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THE PLANKTON

OF

THE NORTH SEA, THE ENGLISH CHANNEL, AND THE SKAGERAK

IN

1898

BY

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For the hydrographical researches of PETTERSSON and EKMAN,[1] the North Sea was explored four times during the year 1898, viz.: in March, June, July—August and November. At the same time samples of water were taken for chemical analysis and of plankton for microscopical examination. At the biological stations at Plymouth and Helder samples were collected almost every week during the whole year and also at S:t Vaast la Hogue from June onwards. For this valuable assistance I beg to tender the directors of the said stations, Mr. E. J. ALLEN, Dr. P. P. C. HOEK and Mr. EUGÈNE MALARD my best thanks. Again, at the expense of the Fishery Association of Gothenburg, samples of plankton were collected almost every week at Måseskär, off the west coast of Sweden, and, though with less regularity, both in the open Skagerak and along the Swedish west coast from Vinga to Väderö.

1. The North Sea in March 1898.

The prevailing plankton type is the *chæto-plankton*, which extends from the British east coast, between the Firth of Tay and Newcastle, to the south-west of Norway and the west of the Danish Peninsula, to about 55° 30′ N., i. e. above the 100 metre plateau. It also occurred south of the Dogger Bank, above the depression of the bottom at this place.

The chæto-plankton region approximately coincides with the southern part of the region of the water with 35 p. mille salinity, as marked on the hydrographical map of PETTERSSON and EKMAN.[1] The northern part of the North Sea, or above the 200 metre plateau, was poor in plankton or almost sterile, containing *Calanus finmarchicus* sparingly. Above the great depth between the 200 metre plateau and the west coast of Norway the water was extremely poor in plankton, containing however some rare specimens of a number of interesting radiolarians, *Ceratium arcticum* and *Coscinodiscus oculus iridis*.

In the spring of 1897, when chæto-plankton also prevailed above the 100 metre plateau, the area of this plankton type was bordered by a band containing arctic and northern forms. This was not the case in 1898. The southern part of the chæto-region, from Newcastle to Skagen, in 1898 contained *Coscinodiscus concinnus* more or less abundantly; and above the edge of the 50 metre plateau as well as above the Fisher Bank *Rhizosolenia styliformis* was met with, more or less sparingly to about 1° 30′ E. and also above the depression south of the Dogger Bank.

[1] Bih. till K. Sv. Vet.-Akad. Handl. Vol. XXV, II, N:o 1. 1899.

As no samples of plankton have been collected above the 50 metre plateau nothing is known about the plankton of the southern North Sea.

The *tripos-plankton*, prevalent during the past summer, autumn, and winter above the 100 metre plateau, occurred in March 1898 chiefly in the eastern part of the North Sea and west of the Danish Peninsula, and there more or less intermingled with chæto and northern neritic plankton: the last-named was present during the winter in the Skagerak.

Origin of the chæto-plankton. I propose in another paper to treat of the origin of the chæto-plankton, and it will there be shown that the diatom, *Chætoceros decipiens*, which constitutes the principal mass of the chæto-plankton, belongs to the west Atlantic area, or to the cold southwards current along the American coast, and that it is thence conveyed by under-currents across the Atlantic towards the Azores and the European coast. In the month of November, when the superficial strata of the Atlantic are driven away — or rather become mixed with those beneath — the species above-mentioned appears at many points between the Newfoundland Banks, the Azores and the mouth of the English Channel. It multiplies during the winter and is conveyed in the spring towards Iceland, the Färöe Channel and into the North Sea, whence it spreads towards Spitzbergen. Other species of the west Atlantic area, which accompany *Chætoceros decipiens* across the Atlantic, such as *Calanus finmarchicus*, *Thalassiothrix longissima* and *Ceratium arcticum*, die sooner or later in water of so high a salinity as 35 p. m.

Some species of the temperate Atlantic, such as *Oncæa minuta*, *O. conifera*, *Oithona plumifera*, *O. similis*, *Collozoum inerme*, frequently follow the chæto-plankton on its way towards the north.

Species which accompany the Chætoceros decipiens into the North Sea. The following species occurred in the North Sea over the whole chæto area or at least in its western parts. Some of them are of southern origin, or belong essentially to the *styli* and *desmo types*, others come from northern regions and from Scotland.

Species of southern origin	Species of northern origin
Acartia Clausii,	*Calanus finmarchicus*,
Microsetella atlantica,	*Metridia hibernica*,
Oithona similis,	*Pseudocalanus elongatus*,
Sagitta bipunctata,	*Temora longicornis*,
Globigerina bulloides,	*Cyttarocylis denticulata*,
Acanthometron quadrifolium,	*Gonyaulax spinifera*,
Halosphæra viridis.	*Chætoceros borealis var. Brightwellii*,
	Coscinodiscus oculus iridis,
	C. polychordus,
	Rhizosolenia semispina.

Biddulphia mobilensis and *Streptotheca Thamesis* come in all probability from the coasts of Scotland.

Among the species mentioned above, *Halosphæra* is not equally distributed over the whole chæto area. It could be traced from the south west of Norway to Newcastle and as far to the north as beyond the 63rd degree of latitude and 0° long.; also from the south of Norway to Skagen and into Skagerak.

2. The North Sea in June 1898.

The chæto-plankton of the spring has almost completely disappeared, some few remnants lingering west of the Danish Peninsula (at 56° N.) and west of Norway (61° N. 2° 30′ E.). Its place is now occupied by *tripos-plankton*, which is the ruling type at this time of the year. It is more richly represented in the eastern than in the western parts of the area.

To the east of the British coast the tripos-plankton is mixed with northern neritic forms, such as *Ceratium tripos v. longipes*, and at the west of the Danish Peninsula and north of the German coast with *Peridinium depressum*.

The southern part of the North Sea contains, north of the continental coast, southern neritic plankton, mixed with styli-plankton.

The hydrographical map for June 1898 by EKMAN and PETTERSSON shows in the north between Norway and Scotland a tongue of 35 p. m. water, temp. 9° to 10°. No samples of plankton from this area have been examined by me. One sample from 61° 50′ N. 2° 30′ E., which may be assumed to be from that kind of water, contained tripos-plankton, but not abundantly.

The bulk of tripos-plankton in my samples had come from the northern or eastern part of the region coloured as containing 34 p. m. water.

The hydrographical map in its south western corner shows an area of 35 p. m. water, indicating that a flow of Atlantic water enters into the North Sea from the south. This fact accounts for the considerable development of the southern neritic plankton above the 50 metre plateau.

Species which seem to come into the North Sea round the north of Scotland. As stated above there are among the plankton, some northern species east of the Scotch coast to Newcastle, such as *Ceratium longipes*. But, on the other hand, there are also in the western region of the North Sea some southern species. I name the following:

Northern forms	Southern forms
Calanus finmarchicus,	*Acartia Clausii*,
Evadne Nordmannii,	*Labidocera Wollastonii*,
Cyttarocylis gigantea.	*Evadne spinifera*,
	Ceratium macroceros,
	Lauderia annulata,
	Peridinium divergens.

In fact the tripos-plankton seems among the prevailing mass of southern origin to contain a certain amount of northern species.

Two remarkable species, *Halosphæra* and *Microsetella*, have disappeared from the North Sea since the spring.

Species in the southern neritic plankton. The flow of Atlantic water through the English Channel into the North Sea had already taken place before the month of June. This becomes apparent if we consider the plankton collected at Helder. *Phæocystis Pouchetii* was very abundant there in April and the beginning of May. It was seen in the beginning of April at Plymouth. When that species disappeared from Helder (before the 12th of May) a number of southern forms, such as *Noctiluca*, *Ceratulina Bergonii*, *Eucampia zodiacus*, *Guinardia flaccida* and *Rhizosolenia Stolterfothii* began to develop.

In June we find that the typical Atlantic species *Rhizosolenia styliformis* had spread over the whole area from Holland to Skagen, thus indicating that Atlantic water had arrived from the E. Channel before June and that its plankton had been dispersed through the water with low salinity off the continental coast. The following species of the southern neritic plankton occur normally in the open Atlantic:

Acurtia Clausii,
Paracalanus parvus,
Diplopsalis lenticula,
Rhizosolenia styliformis.

The following species live, as a rule, above the coast banks, or only occur exceptionally in the ocean:

Animals.	Plants.
Acartia longiremis,	*Chætoceros densus*,
Centropages hamatus,	*C. didymus*,
Temora longicornis,	*C. Villei*,
Podon Leuckartii,	*Eucampia zodiacus*,
Noctiluca miliaris.	*Guinardia flaccida*,
	Lauderia annulata,
	Rhizosolenia Shrubsolei,
	Rh. Stolterfothii,
	Stephanopyxis turgida.

Of these species the *Noctiluca* is the most important. It seems to be confined to the English Channel and the continental coasts of the North Sea. I have not seen a single specimen in any of the thousand plankton-samples from the Atlantic, which I have examined.

3. The North Sea in July—August 1898.

But few plankton-samples were collected at this period and those only from the eastern and southern parts of the North Sea, so that they cannot afford us a complete insight into the state of the North Sea.

The plankton-type which prevails in the east, i. e. from Skagen to 4° E. and 55° N., is the *tripos-plankton.* From the 55th degree to the English Channel southern neritic plankton is the ruling kind. The areas of the water with 33 to 34 p. m. salinity on the hydrographical map by PETTERSSON and EKMAN contain chiefly tripos-plankton, as far at least as the 55th degree of latitude, but south of it there is *southern neritic plankton*, which is also the case with the area with 34 to 35 p. m. salinity, north of the coast of Belgium.

Some species from the preceding period, such as *Oithona similis, Paracalanus parvus, Pseudocalanus elongatus, Ceratium macroceros* and *Guinardia flaccida* have evidently increased in abundancy, others, such as *Evadne Nordmannii, E. spinifera* and especially *Rhizosolenia styliformis* have decreased. *Podon intermedius* and *Oikopleura dioica* begin to develop.

4. The North Sea, November—December 1898.

The prevailing plankton type is the *tripos-plankton,* which extends from the north-east of Scotland to the south west of Norway and to Newcastle. From there the limit can be traced to 53° N. 4° E. and from this point to Skagen. The tripos area corresponds thus on the whole with the area of 35 p. m. water on the hydrographical map by EKMAN and PETTERSSON. As the salinity of the tripos region is higher now than it was in July—August, it is evident that a considerable amount of Atlantic water has entered the North Sea, which also becomes apparent when the composition of the plankton is considered in details.

We note first that the Atlantic organism *Halosphæra,* not seen since the spring, occurs now round Scotland, across the North Sea to Norway and Skagen, i. e. above the 100 metre plateau. The purely Atlantic species *Rhizosolenia styliformis* has about the same distribution. Another remarkable feature in the plankton is the abundance of *Coscinodiscus concinnus* and *Biddulphia mobilensis,* which occur in the E. Channel and spread thence to Skagen, i. e. above the 50 metre plateau.

Species of the tripos region in November. The tripos plankton contains the usual forms, such as *Ceratium tripos, C. macroceros* (which has considerably increased in frequency), *C. furca* and *C. fusus;* but there are besides a number of other forms, partly from the southern and partly from the northern Atlantic, as follows:

Southern species.

Centropages typicus c,
Microsetella atlantica,
Oithona plumifera rr,
Paracalanus parvus cc,
Acanthochiasma fusiforme,
Acanthometron quadrifolium,
Gazelletta hexanema (*r* south of the Orkneys),
Pyrophacus horologium.

Northern species.

Parathemisto oblivia,
Calanus finmarchicus,
Metridia hibernica r,
Pseudocalanus elongatus,
Limacina balea,
Plectophora arachnoides.

The *Evadne Nordmannii*, *E. spinifera*, *Podon intermedius* and *P. Leuckarti* abundant in the preceding periods, have now disappeared.

The southern neritic plankton. As characterizing the plankton above the 50 metre plateau we note now *Coscinodiscus concinnus* and *Biddulphia mobilensis*, but also a considerable number of other species, most of which have been found from the English Channel to Skagen. Among these species we note the following:

Animals.

Proto pedata, in the E. Channel in August, at Skagen in November.
Acartia bifilosa.
Corycæus anglicus.
Euterpe acutifrons, at Plymouth and Helder in September, from the E. Channel to Skagen in November.
Temora longicornis.
Sagitta bipunctata, very common above the whole 50 metre plateau.
Tintinnopsis campanula, from the English Channel to Skagen.

Plants.

Bellerochea malleus.
Chætoceros anastomosans.
Ditylum Brightwellii, abundant from the E. Channel to Skagen.
Guinardia flaccida.
Lithodesmium undulatum, observed from the end of September onwards.
Rhizosolenia robusta, from the English Channel to the mouth of the Schelde.
R. Stolterfothii, from the E. Channel to Skagen, where it appeared in the first few days of October.
Streptotheca Thamesis, from the E. Channel to 55° N. 5° 30′ E.

The Skagerak in 1898.

The seasonal changes in the plankton will be examined for certain periods with reference to the prevailing plankton-types.

Period I. January—February.

The prevailing plankton is tripos-plankton, but is partly mixed with remnants of southern neritic plankton, which disappear, and more or less rarely so with forms which belong to the northern neritic plankton and increase in frequency in the next period.

Besides the most common dinoflagellates of the tripos type, we note some more remarkable species such as *Halosphæra*, which was more or less common in the whole of the Skagerak, and *Arachnactis albida*, not formerly found in the Skagerak. The last-named species was seen during the last few days of January and the first few days of February both in the open Skagerak and along the coast from Vinga to Måseskär. This pelagic actinia is known from

Florö in Norway (winter-time), from 56° 35′ N. 20° 19′ W. (25th of September, C. VOGT), and from 60° N. 7° W. (the 29th of March 1893, VANHÖFFEN). In the year 1898 it was found by OSTENFELD in a sample from 60° 12′ N. 3° 53′ W. (21th of August) and from 59° 59′ N 5° 56′ W. (14th of September). I found it in a collection from 60° 10′ N. 3° 12′ W. (the 6th of September 1898) and from 62° 12′ N. 0° 37′ E. (the 8th of September 1899). The abundancy and sudden appearance of this species over a wide area of the Skagerak in 1898 proves better than anything else that the plankton of the Skagerak is of foreign origin. It is worthy of note that another species, not formerly observed in the Skagerak, was found at the same time viz. *Dictyocysta elegans*, a species that is not rare in the temperate Atlantic nor in the Färöe Channel.

Period II. February—March and April.

This period is characterized by the abundance of arctic and northern species (*Si*, *T*, *Ns*). They had already appeared in the previous period, but did not reach such a considerable development as now. In connection with these northern forms *Chætoceros decipiens* also appears, a species which, as stated above, was the dominant one in the North Sea in March.

The organisms which characterize this period are principally *diatoms*, animals and dinoflagellates being as a rule rare. The diatoms belong to the boreal and arctic regions of the Atlantic. Most of the southern species, which were abundant in the autumn, have disappeared or are scarce, among them *Halosphæra*.

The most decided arctic species, such as *Thalassiosira Nordenskiöldii*, *Chætoceros socialis*, continue during February only and have already disappeared by the middle of March. Others, such as *Chætoceros debilis*, *C. diadema*, *Nitzschia seriata*, continue during April. The most long-lived ones, such as *Thalassiothrix Frauenfeldii*, *Leptocylindrus danicus*, *Rhizosolenia semispina*, *Chætoceros constrictus*, *C. contortus*, *C. hiemalis* do not disappear before the end of May or in June, by which time a number of southern species have become frequent.

The most common diatoms during this period are the following:

Chætoceros constrictus,
C. contortus,
C. debilis,
C. decipiens,
C. diadema,
Chætoceros socialis,
Coscinodiscus oculus iridis,
Thalassiosira gravida,
T. Nordenskiöldii,
T. Frauenfeldii.

Period III. May and June.

This period is remarkable for the abundance of euryhaline species, such as the following:

Animals.	Plants.
* *Acartia longiremis*,	*Cerataulina Bergonii*,
* *Centropages hamatus*,	* *Chætoceros danicus*,

* *Temora longicornis,*
* *Evadne Nordmannii,*
* *Podon Leuckartii.*
Rhizosolenia delicatula,
R. gracillima.

The sign * denotes that species marked thus occur as far into the Baltic as at least to Åland.

Whether these forms are indigenous in the Baltic or enter there from the Cattegatt by means of undercurrents, cannot as yet be decided, as they usually appear simultaneously in the Baltic and along the west coast of Sweden. *Cerataulina Bergonii* comes no doubt through the E. Channel, but *Rhizosolenia gracillima*, although common in the styli-plankton of the Atlantic, does not occur to any extent in the North Sea. The new species *Rh. delicatula* occurs in the southern part of the North Sea.

In the Skagerak, at some distance from the coast, *tripos-plankton* occurs from the middle of May onwards, associated with some more saline or Atlantic species such as *Acartia Clausii, Calanus finmarchicus* and *Oithona similis* or euryhaline ones such as *Pseudocalanus elongatus* and *Evadne spinifera;* these become abundant along the coast during the next period.

Period IV. July to the end of August.

The prevailing plankton type is now *tripos-plankton*, but with an admixture of species remaining from the last period, and of *southern neritic plankton.*

Among the organisms we note the following:

Animals.
Oikopleura dioica,
Acartia Clausii,
Calanus finmarchicus,
Oithona similis.
Paracalanus parvus,
Evadne spinifera,
Sagitta bipunctata.

Plants.
Ceratium tripos,
C. macroceros,
Rhizosolenia gracillima.

Period V. From the end of August to the end of October.

The *tripos-plankton* continues as before, but now the *didymus-plankton* appears with the three species *Chætoceros curvisetus, C. didymus* and *C. Schüttii*, all at the same time and abundantly. From the beginning of September *Centropages typicus* was common and together with this copepod appeared also *Anomalocera Patersonii, Labidocera Wollastonii, Acanthometron quadrifolium* and *Limacina balea*, all probably, with the exception perhaps of Labidocera, from the North of Scotland.

Period VI. From the end of October to the end of December.

The *tripos-plankton* remains throughout, but in this period *Halosphæra* appears. A number of *northern forms* begin to develöp, and the southern species, formerly so abundant, decrease in frequency and die sooner or later. The currents from the south still continue

to convey into the Skagerak such forms as *Chætoceros danicus, Ditylum Brightwellii, Guinardia flaccida* and *Proto pedata,* which latter is not rare in December.

The northern forms are principally diatoms, such as:

Chætoceros borealis,	*Chætoceros similis,*
C. constrictus,	*C. teres,*
C. contortus,	*Coscinodiscus polychordus,*
C. debilis,	*Rhizosolenia setigera,*
C. diadema,	*Skeletonema costatum,*
C. laciniosus,	*Thalassiosira gelatinosa,*
C. scolopendra,	*Thalassiothrix Frauenfeldii.*

The seasonal changes in the plankton of the Skagerak were in 1898 *on the whole* similar to those in 1895, 1896 and 1897.

