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PLANKTON-RESEARCHES

IN 1897

BY

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I. Plankton of the North Sea in 1897.

I have already[1] reported on the state of the North Sea in winter (January and February). The region has since then been explored by Swedish steamers during April—May, July—August and October—November, and a quantity of material has been obtained which affords a good insight into the annual changes in the plankton of the North Sea. To understand these changes it must be borne in mind that, as proved by hydrographical researches, the water of the Atlantic enters the North Sea both by the north of Scotland and through the English Channel. Of considerable importance are also the researches of Mr. Wemyss Fulton on the currents of the North Sea.[2] The results of these investigations are summarised as follows:

1. »There is at all seasons a fairly constant slow circulation of the surface water in the North Sea, Atlantic water entering round the north of Scotland, and passing southwards along the east coasts of Scotland and England, as far as the neighbourhood of the Wash, then in an E.N.E. direction towards the coast of Denmark, and then northerly along the Danish coast. The surface water may or may not enter the Skagerak and penetrate to the west coast of Sweden and Norway, according to the prevailing wind The main body passes up the west coast of Norway and joins the Atlantic stream. The limit between the north-going eastern stream and the south-going western stream varies greatly, probably according to the prevailing wind; but as a rule the extent of the former is greater.»

2. »The movements of the surface water in confined areas, like the western part of the Moray Firth, and the Firth of Forth, is irregular, and depends upon variations in the winds and the tides.»

3. »The speed of the movement is usually about two or three geographical miles a day, but may be much accelerated or retarded by the action of the wind.»

From the above hydrographical statements it appears that the plankton of the northern part of the North Sea (i. e. above the 100 and 200 metre plateaus) is furnished by the Atlantic, north of Scotland. The plankton of the southern part (i. e. above the 50 metre plateau north of the continental coast) which I have called the *didymus-plankton*, on the other hand, is derived partly at least, from the English Channel. A part of it

[1] A treatise on the phytoplankton of the Atlantic and its tributaries, Upsala 1897. 4°.
[2] Fifteenth annual report of the Fishery Board for Scotland. 1897, pag. 334.

may be derived from the Scottish current. To aid us in ascertaining what forms are due to one or the other origin we have a considerable number of observations for the year 1897. M. OSTENFELD of Copenhagen has published[1] a valuable report on the plankton collected throughout the year on the routes: Shetlands—Iceland and Shetlands—Greenland. I have also examined a series of samples from Plymouth, for which I am indebted to the kind assistance of Mr. ALLEN, the director of the marine biological laboratory in that town. Another set of samples has been obtained from the Dutch marine laboratory at Helder and I take this opportunity of thanking Dr. P. HOEK, the director of the laboratory. The Swedish Andrée-Expedition to Spitzbergen has brought home materials contributing to the knowledge of the state of the plankton along the Norwegian coast and at Spitzbergen.[2]

All these materials will be discussed in the following pages.

1. North Sea January—February 1897.

From my paper: »A treatise on the phytoplankton of the Atlantic and its tributaries» I quote the following summary:

1. **Tripos-plankton.** This kind characterises water with a salinity of 35 p. mille and a temperature of 6°, which extends east of Scotland, above the 100 metre plateau. Eastwards the salinity becomes lowered by the admixture of water from the Baltic current.

2. **Concinnus-plankton.** Outside the tripos-region and above the 50 metre plateau *Coscinodiscus concinnus* and *Halosphæra viridis* occur abundantly, and it is easily seen on the map in my above-mentioned paper that these forms have spread with the Scottish current. The salinity of the water with this plankton is as a rule about 34 p. mille, but is influenced by the admixture of the continental water. The plankton with *Coscinodiscus concinnus* was predominant also at Plymouth, and it seems probable that it had been forced out of the North Sea during the abnormal meteorological state that prevailed at that time of the year.

The region between the Shetlands and Iceland was, to judge from the report of OSTENFELD, exceedingly poor in plankton in January and February, containing only a few rare specimens, doubtless remnants from past epochs.

3. **Tricho-plankton.** Skagerak was covered by a thin sheet of water from the Baltic current, which had spread over a mass of water with a salinity of 34 p. mille and a temp. of about 6°. The prevailing plankton in the water last named was *tricho-plankton*, which we may assume to have come through the deep Norwegian fissure, probably from the western Atlantic.

[1] Iagttagelser over overfladvandets temperatur, saltholdighed og plankton paa islandske og grönlandske skibsruter in 1897. Copenhagen 1898. 8°.

[2] Bih. t. K. Sv. Vet. Ahad. Handl. XXIII. 2. N:o 4.

2. North Sea April—May 1897.

The samples collected by the Swedish steamers at the end of April and in the beginning of May prove that considerable changes had occurred since the winter.

1. **Chæto-plankton.** The broad tongue of water with a salinity of 35 p. mille and temperature 5,6 to 7,5[1] contains *chæto-plankton* chiefly. This kind extends to the Shetlands, Färöes and south Iceland. It occurs also abundantly in Skagerak. It was not found at Plymouth, but occurred there abundantly in November and December of 1896, and remnants lingered there still in January and February of 1897. At Iceland and at the Färöes it began to appear in March.

In the southern North Sea (i. e. above the 50 metre plateau) *Chætoceros decipiens* did not occur to any important extent, but its place was there taken by the flagellate *Phæocystis Pouchetii*, which I consider as connected with the chæto-plankton. The slimy masses of the last named organism were found at Helder and north of that station in immense quantities.

It is from the above apparent that the chæto-plankton already began to develop in the mouth of the English Channel in December 1896, arrived at the Färöes and Iceland in March and was enormously developed in April and May. As to the origin of the chæto-plankton I defer the discussion to a future publication. From the collections of the Swedish Expedition to Spitzbergen it is evident that the chæto-plankton appeared there in the middle of July and as it had then disappeared on the route Iceland—Färöes—Shetlands and from the North Sea, it might be assumed that it had migrated towards Spitzbergen, where it was found abundantly in the middle of August, in Hinlopen Strait, but this hypothesis would presuppose a greater velocity of currents than is usually admitted.

2. **Northern and arctic neritic plankton.** The chæto-plankton of the North Sea is bordered by a band containing a number of arctic and northern forms, belonging to the sira-, tricho- and northern neritic types. As these forms are all derived from the north-west and occur intermingled, I treat of them in the following as *northern neritic plankton*. This plankton appears abundantly at the north end of Scotland and in a band above the limit between the 50 metre and 100 metre plateaus. It continues along the west of Scotland to the south of Iceland, and to the east along the Norwegian coast into Skagerak. Similar neritic plankton also occurs sparingly in water of 35 p. mille salinity from the Shetlands along the 60th degree of lat. to the region of the submarine ridge, discovered by the Ingolf expedition and called »Reykianäs Ryg» which extends to the south west from Iceland. West of the Reykianäs Ryg, which seems to have a great influence upon the currents, *styliplankton* is the ruling type.

As it is of considerable interest to examine the distribution of the forms which constitute the northern neritic plankton as defined above, I will treat of each species separately.

[1] See O. Pettersson and G. Ekman. Bih. t. K. Sv. Vet. Akad. Handl. Vol. XXV. Part II. No 1. 1899.

Dinobryum pellucidum occurs in Skagerak and on the Norwegian coast, 60° N. 5° E.

Ceratium tripos var. longipes rules in the North-Sea and along the Norwegian coast. It occurs sparingly at the Shetlands, is not rare N.W. of the Hebrides, but was not seen at Iceland.

Peridinium depressum, which seems to me to differ sufficiently from *P. divergens* to constitute a separate species, appears on the whole to accompany the preceding.

Asterionella spathulifera CL. OSTENFELD considers this species the same as *A. glacialis* CASTR., which seems to me also probable, although not sufficiently proved. This remarkable diatom seems to have a station in the fjords of the south of Iceland. It was found abundantly at Helder and in April also at Plymouth. On the other hand it was observed neither on the route Shetlands—Greenland nor along the Norwegian coast. It seems to invade the British Islands in the spring, following the east coast down to the continental shores of the North Sea. It was found in April 1895 together with other northern forms east of the Wash and, later, in July, according to a letter from Prof. BEYENINCK of Delft, along the Dutch coast in such immense quantities that it coloured the sea coffee-brown and left on the shore a stratum of one centimetre in thickness, thus representing millions of kilogrammes. At the end of the same month it had disappeared.

Biddulphia aurita appeared together with other northern and arctic forms in the beginning of April at Helder, from whence it soon disappeared completely. It is not mentioned from the routes Färöes—Shetlands and Shetlands—Greenland.

Chætoceros atlanticus, rare south of Iceland, around the Färöes and west of Scotland; very sparingly on »Reykianäs Ryg».

C. borealis, not found at Helder and Plymouth. As OSTENFELD has not distinguished between the type and the varieties nothing can be stated about its western distribution.

C. diadema occurred south of Iceland and abundantly at the Shetlands, but not in the Färöe Channel and along the coast of Norway.

C. hiemalis, found rarely at Cape Stadt in Norway.

C. laciniosus, not found off Norway but plentiful near the Shetlands and Färöes, sparingly south of Iceland, but abundantly along the 60th degree of lat. between 11° and 37° W.

C. scolopendra, not found along the Norwegian coast and not on the route Shetlands —Greenland, but sparingly at Färöes. The same may be said about *C. teres*.

Corethron hystrix was found in February at Plymouth, in March off the Hebrides, but not along the Norwegian coast. This species belongs to the styli-plankton.

Coscinodiscus oculus iridis occured very sparingly along the Norwegian coast, was not rare on the route Shetlands—Iceland nor off the south-west of Greenland.

C. polychordus was seen in March at the Hebrides, not along the Norwegian coast and is not mentioned by OSTENFELD.

Lauderia annulata belongs to the styli-plankton and is derived probably from West Scotland, where it was seen in the autumn of 1896.

Nitzschia seriata was not seen off Norway, but plentifully at Färöes. It was also seen abundantly along the 60th degree of lat. from 11° W. to the »Reykianäs Ryg». It follows *Chætoceros laciniosus*.

Rhizosolenia obtusa, rare in the Färöe Channel and on the southern coast of Norway.

R. semispina, common off the Färöes, not rare off Scotland, more or less sparingly from the Shetlands to Greenland. Rare at Plymouth and on some spots west of Norway.

Thalassiosira gravida, rare off Spitzbergen, in the Färöe Channel and south of Greenland.

T. Nordenskiöldi, common off the Shetlands, not rare south of Iceland.

Thalassiothrix Frauenfeldii, sparingly along the 60th degree of lat. to »Reykianäs Ryg»; not seen in the Färöe Channel.

T. longissima is not mentioned from the route Shetlands—Iceland, but is found sparingly about 57° 30′ N. and 36° W. (along with the styli-plankton).

Halosphæra viridis has been seen off the Shetlands, but not on the routes Shetlands —Iceland and Shetlands—Greenland; thus it is probably a remnant from the winter, during which period it occurred south of the Färöes. — Belongs to styli-plankton.

The above facts point to the conclusion that the northern and arctic forms, which bordered the area of the chæto-plankton, are derived from south Iceland and the Shetlands.

3. **Styli-plankton** was found at a spot west of Scotland, and, to a small amount, off the Färöes and Shetlands. This plankton-type appeared contemporaneously at the south-east of Greenland, close above the western slope of the »Reykianäs Ryg».

4. **Tripos-plankton** prevails on the west of the Danish peninsula, from whence it passes into Skagerak together with chæto-plankton and northern neritic plankton.

