On the PLANKTON COLLECTED CONTINUOUSLY DURING TWO TRAVERSES of the NORTH ATLANTIC in the SUMMER of 1897; with DESCRIPTIONS of NEW SPECIES of COPEPODA; and an APPENDIX on DREDGING in PUGET SOUND.

By W. A. HERDMAN, F.R.S.; I. C. THOMPSON, F.L.S.; and ANDREW SCOTT.

[With four cuts and plates V.—VIII.]

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Introduction.

By W. A. Herdman.

The plan of this paper is briefly as follows:—During a trip to America between August 5th and October 5th, 1897, I collected surface plankton in both traverses of the Atlantic, and while at Puget Sound, on the Pacific Coast, dredged and collected at low tide. I noted everything seen in the living condition, and brought home a considerable collection of preserved specimens. My friends Mr. Isaac Thompson and Mr. Andrew Scott have kindly helped me to work out this collection, and the present joint paper is the result.

Through the kindness of R. G. Allan, Esq. (one of the owners), and of Captain Barrett, of the S.S. "Parisian,"

Fig. 1.—Plan of the course, showing the locality of each gathering, photographed from the chart. The position of the ship each day at noon is indicated by the date, *e.g.*, Aug. 9, near the centre. The brackets above the dark line show the gatherings taken on the voyage out, those below represent the return voyage. The arrows on the sea give an indication of the drift of the surface water.

belonging to the Allan Line, I was permitted to make arrangements for running sea-water through my silk tow-nets continuously, day and night, during the voyage from Liverpool to Quebec early in August, and back from Quebec to Liverpool at the end of September (fig. 1).

The method adopted was the "pump" one, by which the nets are not immersed in the sea, but are merely used to strain the organisms from the sea-water which has been pumped into the ship. My nets were made of the best silk bolting-cloth, known technically as grit-gauze, and I used the following four kinds :—

Net A, 32 meshes to the inch.
Net B, 72 meshes to the inch.
Net C, 80 meshes to the inch.
Net D, 172 meshes to the inch.

On the port side of the ship I was allowed to have complete command of a large tap on the main deck, near the galley. This brought sea-water from a large tank in

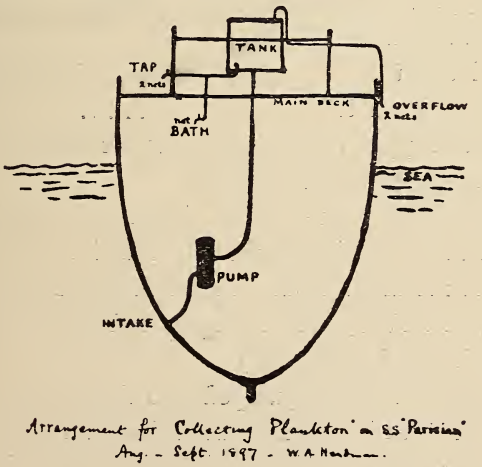
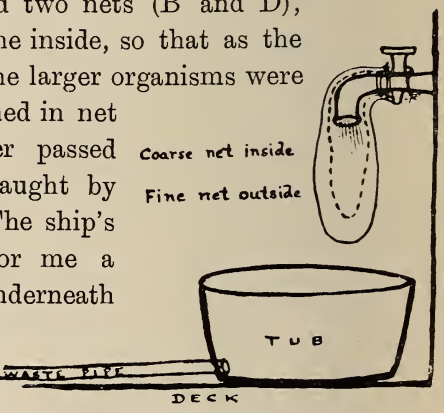


FIG. 2.—Rough diagram to show positions of tap, overflow pipe, &c.

the centre of the ship, which was kept constantly full for supplying baths, lavatories, &c., and for flushing purposes. The tap I used was an emergency one, rarely required. The tank is filled by a pump worked by the engines, so that it is in constant action while the ship is steaming. The sea-water enters by an aperture, provided with a valve, and covered by a grid of three-quarter inch mesh, placed in the ship's bottom, about 8 ft. above the keel and 14 ft. below the surface of the sea (fig. 2).

Over the tap I tied two nets (B and D), the coarser meshed one inside, so that as the water ran through, the larger organisms were screened off and retained in net B, while the smaller passed through and were caught by D, the outer net. The ship's carpenter fixed up for me a shallow tub placed underneath the tap, and into which my nets dipped, while, from a hole near the bottom of the tub a hose pipe was led to the nearest scupper to convey the waste water overboard without flooding the deck (fig. 3).



Nets on Tap, Port side main Deck.

FIG. 3.

On the starboard side of the ship an overflow pipe from the top of the tank discharged over the side a little below the level of the main deck. I used this pipe by tying the two nets, A and C, over its open end, the coarser one being inside the finer (fig. 4.)

The supply of water pumped into the tank is so much in excess of what is normally used that, during the whole voyage, water was pouring freely from the four-inch overflow pipe. When the ship is rolling, however, the dis-

charge becomes somewhat intermittent—sudden rushes caused by the surging of the water in the tank alternating with a more steady flow. These great rushes of water led to the damage of some of the specimens collected in the coarser net on the overflow pipe — this was especially the case with the Amphipoda, Schizopoda, and larger Copepoda. As similar specimens were not so much damaged in the nets at the tap on the port side, we may conclude that little or no damage is received in passing through the pump.

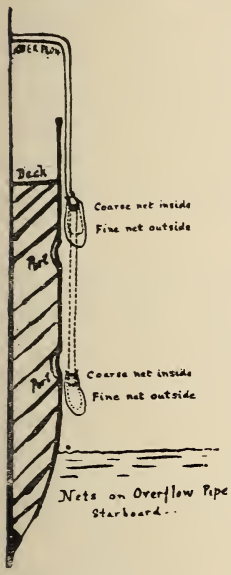


FIG. 4.

With the help of the carpenter I made an estimate of the amount of water passing through each of my nets during the period of time for which they were set. At the tap, when turned on to the extent which I found could just enable the water to get away through the nets, four gallons passed out in 45 seconds, which is about 3,600 gallons in the 12 hours. At the overflow pipe I found that, on the average, about 21,600 gallons passed in the 12 hours, so these overflow nets strained six times as much water as did those on the tap. This, of course, accounts for the much larger quantity of material usually caught by the starboard nets. The difference in size of mesh between the two sets of nets also, no doubt, caused some difference in the results. A further cause of difference was this:—the tap was supplied by a pipe coming from a rose inserted near the bottom of the tank, while the overflow pipe left the very top of the tank, and so carried off the surface water. I noticed frequently that

the larger animals and the more powerful swimmers, such as small fish, Amphipods, Schizopods, and Megalopas were nearly all caught in the nets at the overflow pipe, and I believe that was due merely to the fact that they swam nearer to the top of the water in the tank. This is an important reason for using the overflow pipe, as well as the ordinary taps leading from the tank, in such pump plankton work.

The four nets were emptied and re-set regularly twice a day, at sometime between 8 and 9 a.m., and again between 6 and 7 p.m. Each gathering represents therefore roughly about 12 hours fishing, or more exactly, the day gathering extended over 10 hours, and the night one over 14 hours. The contents of each of the four nets was examined and entered in the note-book separately, but in a few cases, when there seemed no object in keeping them apart, two or more of the gatherings taken in the same locality and period of time, were preserved in the same bottle. Each day and each night, then, of the voyage is represented in the collection by one or more—sometimes four or five—separate bottlefuls of plankton.

I may state at once that I saw no marked difference between the day and the night gatherings. It must be remembered, in this connection, that the source of the water was not quite close to the surface, but at least 14 ft. down.

The "Parisian" left Liverpool about 5-30 p.m. on August 5th, and I fixed my nets so that the water started running through them at 9 p.m. They were examined and emptied at 8 a.m. next morning. This was gathering No. 1. Gathering No. 2 was taken in the same way, from 11 a.m. to 3 p.m. on August 6th, as we lay in the mouth of Lough Foyle, near Moville. The nets were

re-set as we started off from Ireland at 4 p.m., and gathering No. 3 represents from that hour till 7 p.m. We were now in the open Atlantic, and the regular work began—gathering No. 4 being the night, from 8 p.m. on August 6th, to 9 a.m. on August 7th; gathering No. 5, the day August 7th, from 9 a.m. to 7 p.m., and so on (see list below, p. 42).

During the British Association Meeting at Toronto, I found that Mr. W. Garstang, on his voyage out in the "Laurentian," had made use of a somewhat less complete method of obtaining what may be considered as occasional samples of the surface life, by tying a small net over the tap in the gentlemen's bath, and turning the tap on at particular periods of the day for a couple of hours. Mr. Garstang, at Toronto, considered that this "bath tap" intermittent method might give additional information in regard to the distribution of organisms, and in showing the first and last appearance of any form. No doubt this ought to be the case to some extent, if a gathering happened to be taken just as the fauna was changing, but if this critical point be missed, then the method fails, and, in any case, the loss sustained by not having the collection a continuous one more than outweighs any possible advantage in getting earlier information as to the presence, in the water, of some special organism.

However, in order to test the intermittent method and compare it with the continuous gatherings, on the return journey, at the end of September, I attached a fifth fine silk net (same mesh as net D above) to the bath room tap (along with an explanatory notice), and kept the water running through it for the greater part of the day, examining the contents of the net at frequent intervals so as to have gatherings of two hours, three hours, or four hours

duration. The bath gatherings were, of course, always much smaller in quantity than those from the pipes outside, and I do not think that in any case they gave me an organism that I had not obtained in the other nets. On one occasion (September 27th) I obtained the first Radiolaria (*Acanthometra*) in an afternoon (1 to 3 p.m.) gathering from the bath, but they occurred also in the day's gathering examined at between 6 and 7 p.m., so that the utmost that can be claimed is that the bath gatherings showed that the Radiolaria were not necessarily collected late in the afternoon, but may have entered the net before 3 p.m.