January	*Tp, Ns, Nh,*
February—April	*Si, Ns, (T), C,*
May, June	*Nm α,*[1]
July, August	*Tp, Nm α,*
September, October . . .	*Tp, Nm,*
November, December . .	*Tp, Ns, Nm.*

Seasonal distribution of the plankton-organisms in the North Sea and the Skagerak.

Ascidiacea.

Fritillaria borealis LOHM. — *January:* rare in the Skagerak. *March:* rare at Måseskär.

Oikopleura dioica FOL. — *January:* rare in the Skagerak and at Måseskär. *March:* in the North Sea at 57° 18′ N. 8° 27′ E. and 55° 43′ N. 7° 29′ E. *June:* sparingly in the Skagerak. *July, August:* from the E. Channel to west of Skagen, common in the Skagerak and along the coast, remains more or less abundant to *November.*

Amphipoda.

Parathemisto oblivia KRÖYER. — *September:* rare in the Skagerak. *November:* rare SW. of Norway (58° 12′ N. 5° 30′ E.).

[1] I propose to designate as *Nm α* the plankton in which *Rhizosolenia gracillima* occurs abundantly.

Proto pedata LEACH. — *January* and *February* (31. I and 1. II): rare in the Skagerak. *August:* from the E. Channel to Helder. *November:* north of Holland and west of the Danish Peninsula, west coast of Sweden, where it was abundant in *December*.

Cladocera.

Evadne Nordmannii LOVÉN. — *May:* at Måseskär. *June:* common in the North Sea, between 56° and 58° N., from W. Norway to 0° 38′ E. and to Skagen, common in the Skagerak, where it remains until *August*. Along the coast it remains in *October*. Rare at Plymouth from July to September.

E. spinifera P. E. MÜLLER. — Appears in *June* abundantly in the region between Firth of Tay and W. Norway (Stadt) and Skagen, in the Skagerack and along the coast. In *July*, *August* it was found from Skagen to the west of the Danish peninsula. In the Skagerak it remains until *October* and along the coast until the middle of *November*. At Plymouth rare in August.

Podon Leuckarti G. O. SARS. — *June:* rare west of the Danish Peninsula and in the Skagerak. *July:* rare at the entrance to the Skagerak.

P. intermedius LILLJEB. — *July*, *August:* more or less abundant west of the Danish Peninsula, from the mouth of Elbe to Skagen, rare at Plymouth, more or less rare in the Skagerak, where it remains until *October*, or along the coast to the end of that month.

P. polyphemoides LEACH. — Rare in August and September at Helder.

Copepoda.

Acartia bifilosa GIESBR. — *November:* from the E. Channel to Holland and the west of Skagen.

A. Clausii GIESBR. — The whole year in the North Sea, in the Skagerak and at Plymouth. *January to April or May:* rare at Plymouth and in the Skagerak. *March:* in the North Sea, together with *Halosphæra*, common between the Shetlands and Norway. West and south of Norway. South of the Dogger bank. East of Newcastle. *June:* British east coast from Firth of Tay to Newcastle, common. From Holland to Heligoland. Plymouth (maximum from the middle of May to the beginning of September). St. Vaast la Hogue not rare. In the Skagerak not rare from the end of May or beginning of June to October, November (maximum from the middle of August to the end of that month). *July*, *August:* from the Channel to Skagen and above the Fisher Bank. *November:* the E. Channel, Helder, Skagen to the south of Norway. South of the Orkneys.

A. longiremis LILLJEB. — In the North Sea in *March* SW. of Norway and E. of Newcastle, in *June* abundantly in the middle of the North Sea, 57° N. 3° E. and at

54° N. 5° E. *July:* Dutch coast and along the Danish coast to Skagen, not common. *November:* not seen. In Skagerak common in the beginning of June, more or less common in July, along the coast the whole year (maximum June, July).

Anomalocera Patersonii TEMPL. — *March:* Sparingly west of the Clyde. — Skagerak: more or less rare in *July* and in the beginning of *October*. Along the coast: rare the 30. I at Måseskär; from *July* to the beginning of *November*, rare to common.

Calanus finmarchicus GUNN. — A. North Sea: *March* scattered on the space between Stavanger and the Fisher Bank, Firth of Tay and Newcastle, also above the depression S. of the Dogger Bank. *June:* sparingly between Norway and the Shetlands, W. of Firth of Tay and Newcastle, N. of the Dutch coast, S. of Norway. *July, August:* sparingly N. of Holland and at Skagen. *November:* more or less abundant from the Hebrides and the Orkneys to the south of Norway, in the company of *Halosphæra*. Very rare off the continental coast.

B. Plymouth: rare from the end of *May* to the middle of *July* and from the end of *September* to the middle of *November*.

C. Skagerak: common in the middle of *June*, more or less rare until the middle of *November*. Along the coast: rare in *January* and *February*, more or less common from *August* to *December*.

Candace pectinata BRADY. — North Sea: rare in *March* east of Firth of Tay; very rare at Skagen in *November*.

Centropages hamatus LILLJEB. — North Sea: *March* sparingly SW. of Norway and W. of Hanstholm. *June:* not rare on the Dutch coast, together with *Noctiluca*, not rare on the north of the Dogger and Fisher Banks. *July:* not rare N. of the Dutch coast and above the Fisher Bank. *November:* the Channel. — Helder: rare in April and from *August* to *October*. — St. Vaast la Hogue: rare in June. — Skagerak: from *March* to *November;* along the coast from *March* to *November, December*, maximum in June and November.

C. typicus KRÖYER. — A. North Sea: *March:* rare at 57° 21′ N. 2° 27′ E. *June:* rare at 61° 50′ N. 2° 30′ E. *July:* rare at 57° 21′ N. 4° 9′ E. and 57° 40′ N. 10° E. *November:* abundant from the NE. end of Scotland to southern Norway, following *Calanus finmarchicus*, very rare in the E. Channel, rare at Helder in December.

B. Plymouth: the whole year, maximum from May to November.

C. Skagerak: rare in *January* (30. I), more or less abundant from *October* to the middle of *November*. Along the coast: rare in *January* and *June*, more or less abundant from the middle of *July* to *December*, maximum in September and October.

Corycæus anglicus LUBBOCK. — A. North Sea: *March:* rare in the E. Channel and at Hanstholm. *June:* not seen. *July:* very rare W. of the Danish Peninsula. *November:* from the E. Channel along the south coast of the North Sea to Skagen.

B. Plymouth: almost the whole year, maximum from the end of September to the middle of December.

C. Skagerak: rare in January, February, from June to December.

Euterpe acutifrons GIESBR. — The E. Channel: rare at Plymouth in January to March; common in September—December at Plymouth, St Vaast and Helder.

Labidocera Wollastonii LUBB. — Rare in the North Sea, *June*, at 56° N. 2° E. Skagerak: rare in *June;* along the coast not rare in *September*, *October*.

Metridia hibernica BRADY & ROBTS. — North Sea: *March:* rare from Firth of Tay to 57° 21′ N. 2° 27′ E. *June:* rare at 56° 26′ N. 4° 13′ E. *November:* not rare SW. of Hanstholm. Skagerak: rare in January and in July. Along the coast rare in January, June, not rare in *November*, *December*.

Microsetella atlantica BRADY & ROBTS. — North Sea: *March:* abundant east of Firth of Tay, more or less sparingly scattered through the chæto-region to Skagen. Also above the depression S. of the Dogger Bank. *August:* rare SW. of Norway and W. of Jutland. *November:* rare W. of the Danish Peninsula to Skagen. E. of Newcastle. — Plymouth rare in February. Skagerak: rare in July and in October.

Oithona plumifera BAIRD. — *March:* rare N. of the Shetlands. At 61° 32′ N. 2° 31′ E. *November:* at 56° 11′ N. 2° 31′ E. Skagerak: very rare in January.

O. similis CLAUS. — A. North Sea: *March:* abundant between the Shetlands and Norway, E. of Firth of Tay, more or less sparingly scattered in the whole chæto-region. Not rare W. of Denmark at 55° N. *June:* common between the Shetlands and Norway, more or less common from the Firth of Tay to Skagen. Common at 54° 25′ N. 5° 37′ E. *July*, *August:* more or less abundant above the Fisher Bank and from the E. Channel to Skagen. *November:* the same distribution, but rarer. — B. The E. Channel: Plymouth the whole year. St Vaast in November. — Helder from August to November. — C. Skagerak: the whole year, rare June, very common from July to December.

Paracalanus parvus CLAUS. — A. North Sea: *March:* not seen. *June:* rare from the E. Channel to the north of Holland. *July*, *August:* abundant from the E. Channel along the south coast to the Fisher Bank and Skagen. *November:* as before, but also from the north of Scotland to the south of Norway. — B. Plymouth: the whole year, maximum from August to December. C. Skagerak: very rare in January, February, abundant from July to October, November.

Pseudocalanus elongatus BOECK. — A. North Sea: *March:* more or less abundant through the *chæto-region*, from Firth of Tay and Newcastle to Skagen, also above the depression S. of the Dogger Bank. *June:* decidedly rarer, chiefly on the 50 metre plateau, common near the E. Channel. *July*, *August:* above the Fisher Bank, common above the depression S. of the Dogger Bank. *November:* continues above the 50 metre plateau. From

Scotland to the south of Norway and Skagen, in the company of *Halosphæra*. — B. The E. Channel: at Plymouth from January to August, as a rule rare, at St Vaast in June. — C. Skagerak: the whole year, maximum from June to October.

Temora longicornis O. F. Müll. — A. North Sea. *March:* more or less abundant through the *chæto-region*, from Scotland to the Skagerak, above the Fisher Bank and the depression S. of the Dogger Bank. *June, July, August:* from 0° 38′ E. along 56°—57° to Skagerak. South part of the North Sea to the E. Channel. *November:* abundant from the S. of Norway to the Fisher Bank. Southern North Sea. — B. The E. Channel: at Plymouth from February to November, maximum from April to the middle of May. St. Vaast in June and rare in November, December. — C. Skagerak: the whole year, maximum from June to October.

Temorella affinis Poppe. — At Måseskär rare at the end of May, common in November.

Chætognata.

Sagitta bipunctata Quoi & Gaim. — A. North Sea. *March:* through the *chæto-region*, between Firth of Tay, Newcastle and the Fisher Bank. *June:* rare above the Fisher Bank. *July:* rare above the Fisher Bank and in the E. Channel. *November:* very abundant above the Fisher Bank, on the edge of which it seems to have its optimum; thence to the south of Norway. Above the whole 50 metre plateau. B. The E. Channel: more or less common at Plymouth from September to November. — C. The Skagerak: the whole year, abundant from June to November, or, along the coast, to the end of the year.

Pteropoda.

Limacina balea Möller. — A. North Sea: *November:* W. of Hanstholm to 57° N. 3° E. — B. The Skagerak: very common in September, rare in October, common in November (30. XI.).

Zoantharia.

Arachnachtis albida M. Sars. — See page 8.

Ciliata.

Cyttarocylis denticulata Ehb. *s. l.* — The difficulty of distinguishing between the new, nearly related, species of Brandt and Ostenfeld has induced me to retain the old name. All the new species are nearly connected and have the same distribution, or belong exclusively to the western and northern Atlantic and to the Arctic Sea.

North Sea: *March:* rare on some spots in the chæto-region. *June:* common between the Shetlands and Norway. — The Skagerak: rare from January to May; rare in December.

Cyttarocylis Claparedii v. DADAY. — As constituting this species I consider the form given in fig. 1. — Rare in September at Plymouth and Helder.

Dictyocysta elegans EHB. — Rare in *March* at 61° 32′ N. 2° 13′ E. and the 31. 1. in the Skagerak.

Ptychocylis acuta BRANDT (or *Tintinnus urnula* AUCT.). — North Sea: *March:* between the south of Norway and Skagen, rare. *November:* rare E. of Newcastle. — Skagerak: rare from January to March, not rare in *November* and *December*.

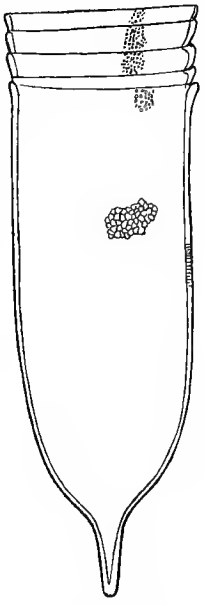

Fig. 1. *Cyttarocylis Claparèdii* v. DAD. 225 t. m.

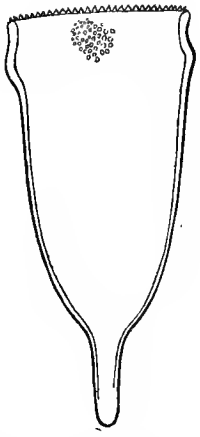

Fig. 2. *Ptychocylis Ehrenbergii* CLAP. & LACHM. 225 t. m.

P. Ehrenbergii CL. & LACHM.? — I am unable to decide what form is represented by the published figures. I believe the annexed fig. 2 represents what is understood as *Tintinnus Ehrenbergii*, but it may perhaps also represent what some authors name *Tint. serratus*. In all cases what I here name P. Ehrenbergii is an easily recognized neritic species. It occurs abundantly in August and September at Plymouth, and from September to December sparingly at Helder.

T. beroidea var. acuminata v. DADAY. — North Sea: rare in March at 55° N. 6° W. Helder: rare in June, more or less scarce from September to December. The E. Channel: Plymouth: rare in February to April, less rare in November, December. S:t Vaast: not rare in August, rare in December. The Skagerak: rare in January, April and May, November and December.

Tintinnopsis campanula EHB., in which species I include *T. campanella* v. DADAY and *T. cinctus* CL. & LACHM., which seem to me to be the young states only. *T. campanella* HKL. is perhaps another species.

North Sea. *July:* rare west of the Danish Peninsula. *November:* not rare on the coast, north of Holland and Germany. — The E. Channel. Plymouth: more or less scarce in August and September. S:t Vaast: rare in August, common in September, rare in November. — Helder: rare in July, not rare in September, rare in October and November. — The Skagerak: from July increasing in abundancy until November.

T. fistularis Moebius (= *T. Helix* Clap. & Lachm.?), — As representing this species I consider the annexed (fig. 3). The membrane is finely and irregularly punctate and the rings variable in height and number. It occurs at the end of October in the Skagerak and at Måseskär.

T. ventricosa Clap. & Lachm. — The E. Channel in November. Plymouth: rare in January and March. S:t Vaast la Hogue from August to December, maximum in September. — Helder: August to November, maximum in September. — The Skagerak: rare in January and in March, maximum in October, November.

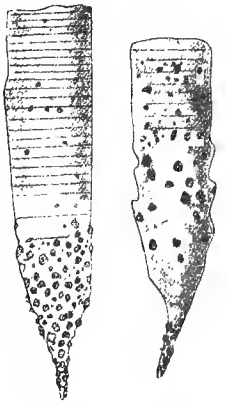

Fig. 3. *Tintinnopsis fistularis* Moeb. 225 t. m.

Fig. 4. *Tintinnopsis Lobiancoi* v. Dad. 225 t. m.

T. Lobiancoi v. Dad. — I suppose the annexed fig. (4) may represent this species, but have some doubts whether it may not be *T. Karajacensis* Brandt. It was found rarely at Helder in August and September, both in 1897 and 1898.

Tintinnus minutus Brandt. — This arctic form was seen sparingly in June, east of Stadt in Norway.

T. secatus Brandt. — The Skagerak: very rare in January and in November, December.

T. Steenstrupii Cl. & Lachm. — The Skagerak from October to December.

T. subulatus Ehrb. — The Skagerak from August to November.

Radiolaria.

Acanthochiasma fusiforme Hkl. — Rare in *November:* NE. of Scotland and E. of Newcastle. In the SW. of Norway. — Plymouth: rare in January, common in August, rare in October. — The Skagerak: very rare in December.

Acanthonia Mülleri Hkl. — North Sea very rare in November between Scotland and the Orkneys.

Acanthometron fuscum Müll. — Very rare in the Skagerak, January (31st) and February (1st).

A. elasticum Hkl. — Very rare in June W. of Stadt in Norway.

A. quadrifolium Hkl. (incl. *A. catervatum* and *Acanthostauros pallidus*). — North Sea: *March:* in the company of *Halosphæra* not rare in several spots from the N. and E. of Scotland to the W. of Norway (63° 1′ N. 1° 36′ E.) and in the chæto region to the Skagerak. Also above the depression south of Dogger bank. November: rare, together with Halosphæra, from the N. of Scotland to the S. of Norway and the Skagerak. — The Skagerak: rare in September, October.

Dictyocha fibula Ehb. — Plymouth: rare in August. In November rare W. of Jutland. The Skagerak: rare in January and in November, December.

Gazelletta hexanema Hkl. — In November very rare S. of the Orkneys.

Litholophus ligurinus Hkl. — Very rare W. of Stadt (Norway) in June.

Plectophora arachnoides (Clap & Lachm.). — *March:* rare at Skagen. *November:* rare N. of Scotland and above the Fisher Bank. — The Skagerak, very rare in January, February.

Rhizopoda.

Globigerina bulloides d'Orb. — Rare in March at 58° 21′ N. 1° 40′ E. and at 58° 40′ N. 4° 18′ E.

Cystoflagellata.

Noctiluca miliaris Surir. — The E. Channel: at Plymouth common from the end of June to the end of July, rare in September, common from October to December. Southern North Sea: abundant in *June* from the E. Channel to the NW. of Heligoland. *July* to *September:* common from the E. Channel to the coast of Holland, rare from September to November. The Skagerak, rare in December.

Silicoflagellata.

Distephanus speculum (EHB). — Rare in *March* at the Fisher Bank, in *August* at Plymouth and in *November* in the E. Channel, at Helder and west of the Danish Peninsula. Rare in the Skagerak in *October* and *November*.

Chlorophyllaceæ.

Halosphæra viridis SCHMITZ. — A. The North Sea: abundant in *March* from 63° N. 1° 30′ E. to Stavanger, sparingly from Stavanger to Skagen and to Newcastle. *November:* at the Hebrides. Between the N. of Scotland, Newcastle and Skagen. — B. The E. Channel: rare in August and September at Plymouth. — C. The Skagerak: in *January, February* and *November, December*.

Dinoflagellatæ.

Ceratium furca DUJ. — North Sea: follows as a rule C. tripos, but rarer. The Skagerak: common in *January*, more or less rare the whole year.

