for *Thalassiosira, Chaetoceras laciniosum* (Table 8) which in March 1922 was found in the greatest quantity of all the *Chaetoceras* species, has a larger figure for individuals than *Rhizosolenia* which diminishes somewhat more quickly, about simultaneously with *Skeletonema.*

In addition to diatoms we find throughout the month Cilioflagellata and Infusoria, but in surbordinate numbers as compared with the diatoms, and with no marked periodicity. *Gymnodinium Lohmanni* is found, however, during the last half of March during the decrease of the diatoms in a regular number of up to 5/600 per litre in the surface layers down to a depth of 20 metres.

Species of the genera *Ceratium, Dinophysis* and *Peridinium* and also a small species of *Oxytoxum* are in the centrifuged samples only found in insignificant quantities. Infusoria are found in somewhat greater quantities, above alle *Mesodinium, Laboea* and *Lohmanniella oviformis;* with the exception of the latter they keep nearer to the surface than the diatoms. *Laboea conica* and *strobila* could not be found at greater depths than 20 metres. It was striking that the *Laboea* species which have brown algæ in their cells *(L. conica, strobila* and *vestita)* became lighter towards the end of the month, and appeared to digest their algæ. *Laboea constricta* is always quite colourless as is also *Lohmanniella oviformis.*

We find as our chief results that the quantity of plankton regularly increases throughout the whole of March until about the 23rd whereupon it diminishes comparatively quickly, while all the algæ sink to a depth where the light is no longer sufficient for assimilation. The curve for the increase of plankton has the same course during the whole month as the curve for the occurrence of oxygen.

II. Hydrographical Sections off the coast.

In order to be able to trace the connection between the hydrographical variations among the islands and the hydrographical situation out in the North Sea, I had an opportunity by the kind assistance of the Director of Fisheries of making three cruises from the investigation station at Kaartveit directly out in the North Sea towards the West. The first Station was taken within the skerries by Kaartveit, the next 20 miles beyond and the following stations at distances of 20 miles.

The first cruise was made on March 1st to the 2nd, whilst the sea from a biological point of view was still in a winter condition, the second cruise was made on March 21st to 23rd during the great diatom maximum, and the third after its decrease on April 7th.

1. *Hydrographical Section March 1st—7th.* Tables I—III.

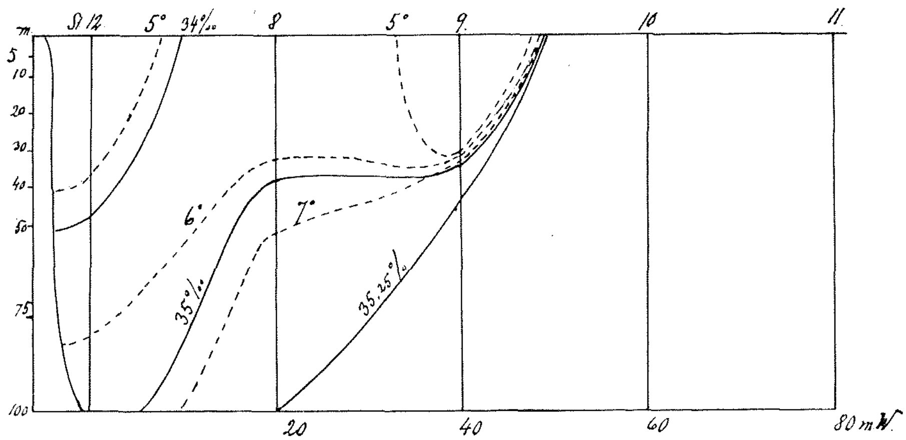

Fig. 4. Hydrographical section off Kaartveit, March 21-23, 1922.

At that time the hydrographical conditions were very homogeneous. Inside the skerries, at Station 1 the surface water had a salinity of between 33 and 34 $^0/_{00}$ down to a depth of 30 m., and even at a depth of 100 metres it was not more than 34.31 $^0/_{00}$. The temperature was between 4.5 and 5.1. The amount of oxygen was untill a depth of 30 metres 7.52 to 7.56 ccs. per litre and decreased slightly downwards to 7.34 ccs. per litre at a depth of 100 metres. At the two outside stations 20 and 40 miles distant from the coast the temperature and salinity were higher, the temperature in the surface layers being about 5.5 and the salinity about 34.5 $^0/_{00}$. The isotherm for 6^0 at Station 2 was between 30 and 40 m., at Station 3 about 70 m. The Isohaline for 35 $^0/_{00}$ at Station 2 was at about 70 metres and at Station 3 below 100 metres. The quantities of oxygen were lower than at station 1; at station 2 they were between 7.00 and 7.20 ccms. per litre, at station 3 between 7.33 and 7.10 ccms. At this station, however, observations of the quantities of oxygen are lacking at a depth of 1—10 metres. At all three stations the quantity of plankton was extremely poor. The total of all diatoms at station 1 at a maximum of 10 metres deep was 4,930 per litre, of which there were 4,000 *Skeletonema costatum.* At station 2 the maximum total was 120—150 diatoms per litre and at station 3, 230—280. In all cases *Skeletonema costatum* constituted more than one half of the total number. Of other species that occurred somewhat regularly may be mentioned *Thalassiosira gravida,* and also a few individuals of *Ceratium* species occurred at all stations. *Mesodinium*

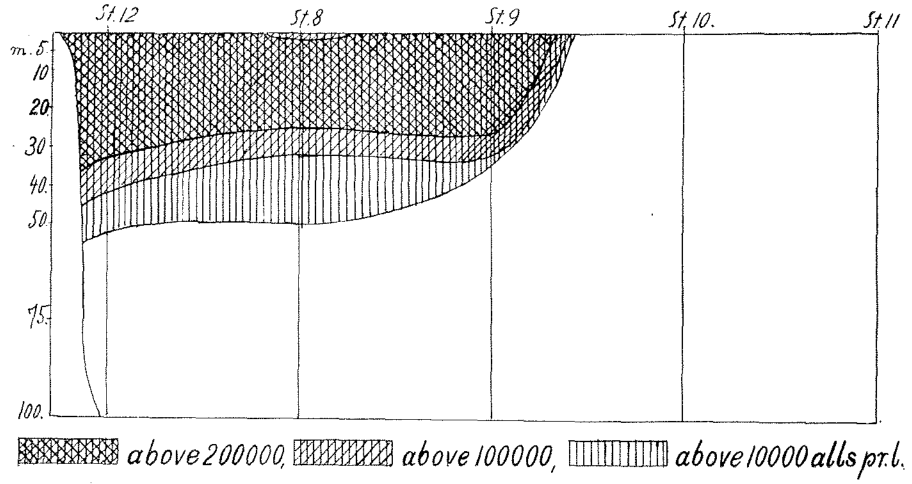

Fig. 5. Distribution of Thalassiosira Nordenskiöldii, section off Kaartveit, March 21-23 1922.

with its algæ symbiosis regularly occurred with a frequence of about 100 per litre. All species were found in relatively greatest numbers inside the skerries, and more scantily at station 2 than at station 3. This early scanty development seems to have its origin at the coast.

2. *Hydrographical Section March 21—23.* (Tables VIII—XII), fig. 4.

This Section proceeds from the skerries (station 12) across the coast stream (stations 8—9) to the Atlantic waters of the North Sea (stations 10—11). The Salinity of the coast stream within the skerries is 33.3 to 34.46 $^{0}/_{00}$, outside the skerries over 34 $^{0}/_{00}$ and the isohaline for 35 $^{0}/_{00}$ at both stations lies at a distance of 20—40 miles from the coast at a depth of 30 and 40 metres. Outside the area of the coast stream at a distance of 60 and 80 miles from land the salinity is over 35.3 everywhere with a very even distribution from the surface to a depth of 100 metres. The temperature in the coast stream varies from 4.15 to somewhat over 5^{0}, slightly lower within the skerries than outside. Outside the skerries the isotherm for 6^{0} falls somewhat together with the isohaline for 35 $^{0}/_{00}$. Quantities of oxygen above 8 cc. per litre is found as far as the coast stream extends, including station 9 at a distance of 40 miles from land. Just as far from land there extends a colossal development of plankton diatoms which are characteristic of the Norwegian coastal waters at that time of the year.

Tab. 9. Section off Kaartveit, 1922. March 21—23, Temperature.

Depth m.	St. 12 Inside the islands	St. 8 20 miles W.	St. 9 40 miles W.	St. 10 60 miles. W	St. 11 80 miles. W
1	4.17	5.22	4.94	7.39	7.26
5	4.15	5.12	4.94	—	—
10	4.16	5.08	4.95	7.40	7.27
20	4.17	5.09	4.96	7.40	7.27
30	4.28	5.73	4.43	7.42	7.29
40	5.53	6.65	7.61	7.39	7.27
50	5.17	6.94	7.75	7.38	7.28
75	5.63	7.27	7.67	7.37	7.28
100	6.61	7.27	7.64	7.30	7.28

Tab. 10, Section off Kaartveit 1922, March 21—23. Salinity.

Depth m.	St. 12 Inside the islands	St. 8 20 miles W.	St. 9 40 miles W.	St. 10 60 miles W.	St. 11 80 miles W.
1	33,33	34.25	34.14	35.34	35.31
5	33.35	34.27	34.11	—	—
10	33.36	34.28	34.11	35.34	35.31
20	33.39	34.30	34.12	35.34	35.31
30	33 49	34.61	34.14	35.34	35.32
40	33.72	35.06	35.24	—	35.32
50	34.05	35.13	35.26	35.34	35.31
75	34.44	35.23	35.31	35.35	35.31
100	34.46	35.25	35.30	35.38	35.31

Tab. 11. Section off Kaartveit 1922, March 21—23. Oxygen, cc pr. l.

Depth m.	St. 12 Inside the islands	St. 8 20 miles W.	St. 9 40 miles W.	St. 10 60 miles W.	St. 11 80 miles W.
1	8.45	8.04	8.15	6.61	7.18
5	8.32	8.12	8.13	—	—
10	8.15	8.02	8.16	7.20	7.37
20	8.14	7.77	7.64	7.14	—
30	8.025	—	7.89	7.12	7.24
40	7.54	7.14	6.99	7.13	7.22
50	7.34	6.63	6.94	7.10	7.14
75	7.22	7.53	6.99	7.10	7.14
100	7.11	—	6.98	7.09	7.15

Tabel 12. Section off Kaartveit 1922. March 21—23.
Diatoms, sum of all species, cells pr. l.

Depth. m.	Station 12 Inside the islands	St. 8 20 miles .W	St. 9 40 miles W.	St. 10 60 miles W.	St. 11 80 miles W.
1	427 800	198 400	780 600	1 120	4 850
5	840 310	397 600	606 100	—	—
10	340 730	449 720	731 700	1 000	6 570
20	713 810	440 300	788 610	460	7 440
30	653 320	210 110	333 800	520	6 240
40	114 020	54 320	260	1 640	9 800
50	41 130	17 000	200	520	7 600
75	1 340	80	100	800	7 840
100	4 910	40	80	2 360	4 420

Tab. 13. Section off Kaartveit 1922, March 21—23.
Skeletonema costatum, cells pr. l.

Depth m.	Station 12 Inside the islands	St. 8 20 miles W.	St. 9 40 miles W.	St. 10 60 miles W.	St. 11 80 miles W.
1	162 000	30 600	355 400	—	1 180
5	321 800	50 200	170 400		
10	81 000	97 400	239 000	—	1 290
20	449 400	134 400	336 600	—	1 900
30	363 000	44 760	106 100	—	660
40	3 800	16 400	—	—	1 940
50	22 120	4 160	—	—	1 720
75	—	—	—	—	1 580
100	1 700	—	—	—	540

Tab. 14. Section off Kaartveit 1922, March 21—23.
Thalassiosira Nordenskiöldii, cells pr. l.

Depth m.	Station 12 Inside the island	St. 8 20 miles W.	St. 8 40 miles W.	St. 9 60 miles W.	St. 11 80 miles W.
0	225 200	108 800	355 600	—	140
5	373 200	284 800	361 800		
10	220 000	270 800	428 200	80	240
20	210 200	251 800	395 800	60	1 180
30	244 000	154 400	212 720	160	—
40	103 400	35 880	180	—	—
50	15 200	11 840	140	20	—
75	880	20	—	20	—
100	2 760	20	40	60	—

Table 9—18 and Sections Figure 4—5 clearly show how closely the development of plankton is connected with hydrographic conditions. The rich diatom plankton is sharply limited to the coast stream with a salinity of under 35 $^0/_{00}$ and temperature below 6°. In the coast stream its distribution is found to be strikingly uniform; there are the same species and the same mutual quantities of each. *Thalassiosira Nordenskiöldii* and *Skeletonema costatum* constitute in numbers the wast majority, and of these *Thalassiosira* as the larger species is in this case the most important from a quantitative point of view.

There are indications that station 8 which has a little higher temperature and salinity than the nearest stations within and without (12 & 9) is not quite so rich in plankton as the latter. The difference is especially striking in the case of *Skeletonema costatum* (Table 13) which more than the other species is considered to be bound to the coast. This slight difference is probably due to the circumstance that the coast stream at station 8 for some reason or other is more mixed with oceanic water than that at the two other Stations.

It is noteworthy that the diatoms are extremely evenly distributed from the surface downwards to a depth of 20 metres; the differences between the observations here lie inside the limits of error of the method of counting. The salinity and temperature also exhibit a similarly even distribution inside the same depths, all indicating that the surface layers have been well-mixed down to a depth of 20 metres or even sligthly deeper. Since the beginning of the month there has thus throughout the whole of the waters of the Coast Stream developped in an explosive manner enormous masses of diatoms.

On the banks outside Lofoten *Birgithe Ruud* (1926) showed that the plankton diatoms in spring developped successively from land out over the banks, evidently stimulated in growth by the nutritive material from land. At Lofoten the development of plankton on the coast banks appears mainly to be a local phenomenon.

Off Bergen we receive an entirely different impression. The regular distribution through the whole area of the Coast Stream indicates that both the various species and the nutritive materials which were conditions for mass development came with the stream itself. This agrees with the circumstance that exactly the same species are found in the Baltic Stream off the Swedish Skagerak coast in February.

Tab. 15. Section off Kaartveit 1922, March 21—23.
Rhizosolenia semispina, cells pr. l.

Depth m.	St. 12 Inside the islands	St. 8 20 miles W.	St. 9 40 miles W.	St. 10 60 miles W.	St. 11 80 miles W.
1	2 800	4 400	7 100	—	—
5	5 100	5 000	5 200		
10	4 800	2 700	4 000	—	—
20	2 000	4 600	5 500	—	—
30	2 300	2 200	3 340	—	—
40	1 200	200	—	—	—
50	580	120	—	—	—
75	160	—	—	—	—
100	90	—	—	—	—

Tab. 16. Section off Kaartveit 1922, March 21—23.
Chætoceras laciniosum, cells pr. l.

Depth. m.	Station 12 Insides the islands	St. 8 20 miles W.	St. 9 40 miles W.	St. 10 60 miles W.	St. 11 80 miles W.
1	17 600	33 600	32 800	—	—
5	87 600	36 800	36 800		
10	29 200	52 000	35 400	—	—
20	34 600	33 400	32 400	—	—
30	20 400	2 720	3 280	—	—
40	1 600	440	—	—	—
50	320	360	—	—	—
75	80	—	—	—	120
100	100	—	—	—	—

This association was first desribed as *Sira plankton by Cleve* (1897). It was subsequently investigated quantitatively by *Gran* (1915, Table III. and Plate 2 figure 1) and by *Astrid Cleve-Euler* (1917). The association of species which was observed off the Swedish West Coast from February 19th—23rd 1912 *(Gran* 1915) contain *Thalassiosira Nordenskiöldii* and *Skeletonema costatum* as the predominating species exactly as they are found in our material from the West Coast of Norway; *Thalassiosira gravida* and *Rhizosolenia semispina* were found in both cases in minor quantities. In the Skagerak this plankton develop-

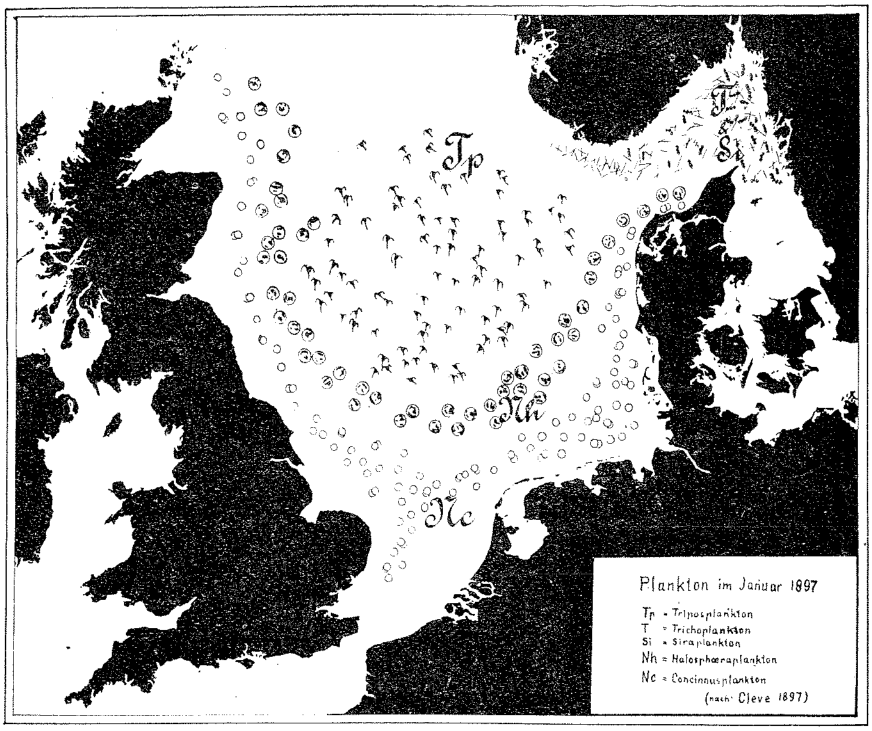

Fig. 6. Plankton-associations in the Skagerak and the North Sea, January 1897, copied from P. T. Cleve.

ped in water with a temperature of about 0 degree and a salinity of 25—32 ‰. If we assume that the diatom plankton of the Skagerak off Sweden developped in the same manner and at the same time in 1922 as in 1912, there should be one month between the mass appearance of the species in the Skagerak and the corresponding occurrence off the West Coast of Norway. According to *Mohn* (1887) the average velocity of the Baltic Stream along the South Coast of Norway is 0.4 sea miles an hour; this exactly corresponds to the fact that the masses of water need about one month from the West coast of Sweden to the waters off Bergen. This movement is illustrated in a quite instructive way by *Cleve's* finely executed chart which I have taken the liberty of re-producing, of the surface plankton in the Skagerak and North Sea in January 1897 (fig. 6)[1]. *Cleve* lacked observations from the district off the West

[1]) Reproduced with permission from a drawing by dr. *Hjalmar Broch* prepared for his treatise in *Abderhaldens* »Handbuch der biologischen Arbeidsmethoden«.