3. North Sea in July—August 1897.

The state of the plankton has considerably changed since the spring. The *chæto-plankton* has disappeared entirely, and of the *northern neritic plankton* a small remnant only lingers on the Dutch coast. On the other hand the *tripos-plankton* has now become the predominant kind in the greater part of the North Sea. *Southern neritic plankton* predominates in the southern North Sea at Helder and, mixed with styli-plankton, on the west of the Danish peninsula.

Outside the North Sea the styli-plankton prevails off the Shetlands and Färöes.

At Plymouth the plankton is now remarkably poor; and the water of 35 p. mille salinity between Norway and Spitzbergen contains styli-plankton very sparingly.

I now give an account of the species, which constitute the tripos-plankton and the southern neritic plankton and occur simultaneously at this season.

The animals have, unfortunately, not been examined, with the exception of *Noctiluca miliaris*, which is very characteristic of the southern neritic plankton. This organism occurred abundantly at Plymouth from the beginning of July and at Helder from the end of June to the end of September.

Ceratium tripos occurs at this season in the same region as *Chætoceros decipiens* did in the spring. It cannot be assumed that the tripos-plankton has been removed from the region west of Danish peninsula, as the water there had a low salinity in the spring

(30 to 33 p. mille) while the water in the central part of the North Sea had in the summer a salinity of 35 p. mille. It seems as if the *Ceratium tripos* came round the north of Scotland in the summer and found in the North Sea the most favorable conditions for its enormous development.

C. (*tripos var.*) *macroceros*, which is to be considered as a distinct species, is as a rule very rare in the spring, but, in the summer, becomes abundant in the whole of the North Sea and along the Scandinavian coasts, as far as Lofoden.

Bacteriastrum varians occurs off the Dutch coast and west of Skagen. It is not mentioned by OSTENFELD as occurring in the northern Atlantic.

Chætoceros densus follows *Bacteriastrum varians.*

C. curvisetus was met with north-west of Skagerak and west of Bergen, but is not mentioned by OSTENFELD as occurring on the route Shetlands—Iceland. It was very common along the Swedish coast from the middle of July and it was seen also at Helder in the same month. It is thus a southern species, which in the summer spreads along the south coast of the North Sea into Skagerak and from there passes with the Baltic current along the Norwegian coast. As it was abundantly found in the autumn of 1896 off the west of Scotland, it also seems to proceed northwards along the west coast of England.

C. didymus and especially *C. Schüttii* follow *C. curvisetus.*

Guinardia flaccida appeared in May at Plymouth and from the middle of June at Helder.

Rhizosolenia Shrubsolei was found more or less abundantly from May to October at Plymouth and in June and July at Helder. It was also found, but sparingly, in the styli-plankton off the Shetlands.

R. Stolterfothii appeared in May at Plymouth, and in July at Helder. It does not, as a rule, reach Skagerak. OSTENFELD mentions it as occurring sparingly at the Shetlands.

R. styliformis. The occurrence of this species west of the Danish peninsula, and its almost complete absence from other parts of the North Sea lead to the conclusion that it had been carried by a current from the English Channel, since it had been observed, although sparingly, in May and June at Plymouth.

4. North Sea in October—November 1897.

The state of the plankton prevailing in July and August has not been much altered. Now, as then, the *tripos-plankton* is the prevailing type, but a number of species, not seen before, appear, the origin of which can be traced partly from Scotland and partly from the English Channel, and which belong partly to the styli-plankton and partly to the neritic plankton of the British Islands.

The *styli-plankton* appears both off the coast of Scotland, down to Newcastle, and on the west of the Danish peninsula.

One species of the *northern neritic plankton-type, Ceratium tripos v. longipes*, was found along the Dutch coast, but there mixed with southern neritic forms and some species which can be traced from Scotland. As this dinoflagellate appeared also in July

—August in the north of Holland, it may either be a remnant or may have been carried down from Scotland.

Outside the North Sea the *tripos-plankton* extends from the northwest of Scotland towards Iceland, but in that region, it is mixed with styli-plankton.

West of Scotland to about 15° W. the styli-plankton is mixed with *Thalassiothrix Frauenfeldii* and *T. longissima*, belonging to the tricho-plankton. The region between 15° W. and Greenland is almost sterile, which is remarkable, as it is just there that *Thalassiotrix longissima* usually abounds in the summer.

As stated above, the species which occur in the North Sea are partly remnants from the summer and partly new. The latter can be classed as derived from the north of Scotland and from the English Channel.

I consider the following as remnants from the summer:

Ceratium furca and *C. fusus*, which in the summer occurred in the western North Sea, have now spread over the whole area.

C. tripos and *C. macroceros* occur now as formerly over the whole North Sea.

Bacteriastrum varians keeps to the southern part of the North Sea and approaches Skagerak.

Chætoceros curvisetus is, as before, confined to the Skagerak.

C. densus has advanced from the southern North Sea towards Skagerak.

C. didymus is confined to the Skagerak.

C. Schüttii occurs now in such a manner, as to appear to belong to the styli-plankton. This species was found in July at Helder, in August and September at Plymouth, in October along the 60° N. from 14° W. to the Shetlands, and remained in November in the south of the Färöes. It was seen also west and east of Scotland. The conclusion which may be drawn from these statements is, that *C. Schüttii* spreads in the summer through the English Channel along the continental coast and on the west of England to the Färöes and round Scotland into the North Sea, where it arrives in the autumn. As this species is common in the Skagerak in the summer it may be assumed that it arrives there along the continental coast.

Coscinodiscus concinnus, almost absent from the North Sea in the summer, occurs now, together with *Biddulphia mobilensis* and *Halosphæra viridis*, along the Scottish, continental and Danish coasts. The *Coscinodiscus* and *Biddulphia* seem to live the whole year round the British coasts, but *Halosphæra* has evidently spread from the south of the Färöes, where it was found abundantly in the beginning of November. In all cases these three species have been carried into the North Sea by the south going Scottish current.

Guinardia flaccida is found, as before, along the continental coast.

Rhizosolenia gracillima is confined, as before, to the Skagerak.

R. semispina occurs, as before, on the east in rare specimens only.

R. Shrubsolei continues to be rare.

R. Stolterfothii occurred in September and October both at Plymouth and at Helder. It was found also west of Scotland, but does not enter into the Scottish current.

Ceratium tripos var. bucephala is abundant round Scotland and spreads along the 57th degree N. into the Skagerak.

Stephanopyxis turgida has about the same distribution.

I consider that the following species arrive from the north of Scotland in the North Sea:

Ceratium furca.
C. fusus.
C. tripos v. bucephala.
Biddulphia mobilensis.
Coscinodiscus concinnus.
Coscinodiscus oculus iridis.
Rhizosolenia styliformis (also through the English Channel).
Stephanopyxis turgida.
Halosphæra viridis.

Among species, which occur in the southern North Sea and arrived through the English Channel, I note the following:

Cerataulina Bergonii. This species appeared at Helder in April and May, and was found at Plymouth in July and October. It has not been mentioned by Ostenfeld as found in the northern Atlantic.

Ditylum Brightwellii occurred at Plymouth from January to May, at Helder in April, and is not mentioned from the northern Atlantic.

Eucampia zodiacus was found abundantly at Helder in September and October, also at Plymouth in October, but not in the northern Atlantic.

Lithodesmium undulatum is very characteristic of the neritic plankton along the continental coast.

Rhizosolenia alata follows *R. styliformis* as a rule, and it may be assumed that it enters the North Sea both from the north and from the south.

R. calcar avis occurs usually in the company of *R. styliformis.*

R. robusta is an inhabitant of the eastern tropical Atlantic, west of Africa, and has never before been seen in the northern Atlantic. This remarkable species was found in September and October both at Plymouth and at Helder, in October between the Färöes and Iceland (Ostenfeld). It reached Hanstholm (Jutland) in the beginning of November and arrived off the Swedish coast at the end of the same month.

I give the following list of the species, which enter the North Sea through the English Channel. Species, marked *, may also arrive round Scotland.

Bacteriastrum varians.
Cerataulina Bergonii.
**Chætoceros curvisetus.*
C. densus.
C. didymus.
**C. Schüttii.*
Ditylum Brightwellii.
Eucampia zodiacus.
Guinardia flaccida.
Lithodesmium undulatum.
**Rhizosolenia alata.*
R. calcar avis.
R. robusta.
R. Shrubsolei.
R. Stoltherfothii.
**R. styliformis.*

It is worthy of remark, that the *chæto-plankton* already begins to appear in the autumn. *Chætoceros decipiens* was then found by Ostenfeld on the south side of Iceland and round Scotland. Is was not rare at Plymouth in the end of November and in the beginning of December.

II. Plankton of the Skagerak in 1897.

During the year 1897 samples were gathered two to four times in each month at Måseskär, in June, July and August on many different spots along the Swedish coast, in September on the route Vinga to Oxö in Norway, in October and November on several points in the Skagerak, and finally in December at some points in the Skagerak and in Gullmarfjord.

The animals in these collections, made from January to September, have been examined by Dr. C. AURIVILLIUS, who has already published the results.[1] The samples gathered from September to the end of the year have been examined by me, also as regards the animals. An extensive amount of observations have thus been accumulated during the year 1897 and will be discussed in the following pages.

I^th^ Period. Jan. 4^th^—Febr. 8^th^. The collections from Måseskär prove that during this period the ruling plankton belonged to the *tricho-* and *tripos*-types. Animals are scarce. Among them we note the northern or arctic *Fritillaria borealis*, *Tintinnus denticulatus*, *Tintinnopsis ventricosa* and the enryhaline *Acartia longiremis*, *Centropages hamatus* and *Temora longicornis*. Some few specimens of the southern neritic plankton, as *Corycæus anglicus*, *Oithona similis*, *Paracalanus parvus* and *Sagitta bipunctata*, which are lingering remnats from the summer, disappear during March and April.

Of *dinoflagellates Ceratium tripos* and its associates in the tripos-plankton are not rare. The northern *Cerat. trip. var. longipes* is not rare.

Almost all *diatoms* are northern or arctic forms, as:

Biddulphia aurita r.
Chætoceros borealis var. Brightwellii + .
C. debilis + .
C. scolopendra r.
C. similis r.
Coscinodiscus oculus irdis + .
C. polychordus r.
Skeletonema costatum + .
Thalassiothrix Frauenfeldii c.
T. longissima c.

Among southern species we note some scarce specimens of *Guinardia flaccida*.

II^nd^ Period. February 23^d^ to April 1^th^. This period is characterized by an increase of arctic forms and by the decrease of the tricho- and tripos-types. In the beginning of the March the chæto-plankton sets in.

Among the *arctic* and *northern* species we note as most characteristic the following:

Dinobryum pellucidum.
Chætoceros borealis var. Brigthwellii.
C. debilis.
C. diadema.
C. hiemalis.
C. socialis.
Chætoceros teres.
Coscinodiscus oculus iridis.
Nitzschia seriata.
Rhizosolenia obtusa.
R. semispina.
Thalassiothrix Nordenskiöldii.

[1] »Die Planktonfauna des Skageraks», K. Sv. Vet. Akad. Handl. Band 30. N:o 3. 1898.

The *chæto-plankton* is represented by *Chætoceros decipiens* and *Phæocystis Pouchetii*. As is seen from the report on the North Sea both the chætoplankton and the northern plankton entered the North Sea round the north of Scotland, the water with chætoplankton pushing before it that with arctic and northern forms, which could be traced to the south side of Iceland.

At the end of March a small amount of *southern neritic* plankton sets in, represented by rare specimens of *Cerataulina Bergonii*, *Chætoceros curvisetus* and *C. danicus*. Of these *Ch. curvisetus* rearches its maximum from the end of September.