C. fusus DUJ. — North Sea: follows C. tripos but rarer. The Skagerak: the whole year, seems to be more abundant from August to the end of the year. — Plymouth: the whole year, maximum in *April*.

C. lineatum EHB. The Skagerak: rare almost the whole year, maximum probably from *August* to *November*.

C. macroceros EHB. — A. The North Sea. *March:* more or less rare in the chæto region from Scotland to Norway and Skagen. *June:* common W. of Skagen to half way between Skagen and Newcastle. Not rare E. of Firth of Tay. *July, August:* very common W. of Skagen and the Danish Peninsula. *November:* very rare W. of Scotland, common from the S. of the Orkneys towards Newcastle and to 53° N. 4′ E., thence to Skagen and S. Norway. — B. The Skagerak: more or less rare until July, later common until the end of the year.

C. tripos NITZSCH. — A. The North Sea. *March:* common in the eastern part, SW. of Norway, W. of Skagen and the Danish Peninsula towards 55° N. Common also at 53° 26′ N. 3° 57′ E. *June:* from Skagen to 1° E., between 56° 30′ and 57° 30′ N. *July, August:* from Skagen to 57° N. 4° E. and to 55° 30′ N. 7° 30′ E. (no observations from the western North Sea). *November:* the whole North Sea from Scotland to Norway, Skagen and to 53° N. 4° E. — B. The E. Channel: the whole year at Plymouth, maximum from *July* to *December*. — C. The Skagerak: common in *January*, then rare to *June*, common from *July* to the end of the year.

C. tripos var. longipes BAIL. — A. The North Sea. *March:* more or less scattered over the *chæto region*, from Scotland to Norway, Skagen and the W. of the Danish Peninsula. *June:* abundant W. of the Hebrides, E. of Firth of Tay (56° 30′ N. 0° 38′ E.) and at 55° 25′ N. 0° 8′ E., less abundant W. of Skagen and above the Fisher Bank. *July, August:* sparingly W. of the Danish Peninsula (observations incomplete). *November:* almost absent from the North Sea, but common at Helder in November and December. — B. In the E. Channel: at Plymouth rare in March, April, not rare in June, July and in December. — C. In the Skagerak: as a rule rare from January to June and from September to the end of the year.

C. tripos v. bucephala CL. A. In the North Sea: rare in *March* on some spots (at 57° N. 6° E., 56° N. 1° E. and 55° N. 1° E.), not seen in June and August. In *November* not rare, sometimes common, round Scotland and between Scotland, Norway and Skagen, rare at 53° N. 4° E. and 55° N. 5° 30′ E. — In the Skagerak rare in January and from *August* to *December*.

C. platycorne v. DADAY (= *C. trip. v. aurita* CL.). — Very rare in November at Plymouth (drifted from the region of the Azores).

Dinophysis acuta EHRB. — In the North Sea as a rule rare, in *March* and *June* at some spots in the eastern region, in *November* at several points between Newcastle and Skagen. In the Skagerak rare from January to March, in June and July and from October to the end of the year.

Diplopsalis lenticula BERGH. — In *June* rare N. of Holland, in November E. of Scotland. At Plymouth rare from January to August. In the Skagerak rare in July and in October.

Gonyaulax spinifera CLAP. & LACHM. — Rare in March in the North Sea (at 56° N. 0° and 55° N. 1° W.). In the Skagerak common in January, not rare in November, December.

Peridinium depressum BAIL. — A. In the North Sea more or less rare in *June* in the eastern part, common NW. of Heligoland and W. of Skagen. In *July, August*, more or less common N. of Holland and on the Fisher Bank. In *November* more or less rare at several points between the N. of Scotland, S. Norway and Skagen. In the Skagerak more or less rare from January to June, less rare in October, December.

P. divergens EHB. — In the North Sea as a rule rare among the tripos-plankton. In the Skagerak rare in January, less rare from July to October.

P. Michaëlis EHB. — Rare in April at Plymouth, in June W. of Schleswig, in October at Måseskär.

P. oblongum AURIV. (= *P. diverg. v. obl.* AUR. and *P. div. v. oceanica* VANH. OSTENF.). Rare in June in the E. Channel at S:t Vaast, in July at Helder, in the Skagerak and at Måseskär.

P. ovatum POUCHET. — Rare in January off the Swedish west coast, in June W. of Cape Stadt and in the E. Channel, in July in the Skagerak, in August at Plymouth, September to November at Helder.

Pyrophacus horologium STEIN. — In *March* at 53° N. 4° E., in *April* very rare at Plymouth, in *June* NW. of Hanstholm, in *November* S. of the Orkneys, ENE. of Newcastle (55° 35′ N. 0° 34′ E.) and at 56° N. 9° E.

Pyrophacus horologium belongs to the tropical Atlantic (also the Indian Ocean) or to the desmo- and styli-plankton, where it has considerably greater size than in the North Sea, when among the tripos-plankton.

Flagellatæ.

Phæocystis Pouchetii LAGERH. — At Helder very abundant in April and May, rare in June, common in August and not rare in October. — At S:t Vaast la Hogue common in June, also in December. — At Plymouth common from the beginning of April to the beginning of June, rare in September.

Cystæ.

Xanthidium Hystrix CL. — Rare in the Skagerak in March, October and November.

By the above name I denote an organism, which belongs to the tripos-plankton and seems to be nearly akin to *X. brachiolatum* MOEBIUS, from which it differs by longer, usually not divided, spines. Probably a stage in the development of some dinoflagellate.

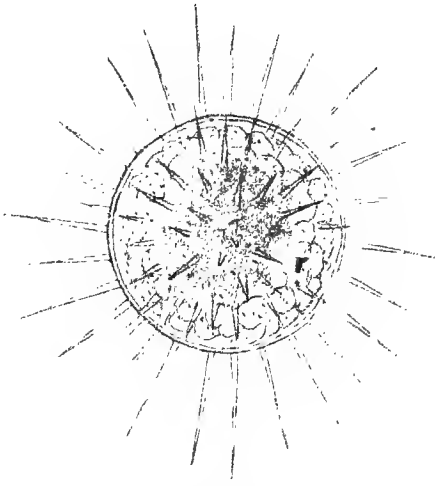

Fig. 5. *Xanthidium hystrix* CL. 500 t m.

X. multispinosum MOEBIUS. — In April at Måseskär, in June at Plymouth, in July at Måseskär, September, October in the Skagerak, always rare.

Hexasterias problematica Cl. — By this name I denote provisionally a unicellular alga, which I have found in several collections. It is a flat disc, diameter 0,04 mm., with six, at the ends truncate and denticulate empty processes, twice as long as the radius of the disc. Having seen only specimens preserved in spirit I am unable to decide whether the chromatophores are yellow or green.

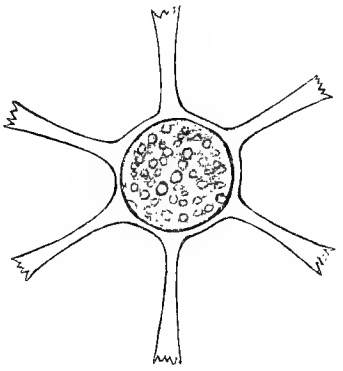

Fig. 6. *Hexasterias problematica* Cl. 500 t. m.

Habitat: Helder, rare in December. Outside the North Sea at the following points: Iceland (Westmannaö 26. X. 98), the Färöes (23. VII. 98), at 51° N. 2° 5′ W. (14. XI. 98), at 66° 30′ N. 22° 30′ W. (29. V. 99) and at 61° 37′ N. 6° 40′ W. (20. V. 99).

Diatomaceæ.

Asterionella japonica Cl. (in Cl. & Möll. Diat. N:o 307, 1882. *A. glacialis* Ostenf. probably Castrac. 1886 *A. spathulifera* Cl.). — At Plymouth in March and April, rather rare in September. Very rare in the Skagerak on the 31st of January.

Asteromphalus heptactis Ralfs. — Very rare in March at 63° 1′ N. 1° 36′ E.

Bacteriastrum delicatulum Cl. — Very rare in June W. of Stadt in Norway.

B. varians Lauder. — In March at Plymouth, in July, August NW. of Heligoland. At Helder common in August, September, rare in October. At S:t Vaast la Hogue more or less sparingly in November, December.

Bellerochea malleus Btw. — In March very rare W. of Jutland (55° 43′ N. 7° 29′ E.). In November at S:t Vaast la Hogue, from the Channel to the coasts of Holland, at Helder and in the Skagerak.

Biddulphia aurita Lyngb. — In *March* on the whole sparingly round the south coast of Norway, at Skagen, on the Fisher Bank and above the depression S. of the Dogger Bank. — At Helder rare in February. In the Skagerak from January to March. In November common at Helder, rarer in the Skagerak and at S:t Vaast la Hogue.

B. mobilensis BAIL. — A. In the North Sea, in *March* more or less abundant round Scotland, between the Shetlands and Cape Stadt, above the Fisher Bank. Common above the depression S. of Dogger Bank. In *November* common from the E. Channel to the W. of Jutland. — B. In the E. Channel at Plymouth more or less abundant from January to April, rarer in October—December, at S:t Vaast la Hogue rare in November. — C. In the Skagerak in January and in October—December.

Cerataulina Bergonii H. PER. — A. In the North Sea rare in March about 57° N. 6° E., rare in June at about 62° N. 2° 30′ E. and 57° N. 9° E. — B. In the E. Channel rare at Plymouth in March, less rare in April and June, rare in November at; S:t Vaast la Hogue rare from June to August. — C. At Helder more or less common from the end of April to the beginning of June, rare in November. — D. In the Skagerak rare in January, more or less common from June to the end of the year, maximum in June and in October.

Chætoceros anastomosans GRUN. — Very rare in August at Helder, in the Skagerak in October.

C. atlanticus CL. — In *March* rare at some spots SW. of Norway and W. of Jutland, in *June* rare W. of Cape Stadt and mid-way between Scotland and Norway.

C. borealis BTW. — A. In the North Sea rare and scattered in *March* through the chæto region, maximum at 57° N. 6° E. In *June* E. of Firth of Tay abundant; less common W. of Jütland. — B. In the Skagerak more or less rare from January to June, more abundant from October to December.

Var. Brightwellii CL. — In the North Sea rare in *March* at some spots in the chæto region from 56° N. 4° E. to Skagen. In the Skagerak rare from January to March and in November.

C. constrictus GRAN. — In *March* common at Skagen and on some points S. of Norway, rare at Plymouth. — In the Skagerak from January to June, maximum in *March*, at Måseskär from March to the middle of June. More or less common in *October, November.*

C. contortus SCHÜTT. — More or less sparingly in July, August at S:t Vaast la Hogue, in September at Helder, in the Skagerak from the end of August to December, and from January to June, maximum in *March* and *June.*

C. coronatus GRAN. — Rare in August at Helder, in the Skagerak in October and November.

C. criophilus CASTR. — Rare in March on some spots SW. of Norway, in January in the Skagerak.

C. curvisetus Cl. — In the North Sea: more or less sparingly in *March* SW. of Norway, at Skagen and W. of Jutland, in *November* rare W. of Jutland. — In the E. Channel at Plymouth more or less common in *March*, very abundant in August, September, at S:t Vaast la Hogue very abundant in October, November, at Helder rare in September. — In the Skagerak more or less rare from January to April, very common from August to November.

C. densus Cl. (= *C. borealis v. densa* Cl.). — In *March* not rare on the Fisher Bank. In *June* E. of Firth of Tay and more or less abundant from the mouth of the Schelde to Schleswig. At Helder rare in June and not rare from August to December. In the E. Channel at Plymouth more or less abundant from the end of March to the end of April, common in July, August, rarer in September. S:t Vaast la Hogue in June and from October to December. In the Skagerak rare in the beginning of October.

C. danicus Cl. — In the E. Channel at S:t Vaast la Hogue rare in July, at Plymouth not rare in September. At Helder in November and December. In the Skagerak from March to June, maximum in *June*, and from the end of *October* to *December*.

C. debilis Cl. — In the North Sea in *March* SW. and S. of Norway, common at Skagen, in *June* E. of Firth of Tay. — At Plymouth rare in April, at Helder common from October to December. — In the Skagerak in *January* to *June* (maximum in *March*), rarer in October, November.

C. decipiens Cl. — A. In the North Sea. In *March* from Skagen to the W. of Stavanger and 58° N. 1° 30′ E., along 55°—56° N. from the Danish Peninsula to the E. of Firth of Tay and Newcastle. At the spot 53° 30′ N. 3° 40′ E. In *June* at one spot between Norway and the Shetlands. West of Jutland 66° N., in *November* very sparingly from the E. Channel to Jutland. — B. In the E. Channel at Plymouth more or less sparingly from January to March, common in October, November, later rare. At S:t Vaast la Hogue very abundant in June, rare in October and December. — In the Skagerak January to June (very abundant in *March*), more or less rare in October, November.

C. diadema Ehb. — Rare in *March* SW. of Norway. At Plymouth rare at the end of September, at Helder rare in December. In the Skagerak from January to May (abundant in *March*) and very common in *November*.

C. didymus Ehb. — A. In the North Sea in *March* rare along the SW. and S. coast of Norway, at Skagen and W. of Jutland. In *June* NW. of Heligoland. In *November* very rare from the E. Channel to the W. of Jutland. At Helder rare from August to the end of November. — B. In the E. Channel: at Plymouth rare in March and in October, common in November. At S:t Vaast la Hogue common in June and July, rare in August, more or less sparingly from the end of October to the end of December. — In the Skagerak rare from January to March, more or less abundant from the end of August to December, maximum *September*, *October*.

[**C. Granii** CL., mentioned in my paper »Plankton Researches in 1897», was not seen in 1898. This species, represented in the annexed figg. 7 and 8, forms loose chains of rectangular, thin-walled cellules (longit.: sagittal axis = 1 : 2). Foramina large, elongate hexagonal, smaller than the cellules. Awns arising from the angles of the cellules, sagittal and obliquely transverse. Their basal part $^1/_3$ as long as the longitudinal axis. The cellcontents seem to contain one parietal plate. Endocysts biconvex, in transverse sagittal section elliptical, covered with numerous simple spines. Sagittal axis 0,013 to 0,015 mm. — Måseskär in March 1897.]

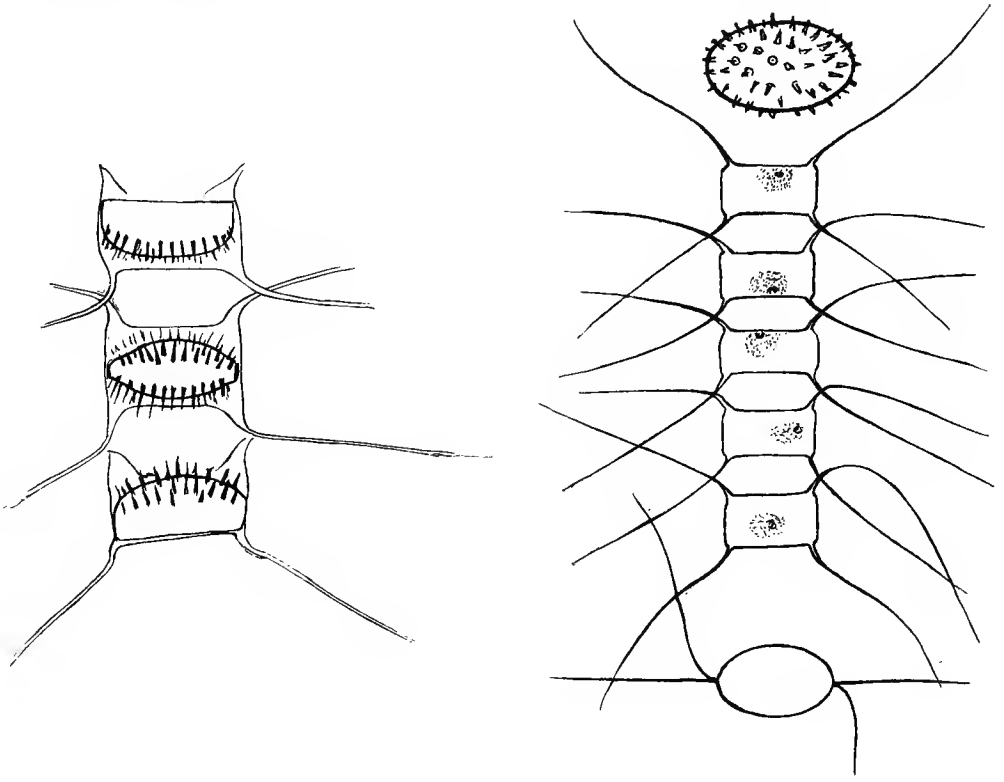

Fig. 7, 8. *Chætoceros Granii* CL. 1000 t. m.

C. hiemalis CL. — In June rare E. of Firth of Tay and common W. of Skagen. In the Skagerak from the end of March to June more or less abundant, and in October, November.

The annexed fig. 9 represents the endocysts 500 t. magnified. They resemble those of *C. laciniosus.*

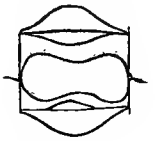

Fig. 9.

C. laciniosus SCHÜTT. — Rare in the Skagerak, January—March, less rare in *November.*

C. Schüttii CL. follows as a rule *C. curvisetus* and *C. didymus.* — A. In the North Sea rare in *March* at the Fisher Bank, in *June* W. of Cape Stadt, in *November*

W. of Jutland. — B. In the E. Channel at Plymouth rare in February, March, abundant in *July*, *August* and in *November*. At S:t Vaast la Hogue rare in August. — C. At Helder rare from the end of September to the end of October. — D. In the Skagerak rare in January, common from October to the middle of *November* (maximum in the beginning of November) or along the coast from the end of August (maximum in *September*).

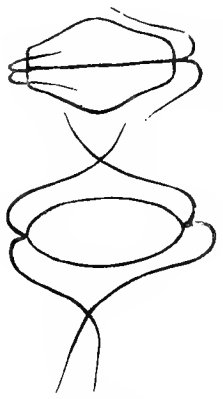

Fig. 10.

C. scolopendra Cl. — In *March* rare SW. of Norway and midway between Skagen and Scotland. — At Helder rare at the end of September. In the Skagerak rare from January to April and in November.

The annexed fig. 10 represents the endocyst, 1000 t. m.

C. seiracanthus Gran. — Rare in the Skagerak, at the end of October.

C. septentrionalis Oestr. — Rare in the Skagerak in March.

C. similis Cl. — Rare in the Skagerak in March and in November.

C. socialis Lauder. — Rare from January to March in the Skagerak, in March on the Fisher Bank.

C. subtilis Cl. — Rare in March in the Skagerak.

C. teres Cl. — In the North Sea rare in March SW. of Norway, at Skagen, on the Fisher Bank and at 56° 34′ N. 2° 20′ E. — At S:t Vaast la Hogue rare in June (appeared again in January 1899). — In the Skagerak from January to March and in *November*, usually rare.