Even in a case where the bath intermittent gatherings show either the presence or the absence of a particular organism temporarily, one should be cautious about drawing conclusions. Many of the pelagic organisms are very wide-spread over the Atlantic, or particular wide areas of it, and the temporary absence may be due to quite minor and irregularly acting causes, such as we usually term "accidental."

Each day I obtained a record of the temperature both of the water as it passed through my nets and also as drawn direct from the sea. As a rule, the water in the nets was from one to two degrees Fahrenheit higher than the sea. The highest temperature recorded was 60° F., and the lowest 37° F. In crossing the Atlantic from Ireland the temperature got higher daily till about long. 30° W., then fell as we approached and went through the Labrador current, and rose again (from 50° F. to 60° F. in 24 hours) after passing through the Straits of Belle Isle.

In coming back, at the end of September, the temperature fell as we passed down the St. Lawrence from 50° F. near the western end of Anticosti, to 37° F. outside the Straits of Belle Isle, in the Labrador current. Then it rose steadily as we got further across the Atlantic and

more into the easterly drift of water that continues the influence of the Gulf Stream up to the Irish coast. On successive days the average temperature was 37°, 49°, 49°, 52°, 54°, and 55° F.

The influence of the change of temperature upon the organisms was most marked, especially in the case of the cold Labrador current, outside the Straits of Belle Isle. In this case, if we had had no thermometer, and had not been able from fog or other reasons to ascertain our position, I believe it would have been possible to recognise that we had entered the Labrador current by the microscopic contents of the tow-nets.

It is a question how far the Gulf Stream can be said to influence the surface fauna in the latitudes where we crossed the N. Atlantic. Although no longer a clearly marked warm current east of long. 40° W., still it merges into, or is continued onwards as, a surface drift of warmer water (due to the prevalent winds) eastwards and northwards to the British Islands and to the coast of Norway, reinforced perhaps by Rennell's current coming up from the Bay of Biscay. In this way the Atlantic drift current, whether called Gulf Stream or not, must have considerable influence upon the nature of the plankton in the north-eastern part of the Atlantic, and we know that pelagic organisms more commonly found in regions further south and west are not infrequently carried to the west coasts of Ireland and Scotland.

The surface fauna of the Gulf Stream has been explored by Mr. Alexander Agassiz and other American naturalists, while the northern part and the southern sub-tropical part of the North Atlantic have been more or less thoroughly investigated by the Prince of Monaco, the naturalists of the German Plankton Expedition, and others; but there is a large central area between west longitudes 20° and 45°

and north of latitude 45° nearly to 60°, where few, if any, observations have been taken. Otto Pettersson and Cleve in their recently published charts mark this region "Okändt," and it is interesting to find that our two traverses in the "Parisian" went right through the length of this "unknown" region. Dr. John Murray made a traverse of the North Atlantic in this part in 1892, but he tells me that, although he gave some of the results in lectures at Boston, he has never published the details of his work. Consequently, we believe the present to be the first complete account published of a continuous traverse across the North Atlantic.

List of the Gatherings, with the Organisms Observed in Each.

By W. A. Herdman, I. C. Thompson, and Andrew Scott.

The outward gatherings are numbered from 1 to 17 consecutively in Arabic numerals, and each number indicates what was gathered during one day or one night, irrespective of the number of nets used and of the number of bottles filled. Where the contents of the different nets were kept separate, the lists are marked (A), (B) &c. The gatherings taken on the homeward journey are labelled from I. to XXIV. in Roman numerals. In some cases the nets at the tap and at the overflow pipe are numbered separately. The gatherings taken from the bath tap are marked **A**, **B**, **C**, &c.

The latitudes and longitudes at the times of emptying the nets have been calculated from the position of the ship at noon each day on the assumption that the ship ran equal distances in equal periods of time during the 24 hours.

As the species of Copepoda are more numerous than the other organisms, we have thought it more convenient to place the Copepoda at the end of each list rather than in their zoological position about the middle

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Outward Journey—Liverpool to Quebec.

1. August 5th, 9 p.m., to August 6th, 8 a.m. From 50 miles off Liverpool to about Rathlin Island, Ireland. Water slightly phosphorescent; no *Ceratium* observed; an ordinary Irish sea gathering, containing:—

Fish eggs.
Gastropod larvæ.
Limacina retroversa.
Nyctiphanes norvegica (small).
Nauplei, and Zoeas (Crab).
Amphipoda (fragments).
Philomedes interpuncta.
Sagitta bipunctata.
Mitraria larva.
Medusoids (small).
Campanularians (broken)
Many Copepoda, including:—
Oithona spinifrons (common).
Calanus finmarchicus (common).
Paracalanus parvus (few).
Temora longicornis (few).
Acartia clausii (few).
Metridia armata (rare).
Pseudocalanus elongatus (few).
Centropages hamatus (few).
C. typicus (few).
Anomalocera patersonii (few).
Longipedia coronata (rare).
Ectinosoma atlanticum (rare).

Thalestris serrulata (rare).
Alteutha interrupta (rare).

2. August 6th, 11 a.m. to 3 p.m.; at anchor in Lough Foyle, Ireland. Very little plankton, few Copepoda.

Coscinodiscus radiatus.
Rotalia beccarii.
Autolytus sp.
Larval Annelid.
Mitraria larva.
Mysis stage of *Crangon.*
Loxoconcha impressa
Idotea marina.
Fragments of *Balanus* and of Zoophytes.
Gastropod larvæ.
Fish egg (large).

The Copepoda were:—

Acartia clausii (common).
Calanus finmarchicus (common).
Pseudocalanus elongatus (common).
Temora longicornis (few).
Centropages hamatus (few).
Oithona spinifrons, and some larval forms.

3. August 6th, 4 p.m. to 7 p.m.; off north-west coast of Ireland; from off Moville, Lough Foyle, to lat. 55° 40′ N., long. 8° 50′ W. Many Copepoda.

Ceratium fusus.
Rhizosolenia sp.
Mitraria larva.
Larval Annelids.
Zoea and Megalopa of Crab.
Mysis stage of *Crangon.*
Fragments of *Balanus.*
Limacina retroversa (swarm).

The Copepoda were :—
Calanus finmarchicus (common).
Centropages typicus (few).
C. hamatus (few).
Metridia armata (rare).
Paracalanus parvus (rare).
Acartia clausii (few).
Oithona spinifrons (common).

4. August 6th, 9 p.m., to August 7th, 9 a.m.; from lat. 55° 40′ N., long. 8° 50′ W., to lat. 56° 15′ N., long. 14° 30′ W.

Globigerina bulloides.
Orbulina universa.
Acanthometra pellucida.
Sphærozoum punctatum.
Limacina retroversa.

Copepoda :—Nauplei, and
Calanus finmarchicus (common).
Acartia clausii (common).
Oithona spinifrons (common).
Metridia armata (few).
Centropages typicus (few).

5. August 7th, 9 a.m. to 7 p.m.; from lat. 56° 15′ N., long. 14° 30′ W., to lat. 56° 30′ N., long. 18° W.; quantity, ·75 cc., mainly Copepoda.

Globigerina bulloides.
Polystomella striato-punctata.
Sphærozoum punctatum.
Acanthometra pellucida.
Ceratium tripos.
Diatoms.
Limacina retroversa.

Copepoda :—
Calanus finmarchicus (common).
Centropages typicus (few).
Acartia clausii (abundant).
Oithona spinifrons (common).

6. August 7th, 7 p.m., to August 8th, 9 a.m.; from lat. 56° 30′ N., long. 18° W., to lat. 56° 30′ N., long. 24° 22′ W.; quantity, 5 cc.
Orbulina universa.
Globigerina bulloides (many).
Acanthometra pellucida.
Sphærozoum punctatum.
Halosphæra viridis.
Coscinodiscus radiatus.
Limacina retroversa.
Fish eggs and embryos.
Conchœcia spinirostris.
Copepoda, many larvæ and
Calanus finmarchicus (common).
Acartia clausii (many).
A. discaudata (rare).
Centropages typicus (few).
Oithona spinifrons (few).
Pleuromma abdominale (few).
Oncea venusta (rare).

7. August 8th, 9 a.m. to 6 p.m.; from lat. 56° 30′ N., long. 24° 22′ W., to lat. 56° 22′ N., long. 28° 8′ W.; temperature 56° F; quantity, 3·5 cc.
Globigerina bulloides.
Acanthometra pellucida.
Sphærozoum punctatum.
Ceratium tripos.
(?) *Pyrocystis.*

Segmenting invertebrate eggs.
Fish eggs.
Nauplei.
Evadne nordmanni.
Copepoda (many) :—
Oithona spinifrons (common).
Calanus finmarchicus (few).
Acartia clausii (common).
Centropages typicus (few).
Anomalocera patersonii (rare).

8. August 8th, 7 p.m., to August 9th, 9 a.m.; from lat. 56° 22′ N., long. 28° 8′ W., to lat. 56° 28′ N., long. 34° 25′ W.; quantity 5 cc.

Globigerina bulloides.
Acanthometra pellucida.
Sphærozoum punctatum.
Ceratium tripos.
C. fusus.
Peridinium divergens.
Limacina retroversa.
Nauplei, and the following Copepoda :—
Nogagus borealis (rare).
Calanus finmarchicus (common).
Pleuromma abdominale (few).
Oithona spinifrons (few).
Acartia clausii (common).

9. August 9th, 10 a.m. to 6 p.m.; from lat. 56° 28′ N., long. 34° 25′ W., to lat. 56° 8′ N., long. 38° 6′ W.; 5 cc. Much yellow debris (*Trichodesmium*, &c., remains and fragments), which stained the nets yellow-brown, and clogged up the meshes of the finer ones.

Peridinium divergens (very abundant).
P. globosus.

Dinophysis atlantica.
Ceratium tripos (abundant).
C. fusus.
Globigerina bulloides.
Coscinodiscus radiatus.
Trichodesmium erythræum (very abundant).

