Observations on the Distribution of Plankton Animal Indicators made on Col. E. T. Peel's yacht "St. George" in the Mouth of the English Channel, July, 1935.

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With 6 Figures in the Text.

THE possible value of *Sagitta elegans* and *S. setosa* together with certain other plankton animals as indicators of water movements at the mouth of the English Channel has been discussed in a previous report (Russell, 1935, b). To confirm the belief there outlined it was necessary that a cruise should be made to see whether the boundaries of the different water masses could be easily indicated by plankton observations alone. Through the great kindness of Col. E. T. Peel, who offered to put his yacht *St. George* at my disposal, an opportunity arose to make this test in July, 1935.

From the data presented in the previous report it was surmised that a body of water characterised by the presence of *S. elegans*, without *S. setosa*, would be found at the mouth of the Channel. The first aim of the cruise was to find this water. A line of stations was taken across the Channel between the Lizard and Ushant. No pure *S. elegans* water was found, although it was evident that a body of water of characteristic plankton content was entering the Channel past Ushant. Just north of Ushant and under the island itself indications were found of a slight admixture of *elegans* water. (While in the previous report this water was called "western" water it will here for convenience be called *elegans* water.) The cruise was continued in a south-westerly direction from Ushant, when two stations were taken at ten-mile intervals. The course was then changed to the north-west and within twenty miles the *elegans* water was found. This *elegans* water was followed up in a northerly direction until in the northern half of the Channel mouth we passed into water characterised by the presence of *S. setosa*. Having demonstrated the existence of *elegans* water the programme was then changed. It was thought that, rather than continue to follow the *elegans* boundary, it would be more valuable at this stage to find whether the distribution of plankton animals could be used to give any indication of the water

movements in the region of the Land's End—Scillies passage. Stations were therefore taken in that area and then westward of the Scillies until the *elegans* water was once more found. The observations were then completed by a cruise round to the north coast of Cornwall as far as St. Ives. The general results of the cruise have shown that certain plankton animals can undoubtedly be used as valuable aids in understanding the hydrography of these regions.

It is a great pleasure to record my deep gratitude to Col. Peel for his

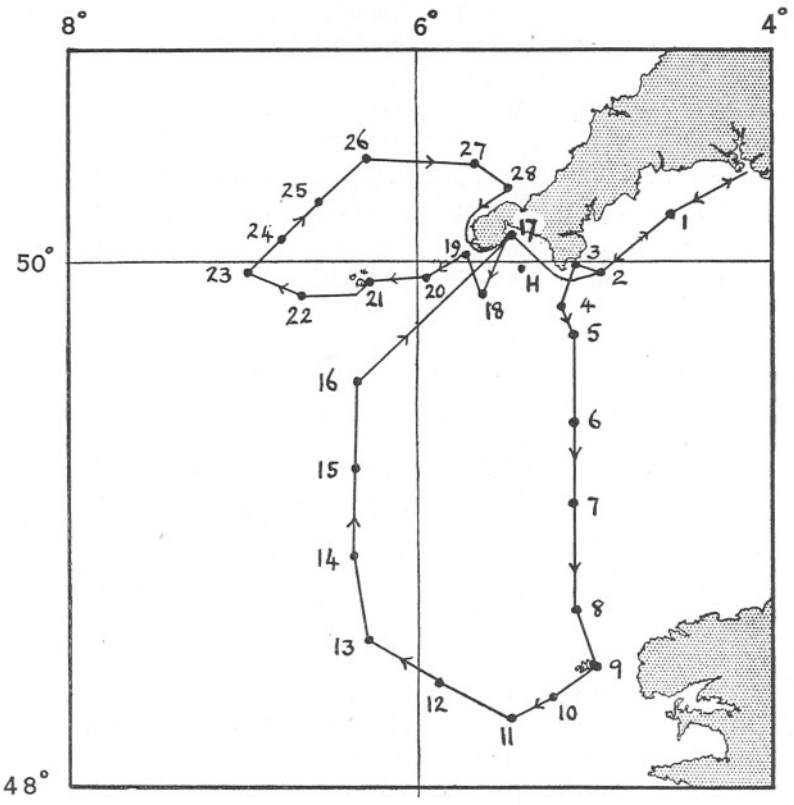

FIG. 1.—Chart showing cruise of *St. George* and positions of Stations.

generosity in enabling this programme to be carried out. His great interest in the work and his kind hospitality have combined to leave pleasant memories for me of a cruise which has produced results of great scientific value. My thanks are also due especially to Captain H. W. Smart and the crew of the *St. George* for their invaluable help so willingly rendered, and also to Col. W. Mackenzie and Major J. S. Paterson for much practical assistance.

Twenty-eight stations were taken between July 23rd and 27th. Their positions are given in Figure 1 and details of the log in Table I (p. 521). Two types of net were used for collecting, a one-metre stramin net and a coarse international standard silk net (58 meshes to one inch, without the coarse netting in front). The two nets were towed together at each open sea station for ten minutes with 40 fathoms of rope out. As large samples of plankton were required to get a true idea of the general *facies* of the catches it was thought that in a preliminary survey deep horizontal hauls would be of more value than vertical hauls. In addition to the open sea stations, four stations (3, 9, 17 and 21) were made while at anchor by streaming the silk net in the tide. While of value in showing the composition of the plankton these catches are not comparable quantitatively with those of the open sea stations. In the charts giving the numbers of animals caught the presence of any species has therefore been indicated at the anchorage stations by a plus sign. I am also greatly indebted to Mr. C. F. Hickling who made two plankton collections for me from a Newlyn fishing vessel off Mounts Bay on the nights of July 26th and 27th marked H in Fig. 1).