C. Weissflogii Schütt. — In the Skagerak in September, on the 3rd of that month common at Måseskär.

C. Villei Gran. — Rare in June at Helder.

Corethron hystrix Hensen. — Rare in June W. of Cape Stadt.

Coscinodiscus concinnus W. Sm. — A. In the North Sea found abundantly in *March* from Skagen along the Danish coast to 55° N. More or less sparingly from the Danish Peninsula, along 56° N., towards Edinburgh and Newcastle. *June* to *August* rare in some spots. In *November* common from the E. Channel to Skagen and from Skagen along 56°—57° N. to 4° E. — B. In the E. Channel at Plymouth common from January to May and from the end of September to the middle of December. — C. At Helder rare in January, February, more or less common from the end of September to the end of December. — D. In the Skagerak more or less sparingly from January to March and from the end of August to December (maximum in *December*).

C. excentricus EHB. — In *November* more or less rare in the SE. region. At Helder rare in January, not rare in November, December. At Plymouth in January, February and in November. In the Skagerak in November and December.

C. oculus iridis EHB. — In the North Sea in March, as a rule in the company of *Halosphæra*, W. of Norway and sparingly scattered through the *chæto region*. In November rare W. of Jutland. At S:t Vaast la Hogue rare in November, at Helder in November, December. In the Skagerak rare from January to March and in November.

C. polychordus GRAN. — Rare in March E. of Newcastle and W. of the Fisher Bank. In the Skagerak rare from January to April and in November.

C. stellaris ROPER. — In the Skagerak rare from January to March.

Dactyliosolen antarcticus CASTR. — Rare in June W. of Cape Stadt.

Ditylum Brightwellii WEST. — A. In the North Sea in *March* common W. of Jutland at 55° 30′ N. 6° 10′ E., rare above the northern edge of the 50 metre plateau. — B. In the E. Channel at Plymouth rare in January, February, very common in September; at S:t Vaast la Hogue rare in December. — C. At Helder more or less rare in November, December. — D. In the Skagerak rare from January to March and from October to the end of November.

Eucampia zodiacus EHB. — A. In the North Sea rare in *March* at 55° 30′ N. 6° 10′ E. In *June* not rare N. of Holland and W. of Schleswig. In *November* sparingly from the E. Channel to the W. of Jutland. — B. In the E. Channel at Plymouth common in April, rare from the end of *September* to the beginning of *December*. At S:t Vaast la Hogue rare in July, August, October and December. — C. At Helder more or less abundant from the beginning of May to the middle of June and from the end of September (very common) to the end of November (rare). — D. In the Skagerak rare in January and in October, November.

Guinardia flaccida CASTR. — In the North Sea in *March* rare at Skagen and not rare above the Fisher Bank, in *June* from the E. Channel to Skagen, most abundant W. of Holland, in *July* not common W. of the Danish Peninsula, in *November* not rare from the E. Channel to Skagen. — B. In the E. Channel, at Plymouth rare in March, not rare in August, September and October, at S:t Vaast la Hogue rare in June, very common from July to August. — C. At Helder common from the end of May to the end of September. — D. In the Skagerak from *July* to *December* (maximum in *November*).

Lauderia annulata CL. — A. In the North Sea rare in *March* on the Fisher Bank, in *June* E. of Firth of Tay and more or less rare from the N. of Holland to Skagen, in *November* rare near the E. Channel. — B. In the E. Channel at Plymouth rare in January, more or less common in March, April and rare in September. — C. At Helder rare from the end of October to December. — D. In the Skagerak rare in January, March and November.

Leptocylindrus danicus Cl. — A. In the North Sea in *March* rare S. and SW. of Norway and at Skagen, in June rare at Skagen. — B. In the E. Channel at Plymouth not rare in August, September and at S:t Vaast in July, August. — C. In the Skagerak more or less scarce from the middle of February to the beginning of June, rare in November.

Lithodesmium undulatum Ehb. — At Helder more or less rare from the end of October to the end of December, east of the E. Channel in November.

Navicula membranacea Cl. — Rare in the E. Channel in November.

Nitzschia seriata Cl. (including *N. fraudulenta* Cl.). — In *March* more or less rare S. and SW. of Norway, in June W. of Skagen. — In the Skagerak more or less rare from February to the middle of June and very rare in November.

Rhizosolenia alata Btw. — Not rare in November W. of Hanstholm. At Plymouth in September and November.

Var. corpulenta Cl. — Rare at Plymouth from August to December.

Var. gracillima Cl. — A. In the North Sea. *June* W. of Skagen, abundant. *July, August* W. of Skagen and on the Fisher Bank. *November* rare N. of Skagen. — B. In the E. Channel at Plymouth more or less sparingly from the end of March to July, very common in July and August. — C. In the Skagerak enormously abundant from June to the end of July, then rarer until December. Appears at Måseskär as early as the end of April.

R. calcar avis Schultze. — From July to November rare W. of the Danish Peninsula. At Helder from the end of September to the end of November. In the Skagerak rare in October and December.

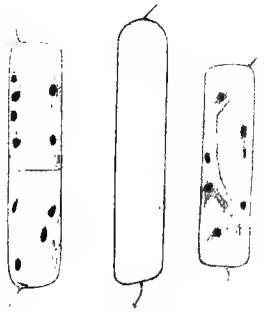

Fig. 11.

R. delicatula Cl. N. sp. — At S:t Vaast la Hogue rare in April and in November, at Helder in August and September, in the Skagerak common in the first half of June, rare in September and November.

The annexed figures (11) represent three specimens in different positions, 500 times magnified. Cells cylindrical, straight, 4 to 5 times longer than broad, extremely thin-walled, without distinct transverse rings. Their ends slightly and irregularly convex with a short, excentric spine. Length 0,05 to 0,07 mm. Breadth 0,0014 mm.

R. obtusa Hensen. — Rare in February at Måseskär.

R. robusta Btw. — Rare at Plymouth in March, April and September, more or less common in *October, November, December*. — In November from the E. Channel to the mouth of Schelde.

R. semispina HENSEN. — A. In the North Sea in *March* rare E. of Firth of Tay and SW. and S. of Norway, in *June* rare between the Shetlands and Cape Stadt, W. of Skagen, E. of Firth of Tay — In the E. Channel rare at Plymouth in April, May. — In the Skagerak more or less rare from January to June, rare in November.

R. setigera BTW. — At Helder rare in June and from September to the end of December, in the Skagerak rare from January to April and from October to the end of the year.

R. Shrubsolei CL. — A. In the North Sea in *June* rare E. of Firth of Tay, more or less rare N. of Holland. In *July, August* rare off the coast of Holland. — B. In the E. Channel at Plymouth rare in January and March, common in April, rare in August. At S:t Vaast la Hogue, very abundant from the middle of June to the middle of August, rare from October to December. — C. At Helder more or less common from the middle of May to November. — D. In the Skagerak more or less rare in July and in the first days of October.

R. Stolterfothii H. PER. — A. In the North Sea in *March* rare at the border of the Fisher Bank. *June:* rare to the north of the Dutch coast. *November:* common near the E. Channel. — B. In the E. Channel at Plymouth rare in March, common from April to the end of June, rare in August, September. At S:t Vaast la Hogue rare from June to August, very common from the end of October to the end of December. — C. At Helder rare in May, June and in November, December. — D. In the Skagerak in September and October, rare.

R. styliformis BTW. — A. In the North Sea in *March* as a rule sparingly from Hanstholm along the Danish coast to about 60° N. and above the Fisher Bank; along the northern border of the Dogger Bank as well as SE. of the Dogger Bank or, practically, along the border of the 50 metre plateau. In *June* from Holland along the Danish coast to Hirthals. In *July* and *August* sparingly at 54°—54° 30′ N. 5° 40′—8° E. In *November* from Skagen along the Danish coast to 55° 30′ N. and above the Fisher Bank. — B. In the E. Channel at Plymouth more or less rare from the end of March to the end of November. — C. At Helder very rare at the end of October and in the middle of November. — D. In the Skagerak rare in January, June and from the middle of September to December.

Skeletonema costatum GREV. — At Plymouth common in March and very common at the beginning of August, later rare. In the Skagerak rare from January to May, common from the beginning of *November*.

Stephanopyxis turgida GREV. — In the North Sea in *June* together with *Rhizosolenia styliformis* between the German and Danish coasts, in *November* very rare W. of Skagen. — At Plymouth rare in April. — In the Skagerak rare in January, September and October.

Streptotheca thamesis Shrubs. — From January to March rare at Plymouth, in *March* W. of Scotland and midway between Scotland and Norway, in *November* common in the E. Channel and sparingly along the Dutch coast to about 56° N. 6° E.

Thalassiosira gelatinosa Hensen. — In the Skagerak rare from January to the beginning of April and in November. Rare in December at Helder.

T. gravida Cl. — In the Skagerak rare from February to the end of April and in December. At S:t Vaast la Hogue in December. — In the North Sea rare in March on the Fisher Bank.

T. Nordenskiöldii Cl. — From January to March rare (at Måseskär common from 9. II. to 21. III.) in the Skagerak. In March rare S. and SW. of Norway and at Skagen. In November rare in the Skagerak.

Thalassiothrix Frauenfeldii Grun. — A. In the North Sea in *March* abundant S. and SW. of Norway and at Skagen, in *June* not rare at Hanstholm. — B. In the Skagerak from January to June, very abundant in March, and very common in November, December.

T. longissima Cl. & Grun. — A. In the North Sea in *March* rare S. and SW. of Norway and at Skagen, in *November* rare at 58° 12′ N. 5° 30′ E. — B. In the Skagerak rare from January to April (common at Måseskär from the 9th to the 15th of February).

An Attempt to classify the Plankton-organisms according to their Geographical and Seasonal Distribution.

Although the exploration of the North Sea in 1898 has been carried out four times only and the data are by no means complete, I venture to classify the plankton-organisms according to their distribution at different seasons. This classification may be in some cases erroneous, for want of sufficient data, but as a rule I consider it correct and in all cases useful as a starting point and basis for future researches. The organisms may be classified as follows.

A. **Forms that, as a rule, are confined to the space above the 50 metre plateau on the bottom.**

1. The whole year: *Corycæus anglicus.*
2. From March to June: *Cerataulina Bergonii*, *Ditylum Brightwellii* (also in November and December).

3. From April to October: *Phæocystis Pouchetii.*

4. From May to November, December: *Eucampia zodiacus, Guinardia flaccida, Rhizosolenia Shrubsolei* and *R. Stolterfothii.*

5. In June: *Chætoceros Villei, Stephanopyxis turgida.*

6. From June to November, December: *Centropages hamatus, Tintinnopsis beroidea var. acuminata, Chætoceros densus, Lauderia annulata, Rhizosolenia setigera, R. styliformis.*

7. From July, August: *Oikopleura dioica, Proto pedata, Paracalanus parvus, Tintinnopsis campanula, T. ventricosa, Noctiluca miliaris, Bacteriastrum varians, Chætoceros anastomosans, C. coronatus, C. didymus, C. curvisetus, Rhizosolenia delicatula.*

8. From September: *Ptychocylis Claparèdii, P. Ehrenbergii.*

9. From October, November: *Acartia bifilosa, Euterpe acutifrons, Bellerochea malleus, Chætoceros danicus, C. Schüttii, Lithodesmium undulatum, Rhizosolenia calcar avis, R. robusta.*

All these forms are, with the exception of *Phæocystis Pouchetii*, of southern habitat.

B. **Forms that, as a rule, are confined to the space above the 100 metre plateau.**

1. Spring-forms, or such as occur in March:

Southern forms:	Northern forms:
Microsetella atlantica,	*Metridia hibernica,*
Oithona similis,	*Ceratium longipes,*
Acanthometron quadrifolium,	*Chætoceros borealis,*
Halosphæra viridis.	*v. Brightwellii.*

2. Summer-forms, or such as occur in June, July, August:

Southern:	Northern:
Evadne spinifera,	*Evadne Nordmannii,*
Ceratium tripos,	*Acartia longiremis,*
C. macroceros.	(*Metridia hibernica*).

3. Autumn-forms, or such as occur in October:
Centropages typicus (southern).

4. Winter-forms, or such as occur in November:

Southern:	Northern:
(*Acanthometron quadrifolium*),	(*Calanus finmarchicus*),
(*Halosphæra viridis*),	*Limacina balea,*
Ceratium tripos v. bucephala.	*Dinophysis acuta.*

The parentheses denote that the enclosed species also occur in the spring.

C. **Forms that occur in the spring above the 100 metre plateau and in the summer or autumn above the 50 metre plateau.**

1. Occurring in the summer above the 50 metre plateau:

Southern:	Northern:
Acartia Clausii,	*Acartia longiremis,*
Oithona similis,	*Pseudocalanus elongatus,*
Sagitta bipunctata.	*Temora longicornis.*

2. Occurring in the winter above the 50 metre plateau:

Southern:	Northern:
Biddulphia mobilensis,	*Chætoceros decipiens,*
Coscinodiscus concinnus,	*C. diadema.*
Streptotheca thamesis.	

Those of the 1st group have probably migrated from the north towards the south. The forms of the 2nd group arrived probably through the E. Channel.

D. **Forms, which occur chiefly in the eastern part of the North Sea.**

1. Winter and spring:

Fritillaria borealis,
Parathemisto oblivia,
Biddulphia aurita,
Chætoceros atlanticus,
C. constrictus,
C. criophilus,
C. curvisetus,
C. scolopendra,
C. socialis,
C. teres.
Coscinodiscus oculus iridis,
Leptocylindrus danicus,
Nitzschia seriata,
Thalassiosira Nordenskiöldii,
Thalassiothrix Frauenfeldii,
T. longissima.

All, with the exception of *Chætoceros curvisetus*, are northern species and it may be assumed that they arrived in the winter through the deep Norwegian fissure or in the spring from the Skagerak.

2. Summer:

Acanthometron elasticum,
Litholophus ligurinus,
Bacteriastrum delicatulum.

All are southern. There was found also *Tintinnus minutus*, which belongs to arctic regions.

Remarks to the tables.

In order to reduce the size of the tables the rarer forms have been excluded. The tables are thus to be completed by the following additional notes.

Table I.[1]

The North Sea in March.

Anomalocera Patersonii TEMPL. — 11. III. 56°10′N. 6°56′E. *r*.

Candace pectinata BRADY.— 6. III. 56°17′N. 0°20′W. *r*.

Centropages typicus KRÖYER. — 8. III. 57°21′N. 2°27′E. *r*.

Corycæus anglicus LUBBOCK. — 6. III. 54°53′N. 7°40′E. *r* 11. III. 56°52′N. 8°9′E. *r*.

Oithona plumifera BAIRD. — 6. III. 61°32′N. 2°13′E. *r*.

Oncæa minuta GIESBR. — 7. III. 63°1′N. 1°36′E. *rr*.

Cyttarocylis gigantea BRANDT. — 6. III. 56°17′N. 0°20′W. *r*.

Dictyocysta elegans EHB. — 5. III. 61°32′N. 2°13′E. *r*.

Plectophora arachnoides CLAP. & LACHM. — 4. III. 57°46′N. 10°29′E. *r*.

Distephanus speculum EHB. — 5. III. 56°58′ N. 5°44′ E. *r*.

Globigerina bulloides D'ORB. — 11. III. 58°21′N. 1°40′E. *r*, 12. III. 58°40′N. 4°18′W. *r*.

Oikopleura dioica FOL. — 4. III. 57°18′N. 8°27′E. + 6. III. 55°43′N. 7°29′E. *r*.

Ceratium lineatum EHB. — 8. III. 58.51′N. 5°9′E. *r*.

Ceratium tripos var. arctica EHB. — 7. III. 63°1′N. 1°36′E. *r*.

var. bucephala CL. — 5. III. 56°58′N. 5°44′E. *r*, 6. III. 55°42′N. 1°5′E. *r*, 6. III. 55°13′N. 0°48′E. *r*.

var. horrida CL. — 6. III. 61°32′N. 2°13′E. *r*, 4. III. 57°18′N. 8°27′E. *r*.

Dinophysis acuta EHB. — 11. III. 55°30′N. 6°10′E. *r*.

Gonyaulax spinifera CLAP. & LACHM. — 9. III. 55°44′N. 0°23′E. *r*, 9. III. 55°12′N. 1°18′W. *r*.

Pyrophacus horologium STEIN. — 10. III. 53°26′N. 3°57′E. *r*.

Asterionella japonica CL. — 12. III. 55° 15′ N. 5°45′ E. *r*.

Asteromphalus heptactis RALFS. — 7. III. 63°1′N. 1°36′E. *r*.

Bellerochea malleus BTW. — 6. III. 53°26′N. 3°57′E. *r*.

Cerataulina Bergonii H. PER. — 5. III. 56°58′N. 5°44′E. *r*.

Chætoceros contortus SCHÜTT. — 9 III. 57°47′N. 10°37′E. +, 4. III. 57°46′N. 10°29′E. +.

C. criophilus CASTR. — 8. III. 58°28′N. 4°27′E. *r*, 8. III. 57°54′N. 3°26′E. *r*, 11. III. 58°21′N. 1°40′E. *r*.

C. densus CL. — 4. III. 57°18′N. 8°27′E. +.

C. diadema EHB. — 8. III. 58°51′N. 5°9′E. *r*, 11. III. 58°21′N. 1. 40′E. *r*.

C. scolopendra CL. — 8. III. 58°51′N. 5°9′E. *r*, 8. III. 57°21′N. 2°27′E. *r*

C. socialis LAUDER. — 10. III. 57°51′N. 7°47′E. *r*.

Coscinodiscus polychordus GRAN. — 9. III. 55°12′N. 1°18′W. *r*, 5. III. 56°58′N. 5°44′E. *r*.

Eucampia zodiacus EHB. — 11. III. 55°30′N. 6°10′E. *r*.

Guinardia flaccida CASTR. — 9. III. 57°47′N. 10°37′E. *r*, 5. III. 56°58′N. 5°44′E. +, 11. III. 55°30′N. 6°10′E. *r*.

Leptocylindrus danicus CL. — 8. III. 58°51′N. 5°9′E. *r*, 10. III. 57°51′N. 7°47′E. *r*, 4. III. 57°46′N. 10°29′E. *r*.

Nitzschia seriata CL. — 9. III. 57°47′N. 10°37′E. +, 10. III. 57°51′N. 7°47′E. *r*, 4. III. 57°46′N. 10°29′E. *r*.

Rhizosolenia Stolterfothii H. PER. — 4. III. 56°58′N. 5°44′E. *r*.