Copepoda, few, some larvæ :—
Oithona spinifrons (common).
Ectinosoma atlanticum (few).

10. August 9th, 7 p.m., to August 10th, 9 a.m.; from lat. 56° 8′ N., long. 38° 6′ W., to lat. 55° 22′ N., long. 44° 11′ W. Nets kept separate.

(A.) Nets on overflow pipe (large gatherings); 200 cc.:—

Ceratium tripos.
Peridinium divergens.
Coscinodiscus radiatus.
Sagitta sp.
Limacina retroversa.
Cliona borealis.
Halocypris atlantica.
Conchœcia spinirostris.
Euthemisto compressa (many young).

Copepod, Nauplei and
Calanus finmarchicus (great abundance).
Heterochæta spinifrons (rare).
Euchæta marina (few).
Oithona spinifrons (few).
Scolecithrix danæ (rare).

(B.) Nets on tap, with much less material (12 cc.) and smaller forms :—

Peridinium divergens (very abundant).
Ceratium tripos.

Coscinodiscus radiatus.
Euthemisto compressa.
Limacina retroversa.
Copepoda :—
Calanus finmarchicus (common).
Oithona spinifrons (few).
Ectinosoma atlanticum (few).

11. August 10th, 9 a.m. to 6 p.m.; from lat. 55° 22′ N., long 44° 11′ W., to lat. 54° 30′ N., long. 47° 28′ W.; 51° F.

Nets on overflow pipe had quantities of large red *Calanus finmarchicus;* the nets on tap had only a few *Calanus,* and the outer finer net had only Diatoms and Dinoflagellates; 30 cc. in all.

Coscinodiscus radiatus.
Ceratium tripos.
Peridinium divergens.
Globigerina bulloides.
Sagitta sp.
Annelid larva (?)
Euthemisto compressa.
Nyctiphanes norvegica.
Copepod Nauplei, and
Calanus finmarchicus (common).
Euchaeta marina (few).
Oithona spinifrons (few).

12. August 10th, 7 p.m., to August 11th, 9 a.m.; from lat. 54° 30′ N., long. 47° 28′ W., to lat. 52° 55′ N., long. 52° 40′ W.; 125 cc.

The coarser net on overflow pipe had the very large red *Calanus* and *Euchæta,* and a few large Amphipods. The finer net had a large mass of grey stuff, chiefly Copepoda. The coarser net on the tap had a number of red *Calanus* and *Euchæta,* and some larval Schizopods, while the

finer net on the tap had *Ceratium*, *Peridinium*, and other minute forms.

Ceratium tripos (two forms).
Peridinium divergens.
P. sp.
Coscinodiscus radiatus.
Globigerina bulloides (a few, very small).
Annelid larva.
Conchœcia spinirostris.
Euthemisto compressa.
Larval Schizopods.
Limacina retroversa.
Copepod Nauplei, and eggs :—
Calanus finmarchicus (very many).
Euchæta marina (few).
Oithona spinifrons (many).
Heterochæta spinifrons (rare).
Pseudocalanus elongatus (common).

13. August 11th, 9 a.m. to 6 p.m. ; from lat. 52° 55′ N., long. 52° 40′ W., to lat. 51° 55′ N., long. 55° 46′ W. ; temperature in sea, 47° to 50° during day ; in tub, 52° F.

Peridinium divergens.
Ceratium tripos (two forms).
C. fusus.
Globigerina bulloides.
Coscinodiscus radiatus.
Cypris stage of *Balanus.*
Sagitta sp.
Cliona borealis.
Limacina retroversa.
Fish eggs.
Decapod Zoea (many large).
Microniscus calani (parasitic on Calanus).
Euthemisto compressa (few, large).

Copepoda :—

Calanus finmarchicus (very few).
Oithona spinifrons (few).
Euchæta marina (few).
Centropages hamatus (few).
Pseudocalanus elongatus (common).
Temora longicornis (few).

14. August 11th, 7 p.m., to August 12th, 9 a.m.; from lat. 51° 55′ N., long. 55° 46′ W., to lat. 49° 37′ N., long. 59° 50′ W.; temperature in tub, 62° F.

(A.) The finer net at overflow pipe (45 cc.) :—

Coscinodiscus radiatus.
Ceratium tripos.
C. fusus.
Peridinium divergens.
Globigerina bulloides.
Sagitta sp. (great quantity).
Euthemisto compressa.
Nyctiphanes norvegica (?).
Zoea of Crab.
Cypris stage of *Balanus.*
Mysis stage of Schizopods.
Fish eggs.

Copepoda, many :—

Calanus finmarchicus (very few).
Temora longicornis (few).
Ectinosoma atlanticum (many).
Acartia denticornis (?) (rare).
Oithona spinifrons (many).
Pseudocalanus elongatus (many).
Centropages hamatus (few).
Corynura discaudata, n. sp. (rare),

(B) The coarser net at overflow pipe (35 cc.) :—
Euthemisto compressa (many large).
Zoea of Crab.
Fish eggs, and some small fishes (damaged).
Limacina retroversa.
Calanus finmarchicus (many).
Anomalocera patersonii (few).

(C) Nets at tap (12 cc.) :—
Ceratium tripos (abundant).
C. fusus.
Peridinium divergens.
Coscinodiscus radiatus.
Zoea of Crab.

Copepoda :—
Calanus finmarchicus (common).
Oithona spinifrons (many).
Temora longicornis (few).
Centropages hamatus (few).
Pseudocalanus elongatus (common).
Ectinosoma atlanticum (rare).
Thalestris serrulata (rare).

15. August 12th, 9 a.m. to 6 p.m. ; from lat. 49° 37′ N., long. 59° 50′ W., to lat. 48° 50′ N., long. 62° 50′ W.

Less in nets than in the morning (20 cc.) :—
Ceratium tripos (very many).
C. fusus.
Peridinium divergens.
Coscinodiscus radiatus.
Sagitta sp. (few).
Euthemisto compressa.
Zoea of Crab.
Cypris stage of *Balanus*.
Evadne nordmanni.
Limacina retroversa.

Small Clupeoid fish (several).

Copepoda :—

Corynura discaudata, n. sp. (rare).
Centropages hamatus (few).
Oithona spinifrons (common).
Anomalocera patersonii (few).
Pseudocalanus elongatus (common).
Calanus finmarchicus (common).
Temora longicornis (few).
Ectinosoma atlanticum (rare).
Eurytemora herdmani, n. sp. (rare).

16. August 12th, 7 p.m., to August 13th, 9 a.m.; from lat. 48° 50′ N., long. 62° 50′ W., to lat. 49° N., long. 67° 45′ W. Coarser net on overflow pipe gave the largest haul as yet, consisting chiefly of *Calanus* and *Euthemisto*.

(A) Nets on overflow pipes (175 cc.) :—

Ceratium tripos.
Peridinium divergens.
Mysis stage of *Crangon*.
Cypris stage of *Balanus*.
Podocerus variegatus.
Evadne nordmanni.
Euthemisto compressa.
Sagitta sp.
Zoea of Crab.
Nyctiphanes norvegica.

Copepoda, many, small :—

Calanus finmarchicus (few).
Pseudocalanus elongatus (many).
Oithona spinifrons (common).
Euchæta marina (few).
Acartia longiremis (few).
A. forcipata, n. sp. (rare).

A. denticornis (?) (rare).
Temora longicornis (few).
Eurytemora herdmani, n. sp. (rare).
Centropages hamatus (few).
Pleuromma abdominale (rare).
Ectinosoma atlanticum (rare).

(B) Nets at tap (30 cc.) :—
Coscinodiscus radiatus.
Globigerina bulloides.
Lamellibranch fry.
Cypris stage of *Balanus.*
Zoea of Crab.
Fish eggs.

Copepoda :—
Calanus finmarchicus (common).
Pseudocalanus elongatus (common).
Oithona spinifrons (common).
Temora longicornis (few).
Eurytemora herdmani, n. sp. (rare).
Corynura discaudata, n. sp. (few).
Acartia longiremis (few).
A. denticornis (?) (rare).
Centropages hamatus (few).

17. August 13th, 9 a.m. to 6 p.m.; from lat. 49° N., long, 67° 45′ W., to 90 miles from Quebec (40 cc.) :—
Coscinodiscus radiatus.
Ceratium tripos.
Peridinium globosus.
Evadne nordmanni.
Podocerus variegatus.
Cypris stage of *Balanus.*
Schizopod fragments.
Euthemisto compressa.

Microniscus calani.
Sagitta sp.
Zoea of Crab.
Leptocephalids.
Copepoda:—
Calanus finmarchicus (common).
Pseudocalanus elongatus (common).
Eurytemora affinis (few).
E. herdmani, n. sp. (common).
Acartia longiremis (few).
A. clausii (common).
A. denticornis (rare).
A. forcipata, n. sp. (rare).
Euchæta marina (few).
Temora longicornis (few).
Ectinosoma sarsii (rare).
Oithona spinifrons (few).

HOMEWARD JOURNEY—QUEBEC TO LIVERPOOL.

In addition to the nets on the overflow pipe and on the tap as before, a fine silk net was now placed on the tap in the bathroom, which was to be worked intermittently. The bath gatherings are labelled **A**, **B**, **C**, &c.

I. September 26th, 9 a.m. to 6 p.m. From Quebec down the St. Lawrence to 30 miles west of Rimouski. Much fine mud with many *Coscinodiscus radiatus;* also:—

Ceratium tripos.
Chydorus sphæricus.
Bosmina longirostris.
Copepoda a few, including:—
Calanus finmarchicus (common).
Pleuromma abdominale (few).
Oithona spinifrons (few).

Oncea conifera (rare).
Ectinosoma sarsii (rare).
Acartia longiremis (abundant).
Eurytemora affinis (common).
E. hærdmani, n. sp. (common).
Pseudocalanus elongatus (abundant).