III[d] Period. April 8[th] to May 29[th]. This period is characterized by the gradual disappearence of the arctic and northern species as well as by the development of the southern neritic plankton and of the tripos-plankton. Still, some apparently northern species, as *Chætoceros constrictus*, *C. contortus* and *Leptocylindrus danicus*, reach their maximum during this epoch.

Of southern species *Acartia Clausii* was found as early as in the beginning of April, the following in the end of April and the beginning of May:

Oithona similis.
Evadne Nordmannii.
Podon Leuckartii.
Ceratium fusus.
Rhizosolenia gracillima.

IV[th] Period. June 19[th] to October 9[th]. The arctic and northern forms are now gone, almost completely, and the predominant plankton-types are the tripos-plankton and the southern neritic plankton.

In this period the following species occur more or less abundantly:

A. *From the end of May:*
Acartia Clausii rearches its maximum in the middle of August.
Oithona similis, common during the entire period.
Evadne Nordmannii, also common during the whole period.
Rhizosolenia gracillima, also common during the whole period.

B. *From the middle and end of June:*
Paracalanus parvus, the whole period.
Tintinnopsis campanula, the whole period.
Tintinnus subulatus rearches its maximum in August.

C. *From August:*
Oikopleura dioica, *Centropages typicus*, *Isias clavipes*, *Sagitta bipunctata* } reach their maximum at the end of the month.
Ceratium macroceros, *Peridinium divergens* } occur through the whole period.
Noctiluca miliaris has its maximum in September.

Chætoceros didymus } were found during the whole period.
C. Schüttii }

Rhizosolenia styliformis, whole of August, continues to the end of the year.

D. *From September:*

Calanus finmarchicus.
**Corycæus anglicus.*
**Labidocera Wollastonii.*
Evadne spinifera.
Acanthometron quadrifolium.
Ceratium tripos var. longipes.
Biddulphia mobilensis.
**Chætoceros densus.*
**Rhizosolenia calcar avis.*
R. semispina.
R. setigera.
Stephanopyxis turgida.

Those marked * arrived probably from the southern North Sea, the others with the Scottish current.

The following, euryhaline animals appeared more or less abundantly, especially in the fjords:

Acartia longiremis.
Centropages hamatus.
Pseudocalanus elongatus.
Temora longicornis.
Temorella affinis.

These may be considered either as coming with the outflowing Baltic water or as stationary in the fjords. The *Pseudocalanus* and *Temora* may however also have followed the Scottish current.

As stated above, the arctic and northern forms have almost completely disappeared. But an interesting exception occurred. Mr. Gunnar Andersson, who hauled in the middle of July south of Hven in Öresund, found there a surface stratum, containing *Acartia bifilosa A. longiremis*, *Temorella affinis*, *Aphanizomenon* and *Nodularia spumigena*, all Baltic forms, but below that stratum near the bottom (or about 40 metres from the surface) a plankton remarkably similar to that, which prevailed in the Skagerak in the spring. *Chætoceros borealis var. Brightwellii*, abundant in the Skagerak in the winter 1896—97, was also very common in the bottom-plankton. There remained thus during the height of summer in Öresund, a remnant from the winter and the spring, below the outflowing Baltic water.

V^th^ Period. October 19^th^ to the end of the year. Tripos- and southern neritic planktons now prevail as before, but, in addition, northern forms in the company of species from the Scottish current begin to arrive. The plankton becomes thus very complicated.

I consider that the following species belong to the southern neritic plankton:

Euterpe acutifrons, found first $^{19}/_{X}$.
Eucampia zodiacus, $^{19}/_{X}$.
Proto pedata, $^{25}/_{XI}$.
Rhizosolenia robusta, $^{25}/_{XI}$.
Bacteriastrum varians $^{21}/_{IX}$ in Skagerak, the $^{9}/_{IX}$ at Måseskär.
Tomopteris helgolandica, $^{4}/_{XII}$ (has possibly been carried by the Scottish current).

As transported by the scottish current I consider the following:

Pseudocalanus elongatus, $^{26}/_{X}$, (still uncertain whether partly indigenous in the Skagerak or arrived with the Scottish or Baltic currents.)

Plectophora arachnoides, $^{19}/_{X}$.

Halosphæra viridis, $^{19}/_{X}$.

Coscinodiscus concinnus, $^{19}/_{X}$.

Ceratium tripos var. bucephala, $^{8}/_{XI}$ in the Skagerak.

Lauderia annulata, $^{4}/_{XII}$.

Among northern forms, belonging the *northern neritic plankton* or to the arctic *sira-plankton*, I note the following:

A. *Found from the 9th or 19th of October:*

Cyttarocylis denticulata.
Dinophysis acuta.
Gonyaulax spinifera.
Chætoceros borealis.
C. constrictus.
C. contortus.
C. debilis.
Chætoceros diadema.
C. laciniosus.
Coscinodiscus oculus viridis.
Skeletonema costatum.
Thalassiosira gelatinosa.
Thalassiothrix longissima.

B. *Found from November:*

Thalassiothrix Frauenfeldii, $^{2}/_{XI}$.
Biddulphia aurita, $^{18}/_{XI}$.

C. *Found first in December:*

Ptychocyclis acuta.
P. obtusa.
Tintinnus secatus.

To sum up the above statements I formulate the plankton in the following manner:

Ith	Period	$^{4}/_{I}$ to $^{8}/_{II}$	Tp. T.
II^{d}	»	$^{23}/_{II}$ to $^{1}/_{IV}$	(Tp. T.) Si. C. Ns.
III^{d}	»	$^{8}/_{IV}$ to $^{29}/_{V}$	(C. Ns.) Tp. Nm.
IVth	»	A. $^{19}/_{VI}$ to the beginning of August .	Tp. Nm.
		B. From August to $^{9}/_{X}$	Tp. Nm. S.
Vth	»	$^{19}/_{X}$ to $^{23}/_{XII}$	(Tp. Nm. S.) Nc. Nh. Ns. T.

Of the above symbols Tp denotes tripos-plankton, T tricho-plankton, Si sira-plankton, C chæto-plankton, S styli-plankton, Nc and Nh plankton with *Coscinodiscus concinnus* and *Halosphæra*, Nm southern and Ns northern coast-plankton.

There is thus *on the whole* the same succession as has been found during the two preceding years.

Tables.

In order to restrict the bulk of the following tables, some rare forms have been omitted.

Species excluded from Table I.

Dinobryum pellucidum Lev.	$^{9}/_{V}$	57° 49′ N.	10° 43′ E.	+
	$^{28}/_{IV}$	57° 50′ N.	7° 13′ E.	r
Ceratium tripos var. bucephala Cl.	$^{1}/_{V}$	57° 17′ N.	8° 47′ E.	r
	$^{9}/_{V}$	57° 18′ N.	6° 15′ E.	r
	$^{27}/_{IV}$	58° 23′ N.	2° 44′ E.	r
	$^{25}/_{IV}$	56° 30′ N.	6° 31′ E.	r
Ceratium tripos v. horrida Cl.	$^{27}/_{IV}$	58° 23′ N.	2° 44′ E.	c
	$^{25}/_{IV}$	57° 53′ N.	6° 30′ W.	r
Dinophysis acuta Ehb.	$^{2}/_{V}$	56° 19′ N.	3° 52′ E.	r
Asterionella spathulifera Cl.	$^{9}/_{V}$	56° 44′ N.	2° 6′ E.	r
	$^{3}/_{V}$	55° 26′ N.	0° 40′ E.	r
Biddulphia aurita Lyngb.	$^{9}/_{V}$	57° 49′ N.	10° 43′ E.	r
	$^{2}/_{V}$	55° 29′ N.	7° 22′ E.	rr
B. mobilensis Bail.	$^{3}/_{V}$	54° 10′ N.	8° 9′ E.	r
	$^{26}/_{IV}$	58° 39′ N.	3° 41′ W.	+
	$^{25}/_{IV}$	57° 53′ N.	6° 30′ W.	r
Chætoceros contortus Schütt	$^{30}/_{IV}$	57° 49′ N.	10° 43′ E.	+
	$^{23}/_{V}$	57° 44′ N.	10° 23′ E.	r
	$^{28}/_{IV}$	57° 50′ N.	7° 13′ E.	+
C. criophilus Castr.	$^{28}/_{IV}$	57° 50′ N.	7° 13′ E.	r
	$^{26}/_{IV}$	58° 39′ N.	3° 41′ W.	r
C. curvisetus Cl.	$^{1}/_{V}$	56° 50′ N.	6° 18′ E.	r
	$^{2}/_{V}$	56° 19′ N.	3° 52′ E.	cc
C. (borealis?) densus Cl.	$^{1}/_{V}$	56° 50′ N.	6° 18′ E.	r
	$^{2}/_{V}$	55° 29′ N.	7° 22′ E.	r
C. hiemalis Cl	$^{30}/_{IV}$	57° 49′ N.	10° 43′ E.	r
	$^{1}/_{V}$	57° 8′ N.	7° 51′ E.	r
	$^{28}/_{IV}$	57° 50′ N.	7° 13′ E.	r
C. laciniosus Schütt	$^{26}/_{IV}$	58° 39′ N.	3° 41′ W.	+
C. socialis Lauder	$^{9}/_{V}$	57° 18′ N.	6° 15′ E.	r
Corethron hystrix Hensen	$^{26}/_{IV}$	58° 39′ N.	3° 41′ W.	r
Coscinodiscus polychordus Gran.	$^{26}/_{IV}$	»	»	+
Eucampania zodiacus Ehb.	$^{1}/_{V}$	57° 17′ N.	8° 47′ E.	r
	$^{15}/_{V}$	54° 33′ N.	6° 47′ E.	r
	$^{3}/_{V}$	55° 26′ N.	0° 40′ E.	r
Leptocylindrus danicus Cl.	$^{30}/_{IV}$	57° 49′ N.	10° 43′ E.	r
	$^{28}/_{IV}$	57° 50′ N.	7° 13′ E.	r
Rhizosolenia setigera Btw.	$^{28}/_{IV}$	57° 50′ N.	7° 13′ E.	r

R. Stolterfothii H. P.	$^{1}/_{V}$	56° 44′ N.	2° 34′ E.	r
Thalassiothrix Frauenfeldii Grun.	$^{30}/_{IV}$	57° 49′ N.	10 43′ E.	r
	$^{23}/_{V}$	57° 44′ N.	10° 23′ E.	r
	$^{28}/_{IV}$	57° 50′ N.	7° 13′ E.	r
Halosphæra viridis Schmit.	$^{2}/_{V}$	55° 29′ N.	7° 22′ E.	r

Species excluded from Table III.