Streptotheca thamesis SHRUBS. — 11. III. 58°21′N. 1°40′E. *r*, 12. III. 55°15′N. 5°45′E. *rr*.

Thalassiosira gravida CL. — 5. III. 56°58′N. 5°44′E. *r*.

The *Peridinium divergens* and *P. depressum* have been omitted, as probably confounded.

[1] The samples from the line Stavanger to Newcastle have been examined by E. JÖRGENSEN.

Table II.

The North Sea in June 1898.

Centropages typicus KRÖYER. — 9—16. 61°50′ N. 2°30′ E. *r.*
Labidocera Wollastonii LUBBOCK. — 5. 56°1′ N. 1°51′ E. *r.*
Metridia hibernica BRADY & ROBTS. — 4. 56°26′N. 4°1′ E. *r.*
Paracalanus parvus CLAUS. — 5. 53°51′ N. 5°1′ E. *r.* 12. 49°31′ N. 3°29′ E. *r.*
Podon Leuckarti G. O. SARS. — 4. 57°27′N. 7°32′E. *r*, 5. 54°14′ N. 8°2′ E. *r.* 4. 55°46′ N. 7° E. *r.*
Sagitta bipunctata QUOI & GAIM. — 4. 57°9′ N. 5°20′ E. *r.* 4. 56°49′ N. 6°5′ E. *r.*
Cyttarocylis gigantea BRANDT. — 9—16. 61°50′ N. 2°30′ E. *c.* 4. 57°20′ N. 9°10′ E. *rr.*
C. media BRANDT. — 9—16. 61°50′ N. 2°30′ E. *rr.*
Tintinnus minutus BRANDT. — 9—16. 61°50′ N. 2°30′ E. *rr.*
Acanthomethron elasticum HKL. — 9—16. 61°50′ N. 2°30′ E. *rr.*
Litholophus ligurinus HKL. — 9—16. 61°50′ N. 2°30′ E. *rr.*
Ceratium lineatum EHB. — 9—16. 61°50′N. 2°30′E. *rr.* 5. 56°12′ N. 1°51′ W. *rr.*
C. tripos var. arctica EHB. — 9—16. 61°50′ N. 2°30′ E. *rr.*
C. tripos var. horrida CL. — 9—16. 61°50′ N. 2°30′ E. *c.* 5. 56°12′ N. 1°51′ W. *r.*
Dinophysis acuta EHB. — 9—16. 61°50′N. 2°30′E. *r.* 5. 54°54′ N. 7°39′ E. *r.*
Diplopsalis lenticula BERGH. — 5. 54°25′N. 5°37′E. +.
Peridinium Michaëlis EHB. — 5. 54°54′ N. 7°39′ E. *r.*
P. ovatum POUCHET. — 9—16. 61°50′ N. 2°30′ E. *r.*
Pyrophacus horologium STEIN. — 5. 56°26 N. 7°55′ E. *r.*
Bacteriastrum delicatulum CL. — 9—16. 61°50′ N. 2°30′ E. *r.*
B. elongatum CL. — 9—16. 61°50′ N. 2°30′ E. *r.*
Chætoceros atlanticus CL. — 9—16. 61°50′N. 2°30′E. *r.* 4. 56°50′ N. 3° E. *r.*
C. danicus CL. — 4. 57°20′ N. 9°10′ E. +.
C. debilis CL. — 5. 56°12′ N. 1°51′ W. *r.*
C. didymus EHB. — 5. 54°14′ N. 8°2′E. *r.*
C. Schüttii CL. — 9—16. 61°50′ N. 2°30′ E. *r.*
Corethron hystrix CASTR. — 9—16. 61°50′N. 2°30′E. *r.*
Coscinodiscus oculus iridis EHB. — 9—16. 61°50′ N. 2°30′ E. *r.*
Dactyliosolen antarcticus CASTR. — 9—16. 61°50′ N. 2°30′ E. *r.*
Leptocylindrus danicus CL. — 4. 57°20′N. 9°10′E. *r.*
Nitzschia seriata CL. — » » » »
Rhizosolenia gracillima CL. — » » » »
R. Shrubsolei CL. — 5. 56°12′ N. 1°51′ W. *r.* 5. 54°25′N. 5°37′E. *r.* 9. 53°16′N. 4°37′E. +.
Thalassiothrix Frauenfeldii GRUN. — 4. 57°20′ N. 9°10′ E. +.

Table III.

The North Sea in July, August.

Corycæus anglicus LUBBOCK. — 2. VIII. 55°28′ N. 6°46′ E. *rr.*
Microsetella atlantica BRADY & ROBTS. — 30. VII. 57°21′N. 4°9′E. *r.* 7. VIII. 56°15′N. 7°50′E. *r.*
Podon Leuckartii G. O. SARS. — 30. VII. 57°32′ N. 7°3′ E. *r.* 30. VII. 57°21′ N. 4°9′ E. *r.*
Bacteriastrum varians LAUDER. — 6. VIII. 54°8′ N. 8°2′ E. *r.*
Coscinodiscus concinnus W. SM. — 6. VIII 54°8′ N. 8°2′ E. *r.* 7. VIII. 56°15′ N. 7°50′ E. *rr.*
Rhizosolenia calcar avis SCHULZE. — 8. VIII. 55°30′N. 7°25′ E. *r.*
R. gracillima CL. — 29. VII. 57°44′ N. 9°37′ E. +. 30. VII. 57°32′ N. 7°3′ E. *r.*
R. styliformis BTW. — 3. VIII. 54°26′ N. 5°43′ E. *r.* 6. VIII. 54°8′ N. 8°2′ E. *r.*

Table IV.

The North Sea in November 1898.

Parathemisto oblivia KRÖYER. — 7. 58°12′N. 5°30′E. *rr.*
Acartia bifilosa LILLJEB. — 13. 50°58′ N. 1°10′ E. *r.* 14. 52°32′N. 13°11′E. *r.* 15. 57°2′N. 8°E. +.
Centropages hamatus LILLJEB. — 13. 51°N. 1°W. *r.*
Metridia hibernica BRADY & ROBTS. — 12. 56°59′N. 5°58′E. +. 13. 57°3′N. 7°16′E. +.
Oithona plumifera BAIRD. — 6. 56°11′N. 2°31′E. +.
Oikopleura dioica FOL. — 14. 52°32′N. 3°11′E. +. 15. 57°2′N. 8°E. +.
Ptychocylis acuta BRANDT. — 7. 55°1′N. 1°10′W. *r.*
Tintinnopsis ventricosa CLAP. & LACHM. — 13. 51°N. 1°W. *r.* 14. 51°N. 2°5′W. *r.*
Tintinnus Steenstrupii CLAP. & LACHM. — 13. 57°38′N. 9°40′E. *rr.*
Acanthochiasma fusiforme HKL. — 7. 58°12′N. 5°30′E. *rr.* 8. 58°40′N. 1°4′W. *r.* 7. 55°1′N. 1°10′W. *r.*

Acanthonia Mülleri HKL. — 8. 58°53′N. 3°5′W. *rr*. 7. 55°1′N. 1°10′W. +.
Gazelletta hexanema HKL. — 8. 58°53′N. 3°5′W. *rr*.
Dictyocha fibula EHB. — 26. 55°30′N. 7°20′E. *r*. 6. 56°42′N. 4°22′E. *rr*.
Distephanus speculum EHB. — 26. 55°30′N. 7°20′E. *r*. 13. 51°N. 1°W. *r*.
Noctiluca miliaris SUR. — 14. 51°45′N. 2°14′E. +. 15. 54°51′N. 5°36′E. +.
Ceratium tripos var. longipes BAIL. — 8. 58°40′N. 1°4′W. *r*. 8. 58°53′N. 3°5′W. *r*. 26. 56°14′N. 7°39′E. +.
Diplopsalis lenticula BERGH. — 8. 58°40′N. 1°4′W. *rr*.
Chætoceros densus CL. — 13. 50°15′N. 0°30′E. +.
C. didymus EHB. — 14. 51°45′N. 2°14′E. *r*. 15. 55°50′N. 6°47′E. *rr*.
C. Schüttii CL. — 13. 57°3′N. 7°16′E. *r*. 6. 56°42′N. 4°22′E. *r*.
Coscinodiscus oculus iridis EHB. — 15. 56°28′N. 7°46′E. *r*.
Eucampia zodiacus EHB. — 14. 51°45′N. 2°14′E. *r*. 15. 56°28′N. 7°46′E. *rr*.
Lauderia annulata CL. — 14. 51°45 N. 2°14′E. +.
Lithodesmium undulatum EHB. — 14. 51°45′N. 2°14′E. +.
Navicula membranacea CL. — 13. 51°N. 1°W. *r*.
Rhizosolenia alata BTW. — 5. 57°22′N. 8°21′E. +
R. gracillima CL. — 15. 56°28′N. 7°46′E. *r*.
R. robusta BTW. — 14. 51°45′N. 2°14′E. *r*. 14. 52°32′N. 3°11′E. *r*.
R. Shrubsolei CL. — 14. 51°45′N. 2°14′E. +. 13. 51°N. 1°W. *r*.
R. Stolterfothii H. PER. — 14. 51°45′N. 2°14′E. *c*
Stephanopyxis turgida GREV. — 5. 57°22′N. 8°21′E. *rr*.
Thalassiothrix longissima CL. & GRUN. — 7. 58°12′N. 5°30′E. *rr*.

Table V.

Helder 1898.

Proto pedata LEACH. — 11. VIII. *rr*.
Acartia bifilosa GIESBR. — 24. XI. *r*.
A. Clausii GIESBR. — 3. XII. *r*.
Pseudocalanus elongatus BOECK. — 10. XII. *r*.
Sagitta bipunctata QUOI & GAIM. — 29. IX. *r*.
Distephanus speculum EHB. — 23. IX. *r*, 11. XI. *r*,
Cyttarocylis Claparedii V. DAD. — 29. IX. *r*.
Tintinnopsis Labiancoi V. DAD. — 11. VIII. *rr*. 29. IX. *rr*.
Ceratium macroceros EHB. — 8. X. *r*.
Peridinium oblongum AUR. — 22. VII. *r*.
Bellerochea malleus BTW. — 29. XI. *r*, 17. XII. *r*.
Chætoceros anastomosans GRUN. — 24. VIII. *r*.
C. contortus SCHÜTT. — 29. IX. *r*.
C. coronatus GRAN. — 11. VIII. *r*.
C. curvisetus CL. — 29. IX. *r*.
C. danicus CL. — 24. XI. *rr*, 21. XII. *r*.
C. diadema EHB. — 17. XII. *rr*, 21. XII. *r*.
C. scolopendra CL. — 29. IX. *rr*.
C. Villei GRAN. — 8, 14. VI. *rr*.
Rhizosolenia styliformis BTW. — 28. X. *rr*, 18. XI. *r*.
Thalassiosira gelatinosa HENSEN. — 21. XII. *r*.

Table VI.

Plymouth 1898.

Microsetella atlantica BRADY & ROBTS. — 16. II. *r*.
Oncæa subtilis GIESBR. — 9. XI. *r*.
Evadne Nordmannii LOVÉN. — 5. VII, 16. VIII, 22. IX. *r*.
E. spinifera P. E. MÜLL. — 23. VI. *r*, 24. VIII. *r*.
Podon intermedius LILLJEB. — 23. VI. *r*, 24. VIII. *r*.
Distephanus speculum EHB. — 16. VIII. *r*.
Dictyocha fibula EHB. — 16. VIII. *r*.
Cyttarocylis Claparèdii V. DAD. — 2. IX. *r*.
Tintinnopsis ventricosa CLAP. & LACHM. — 27. I. *r*, 5. IV. *r*.
Ceratium furca DUJ. — 22. XI. *r*.
C. platycorne V. DAD. — 22. XI. *r*.
Peridinium Michaëlis EHB. — 22. XI. *r*.
P. ovatum POUCH. — 16. VIII. *r*.
Pyrophacus horologium STEIN. — 28. IV. *rr*.
Bacteriastrum varians LAUDER. — 23. III. *r*.
Chætoceros constrictus GRAN. — 23. III. *r*.
C. danicus CL. — 2. IX. *r*.
C. debilis CL. — 14. IV. *r*.
C. diadema EHB. — 22. IX. +.
C. didymus var. longicruris CL. — 2. IX. *r*.
Leptocylindrus danicus. — 16. VIII. +, 2. IX. *r*, 22. IX. +.

Table VII.

Måseskär 1898.

Fritillaria borealis LOHM. — 25. IV. *r*.
Anomalocera Patersonii TEMPL. — 30. I. *r*, 3. IX. +, 1. X. *r*.
Corycæus anglicus LUBB. — 7. IX. *r*.

Metridia hibernica BRADY & ROBTS. — 30. I. *r*.
Temorella affinis POPPE. — 27. V. *r*, 14. XI. *c*.
Podon Leuckartii G. O. SARS. — 27. V. *r*, 4. VI. *r*.
Limacina balea MÖLL. — 3. IX. *r*.
Arachnactis albida M. SARS. — 31. I. *c*.
Tintinnopsis fistularis MOEB. — 26. VII. *r*.
T. ventricosa CLAP. & LACHM. — 1. IV. *r*, 7. XI. *r*.
Tintinnus Steenstrupii CLAP. & LACHM. — 10. X. *rr*.
T. subulatus EHB. — 28. X. *r*.
Acanthometron quadrifolium HKL. — 3. IX. *c*, 21. IX. *r*, 1. X. *r*.
Plectophora arachnoidea CLAP. & LACHM. — 9. II. *r*.
Ceratium tripos var. bucephala CL. — 8. VIII. *r*.
Diplopsalis lenticula BERGH. — 26. VII. *r*.
Gonyaulax spinifera CL. & LACHM. — 30. I. *r*, 3. IX. *r*.
Peridinium Michaëlis EHB. — 21. X. *r*.
Peridinium oblongum AUR. — 26. VII. *r*.
Xanthidium hystrix CL. — 28. X. *r*.
Biddulphia mobilensis BAIL. — 30. I. *r*, 28. X. *rr*, 7. XI. *rr*.
Chætoceros densus CL. — I. X. +, 10. X. *r*.
C. coronatus GRAN. — 10. X. *r*.
C. laciniosus SCHÜTT. — 14. XI. *r*, 27. XI. +.
C. similis CL. — 14. XI. *rr*, 27. XI. *r*.
C. Weissflogii SCHÜTT. — 3. IX. *c*, 21. IX. *rr*.
Coscinodiscus excentricus. — 28. X. *r*, 7. XI. *r*, 27 XI. *r*.
C. stellaris ROPER. — 1. III. *r*.
Rhizosolenia obtusa HENSEN. — 9. II. *r*., 15. II. *r*.
R. Shrubsolei CL. — 3. IX. *r*.
R. Stolterfothii H. PER. — 3. IX. *rr*.
R. styliformis BTW. — 1. X. *rr*, 7. XI. *rr*.
Stephanopyxis turgida GREV. — 21. IX. *rr*.

Table I. The North

Date	5	6	7	8	8	8	8	9	9	9	9	9	10	10	11	11	12
Lat. N.	59°32′	61°32′	63° 1′	58°51′	58°28′	57°54′	57°21′	56°49′	56°16′	55°44′	55°12′	57°47′	57°51′	58° 5′	58°21′	58°30′	58°40′
Long.	4° 15′ E.	2° 13′ E.	1° 36′ E.	5° 9′ E.	4° 27′ E.	3° 26′ E.	2° 27′ E.	1° 31′ E.	0° 33′ E.	0° 23′ E.	1° 18′ W.	10°37′ E.	7° 47′ E.	4° 45′ E.	1° 40′ E.	1° 30′ W.	4° 18′ W.
Temp.	5,1	7,4	6,7	3,8	4,4	6,4	7	6.8	7,2	6,1	6,4	2,0	2,0	3,5	6	7	7
Salinity	34,11	35,12	35,10	32,48	32,85	35,19	35,03	35,03	34,90	34,60	34,66	29,38	27,31	35,17	35,05	35,12	34,71
Acartia Clausii Giesbr.	+	*c*	*r*					.	.			.	.	*r*	.	.	.
A. longiremis Lilljeb.	.	.	.	*r*	*c*		*r*	.	.	.	*c*						.
Calanus finmarchicus Gunn.	.			.	.	*r*	+	*r*	*r*		*r*				*r*		.
Centropages hamatus Lilljeb.	.	.		*r*	*r*									*r*		.	.
Metridia hibernica Brady & Robts.	.	.			.	.	*r*	*r*	*r*					.	.	.	
Microsetella atlantica Brady & Robts.			.			.	*r*		*r*			*r*		.		.	
Oithona similis Claus.	*r*	*c*	+		.	*r*	+	*r*	*r*	*r*	+			.	+	.	
Pseudocalanus elongatus Boeck	.	.		.	.	*r*	*c*	*r*	*r*	*r*	*r*	+		*c*	.	.	.
Temora longicornis O. F. Müll.					.	.	+	*r*	.		.	.		*c*	.	.	.
Cyttarocylis media Brandt			.	.	.	*r*	*r*		.	.	.	*r*	*r*	.		.	.
Ptychocylis acuta Brandt	.		.	*r*		*r*	.	.		.	.	.	*r*	.		.	.
Sagitta hipunctata Quoi & Gaim.	.		.	.	.	.	.	.		.	.			.	.		
Acanthometron quadrifolium Hkl.	*r*	*r*	*r*			.	.		.		.		.		+	*r*	*r*
Halosphæra viridis Schmitz	*c*	+	+	*c*	+	*r*	+	*r*	*r*	+	*r*	*r*	*r*	*r*	*r*		
Ceratium furca Duj.	.		.	*r*	*r*	*r*	*r*	.	*r*	.	*r*	+	.	*r*			.
C. fusus Duj.	.	.		*r*	.	*r*	*r*	.	.	.	*r*		.	*r*	*r*		
C. tripos Nitzsch.	+			+	*r*	*r*	*r*	.	*r*	*r*	*r*	*r*	.	*cc*	+	*r*	.
v. longipes Bail.	.	.		*r*	*r*	.	*r*	.	.	*r*	*r*	+	*r*	.	+	.	
v. macroceros Ehb.	+	+		+	*r*	*r*	.	.	*r*	*r*	*r*	.	.	.		.	
Biddulphia aurita Lyngb.			.	+	*r*	.	.	.	.	.	.	+	*r*		.	.	.
B. mobilensis Bail.	.	*r*		.	.		.	.	.	*r*	.	.	.	.		.	+
Chætoceros atlanticus Cl.				.		*r*	.	.			.	.	.	.	*r*	.	
C. borealis Btw.				*r*	*r*	.	*r*	.	*r*	*r*	*r*	.	*r*	*r*	*r*	.	
v. Brightwellii Cl.			.	.				.	.	.	.	*r*	.		.	.	.
C. constrictus Grev.	.			*r*			.	.			.	+	*c*	.	.	.	
C. curvisetus Cl.	.						.	.	.	.	.	+	+	.	.	.	.
C. debilis Cl.				.	*r*				.	.	.	*c*	*c*	.	.	.	.
C. decipiens Cl.				*r*	*r*		*r*	*r*	+	+	+	+	+	*r*	*c*	.	.
C. didymus Ehb.				*r*	.	.	.	.	.	.	*r*	*r*	*r*	.	.	.	.
C. Schüttii Cl.					.	.		.	.	.	.	.	.	.	.	.	.
C. teres Cl.	.	.	.	.	.	*r*			.	.			.	.	.	.	.
Coscinodiscus concinnus W. Sm.		*r*		.	.	.			*r*	+	+	.	.	.	+	.	*r*
C. excentricus Ehb.	.	.			.	+	*r*		.	*r*	.	.		.	.	.	.
C. oculus iridis Ehb.	+		*c*	*r*	*r*	*r*		.	.		.	.	+	.	.	.	
Ditylum Brightwellii West.	.	.		*r*			.	.	.	.	.	*r*	.		.	.	
Lauderia annulata Cl.	.		.	.	.	.				.	.	.	*r*	.			
Rhizosolenia semispina Hensen	.		.	.	.	.	*r*	*r*	*r*	.	.		*r*		.	.	
R. styliformis Btw.	.			.	.	.	.	.	.	.	.	.	.	.	.		
Thalassiosira Nordenskiöldii Cl.	.		.	*r*	*r*	.	.		.	.		*r*	+	.	.	.	
Thalassiothrix Frauenfeldii Grun.	.	.	.	*cc*	*c*	*c*	*r*	*r*	*r*		*r*	*c*	*cc*	*r*		.	
T. longissima Cl. & Grun.	.			*r*	.	*r*	.	.		.	.	*r*	.	.	.	.	
Plankton-type	*S* *Tp*	*S*	*ST*	*Ns* *Tp* *Nh*	*Ns*	*Ns*	*Ns*	*Ns*	*C*	*CNc*	*CNc*	*Ns*	*Ns*	*Tp*	*C Tp* *Nc*	*O*	*Nc*

Sea in March 1898.

