The Microplankton of Plymouth Sound from the Region beyond the Breakwater.

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With Figures 1–9 in the text, and Tables I and II at the end.

THROUGHOUT a complete year from September, 1915, to September, 1916, sea-water samples were taken regularly two or three times a week from beyond the Breakwater in the region of the Knap buoy, 2½ miles from Plymouth shore, from the surface and at 5 and 7 fathoms. The object was to supplement the existing records from the tow nets as it is well known that a very large amount of material is lost even from the finest nets, as Lohmann has shown exhaustively (1908). So far the only plankton records from this region have been from the tow nets, and a glance at the tables given at the end of this paper will show directly, if compared with those by Gough (1903–7) and Bygrave (1911), also Cleve (1899 and 1900), the great difference in numbers of the smaller forms, or their entire absence from the tow nettings. Again, no actual numerical records have been given from this region. At the same time as the water samples were taken, tow nettings, coarse, medium and very fine, were also secured, and these were regularly examined for comparison.

The water samples were estimated by means of the centrifuge after the manner introduced by Lohmann. A water-bottle was used for the 5 and 7 fathom samples, and the surface sample was collected in a Winchester bottle. Experiment showed that there was no difference in the surface samples when collected either with the water-bottle or Winchester, and it was found more convenient for keeping as it was unnecessary always to examine it the day of collection, as was the case with the water-bottle samples. The Winchester samples keep for two or three days at a uniform temperature. If examined the day they are brought in the water-bottle samples are quite as good as the surface samples in the

Winchester for Peridiniales and Protozoa, which perhaps include the most delicate of all the plankton organisms. The samples were all examined fresh when possible; if impossible, which was only seldom, they were preserved by adding strong Flemming's solution at the time of capture as advised by Gran (1912*a*). For most species this method of preservation was found very satisfactory.

For quantitative estimation a certain amount (usually 50 cc.) of the sample water was put in tubes and centrifuged. Five tubes each holding 10 cc. were examined, the tubes pointed at the end after Lohmann's pattern, so that the contents may be emptied out and leave the residue in the point; this residue was removed carefully with a fine pipette, put on a ruled glass slide and the contents counted. The water was then re-centrifuged and the process gone through again. It was found that although re-centrifuging answered very well for diatoms, *Peridinium* and the more sturdy organisms, it was no use for the fragile forms such as the naked Peridiniales and small Infusoria, many of which are most probably destroyed even before they are brought in.

It was found by experiment that centrifuging for ten minutes gave the best results, the largest number of gymnodinians being secured in this way. This is longer than the time taken by Lohmann, but his centrifuge made many more revolutions than ours, the number of ours not being exactly estimated.

The tow nettings were not exhaustively examined, but the most important organisms were noted and their relative abundance. The nets used were of silk with meshes 26, 50 and 150 to the inch respectively, mouth 56 inches in circumference (inside), and bottom 15 inches in circumference. Length of silk clear of the calico to which it is attached at the ends, 39 inches. Area of silk, 1382 inches. Duration of haul, 10 to 15 minutes, or in exceptional cases a few minutes longer.

The following quick method was adopted: anything large first noted with the naked eye, then a certain amount of each sample taken, and when 30 or more of any organism was present it was marked cc; if 20 but under 30, c; if 6 but under 20, +; if more than one but under 6, r; if only a single specimen rr. In this way a rough estimate of what is common in the tow nets is made. In the case of the very fine samples after stirring two separate drops with a pipette are examined and the above method applied.

On the few days when it was impossible to go beyond the Breakwater the samples and tow nettings were taken from the west channel at the side of the Breakwater. For a fortnight in April it was impossible owing to the storms to go out at all. After this, about the 25th, the increase in plankton is large. The samples were as nearly as possible

taken at the same time of day, between 11 a.m. and 1 p.m., and the state of tide, wind, and weather noted.

A great many species get through the meshes of even the finest nets. Those which are nearly always lost are the smaller Peridiniales, especially the *Gymnodiniaceæ*, the small Infusoria, with the exception of the *Tintinnoidea*, small flagellates (very few of which, however, appeared in our samples), Protozoa of various kinds and many of the smaller diatoms. On looking through the Plymouth records in the Fisheries Investigations we find an almost complete absence of all the very small Peridiniales, and with one exception (that of *Gymnodinium lunula*, which owing to its large size is conspicuous) an absolutely complete absence of *Gymnodiniaceæ* which confirms Lohmann's statement that all were lost. *Prorocentrum micans* is almost absent from the tow nettings, here again in agreement with Lohmann, who found a large loss. Infusoria, except the *Tintinnoidea* are practically absent, and among the diatoms we find records of species such as *Chætoceras curvisetum*, which we have found *the* commonest species of this genus in the plankton, only represented at the most by the sign +, usually r or rr. At times it has appeared with us in quantity in the tow nets, but not nearly as frequently as in the water samples. *Paralia sulcata* is seldom to be found in the nets but is abundant in the water samples, and present nearly all the year round. In Gough's lists it is usually marked r or rr, never by either Bygrave or Gough is it marked cc.

Skeletonema costatum is another good example and one specially marked by Lohmann. Although sometimes recorded as cc for Plymouth, the few times it is thus marked bear no comparison with the numbers really contained in the water. This is a particularly abundant species here, and at Kiel it is shown to be in enormous numbers, most of which escape the net. The species of *Nitzschia* are also good examples, *N. closterium* and *N. delicatissima* particularly nearly always being lost by the net.

On the other hand, a good many of the larger species do not get into the water samples in anything like a representative number. For instance, the genus *Biddulphia* only appears very occasionally, when really it forms a most important part of the plankton at a certain season of the year. *Streptotheca thamensis* is another case; this species being very abundant at times in the tow nettings and only occurring in small numbers in the water samples. The genus *Rhizosolenia*, although the relative abundance of the species is usually well shown in the water samples, is yet sometimes very ineffectually represented. For instance, in June *Rhizosolenia Shrubsolei* appeared in all the tow nets for two or three days, particularly on June 19th, especially in the medium net,

and the specimens were of very large size. These scarcely got into the water samples, so that the curve taken from the numbers obtained from the water samples gives a wrong impression for this species, although the seasonal distribution is correctly, though roughly, shown.

The Metazoa in the water samples only amount to a few individuals and are of no account, so that the quantitative work practically amounts to an estimation of the unicellular organisms. Whilst counting the diatoms they were estimated, as is usual, by cells; however, for the tow nettings the chains were regarded as individuals, otherwise the method given above would not have been suitable owing to the number of cells in a chain.

The tables at the end of the paper show the average number of organisms in the water samples in 50 cc. for each week. The tow nettings are shown for comparison at the same time (marked in letters). The account of the Metazoa from the tow nettings is given without tables, and they are also taken into account in the survey for each month. A list of the dates on which the samples were taken, giving wind and weather, will be found at the end of the paper.

The largest numbers, on the whole, are found in the surface layer, but there is not much difference, and a large amount of mixture of water seems to take place, so that it is difficult to assign to any particular species its particular habitat in depth. *Skeletonema costatum* is most frequent at the surface, also *Chætoceras* species generally, *Lauderia*, *Thalassiosira*, and *Mastigloia*. The greatest fluctuations are nearly always from the surface and can usually be traced to the state of the tide, the 5 and 7 fathom layers being much more regular, as was to be expected. *Skeletonema*, as noticed by Gran (1912*b*) is rather more numerous at the surface. *Paralia sulcata*, however, shows all its maximum numbers either at 5 or 7 fathoms, but as this is naturally a bottom form often coming into the plankton, it is not surprising. *Nitzschia delicatissima*, and *Asterionella japonica* also show largest numbers at 5 and 7 fathoms. The state of the tide affects the numbers, more being taken at or just before high tide, fewest at or just before low tide usually. The highest catches usually come with S. and S.W. winds.

The unicellular organisms other than diatoms occur irregularly at all depths.

On comparing the present records with those of Lohmann at Kiel, much that he states is borne out by these results, although many of his numbers are from estimates with filter as well as centrifuge. *Skeletonema costatum*, which he regards as one of the most important diatoms of the plankton, has a curve which is wonderfully in accordance with ours,

Fig. 1 having a large spring and a small summer maximum (Lohmann, 1908, table XII).

Of his numerical results the Peridiniales are relatively in much larger numbers than in the present records. Although here many species are found to occur and several new species are described, the individual numbers are usually enormously less in these records, even when the

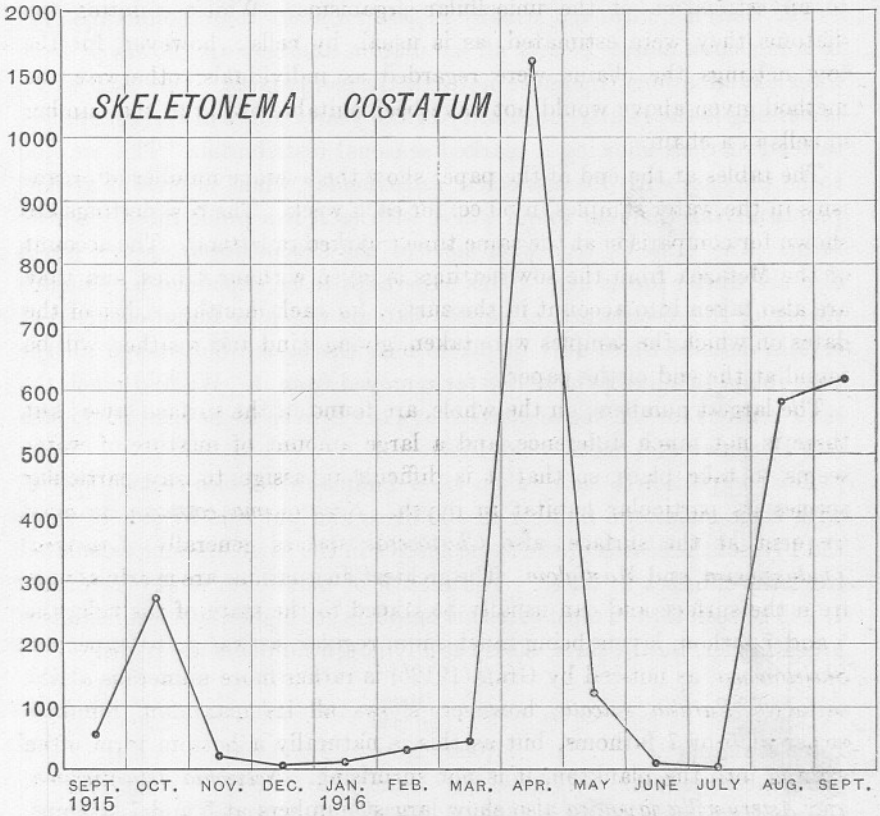

FIG. 1.—Curve of *Skeletonema costatum*, showing average number of individuals in 50 cc. for each month.

season of maximum number agrees. As Lohmann observed at Kiel, so here, there are several amœbæ to be found in the plankton. Ours are of three kinds, one of which is fairly common. With him *Flagellata* are much more numerous than with us, except *Phæocystis*, which is so abundant here in May and June that it interferes with everything, clogging up all the nets. Infusoria Lohmann finds numerous, and there are numerous species of them here, but they are not found in large numbers with the exception of the *Tintinnoidea*. The smaller forms, such as *Laboea* species

and *Strombidium caudatum*, very easily collapse and destroy themselves in a moment. *Tiarina fusus* we find at a larger maximum than at Kiel. Most of the new species, both of the Peridiniales and Infusoria found in the plankton by Lohmann, are present here if not in such large quantities; thus we have *Amphidinium crassum*, *Pouchetia parva*, *Cochlodinium pellucidum*, *Laboea strobila*, and many other species hitherto not known from British seas.

The diatoms, although usually in less numbers than Lohmann's, are in some cases more. Nearly all his diatom numbers are, however, from filter examinations, therefore not exactly comparable. One fact which is striking is the relative regularity of the yearly curve of certain species, instead of their showing a marked seasonal distribution. This we find to be the case with *Thalassiothrix nitzschioides*, which is present at Kiel practically all the year round whilst with us it is a pronouncedly winter form. The same is true with most of the *Coscinodiscus* species which also are winter forms here. This is perhaps to be explained by Gough's theory of the distribution of neritic diatoms which he found occurred at certain definite times only in places near the ocean, but stayed all the year round in suitable localities far removed from it. We find much the same seasons for the above diatoms at Port Erin as we have at Plymouth (see Herdman and Scott, 1908–15).

For comparison I have taken from Lohmann's tables certain species with their maximum number in 100 litres and put side by side of these the Plymouth records of the same species in the same amount calculated from the number in 50 cc. The month of maximum is also recorded. It will be seen that in most cases his numbers are higher, in a few instances much higher, but in three cases the Plymouth numbers are higher.

Species.	*Kiel.*	Month of max.	*Plymouth.*	Month of max.
Paralia sulcata . .	77,000	Nov.	1,000,000	Nov.
Skeletonema costatum .	778,000,000	June	25,000,000	April
Guinardia flaccida .	360,000	May	20,000	Sept.
Asterionella . .	1,800,000	Dec.	3,260,000	July (*japonica*)
Prorocentrum micans .	5,100,000	Aug.	128,000	Sept.
Glenodinium bipes .	2,100,000	May	12,000	Aug.
Ceratium fusus . .	300,000	Sept.	12,000	Aug.
			P. armata	
Pouchetia parva. .	50,000	Sept.	30,000	June
Tiarina fusus . .	11,000	Oct.	14,000	Aug.

As will be seen, the maxima here agree in most cases in being in the spring or autumn. As has been stated above, however, there are several

species which do not agree; for instance, *Coscinodiscus Granii* has a maximum at Kiel in August, whereas I found it confined to the period from November to April, when it is fairly evenly distributed. The maximum of *Prorocentrum micans* in August or September seems to be well established. Ostenfeld (1913) is here also in agreement. *Ceratium fusus* also has its maximum at this time, and *Pyrocystis lunula*, which at Plymouth is only recorded in these months. However, I find that in many cases species having a spring maximum at Kiel have it here in the summer.

A comparison of the present results, with those of Gran (1912) is difficult as his are only for the month of May and from so many stations at various localities and many different depths. However, if we take the Dutch results from the south-western part of the North Sea, which is the nearest to us of all the localities he makes use of, and compare them with the present records for the month of May only, we find the comparison is not without interest. Gran used the centrifuge entirely and the samples were all preserved. He usually took 50 cc. of the sample and calculated from it the number of individuals in a litre. Except in certain cases mentioned below, the numbers are not extremely different. Thus we find the species of *Biddulphia* present in very small numbers (only *B. sinensis* at Plymouth), a large number of several *Chætoceras* species in both (12 species with him, 8 with us). However, whereas there *C. decipiens* and *debile* are the prevailing forms (maximum numbers 11,500 and 6,500 per litre respectively) the prevailing forms here are *C. curvisetum* (maximum number 39,900 per litre) and *C. pseudocrinitum* (maximum number 30,000 per litre). A large number of resting spores of *Chætoceras* species are recorded by Gran and also by Lohmann. They were not recognised and therefore not recorded in the present paper. *Lauderia borealis* (Gran's maximum 2,180 per litre) with us is more abundant (21,580 per litre). *Paralia sulcata* (Gran's maximum 7,180 per litre at 30 m.), with us 700 per litre at 7 fathoms. *Rhizosolenia* species fairly abundant :—

	Dutch records.	Plymouth records.
R. alata . . .	300 (15 m.)	120 surface
R. semispina . .	160 (20 m.)	500 5 f.
R. Shrubsolei . .	480 (10 m.)	1,600 5 f.
R. Stolterfothii .	8,360 (50 m.)	760 surface

Thalassiosira gravida (Gran's maximum 1,760 per litre, Plymouth 6,320 per litre). *Nitzschia delicatissima* much more abundant at Plymouth, *Nitzschia closterium* more abundant in the Dutch records. Of the Silico-

flagellata *Dictyocha fibula* and *Distephanus speculum* are few in numbers as in our records, also the individual numbers of the Peridiniales which are often represented by single examples or by twos and threes. It is, however, among the Infusoria that a great difference is seen, for whereas my own records seldom show more than a few specimens in each sample, the small Infusoria are in fairly large numbers in the Dutch records, especially the species of *Laboea*, which sometimes reach five figures per litre. The Metazoa agree with my records in only being represented by very few individuals.

Herdman's (1908–15) quantitative estimates of the plankton for Port Erin and the south end of the Isle of Man are taken from the tow nets only. These are only comparable with the present records to a certain degree, but some facts stand out as of special interest. Here we find the large spring and smaller autumn maximum for the diatoms, the seasonal distribution of certain genera and their maxima, *Rhizosolenia* species in June; *Chætoceras*, *Thalassiosira* and *Lauderia* in April and May; *Chætoceras* and *Lauderia* again in September and October; all these agree well with our records. The species of *Biddulphia* agree in being almost entirely absent from June to August and being much the most common from November to May. *Coscinodiscus* again agrees in being absent in the summer and early autumn and common in winter and early spring, *Rhizosolenia* species being only common in summer. *Thalassiosira* has its maximum in May both at Port Erin and Plymouth, with a slight second maximum at Plymouth in 1916. *Guinardia* is slightly earlier at Port Erin than at Plymouth. *Lauderia* with a large spring and small autumn maximum at both places, and the same with *Chætoceras*. *Asterionella japonica* appeared in large quantities in May, 1913, at Port Erin. At Plymouth it has a maximum in July and is present on and off from April to January, common through July and August. Apparently this species is irregular in its appearances, as Gough records it from Plymouth as cc in May. The numbers of Peridiniales at Port Erin are enormous compared with the present results; *Ceratium* species and the larger *Peridinium* species forming the basis of the Port Erin records. However, we are in agreement in finding the Peridiniales maximum to occur very shortly after the diatom maximum and the maximum a single one which is only in the summer, May usually at Port Erin, June this year for Plymouth, when the curve shows a conspicuous hump, gradually dwindling in September, after which month very few are present. The smaller Peridiniales are not taken into account in the Port Erin reports, and the *Gymnodiniaceæ*, which turn out to be abundant, are necessarily not noticed as they come through the nets. The same applies to the other small unicellular organisms.

The Diatoms.