General Results.

Full counts were made of all the animals from samples of each catch. Instead of publishing the full tables it is thought that a clearer picture can be presented by plotting on separate charts (Figs. 2, 3 and 4) the numbers of the more important species discussed in this report. Detailed examination of the catches shows that we have here to deal with three distinct bodies of water, *elegans* water, Biscay water, and Channel water. The first and last can for convenience further be subdivided into southern and northern *elegans* waters, and coastal and offshore Channel waters. The observations concerning these bodies of water will be discussed in detail below.

S. elegans Water.

Southern.

The southern *elegans* water extending from Stations 12 to 15 inclusive was characterised by the presence of the following species: *Sagitta elegans*, the hyperiid amphipod *Themisto gracilipes*, young of the pteropod Clione,* late larval stages of Euphausians, the medusa Aglantha, and the copepod Metridia (probably all *M. lucens*). The numbers of the first four indicators are shown in Figure 2 and those of the two last species in

* The usual species found at the mouth of the Channel is *Clione limacina*. On showing the present specimens to Dr. M. V. Lebour, however, she expressed the opinion that they were not *C. limacina*. A number of specimens were therefore sent to Madame A. Pruvot-Fol and I am grateful to her for the following information. They were not *C. limacina*, but unfortunately they were too young to make certain identification possible. They were very probably the young of *Clionina longicauda* (Souleyet), a common Atlantic species.

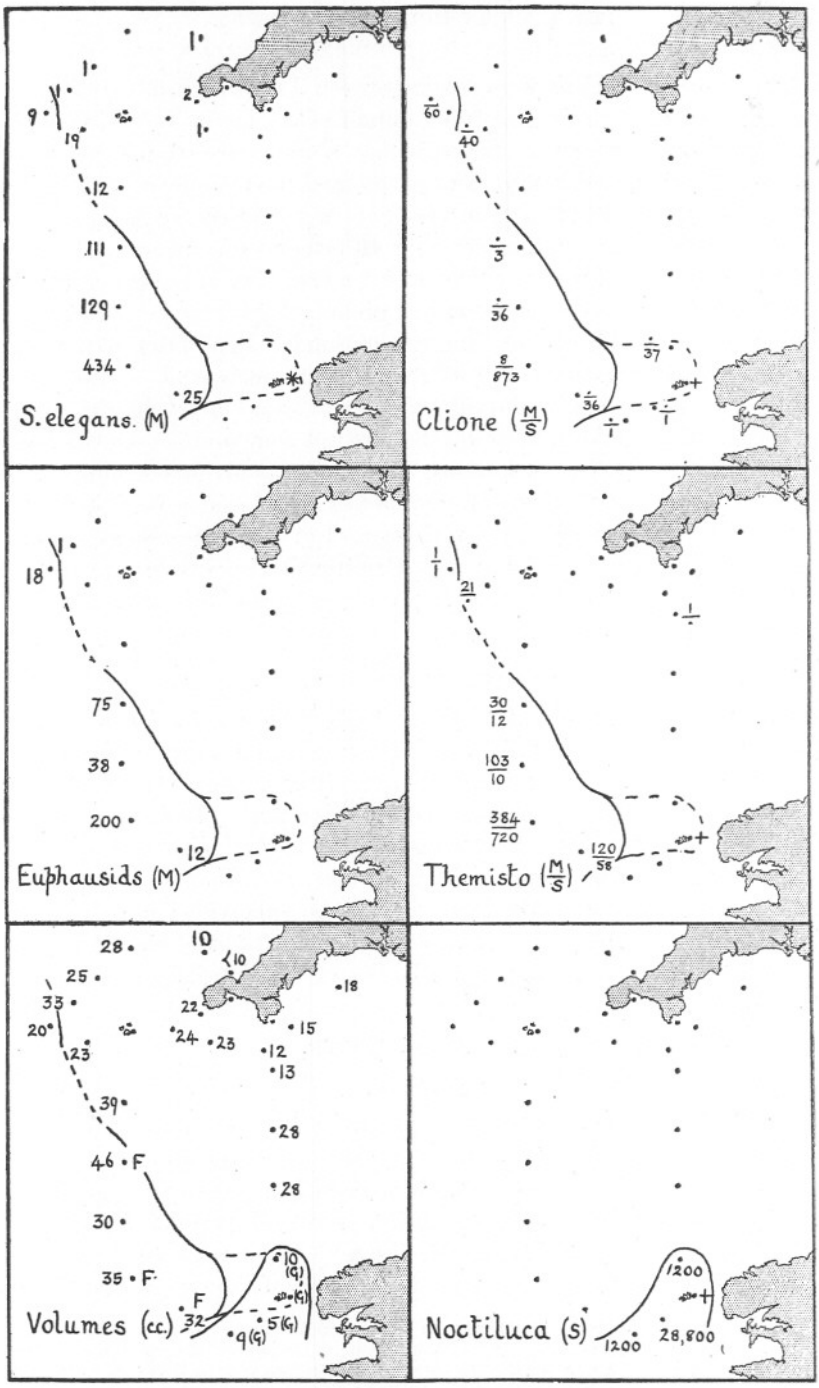

FIG. 2.—Numbers of *S. elegans*, and Euphausian larvæ in metre-net catches; of young Clione and *Themisto gracilipes* in metre net and silk net catches; volumes in c.c. of catches in silk net; and numbers of Noctiluca in silk net catches. (M.=metre net; S.=silk net.)