Ceratium tripos var. horrida Cl.	$^{31}/_{X}$	56° 12′ N.	2° 29′ W.	r
Diplopsalis lenticula Bergh.	$^{29}/_{X}$	57° 43′ N.	10° 20′ E.	r
Xanthidium multispinosum Moeb.	$^{30}/_{X}$	57° 9′ N.	5° E.	r
Distephanus speculum Ehb.	$^{8}/_{XI}$	57° 43′ N.	10° 59′ E.	r
	$^{29}/_{X}$	57° 43′ N.	10° 20′ E.	r
	$^{30}/_{X}$	55° 42′ N.	6° 52′ E.	r
Bacteriastrum varians Lauder	$^{29}/_{X}$	57° 44′ N.	9° 35′ E.	r
	$^{31}/_{X}$	52° 7′ N.	3° 41′ E.	+
Cerataulina Bergonii H. P.	$^{29}/_{X}$	57° 40′ N.	11° 30′ E.	r
	$^{31}/_{X}$	52° 7′ N.	3° 41′ E.	r
Chætoceros constrictus Gran.	$^{29}/_{X}$	57° 40′ N.	11° 30′ E.	r
	$^{29}/_{X}$	57 50′ N.	11° 31′ E.	+
C. contortus Schütt	$^{29}/_{X}$	57° 40′ N.	11° 30′ E.	c
	$^{8}/_{XI}$	57° 43′ N.	10° 59′ E.	+
C. criophilus Castr.	$^{22}/_{XI}$	58° 9′ N.	3° 55′ W.	r
C. danicus Cl.	$^{29}/_{X}$	57° 50′ N.	11° E.	r
	$^{31}/_{XI}$	55° 27′ N.	0° 31′ E.	r
C. (borealis var.?) densus Cl.	$^{7}/_{XI}$	55° 55′ N.	7° 36′ E.	r
	$^{31}/_{X}$	52° 7′ N.	3° 41′ E.	r
C. scolopendra Cl.	$^{29}/_{X}$	57° 50′ N.	11 E.	r
Coscinodiscus excentricus Ehb.	$^{31}/_{X}$	52° 7′ N.	3° 41′ E.	+
Encampia zodiacus Ehb.	$^{29}/_{X}$	57° 43′ N.	10° 20′ E.	r
	$^{31}/_{X}$	52 7′ N.	3° 41′ E.	c
Leptocylindrus danicus Cl.	$^{29}/_{X}$	57° 43′ N.	10° 20′ E.	r
Lithodesmium undulatum Btw.	$^{7}/_{XI}$	57° 5′ N.	8° 28′ E.	rr
Rhizosolenia setigera Btw.	$^{29}/_{X}$	57° 50′ N.	11° E.	r
	$^{29}/_{X}$	57° 43′ N.	10° 20′ E.	r
Streptotheca thamesis Shrubs.	$^{13}/_{XI}$	55° 55′ N.	6° 8′ W.	+
Thalassiothrix longissima Cl. & Grun.	$^{29}/_{X}$	57° 50′ N.	11° E.	r
	$^{29}/_{X}$	57° 43′ N.	10° 59′ E.	+
	$^{11}/_{XI}$	58° 28′ N.	0° 6′ W.	r

Species excluded from Table IV.

Acartia longiremis Lilljeb. $^{3}/_{VII}$ +.
Paracalanus parvus Claus $^{23}/_{VII}$ +.
Evadne Nordmannii Lovén $^{3}/_{VII}$ r.
Podon polyphemoides Leuck. $^{3}/_{VII}$, $^{7}/_{VII}$ r.
Anuræa aculeata Ehb. $^{3}/_{IV}$ c.[1]
Cyttarocylis Claparèdii v. Dad. $^{5}/_{VIII}$, $^{3}/_{IX}$ r.

[1] Determination by Dr. L. Jägerskiöld.

Ptychocylis Markusowskyi v. Dad. $^{3}/_{IX}$, $^{9}/_{IX}$ r.
Tintinnopsis ventricosa Clap. & Lachm. $^{3}/_{VII}$ r.
Bellerochea malleus Btw. $^{3}/_{VII}$, $^{7}/_{VII}$ r.
Chætoceros debilis Cl. $^{9}/_{IV}$ +, $^{26}/_{VI}$ r.
Lauderia annulata Cl. $^{26}/_{VI}$ r.
Thalassiosira gelatinosa Hensen $^{22}/_{IV}$, $^{14}/_{V}$ r.
T. Nordenskiöldii Cl. $^{9}/_{IV}$ r.

Species excluded from the table V.

Ceratium lineatum Ehb. $^{23}/_{II}$, $^{20}/_{XI}$ r.
C. macroceros Ehb. $^{10}/_{VIII}$ +.
Dinophysis homunculus Stein $^{30}/_{VII}$, $^{17}/_{VIII}$ r.
Phyrophacus horologium Stein $^{7}/_{VIII}$, $^{23}/_{VIII}$ r.
Chætoceros criophilus Castr. $^{7}/_{IV}$ r.
Lithodesmium undulatum Ehb. $^{6}/_{X}$ r.
Navicula membranacea Cl. $^{23}/_{VII}$, $^{20}/_{XI}$ r.
Rhizosolenia alata var. corpulenta Cl. $^{23}/_{VIII}$ r.
Thalassiothrix Frauenfeldii Grun. $^{5}/_{II}$ r.

Species excluded from the table VI.

Proto pedata Leach. $^{25}/_{XI}$, $^{4}/_{XII}$ r, $^{23}/_{XII}$ +.
Acartia bifilosa Giesbr. $^{29}/_{VI}$ rr.
Calanus finmarchicus Gunn. $^{16}/_{III}$, $^{22}/_{III}$ r.
Labidocera Wollastonii Lubb. $^{28}/_{IX}$ rr.
Temorella affinis Poppe $^{22}/_{III}$ rr.
Podon intermedius Lilljeb. $^{20}/_{IX}$ r.
Tomopteris helgolandica Greff. $^{4}/_{XII}$ rr.
Synchæta baltica Ehb. $^{14}/_{V}$ +.
Cyttarocylis Claparedii v. Dad. $^{26}/_{VI}$, $^{10}/_{VII}$ +.
Ptychocylis obtusa Brandt $^{17}/_{XII}$ +.
P. acuta Brandt $^{13}/_{I}$, $^{26}/_{I}$, $^{23}/_{II}$ r.
Tintinnopsis ventricosa Clap. & Lachm. $^{8}/_{II}$, $^{5}/_{V}$, $^{11}/_{IX}$ r.
Tintinnus secatus Brandt $^{4}/_{XII}$ r.
Dinobryum pellucidum Lev. $^{22}/_{III}$, $^{22}/_{IV}$, $^{22}/_{V}$ +.
Phæocystis Pouchetii Lagh. $^{16}/_{III}$, $^{1}/_{IV}$ +.
Ceratium tripos v. bucephala Cl. $^{25}/_{XI}$, $^{4-23}/_{XII}$ r.
Peridinium ovatum Pouch. $^{22}/_{IV}$, $^{14}/_{V}$ rr.
Xanthidium multispinosum Moeb. $^{11}/_{IX}$, $^{19}/_{X}$, $^{26}/_{X}$ r.
Bacteriastrum varians Lauder $^{11}/_{IX}$ r.
Chætoceros coronatus Gran $^{11}/_{IX}$ r.
C. Granii Cl. NSp. $^{23}/_{III}$ c.
C. similis Cl. $^{1}/_{I}$, $^{13}/_{I}$, $^{2}/_{III}$ r.
Coscinodiscus polychordos Gran $^{4}/_{I}$, $^{13}/_{I}$, $^{4}/_{IV}$, $^{19}/_{X}$ r.
C. stellaris Roper $^{26}/_{I}$, $^{19}/_{X}$ r.
Lauderia annulata $^{4}/_{XII}$ r.
Nitzschia delicatissima Cl. $^{8}/_{II}$ r.
Rhizosolenia robusta Btw. $^{25}/_{XI}$ r.
Stephanopyxis turgida Grev. $^{4}/_{XII}$.
Thalassiosira gelatinosa Hensen $^{9}/_{X}$, $^{26}/_{X}$ r.

Table I. North Sea

Month	4	5	5	5	5	5	5	5	5	5	5	5
Day	30	9	1	23	10	1	3	2	1	3	2	15
Lat. N.	57° 49	57° 49′	57° 49′	57° 44′	57° 40′	57° 17′	54° 10′	56° 41′	57° 8′	54° 49′	55° 29′	56° 4′
Long.	10° 43′ E.	10° 34′ E	10° 22′ E.	10° 23′ E.	9° 8′ E.	8° 47′ E.	8° 9′ E.	7° 56′ E.	7° 51′ E.	7° 39′ E.	7° 22′ E.	7° 20′ E.
Temp.	6,3	—	6,4	11	7	6,5	8,8	7,1	5,5	8,1	6,8	7,5
Sal.	32,84	—	33,28	28,67	32,32	33,81	28,03	32,63	34,76	30,41	33,20	34,14
Animals not examined	+	+	+	+	+	+	+	+	r	c	+	c
Phæocystis Pouchetii Lagh.	—	—	—	—	—	—	—	—	—	—	—	—
Ceratium furca Duj.	—	—	—	r	r	r	—	—	+	—	—	—
C. fusus Duj.	—	+	+	—	+	c	+	c	+	r	+	—
C. tripos Nitzsch.	r	r	+	c	r	c	+	c	+	c	+	—
var. longipes Bail.	r	c	c	c	cc	+	—	—	—	+	+	—
var. macroceros Ehb.	—	—	—	r	—	—	—	r	—	—	+	—
Peridinium depressum Bail.	—	c	+	—	+	r	r	+	—	+	r	—
Cerataulina Bergonii H. P.	r	—	—	—	—	—	—	—	—	—	—	—
Chætoceros atlanticus Cl.	—	—	—	—	—	—	—	—	—	—	—	—
C. borealis Btw.	+	+	r	—	+	+	—	—	+	—	r	—
var. Brightwellii Cl.	c	—	r	cc	c	+	—	—	—	—	+	—
C. constrictus Gran	c	—	—	+	—	—	—	—	—	—	—	—
C. debilis Cl.	—	—	—	—	—	—	—	—	c	—	—	—
C. decipiens Cl.	c	+	—	+	+	—	—	—	c	—	—	—
C. diadema Ehb.	+	—	—	—	—	—	—	—	—	—	—	—
C. didymos Ehb.	—	—	—	c	—	—	—	—	—	—	—	—
C. scolopeodra Cl.	—	—	—	—	—	—	—	—	—	—	—	—
C. teres Cl.	r	—	—	—	—	r	—	—	—	—	—	—
Coscinodiscus concinnus W. Sm.	—	—	—	—	r	—	—	—	—	—	rr	—
C. oculus iridis Ehb.	—	—	—	—	—	—	—	—	—	—	—	—
Guinardia flaccida Castr.	—	—	—	—	—	r	—	—	r	—	—	—
Lauderia annulata Cl.	—	—	—	—	—	—	—	—	—	—	—	—
Nitzschia seriata Cl.	—	—	—	—	—	—	—	—	r	—	—	—
Rhizosolenia gracillima Cl.	r	—	—	c	—	—	—	—	—	—	—	—
R. obtusa Hensen	r	—	—	r	—	—	—	—	r	—	—	—
R. semispina Hensen	r	r	—	—	—	+	—	—	—	—	—	—
R. Shrubsolei Cl.	—	—	—	—	—	—	—	—	r	—	—	—
R. styliformis Btw.	—	—	r	—	—	r	—	—	—	—	rr	rr
Thalassiosira gravida Cl.	—	—	—	—	—	—	—	—	—	—	—	—
T. Nordenskiöldi Cl.	—	—	—	—	—	r	—	—	+	—	—	—
Thalassiothrix longissima Cl. & Grun.	—	r	—	r	r	—	—	—	—	—	—	—
Planktontype	C. T.	Ns. C.	Ns.	{Ns.(Nm.) T. Tp.}	Ns.	Tp. Ns.	(Tp.)	Tp. Ns.	C. Ns. Si.	Tp. (Ns.)	Tp. Ns.	?