12	4	5	4	5	6	6	4	5	5	6	6	6	5	6	6	6	6	10	11	11	11
55°15′	57°46′	56°58′	57°18′	56°34′	56°17′	56°	57°45′	57° 4′	56°35′	56°08′	55°42′	55°13′	57°40′	57°15′	56°36′	55°43′	54°53′	53°26′	55°30′	56°10′	56°52′
5° 45′	10°29′	5° 44′	8° 27′	2° 20′	0° 20′	2°	10°22′	7° 51′	5° 40′	3° 8′	1° 5′	0° 48′	10°10′	8° 49′	8° 4′	7° 29′	7° 40′	3° 57′	6° 10′	6° 56′	8° 9′
W.	E.	E.	E.	E.	W.	W.	E.	E.	E.	E.	E.	W.	E.	E.	E.	E.	E.	E.	E.	E.	E.
5,5	3	5,3	4,3	6,4	6,2	5,1	— 1	+ 1	2,2	3,6	5,2	6,4	2,8	3	2,8	3,6	3,6	4,4	5,8	4,2	3,6
34,36	33,73	35,13	34,50	35,13	34,96	34,53	32,07	34,60	35,0	35,13	35,06	34,84	33,64	32,79	30,87	32,56	32,15	34,67	34,22	33,23	34,53
		.	.		.	.	.	r	.	.	.	r	.		r	r	+	.	.		r
		.			.	.			.	.	.	.	.				.			.	
	.	+	.		+	r		.	.	.	.	r	.	.	.	.	.	r			
		.	.				.	.	.	.		.		r	r			.	.		
		r			r		.		.	.	.	.					.	.	.		
		+	+		c	c		+	+	r	r	r	r		r	.		r			.
	.	.	+		c	r	.	+	+	.	r	r	r	r	r	.	+	.	.	.	.
		+	.		c	+	.	+	+		r	+	+	c	c	.	.	r	.		.
		.	+	.			.	r	+			.	+		c	c	+	.	.	.	r
			.	.	.	.	.	.	.	.	.	.	.	.		.	.		.			
		.	.		.		.		.	.	.	.	.		r		.			.	
.		c		.	+	+	.		+	+	r	+	.			.	.		.			.
.			.	r	.	+	.		r				.	.					r	r	.	.
		.	.	.		.			.	.	r	.	.	.							
.			+	.		.			.	.	.	.		.		.		r	+		.
r	r		+			.		.	.	r	.	.	.			r	r	+	+	r	r
.	r	+	c			.	c	+	c	+	r	+	r	r	.	r		c	c	c	+
.		r	.	.		.	+	+		.		.	.	r	+	c	r	.	.	c	.
	.		+	.			c	+	r	+		+	r	.	.	.		.		+	+
.	+	.						.	.	.			.	.	.	+	.	r	.	.	r
r	.	+	.			+	.	.	r					r	.	r	.	c	+	r	+
.	.	+	.				.	.			.								r	.	
.	+	c		r		.	.	.		r	.	.	.		r	.	.		.	.	.
.	.	r		.			.	.		r	.	.	.	.	.	.	.		.	.	.
.	c	.	.			.	.		.		.	.			.	.	.	.	.	.	.
	r	r		.	.	.	.		r	.		.			.		.		r		.
	+	.	.		.	.	.		.	.	.			.		.	.		.	.	.
rr	c	cc	.	cc	cc	+	.			r	r	r	r	r	.	.	.		c		.
.	r		.			.		.	.	.							.	.	r		.
.		r	.	.		.			r		.	.			.		.	.	+		.
.	r	r	.	r		.				.	.	.			.		.		.	.	.
.	.	+	+	c		+		r		r	c	r	cc	r	cc	cc	+	c	+	r	c
.		.	r			.				.		.			.	.	.			.	.
	.	r	.	r	+	.	.		r	rr	.	r	.		.	.	.	r		r	.
.	r	.	r	r				.	.	.	.	.		.	.	.	.	.	c		.
	r	r	.						.	.		.		.		.	.	.	r		.
.	.	.	.	.	.						.	.	.			.	.	.		.	.
.	.	r	r	+	+	.			r	r	+	.		r	.	.		+	+	r	+
.	+	.	.	.				.	.	.	.					.		.		.	
	cc	.	r			.		.	.	.	.							.	.		.
.			.					.	r	.	.	.	.	.	.			.	.		.
Nc	Ns C	C (Nc)	Tp Nc	C Nc S	C S	C Nc	Tp	?	Tp	Tp	Nc S	(Tp)	Nc	Nc	Nc	Nc	Nc	Nc Tp	C Tp Nm	Tp	Nc Tp

Tab. II. The North

Date	9—16	3	4	4	4	5	5	4	4	4	4	5
Lat. N.	61° 50′	57° 43′	57° 27′	57° 9′	56° 50′	56° 30′	56° 12′	57° 30′	56° 59′	56° 49′	56° 26′	56° 1′
Long.	2° 30′ E.	9° 50′ E.	7° 32′ E.	5° 20′ E.	3° E.	0° 38′ E.	1° 51′ W.	9° 22′ E.	7° 40′ E.	6° 5′ E.	4° 1′ E.	1° 51′ E.
Temp.	10	9,8	9,0	8,7	9	8,7	9,2	9,7	9,1	9,2	8,9	9,4
Salinity	35,36	33,04	33,59	34,98	35,05	34,96	34,48	33,18	—	34,96	35,04	35,00
Acartia Clausii Giesbr.	*r*			*rr*			+		*r*	*r*		
A. longiremis Lilljeb.	.	*r*	*r*	*r*	*cc*		.	*rr*	.			
Calanus finmarchicus Gunn.	+		.	.	.	+	+		*r*	.	*r*	
Centropages hamatus Lilljeb.	.	.	+	*r*	+	*r*			.	.	*c*	*c*
Oithona similis Claus.	*c*	.	*r*	*rr*	*c*	*r*	*c*	*rr*	.	+		
Pseudocalanus elongatus Boeck.			.				.				*c*	
Temora longicornis O. F. Müll.	.	.	.	*r*	*c*	+					*cc*	.
Evadne Nordmannii Lovén	*c*	+	+	*r*	*c*	*cc*		*rr*			*c*	*c*
E. spinifera P. E. Müll.	*c*		*ccc*	.	*c*	+	+	.		*r*		*cc*
Noctiluca miliaris Surir.	.		.		.		.		.		.	.
Ceratium furca Duj.	+	*r*	*r*	*r*		*r*	.	*r*	*r*	*r*		
C. fusus Duj.	*r*	*r*	*r*	*r*	+	*r*		*r*	*r*	*r*	*r*	*r*
C. tripos Nitzsch.	+	+	*cc*	*ccc*	*cc*	*c*		*c*	*cc*	*cc*	*cc*	+
var. longipes Bail.		+		*r*		*c*	*r*	*c*		+		.
var. macroceros Ehb.	.	*r*	*r*	*r*			.		*c*		*c*	+
Peridinium depressum Bail.	*r*	+	.			+		*c*		*r*		
P. divergens Ehb.	*r*		*r*	*r*	*cc*		*r*	.	+			
Cerataulina Bergonii H. P.	*rr*							.			.	.
Chætoceras borealis Btw.	*rr*						*c*					.
C. densus Cl.				.			*r*					.
C. decipiens Cl.	+						*r*					
C. hiemalis Cl.	.			.			*r*		.		.	
Coscinodiscus concinnus W. Sm.		*r*						*rr*		.	.	*r*
Eucampia zodiacus Ehb.		.								.	.	
Guinardia flaccida H. Per.			.				.	.	.		.	
Lauderia annulata Cl.	.	.	.				+					
Rhizosolenia semispina Hensen	*rr*	.	.				+	.				
R. styliformis Btw.	*rr*	.			*rr*		*rr*	*rr*		.		
Stephanopyxis turgida Grev.	.				.		.	.	.	.	.	
Plankton-type	*S T C*	*Tp*	*Tp*	*Tp*	*Tp*	*Tp*	*S T*	*Tp*	*Tp*	*Tp*	*Tp*	*Tp*

Sea in June 1898.

5	5	4	5	5	5	5	4	4	5	5	5	5	5	9	9	11	12	12
55° 25′	55° 44′	57° 20′	57°	56° 26′	54° 54′	54° 14′	57° 6′	55° 46′	54° 25′	53° 51′	53° 26′	53° 8′	51° 43′	53° 49′	53° 16′	52°	50° 33′	49° 31′
0° 8′	7° 29′	9° 10′	8° 21′	7° 55′	7° 39′	8° 2′	8° 26′	7°	5° 37′	5° 1′	4° 36′	4° 22′	3° 20′	6° 18′	4° 37′	3° 23′	0° 2′	3° 29′
E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	W.
10	11,2	10,08	10,5	11	10,6	12	10,36	10,24	9,48	10,48	11,24	11,48	12,48	12,4	14,1	13,4	11,8	11,8
35,15	32,36	32,20	31,57	31,86	31,57	30,19	32,48	34,21	34,41	34,45	34,33	34,40	30,93	—	—	—	—	—
c	.		.	.	.	+		*r*	+			+					.	*c*
.	.	.	.			.	.		.	*c*				.	.			.
.		.	.					.		*r*	.	.		*r*	.	.	.	
c		.			.	.	.	.	.	+		+	+	*cc*	*r*		+	+
					.		.	.	*c*				.	.				
			.	.	.	.		*r*	+		.			+	.		.	*c*
		.			.	.			*c*			.	+	*c*	.	.	*c*	*c*
.		*rr*	*r*	*rr*			*r*	*r*	.	.		.	.			.		.
.	.		*rr*		.	.			.	.	.	.	.	.			.	.
		.			.	*c*			.		*ccc*	*ccc*	*ccc*	*ccc*	*cc*		.	.
.	*r*			*r*	*r*	*r*		*r*	*r*				.				.	.
r	*r*			*r*	*r*	*r*		*r*	+	*r*	.	*r*	.		*r*	.	.	.
c	.	*r*		+	*r*	*r*		*r*	*r*						*r*		.	
ccc	.	*r*		*r*	*r*	*r*				*r*								.
	.	*r*		+				.	*r*	.		.	.					.
		.		+	*cc*	*r*		+	*cc*	+		.	.					
			r				*r*					.				.		
	.	*r*		.											*r*			
	+	+	*r*	*r*		.	.		.			.				.		
.		.	.		.	+	.	*r*	+	*c*		*r*			+	+		
	c		*r*			.	.		.									
.	.	*c*	.	.			.		.			.			.			
.		*r*							*rr*	.								
.					*rr*	*r*	.	.	+	+	.					.	.	
.				*r*	*rr*	+	*r*	*r*	*r*	.	.		+	.	*cc*	*cc*	.	.
.	.	+		.		*c*		*r*		*r*			.				.	
.	.	+		.	.	.				.	.			.				.
.	*r*	*r*	+	*rr*	*r*	*c*	*r*	*c*	+	*c*		.						
.		.			*r*	.	.	*c*	*r*									
Ns	*C*	*Ns*	(*S*)	(*Tp*)	*Ns?*	*Nm*	*O*	*S*	*Nm*	*Nm*	*Nm*	*Nm*	*Nm*	*Nm*	*Nm*	*Nm*	?	?
Tp		(*Nm*)				(*S*)		*Nm*	(*Ns*)	*S*								

Table III. The North Sea in July, August 1898.

Month	VII	VII	VII	VII	VII	VIII	VIII	VIII	VIII	VIII	VIII	VIII	VIII	VIII	VIII	VIII	VIII	VIII	VIII
Day	29	30	30	30	30	2	2	2	3	3	3	4	6	8	6	7	7	7	7
Lat. N.	57°44′	57°32′	57°29′	57°27′	57°21′	57°42′	56°38′	55°28′	54°26′	53°18′	52°39′	51°42′	54°8′	55°30′	56°	56°15′	56°40′	57°20′	57°40′
Long.	9° 37′ E.	7° 3′ E.	6° 15′ E.	5° 23′ E.	4° 9′ E.	10° 2′ E.	7° 54′ E.	6° 46′ E.	5° 45′ E.	4° 38′ E.	3° 50′ E.	2° 34′ E.	8° 2′ E.	7° 25′ E.	7° 35′ E.	7° 50′ E.	8° 3′ E.	9° E.	10° E.
Temp.	15	12	10	11,5	12	13	13	14	14	16	16	15,5	16	14,5	13,9	14	13,5	13,5	13,8
Salinity	31,24	—	33,69	33,39	33,08	32,29	32,17	32,29	33,69	32,72	34,59	34,45	29,95	32,56	32,29	32,29	31,94	32,12	31,50
Proto pedata LEACH.				.	.	.		.	.		+	*r*		.	.			.	.
Acartia Clausii GIESBR.	*r*		*r*	+	.		.	+	.			+	.	*r*	.	*r*	.	+	
A. longiremis LILLJEB.			.	.		+	+	.			+	.	.	.	.	.	*r*	+	.
Calanus finmarchicus GUNN.	.	.			.	*r*			+	.	.	.	.		.	.		.	*r*
Centropages hamatus LILLJEB.		.	.	.	*r*	*c*	+		+	.	*c*	.	.	.	.	.	.	.	+
C. typicus KRÖYER		.	.	.	*r*	.	.		.	.	.	.	.	.	.		.	.	*r*
Oithona similis CLAUS	*c*	+	+	+	+	*c*	*c*	+	*c*	.	*r*	+	+	.			*c*	*c*	*c*
Paracalanus parvus CLAUS	*c*	.		+		+	+	+	.		*c*	+	+		.	.	.	*c*	*c*
Pseudocalanus elongatus BOECK.	*c*	*c*	*r*	+	*c*		*c*	*c*	.	+	*c*	.	.		.	*r*	+		.
Temora longicornis O. F. MÜLL.	.	*c*	.		+	+	+	.	*c*	+	.	.	+		*r*	+	*r*	+	
Evadne spinifera P. E. MÜLL.	.	+	.			+	*r*	+	+		.	.	.		.		.	*c*	+
Podon intermedius LILLJEB.	*r*	.	.	.	.	.	.	*r*	*c*		.	+	+			+	.	+	*c*
Oikoplenra dioica FOL.		.	.	.			+		.	.	+	+		.	.	.	.	.	.
Sagitta bipunctata QUOI & GAIM.			.	.		*r*		.		.	.	*r*	.	.	.	.	.	.	+
Tintinnopsis campanula EHB.				.	.	.		.	.	.				*r*	*r*	.	*r*	.	.
Noctiluca miliaris SURIR.	.			.	.		.	.		*ccc*	*c*	*ccc*	.	.	.	.		.	.
Ceratium furca DUJ.		.			.	.		*r*		.		.	+	+	.	.	+	.	
C. fusus DUJ.	.	*r*	*r*	*r*	*r*	.	*r*	*r*	.		.			+	.	*r*	.	+	*r*
C. tripos NITZSCH	+	*c*	*c*	*c*	+	*c*	*c*	*c*		.	.	.	*c*	*cc*	*ccc*	+	*c*	*c*	*c*
var. longipes BAIL.			.		*r*			*r*					.	*r*		.	.	.	.
var. macroceros EHB.	*c*	+	*c*	*c*		*c*	*cc*	*c*	+				*c*	+	*c*	+	*c*	*c*	+
Peridinium divergens EHB.	.	*r*	+	*r*		.	.	*r*	.		.	.		*r*	+	.	*r*	*r*	*r*
Guinardia flaccida CASTR.	.				.		.	*rr*	.	*r*	+	+		*c*	+	*r*	+	.	
Rhizosolenia Shrubsolei CL.							.	.	*r*	*r*	+			.			.	.	.
Plankton-type	*Tp*	*Tp*	*Tp*	*Tp*	*Tp*	*Tp*	*Tp*	*Tp*	(*Tp*)	*Nm*	*Nm*	*Nm*	*Tp*	*Tp* *Nm*	*Tp*	*Tp*	*Tp*	*Tp*	*Tp*