Figure 4. Some of these indicators were found in addition at the Stations 8 to 12, but observations given below on the characteristics of the Biscay water which predominated at these stations show that the presence of *elegans* water indicators can only have been due to a mixture of a small amount of that water.

The *elegans* water was further characterised by the richness of the catches. The settled volumes (after 24 hours) of the silk net catches from all the open sea stations are given in Figure 2. At Stations 12, 13 and 15 the fatty nature (marked F on chart in Fig. 2) of these catches was especially noticeable from the masses of fat floating at the surface of the fluid in the storage jars after standing for a month in the laboratory. At no other station was the presence of fat noticeable. The richness of the plankton is exemplified by the great increase in the numbers of Pseudocalanus (plus Paracalanus) as shown in Figure 4. The numbers of *Calanus finmarchicus* were also high in this region. A further characteristic was that the *S. elegans* population consisted to a high degree of large mature specimens. In addition there were at Stations 14 and 15 a few specimens of the siphonophore Stephanomia and at Station 15 one individual of the copepod *Rhincalanus nasutus*.

The catches were also characterised by the purely oceanic nature of their constituents and the small number of component species. This is well shown by the following figures giving the numbers of different types counted in the plankton: Station 1, 29; Station 4, 35; Station 6, 17; Station 7, 24; Station 18, 31; Station 20, 33; and Station 25, 27; giving an average of 28, while corresponding figures in *elegans* water were Station 12, 11; Station 13, 14; and Station 14, 12.

The occurrence of the above indicators, together with the nature of the plankton, affords definite indication that the boundary of this southern region of the *elegans* water lay probably somewhat as indicated by the unbroken line shown on the Charts in Figure 2. The mixture of a small quantity of this water with that lying to the south-east near Ushant is indicated by a broken line.

Northern.

It has been mentioned above that in the second half of the cruise collections were made to the west of the Scillies until the *elegans* water was once more found. This was at Station 23. This water was characterised by the same plankton animals as the southern water, but differed in that Stephanomia was here very much more abundant. The *S. elegans* population had a higher proportion of young stages. It is unfortunate that no station was taken on a direct line between Stations 16 and 23, but it is evident from the fact that the boundary of the *elegans* water was found to lie between Stations 15 and 16 in the south, and between

