

DEPARTMENT OF AGRICULTURE AND TECHNICAL INSTRUCTION
FOR IRELAND.

FISHERIES BRANCH.

SCIENTIFIC INVESTIGATIONS,
1906.

No. II.

Second report on the Copepoda of the Irish
Atlantic Slope,

by

G. P. FARRAN, B.A.

This paper may be referred to as—
“*Fisheries, Ireland, Sci. Invest.*, 1906, II. [1908].”

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SECOND REPORT ON THE COPEPODA OF THE IRISH
ATLANTIC SLOPE,

BY

G. P. FARRAN, B.A.

Plates I-XI.

The list of species here given is the result of a number of deep-water townettings taken off the West coast of Ireland in 1904-5, and may be regarded mainly as a contribution to our knowledge of the plankton of the region lying between soundings of 600 and 1,000 fathoms.

The principal net used on each station was either a large triangular tow-net of coarse silk or mosquito-netting, each side of the mouth measuring six feet, or else a mesoplankton trawl, of Dr. C. G. J. Petersen's design, of coarse screen cloth. At intervals along the wire warp carrying the main net were fixed smaller ring townets without bridles, the rings being fastened directly to the warp, so that they remained vertical and thus were partially closed while the nets were being hauled. These serial townets, when they arrived at the surface in safety, furnished a check, when estimating the error caused by the fishing of the nets during ascent, by giving some indication of the fauna of intermediate depths.

The following list gives the positions of the various stations and the nature and depths of the townets used on each of them. It will be seen that four of them, viz., S.R.139, S.R.140, S.R.197, and S.R.231, are just outside the Irish deep-water area as marked by the 1,000-fathom line, while one, S.R.193, is about on the boundary line, but on which side of it it is impossible to say, as bottom soundings were not taken.

It should be noted that in the following pages the captures of each species are regarded as having taken place at the depth at which the net is recorded to have been fishing, any instances in which this view seems to lead to error being specially referred to. The depth of the net is deduced from the length of warp with which it was fished, and must consequently be regarded as approximate; the possible error is not, however, sufficient to have any serious effect on the results.

Station S.R. 139. 50 miles N. by W. of Eagle Island, Co. Mayo, lat. 55° 0' N., long. 10° 48' W. soundings $\frac{1}{1000}$ fath.,
11th August, 1904.

Medium silk net ¹ , surface.	Medium silk net ¹ , 600 fath.
" " " 100 fath.	" " " 800 fath.
" " " 200 fath.	" " " 1,000 fath.
" " " 400 fath.	Mosquito-net Δ^2 , 1,000 fath.

¹Bolting silk, 25 openings to 1 cm.

²Triangular net, sides 6 feet.

Station S.R. 140. 40 miles N. by W. of Eagle Island, Co. Mayo, lat. $54^{\circ} 50' N.$, long. $10^{\circ} 45' W.$, soundings $\overline{1000}$ fath.
11th August, 1904.

Medium silk net¹, surface.
" " " 330 fath.
" " " 530 fath.
Mosquito-net Δ^2 , 730 fath.

Station S.R. 164. 50 miles W.N.W. of Tearaght, Co. Kerry, lat. $52^{\circ} 6' N.$, long. $12^{\circ} 0' W.$, soundings, 375 fath.
3rd November, 1904.

Medium silk net¹, 100 fath.
" " " 200 fath.
Coarse silk Δ^3 , 350 fath.

Station S.R. 175. 40 miles N. by W. of Eagle Island, Co. Mayo, lat. $54^{\circ} 53' N.$, long. $10^{\circ} 42' W.$, soundings, $\overline{670}$ fath.
14th November, 1904.

Medium silk net¹, 600 fath.
Coarse silk Δ^3 , 600 fath.

Station S.R. 193. 40 miles N. by W. of Eagle Island, Co. Mayo, lat. $54^{\circ} 50' N.$, long. $10^{\circ} 30' W.$, soundings $\overline{650}$ fath.
10th February, 1905.

Fine silk net⁴, surface.
Coarse silk⁵ and cheese cloth⁶ net, 230 fath.
" " " " 430 fath.
Coarse silk net³, 530 fath.
Fine silk net⁴, 630 fath.
Coarse silk Δ^3 , 630 fath.

Station S.R. 197. 50 miles N. by W. of Eagle Island, Co. Mayo, lat. $54^{\circ} 57'$, long. $10^{\circ} 51' W.$, soundings $\overline{1000}$ fath.
11th February, 1905.

Coarse silk⁵, and cheese cloth⁶ net, 80 fath.
" " " " 280 fath.
" " " " 480 fath.
Coarse silk net³, 580 fath.
Fine silk net⁴, 680 fath.
Coarse silk Δ^3 , 680 fath.

Station S.R. 224. Off the Porcupine Bank, lat. $53^{\circ} 7' N.$, long. $15^{\circ} 6' W.$, soundings 860 fath.
12th May, 1905.

Petersen Mesoplankton Trawl⁷, 700 fath.

¹Bolting silk, 25 openings to 1 cm.
²Triangular net, sides 6 feet.
³Grit gauze, 9 openings to 1 cm.
⁴Bolting silk, 50 openings to 1 cm.
⁵Bolting silk, 14 openings to 1 cm.
⁶Ca. 10 openings to 1 cm.
⁷Ca. 7 openings to 1 cm.

Station S.R. 231. 50 miles N. by W. of Eagle Island, Co. Mayo, lat. $55^{\circ} 1' N.$, long. $10^{\circ} 45' W.$, soundings 1,200 fath.

20th May, 1905.

Coarse silk¹ and cheese cloth² net, 200 fath.
 " " " " 400 fath.
 Coarse silk Δ^3 , " " " 750 fath.
 Petersen Mesoplankton Trawl⁴, 1,150 fath.

The most noticeable features of the copepod fauna of the region investigated are the very large number of species represented and the uniformity with which they occur. The first of these facts has been made familiar by the lists published by Professor G. O. Sars, Dr. Woltenden, and the late I. C. Thompson. The second might, perhaps, be inferred from the fairly uniform conditions of light and temperature, but has not been duly emphasised as regards the copepoda. It is, I think, better shown by lengthy hauls with large nets, such as those here dealt with, than by gatherings of small bulk, which, when large numbers of species are present in small quantities, must necessarily contain only a small proportion of the species actually represented. This objection is, of course, equally to be urged against any deductions made from the contents of the small serial townets referred to above.

The number of species recorded below is 164, and of these about 120 may be reckoned as permanent members of the skotoplankton, that is to say in this locality, and may be expected to occur in any townet which is towed within the region of observation at the appropriate depth for a sufficient length of time. Though a few species, such as *Acartia Clausi*, *Calanus finmarchicus*, *Metridia lucens* and *Euchaeta norvegica*, are present in much larger numbers than the rest; yet there is no indication of the presence of any particular species in swarms such as are found in shallow or inshore waters. The nearest approach to such a swarm is in the case of *Scolecithricella dentata* at 200 fathoms on Station S.R. 164, when that species formed ten per cent. of the gathering.

A selection from the temperature and salinity observations made on the townet stations is here given to illustrate the physical conditions under which the gatherings were made.

AUGUST, 1904.

STATION S.R. 139.		STATION S.R. 140.	
Depth in Fath.	Temperature.	Depth in Fath.	Temperature.
1	14.6	0	14.5
10	14.6	10	14.6
60	10.0	67	10.0
94	9.46	98	9.46
500	8.4	480	8.7
800	7.0		

¹Bolting silk, 14 openings to 1 cm.

²Ca. 10 openings to 1 cm.

³Grit gauze, 9 openings to 1 cm.

⁴Ca. 7 openings to 1 cm.

NOVEMBER, 1904.

STATION S.R. 164.			STATION S.R. 175.		
Depth in Fath.	Temp.	Salinity.	Depth in Fath.	Temp.	Salinity.
1	13.2	—	0	10.9	35.44
10	13.2	—	10	10.7	—
50	11.2	35.55	50	10.7	—
100	10.6	—	90	10.0	—
150	10.4	35.62	200	9.5	35.39
200	10.23	35.59	400	9.05	35.48
350	9.78	35.70	670	4.5	35.46

FEBRUARY, 1905.

STATION S.R. 193.			STATION S.R. 197.		
Depth in Fath.	Temp.	Salinity.	Depth in Fath.	Temp.	Salinity.
0	9.6	35.41	0	9.5	35.43
10	9.4	—	10	9.7	—
50	9.5	—	50	9.5	35.34
100	9.55	35.39	100	9.6	35.41
300	9.57	35.41	200	9.6	35.37
480	9.2	—			

MAY, 1905.

STATION S.R. 224.			STATION S.R. 231.		
Depth in Fath.	Temp.	Salinity.	Depth in Fath.	Temp.	Salinity.
0	10.7	35.32	0	10.9	35.28
			10	9.9	—
			53	9.3	—
			100	9.3	35.23
			150	9.2	35.19
			300	8.9	—

In considering the physical conditions under which the tow-nettings were made we may treat of them in four groups according to the months in which the observations were made, one or two of the stations in each group being located in approximately the same position, viz., 40 to 50 miles N. by W. of Eagle Island, County Mayo.

The stations S.R. 139 and S.R. 140 taken in August, 1904, may be considered as identical in position. No salinity observations were taken, but, judging from the International Bulletin for that month, the north-eastward extension of the highly saline oceanic water was greatly reduced, the surface isohaline of 55.5 apparently stopping short at lat. 50° N.

In November, 1904, one station, S.R. 175, was taken in the usual position 40 miles N. by W. of Eagle Island, and the other, S.R. 164, 50 miles W.N.W. of Tearaght, County Kerry. The saline conditions as indicated by the observations and the International charts show a tongue of water of fairly high salinity, reaching up from the southward and keeping close in to the coast, the base of the tongue off Tearaght being considerably saltier than its northward extension. The Tearaght station thus differs from the rest both in its southern position and consequent

high salinity, and also in its moderate depth, so that faunistic differences must not be ascribed to one cause without consideration of the other.

The two stations taken in February, 1905, may be considered together. The salinity conditions during that month were practically identical with those of November, 1904, but the temperature of the water showed a fall of about 1° C. in the upper layers.

In May, 1905, observations show that the flow of highly saline water from the southward, while continuing its northward extension even further than in February, had moved away from the coast, and sweeping far outside the Porcupine Bank, had stretched thence N.E. to the North of Scotland, the water on station S.R. 231 off Eagle Island falling to 35.28 at the surface, and 35.19 at 150 fathoms, and on station S.R. 224 taken outside the Porcupine Bank only reaching 35.32 at the surface.

Applying these considerations to the faunistic lists we should expect to find that stations S.R. 139, S.R. 140, and S.R. 231, taken when the southerly flow was farthest from the coast, contained the smallest proportion of southern species, while in S.R. 164 the presence of southern forms should be more noticeable than in the rest. Stations S.R. 175, S.R. 193, and S.R. 197 should also contain a high southern percentage, while the position of S.R. 224, 180 miles from shore, should counterbalance its lower salinity. These four sub-divisions I have referred to respectively as N. S. M. and O.

These expectations are not very fully borne out by the results, probably because the effects of the periodic northerly drift are greatly diminished at the depths at which most of the specimens were taken.

Putting aside eleven species as being too small for capture except in fine silk nets, and 101 species which may be regarded as indigenous, being common to the stations of both high and low salinity, we find that there are twenty-five species peculiar to N. or N. and O. Nine of these are new, and may or may not represent northern forms. Two, *Cetropages hamatus* and *Temora longicornis*, are members of the coastal fauna, and with them should probably be reckoned *Euchirella rostrata*. One, *Undinella oblonga*, is only known as Polar, and the remaining eleven are probably temperate N. Atlantic forms, six of them being species recently described by Prof. G. O. Sars from the Prince of Monaco's collections.

Taking next those species which occur in M. or S. but not in N., we find that out of twenty-four species there are nine which may be regarded as of Southern origin. These are:—

- | | |
|-------------------------------------|---------------------------------|
| <i>Calanus gracilis.</i> | <i>Xanthocalanus typicus.</i> |
| <i>Calocalanus styliremis.</i> | * <i>Phaenna spinifera.</i> |
| * <i>Clausocalanus arcuicornis.</i> | <i>Pleuromamma abdominalis.</i> |
| * <i>Aetideus Giesbrechti.</i> | * <i>Augaptilus palumboi.</i> |
| * <i>Euchaeta acuta.</i> | |

The majority of these, which I have marked with an asterisk, are more or less epiplanktonic in their habits, and possibly they may all prove to be so. The remaining fifteen are made up of five new species, one, *Haloptilus acutifrons*, which ranges to the Arctic Ocean, and nine of whose distribution not much is known.

Of the four species peculiar to O., one, *Scolecithrix valida*, is new, and the remainder, *Eucalanus attenuatus*, *Lucicutia longiserrata* and *Augaptilus pavoninus* may, I think, be regarded as oceanic species, the position being probably a more important factor than the salinity.

The number of new species described is thirty, three of them being made types of new genera, the list being as follows:—

<i>Mimocalanus cultrifer</i> , gen. et sp. nov.,	<i>Scolecithrix valida</i> ,
<i>Mimocalanus nudus</i> ,	<i>Lucicutia lucida</i> ,
<i>Orycalanus spinifer</i> , gen. et sp. nov.,	<i>Heterorhabdus robustus</i> ,
<i>Spinocalanus spinosus</i> ,	<i>Haloptilus tenuis</i> ,
<i>Chiridius gracilis</i> ,	<i>Haloptilus jons</i> ,
<i>Gaidius validus</i> ,	<i>Augaptilus facilis</i> ,
<i>Gaidius parvispinus</i> ,	<i>Augaptilus similis</i> ,
<i>Euchirella Wolfendeni</i> ,	<i>Augaptilus horridus</i> ,
<i>Euchaeta Sarsi</i> ,	<i>Augaptilus anceps</i> ,
<i>Euchaeta Scotti</i> ,	<i>Phyllopus Helgae</i> ,
<i>Euchaeta quadrata</i> ,	<i>Phyllopus impar</i> ,
<i>Euchaeta rubicunda</i> ,	<i>Candacia gracilimana</i> ,
<i>Valdiviella insignis</i> ,	<i>Paroithona parvula</i> , gen. et sp. nov.,
<i>Undinella brevipes</i> ,	<i>Oncaea exigua</i> ,
<i>Scolecithrix gracilipes</i> ,	<i>Oncaea obscura</i> ,
<i>Scolecithrix globiceps</i> ,	<i>Lubbockia brevis</i> .

Four of these have already been recorded by me (1905) from the west coast of Ireland under pre-existing names, but I have since been convinced of their specific distinctness. *Chiridius gracilis* accordingly replaces the record of *Chiridius Poppei*. *Heterorhabdus robustus* that of *Heterorhabdus vipera*, and *Phyllopus Helgae* and *Phyllopus impar* must jointly take the place of *Phyllopus bidentatus*.

As the collections were mostly made just outside the 1,000-fathom line, it is pretty certain that all the species enumerated are to be found either permanently or periodically within the British-and-Irish deep-water area, though absolute proof is only adducible in the case of those taken on stations S.R. 164, S.R. 175, and S.R. 224.

TABLE OF OCCURRENCE OF SPECIES.

The symbols indicate the relative abundance of the various species in each townetting, their signification being as follows:—

- A = abundant or over 45%.
C = common or 20-45%.
M = moderate or 10-20%.
F = few or 5-10%.
+ very few or less than 5%.

TABLE OF OCCURRENCE OF SPECIES.

Station No.	S.R. 139.								S.R. 140.				S.R. 164.			S.R. 175.			
	0.	100.	200.	400.	600.	800.	1,000.†	1,000.§	0.	330.	530.	730.§	100.	200.	350.‡	600.†	600.‡		
Depth in Fathoms.																			
1	Calanus finmarchicus, ..	+	+	F.	F.	M.	M.	M.	+	+	M.	F.	..	..	+	M.	F.	M.	
2	C. hyperboreus, ..	..	..	..	..	..	..	+	+	..	..	..	..	..	..	..	..	..
3	C. tenuicornis, ..	..	+	..	..	..	..	..	..	..	..	..	..	..	..	..	+	+
4	C. gracilis, ..	..	..	..	..	..	..	..	..	..	..	..	+	..	..	..	+	..
5	Megacalanus princeps, ..	..	..	..	..	..	..	..	+	..	..	..	..	..	..	..	..	..
6	M. longicornis, ..	..	..	..	..	..	..	..	+	..	..	..	..	..	..	..	..	+
7	Eucalanus elongatus, ..	..	+	..	+	+	+	+	+	+	+	+	+	..	..	M.	+	F.	
8	E. crassus, ..	..	..	+	+	..	..	+	+	..	..	+	+	..	..	..	+	+	+
9	E. attenuatus, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
10	Rhincalanus nasutus, ..	+	+	+	+	+	+	+	..	..	+	+	+	+	..	F.	+	F.	
11	Paracalanus parvus, ..	C.	+	+	+	F.	+	+	..	A.	+	F.	..	F.	+	..	+	..	
12	Calocalanus styliremis, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
13	Mimocalanus cultrifer, ..	..	..	..	+	+	+	+	..	..	..	..	..	..	..	..	..	+	..
14	M. nudus, ..	..	..	..	..	..	+	..	..	..	..	..	..	..	..	..	..	..	..
15	Oxycalanus spinifer, ..	..	..	..	..	..	..	+	..	..	..	..	..	..	..	..	..	..	..
16	Spinocalanus abyssalis, ..	..	..	+	+	+	+	+	..	..	+	+	..	..	..	..	+	+	+
17	S. magnus, ..	..	..	..	+	+	+	+	..	+	+	+	..	..	..	..	+	+	..
18	S. spinosus, ..	..	..	..	..	..	..	+	+	..	..	..	+	..	..	..	+	+	+
19	Pseudocalanus elongatus, ..	..	+	+	+	+	+	+	..	..	..	..	..	+	..	..	..	+	..
20	Microcalanus sp., ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
21	Clausocalanus arcuicornis, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	+	..	..	..	..
22	Ctenocalanus vanus, ..	..	+	..	+	+	..	+	..	..	+	..	..	+	..	..	..	+	..
23	Actideus armatus, ..	..	F.	..	+	+	+	+	..	+	+	+	..	F.	+	..	+	+	+
24	A. Giesbrechti, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	+	..	..	..	..
25	Faroella multiserrata, ..	..	..	..	+	+	..	+	..	..	..	+	..	..	..	..	..	+	+
26	Chiridius armatus, ..	..	..	..	+	+	+	+	..	..	+	..	..	..	..	..	F.	+	+
27	C. gracilis, ..	..	..	..	+	..	+	+	..	..	+	..	..	..	..	..	..	+	+
28	Pseudeuchaeta brevicauda, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
29	Gaidius tenuispinus, ..	..	..	..	+	..	+	+	..	..	+	+	..	..	..	..	..	+	+
30	G. affinis, ..	..	..	..	..	..	+	..	..	..	..	..	..	..	..	..	..	..	..
31	G. notacanthus, ..	..	..	..	..	..	..	..	+	..	..	..	..	..	..	..	..	..	+
32	G. parvispinus, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	+
33	G. validus, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
34	Gaetanus pileatus, ..	..	..	+	+	..	+	+	..	..	+	..	+	..	..	+	+	+	+

* Fine silk net.

† Medium silk net.

‡ Coarse silk triangular net.

TABLE OF OCCURRENCE OF SPECIES.

S.R. 193.						S.R. 197.						S.R. 224.	S.R. 231.				Station No.
0.	230.	330.	530.	630.*	630.†	80.	280.	480.	580.	680.*	680.†	700.‡	200.	400.	760.†	1,150.‡	Depth in Fathoms.
..	+	C.	..	F.	C.	..	C.	C.	M.	F.	C.	+	C.	C	F	+	Calanus finmarchicus.
..	+	+	+	+	+	+	..	C. hyperboreus.
+	+	+	C. tenuicornis.
..	+	C. gracilis.
..	+	+	Megacalanus princeps.
..	+	+	+	+	+	+	M. longicornis.
..	+	+	+	..	+	+	F.	+	+	+	+	+	..	+	Eucalanus elongatus.
..	+	+	+	+	+	E. crassus.
..	+	E. attenuatus.
..	+	+	+	+	+	..	+	+	+	+	+	F.	+	+	+	+	Rhincalanus nasutus.
..	Paracalanus parvus.
..	+	Calocalanus styliremis.
..	Mimocalanus cultrifer.
..	M. nudus.
..	Oxycalanus spinifer.
..	..	+	..	+	+	..	+	+	+	+	Spinocalanus abyssalis.
..	+	+	..	+	F.	+	+	..	..	..	..	S. magnus.
..	..	+	..	+	+	+	+	S. spinosus.
+	+	Pseudocalanus elongatus.
..	+	Microcalanus sp.
..	Clausocalanus arcuicornis.
+	Ctenocalanus vanus.
..	+	+	Aetideus armatus.
..	A. Giesbrechti.
..	+	+	+	+	+	+	+	Faroella multiserrata.
..	..	+	+	+	F.	..	+	+	+	+	+	+	..	..	F.	..	Chiridius armatus.
..	+	..	+	+	+	..	+	+	C. gracilis.
..	+	+	Pseudeuchaeta brevis-cauda.
..	+	+	..	+	..	+	+	+	+	..	+	+	..	Gaidius tenuispinus.
..	+	+	+	G. affinis.
..	+	+	+	G. notacanthus.
..	+	+	+	G. parvispinus.
..	+	G. validus.
..	..	+	F.	+	+	..	+	+	+	+	+	F.	..	+	+	+	Gaetanus pileatus.

‡ Mosquito-net triangular net.

‡ Meso-plankton trawl.

TABLE OF OCCURRENCE OF SPECIES—continued.

Station No.,	S.R. 139.								S.R. 140.				S.R. 164.			S.R. 175.		
	Depth in Fathoms,	0.	100.	200.	400.	600.	800.	1,000.†	1,000.§	0.	330.	530.	730.§	100.	200.	350.‡	600.†	600.‡
35	Gaetanus miles, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
36	G. latifrons, ..	..	..	..	..	..	..	..	+	..	..	..	+	..	..	+	+	+
37	G. major, ..	..	..	..	+	+	+	+	..	+	+	+	..	..	+	+	+	+
38	G. minor, ..	..	..	..	+	..	..	..	+	..	..	..	..	..	+	+	+	+
39	Undeuchaeta major, ..	..	..	..	..	..	+	..	+	..	+	+	+	..	..	+	+	+
40	U. minor, ..	..	..	..	..	..	+	..	..	..	+	+	..	..	F	+	+	+
41	Chirundina Streetsi, ..	..	..	..	..	..	..	..	+	..	..	+	+	..	..	+	+	+
42	Euchirella messinensis, ..	+	+	..	..	..	..	..	..	..	..	..	+	..	..	+	..	+
43	E. galeata, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	+	+	..
44	E. maxima, ..	..	..	..	..	..	+	..	+	..	..	..	..	..	..	+	+	..
45	E. curticauda, ..	+	+	..	..	..	+	+	+	..	..	..	+	..	..	+	+	+
46	E. rostrata, ..	..	+	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
47	E. Wolfendeni, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
48	E. obtusa, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
49	Euchaeta acuta, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	+	+	..
50	E. norvegica, ..	..	..	+	+	+	+	+	A.	..	+	+	A.	..	..	M.	+	C.
51	E. barbata, ..	..	..	..	..	..	..	..	+	..	..	..	+	..	..	..	..	..
52	E. Sarsi, ..	..	..	..	..	..	..	..	+	..	..	..	..	..	..	..	..	..
53	E. Scotti, ..	..	..	..	..	..	..	..	+	..	..	..	+	..	..	..	..	..
54	E. quadrata, ..	..	..	..	..	..	..	..	..	..	..	..	+	..	..	+	..	..
55	E. rubicunda, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
56	E. tonsa, ..	..	..	..	+	..	..	+	+	..	..	..	..	..	..	..	+	+
57	E. bisinuata, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
58	Valdiviella insignis, ..	..	..	..	..	..	..	..	..	..	..	..	+	..	..	..	..	..
59	Chiridiella macrodactyla, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	+
60	Phaenna spinifera, ..	..	..	..	..	..	..	..	..	..	..	..	..	+	..	+	+	..
61	Xanthocalanus typicus, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
62	X. Greeni, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
63	Cephalophanes refulgens, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
64	X. pinguis, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	+
65	Onchocalanus cristatus, ..	..	..	..	..	..	..	..	+	..	..	..	+	..	..	..	..	..
66	O. hirtipes, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
67	Cornucalanus chelifer, ..	..	..	..	..	..	+	..	+	..	..	..	+	..	..	..	+	..
68	Undinella oblonga, ..	..	..	..	..	..	..	+	..	..	..	..	..	..	..	..	..	..
69	U. brevipes, ..	..	..	..	..	..	..	+	..	..	..	..	..	..	..	..	..	..

* Fine silk net.

† Medium silk net.

‡ Coarse silk triangular net.

TABLE OF OCCURRENCE OF SPECIES—*continued.*

S.R. 193.						S.R. 197.						S.R. 224.	S.R. 231.				Station No.
0.	230.	330.	530.	630.*	630.†	80.	280.	480.	580.	680.*	680.†	700.‡	200.	400.	750.†	1,150.‡	Depth in Fathoms.
..	G. miles.
..	G. latifrons.
..	G. major.
..	G. minor.
..	Undeuchaeta major.
..	U. minor.
..	Chirundina Streetsi.
..	Euchirella messinensis.
..	E. galeata.
..	E. maxima.
..	E. curticauda.
..	E. rostrata.
..	E. Wolfendeni.
..	E. obtusa.
..	Euchaeta acuta.
..	E. norvegica.
..	E. barbata.
..	E. Sarsi.
..	E. Scotti.
..	E. quadrata.
..	E. rubicunda.
..	E. tonsa.
..	E. bisinuata.
..	Valdiviella insignis.
..	Chiridiella macrodactyla.
..	Phaenna spinifera.
..	Xanthocalanus typicus.
..	X. Greenl.
..	Cephalophanes refulgens.
..	X. pinguis.
..	Onchocalanus cristatus.
..	O. hirtipes.
..	Cornucalanus chelifer.
..	Undinella oblonga.
..	U. brevipes.

§ Mosquito-net triangular net.

|| Meso-plankton trawl.

TABLE OF OCCURRENCE OF SPECIES—*continued.*

Station No.	S.R. 139.								S.R. 140.				S.R. 164.			S.R. 175.		
	0.	100.	200.	400.	600.	800.	1,000.†	1,000.§	0.	330.	530.	730.§	100.	200.	350.†	600.†	600.†	
70	Scolecithricella dentata,	..	..	+	+	..	+	+	..	+	..	..	..	F.	+	+	+	
71	S. ovata, .. ..	..	..	..	+	+	+	+	..	+	+	+	..	..	..	+	..
72	S. minor, .. ..	..	+	..	+	+	+	+	..	+	..	..	..	+	..	+	..
73	Scolecithrix magna,	..	..	..	+	..	..	..	+	..	+	+	+	..	..	+	+	F.
74	S. echinata, .. ..	..	..	..	+	..	+	..	..	..	..	+	..	..	+	+	..
75	S. gracilipes,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
76	S. obtusifrons,	..	..	..	+	..	..	+	..	..	+	..	..	..	..	..	+
77	S. globiceps,	..	..	..	..	..	..	..	+	..	..	..	..	..	..	..	..
78	S. valida, .. ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
79	S. robusta, .. ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	+
80	Scottocalanus securifrons,	..	..	..	..	..	..	..	..	..	..	..	..	..	+	+	+
81	S. persecan,	..	..	..	..	..	..	..	..	..	..	..	..	..	+	..	+
82	Lophothrix frontalis, ..	..	..	..	..	+	..	..	+	..	+	..	+	..	..	..	..
83	Centropages typicus, ..	..	..	+	+	..	+	+	..	+	+	..	..	..	..	+	..
84	C. hamatus, .. ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
85	Temora longicornis, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
86	Temoropia mayumbaensis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
87	Metridia lucens, ..	+	C.	C.	M.	M.	C.	C.	..	+	C.	C.	..	+	F.	F.	C.	+
88	M. venusta, .. ..	..	..	..	+	+	+	+	..	..	+	..	..	..	..	+	+	+
89	M. brevicauda,	..	..	..	+	+	+	+	..	+	..	+	..	..	..	+	+	+
90	M. princeps,	..	..	..	..	..	..	+	+	..	..	..	+	..	..	+	+	+
91	Pleuromamma abdomin-	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	+	+
92	alis. P. robusta, .. ..	..	+	..	+	+	+	+	..	+	+	+	..	..	..	M.	+	F.
93	P. xiphias, .. ..	..	..	..	..	..	+	..	..	..	..	..	..	..	..	+	+	+
94	P. gracilis, .. ..	..	..	..	..	..	..	..	..	..	..	..	..	..	+	..	..	+
95	Lucicutia grandis,	..	..	..	..	..	+	+	+	..	..	..	+	..	..	..	..	..
96	L. magna, .. ..	..	..	..	+	+	+	+	..	..	+	+	..	..	..	+	+	+
97	L. lucida, .. ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
98	L. curta, .. ..	..	..	..	..	+	+	+	..	+	+	+	..	..	..	..	+	+
99	L. longiserrata,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
100	L. flavicornis,	..	..	..	..	..	..	+	..	..	..	..	..	..	+	..	..	..
101	Heterorhabdus norvegicus	..	..	..	+	+	+	+	..	+	+	+	..	..	..	..	+	+
102	H. spinifrons,	..	..	..	..	..	..	..	..	..	..	..	..	..	+	..	+	+
103	H. abyssalis,	..	..	..	..	+	..	+	..	..	..	..	..	..	..	..	..	..
104	H. robustus,	..	..	..	..	..	+	+	..	..	+	..	..	..	..	..	..	..

* Fine silk net.

† Medium silk net.

‡ Coarse silk triangular net.