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5	4	5	5	5	5	5	5	4	5	5	5	5	4	4	4	4
22	28	9	1	22	15	2	21	27	1	9	8	3	26	26	25	25
56° 12′	57° 50′	57° 18′	56° 50′	55°	54° 33′	56° 19′	52° 13′	58° 23′	56° 44′	56° 44′	55° 51′	55° 26′	58° 30′	58° 39′	57° 53′	56° 30′
7° 19′ E.	7° 13′ E	6° 15′ E.	6° 18′ E.	6° 13′ E.	6° 47′ E.	3° 52′ E.	3° 35′ E.	2° 44′ E.	2° 34′ E.	2° 6′ E.	1° 29′ E.	0° 40′ E.	0° 43′ W.	3° 41′ W.	6° 30′ W.	6° 31′ W.
11	5,5	7	6,5	10	7,5	7	11	5,6	6,3	6,5	—	7,5	7,1	6,4	7,3	7,2
32,65	28,50	35,05	34,76	34,09	34,79	35,17	33,68	35,03	35,20	35,20	—	35,08	35,29	34,74	34,55	34,26
c	r	r	+	c	c	+	+	r	r	r	c	c	c	r	c	o
—	—	—	—	—	—	r	c	—	c	c	cc	+	—	—	—	—
r	—	r	c	—	+	r	—	—	—	r	—	r	—	—	r	—
r	—	—	+	—	+	r	—	—	r	r	—	r	—	—	r	—
cc	r	r	+	+	+	—	—	—	r	c	—	—	—	—	—	r
r	—	+	c	—	+	r	—	+	c	+	+	r	—	r	—	r
r	—	r	—	—	+	r	—	r	—	r	—	r	r	r	—	—
c	—	+	+	—	—	—	—	—	r	—	r	r	—	—	—	—
—	r	r	—	—	—	r	—	—	—	—	—	r	—	—	—	—
—	—	+	—	—	—	—	—	—	r	—	+	—	—	—	—	—
—	c	—	—	—	—	—	—	+	r	+	—	—	+	r	—	—
—	+	c	—	—	c	—	—	—	r	+	—	—	—	—	—	—
—	cc	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	c	—	—	—	cc	—	—	r	+	+	—	—	c	—	—
—	+	cc	+	—	—	r	—	cc	cc	c	c	c	c	c	r	r
—	+	—	—	—	—	c	—	—	r	r	—	—	—	+	r	—
—	—	—	—	—	r	r	—	—	—	—	—	—	—	r	—	—
—	r	r	—	—	—	—	—	r	r	r	—	—	—	—	—	—
—	r	r	—	—	—	—	—	—	r	r	—	—	—	—	—	—
rr	—	—	r	—	r	—	—	—	—	—	—	—	—	r	r	—
—	—	—	—	—	—	—	—	+	—	—	—	—	—	r	r	+
—	—	—	—	—	r	r	—	—	+	r	—	r	—	—	—	—
—	—	—	—	—	—	c	—	—	c	+	r	+	—	—	—	—
—	r	r	—	—	—	r	—	—	—	—	—	—	—	c	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	r	r	—	—	—	—	—	—	—	—	—	—	—	—	r	—
—	—	—	r	—	c	r	—	—	+	+	r	c	—	+	+	r
—	—	—	—	—	—	—	—	—	r	r	—	c	—	—	—	—
—	—	—	—	—	+	—	—	—	r	r	r	r	+	+	c	—
—	—	—	—	—	—	+	—	—	+	+	—	+	—	+	—	—
—	—	c	—	—	—	cc	—	—	c	r	—	c	—	c	—	+
—	—	—	—	—	—	r	—	—	r	+	r	r	—	—	—	—
Tp. (Ns.)	C.	C. Ns. Si.	Ns. Tp.	Tp.	Tp. Ns. T.	Si. Ns.	C.	C.	C. Ns. Si.	C. Ns.	C. Ns.	C. Si. Ns.	C. (S.)	Si. C. (S.)	S.	?

Table II. North Sea

Month	7	7	8	8	8	8	8	8	7	8
Day	30	31	1	1	1	1	1	1	31	1
Lat. N.	57° 50′	57° 44′	57° 42′	57° 15′	57° 29′	57° 14′	54° 30′	55° 29′	55° 53′	56° 51′
Long.	11° E.	10° 38′ E.	10° 34′ E.	9° 50′ E.	9° 2′ E.	8° 42′ E.	7° 49′ E.	7° 22′ E.	7° 1′ E.	7° 2′ E.
Temp.	19,75	18	19,5	17	18,5	17,5	17,3	17	17	17
Sal.	23,58	32,55	23,51	33,03	33,16	33,04	31,60	32,17	33,30	33,92
Animals not examined	c	+	+	c	cc	c	c	c	+	cc
Ceratium furca Duj.	—	—	—	—	—	—	r	—	—	—
C. fusus Duj.	—	—	—	—	—	—	r	—	—	—
C. tripos Nitzsch	—	r	+	+	+	—	+	c	+	c
var. longipes Bail	—	r	—	—	—	—	—	—	—	—
var. macroceros Ehb.	—	+	cc	cc	cc	c	c	+	—	+
Peridinium divergens Ehb.	—	—	—	—	—	—	—	—	—	—
Bacteriastrum varians Lauder	—	—	—	+	r	c	r	—	—	—
Chætoceros curvisetus Cl.	cc	+	—	—	—	—	—	—	—	—
C. (borealis var.?) densus Cl.	r	—	—	—	r	+	+	—	—	—
C. didymus Ehb.	c	+	—	—	—	—	—	—	—	—
C. Schüttii Cl.	+	c	—	—	—	—	—	—	—	—
C. Weissflogii Schütt	—	—	—	—	—	r	—	—	—	—
Coscinodiscus concinnus W. Sm.	—	—	—	—	—	—	r	—	—	—
Guinardia flaccida Castr.	r	—	r	—	—	—	r	c	—	—
Rhizosolenia gracillima Cl.	r	r	—	—	—	—	—	—	—	—
R. semispina Hensen	—	—	—	—	—	—	r	—	—	—
R. Shrubsolei Cl.	r	—	—	—	—	—	c	—	—	—
R. Stolterfothii H. P.	—	—	—	—	—	—	c	—	—	—
R. styliformis Brw.	—	—	—	c	+	c	cc	—	—	—
Planktontype	Nm.	Nm. Tp.	Tp.	Tp. S.	Tp. S.	S. Nm. Tp.	S. Nm. Tp.	Nm. Tp.	(Tp.)	Tp.

July—August 1897.

8	7	7	7	7	7	7	7	7	7	8	8	7	8	8
7	31	31	31	31	31	30	31	30	31	1	8	30	7	13
57° 19′	57° 23′	54° 30′	56° 14′	57° 8′	53° 56′	52° 37′	53° 18′	52° 41′	55° 50′	56° 37′	56° 25′	55° 18′	56° 29′	56° 12′
6° 42′ E.	6° 5′ E.	5° 44′ E.	4° 16′ E.	4° 6′ E.	4° 2′ E.	4° E.	3° 12′ E.	2° 29′ E.	2° 1′ E.	0° 30′ E.	0° 12′ E.	0° 13′ W.	0° 14′ W.	1° 30′ W.
17,5	16	16	15	15,75	15,5	18	15	14,5	15,2	14,5	16.5	15,5	16	15,5
31,22	32,56	34,55	35,15	34,79	34,64	33,46	34,41	34,26	35,18	35,10	34,96	34,88	34,91	34,84
+	c	r	cc	c	c	r	+	cc	cc	c	r	c	c	+
—	—	—	—	—	—	—	r	—	r	r	r	r	r	+
—	—	—	—	r	—	—	+	—	—	r	r	r	+	+
+	r	c	cc	c	+	—	+	r	+	+	+	r	r	+
—	—	—	c	—	—	—	c	—	—	—	—	—	—	—
+	c	+	—	c	+	+	+	—	+	c	cc	cc	r	+
—	—	—	—	r	—	—	r	—	r	r	—	—	r	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	r	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	r	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	+	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	rr	—	—	—	—	—	—	—
(Tp.)	Tp.	Tp.	Tp. Ns.	Tp.	Tp.	Nm. Tp.	Ns. Tp.	?	Tp.	Tp.	Tp.	Tp.	(Tp.)	Tp.

Table III. North Sea

Month	10	10	11	10	10	11	10	10	10	10	11	10	10
Day	29	29	8	29	29	7	30	31	30	30	7	30	30
Lat. N.	57° 40′	57° 50′	57° 43′	57° 43′	57° 44′	57° 5′	57° 9′	55°	56° 15′	56° 28′	55° 55′	55° 42′	54° 49′
Long.	11° 30′ E.	11° E.	10° 59′ E.	10° 20′ E.	9° 35′ E.	8° 28′ E.	8° 8′ E.	7° 59′ E.	7° 45′ E.	7° 42′ E.	7° 36′ E.	6° 52′ E.	6° 4′ E.
Temp.	9,3	10	7,2	11,5	9,7	10,2	10,8	11,4	10,7	12	11	12,5	12,5
Sal.	21,81	23,16	19,08	29,88	32,56	33,52	33,66	31,51	32,48	32,41	32,82	34,16	32,9
Animals not examined	+	+	+	+	—	+	—	c	—	—	c	+	c
Ceratium furca Duj.	—	r	r	r	r	+	—	r	r	+	r	+	+
C. fusus Duj.	r	r	r	r	r	c	—	—	r	+	r	+	+
C. tripos Nitzsch	c	c	c	+	r	c	+	c	c	c	+	+	c
var. bucephala Cl.	—	—	r	—	—	r	r	—	—	—	—	—	—
var. longipes Bail	+	r	r	—	—	—	—	—	—	—	—	—	r
var. macroceros Ehb.	c	c	r	c	cc	c	cc	c	cc	c	cc	+	—
Dinophysis acuta Ehb.	—	—	—	r	—	—	—	—	—	r	—	—	r
Peridinium divergens Ehb.	r	—	—	r	r	—	—	—	—	—	—	—	—
Pyrophacus horologium	—	—	—	—	—	—	—	—	—	—	—	r	r
Biddulphia mobilensis Bail.	—	—	r	—	—	—	—	—	—	—	r	—	r
Chætoceros borealis Btw.	r	+	—	+	—	—	—	—	—	—	—	—	—
var. Brightwellii Cl.	—	r	rr	r	r	—	—	—	—	—	—	—	—
C. curvisetus Cl.	c	cc	cc	c	—	—	—	—	—	—	—	—	—
C. decipiens Cl.	—	r	—	r	—	—	—	—	—	—	—	—	—
C. didymus Ehb.	c	c	c	c	—	—	—	—	—	—	—	r	—
C. Schüttii Cl.	c	cc	c	r	—	—	—	—	—	—	—	r	—
Coscinodiscus concinnus W. Sm.	—	r	—	—	—	r	—	+	r	r	+	—	—
C. oculus iridis Ehb.	—	—	—	—	—	r	—	—	—	—	r	—	—
Ditylum Brightwellii Wert.	r	+	r	+	—	r	—	—	—	—	r	—	r
Guinardia flaccida Castr.	—	r	—	—	—	—	—	—	—	r	r	—	—
Rhizosolenia alata Btw.	—	+	—	—	—	rr	—	—	—	—	—	—	—
R. calcar avis Schulz	—	r	—	r	—	rr	—	r	—	r	+	—	—
R. gracillima Cl.	c	+	+	+	—	—	—	—	—	—	—	—	—
R. robusta Norm.	—	—	—	—	—	rr	—	r	—	—	—	—	—
R. semispina Hensen	—	r	r	r	—	—	—	—	—	—	—	—	—
R. Shrubsolei Cl.	—	r	—	r	—	—	—	—	—	—	—	—	—
R. Stolterfothii H. P.	—	—	—	—	—	rr	—	—	—	—	—	—	—
R. styliformis Btw.	—	—	r	—	r	+	—	cc	r	r	c	—	r
Stephanopyxis turgida Guv.	—	—	—	—	—	—	—	r	—	—	r	—	—
Halosphæra viridis Schmitz	—	—	—	—	r	r	—	—	—	—	—	—	+
Planktontype	(Nm. Ns.) Tp.	Nm. Ns.) Tp.	Nm. Tp.	Nm. (Ns.) Tp.	Tp.	Tp. S.	Tp.	S. Tp.	Tp.	Tp.	Tp. S.	Tp.	Tp.