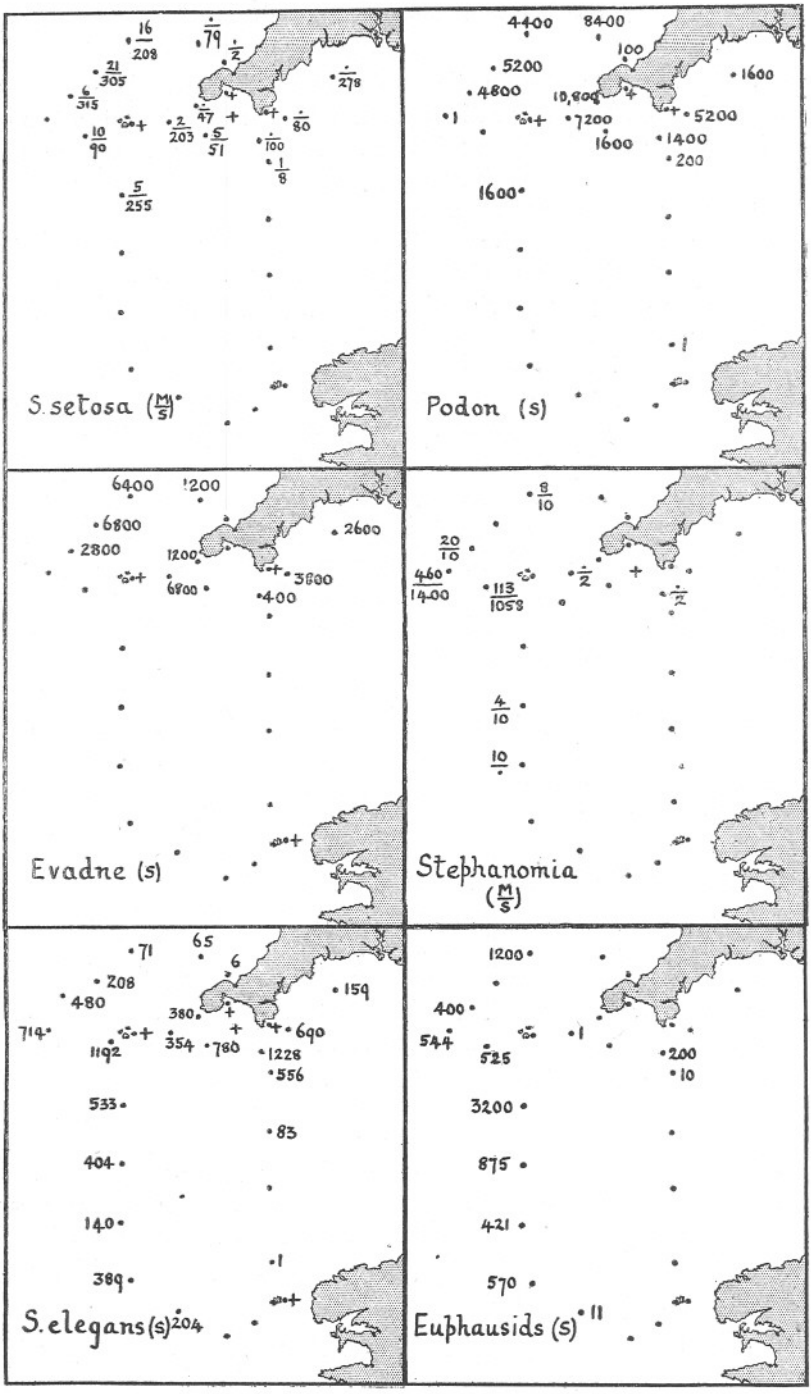

FIG. 3.—Numbers of *S. setosa* and Stephanomia nectophores in metre net and silk net catches; and of Podon, Evadne, *S. elegans* and Euphausian larvæ in silk net catches. (M.=metre net; S.=silk net.)

Stations 23 and 22 and 24 in the north, that the whole western boundary of the *elegans* water can be completed probably as indicated by the dotted line in Figure 2.

The Biscay Water.

Water with a distinct planktonic content was indicated at Stations 8, 9, 10 and 11. It is here called Biscay water and is probably the water called " south-western " in the previous report. All the catches at these stations were characterised by the presence of green flocculent matter containing diatoms and dinoflagellates. Noctiluca was abundant in this water (see Fig. 2). Zooplankton was, relative to the other waters, almost entirely absent, and in spite of the flocculent nature of the catches the volumes were extremely low (see Figure 2, where these green flocculent catches are indicated by the letter G). The presence of a number of large Aglantha at Station 8 and of large *S. elegans* in the silk net collection at the anchorage under Ushant (Station 9) indicates that there had been a mixture here with *elegans* water ; but as the volumes of the plankton were so very low this could only have been slight. The transition from this Biscay water into the *elegans* water from Stations 11 to 12 was very striking.

Channel Water.

Offshore.

This water, probably only completely typified by the collections at Station 7, is characterised by the absence of all indicators, including on this occasion *S. setosa*. The contents of the metre net hauls at Stations 6 and 7 were practically negligible in marked contrast to those in the *elegans* water (see Fig. 5, p. 516).

Coastal.

This coastal subdivision of the Channel water here includes all those stations taken in the Scillies—Land's End—Cornish Coast area north of a line drawn east and west between Stations 5 and 6. The water was characterised by the presence of *S. setosa*. The cladoceran crustacea Podon and Evadne were also confined to the same area (Fig. 3). But this water also contained a considerable population of the indicators of *elegans* water, especially *S. elegans* and Aglantha. It was, however, a noticeable feature that all the individuals were small and immature. This is shown very clearly by a comparison of the metre net catches of *S. elegans* (Fig. 2) with those of the silk net (Fig. 3). *S. elegans* is practically absent from the metre net collections in this area, all the small individuals having passed through the meshes of the stramin. At all stations where Sagitta occurred a number of specimens were measured to the nearest half-millimetre. The results of these measurements, reduced to millimetre intervals, are