A, on bath tap, September 26th, 12 to 5 p.m. (phosphorescent).

A small gathering included in above list.

II. September 26th, 7 p.m., to September 27th, 9 a.m.; from 30 miles west of Rimouski, to lat. 49° 12′ N., long. 64° 50′ W.

Peridinium divergens.
Ceratium fusus.
C. tripos.
Tintinnus denticulatus.
Coscinodiscus radiatus (few).
Chaetoceros (several species).
Other Diatoms and Algæ.
Nyctiphanes norvegicus.

Copepoda, Nauplei, and
Calanus finmarchicus (abundant).
Pleuromma abdominale (common).
Pseudocalanus elongatus (common).
Oithona spinifrons (common).
Temora longicornis (few).
Centropages hamatus (few).
Euchæta marina (few).
Thalestris serrulata (rare).

B, on bath tap, September 27th, 6 a.m. to 9 a.m.

[Very little—some fine sand.]

Diatoms, and *Calanus finmarchicus* (a few).

III. September 27th, 9 a.m. to 5-30 p.m.; from lat. 49° 12′ N., long. 64° 50′ W., to lat. 48° 50′. N., long. 61° 20′. W., (Gulf of St. Lawrence, opposite Anticosti). Diatoms (a good deal of brown stuff, chiefly diatoms), also Coccospheres (few); temp. 50° F.

Ceratium tripos (common).
C. fusus (many), and *C. furca* (few).
Peridinium divergens, and *P. globosus*.
Tintinnus denticulatus, and *T. fistularis*.
T. campanula, and *T. serratus*.
Dictyocha speculum.
Coscinodiscus radiatus.
Chaetoceros atlanticus (very many).
Halosphæra viridis.
Haliomma sp., and *Acanthometra*.
Dinophysis atlantica.
Rotalia beccarii.
Globigerina bulloides.
Sagitta sp., and Lamellibranch fry.

Copepoda:—*Calanus finmarchicus* (common).
Acartia laxa (several).
Oithona spinifrons (common).

C, on bath tap, September 27th, 1 to 3 p.m.
Very little material; some Diatoms, and:—
Acanthometra pellucida.
Peridinium divergens, and *P.* sp.
Ceratium fusus, and *C. tripos*.
Nauplei and small Copepoda (*Oithona*).
Lamellibranch fry.

IV. September 27th, 6 p.m., to September 28th, 9 a.m; from lat. 48 50′ N., long. 61 20′ W., to lat. 51 N., long. 57 40′ W.

Ceratium tripos (common), and *C. fusus*.

Tintinnus denticulatus (common).
Halosphæra viridis.
Peridinium divergens.
Sagitta sp. (many).
Amphipoda.
Megalopa of Crab.
Nyctiphanes norvegica.
Lamellibranchs (fry).
Young fish (Leptocephalid?).
Copepoda many (also Nauplei and eggs):—
Calanus finmarchicus (common).
Acartia longiremis (abundant).
Pleuromma abdominale (common).
Pseudocalanus elongatus (common).
Oithona spinifrons (common).

D, on bath tap, September 28th, 6 a.m to 9 a.m. Moderate amount, same as **IV.**

E. on bath tap, September 28th, 1 to 4 p.m. (going through Straits of Belle Isle, cold, sea temp. 37° F.).
Ceratium tripos (great quantity).
Peridinium divergens, and *Halosphæra viridis.*
Diatoms (*Coscinodiscus*, *Chætoceros*, &c.).
Tintinnus denticulatus, and *Codonella orthoceras.*
Globigerina bulloides.
Dictyocysta atlantica.
Limacina retroversa.
Copepoda (few small) and Nauplei:—
Calanus finmarchicus (common).
Oithona spinifrons (common).

V. September 28th, 9 a.m. to 6 p.m.; from lat. 51° N., long. 57°40′ W., to lat. 52°8′ N., long. 54°30′ W.
Ceratium tripos, and *Peridinium divergens.*
Tintinnus denticulatus, and *Codonella orthoceras.*

Diatoms (*Coscinodiscus*, &c.) and *Halosphæra*.
Limacina retroversa.
Nauplei, and Megalopa (large).
Copepoda:—*Calanus finmarchicus* (abundant).
Pseudocalanus elongatus (abundant).
Oithona spinifrons (abundant).

VI. September 28th, 7 p.m., to September 29th, 9 a.m.; from lat. 52° 8′ N., long. 54° 30′ W., to lat. 53° 25′ N., long. 49° 20′ W. (Very large gathering, phosphorescent.)
Ceratium tripos (common), and *Chætoceras*.
Peridinium divergens (common).
Tintinnus denticulatus, and *Codonella orthoceras*.
Megalopa of Crab.
Copepoda:—*Calanus propinquus* (common).
*C. finmarchicus** (masses of large, red).
Pseudocalanus elongatus (abundant).
Oithona spinifrons (common).

F, on bath tap, September 29th, 7 to 11 a.m.
Ceratium tripos, and *Coscinodiscus radiatus*.
Peridinium divergens (2 varieties).
Tintinnus denticulatus, and *Codonella orthoceras*.
Globigerina bulloides.
Calanus finmarchicus (few).

VII. September 29th, 9 a.m. to 6 p.m.; from lat. 53° 25′ N., long. 49° 20′ W., to lat. 54° 15′ N., long. 46° 22′ W.; temp. 49° F.
Ceratium tripos, and *C. furca* (abundant).
Peridinium sp. (common).
Tintinnus denticulatus (common).
Codonella campanella.
Globigerina bulloides (abundant).
Coscinodiscus radiatus (common).

* Some of these were cooked by Mrs. William Ramsay, and were eaten by the captain and a number of the passengers (see NATURE, vol 56, p. 565).

Coccospheres (few).
Limacina retroversa (many).
Copepoda:—*Calanus finmarchicus* (common).
C. propinquus (few).
Temora longicornis (several).
Oithona spinifrons (common).

G, on bath tap, September 29th, 1 to 4 p.m.
Ceratium tripos, & *Globigerina bulloides* (many).

VIII. September 29th, 7 p.m., to September 30th, 9 a.m.; from lat. 54° 15′ N., long. 46° 22′ W., to lat. 55° 24′ N., long. 41° 10′ W.

Peridinium divergens (very many*).
Coccospheres & *Coscinodiscus radiatus* (common).
Tintinnus denticulatus (few).
Ceratium tripos (few).
Do., variety (?) (abundant).
Dinophysis atlantica (abundant).
Globigerina bulloides (few).
Limacina retroversa.
Copepoda:—*Calanus propinquus* (abundant).
(?) *Pleuromma abdominale*.
Temora longicornis (few).
(?) *Ectinosoma atlanticum*.
Oithona spinifrons (abundant).

H, on bath tap, September 30th, 7 to 11 a.m. (Small quantity, in the main same as above.)
Ceratium tripos (abundant).
Peridinium divergens (abundant).
Tintinnus denticulatus (few).

* This *Peridinium* was so abundant and so red in colour as to give the silk of the nets a reddish tint, and to cause a deposit looking like a fine red powder (recalling the appearance of Dr. Gregory's mixture) at the bottom of the collecting dish.

Coscinodiscus radiatus (common).
Globigerina bulloides (few).
Copepoda:—*Calanus propinquus* (few).
Pleuromma abdominale (few).
Oithona spinifrons (few).
Ectinosoma atlanticum (few).

IX. September 30th, 9 a.m. to 6 p.m.; from lat. 55° 24′ N., long. 41° 10′ W., to lat. 55° 50′ N., long. 38° W. (Comparatively little, much same forms as in morning.)
Peridinium divergens (abundant).
Ceratium tripos (abundant), several varieties.
Dinophysis atlantica (many).
Tintinnus denticulatus.
Coccospheres & *Coscinodiscus radiatus* (common).
Globigerina bulloides (few).
Limacina retroversa..
Copepoda:—*Calanus propinquus* (common).
Oithona spinifrons (common).

I, on bath tap, September 30th, 1 to 6 p.m.
Coscinodiscus radiatus (common).
Tintinnus denticulatus (few).
Peridinium divergens (abundant).
Dinophysis atlantica (few).
Ceratium tripos (abundant), several varieties.
Globigerina bulloides (few).
Copepoda:—*Calanus propinquus* (common).
Pleuromma abdominale (few).
Oithona spinifrons (few).

X. September 30th, 7 p.m., to October 1st, 10 a.m.; from lat. 55° 50′ N., long. 38° W., to lat. 56° 10′ N., long. 31° 40′ W. (Rather more material than usual.
Peridinium divergens (very large).
Ceratium tripos (abundant), several forms.

C. fusus, and *C. furca* (few).
Dinophysis atlantica (common).
Podosira montagnei (few).
Tintinnus denticulatus.
Acanthometra pellucida.
Coccospheres.
Coscinodiscus radiatus.
Globigerina bulloides (many).
Limacina retroversa.
Copepoda (many small), including
Calanus finmarchicus (abundant).
Pleuromma abdominale (few).
Euchæta marina (few).
Heterochæta spinifrons (few).
Oithona spinifrons (abundant).

J. on bath tap, October 1st, 7 a.m. to noon.
Ceratium tripos.
Acanthometra pellucida (several).
Globigerina bulloides (many).

XI. October 1st, 10 a.m. to 6 p.m.; from lat. 56° 10′ N., long. 31° 40′ W., to lat. 56° 20′ N., long. 28° 24′ W.

Globigerina bulloides (many).
Dictyocha speculum.
Dinophysis atlantica.
Tintinnus denticulatus.
Coscinodiscus radiatus.
Peridinium divergens (many).
Ceratium tripos (few).
Do. var. *arcuatum* (common).
C. furca, and *C. fusus* (few).
Podosira montagnei.
Limacina retroversa.
Acanthometra pellucida.