October—November 1897.

10	10	10	10	10	10	10	11	11	11	10	11	11	11	11	11	11
30	30	31	31	31	30	31	11	1	11	31	12	22	12	22	13	13
56° 33′	57° 9′	53° 12′	52° 7′	55° 58′	56° 36′	55° 27′	58° 28′	55° 2′	58° 18′	56° 12′	58° 55′	58° 9′	58° 40′	58° 3′	57° 8′	55° 55′
5° 21′ E.	5° E.	4° 21′ E.	3° 41′ E.	2° 41′ E.	1° 20′ E.	0° 31′ E.	0° 6′ W.	1° 15′ W.	2° W.	2° 29′ W.	3° 27′ W.	3° 55′ W.	4° 48′ W.	5° 14′ W.	5° 46′ W.	6° 8′ W.
11,4	11	12	13	10,6	10,9	10,4	10,5	—	11	11,3	11,5	—	11,5	—	12	11,5
34,88	33,85	33,66	34,07	35,12	35,17	34,96	35,25	34,50	35,22	34,33	34,94	---	34,76	—	34,24	34,04
c	+	c	+	r	+	+	+	+	c	c	+	r	c	—	r	—
—	r	+	—	+	r	c	r	+	+	r	—	—	—	+	—	—
—	+	r	+	cc	—	c	+	c	—	r	—	r	—	+	—	—
c	—	+	—	cc	c	c	—	+	+	c	—	c	r	+	r	+
—	—	—	—	—	r	—	—	r	c	—	—	c	—	c	—	r
—	—	c	c	—	r	—	—	—	r	—	—	—	r	—	—	—
—	cc	—	—	r	cc	c	c	cc	c	c	+	+	+	c	—	—
r	r	—	—	r	—	r	—	r	—	—	—	—	—	—	—	—
r	r	—	—	r	r	r	—	r	r	—	—	—	r	—	—	—
r	—	—	—	r	—	r	—	r	—	—	—	—	—	—	—	—
—	—	+	c	—	—	—	+	—	—	—	—	—	r	—	r	r
—	—	—	—	—	—	—	—	—	—	—	—	r	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	r	—	—	—	—	—	r	—	—	—
—	—	—	—	—	r	r	+	—	r	—	r	r	+	—	r	+
—	—	—	—	—		—	r	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	c	—	r	—	—	—	—	—	r	+
r	—	r	r	—	—	—	+	—	—	—	—	—	—	—	—	+
—	—	—	—	—	—	—	c	—	r	—	r	—	+	—	—	—
+	—	—	c	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	r	r	—	—	—	—	—	—	—	—	—	—	—	—	—
r	—	—	—	—	r	r	—	—	r	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	r	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	r	—	—	—	r	r	—	—	—	—	—	—	—	—	—	—
r	—	+	c	—	—	—	—	—	—	—	—	—	—	—	—	+
r	—	—	—	—	—	—	c	—	c	—	—	—	—	—	—	—
r	—	—	—	—	r	—	—	—	—	—	—	—	—	—	—	—
r	—	r	—	—	r	—	+	—	+	—	+	c	r	+	r	c
Tp. (Nm.)	Tp.	{Ns. Tp. Nm.}	Nm. Ns.	Tp.	Tp.	Tp.	Tp. S.	Tp.	Tp. S.	Tp.	Tp.	Tp.	(Tp.)	Tp.	?	Tp. (C.)

Table IV.

Month	4	4	4	4	5	5	5	5	6	6	6
Day	3	9	22	29	7	14	20	26	13	19	26
Temp.	5,9	7,2	9,4	10,6	10,1	9,4	13,7	12,7	17,2	14,3	17,2
Areom D.	1,0229	1,0237	1,0224	1,0236	1,0239	1,0238	1,0226	1,0245	1,0238	1,0232	1,0222
Wind	E.N.E.	S.W.	S.W.	S.W.	W.N.W.	W.S.W.	N.E.	S.W.	S.W.	N.W.	N.E.
Tide	Ebb.	Ebb.	Flood.	Flood.	Ebb.	Flood.	Ebb.	Flood.	Flood.	Flood.	Flood.
Oikopleura dioica Fol.	—	—	—	—	—	—	—	—	—	—	+
Acartia Clausii Giesbr.	—	—	—	—	—	—	—	—	—	—	+
Centropages hamatus Lilljeb.	—	—	—	—	—	—	—	—	—	—	c
Enterpe acutifrons Dam.	—	—	—	—	—	—	—	—	—	—	—
Oithona similis Claus	—	—	—	—	—	—	—	—	—	—	—
Pseudocalanus elongatus Boeck	—	—	—	—	—	—	—	—	—	—	—
Temora longicornis O. E. Müll.	—	—	—	—	—	—	—	—	—	—	r
Noctiluca miliaris Suriray	—	—	—	—	—	—	—	—	—	—	+
Ptychocylis Ehrenbergii Clap. & Lachm.	—	—	—	—	—	—	—	—	—	—	—
Tintinnopsis beroidea v. acuminata v. Dad.	—	—	—	—	—	—	—	—	—	—	—
T. campanula Ehb.	—	—	—	—	—	—	—	—	—	rr	—
T. Labiancoi v. Dad.	—	—	—	—	—	—	—	—	—	rr	—
Tintinnus subulatus Ehb.	—	—	—	—	—	—	—	—	—	—	—
Phæocystis Pouchetii Lagh.	—	r	—	ccc	ccc	cc	ccc	ccc	ccc	—	—
Ceratium fusus Duj.	—	—	—	—	—	—	—	—	—	—	—
C. trip. v. longipes Bail.	—	—	—	—	—	—	—	—	—	—	—
Diplopsalis lenticula Bergh	—	—	—	—	—	—	—	—	—	—	—
Peridinium divergens Ehb.	—	—	—	—	—	—	—	—	—	—	r
Pyrophacus horologium Stein	—	—	—	—	—	—	—	—	—	—	r
Asterionella spathulifera Cl.	r	+	r	—	—	—	—	—	—	—	—
Bacteriastrum varians Lauder	—	—	—	—	—	—	—	—	—	—	—
Biddulphia aurita Lyngb.	cc	c	—	—	—	—	—	—	—	—	—
B. mobilensis Bail.	—	r	—	—	—	—	—	—	—	r	r
Cerataulina Bergonii H. Per.	—	r	c	r	cc	r	—	—	r	r	r
Chætoceros contortus Schütt.	—	—	—	—	—	—	—	—	—	—	r
C. curvisetus Cl.	—	—	—	—	—	—	—	—	—	—	—
C. danicus Cl.	—	—	—	—	—	—	—	—	—	—	—
C. decipiens Cl.	—	r	r	—	—	—	—	—	—	r	r
C. (borealis var.?) densus Cl.	—	—	—	—	—	—	—	—	r	—	r
C. didymus Ehb.	—	—	—	—	—	—	—	—	—	—	—
C. Schüttii Cl.	—	—	—	—	—	—	—	—	—	—	—
Coscinodiscus concinnus W. Sm.	—	—	—	—	—	—	—	—	—	—	r
C. excentricus Ehb.	—	—	+	—	—	—	—	—	—	—	r
C. oculus iridis Ehb.	—	—	r	—	—	—	—	—	—	r	r
Ditylum Brightwellii West.	r	r	+	—	—	—	—	—	—	—	—

Helder 1897.

7	7	7	7	7	8	8	8	9	9	9	9	9	10	10	11	12
3	7	14	23	29	5	12	28	3	9	15	22	29	21	28	12	8
17	15,6	18,1	17,2	18,5	21	19,6	18	17,1	14,6	15,4	14,2	15,7	11,1	11	8	6,8
1,0229	1,0240	1,0230	1,0246	1,0225	1,0214	1,0226	1,0225	1,0230	1,0235	1,0230	1,0252	1,0223	1,0233	1,0255	1,0263	1,0256
W.	W.S.W.	N.E.	N.W.	S.W.	E.S.E.	W.	S.W.	W.S.W.	N.	E.	W.	S.E.	N.E.	S.E.	S.S.W.	S.W.
Ebb.	Ebb.	Ebb.	Flood.	Ebb.	Ebb.	Flood.	Flood.	Ebb.	Flood.	Ebb.	Flood.	Ebb.	Flood.	Ebb.	Ebb.	Flood.
c	c	+	—	r	—	—	—	—	—	r	—	—	—	—	—	—
—	r	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—
+	+	+	c	—	—	—	r	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	c	r	+	—
+	+	r	+	r	—	+	+	c	+	r	+	—	c	—	+	—
+	—	+	—	r	—	—	—	—	—	—	—	—	—	—	—	—
r	+	—	+	—	+	—	r	—	—	—	—	—	—	—	—	—
+	c	r	c	+	—	+	—	+	cc	—	c	—	r	—	—	—
—	—	—	r	r	r	r	—	—	r	—	r	—	r	—	—	—
—	—	—	—	—	r	r	—	—	—	—	r	—	+	—	—	r
—	—	—	—	+	+	+	+	+	r	—	r	r	+	—	—	—
—	—	—	rr	r	—	—	r	—	—	—	—	—	—	—	—	—
—	—	—	—	—	r	—	—	—	—	—	—	—	r	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	r	r	+	—	—	r	r	r	r	r	—
—	—	—	—	—	—	—	—	—	—	—	—	—	r	r	c	r
r	—	—	—	—	r	—	—	—	—	—	—	—	—	—	r	—
r	—	—	—	r	r	r	—	—	—	—	r	—	—	—	—	—
—	—	—	r	—	—	—	—	—	—	—	—	r	—	—	—	—
r	—	—	—	r	—	—	—	—	—	—	—	—	—	—	—	—
—	r	—	—	r	r	r	—	+	c	+	+	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
r	r	—	r	—	—	—	—	+	c	+	+	c	r	+	c	—
+	r	r	—	r	r	—	—	—	—	—	—	—	r	—	—	—
r	—	—	—	—	—	—	—	—	—	+	r	—	—	—	—	—
—	r	—	r	+	—	—	—	—	—	—	r	—	—	—	—	—
—	r	+	—	r	—	—	—	—	r	—	r	—	—	r	—	—
r	+	r	r	r	—	—	—	—	—	—	—	—	—	—	—	—
r	r	r	r	+	—	—	r	—	—	—	r	—	r	—	—	—
—	r	r	—	r	r	—	—	r	—	+	r	—	—	—	—	—
r	r	+	r	+	—	—	—	—	—	—	+	—	—	—	—	—
—	r	r	—	—	—	—	—	c	c	c	+	c	—	—	+	—
—	—	r	—	—	—	—	—	—	+	—	+	—	—	—	r	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	r	—	—	—	—	—	—	—	—	r	+	—

Table IV.

Month	4	4	4	4	5	5	5	5	6	6	6
Day	3	9	22	29	7	14	20	26	13	19	26
Encampia zodiacus Ehr.	—	r	c	—	+	r	—	—	—	—	r
Guinardia flaccida Castr.	—	—	—	—	—	—	—	—	+	c	c
Lithodesmium undulatum Ehr.	—	—	r	—	—	—	—	—	—	—	r
Nitzschia delicatissima Cl.	—	—	—	+	+	+	+	cc	cc	—	—
Rhizosolenia delicatula Cl.[1]	—	—	—	—	—	—	—	—	—	—	—
R. robusta Norm.	—	—	—	—	—	—	—	—	—	—	—
R. setigera Btw.	—	—	—	—	—	—	—	—	—	—	—
R. Shrubsolei Cl.	—	—	—	—	+	r	—	r	+	c	c
R. Stolterfothii H. Per.	—	—	—	—	—	—	—	—	—	—	—
Streptotheca thamesis Shrubs.	—	—	—	—	—	—	—	—	—	—	r
Planktontype	Ns.	Ns.	Nm.	C.	C. Nm.	C.	C.	C.	C.	Nm.	Nm.