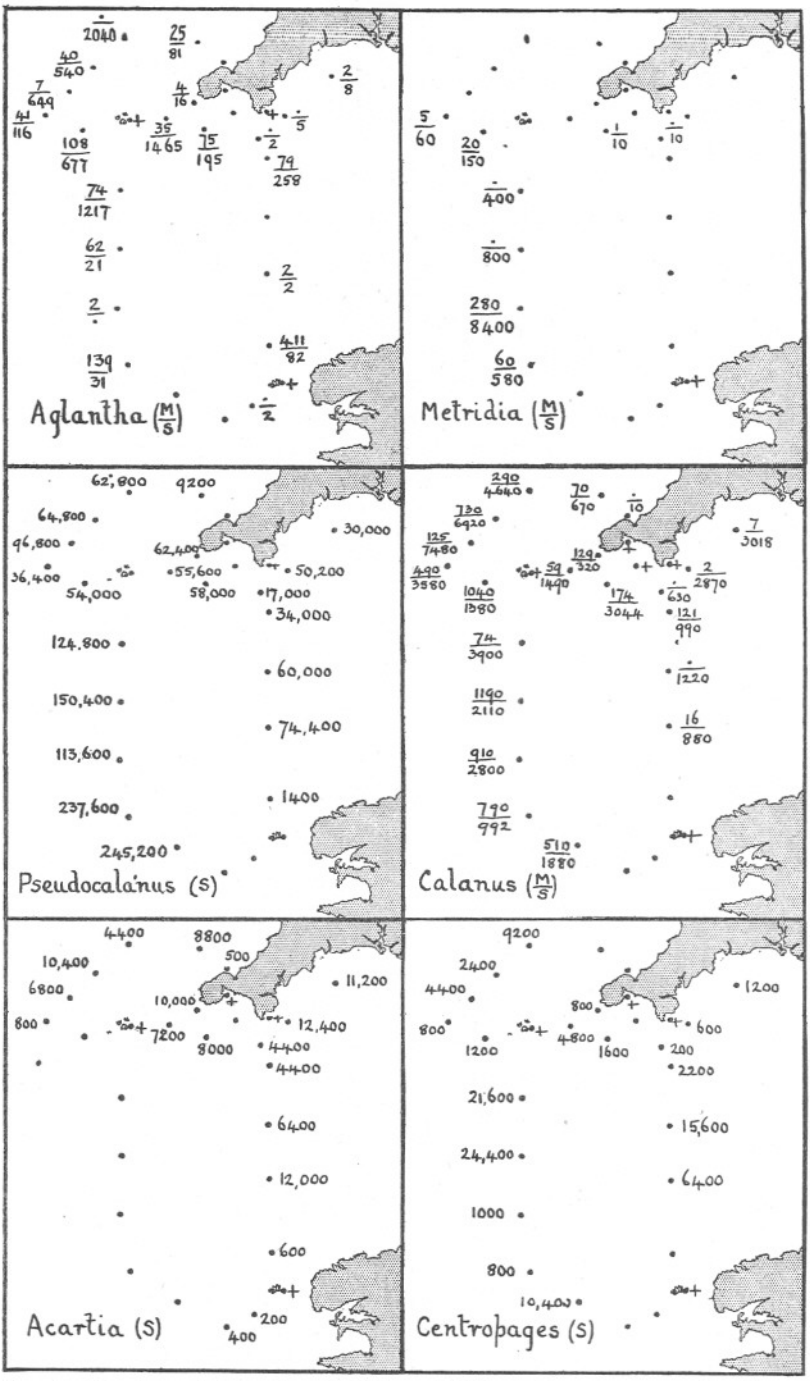

FIG. 4.—Numbers of Aglantha, Metridia and Calanus in metre net and silk net catches; and of Pseudocalanus (plus Paracalanus), Acartia and Centropages in silk net catches. (M.=metre net; S.=silk net.)

given in Tables II–V (pp. 521–522). A study of the size distribution of *S. elegans* is of value as indicating whence the individuals found in this coastal Channel water have been derived. If in Table II we compare the sizes of *S. elegans* at Stations 15 and 16 we notice at Station 16 a complete absence of large mature specimens and indeed all individuals above 9 mm. in length; there is also at Station 16 a much higher proportion of the youngest stages of 5 mm. and under than at Station 15. Between these two stations we passed from *elegans* water to water containing *S. setosa*. A comparison of Stations 23 and 24 shows the same story, namely a disappearance of large *elegans* and increased proportion of very small on passing from *elegans* to *setosa* water. It is known that the youngest individuals of Sagitta can live much nearer the surface in the daytime than the older individuals; and that they migrate right to the surface at dusk, and tend to leave the surface much later than their elders (Russell, 1931). The small Sagitta are therefore in the surface layers for a considerable period of time and can become separated from the older individuals by a movement of the surface waters. It follows, therefore, that the change in the size composition of the *elegans* population on passing into the *setosa* water can be explained by a drift of surface waters in a north-westerly direction, probably due to wind action. The absence of mature *elegans* in the *setosa* water precludes any possibility of suggesting that there has been an actual mass mixing of *elegans* water with the coastal Channel water. This explanation of the occurrence of *elegans* water indicators in coastal Channel water by surface drift receives further confirmation in that the same tendency for a preponderance of youngest stages in the coastal water was noticed for other animals, e.g. Calanus and Aglantha. It has been clearly shown by Nicholls (1933) that the youngest stages of Calanus live in the surface layers, and it is most probable that the same would be found true of Aglantha.

Further examination of Table II shows also that as one proceeds further east from Stations 16 and 24 there is a slight tendency for an increase in the numbers of larger *S. elegans* from which the direction of flow of the water might be inferred. A comparison of the proportions of *elegans* to *setosa* in the Sagitta population might also throw light on the nature of the water movements in this region. Actually the proportions of these two species did show rather consistent differences. The area in which *setosa* composed 40% or more of the Sagitta population is indicated in Figure 6 (dotted area); the supposed boundary between this area and that in which *elegans* were the more abundant is shown by a dotted line. The indications are that *setosa* water extended as a tongue from the north through the Scillies–Land's End passage. While too much stress cannot be laid on this single observation, it indicates the possibility that a number of closely spaced collections made at frequent intervals