In estimating the diatoms, we find they fall naturally into two groups; the first and most important includes the species beginning about April and usually ending about September, the second including those having their maximum in the winter or spring and extending from September

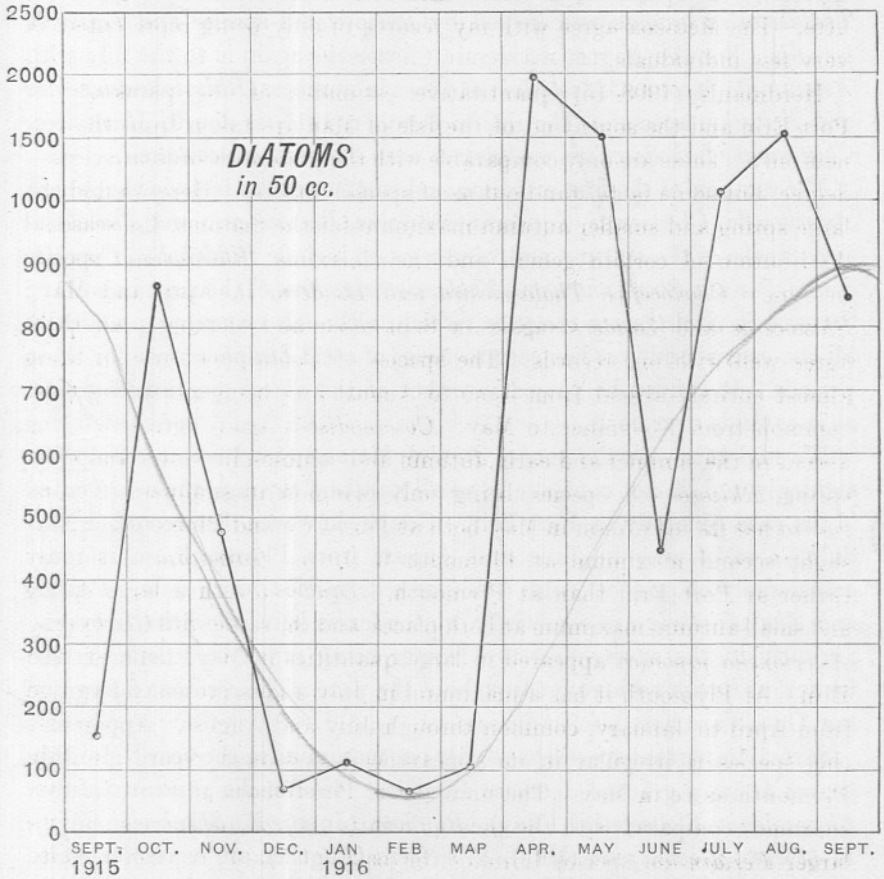

FIG. 2.—Curve showing average number of diatoms in 50 cc. for each month.

or October to the end of March or April and May. In September these groups sometimes overlap, but the two large general maxima occur about April and from August to October, the diatoms of the first group thus being mainly responsible for both the spring and autumn maxima.

The curve here given (Fig. 2) shows the average number of diatoms in 50 cc. monthly throughout the year. The largest maximum is in April, although May comes very near. The autumn maximum here this year is

early and occurs in August. It is very nearly as big as the spring maximum. Also in the curve there is another maximum in October, 1915, after which the numbers are very low, until they suddenly rise enormously in April. The October maximum is possibly the ordinary autumn maximum occurring later in 1915 than in 1916. For the rise in April *Skeletonema costatum* is almost wholly responsible; in May *Chætoceras* species are mainly responsible, together with *Nitzschia delicatissima*, *Thalassiosira gravida* and helped by *Rhizosolenia* species and *Lauderia borealis*. For the August maximum *Chætoceras* again is to the fore with *Asterionella japonica*, *Mastigloia* at times in numbers, *Rhizosolenia* species and *Nitzschia* species. The rise in October, 1915, is due to *Mastigloia*, *Chætoceras*, *Lithodesmium undulatum* and *Skeletonema costatum*.

The diatoms of the first or spring and summer group include the genera *Asterionella*, *Chætoceras*, *Lauderia*, *Nitzschia*, *Rhizosolenia* and *Thalassiosira*; those of the autumn and winter group include *Biddulphia*, *Coscinodiscus*, *Paralia*, *Streptotheca* and *Thalassiothrix*. One of the most important diatoms is *Skeletonema costatum*, which, although occurring practically all the year round, yet has certain times of total disappearance for short periods. It cannot be placed in either of the above-mentioned groups as it extends over both.

We find this year the genera *Biddulphia* and *Coscinodiscus* disappear suddenly and do not continue in small numbers through the summer, as is the case generally at Port Erin. Gough, however, has recorded *Biddulphia mobiliensis* in June and August from Plymouth, so it must occasionally be present; also *Coscinodiscus* species very rarely. *Paralia* and *Thalassiothrix* are essentially winter forms here, the latter stopping abruptly in the spring and the former being much commoner in the winter, although occurring throughout the year. The records of Bygrave and Gough are here also in agreement.

Several important species have only one maximum in the year. Monthly curves show a gradual decrease from it. *Asterionella japonica* (July), *Rhizosolenia Stolterfothii* (May), *R. alata* (June), *R. Shrubsolei* (May), *R. hebetata* f. *semispina* (May), *R. setigera* (August), are examples; also *Biddulphia* species and *Coscinodiscus* species (autumn to spring) the curves of which could not be exactly determined because of their presence only sparingly in the water samples. The following are some of the most important species which have two maxima: the larger in April, May or June, usually very much exceeding the second in August or September: *Skeletonema costatum* (April and September), *Chætoceras curvisetum* (May and September), *Lauderia borealis* (April and August), *Thalassiosira gravida* (May and September). These results agree roughly very well with the previous records for Plymouth by Gough and Bygrave.

Large masses of a species of *Mastigloia* in a gelatinous sheath sometimes occur at intervals and swell the number of diatoms largely. In these cases they are usually so numerous that I have estimated them in 10 cc. instead of 50 ; I have also done this with other species when very numerous.

Table II shows the average number of diatoms in 1 cc. for each month. In the following details of the species the classification of " Nordisches Plankton," Vol. III, Gran (1905) is used.

(1) *Melosira Borreri* Grev. Not common. In water samples, October to March.

(2) *Paralia sulcata* (Ehr.). Occurs almost all the year round in small numbers, but is essentially a winter species. Common from October to April with a maximum in November, then dwindles and picks up again in August. Nearly always goes through the nets. More frequent at 5 and 7 fathoms although common sometimes at the surface. Belongs, properly speaking, to the bottom but very often comes up to be a true member of the plankton.

(3) *Skeletonema costatum* (Grev.). Very common for nearly the whole year, but has periods of disappearance. Rare in December and part of January, June and July. Maximum of 250 per cc. in April, when it helps largely in making the spring diatom maximum. Very numerous in August, September and October. A smaller second maximum in August, and in October, 1915, a still smaller one. Lohmann considers *Skeletonema costatum* the most important diatom at Kiel, where in June it reached a maximum of 780,000,000 per 100 litres. He finds it prefers water of 10 m. depth. Gran (1912*b*) shows it likes surface water, and I have found that although common in all three depths it is usually commonest in the surface samples and its maximum of 12,500 in 50 cc. is from the surface. This is one of the most important of the plankton diatoms at Plymouth, but passes through the net in quantity.

(4) *Thalassiosira gravida* Cleve. This is the only species of the genus found commonly in the water samples. It is abundant from the end of March to the middle of September with an interval of scarcity in July and August. May and June are the months given by Herdman for the maximum of the genus at Port Erin, which agrees well with us. It occurs at all depths, but its maximum in May of 316 in 50 cc. is from the surface.

(5) *T. Nordenskioldii* Cleve. Not very common, occurring at intervals. Frequent in May.

(6) *T. decipiens* (Grun.). Rare.

(7) *T. subtilis* (Ostenf.). This little species with its surrounding matrix occurred only rarely in 1916, although it was frequently noticed in 1915.

(8) *T. condensata* (Cleve). Very rare.

(9) *Lauderia borealis* Gran. An important part of the plankton from May to September, with intervals of scarcity. Helps largely in forming both diatom maxima. Rare from late autumn to early spring. Maximum in May. Its seasonal distribution agrees with Herdman's records for Port Erin. At all depths, but largest numbers at the surface. Maximum of 1,079 in 50 cc. in May from the surface.

(10) *Leptocylindrus danicus* Cleve. Fairly common from May throughout the summer, at other times very rare.

FIG. 3.—*Leptocylindrus sp.* × 700.

(11) *L. sp.* (Fig. 3). A small species which is like *L. minimus* Gran (1912), but never twisted as he describes; occurs fairly commonly in the summer plankton. There are seldom more than two cells in a chain and these are always quite straight. The two chromatophores, size and form agree with Gran's species.

(12) *Guinardia flaccida* (Castr.). Common at intervals from April to September, with a maximum in July. More common in the very fine tow nettings than in the water samples. The large numbers occurring at Port Erin in May and June (maximum in June) are noticeable.

(13) *Hyalodiscus stelliger* Bail. Fairly common from October to February; a winter species. At other times rare.

Genus COSCINODISCUS Ehr.

All the species of *Coscinodiscus* we have found practically absent during the summer, which agrees well with Port Erin; although they continue through the year there except sometimes for one month, they are in very much smaller numbers through the summer. From September to May they occur at times abundantly and are common in the very fine tow nettings.

(14) *Coscinodiscus excentricus* Ehr. Common from September to May.

(15) *C. radiatus* Ehr. Common from September to May. *C. excentricus* and *C. radiatus* are the most abundant species.

(16) *C. sub-bulliens* Jörg. Only noticed from September to December. Not very common.

(17) *C. Granii* Gough. Begins in November and remains till April. Sometimes common in December, January and February.

(18) *Actinocyclus Ehrenbergi* Ralfs. In tow nettings only. Rare. September.

(19) *Actinoptychus undulatus* (Bail.). From the middle of September to the end of April, never very abundant, more frequent in tow nettings than in the water samples. Not seen at all in the summer.

Genus Rhizosolenia (Ehr.) Brightw.

With the exception of *R. robusta* which is the only winter form all the species of *Rhizosolenia* are markedly summer forms; beginning to be abundant in May they continue common until the end of September at all depths. If we compare this with the Port Erin records we find it agrees well except for the fact that at Port Erin there are very few present in August.

The curve (Fig. 4), giving the distribution of the various species, shows *R. Stolterfothii* as much the most abundant with a big maximum in June. As mentioned above, however, *R. Shrubsolei* occurred in enormous numbers in June in the tow nets, of a large size, and was not adequately represented in the water samples. The maximum of the species on the curve ought to rise very much higher. I find that *R. Shrubsolei* and *Stolterfothii* run together to a great extent, although *Shrubsolei* almost disappears in July, whilst *Stolterfothii* continues common well into September. The genus is hardly represented at all from November to April. Its absence being very striking, *R. alata* follows *R. Stolterfothii* closely, although it is not so common. *R. hebetata* form *semispina*, has its maximum in May. *R. setigera* is later, beginning in June and ending in September, with a maximum in August; thus it is later and remains less time than any of the others. All the species are abundant in the tow nets.

(20) *Rhizosolenia Stolterfothii* H. Perag. Perhaps the commonest of the *Rhizosolenia* species. Very common from May to September, with a maximum in June; disappears entirely in December.

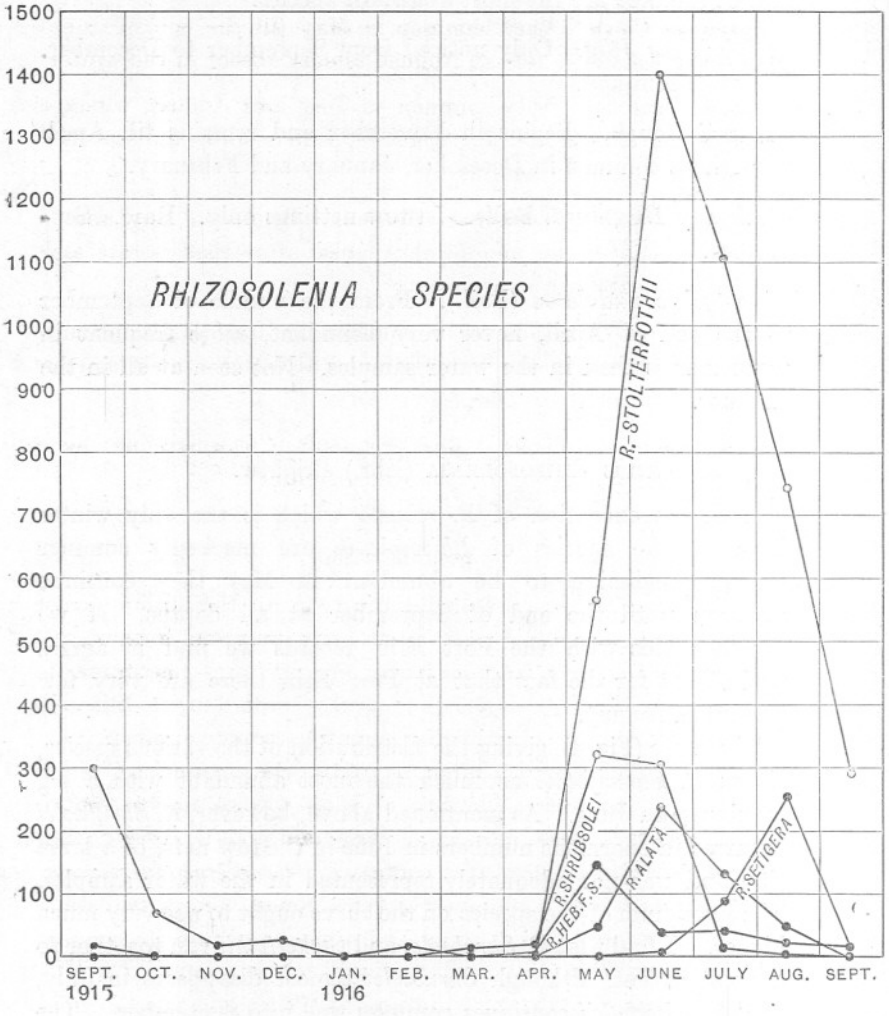

FIG. 4.—Curve showing average number of *Rhizosolenia Shrubsolei, Stolterfothii, alata, setigera,* and *hebetata f. semispina* in 1000 cc. for each month.

In the tow nettings it occurs in long spirals with many cells in each. In the water samples, however, these are broken up and only a few cells cling together, and many single cells are present.

(21) *R. robusta* Norman. This is the only winter *Rhizosolenia* here. It begins in November and, although never common, continues till April. Chiefly in the tow nettings. Very seldom in the water samples.

(22) *R. Shrubsolei* Cleve. Very common in May till the end of June, then dwindles and is rare in August, almost absent in the winter.

(23) *R. setigera* Brightw. Very common in July and August, when it seems to take the place of *R. Shrubsolei*; rare in spring and autumn and almost absent in winter.

(24) *R. hebetata* (Bail.) f. *semispina* (Hensen). Begins in May and is very common till the middle of August, after that is rare and disappears entirely in the winter.

(25) *R. alata* Brightw. Begins to be common in June and continues till August, after that is only rarely found, although a few stragglers are present throughout the year.

(26) *Corethron criophilum* Castr. Most frequent in October but never common. Absent for nearly the whole summer.

Genus Chætoceras Ehr.

Although scattered throughout the year, all the species occur chiefly in the spring, summer and early autumn, forming an important portion of both maxima. A very large maximum in May (Fig. 5) agrees with the Port Erin records, but the autumn maximum in August is small, not amounting to more numbers than in March. This rise in March is partly due to numbers of *C. densum*, the maximum number of that species in the water samples. This species, however, is large and, like *C. boreale*, does not get much into the water samples. *Chætoceras curvisetum*, which is much the commonest species found, shows two well-marked maxima, a large spring and a small autumn maximum, these agreeing with the Port Erin records for the genus. The fact that on several days in early autumn no *Chætoceras* species were seen in the water samples brings the average for the month down.

(27) *Chætoceras densum* Cleve. Frequent in the tow nettings, but too large to be found much in the water samples. Present most of the year except at times in the summer.

(28) *C. convolutum* Castr. From spring to autumn, sometimes abundant

(29) *C. danicum* Cleve. Rare, at intervals through the year

(30) *C. boreale* Bail. Chiefly in two nettings. Occasionally in spring and early autumn.

(31) *C. decipiens* Cleve. Fairly common in spring and summer, rare in autumn and winter.

(32) *C. teres* Cleve. Chiefly in February and March, common in March.

(33) *C. contortum* Schütt. Occasionally in July, August and September.

(34) *C. didymum* Ehr. Begins in February and continues through the spring and summer until October. Very common in August.

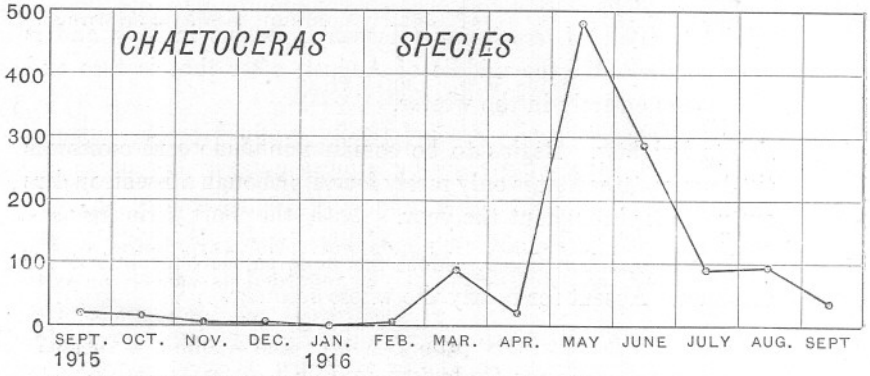

FIG. 5.—Curve showing the average number of *Chætoceras* in 50 cc. for each month.

(35) *C. constrictum* Gran. One of the commonest species from July to the end of September with its maximum in May when it suddenly appeared and disappeared. Resting spores noticed commonly in August forming in the chains. At all depths, but the largest numbers nearly always at the surface.

(36) *C. Willei* Gran. Rare from June to October.

(37) *C. breve* Schütt. Rare in August. This is recorded often by Gough.

(38) *C. laciniosum* Schütt. Occasionally from June to October.

(39) *C. diadema* (Ehr.). Only seen once in August.

(40) *C. pseudocrinitum* Ostenf. Common in May and June, at other times rare. At all depths.

(41) *C. curvisetum* Cleve. The commonest species of *Chætoceras :* beginning in March it continues throughout the summer till the middle of September. Maximum of 37 per cc. at the end of May. This is certainly the most important species of *Chætoceras* here and helps greatly to swell the diatom maximum both in May and August. Largest number at the surface, although it occurs at all depths.

(42) *C. debile* Cleve. Not very common, May and June.

(43) *Chætoceras* spp. Species which could not be identified were common in July and August.

(44) *Eucampia zoodiacus* Ehr. Occasionally from May to October.

(45) *Streptotheca thamensis* Shrubs. Common from September to April, otherwise rarely seen. More frequent in tow nettings than in water samples.

(46) *Cerataulina Bergoni* H. Perag. Fairly common in May and June.

Genus Biddulphia Gray.