Tac. 17. Section off Kaartveit 1922, March 21—23.
Thalassiosira gravida, cells pr. l.

Depth m.	Station 12 Inside the islands	St. 8 20 miles W.	St. 9 40 miles W.	St. 10 60 miles W.	St. 11 80 miles W.
1	2 200	600	4 600	200	120
5	2 000	2 600	2 200		
10	2 600	1 800	3 800	200	630
20	1 400	1 600	2 600	220	260
30	4 200	680	1 720	80	1 020
40	1 200	600	—	260	1 160
50	200	120	—	240	880
75	—	—	—	260	440
100	—	—	—	520	260

Tab. 18. Section off Kaartveit 1922, March 21—23.
Nitzschia delicatissima, cells pr. l.

Depth m.	Station 12 Insides the islands	St. 8 20 miles W.	St. 9 40 miles W.	St. 10 60 miles W.	St. 11 80 miles W.
1	400	1 000	200	140	1 540
5	1 000	400	200		
10	400	400	600	300	1 580
20	2 400	400	—	80	1 060
30	600	200	—	60	1 080
40	—	120	—	100	2 060
50	280	—	—	—	2 640
75	—	—	—	—	1 820
100	—	—	—	—	2 360

Coast of Norway so that we have no material to enable us to judge how far Northwards the plankton reached at that time (in January). In any case the mass development of *Thalassiosira* did certainly not take place until later on. Norwegian fishermen are aware that the »flowering« of the sea off the West Coast of Norway regularly takes place about the third week of the month of March.

There still remains a discussion of the development of plankton which we find at the outermost Station in our Section, Station 11, under quite Atlantic conditions, with salinity 35.31 and temperature 7.26 to 7.29. As is shown in Table 12 there are here regularly found from the surface as far down as the observations extend (100 metres) some few thousand of diatom cells per litre (4—10,000). It is another association of species; *Rhizosolenia semispina* is entirely lacking and *Thalassiosira Nordenskiöldii* and *Chætoceras laciniosum* are found somewhat scantily, but *Thalassiosira gravida* is found in almost as large quantities as in the coast stream, *Nitzschia delicatissima* more frequently while *Skeletonema costatum* occurs in numbers corresponding to 1/4 of the whole. We also find both oceanic forms such as *Chætoceras atlanticum* and *peruvianum, Dactyliosolen antarcticus, Thalassiothrix longissima,* and relatively Southern *neritic* forms such as *Asterionella japonica, Ditylum Brightwellii, Navicula distans, Paralia sulcata* and *Rhizosolenia Stolterfothii. Navicula distans* and *Paralia sulcata* are typical North Sea forms. The association of species is very mixed; the supply of nourishment which is the condition of the still scanty development may conceivably have come to some extent from some coast or other as the salinity and temperature are slightly lower than at the poorer station 10 further in. But the richer development may also be due to the vertical circulation which has carried nutritive matter up from the depths. We see clearly that such circulation has taken place from the even distribution of the temperature, salinity and plankton throughout the whole of the layer of water investigated. The only factor which shows a distinct difference between the surface layers and those deeper down is oxygen. If we dare rely upon such small differences between the observations they should show that the photosynthesis is greater than respiration down to a depth of 40 metres inclusive, which otherwise wel agrees with *Gaarder's* (1915) results from these latitudes.

3. *Hydrographical Section April 7th 1922.* (Tab. XV—XVII, fig. 7).

The last hydrographical section was taken on April 8th after the mass production of diatoms had ceased. The hydrographical situation was not essentially changed; the water of the coast stream however now covers the surface at station 17 also, which corresponds to station 10 in the previous section. The temperature in the surface layer of the coast stream is still between 4 and 5° and the salinity between 33 and 35 ‰. Diatoms are now found very scantily in the water of the coast stream as shown by the Tables. Of *Thalassiosira Nordenskiöldii* there are found

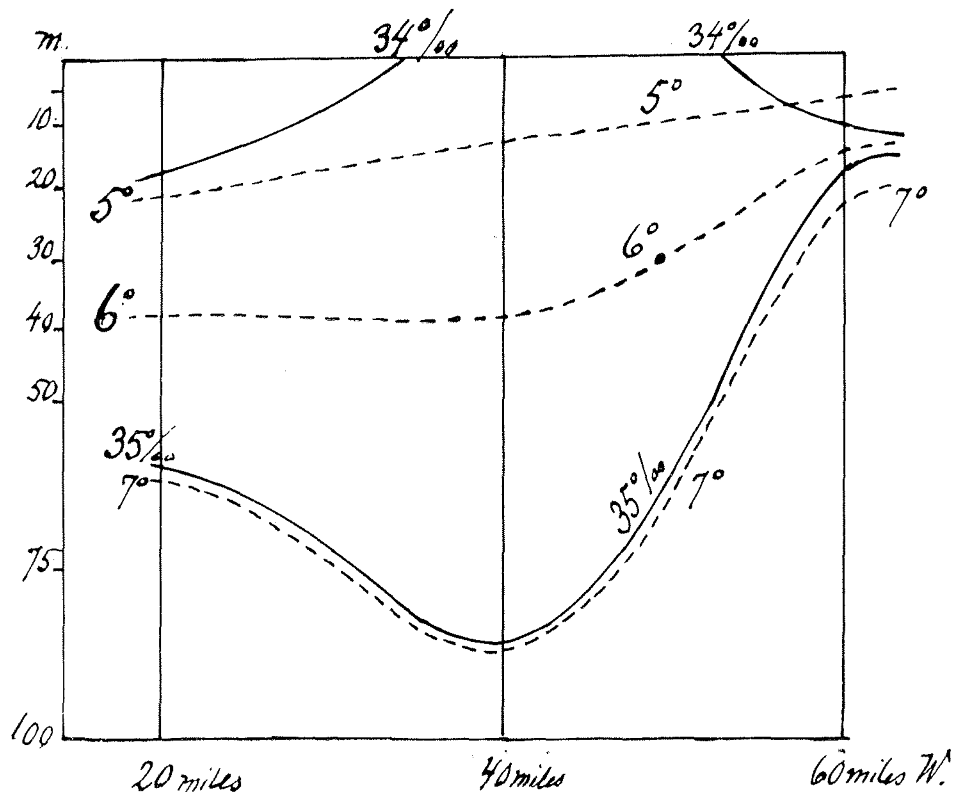

Fig. 7. Hydrographical section off Kaartveit, April 7, 1922.

more resting spores than vegetative cells, and the main mass is found in the salter layer of water under the actual coast stream. Both this and other species must to a great extent have sunk from the surface layers. The character of the plankton in the coast stream is now determined by Infusoria such as *Mesodinium* and *Laboea conica*. But at station 17 there is proceeding a quite rich development, not in the surface layers which have come from the coast stream, but from 20 metres and downwards in waters with a temperature of over 6° and a salinity of over 35 ‰. The chief forms are *Chatoceras debile* which attains a number of more than 100,000, and *Thalassiosira gravida*.

The fact that the coast stream has now become so poor is most probably due to the circumstance that the stores of nutritive matter brought down from the Skagerak are used up, which, according to the investigations of *Atkins* (1923) regarding the occurrence of phosphorus compounds can take place in a comparatively short time. The temperature and salinity have not greatly changed, at least not so much that they can have placed any limits on development. Another factor that might give similar results could perhaps be an accumulation of products of assimilation which might have poisonous effects. It has been shown (*Gran* and *Ruud* 1926, *Gaarder* and *Gran* 1927) that the plankton diatoms secrete comparatively large quantities of dissolved organic matter; but, so far, we have no knowledge as to how these stuffs act upon the development of algæ. It will be possible to approach these questions further by continued investigations.

III. Investigation in Hardanger Fjord
April 20th—21st 1922.

For a comparison of the development of plankton in the coast stream, it was of interest to carry out investigations of the corresponding conditions in the deep Hardanger Fjord, which extends far into the country just to the South of the region of our investigation. I considered it probable beforehand that the conditions there would be more stationary than those in the coast stream and that in the Fjord there might still be found a comparatively rich diatom plankton, even though the development in the coastal waters had already ceased. During a cruise of investigation in March 1898 I had convinced myself that the rich coast plankton which belongs to the coast stream did not extend farther in than between the large islands which lie at the mouth of the fjord. It was of interest to show whether the Fjord has its own characteristic plankton which develops independently of the supplies of nutritive matter from without.

The section in Figure 8 shows the hydrographical situation. The salinity of the surface layers decreases from the mouth of the Fjords inwards. At the mouth itself, station 22, however the salinity of the surface layers is slightly lover than in the fjord. The temperature at the surface is over 5° the whole way on account of heating from above, but a little below the surface at somewhat varying depths in various places we find a minimum temperature which at the innermost Station goes down to 4.64° at a depth of 20 metres.

Although the surface layers differ so little from the water of the coast stream, both in salinity and temperature, the character of the

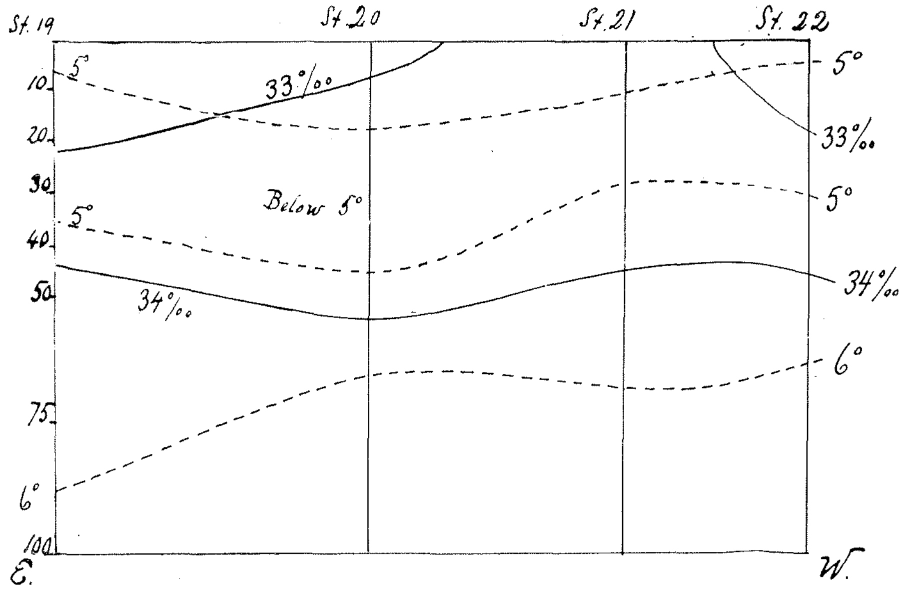

Fig. 8. Hydrographical section in the Hardanger Fjord, April 20-21, 1922.

plankton is quite different. At the two innermost stations it is quantitatively very rich which is also expressed by the extremely high content of oxygen. The predominant species is *Leptocylindrus miniinus* with up to 2½ millions cells per litre. Next comes *Thalassiosira bioculata* with up to 11,000 per litre. Both species are of a far more southern type than the dominating species of the coastal waters. At Station 20, where the plankton has its maximum, both quantitatively and qualitatively, we find in addition such southern species as *Asterionella japonica, Chaetoceras compressum* and *curvisetum, Eucampia zoodiacus, Leptocylindrus danicus, Rhizosolenia faeroeensis* and *Stolterfothii,* besides a wealth of species of *Peridinia.* There is a special abundance of one species which without fuher investigation I have provisionally determined as *Peridinium geminum;* it forms short chains like *Gonyaulax catenata (Levander)* and appears to have brown chromoplasts. The same species is also found at the next outermost Station, at Lervik, but in smaller quantities. At the mouth of the Fjord (Station 21), the plankton is scanty as in the rest of the coast waters; only small quantities of forms from the Fjord are found there.

Leptocylindrus minimus as shown by the Table 19 is mostly found in the surface layer, whilst *Thalassiosira bioculata* and the other species

Tab. 19. Hardanger Fjord 1922, April 19—20.
Leptocylindrus minimus, cells pr. l.

Depth m.	St. 19 Off Oeistese (inner Fjord)	St. 20 Off Kvinherred Church	St. 21 Off Lervik	St. 22 Off Bømmelhuk (mouth of the fjord)
1	1 452 000	778 000	42 000	—
5	2 387 000	2 480 000	318 400	—
10	2 260 000	2 230 000	396 900	180
20	560	68 160	201 300	—
30	—	1 660	24 440	1800
40	40	12 160	80	240
50	—	960	—	—
75	—	—	—	60
100	—	—	—	80

Tab. 20 Hardanger Fjord 1922. April 19—20.
Thalassiosira bioculata, cells pr. l.

Depth m.	Station 19 off Oeistese	St. 20 off Kvinherred church	St. 21 off Lervik	St. 22 off Bømmelhuk
1	—	—	1 360	—
5	440	60	1 900	—
10	240	3 880	3 8C0	—
20	880	9 300	11 280	—
30	1 800	5 380	1 620	—
40	190	3 760	—	—
50	—	1 200	—	—
75	—	—	—	—
100	—	—	—	—

have their maximum in the colder water of 4—5° at a depth of 20—30 metres. Presumably the mass development of *Leptocylindrus* began after the other species had vegetated for some time, so that they had time to sink down; the sources of nourishment for the flowering undoubtedly come from the melting snow on the cultivated fields around the Hardanger Fjord.

The great qualitative difference between the plankton of the Hardanger Fjord and the coastal waters is understandable if we remember that the coastal waters come from the Skagerak where the plankton has commenced its development under a temperature of nearly 0°, whilst the plankton of the Hardanger Fjord has developped under a temperature of between 4 and 5°. We thus find in this difference a new support for our views that the plankton of the coastal waters comes from the east.

IV. Culture Experiments.

In accordance with that method which Dr. *Gaarder* and I had previously employed at Drøbak, there were in the month of March suspended at a depth of 1 metre in the sea at Kaartveit litre flasks containing sea water which had previously been investigated for plankton and content of oxygen. Some of the flasks received no supply of nutritive matter, others either KNO_3 corresponding to .05 mgs. of N per litre, $Na_2\ HPO_4$ corresponding to .05 mgs., or both of these nutritive substances simultaneously. As a rule there were employed simultaneously two or three flasks with the same contents, so that the mean values could be calculated. The object was to test whether the addition of nutritive salt increased the production of plankton and of oxygen in the flasks.

As a rule there was suspended one flask covered by opaque cloth in order that at the same time the consumption of oxygen by respiration could be estimated. In all the experiments the temperature was about 4—5°.

Experiment 1. March 8th—11th, content of oxygen 7.41 cc. per litre. 3 flasks received an addition of nitrates and phosphates, 3 flasks received no addition. Original content of plankton (cells per litre)

	Before the Experiment (8/3)	Without Addition	With Nitrates and Phosphates
Oxygen cc. per litre	7.41	7.50	7.59
Chætoceras compressum	525	18 133	20 733
„ *debile*	185	1 990	2 120
„ *laciniosum*	115	827	920
Skeletonema costatum	15 965	123 173	141 093
Thalassiosira gravida	220	827	1 000
„ *Nordenskiöldii*	210	5 267	3 333

Skeletonema costatum 15,965, *Thalassiosira Nordenskiöldii* 210, *Thalassiosira gravida* 220, *Chætoceras compressum* 525, *Chætoceras laciniosum* 115, *Chætoceras debile* 185, in addition to a number of other species in smaller quantities.

The difference between the unfertilised and the fertilised flasks is small. The increase in oxygen without fertilising is .09 ccs, with fertilising .18 cc. The reproduction of diatoms is good throughout. *Skeletonema costatum,* which in the original sample is found in the greatest numbers, has multiplied 8 times, i. e. an increase of 100 % per 24 hours. Some of the other species appear to have multiplied even more rapidly, but as the quantity beforehand was small so that a slight error in the centrifugal method could make a great difference, too great stress should not be laid upon the values for the rapidity of reproduction which can be estimated from these observations.

In comparison with the rapid increase the difference between the quantity in the fertilised and unfertilised flasks is very small. It may be asserted that the lack of nutritive matter cannot have been the limiting factor of production at that period.