Table IV. The North

Date	6	6	7	7	8	8	9	12	12	12	12	13	13	13	26
Lat. N.	57°48.	57°51′	58°12′	58°15′	58°40′	58°53′	57°18′	56°47′	56°51′	56°55′	56°59′	57° 3′	57°38′	56°55′	56°14′
Long.	10°35′ E.	8° 36′ E.	5° 30′ E.	3° 50′ E.	1° 4′ W.	3° 5′ W.	5° 49′ W.	2° 46′ E.	3° 32′ E.	4° 40′ E.	5° 58′ E.	7° 16′ E.	9° 40′ E.	7° 30′ E.	7° 39′ E.
Temp.	10	10	10	10,5	11	11	11	9,4	9,7	9,7	9,1	—	9,1	—	8,4
Salinity	31,94	32,44	33,40	35,44	35,65	35,32	33,08	35,03	34,83	34,86	34,86	—	32,25	—	32,91
Proto pedata LEACH.	.	.						.			.				*c*
Acartia Clausii GIESBR.	.	+	+	.	.	*c*			*r*				.	.	.
Calanus finmarchicus GUNN.	*c*		*c*	*c*	+	+	*c*	.		*r*	+	*c*		.	.
Centropages typicus KRÖYER	*c*	*c*	*c*	*c*		*r*	.	+	*c*	*c*	+	*c*		*r*	.
Corycæus anglicus LUBB.	.	.		.	.	.	.		.			.	.		+
Euterpe acutifrons GIESBR.	.				.	.	.				.				.
Microsetella atlantica BRADY & ROBTS		.		.				.			.	*r*	.	.	.
Oithona similis CLAUS	+	.	+				*r*	.	.		.	.		*r*	
Paracalanus parvus CLAUS	*c*	+	.	+		+			+	*c*	+	*c*			*c*
Pseudocalanus elongatus BOECK.	*c*	.	*c*	+	.	+		*c*	.				.	.	.
Temora longicornis O. F. MÜLL.	*c*		+	+		.	.	*c*	*c*	*c*	+	*c*	*r*	*r*	
Limacina balea MÖLLER			.		.			*r*		*c*	*c*	*c*	*r*	.	
Sagitta bipunctata QUOI & GAIM.	*c*	*cc*	*c*	*c*				*c*	.	+	.		.		+
Tintinnopsis campanula EHB.						.	.	.	.			.	.		.
Acanthometron quadrifolium HKL.	.	*rr*	*rr*		*rr*	*r*	.								.
Plectophora arachnoides CLAP. & LACHM.	*rr*	*rr*	*rr*		.	*rr*		.	.		.			*r*	.
Halosphæra viridis SCHMITZ.	+	*c*		+	+	*c*	*c*	*r*	+		*r*	+			.
Ceratium furca DUJ.	*r*		*r*			*r*	.	+		.	.	+	*c*	*rr*	.
C. fusus DUJ.	+	*c*	*r*	*c*	.	*r*	.	+	+	+	*r*	+	*r*	*rr*	.
C. tripos NITZSCH	*c*	*ccc*	*cc*	*cc*	+	*ccc*	*r*	*cc*	*c*	+	*cc*	*c*	*c*	*cc*	+
var. bucephala CL.	*r*	*c*	+	+	+	.	*r*	+	*r*	*r*	+	+	.		.
var. macroceros EHB.	*cc*	*cc*	*ccc*	*ccc*	*cc*	*cc*	*r*	*cc*	*c*	+	*cc*		*c*	*rr*	.
Dinophysis acuta EHB.					.		.	*r*	*r*		*r*		*r*	.	.
Peridinium depressum BAIL.	*r*		*r*	*r*	*r*	+	.	.	.		*r*		*r*		
P. divergens EHB.						.	.			.	.	*r*			
Pyrophacus horologium STEIN				.		*rr*	.	.		.	.			.	
Bellerochea malleus BTW.							.	.	.	.	.			.	
Biddulphia mobilensis BAIL.	.		.	.			.	.		.	.		.	.	.
Chatoceros curvisetus CL.	.	.	.		.	.		.	.	.	.	*r*	.	.	.
C. decipiens CL.		.					.	.		.	.			.	.
Coscinodiscus concinnus W. SM.	.		*rr*	*r*		.	.	.	.		.			+	+
C. excentricus EHB.	.		.		.	.	.	.	.	.	.	.		.	.
Ditylum Brightwellii WEST.	.	.	.			.	.	.		.	.	.		*rr*	.
Guinardia flaccida H. PER.	.	.	.			.	.		.	.		.		*r*	
Rhizosolenia calcar avis SCHULZE	.	.				.			.	.	.			*rr*	.
R. styliformis BTW.		.	*rr*	.	.	*rr*		.	.	.		*rr*	.	*rr*	.
Streptotheca thamesis SHRUBS.	.	.	.	.		.				.		.	.	.	.
Plankton-type	*Tp* (*Nh*)	*Tp* *Nh*	*Tp*	*Tp* (*Nh*)	*Tp* (*Nh*)	*Tp* *Nh*	*Nh*	*Tp*	*Tp*	(*Tp*)	*Tp*	*Tp* (*Nh*)	*Tp*	*Tp*	*Nm* *Nc*

Sea in November 1898.

26	5	5	6	6	6	7	7	13	13	14	14	14	14	15	15	15	15	13	14
55°30′	57°41′	57°22°	57°1′	56°42′	56°11′	55°35′	55° 1′	50°15′	50°58′	51°45′	52°32′	53°19′	54°15′	54°51′	55°50′	56°28′	57°2′	51°	51°
7° 20′	9° 55′	8° 21′	6° 17′	4° 22′	2° 31′	0° 34′	1° 10′	0° 30′	1° 10′	2° 14′	3° 11′	4° E.	4° 47′	5° 36′	6° 47′	7° 46′	8° E.	1° W.	2° 5′
E.	E.	E.	E.	E.	E.	E.	W.	E.	E.	E.	E.		E.	E.	E.	E.			W.
9,2	9,5	11,2	10,7	10,1	10,0	9,8	9,4	14	13,2	14	13	12,2	12	12	11,2	10	9	14,5	14
34,12	32,56	33,93	34,86	34,94	35,10	35,29	34,21	35,37	35,46	35,37	35,56	35,08	35,17	35,01	35,01	32,79	31,74	34,55	35,60
rr	.	.					.	.	.	.		.	+		+	.	+		.
.	+	.	.	.	+	+		*c*		*c*	*r*	.	.		.	.	.	*r*	*r*
rr		.			+	.			.	*rr*		*r*	.	.			.	.	.
.	.		.	+		*r*				.	.						.	.	*r*
.	*r*	*r*		.		.	.	*r*	.	*r*		+	.	*r*	*r*	+	.	.	.
.	.	.	.	.			.	+	*r*	+		.		.	.	.		*r*	
+	*r*			.			+					.					*r*		
r	.	+	.	+	+	+			.	*r*		.		*r*		*r*	*r*	*r*	
.	+	*c*		+	*c*	.		+	+	*c*	.	+		*r*	+			*r*	*r*
rr		+	.	*c*	*r*	*r*		.	.	.	*r*	+	.	*c*		*r*	*r*		
	.	.	.	.	*r*	*r*		*r*	+	+	+	*r*	.			+	*c*		.
	.	.	.					.	.	.		.	.				.		
.	+	*c*	*ccc*	*ccc*	*c*	*r*	.	+		+	+		+	+	*c*	+	*c*		
.	.	.	.					.		*r*	*r*	+	*r*	.	+	.		*r*	
	.	.	.	*r*	+		.	.			.	.	.	.		.	.	.	.
.	.	.		.		.	.	.	.		.	.	.	.	.	*rr*			.
				r	*r*	+		.			.		.	.			.		.
.	.			.	+			.		.	.		*r*	*r*	.			.	
	.	*r*	.	*c*	+		+				.		*r*	*r*		*r*	*r*		
.	+	+	*c*	*c*	*c*	*cc*	+	.		.	.	+	*c*	*c*	+	*c*	*c*		
.	.	.		+	+		.	.	.	.		*r*	.	*r*	.	.			
.	+	+	*c*	*c*	*c*	*cc*	+	.				*c*	+	+		*cc*	*c*	.	.
.	.		.	.	*r*	*r*	*r*	.	.	.	.			.					
r	.	.	.		*r*	.	.	.	.	.	*r*	.		.		*r*	*r*		
.	.	.	.		*r*	.		.		.	.	.	*r*			*r*	.	.	
.	.	.	.	*r*	*r*	*r*	.	.	.		.	.		.	.	.	.		
.	.			.	.	.	.	+	.	*r*	*r*	+	.	.		.	.	*r*	
r		.	*r*		.			*c*	+	*c*	*c*	*c*	*c*	*r*	*r*	.	.	*r*	
r	.	.		*r*	.	.		.	.	.	.					.		.	
.	.	.		*r*	.	.	.		.		*r*			*r*	.	.	.	.	*rr*
	+	+	*r*	*c*		.		*c*	.	+	+	+	*r*	+	*r*	*r*	*r*		.
		.	.		.		.		.		*r*	.	+	*r*	*c*	*r*			*r*
.					.					*c*	.	*r*	*c*	+	.	*r*		*r*	
.		.		.						*r*	.		+	+	+	+	+	*r*	
r		*r*		.				.	.		.	.	.	.	.	+	*r*	.	
+	*ccc*	*c*	*c*	+		*r*	.	.	.		.			.	.	*r*	*r*		
.	.		.	.	.		.	*r*		*r*	.	.		*r*	.	.		*c*	
S	*S* (*Tp*)	*S* (*Tp*)	*S* *Tp*	*Tp* (*S*)	*Tp*	*Tp*	(*Tp*)	*Nm* *Nc*	*Nm*	*Nm* *Nc*	*Nc* *Nm*	*Nc* *Nm* *Tp*	*Nc* *Tp*	*Nc* *Tp* *Nm*	*Nc* *Tp* *Nm*	*Tp* (*Nm*)	*Tp* *Nm*	*Nm*	*O*

Table V.

Month	1	2	4	5	5	5	5	6	6	6	6	7
Day	4	9	26	3	12	17	27	3	8	14	23	22
Temp.	5,7	4,4	8,7	10,3	9,9	10,6	11,9	12,4	14,6	15,0	14,6	—
Areom. Density	1,0242	1,0210	1,0235	1,0240	1,0244	1,0234	1,0247	1,0205	1,0225	1,0217	1,0247	—
Wind	SW.	NE.	NE.	SE.	NNW.	E.	NW.	W.	ENE.	NE.	W.	—
Tide	Ebb.	Ebb.	Ebb.	Flood.	Ebb.	Flood.	Ebb.	Flood.	Ebb.	Flood.	Ebb.	—
Oikopleura dioica Fol.			.				.	.	.	.		
Centropages hamatus Lilljeb.		.	*r*	.	.	.	.		.	.		
C. typicus Kröyer	.		.	.	.	.	.	.	.	.		
Corycæus anglicus Lubbock	.		.					.	.			
Euterpe acutifrons Dana					.	.	.		.			
Oithona similis Claus.			.			.			.	.		
Paracalanus parvus Claus.		.				.	.	.	.	.		
Temora longicornis O. F. Müll.			*r*	.	*r*	.	.		.	.		
Podon polyphemoides Leuck.	.	.	.				.			.	.	
Noctiluca miliaris Suriray	.		.		.	*c*		.	+	*c*	*c*	.
Ptychocylis Ehrenbergii Clap. & Lachm.	.	.	.		.	.	.					
Tintinnopsis beroidea v. acuminata Dad.		.			.	.			*r*	.	.	
T. campanula Ehb.			.		.	.					.	*r*
T. ventricosa Clap. & Lachm.			.			.	.			.		.
Phæocystis Pouchetii Lagh.		.	*ccc*	*c*	.			.		.	.	*r*
Ceratium fusus Duj.		.	.	*r*	.	+	*r*	*r*	*r*	*r*	*r*	.
C. trip. v. longipes Bail.	.				.		.	.		.		.
Peridinium ovatum Pouchet.						.		.				
Bacteriastrum varians Lauder		.					.	.	.	.	.	
Biddulphia aurita Lyngb.		*rr*			.	.	.	.	.		.	.
B. mobilensis Bail.							.	.	.	.	.	.
Cerataulina Bergonii H. Per.	.	.	*r*	+	*c*		+	+	.		.	.
Chætoceros debilis Cl.	.	.		.	.		.	.		.	.	.
C. decipiens Cl.		.		+	*r*	*r*	.	.	.	.	.	.
C. (borealis v.?) densus Cl.				.			.	.		*r*	.	.
C. didymus Ehb.		.			.	.		.	.		.	.
C. Schüttii Cl.	.	.	.	.	.	.	.			.	.	
Coscinodiscus concinnus W. Sm.	*r*	*r*	.	.		.	.					
C. excentricus Ehb.	*r*		.	.	.	.	.	.		.	.	
C. oculus iridis Ehb.			.	.				.	.	.	.	
Ditylum Brightwellii West.			.	.		.	.	.	.	.	.	.
Eucampia zodiacus Ehb.		.	.	+	*cc*	*c*	*c*	+	+	+	.	.
Guinardia flaccida Castr.				+	*c*	*c*	+	*cc*	*cc*	*cc*	*cc*	*c*
Lauderia annulata Cl.			.	.	.	.	.	.		.	.	.
Lithodesmium undulatum Ehb.	.	.	.		.	.	.	.		.		
Rhizosolenia calcar avis Schulze	.	.		.	.	.	.		.		.	.

Helder 1898.

7	8	8	8	9	9	9	9	10	10	11	11	11	11	12	12	12	12	12
25	1	11	24	8	16	23	29	8	28	4	11	18	24	3	10	17	21	28
16,4	17,2	17,7	19,3	19,2	19,0	16,2	15,2	12,8	12,3	11,8	10,2	9,0	5,4	8,6	8,4	7,4	6,2	6,6
1,0325	1,0224	1,0234	1,0228	1,0232	1,0221	1,0237	1,0248	1,0235	1,0245	1,0240	1,0247	1,0238	1,0233	1,0256	1,0253	1,0247	1,0251	1,0250
NW.	NW.	WSW.	NNW.	—	ESE.	N.	WSW.	ENE.	SSW.	WSW.	E.	ESE.	ESE.	—	—	W.	—	SW.
Ebb.	Flood	Ebb.	Ebb.	Ebb.	Ebb.	Ebb.	Flood.	Ebb.	Ebb.	Ebb.	Flood.	Ebb.	Flood	Ebb.	Flood.	Ebb.	Ebb.	Flood.
		r	.	*r*	.	.	*r*										.	
.		*r*	*r*	+	.			*r*	.									.
.						.		.		.						*r*	+	
.	.			.	.		.	.			*r*			*r*	*r*		*r*	
.					.	*r*	+	*c*	*r*	.	*c*	+	*r*	*r*	.	.	+	.
.		*r*	*r*		*r*	*r*	+	+	*r*	*r*	+	*r*	.	.		.	*c*	*r*
.		*r*		*r*	.	.	*r*	.		*r*	.	.		*r*	*r*			*r*
	.	*r*			*r*		*r*	*r*		.	.				+	*r*	+	*r*
	.	*rr*		.	.	.	*r*	.		.				.	.		.	
c	+	*ccc*	*c*	*cc*	+			*r*	*r*	*r*	*r*			.	.	.		.
.	.	.	.	.	.	.	*r*	*r*	.		.	.	*rr*		.	*rr*	.	.
.				.	.	+	+	*r*		.	*r*	.				+	*c*	*r*
r	*r*	*r*	*r*	+	.	+	+	*r*	*r*	.	.	*r*		.		.		
.	*r*	*r*	*rr*	*r*	+	.	*r*	.		.	*r*	.			.	.	.	
r	+	.	*c*	.	.		.	.	+	.				.	.	.	.	
.	.		.	.	.	.	.	.	.	*r*		.	*r*	*r*		.	*c*	*r*
	.			.	.	.		.		.		.		+	+	+	*c*	*r*
	.			.	.	.	*r*	*r*		*r*	.	*rr*			.			.
		c	+	.	+	+	*c*	*r*	*r*	.	.							.
			.		.	.	.	.	.		.		.			*rr*	*c*	
.		.		.	.	+	*c*	+	+	+	*c*	+		+	+	+	+	*r*
.	.	.		.		.	.		.	.	*r*							.
.	.	.	.	.	.		+	*r*	*cc*		*cc*	*c*	*cc*	.	.	*r*	*c*	.
.		.			.						.				.			
.	.	*r*	*r*	.	*r*		*r*	*r*	+	*r*	+	*r*	*r*	*r*	.	.	.	.
.	*rr*		*rr*	.	.		*r*	*r*	*r*		*r*	*r*	*r*				.	
	.	.	.	.		.	*rr*	.	.	*r*	*r*	*r*	*r*					.
.	.	.	.	.	.	+	*c*	+	*r*	+	*r*			*cc*	+	+	+	*r*
	.		.	.				.	.	+	+		.				+	
.		.			.		.	.	.	.	*r*	.	.	+		*r*	.	
.		.	.	.	.	.		.	+	+	*r*	*r*	*r*	*r*		*r*	*r*	.
	.	.	.		.	.	*cc*	.	*r*	*r*	.	+	*r*			.	.	.
cc	*c*	+	.	*c*	*c*	.	*c*	.	*r*	.	*r*		.					.
.	.	.	.	.	.	.	.	.	*r*	.		*r*			.	.	*rr*	
.	.		.	.	.	.	+	*r*	*r*		*r*	+	*r*			*r*	*r*	*r*
.	.	.	.	.		.	*r*	.		.	*r*		*r*	.		.	.	.
.	.	*rr*	.		*rr*	.	.	.	.		.		.			.		
.	.	.	.	*r*			*rr*	.	*r*		*r*	*r*	*r*				*r*	
+	*c*	+	.	.	.	.	.	.		.	.				.		.	
.	.	.	.	.	.	.	.	.	.	.	*r*	+	*r*	.	.	.	*r*	.
.	.	.	.	.	.	.	.	.	.	.	.	.	.		.		*r*	.

Table VI.