TABLE OF OCCURRENCE OF SPECIES—*continued*.

S.R. 193.						S.R. 197.					S.R. 224.	S.R. 231.				Station No.	
0.	230.	330.	530.	630. ^o	630. [†]	80.	280.	480.	580.	680. ^o	680. [†]	700.||	200.	400.	750. [†]	1,150.||	Depth in Fathoms.
..	+	+	+	+	Scolecithricella dentata.
..	..	+	+	..	+	+	+	..	+	+	+	..	S. ovata.
..	+	S. minor.
..	..	+	..	+	+	..	+	+	..	+	+	+	..	+	+	+	Scolecithrix magna.
..	+	+	+	+	S. echinata.
..	+	..	+	+	+	S. gracilipes.
..	+	+	+	..	+	+	+	..	+	+	+	S. obtusifrons.
..	+	S. globiceps.
..	+	S. valida.
..	+	+	+	..	+	+	S. robusta.
..	+	+	+	+	+	+	+	Scottoalanus securifrons.
..	..	+	..	+	+	+	+	+	+	S. persecan.
..	..	+	+	..	+	+	+	..	+	+	+	+	Lophothrix frontalis.
..	Centropages typicus.
..	+	C. hamatus.
..	+	Temora longicornis.
..	+	+	Temoropia mayumbaensis.
A.	A.	C.	M.	M.	M.	A.	C.	C.	F.	M.	C.	..	A.	C.	F.	+	Metridia lucens.
..	..	+	..	+	+	..	F.	+	..	+	+	+	..	+	..	..	M. venusta.
..	..	+	..	+	+	F.	..	+	+	..	..	+	..	..	M. brevicauda.
..	..	+	..	+	+	..	+	+	+	..	+	+	+	+	M. princeps.
..	+	+	..	+	Pleuromamma abdomin-
..	+	C.	..	+	M.	F.	M.	+	M.	+	F.	..	..	C.	F.	..	alis.
..	+	+	+	+	+	+	P. robusta.
..	P. xiphias.
..	+	+	+	+	+	+	+	P. gracilis.
..	F. Lucicutia grandis.
..	..	+	+	+	+	+	+	+	..	+	..	+	L. magna.
..	L. lucida.
..	..	+	..	+	+	+	+	+	+	+	L. curta.
..	L. longiserrata.
..	I. flavicornis.
..	M.	+	F.	..	+	+	F.	+	+	+	+	+	+	+	Heterorhabdus norvegicus.
..	E.	..	+	..	+	..	..	+	+	+	..	..	..	..	H. spinifrons.
..	H. abyssalis.
..	H. robustus.

† Mosquito-net triangular net.

|| Meso-plankton trawl.

TABLE OF OCCURRENCE OF SPECIES—*continued.*

Station No.,	S.R. 139.								S.R. 140.				S.R. 164.			S.R. 175.		
	Depth in Fathoms.	0	100.	200.	400	600	800.	1,000.†	1,000.‡	0.	330.	530.	730.§	100.	200.	350.‡	600.†	600.‡
105	<i>Heterorhabdus Grimaldii</i>,	..	..	..	..	..	+	..	..	..	..	..	..	..	..	..	..	..
106	<i>H. longicornis</i>,	..	..	..	+	..	+	+	..	+	+	+	..	..	..	..	+	+
107	<i>Mesorhabdus annectens</i>,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	+
108	<i>Disseta palumboi</i>,	..	..	..	..	..	..	..	+	..	..	..	+	..	..	..	..	..
109	<i>Haloptilus longicornis</i>,	..	..	..	..	..	..	..	..	..	..	..	..	+	+	+	+	+
110	<i>H. acutifrons</i>,	..	..	..	..	..	..	..	..	..	..	..	..	+	+	..	+	+
111	<i>H. tenuis</i>,	..	..	..	..	..	+	..	..	..	..	..	..	..	..	..	..	+
112	<i>H. fons</i>,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	+
113	<i>Augaptilus elongatus</i>,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	+
114	<i>A. nodifrons</i>,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	+	..
115	<i>A. laticeps</i>,	..	..	..	+	..	..	+	..	..	..	..	..	..	..	..	+	+
116	<i>A. brevicaudatus</i>.	..	..	..	..	..	..	..	..	..	..	..	..	..	+	+	+	+
117	<i>A. facilis</i>,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
118	<i>A. gibbus</i>,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
119	<i>A. palumboi</i>,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	+	..
120	<i>A. bullifer</i>,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
121	<i>A. truncatus</i>,	..	..	..	..	..	..	..	+	..	..	..	..	..	..	..	..	..
122	<i>A. similis</i>,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
123	<i>A. magnus</i>,	..	..	..	..	+	..	+	+	..	..	..	+	..	..	+	+	+
124	<i>A. angustus</i>,	..	..	..	..	+	..	..	..	..	..	..	+	..	..	+	+	..
125	<i>A. filigerus</i>,	..	..	..	..	..	+	..	..	..	..	..	..	..	..	+	+	+
126	<i>A. Rattrayi</i>,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	+	..	+
127	<i>A. horridus</i>,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
128	<i>A. longicaudatus</i>,	..	..	..	..	..	+	..	..	..	..	..	+	..	..	+	+	+
129	<i>A. anceps</i>,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
130	<i>A. megalurus</i>,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	+	+
131	<i>Pontoptilus muticus</i>,	..	..	..	..	..	..	..	..	..	..	..	+	..	..	..	..	..
132	<i>P. abbreviatus</i>,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
133	<i>Arietellus simplex</i>,	..	..	..	..	..	..	..	+	..	..	..	+	..	..	..	..	..
134	<i>A. pavoninus</i>,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
135	<i>A. plumifer</i>,	..	..	..	..	..	..	..	+	..	..	..	+	..	..	+	..	+
136	<i>Paraugaptilus Buchani</i>,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
137	<i>Phyllopus Helgae</i>,	..	..	..	+	+	+	+	..	..	+	+	..	..	..	+	+	+
138	<i>P. impar</i>,	..	..	..	..	+	..	+	..	..	..	..	..	..	..	..	..	+
139	<i>Candacia rotundata</i>,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	+	+	+

* Fine silk net.

† Medium silk net.

‡ Coarse silk triangular net.

TABLE OF OCCURRENCE OF SPECIES—continued.

S.R. 193.						S.R. 197.						S.R. 224.	S.R. 231.				Station No.
0.	230.	330.	530.	630.†	630.†	80.	280.	480.	580.	680.‡	680.†	700.‡	200.	400.	750.†	1,150.‡	Depth in Fathoms.
..	+	+	Heterorhabdus Grimaldii.
..	+	+	+	..	+	+	+	+	+	H. longicornis.
..	+	+	+	Mesorhabdus annectens.
..	+	+	+	Disseta palumboi.
..	+	+	..	+	+	Haloptilus longicornis.
..	+	H. acutifrons.
..	+	H. tenuis.
..	+	H. fons.
..	+	+	Augaptilus elongatus.
..	+	+	+	+	+	+	A. nodifrons.
..	+	+	+	+	A. laticeps.
..	+	+	+	+	A. brevicaudatus.
..	+	A. facilis.
..	+	A. gibbus.
..	+	+	+	A. palumboi.
..	+	A. bullifer.
..	+	A. truncatus.
..	+	+	A. similis.
..	+	+	+	+	+	..	+	+	+	A. n.agnus.
..	+	+	+	+	A. angustus.
..	+	+	+	+	A. fligerus.
..	+	+	+	+	A. Rattrayi.
..	+	+	+	+	A. horridus.
..	+	+	+	+	+	+	A. longicaudatus.
..	A. anceps.
..	+	+	+	A. megalurus.
..	Pontoptilus muticus.
..	+	+	+	P. abbreviatus.
..	+	+	Arietellus simplex.
..	+	A. pavoninus.
..	+	A. plumifer.
..	+	Parangaptilus Buchani
+	+	+	..	+	+	+	..	+	+	+	..	Phyllopus Helgas.
..	P. impar.
..	+	Candacia rotundata.

‡ Mosquito-net triangular net.

‡ Meso-plankton trawl.

TABLE OF OCCURRENCE OF SPECIES—*continued.*

Station No.,		S.R. 139.							S.R. 140.				S.R. 164.			S.R. 175.		
		0.	100.	200.	400.	600.	800.	1,000 †	1,000 ‡	0.	330.	530.	730 ‡	100.	200.	350. †	600. †	600. †
Depth in Fathoms,																		
140	<i>Candacia norvegica</i>, ..	..	..	..	..	+	+	+	..	..	..	+	..	..	..	..	+	+
141	<i>C. gracilimana</i>, ..	..	..	..	+	..	..	..	..	..	+	..	..	..	..	..	..	..
142	<i>Anomalocera Patersoni</i>, ..	..	..	..	..	..	..	..	..	+	..	..	..	..	..	..	..	..
143	<i>Bathypontia elongata</i>, ..	..	..	..	..	..	..	..	..	+	..	..	..	..	..	..	..	..
144	<i>Acartia Clausi</i> , ..	A.	C.	C.	C.	A.	C.	C.	..	F.	M.	C.	..	A.	A.	..	M.	+
145	<i>Mormonilla phasma</i>, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	+
146	<i>M. minor</i>, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
147	<i>Oithona similis</i>, ..	+	+	..	+	+	..	+	..	+	..	+	..	..	..	..	..	..
148	<i>O. plumifera</i>, ..	..	..	M.	+	+	+	+	F.	..	..	F.	F.	..	F.	F.	..	F.
149	<i>Paroithona parvula</i>, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
150	<i>Microsetella rosea</i>, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
151	<i>Clytemnestra rostrata</i>, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
152	<i>Aegisthus mucronatus</i>, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	+
153	<i>Monstrilla longicornis</i>, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
154	<i>Oncaea mediterranea</i>, ..	..	..	..	..	..	..	+	..	..	..	..	..	..	..	..	..	..
155	<i>O. conifera</i>, ..	..	+	M.	F.	F.	F.	M.	F.	..	+	M.	M.	..	..	..	..	+
156	<i>O. ornata</i>, ..	..	..	..	..	..	..	+	+	..	..	..	+	..	..	..	..	+
157	<i>O. notopus</i>, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
158	<i>O. subtilis</i>, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
159	<i>O. minuta</i>, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
160	<i>O. exigua</i>, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
161	<i>O. obscura</i>, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
162	<i>Conaea rapax</i>, ..	..	..	..	+	..	+	+	..	..	..	..	+	..	..	..	..	+
163	<i>Lubbockia brevis</i>, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
164	<i>Corina granulosa</i>, ..	..	..	..	..	..	..	..	..	..	..	..	..	+	..	..	..	..

* Fine silk net.

† Medium silk net.

‡ Coarse silk triangular net.

TABLE OF OCCURRENCE OF SPECIES—*continued*.

S.R. 193.						S.R. 197.						S.R. 224.	S.R. 231.				Station No.
0.	230.	330.	530.	630.*	630.†	80.	280.	480.	580.	680. [§]	680.†	700.‡	200.	400.	750.†	1,150.‡	Depth in Fathoms.
..	+	+	+	+	..	+	+	+	..	Candacia norvegica.
..	C. gracilimana.
..	+	+	Anomalocera Patersoni.
..	+	+	+	Bathypontia elongata.
+	+	+	+	Acartia Clausi.
..	+	Mormonilla phasma
..	+	+	M. minor.
A.	F.	..	..	..	..	..	+	..	..	..	..	..	..	Oithona similis.
+	M.	+	..	..	..	..	F.	..	..	..	..	..	..	O. plumifera.
..	F.	..	..	..	..	..	+	..	..	..	..	..	..	Paroithona parvula.
..	+	+	Microsetella rosea.
..	+	Clytemnestra rostrata.
..	+	..	+	Aegisthus mucronatus.
..	+	Monstrilla longicornis.
..	Oncaea mediterranea.
..	C.	+	..	..	+	..	C.	..	..	..	+	..	..	O. confiera.
..	F.	..	..	..	..	..	+	..	..	..	..	..	..	O. ornata.
..	F.	..	..	..	..	..	+	..	..	..	..	..	..	O. notopus.
+	+	O. subtilis.
..	+	F.	..	..	..	..	..	..	O. minuta.
..	F.	..	..	..	..	..	+	..	..	..	..	..	..	O. exigua.
..	+	+	O. obscura.
..	+	+	Conaea rapax.
..	+	Lubbockia brevis.
..	Corina granulosa.

§ Mosquito-net triangular net.

‡ Meso-plankton trawl.

ORDER **COPEPODA.**SUB-ORDER **Gymnoplea.**TRIBE **AMPHASKANDRIA.**FAMILY **CALANIDAE.**GENUS **Calanus**, Leach.**Calanus finmarchicus** (Gunner).*Cetochilus septentrionalis*, Goodsir, 1843.*Cetochilus helgolandicus*, Claus, 1863.*Calanus helgolandicus*, G. O. Sars, 1903.

If Prof. G. O. Sars' view be adopted the name of this species should stand as *C. helgolandicus* as all the specimens met with belonged to the smaller species or variety.

Occurrence.—This species appears to be widely distributed at all depths investigated, and, next to *Metridia lucens* and *Acartia Clausi*, is probably the commonest copepod of the deep water adjoining our shores, though it does not occur there in such vast swarms as are found in the coastal waters of lower salinity.

Calanus hyperboreus, Kröyer.

Occurrence.—This is one of those species whose headquarters are within the Arctic Circle, but whose range is continued southwards in the colder layers of deep water. It occurred on five out of the eight stations, at depths of from 630 to 1,000 fathoms, but only very few specimens were met with at any one time.

Calanus gracilis, Dana.

Occurrence.—This is doubtless usually a surface species with an occasional small vertical distribution; but the fact that of the three captures here recorded one was at 600 and one at 630 fathoms, leads one to suppose that it sometimes descends to greater depths.

Calanus tenuicornis, Dana.

Occurrence.—This, like the preceding species, is a doubtful inhabitant of the greater depths, but the appearance of a few specimens in the fine-meshed townets at 600, 630 and 680 fathoms is in its favour, though there is a possibility that the captures may have been made during the ascent of the nets. The two other occurrences here recorded are from the surface and 100 fathoms.

GENUS **Megacalanus**, Wolfenden.**Megacalanus princeps** (Brady).

Calanus princeps, Brady, 1883.

Macrocalanus princeps, Sars, 1905.

Heterocalanus medius, Wolfenden, 1906.

nec *Megacalanus princeps*, Wolfenden, 1904.

nec *Megacalanus princeps*, Wolfenden, 1905.

The simultaneous recapture of one of the finest of Brady's "Challenger" copepods by the Prince of Monaco, Dr. Wolfenden, the "Helga," and, though unrecorded, the "Thor," is interesting, and illustrates the renewed attention which is now being paid to deep-water plankton investigations.

As regards the inclusion of *Heterocalanus medius* in the synonymy of this species, I have compared the type specimen of *M. princeps* in the British Museum with Dr. Wolfenden's description of *H. medius* (1906), and I cannot avoid the conclusion that they are identical.

Occurrence.—This species is confined to great depths, and is much scarcer than its fellow *M. longicornis*. It was met with on three stations, viz., S.R. 139, S.R. 224 and S.R. 231, one specimen on the first at 1,000 fathoms and four on each of the others at 700 and 1,150 fathoms respectively.

Megacalanus longicornis (G. O. Sars).

Megacalanus princeps, Wolfenden, 1904.

Macrocalanus longicornis, G. O. Sars, 1905.

Megacalanus Bradyi, Wolfenden, 1905.

Occurrence.—This species is almost always captured when fishing between 600 and 1,000 fathoms, but never in large numbers and frequently immature. Possibly the fully mature individuals may be found more plentifully at greater depths.

GENUS **Eucalanus**, Dana.**Eucalanus elongatus** (Dana).

Occurrence.—One of the most widely distributed copepods in the N.E. Atlantic, and apparently more common in autumn and winter, but this may perhaps be due to variations in salinity.

It occurred on every station and in 25 out of the 34 gatherings.

Eucalanus attenuatus (Dana).

Occurrence.—The headquarters of this species evidently do not lie off the west coast of Ireland, as it was only met with once during the period here dealt with, viz., on station S.R. 224, 700 fathoms, three specimens.

Eucalanus crassus, Giesbr.

Occurrence.—This species seems to be a regular member of the skoto-plankton as well as occurring at intermediate depths. It is always met with in very small numbers.

GENUS **Rhincalanus**, Dana.**Rhincalanus nasutus**, Giesbr.

Occurrence.—This species, like *Eucalanus elongatus*, is a noticeable feature of most townettings from the west coast of Ireland taken over 40 miles from shore. It was taken in 29 out of the 34 gatherings at all depths from the surface to 1,150 fathoms.

GENUS **Paracalanus**, Boeck.**Paracalanus parvus** (Claus).

Occurrence.—This species seems to be generally distributed between 500 fathoms and the surface, but is not invariably present. No conclusions can be drawn from its absence from the records of stations after S.R. 175, as the mesh of the serial townets used was too large to capture it with certainty. The same remark applies to all species of a similar size.

GENUS **Calocalanus**, Giesbr.**Calocalanus styliremis**, Giesbr.

Occurrence.—A single specimen was taken on station S.R. 197 in a 680-fathom townet, but it seems possible that the capture was made during the hauling of the net. The record, like that by Dr. Wolfenden of *Calocalanus pavo*, probably represents an accidental in-wandering from more southern regions.

GENUS **Mimocalanus**, nov.

Female—Cephalon imperfectly fused with first thoracic segment. Fourth and fifth thoracic segments separate. Rostrum absent. Abdomen four-jointed, symmetrical. Furca short. First antenna 24-jointed, joints 8 and 9 partially fused. Second antenna with branches of about equal length. Mandible with large two-branched palp; endopodite two-jointed, larger than exopodite. Maxilla with setae on all lobes well developed, of the *Paracalanus* type. First maxillipede of the *Paracalanus* type, none of the setae being excessively developed. Second maxillipede

of the *Paracalanus* type. First to fourth feet with jointing and setae as in *Spinocalanus*, except that the outer-edge spine on the first joint of the exopodite of the first foot is absent. Terminal spines of the exopodites of second to fourth feet very broad, with finely serrate margin. No spinules on the faces of the feet. Fifth feet absent.

Male unknown.

This genus in its outward form and proportions has a very close resemblance to *Spinocalanus*, and it is to this apparent mimicry that I have referred in giving it the above name. It further agrees with that genus in having five inner-edge setae on the third joints of the endopodites of the second to fourth feet, but differs in the partial separation of the 8th and 9th joints of the first antennae, and in the absence of spinules on the inner face of the swimming feet.

Pending the discovery of the male it seems advisable to place it between the genera *Spinocalanus* and *Paracalanus*, with which latter it agrees in the absence of fusion between joints 8 and 9 of the first antenna.

Mimocalanus cultrifer, gen. et sp. n.

Pl. I, figs. 5-9.

Female—length 1.44 mm.

Cephalothorax oblong ovate in dorsal view, somewhat contracted anteriorly, very slightly vaulted. Cephalon fused with the first thoracic segment, but showing the line of suture. Fourth and fifth thoracic segments showing a very distinct line of suture, the fifth segment produced into lateral extensions rounded at the ends.

Abdomen of four segments, measuring slightly more than one-fourth of the cephalothorax. Genital segment about as long as broad, very slightly swollen ventrally. Second to fourth segments each about half as long as the genital segment. Furcal rami about as long as broad, separated by rather more than their own width.

First antenna (Pl. I, fig. 5) broken in all specimens found, but is probably as long as the whole body, 23 or 24-jointed, joints 8 and 9 partially fused in some specimens but almost separate in others.

Second antenna with the branches of equal length. No setae on the first or second joints of the exopodite, one seta each on the third to sixth joints, terminal joint with one median and three distal setae.

Mandible with two setae on the second basal joint. The endopodite consists of two elongated joints, the first with three, the second with ten setae. The exopodite is somewhat shorter than the endopodite and bears six setae. The cutting edge of the mandible bears seven teeth, the distal tooth being about twice as long as the rest.

The maxilla is of the same form as in *Paracalanus parvus*, and the number of setae on it appears to correspond closely.

The first maxillipede (Pl. I, fig. 9) bears five large setae on the first lobe and three on each of the four succeeding lobes; one seta on the third lobe, and one on the fourth, being noticeably thicker than the rest.

The second maxillipede resembles in general form and number of setae that of *Paracalanus parvus*, but the proportionate length of the joints differs slightly, the fourth and fifth joints being equal and about twice as long as the third; the sixth joint is slightly longer than the fifth.

The first foot (Pl. I, fig. 8) has a three-jointed exopodite, the first joint being without setae or spines, the second joint with one outer-edge spine and one inner-edge seta, and the third joint with one outer-edge spine, one terminal seta, and four inner-edge setae. The endopodite bears four setae, the proximal inner-edge seta being much smaller than the rest. The second basal joint carries the usual curved seta engaging with the setose outer-edge process of the endopodite.

The second foot has a two-jointed endopodite, the first joint with one inner-edge seta and the second with two terminal and two inner-edge setae.

The third and fourth feet have each a three-jointed endopodite, the first and second joints with one and the third joint with five setae. The exopodites of the second to fourth feet are three-jointed, the first and second joints each with one outer-edge spine and one inner-edge seta, the third joint with three outer-edge and one terminal spine, and five inner-edge setae. The outer-edge spines are all very well developed, and the terminal spines have very broad laminae with finely serrate margin. There are about fifty serrations on the terminal spine of the second foot.

The fifth feet are absent.

Male unknown.

In figuring the appendages of this and the following species, *M. nudus*, I have not thought it necessary to give the same appendage twice, as the resemblance between the two, except as regards size, is so close that the same figures may well be used for both.

Occurrence.—This species was taken on two stations, viz.:—S.R. 139 and S.R. 175, at depths from 400 to 1,000 fathoms, and probably escaped capture or was overlooked owing to its small size on other occasions.

Mimocalanus nudus, sp. n.

Pl. I, figs. 1-4.

Female—length 2.64 mm.

Cephalon fused with first thoracic segment, slightly vaulted above, fourth and fifth thoracic segments fused, the lateral margins of the latter produced and rounded.

Abdomen measuring about one-fourth of the cephalothorax, genital segment slightly longer than the two succeeding segments taken together, very slightly swollen ventrally. Second and

third abdominal segments of about equal length, and slightly shorter than the anal segment. Furca about as long as broad, the furcal setae missing in my specimen.

First antenna incomplete, but probably slightly longer than the body.

Proportional length of joints in .01 mm.

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

The segmentation between joints 8 and 9 is indicated, but not noticeably.

The other appendages (Pl. I, figs. 1-4) are similar to those of *M. cultrifer*.

Male unknown.

It needs a close inspection to distinguish this species from *Spinocalanus magnus*, to which, in size and appearance, it approximates very closely, but the broadly laminate terminal spines of the swimming feet will at once serve to identify it under the microscope. Its much larger size separates it from *Mimocalanus nudus*, and probably the examination of a number of specimens will reveal other points of difference from that species.

Occurrence.—One specimen was taken on station S.R. 139 at a depth of 800 fathoms.

GENUS *Oxycalanus*, nov.

Female with cephalon fused with first thoracic segment. Fourth and fifth thoracic segments fused. Rostrum of two long slender ventrally directed points. Abdomen four-jointed, symmetrical. Furca short. First antenna 23-jointed, joints 8-9, and 24-25 being fused. Second antenna of the *Pseudocalanus* type, the exopodite being slightly longer than the endopodite. Mandible of the *Pseudocalanus* type, the endopodite and exopodite being about equal. Maxilla and first maxillipede of the *Pseudocalanus* type. Second maxillipede with a strong distal inner-edge spine on the first joint, but otherwise as in *Pseudocalanus*. First to fourth swimming feet with jointing and setae as in *Spinocalanus*, the posterior face of the endopodites with scanty spinulation. Fifth feet absent.

Male unknown.

This genus agrees with *Spinocalanus* in having five inner-edge setae on the third joints of the exopodites of the second to fourth swimming feet, and also in the spinules on the faces of their endopodites and on the lobes of the first maxillipede. It is, however, separated from that genus by the strong bifurcate rostrum, which resembles in some respects that of *Aetideus*.

Oxycalanus spinifer, gen. et sp. n.

Pl. I, figs. 11-17.

Female—length 2.32 mm.

Cephalothorax moderately elongate, elliptical in dorsal view. Cephalon fused with first thoracic segment, not vaulted, and

produced into a rostrum of two long straight points directed ventrally. Fourth and fifth thoracic segments fused, their lateral margins rounded and produced posteriorly, reaching almost to the middle of the genital segment.

Abdomen of four segments, contained three and a half times in length of cephalothorax. Genital segment a little shorter than second and third segments together. Fourth segment a little shorter than third and equal to the furca.

Furca with rami as long as broad, and separated by rather more than their own width. Furcal setae imperfect in my specimen.

First antenna reaching almost to the end of the genital segment, 23-jointed, joints 8-9 and 24-25 being fused, the latter not completely.

Length of joints in .01 mm.

1.	2.	3.	4.	5.	6.	7.	8+9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24+25.
10.	14.	6.	6.	6.	6.	6.	10.	7.	7.	8.	9.	10.	11.	12.	12.	12.	12.	11.	10.	9.	10.	15.

Second antenna (Pl. I, Fig. 15): terminal joint of endopodite with 6 + 8 setae, exopodite rather longer than endopodite, first joint with one distal seta, second joint with two setiferous lobes and a small distal seta, third to sixth joints with the usual distal seta, terminal joint with one median and three distal setae.

Mandible of the same form as in *Pseudocalanus elongatus*.

The maxilla (Pl. I, Fig. 17) is of the same type as in *Spinocalanus*, the exopodite being well developed. The inner lobes bear, respectively, 13, 5, and 4 setae or spines, the second basal 5, the endopodite 3 + 5 + 7, the exopodite 10, and the outer lobe 9 setae.

The first maxillipede (Pl. I, Fig. 16) is of the *Pseudocalanus* type, but bears a well marked process or hump proximal to the first lobe.

First lobe with four large terminal and two smaller lateral setae, second, third, and fourth lobes each with four setae, fifth lobe with five setae, one seta on each of the fourth and fifth lobes rather larger than the rest, that on the fourth the most so.

The second maxillipede is roughly of the *Pseudocalanus* type, but the proportions differ slightly, the fourth joint being considerably longer than the third, and twice as long as the fifth. The proportionate lengths of the joints are 16:18:5:7:3½:4:1½.

The swimming feet are comparatively slender.

The first foot (Pl. I, Fig. 14) has a three-jointed exopodite, with outer-edge spines on each joint. The third joint has one terminal and four inner-edge setae. The one-jointed endopodite has a slight indication of segmentation into two, and bears five setae.

The second foot (Pl. I, Fig. 13) has two transverse rows of small setae across the posterior face of the second joint of the endopodite, and a spinose outer margin to the first basal joint.

The third (Pl. I, Fig. 12) and fourth feet have transverse rows of slender spinules on the second and third joints of their endopodites, and on the second basal joint of the fourth foot there are two transverse rows of long acicular spinules.

The terminal spines of the second to fourth feet have finely serrate laminae.

Fifth feet absent.

Male unknown.

Occurrence.—A single specimen was taken on station S.R. 139 at a depth of 1,000 fathoms.

GENUS *Spinocalanus*, Giesbrecht.

Spinocalanus abyssalis, Giesbrecht.

The great majority of the specimens found measured approximately 1.5 mm., but a few from a depth of 600 to 1,000 fathoms only reached 1.0 mm., and seemed to represent a small deep-water variety, though no differences in structure or form on which a specific discrimination might be based were observed. It is worth noting that, while the size given by Professor G. O. Sars for his Norwegian specimen is 1.6 mm., that of both the N. Polar and Pacific forms is 1.1 to 1.25 mm., a fact which precludes the idea of the existence of a northern and a southern race.

Occurrence.—This species seems to be constantly present in moderate numbers at all depths, from 200 to 1,000 fathoms.

Spinocalanus magnus, Wolfenden.

Occurrence.—This rather noticeable species, which however avoided publicity till it was recently described by Dr. Wolfenden, is very characteristic of townettings over the Atlantic slope, occurring frequently from the surface to 1,000 fathoms though never very plentiful.

Spinocalanus spinosus, sp. n.

Pl. I, fig. 10.

Female—length 1.9 mm.

Cephalothorax of the same form as in *Spinocalanus abyssalis*, but slightly more robust. Lateral faces of thoracic segments (Pl. I, fig. 10), finely spinulose. Antennae, mouth parts, and swimming feet as in *S. abyssalis*. Genital swelling less prominent than in *S. abyssalis*, with which the abdomen agrees in other respects.

Male unknown.

This species may readily be distinguished from *S. abyssalis* by its slightly larger size and more robust form, and by the fine spinulation on the sides of the thoracic segments. It agrees in size with *S. latifrons*, but it seems unlikely that, if they are identical, Prof. G. O. Sars would have omitted to mention such a noticeable feature as the thoracic spinulation in his description.

Occurrence.—It was found in small numbers on five stations, at depths between 330 and 1,000 fathoms.

GENUS **Pseudocalanus**, Boeck.**Pseudocalanus elongatus** (Boeck).

Occurrence.—Was only met with in small numbers. It is a distinctly epiplanktonic species, and is probably not usually associated with water of high salinity.

GENUS **Microcalanus**, G. O. Sars.**Microcalanus**, sp.

A species of *Microcalanus*, length .55 mm., occurred in small numbers on station S.R. 193, 630 fathoms (fine silk net), and S.R. 197, 680 fathoms (fine silk net). It bears a great resemblance to *Microcalanus pusillus* in general form, and probably should be referred to that species in spite of its smaller size. As, however, the antennae were broken, and the exopodites of the swimming feet, which bear the characteristic terminal spines, were missing in all the specimens found, I have thought it best not to record it definitely.

GENUS **Clausocalanus**, Giesbrecht.**Clausocalanus arcuicornis** (Dana).