The *Biddulphia* species are practically confined to the autumn, winter and early spring, being almost entirely absent in the summer. This agrees fairly well with the Port Erin records, although there, in small numbers only, they are found in the summer. At any rate they may be regarded as winter, or early spring, and autumn forms. *B. mobiliensis*, *regia* and *sinensis* are all common in the early spring, winter and autumn. Whether *B. regia* and *sinensis* should be regarded as good species is a matter discussed at length by Herdman (1912), who has shown that intermediate forms are to be found and has figured forms from Port Erin which appear to be half *B. sinensis* and half *B. regia* or *mobiliensis*, his final decision being that they are probably all the same species. He therefore regards *B. sinensis* and *B. regia* as distinct forms of *B. mobiliensis*. There seems to be no doubt about the sudden appearance of the exotic species *B. sinensis* in numbers at Port Erin in November, 1909, and also that it suddenly appeared at the mouth of the Elbe in 1903, as is shown by Ostenfeld (1908) : having spread from the mouth of the Elbe into various places including the North-East of Scotland it was then found on the Belgian coast, Ostenfeld accounting for its presence there by imagining a reversal of the usual north-going current. Its first appearance at the mouth of the Elbe Ostenfeld thinks is probably due to its being taken there by some ship. In 1908 he predicted its discovery in the Channel, as up to that time it had not been found to occur there. In order to ascertain whether it was present in Plymouth in former years (it certainly is common here now) I examined a large number of old tow nettings mostly from the West Channel, Plymouth, and all from this district. Beginning

in 1897 I searched through samples of various dates, particularly autumn, winter and spring, without finding any trace of *B. sinensis* until October, 1909, when it suddenly became abundant and continued so within the limits of its seasonal range as is shown in these records until the present time. It is very distinct and easily recognised and I find it hard to believe it is not a true species distinct from *mobiliensis* and *regia*. It occurs with them and is easily distinguished from them, and this year continues to stay longer than the others. The fact also, quoted by Herdman, that Dr. Allen and Mr. Nelson grew cultures of all three forms, which bred true for a year is strong evidence in favour of their being separate species. In some samples taken by Dr. Garstang in 1897 *P. mobiliensis* and *regia* were common,

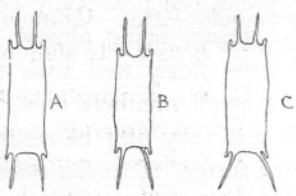

FIG. 6.—Varieties of *Biddulphia regia*. × 60.

and amongst these I found an occasional specimen which showed an approach *to sinensis*.

The figures (Fig. 6) were drawn with the camera lucida, and are very like some of Herdman's figures. Although, however, one end is decidedly like *sinensis* and the cell is elongated (probably soon going to divide), I think these are varieties of *regia* only and not true *sinensis* species. It seems from this that occasionally *B. regia* can show varieties approaching *B. sinensis* and perhaps this is the explanation of Herdman's mixed forms. If this explanation be correct we thus find *B. sinensis* appearing at Plymouth suddenly in October, 1909, and at Port Erin in November of the same year. The difficulty as to its origin is still a puzzle.

(47) *Biddulphia mobiliensis* (Bail.) Grun. Begins to be abundant in the middle of November, keeping up its numbers until the end of March, is scarce in April, finally disappearing at the end of the month, not to reappear until the middle of August and then only singly.

(48) *B. regia* M. Schulze. Much the same as *B. mobiliensis* but not quite so abundant and disappears earlier.

(49) *B. sinensis* Grev. Not so abundant as the other two but fairly common, continues until the end of May.

(50) *B. favus* (Ehr.) v. Heurck. Rare, February and April.

(51) *B. alternans* (Bail.) v. Heurck. Rare, October and early spring.

(52) *Bellerochia malleus* (Brightw.) v. Heurck. Rare, September.

(53) *Lithodesmium undulatum* Ehr. Common from August to October, rare at other times.

(54) *Ditylium Brightwelli* (West) Grun. Appears and disappears periodically from January to September. In March and September very common in the tow nets.

(55) *Fragillaria* sp. Sometimes present in long strings in summer.

(56) *Thalassiothrix nitzschioides* Grun. Common from September to the end of April. A winter species In summer rare or entirely absent.

(57) *Asterionella japonica* Cleve. Important in the late summer. Occurs in single groups rarely at intervals from October to the end of June, then suddenly becomes very common in July, rising to over 478 per cc. at the end of the month, abundant in August and gradually dwindles through September. Present in the tow nettings as well as the water samples. This seems to be erratic in its appearance as Gough records it as cc. in April and May (as *A. glacialis*). The largest numbers occur at 5 and 7 fathoms, maximum at 5 fathoms.

(58) *A. Bleakeleyi* W. Smith. Only occurred twice, November and December.

(59) *Lycmophora Lynbergi* (Kütz) Grun. Rare, at intervals through the year.

(60) *Grammatophora serpentina* Ehr. A littoral species, rare.

(61) *Acnanthes longipes* Ag. Rare, in tow nettings, autumn and early spring.

(62) *Navicula membranacea* Cleve. Fairly common from July to November.

(63) *N.* sp. Many species of *Navicula* occurred through the year which were not identified.

(64) *Pleurosigma* sp. Several species occurred through the year.

(65) *Mastigloia* sp. Occurred at intervals in such numbers as to materially influence the records. The large numbers are always at the surface, although in July and August it occurs at all depths.

(66) *Amphiprora maxima* Greg. Rare, chiefly in autumn and winter.

(67) *Amphora ostracaria* Breb. Rare, only in autumn.

(68) *A.* sp. Rare, September and August.

Genus NITZSCHIA Hassal.

The species of *Nitzschia* occur throughout the year and, unless entangled in larger organisms, get through the nets in numbers. In *Phæocystis*, *Nitzschia* species entangle themselves to a large extent, chiefly *N. closterium* and a needle-like species which I believe to be *N. delicatissima*. However, when it is entangled it is generally single or there are two together. It is never in a chain or three or five as is often the case with this species when it is free. When not entangled it is not so common.

FIG. 7.—*Nitzschia closterium* W. Sm. Long and short forms. × 350.

(69) *Nitzschia closterium* W. Sm. Occurs throughout the year. Never in very large numbers. Two forms are seen (Fig. 7), the long form with its ends curled slightly and a much smaller form with straight ends. Possibly the latter is the young just after division. In cultures the central part is very often much inflated. At all depths.

(70) *N. seriata* Cleve. Fairly abundant in August and September, rare at other times.

(71) *N. delicatissima* Cleve. In May and June this species plays an important part in the plankton. From July to the middle of September it is fairly common, after that occurring only occasionally. At all depths but largest numbers at 5 and 7 fathoms.

(72) *N. panduriformis* Grev. Very rare, September and October.

(73) *Bacillaria paradoxa* Gmel. Never in large numbers, but occurs throughout the year both in water samples and tow nettings. Almost absent in May and early June.

(74) *Campylodiscus* sp. At least four species of *Campylodiscus* occur in the tow nettings occasionally. Also *Surirella fastuosa* Ehr. is fairly common. All these are bottom forms and do not strictly belong to the plankton.

THE PERIDINIALES.

In the microplankton the group of Peridiniales comes next to the diatoms in importance. A very large number of these go through the finest net, and practically all the smaller forms including almost the whole of the *Gymnodiniaceæ* are lost. Former tow-net records show hardly any of these. *Ceratium* and the larger *Peridinium* species have been shown to be plentiful, but there is a very marked absence of the smaller

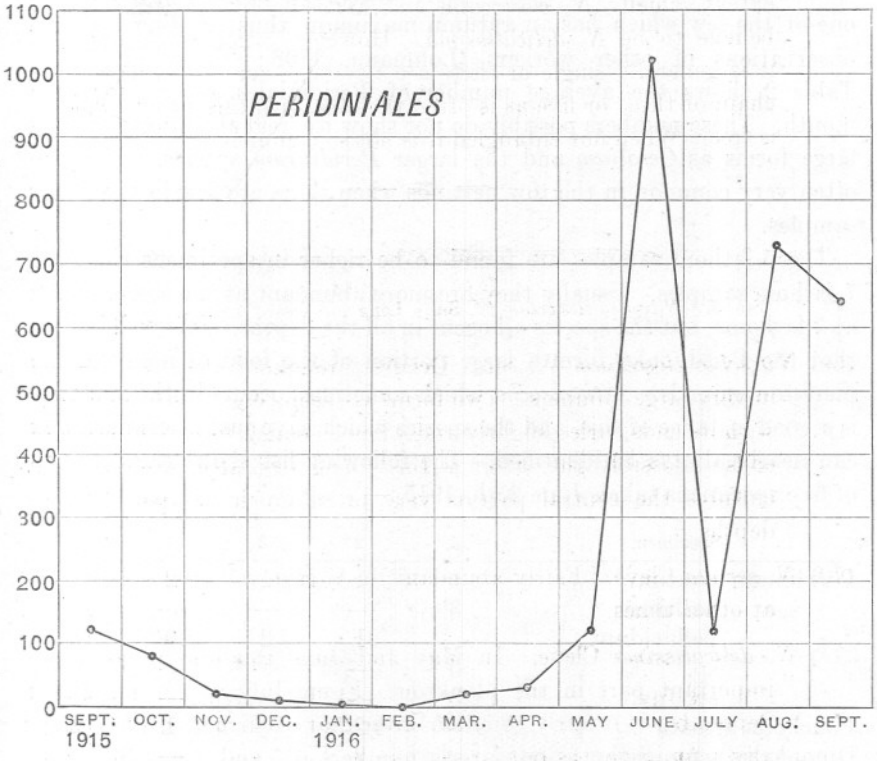

FIG. 8.—Curve showing the average number of Peridiniales in 1000 cc. for each month.

forms. This is perhaps the group which shows the loss from the net to the greatest degree. Because of the number of new species and new records of this group I have given the systematic details in a separate paper of this journal (p. 183). Lohmann has described many new forms from the microplankton, and several of these are found to occur here. In most cases his numbers are much greater than mine ; also the numbers given in Prof. Herdman's records for Port Erin are very large, but the different methods employed make the two records hardly com-

parable. Probably many of the more delicate forms are lost, but the relative seasonal abundance is well shown by the curve (Fig. 8) which shows June as the maximum month, thus agreeing with other observers. In this curve there is a depression in July which may be due to the fact that most of the samples were preserved in that month, rather than to the fact that the numbers are much less than in August. From September the curve falls and is very low until May, showing an almost complete absence of Peridiniales in the winter. Even if some of the individuals are lost the results show well the relative abundance of the species. *Prorocentrum micans* which is largely lost in the tow nettings is one of the few which has an autumn maximum, thus agreeing with the observations of other workers (Lohmann, 1908; Ostenfeld, 1913). Table 2 shows the average number of Peridiniales per cc. for each month. These numbers possibly do not show the real abundance of such large forms as *Ceratium* and the larger *Peridinium* species, which are often very common in the tow nettings when there are few in the water samples.

The 5-fathom samples are found to be richer in specimens than the 7-fathom samples. Usually they are more abundant at the surface than at 5 fathoms, but the species all occur in all the depths. It is well known that the Peridiniales form a large portion of the food of many of the plankton animals. *Actinotrocha* which sometimes occurs in the tow nets is a good instance of this, and the species which have just been swallowed can nearly always be identified. The following list shows the contents of five specimens taken June 25th, 1915 :—

Specimen.	1	2	3	4	5
Peridinium ovatum . .	1	1	1	2	1
,, pallidum . .	3	—	—	—	—
,, pellucidum . .	—	1	2	9	2
,, sp. . . .	5	—	—	—	—
,, sp. Juv. . .	3	—	—	—	—
Pouchetia armata . .	—	2	—	1	2
Dinophysis acuminata . .	—	2	—	—	—
Other organisms . . .	—	1	—	5	—

FLAGELLATA.

"Nordisches Plankton," Vol. 2.

Phæocystis is certainly by far the most important of the flagellates, which interferes enormously with the catches by blocking up the tow nets in the early summer and entangles in its gelatinous covering many diatoms and Peridiniales. It also serves as food for many of the plankton

organisms. I have recorded this species by colonies instead of cells, as it was practically impossible to count the latter.

Halosphæra viridis comes next in importance, its swarm spores occurring oftener in the water samples than the spheres themselves. The other flagellates occur sparingly but belong to the genera recorded by others from plankton and are almost entirely missed by the nets.

Oxyrrhis marina I have placed with the Peridiniales; this species and a small species of *Carteria*, although not often found in the water samples, multiply freely in cultures where they are often found. The numbers obtained for flagellates, with the exception of *Phæocystis*, are much smaller than Lohmann's.

(1) *Phæocystis Pouchetii* (Hariot) Lagerheim. Begins to be common in the middle of May and continues till the middle of June, interfering with all the tow nettings. Rare at other times. Not many colonies get into the water samples. The unidentified flagellates are chiefly swarm spores, probably of *Phæocystis*.

(2) *Dinobryon* sp. (cf. *balticum* (Schütt) Lemm.). Rare in August in the water samples in small colonies. A minute species.

(3) *Carteria* sp. A very small species, rare, in water samples only.

(4) *Trochiscia Clevei* Lemm. Rare, September and May.

(5) *Halosphæra viridis* Schmitz. Not uncommon from September to February. Very frequent in summer, especially the swarm spores, usually swimming freely but sometimes still in the parent sphere.

COCOSPHAERALES.

"Nordisches Plankton," Vol. 2.

Pontosphæra Huxleyi Lohmann. This is the only species found. It occurs occasionally in summer and in early autumn is sometimes abundant.

Coccoliths of other species are very rarely seen.

SILICOFLAGELLATA.

"Nordisches Plankton," Vol. 2.

The usual two species occur fairly commonly in the water samples.

(1) *Dictyocha fibula* Ehr. From September to December and from March to September. Commonest in September.

(2) *Distephanus speculum* (Ehr.) Haeckel. Throughout the year, except in mid-winter, rather more abundant than *Dictyocha*. Commonest in September and October.

RHIZOPODA.

Amœbæ, as Lohmann has pointed out, are not uncommon in the plankton. He records two forms, the largest number being 75,000 in 100 litres, but usually much less. He found July and August were the months in which they occur, and they were only found in depths of 5 and 10 m. I find them from May to October, the greatest number being 140 in a litre. However, I have seen them much commoner than this in surface samples in 1915 when they were not counted. They occur in the surface water and also from 5 and 7 fathoms, the greatest number being from the surface. They are to be found either by examining the water directly or keeping it for a day or two, and, I think, there is no doubt that they are really free-living and do not come from harbouring in other animals. Three forms occur, one very much more common than the others. I have designated them A, B and C. B is very common, A and C only occurred once each. A prominent feature of all is the form of the pseudopodia, which are all spiky when fully outstretched and in the forms A and B give the animal the appearance of a heliozoon. However, they were constantly observed to retract and were in reality perfectly soft although apparently firm.

Form A (Fig. 9, A, 1, 2 and 3), a very minute species, pale greenish brown with very long and exceedingly slender spine-like pseudopodia. Greenish and brown granules inside. Circular even when the pseudopodia are retracted.

Form B (Fig. 9, B, 1, 2 and 3). Very common, larger than A, hyaline and perfectly colourless. Perhaps this is the same species as Lohmann's No. 2. The pseudopodia stick out in regular spikes, much shorter and thicker than in A. These move in various ways and can be completely retracted. May to October. Maximum in May.

Form C (Fig. 9, C, 1, 2 and 3). A very clear and also perfectly colourless form with a conspicuous central nucleus. At one end only is a small frill of spiky pseudopodia. These are usually in the same position, but are capable of being changed and appearing in another place.

All these Amœbæ are entirely lost by the nets.

Heliozoa indet. Rare, only in November.

Foraminifera indet., including *Polystomella* sp., occurred fairly frequently in the tow nets, especially in winter when they were stirred up from the bottom.

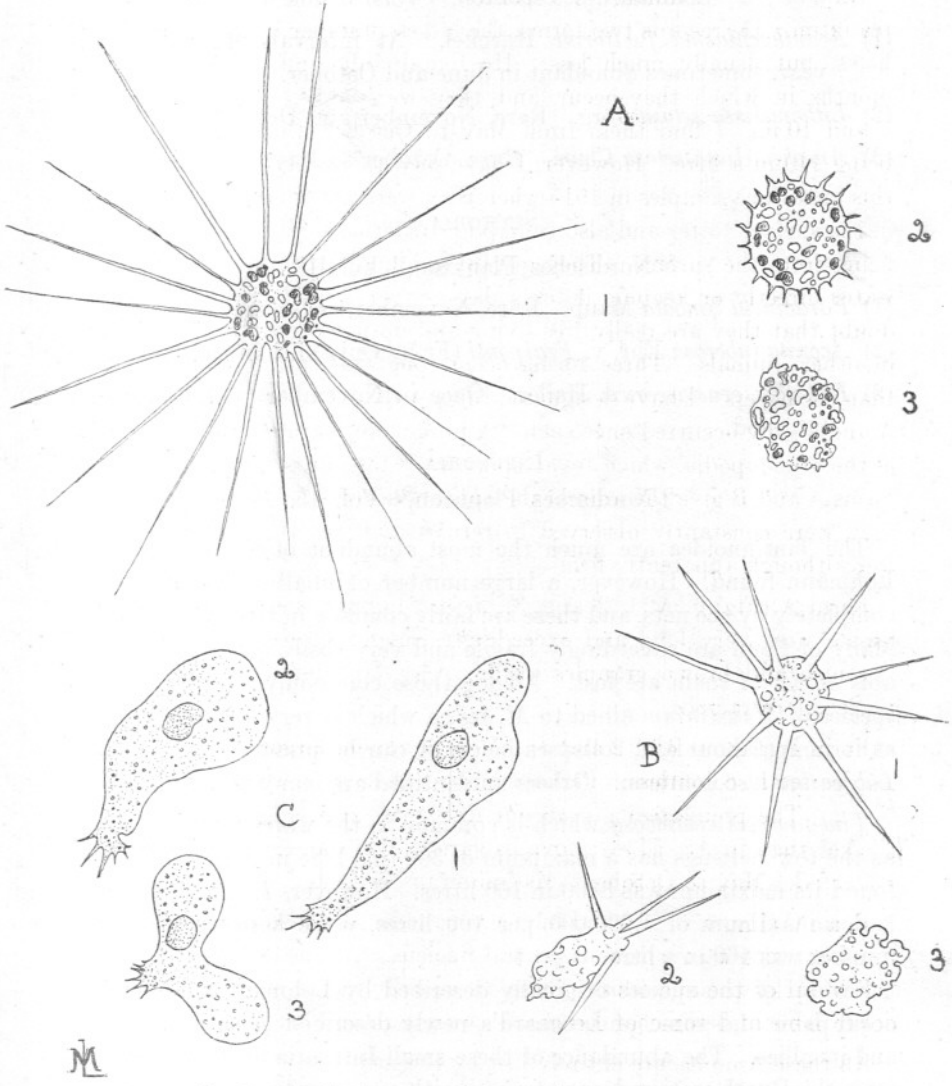

FIG. 9.—Amœbæ from the plankton. A × 500, B and C × 350.

RADIOLARIA.

"Nordisches Plankton," Vols. 3 and 17.

(1) *Acanthochiasma fusiforme* Haeckel. At intervals throughout the year, sometimes abundant in June and October.

(2) *Lithomelissa setosa* Jörg. Rare, November and December.

(3) *Amphimelissa setosa* Cleve. Rare, October to May.

SUCTORIA.

"Nordisches Plankton," Vol. 16.

(1) *Paracineta limbata* Maup. Rare, November to January.

(2) *Acenita tuberosa* Ehr. v. *Fraiponti* (Fr.). Only once in October.

(3) *Ephelota crustaceorum* Haller. Once in November on the legs of a Copepod.

INFUSORIA.

"Nordisches Plankton," Vol. 15.

The Tintinnoidea are much the most abundant of the Infusoria, as Lohmann found. However, a large number of small Infusoria are lost completely by the nets, and these are fairly common in the water samples. Many of them are exceedingly fragile and very easily destroyed. Probably many of them are lost. Among those commonly found is a small species of *Mesodinium* allied to *M. pulex*, which is very difficult to count as it jumps about and collapses before it can be preserved. Species of *Laboea* are also common. Others unidentified are many and varied.

Tintinnopsis ventricosa which is common in the water samples as well as the tow nettings has a maximum of 300 in a litre in June Lohmann found its maximum was 8800 in 100 litres. However, *T. beroidea* at Kiel had a maximum of 1,200,000 per 100 litres, while here its maximum number was 460 in a litre.