Experiment 2. March 13th—16th. Same conditions. The plankton is now somewhat richer.

Result.

	Before the Experiment (13/3)	Without Addition	With Nitrates and Phosphates
Oxygen cc. per litre	7.10	7.81	7.85
Chætoceras laciniosum	2 110	12 100	11 167
Rhizosolenia semispina	205	525	467
Skeletonema costatum	71 930	286 400	437 100
Thalassiosira Nordenskiöldii	23 550	101 250	63 967
Distephanus speculum	180	750	267
Mesodinium	770	1 050	1 833

In this case reproduction is less abundant than in the previous experiment, in the best cases up to five times in 72 hours *(Chætoceras laciniosum* and *Skeletonema).* The difference between the fertilised and non-fertilised class is still inconsiderable.

Experiment 3. March 16th—19th. Still the same plan of experiment, but for the purposes of control one of the flasks was packed in opaque cloth in order to investigate the intensity of respiration.

	Before the Experiment	After the Experiment		
		In Darkness	Without Addition	With Nitrates and Phosphates
Oxygen cc. per litre.......	8.22	8.15	9.63	9.88
Chætoceras debile	650	1 000	1 900	3 700
„ *diadema*	1 000	1 800	5 100	12 700
„ *laciniosum*	13 800	16 000	19 400	34 900
Nitzschia seriata..........	250	600	2 300	2 100
Rhizosolenia semispina....	1 025	2 600	2 150	2 800
Skeletonema costatum.....	291 500	932 500	1 720 800	2 146 000
Thalassiosira gravida	1 750	5 200	3 600	3 070
„ *Nordenskiöldii*	132 650	259 600	409 300	369 600

The increase in oxygen is great, without fertilising 1.41 ccs., with fertilising 1.66 ccs. per litre in three days. The quantity of plankton is now near its maximum. Reproduction is uneven, in the case of *Skeletonema* up to 6—7 times, in the case of most other species less. The difference between the fertilised and not fertilised flasks is inconsiderable. It is relatively greatest as regards oxygen .25 cc. The experiences at Drøbak of *Gaarder* and *Gran* (1927) might render conceivable the possibility that the difference could be connected with the circumstance that the nitrate reduction gives a surplus of oxygen.

Experiment 4. March 25th—28th, 2 flasks without addition, two with only phosphates, 2 with phosphates and nitrates, two with nitrates alone, one of which was in darkness.

The consumption of oxygen by respiration is now greater than before .30 cc. per litre in three days. The production of oxygen by photosynthesis gives distinct positive results of fertilising especially with nitrates, but the reproduction of the algæ is unsatisfactory whether due to some fault in method during the experiment or whether there may have been formed poisonous products of assimilation from the wealth of diatom plankton. As regards possible errors in the experiment, the only one I can find is that the algæ may have been exposed to too strong

	Before Experiment	After the Experiment				
		In Darkness	Without Addition	With Phosphate	With Nitrate	With Nitrate and Phosphate
Oxygen cc. per litre........	8.38	8.08	8.73	8.80	9.07	9.13
Nitzschia seriata...........	400	600	2 400	2 100	3 200	3 200
Rhizosolenia semispina.....	1 200	1 700	2 250	4 000	3 400	3 100
Skeletonema costatum......	154 300	88 200	6 500	175 300	85 600	147 700
Thalassiosira gravida......	1 500	1 600	5 300	2 500	1 800	3 200
,, *Nordenskiöldii*	111 000	76 400	205 600	225 600	131 400	204 700

light when there was bright sunshine which has undoubtedly a bad effect, and it would doubtless be practical in subsequent experiments to lower the flasks to a depth of five metres, where as a rule the algæ still have entirely optimal conditions of illumination.

Experiment 5. March 31—April 3, same plan as in experiment 4.

	Before Experiment	After the Experiment				
		In Darkness	Without Addition	With Phosphate	With Nitrate	With Nitrate and Phosphate
Oxygen cc. per litre........	8.05	7.85	8.00	8.08	8.18	8.23
Chætoceras debile..........	80	2 200	2 200	4 800	5 860	6.640
,, *diadema*.......	1 880	1 240	3 360	2 660	6 620	5 460
Nitzschia seriata...........	560	240	240	820	740	920
Rhizozolenia semispina.....	260	340	480	470	490	450
Skeletonema costatum......	160	480	1 080	4 520	2 240	5 800
Thalassiosira Nordenskiöldii	3 760	5 280	3 200	16 400	19 340	17 920

The plankton is now so much poorer from a quantitative point of view that the production of oxygen in the flasks without fertilisers does not correspond to the consumption of oxygen by respiration. But fertilising, especially with nitrogen now gives distinct evidence both in the development of oxygen and in the reproduction of the algæ. This experiment shows distinctly that the occurrence of dissolved nutritive matter after the great period of flowering is the limiting factor for further development.

Experiment 6. April 3—6. Same plan, but only the variations in oxygen were investigated.

Oxygen cc. per litre:

Before the Experiment	7.81		
After stay in darkness	7.30	difference	— 0.51
Without addition	7.45	„	— 0.36
With Phosphates	7.46	„	— 0.36
With Nitrates	7.43	„	— 0.38
With phosphates & nitrates	7.68	„	— 0.13

The consumption of oxygen is very great .17 cc. per 24 hours; the water presumably contained a great deal of soluble organic matter. In the production of oxygen the nitrates and phosphates alone have not given any results but the addition of both substances simultaneously has done so.

On comparing the determinations of oxygen from all experiments we obtain.

Oxygen cc. per litre	Before Experiment	Without Addition	Increase	With Nitrate & Phosphate	Increase	In Darkness	Difference
1. 8—11 March	7.41	7.50	+ 0.09	7.59	+ 0.18	—	—
2. 13—16 „	7.70	7.81	+ 0.11	7.85	+ 0.15	—	—
3. 16—19 „	8.22	9.63	+ 1.41	9.88	+ 1.66	8.15	— 0.07
4. 25—28 „	8.38	8.73	+ 0.35	9.13	+ 0.75	8.08	— 0.30
5. 31 March—3 April.	8.05	8.00	— 0.05	8.23	+ 0.18	7.85	— 0.20
6. 3—6 April	7.81	7.45	— 0.36	7.68	— 0.13	7.30	— 0.51

The differences in the net production of oxygen which is conditional upon the addition of nitrates and phosphates are positive throughout, but quite small at the beginning 0.09 and 0.04 cc. In the middle of the month (Experiment 3) the difference increased to .25 cc., and on the 25th—28th to .40. The scanty plankton on March 31st shows in the fifth experiment a smaller difference .23 cc., and the same difference .23 cc. in the last experiment, April 3rd—6th. These figures show, as stated above, that the addition of nutritive salts at the end of the period had a greater effect than in the begining, but they are not adequate for a decision as to whether they have acted solely as nutritive stuffs or whether they have chiefly had stimulating effects. We must also take into consideration that a part of the increase in oxygen may be due to reduction of nitrates. With the experiences now gained it will be possible to avoid a number of the sources of error in subsequent experiments.

Discussion of the Results.

The chief object of the experiments was to obtain a valuation as to how large the net production of organic substances can be during the flowering of the rich spring plankton off the coast of Norway.

In the preliminary report published in Norwegian language (*Gran* 1923), I have estimated from the increase in the oxygen dissolved in sea water the net production during 3—4 weeks in March 1922 at 1.4 g. glucose per cubic metre, reckoning the increase in oxygen at 1 cc. per liter. In further estimating that this production was restricted till the uppermost layers of water down to a depth of 10 metres, this should correspond to a production of 14 g. glucose per sq. metre of the surface over an area which extended from the coast to 40 miles from the latter.

This should be a minimum value when we take into account that the surface layers in their saturated condition must steadily give off oxygen to the atmosphere.

According to the results of culture experiments, we arrive at considerably higher values. The net surplus of oxygen in the culture flasks increased steadily from March 8th to March 19th. During the period March 19th—25th no culture experiments were made on account of the cruise on the »Johan Hjort«, and during the experiment on March 25th —28th the increase in oxygen was again less. If we calculate the production of oxygen in the days March 19th—25th as equal to the average values of the experiments, 3 (16—19/3) and 4 (25—28/3) we obtain a net surplus of oxygen in 20 days, from the 8th—28th March, equals .09 plus .11 plus 1.41 plus 1.76 plus .35 equals 3.72 cc. O_2 per litre corresponding to 5.2 g. glucose per m.^{3} or an average of .26 g. glucose per 24 hours per cubic metre.

This value is more than three times greater than the minimum value which we arrived at after the observations in the open sea. Nor should this calculation give too large values. In the culture flasks the conditions for the growth of the algæ and for their photosynthesis cannot be better than in the open sea. And during the greater part of the period of experiment, at least until the 23rd, the amount of assimilating algæ in the sea has steadily increased. In the culture flasks we had no more plankton than in the sea outside, rather less. During some of the experiments several of the species shewed poor growth which indicates less favourable conditions in the culture flasks.

For the purposes of comparison we have *Pütter's* (1924) values from the Kiel Bay. We here find as the average value for the summer months after the culture experiments 2.27 g. of glucose per cubic metre per 24 hours. His values are gross values in that to the net values he has added the total consumption of oxygen by the respiration of plankton and bacteria. If we take into consideration that the water in the Kiel Bay is always very full of nutritive substances and that assimilation will be quicker with the summer temperature than at 4^0 to 5^0, it is perhaps not more than could be expected that his gross values are nearly ten times greater than our net value.

Pütter's last results from the Canary Islands (1926) after the analysis of flasks which had stood on shore under the shadow of trees cannot be employed for this comparison.

Atkins (1922, 1923, 1924) from the variations in p_H estimated the *annual* net surplus of plankton production in the English channel at 3 g. of glucose per cubic metre, or less than our net surplus for 20 days. The assumptions for *Atkins*' calculations are that throughout the year he had the same masses of water to deal with and that the net surplus is constantly added up in the course of the summer months whilst again it is consumed in winter. These assumptions scarcely hold in our waters. The quantities of organic matter which are produced at the cost of the wealth of nutritive supplies from the Baltic, move with the current and are distributed far outside the area of production. We should therefore obtain an erroneous idea of the productivity of our seas if we should measure them solely in accordance with the chemical changes in a definite locality.

On the other side assimilation and dissimilation proceed much more quickly than we should be inclined to expect beforehand. According to the investigations to hand (Cp. *Gran* and *Ruud* 1926), it is extremely probable that a large part of the surplus is found in a soluble form, as soluble organic matter in the sea water and is very rapidly oxydised by the activity of bacteria. We have seen above that the great surplus of oxygen which had accumulated in the course of the month of March was very quickly displaced by a deficit. During the culture experiment from April 3rd—6th there was so little phytoplankton present that the quantity of oxygen decreased under full illumination by .12 cc. per litre per day, and in darkness, by .17 cc. per litre per day. In the coastal regions where the supply of nutritive substances varies, several such maxima and minima may succeed each other in the course of the year, so that it is difficult to estimate the total yearly production by comparing the chemical conditions during the winter maximum with the conditions during any single observed maximum. I will not, however, contend that conditions in the English Channel may be so even and steady that *Atkins*' calculations may give a true estimate of the production in that area.

Summary:

1. In March—April 1922 there were carried out continuous hydrographical — biological investigations at the Island of Sotra off Bergen and three sections from the coast out in the North Sea at distances of 20 miles between the stations. The investigations were carried out from the surface to a depth of 100 metres, with determinations of temperature, salinity, content of oxygen and of plankton of all samples of water, the last named being determined by centrifuging.

2. Near the coast the temperature at the surface remained very even the whole time, about 4—5° and likewise the salinity between 33 and 34 ‰. At first the plankton was very scanty from a quantitative point of view but after a time it slowly increased and later on grew rapidly to a maximum about March 23rd. The predominant species were *Thalassiosira Nordenskiöldii* and *Skeletonema costatum*, both of which attained a density of over 200,000 cells per litre. After the 23rd the amount of plankton rapidly decreased, the algæ sinking from the surface layers down towards the depths.

The quantity of oxygen increased above saturation and decreased parallel with the production of plankton with a maximum from March 23rd to 28th. In the middle of April the layers of water were undersaturated right up to the surface.

3. Hydrographical Sections. On March 1st to 2nd the layers of water were homogeneous with temperatures below 6° and salinity below 35 ‰ right out to a distance of 40 miles from the coast. Close up to the shore there began a scanty development of plankton with *Skeletonema costatum* as the predominating species, otherwise the plankton was very poor in individuals.

The Section March 21st—23rd showed homogeneous layers of water from the coast to and including a distance of 40 miles from the coast, with salinity under 35 ‰ and temperature under 6° at the surface layers the whole way. Outside the above limits there were Atlantic Waters with a temperature of over 7° and a salinity of over 35.25.

The Coast Stream up to a distance of 40 miles from the shore contained a very rich diatom plankton with extremely even distribution both as regards quality and quantity. The predominating species were *Thalassiosira Nordenskiöldii* and *Skeletonema costatum* both with a density of over 200,000 cells per litre, a typical *Sira-plankton* according to *Cleve's* definition.

The regular distribution of these large quantities of plankton can best be explained under the assumption that both the species and the supplies of nutritive material which are a condition for their continued reproduction came with the Baltic Stream from the Skagerak, where a corresponding plankton occurs outside the Swedish coast about 1 month earlier (February 1912) under conditions of temperature of about 0° and salinity under 32 ‰. The average velocity of the Baltic Stream according to *Mohn* is 0.4 sea miles per hour, a speed which would just in the course of a month carry waters from the Skagerak Coast of Sweden to the coastal waters off Bergen.

The Section on April 7th shows altered conditions. The waters of the Coast Stream are now very poor in plankton. A number of diatoms have sunk down into the salter layers of water under the Coast Stream, whilst a development has commenced in the Atlantic waters outside the Coast Stream.

A Section into the Hardanger Fjord, April 20th—21st shows in the mouth of the Fjord the same poorness in plankton and the same low content of oxygen as in the rest of the coast stream. But in the Fjord there has developped in the surface layers a rich diatom plankton of *Leptocylindrus minimus* (with a density of up to 2½ millions per litre), *Thalassiosira bioculata* and subordinate quantities of a number of more southern forms. These species have developped at temperatures corresponding to the conditions in the coastal waters (4 to 5^0), but form nevertheless a sharp contrast to the cold water species in the coast stream. This contrast gives new support to our theory that the diatoms of the coast stream first developped under the Arctic conditions in the Skagerak in the month of February, whilst the plankton of the Hardanger Fjord which developped later has a biological character corresponding to the conditions in that district. The production in the fjord will depend upon the supplies of nourishment during the melting of snow on the cultivated fields in Hardanger.

4. Culture experiments were carried out during the period of observation in accordance with the method earlier employed by *Gaarder* and *Gran* in the Oslo fjord. Flasks with their natural plankton were suspended in the sea for 3 days at a depth of one metre. To some of the flasks there were added small quantities of nitrates or phosphates or of both, others were suspended without any such addition, others again enveloped in opaque cloth for the determination of the consumption of oxygen by the respiration of bacteria and plankton. In the first half of the month the development of the diatoms and the production of oxygen was practically equally great in all flasks, indicating that the occurrence of nutritive salts at that time was not yet the limiting factor for the nourishment of the algæ. Towards the end of the month the addition of nutritive matter gave distinctly positive results.

5. After the increase in oxygen in the sea, the production throughout the whole of the surface layers of the coast stream down to a depth of 10 metres was estimated at 1.4 g. glucose per cubic metre as the minimum value for 3 weeks. From the results of the culture experiments we obtain considerably higher values, 5.2 g. glucose per cubic metre in 20 days, or an average of 0.26 g. glucose per 24 hours per cubic metre. Nor should this value be too high, but we must take into consideration that

probably 80 % to 90 % of the products of assimilation pass into the water in a soluble form and are again quickly oxydized by bacteria.

These results are discussed in the final Chapter with a comparison of the values found by *Pütter* and *Atkins*.

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Tab. I. Station 1, 1922 March 1. By Kaartveit, insides the islands.