[1] This new species will be described in my paper on the plankton of the North Sea and Skagerak in 1898.

Helder 1897.

7	7	7	7	7	8	8	8	9	9	9	9	9	10	10	11	12
3	7	14	23	29	5	12	28	3	9	15	22	29	21	28	12	8
—	r	—	—	r	—	—	+	r	r	cc	c	+	c	+	—	—
cc	c	+	+	+	—	—	—	—	—	r	+	r	c	+	+	—
—	r	r	—	—	r	—	—	—	r	r	r	r	r	r	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	r	r	—	—	—	—	—	—	—	—	—	—	+	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	r	r	r	+	+
—	+	—	—	—	—	—	—	—	—	—	—	r	r	—	—	—
cc	cc	cc	r	+	+	—	—	—	—	—	r	—	r	—	—	—
r	r	r	cc	cc	c	r	—	—	—	—	—	—	c	cc	+	—
r	r	r	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Nm.	Nm.	Nm.	Nm.	Nm.	Nm.	Nm.	Nm.	Nc. (Nm.)	Nc. Nm.	Nc. Nm.	Nc. Nm.	Nc. Nm.	Nc. Nm.	Nc. Nm.	Nc. (Nm.)	(Nm.)

Table V.

Month	1	2	2	2	4	4	4	5	5	6	7	7	7
Day	16	5	17	23	1	7	15	4	21	24	21	23	30
Halosphæra viridis Schmitz	—	—	—	—	—	—	—	—	—	—	—	—	r
Ceratium furca Duj.	—	—	—	—	—	—	—	—	—	—	+	—	r
C. fusus Duj.	—	r	r	—	r	—	r	r	r	+	+	—	r
C. tripos Nitzsch	—	—	r	—	—	—	—	—	—	—	+	—	+
var. longipes Bail.	r	r	c	—	—	—	—	—	—	—	r	—	—
Dinophysis acuta Ehb.	—	—	—	—	—	—	—	—	—	r	r	—	r
Diplopsalis lenticula Bergh	—	—	—	+	—	—	—	—	—	+	—	—	+
Peridinium divergens Ehb.	—	—	—	—	—	—	—	—	—	r	r	—	r
var. depressa Bail.	—	—	—	—	—	—	—	—	—	—	—	—	—
P. Michaëlis Ehb.	—	r	—	—	—	—	—	—	—	r	r	—	—
Phæocystis Ponchetii Lagh.	—	—	—	—	—	—	—	r	—	—	—	—	—
Asterionella spathulifera Cl.	—	r	—	—	—	—	—	c	—	—	—	—	—
Biddulphia mobilensis Bail.	cc	c	c	cc	c	c	c	r	—	—	—	—	—
Cerataulina Bergonii H. Per.	—	—	—	—	—	—	—	r	r	r	—	—	r
Chætoceros (borealis var.) densus Cl.	—	—	—	—	+	r	+	r	—	—	—	—	—
C. curvisetus Cl.	—	—	—	—	r	—	—	—	—	—	—	—	—
C. danicus Cl.	—	—	—	r	—	—	—	—	—	—	—	—	—
C. debilis Cl.	—	—	—	—	r	r	r	r	—	—	—	—	—
C. decipiens Cl.	r	r	r	r	r	—	—	r	—	—	—	—	—
C. (didymus var.) longicruris Cl.	—	—	—	—	—	—	—	—	—	—	—	—	—
C. Lorenzianus Gran.	—	—	—	—	—	—	—	—	—	—	—	—	—
C. Schüttii Cl.	—	—	—	—	—	—	—	—	—	—	—	—	—
Corethron hystrix Hensen	—	r	—	r	—	—	—	—	—	—	—	—	—
Coscinodiscus concinnus W. Sm.	c	+	+	c	r	—	+	—	—	—	—	—	—
C. excentricus Ehb.	+	c	+	cc	+	+	+	—	—	—	—	—	—
Ditylum Brightwellii West.	+	+	r	+	r	r	—	r	—	—	—	—	—
Eucampia zodiacus Ehb.	—	—	—	—	—	—	—	r	—	—	—	—	—
Guinardia flaccida Castr.	—	—	—	—	—	—	+	+	c	r	—	—	—
Leptocylindrus danicus Cl.	—	—	—	—	—	—	—	—	—	—	—	—	—
Rhizosolenia alata Btw.	—	—	—	—	—	—	—	—	—	—	—	—	—
var. gracillima Cl.	—	—	—	—	—	—	—	—	—	+	—	—	r
R. robusta Btw.	—	—	—	—	—	—	—	rr	—	—	—	—	—
R. semispina Hensen	—	—	—	—	r	r	+	r	—	+	+	r	r
R. Shrubsolei Cl.	—	r	—	—	—	—	+	c	+	+	c	r	+
R. Stolterfothii H. Per.	—	—	—	—	—	—	—	r	c	c	+	+	+
R. styliformis Btw.	—	r	—	—	—	—	—	rr	—	r	—	—	—
Skeletonema costatum Grev.	—	—	—	r	—	r	r	+	—	—	—	—	—
Streptotheca thamesis Shrubs.	+	+	—	r	r	r	+	c	—	—	—	—	—
Planktontype	Nc.	Nc.	Nc. Ns.	Nc.	Nc.	Nc.	Nc.	Nm.Ns.	Nm.	{Nm. (Ns.)}	Nm. (Ns.)}	Nm.	Nm.

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8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11	11	12	12	12
5	10	17	23	2	7	17	30	6	12	23	28	3	18	20	23	29	2	11	20
—	—	r	—	—	—	+	r	r	—	—	—	r	+	+	—	—	—	—	—
+	+	r	—	—	—	—	—	—	—	—	—	—	—	r	—	—	—	—	—
+	+	r	—	—	—	—	—	—	—	r	r	—	—	—	—	—	—	—	—
+	—	r	r	+	c	+	c	—	+	+	+	—	—	cc	+	+	+	—	—
—	—	r	+	—	c	r	—	—	r	—	—	—	—	—	—	—	—	—	—
+	r	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
cc	c	—	—	—	—	—	r	—	—	—	—	r	—	r	+	—	+	—	—
+	r	r	c	r	+	+	—	+	—	—	—	—	—	—	—	—	—	—	—
—	—	r	+	—	+	+	—	—	—	—	—	—	—	—	—	—	—	—	—
r	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	+	+	—	—	—	—	—	—	—	—	—	—	—	—
—	r	—	c	—	—	—	—	—	—	r	—	—	cc	r	r	—	—	—	—
—	—	—	r	r	r	r	—	r	r	cc	+	c	+	+	c	—	+	r	+
—	—	—	—	—	—	—	—	—	r	r	r	—	—	—	—	—	—	—	—
—	r	r	+	—	—	+	—	cc	—	r	r	—	—	—	—	—	—	—	—
—	r	—	+	+	r	r	—	r	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	r	+	r	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	r	—	—	—	—	r	—	—	—	r	cc	c	—	c	r	r
—	—	—	+	r	—	r	—	—	—	—	—	—	—	—	—	—	—	—	—
—	r	—	—	—	r	—	—	—	—	—	r	—	—	—	—	—	—	—	—
r	r	—	+	r	—	—	—	—	—	—	—	—	r	r	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	r	—	—	—	—	—
—	—	r	—	—	—	r	—	—	—	r	—	—	r	+	c	+	+	r	r
—	—	—	—	—	—	r	—	—	r	r	—	r	—	+	+	+	+	r	r
—	—	—	—	—	—	—	—	—	—	—	—	—	r	r	—	—	—	—	—
—	—	—	r	—	—	—	—	r	r	r	r	—	—	r	—	—	—	—	—
—	r	—	r	r	r	r	r	—	r	r	r	—	r	—	—	—	—	—	—
—	+	—	+	r	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	r	+	r	+	+	—	r	r	r	+	—	—	—	—	—
r	+	r	+	+	+	r	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	r	r	r	—	c	+	c	+	—	—	r	—	—	—	—	—
—	—	r	+	c	—	—	—	—	r	—	—	—	—	—	—	—	—	—	—
—	r	—	r	+	+	—	—	+	+	r	r	—	—	—	—	—	—	—	—
+	+	—	—	—	r	r	r	r	—	r	r	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	r	+	—	—	—	—	—	r	—	—	—	—	—
—	—	—	—	—	—	—	—	r	—	—	—	—	—	r	—	—	—	—	—
—	—	—	—	—	—	r	—	—	—	+	r	+	r	r	r	—	—	—	—
Nm.	Nm.	Nm.	Nm.Ns.	Nm.Ns.	Nm. Ns.Tp.	Nm. Ns.	Nm. Tp.	Nm. S.	Nm. S.	Nc. S.	Nc. S.	Nc. S.	Nc. Ns.	Nc. C. Tp.	Nc. C.	Nc.	Nc. C.	(Nc. C.)	Nc. C.

Table VI.

Month	1	1	1	2	2	3	3	3	4	4	4	5
Day	4	13	26	8	23	2	16	22	1	8	22	5
Temp.	1,8	1,40	0,7	—0,45	1,5	1,8	0,25	1,45	2,35	3,45	4,50	7,65
Sal.	25,64	31,13	30,62	30,62	30,74	27,97	21,94	23,30	25,71	28,46	27,22	22,16
Fritillaria borealis Lohm.	rr	—	—	r	r	—	r	r	—	—	—	r
Oikopleura dioica Fol.	—	—	—	—	—	—	—	—	—	—	—	—
Acartia Clausii Giesbr.	—	—	—	—	—	—	—	—	—	rr	—	r
A. longiremis Lilljeb.	r	r	r	—	—	—	—	r	—	rr	+	—
Centropages typicus Kröyer	—	—	—	—	—	—	—	—	—	—	—	—
C. hamatus Lilljeb.	—	r	r	—	—	—	—	+	—	rr	—	r
Corycæus anglicus Lubb.	r	—	—	—	—	—	—	—	—	—	—	—
Euterpe acutifrons Dana	—	—	—	—	—	—	—	—	—	—	—	—
Oithona similis Claus	r	r	r	r	r	rr	—	—	—	—	r	r
Paracalanus parvus Claus	r	—	—	—	—	—	rr	rr	—	—	—	—
Pseudocalanus elongatus Boeck	—	—	r	—	—	—	rr	+	—	rr	+	r
Temora longicornis O. F. Müll.	r	—	—	—	r	—	r	+	—	—	—	—
Evadne Nordmanni Lovén	rr	—	—	—	rr	—	—	—	—	—	—	r
E. spinifera P. E. Müll.	—	—	—	—	—	—	—	—	—	—	—	—
Podon Leuckartii G. O. Sars	—	—	—	—	—	—	—	—	—	—	—	r
Sagitta bipunctata Quoi & Gaim.	r	—	rr	—	r	—	—	—	—	—	—	—
Cyttarocylis denticulata Ehb. (incl. var.)	rr	rr	—	r	—	—	r	—	r	rr	rr	+
Tintinnopsis campanula Ehb.	—	—	—	—	—	—	—	—	—	—	—	—
Tintinnus subulatus Ehb.	—	—	—	—	—	—	—	—	—	—	—	—
Noctiluca miliaris Suriray	r	—	—	—	—	—	—	—	—	—	—	—
Acanthometron quadrifolium Hkl.	—	—	—	rr	—	—	—	—	—	—	—	—
Plectophora arachnoides Clap. & Lachm.	—	—	—	—	—	—	—	—	—	—	—	—
Dictyocha fibula Ehb.	—	—	—	—	—	—	—	—	—	—	—	—
Distephanus speculum Ehb.	—	—	—	—	—	—	—	—	—	r	—	r
Ceratium furca Duj.	r	—	rr	rr	—	—	—	—	rr	—	—	—
C. fusus Duj.	r	r	—	rr	—	—	—	—	—	—	—	rr
C. lineatum Ehb.	—	—	—	—	—	—	—	—	—	—	—	—
C. tripos Nitzsch	c	cc	+	r	+	rr	r	rr	rr	—	rr	rr
var. longipes Bail.	+	+	r	r	+	r	r	rr	rr	rr	rr	rr
var. macroceros Ehb.	—	—	rr	rr	—	—	—	—	—	—	—	—
Dinophysis acuta Ehb.	—	r	—	—	—	rr	—	—	—	—	rr	rr
Diplopsalis lenticula Bergh	r	—	—	—	—	—	—	—	—	—	—	—
Gonyaulax spinifera Stein	r	—	—	—	—	—	—	—	—	—	—	—
Peridinium depressum Bail.	r	r	rr	r	r	r	r	r	rr	rr	rr	rr
P. divergens Ehb.	—	—	—	rr	—	—	—	—	—	—	—	—
P. Michaëlis Ehb.	—	r	—	—	—	—	—	—	—	—	—	rr
P. pellucidum Bergh	r	r	—	rr	—	—	r	rr	rr	rr	—	rr
Halosphæra viridis Schmitz	—	—	—	—	—	—	—	—	—	—	—	—
Biddulphia aurita Lyngb.	r	r	r	r	+	+	r	r	r	—	—	—