Several of the species originally described by Lohmann are found to occur here and some of Leegaard's newly described species of *Laboea* and its allies. The abundance of these small Infusoria as found by Gran from the Dutch waters does not agree with our records.

(1) *Lachymaria* sp. Only occurred once, water samples, May.

(2) *Coleps* sp. A small species shaped like a flower-pot with square ends, water samples, rare, August.

(3) *Tiarina fusus* Cl. and L. Fairly common in August and September, rare in July and October, chiefly in water samples.

(4) *Mesodinium* sp. Common in water samples.

(5) *Nassula* sp. Rare from May to August, water samples.

(6) *Strombidium caudatum* From. Rare in summer, water samples.

Genus Laboea Lohmann.

The species of this genus, so far as I have seen, all have a yellow colour. They are common in the summer but occur all through the year although very rare in winter. Some of the most delicate of the Infusoria. Never found in the tow nettings.

(7) *Laboea conica* Lohm. The commonest species of the genus. Occurs fairly often through the summer, but never in large numbers.

(8) *L. strobila* Lohm. Occasionally from July to November and also in January.

(9) *L. acuminata* Leegaard. Occasionally through the year, chiefly in May.

(10) *L. spiralis* Leegaard. Rare, May and July.

(11) *L.* sp. All through the year several unidentified species occurred, except for part of December and January.

(12) *Lohmanniella oviformis* Leegaard. Rare, only in August, water samples.

(13) *Euplotes vannus* O.F.M. Once only in July, water samples.

(14) *E.* sp. Rare, September, water samples.

(15) *Tintinnus subulatus* Ehr. From July to October, not uncommon, most frequent in August.

(16) *Tintinnopsis beroidea* (Stein). Very common, both in tow nettings and water samples, but especially in the former early in November, middle of December, end of March and again through July and August; at other times not so frequent. Almost absent through October and the latter part of September.

(17) *T. campanula* (Ehr.). Occasionally at intervals from August to March, not observed from April to July. Both in tow nettings and water samples.

(18) *T. ventricosa* Cl. and L. Common at intervals throughout the year. Commonest in September. In both tow nettings and water samples, but commonest in the water samples.

(19) *Cittarocyclis denticulata* Ehr. Occasionally from August to October. This species is abundant close to the shore.

(20) *C. edentata* Brendt. Once only in October, water samples.

(21) Infusoria indet. Chiefly in the summer and early autumn in numbers.

THE METAZOA.

The Metazoa in the water samples being negligible the following is an account of the tow nettings examined as described above through the same period as the water samples and from the same locality.

CŒLENTERATA.

The medusæ are chiefly confined to the coarse and medium tow nets. Beginning at the end of January with *Phialidium hemisphericum* they continue for the rest of the year until nearly the end of November when they are absent for the winter. Ctenophores and Siphonophores represented chiefly by *Pleurobrachia pileus* and *Muggiæa atlantica* are common in the summer, although *Pleurobrachia* was not so numerous as usual this year, possibly owing to the April storms and the coldness of May and June.

The medusæ are specially interesting because they carry other animals parasitically and thus serve as effective transports. Those chiefly so utilised are *Cosmetira pilosella, Phialidium hemisphericum, Obelia* sp., *Turris pileata* and *Stomotoca dinema* ; perhaps the species most frequently so used, and necessarily so as they are the commonest, are *Phialidium hemisphericum* and *Obelia* sp. *Phialidium* serves as host for larval trematodes, larval pycnogonids and larval *Peachia*. *Obelia* has not been noticed as a host for *Peachia* larvæ, probably because it is too heavy to be carried by so small a medusa. *Cosmetira* serves as host for all three, *Turris pileata* and *Stomotoca dinema* for larval trematodes. The trematodes are always the late cercaria stage of *Pharyngora bacillaus* (Molin), which reaches maturity in the mackerel (Lebour, J.M.B.A., 1915). This occupies the manubrium and mesoglœa. It is interesting in this connexion that E. T. Browne (P.Z.S., 1896) notes that a species of cercaria infects the mesoglœa of *Phialidium temporarium* (i.e. *P. hemisphericum*) in Valencia Harbour, and that *Halcampa* (i.e. *Peachia* larva) also selected this medusa, attaching itself to the generative organs. I find that *Halcampa* attaches itself to the medusa margin as well as the inside of the generative organs. The pycnogonid *Anaphia petiolata* Kröyer lives in the larval state tightly folded up in the manubrium of *Phialidium, Obelia* and *Cosmetira* (Lebour, J.M.B.A., 1915).

ANTHOMEDUSÆ.

"The Medusæ of the World," Mayer.

(1) *Steenstrupia rubra* Forbes. Begins in April and is common till the middle of June when it disappears.

(2) *Hybocodon prolifer* L. Ag. Begins at the end of March, is common through April, very common in May up to the middle, then dwindles and disappears in the beginning of June.

(3) *Sarsia prolifera* Forbes. Rare, in June only.

(4) *S. tuberosa* Lesson. Once only in June.

(5) *S. eximia* Allman. Once only in September.

(6) *Slabberia halterata* Forbes. Once only early in September.

(7) *Stomotoca dinema* L. Ag. Begins in July, is common through the month, becomes less common and disappears in November.

(8) *Turris pileata* (Haeckel). Fairly common now and then in June, July and August, rare in September and October.

(9) *Bougainvillia brittanica* Forbes. Once only in June.

(10) *Rathkea octopunctata* Haeckel. Begins in the middle of February, one of the first medusæ to appear, becomes very common in April and the beginning of May, disappears in the middle of June. It, however, reappears in September as a single specimen.

(11) *Willsia stellata* Forbes. Once only at the end of August.

LEPTOMEDUSÆ.

(12) *Obelia* sp. Medusæ extremely abundant. Begins at the end of February, very common from May to October, leaves off at the end of November and is absent through December, January and most of February.

(13) *Cosmetira pilosella* Forbes. Begins in May, very common on and off from June to September.

(14) *Clytia volubilis* Lamouroux. Once only in April.

(15) *Phialidium hemisphericum* (Gron.). Perhaps the commonest of the medusæ here. Begins at the end of January, is common from May to October and continues till the middle of November.

(16) *Saphenia gracilis* Forbes and Goods. Rare in May. On June 14th the nets were full of it and it was abundant once in August.

Semæostomeæ.

(17) *Chysaora* sp. Once in November.

(18) *Aurelia* sp. Ephyræ. One on January 24th. Continues fairly commonly from February to the beginning of April, then stops. One occurred on September 6th.

Siphonophora.

(19) *Muggiæa atlantica* J. T. Cunn. Once at the end of January, rare in February, but continues till September, when it is very common.

Ctenophora.

(20) *Pleurobrachia pileus* Fab. Fairly common, February to July, and from September to November, chiefly young forms.

(21) *Bolina infundibulum* Fab. On June 14th the nets were full of it with *Saphenia gracilis*. In October, 1915, it was fairly common.

(22) *Beroë cucumis* (Fab.). In October and November, 1915, and in May to August, 1916, rare.

Zoantharia.

(23) *Arachnactis Bournei* Fowl. Larva of *Cerianthus Lloydii* Gosse. From March to June, common.

(24) *Peachia* sp. larva (=*Halcampa chrysanthellum* (Peach) of Haddon), common, May and June to the middle of July, on medusæ.

Platyhelminthes.

Amongst these are some interesting larval trematodes which occur in the free state, having been captured probably in the interval of changing hosts. Also two parasitic in medusæ and in *Sagitta*, both of which eventually enter fish as their final host.

(1) *Pharyngora bacillaris* (Molin). What I believe to be the free-swimming tailed cercaria of this species occurred once in fair numbers on January 28th, 1916. It is described in a separate paper (p. 201) of this Journal. The late cercaria without a tail is found parasitic in medusæ and in *Sagitta*, besides being sometimes free in the sea at intervals throughout the year. Commonest in June.

(2) *Derogenes varicus* (O. F. Müll.). Occurs in *Sagitta bipunctata* in the late cercaria stage in June. In old material of previous years it is quite common.

(3) Turbellarian indet. Occurred occasionally in August and November.

NEMATODA.

Unidentified trematodes occurred occasionally free in the autumn and winter; a larval *Ascaris* (described in another paper of this Journal, p. 201) is common in *Sagitta bipunctata*.

ANNELIDA.

E. J. Allen, "Polychæta of Plymouth and the South Devon Coast, etc.," J.M.B.A., 1915.

The annelids with the exception of *Tomopteris* and *Autolytus* are all larval forms.

(1) *Autolytus longiferiens* De St. Joseph. Occurred once at the end of January with eggs, twice with eggs at the beginning of September, and one male.

(2) *A. rubropunctatus* (Grube). Once in September, 1915, twice in November, once in August and twice in September, 1916, always with eggs.

(3) *A. pictus* (Ehlers). Once in September and once in November, 1915. Once in September, 1916, always with eggs.

(4) *A.* sp. These were allied to *A. Edwarsi*, a small species, three with eggs and one male, always in September.

(5) *Polynoë* sp. juv. Once in December and once in the end of March.

(6) Spionid larva, occasionally from November to March. Rarely in May and July.

(7) *Magelona* sp. larva. Fairly common in July and August.

(8) *Pœcilochætus serpens* Allen, larva. Occurred in small numbers every month except December and April. Commonest in May and August.

(9) *Cirratulus* sp. juv. Once only early in March.

(10) Terebellid larva. Present every month, but not usually in large numbers except once in November, then rare till the end of February, when it increases and is very common in May. The houses of the very young larvæ are extremely pretty, the animal using all sorts of small organisms to cover itself, especially

diatoms, but sometimes the case is entirely of sponge spicules. As the worm grows the house becomes transparent and hyaline.

(11) *Pectinaria* sp. larva. Only found rarely in October and December.

(12) Annelid larvæ indet. Occurred occasionally but particularly from January to the end of March when they were at times abundant in very young stages.

(13) *Tomopteris heligolandicus* Greef. Begins in the middle of June and is very common in July, rare in September and October. Young forms chiefly from July to September.

CHÆTOGNATHA.

Sagitta bipunctata (Q. & G.). Present throughout the year, scarce in most of March, April, May and June. Very common most of the rest of the year.

POLYZOA.

Cyphonautes larva. Fairly common from September to the end of March, rare from April to August. Commonest at the end of March.

PHORONOIDEA.

Actinotrocha larva. Only seen in July and September, 1916. More common in 1915.

ROTIFERA.

Synchæta sp. Rare, September, October and March.

CRUSTACEA.

Copepoda.

Sars, G. O., "Crustacea of Norway, Copepoda."

(1) *Calanus finmarchicus* Gunner. Common on and off from the end of April to the beginning of November, generally present in small numbers at other times.

(2) *Paracalanus parvus* Claus. Unusually scarce this year except at certain times. Very common in May, common parts of August, September and October. Very common for part of November, then becomes rare or absent.

(3) *Pseudocalanus elongatus* Boeck. Perhaps the commonest copepod here. Exceedingly common all through the year except from the middle of May to the end of July, when it becomes rarer and is sometimes absent.

(4) *Centropages typicus* Kröyer. Common in September and October, 1915, scarce or absent through the winter, rather more abundant in May, becoming rare again in August.

(5) *C. hamatus* Lillj. Common in September and October, 1915, then absent until August, when it is very common on the 16th.

(6) *Isias clavipes* Boeck. Fairly common in May, rare in June.

(7) *Temora longicornis* Müller. Very common all through the summer and in the middle of February, common in parts of November, but rather rare in winter.

(8) *Anomalocera Patersoni* Templeton. From September to the beginning of November; not common.

(9) *Labidocera Wollastoni* Lubb. Not common, in July.

(10) *Candacia armata* Boeck. Rare through the winter, common in July and September.

(11) *Parapontella brevicornis* Lubb. Common in February and March and occasionally in May, otherwise rare; absent from October to February.

(12) *Acartia clausii* Giesbr. I find this species of *Acartia* the only one present in 1916. It is exceedingly abundant most of the year, very common on and off from May to the beginning of January and very seldom absent altogether.

(13) *Longipedia Scotti* G. O. Sars. Once only in February.

(14) *L. minor* Scott. Once in water samples and once in the tow nets, June.

(15) *Euterpina acutifrons* (Dana). Rare, October to December.

(16) *Idyœa furcata* Baird. Once only in December.

(17) *Amphiascus similis* Claus. Rare, September and October.

(18) *Oithona similis* Claus. More or less common throughout the year except from November to January. Very common in the middle of February and the middle of May.

(19) *O. nana* Grubb. Rare, January to May.

(20) *O. plumifera* Baird. Rare, from February to May, and in September.

(21) *Coryceus anglicus* Lubb. Present most of the year, but rarest in the summer. Through October and November it agrees with *Pseudocalanus* in its abundance, but becomes scarce in December.

(22) *Thaumaleus longispinosus* Brown. Once only in September, 1915, with eggs.

(23) *Caligus rapax* M. Edw. Free in the tow nettings in September, December and March. On one occasion a female with eggs was present; an unusual occurrence in the free state.

Copepod nauplii are common on and off for most of the year. At the end of January they were very abundant, also at the end of May and beginning of July. *Calanus* and *Temora* are the commonest forms identified.

Cirripedia.

"Nordisches Plankton," Vol. 11.

Balanus nauplii occur in the beginning of February, are very common in the middle of February and continue till the beginning of May, when they dwindle and disappear except for a straggler or two in June. In the end of July they reappear and stay till the beginning of October. Cypris stages begin in the end of April and continue until the end of May, are rarer in June and disappear in July. A few were seen in September and February. The fact that there are two seasons for these larvæ (which is borne out by other Plymouth records) probably means that the July forms are a different species, as at Port Erin only the spring larvæ occur.

Cladocera.

"Nordisches Plankton," Vol. 1.

(1) *Evadne Nordmanni* Lovén. Begins in the end of April and grows very common in May, is common through the summer until the middle of September when it disappears.

(2) *Podon intermedius* Lillj. Very similar in occurrence to *Evadne*, but is more frequent in August and September.

Amphipoda.

Sars, G. O., "Crustacea of Norway, Amphipoda."

(1) *Apherusa bispinosa* (Bate). Occurred once in October and once in January.

(2) *A. Clevii* Sars. A few specimens once in August and twice in June.

(3) *Caprella* sp. Once at the end of August.

Amphipoda indet. Rarely in April and September.

Isopoda.

"Nordisches Plankton," Vol. 14.

(1) *Idotea viridis* (Slabber). Rare in November and March.

(2) *Gnathia maxillaris* (Mont.). Young larva, free, rare, December. Praniza larva once in the middle of May.

(3) *Microniscus* sp. On Copepods, chiefly *Calanus*, *Acartia* and *Pseudocalanus*, from September to December, rare in March, most frequent in September.

(4) *Bopyrina* sp. Rare, January and February.

Cumacea.

Sars, G. O., "Crustacea of Norway, Cumacea."

(1) *Pseudocuma cercaria* (P. G. van Ben). Very rare, September and February.

Schizopoda.

"Nordisches Plankton," Vol. 12.

(1) *Nyctiphanes Couchii* T. Bell. Not common, in the beginning of May only, immature.

(2) *Macropsis Slabberia* Van Ben. Rare, December only.

(3) *Siriella Clausii* G. O. Sars. Once only in October.

(4) *Leptomysis mediterranea* G. O. Sars. Not common, November to January.

Euphausicdæ larvæ. Not common, October, November, March to May and August.

Stomatopoda.

Squilla Desmaresti Risso, larva. Once only in October, 1915.

Macrura.

These are all larval forms; starting with *Carcinus mœnas* early in January they gradually increase and are very common through the spring and early summer, and although plentiful through August and September, fall off considerably in October, being only represented by stray stragglers through the winter.

(1) *Leander* sp. larva. On and off from May to November. Single specimens at the end of February. Commonest in July.

(2) *Galathea* sp. larva (Sars, G. O., "Bidrag til Kundskaben om Decapodernes Forhandlingar," Arch. Math. Naturw., 13, 1889–90). Begins at the end of January and continues common till May, when it dwindles and disappears in September, commonest in March.

(3) *Eupagurus* sp. larva (Sars, *ibid.*, 1889–90). Very rare at the beginning of January, continues rare through March to the end of April when it is common, continues fairly common till the middle of May, rare from June to October. Older stages occasionally in the summer.

(4) *Hippolyte* sp. larva (Sars, "Account of the Postembryonal Development of Hippolyte varians Leach," Arch. Math., etc., 32, 1911). Common June to September, specially abundant in September, continues into November, and was found twice in December, rare in the spring.

(5) *Crangon vulgaris* L. larvæ (Sars, "Bidrag til Kundskaben om Decapodernes Forhandlingar," Arch. Math., etc., 14, 1890). From February to September, never very common.

(6) *Ægeon fasciatus* Risso, larva (Gurney, R., "The Metamorphoses of the Decapod Crustaceans Ægeon (Crangon) fasciatus, etc.," P.Z.S., Vol. II, 1903). One specimen in January. On and off from May to September.

(7) *Ceraphilus nanus* (Kröyer), larva (Sars, *ibid.*, No. 14). Rare, September and October.

Crangonidæ larvæ indet. Occurred occasionally from June to October.

Other Macruran larvæ indet. chiefly allied to *Hippolyte*, common in July and August.

(8) *Jaxea noctiana*, *Trachilifer* larva (Bouvier, J.M.B.A., X, N.S., 1913). Occurred once on August 16th, 1916. Unusual to find it so far inland.

BRACHYURA.

(9) *Porcellana* sp. zoea (Sars, *ibid.*, 13). One specimen on March 23rd, then begins at the end of April and in June and July is very common, continues till the middle of October.

(10) *Eurynome aspera* (Penn.) zoea (Cano, G., "Sviluppo œ Morphologia degli Oxyrhynchi," Mitt. Zool. Stat. Neapel, X, 1893). Rare, March and July.

(11) *Cancer pagurus* L. zoea (Pearson, J., "Memoir on Cancer the Edible Crab," 16th Lancs Sea Fish. Lab. Rep. for 1907). From the middle of January to March, common.

(12) *Portunus* sp. zoea (Williamson, C. H., "Report on Larval and Later Stages of Certain Decapod Crustacea," 28th Ann. Rep. Fish. Board Scotland, 1907). Many species, begin early in March, become very common in April and continue till September, less common from October to November, after which they disappear.

(13) *Carcinus mœnas* Leach zoea (Williamson, C. H., "On the Larval and Early Young Stages and Rate of Growth of the Shore Crab" (Carcinus mœnas Leach) 21st Ann. Rep. of Fish. Board for Scotland, 1903). The first of the Brachyura larvæ to appear, arrives early in January, is specially abundant in February and continues till May, after that very scarce.

(14) *Corystes cassivelaunus* (Penn.) zoea (Gurney, R., "The Metamorphosis of Corystes cassivelaunus (Penn.)," Q.J.M.S., 1903). From the middle of February to July, fairly common, rare in September.

Brachyura zoea indet. With a long spine like Corystes fairly common in September.

Megalopa indet. Scarce, from May to November.

PYCNOGONIDA.

Norman, A. M., "The Podosomata (=Pycnogonida) of the Temperate, Atlantic and Arctic Oceans," J. of the Linn. Soc. Zool., Vol. XXX.