Occurrence.—Only one specimen was met with in the tow-nettings we have dealt with, on station S.R. 164 (the most southerly station) at 200 fathoms.

This species seems to be an epiplanktonic southern form though it has occasionally been taken off the west coast of Ireland, and has been recorded at intervals from the English Channel during the course of the International Investigations.

GENUS **Ctenocalanus**, Giesbrecht.**Ctenocalanus vanus**, Giesbrecht.

Occurrence.—Seems to be generally distributed in the N.E. Atlantic, from the surface to 1,000 fathoms, but is always taken in very small numbers.

GENUS **Aetideus**, Brady.**Aetideus armatus** (Boeck).

Pseudocalanus armatus, Boeck, 1872.

Aetideus armatus, Brady, 1883.

Aetideus tenuirostris, Wolfenden, 1902.

Occurrence.—This species is widely distributed off the west coast of Ireland from the surface to 1,000 fathoms, and is often moderately common.

Aetideus Giesbrechti, Cleve.*Aetideus armatus*, Giesbrecht, 1892.*Aetideus Giesbrechti*, Cleve, 1904.*Aetideus Giesbrechti*, G. O. Sars, 1905.

Occurrence.—Represented by a single specimen from 200 fathoms on station S.R. 164 (the most southerly station).

This should probably be regarded as a southern species and not as a permanent inhabitant of these waters. The recorded distribution is the central Pacific, off Gibraltar, the Mediterranean, and South Africa.

GENUS **Faroella**, Wolfenden.**Faroella multiserrata** (Wolfenden).*Pseudactideus multiserrata*, Wolfenden, 1903, nom. nud.*Faroella multiserrata*, Wolfenden, 1904.*Actideopsis multiserrata*, G. O. Sars, 1907.

Being in doubt as to the correctness of my identification of this species, I submitted specimens both to Dr. Wolfenden and Prof. G. O. Sars. The latter wrote that they were quite distinct from his *Actideopsis rostrata*, while Dr. Wolfenden informs me that, except for a rather coarser serration of the terminal spines of the swimming feet (ca. 32 serrations on the spines of the second feet in my specimens), and a slightly more prominent rostrum (probably due to different methods of preservation), they are in agreement with his Färöe Channel specimens. I have accordingly recorded them under the name given by him.

The main points of difference between *Faroella* and *Actideopsis* are apparently the much more prominent rostrum and separate fifth thoracic segment possessed by the latter. Sars regards them as being congeneric.

The integument of this species, like that of *Chiridius armatus*, is dotted with minute asperities, and the general resemblance between it and the members of the genus *Chiridius* is so marked that it raises a doubt as to whether it is right to separate it from them.

Occurrence.—*Faroella multiserrata* is a distinctly deep-water species, occurring not uncommonly from 400 to 1,000 fathoms. It was found on six out of the eight stations and in thirteen gatherings. It was absent from S.R. 164, the most southerly station, probably on account of insufficient depth.

GENUS *Chiridius*, Giesbrecht.*Chiridius armatus* (Boeck).*Euchaeta armata*, Boeck., 1872.*Chiridius armatus*, G. O. Sars, 1903, nec. 1900.*Pseudaetidius armatus*, Wolfenden, 1903, 1904.

I have here followed Prof. G. O. Sars in his re-definition of Giesbrecht's genus *Chiridius* (as distinct from *Gaidrus*) so as to include the above species, since the presence or absence of a rostrum does not seem to be sufficient to separate generically species which in other respects minutely resemble each other. The fact that Giesbrecht originally defined the genus as not having a rostrum should not in itself have any weight.

Amongst the numerous specimens of *C. armatus* examined one female was found with a single rostrum. It was identical in size and in all its parts, except that mentioned, with the rest, and as no second specimen has been found there seems to be no reason for regarding it as anything but a case of individual variation.

Occurrence.—*C. armatus* occurred on all the stations except S.R. 164, and at all depths between 280 and 1,000 fathoms, being rather more numerous at about 750 fathoms.

Chiridius gracilis, sp. n.*Chiridius Poppei*, Farran, 1905.

Pl. II, figs. 1-3.

Female—length 2.4-2.8 mm.

Cephalothorax oblong-ovate, of the same form as in *Chiridius armatus*. Cephalon fused with first thoracic segment, rostrum absent. Fourth and fifth thoracic segments fused, the latter produced into a strong point on either side, as in *C. armatus*.

Abdomen contained about two and a half times in the length of the cephalothorax. Genital segment about two-thirds as long as the two following segments taken together. The proportional lengths of the abdominal segments are 21 : 16 : 14 : 11. Furcal rami about one and a half times as long as broad, and equal in length to the anal segment. Furcal setae slender.

First antenna reaches to about the end of the cephalothorax, the proportionate length of the joints being approximately as in *C. armatus*, joints 8-9 fused and 24-25 separate.

Second antennae and mandible as in *C. armatus*.

Maxilla of the same type as in *C. armatus*, but with the second basal more elongate and parallel sided.

First and second maxillipedes as in *C. armatus*.

First foot as in *C. armatus*.

Second foot (Pl. II, fig. 3) with three-jointed exopodite; the first and second joints are however partially fused, and the muscle

for moving the second joint absent (as is also the case in *C. armatus*, though in that species the joints appear to be completely separate). The endopodite of the second foot has its two joints almost completely fused, the segmentation being only indicated by a faint line.

Third foot with three-jointed exopodite and imperfectly three-jointed endopodite, the segmentation between the first and second joints not being complete.

Fourth foot much more slender than the third, but resembling it in jointing, except that the segmentation of the endopodite is complete. The terminal spines of the second to fourth feet are coarsely serrate as in *C. armatus*.

Fifth feet absent.

Male unknown.

This species was formerly recorded by me (1905) as a large form of *C. Poppei*, but I have thought it best to describe it as a new species. It stands in size midway between *C. obtusifrons* from the Norwegian Sea, and *C. Poppei* from the Mediterranean, both of which, like it, have no rostrum. *C. obtusifrons* is almost twice its size, and has undergone a greater reduction in the jointing of the swimming feet, the endopodite of the second foot being without a trace of segmentation, and the first and second basal joints of the endopodites of the third and fourth feet almost completely fused. It also differs in having the points of the fifth thoracic segments somewhat shorter.

C. Poppei, on the other hand, is very much smaller (1.8 mm.), and may also be separated by its shorter abdomen and more robust form, though agreeing in the jointing of the swimming feet.

Occurrence.—*C. gracilis* was taken on every station but S.R. 164, and in twelve out of thirty-four gatherings, generally a few specimens in each. Its range was from 280 to 1,000 fathoms.

GENUS *Pseudeuchaeta*, G. O. Sars.

Pseudeuchaeta brevicauda, G. O. Sars.

I have ventured to differ from Prof. G. O. Sars in removing this species from the neighbourhood of *Euchaeta*, as it seems to me that the apparent resemblance to that genus is only superficial, and that the genus *Pseudeuchaeta* is in reality closely allied to *Bradyidius*, *Bradyetes*, and *Bryaxis*. The first antenna is noticeably of the same type as in *Bradyidius*, the profuse setae and the large separate terminal joint being very characteristic. The mouth appendages, except the second maxillipede, are of a form common to many of the Aetidiidae, but differ from those of *Euchaeta*, especially as regards the maxilla. The second maxillipede, which at first sight appears to resemble that of *Euchaeta*, differs in the position of the median setae of the second joint which are placed nearer the proximal than the distal end. The jointing of the swimming feet agrees much more closely with the Aetidiidae than with *Euchaeta*, and the appendicular seta of the furca, which in *Euchaeta* is remarkable for its length, is in this species very short.

I am indebted to Prof. G. O. Sars for kindly confirming my identification of this species from drawings which I sent to him.

Occurrence.—Taken on stations S.R. 224, three specimens, females, at 700 fathoms, and S.R. 231, one female, at 1,150 fathoms.

GENUS **Gaidius**, Giesbrecht.

Gaidius tenuispinus (G. O. Sars).

Chiridius tenuispinus, G. O. Sars, 1900.

Gaidius boreale, Wolfenden, 1902.

Gaidius tenuispinus, G. O. Sars, 1903.

Occurrence.—On all stations except S.R. 164, and ranging from the surface to 1,000 fathoms. It was found in seventeen out of thirty-four gatherings, and may be regarded as a permanent and characteristic member of the fauna of the district.

Gaidius affinis (G. O. Sars).

Gaidius affinis, G. O. Sars, 1905.

Pl. II, figs. 9-10.

Some specimens of this species were submitted to Prof. G. O. Sars who kindly confirmed the identification. They are rather larger than the typical *G. affinis*, measuring from 3.9 to 4.5 mm. instead of 3.6 mm. *G. affinis* resembles very closely *G. intermedius* of Wolfenden from the Antarctic, and is only to be distinguished from *G. brevispinus*, with which its swimming feet agree, by its smaller size and the longer and more slender spines on the fifth thoracic segment directed obliquely posteriorly.

Occurrence.—This species was taken on three stations at depths from 700 to 1,150 fathoms, very few specimens, all females, being found.

Gaidius validus, sp. n.

Pl. II, figs. 11-17.

Female—Immature, length 6.2 mm.

The only specimen obtained of the above was an immature female, but as it appeared to have reached the full development of its limbs and mouth parts I have described and named it.

Cephalothorax elongate, parallel-sided, noticeably contracted in dorsal view in front of the second antennae, and more pointed anteriorly than in the other members of the genus. Cephalon fused with the first thoracic segment and more than twice as long as the remaining thoracic segments. Fourth and fifth thoracic segments (Pl. II, fig. 11) fused and bearing on either side a strong spine which springs from the lateral margin. These segments resemble in dorsal view those of *Centropages typicus*, but the spines are not divergent as in that species.

Abdomen measuring about one-fourth of the cephalothorax, with four equal segments (immature segmentation). Furcal rami divergent, about as long as broad.

First antenna a little longer than the body, 24-jointed, joints 8-9 being fused and 24-25 separate. The proportionate length of the joints is approximately as in *G. affinis* and *G. brevispinus*.

Second antenna (Pl. II, fig. 12) with endopodite measuring about two-thirds of exopodite. First joint of the exopodite with a small distal seta, second joint with two setiferous lobules on the proximal half of the joint and a small distal seta, third to sixth joints each with a long distal seta, seventh joint with a small median and three large distal setae.

Mandible as in the rest of the genus.

Maxilla (Pl. II, fig. 14) with the second and third inner lobes very long, second basal joint large with parallel sides and six distal setae, endopodite with about sixteen setae, exopodite small oval with ten setae, outer lobe with seven long setae and two short curved proximal setae.

First maxillipede as in *Gaetanus*, with a strong curved spine on the fourth and fifth lobes.

The second maxillipede (Pl. II, fig. 13) is of the *Gaetanus* type. The terminal spine on the inner margin of the second joint is very much reduced, and the sensory lobe on the outer margin very prominent.

First foot (Pl. II, fig. 15) having a three-jointed exopodite with a spine on the outer margin of each joint. The segmentation between the first and second joints is not complete (possibly an immature character).

Second foot (Pl. II, fig. 16) with three-jointed exopodite and imperfectly two-jointed endopodite.

Third and fourth feet with three-jointed exopodites and endopodites. The terminal spines of the endopodite of the second to fourth feet are coarsely serrate. The first basal joint of the fourth foot does not bear any well-marked spines, but the setae on its margin are straight and noticeably shorter and stiffer than those of the third foot.

Fifth feet absent.

Male unknown.

This species appears to be distinct from *G. divaricatus*, which, if I rightly interpret Prof. G. O. Sars' description, is separated from it not only by its much smaller size (4.25 mm.), but also by having the fifth segment of the thorax distinct from the fourth, and the lateral thoracic spines divergent.

Occurrence.—One specimen was taken on station S.R. 231, 1,150 fathoms.

Gaidius notacanthus, G. O. Sars.

Pl. III, fig. 7.

All the females captured of this species were immature, but the presence of three mature males enables me to give a figure of the fifth pair of feet which, while of the same type as those of

G tenuispinus, have the second and third joints of the exopodite of the left foot much shortened, bearing lamellae and fringed with fine setae. The maxilla and first maxillipede in the male are, as usual, reduced, and the outer-edge spine of the first joint of the exopodite of the first foot is only represented by a very small tooth. Prof. G. O. Sars has kindly identified some specimens of this species which I sent to him.

Occurrence.—A few specimens were taken on four stations from depths of 600 to 1,150 fathoms.

Gaidius parvispinus, sp. n.

(Pl. II, figs. 4-8).

Female—immature, length 4.9 mm.

Cephalothorax of the usual *Gaidius* form, but with the fourth and fifth thoracic segments separated, as in *G. notacanthus*. The fifth segment (Pl. II, fig. 5) bears on its postero-lateral margin a very short, ventrally directed, hooked spine. Rostrum single, short, stout. Abdomen of four segments (immature segmentation).

The first antenna is 23-jointed, the proportional length of the joints being very much as in *G. tenuispinus*.

The second antenna agrees better with that of the genus *Chiridius* than *Gaidius*, the first joint of the endopodite being short and stout, about equal in length to the second joint of the exopodite. The arrangement of setae is as usual.

The mandible palp is as in *Chiridius*. The cutting edge was not examined.

The maxilla is of the same form as in *Chiridius*, but the outer lobe is very small though bearing the usual ten setae.

The first maxillipede is as in *Chiridius*. The tips of the second to fourth lobes are crowded with minute acicular spinules.

The second maxillipede (Pl. II, fig. 8) is of the *Chiridius* type, but the first joint is somewhat shorter. The proportional lengths of the first, second, and third to seventh joints are approximately 2 : 3 : 1. The first joint, as in *Chiridius*, has no lobule on its lower edge.

The first foot (Pl. II, fig. 6) has an imperfectly three-jointed exopodite, the first joint being partially fused with the second, and bearing an outer-edge spine at the distal margin reaching to the base of the outer-edge spine of the second joint. The endopodite is broad and rounded.

The second foot (Pl. II, fig. 7) has a three-jointed exopodite, but the articulation between the first and second joints is incomplete. The terminal spine of the third joint is very finely serrulate. The endopodite is one-jointed, but with a faint transverse line marking the fusion of the two original joints.

The third and fourth feet have three-jointed exopodites and endopodites, the segmentation between the first and second joints of the endopodites being not complete, possibly an immature characteristic. The outer edges of the basipodites are smooth.

The fifth pair of feet are undeveloped, and consist on either side of two basal joints and a finger-and-thumb like exopodite and endopodite.

Male unknown.

I regard this immature form as being of undifferentiated sex which, for purposes of comparison, may be regarded as female, even though an undeveloped fifth pair of legs are present.

The limbs and appendages are practically identical, except for their smaller size, with those of *G. notacanthus*, and differ from those of *G. affinis*, *G. brevispinus*, *G. tenuispinus*, and *G. pungens* in their more robust form, in the stouter endopodite of the second antenna, in the absence of a lobule on the first joint of the second maxillipede, in the presence of an outer-edge spine on the first joint of the exopodite of the first foot, and in the finer serration of the terminal spines of all the swimming feet.

There is no doubt that both *G. notacanthus* and *G. parvispinus* should be separated generically from *Gaidius*, but no harm can be done by leaving them in that genus, as G. O. Sars has done, until mature females of one or both of them have been met with.

I would have been inclined to ascribe this species to *G. cryptospinus* if it were not that in that species the endopodite of the second foot is distinctly two-jointed, and the lateral spines of the fifth thoracic segment are described as nodiform protuberances, a description which does not accurately designate the lateral spines of *G. parvispinus*.

Occurrence.—On stations S.R. 175 and S.R. 197, between 580 and 680 fathoms.

GENUS *Gaetanus*, Giesbrecht.

Gaetanus pileatus, Farran.

Gaetanus pileatus, Farran, 1901.

Gaetanus caudani, G. O. Sars, 1905.

Gaetanus caudani, Wolfenden, 1904.

Gaetanus caudani, Pearson, 1906.

nec *Gaetanus caudani*, Canu, 1896.

This species has been recorded from the N.E. Atlantic by Dr. Wolfenden (1904) under the name of *G. caudani*, and Prof. G. O. Sars informs me that his record of *G. caudani* (1905) also refers to it. I do not think, however, that in the face of the discrepancies between this species and Canu's minute and carefully worded description that these identifications can be upheld. Canu states his specimen to have been an immature male with a rudimentary pair of fifth feet, but as far as I can ascertain no distinction can be drawn between males and females at this stage, as both sexes appear to possess rudimentary fifth feet

which are lost by the female in the final ecdysis, at any rate in this genus. In any case the immature specimens at the stage described by Canu agree with the mature females in form of limbs and mouth parts, differing only in the jointing of the abdomen, so that doubt cannot be thrown on Canu's description on this account.

The first swimming foot in *G. pileatus* has a two-jointed exopodite, while in *G. caudani* the exopodite is three-jointed with outer-edge distal spines on each joint; to quote the original description—"La rame externe des pattes de la 1^{re} paire est composée de trois articles, et semblable presque en tous points à la rame externe de la 1^{re} patte de *G. armiger* (ajouter à celle-ci une épine au bord distal externe du 1^{er} article de la rame externe, pour compléter l'organisation cher *G. caudani*)."

A further point of difference is to be found in the second antennae, the second joint of the exopodite of which in *G. caudani* bears two setiferous lobules on its inner margin, while in *G. pileatus* the margin of the joint is bare.

Occurrence.—This species is a very noticeable feature in the deep-water fauna off the west coast of Ireland, occurring, often in considerable numbers, in almost every townet from 200 to 1,150 fathoms.

Gaetanus miles, Giesbrecht.

Occurrence.—This species was found on three stations, viz., S.R. 197, 680 fathoms, S.R. 224, 700 fathoms, and S.R. 231, 400 fathoms, only single specimens on each occasion, so that it can hardly be regarded as a permanent inhabitant of these waters.

Gaetanus latifrons, G. O. Sars.

Gaetanus latifrons, G. O. Sars, 1905.

Gaetanus Holti, Farran, 1905.

Gaetanus longispinus, Wolfenden, 1905.

There can, I think, be no doubt as to the identity of *G. latifrons* and *G. longispinus*, and possibly both may prove to be synonyms of *G. caudani*.

Occurrence.—This species is a noticeable feature in N.E. Atlantic townettings, though not so common as *G. pileatus* or *G. major*. It was taken on every station at depths of from 330 to 1,150 fathoms.

Gaetanus major, Wolfenden.

Gaetanus major, Wolfenden, 1903.

?*Gaetanus Kruppi*, Giesbrecht, 1903.

G. Kruppi appears to be at most a rather smaller Mediterranean variety of this species, with a similar habitat.

Occurrence.—Occurred on every station and in almost every townetting from 300 to 1,150 fathoms. It is one of the most characteristic copepods that occur off the west coast of Ireland, though apparently never approaching the surface.

Gaetanus minor, Farran

Occurrence.—A not uncommon species off the west coast of Ireland, and not confined to such great depths as the records given in the table seem to show. Its small size will account for its apparent scarcity.

GENUS **Undeuchaeta**, Giesbrecht.

Undeuchaeta major, Giesbrecht.

Chirundina angulata, G. O. Sars, 1905.

Occurrence.—On every station at depths of from 350 to 1,000 fathoms, and in sixteen out of the thirty-four gatherings, generally in moderate numbers.

Undeuchaeta minor, Giesbrecht.

Occurrence.—On every station, at depths of from 400 to 1,000 fathoms. It was only represented in eleven gatherings, but when it was present was usually more numerous than *U. major*.

GENUS **Chirundina**, Giesbrecht.

Chirundina Streetsi, Giesbrecht.

Euchirella carinata, Wolfenden, 1902.

Occurrence.—This species is of frequent occurrence in the N.E. Atlantic, having been taken on every station at depths of from 300 to 1,000 fathoms.

GENUS **Euchirella**, Giesbrecht.

Euchirella messinensis (Claus).

There does not appear to be any noticeable difference between the species as figured by Giesbrecht from the Mediterranean and as occurring in the N.E. Atlantic.

Occurrence.—Occurs frequently but not universally in deep water off our western coasts, having been taken on five stations at depths of from 350 to 700 fathoms.

Euchirella galeata, Giesbrecht.

Occurrence.—A few specimens were taken on five stations, at depths of from 350 to 700 fathoms.

Euchirella maxima, Wolfenden.*Euchirella maxima*, Wolfenden, 1905.

Occurrence.—This very distinct and easily recognised species was taken on five stations at depths of from 350 to 1,000 fathoms.

It seems probable that this and the two preceding species are permanent inhabitants, though not in large numbers, of the deep water off the Irish coast.

Euchirella curticauda, Giesbrecht.

I have not met with any mature specimens which could be referred to Wolfenden's *E. atlantica*, but a few immature specimens measuring about 6.2 mm., and closely resembling *E. curticauda* in form, may possibly belong to it. In my specimens of *E. curticauda* the size varied from 4.3 to 4.8 mm., and the number of spines on the basal joint of the fourth foot from nine to twelve, but no definite distinction between the N.E. Atlantic and the typical form could be made out.

Occurrence.—This species is of frequent occurrence and often moderately common. It was taken on every station at depths of from 200 to 1,000 fathoms, and in eighteen out of thirty-four gatherings. It has on other occasions been taken at the surface.

Euchirella rostrata (Claus).

Occurrence.—This species was met with on two stations, viz., S.R. 224, when a considerable number of specimens was taken at 700 fathoms, and S.R. 231, when it occurred in small numbers in the nets at 200, 400, 750, and 1,000 fathoms. It is known to be a species of epiplanktonic habits and wide distribution in European waters, so that it should probably not be regarded as a permanent member of the N.E. Atlantic deep-water fauna. The specimens met with varied in size from 3.3 mm. to 4.2 mm.

Euchirella Wolfendeni, sp. n.

Pl. II, figs. 18-19.

Pl. IV, fig. 3.

Female (Pl. IV, fig. 3)—length 7.4 mm.

Cephalothorax ovate, robust. Cephalon fused with first thoracic segment, but the line of segmentation visible, without crest, and very slightly vaulted. Rostrum of moderate length. Fourth and fifth thoracic segments separate, the latter contracted posteriorly, and with rounded lateral margins.

Abdomen about one fourth as long as the cephalothorax. Genital segment about as long as broad, asymmetrical, not swollen below, with a projecting lobule on the right side and a low tubercle on the left. Second segment about as broad as long,

rather longer than third, and twice as long as the anal segment. Furcal rami about as broad as long, divergent, with setae of moderate length.

First antenna as long as the whole body.

Second antenna (Pl. II, fig. 18) with endopodite rather more than half as long as exopodite, and bearing 7+8 setae.

Mandible with strongly toothed cutting edge and slender unbranched palp, second joint of basipodite of mandible without setae, first joint of exopodite short, without setae, second joint long, with small median seta, third and fourth joints each with a long distal seta, fifth joint with two long setae.

Maxilla of the same general form as in *E. rostrata*, the exopodite being very small, but the setae are much more numerous than in that species. Second inner lobe with five strong setae, third inner lobe with four more slender setae, second basal with five, and endopodite with at least sixteen setae. Exopodite with eleven and outer lobe with seven large and one small setae.

First and second maxillipedes of the same general form as in *E. rostrata*.

First foot with three-jointed exopodite, the first and second joints not being completely separated, each joint bearing a distal outer-edge seta, that on the first joint being rather slender but reaching beyond the extremity of the second joint. The endopodite is one-jointed, broad and oval, with a well marked shoulder.

Second foot with a three-jointed exopodite and one-jointed endopodite.

Third and fourth feet each with three-jointed exopodites and endopodites. The first basal joint of the fourth foot (Pl. II, fig. 19) bears a transverse row of seven short strong equal spines on a process projecting from its inner margin.

The terminal spines of the second to fourth feet are rather finely serrate, that of the second foot having about sixty serrations.

Fifth feet absent.

Male unknown.

If we compare this species with the other known non-cristate rostrate females of the genus *Euchirella*, viz., *E. messinensis*, *E. bella*, *E. venusta*, *E. brevis*, *E. rostrata*, *E. hirsuta*, *E. elongata*, and *E. spinosa*, we may separate the first four as having four or less spines on the fourth foot basal. Of the remainder, *E. hirsuta* and *E. spinosa* have fourteen basal spines on the fourth foot, while *E. rostrata* may be separated by its very long rostrum and much more globose cephalon, and *E. elongata*, which approaches *E. Wolfendeni* most nearly, by the pointed lateral margins of the fifth thoracic segment. *E. Wolfendeni* may perhaps turn out to be a synonym of *Undeuchaeta pustulifera*, but Sars' description of that species is not sufficient to decide the point with certainty.

Occurrence.—This species was taken on two stations. viz. :—S.R. 224, five specimens at 700 fathoms, and S.R. 231, three specimens at 1,000 fathoms. It is impossible from these records to say whether it is a permanent inhabitant or a chance visitor, but the former seems to be the more probable.

Euchirella obtusa (G. O. Sars).*Undeuchaeta obtusa*, G. O. Sars, 1905.

Pl. II, figs. 20-21.

Pl. IV, fig. 2.

I have included this species under the genus *Euchirella* rather than under that in which it was originally placed by Prof. G. O. Sars, as it does not appear to me to be congeneric with *Undeuchaeta major* and *U. minor*. The published description, as far as it goes, agrees exactly with my specimens.

Occurrence.—Five specimens in all were taken on three separate stations; one on S.R. 197 at 680 fathoms, one on S.R. 224 at 700 fathoms, and three on S.R. 231 at 1,000 fathoms. It may consequently be considered as a permanent, though rather scarce member, of the N.E. Atlantic skoto-plankton.

GENUS **Euchaeta**, Philippi.**Euchaeta acuta**, Giesbrecht.

Occurrence.—Not characteristic of the N.E. Atlantic skoto-plankton, though a few specimens have been taken in deep water. Two females, measuring 4.4 mm., were taken at 700 fathoms on station S.R. 224, and eleven females, two of them ovigerous, at 350 fathoms on station S.R. 164. A single male, most probably of this species, was found on station S.R. 175 at 600 fathoms.

Euchaeta norvegica, Boeck.

E. norvegica has not been noticed to vary in size except within very small limits, the average length of the N.E. Atlantic examples being 7 mm., and it seems probable that the dimensions 7-15 mm. given by Giesbrecht (1898) in the "Tierreich" are founded on incorrect identifications by other authors.

Occurrence.—This species is one of the most noticeable features of the deep-water fauna off the west coast of Ireland. It usually forms at least half the copepod contents in bulk of any coarse silk or other similarly meshed net, fished between 300 and 1,000 fathoms, and is occasionally taken in an immature state at or near the surface.

Euchaeta barbata, Brady.*Euchaeta barbata*, Brady, 1883.

Pl. III, figs. 13-14.

In the material taken by the *Helga*, and here dealt with, there occurred in small numbers three species of *Euchaeta*, all closely allied, and all agreeing in form with the original description of

E. barbata, but clearly differing from each other in size and colour, and in a few minute structural points. In this difficulty it seemed to me that the species agreeing most nearly in size with the type specimen would have the best claim to the name given by Brady. I have accordingly applied the name to the species of medium size, which measures from 8.1-8.8 mm., Brady's original specimen measuring 8.4 mm.

In colour this species is of a deep crimson, darker on the limbs and mouth parts and on the edges of the body segments, thus differing from both the larger and smaller forms, which are not so deeply coloured and have a vermilion tinge. It is further separated from them by the presence of a small tubercle on the left side of the genital segment, situated slightly posterior to the genital opening. (Pl. III, fig. 13).

An examination of Brady's type specimen in the British Museum did not throw much light on the question, as the single specimen had been mounted, and the balsam in the slide having partially dried up, it was impossible to see whether the lateral tubercle on the genital segment were present or not.

Occurrence.—*Euchaeta barbata*, as defined above, occurred in small numbers on five stations at depths of from 700 to 1,000 fathoms.

***Euchaeta Sarsi*, sp. n.**

? *Euchaeta barbata*, G. O. Sars, 1903.

Euchaeta barbata, Wolfenden, 1904.

? *Euchaeta porrecta*, G. O. Sars, 1905.

Pl. III, figs. 15-16.

Female—length 9.8-10.2 mm.

Colour, body with a faint reddish tinge, the mouth parts of a bright red, particularly on the maxillipede spines, the swimming feet similarly coloured but less deeply.

Form of the body as in *E. barbata*, the posterior lateral margins of the last thoracic segment rounded and bearing a thin bunch of long hairs. Epistome densely hirsute.

First three abdominal segments in the proportion 11 : 6 : 6. Genital segment (Pl. III, fig. 15) resembles that of *E. barbata*, except that the small sinistral tubercle is absent. The ventral surface of the second and third abdominal segments is very setose, and the dorsal surface of the third segment bears a few scattered short hairs. The first, third, and fourth furcal setae (from within) are approximately of equal length, the second seta is very long, and the appendicular seta extremely long and slender, the proportional lengths being 1 : 3 : 7. The antennae and mouth parts resemble those of *E. barbata*; the second maxillipede seems, however, to be rather more slender.

The first foot has the outer-edge seta at the fusion of the first and second joints extremely minute, the segmentation between the joints being very faintly indicated. In the exopodite of the

second foot (Pl. III, fig. 16), the sinus between the second and third outer-edge spines of the third joint is not so deep as in *E. barbata*. It falls short of the line joining the bases of the first outer-edge spine and the second inner-edge seta. The second outer-edge spine is much shorter than in *E. barbata*. The remaining feet are of the same type as in *E. barbata*, and do not call for remark.

Male unknown.

This species is undoubtedly the *E. barbata* of Wolfenden, and possibly also that of G. O. Sars (1903), although the size given by the latter (12.0 mm.) is rather larger, and the proportionate lengths of the furcal setae not quite the same. The figure of the genital segment is also slightly different.