Depth, m.	0	5	10	20	30	40	50	75	100
t^0 C.	4.6	4.5	4.5	4.5	4.6	4.76	4.92	4.95	5.1
Salinity ‰	33.62	33.82	33.89	33.90	33.97	34.12	34.17	34.23	34.31
σ_t	26.655	26.825	26.87	26.88	26.925	27.025	27.05	27.095	27.14
O_2 cc. pr. l.	—	7.54	7.54	7.52	7.56	7.49	7.42	7.42	7.34
Number of cc. counted	100	100	100	100	100	50	50	50	50
Chlorophyceae.									
Halosphaera viridis	—	—	—	—	10	—	—	—	—
Diatoms.									
Actinocyclus Ehrenbergii	—	—	—	—	—	—	—	—	20
Chætoceras cinctum	—	100	90	—	160	—	—	—	—
— curvisetum	—	320	—	—	—	—	—	—	—
— debile	—	—	—	—	180	—	—	—	—
— decipiens	40	—	—	—	—	—	—	—	—
— sociale	—	—	—	40	—	—	—	—	—
Lauderia glacialis	—	70	60	120	—	—	—	—	—
Navicula sp.	—	—	10	—	—	20	—	—	—
Nilzschia seriata	—	80	—	—	—	—	—	—	—
— sp.	—	—	—	—	10	—	—	—	—
Pleurosigma sp.	—	10	—	10	—	—	—	—	—
Skeletonema costatum	540	4000	1260	2900	650	600	960	—	680
Thalassiosira decipiens	—	80	60	90	—	—	—	—	—
— gravida	120	100	10	40	20	—	120	—	—
— Nordenskiöldii	—	—	50	80	20	—	40	60	40
— sp.	—	—	—	10	—	—	—	—	—
Thalassiothrix nitzchioides	—	170	90	40	30	—	40	40	—
Diatoms total number	700	4930	1630	3330	1080	620	1160	100	740
Dictyocha fibula	—	—	—	—	—	—	20	—	—
Distephanus speculum	—	10	10	20	—	—	20	—	—
Cilioflagellata.									
Ceratium furca	—	—	10	—	—	—	—	—	—
— intermedium	10	—	—	—	10	—	—	—	—
— lineatum	—	—	—	10	—	—	—	—	—
— longipes	—	10	—	—	—	—	—	—	—
— tripos	10	10	20	10	10	—	20	—	—
Dinophysis acuminata	10	—	10	—	—	—	—	—	—
— norvegica	—	10	—	—	—	—	—	—	—
Gymnodinium Lohmanni	20	—	40	30	20	—	20	—	—
Peridinium sp.	10	—	10	40	—	—	—	—	—
Protozoa.									
Laboea conica	40	40	30	20	—	—	—	—	—
— constricta	—	—	10	—	10	20	—	—	—
— strobila	20	20	20	10	—	—	—	—	—
— vestita	160	100	30	50	—	—	—	—	—
Lohmanniella oviformis	10	20	10	30	—	20	—	60	—
Mesodinium	140	100	70	60	—	—	—	—	—
Tintinnopsis sp.	20	10	—	—	10	—	—	—	—
Nauplii	—	—	—	—	10	—	—	—	—
Microsetella atlantica	—	—	—	—	—	—	—	—	20
Fritillaria borealis	—	—	10	—	—	—	—	—	—

Tab. II. Station 2. 1922 March 2. 13.11—14.33 p.m. 20′ W. of Lysø (N. 60° 19′, E. 4° 17′).

Depth, m.	0	5	10	20	30	40	50	75	100
t° C.	—	5.5	5.5	5.49	5.85	6.09	6.23	6.49	6.6
Salinity ‰	—	34.44	34.44	34.52	34.71	34.79	34.88	35.03	35.10
σ_t	—	27.195	27.195	27.26	27.36	27.40	27.45	27.53	27.575
O_2 cc. pr. l.	—	—	7.19	7.20	7.13	7.00	7.13	7.07	7.07
Numbers of cc. counted	100	100	100	100	100	100	100	100	100
Diatoms.									
Actinocyclus Ehrenbergi	—	20	—	—	10	—	10	—	—
Biddulphia mobiliensis	—	—	—	—	10	—	—	—	—
Coscinodiscus radiatus	—	—	—	—	—	—	10	—	10
Hyalodiscus sp.	—	—	—	—	—	—	20	—	—
Navicula sp.	—	—	10	20	—	—	—	—	—
Nitzschia seriata	—	—	—	10	—	—	—	—	—
Paralia sulcata +	—	100	40	—	90	—	—	—	60
Skeletonema costatum	50	—	—	40	—	—	—	—	—
Thalassiosira decipiens	20	—	—	—	—	—	—	—	—
— gravida	30	—	10	10	30	10	—	30	—
Thalassiothrix nitzschioides	—	—	—	10	10	20	10	20	10
Diatoms, total number	100	120	60	90	150	30	50	50	80
Cilioflagellata.									
Ceratium furca	—	—	—	20	10	—	—	—	—
— fusus	—	—	—	—	10	—	—	—	—
— longipes	10	—	—	10	—	—	—	—	—
Gonyaulax spinifera	—	—	10	—	10	—	—	—	—
Gymnodinium Lohmanni	10	—	—	—	—	—	—	—	—
Peridinium divergens	10	10	—	—	—	—	—	—	10
— sp.	10	—	—	—	—	—	—	—	—
Infusoria.									
Laboea conica	20	—	—	—	—	—	—	—	—
— emergens	—	20	—	—	—	—	—	10	—
— vestita	—	—	—	—	30	—	—	10	—
Lohmanniella oviformis	—	30	—	10	50	10	—	10	10
Mesodinium	30	50	80	—	—	—	—	—	—
Tintinnopsis sp.	—	—	—	—	20	—	—	—	—
Tintinnus acuminatus	—	—	—	—	—	—	—	—	10
Metazoa.									
Pseudocalanus elongatus	—	—	—	—	—	—	—	—	10
Larvae of Annelida	—	—	—	—	—	—	—	10	—

Tab. III. St. 3. 1922. March 2. 18.24—19.37 p.m. 40′ W. of Lysö. (N 60° 14′. E. L. 3° 38)

Depth m.	0	5	10	20	30	40	50	75	100
T° C	—	5.52	5.53	5.53	5.56	5.66	5.73	6.25	6.25
Salinity ‰	—	34.53	34.55	34.56	34.62	34.63	34.66	34.85	34.96
σ_t	—	27.265	27.28	27.285	27.33	27.325	27.335	27.42	27.505
O_2 cc pr. l.	—	—	7.28	7.33	7.28	7.28	7.28	7.10	7.13
Numbers of cc counted	50	91	100	50	50	91	100	91	84
Diatoms.									
Actinocyclus Ehrenbergi	—	—	—	—	—	—	10	—	—
Biddulphia sinensis	—	—	—	—	—	—	—	—	12
Coscinodiscus centralis	20	—	—	—	—	—	—	—	—
— excentricus	20	—	—	—	—	—	—	—	—
— radiatus	—	—	10	—	—	—	—	—	12
Lauderia glacialis	—	22	20	60	20	11	10	—	—
Navicula sp.	—	—	—	20	—	—	—	—	—
Skeletonema costatum	—	88	—	180	120	132	—	—	—
Thalassiosira decipiens	—	—	—	20	—	—	—	—	—
— gravida	—	—	30	—	—	88	10	11	12
— Nordenskiöldii	40	—	20	—	—	—	—	—	—
Diatoms, total number	80	110	80	280	140	231	30	11	36
Cilioflagellata.									
Ceratium furca	40	11	10	20	20	22	10	—	—
— fusus	—	—	10	—	20	11	—	—	—
— longipes	—	—	10	—	—	—	—	—	—
— tripos	—	22	10	20	—	22	—	—	—
Denophysis acuminata	20	—	—	—	—	—	—	—	—
— acuta	—	—	—	—	—	—	10	—	—
— norvegica	—	—	—	—	20	—	—	—	—
Gonyaulax spinifera	—	11	—	—	—	—	—	—	—
Gymnodinium Lohmannnii	—	—	—	—	—	11	—	—	—
Peridinium crassipes	20	—	—	—	—	—	—	—	—
— pallidum	—	—	—	—	—	11	—	—	—
— sp.	20	11	—	20	—	—	—	—	—
Infusoria.									
Laboea conica	—	—	10	—	—	—	—	—	—
— constricta	—	—	—	20	20	—	20	—	—
— strobila	—	—	10	—	—	—	—	—	—
— vestita	60	44	30	20	—	—	—	—	—
Lohmanniella oviformis	40	11	10	20	—	20	—	—	—
Mesodinium	60	88	10	20	—	—	—	—	—
Tintinnopus op.	—	22	—	20	20	22	—	—	—
Tintinnus acuminatus	—	—	—	—	—	—	—	11	—
Metazoa.									
Nauplii of Copepoda	—	—	—	—	20	—	10	—	—
Microsetella atlantica	—	—	—	—	—	—	—	—	—
Larvae of Echinodermata	—	—	—	—	—	—	—	—	12

Tab. IV. Station 4, 1922. March 9. Off Kaartveit inside the islands.

Depth, m.	1	10	20	30	40	50	75	100
t° C	4.55	4.63	4.65	4.69	4.70	4.69	4.93	5.04
Salinity ‰	33.40	33.89	33.90	33.90	33.96	33.96	34.19	34.33
σ_t	26.48	26.855	26.865	26.86	26.905	26.905	27.065	27.155
O_2, cc pr. l.	—	—	—	7.57	7.46	7.44	7.40	7.28
Number of cc counted	25	25	25	25	50	50	50	50
Halosphæra viridis	40	—	—	—	—	—	—	—
Diatoms.								
Chaetoceras cinctum	2 200	—	320	—	—	—	—	—
— compressum	160	—	—	—	—	—	—	—
— debile	680	—	—	—	—	—	—	—
Coscinodiscus radiatus	—	40	—	—	—	—	—	—
Lauderia glacialis	600	—	—	40	—	80	120	—
Nitzschia seriata	280	—	—	—	—	—	—	120
Navicula sp.	—	—	80	—	40	40	—	—
Rhizosolenia Shrubsolei	—	—	—	—	40	—	—	—
Skeletonema costatum	22 160	520	3 360	2 840	3 280	600	1 080	4 180
Thalassiosira decipiens	—	—	80	—	—	—	—	—
— gravida	520	40	—	40	80	40	80	280
— Nordenskiöldii	440	—	—	—	—	—	—	—
Thalassiothrix nitzschioides	160	—	—	—	320	—	—	160
Diatoms, total number	25 200	600	3 840	2 920	3 760	760	1 280	4 740
Dictyocha fibula	—	—	—	—	—	—	40	—
Distephanus speculum	80	—	40	—	40	—	—	—
Cilioflagellata.								
Ceratium furca	40	—	—	—	—	—	—	—
— tripos	—	—	—	40	—	—	—	—
Gonyaulax spinifera	—	—	—	—	—	—	—	40
Gymnodinium Lohmanni	40	—	80	—	—	—	—	—
Gyrodinium sp.	160	360	240	—	—	—	—	—
Peridinium ovatum	—	—	40	—	—	—	—	—
— sp.	—	40	—	—	—	—	—	40
Torodinium robustum	40	120	—	40	—	—	—	—
Protozoa.								
Laboea conica	—	160	—	—	—	—	—	—
— constricta	—	40	40	80	40	40	120	120
— strobila	—	40	—	—	—	—	—	—
— vestita	480	320	80	—	—	—	40	—
Lohmanniella oviformis	40	80	200	80	160	40	—	—
Mesodinium	1 080	40	—	—	—	—	—	—
Tintinnopsis sp.	—	—	40	—	40	—	—	—
Oikopleura	—	—	—	—	40	—	—	—

Tab. V. Station 5, 1922, March 13. By Kaartveit, insides the islands.

Depth m	0	1	5	10	20	30	50
t^{0} C.	—	4.20	4.33	4.34	4.37	4.43	4.54
Salinity ‰	—	33.64	33.73	33.75	33.78	33.82	33.92
σ_t	—	26.71	26.765	26.785	26.80	26.825	26.885
O_2, cc pr. l.	—	7.66	7.55	7.57	7.60	7.86	7.68
Number of cc counted	100	25	25	25	25	25	25
Eutreptia Lanowii	—	—	80	—	—	—	—
Diatoms.							
Biddulphia aurita	—	80	360	680	—	—	1 160
Chaetoceras boreale	70	—	—	—	200	160	—
— cinctum	530	—	—	680	200	—	320
— constrictum	70	360	—	—	—	—	1 120
— curvisetum	—	—	—	520	—	240	—
— debile	50	920	160	1 400	2 720	1 760	—
— decipiens	80	—	—	—	—	—	—
— diadema	280	—	80	120	—	—	560
— laciniosum	2 110	3 480	3 080	1 880	2 400	2 240	3 080
— simile	70	—	120	—	120	120	—
— scolopendra	—	1 960	360	480	—	—	—
— sociale	220	240	680	480	520	1 280	—
— subtile		—	—	—	—	—	—
— compressum	—	320	—	—	—	—	—
Detonula confervacea	—	480	—	—	—	—	—
Ditylum Brightwelli	15	—	—	—	—	—	—
Lauderia glacialis	230	440	40	480	280	1 080	40
Leptocylindrus danicus	90	—	320	—	—	—	—
— minimus	30	—	—	—	160	—	—
Nitzschia delicatissima	150	240	40	80	400	400	—
— seriata	210	240	—	—	—	—	—
Rhizosolenia semispina	205	400	260	180	240	320	300
— setigera	5	—	60	—	—	40	—
Skeletonema costatum	71 930	68 360	46 480	60 920	93 720	122 520	100 680
Thalassiosira decipiens	60	1 440	160	160	440	560	—
— gravida	260	—	—	40	200	160	160
— Nordenskiöldii	23 550	32 440	24 960	18 200	30 880	51 520	29 200
— minor	170	200	200	160	760	1 240	480
— quadrata	80	160	—	—	120	960	600
Thalassiothrix nitzchioides	160	320	—	—	160	—	—
Diatoms, total number	100 645	112 080	77 360	86 460	133 520	184 200	137 700
Distephanus speculum	180	280	80	—	80	—	—

Tab. V. Station 5. Continued.

Depth m.	0	0	5	10	20	30	50
t° C.	—	4.20	4.33	4.34	4.37	4.43	4.54
Salinity ‰	—	33.64	33.73	33.75	33.78	33.82	33.92
σ_t	—	26.71	26.765	26.785	26.80	26.825	26.885
O_2, cc pr. l.	—	7.66	7.57	7.57	7.60	7.86	7.68
Number of cc counted	100	25	25	25	25	25	25
Cilioflagellata.							
Ceratium furca	10	—	—	—	—	—	—
— fusus	—	—	—	—	40	—	—
— longipes	—	40	—	40	—	—	—
— macroceros	10	—	—	—	—	—	—
— tripos	20	—	—	—	—	—	—
Dinophysis acuta	30	—	—	—	40	—	—
— norvegica	—	—	—	—	40	—	—
Gymnodinium Lohmanni	70	—	40	—	40	—	—
Gyrodinium sp.	50	80	—	—	—	—	—
Peridinium pellucidum	—	—	—	40	—	—	—
— sp.	—	—	—	—	40	80	—
Torodinium robustum	30	40	—	—	—	40	—
Infusoria.							
Cyttarocylis denticulata	10	—	—	—	—	—	—
Laboea conica	10	—	80	80	—	—	—
— strobila	10	40	280	—	—	—	—
— vestita	6 100	4 640	1 280	—	80	80	40
Lohmanniella oviformis	420	200	240	40	440	280	360
— spiralis	50	40	—	40	40	80	40
Mesodinium	770	2 760	880	80	—	—	—
Ptychocylis urnula	20	—	—	—	—	—	—
Tintinnopsis sp.	—	—	—	—	—	80	—

Tab. VI. Station 6, 1922 March 14. Kaartveit, inner harbour.

Depth, m.	1	5	10	19
t^0 C.	4.30	4.42	4.45	4.51
Saliniiy ‰	32.96	33.49	33.63	33.64
σ_t	26.155	26.565	26.675	26.675
O_2 cc. pr. l.	7.66	7.47	7.44	7.43
Number of cc. counted	25	25	25	25
Euptreptia Lanowii	3 680	120	200	—
Diatoms.				
Biddulphia aurita	—	—	320	—
Chaetoceras boreale	—	120	—	—
— cinctum	—	280	—	—
— laciniosum	960	800	400	200
— scolopendra	—	—	480	—
— sociale	600	200	—	720
Lauderia glacialis	—	480	160	—
Leptocylindrus danicus	—	240	—	400
Nitzschia delicatissima	—	—	160	—
Pleurosigma sp.	—	—	80	40
Rhizosolenia semispina	—	160	40	20
Skeletonema costatum	7 400	3 320	8 720	9 360
Thalassiosira decipiens	240	—	—	—
— gravida	—	—	—	40
— Nordenskiöldii	2 920	7 880	4 960	4 600
— minor	—	—	320	160
Thalassiothrix nitzchioides	—	—	—	200
Diatoms, total number	15 800	13 600	15 840	15 740
Distephanus speculum	120	—	80	160
Cilioflagellata.				
Diplopsalis lenticula	40	—	—	—
Gymnodinium Lohmanni	—	80	—	—
Gyrodinium sp.	240	80	—	80
Peridinium sp.	40	—	—	40
Torodinium robustum	—	40	—	—
Infusoria.				
Laboea conica	160	160	40	—
— constricta	—	160	—	—
— strobila	—	40	—	—
— vestita	1 080	560	160	—
— elegans	—	40	—	—
Lohmanniella oviformis	160	80	80	—
Mesodinium	—	200	80	—
Nauplii of Copepoda	—	40	—	80

Tab. VII. Station 7, 1922 March 17. Kaartveit, inside the islands.