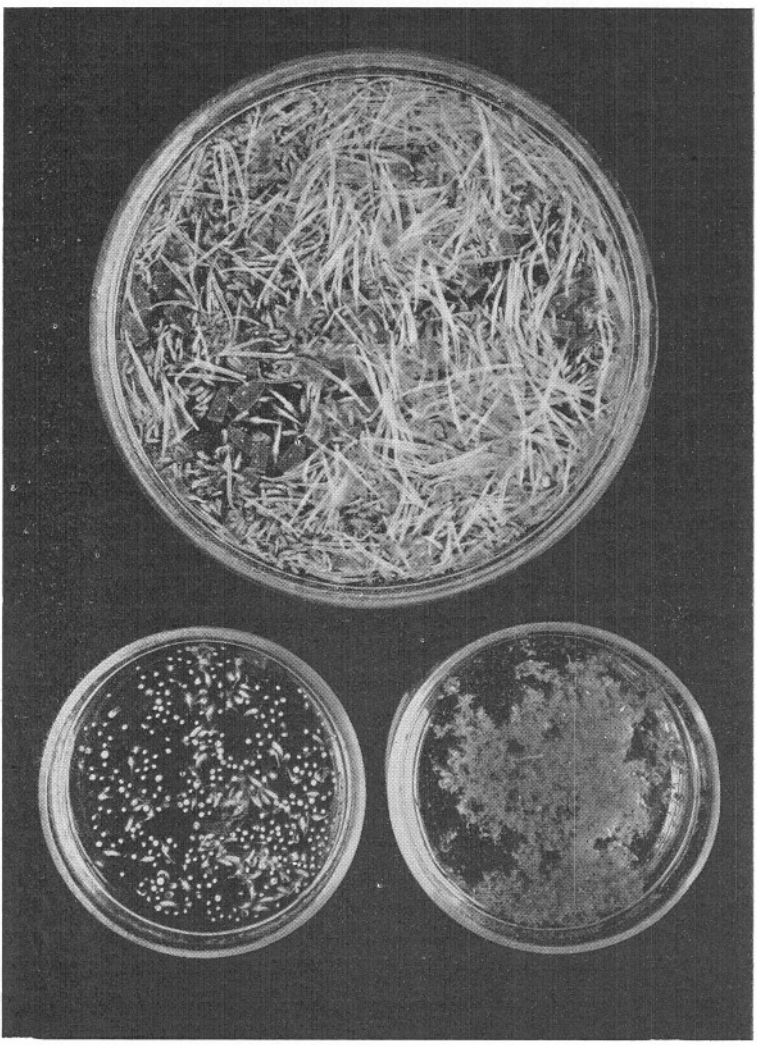

Photo *D. P. Wilson*

FIG. 5.—Actual catches of 10-minute hauls with the one-metre stramin net at St. 13—*elegans* water (above); St. 11—Biscay water (bottom right); and St. 7—Channel water (bottom left).

might prove of great value in helping to show the complex water movements in this small area. In elucidating the results obtained by such collections it should not be forgotten that the actual numbers of the two species are of little significance unless their size is also taken into consideration. The very youngest stages will naturally be more numerous than older stages on which the rate of mortality has had its effect.

Discussion.

The above results have proved without doubt that a number of plankton animals can be used to aid the hydrographer in a study of the water movements in the region of the Channel mouth. Indeed, apart from the detailed study of the silk net catches necessary in the Scillies–Cornish coast region, the main results of the investigation were known before ever the plankton sample bottles were opened in the laboratory. The division of the three main masses—*elegans*, Channel and Biscay waters—could be shown by visual inspection of the metre net catches as soon as they came out of the water. The differences in the catches from the three types of water were so obvious that they could be seen immediately by any member of the crew. Typical examples of these catches are shown in Figure 5 by photographs kindly taken for me by Mr. D. P. Wilson.

In the silk net catches, however, these differences were not obvious until examined more carefully because the great numbers of small copepods hid the true indicators. It should be possible to simplify such observations in the future by using silk nets with meshes large enough to allow copepods of the size of Pseudocalanus to pass through and yet retain sufficiently small Sagitta to indicate the size composition of the population. The other indicators are large enough to be retained by such a mesh.

A chart is given in Figure 6 showing the general distribution of the water masses as inferred from the plankton collections. The *elegans* water may possibly have bulged slightly further into the Channel mouth than there indicated, but certainly did not reach the Lizard–Ushant line.

This distribution is quite in accord with previous conclusions from hydrographic data alone. There can probably now be little doubt that the *elegans* water represents that area of cyclonic circulation shown by Matthews (1914), and on this occasion it practically blocked the mouth of the Channel as Lumby (1925, p. 12) has shown for the summer months. From its plankton content there can be no doubt that a large body of this water was present off Plymouth in 1930 (Russell, 1935, b) and moreover the *S. elegans* were of the same size as those found off Plymouth in July of that year (Russell, 1932). The complex nature of the water movements in the Scillies–Land's End region is well known and the study

of the plankton here could probably be of great help in the future. The flow of water round Land's End as shown by the high percentage of *S. elegans* is in accord with previous hydrographic observations at certain times. (See Harvey, 1930, pp. 804–807.)

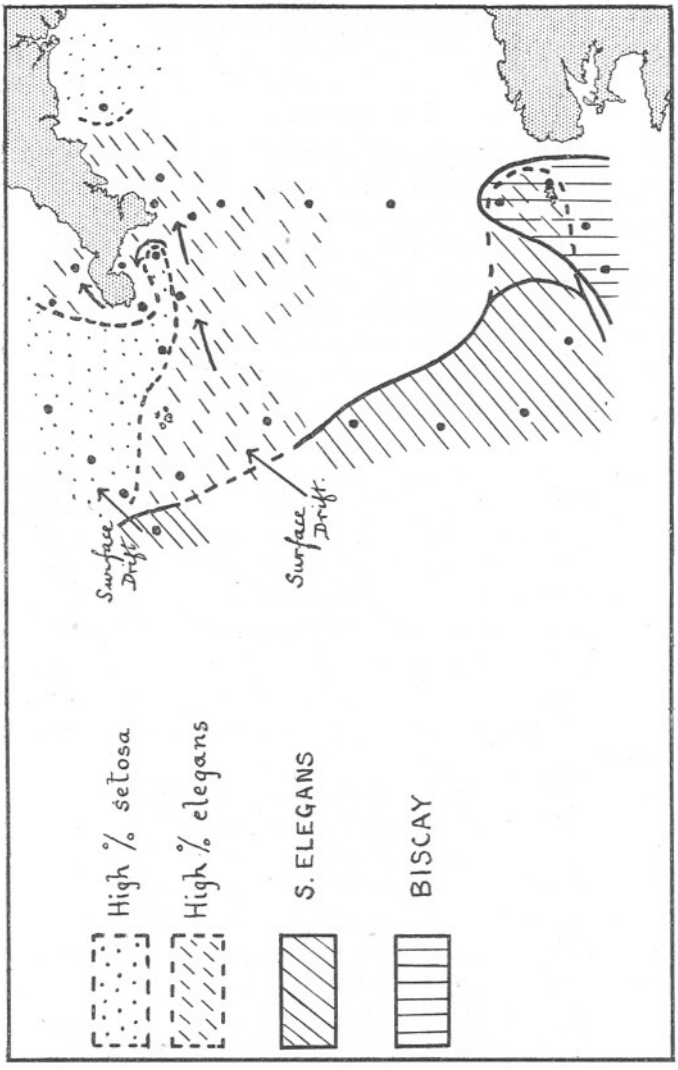

FIG. 6.—Distribution of water masses in English Channel mouth region as inferred from collections of plankton made on Col. Peel's yacht *St. George*, July, 1935.