Copepoda :—*Calanus finmarchicus* (common).
Acartia longiremis (common).
Pleuromma abdominale (several).
Pseudocalanus elongatus (common).
Oithona spinifrons (common).

XII. October 1st, same locality; another net on overflow pipe; 12 to 6 p.m.

Ceratium tripos (few).
Coscinodiscus radiatus (few).
Tintinnus denticulatus.
Globigerina bulloides.
Acanthometra pellucida.
Radiolaria (several), *Amphibelone*, sp.
Limacina retroversa (abundant).
Schizopoda (few, damaged, (?) *Euphausia*).
Euthemisto compressa (few).
Copepoda :—*Acartia longiremis* (common).
Pseudocalanus elongatus (common).
Oithona spinifrons (common).

K, on bath tap, October 1st, 1 to 6 p.m. Some of the commoner forms in **XI.**

XIII. October 1st, 6 p.m., to October 2nd, 9 a.m.; from lat. 56° 20′ N., long. 28° 24′ W., to lat. 56° 30′ N., long. 22° W. Nets at overflow pipe.

Globigerina bulloides (few).
Sagitta sp. (few).
Nauplei.
Euthemisto compressa (abundant).
Euphausia (?) *inermis* (abundant).
Limacina retroversa (very many).
Small fish (damaged).
Copepoda (many small, white).
Acartia longiremis (few).

Pleuromma abdominale (abundant).
Euchæta marina (common).
Centropages typicus (common).

XIV. October 1st to 2nd, same time and locality as last. Nets at tap.

Ceratium tripos (common).
C. fusus, and *C. furca* (few).
C. globosum (common).
Peridinium divergens.
Coccospheres (several).
Globigerina bulloides (abundant).
Dictyocysta elegans.
Asterionella formosa (several).
Dinophysis atlantica.
Dictyocha speculum.
Radiolaria (*Haliomma*, *Acanthometra*).
Limacina retroversa, and *Creseis acicula.*
Sagitta sp. (several).
Copepoda :—*Calanus finmarchicus* (few).
C. tonsus (few).
Acartia longiremis (abundant).
Pleuromma abdominale (common).
Scolecithrix danæ, and *S. minor* (several).
Centropages hamatus (few).
Oithona spinifrons (common).
Ectinosoma atlanticum (few).

L, on bath tap, October 2nd, 7 a.m. to 3 p.m.
Globigerina bulloides.
Acanthometra pellucida.
Peridinium divergens.
Dictyocysta elegans.
Creseis acicula
Limacina retroversa.
Copepoda (small), *Acartia longiremis.*

XV. October 2nd, 9 a.m. to 7 p.m.; from lat. 56° 30′ N., long. 22° W., to lat. 56° 22′ N., long 18° 43′ W. Nets on overflow pipe.

Acanthometra pellucida (few).
Globigerina bulloides (few).
Peridinium divergens.
Ceratium tripos.
Euphausia sp. (many young).
Euthemisto compressa (all immature, abundant).
Hyperia promontorii, Steb.
Sagitta sp. (few).
Creseis acicula.
Young Syngnathid fish.
Copepoda, many small, including:—
Acartia longiremis (abundant).
Centropages hamatus (few).

XVI. October 2nd, same time and locality as **XV.** Nets at tap (brilliantly phosphorescent).

Peridinium divergens.
Ceratium tripos (common), several varieties.
C. fusus (common), and *C. furca* (common).
Globigerina bulloides (common).
Haliomma sp.
Stylodictya heliospira (?).
Pteropods.
Copepoda:—*Calanus finmarchicus*, and *C. tonsus*
Acartia longiremis, and *A. discaudatus.*
Pseudocalanus elongatus (abundant).
Euchæta philippi (several).
Centropages typicus (common).
Oithona spinifrons (common).
Ætidius armatus (several).

M, on bath tap, October 2nd, 3 p.m. to 7 p.m.
Globigerina bulloides.

Radiolaria (*Haliomma*).
Peridinium divergens.
Ceratium tripos, and var. *macroceros.*
C. furca, and *C. fusus.*
Larval Schizopods.
Limacina retroversa.
Copepoda (small):—*Acartia longiremis.*
Calanus finmarchicus.
Oithona spinifrons.
Pseudocalanus elongatus.
Centropages hamatus, and *C. typicus.*

XVII. October 2nd, 8 p.m., to October 3rd, 9 a.m.; from lat. 56° 22′ N., long. 18° 43′ W., to lat. 56° 5′ N., long. 12° 30′ W. Nets on overflow pipe (many large Crustacea).

Globigerina bulloides (common).
Ceratium tripos (many).
Sagitta sp.
Limacina retroversa.
Small Syngnathid fish.
Euthemisto compressa (common).
Nyctiphanes norvegica (common).
Copepoda:—*Calanus finmarchicus* (few).
C. propinquus (few).
Acartia longiremis (common).
Pleuromma abdominale (common).
Pseudocalanus elongatus (common).
Euchæta marina (few).
Centropages typicus (common).
Eucalanus attenuatus (few).
Ætidius armatus (few).

XVIII. October 2nd and 3rd; same time and locality as last. Nets at tap (all fine stuff).
Ceratium tripos (many).

C. fusus (common), and *C. furca* (common).
Acanthometra pellucida (few).
Globigerina bulloides.
Stephanomonas quadrangularis.
Dictyocha speculum and *D. fibula.*
Peridinium divergens (sev. varieties).
Tintinnus acuminatus, and *T. denticulatus.*
Dinophysis atlantica.
Dictyocysta templum (?), and *D. elegans.*
Coccospheres.
Coscinodiscus radiatus, and other Diatoms.
Limacina retroversa.
Copepoda :—*Calanus finmarchicus* (abundant).
Acartia longiremis (abundant).
Metridia armata (common).
Centropages typicus (common) & *C. hamatus* (few).
Oithona spinifrons.

N, on bath tap, October 3rd, 7 a.m. to noon. Small gathering, much the same as finer net at tap in above.

Ceratium tripos, C. fusus, and *C. furca.*
Peridinium divergens and *P. globosus.*
Acanthometra pellucida.
Globigerina bulloides.
Dictyocysta templum (?).
Coscinodiscus radiatus.
Tintinnus denticulatus.
Copepoda as follows :—
Calanus finmarchicus (few).
Centropages hamatus (few).
Acartia longiremis (abundant).
Oithona spinifrons (common).
Pseudocalanus elongatus (abundant).

O, on bath tap, October 3rd, 1 p.m. to 5 p.m. Same as last.

XIX. October 3rd, 9 a.m. to 6 p.m.; from lat. 56° 5′ N., long. 12° 30′ W., to 20 miles north of Tory Island. Nets at overflow pipe.

Medusæ (torn).
Peridinium divergens.
Dictyocysta elegans.
Dictyocha fibula.
Ceratium tripos and *C. furca.*
Globigerina bulloides (common).
Radiolaria (*Haliomma*, &c.).
Podon intermedium (few.)

Copepoda many, including:—
Calanus finmarchicus (abundant).
Acartia longiremis (abundant).
Pseudocalanus elongatus (common).
Centropages typicus (common).

XX. October 3rd, same time and locality as **XIX.** Nets at tap (much small stuff).

Ceratium tripos, *C. fusus*, and *C. furca.*
Heliosphæra sp.
Acanthometra pellucida.
Dictyocha speculum, and *D. fibula.*
Dictyocysta elegans.
Globigerina bulloides.
Peridinium divergens.
Coscinodiscus radiatus.

Copepod Nauplei, and
Calanus finmarchicus (abundant).
Pseudocalanus elongatus (common).
Candace pectinata (scarce).
Metridia armata (common).
Oithona spinifrons (few).
Acartia longiremis (abundant).

Centropages typicus (few).
C. hamatus (few).

P, on bath tap, October 3rd, 5 p.m., to October 4th, 10 a.m. (off Port Erin).

Ceratium tripos, *C. fusus*.
Peridinium divergens.
Dictyocysta elegans.
Diatoms.
Globigerina bulloides.
Copepoda :—
Calanus finmarchicus (common).
Centropages hamatus (few).
Metridia armata (few).
Pseudocalanus elongatus (common).
Oithona spinifrons (few).
Acartia longiremis (few).
Isias clavipes (scarce).

XXI. and **XXII.** October 3rd, 7 p.m., to October 4th, 9 a.m.; from 20 miles north of Tory Island to 15 miles west of Peel. Great deal of material. Part of it porbably from entrance to Lough Foyle, where we stopped for an hour at midnight. Nets at overflow pipe had Sagitta, Medusæ, Amphipoda, and the larger Copepoda; nets at tap had much finer stuff—the Protozoa and the smaller Copepoda.

Ceratium tripos (few).
C. fusus (few).
Navicula sp.
Dictyocysta elegans.
Globigerina bulloides.
Unicellular Algæ.
Medusæ (small).
Sagitta sp. (abundant).

Megalopa.
Gastrosaccus spinifer.
Hyperia galba.
Euthemisto compressa (common).
Copepoda many, including:—
Calanus finmarchicus (common).
Acartia longiremis (common).
Metridia armata (common).
Pseudocalanus elongatus (common).
Centropages hamatus (few).
C. typicus (few).
Anomalocera patersonii (few).

XXIII. October 4th, 9 a.m. to 2 p.m.; from 15 miles west of Peel to near Liverpool Bar. Nets at overflow pipe.

Sagitta bipunctata (abundant).
Ceratium tripos (common).
C. fusus (common), and *C. furca* (common).
Dictyocha speculum.
Coscinodiscus radiatus (common).
Globigerina bulloides (common).
Biddulphia sp. (common).
Copepoda many, including:—
Calanus finmarchicus (common).
Acartia longiremis (abundant).
Metridia armata (few.)
Pseudocalanus elongatus (abundant).
Centropages hamatus (few).
Isias clavipes (common).
Parapontella brevicornis (few).
Labidocera wollastoni (common).