Depth, m.	1	5	10	20	30	40	50	75	100
t^0 C.	4.10	4.23	4.29	4.48	4.44	4.69	4.89	5.12	5.22
Salinity ‰	32.99	33.49	33.53	33.69	33.76	33.79	34.05	34.22	34.29
σ_t	26.20	26.585	26.61	26.715	26.775	26.915	26.95	27.055	27.105
O_2, cc. pr. l.	8.38	8.38	8.06	7.81	7.63	—	7.47	7.32	7.29
Number of cc. counted	5	5	20	25	25	25	25	25	50
Diatoms.									
Biddulphia aurita	—	1 000	450	40	40	80	—	—	—
Chaetoceras boreale	—	400	—	—	—	—	—	—	—
— constrictum	600	1 200	—	—	—	—	—	—	—
— curvisetum	—	400	300	—	—	—	—	—	—
— debile	4 400	2 600	600	80	—	—	—	—	—
— decipiens	400	600	200	240	—	120	—	—	—
— laciniosum	17 400	12 400	4 400	1 200	—	—	—	—	—
— sociale	1 000	—	—	—	—	—	—	160	—
— teres	200	1 200	150	—	—	—	—	—	—
Coscinodiscus concinnus	200	—	—	—	—	—	—	—	—
Coscinosira polychorda	—	—	500	—	—	—	—	—	—
Lauderia glacialis	—	200	450	—	—	—	—	—	—
Leptocylindrus danicus	—	—	500	—	—	—	—	—	—
Navicula sp.	4 000	5 200	4 850	2 040	160	120	—	40	—
Nitzschia Closterium	200	—	—	—	—	—	—	—	—
— delicatissima	400	—	—	—	—	—	—	—	—
— seriata	800	600	1 100	240	—	—	—	—	—
Rhizosolenia semispina	3 100	3 000	2 050	980	320	220	300	20	110
— setigera	100	200	50	20	40	—	—	—	—
Skeletonema costatum	454 000	324 600	206 000	35 040	8 480	7 720	6 040	3 800	1 300
Thalassiosira decipiens	—	—	—	80	160	160	120	—	—
— gravida	1 200	2 000	700	600	80	40	40	—	40
— Nordenskiöldii	131 000	222 200	160 050	46 800	9 960	8 840	4 880	1 400	440
— sp.	1 400	1 400	—	—	—	—	—	—	—
Diatoms, total number	620 400	579 200	382 350	87 320	19 280	17 420	11 740	5 420	1 890
Distephanus speculum	—	—	—	80	—	—	—	—	—
Cilioflagellata.									
Ceratium furca	—	—	50	—	—	—	—	—	—
— fusus	—	—	50	—	—	—	—	—	—
Dinophysis acuminata	—	—	50	—	—	—	—	—	—
— norvegica	—	—	50	—	—	—	—	—	—
Gymnodinium Lohmanni	—	200	50	—	40	—	—	—	—
Peridinium pellucidum	—	—	—	—	—	—	40	—	—
— Steinii	—	—	—	—	—	—	—	40	—
— sp.	—	—	—	—	—	—	—	—	20
Infusoria.									
Laboea conica	—	600	—	—	—	—	—	—	—
— strobila	—	400	50	—	—	—	—	—	—
— vestita	—	5 000	50	—	—	—	—	—	—
Lohmanniella oviformis	—	—	—	—	80	40	—	40	—
Mesodinium	400	1 200	—	40	—	—	—	—	—
Ptychocylis urnula	200	—	—	—	—	—	—	—	—

Tab. VIII. Station 8, 1922. March 21. 60° 21' N.Lat 4°16' E. Gr. (20 miles W. of Lysö).

Depth m.	1	5	10	20	30	40	50	75	100
T° C	5.22	5.12	5.08	5.09	5.73	6.65	6.94	7.27	7.27
Salinity ‰	34.25	34.27	34.28	34.30	34.61	35.06	35.13	35.23	35.25
σ_t	27.075	27.105	27.115	27.13	27.31	27.53	27.55	27.58	27.59
O_2 cc. pr. l.	8.04	8.12	8.02	7.77	—	7.14	6.63	7.53	—
Number of cc. Counted	(100) 5.	(100) 5.	(100) 5.	(100) 5.	(100) 25.	25.	50.	50.	50
Diatoms.									
Actinocyclus Ehrenbergi	—	—	—	—	—	—	—	—	20
Asteromphalus heptactis	—	—	—	—	10	—	—	—	—
Biddulphia aurita	400	600	—	600	240	80	—	—	—
Chaetoceras boreale	—	—	—	—	160	—	—	—	—
— constrictum	—	400	—	1 200	—	—	—	—	—
— convolutum	—	200	—	—	150	—	—	—	—
— curvisetum	—	—	400	800	—	—	—	—	—
— debile	7 000	6 800	9 800	7 000	960	120	100	—	—
— decipiens	400	600	200	—	280	—	—	—	—
— diadema	6 000	4 200	3 000	—	—	—	—	—	—
— laciniosum	33 600	36 800	52 000	33 400	2 720	440	360	—	—
— scolopendra	2 200	1 600	2 800	400	400	—	—	—	—
— simile	—	400	—	—	—	—	—	—	—
— teres	800	400	1 400	1 800	440	40	20	—	—
Coscinodiscus radiatus	—	200	20	—	40	—	20	—	—
Coscinosira polychorda	—	—	—	—	80	40	20	40	—
Ditylum Brightwelli	—	—	—	—	—	—	20	—	—
Lauderia glacialis	—	—	200	—	120	120	—	—	—
Leptocylindrus danicus	—	800	4 400	1 400	800	80	—	—	—
Navicula sp.	1 000	400	2 000	200	760	120	200	—	—
Nitzschia Closterium	—	—	200	—	40	—	—	—	—
— delicatissima	1 000	400	400	400	200	120	—	—	—
— seriata	1 200	400	200	400	560	40	20	20	—
Pleurosigma affine	—	—	—	—	40	—	—	—	—
— sp.	—	200	—	—	40	—	—	—	—
Rhizosolenia calcar avis	—	—	—	100	—	—	—	—	—
— semispina	4 400	5 000	2 700	4 600	2 200	200	120	—	—
— setigera	—	200	—	200	20	40	—	—	—
Skeletonema costatum	30 600	50 200	97 400	134 400	44 760	16 400	4 160	—	—
Thalassiosira gravida	600	2 600	1 800	1 600	680	600	120	—	—
— Nordenskiøldii	108 800	284 800	270 800	251 800	154 400	35 880	11 840	20	20
Thalassiothrix nitzschioides	400	400	—	—	—	—	—	—	—
Diatoms, all species together	198 400	397 600	449 720	440 300	210 110	54 320	17 000	80 —	40
Distephanus speculum	—	—	—	—	160	40	—	20	20
Cilioflagellata.									
Ceratium furca	—	20	40	10	40	—	—	—	—
— fusus	10	10	20	10	30	—	—	—	—
— longipes	10	20	—	40	30	—	.	—	—

Tab. VIII. Station 8. Continued,

Depth m.	1	5	10	20	30	40	50	75	100
T^0 C	5.22	5.12	5.08	5.09	5.73	6.65	6.94	7.27	7.27
Salinity ‰	34.25	34.27	34.28	34.30	34.61	35.06	35.13	35.23	35.25
σ_t	27.075	27.105	27.115	27.13	27.31	27.53	27.55	27.58	27.59
O_2 cc. pr. l.	8.04	8.12	8.02	7.77	—	7.14	6.63	7.53	—
Number of cc. Counted	(100) 5.	(100) 5.	(100) 5.	(100) 5.	(100) 25.	25.	50.	50.	50.
Ceratium macroceros	—	—	10	—	10	—	—	—	—
— tripos	10	—	10	30	10	—	—	—	—
Glenodinium bipes	—	400	—	200	40	—	—	—	—
Gymnodinium Lohmanni	400	—	400	—	—	—	—	—	—
Peridinium divergens	—	—	—	200	—	—	—	—	—
— pellucidum	—	|	—	—	40	—	—	—	—
Infusoria.									
Cyttarocylis denticulata	10	—	—	—	—	—	—	—	—
Laboea crassula	—	—	—	—	40	—	120	—	—
— strobila	—	200	—	—	—	—	—	—	—
— vestita	400	800	—	—	40	—	—	—	—
Lohmanniella oviformis	1 000	600	200	400	80	40	40	20	—
Mesodinium	200	200	—	—	—	—	—	—	—
Ptychocylis urnula	10	—	80	10	—	—	—	—	—
Tintinnopsis sp.	—	—	—	—	160	—	—	—	—
Infusoria indeterminata	—	—	—	—	—	—	60	—	—
Globigerina bulloides	—	—	—	—	—	—	—	—	20
Nauplii of Copepoda	—	—	30	10	30	—	—	—	—

Tab. IX. Station 9, 1922, March 21. 60° 15 N. lat. 3° 37' E. gr. 40 miles W. of Lysø.

Depth m.	1	5	10	20	30	40	50	75	100
t° C.	4.94	4.94	4.95	4.96	4.43	7.61	7.75	7.67	7.64
Salinity ‰	34.14	34.11	34.11	34.12	34.14	35.24	35.26	35.31	35.30
σ_t	27.025	26.995	26.995	27.00	27.085	27.535	27.54	27.585	27.585
O_2 cc. pr. l.	8.15	8.13	8.16	7.94	7.89	6.99	6.94	6.99	6.98
Number of cc. conted	(100) 5	(100) 5	(100) 5	(100) 5	(11) 25	50	50	50	50
Diatoms.									
Actinocyclus Ehrenbergi	—	—	—	—	—	—	20	20	—
Biddulphia aurita	400	—	—	—	1 040	—	—	—	—
Chaetoceras boreale	600	400	—	—	40	—	—	—	—
— constrictum	—	—	800	—	120	—	—	—	—
— convolutum	—	—	—	800	—	—	—	—	—
— curvisetum	800	—	—	—	—	—	—	—	—
— debile	5 600	6 800	7 400	1 800	1 280	—	—	—	—
— decipiens	1 600	200	1 200	—	200	—	—	—	—
— diadema	8 200	12 000	6 600	9 800	6 80	—	—	—	—
— laciniosum	32 800	36 800	35 400	32 400	3 280	—	—	—	—
— scolopendra	800	3 200	—	—	—	—	—	—	—
— teres	1 800	1 600	600	1 000	1 480	—	—	—	—
Coscinodiscus radiatus	—	—	—	10	—	—	20	20	—
Coscinosira polychorda	—	400	—	—	—	40	—	—	40
Lauderia glacialis	800	800	600	200	—	20	20	40	—
Leptocylindrus danicus	1 200	1 800	2 200	—	120	—	—	—	—
Navicula sp.	1 400	1 600	600	800	680	20	—	20	—
Nitzschia delicatissima	200	200	600	—	—	—	—	—	—
— seriata	2 200	600	600	1 200	720	—	—	—	—
Rhizosolenia semispina	7 100	5 200	4 000	5 500	3 340	—	—	—	—
— setigera	100	100	—	100	—	—	—	—	—
Skeletonema costatum	355 400	170 400	239 000	336 600	106 100	—	—	—	—
Thalassiosira decipiens	—	—	—	—	280	—	—	—	—
— gravida	4 600	2 200	3 800	2 600	1 720	—	—	—	—
— Nordenskiöldii	355 600	361 800	428 200	395 800	212 720	180	140	—	40
Diatoms, all species together	780 600	606 100	731 700	788 610	333 800	260	200	100	80
Distephanus speculum	200	200	—	200	40	—	—	—	—
Cilioflagellata.									
Ceratium furca	20	20	20	—	20	—	—	—	—
— fusus	—	—	—	40	40	—	—	—	—
— intermedium	—	—	—	—	—	20	—	—	—
— longipes	20	30	10	10	—	—	—	—	—
— macroceros	—	—	—	—	10	—	—	—	—
— tripos	30	20	10	10	20	—	—	—	—
Dinophysis acuminata	—	—	—	—	10	—	—	—	—
— norvegica	—	10	20	—	10	—	—	—	—
Glenodinium bipes	200	—	—	200	—	—	—	—	—
Gonyaulax spinifera	20	—	—	10	—	—	—	—	—
Gymnodinium Lohmanni	200	200	200	200	—	—	—	—	—
— sp.	200	200	600	—	—	—	—	—	—

Tab. IX. Station 9. Continued.

Depth m	1	5	10	20	30	40	50	75	100
t⁰ C.	4.94	4.94	4.95	4.96	4.43	7.61	7.75	7.67	7.64
Salinity ‰	34.14	34.11	34.11	34.12	34.14	35.24	35.26	35.31	35.30
σ_t	27.025	26.995	26.995	27.00	27.085	27.535	27.54	27.585	27.585
O_2	8.15	8.13	8.16	7.94	7.89	6.99	6.94	6.99	6.98
Number of cc. conted	(100) 5	(100 5)	(100) 5	(100) 5	(100) 25	50	50	50	50
Peridinium depressum	—	20	—	10	30	—	—	—	20
— ovatum	20	50	—	—	10	—	—	—	—
— pallidum	10	—	10	—	—	—	—	—	—
— pellucidum	—	200	—	—	—	—	—	—	—
— sp.	200	—	—	—	—	—	—	—	—
Torodinium robustum	—	—	200	—	—				
Infusoria.						—	—	—	—
Cyttarocylis denticulata	—	—	10	—	—	—	—	—	—
Laboea acuminata	—	200	400	—	—	—	—	—	—
— conica	—	—	—	—	—	20	—	—	—
— crassula	—	—	—	—	40	120	—	—	60
— strobila	10	—	—	—	—	—	—	—	—
— vestita	—	400	400	—	—	—	—	—	—
Lohmanniella oviformis	200	400	200	200	40	60	20	40	80
Mesodinium	400	400	600	—	40	—	—	—	—
Ptychocylis urnula	40	30	40	20	10	—	—	—	—
Tintinnopsis sp.	200	200	—	—	—	—	—	—	—
Nauplii of Copepoda	20	20	20	20	—	—	—	—	—

Tab. X. Station 10, 1922, March 21—22. 60° 9′ N. lat., 2° 58′ E. Gr. 60 miles W. of Lysø.

Depth, m.	1	10	20	30	40	50	75	100
t° C.	7.39	7.40	7.40	7.42	7.39	7.38	7.37	7.30
Salinity ‰	35.34	35.34	35.34	35.34	—	35.34	35,35	35.38
σ_t	27.65	27.65	27.65	27.645	—	27.655	27.665	27.70
O_2 cc. pr. l.	6.61	7.20	7.14	7.12	7.13	7.10	7.10	7.09
Number of cc. counted	50	50	50	50	50	50	50	50
Diatoms.								
Cerataulina Bergonii	80	—	—	—	—	—	—	—
Chaetoceras atlanticum	20	140	—	—	20	20	—	—
— boreale	20	—	—	—	—	—	—	—
— compressum	40	—	—	—	—	—	—	—
— constrictum	—	—	—	20	—	—	—	—
— decipiens	—	60	—	40	—	100	—	—
— teres	—	—	—	40	—	—	—	—
Coscinodiscus excentricus	—	20	—	20	20	40	—	60
— radiatus	—	20	—	—	60	60	20	40
Dactyliosolen antarcticus	—	—	—	—	20	—	—	—
Lauderia glacialis	—	20	—	—	60	—	—	—
Navicula sp.	—	—	—	20	—	—	—	—
Nitzschia Closterium	—	20	—	40	—	—	—	—
— delicatissima	140	300	80	60	100	—	—	—
— paradoxa	20	20	—	40	80	40	—	—
Paralia sulcata	480	—	100	—	760	—	480	1500
Pleurosigma affine	—	20	—	—	—	—	—	20
Nitzschia seriata	—	60	—	—	—	—	20	—
Thalassiosira bioculata	—	—	—	—	220	—	—	160
— gravida	200	200	20	80	260	240	260	520
— Nordenskiöldii	—	80	260	160	—	20	20	60
Thalassiothrix nitzschioides	120	40	—	—	40	—	—	—
Diatoms, all species together	1120	1000	460	520	1640	520	800	2360
Distephanus speculum	20	20	20	20	—	—	—	—
Cilioflagellata.								
Ceratium fusus	—	20	—	—	—	—	—	—
— intermedium	—	—	—	—	—	20	—	—
Dinophysis rotundata	—	—	—	—	—	20	—	—
Gymnodinium Lohmanni	—	—	—	—	20	—	—	—
Peridinium sp.	40	—	20	20	20	40	—	—
Infusoria.								
Laboea conica	—	40	40	—	—	—	—	—
— crassula	—	40	20	80	40	20	—	140
— vestita	—	20	—	—	—	—	—	—
Mesodinium	20	40	40	—	—	—	—	—
Strombidium acutum	—	20	—	—	—	—	—	—
Tintinnopsis sp.	20	—	—	—	20	—	—	20
Tintinnus acuminatus	—	20	—	—	—	—	—	—
Oithona similis	—	—	20	—	—	—	—	—
Fritillaria borealis	—	—	—	—	20	—	—	—

Tab. XI. Station 11, 1922 March 22. 60° 31′ N. lat., 2° 19′ E. Gr. 80 miles W. of Lysø.

Depth, m.	1	10	20	30	40	50	75	100
t° C.	7.26	7.27	7.27	7.29	7.27	7.28	7.28	7.28
Salinity ‰	35.31	35.31	35.31	35.32	35.32	35.31	35.31	35.31
σ_t	27.645	27.645	27.645	27.645	27.65	27.645	27.645	27.645
O_2 cc. pr. l.	7.18	7.37	—	7.24	7.22	7.14	7.14	7.15
Number of cc. counted	50	100	50	50	50	50	50	50
Diatoms.								
Asterionella japonica	—	—	—	—	—	—	100	—
Cerataulina Bergonii	—	—	—	720	—	20	140	—
Chaetoceras atlanticum	280	300	180	320	400	180	360	200
— boreale	—	—	—	—	40	—	—	—
— compressum	160	540	1 160	780	700	—	1 400	580
— decipiens	440	40	160	400	—	320	200	—
— diadema	—	100	—	320	—	—	—	—
— laciniosum	—	—	—	—	—	—	120	—
— peruvianum	—	—	—	40	—	20	—	—
— Schüttii	—	—	—	—	640	80	—	—
— scolopendra	80	150	—	220	1 000	—	240	—
— debile	160	—	—	—	—	—	360	—
Dactyliosolen antarcticus	—	—	—	—	—	20	—	—
Ditylum Brightwelli	10	20	—	—	—	20	—	—
Coscinodiscus centralis	—	—	—	—	40	—	—	—
— excentricus	20	20	—	80	120	80	120	—
— radiatus	60	20	60	—	20	—	20	20
Lauderia glacialis	—	—	—	—	80	—	—	—
Navicula distans	—	—	—	—	—	20	—	—
Nitzschia Closterium	—	—	60	—	140	40	180	180
— delicatissima	1 540	1 580	1 060	1 080	2 060	2 640	1 820	2 360
— paradoxa	—	440	280	300	320	880	320	—
— seriata	—	40	480	—	—	—	—	—
Pleurosigma affine	—	—	—	—	20	20	—	20
— sp.	—	20	—	20	60	40	60	40
Rhizosolenia Stolterfothii	60	—	—	280	—	—	380	—
Paralia sulcata	160	840	320	—	880	460	—	100
Skeletonema costatum	1 180	1 290	1 900	660	1 940	1 720	1 580	540
Thalassiosira decipiens	60	60	60	—	40	—	—	40
— gravida	120	630	260	1 020	1 160	880	440	260
— Nordenskiöldii	140	240	1 180	—	—	—	—	—
— minor	—	100	260	—	—	—	—	—
Thalassiothrix longissima	—	—	20	—	—	—	—	—
— nitzschioides	380	140	—	—	140	160	—	80
Diatoms, all species together	4 850	6 570	7 440	6 240	9 800	7 600	7 840	4 420
Distephanus speculum	—	—	—	—	60	—	—	20

Tab. XI. Station 11. Continued.