In my previous report (Russell, 1935, b) a list of plankton indicators for *elegans* water was given. To these should now be added *Themisto gracilipes*, a distinctive species easily seen. It would appear that Metridia can also be regarded as an indicator but its small size renders it less

practical. The Channel water is characterised by the absence of any indicators, except *S. setosa* when it occurs. On this occasion that species appeared to be confined to the coastal area ; future observations alone can show whether it may at times also be found in the offshore water.* Acartia (Fig. 4) also appears to be confined on this occasion to Channel water, both coastal and offshore. But its small size renders it impracticable for rapid identification. Such few as were submitted to microscopic examination proved to be *A. clausi*, but it is impossible to identify large numbers without great labour. In Figure 4 I have included also Pseudocalanus (plus Paracalanus), Calanus and Centropages. The increase in numbers shown so definitely by the former in *elegans* water is probably significant, but the fact that these species may occur in numbers in Channel water also makes them of no use as indicators. The distribution of Aglantha (Fig. 4) was consistent. The large individuals were found in *elegans* water and very small specimens in the coastal Channel water. This species is however probably a very rapid breeder, having a number of successive quickly maturing broods in the summer months, and its presence should therefore be treated with caution unless supported by the other indicators.

It appears that *S. elegans* alone is sufficient for practical purposes. It is an abundant holoplanktonic species, and its shape and size make a study of the age composition of its populations a much simpler matter than for any other animal. If its presence is supported by other indicators, as it always appears to be, we can feel doubly confident.

The observed increase in the abundance of the plankton in *elegans* water and its fatty nature supports the supposition that this water is likely to be found to be richer in nutrient salts than Channel water (Russell, 1935, a, p. 171, and 1935, b, p. 321). The changes in the distribution of plankton with a high fat content shown by Wimpenny (1929) in the North Sea may possibly also find their explanation in the movements of Atlantic and North Sea water.

SUMMARY.

In July, 1935, a cruise was made in Col. E. T. Peel's yacht *St. George* to study the distribution of certain plankton animal indicators in the mouth of the English Channel.

Three bodies of water were clearly shown by their plankton content : (1) water characterised by the presence of *Sagitta elegans*, Clione, *Themisto*

* At the Station E2, approximately mid-way on a line between Plymouth and Ushant, a sample of plankton collected in the metre stramin net on September 13th, 1935, contained *S. setosa*. At the same position on November 21st, 1935, only *S. elegans* were found.

gracilipes, Euphausian larvæ, Stephanomia and Aglantha; (2) Biscay water, on this occasion characterised by Noctiluca and a paucity of zooplankton; and (3) Channel water characterised by the presence of *Sagitta setosa* and absence of other indicators.

It has been shown that the study of certain plankton animals should prove of help in understanding the hydrography of the Channel mouth region.

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TABLE I.

Station List—*St. George* Cruise, July, 1935.

Station Number.	Date.	Time.	Position.
1	23.vii.35	7.00–7.10 p.m.	50° 08′ N.: 4° 32′ W.
2	,,	9.05–9.15 p.m.	49° 56′ N.: 4° 58′ W.
3	24.vii.35	5.30–5.45 a.m.	Anchorage 1 mile off Cadgwith.
4	,,	9.00–9.10 a.m.	49° 51′ N.: 5° 11′ W.
5	,,	10.15–10.25 a.m.	49° 44′ N.: 5° 08′ W.
6	,,	12.35–12.45 p.m.	49° 26′ N.: 5° 08′ W.
7	,,	2.52–3.02 p.m.	49° 02′ N.: 5° 08′ W.
8	,,	5.13–5.23 p.m.	48° 36′ N.: 5° 08′ W.
9	,,	9.00–9.45 p.m.	Anchorage behind Ushant.
10	25.vii.35	7.00–7.10 a.m.	48° 20′ N.: 5° 15′ W.
11	,,	8.20–8.30 a.m.	48° 18′ N.: 5° 27′ W.
12	,,	10.40–10.50 a.m.	48° 25′ N.: 5° 53′ W.
13	,,	1.00–1.10 p.m.	48° 35′ N.: 6° 21′ W.
14	,,	3.15–3.25 p.m.	48° 54′ N.: 6° 24′ W.
15	,,	5.30–5.40 p.m.	49° 13′ N.: 6° 23′ W.
16	,,	8.05–8.15 p.m.	49° 32′ N.: 6° 22′ W.
17	26.vii.35	9.00–9.15 a.m.	Anchorage off Penzance.
18	,,	4.35–4.45 p.m.	49° 52′ N.: 5° 40′ W.
19	,,	5.55–6.05 p.m.	50° 00′ N.: 5° 44′ W.
20	,,	7.40–7.50 p.m.	49° 57′ N.: 5° 57′ W.
21	,,	9.00–9.45 p.m.	Anchorage in Crow Sound, Scilly.
22	27.vii.35	8.00–8.10 a.m.	49° 52′ N.: 6° 42′ W.
23	,,	9.30–9.40 a.m.	49° 55′ N.: 7° 00′ W.
24	,,	11.00–11.10 a.m.	50° 03′ N.: 6° 49′ W.
25	,,	12.35–12.45 p.m.	50° 11′ N.: 6° 35′ W.
26	,,	2.15–2.25 p.m.	50° 21′ N.: 6° 20′ W.
27	,,	4.30–4.40 p.m.	50° 21′ N.: 5° 40′ W.
28	,,	5.35–5.45 p.m.	50° 17′ N.: 5° 35′ W.