(1) *Anaphia petiolata* (Kröyer) juv. In June, September and October free, with the hind legs not fully developed. In the larval stage living in medusæ common from July to September.

(2) *Pallene brevirostris* Johnston. Occurred once at the end of October.

Mollusca.

Polycera quadrilineata (Müll.). Once only in September, 1915.

Larval *Gasteropoda*. On and off nearly all the year, commonest in July. Rare in mid-winter.

Larval *Lamellibranchiata*. On and off, not very common for most of the year. Commonest in September, rare in winter.

Limacina balea Müller *retroversa* (Flemm.). Common in the middle of September, 1915. Occurred occasionally from July to October. Common once in August, 1916.

ECHINODERMATA.

Holothurian juv. Rare in December and January.

Ophiopluteus. Begins in March, very common towards the end of the month, dwindles in April and disappears in May. Occurs again in August and September, common in September.

Echinopluteus. A few occurred once in the middle of November, 1915, begins in May, not common. Very common at intervals in July and August.

Auricularia. Rare, January and February.

Very young Echinoderm larvæ in March.

TUNICATA.

Oikopleura dioica Fol. Common from February to May and from August to September, otherwise not very common and occurring at intervals. Commonest in early April and early August.

Appendicularian indet. Rare in August till November, and in February.

Fish eggs and young fish were occasionally present.

A Survey of the Plankton in each month both from water samples and tow nets.

1915. *September* (21st to 30th).

Winds mainly S. and S.E. Weather fairly fine. Shows both groups of diatoms. *Coscinodiscus* species, *Biddulphia mobiliensis* and *regia* beginning, *Rhizosolenia* which is almost at the end of its season not common except *R. Stolterfothii*, which is still abundant. *Skeletonema*, *Chætoceras constrictum* and *Asterionella* common, *Paralia* fairly common. Very few Peridiniales except *Prorocentrum micans* which is near its maximum and *Ceratium fusus*. Of the other unicellular groups *Laboea* species occur in small numbers, *Tintinnopsis ventricosa* is abundant and *Pontosphæra Huxleyi* occurs singly several times.

Of the Cœlenterates *Phialidium hemisphericum* and *Obelia* medusæ with young *Pleurobrachia* are common, but no other species. Amongst the Annelids *Autolytus longiferiens* and *rubropunctatus* occur singly with eggs and a few larvæ of various kinds are present. *Sagitta* is very common, *Cyphonautes* present but not abundant.

Many copepods occur, *Acartia*, *Calanus* and *Pseudocalanus* are the commonest, also common are *Centropages typicus* and *hamatus* and *Temora* and *Coryceus* is common at the end of the month. Brachyura zoeæ and the larva of *Hippolyte* are common, *Porcellana* zoeæ and *Podon intermedius* are common in the middle of the month and dwindle or

disappear at the end. *Limacina balea* f. *retroversa* was common once in the middle of the month.

Chief forms—*Asterionella japonica*, *Chætoceras constrictum*, *Rhizosolenia Stolterfothii*, *Skeletonema costatum*, *Prorocentrum micans*, *Phialidium hemisphericum*, Obelia sp., *Sagitta bipunctata*, *Calanus finmarchicus*, *Pseudocalanus elongatus*, *Acartia Clausii*, *Centropages typicus*, Brachyura zoeæ and *Hippolyte* larvæ.

October.

S.E. winds prevalent. Chiefly fine weather. *Asterionella* common until the middle, then dwindles and disappears. *Biddulphia* species not yet common. *Chætoceras* species common at the beginning and fall off in numbers towards the end, *Lithodesmium undulatum* common until the middle, *Mastigloia* sp. very abundant from the middle to the end of the month.

Nitzschia closterium common. *Paralia* on the increase. *Rhizosolenia Stolterfothii* common at the beginning but absent at the end, *Skeletonema* common and *Streptotheca thamensis* present with it nearly all the month. Of the Peridiniales *Ceratium bucephalum* is fairly common, *C. fusus* present in small numbers, *Prorocentrum micans* continually present, *Peridinium divergens* sometimes fairly common.

Laboea species still present in small numbers, and *Tintinnopsis ventricosa*, *Pontosphæra* more frequent, very common at the end of the month. Of the Cœlenterates *Stomotoca dinema* and *Turris pileata* occur although only *Phialidium hemisphericum* and *Turris pileata* are common. Besides *Pleurobrachia* which is sometimes common, *Beroë* and *Bolina* both occur. Annelid larvæ rare. *Sagitta* very common, *Cyphonautes* continues but is rare.

Of the copepods *Calanus* is still common, but *Pseudocalanus*, *Temora* and *Acartia* are the commonest ; *Coryceus* is also very common and seems to follow *Pseudocalanus* closely in numbers, *Centropages typicus* and *hamatus* fall off in numbers. All the larval Crustacea are much less numerous.

Chief forms—*Asterionella japonica*, *Chætoceras constrictum*, *convolutum* and *densum* at the beginning, *Mastigloia* sp. from the middle of the month, *Nitzschia closterium*, *Skeletonema costatum*, *Ceratium bucephalum*, *Prorocentrum micans*, *Phialidium hemisphericum*, *Obelia* sp., *Sagitta bipunctata*, *Calanus finmarchicus*, *Temora longicornis*, *Pseudocalanus elongatus*, *Coryceus anglicus* and *Acartia Clausii*.

November.

N.E. winds prevalent. Mostly cold.

Asterionella much reduced in numbers. *Biddulphia mobiliensis* and *regia* both come on and are very common from the middle to the end of the month. *Chætoceras* species greatly reduced, almost disappearing. *Guinardia* common towards the end of the month, also *Hyalodiscus stelliger*, *Mastigloia* sp. in large numbers at the beginning, absent after the 8th. *Paralia* becomes abundant, *Skeletonema* very common with *Streptotheca* common also. *Ceratium bucephalum* and *Prorocentrum micans* much scarcer, the latter absent altogether at the end of the month. *Tintinnopsis beroidea* very common at times through the month. Hardly any cœlenterates except *Phialidium* and *Obelia*, and these disappear at the end of the month. *Autolytus pictus* and *rubropunctatus* appear with eggs. *Sagitta* very common, copepods abundant, *Calanus* becoming scarce, *Centropages* almost absent, *Paracalanus* common, *Acartia*, *Pseudocalanus* and *Coryceus* very common. Crustacea larvæ practically absent.

Chief forms—*Biddulphia* species, *Guinardia flaccida*, *Hyalodiscus stelliger*, *Mastigloia* sp., *Paralia sulcata*, *Skeletonema costatum*, *Streptotheca thamensis*, *Tintinnopsis beroidea*, *Sagitta bipunctata*, *Paracalanus parvus*. *Pseudocalanus elongatus*, *Acartia Clausii* and *Coryceus anglicus*.

December.

S.W. winds prevalent. A good deal of overcast and showery weather.

Biddulphia mobiliensis very common, *regia* not so common, *sinensis* rare. *Chætoceras* almost absent, *Coscinodiscus* species begin to be common, especially *C. excentricus*, *Rhizosolenia Stolterfothii* which has been dwindling in numbers disappears at the end of the month. *Skeletonema* common early, rare at the end of the month. All Peridiniales rare. *Tintinnopsis beroidea* common till the middle of the month. Copepods scarce except *Pseudocalanus* and *Acartia*, *Calanus* rare and absent for a large part of the month.

Chief forms—*Biddulphia mobiliensis*, *Coscinodiscus excentricus*, *Skeletonema costatum*, *Tintinnopsis beroidea*, *Sagitta bipunctata*, *Pseudocalanus elongatus* and *Acartia Clausii*.

1916. *January.*

Nearly all S. and S.W. winds. Weather mostly fine.

Biddulphia mobiliensis and *regia* common. *Coscinodiscus excentricus* common, *Paralia* common, *Skeletonema* rare until the end of the month

when it becomes common again. *Streptotheca* following it in much the same abundance, *Thalassiothrix* common at the end of the month. Peridiniales practically absent. One specimen of *Muggiæa atlantica* at the end of the month, one *Aurelia* ephyra on the 24th. *Sagitta* very common. Copepods rare except *Pseudocalanus*, nauplius stages increase and are very common at the end of the month, zoea stage of *Carcinus mœnas* and *Cancer pagurus* begins in the middle of the month. *Galathea* larva begins at the end. Young fish and fish eggs present.

Chief forms—*Biddulphia mobiliensis* and *regia*, *Coscinodiscus excentricus*, *Paralia sulcata*, *Sagitta bipunctata*, *Pseudocalanus elongatus*, copepod nauplii, Brachyura zoeæ and *Galathea* larvæ in the second half of the month.

February.

S. and S.W. winds at the beginning, N.E. at the end. Stormy weather mostly till the end of the month.

Biddulphia mobiliensis and *regia* common, *sinensis* more frequent. *Chætoceras* begins again at the end of the month, *C. curvisetum*, *convolutum* and *teres* common. *Coscinodiscus excentricus* common, *radiatus* fairly common. *Paralia* common, *Skeletonema* and *Streptotheca* very common. *Thalassiothrix* common at the end of the month. Practically no Peridiniales. Single specimens of *Phialidium* and *Obelia*. *Rathkea octopunctata* becomes common at the end of the month. Ephyræ of *Aurelia* present on the 10th and increase at the end of the month. *Pleurobrachia* and *Muggiæa* present. *Sagitta* not so common, Terebellid, larvæ fairly common, *Cyphonautes* larvæ fairly common on the 10th.

Copepods common up to the 17th, then scarce, probably owing to the N.E. winds coming on. *Calanus* rare, *Temora* and *Oithona similis* very common on the 17th, *Pseudocalanus* common all the month. *Parapontella brevicornis* at the latter end, *Carcinus mœnas* zoea very common. *Galathea* larva common, *Crangon vulgaris* larva fairly frequent. *Corystes* zoea begins and *Levander*. Copepod nauplii fairly common and *Balanus* nauplii very common, beginning on the 5th. *Oikopleura dioica* fairly common.

Chief forms—*Biddulphia mobiliensis* and *regia*, *Coscinodiscus excentricus* and *radiatus*, *Paralia sulcata*, *Skeletonema costatum*, *Streptotheca thamensis*, *Temora longicornis*, *Oithona similis*, *Carcinus mœnas* zoea, *Galathea* larva, *Balanus* nauplius and *Oikopleura dioica*.

Here we find a rush of larval Crustacea especially towards the end of the month.

March.

Prevailing winds N.E. and N. with S.W. in the middle and end. Weather usually cold.

Biddulphia mobiliensis very common, *regia* not so common, *sinensis* increasing. *Chætoceras curvisetum* very common, *teres* and *convolutum* common. *Coscinodiscus excentricus* common, *radiatus* not so common. *Ditylium Brightwelli* common at times, *Rhizosolenia Shrubsolei* begins to be abundant in the middle and is very common in the end, *Paralia* fairly common through the month, *Skeletonema* and *Streptotheca* very common, *Thalassiosira gravida* begins to be fairly common in the middle and becomes very common at the end, the same with *Thalassiothrix*. *Tintinnopsis beroidea* is very common at the end of the month. A few *Phialidium* and *Obelia* medusæ present. *Rathkea octopunctata* occurs the whole month, getting common towards the end. *Hybocodon prolifer* begins in the middle and gets common towards the end. Terebellid larvæ are common through the month. *Poecilochætus* larva rare, *Sagitta* occurs all through the month but is not common. *Cyphonautes* very common at the end of the month.

Copepods not very abundant except *Pseudocalanus*, which is very common, *Calanus* rare but present throughout the month, *Acartia*, *Temora* and *Parapontella* fairly common, *Carcinus mœnas* zoea common at the beginning but absent towards the end, *Portunus* sp. zoea begins. *Corystes* zoea occurs through the month but is not common, *Galathea* larva common at the beginning, rare towards the end, *Crangon vulgaris* larva through the month but not common. Copepod nauplii increase at the end of the month. *Balanus* nauplii very common all through the month. Larval Gasteropoda all through the month, common at the end. Larval Lamellibranchiata not so common. *Ophiopluteus* larvæ through the month, common at the end, *Auricularia* larva present once at the beginning. *Oikopleura* fairly common through the month. Young fish rare, fish eggs fairly common.

Chief forms—*Biddulphia mobiliensis*, *Chætoceras curvisetum*, *teres* and *convolutum*, *Coscinodiscus excentricus*, *Skeletonema costatum*, *Streptotheca thamensis*, *Rathkea octopunctata*, Terebellid larvæ, *Pseudocalanus elongatus*, *Balanus* nauplius, *Ophiopluteus* larvæ and *Oikopleura dioica*.

April.

Winds N., E. and S. South at the end. Between 10th and 25th so strong that no samples were taken, after that S. wind and abundant plankton. All calm many days when the samples were taken after the storms.

Biddulphia mobiliensis not so common, *regia* rare, *sinensis* more common, *Lauderia* common, *Nitzschia delicatissima* common at the end, *Skeletonema* very common, *Streptotheca* very common at the beginning, rare at the end, *Thalassiosira gravida* common. *Ceratium fusus*, *Peridinium* spp. and *Prorocentrum* not very common but occur throughout the month. *Phæocystis* very common at the end. *Phialidium* and *Obelia* become common at the end of the month, *Steenstrupia rubra* and *Clytia volubilis* occur rarely, *Rathkea octopunctata* very common, *Arachnactis*, *Muggiæa* and *Hybocodon* occur through the month but not commonly except *Hybocodon* at the end of the month. Terebellid larvæ fairly common, *Sagitta* rare.

Calanus very common at the end of the month, *Temora and Pseudocalanus* very common. *Portunus* sp. zoea very common, copepod nauplius and *Balanus* nauplius very common. Cypris stage of *Balanus* begins at the end of the month. Young fish and fish eggs rare.

Chief forms—*Chætoceras curvisetum*, *Lauderia borealis*, *Skeletonema constatum*, *Thalassiosira gravida*, *Rathkea octopunctata*, *Temora longicornis*, *Pseudocalanus elongatus*, *Portunus* sp. zoea, *Balanus* and copepod nauplii.

May.

Prevailing winds S. and S.W. Sometimes E. and N.W. Weather variable, fine at the end with S. and S.W. winds.

Chætoceras species common, especially *C. curvisetum* and *pseudocrinitum*, *Lauderia* very common at the beginning, dwindles at the end of the month. *Mastigloia* sp. in large numbers from the middle to the end of the month, *Nitzschia delicatissima* very common, *Rhizosolenia* species increasing, *R. Shrubsolei* very common, *R. Stolterfothii* gradually increasing so that it is very common at the end of the month, *R. hebetata* and *semispina* very common from the middle to the end of the month, *R. alata* occurs through the whole month but is not common. *Skeletonema* very common. *Thalassiosira gravida* common. Various Peridiniales occur but not in large numbers. Infusoria too in small numbers abound. *Phæocystis Pouchetii* is very common through the whole month. Amœbæ fairly common. *Phialidium* and *Obelia* are very common and various other medusæ are present. *Sagitta* is not common and disappears at the end of the month. *Calanus*, *Temora*, *Acartia* and *Pseudocalanus* are abundant, *Paracalanus* very common early in the month, several other copepods present in smaller numbers. *Portunus* sp. zoea is common, Megalopa stages appear in the middle of the month. Various other Crustacea larvæ are present, of these *Eupagurus*, *Porcellana* and *Corystes* are common. *Evadne Nordmanni* and *Podon intermedius*

are common in the middle of the month, copepod nauplii are common and *Balanus* nauplii very common in the beginning, the cypris stages being commoner in the middle of the month when they abound.

Chief forms—*Skeletonema costatum*, *Rhizosolani Shrubsolei*, *Stolterfothii* and *hebetata* f. *semispina*, *Mastigloia* sp., *Thalassiosira gravida*, *Lauderia borealis*, *Chætoceras curvisetum*, *Phæocystis Pouchetii*, *Phialidium hemisphericum*, *Obelia* sp., *Calanus finmarchicus*, *Temora longicornis*, *Acartia Clausii*, *Pseudocalanus elongatus*, *Portunus* sp., zoeæ and *Balanus* nauplii and cypris stages.

June.

Prevailing winds N., S. at end of month. Weather mostly cold and dull.

Cerataulina Bergoni fairly common at the beginning, *Chætoceras* dwindles but *C. curvisetum* and *pseudocrinitum* are still common at the beginning and an undetermined species is common through the month particularly in the tow nets. *Leptocylindrus danicus* is fairly common and *Mastigloia* is occasionally present in large numbers. *Nitzschia delicatissima* is very common till the middle of the month and falls off towards the end. *Paralia* is rare, Rhizosolenia species very common, *R. Shrubsolei* and *Stolterfothii* very common through the month, *R. hebetata* f. *semispina* very common towards the end, *R. alata* gradually increasing, to be very common in the middle and continuing so till the end of the month. *Skeletonema* not common. *Thalassiosira gravida* rare. Maximum of the Peridiniales. *Amphidinium crassum* begins, *Ceratium fusus* fairly common, *Dinophysis* species, *Diplopsalis pillula*, *Glenodinium bipes*, *Gymnodinium rhomboides*, *Pouchetia armata*, *Spirodinium spirale* and *glaucum* all at a maximum. Various species of *Peridinium* fairly abundant. Various Infusoria occur, although never in large numbers. *Phæocystis* very common till the middle of the month when it disappears. Medusæ abound, especially *Phialidium* and *Obelia*. On the 14th *Saphenia gracilis* was very abundant, and with it a large number of *Bolina infundibulum*. The day was cold and dull with a north wind. On the same day *Spirodinium glaucum* and *Dinophysis acuminata* were at a maximum. The larva of Peachia sp. (Halcampa) was very common on medusæ. *Sagitta* rare.

Copepods not very abundant, *Calanus*, *Temora* and *Acartia* common. *Pseudocalanus* very rare, *Portunus* sp. zoea very common, Megalopa stages fairly common, larvæ of *Hippolyte* and *Porcellana* very common on the 21st. Copepod nauplii not so common, *Balanus* cypris stage disappears after the beginning of the month. *Anaphia petiolata* and larval Gasteropoda common at the end of the month.

Chief forms—*Guinardia flaccida*, *Rhizosolenia* species, *Glenodinium bipes*, *Gymnodinium rhomboides*, *Pouchetia armata*, *Spirodinium spirale* and *glaucum*, *Phialidium hemisphericum*, *Obelia* sp., *Calanus finmarchicus*, *Temora longicornis*, *Acartia Clausii*, *Portunus* sp. zoea, *Hippolyte* and *Porcellana* larvæ.

July.

S. and S.W. winds prevail. Fairly fine most of the month.

Asterionella very common all the month. *Chætoceras constrictum* very common, *C. curvisetum*, very common at the end of the month only. *Guinardia* very common in the middle, not so common at the beginning and end of the month. *Rhizosolenia* species very common, *R. alata* and *R. Stolterfothii* very common all the month, *R. Shrubsolei* not so common, *R. setigera* begins and gradually gets common, being very common at the end of the month. Peridiniales not so numerous. *Ceratium fusus* very common in the middle of the month. *Prorocentrum* increasing. Infusoria fairly common, especially *Tintinnopsis beroidea*, which at times is exceedingly abundant. *Phialidium* and *Obelia* very common. Other medusæ scarce. *Calanus*, *Temora*, *Acartia* and *Pseudocalanus* very common. *Portunus* sp. zoea and *Porcellana* zoea very common. Copepod nauplii common. *Echinopluteus* common at the end of the month.