Occurrence.—A few specimens were taken on three stations, viz. :—S.R. 139, 1,000 fathoms, S.R. 224, 700 fathoms, and S.R. 231, 1,000 fathoms.

***Euchaeta Scotti*, sp. n.**

Pl. III, figs. 11-12.

Female—length 5.7-6.3 mm.

Colour of body reddish, rather more deeply coloured than in *E. Sarsi*. Legs and mouth parts vermilion.

Form of the body as in *E. barbata*; the cephalothorax seems however to be somewhat more robust. Epistome hirsute. The bunch of hairs on the fifth thoracic segment well developed.

Lengths of the first three abdominal segments in the proportion 11 : 6 : 6. The genital segment (Pl. III, fig. 11) is of the same form as in *E. barbata*, except that the small sinistral tubercle is absent. The ventral surface of the second and third abdominal segments is setose, their dorsal surface being covered more sparingly with much shorter hairs. The first, third, and fourth furcal setae, reckoning from within, are approximately equal, the second slightly longer, and the appendicular seta very long, the proportional lengths being 5 : 7 : 16.

Antennae and mouth parts as in *E. barbata*.

In the first pair of feet the outer-edge seta at the fusion of the first and second joints of the exopodite is very minute, and can with difficulty be observed. The fusion of the joints is very complete, the suture being barely indicated.

In the exopodite of the second pair of feet (Pl. III, fig. 12), the sinus between the second and third outer-edge spines of the third joint is not so deep as in *E. barbata*. The second outer-edge spine in the same joint is much smaller than in *E. barbata*, falling far short of the base of the third outer-edge spine. There is no noticeable difference between the remaining feet and those of *E. barbata*.

Male unknown.

Occurrence.—This species was taken on the same five stations as *E. barbata* at depths of from 700 to 1,000 fathoms, but very few specimens were found on each occasion.

Euchaeta quadrata, sp. n.*Euchaeta barbata*, Scott.

Pl. III, figs. 20-21.

Female—length 6.9 mm.

Body colourless, second maxillipede reddish purple, especially on the setae.

Cephalothorax similar in shape to that of *E. norvegica*, except that the fifth thoracic segment is rounded laterally and bears a marginal patch of hairs. Rostrum more slender than in *E. norvegica*.

Abdomen half as long as the cephalothorax, its first three segments being in the proportion 5:4:3. Genital segment (Pl. III, fig. 20) with a parallel-sided almost quadrate projection from the centre of its ventral face, equal in height to the diameter of the segment, and at right angles to it. Second and third abdominal segments without hairs. Furca slightly hirsute. First, third, and fifth furcal setae (counting from within) of about equal length. Second seta twice as long as first. Appendicular seta very long, broken in my specimens.

The first antennae reach, when extended, to the middle of the genital segment.

Second antennae as in *E. norvegica*; terminal setae of endopodite 8+6; mandible as in *E. norvegica*.

Maxilla with nine setae on the outer lobe, eleven on the exopodite, and about thirteen on the endopodite.

First maxillipede as in *E. norvegica*. Second maxillipede of the same form as in *E. norvegica*, but the distal part of the inner edge of the second joint is very finely setose and the setae on the third to seventh joints rather more slender.

First foot in form as in *E. norvegica*, but the outer-edge seta at the fusion of the first and second joints is very minute.

Second foot (Pl. III, fig. 21) with the second outer-edge spine of the third joint of the exopodite reaching to the end of the joint.

Third and fourth feet as in *E. norvegica*.

Fifth feet absent.

Male unknown.

This species is easily recognised by its very large protruding genital swelling, which appears almost square in lateral view. It has been recorded by Dr. T. Scott from the Gulf of Guinea, as an examination of the specimens in the British Museum shows, under the name of *E. barbata*.

Occurrence.—This species seems to be a fairly constant feature of the N.E. Atlantic fauna, though not descending to such depths as some of the other *Euchaetae*. It was taken in small numbers on five stations at from 350 to 700 fathoms.

Euchaeta rubicunda, sp. n.

Pl. III, figs. 8-10.

Female—length 8.8 mm.

Colour of a bright reddish crimson, darker on the margins of the body segments.

Cephalothorax of the *E. norvegica* type, but with rounded setiferous postero-lateral margins to the fifth thoracic segment. Rostrum slightly shorter than in *E. norvegica*.

Abdomen short, being contained about two and half times in the length of the cephalothorax. Genital segment (Pl. III, figs. 8-9) equal in length to the two following segments taken together. The genital process is large, the genital opening being flanked by a pair of lateral plates of the *E. barbata* type, but more swollen and connected posteriorly at their base. Within these plates are a pair of small tubercular processes. The posterior face of the genital process is inflated. There is a low longitudinal chitinous ridge running dorsally along the anterior half of the left side of the genital segment. The second and third abdominal segments are of equal length and setose on their ventral and lateral faces.

The first, third, and fourth furcal setae (counting from within) are of equal length, the second twice as long, and the appendicular seta four times as long as the first.

The first antenna reaches, when extended, to the base of the fourth pair of feet.

Second antenna and mandible as in *E. norvegica*.

Maxilla with five setae on the outer lobe, ten on the exopodite, and nine on the endopodite

First and second maxillipedes as in *E. norvegica*.

First foot, with the segmentation between the first and second joints of the exopodite rather more plainly indicated than in *E. norvegica*. The outer margin of the fused joints is deeply hollowed, and the first outer seta very minute.

Second foot (Pl. III, fig. 10) with the sinus between the second and third outer-edge spines of the third joint of the exopodite very deep.

The second outer-edge spine reaches to the end of the joint.

Third and fourth feet as in *E. norvegica*.

Male unknown.

This species, like the three just described, is an addition to the *norvegica* section of *Euchaeta*.

Occurrence.—One specimen from 1,150 fathoms on station S.R. 231.

Euchaeta tonsa, Giesbrecht.

Occurrence.—This is a rather characteristic species in deep water tow-nettings ranging from 400 to 1,000 fathoms. It occurred on six stations, and in thirteen out of the thirty-four gatherings. The N.E. Atlantic form appears to be identical with that described by Giesbrecht from the Pacific.

Euchaeta bisinuata, G. O. Sars.*Euchaeta bisinuata*, G. O. Sars, 1907.

Pl. III, figs. 17-19.

Pl. IV, fig. 4.

Professor G. O. Sars describes the genital protuberance of the female of this species as being divided into three lobules, of which the most anterior is double. I have figured the arrangement (Pl. III, fig. 17) as shown in all the specimens which I have examined, in which both of the anterior lobules are paired. With this exception the Irish specimens agreed closely in size and structure with the description of the type, and I have no doubt that they are identical.

Occurrence.—Taken in small numbers on three stations at depths between 700 and 1,150 fathoms.

GENUS **Valdiviella**, Steuer.**Valdiviella insignis**, sp. n.

Pl. III, figs. 1-6; Pl. IV, fig. 5.

Female (Pl. III, fig. 1)—length 11.5-12.0 mm.

Cephalothorax robust, ovate, of the same form as in *Euchaeta*. Cephalon fused with first thoracic segment. Fourth and fifth thoracic segments fused, the latter with postero-lateral margin rounded. Rostrum of two sharp strong points.

Abdomen rather less than half the length of the cephalothorax, of four segments, their proportional lengths, with the furca, being about 5:4:3:1:1. Genital segment moderately swollen below and in dorsal view. Second and third segments with tufts of hair on their ventral surface, and denticulated dorsally on their posterior margin. Furcal rami oval, rather longer than wide, separated by more than their own width. First, third, and fourth furcal setae (counting from within) of about equal length, second seta about one and two third times as long, and appendicular seta about two-thirds as long. The length of the innermost seta is equal to that of the second and third abdominal segments taken together. Egg sacs two, oval, with numerous ova.

The first antenna reaches to the end of the thorax.

Length of joints in .01 mm.

1.	2.	3.	4.	5.	6.	7.	8-9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24-25.
35.	30.	27.	30.	36.	36.	27.	36.	12.	14.	12.	21.	24.	44.	63.	72.	63.	69.	60.	50.	45.	42.	45.

These measurements differ from those of *V. oligarthra* in the proportionately greater length of the more distal joints. The end joint is proportionately shorter than in that species.

Second antenna with one seta on the second basal joint. The inner lobe of the terminal joint of the endopodite bears two setae, the outer lobe six large and one small setae.

The mandible appears to be the same as in *V. oligarthra*.

Maxilla (Pl. IV, fig. 5) with seven setae on the outer lobe, the median one much the largest. The exopodite bears eleven setae, the endopodite three, and the second basal joint three. The first inner lobe has eleven setae, the second and third lobes four setae between them; they are superposed and possibly fused.

The first maxillipede (Pl. III, fig. 4) with three setae on each of the five lobes, the terminal seta on the fifth lobe being much stronger than the rest. The terminal joints of the maxillipede bear six comparatively long setae.

Second maxillipede with joints of the same proportionate length as in *V. oligarthra*, the first joint being two-thirds as long as the second and twice as long as the terminal joints. The first lobe bears one, the second two, the third one or more, and the fourth three setae.

First foot (Pl. III, fig. 6), as in *V. oligarthra*, the exopodite being two-jointed and the endopodite one-jointed.

The second foot (Pl. III, fig. 2) differs from that of *V. oligarthra* in having the exopodite imperfectly three-jointed, the segmentation between the first and second joints being faintly indicated, but the outer-edge spine at the end of the first joint fully developed, not rudimentary as in *V. oligarthra*.

The third foot (Pl. III, fig. 5) has an imperfectly three-jointed exopodite, the articulation between the first and second joints being plainly indicated though not functional. The endopodite has only a very faint indication of segmentation between the first and second joints.

Fifth feet absent.

Colour, a bright red, deepest on the limbs and mouth parts. Egg sacs orange.

Male unknown.

Of the two other known species of this genus, one, *V. brevicornis*, is only about half as long as the present species; the other, *V. oligarthra*, while nearly agreeing with it in size, may be separated by its shorter first antennae and the different form of the second pair of feet.

Occurrence.—Three specimens of this species were taken at depths of 700, 730, and 1,150 fathoms.

GENUS *Chiridiella*.

Chiridiella macrodactyla, G. O. Sars.

Chiridiella macrodactyla, G. O. Sars.

Pl. IV, figs. 6-14.

The original description of *C. macrodactyla* differs in some few points from my specimens, but the differences are mainly those of proportion and not of structure, and do not warrant a

separate description. The abdomen in the *Helga* specimens is scarcely more than one-fifth of the length of the cephalothorax. The segmentation between the cephalon and first thoracic segment is indicated but not complete. The first antenna is almost as long as the whole body, and the exopodite of the first foot is more than twice as long as the endopodite.

The very strangely modified claw-like structure of the first maxillipede (Pl. IV, fig. 14) agrees with that of Sars' specimens, and from its occurrence in the female is probably due either to a predatory or semi-parasitic mode of existence. The reduction of the first pair of swimming feet would seem to point to the latter conclusion, though the presence of the species free in townettings is against it.

The absence of an inner-edge seta on the second basal joint of the first foot (Pl. IV, fig. 6) is noteworthy, and, as far as I know, is not found in any other instance among the Amphaskandria.

Occurrence.—Single specimens were taken on stations S.R. 175 at 600 fathoms, and S.R. 193 at 630 fathoms.

GENUS *Phaenna*.

Phaenna spinifera, Claus.

Occurrence.—This species is only sparingly represented in the collection. It was found on station S.R. 164, one specimen at 100 fathoms and two at 350 fathoms, and on station S.R. 175, two specimens at 600 fathoms. The deep-water records may perhaps be accounted for by supposing the captures to have been made during the ascent of the net, as previous records of this species would lead to the belief that it is of epiplanktonic habits.

GENUS *Xanthocalanus*, Giesbrecht.

Xanthocalanus typicus (T. Scott).

Amallophora typica, T. Scott, 1894.

Xanthocalanus typicus, Giesbrecht, 1898.

Pl. IV, figs. 15-17.

The species has up to the present only been known by Dr. T. Scott's (1894) description of the male from the Gulf of Guinea. The female shows, equally with the male, the curious sensory appendage formed by the enlargement of one of the terminal sensory setae of the first maxillipede (Pl. IV, fig. 16), which has the form of a sheaf of corn, and gave rise to the generic name *Amallophora* or sheaf bearer, of which this species was constituted the type by Scott. The species has since been removed by Giesbrecht (1898) to the genus *Xanthocalanus*, and his judgment in this respect is partly confirmed by the present specimen, the fifth feet of which are somewhat of the *Xanthocalanus* type, consisting of three short equal joints, the last joint with a pair of terminal diverging spines. The first foot (Pl. IV, fig. 17) appears at first sight to

have a three-jointed endopodite, but closer examination shows that the apparent segmentation is in reality a ridge running across the face of the joint.

The generic name *Amalophora* has been revived by Sars for a section of the genus *Scolecithrix*, one member of which, *Amalophora magna*, was included by Scott in the genus *Amalophora*, though not congeneric with the type species *A. typica*. This use of the name cannot be upheld, as the name should properly stand as a synonym of the genus *Xanthocalanus*, unless it should become necessary at any time to revive it in favour of the present species, a contingency which does not seem impossible.

Occurrence.—A single specimen of the female of this species was taken on station S.R. 197 at 680 fathoms.

? *Xanthocalanus pinguis*, Farran.

Pl. IV, fig. 18.

In view of the difficulty of deciding how far small differences met with in a single specimen should be regarded as constant or as individual variation, I have some hesitation in referring to *X. pinguis* the specimen whose capture is recorded below. The length of the specimen is 5.1 mm., which is slightly in excess of that of *X. pinguis*, viz., 4.5 mm. The form of the body is very similar, the fifth thoracic segment slightly more acute but swollen and full of oil drops. The mouth parts and swimming feet are similar. The fifth pair of feet (Pl. IV, fig. 18) are similar in form, but differ somewhat in spinulation; the first joint has about twenty short stout spinules in two rows along the inner edge, the outer edge being smooth; the second joint has about six inner-edge spinules similar to those on the first joint, the distal half of the outer edge bearing a cluster of lancet-shaped spinules; there are a pair of lateral and a pair of terminal spines on the third joint as in *X. pinguis*, and the face of the joint bears a patch of slender spinules of two sizes near the tip.

Occurrence.—A single specimen taken on station S.R. 193 at a depth of 630 fathoms.

Xanthocalanus Greeni, Farran.

Xanthocalanus Greeni, Farran, 1905.

As Prof. G. O. Sars has recorded both *X. muticus* and *X. Greeni* from the Monaco collections, my suggestion that they were probably identical must be regarded as incorrect.

Occurrence.—This species is evidently a regular inhabitant of the deep water of the N.E. Atlantic, though not in great numbers. It occurred on three stations at depths of from 680 to 1,150 fathoms, nine specimens in all being taken, the largest measuring 10 mm.

GENUS **Cephalophanes**, G. O. Sars.**Cephalophanes refulgens**, G. O. Sars.*Cephalophanes refulgens*, G. O. Sars, 1907.

Pl. V, figs. 5-7

Occurrence.—Taken in small numbers on stations S.R. 175, S.R. 193, and S.R. 197, at depths between 580 and 680 fathoms.

GENUS **Onchocalanus**, G. O. Sars.**Onchocalanus cristatus** (Wolfenden).*Xanthocalanus cristatus*, Wolfenden, 1904.*Onchocalanus trigoniceps*, G. O. Sars, 1905.

A comparison of Sars' and Wolfenden's descriptions leaves no doubt that they refer to the same species.

Occurrence.—This species is not uncommon in deep water, having been taken on six stations and in ten gatherings at depths of from 330 to 1,150 fathoms.

Onchocalanus hirtipes, G. O. Sars.

My specimen measured 5.7 mm., which is somewhat in excess of the measurement given by Sars, and the fifth pair of feet were asymmetrical, being three-jointed on one side and five-jointed on the other. In other respects there was agreement with Sars' description. The form of the genital segment in dorsal view is very characteristic, being very much narrowed anteriorly, broad in the middle, and slightly narrowed posteriorly.

Occurrence.—A single specimen was taken on station S.R. 231 at 1,150 fathoms.

GENUS **Cornucalanus**, Wolfenden.**Cornucalanus chelifer** (I. C. Thompson).*Scolecithrix chelifer*, Thompson, 1903.*Scolecithrix chelifer*, Farran, 1905.*Xanthocalanus chelifer*, Farran, 1905.*Cornucalanus magnus*, Wolfenden, 1905.*Onchocalanus chelifer*, Pearson, 1906.

In spite of the rather inaccurate description of *Scolecithrix chelifer* given by I. C. Thompson, there can, I think, be no doubt as to the identity of the species referred to by him. I have

accordingly retained the specific name *chelifer*, while adopting the generic name of *Cornucalanus*, which was proposed by Dr. Wolfenden (1905) for a species from the "Gauss" collection, which he called *Cornucalanus magnus*. As there does not appear to be any difference between the Antarctic and N. Atlantic forms I have placed *C. magnus* as a synonym of *C. chelifer*.

Mr. Pearson (1906) has placed this species in Sars' genus *Onchocalanus*, but, as Dr. Wolfenden (1905, p. 20) has already pointed out, they are in reality quite distinct.

Occurrence.—This species is of frequent occurrence in deep-water tow-nettings off the west coast of Ireland. It was taken on seven out of eight stations at depths of from 330 to 1,150 fathoms.

GENUS *Undinella*, G. O. Sars.

Undinella oblonga, G. O. Sars.

Occurrence.—This Arctic species was once taken, on station S.R. 139 at 1,000 fathoms.

Undinella brevipes, sp. n.

Pl. V, figs. 1-4.

Female—length 1.6 mm.

Cephalothorax stout, ovate. Cephalon slightly vaulted, partially separated from the first thoracic segment, fourth and fifth thoracic segments fused. Rostrum a flattened tapering plate, hollowed at the apex, and produced into two slender filaments. Fifth thoracic segment produced on either side into an acute point, and reaching almost to the middle of the genital segment.

Abdomen contained about three times in the length of the cephalothorax. Genital segment rather longer than broad, slightly longer than either of the two following segments; anal segment very short, almost entirely concealed. Furcal rami almost twice as long as wide. Furcal setae about as long as the abdomen.

First antenna reaches, extended, to the beginning of the genital segment. Its jointing is proportionately the same as in *U. oblonga*.

Second antenna and mandible as in *U. oblonga*.

Maxilla as in *U. oblonga*, with only two setae on the exopodite as in that species.

First and second maxillipedes resemble those in *U. oblonga*.

First foot as in *U. oblonga*.

Second foot with three-jointed exopodite and one-jointed endopodite, but the segmentation of the latter into two is plainly indicated, as it is also in my specimen of *U. oblonga*. The terminal spine of the exopodite is about equal to the combined lengths of the first and second joints, and is very finely serrulate.

The third (Pl. V, fig. 3) and fourth feet resemble those of *U. oblonga*, but have the terminal spine slightly longer in proportion.

The fifth pair of feet is symmetrical, three-jointed, but much shorter than in *U. oblonga*. The basal joints are very large and

fused in the middle line. The second joints on each side are slightly shorter, and much more slender than the basal. The terminal joints are ovate, slightly shorter than the second, bearing on one foot three short stout terminal spines or teeth, and on the other one terminal and one outer-edge tooth.

Male unknown.

The differences between this and the only other known species of the genus, *U. oblonga*, are well marked. The much smaller size, acute margins to the fifth thoracic segments, and short stout fifth pair of feet are the most noticeable points of difference.

Occurrence.—A single specimen was taken along with *U. oblonga* on station S.R. 139 at 1,000 fathoms.

GENUS *Scolecithricella*, G. O. Sars.

Scolecithricella dentata (Giesbrecht).

Occurrence.—This species is widespread off the west coast of Ireland, and often common. It occurred on all the stations except S.R. 224, on which the net used was too coarse for its capture, and in thirteen out of thirty-four gatherings, at depths of from 200 to 1,000 fathoms. On station S.R. 164 it formed 10 per cent. of the whole townetting at 200 fathoms.

Scolecithricella ovata (Farran).

Occurrence.—The vertical range of this species seems to be from the surface to 1,000 fathoms. It is of frequent occurrence over deep water off the west coast of Ireland, but is only found in small numbers. It was taken on six out of the eight stations, and in sixteen out of the thirty-four gatherings, at all depths from the surface to 1,000 fathoms.

Scolecithricella minor (Brady).

Occurrence.—This is a more common species than the records here given seem to show, but its small size probably accounts for its not having been captured oftener. It was taken on five stations at depths of from 100 to 1,000 fathoms, and has on other occasions been often taken at or near the surface.

GENUS *Scolecithrix*, Brady.

Scolecithrix magna (T. Scott).

Amallophora magna, Scott, 1894.

Scolecithrix cristata, Giesbrecht, 1895.

Scaphocalanus acrocephalus, Sars, 1900.

An examination of Scott's types in the British Museum leaves no doubt that the species described by him is the same as *Scolecithrix cristata* of Giesbrecht.

For the reasons given above, under *Xanthocalanus typicus*, I have regarded the genus *Amalophora* as a synonym of *Xanthocalanus*, and have not used it, in the sense in which it was used by Sars, for a section of Giesbrecht's comprehensive genus *Scolecithrix*. If that sub-division be regarded as of generic rank, as doubtless it should be, at least in part, the correct name for it appears to be *Scaphocalanus*. I have, however, thought it better for the present to continue to use the genus *Scolecithrix* in its larger sense.

Occurrence.—A very common and noticeable species in deep water. It occurred on every station, and in almost every tow-netting, between 280 and 1,150 fathoms.

***Scolecithrix echinata*, Farran.**

Scolecithrix echinata, Farran, 1905.

Amalophora echinata, Pearson, 1906.

Pl. VI, fig 6.

I have figured the fifth foot (Pl. VI, fig. 6) as my former figure (1905, Pl. V, fig. 17) was not quite accurate. There is a very small spine on the distal extremity of the outer edge of the second joint of the exopodite of the first foot, which was not mentioned in the original description.

Occurrence.—Though frequently taken, this species is never present except in small numbers. It was taken on every station but one, at depths of from 350 to 800 fathoms.

***Scolecithrix gracilipes*, sp. n.**

Pl. VI, figs. 1-4.

Female (Pl. VI, fig. 1)—length 2.3-2.5 mm.

Cephalothorax elongate, ovate, very slender. Cephalon slightly vaulted, fused with first thoracic segment. Fourth and fifth thoracic segments fused, the latter with the postero-lateral margins rounded, not produced.

Abdomen rather slender, slightly less than one-third of the length of the cephalothorax and equal to the second to fifth thoracic segments. Genital segment not swollen, about one and a half times as long as either the second or third abdominal segments, which are each about twice as long as the fourth segment. Furcal rami about twice as long as broad.

First antenna broken in all my specimens.

Second antenna and mouth parts almost exactly as in *S. brevicornis* and *S. echinata*.

First to fourth swimming feet as in *S. brevicornis* and *S. echinata*.

The second joint of the exopodite of the first foot (Pl. VI, fig. 2) has a small distal spine on its outer margin, as has likewise

S. echinata, my original description being in error on this point.

Fifth feet symmetrical, two-jointed, the first joint rather longer than broad, the second joint about twice as long as the first, with a small outer-edge tooth near its extremity, a terminal spine about three-quarters as long as the joint, and a long and slender inner-edge spine twice as long as the joint itself.

The fifth feet (Pl. VI, fig. 3) resemble those of *S. brevicornis*, except for the position of the tooth on the outer edge of the second joint. In my specimens it is placed comparatively near the terminal spine, dividing the outer edge in the proportion 5:1. In *S. brevicornis*, as figured by Sars (1900, Pl. X, fig. 14, 1903, Pl. XXXVI.), it is placed opposite the base of the inner-edge spine, dividing the outer edge in the proportion 2:1.

Male unknown.

It is with some hesitation that I have given a name to this species instead of recording it as *S. brevicornis*. The differences between the two are very slight, but if constant quite sufficient to distinguish them. These differences are the larger size of *S. gracilipes*, though this in itself, within the bounds of probable variation, is no valid distinction; its more slender and, compared to the abdomen, longer cephalothorax, and the more distal position occupied by the outer-edge tooth on the second joint of the fifth foot. As Sars' species is only known from a few specimens from within the Arctic circle, it seemed on the whole safer to record the N. Atlantic form under a separate name until the Northern species should become better known.

In a tow-netting taken 30 miles N. by W. of Eagle Island, County Mayo, in May, 1904, at 600 fathoms, there occurred a species of *Scolecithrix* which so closely resembled the above species that I have not ventured to separate it. It measured 2.7 mm., and in its external form, and in such mouth parts and limbs as remained it agreed exactly with *S. gracilipes* except as regards its fifth pair of feet. These (Pl. VI, fig. 4) had a second basal joint bearing a rudimentary endopodite inserted between the first basal and the terminal joint, both of which resembled those of *S. gracilipes*.¹ Until the contrary is shown, I should prefer to regard this as the accidental retention of a developmental character in the mature female which is to be found normally in a modified form in the immature male. The form of fifth feet in the genus *Racovitzanus* (Giesbrecht, 1902) is very similar to this, and may perhaps be explained in the same way, the genus only being known from a single specimen.

Occurrence.—*Scolecithrix gracilipes* was found on two stations, S.R. 193 at 630 fathoms, and S.R. 197 at 280, 480, and 680 fathoms, very few specimens in all being taken.

¹ A similar instance has been noticed in the case of *Scolecithrix valida*.

Scolecithrix obtusifrons (G. O. Sars).*Amalophora obtusifrons*, G. O. Sars, 1905.*Scolecithrix emarginata*, Farran, 1905.

This species is a noticeable feature of the deep-water plankton off the west coast of Ireland. It occurred on all the stations except S.R. 164, which was perhaps too shallow for it, at depths of from 330 to 1,150 fathoms, usually in more than one townet on each station.

I submitted specimens of this species, formerly described by me (1905) as *Scolecithrix emarginata*, to Professor G. O. Sars, who was good enough to inform me that they belonged to the species described by him as *Amalophora obtusifrons*. My surmise that *S. emarginata* might prove to be a synonym of *Scolecithricella gracilis* is accordingly incorrect.

Scolecithrix globiceps, sp. n.

Pl. V, figs. 8-13. Pl. VI, fig. 8.

Female (Pl. V, fig. 13)—length 4.3-4.5 mm.

Cephalothorax elongate, ovate, the anterior part of the cephalon somewhat inflated in dorsal view, but not vaulted. Fourth and fifth thoracic segments fused; second to fifth segments together equal in length to one-third of the cephalothorax.

Abdomen contained three and a half times in the length of the cephalothorax. Genital segment not swollen ventrally, two-thirds as wide as long. Second and third abdominal segments about two-thirds as long as the genital segment. Anal segment very short. Furcal rami rather longer than wide.

First antenna longer than the body by about one joint, jointing as in *S. obtusifrons*.

Second antenna with endopodite about four-fifths as long as the exopodite and bearing 8 + 6 setae.

Mandible as in *S. robusta* and *S. obtusifrons*.

Maxilla (Pl. V, fig. 10): small exopodite of medium size, endopodite with eight setae, second basal with five setae, second and third inner lobes with two and four setae respectively.

In the first maxillipede (Pl. V, fig. 12) the large seta on the fifth lobe has a very minute, almost invisible marginal denticulation, and the largest setae on the second, third, and fourth lobes are finely denticulated. Five of the terminal sensory setae are short with bud-like terminations, the remainder, numbering four or five, are longer with rounded ends.

The basal joint of the second maxillipede (Pl. V, fig. 11) has a median sensory seta with a bud-like termination. The distal spine of the first joint has a broad base tapering abruptly to a very attenuated termination.

First foot (Pl. V, fig. 8) with three-jointed exopodite. The distal outer-edge spine of the first joint is as thick as that on the second joint, and reaches to its base.

Second foot (Pl. V, fig. 9) with curved outer-edge spine on the first joint of the exopodite nearly half as long as the second joint. The second joint bears a curved transverse row of spinules. The third joint bears a small patch of very small spinules proximally and two bands of spinules, the median one horse-shoe shaped, and the distal forming an elongate oval. Terminal spine of the exopodite coarsely serrate with about 24 denticulations.

In the third foot the second basal joint has a small patch of very small spinules at the apex of the posterior face, the second joint of the exopodite has a transverse distal band of spinules and a patch of very small spinules at its apex, the third joint has two transverse curved rows of spinules. The first and second joints of the endopodite have each two transverse rows of large spinules.

In the fourth foot the exopodite was imperfect in my specimens. The second joint of the endopodite has a transverse distal row of large spines, the third joint being bare. The outer anterior faces of both exopodites and endopodites of the third and fourth feet are minutely spinulose.

Fifth feet (Pl. VI, fig. 8) imperfectly two-jointed, the division between the joints being very faint in some specimens but more evident in others. The first joint is about as broad as long, with a patch of spinules distally near its outer edge. The second joint has a large slightly serrate spine, about as long as the joint, arising from the middle of the inner edge. The terminal spine is stout, short, about one-third of the length of the joint. On the outer margin of the joint, opposite to the base of the inner-edge spine, is a small tooth, and midway between the tooth and the base of the joint a patch of spinules similar to those on the first joint.

Male unknown.

If it had not been that this species appears to belong to Sars' genus *Amallophora*, I should have felt inclined to identify it with *Scolecithrixella gracilis*, with the description of which it agrees rather well. There are not any well marked characters by which this species can be readily identified, the most noticeable being the somewhat inflated cephalon, the coarse spinulation of the terminal spines of the swimming feet and the form and spinulation of the fifth pair of feet.

In company with *S. globiceps* on one station there occurred some specimens of a *Scolecithrix* which resembled it very closely in external appearance, but which I have described below as distinct on account of some small differences, especially in the fifth pair of feet.

Occurrence.—A few specimens were taken on two stations, viz., S.R. 139, at 1,000 fathoms, and S.R. 224, at 700 fathoms.

Scolecithrix valida, sp. n.