XXIV. October 4th, same time and locality as **XXIII.** Nets at tap (fine stuff).

Ceratium tripos (abundant).

C. furca, and *C. fusus*.
Coscinodiscus radiatus.
Peridinium divergens.
Dictyocha speculum.
Tintinnus acuminatus.
Codonella campanula.
Halosphœra viridis.
Rotalia beccarii.

Copepoda :—

Calanus finmarchicus (common).
Acartia longiremis (common).
Metridia armata (few).
Pseudocalanus elongatus (few).
Temora longicornis (few).
Centropages typicus (few).
Labidocera wollastoni (common).
Oithona spinifrons (common).

Notes on New and Other Copepoda.

By I. C. Thompson and Andrew Scott.

The collection comprises 39 species, of which three are described as new to science, as follows :—

LIST.	DISTRIBUTION.
Calanus finmarchicus (Gunner).	General.
C. propinquus, Brady.	Mid-Atlantic.
C. tonsus, Brady.	Mid-Atlantic.
Paracalanus parvus (Claus).	Off British coast.
Pseudocalanus elongatus (Boeck).	General.
Eucalanus attenuatus, Dana.	Mid-Atlantic.
Ætidius armatus, Brady.	Mid-Atlantic.
Euchæta marina (Prestandrea).	Mid-Atlantic
E. philippi, Brady.	Mid-Atlantic.
Scolecithrix danæ (Lubbock).	Mid-Atlantic.

S. minor, Brady.	Mid-Atlantic.
Centropages typicus, Kröyer.	British to Mid-Atlantic.
C. hamatus (Lilljeborg).	General.
Isias clavipes, Boeck.	Off British coast.
Temora longicornis (O. F. Müller).	General.
Eurytemora affinis (Poppe).	In St. Lawrence.
E. herdmani, n. sp.	In St. Lawrence.
Metridia armata, Boeck.	Off British coast.
Pleuromma abdominale (Lubbock).	General.
Heterochæta spinifrons, Claus.	Mid-Atlantic to Canada.
Candace pectinata, Brady.	Off British coast.
Labidocera wollastoni (Lubbock).	Off British coast.
Anomalocera patersonii, Templeton.	Off both coasts.
Parapontella brevicornis (Lubbock).	Off British coast.
Acartia clausii, Giesbrecht.	General.
A. longiremis (Lilljeborg).	General.
Acartia laxa, Dana.	Off Anticosti.
A. denticornis, Brady.	In St. Lawrence.
A. forcipata, n. sp.	In St. Lawrence.
Corynura discaudata, n. sp.	In St. Lawrence.
Oithona spinifrons, Boeck.	General.
Oncæa conifera, Giesbrecht.	In St. Lawrence.
O. venusta, Philippi.	In St. Lawrence.
Ectinosoma sarsii, Boeck.	In St. Lawrence.
E. atlanticum (Brady and Robertson).	All the way.
Longipedia coronata, Claus.	Irish Sea.
Thalestris serrulata, Brady.	Both coasts.
Alteutha interrupta (Goodsir).	Irish Sea.

Calanus finmarchicus has a world-wide distribution, having been recorded from the North Atlantic, Arctic Ocean, and European seas (Brady); Mediterranean, West Coast of South America, and Hongkong (Giesbrecht); Australasia and South Pacific (Brady); Sulu Sea (Dana).

It was found in nearly all the tow-nettings, and although considerable difference in size was noticed between various individuals, they did not appear to be structurally different. The largest specimens observed were in the material collected while traversing the Labrador current.

Calanus propinquus and *C. tonsus* were observed in a few of the gatherings in mid-ocean, where they appeared to take the place of *C. finmarchicus*.

Paracalanus parvus was found in the tow-nettings taken between Liverpool and the north coast of Ireland, but nowhere else.

Pseudocalanus elongatus, a very common species around our shores, occurred in nearly all the tow-nettings, and was even more numerous than *Calanus finmarchicus*. It is evidently common in the North Atlantic, although it has not hitherto been recorded from any locality outside European seas. In the case of many of the species the present collection has extended the known range of distribution.

Eucalanus attenuatus was observed in one only of the tow-nettings, taken near mid-ocean.

Ætidius armatus occurred in the same collection as *Eucalanus*; it was also taken on the previous day. This species, though widely distributed, was not known to occur in the Atlantic north of the Mediterranean, until quite recently. Mr. T. Scott records it from the Shetland-Faröe Channel. Other records for this Copepod are:— Indian Ocean, Torres Straits, off Port Jackson, and in the Chinese Sea (Brady); off Gibraltar (Giesbrecht), Malta (I. C. Thompson), Gulf of Guinea (T. Scott).

Euchæta marina was found in the majority of the collections taken between mid-ocean and Quebec. This is another species which appears to have a wide distribution, and more especially in tropical seas.

Euchæta philippi occurred sparingly in material collected between lat. 56° 22′ N., long. 18° 43′ W., and lat. 56° 5′ N., long. 12° 30′ W. It has hitherto only been known from the South Atlantic and South Pacific.

Scolecithrix danæ and *S. minor* were observed in material collected in mid-ocean on both traverses, but they occurred very sparingly. *S. minor* has already been recorded from North Atlantic waters, but there does not appear to be any record of *S. danæ* having been found north of the Mediterranean.

Centropages typicus occurred in the majority of the collections taken between the Irish sea and lat. 56° 30′ N., long. 24° 22′ W., to lat. 56° 22′ N., long. 28° 8′ W.

C. hamatus has apparently a more westerly distribution than *C. typicus*, and was found in the majority of the collections. The present collection shows a considerable extension of the distribution of these two species, especially the latter. So far neither of them have been recorded south of the Canary Islands. Mr. I. C. Thompson records *C. typicus* only from these Islands.

Isias clavipes was only found in the collection taken between Ireland and the Isle of Man. It is a common species in the L.M.B.C. district.

Temora longicornis occurred in the majority of the collections. There appears to be little difference between the forms from the British waters and those from the American coast, whereby the American forms could be ascribed to Dana's species, *T. turbinata*. The collection shows a considerable extension of distribution of this species.

The presence of *Eurytemora affinis* in considerable quantity between Quebec and Rimouski suggests a plentiful admixture of fresh water with the St. Lawrence in that neighbourhood, this being usually a brackish water species.

It has already been recorded from Minnesota (U.S.A), by C. L. Herrick, in his report on the Cyclopidæ of Minnesota, so that it would appear to be a widely distributed species. On the Continent of Europe, *E. affinis* sometimes occurs in immense profusion, constituting, it is said, at some seasons, the almost exclusive food of certain fishes, as of the Shad in the Rhine and the Herring in the Baltic.

A striking new species of *Eurytemora*, which is described and figured below as *E. herdmani*, was found in fair numbers in some gatherings in the St. Lawrence.

Pleuromma abdominale occurred plentifully, particularly amongst the plankton collected towards the other side, and in Mid-Atlantic, though sparingly taken in British waters. The distinguishing generic character, the dark coloured pleural eye, though generally present, was certainly entirely absent in many specimens, those with and those without the eye being found in the same gathering. Brady refers to the absence of the eye in many specimens. The nearly allied form, *Metridia armata*, was found generally distributed towards this side of the ocean. It is generally a very noticeable feature in plankton collections taken off the west Irish coast.

Heterochæta spinifrons was found very sparingly in collections taken between mid-ocean and Canada. The collection shows an extension of the distribution of this species in the North Atlantic.

Candace pectinata only occurred in a single gathering, the one taken between Rockall and the north coast of Ireland. North of the Mediterranean this species does not appear to have been taken anywhere else except round the British coasts, in several parts of which it has been recorded since Brady first described it from specimens collected at the Scilly Islands.

Labidocera wollastoni occurred in the collections made

in the Irish Sea on the homeward journey. It has already been recorded from this neighbourhood and about Puffin Island by Mr. Thompson.

Anomalocera patersonii was found rather plentifully in a gathering taken off the south of Rockall Bank, and again in one taken off the south-east end of the Island of Anticosti. This species, though generally distributed in the waters of the North Atlantic, North Sea, and Mediterranean, does not appear to have been recorded from any locality south of the Mediterranean. Its northern limit is Greenland.

Parapontella brevicornis was found only once, in the collection between the Isle of Man and Liverpool.

Acartia clausii occurred in nearly all the collections made between Liverpool and lat. 56° 8′ N., long. 38° 6′ W. In a few of the gatherings it was by far the most common species. Between lat. 56° 8′ N., long. 38° 6′ W., and lat. 49° N., long. 67° 45′ W., not a single specimen was observed, but in the collection made from the latter position to 90 miles from Quebec, it was again fairly common; this so far appears to be the western limit of its distribution.

Acartia longiremis is also apparently a widely distributed species, and was found in many of the collections.

Acartia laxa, easily distinguished from both the above species by the presence of spines on the posterior lateral angles of the cephalothorax, was taken in the Gulf of St. Lawrence, opposite the Island of Anticosti, but in no subsequent gathering. North of the latitude of the Cape Verde Islands this species has not been previously recorded, so that the present collection shows a considerable extension of its distribution. A fourth species of *Acartia*, found in the St. Lawrence, appears to be new, and is described below as *A. forcipata*, n. sp.

A species of *Corynura*, from the St. Lawrence, also appears to be new, and is described as *C. discaudata*, n. sp. It was also found in Puget Sound (see Appendix, p. 84).

Oithona spinifrons occurred in considerable numbers almost throughout the collections. All the specimens of *Oithona* observed have been ascribed to this species, although their mutilated condition rendered identification somewhat difficult. Clusters of ovisacs belonging to this species were found in many of the collections.

Oncœa conifera occurred sparingly in the collection made between Quebec and 30 miles west of Rimouski. The present record is a considerable extension of its limit of distribution.