Both the 1-metre stramin and coarse silk nets were used at all stations except Stations 3, 4, 9, 17 and 21 where the coarse silk net alone was used: at the anchorages this net was fished in the tide.

TABLE II.

Length Measurements of *S. elegans* in Silk Net Catches.

Station number	Body Length in millimetres. 3	4	5	6	7	8	9	10	11	12	13	14 & over
1	–	2	19	16	20	1	–	–	–	–	–	–
2	3	18	17	7	7	2	–	–	–	–	–	–
3	–	9	16	5	5	1	1	–	–	–	–	–
4	1	16	16	20	26	14	7	1	–	–	1	–
5	2	2	18	9	8	4	–	–	–	–	–	–
6	3	3	2	–	1	–	–	–	–	–	–	–
8	–	–	–	–	1	–	–	–	–	–	–	–
9	–	–	–	1	4	9	13	7	5	9	6	4
12	–	1	2	14	37	32	19	10	3	5	1	–
13	–	–	–	–	1	4	8	21	22	29	16	19
14	–	–	2	3	9	18	9	20	20	11	7	17
15	1	6	6	14	12	19	30	17	34	16	19	7
16	11	23	17	14	13	21	6	–	–	–	–	–
17	3	15	12	2	1	–	–	–	–	–	–	–
18	4	15	23	31	25	7	11	6	5	2	1	–
19	3	11	19	21	19	12	5	4	1	1	–	–
20	5	17	8	9	3	2	–	–	–	–	–	–
21	1	5	10	3	–	–	–	–	–	–	–	–
22	1	21	18	17	11	18	17	9	6	2	–	–
23	1	11	19	18	13	11	12	9	7	6	1	–
24	9	24	9	4	–	–	–	–	–	–	–	–
25	5	14	7	2	–	–	–	–	–	–	–	–
26	6	1	–	1	–	–	–	–	–	–	–	–
27	–	–	6	6	4	2	–	1	–	–	–	–
28	–	1	3	1	1	–	–	–	–	–	–	–

TABLE III.

LENGTH MEASUREMENTS OF *S. elegans* IN METRE NET CATCHES.

Station number	Body Length in millimetres. 4	5	6	7	8	9	10	11	12	13	14	15 & over
12	–	–	–	–	1	1	3	4	8	5	–	3
13	–	–	–	–	1	2	12	18	18	23	16	23
14	–	–	–	2	2	4	7	10	10	12	20	23
15	–	–	–	1	–	4	18	23	26	16	8	8
16	–	1	–	2	3	4	1	1	–	–	–	–
18	–	–	–	–	–	–	–	–	–	–	1	–
19	–	–	1	–	–	–	1	–	–	–	–	–
22	–	1	–	–	2	4	7	3	–	2	–	–
23	1	–	–	–	1	–	1	3	2	1	–	–
24	1	–	–	–	–	–	–	–	–	–	–	–
25	–	1	–	–	–	–	–	–	–	–	–	–
27	–	–	–	–	–	1	–	–	–	–	–	–

TABLE IV.

LENGTH MEASUREMENTS OF *S. setosa* IN SILK NET CATCHES.

Station number	Body Length in millimetres. 3	4	5	6	7	8	9	10	11	12
1	–	5	11	16	24	22	7	3	–	–
2	–	3	2	3	1	–	–	–	–	–
3	–	4	3	5	5	6	9	5	1	–
4	–	4	4	–	4	6	11	8	–	–
5	–	1	1	1	–	–	4	–	–	1
16	4	8	2	16	17	8	2	–	–	–
17	–	–	–	1	–	–	–	–	–	–
18	–	–	4	2	–	3	1	2	3	–
19	1	–	2	4	2	–	2	5	1	2
20	3	8	10	9	5	3	–	–	–	–
21	1	5	4	2	–	–	–	–	–	–
22	–	2	3	2	3	4	4	1	–	–
24	3	10	14	20	14	8	–	–	–	–
25	1	9	20	13	12	–	–	–	–	–
26	–	10	10	20	9	3	–	–	–	–
27	1	3	6	5	1	–	–	–	–	–
28	–	1	–	–	–	–	–	–	–	–

TABLE V.

LENGTH MEASUREMENTS OF *S. setosa* IN METRE NET CATCHES.

Station number	Body Length in millimetres. 3	4	5	6	7	8	9	10	11	12	13
15	–	–	–	–	1	–	–	–	–	–	–
16	–	–	–	–	3	1	–	–	–	–	1
18	1	–	3	–	–	–	–	–	–	1	–
20	–	–	1	1	–	–	–	–	–	–	–
22	–	–	2	2	2	2	2	–	–	–	–
24	2	–	–	3	1	–	–	–	–	–	–
25	–	3	6	7	6	–	–	–	–	–	–
26	–	1	5	3	3	1	–	–	–	–	–