Depth, m.	1	10	20	30	40	50	75	100
t^0 C.	7.26	7.27	7.27	7.29	7.27	7.28	7.28	7.28
Salinity ‰	35.31	35.31	35.31	35.32	35.32	35.31	35.31	35.31
σ_t	27.645	27.645	27.645	27.645	27.65	27.645	27.645	27.645
O_2 cc. pr. l.	7.18	7.37	—	7.24	7.22	7.14	7.14	7.15
Number of cc. counted	50	100	50	50	50	50	50	50
Cilioflagellata.								
Ceratium furca	—	20	—	—	—	20	—	—
— fusus	—	—	20	—	—	—	—	—
— longipes	—	—	20	—	—	—	—	—
Gymnodinium Lohmanni	—	—	—	20	20	—	—	20
Gyrodinium sp.	—	10	—	80	—	—	—	—
Peridinium sp.	—	10	20	40	20	—	—	—
Torodinium robustum	—	10	40	20	40	—	—	20
Infusoria.								
Laboea conica	20	10	40	—	—	—	—	—
— crassula	60	30	40	60	20	40	20	20
— strobila	—	10	—	—	—	—	—	—
— vestita	40	—	60	40	60	60	—	—
Lohmanniella oviformis	40	120	100	200	20	40	20	20
Mesodinium	20	30	80	60	60	40	—	—
Tintinnus acuminatus	—	—	—	—	20	—	—	40
Undella pellucida	—	—	20	—	20	—	20	—
Fritillaria borealis	—	—	—	20	20	—	—	—

Tab. XII. Station 12, 1922. March 23. Kaartveit, inside the islands.

Depth m.	1	5	10	20	30	40	50	75	100
t° C.	4.17	4.15	4.16	4.17	4.28	5.53	5.17	5.63	6.61
Salinity ‰	33.33	33.35	33.36	33.39	33.49	33.72	34.05	34.44	34.46
σ_t	26.46	26.485	26.49	26.51	26.58	26.62	26.92	27.18	27.065
O_2, cc. pr. l.	8.45	8.32	8.15	8.14	8.025	7.54	7.34	7.22	7.11
Number of cc. counted	(100) 5	(100) 5	(100) 5	(100) 5	(100) 5	(100) 5	25	25	50
Diatoms.									
Biddulphia aurita	600	—	400	—	1 200	—	240	—	—
Chaetoceras boreale	—	—	600	—	—	—	—	—	—
— compressum	—	1 200	—	—	600	—	—	—	—
— constrictum	—	3 600	—	400	—	—	—	—	—
— curvisetum	—	1 200	3 800	400	800	—	160	—	—
— debile	3 600	16 200	5 600	4 000	4 800	400	720	—	—
— decipiens	800	1 000	200	400	—	—	120	—	—
— diadema	9 600	9 200	7 000	3 800	2 800	800	40	—	—
— laciniosum	17 600	87 600	29 200	34 600	20 400	1 600	320	80	100
— scolopendra	600	9 600	1 400	—	—	800	—	—	—
— teres	200	2 200	200	1 200	1 000	—	—	—	—
Coscinodisus concinnus	—	—	20	—	—	—	—	—	—
— radiatus	—	10	10	10	20	20	10	—	—
Coscinosira polychorda	—	—	400	—	—	—	80	—	—
Encampia groenlandica	—	400	—	—	—	—	—	—	—
Lauderia glacialis	200	—	—	—	400	—	—	—	—
Leptocylindrns danicus	400	800	—	200	1 200	—	—	—	—
Navicula sp.	200	3 200	1 000	1 800	1 400	400	600	120	260
Nitzschia delicatissima	400	1 000	400	2 400	600	—	280	—	—
— seriata	1 400	800	2 000	1 600	3 800	—	320	—	—
Rhizosolenia semispina	2 800	5 100	4 800	2 000	2 300	1 200	580	160	90
— setigera	—	100	100	—	—	—	20	20	—
Skeletonema costatum	162 000	321 800	81 000	449 400	363 000	3 800	22 120	—	1 700
Thalassiosira gravida	2 200	2 000	2 600	1 400	4 200	1 200	200	—	—
— Nordenskiöldii	225 200	373 200	220 000	210 200	244 000	103 400	15 200	880	2 760
Thalassiothrix nitzschioides	—	—	—	—	800	400	80	—	—
Diatoms, all species	427 800	840 310	340 730	713 810	653 320	114 020	41 130	1 340	4 910
Cilioflagellata.									
Ceratium furca	—	20	—	10	10	10	10	—	—
— fusus	10	20	—	—	—	—	—	—	—
— lineatum	—	20	—	—	—	—	—	—	—
— longipes	10	20	10	10	10	—	—	—	—
— macroceros	—	—	—	—	—	10	—	—	—
— tripos	50	10	10	10	—	20	10	—	—
Dinophysis acuminata	10	—	—	—	—	—	—	—	—
— acuta	—	10	40	10	—	—	—	—	—
— norvegica	20	40	—	—	—	—	—	—	—
Goniodoma Ostenfeldi	—	—	—	30	—	—	—	—	—
Gonyaulax spinifera	—	10	10	10	10	—	—	—	—
Gymnodinium Lohmanni	200	600	—	200	—	200	—	—	—
Oxytoxum	200	600	—	—	200	—	—	—	—

Tab. XII. Station 12. Continued.

Depth m.	1	5	10	20	30	40	50	75	100
t⁰ C.	4.17	4.15	4.16	4.17	4.28	5.53	5.17	5.63	6.61
Salinity ⁰/₀₀	33.33	33.35	33.36	33.39	33.49	33.72	34.05	34.44	34.46
σ_t	26.46	26.485	26.49	26.51	26.58	26.62	26.92	27.18	27.065
O_2, cc. pr. l.	8.45	8.32	8.15	8.14	8.025	7.54	7.34	7.22	7.11
Number of cc. counted	(100) 5	(100) 5	(100) 5	(100)*5	(100) 5	(100) 5	25	25	50
Peridinium depressum	—	20	10	—	—	—	—	—	—
— divergens	10	10	—	—	—	—	—	—	—
— ovatum	10	10	10	10	30	10	—	—	20
— pallidum	10	20	20	40	—	—	—	—	—
— pellucidum	10	40	—	40	—	—	—	—	—
— sp.	60	50	20	40	70	10	—	—	—
Infusoria.									
Laboea acuminata	—	30	—	—	—	—	—	—	—
— conica	—	100	—	—	—	—	—	—	—
— crassula	—	—	—	—	—	—	40	40	—
— strobila	—	50	20	10	—	—	—	—	—
— vestita	200	400	200	200	200	—	—	—	40
Lohmanniella oviformis	200	—	400	—	—	—	—	—	60
Mesodinium	1 200	400	600	200	400	—	—	—	20
Cyttarocylis denticulata	—	—	—	10	—	—	—	—	—
Ptychocylis urnula	—	70	40	40	20	—	—	—	—
Tintinnopcis sp.	—	30	—	—	—	10	—	—	—
Rotatoria	—	—	—	10	—	—	—	—	—
Nauplii of Copepoda	—	30	20	—	—	10	—	—	—
Fritillaria borealis	—	—	10	—	—	—	—	—	—

Tab. XIII. Station 13, 1922 March 28. Kaartveit, inside the islands.

Depth m.	1	10	20	30	40	50	75	100
T° C	4.19	4.33	4.23	4.31	4.68	5.01	5.35	5.46
Salinity ‰	33.29	33.31	33.39	33.56	33.91	34.12	34.32	34.37
σ_t	26.425	26.435	26.505	26.665	26.87	26.995	27.115	27.145
O_2 cc. pr. l.	8.39	8.48	8.54	8.07	7.68	7.29	7.02	6.32
Number of cc. Counted	(100) 20	(100) 10	(100) 10	(100) 10	(100) 10	50	50	50
Diatoms.								
Biddulphia aurita	—	—	—	—	—	120	—	—
Chaetoceras boreale	—	400	500	1 600	100	—	—	—
— compressum	—	3 900	800	2 900	—	—	—	—
— constrictum	400	—	—	300	—	—	—	—
— curvisetum	—	1 000	—	—	400	—	—	—
— debile	—	400	300	3 300	3 200	—	—	—
— decipiens	300	—	200	—	100	—	—	—
— diadema	5 700	4 300	1 700	4 900	300	160	—	100
— laciniosum	2 200	2 700	—	1 900	800	40	80	—
— teres	—	—	300	—	600	20	—	—
Coscinoeiscus radiatus	—	—	—	—	—	—	—	—
Lauderia glacialis	—	300	—	100	—	—	80	60
Leptocylindrus danicus	200	—	400	200	—	—	—	60
Navicula sp.	—	—	—	100	—	—	—	—
Nitzschia delicatissima	—	—	100	500	200	20	—	—
— seriata	300	300	600	1 800	700	—	—	—
Rhizosolenia semispina	1 250	1 150	850	1 750	1 350	360	140	200
— setigera	—	—	—	—	50	—	—	10
Skeletonema costatum	6 400	8 100	—	23 700	30 800	1 300	400	1 720
Thalassiosira gravida	900	500	800	600	700	200	20	—
— Nordenskiøldi	23 000	28 400	37 400	48 700	32 800	12 480	7 120	10 600
Thalassiothrix nitzschioides	—	—	—	—	—	40	—	—
Diatoms, all species	40 650	51 450	43 950	92 350	72 100	14 780	7 920	12 830
Distephanus speculum	—	—	—	200	—	—	—	—
Cilioflagellata.								
Ceratium furca	10	20	40	—	10	—	—	—
— fusus	—	20	30	—	—	—	—	—
— lineatum	—	—	10	—	—	—	—	—
— longipes	30	40	20	—	—	—	—	—
— tripos	10	10	10	10	—	—	—	—
Dinophysis acuminata	30	60	20	10	—	—	—	—
— acuta	30	10	—	—	—	—	—	—
— norvegica	70	80	20	10	—	—	—	—
— rotundata	—	20	—	20	—	—	—	—
Diplopsalis lenticula	30	110	10	70	10	20	—	—
Gonyaulax polyedra	—	20	—	10	—	—	—	—
— spinifera	60	30	10	20	30	—	20	—
Glenodinium bipes	—	—	—	—	20	20	—	—

Tab. XIII. Station 13. Continued.

Depth m.	1	10	20	30	40	50	75	100
T° C	4.19	4.33	4.23	4.31	4.68	5.01	5.35	5.46
Salinity ‰	33.29	33.31	33.39	33.56	33.91	34.12	34.32	34.37
σ_t	26.425	26.435	26.505	26.665	26.87	26.995	27.115	27.145
O_2 cc. pr. l.	8.39	8.48	8.54	8.07	7.68	7.29	7.02	6.32
Number of cc. counted	(100) 20	(100) 10	(100) 10	(100) 10	(100) 10	50	50	50
Gymnodinium Lohmanni	170	520	470	140	100	160	20	20
Gyrodinium sp.	720	600	250	300	230	80	60	—
Oxytoxum	10	200	200	200	200	380	240	260
Peridinium conicum	10	—	—	10	—	—	—	—
— depressum	20	10	40	—	—	—	—	—
— divergens	—	—	10	10	—	—	—	—
— geminum	—	50	10	20	20	—	—	—
— ovatum	40	40	20	20	—	—	—	—
— pallidum	60	90	40	20	10	40	—	—
— pellucidum	120	100	110	50	60	80	—	—
Torodinium robustum	20	—	10	—	—	—	—	—
Infusoria.								
Cyttarocylis denticulata	60	20	—	—	—	—	—	—
Laboea acuminata	50	40	50	30	—	—	—	—
— conica	110	340	50	—	—	—	—	—
— crassula	—	100	100	—	100	—	40	60
— strobila	50	230	40	10	—	—	—	—
— vestita	50	100	500	—	—	20	—	—
Lohmanniella oviformis	600	400	500	300	—	—	—	20
Mesodinium	430	1 140	10	160	390	360	—	—
Ptychocylis urnula	100	170	100	10	—	—	20	—
Tintinnopsis sp.	10	10	20	20	90	40	—	—
Naupli of Copepoda	20	10	30	—	20	20	—	—
Rotatoria	—	30	10	—	10	—	—	—
Fritillaria borealis	—	—	30	10	—	20	—	—

Tab. XIV. Station 14 1922 March 31. Kaartveit, inside the islands.

Depth	0	5	10	20	30	40	50	75	100
t° C.	4.11	4.10	4.06	4.40	4.64	4.94	5.16	5.58	5.75
Salinity ‰	33.32	33.36	33.39	33.57	33.76	34.13	34.18	34.40	34.54
σ_t	26.465	26.495	26.525	26.625	26.74	27.015	27.03	27.15	27.23
O_2 cc. pr. l.	8.05	7.95	7.95	7.94	7.56	7.32	7.11	6.91	7.085
Number of cc. counted	(100) 25	(100) 25	(100) 25	(200) 25	(100) 25	25	50	50	50
Diatoms.									
Asterionella japonica	—	—	—	—	80	—	—	—	—
Biddulpha aurita	—	80	—	—	—	—	—	40	—
Chaetoceras boreale	—	160	240	480	260	—	—	—	—
— compressum	—	1 080	—	100	80	60	—	—	—
— constrictum	—	160	—	100	—	—	—	—	—
— curvisetum	160	760	880	120	340	—	—	—	—
— debile	80	2 160	1 960	3 000	1 000	—	—	80	—
— decipiens	—	200	80	40	300	—	40	—	—
— diadema	1 880	3 480	7 160	2 280	460	80	140	—	—
— laciniosum	—	280	440	300	180	180	—	—	80
— teres	—	240	920	460	140	—	—	—	—
— scolopendra	—	—	—	—	—	—	—	—	120
Coscinodiscus concinnus	—	—	20	—	—	—	—	—	—
— radiatus	—	20	—	—	—	—	20	20	—
Dastyliosolen tenuis	—	—	—	—	60	—	—	—	—
Eucampia Zoodiacus	—	120	80	—	—	—	—	—	—
Lauderia glacialis	—	—	40	—	—	20	60	20	—
Leptocylindrus danicus	—	240	1 320	480	200	300	—	—	—
— minimus	—	—	240	—	—	—	—	—	—
Navicula sp.	—	—	40	—	—	—	20	20	—
Nitschia delicatissima	40	80	—	—	—	—	—	—	—
— seriata	560	280	400	280	200	100	80	—	40
Paralia sulcata	—	—	—	—	—	—	—	60	—
Rhizosolenia faroeensis	—	—	—	—	—	—	20	—	—
— semispina	260	240	300	900	1 000	900	230	80	130
— setigera	20	40	20	—	20	20	—	—	—
Skeletonema costatum	160	680	1 760	1 080	880	1 260	560	—	1 100
Thalassiosira bioculata	—	160	—	20	40	20	40	—	—
— gravida	120	1 000	480	1 340	560	240	80	—	—
— Nordenskiöldii	3 760	9 480	12 480	31 280	33 840	21 080	8 660	2 800	400
Thalassiothrix nitzschioides	—	—	—	—	40	—	—	—	—
Diatoms, all species	7 040	20 940	28 840	43 260	39 680	24 260	9 950	3 120	1 870
Cilioflagellata.									
Dinophysis acuminata	—	—	40	—	—	—	—	—	—
— norvegica	80	—	80	40	—	—	—	—	—
Ceratium furca	10	10	20	20	20	20	—	—	—
— fusus	—	10	20	40	20	—	—	—	—
— longipes	20	10	30	100	20	—	—	—	—

Tab. XIV.. Stat. 14. Continued.