Chief forms—*Asterionella japonica*, *Chætoceras constrictum*, *Rhizosolenia* species, *Ceratium fusus*, *Tintinnopsis beroidea*, *Phialidium hemisphericum*, *Obelia* sp., *Portunus* and *Porcellana* zoeæ.

August.

Prevailing winds S., some E. and some W. Mostly fine weather.

Second diatom maximum at the beginning of the month caused chiefly by *Mastigloia*, *Asterionella*, *Chætoceras*, *Lauderia*, *Rhizosolenia* and *Skeletonema* which are all very common. *Chætoceras constrictum* the commonest. *C. didymum* very common on the 10th. *Lithodesmium* scarce at the beginning but very common at the end of the month. *Rhizosolenia alata* is very common until after the middle when it becomes scarce and very rare at the end of the month. *R. hebetata* f. *semispina* very common at the beginning, disappears at the end, *R. setigera* very common after the middle but scarce at the end, *R. Stolterfothii* very common for the whole month. *Skeletonema* very common for most of the month, Peridiniales fairly frequent, especially *Prorocentrum micans*. Infusoria fairly abundant, especially *Tintinnus subulatus* and *Tintinnopsis beroidea*. *Dictyocha* and *Distephanus* begin in the middle of the month, *Phialidium* and *Obelia* very common. *Muggiæa atlantica* becomes common at the end of the month. Copepods abundant. *Calanus*, *Centropages typicus*

and *hamatus* fairly common, *Acartia* and *Pseudocalanus* very common, *Candacia armata*, *Coryceus* and *Paracalanus* common at times. Brachyura zoeæ and other crustacea larvæ rare. *Evadne Nordmanni* and *Podon intermedius* common. *Balanus* nauplii very common at times. Echinoplutei very common on the 10th, Ophioplutei fairly common through the month. *Oikopleura* fairly common.

Chief forms—*Asterionella japonica*, *Chætoceras constrictum*, *Rhizosolenia Stolterfothii*, *Ceratium fusus*, *Prorocentrum micans*, *Tintinnus subulatus*, *Tintinnopsis beroidea*, *Phialidium hemisphericum*, *Obelia* sp., *Acartia* and *Pseudocalanus*, *Evadne Nordmanni* and *Podon intermedius*.

September (till the 18th).

Prevalent winds W. and N.W. Usually fine weather.

Asterionella much scarcer, *Chætoceras curvisetum* very common again, other *Chætoceras* species not so common. *Lithodesmium* and *Lauderia* fairly common. *Rhizosolenia* species rare except *R. Stolterfothii*, *Skeletonema* still very common. Peridiniales scarce except *Ceratium fusus* and *Prorocentrum micans* which is at its maximum. Infusoria fairly abundant, especially *Tintinnopsis* species. *Dictyocha* and *Distephanus* at their maximum. Few medusæ except *Phialidium* and *Obelia*. *Muggiæa* very common. *Sagitta* common.

Copepods fairly abundant, *Calanus* and *Temora* common, *Acartia* and *Pseudocalanus* very common. Various crustacea larvæ in small numbers. *Evadne* disappears at the beginning, *Podon* is common through the month. Copepod and *Balanus* nauplii very common. *Lamellibranchiata* larvæ common at times. Ophioplutei very common.

Chief forms—*Chætoceras curvisetum*, *Rhizosolenia Stolterfothii*, *Skeletonema costatum*, *Prorocentrum micans*, *Tintinnopsis beroidea*, *Muggiæa atlantica*, *Acartia*, *Clausii*, *Pseudocalanus elongatus*, *Podon intermedius*, *Ophiopluteus*.

The dates on which the plankton samples were taken, with wind and weather, morning tide and time at which taken. * Indicates that the samples were taken from the west channel. P Indicates preserved samples.

1915.	Weather.	Wind.	Greenwich time.	Morning tide.
September 21 P	fine	E.	11.30 a.m.	4.7
*23 P	drizzling	S.	abt. 11 a.m.	5.38
*25 P	fine	S.	12 noon	6.49
27 P	fine	N.W.	12 noon	7.45
29 P.	showery	N.	11.30 a.m.	8.40

		Weather.	Wind.	Greenwich time.	Morning tide.
October	1 P.	cloudy	S.S.W.	11 a.m.	9.41
	*4 P	overcast	S.S.E.	12 noon	1.10
	6	fine	S.S.W.	abt. 11 a.m.	3.37
	11	very fine	S.	12 noon	7.5
	13	fine	S.S.W.	abt. 11 a.m.	8.25
	15	unsettled	N.E.	abt. 11 a.m.	9.58
	*18	very fine	W.N.W.	abt. 12 noon	1.28
	*21	heavy showers	S.S.W.	abt. 11 a.m.	4.28
	27	calm	E.N.E.	11.30 a.m.	7.44
	29	fine, dry	E.N.E.	12.20 p.m.	8.25
November	1	dull, gusty	E.S.E.	11 a.m.	11.45
	3	fine, clear	E.N.E.	11.45 a.m.	1.49
	5	fine, cold	N.N.E.	11.45 a.m.	3.44
	8	cloudy, rain	S.W.	11 a.m.	5.59
	*11	rough, rain	S.	11 a.m.	8.18
	15	calm, cold	E.	12 noon	12 noon
	17	fine, cold	E.	12.45 p.m.	2.8
	19	cold, clear	E.	11.10 a.m.	3.52
	22	cold, dull	N.E.	11.15 a.m.	5.52
	24	fine, cold	E.N.E.	11.40 a.m.	6.58
	26	misty, smooth	N.E.	11.45 a.m.	8.2
	29	wet, rough	S.S.E.	11.40 a.m.	9.15
December	2	wet, rough	E.	12.15 p.m.	0.27
	9	wet, rough	S.S.W.	11.30 a.m.	7.23
	13	fine, cold	N.N.W.	11.30 a.m.	10.38
	16	fine, cold, showery	E.N.E.	12.25 p.m.	1.8
	*20	misty, calm	N.	11.30 a.m.	4.53
	22	misty, warm, smooth	S.W.	11.30 a.m.	6.13
	*29 P	strong wind, rain	S.	11.30 a.m.	10.23
1916.					
January	3 P	sunny, heavy swell	S.W.	11.30 a.m.	3.36
	* 5 P	sunny, sea mod.	—	11.30 a.m.	5.34
	8 P	fair	N.W.	11.30 a.m.	8.5
	11 P	dull, warm	—	11.30 a.m.	10.45
	*14	fair	W.	2.5 p.m.	noon
	18	swell	S.W.	2.45 p.m.	4.3
	24	fine	W.	11.25 a.m.	8.12
	*26	nasty sea	S.W.	11.20 a.m.	9.38
	28	fine	S.	11.15 a.m.	10.39
	31	dull	N.E.	11.40 a.m.	1.35

		Weather.	Wind.	Greenwich time.	Morning tide.
February	5	heavy sea	S.	11.35 a.m.	7.7
	*8	cold, clear	S.W.	11.40 a.m.	8.59
	10	dull, cold	S.W.	11.20 a.m.	10
	17	cold, sunny, nasty sea	S.W.	11.30 a.m.	4.54
	*21a	stormy	N.E.	10.45 a.m.	7.22
	25	snow showers	N.E.	11.10 a.m.	9.32
	28	fine	N.E.	11 a.m.	noon
March	1	fine, smooth	E.	11.15 a.m.	3.55
	8	snow showers	N.	11.5 a.m.	8.22
	*10	cold, rough	N.E.	11 a.m.	9.21
	14	stormy	E.	10.50 a.m.	0.31
	16	fine	S.W.	noon	3.21
	21	misty, calm	N.	noon	6.52
	23	cold, calm	N.	11.10 a.m.	8.1
	27	cold, wet	S.E.	11.10 a.m.	11.4
	29	cold, sunny	S.W.	11.30 a.m.	1.21
	31	calm, dull	S.	12.20 p.m.	4.1
April	4	calm, sunny	N.	11 a.m.	6.49
	6	calm, sunny	E.	11.50 a.m.	7.50
	10	calm, sunny	S.	11.50 a.m.	10.5
	25	calm, sunny	S.	11.10 a.m.	11.8
	27	sunny, warm	S.	12.15 p.m.	1.16
May	1	sunny, warm	E.	11.20 a.m.	5.5
	3	calm, misty	S.	12 noon	6.21
	5	showery, gusty	E.	11 a.m.	7.25
	9	showery, gusty	S.W.	11.50 a.m.	9.43
	12	rain, smooth	S.	12.45 p.m.	0.29
	15	rather rough, dull	W.	11.20 a.m.	3.40
	17	showery, dull	—	11.25 a.m.	5.15
	19	fine, warm	E.	0.15 p.m.	6.48
	22	fine, breezy	N.W.	10.25 a.m.	9.8
	24	fine, cloudy	S.	11.40 a.m.	11.4
	26	fine	S.W.	11 a.m.	0.44
	29	fine, warm	S.	10.40 a.m.	3.49
	31	fine, warm	S.	10.40 a.m.	5.20
June	2	fine, warm	N.W.	11.40 a.m.	6.35
	6	cold, rough	W.toN.W.	10.48 a.m.	8.46
	8	fine, cold	S.	11.20 a.m.	10.8
	12	cold, dull	W.	10.25 a.m.	1.49
	14	cold, dull	N.	10.25 a.m.	3.55
	19	cold, fair	N.W.	10.45 a.m.	8.16

		Weather.	Wind.	Greenwich time.	Morning tide.
	21	dull, cold	S.	11 a.m.	9.50
	27	cold, fine	S.	11.45 a.m.	3.13
	29	stormy, showery	S.	10.40 a.m.	5.3
July	4 P		S.	10.30 a.m.	5.3
	7 P	heavy swell	S.S.W.	10.40 a.m.	9.38
	11 P	fair	S.W.	10.45 a.m.	noon
	13 P	heavy sea	S.W.	12 noon	3.28
	18 P	fine	N.	10.50 a.m.	8.5
	21 P	very fine	S.	3 p.m.	10.2
	25 P	very fine	S.W.	10.50 p.m.	1.13
	27	very fine	N.W.	11.15 a.m.	3.46
August	1	misty	S.E. & S.W.	1.30 p.m.	7.12
	3	very fine	S.	11.5 a.m.	8.9
	8*a*	fine	E.	11 a.m.	11.32
	10	very fine	W.	10.55 a.m.	1.40
	16	windy, rough	S.	11.35 a.m.	7.43
	18	fine	S.	11.15 a.m.	8.57
	22	fine	E.	11 a.m.	11.42
	28	fine	S.	11.40 a.m.	5.39
	31	misty, swell	S.	11.10 a.m.	7.17
September	4	showery	W.	10.20 a.m.	9.25
	6	very fine	S.	11 a.m.	11.11
	8	very fine	N.E.	10.40 a.m.	11.35
	11	showery, fine	N.W.	10.40 a.m.	5.8
	13	fine	W.	10.40 a.m.	6.38
	15	fine	W.	noon	7.49
	18	fine	N.W.	10.30 a.m.	9.24

[*a* These samples were taken at 4 and 6 fathoms.]

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TABLE I

The Microplankton of Plymouth Sound from the region beyond the Breakwater, showing the average number of individuals in 50 cc. each week, also relative abundance in the tow-nettings. The numbers show the individuals in the water samples, the letters their relative abundance in the tow-nettings.

Month	1915. September.					October.				November.					December.				1916. January.				February.			
Week ending	25	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29	5	12	19
Diatomaceæ.																						
1. Melosira Borreri Grev.		rr				0·3				rr 0·2						r 0·2			0·2 r	r	r	
2. Paralia sulcata (Ehr.)	22 c	32 +	7 rr	28 +	28 r	25 +	91 +	22	85 +	44	53 +	63 +	62 +	28 +	78 +	121 +	81 +	80 r	67 r	26 r	49 +	62 r
3. Skeletonema costatum (Grev.)	34 +	129 cc	850 cc	108 +	293 cc	29 +	43 cc	19 r	19 cc	11 cc	15 cc	2 +	6 +	2 +	rr 0·7	8	35		17 c	17 cc	16 cc	13 +
4. Thalassiosira Nordenskiöldii Cleve	0·5 +		2				0·1	r	1		rr											
5. ,, decipiens (Grun)		0·2	1																			
6. ,, gravida Cleve	0·1		1	0·1			0·2 rr		0·6 rr	1 r	0·5	0·5	0·3 r	0·5 r					0·7	1·3	0·6	
7. ,, subtilis (Ostenf.)										c			r	rr					rr		rr	
8. ,, condensata (Cleve)										0·1												
9. Lauderia borealis Gran			r							0·6 r	0·8 rr	2	0·3 rr	1 rr			1	0·3	2	0·5 rr		
10. Leptocylindrus danicus Cleve										rr	rr	rr	0·3 rr	0·5								
11. ,, sp.											1	0·2	1									
12. Guinardia flaccida (Castr.)	0·2 r	0·2 +	r	0·7 +	0·2 rr	0·2 rr	+	+	1 c	cc	r	+	0·2 rr				r					
13. Hyalodiscus stelliger Bail.		r 0·3	rr	0·4 +	0·3 r	r 0·6 +	0·2 r	0·4 cc	1 c	+	0·3 +	1 +	0·7 r	0·6 +	3 +	1 c	1 +	0·5 +	1 r	0·5 +	2 rr	
14. Coscinodiscus excentricus Ehr.		0·6	0·2		0·2		rr	0·3 +	0·2 +	0·5 +	0·6 +	cc	0·5 c	3 r	0·7 +	0·5 +	0·3 +	0·2 cc	c	1 cc	cc	
15. ,, radiatus Ehr.	0·4 r	0·3 r	r	0·1 r	r	0·5 rr	0·2 r	r	0·1 r	0·1 +	0·2 +	+	0·5 r	0·7		0·4 c	r	+	0·4 +	0·2	+	cc
16. ,, sub-bullens Jörg.	0·2 r	0·1 r	r	0·4 r		+	r		rr	+				rr								
17. ,, Grani Gough									r	rr	0·5 +	r	0·3 r	r	r	0·3	+	r	r			
18. Actinocyclus Ehrenbergi Ralfs.		rr																				
19. Actinoptychus undulatus (Bail.)	0·1 r			0·1 +	rr	rr	r 0·2	r 0·2	r 0·3 +	0·5 r	0·3	r	0·2 rr	0·2	0·2 rr	0·3	r	0·2 r	r	r	r	
20. Rhizosolenia Stolterfothii H. Perag.	19 c	13 c	5 r	1 cc	8 rr		rr	2	+	1 +	1 r	5 rr	2 +		0·4							
21. ,, robusta Norman								r	r	r	r			rr	r	rr	rr					
22. ,, Shrubsolei Cleve		c	1 r	0·2	0·3 c	rr	rr	r	r	+	+	rr 0·3	0·7			rr		r		r		
23. ,, setigera Brightw.	0·2	0·1 rr	0·2	0·1	0·2 rr			rr	rr										0·1 rr		rr	
24. ,, hebetata f. semispina (Hens.)		0·2 r	+	+	r		0·1												r			
25. ,, alata Brightw.				0·1 c		r				r												
26. Corethron criophilum Castr.	0·3	0·1 r	0·7 r	0·4 c	0·7 +	r 0·2 r	1	+	0·1	0·2 rr		0·2 rr										
27. Chaetoceras densum Cleve	0·4 c	7 r	3 c	0·6 r	0·3 rr	r	r	+	+	c	+	1	0·7 r					r	r	r	+	2 r
28. ,, convolutum Castr.		c 0·1 +	8 +	0·8	5	rr				r									rr	rr		
29. ,, danicum Cleve							r 0·2 rr	0·1 +		r			r						rr			
30. ,, boreale Bail.			c	r			rr		+										r	r	r	
31. ,, decipiens Cleve		rr			1			r 0·7 r	+	r	0·3 r						rr		+	rr	r	r
32. ,, teres Cleve																						
33. ,, contortum Schütt	1 r	1		0·3 r	0·3				rr		0·8								rr	rr		rr
34. ,, didymum Ehr.	3 c	23 cc	25 cc	+	11 rr	1 rr	1 r		r	r		0·5 r				rr			rr	r	r	rr
35. ,, constrictum Gran.		rr	+																			
36. ,, Willei Gran.	c 0·8 rr	0·5 rr	r	1 r	rr	rr	r 0·1 r												rr		rr	r
37. ,, lacinisum Schütt																						
38. ,, breve Schütt																						
39. ,, diadema (Ehr.)																						
40. ,, pseudocrinitum Ostenf.					rr		rr	1														
41. ,, curvisetum Cleve																						
42. ,, debile Cleve																						
43. ,, sp.																						
44. Eucampia zoodiacus Ehr.	0·1 r	0·4	0·3 r		0·5																	
45. Streptotheca thamensis Shrubs.	0·2 +	1 +	1 c	3 cc	9 cc	0·7 +	0·3 +	0·5 r	0·3 cc	0·3 c	r	r	0·2 +	+	2 rr	0·2 +	+	0·3 +	0·1 cc	0·2 +	0·3 cc	3 +
46. Cerataulina Bergonii H. Perag.				r					0·1 r													
47. Biddulphia mobiliensis (Bail.)	+	0·3 r	0·3 r	0·3 +	1 +	+	0·1 +	e	0·1 cc	0·6 cc	0·2 cc	2 cc	2 cc	1 cc	3 cc	cc	0·5 cc	2 c	0·4 cc	+	0·7 cc	2 cc
48. ,, regia M. Schulze		rr	+	+			r	+	cc	0·1 c	0·2 +	+	0·2	r	+	r	+	r	cc	+	cc	cc
49. ,, sinensis Grev.									c	r	rr	r				0·2		r		0·2	r	
50. ,, favus (Ehr.) v. Heurck									r											rr		
51. ,, alternans (Bail.) v. Heurck									0·8 r		r								r			r
52. Bellerochia malleus (Brightw.)		r																				
53. Lithodesmium undulatum Ehr.	0·3 +	3 +	5 cc	+	0·7 c		rr		0·1		0·3		0·2	0·6	r	r 0·6		r				
54. Ditylium Brightwelli (West) Grun																rr 0·3 rr	r			+	r	
55. Fragilaria sp.		r							r						2			rr				
56. Thalassiothrix Nitzschioides Grun	4 +	3 r	r	1 r	0·5	0·3	1 r	4	4 r	5 r	4 r	5 r	2 r	0·3	0·6	4 r	4	5 cc	rr	3 +	rr	
57. Asterionella japonica Cleve	2 c	23 +	4 cc	0·4 +	3 r	r	2 r		+							4 rr			r	3 rr		
58. ,, Bleakeleyi W. Sm.											0·2											
59. Lycmophora Lyaloergi (Kütz) Grun					0·2																	
60. Grammatophora serpentina Ehr.		0·1			0·5				0·1	0·2				rr 0·3	0·3							rr