Pl. V, figs. 14–17. Pl. VI, fig. 7.

Female (Pl. V, figs. 14, 15)—length 3·8–3·9 mm.

Cephalothorax oblong ovate, rather more robust than in *S. globiceps*. Cephalon slightly inflated as in that species, rostral

processes two, stout, slightly recurved. Fourth and fifth thoracic segments fused, the latter more constricted posteriorly than in *S. globiceps*.

Abdomen contained about three and two-third times in the length of the cephalothorax. Genital segment not swollen below, about four-fifths the length of the two following segments together. Anal segment very short. Furca small, about one and a half times as long as broad.

First antenna reaching about to the end of the second abdominal segment.

Second antenna with endopodite about four-fifths of exopodite, and bearing 8 + 6 setae.

Mandible as in *S. globiceps* and *S. obtusifrons*.

Maxilla with eight setae on the endopodite, five on the second basal, and two and four respectively on the second and third inner lobes.

First maxillipede with bud-like endings on five of the terminal sensory setae, the rest elongate with rounded tips. The bud-like ends seem to be larger than in *S. globiceps*, and the spine on the fifth lobe more slender basally, but otherwise the maxillipede agrees with that species.

Second maxillipede as in *S. globiceps*, but the distal spine on the first joint is not so strong as in that species.

The first foot (Pl. V, fig. 17) resembles that of *S. globiceps*. The outer-edge spine on the second joint seems variable in length; in one specimen it is as long as in *S. globiceps*, and in another somewhat shorter.

Second foot (Pl. V, fig. 16) as in *S. globiceps*, except as regards the terminal spine which is more finely serrate and has a broader lamina. The teeth on the terminal spine number about thirty-four, each individual tooth on the lower half of the spine being fused with its neighbour medianly but free distally and proximally. A similar arrangement of teeth is found in *S. obtusifrons*, but in that species the teeth are much finer and more closely set.

Third foot with a terminal spine similar to that of the second foot. The spinulation of the second and third feet is the same as in *S. globiceps*.

Fourth feet imperfect in my specimen.

Fifth feet (Pl. VI, fig. 7) two-jointed, first joint small, about as broad as long, second joint elongate, clavate, nearly three times as long as broad, rounded distally and narrowed basally to less than the width of the first joint for about one quarter of its length. On the middle of the inner edge is a strong finely toothed spine, and opposite it on the outer edge a small tooth. At the end of the inner edge is a stout spine about one-third the length of the joint, and in one specimen there occurred a slightly smaller spine situated on the apex of the joint.

Male unknown.

It is somewhat difficult to distinguish between this species and *S. robusta*, *S. obtusifrons* and *S. globiceps*. The fifth feet closely resemble those of *S. obtusifrons*, but the form of the last

thoracic segment distinguishes it from that species. *S. robusta* is very like it in external appearance, but is much smaller and slightly more robust, and its fifth feet are distinctly different. *S. globiceps* is extremely hard to separate without examination of the fifth pair of feet, as it is almost identical in external appearance. It is, however, a little larger and not so robust, and has proportionately a slightly longer abdomen.

Occurrence.—This species was only found on station S.R. 224 at a depth of 700 fathoms, six specimens having been taken.

***Scolecithrix robusta*, T. Scott.**

Pl. VI, fig. 5.

Occurrence.—This species was taken on four stations at depths of from 400 to 680 fathoms.

The size of these specimens varied from 2.65 to 3.1 mm., and the inner-edge spine of the fifth foot (Pl. VI, fig. 5) was straight instead of being slightly curved as in the type.

GENUS ***Scottocalanus***, G. O. Sars.

***Scottocalanus securifrons* (T. Scott).**

Scolecithrix securifrons, ♀, T. Scott, 1883, pars.

Scolecithrix securifrons, Canu, 1896.

Lophothrix securifrons, Wolfenden, 1904.

Scottocalanus acutus, G. O. Sars, 1905.

There seems to have been a good deal of confusion between this and the next species, *Scottocalanus persecans*, which closely resembles it, but can at once be separated by its rounded fifth thoracic segment in both sexes, whereas in *S. securifrons* the fifth segment is pointed laterally in both male and female. Scott, in his original description (1893), has indicated most clearly the female of the present species, his figures, showing the fifth thoracic segment with acute lateral terminations, and the short abdomen with large genital segment partially overlapping the second abdominal segment ventrally, being quite unmistakable. His figure of the male, however, undoubtedly refers to the following species, *S. persecans*, and in the type specimens in the British Museum the females of both species are bottled together under the name of *Scolecithrix securifrons*. Canu (1896) was the first to rediscover the species, in the "Caudan" Collections from the Bay of Biscay, and in his notes upon it expressly states that he uses the name *S. securifrons* for the form with the acute fifth thoracic segments. It has subsequently been recorded by Dr. Wolfenden, who places it in the genus *Lophothrix*, and Prof. G. O. Sars, who has however, as he has been good enough to inform me, described it as a new species under the name *Scottocalanus acutus*, while using Scott's name *securifrons* to designate the species with the rounded fifth thoracic segments.

Occurrence.—This species is very characteristic of deep-water townettings off the west coast of Ireland. It occurred on every station except S.R. 140, usually in the deepest nets, though on station S.R. 197 it was taken at 100 fathoms. It seemed to be most plentiful at about 700 fathoms.

Scottocalanus persecans (Giesbrecht).

Scolecithrix securifrons, T. Scott, 1893, pars.

Scolecithrix persecans, Giesbrecht, 1895.

Scottocalanus securifrons, G. O. Sars, 1905.

There are a few minor differences between the male of the Atlantic form and that described by Giesbrecht from the Pacific. In the first antennae the 20th and 21st (original) joints are separate and not partially fused as in Giesbrecht's description, and there is a partial fusion of the 14th and 15th joints on both sides. In the right fifth foot the endopodite reaches nearly to the middle of the second joint of the exopodite, and is curved towards it instead of being straight, and only slightly longer than the first joint, as in Giesbrecht's figure. The female of this species does not appear to have been described. It resembles the female of *S. securifrons*, as has been mentioned above, the fifth feet being almost identical. The most noticeable points of difference are the fifth thoracic segment, which has a rounded postero-lateral margin with a minute notch at its extremity, and the abdomen, which is rather longer and of almost uniform thickness throughout, the genital segment being scarcely swollen ventrally.

In vertical distribution and numbers this species agrees with *S. securifrons*. It was taken on five stations at depths of from 330 to 1,150 fathoms.

GENUS **Lophothrix**, Giesbrecht.

Lophothrix frontalis, Giesbrecht.

Occurrence.—This is a very widespread and not uncommon species in the N.E. Atlantic. It was taken on every station at all depths from 330 to 1,150 fathoms, and in fifteen out of thirty-four gatherings.

TRIBE HETERARTHANDRIA.

FAMILY *CENTROPAGIDAE*.

GENUS **Centropages**, Kröyer.

Centropages typicus Kröyer.

Occurrence.—Found in small numbers on three stations, from the surface to 1,000 fathoms. Though occasionally occurring in deep oceanic waters, its more usual habitat is epiplanktonic and coastal.

Centropages hamatus (Lilljeborg).

Occurrence.—The capture of a very few specimens of this species on station S.R. 231 at 400 fathoms, in company with *Temora longicornis*, is rather remarkable, as both of these species are distinctly littoral, abounding in the coastal waters and estuaries of low salinity.

GENUS **Temora**, Baird.**Temora longicornis** (Müller).

Occurrence.—Though not such a distinctly littoral species as *Centropages hamatus*, yet its occurrence at 400 fathoms on station S.R. 231 is worth noting.

GENUS **Temoropia**, T. Scott.**Temoropia mayumbaensis**, T. Scott.

Pl. VI, figs. 9-15.

In spite of several small differences between my specimens, all of which were females, and Dr. T. Scott's descriptions, it seems best to designate them by the above name. I have figured the whole animal (Pl. VI, fig. 15), and some appendages, of which the existing figures are insufficient.

The length of my specimens was 7.2 to 8.0 mm.

Cephalothorax ovate in dorsal view.

Cephalon evenly rounded, not vaulted, imperfectly separated from the first thoracic segment. Rostrum short, two-pointed. Fourth and fifth thoracic segments separate.

The first antenna (Pl. VI, fig. 12) was broken in all specimens. The proportional length of the proximal joints is shown in the figure.

The maxilla (Pl. VI, fig. 11) has all its lobes developed and setiferous. The number of setae shown in the figure is approximately correct, though it is possible that some of the more minute ones may have escaped notice or been broken off. The three distal setae of the exopodite are much more slender than the rest.

The second maxillipede (Pl. VI, fig. 10) has the terminal joints rather elongate, the setae, with the exception of the two terminal ones on the last joint, being comparatively short. The jointing of the swimming feet (Pl. VI, figs. 13-14) seems to be as given by Scott, but all the feet, except the first pair, were imperfect in every specimen examined.

The fifth pair of feet (Pl. VI, fig. 9) is symmetrical, and differs in this respect from that figured by Scott, in which one foot is much stouter than the other. The general form of the foot is similar, consisting of two basal joints, an exopodite about as long

as the second basal with a stout terminal spine, and a smaller tooth on the extremity of the inner margin, and a very small endopodite terminating in a long slender spine and a small seta.

If the differences in the fifth feet, between the specimens from the Gulf of Guinea and those from off the west coast of Ireland, should prove to be constant, it would necessitate their separation into two distinct species, but until more specimens of the former have been examined, it is not possible to decide this question.

Occurrence.—Found in moderate numbers in the fine silk nets on stations S.R. 193 and S.R. 197, at 630 and 680 fathoms respectively.

GENUS *Metridia*, Boeck.

Metridia lucens, Boeck.

Occurrence.—Taking both inshore and oceanic gatherings into account, this species is probably the most abundant and widespread of the copepods of the west of Ireland. Though it does not occur in such immense swarms as *Calanus finmarchicus*, yet it usually divides the bulk of most townettings with that species, and in winter forms the greater part. It was common at all depths investigated.

The absence of *Metridia longa* from these records is noteworthy, and is doubtless to be explained by the fact that the persistent drift from the southward checks any incursion of stragglers from its more northerly habitat, though lying so close at hand. That it does occasionally occur to the southward of its usual range is shown by Wolfenden's record of it from between 55° and 56° N. (Thompson's records of *M. longa* from the Irish coast undoubtedly refer to *M. lucens*, a species which is never recorded by him.

Metridia venusta, Giesbrecht.

Metridia venusta, Giesbrecht, 1889.

Metridia Normani, ♂, Giesbrecht, 1892.

Occurrence.—This species occurs regularly in townettings, at depths of from 300 to 1,000 fathoms. It was taken on every station, and in seventeen out of thirty-four gatherings, in small or moderate numbers.

Metridia brevicauda, Giesbrecht.

Occurrence.—The records of this species are almost identical with those of *M. venusta*. It was, however, taken at the surface on station S.R. 140, and was absent from station S.R. 224, where no net suitable for its capture was used.

Metridia princeps, Giesbrecht.

Occurrence.—This noticeable species is very characteristic of offshore deep-water townettings. It was taken on every station, and in sixteen out of thirty-four gatherings at depths of from 280 to 1,150 fathoms.

GENUS **Pleuromamma**, Giesbrecht.**Pleuromamma abdominalis** (Lubbock).

Occurrence.—Though this species has often been recorded from the North Atlantic, most of the records, as has frequently been pointed out, are erroneous, and refer to *P. robusta*. *P. abdominalis* is a decidedly scarce species in the area here dealt with, and perhaps should not be regarded as a permanent denizen, as not more than three or four specimens have been met with at one time. There is very little chance of its being mistaken for *P. robusta*, as the pigmentation is markedly different, the red colour being much more diffuse and far less permanent than in that species.

Pleuromamma robusta (Dahl).

Occurrence.—Occurred on every station, and almost in every townetting from the surface to 1,000 fathoms, and was frequently present in considerable numbers. It is one of the most widespread and characteristic copepods of the deep water off the west coast of Ireland, but in spite of this seems rarely, if at all, to be drifted coastwards.

Pleuromamma xiphias (Giesbrecht).

Occurrence.—Taken on all the stations, except S.R. 140 and S.R. 231, at depths of from 100 to 800 fathoms, usually in small numbers. It would seem to be a permanent inhabitant of these regions.

Pleuromamma gracilis (Claus).

Occurrence.—Only absent from three stations, viz., S.R. 139, S.R. 140, and S.R. 224. Its small size and the small numbers in which it usually occurs are probably sufficient to account for its not having been taken on these occasions.

GENUS **Lucicutia**, Giesbrecht.**Lucicutia grandis** (Giesbrecht).

Leuckartia grandis, Giesbrecht, 1895.

Lucicutia grandis, Giesbrecht, 1898.

Lucicutia grandis, Wolfenden, 1904.

? *Lucicutia maxima*, Steuer, 1904.

The original specimen described by Giesbrecht from the Pacific seems to differ from the Atlantic forms merely in having the

inner edge of the second joint of the basipodite of the right fifth foot of the male somewhat swollen and spinulose. In all my specimens it was smooth and almost straight.

Wolfenden's suggestion that *Lucicutia maxima* of Steuer is identical with the present species seems very probable, though in none of my specimens were any traces of lateral hooks on the cephalothorax visible.

Occurrence.—Taken on four stations at depths of from 700 to 1,150 fathoms. On station S.R. 231 there were a considerable number of specimens present in the mesoplankton trawl at 1,150 fathoms.

Lucicutia magna, Wolfenden.

Lucicutia magna, ♂, Wolfenden, 1903.

Lucicutia atlantica, ♀, Wolfenden, 1904.

Lucicutia gracilis, G. O. Sars, 1905.

Lucicutia atlantica, Farran, 1905.

Lucicutia atlantica, Pearson, 1906.

As males agreeing with Wolfenden's *Lucicutia magna*, of which only the male has been described, and females evidently belonging to *L. atlantica*, of which the male is unknown, were taken in the same townets, I have included both species under the earlier name, as, apart from sexual differences, they agree closely with each other.

Occurrence.—Taken on seven out of the eight stations at depths of from 330 to 1,000 fathoms, usually in small numbers.

Lucicutia lucida, sp. n.

Pl. III, fig. 22. Pl. VI, figs. 16-20.

Female (Pl. VI, fig. 16)—length 3.5 mm. *Male*—3.25 mm.

Cephalothorax ovate in dorsal view. Cephalon broader anteriorly than in *L. magna*, without lateral processes. Rostral papilla not visible in dorsal view.

Abdomen about two-thirds of the length of the cephalothorax. In the female the genital segment is about twice as long as broad, with a small ventral prominence. The two following segments are of equal length, and together equal to the genital segment. The anal segment is about three-quarters as long as the genital segment. The furcal rami are moderately long, about four and a half times as long as broad, and slightly shorter than the genital segment. They are very richly furnished with luciferous glands. The furcal setae are short and slender, the outermost seta arising at the distal two-fifths of the outer margin. There is a very minute seta situated on the outer margin, between the outermost seta and the base of the ramus.

In the abdomen of the male (Pl. VI, fig. 18) the first and second segments together are equal to the third and fourth

together, and slightly shorter than the furca. The anal segment is about three-quarters as long as the furca. The furcal rami agree in proportions and setae with those of the female.

The first antennae (Pl. VI, fig. 17) when extended reach about to the end of the body in both sexes, the total length in the female being 3.2 mm., and in the male 3.0 mm.

Length of joints of first antenna of female in .01 mm :—

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.
7.	4.	5.	6.	7.	7.	6.	8.	8.	8.	9.	9.	15.	15.	18.	20.	20.	22.	20.	20.	15.	15.	18.	15.	9.

Length of joints of left geniculated antenna of male in .01 mm :—

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.
24.	7.	6.	8.	8.	8.	7.	7.	7.	8.	8.	8.	10.	16.	19.	20.	20.	18.	33.	33.	40.	40.	19.	11.	

The right antenna of the male is similar to that of the female. The mouth parts are similar in both sexes, and do not show any noticeable features, being almost identical with those of *L. magna*.

The first to fourth pairs of swimming feet are similar in both sexes. The first foot (Pl. VI, fig. 20) has a three-jointed endopodite and a medium-sized tubular process on the second basal joint. The terminal spine of the exopodite is slightly longer than the third joint, and about equal to half the exopodite.

The second to fourth feet are of the usual type in the genus, and resemble each other. The terminal exopodite spines are short, about equal in length to the second and third joints of the endopodites. All the terminal spines of the exopodites are very minutely serrulate.

The fifth foot (Pl. VI, fig. 19) in the female has the terminal spine of the exopodite short, contained two-and-a-half times in the length of the third joint, and equal to about half the endopodite. The inner-edge spine on the second joint of the exopodite is slender, and more than half the length of the third joint.

In the male the fifth pair of feet (Pl. III, fig. 22) are of the usual form, except that the spinous process of the basipodite of the right foot is on the first instead of on the second joint. The second joint of the basipodite is smooth. The exopodite and endopodite are each two-jointed, the former with a strong distal spine on the outer edge of the first joint, the latter with the second joint less foliose than usual. The left foot has a large rounded process, bearing a few spinules, on the second joint of the basipodite. This is badly shown in the figure, the joint having become distorted in mounting before it was drawn. The exopodite and endopodite resemble those of *L. flavicornis*.

Of the known species of *Lucicutia* with a three-jointed endopodite on the first foot, viz., *L. flavicornis*, *L. longicornis*, *L. grandis*, *L. maxima* and *L. curta*, the first two may be distinguished from *L. lucida* by their much smaller size; *L. grandis*, and *L. maxima*, if distinct, are about twice as large, and *L. curta* differs in its stout robust form and shorter caudal rami.

Of the two new species recently described by Prof. G. O. Sars the jointing of the endopodite of the first foot is not mentioned, but in *L. intermedia* the genital segment of the female is

equal to the two following segments conjointly, and the outer edge seta of the furca is situated at the middle of the outer margin, while in *L. tenuicauda* the furca is equal in length to the rest of the abdomen. None of these characters agree with those found in *L. lucida*.

Occurrence.—Two specimens of this species, a male and a female, were taken on station S.R. 197 at a depth of 680 fathoms.

Lucicutia curta, Farran.

Lucicutia curta, Farran, 1905.

Occurrence.—Taken on six out of eight stations, from the surface to 1,000 fathoms.

Lucicutia longiserrata (Giesbrecht).

Pl. VI, figs. 21-22.

Occurrence.—Two specimens, a female and a male, apparently belonging to the same species, were taken on Station S.R. 224 at 700 fathoms. Though the female measured 3.0 mm. while Giesbrecht's *L. longiserrata* was only 2.2 mm., yet the agreement in other respects was so near that I have recorded it under the above name. The only noticeable difference was in the tubular basal process of the first foot (Pl. VI, fig. 21), which was not so long as shown in Giesbrecht's figure.

Lucicutia flavicornis (Claus).

I have included under the above name a few small specimens of *Lucicutia* which occurred, one or two at a time, in some of the gatherings. They measured from 1.5 to 2.0 mm., and agreed in all their main features with *L. flavicornis* as described by Giesbrecht, the differences between them being well within the limits of the variations recorded by him.

The specimens were too few to make any detailed study of, but it is perhaps worth noting that in examining the females they seemed to fall into two groups separated as follows:—

- (1.) Solid tapered tubercle, notched at its extremity, on second basal of first foot; outer margin of third joint of exopodite of fifth foot with four teeth on its proximal moiety.
- (2.) Low flat cylindrical tubercle on second basal of first foot; outer margin of third joint of exopodite of fifth foot with its proximal moiety smooth; inner-edge spine of second joint of exopodite not so long as in (1). Animal slightly larger.

Occurrence.—On four stations at depths between 200 and 1,000 fathoms.

GENUS *Heterorhabdus*, Giesbrecht.*Heterorhabdus norvegicus* (Boeck).

Occurrence.—The most plentiful species of its genus. Present on all stations except S.R. 164, and almost in every townetting from the surface to 1,150 fathoms. The absence of the species from S.R. 164 cannot indicate a southern limit to its range, as Dr. Wolfenden took it between 51° and 52° N., but it is possibly due to a thinning out of its numbers.

Heterorhabdus spinifrons (Claus).

Occurrence.—This species occurred on six out of the eight stations, but always in small numbers. Specimens of the female from this area reach a length of 4.0 mm.

Heterorhabdus abyssalis (Giesbrecht).

Heterochaeta abyssalis, Giesbrecht, 1889.

Heterorhabdus abyssalis (?), Farran, 1905.

Occurrence.—One specimen of a female, length 2.65 mm., similar to specimens from the west coast of Ireland, which I formerly referred to this species, was taken on station S.R. 139 at a depth of 1,000 fathoms, in company with a male agreeing closely with Giesbrecht's description of *H. abyssalis*. Another specimen of the female was taken at 400 fathoms on the same station.

Heterorhabdus robustus, sp. n.

Heterorhabdus vipera, Farran, 1905.

Pl. VII, figs. 1-10.

Female (Pl. VII, figs. 1, 2)—length 3.5-4.0 mm. *Male*—3.4-3.7 mm.

The cephalothorax is stout and robust in both sexes, but not as much so as in *H. compactus*. Rostral prominence low, just visible in dorsal view.

Abdomen measuring about half the length of the cephalothorax, with large dilated genital segment in the female. Furcal rami (Pl. VII, fig. 3) equal in length to the two preceding segments taken together.

The first antennae reach, when extended, slightly beyond the genital segment.

Second antennae as in *H. compactus*.

Mandibles as in *H. vipera*, the cutting edge of the right mandible (Pl. VII, fig. 5) with four denticles, the two median bifid, the distal curved and laminate, and very slightly longer than the rest. The cutting edge of the left mandible (Pl. VII, fig. 4) bears three denticles, the distal very long and sickle-shaped.

The maxilla (Pl. VII, fig. 7) resembles in form that of *H. vipera*, but differs in having longer setae on the endopodite.

The first maxillipede (Pl. VII, fig. 6) resembles that of *H. vipera*. In the figure the feathering and serrulation of the setae and spines is not shown.

The second maxillipede is as in *H. vipera* and *H. compactus*, the median seta on the first joint being small and slender.

The first to fourth swimming feet (Pl. VII, fig. 10) in both sexes resemble those of *H. vipera* and *H. compactus*.

The fifth feet in the female (Pl. VII, fig. 9) only differ from those of *H. vipera* in having the inner-edge spine on the second joint of the exopodite slightly shorter than the third joint. In *H. vipera* it is longer than the third joint, while in *H. compactus* it is equal to it.

In the male the left fifth foot (Pl. VII, fig. 8) is of the same general form as that of *H. vipera*, but differs in the shape of the third joint of the exopodite, which is more ovate, and bears shorter spines. The right fifth foot (Pl. VII, fig. 8) differs considerably from that of *H. vipera*, the third joint of the exopodite and the processes on the second joint and on the second basal joint being of a totally different form.

H. robustus is an addition to that section of *Heterorhabdus*, represented by *H. vipera*, *H. compactus* and *H. brevicornis*, which is distinguished by the absence of a long median spine on the first joint of the second maxillipede, and the presence of a broad foliose exopodite on the third foot. In Sars' original description of *H. compactus* he has described and figured the fourth foot as being foliose, instead of the third, but this is clearly an oversight. *H. atlanticus* is separated from this section by having the third and fourth feet similar and without foliose exopodites, as in *H. longicornis*.

On account of the resemblance of *H. robustus* ♀ to *H. compactus*, I forwarded specimens to Prof. G. O. Sars, who kindly informed me that they were quite distinct. The principal points of difference have been referred to above.

H. robustus ♀ is only distinguishable from *H. vipera* by its larger size and the above-mentioned differences in the maxilla and fifth feet. My former record of a large form of *H. vipera* (1905) in reality refers to *H. robustus* and must be deleted. The difference between the fifth feet of the males of the two species is much more noticeable. The description of *H. brevicornis* is very incomplete, but its very small size, 2.0 mm., is a sufficient, though not satisfactory, distinction.

Occurrence.—This species was taken on stations S.R. 139, S.R. 140, S.R. 175 and S.R. 224 at depths of from 330 to 1,000 fathoms, usually in small numbers. It is probably a permanent inhabitant of the Irish deep-water area.

***Heterorhabdus Grimaldii*, Richard.**

Occurrence.—This very fine species, the largest of its genus, and differing considerably in structure from all the other members, was taken on three stations, viz., S.R. 139, at 800 fathoms,

S.R. 224, three specimens at 700 fathoms, and S.R. 231, six specimens at 1,000 fathoms. It is evidently a permanent though rather scarce inhabitant of the area.

Heterorhabdus longicornis (Giesbrecht).

The specimens met with of both sexes may be separated into two groups according to their sizes, those from 3.0 to 3.5 mm. and those measuring about 4.5 mm. These groups occurred together but intermediate specimens were not found. As no structural differences between the two sizes could be made out I have included them all under the name of *H. longicornis*.

Occurrence.—Taken on every station but S.R. 164 from the surface to 1,150 fathoms.

GENUS **Mesorhabdus**, G. O. Sars.

Mesorhabdus brevicaudatus (Wolfenden).

Heterorhabdus brevicaudatus, Wolfenden, 1905.

Mesorhabdus annectens, G. O. Sars, 1905.

Mesorhabdus brevicaudatus, G. O. Sars, 1907.

Occurrence.—In small numbers on three stations at depths of from 580 to 680 fathoms.

GENUS **Disseta**, Giesbrecht.

Disseta palumboi, Giesbrecht.

Disseta palumboi, Giesbrecht, 1889.

Heterorhabdus grandis, Wolfenden, 1904, 1905.

Heterorhabdus grandis, Pearson, 1906.

Dr. Wolfenden's figures of *Heterorhabdus grandis* (1904, Pl. IX, fig. 36; 1905, Pl. IV, figs. 7-8) furnish unmistakable proof of the identity of that species with *Disseta palumboi*.

Occurrence.—This species is evidently widely distributed in small numbers in the deep-water area, having been taken on five stations at depths of from 680 to 1,150 fathoms—from one to seven specimens of both sexes on each station.

GENUS **Haloptilus**, Giesbrecht.

Haloptilus longicornis (Claus).

Occurrence.—This species was taken in very small numbers on five stations at depths of from 200 to 630 fathoms. As other records go to show that this is an epiplanktonic species, widespread in the N.E. Atlantic, it is possible that the deeper records,

600 fathoms on stations S.R. 175 and S.R. 193, may refer to specimens taken during the ascent of the net. Dr. Wolfenden, using closing nets only, found the species between 100 and 200 fathoms.

Haloptilus acutifrons (Giesbrecht).

Occurrence.—This species seems rather scarcer than the preceding, having been only taken on three stations, in all cases in company with *H. longicornis*. Probably its scarcity is due to a more restricted northern range.

Haloptilus tenuis, sp. n.

Pl. VII, figs. 16-22.

Female (Pl. VII, fig. 18)—length 4.62 mm.

Cephalothorax ovate, elongate, broadest at its anterior third. Cephalon (Pl. VII, fig. 17) very much vaulted and with an anterior caecum, distinctly mucronate in lateral view, but with the point scarcely visible when seen dorsally.

Abdomen (Pl. VII, fig. 16) short, contained about six times in the length of the cephalothorax. Genital segment as long as broad, and one and a half times as long as the two following segments taken together. Anal segment equal to the second and third abdominal segments taken together, and a little shorter than the furca. Furcal setae short, the appendicular seta very long and slender.

The first antenna is longer than the body by about three joints. Its total length is 4.7 mm.

Length of joints in 0.1 mm. :—

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.
24.	9.	9.	9.	12.	12.	12.	12.	14.	14.	17.	20.	24.	26.	27.	27.	29.	29.	25.	20.	21.	18.	21.	21.	16

In the second antenna (Pl. VII, fig. 19) the exopodite is a little more than half as long as the endopodite.

The mandibular palp is elongate and slender, the two branches being of equal length. The cutting edge of the mandible bears one large and three small teeth as in *H. mucronatus*.

The maxilla (Pl. VII, fig. 21) resembles that of *H. acutifrons* in general form. The outer lobe bears three minute setae followed by six large setae, the most proximal of the large setae being considerably thicker than the rest. The exopodite has four medium-sized outer-edge setae, two large terminal setae, and five very small setae on the extremity of the inner edge. The endopodite is one-jointed, and bears a medium terminal seta and two or three small setae. The second basal bears five setae, the three median being the largest. The third inner lobe is knob-shaped and bears three setae, the second one seta, and the first five spines much longer and more slender than in *H. acutifrons*.

The first maxillipede (Pl. VII, fig. 20), has none of its setae modified into spines. The three terminal setae are the largest and smooth, except for a slight distal pectination.

The second maxillipede is of the ordinary form, the proportional length of the joints being 18:13:7:6:5:4:2. The large setae on the four last joints are almost smooth.

The first to fourth pair of swimming feet have no noticeable features.

In the fifth feet (Pl. VII, fig. 22), the terminal spine of the exopodite is three-fourths as long as the third joint. The inner-edge seta of the second joint is very slender, and about half as long as the joint. It is very finely feathered.

Male unknown.

This species in external appearance and size approaches very near to *H. spiniceps*, but its abdomen is proportionately a little longer and the cephalic spine not so prominent. It also differs in the maxilla, which in *H. spiniceps* has only two setae on the endopodite, and in the first maxillipede, which in *H. spiniceps* has strong hooks on the fifth and sixth lobes. It agrees with *H. acutifrons* in the form of the maxilla and first maxillipede, but differs in the shape of the body and in being considerably larger. Of the other species with cephalic spines *H. oxycephalus*, *H. mucronatus* and *H. aculeatus* have the head much more acute, and *H. ocellatus* is about twice as large, besides differing in other respects.

Occurrence.—Three specimens of *H. tenuis* were taken on stations S.R. 139, 800 fathoms; S.R. 175, 600 fathoms; and S.R. 224, 700 fathoms.

Haloptilus fons, sp. n.