Oncœa venusta also occurred sparingly in the collection made between lat. 56° 30′ N., long. 18° W., and lat. 56° 30′ N., long. 24° 22′ W., which is an extension of its limit of distribution in the North Atlantic.

Ectinosoma sarsii occurred in the last of the outward and first of the homeward collections made between Rimouski and Quebec. The species does not appear to have been previously recorded from the American coasts, so that the present collection shows a considerable extension of its distribution.

Ectinosoma atlanticum has a world-wide distribution; it occurred in several of the gatherings, but only sparingly.

Longipedia coronata was only observed in the collection made between Liverpool and the north of Ireland.

Thalestris serrulata occurred sparingly in three collections, those between Liverpool and the north of Ireland, in the Straits of Belle Isle, and between Rimouski and Anticosti. Out of British seas this species has not hitherto been recorded, so that the present collection shows a considerable extension of distribution of the species, which is apparently one of the pelagic Harpacticidæ.

Alteutha interrupta occurred sparingly in the collection made between Liverpool and the north of Ireland.

One specimen of an interesting parasitic species, *Nogagus borealis*, was found in one of the mid-Atlantic collections. It was first recorded by Steenstrup and Lütken in 1861, from a specimen found free swimming in the South Atlantic. Other members of the genus *Nogagus* are known to be parasitic upon sharks. This was the only parasitic form found in the collections.

The description of the three new species* is as follows:

Eurytemora herdmani, n. sp. (Pl. V., figs. 1—11.)

Length (exclusive of tail setæ), 1·6 mm. Body ovate anteriorly, the posterior angles being produced in the female into large conspicuous wing-like expansions (fig. 1).

Anterior antennæ (fig. 2) about as long as the cephalothorax; 24-jointed in the female, 21-jointed in the male right antenna (fig. 9). The proportional lengths of the joints in the female antennæ are as follows:—

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
36	10	8	8	8	6	7	5	6	5	5	8	13	14	15	16	17	18	18	18	16	16	19	26

Each joint bears one or more setæ on the upper surface. The 17th and 18th joints of the right male antenna (fig. 9) are finely denticulated on the upper edge; a geniculation being between the 18th and 19th joints. The apical joint is very small, the previous joints being much longer than any of the others. Posterior antenna (fig. 3) similar to that of *E. clausii*, with the exception of the setæ being non-plumose.

The mouth organs follow the general character of the Calaninæ. The mandibles (fig. 4) are large and powerful,

* See also description of a new species from Puget Sound in Appendix, p. 87.

the seven teeth being bifid, a curved claw-like spine forming the apex of a separate lobe. Basal portion of the palp large, the two setose branches being 2 and 4-jointed respectively.

The posterior foot jaws (fig. 5) are stouter than in most of the Calaninæ; the fine smaller terminal joints are densely setose. The second joint has four non-plumose setæ, and the basal joint three pairs of plumose setæ. Inner branch of 1st pair of swimming feet is 1-jointed, that of the 2nd, 3rd, and 4th 2-jointed (figs. 6 and 7). The 5th feet are jointed similarly to *E. affinis*. The penultimate joint in the female is much the longest, and is produced on the inner side downwards into a long spear-like spine extending beyond the spine of the terminal joint, and provided with short sharp teeth on each side (fig. 8).

The 5th feet of the male (fig. 10) are less robust than in *E. affinis*, the joints being more slender. The abdomen is 3-jointed in the female and 5 in the male (fig. 11); the first segment in the female has a conspicuous obtuse projection on each side posteriorly. Caudal stylets, long and narrow, with one lateral seta and four terminal setæ on each stylet, all finely plumose.

Males and females of this new species were found plentifully in association with *E. affinis* in the St. Lawrence, between Quebec and Rimouski. The penultimate joint of the abdomen in the female readily distinguishes it from the other species of the genus.

It is with peculiar pleasure that I. C. Thompson and A. Scott associate with this striking Copepod the name of Prof. Herdman, who collected the material upon which this paper is based.

Corynura discaudata, n. sp. (Pl. VI., figs. 1—11, Pl. VII., figs. 1, 2.)

Length (female, exclusive of tail setæ), 2·25 mm. Anterior antennæ long and slender, about the length of the entire animal, exclusive of the caudal segments (fig. 1); 18-jointed in the female (fig. 2), and 19 or 20 in the male, right (fig. 10), the former having six long setæ and several short spinous ones on the upper surface, and several long plumose setæ at the apex and shorter ones on the 1st and 2nd joints.

The right antenna (fig. 10) of the male is geniculated between the 14th and 15th joints, and is profusely clothed with short setæ on the upper surface, the apical setæ only being finely plumose. The proportional lengths of the joints in the female antennæ are as follows:—

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
12	21	8	21	10	12	12	14	15	19	19	20	18	16	16	17	21	13

Both branches of the posterior antennæ (fig. 3) are 2-jointed, those of the outer joint being of about equal length. The basal joint of the inner branch is very short, and the apical joint considerably larger than those of the outer branch.

The mouth organs are similar to those of *C. gracilis* with the exception of the mandible palp (fig. 4), the branches of which, in the present species, are respectively 2 and 3-jointed.

Both branches of the first pair of swimming feet (fig. 8) are 3-jointed; the inner branch of pairs 2, 3, and 4 (fig. 9) are 2-jointed, all bearing densely plumose setæ. Fifth pair in the female (Pl. VII., fig. 1) are simple, 2-jointed, similar to those of *C. gracilis*, but without any dentation at the apex. In the male (Pl. VII., fig. 2) the 5th pair is strongly hooked and prehensile.

Abdomen 3-jointed in the female and 5 in the male (fig.

11). The second joint of the male is drawn down posteriorly forming a blunt tooth with minute setæ at the apex.

The two last joints are slightly twisted laterally, the caudal segments, which are about three times as long as broad, being further curved round from the perpendicular. The right stylet is considerably larger than the left, and has on the outer side a strong prominent spine more than double the size of that on the other segment. Each segment bears five terminal plumose setæ.

The male is at once recognisable by the posteriorly produced tooth on the second joint of the abdomen and by the caudal stylets.

A number of specimens, both male and female, were taken in the nets on the 12th August, about the mouth of the St. Lawrence, near the Island of Anticosti, and the species was subsequently found plentifully in the plankton collected by Prof. Herdman in Puget Sound, on the Pacific Coast.

Acartia forcipata, n. sp. (Pl. VII., figs. 3—10.)

Length (exclusive of tail setæ), 2·35 mm. Body (fig. 3) similar in shape and appearance to the other members of the genus *Acartia*. Outer branch of posterior antennæ (fig. 4) 2-jointed; inner branch 3-jointed, the apical and penultimate joints being very short. Terminations of both joints bear a large number of long setæ; the basal joint of outer branch has seven spinous setæ on outer side. Mandible palp (fig. 5) has two short branches, 1- and 4-jointed respectively, both with long setæ, some of them plumose. Anterior foot jaw (fig. 6) 3-jointed, bearing numerous long uncinate and plumose setæ. Posterior foot jaw (fig. 7) composed of broad basal portion bearing long setæ, and a spinous 3-jointed branch.

Swimming feet, 1st to 4th pair (figs. 8 and 9) 2-jointed

on the inner branches, 3-jointed on the outer, the setæ of first foot (fig. 8) being non-plumose, the others (fig. 9) densely plumose, and having the characteristic *Acartia* spinal termination to outer branch.

The female 5th feet (fig. 10) of this species differ from the general character of the other known species of *Acartia* in being 2-jointed, whereas, in the other species, they are rudimentary. The stout basal joints bear a long plumose seta on each outer side. The terminal joints, which are about three times as long as broad, have a short central spine on the outer side, and a very long gracefully curved spine placed centrally on the inner side, also two short terminal spines.

Three specimen only of this evidently quite distinct species were taken in the St. Lawrence, about 100 miles from Quebec. The unfortunately mutilated condition of the anterior antennæ renders any accurate description of them impossible, but the 5th pair of swimming feet are sufficiently diagnostic of the species.

Conclusion.

By W. A. Herdman.

This method of collecting samples of the surface fauna, from an ocean liner going at full speed, in any required number and quantity per day or hour, was first practised, I believe, by Dr. John Murray, in a traverse of the Atlantic from Glasgow to New York in 1892, and afterwards in a trip through the Bay of Biscay, and the Mediterranean. From my experience I can entirely confirm the opinion expressed to me by Dr. Murray, that this plan of collecting is simple, effective, and inexpensive. It requires no complicated apparatus; there is no difficulty in the manipulation, and no trouble to speak of need be given to any

of the ship's company. By this method naturalists can now obtain, at very slight expense, a series of gatherings across the great oceans in every direction traversed by passenger or cargo steamers. The ship's surgeon, or any other officer with a taste for natural history, or who is willing to take a very little trouble to help in advancing scientific enquiry into the life of the ocean can, by taking charge of a tow-net and a set of collecting bottles for a marine biologist, help in making an interesting series of observations which may lead to important conclusions.*

As Copepoda are edible, and can be obtained from the sea-water tap, the cook at sea has a new dish or, at the least, a sauce to add to the bill of fare, and all sailors ought to know, as was first pointed out by the Prince of Monaco, that they have a possible food supply, easily caught, in the sea around them. A tow-net should form part of the equipment of every ship's boat, ready for use in case of shipwreck; and every ship ought to carry a set of tow-nets, and collect material daily in order that the biologist may more accurately map out the exact distribution of organisms over the high seas, and determine the characteristics of the different oceanic currents throughout the year.

* If there are any such gentlemen sailing from the port of Liverpool, I hope they will place themselves in communication with me by calling at my laboratory in University College. I shall be glad at any time to supply the necessary nets and collecting bottles, and to give the simple instructions required.

APPENDIX:—NOTE on DREDGING and TOW-NETTING in PUGET SOUND, PACIFIC COAST.

By W. A. Herdman.