Month	March.					April.					May.					June.				July.					August.				September.			
Week ending	26	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26	2	9	16	23
									None taken																						
1. Melosira Borreri Grev.	0·2 r	0·2 r	0·3 rr	o	0·3 rr	rr												r											r		
2. Paralia sulcata (Ehr.)	53 r	14 r	8 rr	12	14 r	35 r	20 rr	7		23	9 rr	8	3 rr	2	3 rr	5 rr	2	3		7 rr	2 rr	2		3 r	4	24 rr	rr	19 rr	4 rr	17 rr	19
3. Skeletonema costatum (Grev.)	40 cc	15 cc	36 r	53 c	29 c	58 cc	34 +	194 cc		4348 cc	191 c	84 +	79 +	156 r	122 cc	5	2	0·7	12	6 rr	1 rr	3 rr	8 rr	26 rr	108 cc	341 cc	362 cc	2042 cc	74 cc	700 cc	139 +
4. Thalassiosira Nordenskiöldii Cleve	2	0·8			1			2			23 r	7		0·6																	
5. ,, decipiens (Grun)					0·3	0·4						0·3																			
6. ,, gravida Cleve	0·5	0·2 r	0·5	0·7	20 +	21 cc	13 r	24 c		61 +	51 +	69	20 c	36	35 +	4		2 rr	2 r				3 rr	2	4 r	0·3 rr	2 .	0·3	7	14 r	33 r
7. ,, subtilis (Ostenf.)		r			r	0·2 rr	rr	2																					0·5	rr
8. ,, condensata (Cleve)						0·4 rr																									
9. Lauderia borealis Gran	rr	3 rr	8 rr	0·7 r	6 +	7 r	2 +	20 +		90 c	373 cc	9	2 r	0·1	2	5	1	2	8 r		0·2		2 r	2 +	12 r	24 r	50 c	10 rr	4 rr	6	7 r
10. Leptocylindrus danicus Cleve											0·9 rr	4	3	4	7	18 r	11	23 rr	33 rr	4	1	1 rr	20 +	4	21 rr	0 rr	11 r	0·7 rr	4	5 r	r
11. ,, sp.																			4		5 rr	1	35	9	15 rr	9	71		5	0·4		
12. Guinardia flaccida (Castr.)						r				rr	0·6 r	r	c	+	c	2 c	1 cc	2 cc	0·5 +	0·8 +	1 cc	3 cc	1 +	0·3 r		1 c	0·7 +		1 +	0·6 cc		+
13. Hyalodiscus stelliger Bail.	1 r	0·2	0·7	0·2	0·2	0·5	0·3 rr			0·5	rr	0·2	0·3	0·2	rr			r		r	r		rr		3 +	rr		r	0·7 +	1 r	
14. Coscinodiscus excentricus Ehr.	0·2 cc	cc	0·5 +	0·2 +	2 cc	1 cc	0·2 +	0·3 +																				0·3 r	0·5 r	rr	
15. ,, radiatus Ehr.	0·7 +	1 r	1 r	0·8 r	1 r	0·7 +	1 +	0·3 rr		0·2 r																					
16. ,, sub-bullens Jörg.		r	rr			rr	0·2			rr	r	r	r		rr													0·1	rr		
17. ,, Grani Gough	+	r		r	+	r	r	rr																						r	
18. Actinocyclus Ehrenbergi Ralfs.																			rr		rr	r	r	r	r	r			0·2		
19. Actinoptychus undulatus (Bail.)	0·3 r		0·3	0·3	2	0·2				0·2																					
20. Rhizosolenia Stolterfothii H. Perag.					r						10 +	6 +	11 c	6 +	25 cc	222 +	90 cc	51 cc	74 cc	37 c	81 cc	98 cc	98 cc	83 cc	41 cc	16 cc	42 cc	19 cc	19 cc	4 cc	1
21. ,, robusta Norman	rr				rr	rr					rr	rr																			
22. ,, Shrubsolei Cleve	rr	+	0·5 +	0·2 +	+	0·3 cc	1 +	+		0·8 +	2 cc	2 +	3 cc	7 cc	14 cc	41 cc	14 +	5 cc	1 c	1 c	1 +	+	+			1 r	3 r	0·2 rr	0·1 rr	+	
23. ,, setigera Brightw.	r	0·3 r	rr	0·2 rr	rr	0·1 r	rr	rr		rr	rr	2	4	5	0·4					2 r	1 +	6 r	3 cc	31 cc	25 cc	8 cc	0·3	0·3 rr	0·1 rr	0·5 rr	
24. ,, hebetata f. semispina (Hens.)		rr			rr	r					+	cc	cc	cc	12 cc	2 cc	3 cc	3 cc	1 +	3 r	1 cc	1 cc	0·8 cc	1 cc	1 cc	1 rr	0·3 r		0·5	0·3	
25. ,, alata Brightw.	rr	rr			r	r	rr	rr		rr	0·1 r	0·5 rr	0·6 r	1 r	0·2 r	6 +	8 cc	17 cc	20 cc	17 cc	11 cc	1 cc	cc	4 cc	4 cc	0·8 cc	2 cc	0·5 r	r	+	
26. Corethron criophilum Castr.		rr			0·2 rr																		cc			r		rr	0·7 r	0·6 r	
27. Chaetoceras densum Cleve	0·8 r	1 +	4 c	2 cc	5 r	r		r		r	4 r	2 rr	3 +	5 c	3 +	1 r	1 +	0·5 r								rr	r		1 +	1 +	
28. ,, convolutum Castr.		cc	7 cc	0·8 cc	r	r		r		3 r	5 rr	3	0·1	6 rr	0·4	1		3	4 r	2	5 rr	6 +	15 r	5	4			0·5 rr	rr	0·5	
29. ,, danicum Cleve			0·2			rr															0·3 rr	0·3	1 r			r		0·1	rr	0·5 rr	
30. ,, boreale Bail.			r								2		rr										3								
31. ,, decipiens Cleve		r	2 +	0·7 r	0·7 r	2 +	0·7	2		9 r	6 r	2 +	2 r	13	24	0·8		1	3	0·7		1 r	15 r	rr	rr		rr		1 rr	0·7	
32. ,, teres Cleve	+	c	2 c	4 cc	4 +	0·6 +	r	r		1 r																					
33. ,, contortum Schütt		+	1 rr		2	r	0·3			r	r	r								1			3	4	3			0·7			
34. ,, didymum Ehr.		1				rr				2 +	2	9		2	195	1				0·5 rr	rr		5 c	7 +	12 cc		rr				
35. ,, constrictum Gran.																				24 cc	33 cc	68 cc	43 cc	189 cc	66 cc	5 rr	2 +	3 rr	6 r	r	rr
36. ,, Willei Gran.																		1	0·5				1		7		rr				
37. ,, lacinisum Schütt	rr									0·8				0·2	-			2	1	0·5			0·5						0·6 r	rr	
38. ,, breve Schütt																								0·5				1			
39. ,, diadema (Ehr.)																															
40. ,, pseudocrinitum Ostenf.	rr											35	41 rr	215 r	216 +	7			2				8				4	6	r	0·7	2
41. ,, curvisetum Cleve		e	5 cc	1 cc	4 c	cc	+	21 cc		16 r	12 +	30 +	24 +	118 cc	522 cc	130 cc	7 rr	8 r	3 rr		2	5	15 cc	5 cc	4 r	rr	r	0·5 r	9 +	53 cc	21 +
42. ,, debile Cleve										r		3	1 rr	3	15 rr	3											2		4	5 r	rr
43. ,, sp.			rr	rr											168	17	4	14	46	14			62 +	12	34 rr	6	8	r			
44. Eucampia zoodiacus Ehr.					1													rr	rr	0·3	0·7 rr	0·8	4 r	rr	0·3 r	rr		0·3	3 +	1 +	3 rr
45. Streptotheca thamensis Shrubs.	1 cc	3 cc	3 cc	2 cc	2 cc	4 cc	3 cc	1 c		0·5 +	rr										0·3		rr	rr	r	0·7 +	0·2 cc	0·6 cc	1 cc	4 c
46. Cerataulina Bergonii H. Perag.										3 rr	5 rr	7	1	0·3	4 r	30 r	2							rr						1
47. Biddulphia mobiliensis (Bail.)	cc	0·7 c	0·7 cc	0·7 +	2 cc	1 cc	0·7 +	rr																							
48. ,, regia M. Schulze	cc	c	+	r	+	0·1 +	0·2 r												rr					rr	rr	rr		0·1			
49. ,, sinensis Grev.	c		+	0·3 r	0·2 r	0·1 c	1 c	0·6 r		0·5 +	0·2 c	0·7	r	0·1 rr																	
50. ,, favus (Ehr.) v. Heurck																					rr								r	r	
51. ,, alternans (Bail.) v. Heurck	rr				rr																										
52. Bellerochia malleus (Brightw.)																															
53. Lithodesmium undulatum Ehr.																															
54. Ditylium Brightwelli (West) Grun																															
55. Fragilaria sp.																															
56. Thalassiothrix Nitzschioides Grun																															
57. Asterionella japonica Cleve																															
58. ,, Bleakeleyi W. Sm.																															
59. Lycmophora Lyaloergi (Kütz) Grun																															
60. Grammatophora serpentina Ehr.	0·2					0·2	0·1			rr						0·2				0·2				0·5	0·8	0·2 0·2			0·1		

TABLE I—*continued.*

The Microplankton of Plymouth Sound from the region beyond the Breakwater, showing the average number of individuals in 50 cc. for each week, also relative abundance in the tow-nettings. The numbers show the individuals in the water samples, the letters their relative abundance in the tow-nettings.

Month	1915. September.				October.					November.					December.				1916. January.				February.		
Week ending	25	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29	5	12	19
61. Acnanthes longipes Ag.	scarce	r		0·2																		
62. Navicula membranacea Cleve	9	0·1 +	16	0·3 r	12 c	3 +	5	12 +	21 +	1 r	2 rr											
63. ,, sp.		2 r	2 rr	1 +	4	4 rr	4 r	3 r	2	2 r	2 r	2 r	2 rr	2	2 r	0·5 r	0·3	0·3 r	1	1	1	1 r	0·5	2
64. Pleurosigma sp.	1	1 rr	0·3 r	2 r	2 rr	2 rr	2 rr	1	4 r	2 r	5 rr	3 r	2	0·8	3	3	3 r	4	2	0·5	3	3
65. Mastigloia sp.	0·2	0·4	0·4	10	2003 rr	348	1650	70				rr										
66. Amphiprora maxima Greg	0·1	0·1								0·1 rr		rr		rr	0·3	0·1 rr	0·2		0·1			
67. Amphora ostracaria Bréb.	0·1			rr																		
68. ,, sp.		r	r	0·2					rr		rr											
69. Nitzschia closterium W. Sm.	1	0·7	0·7	49	129	5	5	2	2 rr	1	2	1	2	0·5			0·2		2	0·3	0·3	0·3
70. ,, seriata Cleve	0·1	r		0·2	1		0·3	0·5	0·2 rr													
71. ,, delicatissima Grev.	0·1										r		rr									
72. ,, pandariformis Gm.	0·1			0·2	0·1	4				rr					0·3	0·1				0·2		
73. Bacillaria paradoxa Gm.	1	0·2	3 r	2 r																		
74. Campylodiscus and Surirella spp.	0·2	0·2 rr	r	r	r	0·2 rr	0·5 r	r	r	rr	rr	0·2 rr	r	r	0·1 rr		rr	rr		r		
Peridinioids																						
75. Exuviella compressa (Bailey)	0·2	0·1		0·2																		
76. Prorocentrum micans Ehr.	5 +	4 r	0·6 rr	6 +	4	2	2	0·2	0·3		0·2	0·3		0·2				rr	0·3			
77. Dinophysis acuta Ehr.																						
78. ,, acuminata Cl. & L.																						
79. ,, hominculus v. tripos Lemm.																						
80. ,, ovum Schütt					0·2																	
81. ,, rotundatum Cl. & L.		r	0·1	0·2	0·1	0·2					0·2								0·1			
82. Glenodinium bipes Pauls	1	0·5																				
83. Protoceratium reticulatum Cl. & L.																						
84. Goniulax triacantha Jörg.	0·1																					
85. ,, polygramma Stein				0·3																		
86. ,, spinifera (Cl. & L.)	1	1																	0·2			
87. ,, scrippsæ Kofoid	0·3																					
88. ,, polyedra Stein														rr								
89. Amylax lata Meunier	0·6	0·1		0·1																		
90. Diplopsalis lenticula Bergh	0·3	r	r		r		r	r	r	rr	r											
91. ,, pillula Ostf.														r	0·2 rr							
92. Peridinium orbiculare Pauls.																						
93. ,, cerasus Pauls.																						
94. ,, roseum Pauls.																						
95. ,, ovatum (Pouchet)														rr		rr			rr			
96. ,, pedunculatum Schütt														rr								
97. ,, pallidum Ostf.			0·1																			
98. ,, pellucidum (Bergh.)																						
99. ,, oceanicum Vanh.																		rr		rr	rr	
100. ,, divergens Ehr.	0·4	0·1 r	0·1 r	r	0·1 e	+	0·3 +	r	+		r								r			
101. ,, crassipes Kofoid	0·3 rr	1																				
102. ,, conicum (Gran.)	1	0·3 r	0·1 r	3	0·1 r	0·2 rr	0·3	0·1 r	0·2	r	rr			r	r					0·5 rr		
103. ,, Thorianum Pauls.																						
104. Peridiniaceæ juv. et indet.																						
105. Pyrophacus horologicum Stein	0·5																					
106. Oxytoxum Milneri Murr. & Whitt.	0·1																					
107. Ceratium platycorne v. Daday	0·1	0·3		r					rr		+	r	r	r	rr							
108. ,, bucephalum (Cleve)	0·2	0·1 r	r	r	r 0·1 cc	0·8 +	c	0·1 +	0·2 +	+	+											
109. ,, tripos (O. F. Müll.)														r								
110. ,, tripos f. lineata (Ehr.)											rr											
111. ,, arcticum (Ehr.)													r									
112. ,, macroceros (Ehr.)	0·1			rr			rr	rr	r		rr	rr		r						rr		rr
113. ,, furca (Ehr.)	0·3	0·7		r	rr		rr															
114. ,, fusus (Ehr.)	3 +	0·5 r	0·2 r	rr	+	0·7				r	0·1	1		0·2					0·1			
115. Amphidinium crassum Lohm.	0·1 rr	0·1																				
116. Gymnodinium teredo Pouchet	1 r	0·2		0·2		0·7 rr	0·6		0·3				r	c	c							
117. ,, pseudonoctiluca Pouchet	0·3	r																				
118. ,, viridis n.sp.																						
119. ,, rhomboides Schütt	3	3					0·1															
120. ,, triangularis n.sp.																						

Month	March.				April.					May.				June.					July.				August.					September.			
Week ending	26	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26	2	9	16	23
61. Acnanthes longipes Ag.	r						rr																								
62. Navicula membranacea Cleve										2		0·5			2		0·1 r	4	r	10 cc	r	2 +	rr	0·8	+	+		2 r	3 r	2
63. ,, sp.	2		r		rr	rr	r				0·2	1	2	4	0·4	2	0·5	0·7	1	0·8	0·7	0·3	5	1	1	2	0·7	5	4 rr	4 rr	4
64. Pleurosigma sp.	2	0·8 rr	2	0·7 r	2	2 r	2 r	3 rr		2 rr	rr	0·5	1 r	0·4 rr	0·3	0·5	0·2 r	1 rr	0·8		0·7	0·2 rr	rr	0·3	2			1	0·7	3	2
65. Mastigloia sp.										0·7	136	112	578	166	71	173	150			20	67	162	1133			25				
66. Amphiprora maxima Greg						0·1	0·3			0·2		rr	rr										0·2	rr	rr						
67. Amphora ostracaria Bréb.											0·1																				
68. ,, sp.																				0·2 r			0·2	0·2 r	r						
69. Nitzschia closterium W. Sm.	0·2	0·7	0·8	0·8	1	1	3			5 rr	3 r	6	3	2 rr	0·7	6	0·3		0·8	0·2	0·7 rr	0·7	10 rr	2	3	3	5 r	7 rr	8 rr	5 rr	3
70. ,, seriata Cleve		0·2								0·2	167 cc	2367 cc	906 cc	179 cc	28 cc	210 cc	5 cc	2	1	3	3	2	22 +	0·3	15 r	4	24 r	5 rr	6 r	16	16
71. ,, delicatissima Grev.													1				1									2 +			0·4	1	rr
72. ,, pandariformis Gm.	0·5 +	r	2		2	2 +	1 c	c						rr		0·1 rr		r		0·2 r		0·2 r					0·2		r	rr	
Peridinioids																															
75. Exuviella compressa (Bailey)																			0·7				0·5								
76. Prorocentrum micans Ehr.	0·2	0·2		0·8	0·1	0·7	0·3 rr			0·2	0·3	0·3	0·5	1	1 r	2	0·5		2	0·3 rr	0·8 rr	0·7	3 rr	7 rr	10 rr	17 rr	19 rr	17 r	14 r	24 r	12 r
77. Dinophysis acuta Ehr.		rr													rr			0·2 r		rr	0·2 +		0·2 +	3 +	0·3 rr						
78. ,, acuminata Cl. & L.															0·5	3	6	2	0·5				0·3	0·8	1	0·3		0·5		0·9	3
79. ,, hominculus v. tripos Lemm.																										rr					
80. ,, ovum Schütt																								0·5	rr						
81. ,, rotundatum Cl. & L.										0·4		0·1	0·7		1	0·3 rr		0·2		0·2			0·7	0·2 rr	0·3 rr	r	0·6	0·5	0·1		
82. Glenodinium bipes Pauls										0·2	0·7	2	0·3	1	3 rr	38	12	0·5	0·5					0·2			0·3				
83. Protoceratium reticulatum Cl. & L.																0·7	0·3	0·5		rr				0·2			0·3				
84. Goniulax triacantha Jörg.																0·2	0·2		0·2			0·2		0·8	4						
85. ,, polygramma Stein																								0·2	0·3						
86. ,, spinifera (Cl. & L.)											0·1							0·5	1					0·5							
87. ,, scrippsæ Kofoid											0·1	0·1						0·2				0·5	1	0·3	0·3		3	0·2	0·8		
88. ,, polyedra Stein											0·6						0·7							0·3							
89. Amylax lata Meunier																0·2								0·2				0·1	0·6	
90. Diplopsalis lenticula Bergh																0·2								0·2						
91. ,, pillula Ostf.																7	2	0·7	1								0·3	0·1		
92. Peridinium orbiculare Pauls.																															
93. ,, cerasus Pauls.																															
94. ,, roseum Pauls.																															
95. ,, ovatum (Pouchet)																															
96. ,, pedunculatum Schütt																															
97. ,, pallidum Ostf.																															
98. ,, pellucidum (Bergh.)																															
99. ,, oceanicum Vanh.																															
100. ,, divergens Ehr.																															
101. ,, crassipes Kofoid																															
102. ,, conicum (Gran.)																															
103. ,, Thorianum Pauls.																															
104. Peridiniaceæ juv. et indet.																															
105. Pyrophacus horologicum Stein																															
106. Oxytoxum Milneri Murr. & Whitt.																															
107. Ceratium platycorne v. Daday																															
108. ,, bucephalum (Cleve)																															
109. ,, tripos (O. F. Müll.)																															
110. ,, tripos f. lineata (Ehr.)																															
111. ,, arcticum (Ehr.)																															
112. ,, macroceros (Ehr.)																															
113. ,, furca (Ehr.)																															
114. ,, fusus (Ehr.)																															
115. Amphidinium crassum Lohm.																															
116. Gymnodinium teredo Pouchet																															
117. ,, pseudonoctiluca Pouchet																															
118. ,, viridis n.sp.																															
119. ,, rhomboides Schütt																															
120. ,, triangularis n.sp.																															