Pl. VII, figs. 11-15.

Female (Pl. VII, fig. 11.)—length 5·7-6·6 mm.

Cephalothorax about three times as long as wide in dorsal view, the sides parallel and the ends rounded. Cephalon shaped somewhat as in *H. chierchiaie*, but with the rostral papilla not so evident, very slightly vaulted, and rather angular in outline. Anterior caecum absent.

Abdomen (Pl. VII, fig. 15) a little more than one-fourth the length of the cephalothorax. Genital segment about as broad as long, and one and a half times as long as the two following segments taken together. Second abdominal segment slightly longer than the third, the two together being about four-fifths as long as the anal segment. Furcal rami slightly longer than broad, the appendicular setae being moderately long and slender.

The first antennae are longer than the body by about five joints, their length in a specimen measuring 6·6 mm. being 8 mm.

Length of joints of first antenna in ·01 mm. :—

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25.
42. 18. 21. 21. 23. 23. 21. 21. 23. 24. 29. 35. 42. 42. 42. 42. 42. 41. 36. 27. 29. 27. 35. 30. 23.

The second antennae resemble in some respects those of *H. chierchiaie*, particularly in the exopodite, which shows the division between the first and second joints well marked. The endopodite

is shorter and thicker than in *H. chierchiaie*, the first joint being equal in length to the exopodite. The second basal joint is thick, and about two-thirds as long as the first joint of the endopodite. It bears two distal setae which are not so long as the single seta of *H. chierchiaie*.

The mandibular palp is of the same form as in *H. ornatus*. The cutting edge (Pl. VII, fig. 13) is of a form not found in any other members of the genus. It is strongly chitinised, and bears five teeth, the two distal being strong and multicuspoid, the two following each with a single small cusp on their dorsal margin, and the lowest simple and slender.

The maxilla (Pl. VII, fig. 14) resembles most nearly that found in *H. chierchiaie*, but differs in the exopodite, which bears two large distal setae, four smaller outer-edge setae and five very small inner-edge setae, that of *H. chierchiaie* having eight sub-equal setae. The endopodite, like that of *H. chierchiaie*, is imperfectly three-jointed, but bears 4 + 4 + 5 setae instead of 3 + 1 + 3 as in that species.

The first maxillipede, as in *H. chierchiaie*, has three setae on the second and third lobes. The setae on the fifth and sixth lobes are no thicker than the largest setae on the following joints.

The second maxillipede resembles that of *H. mucronatus*, the proportional lengths of the joints being 30 : 24 : 9 : 8 : 6 : 5 : 2.

The swimming feet show some noticeable features. The first feet resemble those of *H. chierchiaie*, but lack the setose patches on the outer margin of the exopodite.

The terminal spines of the exopodites of the second to fourth feet are unusually long, that of the second foot being as long as the third joint of the exopodite, and that of the fourth foot being two-thirds as long as the same joint of its exopodite.

The fifth pair of feet (Pl. VII, fig. 12) agree in most points with those of *H. chierchiaie*, but may be distinguished by the longer inner-edge spine with thickened base of the second joint of the exopodite.

Male unknown.

Haloptilus fons is more closely allied to *H. chierchiaie* than to any other described species of the genus. The latter species was, as Giesbrecht has pointed out, the least specialised member of the genus, but in most of the points in which *H. fons* differs from *H. chierchiaie* an even less degree of specialisation is noticeable, particularly in the cutting edge of the first joint of the basipodite of the mandible. In *H. fons* the cutting edge is broad, heavily chitinised, and provided with strong multicuspoid teeth, while throughout the rest of the genus it is narrow, weak, and provided with two or three simple or notched teeth. This dissimilarity is doubtless correlated with some slight difference in food or methods of feeding, which has, perhaps, induced the further specialisation shown in the elongation of the second antennae and the reduction of setae on the maxilla and first maxillipede.

H. angusticeps, recently described by Prof. G. O. Sars, also agrees with this species in its well developed mandible and its maxilla with a three-jointed endopodite. It is, however, considerably smaller, and apparently of a much more slender form, with shorter antennae.

Occurrence.—*Haloptilus fons* was taken on two stations, viz., S.R. 175, one specimen at 600 fathoms, and S.R. 231, one specimen at 1,000 fathoms.

GENUS *Augaptilus*, Giesbrecht.

This genus was founded by Giesbrecht in 1889 to receive *Hemicalanus longicaudatus* of Claus; at the same time he added five new species, and, in 1892, also included *Hemicalanus filigerus* of Claus; G. O. Sars, in 1893, adding *A. glacialis*, and T. Scott, in 1894, *A. Rattrayi*. The recent large increase of the genus was initiated by Wolfenden when, in 1902, he described *A. zetesios*, followed in 1904 by *A. magnus* and *A. gibbus*, Steuer in 1904 also adding *A. fungiferus*. The total number of species was, in 1905, brought up to twenty-six by Sars' description of thirteen new species from the Prince of Monaco's collections, and five were subsequently added by him in 1907 from the same source. As of these thirty-one species only nine have been figured, it has become a matter of some difficulty to correctly identify specimens, particularly in view of the fact that there does not seem any probability of the limits of the genus having been reached.

In the collections here dealt with the genus is represented by eighteen species, four of which I have described as new, the rest being referred to species already known.

The difficulty of subdividing this very cumbrous genus does not seem to have been simplified since Giesbrecht, in 1892, foreseeing the increase which has now become an accomplished fact, provisionally included all the species then known under one generic name. The separation of the *longicaudatus* group, which apparently contains the type of the genus, and which is characterised by the extreme reduction of its maxilla and the length of its abdomen and furca, has become more marked, but of the remaining species it is impossible to use any arrangement which does not separate species which in some points closely resemble each other; e.g., if the nature of the maxilla be used as a means of classification, such totally dissimilar forms as *A. bullifer* and *A. Rattrayi* will be placed together, while if the presence or absence of a rostrum be regarded as of importance, two such closely allied forms as *A. squamatus* and *A. laticeps* will be separated.

Augaptilus elongatus is apparently the most primitive form, and in it, as also in *A. nodifrons*, the endopodite of the maxilla is indicated as a distinct joint, thus forming a link with the genus *Haloptilus*.

Augaptilus elongatus, G. O. Sars.

Augaptilus elongatus, G. O. Sars, 1905.

Prof. G. O. Sars' description clearly indicates the species referred to, and only needs to be supplemented by a more detailed description of the maxilla. The first inner lobe of the maxilla

bears ten moderate curved spines, the second lobe one large and one small seta, the third lobe two small setae. The basipodite, second joint, or, as Sars calls it, the first joint of the endopodite, is furnished with three medium setae. The endopodite itself is a very small, almost square, joint with three terminal setae. The exopodite is long and narrow, with seven setae, the two terminal being the largest. The outer lobe bears six large setae situated distally to three very fine setae. My specimens agreed in size with those originally described.

Occurrence.—Taken on three occasions, on station S.R. 175, at 600 fathoms; S.R. 224, at 700 fathoms; and S.R. 231, at 1,150 fathoms.

Augaptilus nodifrons, G. O. Sars.

Augaptilus nodifrons, G. O. Sars, 1905.

My specimens, all females, differed from those described by Sars in having three inner-edge lobes on the maxilla, the first well developed, the second and third small, and each with a single terminal seta. The type specimen is described as having only two inner-edge lobes. The rest of description agrees very closely with my specimens, the noticeable specific characters being the nodular rostral prominence without filaments, the two-branched mandible with a well developed cutting edge, the jointed endopodite with two terminal setae, the absence of buttons on the maxillipedes, and the stout curved spine on the inner edge of the second joint of the exopodite of the fifth pair of feet.

The size of the specimens met with mostly varied between 5.4 and 5.7 mm., but one, taken on station S.R. 231, reached 7.1 mm.

Occurrence.—This is not an uncommon species, having been taken on five stations at depths of from 580 to 1,150 fathoms.

Augaptilus laticeps, G. O. Sars.

Augaptilus laticeps, G. O. Sars, 1905.

Being doubtful as to whether my identification of this species was correct, I submitted it to Prof. G. O. Sars, who was good enough to inform me that the specimen sent was *A. laticeps*, pointing out at the same time that it might be distinguished from *A. squamatus* by the fact that the latter has no rostral appendages, while in *A. laticeps* they are present as a pair of slender filaments.

Colour.—This species may at once be distinguished from all others in a townetting by its light olive green colour which is retained for a long time, at least two years, by specimens preserved in formaline.

Occurrence.—This is a moderately frequent species in deep water, having been taken on six stations at depths of from 400 to 1,150 fathoms.

Augaptilus brevicaudatus, G. O. Sars.*Augaptilus brevicaudatus*, G. O. Sars, 1905.

My identification of this species was kindly confirmed by Prof. G. O. Sars. The following particulars added to his description will make the species more easy of recognition. Mandible two-branched, cutting edge feebly developed with one large curved tooth occupying more than half the edge, two equal slender teeth, and one very minute acicular proximal tooth. Maxilla with eleven spines on first inner lobe, one and two setae on the second and third inner lobes, two setae on the very rudimentary endopodite, two equal setae on the extremity of the exopodite, and six setae on the outer lobe. First and second maxillipedes with sensory buttons.

Colour.—The colour of this species is unusual, consisting of a patch of rich deep brown round the mouth, the rest of the body being colourless except for a scanty brown shading on the second antenna and the exopodite of the mandible.

Occurrence.—Occurred in small numbers on five stations, at depths of from 350 to 1,150 fathoms.

Augaptilus facilis, sp. n.

Pl. III, figs. 23, 24.

Pl. VIII, figs. 1-6.

Female.—length 5.4 mm.

Cephalothorax elongate, oval, slightly more than three times as long as broad. Rostrum of two slender filaments rising from a papilla.

Abdomen contained about three and three-fourth times in the length of the cephalothorax. Genital segment about equal to the second and third abdominal segments and furca taken together, the proportional lengths of the abdominal segments and furca being 9:3:4:3. Furca about one and a half times as long as broad, with short, sparingly plumose setae. Appendicular seta slightly shorter than the innermost terminal seta, and directed obliquely outwards.

The first antenna is longer than the body by about five joints, the proportional length of the joints in .01 mm. being

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25.
30. 12. 16. 18. 20 21. 22. 24. 27. 30. 36. 36. 36. 34. 34. 34. 35. 36. 32. 32. 30. 35. 35. 26.

The second antenna (Pl. VIII, fig. 2) has both branches of about equal length. The second basal joint bears one very small terminal seta, the second joint of the endopodite 6 + 7 setae. The exopodite is distinctly eight-jointed, with a distal inner-edge seta on each of the joints, those on the fourth and fifth joints being the largest, and that on the seventh joint almost obsolete. The inner-edge seta of the last joint is situated on the extreme distal margin of the joint close to the base of the three terminal setae.

The mandible has a feebly developed two-branched palp, the endopodite without setae, the exopodite five-jointed, with a small seta on each of the four terminal joints. The cutting edge of the mandible (Pl. VIII, fig. 6) is broad, with two large bicuspid teeth, two small teeth, one acicular and the other short, and a proximal articulated spine, the small teeth lying close together, the others widely separated.

The maxilla (Pl. VIII, fig. 5) has the first inner lobe with eight spines, the second with one strong seta, and the third with a slender seta. The exopodite bears three terminal setae and the outer lobe four setae.

The first maxillipede (Pl. VIII, fig. 3) is short, having the setae on the first joint arranged in groups of 2 + 2 + 3, and on the second joint of 2 + 2. The four terminal joints are very much shortened, each bearing two setae of equal size.

The second maxillipede (Pl. III, fig. 24) has setae of moderate length arranged in groups of 1 + 3 + 3 on the first joint, and on the second joint two moderate + one moderate and one long seta, the third joint having two short and two long seta, the fourth three short and one long, the fifth and sixth each two short and one long, and the seventh two very short and one long. All the longer setae on both the maxillipedes bear small but distinct sensory buttons.

The first foot is of the usual form, but has no outer-edge spine on the second joint of the exopodite and only one on the third.

The second foot has the outer-edge spines of the third joint of the exopodite very small and deeply set.

In the third and fourth feet (Pl. III, fig. 23) the second joint of the exopodite has its outer edge below the terminal outer-edge spine produced into a blunt process overlapping the spine, and in the third joint of the exopodite there is a similar process between the second and third outer-edge spines, which reaches beyond the end of the joint. The terminal spine of the exopodite of the third foot is about as long as the third joint; in the fourth foot it is a little shorter. The terminal spines of the second to fifth feet are very finely serrulate.

The fifth foot (Pl. VIII, fig. 4) is of the usual form with the inner-edge seta of the second joint of the exopodite straight and slender and finely plumose, reaching to just beyond the base of the first inner-edge seta of the third joint.

Male unknown.

This species seems to come nearer to *A. gracilis* than to any other described species, but differs from Sars' description of that species in its shorter abdomen, which in *A. gracilis* measures more than one-third of the length of the cephalothorax, and in having sensory buttons on the setae of the first and second maxillipedes, these structures being absent in *A. gracilis*.

Occurrence.—One specimen of *Augaptilus facilis* was taken on station S.R. 197 at a depth of 680 fathoms.

Augaptilus gibbus, Wolfenden.*Augaptilus gibbus*, Wolfenden, 1904.*Augaptilus gibbus*, G. O. Sars, 1905.

Prof. G. O. Sars informs me that he considers the species described by him as *A. gibbus* as synonymous with that described a little earlier by Dr. Wolfenden, by a curious coincidence, under the same name. The maxilla in my specimen differed from that described by Dr. Wolfenden in having eight spines on the first inner lobe. The second inner lobe bore a single strong seta. The third was only indicated, and was without setae. The exopodite bore four rather slender setae and the outer lobe seven setae, the three central ones large, the outer ones extremely small. The length of my specimen, a female, was 3.36 mm.

Occurrence.—One specimen was taken on station S.R. 193 at a depth of 630 fathoms.

Augaptilus palumboi, Giesbrecht.

Occurrence.—This species occurred on four stations at depths between 600 and 1,000 fathoms. It is probably a permanent inhabitant of the region dealt with, its small size accounting for the comparatively few records.

Augaptilus bullifer, Giesbrecht.

Occurrence.—Only one specimen was met with, on station S.R. 231, at 1,150 fathoms.

Augaptilus truncatus, G. O. Sars.*Augaptilus truncatus*, G. O. Sars, 1905.

Prof. G. O. Sars, to whom I submitted a specimen, was good enough to confirm my identification of this species. The maxilla in my specimens was very much reduced, the first inner lobe bearing six weak slender spines, the second and third lobes almost obsolete, but each with a minute terminal hair. The exopodite was long and slender, with one very minute and two medium setae. The outer lobe bore six medium setae.

Occurrence.—Three specimens were taken at 1,150 fathoms on station S.R. 231, and one at 1,000 fathoms on station S.R. 139.

Augaptilus similis, sp. n.

Pl. VIII, figs. 7-14.

Female—length 7.4-8.1 mm.

Cephalothorax moderately robust, ovate. Rostrum of two slender filaments on a prominent papilla.

Abdomen about one-third as long as the cephalothorax. Genital segment slightly longer than the two following segments and the furca taken together. Anal segment equal to the furca, and about one and a half times as long as the second abdominal segment. Furcal rami nearly twice as long as broad, and separated by about their own width. The furcal setae are rather setose, the second from within being about twice as long as the rest, and the appendicular seta very small and slender.

The first antenna is longer than the body by about three joints. Proportional length of joints in '01 mm. : —

| | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | 12. | 13. | 14. | 15. | 16. | 17. | 18. | 19. | 20. | 21. | 22. | 23. | 24. | 25. |
| 20. | 12. | 16. | 16. | 16. | 17. | 18. | 18. | 19. | 21. | 25. | 32. | 44. | 44. | 46. | 46. | 48. | 48. | 48. | 38. | 38. | 34. | 36. | 32. | 24. |

In the second antenna (Pl. VIII, fig. 11) the endopodite is very slightly longer than the exopodite. The first joint of the endopodite is equal in length to the second basal joint; the second joint is more than twice as long as the first joint, and bears 6 + 8 setae. The exopodite is faintly eight-jointed, the seta on the inner edge of the second joint being absent, but those on the other joints well developed.

The mandible is two-branched, the endopodite being small and two-jointed, with three distal setae; the exopodite four-jointed, with five setae. The cutting edge (Pl. VIII, fig. 13) bears two strong bicuspid teeth, two slender simple teeth, and a pectinate articulated spine.

The maxilla (Pl. VIII, fig. 9) is feebly developed, the first inner lobe bearing five weak spines, the second and third lobes absent, the second basal, or endopodite, with one seta as in *A. bullifer*, the exopodite elongate with one long terminal seta and one very minute and one small outer-edge seta, and the outer lobe with five stout setae.

The first maxillipede (Pl. VIII, fig. 8) is long, the first joint with $x + 1 + 2 + 3$ setae, the second joint with $3 + 3$ setae, the remaining joints very much shortened, bearing twenty sub-equal closely crowded setae with well-developed sensory buttons (Pl. VIII, fig. 12).

The second maxillipede (Pl. VIII, fig. 7) is very long, the first joint with $1 + 2 + 3$ very small setae, the second joint with $2 + 2$ small setae, the third joint with two long and two very small setae, the fourth joint with one long and three very small setae, the remaining three joints each with one large and one or two very small setae. All the large setae bear well-developed sensory buttons.

The first foot is of the usual form. The outer-edge seta on the first joint of the exopodite is longer than the two following joints. There is one very small outer-edge spine on the second joint of the exopodite, and two similar spines on the third joint.

The second to fourth feet have no noticeable characteristics. The outer-edge spines on the third joints of the exopodites are small and deeply set.

The fifth foot (Pl. VIII, fig. 14) has the seta on the inner edge of the second joint of the exopodite stiff and moderately setose,

and standing almost at right angles to the inner margin of the joint; if adressed it would reach to between the first and second inner-edge setae of the third joint.

Colour.—Body colourless, containing a little red oil; base of first antenna, endopodite of second antenna, and three outer furcal setae of an olive-green colour.

Male unknown.

This species is in some points closely allied to *A. truncatus*, but differs very markedly in the arrangement of setae on the terminal joints of the first maxillipede.

Occurrence.—Taken on stations S.R. 224 and S.R. 231 at 700 and 1,150 fathoms, four specimens in all having been met with.

Augaptilus magnus, Wolfenden.

Augaptilus magnus, Wolfenden.

? *Augaptilus fungiferus*, Steuer.

The body of this species is colourless, but usually contains orange-red oil drops, crowded round the mouth and gut, and in the female the ovary shows as two opaque lateral masses of a salmon-pink colour joined together anteriorly. It seems possible, but by no means certain, that the *Augaptilus fungiferus* of Steuer is a synonym.

Occurrence.—This noticeable and easily distinguished species is of frequent occurrence in the deep water townettings, and is often taken in considerable numbers. It was found on every station from depths of 100 fathoms, on S.R. 164, to 1,150 fathoms, on S.R. 231.

Augaptilus angustus, G. O. Sars.

Augaptilus angustus, G. O. Sars, 1905.

This species is easily recognised by its long antennae, the absence of rostral filaments and of sensory buttons on the maxillipedes, and by the three distal setae on the basal, or, as Prof. G. O. Sars calls it, the endopodal part of the maxilla. The animal when alive is suffused with vermilion, most deeply on the region round the mouth, and contains numerous orange-red oil globules.

Occurrence.—On every station, but in very small numbers, at depths of from 350 to 1,150 fathoms.

Augaptilus filigerus (Claus).

The colouring in life consists of vermilion on the first and second maxillipedes and circum-oral area, and in a less degree on the second antenna, and of a faint reddish tinge on the first antenna. There are small orange oil drops scattered through the

body, and the tip of the exopodites of the second to fourth feet contains a small patch of highly refractive greenish-yellow oil drops, possibly with a photogenic function.

Occurrence.—Taken on seven stations at depths of from 350 to 1,150 fathoms.

Augaptilus Rattrayi, T. Scott.

Pl. VIII, fig. 21.

The colouring, as is the case in many members of the genus, is characteristic. It consists of a small, very deeply-coloured circular brown patch round the mouth, the rest of the body being colourless. In very few instances was this pigment spot absent. This species must be distinguished from the following closely allied but much larger *A. horridus*.

Occurrence.—This species, first recorded from the Gulf of Guinea, seems to be a permanent inhabitant of the N.E. Atlantic. It was taken on six stations at depths of from 350 to 1,150 fathoms.

Augaptilus horridus, sp. n.

Pl. VIII, fig. 20.

Female—length 10 mm.

Cephalothorax robust, resembling in general form that of *A. Rattrayi*, but much more vaulted anteriorly, the cephalon being almost conical both in dorsal and lateral view. The whole surface is closely covered, as in *A. Rattrayi*, with short stiff hairs or bristles.

The abdomen, mouth organs, and swimming feet are identical with those of *A. Rattrayi*.

In none of the specimens found was there any trace of pigment visible.

Its much larger size and conical cephalon are sufficient to distinguish this species without difficulty from *A. Rattrayi*. Another difference is the absence in *A. horridus* of the brown pigment patch which is almost always present in the smaller species.

Occurrence.—This species is not a common one, having only been taken on three stations at depths of from between 630 and 1,150 fathoms, most of the specimens being immature.

Augaptilus longicaudatus (Claus).

If I am correct in referring all the specimens to this one species, *A. longicaudatus* exhibits a great variability in size, measuring from 3.6 to 6.1 mm., the intermediate sizes being frequently met with.

The animal is sometimes colourless, but is usually marked by an oval patch of opaque olive green dorsally on the second thoracic

segment; sometimes, but rarely, a similar patch is present on the fourth segment. *Augaptilus longicaudatus* is said to be distinguished from all other members of the genus which possess an elongate furca by having ten large setae on the terminal joints of the second maxillipede, all the other described species, viz., *A. megalurus*, *A. glacialis*, and *A. zetesios*, having only five such setae. Amongst the specimens of what appeared to be *A. longicaudatus* in the collection it was found, however, that all the females of 4.5 mm. and over had fifteen, or perhaps in some cases fourteen, large terminal setae on the second maxillipede and one specimen, measuring 5.9 mm., had also fifteen, instead of the usual seven setae on the terminal joint of the first maxillipede. A male specimen, which measured 4.8 mm., had only the normal number of setae on both maxillipedes. As no other points of difference could be made out, I have not ventured at present to regard those I have mentioned as specific, though I have no knowledge of a parallel instance among the copepoda. The variation above referred to is, it should be noted, in the nature and not the number of the setae, the third joint of the second maxillipede having, in the alternative instances, three large and one small, or four large setae.

Occurrence.—This species occurred tolerably frequently in the townettings, having been taken on all the stations, except S.R. 140, at depths of from 100 to 1,150 fathoms, usually nearer the latter.

Augaptilus anceps, sp. n.

Plate VIII, figs. 15-19.

Female—length 3.75 mm.

Cephalothorax elongate ovate. Cephalon slightly vaulted, somewhat tapered anteriorly, but not so much as in *A. zetesios*.

Abdomen (Pl. VIII, fig. 15) contained about two and four-fifth times in the length of the cephalothorax. The genital segment is almost symmetrical, and about one and a half times as long as the two following segments taken together, the approximate relative lengths of the abdominal segments and furca, measuring the latter along its inner margin, being 6:2:2:3. The furca is about four times as long as wide, the appendicular seta being about as long as the abdomen exclusive of the furca. The other furcal setae were broken.

The first antenna exceeds the body by about four joints, the approximate lengths of the joints in .01 mm. being—

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25.
18. 6. 6. 6. 7. 7. 7. 7. 12. 15. 18. 24. 25. 25. 25. 26. 27. 24. 21. 22. 18. 18. 18. 16.

The second antenna has an endopodite slightly longer than the exopodite, with 6 + 6 terminal setae. The exopodite is five-jointed but the limits of the joints can only be made out with difficulty. The outer-edge setae cannot be referred to their respective joints, their arrangement (Pl. VIII, fig. 17) being more easily figured than described. The proximal of the two large outer-edge setae found in *A. zetesios* and *A. glacialis* is only represented by a small papilla.

The mandible agrees fairly well with that of *A. glacialis*.

The maxilla (Pl. VIII, fig. 19) has only one seta on the inner lobe, as in *A. longicaudatus*; the endopodite bears two equal terminal setae, and the exopodite one very large and one small seta.

The first and second maxillipedes agree in form and number of setae with those of *A. zetesios* and *A. glacialis*; the first lobe of the second maxillipede, however, bears three setae, while Wolfenden's figure of *A. zetesios* shows only two.

The first to fourth feet resemble those of *A. glacialis* and *A. zetesios*, the teeth on the outer edge of the exopodite of the first foot showing the same compound structure as is shown in Wolfenden's figures.

The fifth feet are very similar to those of *A. zetesios*, the inner-edge spine on the second joint of the exopodite (Pl. VIII, fig. 18) reaching to the base of the third inner-edge seta of the third joint. The spine is very strong, straight and coarsely denticulate, the proximal denticulations being larger than are figured by Wolfenden for *A. zetesios*.

Male unknown.

This species is very closely allied to *A. glacialis* and *A. zetesios*, but is considerably smaller than either. It differs from both in having the exopodite of the second antenna shorter than the endopodite, and bearing only one large lateral seta, and also in having only one seta on the inner lobe of the maxilla. The furcal rami are considerably shorter than in either species, and the proportional lengths of the abdomen and its segments also differ. From *A. megalurus* it may be separated by its smaller size, shorter genital segment, and the presence of the strong denticulate spine on the exopodite of the fifth foot.

Occurrence.—One specimen of the above was taken, on station S.R. 197 at 580 fathoms.

***Augaptilus megalurus*, Giesbrecht.**

These specimens differed in some small points from *A. megalurus* as described by Giesbrecht from the Pacific, so it seemed advisable to give some figures in case the Atlantic form may turn out to be specifically distinct.

The total length was 5.7-6.1 mm. in females and 5.0 mm. in males, as against 4.5 mm. and 4.0 mm. as given by Giesbrecht. The abdomen was contained three times in the length of the cephalothorax. The proportional length of the abdominal segments agrees fairly well with Giesbrecht's description, but the genital segment is slightly shorter and the anal segment slightly longer. The whole body is very elongate and stiff, with a vaulted conical cephalon, and forms a noticeable contrast to the more rounded lines and general stouter form of *A. longicaudatus*. The jointing of the first antenna agrees in general with the typical *A. megalurus*, but the terminal joints are in the proportion 15:12:12; the proportion shown in Giesbrecht's figure being about 21:19:20. The exopodite and endopodite of the second antenna are of equal length in the

female, the exopodite being the longer in the male. The remaining appendages agree well enough with the published description, but some small points of difference may be made out in the form of the fifth pair of feet of the male.

Occurrence.—Taken in small numbers on four stations between 600 and 700 fathoms.

GENUS **Pontoptilus**, G. O. Sars.

Pontoptilus muticus, G. O. Sars

Pontoptilus muticus, G. O. Sars, 1905.

I sent drawings of the single specimen found to Professor G. O. Sars, who kindly informed me that it agreed fairly well with the form recorded by him as *P. muticus*. I have accordingly recorded it under that name. It is easily recognised by its very robust form and opaque coarsely dotted integument, which is of a reddish brown colour. The rostrum is absent, the first antenna is almost as long as the body, and the fifth feet have a two-jointed endopodite. The endopodite of the maxilla consists of two large oval joints, each bearing a single seta. The length of the specimen was 6.0 mm.

Occurrence.—A single specimen, a female, of this species was taken on station S.R. 140 at a depth of 750 fathoms.

Pontoptilus abbreviatus, G. O. Sars.

Pontoptilus abbreviatus, G. O. Sars, 1905.

Professor G. O. Sars was good enough to examine the drawings of the *Helga* specimens, and writes to me that they are apparently *P. abbreviatus*.

This species is transparent and colourless, except for a small group of olive-brown spots on either side of the cephalon, close to the postero-ventral angle, and a few orange oil globules near the base of the maxillipedes. The rostrum consists of two slender filaments; the first antenna exceeds the body by about four joints; the endopodite of the maxilla bears numerous setae, and the endopodite of the fifth foot is one-jointed.

Occurrence.—This species is evidently more common than the last, single specimens, all females, having been taken on three stations at depths of from 630 to 1,150 fathoms.

GENUS **Arietellus**, Giesbrecht.

None of the specimens of *Arietellus* in the collection can be referred to the Mediterranean *A. setosus*. They comprise three, if not four, of the species recently described by Professor G. O. Sars, my identification of them having been kindly confirmed by their author. The specific characters lie almost entirely in the form of the cephalothorax, the last thoracic segment, and the furcal rami and setae; the resemblance between the appendages of the various species being so close as to afford no grounds for their discrimination.

Arietellus simplex, G. O. Sars.*Arietellus simplex*, G. O. Sars, 1905.

A. simplex is distinguishable from other described species by its large size, rounded fifth thoracic segments, and comparatively long furcal rami.

Occurrence.—This is perhaps the best represented species of the genus in the collection. It was taken on five stations at depths of between 700 and 1,000 fathoms.

Arietellus pavoninus, G. O. Sars.*Arietellus pavoninus*, G. O. Sars, 1905.

This species, like *A. simplex*, has the lateral margins of the fifth thoracic segment rounded, but it is easily distinguished by its smaller size (5.25 mm. in my specimen), broad robust body, and the short, widely divergent, furcal rami.

Occurrence.—A single specimen was taken on station S.R. 224, at a depth of 700 fathoms.

Arietellus plumifer, G. O. Sars.*Arietellus plumifer*, G. O. Sars, 1905.

Occurrence.—This species was taken on five stations at depths between 350 and 1,000 fathoms. It occurred in somewhat smaller numbers than *A. simplex*, and many of the specimens were immature.

Arietellus sp.