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5	5	5	6	6	7	7	9	9	9	10	10	10	11	11	11	11	12	12	12
14	22	29	19	29	10	19	11	20	28	9	19	26	2	10	18	25	4	17	23
9,05	12,15	13,65	14,60	16,20	14,45	18,35	15,0	14,75	13,45	11,70	11,25	9,9	8,6	7,5	8,1	7,5	5,75	4,6	—
20,67	19,59	18,75	19,73	22,02	28,07	20,80	30,14	20,83	23,87	24,01	26,34	21,52	20,29	21,32	23,30	31,85	32,17	25,08	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	+	r	+	—	r	+	r	—	+	—	—	—
—	+	—	—	—	—	—	—	—	r	—	r	—	r	—	—	+	—	—	r
r	r	r	—	—	rr	—	—	—	—	—	—	rr	—	+	—	—	+	—	+
—	—	—	—	—	—	—	—	r	r	r	r	r	r	r	r	r	—	—	—
—	r	—	—	r	—	—	—	—	—	—	—	—	r	—	r	—	—	—	—
—	—	—	—	—	—	—	—	r	rr	+	—	—	—	—	—	r	—	—	—
—	—	—	—	—	—	—	—	—	—	—	rr	—	rr	—	rr	r	r	—	—
—	+	c	c	—	cc	—	c	+	+	r	r	+	r	+	+	+	+	+	—
rr	—	—	—	c	c	c	c	c	+	+	+	+	—	r	r	+	—	—	—
r	r	r	—	r	—	—	—	—	—	—	—	r	r	r	r	+	—	+	r
r	+	+	—	r	—	—	—	—	—	—	rr	—	—	—	rr	r	+	+	—
c	+	+	+	+	+	c	—	—	—	—	—	—	—	—	rr	—	—	—	—
—	—	—	—	—	—	r	r	—	—	+	—	rr	rr	—	—	—	—	r	rr
r	—	r	rr	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	r	—	—	—	—	+	—	—	—	—	rr	—	—	—	c	c	—	—
+	+	r	rr	—	—	—	—	—	—	—	rr	rr	rr	rr	—	r	—	r	—
—	—	—	+	r	r	r	+	r	+	—	r	rr	—	rr	—	—	—	—	—
—	—	—	—	r	—	r	—	—	—	—	—	rr	rr	rr	—	—	—	—	—
—	—	—	—	—	—	—	c	c	—	—	—	—	—	—	—	—	+	—	—
—	—	—	—	—	—	—	r	—	—	r	—	—	—	—	—	r	—	—	—
—	—	—	—	—	—	—	—	—	—	—	rr	—	—	—	rr	r	r	—	—
—	—	—	—	—	—	—	—	—	—	—	r	r	—	r	—	—	—	—	—
—	—	—	—	—	—	—	—	—	r	—	—	r	r	r	r	—	—	—	—
—	r	r	—	—	—	—	—	rr	—	—	rr	rr	+	rr	+	r	r	r	r
rr	r	—	r	+	rr	—	—	rr	—	—	—	—	r	—	r	c	c	+	r
—	—	—	—	—	—	—	—	—	—	—	r	r	r	r	—	r	r	r	r
rr	c	c	+	c	c	r	r	c	+	rr	r	r	c	+	c	cc	cc	cc	cc
+	—	—	—	—	—	—	r	rr	—	r	rr	r	+	+	r	r	—	r	—
rr	—	—	r	—	rr	r	c	r	r	rr	r	—	r	—	+	+	+	—	—
—	r	—	—	—	—	—	—	—	—	—	rr	rr	r	r	—	r	r	r	—
—	—	—	—	—	—	—	—	—	—	rr	—	rr	r	—	—	—	—	—	r
rr	—	—	—	—	—	—	—	—	—	rr	—	—	—	—	r	r	—	—	—
r	r	r	rr	—	rr	—	—	—	—	—	rr	rr	—	—	—	—	—	—	—
—	—	—	—	—	—	—	r	rr	—	rr	—	rr	r	—	—	r	r	r	—
—	rr	—	—	—	—	—	—	—	—	—	—	—	—	r	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	r	—	r	r	+	+	c	+	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	r	—	—	—	—

Table VI.

Month	1	1	1	2	2	3	3	3	4	4	4	5
Day	4	13	26	8	23	2	16	22	1	8	22	5
B. mobiliensis Bail.	—	—	—	—	—	—	—	—	—	—	—	—
Cerataulina Bergonii H. P.	—	—	—	—	—	—	—	r	r	r	r	r
Chaetoceros borealis Btw.	—	—	r	—	r	+	+	c	c	c	c	+
var. Brightwellii	+	+	+	+	—	+	c	c	c	c	c	c
C. constrictus Gran	—	r	—	r	—	—	+	+	c	c	c	cc
C. contortus Schütt	r	—	—	—	—	r	—	r	—	—	+	+
C. eriophilus Castr.	—	—	—	—	—	—	—	r	r	r	r	—
C. curvisetus Cl.	—	—	—	—	—	—	—	—	—	—	—	—
C. danicus Cl.	—	—	—	—	—	—	—	r	—	—	—	—
C. debilis Cl.	—	—	+	+	—	cc	cc	c	c	c	r	r
C. decipiens Cl.	—	—	r	r	—	c	r	+	+	c	c	+
C. diadema Ehb.	—	—	—	—	—	—	—	c	c	+	+	r
C. didymus Ehb.	—	—	—	—	—	—	—	—	—	—	—	—
C. hiemalis Cl.	—	r	—	—	r	r	—	+	r	+	+	r
C. laciniosus Schütt	—	r	—	r	r	r	r	r	—	—	—	—
C. Schüttii Cl.	—	—	—	—	—	—	—	—	—	—	—	—
C. scolopendra Cl.	—	r	r	—	r	r	r	r	+	+	+	r
C. socialis Laud.	—	—	—	—	—	+	—	r	c	+	—	—
C. teres Cl.	—	—	r	r	r	+	+	+	+	+	—	—
Coscinodiscus concinnus W. Sm.	+	—	r	—	—	+	c	+	+	—	r	—
C. oculus iridis Ehb.	+	—	+	c	c	c	cc	c	c	r	rr	—
Ditylum Brightwellii West	—	—	—	—	—	—	—	—	—	—	—	—
Encampia zodiacus Ehb.	—	—	—	—	—	—	—	—	—	—	—	—
Guinardia flaccida Castr.	—	r	r	—	—	—	—	—	—	—	—	—
Leptocylindrus danicus Cl.	—	—	—	—	—	—	—	r	r	+	c	c
Nitzschia seriata Cl.	—	—	—	—	—	—	+	+	+	+	r	—
Rhizosolenia calcar avis Schulze	—	—	—	—	—	—	—	—	—	—	—	—
R. gracillima Cl.	—	—	—	—	—	—	—	—	—	—	—	+
R. obtusa Hensen	—	—	—	r	r	—	r	r	r	+	+	r
R. semispina Hensen	—	—	—	—	r	—	—	r	—	r	r	—
R. setigera Btw.	—	—	—	—	—	r	—	r	r	r	r	—
R. Shrubsolei Cl.	—	—	—	—	—	—	—	—	—	—	—	—
R. styliformis Btw.	—	—	—	—	—	—	—	—	—	—	—	—
Skeletonema costatum Grev.	c	r	—	—	—	—	—	—	—	r	—	—
Thalassiosira gravida Cl.	—	—	—	r	r	—	r	—	r	r	—	—
T. Nordenskiöldi Cl.	r	r	—	r	cc	cc	cc	c	c	r	r	—
Thalassiothrix Frauenfeldii Grun.	+	cc	c	r	+	r	—	+	r	+	+	+
T. longissima Cl. & Grun.	c	c	cc	c	c	+	—	+	—	r	r	—
Planktontype	Tp. T.	Tp. T.	Tp. T.	T.	Si. T.	Si. C.	{Si. C. / Ne.}	C. Si.	C. Si.	C. Ns.	C. Ns.	C. Ns.

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5	5	5	6	6	7	7	9	9	9	10	10	10	11	11	11	11	12	12	12
14	22	29	19	29	10	19	11	20	28	9	19	26	2	10	18	25	4	17	23
—	—	—	—	—	—	—	—	—	r	—	r	—	r	r	r	r	r	—	—
—	r	r	r	r	—	+	—	r	—	—	r	—	r	—	r	r	r	—	—
—	—	—	—	—	—	—	—	—	—	—	r	—	+	—	r	r	r	—	—
c	—	r	r	—	—	—	—	—	—	—	r	—	—	r	—	r	r	—	r
—	r	r	r	—	—	—	—	—	—	r	—	+	—	r	—	—	r	—	—
+	+	r	—	—	r	r	—	+	c	cc	+	c	c	cc	r	—	—	—	—
r	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	r	r	—	—	—	c	c	c	c	cc	c	cc	c	+	+	—	r
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—	—	—	—	—	—	—	—	—	—	—	—	r	—	r	r	r	—	—	—
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—	—	—	—	—	—	r	rr	—	—	—	—	r	r	r	r	r	—	r	—
c	c	+	—	—	—	—	—	—	—	r	—	—	—	r	—	—	—	—	—
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cc	cc	cc	cc	cc	ccc	ccc	—	c	c	cc	+	c	c	c	c	c	—	—	—
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+	c	c	—	—	—	—	—	—	—	—	—	—	r	—	r	—	—	—	—
r	—	—	—	—	—	—	—	—	—	—	r	r	r	r	+	r	c	r	+
Ns. Nm.	Nm. Tp. Ns.	Nm. Tp.	Nm.	Tp.Nm.	Nm.Tp.	Tp.Nm.	S. Tp.	Nm.	Nm.	Nm.	∫ Nm. (Ns.)	Nm. (Ns.)	Nm.Tp. (Ns.)	Nm.Tp. (Ns.)	Nm.Tp. Ns.	Tp. Nc. S.	Tp. T. Nc.	Tp. Nc.	Tp. T. Nc.