Depth	0	5	10	20	30	40	50	75	100
t° C.	4.11	4.10	4.06	4.40	4.94	4.94	5.16	5.58	5.75
Salinity ‰	33.32	33.36	33.39	33.57	33.76	34.13	34.18	34.40	34.54
σ_t	26.465	26.495	26.525	26.625	26.74	27.015	27.03	27.15	27.23
O_2 cc. pr. l.	8.05	7.95	7.95	7.95	7.56	7.32	7.11	6.91	70.85
Number of cc. counted	(100) 25	(100) 25	(100) 25	(200) 25	(100) 25	25	50	50	50
Ceratium macroceros	—	10	—	—	—	—	—	—	—
— tripos	20	10	20	—	—	—	—	—	—
Diplopsalis lenticula	—	10	—	—	—	—	—	—	—
Gonyaulax spinifera	80	80	20	—	20	—	—	—	—
Gymnodinium Lohmannii	80	240	240	220	120	—	100	60	20
Gyrodinium sp.	—	—	80	220	200	40	220	20	—
Oxytoxum sp.	40	40	40	40	60	80	440	280	—
Peridinium conicum	—	—	—	—	20	—	—	—	—
— depressum	—	10	20	20	—	—	—	—	—
— divergens	—	—	—	20	—	—	—	—	—
— ovatum	10	10	20	20	—	20	—	20	—
— pallidum	—	20	10	20	—	—	—	—	—
— pellucidum	—	10	30	40	60	160	140	—	—
— pyriforme	—	—	—	20	—	—	—	—	—
— sp.	120	—	120	—	40	60	100	—	—
Torodinium robustum	—	—	40	—	20	—	—	—	—
Infusoria.									
Cyttarocylis denticulata	10	10	30	—	—	—	20	—	—
Laboea acuminata	—	—	—	—	—	—	—	—	—
— conica	—	—	—	140	—	—	—	—	—
— crassula	—	—	—	—	40	—	40	20	20
— strobila	—	—	120	20	—	—	—	—	—
— vestita	—	40	440	60	40	20	20	40	—
Lohmanniella oviformis	—	80	200	20	60	80	60	—	—
Mesodinium	40	600	720	240	20	—	80	—	—
Ptychocylis urnula	—	40	70	60	40	20	—	—	—
Tintinnopsis sp.	—	—	—	—	20	—	—	—	—
Rotatoria	—	—	10	—	—	—	—	—	—
Nauplii of Copepoda	—	—	10	20	20	—	—	—	40
Fritillaria borealis	—	10	—	—	—	—	—	—	—

Tab. XV. Station 15, 1922. April 7. 20 miles W. of Lysø.

Depth, m.	1	5	10	20	30	40	50	75	100
Temperature	4.20	4.22	4.47	5.00	5.57	6.13	6.26	7.68	7.36
Salinity ‰	33.38	33.44	33.74	34.17	34.56	34.76	34.87	35.22	35.20
σ_t	26.50	26.545	26.76	27.04	27.29	27.365	27.44	27.515	27.55
Oxygen, cc. pr. l.	7.48	7.52	7.43	7.52	7.345	6.66	6.54	6.23	5.675
Number of cc. pr. counted	50	50	50	50	50	25	25	50	50
Diatoms.									
Biddulphia aurita	—	—	—	—	—	—	560	—	—
Cerataulina Bergonii	—	—	—	—	40	—	—	20	—
Chaetoceras boreale	—	—	—	—	—	740	—	—	—
— compressum	—	—	—	660	3 600	200	120	—	—
— constrictum	—	—	—	—	560	400	440	—	—
— convolutum	—	—	—	420	—	—	—	80	—
— debile	—	680	—	—	6 600	2 020	—	—	—
— decipiens	—	—	—	20	100	220	80	—	—
— diadema	—	—	—	—	600	480	600	—	—
— — , spores	—	—	—	—	40	40	480	120	280
— laciniosum	—	—	—	—	—	20	920	100	—
— scolopendra	—	—	—	—	1 020	600	—	—	—
— sociale	—	—	—	—	240	301 000	720	1 280	—
— — , spores	—	—	—	—	—	—	—	1 180	700
— teres	—	200	—	—	60	—	—	—	—
Coscinodiscus radiatus	—	—	—	—	—	—	—	—	40
Lauderia glacialis	—	—	—	—	—	—	40	—	—
Leptocylindrus danicus	—	—	180	580	100	120	—	80	—
Nitzschia Closterium	—	—	—	—	—	—	—	20	—
— *delicatissima*	—	—	—	40	40	—	—	—	—
— seriata	—	—	—	—	—	180	40	—	—
Rhizosolenia Færoeensis	—	—	—	120	120	20	—	—	—
— semispina	—	—	60	30	30	220	180	90	60
Skeletonema costatum	—	—	—	—	—	160	600	700	700
Thalassisosira decipiens	—	—	—	—	—	540	—	—	—
— gravida	—	—	—	—	380	960	160	60	40
— Nordenskiöldii	—	—	—	—	780	7 340	3 000	40	40
— — , spores	—	—	140	1 460	80	3 260	11 760	3 480	2 440
— sp.	—	—	—	120	—	—	—	—	40
Thalassiothrix nitzschioides	—	—	—	—	—	—	—	120	—
Diatoms, total number	—	880	380	3 450	14 330	318 520	19 700	7 370	3 640
Cilioflagellata.									
Ceratium furca	20	60	60	—	—	—	—	—	—
— fusus	—	20	—	—	—	—	—	—	—
— longipes	60	80	60	60	—	—	—	—	—
— macroceros	20	—	40	—	—	—	—	—	—
— tripos	40	20	60	—	—	—	—	—	—
Dinophysis acuta	20	—	20	—	—	—	—	—	—
— norvegica	60	40	160	40	—	—	—	—	—
Gonyaulax spinifera	—	—	—	20	—	—	—	—	—
Gymnodinium Lohmanni	120	340	480	280	40	—	80	60	80

Tab. XV. Station 15. Continued.

Debth, m.	1	5	10	20	30	40	50	75	100
Temperature	4.20	4.22	4.47	5.00	5.57	6.13	6.26	7.68	7.36
Salinity ‰	33.38	33.44	33.74	34.17	34.56	34.76	34.87	35.22	35.20
σ_t	26.50	26.545	26.76	27.04	27.29	27.365	27.44	27.515	27.55
Oxygen, cc. pr. l.	7.48	7.52	7.43	7.52	7.345	6.66	6.54	6.23	5.675
Number of cc. pr. counted	50	50	50	50	50	25	25	50	50
Peridinium depressum	20	20	20	20	60	—	—	—	—
— ovatum	—	—	60	—	80	—	—	20	—
— pallidum	20	60	20	40	60	—	—	—	—
— sp.	140	180	40	60	60	20	—	—	—
Torodinium robustum	20	100	—	20	40	—	—	—	—
Infusoria.									
Cyttarocylis denticulata	20	60	—	—	—	—	—	—	—
Laboea conica	60	60	1 020	1 380	20	—	—	—	—
— crassula	20	40	60	—	320	40	80	—	—
— strobila	40	20	120	—	—	—	—	—	—
— vestita	80	20	340	1 120	160	20	—	—	—
Lohmanniella oviformis	—	—	100	40	100	40	—	20	40
— spiralis	—	—	—	20	—	—	—	—	—
Ptychocylis urnula	—	—	—	20	—	—	—	—	—
Tintinnus acuminatus	—	—	—	—	—	—	—	—	20
Mesodinium	740	1 020	880	1 160	720	60	40	—	—

Tab XVI. Station 16. 1922, April 7. 60⁰ 18' N. lat. 3⁰ 37' E. Gr. 40 miles W. of Lysö.

Depth, m.	1	5	10	20	30	40	75	100
Temperature	4.83	4.85	4.81	5.32	5.77	6.09	6.43	7.41
Salinity ‰	34.04	34.05	34.03	34.34	34.55	34.72	—	35.19
σ_t	26.95	26.955	26.945	27.14	27.245	27.34	—	27.53
Oxygen, cc. pr. l.	7.35	7.42	7.25	7.68	7.285	6.61	6.56	6.29
Number of cc. counted	50	50	50	50	50	50	50	50
Diatoms.								
Biddulphia aurita	—	—	—	—	—	—	120	—
Chaetoceras boreale	—	—	20	—	—	760	—	—
— compressum	—	—	—	—	2 020	1 720	—	—
— constrictum	—	—	—	—	—	140	220	—
— curvisetum	—	—	—	—	—	80	—	—
— debile	—	—	—	—	160	4 220	180	—
— decipiens	—	—	—	—	—	480	100	—
— diadema	—	—	—	—	—	300	40[1])	60[1])
— laciniosum	—	—	—	—	—	—	—	640
— scolopendra	—	—	—	—	—	4 780	—	320
— sociale	—	—	—	—	—	—	140	—
— teres	—	—	—	—	—	220	—	—
Leptocylindrus danicus	—	—	40	180	260	—	—	—
— minimus	—	—	—	—	—	—	—	40
Nitzschia Closterium	—	—	—	—	—	20	—	—
— seriata	—	—	—	—	—	20	—	—
Rhizosolenia færöensis	—	—	—	—	660	60	—	—
— semispina	—	—	—	—	20	—	50	10
— setigera	—	—	—	—	—	—	10	—
Skeletonema costatum	—	—	—	—	80	—	360	1 300
Thalassiosira bioculata	—	—	—	60	1 180	—	—	—
— gravida	—	320	—	—	—	480	—	40
— Nordenskiöldii	—	—	—	—	—	10 020	460	140
— — spores	—	—	—	—	—	540	3 040	2 420
— sp.	—	—	—	—	—	—	—	800
Thalassiothrix nitzschioides	—	—	—	—	—	—	140	—
Diatoms, total number	0	320	60	240	4 380	23 840	4 860	5 770
Cilioflagellata.								
Ceratium furca	20	40	80	—	—	—	—	—
— fusus	20	—	—	—	20	—	—	—
— intermedium	—	—	—	20	—	—	—	—
— longipes	40	40	20	60	—	—	—	—
— tripos	—	40	80	40	20	—	—	—
Dinophysis acuminata	40	—	80	—	—	—	—	—
— acuta	—	—	40	20	—	—	—	—
— norvegica	80	60	60	—	—	—	—	20
Gonyaulax spinifera	—	—	20	—	—	—	—	—
Gymnodinium Lohmanni	200	80	140	80	60	40	20	20

[1]) with spores.

Tabel XVI. Station 16. Continued.

Depth, m.	1	5	10	20	30	40	75	100
Temperature	4.83	4.85	4.81	5.32	5.77	6.09	6.43	7.41
Salinity ⁰/₀₀	34.04	34.05	34.03	34.34	34.55	34.72	—	35.19
σ_t	26.95	26.955	26.945	27.14	27.245	27.34	—	27.53
Oxygen, cc. pr. l.	7.35	7.42	7.25	7.68	7.285	6.61	6.56	6.29
Number of cc. counted	50	50	50	50	50	50	50	50
Peridinium depressum	—	20	—	—	—	20	—	—
— divergens	20	—	—	20	20	—	—	—
— ovatum	—	20	40	20	40	20	—	—
— pallidum	60	—	60	20	—	60	—	—
— pellucidum	20	—	—	—	—	40	—	—
— sp.	80	40	120	20	—	40	—	—
Phalacroma rotundatum	—	20	20	—	—	—	—	—
Torodinium robustum	80	40	—	—	—	—	—	—
Infusoria.								
Laboea conica	220	60	140	760	120	—	—	—
— crassula	20	20	100	40	160	20	—	—
— strobila	20	40	240	20	60	—	—	—
— vestita	80	80	200	80	140	120	—	—
Lohmanniella oviformis	—	60	—	20	40	20	20	—
Mesodinium	1 300	1 380	1 260	360	680	340	20	—
Ptychocylis urnula	—	20	—	40	20	20	—	60
Tintinnus acuminatus	—	—	—	—	—	20	—	—

Tab. XVII. Station 17, 1922. April 7. 60° 17′ N. lat. 2° 55′ E. Gr. 60 miles W. of Lysø.

Depth, m.	1	5	10	20	30	40	50	75	100
Temperature	4.85	4.96	5.09	6.92	7.43	7.54	7.28	7.28	6.28
Salinity ‰	33.86	33.89	34.00	35.05	35.22	35.25	35.24	35.28	35.30
σ_t	26.805	26.82	26.89	27.48	27.55	27.555	27.585	27.62	27.68
Number of cc. counted	25	25	25	25	25	25	25	25	50
Diatoms.									
Biddulphia aurita	—	—	—	—	—	—	—	—	560
Cerataulina Bergonii	40	—	—	—	—	—	—	—	60
Chaetoceras atlanticum	—	—	—	400	—	—	—	—	640
— compressum	1 640	—	720	17 360	2 000	—	2 040	—	520
— constrictum	—	—	—	9 880	2 720	—	1 600	—	—
— convolutum	—	—	—	440	—	—	—	—	—
— curvisetum	—	—	—	600	—	360	—	—	—
— debile	—	—	—	113 960	15 560	1 760	12 320	—	460
— decipiens	—	600	—	2 480	1 360	—	840	—	3 340
— diadema	—	—	320	4 480	1 760	360	2 880	280[1]	1 020
— boreale	—	160	—	960	280	—	—	—	—
— laciniosum	160	—	—	1 800	1 160	520	840	—	1 440
— scolopendra	—	—	—	11 640	6 120	1 440	4 000	—	540
— sociale	—	—	—	cc.	cc.	c.	cc.	c.	c.
— teres	—	—	—	9 520	1 360	200	1 160	—	—
Coscinodisus excentricus	—	—	—	—	40	—	—	—	—
— radiatus	—	—	—	—	—	40	—	80	60
Coscinosira polychorda	—	—	—	80	—	—	120	—	40
Dactyliosolen tenuis	—	—	—	—	—	—	—	—	60
Leptocylindrus danicus	80	200	80	1 440	480	—	1 280	—	—
Nitzschia Closterium	—	—	—	—	—	—	80	—	—
— delicatissima	—	—	—	—	120	80	—	—	—
— seriata	—	—	—	360	280	120	640	—	—
Paralia sulcata	—	—	—	—	—	—	—	—	280
Rhizosolenia semipina	20	60	40	—	40	160	400	—	130
— Stolterfothii	—	—	—	120	—	—	—	—	—
Skeletonema costatum	—	—	—	320	—	720	720	840	2 060
Thalassiosira decipiens	—	—	—	80	400	160	—	—	220
— gravida	—	—	80	14 960	8 560	1 720	4 640	160	180
— Nordenskiöldii	—	—	—	16 640	54 480	25 800[1]	36 680[1]	4 400[1]	52 120
— sp.	—	—	—	—	80	—	—	—	240
Thalassiothrix nitzschioides	—	—	—	—	280	280	—	—	2 180
Diatoms, total number[2]	1 940	1 020	1 240	207 520	97 080	33 720	70 740	5 760	66 150
Distephanus speculum	—	—	—	40	—	—	—	—	—
Ceratium furca	120	40	80	—	—	—	—	—	—
— fusus	80	40	80	—	—	—	—	—	—
— longipes	40	—	40	—	40	—	—	—	—
— macroceros	—	40	—	—	—	—	—	—	—
— tripos	120	—	40	—	—	—	—	—	—
Dinophysis norvegica	440	80	80	—	—	—	—	—	—
Gymnodinium Lohmanni	1 160	480	1 400	400	80	120	40	80	60

[1]) with spores. [2]) Chætoceras sociale not reckoned.

Tab. XVII. Station 17. Continued.

Depth, m.	1	5	10	20	30	40	50	75	100
Temperature	4.85	4.96	5.09	6.92	7.43	7.54	7.28	7.28	6.28
Salinity ‰	33.86	33.89	34.00	35.05	35.22	35.25	35.24	35.28	35.30
σ_t	26.805	26.82	26.89	27.48	27.55	27.555	27.585	27.62	27.68
Number of cc. counted	25	25	25	25	25	25	25	25	50
Gyrodinium sp.	40	—	40	—	—	—	—	—	—
Peridinium depressum	—	—	40	80	—	—	—	—	—
— ovatum	—	40	—	—	—	—	—	—	—
Torodinium robustum	160	—	120	—	—	—	—	—	20
Infusoria.									
Cyttarocylis denticulata	—	120	—	—	—	—	—	—	—
Laboea acuminata	—	—	—	—	—	40	—	—	40
— conica	920	560	400	360	—	—	—	—	—
— emergens	80	120	160	160	—	40	40	—	140
— strobila	200	160	80	—	—	—	—	—	—
— vestita	1 600	800	1 240	200	80	—	—	—	120
Lohmanniella oviformis	280	40	40	240	—	40	80	40	20
— spiralis	80	80	—	—	—	—	—	—	—
Mesodinium	1 400	840	1 320	1 720	440	160	40	—	—
Ptychocylis urnula	80	40	80	—	40	—	40	40	—
Tintinnus acuminatus	—	—	—	40	40	—	40	—	—

Tab. XVIII. Station 18, 1922. April 19, Kaartveit, inside the islands.