In addition to the above-mentioned species, there occurred a few specimens which approached rather closely to *A. Giesbrechti*, but showed no sign of the asymmetry which characterises that species. Prof. G. O. Sars tells me that since the publication of his description he has met with other specimens of *A. Giesbrechti*, in which the asymmetry was much less marked. It seems advisable, in consequence, to defer consideration of the species till a larger series of specimens can be examined.

GENUS **Paraugaptilus**, Wolfenden.**Paraugaptilus Buchani**, Wolfenden.*Paraugaptilus Buchani*, Wolfenden, 1904.

Occurrence.—A single specimen, female, was taken on station S.R. 193, at 600 fathoms. Its bright lemon yellow colour when alive was rather remarkable.

GENUS *Phyllopus*, Brady.

In a former paper I referred the specimens of *Phyllopus* taken off the west coast of Ireland to Brady's original species, *P. bidentatus*. An examination of a large number of specimens has convinced me that this view cannot be sustained, and that all the Irish specimens must be recorded as belonging to the two new species which I have described below.

Phyllopus Helgae, sp. n.

Phyllopus bidentatus, partim, Farran, 1905.

Pl. IX, figs. 5, 6.

Female—length 2·3–2·4 mm. *Male*—2·4 mm.

The body of the female is short and robust, broadly rounded anteriorly. The fifth thoracic segment is contracted posteriorly, the lateral margins being rounded, and very slightly produced.

The abdomen (Pl. IX, fig. 5) is contained two-and-one-third times in the length of the cephalothorax, the proportional length of the abdominal segments and furca being about 8:3:3:4:3; the second segment is, however, very slightly longer than the third. The genital segment is asymmetrical, the paired genital openings being placed diagonally, that on the right being the most anterior. There is a low tubercle placed ventrally on the middle of the right side, and a small chitinous papilla on the left side close to the postero-ventral margin.

The first antennae reach to about the middle of the genital segment, the proportional length of the joints in .01 mm. being

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|------|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1-2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | 12. | 13. | 14. | 15. | 16. | 17. | 18. | 19. | 20. | 21. | 22. | 23. | 24. | 25. |
| 15. | 6. | 6. | 6. | 6. | 4. | 3. | 3. | 3. | 3. | 3. | 5. | 6. | 7. | 9. | 10. | 11. | 12. | 11. | 9. | 9. | 9. | 11. | |

The other cephalic appendages and the first to fourth feet do not apparently differ from those of *P. bidentatus*, as figured by Giesbrecht. The fifth pair of feet are slightly asymmetrical, the right being a little longer than the left. They have already been figured by me (1905, Pl. XI, fig. 21) in the paper referred to above. They differ from both Giesbrecht's and Brady's figures by the greater elongation of all the joints, particularly the third, and by the smaller size of the setae on the outer edge of the second joint.

The male resembles the female in general form, but is not quite so robust. It has already been figured by me in sufficient detail (1905, Pl. XI, figs. 12–19) under the name of *Phyllopus bidentatus*.

Occurrence.—This species is by far the most common *Phyllopus* in the gatherings, having been taken on every station but S.R. 224, and almost in every townetting between 300 and 750 fathoms, males being slightly more numerous than females.

Phyllopus impar, sp. n.*Phyllopus bidentatus*, Scott, 1894.*Phyllopus bidentatus*, partim, Farran, 1905.

Plate IX, figs. 1-4.

Female—length 2.65-3.0 mm. *Male*—2.95 mm.

The female is stout and robust, the cephalothorax resembling that of *P. Helgae* except for the fifth thoracic segment, which is moderately contracted posteriorly, and produced to form lateral pointed wings on each side of the genital segment, reaching to the middle of the segment on the left, and to the end on the right side.

The abdomen is shorter than in *P. Helgae*, being contained about two-and-a-half times in the length of the cephalothorax. The proportionate lengths of the abdominal segments and furca are approximately 9:5:4:7. The genital segment is considerably broader than long, owing to a very large dextral and a somewhat smaller sinistral tubercle. The furcal rami are about twice as long as broad, and slightly longer than the anal segment.

The first antenna reaches to about the end of the genital segment, the proportional lengths of the joints in .01 mm. being

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|------|----|----|----|----|----|----|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1-2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | 12. | 13. | 14. | 15. | 16. | 17. | 18. | 19. | 20. | 21. | 22. | 23. | 24. | 25. |
| 18. | 7. | 7. | 6. | 7. | 7. | 5. | 3.5. | 3.5. | 3.5. | 3.5. | 3.5. | 4. | 5. | 6. | 8. | 9. | 11. | 12. | 10. | 9. | 7. | 9. | 12. |

The remaining cephalic appendages, and the first to fourth feet, seem to agree with those of *P. bidentatus*, as figured by Giesbrecht, and those of *P. Helgae* described above.

The fifth pair of feet are five-jointed, the basal joints being very short and fused along their inner margins. The second joint on the right side is entirely unarmed; on the left side in one specimen it bears a very short spine on the distal margin of the posterior face close to the outer edge; in another specimen this spine is missing. The third joint (first joint of the exopodite) is about as broad as long, and bears a small distal outer-edge spine, flanked externally by a very small denticle. The second joint of the exopodite bears a long curved seta on its inner margin—the outer margin being armed by two denticles. The terminal joint bears six denticles, arranged in pairs on its outer margin, and a strong short distal spine.

I have figured (Pl. IX, figs. 3, 4) the fifth feet of what I believe to be the male of this species. The animal in general appearance, and in most of its appendages resembled the male of *P. Helgae* referred to above. It was, however, rather larger, and showed some differences in the form of the fifth feet, the wing on the first joint of the left foot being considerably smaller, and the terminal hook of the same foot shorter and more curved.

A specimen of *P. impar*, previously taken by the *Helga* off the West of Ireland had been referred by me (1905, p. 45) to *P. bidentatus*, where, in a passage pointing out its resemblance

to the *P. bidentatus* figured from the Gulf of Guinea by Dr. T. Scott, by an unfortunate misprint the fifth thoracic segment was described as symmetrical.

Occurrence.—Two females of this species were taken on station S.R. 139, at depths of 600 and 1,000 fathoms, and two males on S.R. 175, at 600 fathoms.

FAMILY CANDACIIDAE.

GENUS *Candacia*, Dana.

Candacia rotundata, Wolfenden.

Candacia rotundata, Wolfenden, 1904,

Candacia inermis, Cleve, 1904.

Candacia obtusa, G. O. Sars, 1905.

(Pl. IX, fig. 15).

The male of this species was met with on a few occasions. It measures 3.8 mm. in length. The fifth thoracic segment is rounded on the left side as in the female, but on the right its postero-ventral angle is produced into a slender dorsally curved hook. The right side of the genital segment bears an elongate blunt tubercular process partly overlapping the second segment, and on the left side of the genital segment is a low tubercle. The fifth pair of feet (Pl. IX, fig. 15) is very like that of *C. longimana*, but the terminal joint of the left foot is proportionally much shorter.

Occurrence.—Taken in small numbers on six stations at depths of between 350 and 760 fathoms.

Candacia norvegica, Boeck.

Occurrence.—Taken on six stations at depths of between 400 and 1,000 fathoms. It occurred in thirteen townettings as against the nine in which *C. rotundata* was found.

Candacia gracilimana, sp. n.

(Pl. IX, figs. 7-14).

Male—length 2.25 mm.

Form of body resembling in general that of *C. armata*, the fifth thoracic segments being produced into a sharp point on each side of the genital segment but not, however, blackened as in that species. The point on the right side is slightly the longer.

The abdomen is rather shorter than in *C. armata*, being contained slightly more than two-and-a-half times in the length of the

cephalothorax. The genital segment (Pl. IX, fig. 11) bears a pointed process on the right side as in *C. armata* and *C. curta*, but directed slightly forwards instead of backwards as in those species. The left side of the genital segment bears a small inconspicuous tubercle.

The first antenna is twenty-four-jointed, reaching a little beyond the genital segment, the thick basal portion consisting of seven joints. The proportional length of the joints of the left antenna is approximately the same as in *C. norvegica*, but the twenty-second and twenty-third joints are together equal to the twenty-fourth. The clasping mechanism of the seventeenth and eighteenth joints of the right antenna (Pl. IX, fig. 12) resembles that of *C. norvegica*, the seventeenth joint having very fine toothing all along its upper margin, and the eighteenth a short longitudinal row of fine teeth on its proximal end.

The second antenna and mandible resemble those of *C. norvegica*.

The maxilla (Pl. IX, fig. 10) bears on the first inner lobe one strong terminal hooked spine with a small spine near its base and nine setae. The second inner lobe is very long and slender. The second basal bears two setae and a minute spine, and the endopodite 2 + 5 setae.

The first maxillipede (Pl. IX, fig. 13) is moderately elongate, rather more so than in *C. armata*, the first joint bearing on the first lobe three slender setae, on the second a minute hair, and on the third a moderate seta and a minute hair. The third joint is elongate, about half as long as the first, and three times as long as wide.

The second maxillipede has no distinctive marks.

The swimming feet (Pl. X, figs. 7-9) resemble those *C. longimana*, except that the first foot is more slender, and has no setae on the second basal joint. The terminal spine of the exopodite of the third foot is short and bent, but not quite so much as in *C. longimana*.

The serration of the proximal and median divisions of the outer edge of the third joints of the exopodites of the second to fourth feet is only slightly finer than that of the distal portions.

The fifth feet (Pl. IX, figs. 13, 14) resemble those of *C. longimana*, but the moveable claw (second and third joints of exopodite) of the right foot ends in a much more curved point than in that species.

Female unknown.

This species evidently belongs to that group of the genus represented by *C. norvegica*, *C. longimana*, and *C. tenuimana*. It is not improbable that it may turn out to be the as yet undescribed male of the last named, but as *C. tenuimana* has not been recorded from the N. Atlantic, the use of a new name seems to be the course least likely to lead to confusion.

Occurrence.—One specimen was taken on station S.R. 139 at 400 fathoms and another on S.R. 140 at 350 fathoms.

FAMILY PONTELLIDAE.

GENUS **Anomalocera**, Templeton.**Anomalocera Patersoni**, Templeton.

Occurrence.—This species is widely distributed at the surface on the west coast of Ireland, but usually in small or moderate numbers, never apparently occurring in the vast swarms which at times indicate its presence in the Irish Sea. There are only three records of its occurrence in the present collection, a few specimens having been taken at the surface on station S.R. 140, one in the large triangle net at 700 fathoms at S.R. 193, and three in the mesoplankton trawl at 1,000 fathoms on S.R. 231. The last two records may be put down to accidental captures during the ascent of the net.

GENUS **Bathypontia**, G. O. Sars.**Bathypontia elongata**, G. O. Sars.

Professor G. O. Sars informs me that the drawings of this species which I sent him agreed exactly with the form described by him. It is, perhaps, worth noting, however, that in my specimens the eighth and ninth and twenty-fourth and twenty-fifth joints of the first antenna were fused.

The male does not differ noticeably from the female except in the form of the clasping antennae and of the fifth pair of feet. The clasping antenna (Pl. IX, fig. 16) is nineteen-jointed, the eleven proximal joints being narrow and distinctly separated from the following four somewhat thickened and ill-defined joints. The sixteenth joint is strongly bowed and is followed by three unaltered joints as in the female. The fifth feet (Pl. IX, fig. 17) are almost symmetrical, and consist on each side of four elongate tapering joints, the last joint terminated by a small spine.

Occurrence.—Three specimens were met with, one, a male, on station S.R. 193 at 600 fathoms, and the others, both females, on S.R. 197 at 700 fathoms and S.R. 224 at 700 fathoms.

GENUS **Acartia**, Dana.**Acartia Clausi**, Giesbrecht.

Occurrence.—In the deep water off the west coast of Ireland this copepod is, apparently, always present at all depths from surface to 1,000 fathoms, usually in large numbers. Its absence from some of the tow-nettings recorded in the table is to be explained by the large size of the mesh used on those occasions.

This is the only member of the genus which I have met with off the west coast of Ireland except in the bays and harbours with water of low salinity where *A. discaudata* is associated with it.

I do not think any of the west coast records of *A. longiremis* can be regarded as trustworthy, though there is of course no reason why it should not sometimes be found there.

SUB-ORDER Podoplea.

TRIBE AMPHARTHANDRIA.

FAMILY MORMONILLIDAE.

GENUS **Mormonilla**, Giesbrecht.**Mormonilla phasma**, Giesbrecht.

Occurrence.—Taken in small numbers in the fine-meshed townets, at 600 fathoms on station S.R. 175 and 680 fathoms on S.R. 195.

Mormonilla minor, Giesbrecht.

Mormonilla minor, Giesbrecht, 1891.

Mormonilla polaris, G. O. Sars, 1900.

Mormonilla atlantica, Wolfenden, 1905.

My specimens show the triple jointing of the endopodite of the first foot, on which both Sars and Wolfenden rely for the separation of their species from *M. minor*, but as Giesbrecht in his detailed description of *M. minor* qualifies his statement that the endopodite is two-jointed by saying that, while the first and second joints are fully separated, the second and third are fused "bis auf eine zarte Grenzlinie," I do not think that any dependence can be put on that character. Some of my specimens seemed to show an additional joint in the first antenna immediately distal to the first long seta, but as the appearance of a joint can be produced by folding the antenna at any point, this character, too, is somewhat unreliable.

Occurrence.—In small numbers on stations S.R. 193, 630 fathoms, and S.R. 197, 680 fathoms, being taken in company with *M. phasma* on the latter station.

FAMILY CYCLOPIDAE.

GENUS **Oithona**, Baird.**Oithona similis**, Giesbrecht.

Occurrence.—Taken on four stations. As it is apparently widespread and common off the west coast of Ireland its absence from some townettings may doubtless be put down to its small size.

Oithona plumifera, Baird.

The correct name for this common N.E. Atlantic species of *Oithona* still seems to be somewhat doubtful. It is usually recorded as *O. plumifera*, but sometimes apparently as *O. setigera*. It agrees most nearly with what Giesbrecht regards as *O. plumifera*, but differs in having four setae on the endopodite of the mandible instead of three, and also in the larger size of the single seta on the endopodite of the maxilla. The plumose setae attached to the sides of the thorax, figured by both Baird and Giesbrecht in *O. plumifera*, have never been present in any of the specimens which I have seen, but it is possible that they have been broken off.

Occurrence.—On six out of eight stations, often being moderately plentiful.

GENUS **Paroithona**, nov.

Closely allied to *Oithona*, which it resembles in general form and in the jointing of the cephalothorax and abdomen. The rostrum, in the only known species, is absent. The first and second antennae and the mandible are as in the genus *Oithona*. The maxilla has three well-developed inner lobes, the endopodite represented by a lobule without setae and the exopodite apparently absent. The first and second maxillipedes are as in the genus *Oithona*. The swimming feet have each a three-jointed exopodite and two-jointed endopodite, the fifth pair of feet being represented by a single seta on each side of the fifth segment.

Paroithona parvula, sp. n.

Pl. X, figs. 1-13.

Female—length .46 mm.

General form of body resembling that of *Oithona nana*, but with shorter abdomen. The second, third and fourth (anal) segments of the abdomen are of equal length and slightly more than half as long as the genital segment. The furcal rami (Pl. X, fig. 3) are one-and-a-half times as long, and bear six setae. The innermost furcal seta is about one-and-a-half times as long as the furca, the second is moderately large but broken off close in all my specimens, the third is three times as long as the furca, the fourth very small, the fifth about as long as the furca, and the appendicular seta strong and exceeding the total length of the abdomen. The rostrum is absent, the front of the cephalon resembling that of *Oithona nana*, but being rather more rounded. (Pl. X, fig. 2).

The first antenna (Pl. X, fig. 4) reaches to the beginning of the fourth thoracic segment. It is six-jointed and bears numerous long setae.

The second antenna (Pl. X, fig. 5) is two-jointed, the basal joint with one outer-edge seta; the second joint, representing the

fusion of the second and third joints in *Oithona*, with two short setae on the proximal part of the outer edge, three setae at the point of fusion of the joints and five terminal setae increasing in size from without inwards.

The mandible (Pl. X, fig. 10) resembles rather closely that of *Oithona nana*. The exopodite is not segmented and bears four setae. The endopodite is small, about two-and-a-half times as long as broad, and bears four small setae. The terminal portion of the second basal carries a single strong curved prickle-bearing spine.

The maxilla (Pl. X, fig. 6) has the three inner lobes well developed; the first with five strong spines, the second with a single seta and the third with one large and one small seta. The endopodite is only represented by a small bare lobule. The presence of an exopodite could not be made out.

The first maxillipede (Pl. X, fig. 11) is of the same general form as in *Oithona nana*, but does not apparently bear more than two setae on any of its lobes.

The second maxillipede (Pl. X, fig. 9) is four-jointed, the first joint with 3 + 1 setae, the second with 1 + 1, the third with 3, and the fourth with 2 + 1, the longer setae on the third and fourth joints being bent backwards as in the genus *Oithona*.

All the swimming feet (Pl. X, figs. 7, 8, 12, 13) have three-jointed exopodites and two-jointed endopodites. The outer-edge spines of the exopodites are arranged as 1, 1, 2 on the first three feet and 1, 1, 1 on the fourth foot. The inner edge setae are arranged as 0, 1, 3 on the first foot, 0, 1, 5 on the second and third feet and 0, 0, 5 on the fourth feet. The terminal spines of the exopodites are very long and slender.

The endopodites have an outer-edge seta on the first joint in the first and fourth feet, but not in the second and third feet.

The second joint of the endopodite in the first foot bears eight setae, in the second foot seven setae, in the third foot five setae, and in the fourth foot five seta.

The fifth foot is represented on either side of the fifth thoracic segment by a single seta.

Male unknown.

In the foregoing description and in the accompanying figures the numbers of the setae must be regarded as being somewhat doubtful, since, on account of the minute size and extreme transparency of the specimens, it was a matter of some difficulty to discover whether the smaller setae and spines were present or not.

Occurrence.—This species was present in moderate numbers in the fine silk townets at 630 and 680 fathoms on stations S.R. 193 and S.R. 197.

It seems not unlikely that Thompson's (1903) record of *Oithona nana* from deep water in the N.E. Atlantic refers in reality to this species.

FAMILY *HARPACTICIDAE*.GENUS *Microsetella*, Brady and Robertson.*Microsetella rosea*, Dana.

All the specimens of *Microsetella* found belonged to this species, which is easily distinguishable from *M. atlantica* by the longest furcal seta being twice as long as the body instead of equal to it, and also by the different form of the fifth foot.

Occurrence.—In the fine silk nets at stations S.R. 193 and S.R. 197, at 630 and 680 fathoms respectively.

GENUS *Clytemnestra*, Dana.*Clytemnestra rostrata*, Brady.

Occurrence.—A single specimen was taken in the fine silk net at 630 fathoms, on station S.R. 193.

GENUS *Aegisthus*, Giesbrecht.*Aegisthus mucronatus*, Giesbrecht.

The *Helga* specimens agree closely with Giesbrecht's figures and description, and cannot be referred to Wolfenden's *A. atlanticus*, as both the exopodite and endopodite of the first foot are only imperfectly three jointed and the fifth foot has only an indication of a basal joint. *A. longirostris* described from the Gulf of Guinea by Dr. T. Scott, is separated from both *A. mucronatus* and *A. atlanticus* by having two setae on the inner edge of the fifth foot.

Occurrence.—A few specimens were taken on three stations, S.R. 175, at 600 fathoms, S.R. 224 at 700 fathoms, and S.R. 231 at 400 fathoms.

FAMILY *Monstrillidae*.GENUS *Monstrilla*, Dana.*Monstrilla longicornis*, I. C. Thompson.

Monstrilla longicornis, I. C. Thompson, 1890.

Monstrilla longicornis, Giesbrecht, 1892.

This genus is mainly an inhabitant of littoral or shallow waters, the earlier stages of its life history being passed within the bodies of certain tubicolous polychaete worms, so that its capture forty miles from shore in waters of over 650 fathoms in depth is rather unusual.

Occurrence.—A single specimen, a full grown female, was taken at 630 fathoms on station S.R. 193.

TRIBE ISOKERANDRIA

FAMILY ONCAETIDAE.

GENUS *Oncaea*, Philippi.*Oncaea mediterranea* (Claus).

Occurrence.—A single female specimen was taken at 1,000 fathoms on station S.R. 139. Its bright orange colour and thickened integument are sufficiently remarkable to call attention to the animal, so that it is not likely to have been passed over on other occasions, as might easily happen with other members of the genus.

Oncaea conifera, Giesbrecht.

Occurrence.—This is by far the most plentiful species of *Oncaea* occurring off the west coast of Ireland. It was taken on six stations, and almost always when the mesh of the net was small enough to prevent its passage it formed a noticeable feature in the gathering. It apparently occurs at all depths from the surface to 1,000 fathoms.

Oncaea ornata, Giesbrecht.

Occurrence.—Next to *O. conifera* this seems to be the commonest *Oncaea* of the N.E. Atlantic off the Irish coast. It occurred on five stations at depths between 530 and 1,000 fathoms.

Oncaea notopus, Giesbrecht.

Occurrence.—This species was taken in moderate numbers at 630 fathoms on station S.R. 193, and 680 fathoms on S.R. 197.

The specimen measured .95 mm., the size of Giesbrecht's typical examples, while those from the Arctic Ocean, as recorded by Sars (1900) measured .7 mm., and from the Antarctic (Giesbrecht, 1902) only .65 mm.

Oncaea subtilis, Giesbrecht.

Occurrence.—Taken at the surface on station S.R. 193, and in small numbers in the 680 fathom net on S.R. 197. This species seems to be quite distinct from *O. curvata* from the Antarctic.

Oncaea minuta, Giesbrecht.

I have recorded the *Helga* specimens under the name of *O. minuta* as they agree very closely in structure with that species, although of distinctly larger size. The females measured from .68 to .76 mm., the males .62 mm.; whereas the female of *O. minuta* measures .56 to .58 mm. The first antenna has joints

of the same proportional length as in *O. minuta*. The second antenna agrees with Giesbrecht's figure of that of *O. venusta*. In the mandible the denticulation of the larger laminate appendage is subterminal. The maxilla and first maxillipede show no distinctive marks. The second maxillipede agrees with Giesbrecht's figure of that of *O. minuta*.

The outer-edge spines of the exopodites of the swimming feet are reduced in size; in the fourth foot the outer edge spine of the second joint does not reach to the base of the first outer-edge spine of the third joint, as is also the case with *O. minuta*. The third joint of the endopodite of the fourth foot ends in a blunt conical process. The proximal outer-edge seta of the same joint seems to be without a denticulate lamina, but it is difficult to be sure of this, as some specimens seem to show a trace of it. The fifth feet are similar to those of *O. minuta*.

Occurrence.—In the fine silk nets on stations S.R. 193 and 197, at 630 and 680 fathoms respectively, in moderate numbers.

Oncaea exigua, sp. n.

Pl. X, figs. 25-29.

Pl. XI, figs. 10-12.

Female—length 48-52 mm.

Anterior division of the body ovate, the cephalon being rather broad and equal in length to the four following thoracic segments. Genital segment very large, at least two-thirds of the whole abdomen; genital openings rather far apart and situated in front of the anterior third of the genital segment. The second and third abdominal segments are extremely short, the anal segment about two-thirds as long as broad, and the furcal rami slightly longer than the anal segment and twice as long as broad.

The first antenna is six-jointed, the proportional lengths of the joints being approximately, 3:4:5:12:3:1:3. The segmentation between the last two joints is, however, not fully developed.

The second antenna (Pl. X, fig. 26), resembles that of *O. subtilis*, the terminal joint being as long as the basal and considerably longer than the second.

The structure of the mandible and maxilla was not satisfactorily made out.

The first maxillipede (Pl. X, fig. 28), has the terminal claws more slender than usual, but shows no other difference in structure.

The second maxillipede (Pl. X, fig. 29) has the second joint about two-and-a-half times as long as its greatest width, and bearing two strong lateral spines, the distal finely denticulate and about one-and-a-half times as long as the proximal which is smooth. The distal margin of the joint bears about six minute spinules close together, and proximal to them two more distant but similar spinules. On the opposite face of the joint to the

two large spines and slightly in front of the larger there are two short very fine setae which might easily be overlooked but appear to be constant. A similar pair of setae seem to be present in *O. curvata*. The terminal claw of the maxillipede is smooth.

The swimming feet (Pl. X, fig. 27, Pl. XI, figs. 10-12) are of the usual form, but none of the endopodites end in a conical process and their terminal spines are long and slender and not laminate. The lamina is apparently absent from the outer-edge spines on the third joints of the exopodites of all feet, and of the first joint of the fourth foot. There are only two outer-edge spines on the third joint of the exopodite of the first foot, and in the fourth foot only one. The outer-edge spine of the second joint of the exopodite of the fourth foot is absent.

The fifth foot is reduced to a minute nodule and bears a single seta.

Oncaea exigua differs markedly from any already described species. It agrees with *O. subtilis* and *O. curvata* in having an elongated terminal joint to the second antenna and no conical termination to the fourth foot endopodite, but it differs entirely from either in the form of its abdomen. The reduction of the number of spines on the outer edge of the exopodites of the first and fourth swimming feet is not found in any other species of *Oncaea*.

Occurrence.—This very minute species occurred in small numbers in the fine silk nets at 630 and 680 fathoms on stations S.R. 193 and 197.

Oncaea obscura, sp. n.

Pl. X, figs. 14-23.

Female—length .5 mm. *Male*—·5 mm.

Female with the anterior division of the body regularly ovate in dorsal view, about two-and-one-fifth times as long as broad.

Abdomen (Pl. X, fig. 23) contained two-and-a-half times in length of cephalothorax. The genital segment is nearly twice as long as broad, of uniform thickness, not inflated, as most species of *Oncaea* are. The second and third abdominal segments are short and the anal segment about as broad as long. The furcal rami are slightly shorter than the anal segment and twice as long as wide.

The first antenna is jointed, the proportional length of the joints being approximately, 4 : 9 : 16 : 5 : 2 : 4.

The second antenna (Pl. X, fig. 14) is of the same form as in *O. conifera* but the second joint has the upper edge finely serrate as in *O. ornata*. The spines of the proximal group on the third joint are all of about the same thickness.

The mandible (Pl. X, fig. 16) and maxilla (Pl. X, fig. 18), resemble those of *O. conifera*.

The first maxillipede is as usual.

The second maxillipede (Pl. X, fig. 15) has a moderately broad second joint with two small marginal spines; the proximal

smooth, the distal serrate. The upper margin of the joint distal to the serrate spine is finely setose. The inner margin of the terminal claw is very finely denticulate. The basal joint is produced anteriorly into a stout thumb-like process.

The swimming feet (Pl. X, figs. 19-21) have the usual number of spines and setae, the laminate spines of the exopodites being well-developed. Conical terminal processes are present on the endopodites of the first three feet, but absent from the fourth. The terminal spine of the endopodite of the fourth foot is unusually long, being about two-thirds as long as the third joint.

The fifth foot on either side consists of a very short papilla-like joint with two short terminal setae, and a similar seta at its base.

The male of this species resembles the female in general appearance, the differences in the form of the abdomen between the sexes being less than usual. The genital segment (Pl. X, fig. 22) is narrow, a little less than twice as long as wide, the terminal lateral processes not spreading. The three following segments are very short, and the anal segment longer than usual, being nearly as long as wide. The furcal rami are a little shorter than in the female. The principal differences to be noted in the appendages are in the second antenna and the second maxillipede, and in the fourth foot, in which the terminal spine of the endopodite is only half as long as the joint. The terminal joint of the second antenna is scarcely longer than broad, and bears very short curved spines. The second maxillipede (Pl. X, fig. 17) has a pear-shaped second joint, with one slender marginal seta. The upper margin of the second joint is very finely setose, that of the claw being smooth.

Though *Oncaea obscura* does not show any close relationship to any of the already described species, yet it does not possess any marked characteristics; the form of the abdomen, which finds its nearest parallel in *O. tenuimana*, being the feature by which it can most easily be recognised.

It may be useful to draw up a table, taken largely from that of Giesbrecht, of the known females of the genus *Oncaea*, which will include the two species described above.

Occurrence.—Very few specimens of this species were taken in the fine silk nets at 630 and 680 fathoms on Stations S.R. 193 and S.R. 197.

Key to the Females of the Genus *Oncaea*.

- I. Endopodite of 4th foot with terminal process.
 - A. 2nd thoracic segment projecting in lateral view,

O. conifera.
 - B. 2nd thoracic segment not projecting.
 - i. 4th thoracic segment pointed, terminal spine of exopodite of swimming feet longer than 3rd joint,

O. dentipes.
 - ii. 4th thoracic segment rounded, terminal spine of exopodite of swimming feet shorter than 3rd joint,

O. minuta.

II. Endopodite of 4th foot without terminal process.

A. Third joint of 2nd antenna shorter than second.

i. Furca longer than anal segment.

a. Furca four times as long as wide.

1. Body strongly chitinised, purple,

O. venusta.

2. Body slightly chitinised, orange or red,

*O. mediterranea.*b. Furca 2-2½ times as long as wide, *O. media.*

ii. Furca shorter than anal segment.

a. Second joint of 2nd antenna serrate.

1. Genital segment forms half of abdomen,

O. obscura.

2. Genital segment forms two-thirds of abdomen,

O. ornata.

b. Second joint of 2nd antenna smooth.

1. 5th feet long, directed dorsally,

O. notopus.

2. 2nd maxillipede very long and slender,

O. tenuimana.

B. Third joint of 2nd antenna longer than or equal to second.

i. Genital segment forms less than half of abdomen.

a. Genital segment equals 2nd + 3rd abdominal segments, *O. subtilis.*b. Genital segment equals 2nd + 3rd + 4th abdominal segments, *O. curvata.*

ii. Genital segment forms two-thirds of abdomen,

*O. exigua.*GENUS **Conaea**, Giesbrecht.**Conaea rapax**, Giesbrecht.

Occurrence.—Taken in small numbers on four stations at depths between 200 and 630 fathoms.