Month	1	1	1	2	2	2	2	3	3	3	3	3	4	4	4	4	5	5	5	6
Day	12	18	27	4	11	16	23	3	8	15	23	31	5	14	21	28	11	20	26	7
Acartia Clausii GIESBR.	r	r				r	r	r	r		+	+			r		cc		+	
Calanus finmarchicus GUNN.		.							.					.					r	r
Centropages typicus KRÖYER	r	r	.							r			.	.	r		+	+	+	.
Corycæus anglicus LUBB.	r	+	r		r	r	r		r			r		.					.	
Euterpe acutifrons DANA.	r	r		r	r	.	r		+			+							.	
Oithona similis CLAUS	r	+	.	r	r	+	r	r	+	c	+	+	r	r		rr		+	.	.
Paracalanus parvus CLAUS	r	c			r					+	r	.		.			.	+	.	.
Pseudocalanus elongatus BOECK.		+				r	r		r	+	r	.			.	.			.	.
Temora longicornis O. F. MÜLL.		.				.	r					c		.	r	.	c		.	.
Sagitta hipunctata QUOI & GAIM.		+											.	.		.			.	
Noctiluca miliaris SURIRAY		.						.											.	
Acanthochiasma fusiforme HKL.	r	r									.	.	.	.	.		.		.	.
Dictyocylis Ehrenbergii CLAP. & LACHM.	.												.	.	.			.	.	
Lintinnopsis beroidea v. acuminata DAD.						r						r	.	.	.	r			.	.
L. campanula EHB.											.				.			.		
Phæocystis Pouchetii LAGH.									.	.	r		+	c	c	cc	ccc	ccc	cc	cc
Ceratium fusus DUJ.			r				.	r		+		r	+	.	+	c		.	.	.
C. tripos NITZSCH	.	+	+	r			r	r	r	+				.	.	r		.	.	
v. longipes BAIL.			.			.	.	rr		r					r	rr	.			
Diplopsalis lenticula BERGH.	.	r						r		r		.	.	.	.	r			.	
Peridinium divergens EHB.		r	r		.	.		.	.	+		+	r		.	r			.	.
Halosphæra viridis SCHMITZ					.	.		.	.		.			.				.	.	.
Asterionella japonica CL.		.	.				.	.	.	.	rr		r	r		rr			.	.
Biddulphia mobilensis BAIL.	c	c	c	c	c	c	c	+	+	+	+	.		.	.		.		.	
Cerataulina Bergonii H. P.			.			.		rr	.				r		+	+				.
Chætoceros curvisetus CL.	.					.	.		r		c	.	+		.			.		.
C. decipiens CL.	r	r	r			r		.		+	+	r	+		.		.		.	.
C. (borealis var.) densus CL.											+	r	c	c	+	r	.	.		.
C. didymus EHB.	.						.	.	.	rr	.	.	.	.	.	.	.	.	.	.
C. Lorenzianus GRUN.	.		.				.	.			.		.	.	.	.			.	.
C. Schüttii CL.						rr				rr	.	.	.	.	.	.		.	.	
Coscinodiscus concinnus W. SM.	c	c	c	c	c	c	c	r	r	+	+	c	+	c	+			+	.	+
C. excentricus EHB.		+	+	+	+	+		.				.	.		.		.	.		.
Dictylum Brightwellii WEST.	.	r	r		.	.	r	.	.						.		.	.		
Encampia zodiacus EHB.			.					.			r		c	+	c	c		.	.	
Guinardia flaccida CASTR.		.	.	.		.	.	.			r	r	.	.	.		.	.		.
Lauderia annulata CL.	r		.			.		r	r	c	c		.	.	+	.	.	.	.	
Rhizosolenia alata BTW.			.								.	.	.			.	.	.	.	
v. corpulenta CL.					.	.		.			.	.			rr				.	
R. gracillima CL.			.	.		.	.					r	r	r	.	r		.	+	r
R. robusta NORM.		.		.	.	.	.			.	.		r	r	r	.	r	.	.	
R. semispina HENSEN	.		.		.	.		.	.		.			r	.	+	.		+	r
R. Shrubsolei CL.	.		r				.	.		r		.	.		+	c				
R. Stolterfothii H. P.			.			.		.			r	.	c	c	c	cc	.	+	cc	c
R. styliformis BTW.			.	.				.			r	r	r		r	.	.	.	r	r

Plymouth 1898.

6 15	6 23	7 5	7 14	7 22	7 30	8 5	8 12	8 16	8 24	9 2	9 9	9 22	9 27	10 4	10 11	10 20	10 31	11 3	11 9	11 12	11 17	11 22	12 1	12 3	12 7	12 14	12 19	12 31
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*	*c*	+	+	+	+		+	*r*	+	+	*r*	+	.	*c*	+	.
r	.							.	.	*r*			*r*	+	*c*	*cc*	*c*	+	*c*	*r*	.			*r*				
	r		.		+			+	*c*	*r*		+		+				*r*	*c*	+		*r*		+		*c*		
	.				*c*	.		+	+	.	*c*	*c*	*c*	*c*	*c*	*cc*	+	*r*	*r*	*c*	+	*r*	.			.	*c*	
.	+						.		*r*	.																		.
.	+	.	.		*r*			.	+		.				*r*		*r*	.	+	.	*r*		.					
	.			.	.		.			+	*r*	.		*r*	+	*r*		.	*c*	+								
	ccc		.	*ccc*	*c*					*r*	+	*r*	*r*	*cc*	*ccc*	*cc*	*c*	+	+	*r*	*c*		*c*				*rr*	
					.	.	*c*	*r*	.	.				*r*									.			.		
						c		*r*		+	*r*				.					.						.	.	
						.		.	.			.			.		.	.					*r*			+	.	.
			.	.		.	.	+		+	*r*	.	+		.	.		.	.									
.				.							.		*r*					.	.		.						.	
r				.	+			*r*			.									.			*r*	.				
+	.		.		*c*	*c*		*r*	.		+	*r*				*r*	+		*r*	*r*	+	*c*	*r*	*r*	*r*	+	*c*	
.	+	.		+	*c*	*c*				*rr*	.	.						.	.		.				.	+	
+								*r*				.					.		.							.		
											.	.				.	.				.	*rr*						
.	.		.			*r*		*r*	.			.	*r*	.		.	.	.				.						
				.		.		.			*rr*	.		.		.	.	.					.					
		.	.				.	.					*r*	.		*r*	*r*			.			*r*		*r*		*r*	*r*
+		.								*rr*			.	.	.	.												
						r	*c*	*c*	*r*	*cc*	*c*	*c*	*r*			.					.		.					
		.	.	.	.					.		*c*	+	*r*					,	*r*	*c*	+	+		*r*		*r*	
r		.	.	.		*c*	+	.	.		*r*	.	*r*	.			.									.	.	
			.			.							.	*rr*			.				*c*	*r*	*r*	*r*		*r*	.	
		.		.	.	+	+	+			*r*				.		.	.			.	.					.	.
			c	*r*	*c*	*c*	*c*	*c*	.	*r*		.		.	.		.	.	.	.	*c*	.				.	.	
		.		.	.			.				.	*c*	*cc*	.	+	*c*	+	*cc*	*cc*	*c*	*c*	*c*	*r*	*r*	*c*	*cc*	.
														.				.			.	+						
					.	.		.	.	*c*	*ccc*	+	+	.		.		.		.		.	.						
.							.	.	.	.		*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*			.		
+		*cc*	*ccc*	*cc*	*ccc*	*c*	*cc*	*cc*		*c*					.			.						.				
.		.	.	.	.			.		*rr*		*r*	*r*	*c*	*r*	*r*	+	+	*r*	*r*	*cc*	*r*	*r*	*r*		*r*	*r*	
		.			.	.	.	.			*rr*				.		.		.	.	.							
							r			.										.								
c	+					+	*r*	*r*			*r*	.									.					.		
+	*rr*				*r*	*r*				*r*	*r*	*r*	.		*r*		+		.		*r*	*r*						
					c	*c*		+	*r*	*r*		.							.									
		.						.		.																		
		.						.	.	.		.																
Nm *S*	*Nm*	***Nm***	*Nm*	*Nm*	*Nm* *Ns*	*Nm* ***Ns***	*Nm*	*Nm*	*Nm*	*Nm*	*Nm*	*Nm* *C*	*Nm* *Nc*	*Nm* *Nc* *S*	*Nm*	*Nm*	*Nm* *Nc* *S*	*Nm* *Nc* *S*	*Nc*	*Nc*	*Nc* *Nm* *S C*	*Nc* *Tp* *C*	*Nc* *Nm*	(*Nm*)	(?)	*Nm* *Nc*	*Nc* *Nm* *Tp*	*O*

Table VII.

Month	I	I	I	II	II	II	III	III	III	III	III	IV	IV	IV
Date	2	10	30	9	15	22	1	8	11	21	29	1	7	13
Temp.	3,70	3,65	—	—	2,10	2,45	1,95	1,80	—	—	2,10	—	3,95	3,40
Sal.	23,58	25,95	—	—	26,27	27,34	22,62	26,94	—	—	22,48	—	27,22	24,04
Oikopleura dioica Fol.	.		r	.	.		.							.
Acartia Clausii Giesbr.	.	.	.			.	.	.				.		
A. longiremis Lilljeb.	+	.		r	r	.	r	r	r	.		rr	r	
Calanus finmarchicus Gunn.	.		r	r	.	.			.	.		.		
Centropages hamatus Lilljeb.	+		+	.		.			r		.	rr		
C. typicus Kröyer	r		r	.		.		.		.			.	
Oithona similis Claus	c	+	.		r		r	r			.	rr		
Paracalanus parvus Claus			.		.	.					.			
Pseudocalanus elongatus Boeck.	.	.		+	r	.	r	r	r			r		
Temora longicornis O. F. Müll.	+	.	.	+			rr		r		.	.	.	.
Evadne Nordmannii Lovén	.							.					.	
E. spinifera P. E. Müll.												.		.
Podon intermedius Lilljeb.		.	.					.			.	.		
Sagitta bipunctata Quoi & Gaim.	+	.		r				.	.					
Cyttarocylis denticulata Ehb.	r		r		r		r	.	.				r	
Ptychocylis acuta Brandt	r		r	r	r	r	r	.		.				
Tintinnopsis beroidea v. acuminata v. Dad.	.		r											rr
T. campanula Ehb.	.	.			.			.						
Distephanus speculum Ehb.		.	.		.			.		.				
Halosphæra viridis Schmitz	r	+	cc	c	+	r				rr		.	.	
Ceratium furca Duj.			+	r				.		rr	.	.	r	.
C. fusus Duj.		.		.		.		.		rr		.	r	.
C. lineatum Ehb.	r	.	.		.		.			rr				.
C. tripos Nitzsch	ccc	+	cc	c	+	+	r	r		rr	rr		r	
v. longipes Bail.	r	r	r	+	+	+	r	+		rr		r	r	rr
v. macroceros Ehb.			r	.		+						.		.
Dinophysis acuta Ehb.	r	.	r	.	.		r	.						.
Peridinium depressum Bail.	r				r	+	r	r		r		r	.	.
P. divergens Ehb.			.	.	.					.		.		.
Xanthidium multispinosum Moeb.			.	.	.	.				.	.	r	.	
Biddulphia aurita Lyngb.	rr	.	r	r	r	c	r	r	.	r	.	r		
Cerataulina Bergonii H. Per.	rr			.	.	.			.				r	r
Chætoceros borealis Btw.		+	r	r	r	+	.	r	.		r	r	+	

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IV	IV	V	V	V	V	VI	VI	VII	VII	VIII	VIII	VIII	IX	IX	X	X	X	X	XI	XI	XI
20	25	1	10	16	27	4	10	6	26	8	15	24	3	21	1	10	21	28	7	14	27
3,25	—	5,95	8,30	8,45	10,10	11,45	16,5	15,55	14,80	14,65	15,30	17,10	14,70	14,10	—	—	8,10	8,65	8,35	7,10	4,85
25,28	—	19,78	18,61	22,22	20,29	20,43	19,56	18,83	24,32	24,58	23,59	19,66	30,10	27,01	—	—	22,60	22,56	25,83	18,78	23,05
	.	.				.		c	+	+	+	+	c	+	c	.	+	+	+	+	
	rr	.		.	+				r	+	c	c	+	.	r		r		.	r	rr
	r	r	r	.	+	r				.	.		r		.	.		r	r	+	.
	.			.			.		r		+	r		+	+	+					.
.	rr	r	r		+	r	r	r	.	r	.		r		r		.	r		c	.
		.				.				+	.		+		c	c	c	+	.		
.		r	r	rr	.	r	+	c	+	c	c	c	c	c	c	+	+	c	+		
.	.	.			.	.	.	c	+	c	cc	c	cc	c	c	c	c	+			rr
.		r		.	+	.	.	.	.	+	.	r	+		+		r		.		rr
.		.	.	.	+	r	+	.		r	r		r				r	r	.	r	rr
		rr	r	rr	+	r	+		r	c				+	+	.	.	.	.	.	.
			.				.		.	c	cc		c		c	c	r				rr
	.								rr	rr	rr		r	rr	r		r	r		.	.
.	.		.				r	.			+	c	c	+	+	+	.	+		+	.
.	r	r	r	r	r	r			.			.			.	.			.	.	.
.	.										.				.		.				
.	r	rr	.	r	.	.								.				.			
	.		.	.				.	r		.	rr	r	.	r	rr		r	.	rr	.
			.	.					.	.	.			.	rr	rr	.	.	rr	rr	rr
	.		.							.	.			.	.	.			r		r
	.	.	.	.				r		.	.		r			r	r		r		.
				.	r			.		+		+		.	.	r	r	r	r	r	.
	.			.	.	.		.		r	.			.		.	r	.	r	r	.
	rr	r	r	r	r	r	+	+	c	ccc	cc	cc	+	+	.	+	c	c	+	cc	+
r	rr		r	r	r	r	.	.		.	.	.	r	.	.	r	r			r	r
	.		.	.	.			.	r	+	r		c	+	c				r	.	rr
	.	.		.	.			.	r			r		r	.	.			rr		
.	.	.		.					r		.	.	.			.			r	r	.
.		.	.	.	.		.	r	r	r	r	r	.	r		r	r	.			.
.	rr		.			.	.	.	r			.	.		r	rr	.				
	.		.	.			.		.		.		.	.	.						
.	r	rr	rr	+	c	c	c	r				+	r			.		r		r	.
r	c	+	r	r	r	r						.			.		.	c	r	r	+
.	.	rr	.	.	.	.	.							.		.	.	.		.	r
cc	ccc	ccc	ccc	cc	+	+	.				.					.	.	+	+	.	.
+	.	+		c	+		.					r	r	r	.	+	.		r	+	c
r	.	.	.	.		.	.					c	c	+	c	cc	cc	cc	cc	c	c
r		cc	ccc	ccc	cc	c	cc				.	.	.	.	.			c	c	r	+

Month	I	I	I	II	II	II	III	III	III	III	III	IV	IV	IV
Date	2	10	30	9	15	22	1	8	11	21	29	1	7	13
Temp.	3,70	3,65	—	—	2,10	2,45	1,95	1,80	—	—	2,10	—	3,95	3,40
Sal.	23,58	25,95	—	—	26,27	27,34	22,62	26,94	—	—	22,48	—	27,22	24,04
C. debilis Cl.					*c*	*c*	*c*	+	*c*	*c*	*c*	+	*r*	*r*
C. decipiens Cl.		*r*	*r*	+	+	*c*	.	+	*c*	+	+	+	+	.
C. diadema Ehb.	*r*			*r*			+	*r*	+	+	+	+	*r*	*r*
C. didymus Ehb.		.	*r*				*r*	+	.		.	.		
C. hiemalis Cl.									.		+	*r*	*c*	*r*
C. Schüttii Cl.								.		.			.	.
C. scolopendra Cl.		.		*r*	*r*	*r*		*r*		*r*		*r*		
C. socialis Lauder				+	*c*	+	+	+	+					
C. teres Cl.			*r*				*r*		*r*		*r*		*r*	
Coscinodiscus concinnus W. Sm.	+	+	*r*		*r*			*r*						
C. oculus iridis Ehb.			+	*c*		+	*r*	*r*		.	.		.	
C. polychordus Gran.					*r*	*r*	+				*r*	.	*r*	
Ditylum Brightwellii West.				.			.						*r*	
Guinardia flaccida Castr.					.									
Leptocylindrus danicus Cl.				.	*r*		*r*	*r*	*c*	*r*	+		*r*	*r*
Nitzschia seriata Cl.					*r*	*r*	*r*	*r*	*r*	+	+	*r*	+	*r*
Rhizosolenia delicatula Cl.											.			
R. gracillima Cl.										.		.		
R. semispina Hensen	*rr*		*r*							*r*		*r*	*r*	*r*
R. setigera Btw.		.			.						*r*	*r*	*r*	
Skeletonema costatum Grev.	*rr*	*r*	*r*	*r*	*r*	*r*	*r*			*r*	*r*	*r*		.
Thalassiosira gelatinosa Hensen				*r*	*r*	*r*	*r*				*r*	*r*	*r*	
T. gravida Cl.			.	*r*	*r*	+	.	*r*		*r*	*r*		*r*	.
T. Nordenskiöldii Cl.	.	.	*r*	*c*	*cc*	*cc*	*c*	+	+	+	*r*			
Thalassiothrix Frauenfeldii Grun.	*r*	.	.	+	*c*	*cc*	*cc*	*ccc*	*cc*	*ccc*	*cc*	*cc*	*c*	+
T. longissima Cl. & Grun.	*rr*	*r*		*c*	*c*		*r*	*r*		*r*	*r*		*r*	
Plankton-type	*Tp*	(*Tp*)	*Tp* *Nh*	*Tp* *T* *Si*	(*Tp*) *T Ns* *Si*	*Si* *Ns* (*C*)	*Si* *Ns*	*Ns*	*Ns*	*Ns*	*Ns*	*Ns*	*Ns* (*Nm*)	*Ns* (*Nm*)

IV	IV	V	V	V	V	VI	VI	VII	VII	VIII	VIII	VIII	IX	IX	X	X	X	X	XI	XI	XI
20	25	1	10	16	27	4	10	6	26	8	15	24	3	21	1	10	21	28	7	14	27
3,25	—	5,95	8,30	8,45	10,10	11,45	16,5	15,55	14,80	14,65	15,30	17,10	14,70	14,10	—	—	8,10	8,65	8,35	7,10	4,85
25,28	—	19,78	18,61	22,22	20,29	20,43	19,56	18,83	24,32	24,58	23,59	19,66	30 10	27,01	—	—	22,60	22,56	25,83	18,78	23,05
+	r																				
c		+	+	r	+		.								r						
+		r																+	c	+	c
.												c	r	ccc	+	cc	c	+			
+	+	+	+	c	+		r					r				r	r	r	r		r
												c	c		+	c	c	c		+	
																					r
		rr																			
													r		r			r	r		r
r																					r
																		r	r	r	r
	.					r		r					r	r				+	r	r	r
r	c	c	+	c	+	+	+														
r	r			r		+															
	.		r			r	c														
	+	r	r	r	c	c	cc	ccc	ccc			c	r	+		+	+	+	c	r	c
r	c	+	+	r	c		r									.					
																		r	+	rr	r
r		r																		+	cc
																			rr	r	r
	r																				
r																					rr
cc	cc	c	c	c	cc	c	c						.						c	+	c.
	.																				
Ns C	Ns (Nm)	Ns Nm	Nm Ns	Nm Ns	Ns Nm	Ns Nm	Nm (Ns) (Tp)	Nm (Tp)	Nm (Tp)	Tp	Tp	Nm (Tp)	Nm (Tp)	Nm (Tp)	Nm (Tp)	Nm (Tp)	Nm (Tp)	Nm (Tp)	Nm Tp (Ns)	Nm (Tp) Ns	Ns Tp	Ns