TABLE I—*continued.*

The Microplankton of Plymouth Sound from the region beyond the Breakwater, showing the average number of individuals in 50 cc. for each week, also relative abundance in the tow-nettings. The numbers show the individuals in the water samples, the letters their relative abundance in the tow-nettings.

Month	1915. September.					October.					November.					December.					1916. January.					February.				
Week ending	25	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29	5	12	19	26
121. Gymnodinium minor n.sp.																							
122. Spirodinium fissum Levander				0·1			0·2				0·2		r	r	0·2				0·1				r
123. ,, spirale (Bergh.)																							
124. ,, crassum Pouchet																							
125. ,, glaucum n.sp.																							
126. Cochlodinium helix (Pouchet)																							
127. ,, pellucidum Lohm.																							
128. Pouchetia armata Dogiel																							
129. ,, parva Lohm.																							
130. ,, fusus Schütt																							
131. Polykrikos Schwarzii Bütsch.		0·1																					
132. Gymnodiniacee juv. et indet.																							
133. Pyrocystis lunula Schütt				rr																			
134. Oxyrrhis marina Duj.																							
Flagellatæ.																							
135. Phæocystis Pouchetii (Hériot)																							
136. Dinobryon sp.																							
137. Carteria sp.																							
138. Trochiscia Clevei Lemm.				0·1																			
139. Halosphæra viridis Schmitz		0·1	0·2	0·1	0·2		0·1				0·3												
140. Flagellata indet.	0·1																						
Coccosphaerales.																							
141. Pontosphaera Huxleyi Lohm.	0·2	0·2			0·3																		
Silicoflagellatæ.																							
142. Dictyocha fibula Ehr.				0·2				0·2		0·1				0·3				0·2		0·1			
143. Distephanus speculum (Ehr.)	0·1	0·2	0·3	1	1	0·3	0·4	0·2	0·2					0·1									
Gymnomyxa.																							
144. Amœba sp.			0·2			0·2		0·3															
145. Foraminifera indet.	r	0·1 r	0·2 r	0·2 c	0·5 r	0·3 r	0·1 rr	0·2 r		+ 0·2 r	0·2 rr	0·6 +	0·8			rr 0·4 +	0·3	0·3	1 r	1 r	0·7 r	2 r	1
146. Heliozoa indet.										rr													
147. Acanthochiasma fusiforme Haeckel		0·1 rr		0·2	0·3	2	1	0·7								rr							+
148. Lithomelissa setosa Jörg.									rr	rr			rr										
149. Amphimelissa setosa Cleve						0·2	0·1			r													
Suctoria.																							
150. Paracineta limbata Maup.								0·2															
151. Acineta tuberosa Ehr. v. Fraiponti Fr.				rr	0·2																		
Infusoria.																							
152. Lachrymaria sp.																							
153. Coleps sp.				0·1																			
154. Tiarina fusus Cl. & L.																			0·1	0·2			0·2
155. Mesodinium sp.																							
156. Nassula sp.																							
157. Strombidium caudatum From.		0·1					0·2																
158. Laboea conica Lohm.	0·8		0·1				0·1							0·2					0·1	1	0·2		
159. ,, strobila Lohm.	0·4	0·2					0·1																
160. ,, acuminata Lecgaard	0·1			0·1																			
161. ,, spiralis Lecgaard							0·1		0·1														
162. ,, sp.	2	1	2	0·4	0·5		0·8	0·2	0·6	0·5				0·3									
163. Lohmaniella oviformis Lecgaard																							
164. Euplotes vannus O.F.M									0·1														
165. ,, sp.										rr													
166. Tintinnus subulatus Ehr.	0·1			r	0·2		rr																
167. Tintinnopsis beroidea (Stein)						0·5 r	5 cc	0·2 rr	0·5 cc	0·3 rr	1 cc	0·3	2 cc	6 c	rr 0·4 +	2 +	4 +	0·5 +	2 +	0·2 rr	0·3	0·5
168. ,, campanula (Ehr.)	+	0·2 r	r	r					0·2	rr					rr								
169. ,, ventricosa Cl. & L.	3 +	0·9 +	2 +	0·7 +	1 rr		rr		rr		0·3	0·6	rr	0·3				0·1			rr	0·3	0·2
170. Cittarocyclis denticulata Ehr.		r	+				0·1								0·2								
171. ,, edentata Brendt																							
172. Infusoria indet.			1	0·							0·2			0·3				0·3	0·1				0·2

Month	March.				April.				May.					June.				July.					August.				September.				
Week ending	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26	2	9	16	23
121. Gymnodinium minor n.sp.															8	0·5		0·2					0·2							
122. Spirodinium fissum Levander				0·1							1	0·5 rr	0·4	0·3	2	4	0·8	0·3				1	0·3	2	0·3	0·3	0·3	0·2	0·7	
123. ,, spirale (Bergh.)																	0·3					0·2	0·2							
124. ,, crassum Pouchet											0·2		0·6 rr	0·1	12	21	1	1	0·2				0·5	0·7	0·7	2	0·7	0·1	1	2
125. ,, glaucum n.sp.																								0·3						
126. Cochlodinium helix (Pouchet)																														
127. ,, pellucidum Lohm.										0·2																				
128. Pouchetia armata Dogiel																						0·2			0·2		0·3		0·1	
129. ,, parva Lohm.																														
130. ,, fusus Schütt																				rr									0·2 r	
131. Polykrikos Schwarzii Bütsch.																				0·2 r		0·2	1		r 0·2	0·3	0·7 rr		0·5	
132. Gymnodiniacee juv. et indet.		0·2							0·8	0·5	1	1	0·5	1	9	5	1	1												
133. Pyrocystis lunula Schütt																0·3	rr		0·2	0·2 rr	0·2									
134. Oxyrrhis marina Duj.															rr															
Flagellatæ.																						1								
135. Phæocystis Pouchetii (Hériot)										19	70	12	8	4	11	0·2						3	0·7							
136. Dinobryon sp.																	0·3	0·3				1								
137. Carteria sp.										0·1																				
138. Trochiscia Clevei Lemm.									0·2								0·2	0·2			0·5	0·2	0·2	0·2	0·2					
139. Halosphæra viridis Schmitz									0·3				0·1	0·1				0·3			0·3	1	0·7	0·2	0·7			1	0·5	0·6
140. Flagellata indet.																														
Coccosphaerales.																												0·1		
141. Pontosphaera Huxleyi Lohm.																														
Silicoflagellatæ.			0·2	0·2	0·2					0·1		0·1	0·1	0·1	0·2		0·3					0·2					0·5	1	1	0·3
142. Dictyocha fibula Ehr.																										0·6	1	0·3		
143. Distephanus speculum (Ehr.)	0·2	0·2	0·5	0·2	0·2	0·5	1		0·7																					
Gymnomyxa.											0·2	1	4	0·5	0·2	1	0·7						0·3	0·2			0·6	0·1	
144. Amœba sp.											0·2														r			0·4	rr	
145. Foraminifera indet.	0·5 r			0·2 r	0·2																					0·3				
146. Heliozoa indet.		rr		rr														0·2												
147. Acanthochiasma fusiforme Haeckel						rr																0·2 rr	0·2	0·2	rr	0·3				
148. Lithomelissa setosa Jörg.							rr				rr																			
149. Amphimelissa setosa Cleve										0·1																				
Suctoria.																														
150. Paracineta limbata Maup.																														
151. Acineta tuberosa Ehr. v. Fraiponti Fr.																														
Infusoria.											0·2																			
152. Lachrymaria sp.																								0·2 r	rr			0·1		
153. Coleps sp.																		0·2					0·5	3 rr	0·7 +		0·8	0·3 rr	1	
154. Tiarina fusus Cl. & L.		0·3	0·7	0·3			2		0·7	0·1	1	1		0·1	0·2							0·2	0·2	0·2			0·2	1	1	
155. Mesodinium sp.											0·2							0·2					0·2	0·5		0·3				
156. Nassula sp.																							0·2							
157. Strombidium caudatum From.																														
158. Laboea conica Lohm.		0·5	0·5	0·2					0·3	0·5	0·1	0·3	0·2	1		1	0·3	0·2	0·2		0·5	0·7	0·5	0·2	0·3			0·5		
159. ,, strobila Lohm.																		rr	1 r	0·3								0·1		
160. ,, acuminata Lecgaard	0·2												0·1	0·2								0·2	0·2					0·1	0·3	
161. ,, spiralis Lecgaard										0·2	0·1									1	0·8							0·2	0·1	
162. ,, sp.	0·3		0·3 rr	0·2	0·2	0·2			0·2	0·2	1 r	0·4 r	0·1 r		0·7	0·5	r	0·7	0·7	0·2	0·5	0·7 r		0·3	0·7	2				
163. Lohmaniella oviformis Lecgaard																							0·2							
164. Euplotes vannus O.F.M																														
165. ,, sp.		0·2							0·5			0·2					0·3				r	0·7		0·3	11 rr	1	1 rr	1 rr	0·3	0·7	0·3
166. Tintinnus subulatus Ehr.																		0·2 r	0·5	1	1	2 cc	2 cc	6 r	3 r	5 +	0·7 r	3 +	1 rr	0·6 r
167. Tintinnopsis beroidea (Stein)	r		0·3 rr	0·3 r	2 cc	1 r	0·6 r		0·2 r	rr													0·3 rr	rr	0·3 r	0·6	rr	0·1 rr	0·1 r	
168. ,, campanula (Ehr.)	r					0·3 +			0·8 r		0·8	1	4 r	1	3		1 rr	1	0·3	0·7	4 rr	2	0·3	0·3	0·3	3	1 rr	1 r	0·6 r	r
169. ,, ventricosa Cl. & L.																												0·3	rr	
170. Cittarocyclis denticulata Ehr.																														
171. ,, edentata Brendt																														
172. Infusoria indet.		0·3 rr					0·3		0·5		3	0·9	1		0·2							2	0·2	0·3			1	3	3 r	1

TABLE II

Average number of Diatoms and Peridiniales in 1 cc. *for each month.*

			Diatoms.					Peridiniales.				
		In 50 cc. Surface.	5 fath.	7 fath.	Total in 150 cc.	Average in 1 cc.	Average in 1 cc. for month.	Surface.	fath. 5	7 fath.	Total in 150 cc.	Average in 1 cc.	Average in 1 cc. for month.
1915.	September 21	82	61	55	198	1·32		8	15	14	37	0·24	
	,, 23	113	104	76	293	1·95		5	8	1	14	0·09	
	,, 25	191	104	77	372	2·48	2·99	6	7	7	20	0·13	0·12
	,, 27	355	84	191	630	4·28		8	2	7	17	0·11	
	,, 29	334	233	184	751	5·01		8	9	3	20	0·13	
	October 1	321	247	282	850	5·66		1		1	2	0·01	
	,, 4	901	1895	944	3740	24·93		3	2		5	0·03	
	,, 6	868	402	505	1775	11·83			2	2	4	0·02	
	,, 11	143	166	451	760	5·06		8	9	6	23	0·15	
	,, 13	468	150	62	680	4·53		13	12	8	33	0·22	
	,, 15	358	168	70	596	3·97	17·41	5	3	5	13	0·09	0·08
	,, 18	13213	225	119	13575	90·50		7	11	3	21	0·14	
	,, 21	403	235	845	1483	9·88		9	6	2	17	0·11	
	,, 27	995	60	27	1082	7·21		5	5	2	12	0·08	
	,, 29	1143	362	74	1579	10·53		4	1	2	7	0·04	
	November 1	3469	522	73	4064	27·09		6	1	2	9	0·06	
	,, 3	3647	48	52	3747	24·98		11	5	2	18	0·12	
	,, 5	6114	197	185	6496	43·30		3		2	5	0·03	
	,, 8	535	53	79	667	4·44			2		2	0·01	
	,, 11	68	62	87	217	1·44			1		1	0·006	
	,, 15	168	101	213	482	3·21	9·5	1		1	2	0·01	0·02
	,, 17	50	158	86	294	1·96		3			3	0·02	
	,, 19	52	99	189	340	2.26				2	2	0·01	
	,, 22	102	35	70	207	1·38							
	,, 24	81	64	123	268	1·78							
	,, 26	114	68	29	211	1·40				1	1	0·006	
	,, 29	90	104	69	263	1·75		1	1	1	3	0·02	
	December 2	131	71	78	280	1·86		5	1		6	0·04	
	,, 9	72	99	95	266	1·77		1			1	0·006	
	,, 13	65	74	83	222	1·48							
	,, 16	59	103	154	316	2·10	1·5						0·008
	,, 20	52	77	60	189	1·26		1	1		2	0·01	
	,, 22	16	23	24	63	0·42			1		1	0·006	
	,, 29	41	137	101	279	1·86							
1916	January 3	59	184	119	362	2·41							
	,, 5	47	118	422	587	3·91							
	,, 8	53	99	92	244	1·62							
	,, 11	109	85	144	338	2·25							

TABLE II—*continued.*

Average number of Diatoms and Peridiniales in 1 cc. *for each month.*

			Diatoms.					Peridiniales.				
		In 50 cc. Surface.	5 fath.	7 fath.	Total in 150 cc.	Average in 1 cc.	Average in 1 cc. for month.	Surface.	5 fath.	7 fath.	Total in 150 cc.	Average in 1 cc.	Average in 1 cc. for month.
1916.	January 14	139	52	116	307	2·04							
	,, 18	104	171	115	390	2·60	2·19	1			1	0·006	0·003
	,, 24	122	132	77	331	2·20							
	,, 26	105	97	78	280	1·86			2		2	0·01	
	,, 28	89	94	136	319	2·12							
	,, 31	20	34	139	139	0·92		3	1		4	0·02	
	February 5	90	47	23	160	1·06							
	,, 8	127	128	126	381	2·54							
	,, 10	34	44	11	89	0·59			1		1	0·006	0·002
	,, 17	83	71	129	283	1·88	1·62						
	,, 21	110	74	101	285	1·90							
	,, 25	160	43	145	348	2·32		1			1	0·006	
	,, 28	81	34	45	160	1·06		1			1	0·006	
	March 1	57	38	4	99	0·66		1			1	0·006	
	,, 8	147	57	145	349	2·32							
	,, 10	83	40	54	117	1·18		1		2	3	0·02	
	,, 14	81	59	20	160	1·06		2			2	0·01	
	,, 16	273	48	19	340	2·26	2·07	1			1	0·006	
	,, 21	40	143	58	250	1·66			2		2	0·01	0·02
	,, 23	120	151	98	369	2·46			2	1	3	0·02	
	,, 27	275	51	70	396	2·64		14	1	1	16	0·10	
	,, 29	195	171	129	495	3·30		1	3	1	5	0·03	
	,, 31	153	127	207	487	3·24		1			1	0·006	
	April 4	53	120	100	273	1·82		1	6	2	9	0·06	
	,, 6	46	106	113	265	1·76		1	4	3	8	0·05	
	,, 10	712	85	74	871	5.80	38·56			2	2	0·01	0·03
	,, 25	2340	1517	2972	6829	45·52		3	1		4	0·02	
	,, 27	12,680	4705	3303	20,688	137·92		3	1	1	5	0·03	
	May 1	1909	1142	1368	4419	29·46		9	1	5	15	0·10	
	,, 3	1498	641	262	2401	16·00		13	5	4	22	0·14	
	,, 5	415	229	415	1059	7·06		1	7	4	12	0·08	
	,, 9	3331	1466	4592	9389	62·59		4	19	6	29	0·19	
	,, 12	1911	2354	3141	7406	49·37		12	2	1	15	0·10	
	,, 15	510	832	537	1879	12·52	30·42	6	12	8	26	0·17	0·12
	,, 17	1751	3281	1442	6474	43·16		1	6	5	12	0·08	
	,, 19	1271	1034	381	2694	17·96			4		4	0·02	
	,, 22	997	1502	1429	3928	26·18		13	15	7	35	0·23	
	,, 24	6451	213	93	6757	45·04		1	16	10	27	0·18	

TABLE II—*continued.*

Average number of Diatoms and Peridiniales in 1 cc. *for each month.*

			Diatoms.					Peridiniales.				
		In 50 cc. Surface.	5 fath.	7 fath.	Total in 150 cc.	Average in 1 cc.	Average in 1 cc. for month.	Surface.	5 fath.	7 fath.	Total in 150 cc.	Average in 1 cc.	Average in 1 cc. for month.
1916.	May 26	1160	125	88	1373	9·15		1			1	0·006	
	,, 29	4628	366	1377	6371	42·47							
	,, 31	3468	1412	308	5188	34·58		14	10	19	43	0·28	
	June 2	2017	296	173	2486	16·57		5	20	4	29	0·19	
	,, 6	1719	703	468	2890	19·26		107	62	55	224	1·89	
	,, 8	557	671	606	1834	12·22		223	70	74	367	2·44	
	,, 12	1052	205	107	1364	9·09		56	97	124	277	1·84	1·02
	,, 14	357	99	155	611	4·07	9·12	93	67	38	198	1·32	
	,, 19	879	306	149	1334	8·89		21	35	24	80	0·53	
	,, 21	181	156	82	419	2·79		53	13	15	81	0·54	
	,, 27	326	205	119	650	4·33		24	8	13	45	0·30	
	,, 29	266	189	271	726	4·84		47	27	6	80	0·53	
	July 4	71	176	116	363	2·42			6	2	8	0·05	
	,, 7	73	10,155	83	10,311	68·74		1	8	2	11	0·07	
	,, 11	253	200	180	633	4·22		4	2	6	12	0·08	
	,, 13	100	347	136	583	3·88	21·39	8	2		10	0·06	
	,, 18	292	504	337	1133	7·55		2	5		7	0·04	0·12
	,, 21	824	227	169	1220	8·13		1	5	1	7	0·04	
	,, 25	2521	125	764	3410	22·73		12	35	6	53	0·35	
	,, 27	1164	5421	1434	8019	53·46		7	20	22	49	0·32	
	August 1	4588	987	7833	13,410	89·40		87	103	182	272	1·81	
	,, 3	746	1655	1002	3403	22·68		39	63	11	113	0·75	
	,, 8	655	586	894	2135	14·23		38	17	55	110	0·73	
	,, 10	1702	821	3389	5912	39·41		26	46	42	114	0·76	
	,, 16	1043	523	1193	2759	18·39	31·78	25	42	20	87	0·58	
	,, 18	142	263	62	467	3·11		15	14	6	35	0·23	
	,, 22	1136	432	292	1860	12·40		58	39	5	102	0·68	0·73
	,, 28	7276	1743	1439	10,458	69·72		43	22	12	77	0·50	
	,, 31	360	2041	103	2504	16·69		50	35	6	91	0·60	
	September 4	416	30	129	575	3·83		23	12	2	37	0·24	
	,, 6	863	490	352	1705	11·36		16	38	10	64	0·42	
	,, 8	1363	1508	2397	5268	35·12	17·11	32	82	53	167	1·11	
	,, 11	3505	1278	1020	5803	38·68		59	87	16	152	1·01	0·64
	,, 13	271	843	103	1217	8·11		51	39	9	99	0·66	
	,, 15	292	243	300	835	5·56		40	33	19	92	0·60	
	,, 18							26	23	lost.	49	0·49	