Depth, m.	1	10	20	30	40	50	75	100
Temperature	4.80	4.96	5.35	5.40	5.47	5.50	5.66	5.74
Salinity ‰	32.85	33.40	33.96	34.07	34.16	34.22	34.35	34.41
σ_t	26.015	26.435	26.83	26.91	26.975	27.01	27.105	27.135
Oxygen, cc. pr. l.	—	6.90	6,55	6.43	6.485	6.38	6.38	6.35
Number of cc. counted	50	50	50	50	50	50	50	50
Diatoms.								
Actinocyclus Ehrenbergi	—	—	—	—	—	20	—	—
Chatoceras decipiens	—	—	—	20	—	—	—	—
Hyalodiscus sp.	—	—	—	20	—	—	—	—
Pleurosigma sp.	20	—	—	—	—	—	—	—
Thalassiosira decipiens	—	—	—	20	—	—	—	—
— Nordenskiöldii	—	—	—	20	—	—	—	—
Diatoms, total number	20	—	—	80	—	20	—	—
Cilioflagellata.								
Ceratium furca	20	—	—	—	—	—	—	—
— fusus	—	20	—	—	20	20	—	—
— longipes	20	—	—	—	—	—	—	—
— tripos	40	20	—	—	—	20	—	—
Dinophysis acuminata	—	—	—	20	20	—	—	—
— norvegica	80	—	—	20	—	—	—	—
Diplopsalis lenticula	20	—	—	80	—	—	—	—
Peridinium depressum	40	—	—	—	—	—	—	—
— ovatum	—	—	20	20	40	—	—	—
— pallidum	—	—	—	20	60	20	—	—
— pellucidum	—	—	—	120	60	40	—	—
— pyriforme	20	—	—	—	—	—	—	—
— sp.	—	—	60	20	—	40	—	20
Phalacroma rotundatum	20	—	—	—	—	—	—	—
Torodinium sp.	—	40	—	—	—	—	—	—
Infusoria.								
Laboea conica	80	440	280	—	—	—	—	—
— emergens	—	20	—	—	—	—	—	—
— strobila	—	80	60	—	—	—	—	—
— vestita	—	20	20	—	—	—	—	—
— sp.	—	—	—	—	—	—	—	20
Lohmanniella oviformis	—	—	20	—	—	40	20	20
Mesodinium	20	280	360	200	60	20	—	—
Tintinnopsis sp.	—	—	—	—	—	20	—	—

Tab. XIX. St. 19. 1922, April 20. Of Øistese, Hardanger Fjord.

Depth, m.	1	5	10	20	30	40	50	75	100
Temperature	5.49	5.04	4.90	4.64	4.74	5.34	5.52	5.85	6.16
Salinity ‰	32.25	32.68	32.79	32.97	33.30	33.95	34.10	34.39	34.59
σ_t	25.54	25.855	25.96	26.125	26.375	26.82	26.92	27.115	27.225
Oxygen. cc. pr. l.	8.21	8.25	8.275	8.14	7.56	6.70	6.60	6.57	6.36
Number of cc. counted	50	25	25	25	25	100	100	100	100
Diatoms.									
Actinocyclus Ehrenbergi	—	—	—	—	—	—	10	—	—
Coscinodiscus radiatus	—	—	40	—	—	—	10	—	—
Coscinosira polychorda	—	—	—	—	—	—	—	30	—
Eucampia Zoodiacus	—	280	—	—	—	—	—	—	—
Leptocylindrus danicus	—	—	80	200	—	—	—	—	—
— minimus	1 452 000	2 387 000	2 260 000	560	—	40	—	—	—
Nitzschia seriata	—	280	120	—	—	—	—	—	—
Thalassiosira bioculata	—	440	240	880	1800	190	—	—	—
— decipiens	—	—	—	—	—	140	160	20	—
— Nordenskiöldii	—	—	—	—	80	50	40	—	—
— sp.	—	120	—	—	—	—	—	—	—
Diatoms, total number	1 452 000	2 388 120	2 260 480	1640	1880	420	220	50	—
Cilioflagellata.									
Ceratium fusus	—	80	40	160	—	—	—	—	—
— lineatum	20	120	400	200	—	—	—	—	—
— longipes	—	40	—	160	—	—	—	—	—
— tripós	—	—	40	—	—	—	—	—	—
Dinophysis acuminata	—	320	40	160	240	—	—	—	—
— acuta	40	—	40	40	—	—	—	—	—
— norvegica	80	80	240	80	120	—	—	—	—
Glenodinium sp.	20	360	320	—	—	—	—	—	—
Gonyaulax spinifera	—	120	80	40	40	30	—	10	—
— triacantha	—	40	—	—	—	—	—	—	—
Gymnodinium Lohmanni	80	720	720	40	40	—	20	—	10
Peridinium achromaticum	—	120	—	—	—	—	—	—	—
— conicum	—	40	—	—	—	—	10	—	—
— geminum	680	7 520	5 360	880	1920	—	—	10	—
— ovatum	—	40	—	160	—	—	10	—	—
— pellucidum	200	440	720	480	120	—	—	—	—
— pentagonum	—	—	—	40	—	—	—	—	—
— Steinii	—	—	—	40	—	—	10	—	—
— sp.	—	—	200	200	—	—	—	—	—
Phalacroma rotundatum	—	—	—	—	40	—	—	—	—
Protoceratium reticulatum	—	40	40	80	—	—	—	—	—
Torodinium robustum	—	—	—	—	40	—	—	—	—
Infusoria.									
Laboea conica	—	80	200	40	40	—	—	—	—
— crassula	—	—	40	—	—	—	—	10	—
— strobila	—	80	—	200	40	—	—	—	—
— vestita	—	—	—	—	—	—	70	—	—
Lohmanniella oviformis	—	40	—	—	40	10	10	—	—
— spiralis	—	—	—	—	40	10	—	—	—
Mesodinium	—	360	120	120	40	20	10	10	—
Infusoria cetera	—	360	160	80	—	—	—	10	—

Tab. XX. Station 20. April 20, 1922. Hardanger Fjord, off Kvinherred church.

Depth, m.	1	5	10	20	30	40	50	75	100
Temperature	5.30	5.46	5.21	4.90	4.85	4.92	5.86	6.13	6.63
Salinity ‰	32.42	32.86	33.13	33.29	33.32	33.49	33.96	34.43	34.68
σ_t	25.625	25.945	26.195	26.35	26.38	26.51	26.765	27.11	27.23
Oxygen, cc. pr. l.	7.90	8.18	8.29	7.44	7.42	7.315	6.66	—	6.27
Number of cc, couted	50	50	50	50	50	50	100	100	100
Flagellata.									
Eutreptia Lanowii	20	—	40	—	—	—	—	—	—
Diatoms.									
Actinocyclus Ehrenbergii	—	—	—	—	—	—	10	—	10
Asterionella japonica	—	—	—	160	—	—	—	—	—
Chaetoceras boreale	—	—	—	—	60	60	—	—	—
— compressum	—	—	—	800	80	120	—	—	—
— convolutum	—	—	60	—	—	—	—	—	—
— curvisetum	80	80	460	1 480	780	280	170	—	40
— debile	—	—	—	140	—	—	—	—	—
— decipiens	—	—	40	200	240	100	—	—	—
— diadema	—	—	—	160	60	—	—	—	—
— didymum	—	—	—	—	—	60	—	—	—
— laciniosum	—	—	—	60	—	—	—	—	—
— teres	—	—	—	60	—	—	—	—	—
Coscinodisus radiatus	—	—	—	20	80	20	—	—	—
Coscinosira polychorda	—	—	—	—	80	—	—	—	—
Eucampia Zoodiacus	—	—	—	300	360	120	—	—	—
Lauderia glacialis	—	—	—	20	20	—	—	—	—
Leptocylindrus danicus	—	140	580	3 980	2 480	1 840	340	—	—
— minimus	778 000	2 480 000	2 230 000	68 160	1 660	12 160	960	—	—
Nitzschia Closterium	—	—	—	80	—	60	10	—	—
— delicatissima	—	—	—	—	—	240	—	—	—
— seriata	20	60	60	460	80	320	490	—	—
Rhizosolenia færøensis	—	—	100	160	20	120	40	—	—
— semispina	—	—	—	30	—	—	—	—	—
— Stolterfothii	—	—	—	1 020	—	—	—	—	—
Skeletonema costatum	—	80	80	460	240	400	—	—	—
Thalassiosira bioculata	—	60	3 880	9 300	5 380	3 760	1 200	—	—
— decipiens	—	—	—	100	—	40	90	80	—
— gravida	—	—	—	40	280	—	—	10	20
— Nordenskiöldii	—	—	—	30	260	160	50	—	—
Diatoms, total number	778 120	2 480 420	2 235 300	87 210	12 160	19 860	3 360	90	70
Cilioflagellata.									
Ceratium furca	—	—	—	—	40	—	—	—	—
— fusus	20	20	—	20	20	—	—	—	—
— bucephalum	20	—	—	—	—	—	—	—	—
— lineatum	—	—	60	120	—	—	—	—	—
— longipes	—	80	120	40	—	—	—	—	—
— tripos	40	40	20	—	—	—	—	—	—

Tab. XX. Station 20. Continued.

Depth, m.	1	5	10	20	30	40	50	75	100
Temperature	5.30	5.46	5.21	4.90	4.85	4.92	5.86	6.13	6.63
Salinity ‰	32.42	32.86	33.13	33.29	33.32	33.49	33.96	34.43	34.68
σ_t	25.625	25.945	26.195	26.35	26.38	26.51	26.765	27.11	27.23
Oxygen, cc. pr. l.	7.90	8.18	8.29	7.44	7.42	7.315	6.66	—	6.27
Number of cc. counted	50	50	50	50	50	50	100	100	100
Dinophysis acuminata	220	240	100	20	20	—	—	—	10
— acuta	—	—	—	—	—	—	—	10	—
— norvegica	580	1 880	500	60	180	20	—	—	—
Diplopsalis lenticula	—	—	20	60	60	—	—	—	20
Glenodinium sp.	240	—	20	—	20	—	—	—	—
Gonyaulax spinifera	—	80	300	—	140	160	—	—	—
Gymnodinium Lohmanni	240	880	480	280	100	100	20	—	—
— sp.	—	240	280	—	—	—	—	—	—
Peridinium achromaticum	120	320	—	—	—	—	—	—	—
— depressum	—	20	—	—	—	—	—	—	—
— divergens	—	—	40	—	—	20	—	—	—
— geminum	160	200	4 860	980	200	180	30	—	—
— ovatum	200	560	240	40	40	—	—	—	—
— pallidum	—	—	—	—	20	20	40	—	—
— pellucidum	1 280	1 340	810	140	160	—	—	—	—
— sp.	—	—	100	60	40	—	—	—	—
Phalacroma rotundatum	—	120	—	—	—	—	—	—	—
Torodinium robustum	—	40	60	20	—	—	—	—	—
Infusoria.									
Cyttarocylis denticulata	—	—	—	20	—	—	—	—	—
— norvegica	—	—	—	—	—	20	—	—	—
Laboea conica	20	400	720	40	—	—	10	10	—
— crassula	—	—	140	—	60	—	—	—	—
— emergens	—	—	—	—	—	20	—	—	—
— strobila	—	200	520	140	20	—	—	—	—
— vestita	—	—	—	40	—	—	—	—	—
Lohmanniella oviformis	—	—	80	60	60	—	—	—	—
Mesodinium	—	560	580	360	180	120	130	—	—
Ptychocylis urnula	—	—	40	—	—	—	—	—	—
Strombidium acutum	—	40	240	120	—	—	—	—	—
Tintinnopsis sp.	20	—	—	—	—	—	—	—	—

Tab. XXI. St. 21. 1922, April 20. Hardanger-Fjord, off Lervik.

Depth, m.	1	5	10	20	30	40	50	100
Temperature	5.49	5.43	4.99	4.88	5.01	5.37	5.67	6.65
Salinity ‰	33.08	33.08	33.09	33.22	33.44	33.84	34.15	34.69
σ_t	26.12	26.13	26.185	26.31	26.46	26.735	26.92	27.235
Oxygen, cc. pr. l.	7.635	7.64	8.025	7.58	7.215	6.885	6.63	6.265
Number of cc. counted	50	50	50	50	50	50	50	50
Flagellata.								
Eutreptia Lanowii	440	220	40	—	—	—	—	—
Diatoms.								
Chaetoceras compressum	120	520	480	980	—	—	—	—
— constrictum	—	420	—	220	160	—	—	—
— curvisetum	560	1 080	—	80	—	—	—	—
— decipiens	80	440	600	180	620	—	—	—
— diadema	—	320	—	—	—	—	—	—
— scolopendra	—	300	—	140	—	—	—	—
— teres	—	—	—	120	—	—	—	—
Eucampia zoodiacus	—	—	—	—	—	—	—	60
Leptocylindrus danicus	140	1 080	3 920	3 220	440	140	—	—
— minimus	42 000	318 400	396 600	201 300	24 440	80	—	—
Nitzschia delicatissima	—	—	—	80	—	—	—	—
— seriata	20	—	—	40	40	—	—	60
Rhizosolenia alata	—	—	—	30	—	—	—	—
— færöensis	—	—	360	300	520	120	—	—
— fragilissima	160	240	—	—	—	—	—	—
— semispina	—	—	20	50	—	—	60	—
Skeletonema costatum	400	—	800	340	980	—	—	—
Thalassiosira bioculata	1 360	1 900	3 800	11 280	1 620	—	—	—
Cilioflagellata.								
Ceratium furca	20	—	—	—	—	—	—	—
— fusus	20	—	—	20	—	—	—	—
— lineatum	—	20	80	—	—	—	—	—
— longipes	100	80	120	120	—	—	—	—
— tripos	40	60	40	—	20	—	—	—
Dinophysis acuminata	180	180	160	20	—	—	—	—
— norvegica	360	260	960	20	—	—	—	—
Goniodoma sp.	—	100	200	—	—	—	—	—
Gymnodinium Lohmanni	400	800	280	60	20	—	—	—
— sp.	860	—	—	—	—	—	—	—
Gonyaulax spinifera	20	60	—	—	—	—	—	—
— sp.	140	—	120	60	—	—	—	—
Peridinium conicum	—	—	—	20	—	—	—	—
— depressum	20	40	—	—	—	20	—	20
— ovatum	180	200	160	20	40	—	—	—
— pallidum	—	—	—	—	—	20	—	—
— sp.	480	580	160	120	80	40	40	—

Tab. XXI. Station 21. Continued.

Depth, m.	1	5	10	20	30	40	50	100
Temperature	5.49	5.43	4.99	4.88	5.01	5.37	5.67	6.65
Salinity ‰	33.08	33.08	33.09	33.22	33.44	33.84	34.15	34.69
σ_t	26.12	26.13	26.185	26.31	26.46	26,735	26.92	27.235
Oxygen, cc. pr. l.	7.635	7.64	8.025	7.58	7.215	6.885	6 63	6.265
Number of cc. counted	50	50	50	50	50	50	50	50
Phalacroma rotundatum	60	—	40	—	—	—	—	—
Torodinium robustum	160	60	—	—	—	—	—	—
Oxytoxum sp.	—	40	—	—	—	—	—	—
Infusoria.								
Cyttarocylis denticulata	20	—	—	—	—	—	—	—
Laboea conica	900	580	1 080	60	—	—	20	—
— crassula	20	60	—	40	—	—	—	—
— strobila	20	120	120	—	—	—	—	—
— vestita	740	380	40	80	40	—	—	—
Lohmanniella oviformis	40	40	—	20	20	—	—	20
— spiralis	20	—	—	—	—	—	—	—
Mesodinium	1 740	1 820	1 120	300	160	100	20	20
Ptychocylis urnula	20	—	—	—	—	—	—	—

Tab. XXII. Station 22, 1922, April 20. Hardanger-Fjord, off Bømmelhuk.

Depth, m.	1	5	10	20	30	40	50	75	100
Temperature	5.26	4.99	4.90	4.71	4.96	5.29	5.78	6.29	6.40
Salinity ‰	32.82	32.88	32.91	33.04	33.44	33.76	34.14	34.56	34.66
σ_t	25.94	26.02	26.05	26.18	26.465	26.68	26.925	27.18	27.25
Oygen, cc. pr. l.	7.575	7.50	7.51	7.615	7.11	6.93	6.62	6.375	6.35
Number of cc. counted	50	50	50	50	50	50	50	50	50
Flagellata.									
Eutreptia Lanowii	200	—	—	—	—	—	—	—	—
Diatoms.									
Chætoceras decipiens	100	—	—	—	—	—	—	180	—
— laciniosum	60	—	—	—	—	—	—	—	—
Leptocylindrus danicus	—	—	—	—	—	—	160	—	100
— minimus	—	—	180	—	1800	240	—	60	80
Rhizosolenia Færøensis	—	—	20	—	—	20	80	—	—
— fragilissima	—	—	—	120	—	—	—	—	—
— semispina	—	—	—	—	30	10	—	—	—
Diatoms, total number	160	—	200	120	1830	270	240	240	180
Cilioflagellata.									
Ceratium furca	20	—	20	—	20	—	—	—	—
— longipes	40	100	20	20	—	—	—	—	—
— macroceros	—	—	20	—	—	—	—	—	—
— tripos	20	20	—	—	—	20	—	—	—
Dinophysis acuminata	40	20	80	—	20	—	—	—	—
— acuta	—	—	40	—	—	—	—	20	—
— norvegica	240	200	180	—	—	—	—	—	—
Diplopsalis lenticula	—	—	—	20	40	20	—	—	—
Gonyaulax polyedra	40	—	—	—	—	—	—	—	—
— spinifera	—	—	—	—	40	20	—	—	20
Gymnodinium Lohmanni	60	80	—	60	—	—	—	—	—
— sp.	60	—	—	—	—	—	—	—	—
Gyrodinium sp.	—	—	40	20	—	—	—	—	—
Peridinium depressum	40	40	—	—	20	—	—	—	—
— ovatum	—	20	—	60	40	40	20	—	—
— pallidum	—	—	20	—	—	40	20	—	—
— sp.	—	—	40	20	—	120	60	—	—
Phalacroma rotundatum	—	—	20	—	—	—	—	—	—
Torodinium robustum	—	80	60	60	20	—	—	—	—
Infusoria.									
Laboea acuminata	—	—	—	20	—	—	—	—	—
— conica	140	60	60	400	—	—	—	—	—
— crassula	—	—	20	—	40	—	—	—	—
— strobila	20	—	—	20	—	—	—	—	—
— vestita	—	300	120	180	80	20	60	—	—
Lohmanniella oviformis	—	60	120	60	20	40	—	20	—
Mesodinium	60	1000	440	540	80	180	80	—	20