Between the dates occupied, as is shown above, in collecting on the Atlantic, I crossed North America by the Canadian Pacific Railway and spent nearly a week on the shores of Puget Sound, examining the shore and shallow water animals at various points:—notably, Victoria (British Columbia) and Port Townsend, in Washington State (U.S.A.). At Victoria I received much kindness, directions as to localities, and help in collecting from Dr. Crompton and other members of the Natural History Society. Mr. Fannin, the Curator of the Museum, also kindly gave me facilities for preserving and packing my specimens.

At Port Townsend, thanks to the kindness of my friend Dr. Bashford Dean, and Mr. B. B. Griffin, a member of the Columbia University Expedition to Alaska, who gave me the fullest information as to localities, and lent me their dredging apparatus, I was able to do a good deal of collecting in a short space of time. I hired a small steamer—the "Nettie B."—belonging to Capt. Hardie; and was engaged in tow-netting and dredging during parts of two days, Sept. 4th and 5th, off Port Townsend, and in Scow Bay and round Marrowstone Point opposite the port. The depths were up to about 20 fathoms.

At Victoria we had one day's dredging in a petroleum launch, at depths of from 5 to 15 fathoms, and one morning's collecting at low tide on the shore. I was fortunate at both localities in getting a good deal of material, which was preserved and brought home. The collection, now

in the Zoological Museum at University College, Liverpool, is not yet fully worked out; but the following brief remarks upon it may be of interest.

Off Victoria, B.C., we found:—

Various sponges.
Aglaophenia sp., and other Zoophytes.
Pennatula sp.
Actinians (several).
Cribrella leviuscula.
Asterias sp. (six rays).
Cucumaria (2 species).
Holothuria californica.
Echinids (2 species).
Annelids (various).
Sternaspis sp.
Polyzoa (various).
Terebratula sp.
Balanus (very large species, and two others).
Amphipods (various).
Idotea exsecata (large specimens).
Pagurids (several species, large).
Oregonia sp.
Pugettia sp.
Crabs (many, belonging to 4 genera).
Palæmon (various).
Hippolyte (several species).
Cryptochiton stelleri (very large).
Katharina tunicata (in abundance at low tide).

Also Mollusca belonging to the following genera:—*Leda* (2 species), *Pecten* (2 species), *Pandora*, *Cardium*, *Tellina*, *Pectunculus*, *Lyonsia*, *Fissurella*, *Puncturella*, *Patella*, *Calyptræa*, *Acmœa?* *Chiton*, *Bulla?* *Trochus*, *Buccinum*, *Turbinella*, *Murex* (2 species), *Crepidula*, *Natica*, *Neptunea*, *Tethys* (several specimens).

Ascidia sp.
Cynthia sp. (in great abundance).
Chelyosoma producta.
Molgula sp.
Compound Ascidians.

At Port Townsend we got:—

Zoophytes and Polyzoa (off Marrowstone Point).
Sponges (many, in Scow Bay).
Medusæ (small, also large Rhizostomidæ).
Actinians.
Holothuria californica (many, very large).
Annelida (various).
Amphipoda, Isopoda, and Macrura (many).
Pandalus danæ.
Crangon nigricauda.
Elysia sp. (on *Zostera*).
Eolis (large white species).
Tethys sp.
Cynthia sp. (in great profusion, evidently covering large areas of the sea bottom in Scow Bay.)
Ascidia sp.
Eggs of *Chimaera* and of a large Skate.

Mr. I. C. Thompson has examined for me the townettings taken off Port Townsend, and he reports to me that they contain the following forms:—

Coscinodiscus radiatus (abundant).
C. concinnus (a few).
Ceratium fusus (abundant).
Pleurosigma sp. (scarce).
Other Diatoms (very many).
Chaetoceros sp.
Biddulphia sp.
Confervoid algæ.

Medusæ (many).
Evadne nordmanni.
Schizopods.
Oikopleura sp. (many).
Copepoda :—
Calanus finmarchicus (abundant).
Pseudocalanus elongatus (common).
Acartia clausii (scarce).
Corycæus pellucidus (abundant).
C. obtusus (common).
Oithona spinifrons (common).
Laophonte curticauda (few).
Anomalocera patersonii (few).
Diosaccus tenuicornis (scarce).
Pontella securifer (scarce).
Corynura discaudata, n. sp. (see above, p. 80).

And a new species of Copepod which seems to require a new genus, and which Mr. Thompson characterises as follows :—

Family Sapphirinidæ, Thorell.

Genus *Pseudolichomolgus*, n. gen.

Like *Lichomolgus* in general appearance; also in the antennæ, mandibles, maxillæ, anterior foot jaw, and fifth pair of swimming feet.

Conspicuous spinous rostrum.

Both branches of first four pairs of swimming feet 2-jointed.

Pseudolichomolgus columbiæ, n. sp. (Pl. VIII., figs. 1—10.)

Male :—Length, 1·98 mm. Body elongated, cephalothorax ovate, its first segment occupying nearly half of its entire length. Rostrum (fig. 3) anchor shaped, composed of three strong spines, the two outer ones slightly curved outwards at end. The upper arched surface is

produced centrally into a rounded flap. Anterior antennæ (fig. 2) 7-jointed, their relative lengths being as follows:—

1	2	3	4	5	6	7
12	12	4	11	10	9	9

the first four being nearly double the width of the terminal joints. All bear short spines, a long one terminating the fourth and fifth joints, and three the apical joint.

Posterior antennæ (fig. 4) 5-jointed, the fourth joint very short. A sharp powerful curved claw with broad base forms the apex. Mandible (fig. 5) broad at the base with long slender finely setose stilet; no palp. Maxilla (fig. 6) consists of a broad base terminated by two spines.

Anterior foot jaw (fig. 7) of similar character to the mandible, with one finely plumose seta. Posterior foot jaw (fig. 8) consists of a single broad plate, its length half its breadth, and bearing a row of fine spines on its outer edge. Each branch of first four pairs of swimming feet (figs. 9 and 10) 2-jointed with strong spines and densely plumose setæ.

The first foot (fig. 9) is fringed with short setæ on the lower surface of basal joint. Fifth feet (fig. 1) 1-jointed, each having two terminal spines.

A single specimen of this singular species (sex, male) was taken by tow-net in Puget Sound.* Though bearing a strong resemblance to *Lichomolgus*, its remarkable rostrum and singular posterior foot jaw, as well as the 2-jointed swimming feet, completely separate it from that genus.

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* The specific name *columbiæ* refers to its occurrence in the strait between "Columbia" and British Columbia, and where, moreover, much good work has been done by zoological expeditions from the Columbia University, New York.

Some of the above-named animals from Puget Sound are common British species, and others are closely related or representative forms. I noted the presence of Starfishes very closely resembling our North Atlantic *Cribrella sanguinolenta*, *Stichaster roseus*, and *Solaster endeca;* while Mr. A. O. Walker, who is examining the higher crustacea, writes to me:—"The *Pandalus*, which is *P. danæ*, St., only differs from our common *P. montagui* in having one more tooth on the lower side of the rostrum, and two small teeth at its extremity instead of one; and *Crangon nigricauda*, St., is so very near our common Shrimp, that I do not think it ought to have been separated. Then there is a *Hippolyte* very like our *H. pusiola*, Kr., and another like our *H. spinus*, and so on. The *Idotea* is certainly *I. exsecata*, St., it represents our *I. linearis*."

This close resemblance between our common British species and some of the animals from this arm of the Pacific, a third of the way round the world, is most interesting. There are also, however, some very characteristic forms, such as the huge Holothurians and the magnificent Cryptochitons.

Explanation of Plates.

Plate V., *Eurytemora herdmani*, n. sp.

Fig. 1, female, dorsal view, × 35; fig. 2, anterior antenna, female, × 75; fig. 3, posterior antenna, × 95; fig. 4, mandible and palp, × 85; fig. 5, posterior foot jaw, × 125; fig. 6, foot of first pair, × 255; fig. 7, foot of fourth pair, × 255; fig. 8, foot of fifth pair, female, × 152; fig. 9, anterior antenna, male, × 75; fig. 10, fifth pair of feet, male, × 100; fig. 11, abdomen and caudal stylets, male, × 40.

PLATE VI., *Corynura discaudata*, n. sp.

Fig. 1, female, dorsal view, × 24; fig. 2, anterior antenna, female, × 35; fig. 3, posterior antenna, × 55; fig. 4, mandible and palp, × 35; fig. 5, maxilla, × 125; fig. 6, anterior foot jaw, × 55; fig. 7, posterior foot jaw, × 55; fig. 8, foot of first pair, × 85; fig. 9, foot of fourth pair, × 85; fig. 10, anterior antenna (right), male, × 40; figs. 11, abdomen and caudal stylets, male, × 40.

PLATE VII.

Figs. 1 and 2. *Corynura discaudata*, n. sp.

Fig. 1, fifth pair of feet, female, × 75; fig. 2, fifth pair of feet, male, × 75.

Figs. 3 to 10. *Acartia forcipata*, n. sp.

Fig. 3, female, dorsal view, × 25; fig. 4, posterior antenna, × 125; fig. 5, mandible and palp, × 50; fig. 6, anterior foot jaw, × 125; fig. 7, posterior foot jaw, × 75; fig. 8, foot of first pair, × 125; fig. 9, foot of fourth pair, × 125; fig. 10, fifth pair of feet, female, × 125.

PLATE VIII.

Pseudolichomolgus columbiæ, n. gen. and sp.

Fig. 1, female, dorsal view, × 18; fig. 2, anterior antenna, × 305; fig. 3, rostrum, × 255; fig. 4, posterior antenna, × 250; fig. 5, mandible, × 455; fig. 6, maxilla, × 500; fig. 7, anterior foot jaw, × 500; fig. 8, posterior foot jaw, × 380; fig. 9, foot of first pair, × 215; fig. 10, foot of fourth pair, × 215.

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