GENUS **Lubbockia**, Claus.**Lubbockia brevis**, sp. n.

Pl. XI, figs. 1-9.

Female—length .85 mm.

The cephalon in the single specimen found was somewhat crushed, but appears to be considerably stouter than in *L. squillimana*, and much less pointed anteriorly; it is distinctly separated from the first thoracic segment. The fourth thoracic segment is rounded laterally, and the fifth almost globular.

The abdomen is of four segments, the genital segment showing a faint suture just behind the genital openings. The proportional lengths of the abdominal segments and furca is approximately 11: 4: 3: 4: 7. The furcal rami are four times as long as broad, the furcal setae being missing in my specimen.

The first antenna (Pl. XI, fig. 2) is very short, six-jointed; the proportional lengths of the joints being 8: 6: 8: 4: 3: 4.

The second antenna (Pl. XI, fig. 6) is three-jointed, the third joint (exopodite) being longer than the first and second together (basals) and bearing five terminal claw-like setae, the outermost being longer and more slender than the rest. Possibly one or more terminal setae have been broken off. There is one inner-edge seta situated at the distal third of the joint, and a very minute seta near the middle of the inner edge. The proximal half of the outer edge and part of the face of the joint adjoining is very finely setose.

The form of the mandible and maxilla could not be made out satisfactorily.

The first maxillipede (Pl. XI, fig. 9) seems to be of the same form as in *L. aculeata*.

The second maxillipede (Pl. XI, fig. 5) agrees with *L. minuta* in having no teeth on its second joint such as are found in *L. aculeata* and *L. squillimana*. The terminal claw is of the usual form.

The swimming feet (Pl. XI, figs. 3, 4, 7, 8) agree with those of *L. minuta* in having three outer-edge spines on the third joint of the exopodites of the first and second feet. The jointing of all the swimming feet appears to be complete. The fifth pair of feet do not possess the outer terminal tooth which is found in *L. aculeata* and *L. squillimana*, and of the two terminal spines the outer is equal in length to the joint and not laminate, while the inner is laminate and twice as long.

Male unknown.

This species, while differing noticeably from both *L. aculeata* and *L. squillimana* in form and to a less degree in structure, is linked to them by *L. minuta*, which has the elongate abdomen of the two latter, but the smooth second maxillipede and the three outer-edge exopodite spines of the first and second feet of *L. brevis*.

Occurrence.—One specimen of *L. brevis* was taken in the fine silk net at 630 fathoms on station S.R. 193.

GENUS *Corina*, Giesbrecht.

Corina granulosa, Giesbrecht.

Occurrence.—A single specimen was taken at 100 fathoms on station S.R. 164. It measured .85 mm. in length, the size of the Pacific specimen described by Giesbrecht being .68 mm.

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EXPLANATION OF PLATES.

All the figures were drawn with the assistance of a camera lucida.

PLATE I.

Mimocalanus nudus, gen. et sp. nov.

| | | | | | | | |
|-----------------|-------------|---------------------|----|----|----|------|-----|
| Fig. 1.—Female, | third foot, | .. | .. | .. | .. | .. × | 90 |
| Fig. 2. | ,, | second antenna, | .. | .. | .. | .. × | 110 |
| Fig. 3. | ,, | mandible, palp, | .. | .. | .. | .. × | 133 |
| Fig. 4. | ,, | second maxillipede, | .. | .. | .. | .. × | 133 |

Mimocalanus cultrifer, sp. n.

| | | | | | | | |
|-----------------|----------------|--------------------|----|----|----|------|-----|
| Fig. 5.—Female, | first antenna, | .. | .. | .. | .. | .. × | 79 |
| Fig. 6. | ,, | dorsal, | .. | .. | .. | .. × | 51 |
| Fig. 7. | ,, | lateral, | .. | .. | .. | .. × | 51 |
| Fig. 8. | ,, | first foot, | .. | .. | .. | .. × | 280 |
| Fig. 9. | ,, | first maxillipede, | .. | .. | .. | .. × | 280 |

Spinocalanus spinosus, sp. n.

| | | | | | | | |
|------------------|--------------------------|----|----|----|----|------|-----|
| Fig. 10.—Female, | spinulation on carapace, | .. | .. | .. | .. | .. × | 300 |
|------------------|--------------------------|----|----|----|----|------|-----|

Oxycalanus spinifer, sp. n.

| | | | | | | | |
|------------------|----------|--------------------|----|----|----|------|-----|
| Fig. 11.—Female, | lateral, | .. | .. | .. | .. | .. × | 35 |
| Fig. 12. | ,, | third foot, | .. | .. | .. | .. × | 96 |
| Fig. 13. | ,, | second foot, | .. | .. | .. | .. × | 96 |
| Fig. 14. | ,, | first foot, | .. | .. | .. | .. × | 96 |
| Fig. 15. | ,, | second antenna, | .. | .. | .. | .. × | 99 |
| Fig. 16. | ,, | first maxillipede, | .. | .. | .. | .. × | 243 |
| Fig. 17. | ,, | maxilla, | .. | .. | .. | .. × | 243 |

PLATE II.

Chiridius gracilis, sp. n.

| | | | | | | | |
|-----------------|---------|--------------|----|----|----|------|-----|
| Fig. 1.—Female, | dorsal, | .. | .. | .. | .. | .. × | 26 |
| Fig. 2. | ,, | lateral, | .. | .. | .. | .. × | 26 |
| Fig. 3. | ,, | second foot, | .. | .. | .. | .. × | 100 |

| | | | |
|--|-------------------------|-------------------------------------|----|
| <i>Gaidius parvispinus</i> , sp. n. | | | |
| Fig. 4.—Female, | dorsal, | .. .. . | 18 |
| Fig. 5. | ,, | fifth thoracic segment, | 31 |
| Fig. 6. | ,, | first foot, | 51 |
| Fig. 7. | ,, | second foot, | 45 |
| Fig. 8. | ,, | second maxillipede, | 45 |
| <i>Gaidius affinis</i> , G. O. Sars. | | | |
| Fig. 9.—Female, | first foot, | .. .. . | 85 |
| Fig. 10. | ,, | second foot, | 70 |
| <i>Gaidius validus</i> , sp. n. | | | |
| Fig. 11.—Female, | fifth thoracic segment, | .. .. . | 25 |
| Fig. 12. | ,, | second antenna, | 37 |
| Fig. 13. | ,, | second maxillipede, | 37 |
| Fig. 14. | ,, | maxilla, omitting first inner lobe, | 55 |
| Fig. 15. | ,, | first foot, | 37 |
| Fig. 16. | ,, | second foot, | 37 |
| Fig. 17. | ,, | dorsal, | 13 |
| <i>Euchirella Wolfendeni</i> , sp. n. | | | |
| Fig. 18.—Female, | second antenna, | .. .. . | 45 |
| Fig. 19. | ,, | fourth foot, | 45 |
| <i>Euchirella obtusa</i> (G. O. Sars). | | | |
| Fig. 20.—Female, | second antenna, | .. .. . | 48 |
| Fig. 21. | ,, | fourth foot, | 48 |

PLATE III.

| | | | |
|--|---------------------------|---------------------------|-----|
| <i>Valdiviella insignis</i> , sp. n. | | | |
| Fig. 1.—Female, | lateral, | .. .. . | 6·7 |
| Fig. 2. | ,, | second foot, | 36 |
| Fig. 3. | ,, | mandible, cutting edge, | 36 |
| Fig. 4. | ,, | first maxillipede, | 43 |
| Fig. 5. | ,, | third foot, | 36 |
| Fig. 6. | ,, | first foot, | 36 |
| <i>Gaidius notacanthus</i> , G. O. Sars. | | | |
| Fig. 7.—Male, | fifth feet, | .. .. . | 36 |
| <i>Euchaeta rubicunda</i> , sp. n. | | | |
| Fig. 8.—Female, | genital segment, ventral, | .. .. . | 19 |
| Fig. 9. | ,, | genital segment, lateral, | 19 |
| Fig. 10. | ,, | exopodite of second foot, | 36 |
| <i>Euchaeta Scotti</i> , sp. n. | | | |
| Fig. 11.—Female, | genital segment, lateral, | .. .. . | 32 |
| Fig. 12. | ,, | exopodite of second foot, | 36 |
| <i>Euchaeta barbata</i> , Brady. | | | |
| Fig. 13.—Female, | genital segment, lateral, | .. .. . | 32 |
| Fig. 14. | ,, | exopodite of second foot, | 36 |
| <i>Euchaeta Sarsi</i> , sp. n. | | | |
| Fig. 15.—Female, | genital segment, lateral, | .. .. . | 32 |
| Fig. 16. | ,, | exopodite of second foot, | 36 |
| <i>Euchaeta bisinuata</i> , G. O. Sars. | | | |
| Fig. 17.—Female, | genital segment, lateral, | .. .. . | 37 |
| Fig. 18. | ,, | exopodite of first foot, | 31 |
| Fig. 19. | ,, | exopodite of second foot, | 36 |

| | | | | | |
|------------------|------------------------------------|---------------------------|----|------|----|
| | <i>Euchaeta quadrata</i> , sp. n. | | | | |
| Fig. 20.—Female, | genital segment, lateral, | .. | .. | .. × | 30 |
| Fig. 21. | ,, | exopodite of second foot, | .. | .. × | 44 |
| | <i>Lucicutia lucida</i> , sp. n. | | | | |
| Fig. 22.—Male, | fifth feet, | .. | .. | .. × | 66 |
| | <i>Augaptilus facilis</i> , sp. n. | | | | |
| Fig. 23.—Female, | fourth foot, | .. | .. | .. × | 54 |
| Fig. 24. | ,, | second maxillipede, | .. | .. × | 49 |

PLATE IV.

| | | | | | |
|------------------|---|---------------------|----|------|------|
| | <i>Euchirella obtusa</i> , G. O. Sars. | | | | |
| Fig. 1.—Female, | abdomen, lateral, | .. | .. | .. × | 23 |
| Fig. 2. | ,, | dorsal, | .. | .. × | 14 |
| | <i>Euchirella Wolfendeni</i> , sp. n. | | | | |
| Fig. 3.—Female, | dorsal, | .. | .. | .. × | 12·7 |
| | <i>Euchaeta bisinuata</i> , G. O. Sars. | | | | |
| Fig. 4.—Female, | lateral, | .. | .. | .. × | 15·3 |
| | <i>Valdiviella insignis</i> , sp. n. | | | | |
| Fig. 5.—Female, | maxilla, | .. | .. | .. × | 57 |
| | <i>Chiridiella macrodactyla</i> , G. O. Sars. | | | | |
| Fig. 6.—Female, | first foot, | .. | .. | .. × | 93 |
| Fig. 7. | ,, | third foot, | .. | .. × | 93 |
| Fig. 8. | ,, | second foot, | .. | .. × | 93 |
| Fig. 9. | ,, | second maxillipede, | .. | .. × | 79 |
| Fig. 10. | ,, | maxilla, | .. | .. × | 170 |
| Fig. 11. | ,, | second antenna, | .. | .. × | 93 |
| Fig. 12. | ,, | first antenna, | .. | .. × | 42 |
| Fig. 13. | ,, | lateral, | .. | .. × | 28 |
| Fig. 14. | ,, | first maxillipede, | .. | .. × | 79 |
| | <i>Xanthocalanus typicus</i> , T. Scott. | | | | |
| Fig. 15.—Female, | first maxillipede, | .. | .. | .. × | 109 |
| Fig. 16. | ,, | fifth foot, | .. | .. × | 117 |
| Fig. 17. | ,, | first foot, | .. | .. × | 76 |
| | <i>Xanthocalanus pinguis</i> , Farran. | | | | |
| Fig. 18.—Female, | fifth foot, | .. | .. | .. × | 79 |

PLATE V.

| | | | | | |
|-----------------|--|---------------------|----|------|-----|
| | <i>Undinella brevipes</i> , sp. n. | | | | |
| Fig. 1.—Female, | lateral, | .. | .. | .. × | 60 |
| Fig. 2. | ,, | rostrum, | .. | .. × | 253 |
| Fig. 3. | ,, | third foot, | .. | .. × | 133 |
| Fig. 4. | ,, | fifth pair of feet, | .. | .. × | 347 |
| | <i>Cephalophanes refulgens</i> , G. O. Sars. | | | | |
| Fig. 5.—Female, | lateral, | .. | .. | .. × | 19 |
| Fig. 6. | ,, | second foot, | .. | .. × | 75 |
| Fig. 7. | ,, | fifth pair of feet, | .. | .. × | 153 |

Scolecithrix globiceps, sp. n.

| | | | | | | | | |
|-----------------|-------------|-------------------------|----|----|----|----|---|-----|
| Fig. 8.—Female, | first foot, | .. | .. | .. | .. | .. | × | 66 |
| Fig. 9. | ,, | second foot, | .. | .. | .. | .. | × | 66 |
| Fig. 10. | ,, | maxilla, terminal part, | .. | .. | .. | .. | × | 150 |
| Fig. 11. | ,, | second maxillipede, | .. | .. | .. | .. | × | 72 |
| Fig. 12. | ,, | first maxillipede, | .. | .. | .. | .. | × | 147 |
| Fig. 13. | ,, | dorsal, | .. | .. | .. | .. | × | 22 |

Scolecithrix valida, sp. n.

| | | | | | | | | |
|------------------|---------|--------------|----|----|----|----|---|----|
| Fig. 14.—Female, | dorsal, | .. | .. | .. | .. | .. | × | 25 |
| Fig. 15. | ,, | lateral, | .. | .. | .. | .. | × | 19 |
| Fig. 16. | ,, | second foot, | .. | .. | .. | .. | × | 66 |
| Fig. 17. | ,, | first foot, | .. | .. | .. | .. | × | 87 |

PLATE VI.

Scolecithrix gracilipes, sp. n.

| | | | | | | | | |
|-----------------|----------|------------------------|----|----|----|----|---|-----|
| Fig. 1.—Female, | lateral, | .. | .. | .. | .. | .. | × | 32 |
| Fig. 2. | ,, | first foot, | .. | .. | .. | .. | × | 91 |
| Fig. 3. | ,, | fifth foot, | .. | .. | .. | .. | × | 417 |
| Fig. 4. | ,, | fifth foot, variation, | .. | .. | .. | .. | × | 480 |

Scolecithrix robusta, T. Scott.

| | | | | | | | | |
|-----------------|-------------|----|----|----|----|----|---|-----|
| Fig. 5.—Female, | fifth foot, | .. | .. | .. | .. | .. | × | 273 |
|-----------------|-------------|----|----|----|----|----|---|-----|

Scolecithrix echinata, Farran.

| | | | | | | | | |
|-----------------|-------------|----|----|----|----|----|---|-----|
| Fig. 6.—Female, | fifth foot, | .. | .. | .. | .. | .. | × | 417 |
|-----------------|-------------|----|----|----|----|----|---|-----|

Scolecithrix valida, sp. n.

| | | | | | | | | |
|-----------------|-------------|----|----|----|----|----|---|-----|
| Fig. 7.—Female, | fifth foot, | .. | .. | .. | .. | .. | × | 273 |
|-----------------|-------------|----|----|----|----|----|---|-----|

Scolecithrix globiceps, sp. n.

| | | | | | | | | |
|-----------------|-------------|----|----|----|----|----|---|-----|
| Fig. 8.—Female, | fifth foot, | .. | .. | .. | .. | .. | × | 273 |
|-----------------|-------------|----|----|----|----|----|---|-----|

Temoropia mayumbaensis, T. Scott.

| | | | | | | | | |
|-----------------|-------------|---------------------|----|----|----|----|---|-----|
| Fig. 9.—Female, | fifth foot, | .. | .. | .. | .. | .. | × | 293 |
| Fig. 10. | ,, | second maxillipede, | .. | .. | .. | .. | × | 293 |
| Fig. 11. | ,, | maxilla, | .. | .. | .. | .. | × | 366 |
| Fig. 12. | ,, | first antenna, | .. | .. | .. | .. | × | 280 |
| Fig. 13. | ,, | second foot, | .. | .. | .. | .. | × | 293 |
| Fig. 14. | ,, | first foot, | .. | .. | .. | .. | × | 293 |
| Fig. 15.] | ,, | lateral, | .. | .. | .. | .. | × | 92 |

Lucicutia lucida, sp. n.

| | | | | | | | | |
|------------------|----------------------|-------------|----|----|----|----|---|----|
| Fig. 16.—Female, | dorsal, | .. | .. | .. | .. | .. | × | 23 |
| Fig. 17.—Male, | first antenna, left, | .. | .. | .. | .. | .. | × | 39 |
| Fig. 18. | ,, | abdomen, | .. | .. | .. | .. | × | 44 |
| Fig. 19.—Female, | fifth foot, | .. | .. | .. | .. | .. | × | 84 |
| Fig. 20. | ,, | first foot, | .. | .. | .. | .. | × | 88 |

Lucicutia longiserrata (Giesbr.).

| | | | | | | | | |
|------------------|-------------|-------------|----|----|----|----|---|----|
| Fig. 21.—Female, | first foot, | .. | .. | .. | .. | .. | × | 92 |
| Fig. 22. | ,, | fifth foot, | .. | .. | .. | .. | × | 92 |

PLATE VII.

Heterorhabdus robustus, sp. n.

| | | | | | | | | |
|-----------------|---------------------|------------------------------------|----|----|----|----|---|----|
| Fig. 1.—Female, | dorsal, | .. | .. | .. | .. | .. | × | 22 |
| Fig. 2. | ,, | lateral, | .. | .. | .. | .. | × | 22 |
| Fig. 3. | ,, | furca, | .. | .. | .. | .. | × | 52 |
| Fig. 4. | ,, | left mandible, cutting edge, | .. | .. | .. | .. | × | 69 |
| Fig. 5. | ,, | right mandible, cutting edge, | .. | .. | .. | .. | × | 69 |
| Fig. 6. | ,, | first maxillipede, | .. | .. | .. | .. | × | 52 |
| Fig. 7. | ,, | maxilla, exopodite and endopodite, | .. | .. | .. | .. | × | 69 |
| Fig. 8.—Male, | fifth pair of feet, | .. | .. | .. | .. | .. | × | 69 |
| Fig. 9.—Female, | fifth foot, | .. | .. | .. | .. | .. | × | 69 |
| Fig. 10. | ,, | second foot, | .. | .. | .. | .. | × | 52 |

| | | | | |
|------------------|----------------------------|-----------------------------------|----|---------|
| | | <i>Haloptilus jons</i> , sp. n. | | |
| Fig. 11.—Female, | dorsal, | .. | .. | .. × 12 |
| Fig. 12. | ,, fifth foot, | .. | .. | .. × 62 |
| Fig. 13. | ,, mandible, cutting edge, | .. | .. | .. × 64 |
| Fig. 14. | ,, maxilla, | .. | .. | .. × 62 |
| Fig. 15. | ,, abdomen, | .. | .. | .. × 27 |
| | | <i>Haloptilus tenuis</i> , sp. n. | | |
| Fig. 16.—Female, | abdomen, | .. | .. | .. × 37 |
| Fig. 17. | ,, cephalon, lateral, | .. | .. | .. × 17 |
| Fig. 18. | ,, dorsal, | .. | .. | .. × 17 |
| Fig. 19. | ,, second antenna, | .. | .. | .. × 46 |
| Fig. 20. | ,, first maxillipede, | .. | .. | .. × 65 |
| Fig. 21. | ,, maxilla, | .. | .. | .. × 84 |

PLATE VIII.

| | | | | |
|------------------|---|------------------------------------|----|-----------|
| | | <i>Augaptilus facilis</i> , sp. n. | | |
| Fig. 1.—Female, | dorsal, | .. | .. | .. × 16 |
| Fig. 2. | ,, second antenna, | .. | .. | .. × 45 |
| Fig. 3. | ,, first maxillipede, | .. | .. | .. × 64 |
| Fig. 4. | ,, fifth foot, | .. | .. | .. × 72 |
| Fig. 5. | ,, maxilla, | .. | .. | .. × 120 |
| Fig. 6. | ,, mandible, cutting edge, | .. | .. | .. × 120 |
| | | <i>Augaptilus similis</i> , sp. n. | | |
| Fig. 7.—Female, | second maxillipede, | .. | .. | .. × 29 |
| Fig. 8. | ,, first maxillipede, | .. | .. | .. × 34 |
| Fig. 9. | ,, maxilla, | .. | .. | .. × 63 |
| Fig. 10. | ,, dorsal, | .. | .. | .. × 11.3 |
| Fig. 11. | ,, second antenna, | .. | .. | .. × 35 |
| Fig. 12. | ,, details of setae, first maxillipede, | .. | .. | .. × 112 |
| Fig. 13. | ,, mandible, cutting edge, | .. | .. | .. × 112 |
| Fig. 14. | ,, fifth foot, | .. | .. | .. × 51 |
| | | <i>Augaptilus anceps</i> , sp. n. | | |
| Fig. 15.—Female, | abdomen, | .. | .. | .. × 45 |
| Fig. 16. | ,, dorsal, | .. | .. | .. × 59 |
| Fig. 17. | ,, second antenna, part of exopodite, | .. | .. | .. × 133 |
| Fig. 18. | ,, fifth foot, exopodal spine, | .. | .. | .. × 267 |
| Fig. 19. | ,, maxilla, | .. | .. | .. × 137 |

| | | | | |
|------------------|--------------------|-------------------------------------|----|---------|
| | | <i>Augaptilus horridus</i> , sp. n. | | |
| Fig. 20.—Female, | cephalon, lateral, | .. | .. | .. × 11 |

| | | | | |
|------------------|--------------------|--|----|---------|
| | | <i>Augaptilus Rattrayi</i> , T. Scott. | | |
| Fig. 21.—Female, | cephalon, lateral, | .. | .. | .. × 11 |

| | | | | |
|------------------|-------------|-----------------------------------|----|---------|
| | | <i>Haloptilus tenuis</i> , sp. n. | | |
| Fig. 22.—Female, | fifth foot, | .. | .. | .. × 79 |

PLATE IX.

| | | | | |
|-----------------|----------------------|---------------------------------|----|---------|
| | | <i>Phyllopus impar</i> , sp. n. | | |
| Fig. 1.—Female, | dorsal, | .. | .. | .. × 32 |
| Fig. 2. | ,, abdomen, lateral, | .. | .. | .. × 45 |
| Fig. 3.—Male, | left fifth foot, | .. | .. | .. × 59 |
| Fig. 4. | ,, right fifth foot, | .. | .. | .. × 59 |

| | | | | |
|-----------------|-------------------|----------------------------------|----|---------|
| | | <i>Phyllopus Helgae</i> , sp. n. | | |
| Fig. 5.—Female, | abdomen, ventral, | .. | .. | .. × 45 |
| Fig. 6. | ,, dorsal, | .. | .. | .. × 29 |

| | | | | |
|---------------|---|--------------------------------------|----|----------|
| | | <i>Candacia gracilimana</i> , sp. n. | | |
| Fig. 7.—Male, | fourth foot, third joint of exopodite, | .. | .. | .. × 133 |
| Fig. 8. | ,, third foot, third joint of exopodite, | .. | .. | .. × 133 |
| Fig. 9. | ,, second foot, third joint of exopodite, | .. | .. | .. × 133 |
| Fig. 10. | ,, maxilla, | .. | .. | .. × 203 |
| Fig. 11. | ,, genital segment, | .. | .. | .. × 57 |
| Fig. 12. | ,, first antenna, hinge, | .. | .. | .. × 203 |
| Fig. 13. | ,, first maxillipede, | .. | .. | .. × 69 |
| Fig. 14. | ,, fifth feet, | .. | .. | .. × 139 |

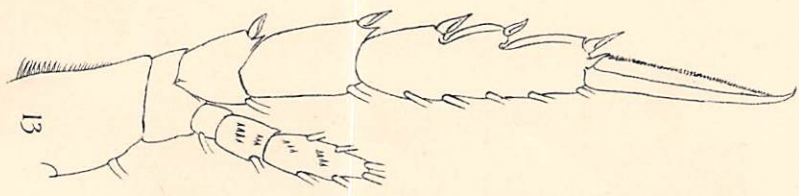
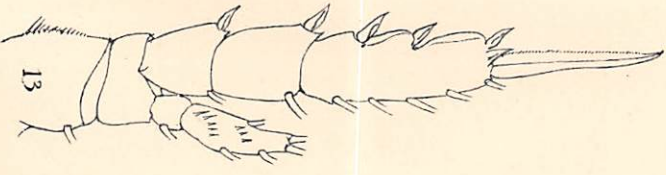
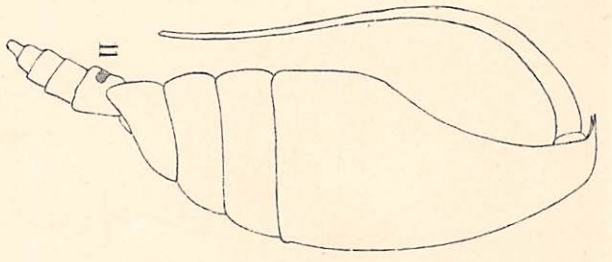
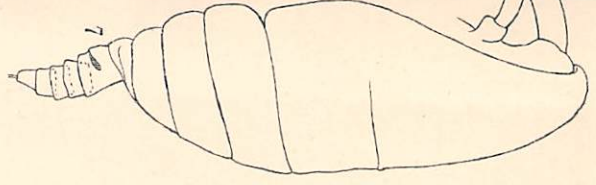
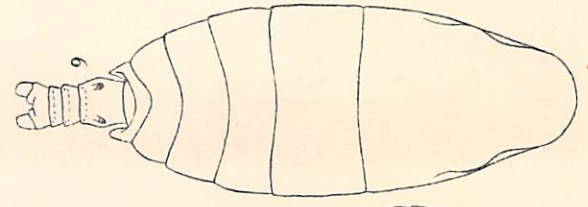
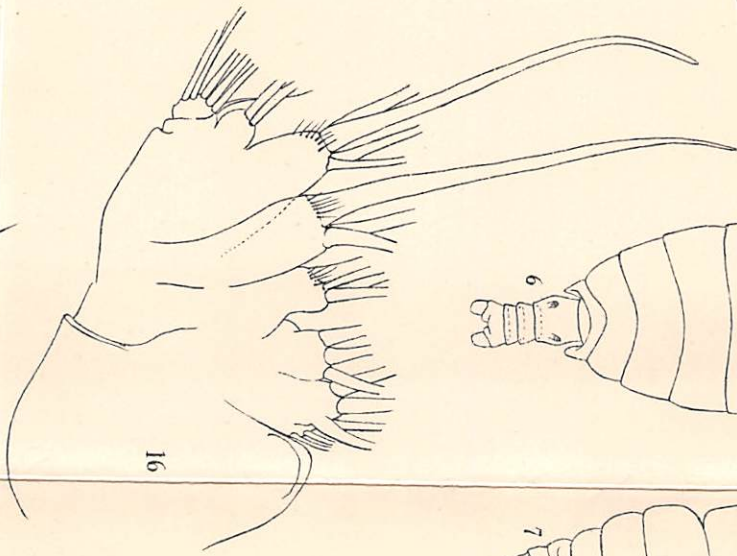
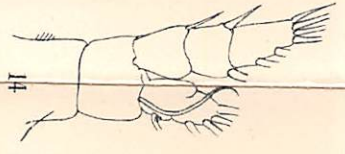
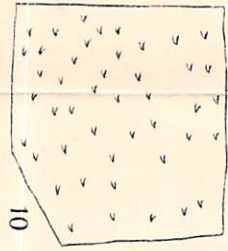
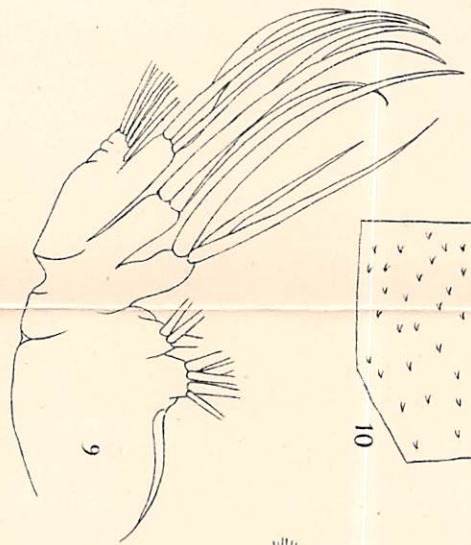
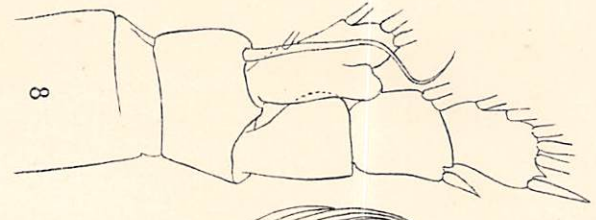
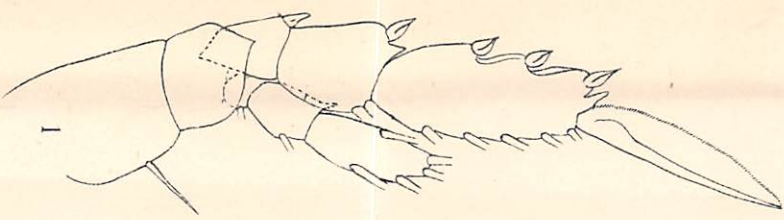
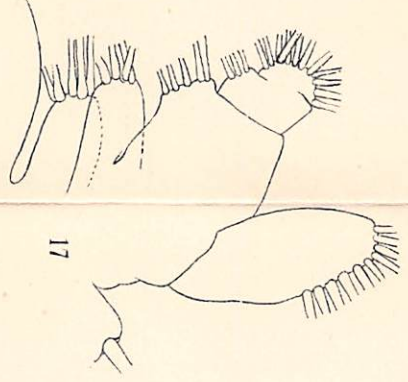
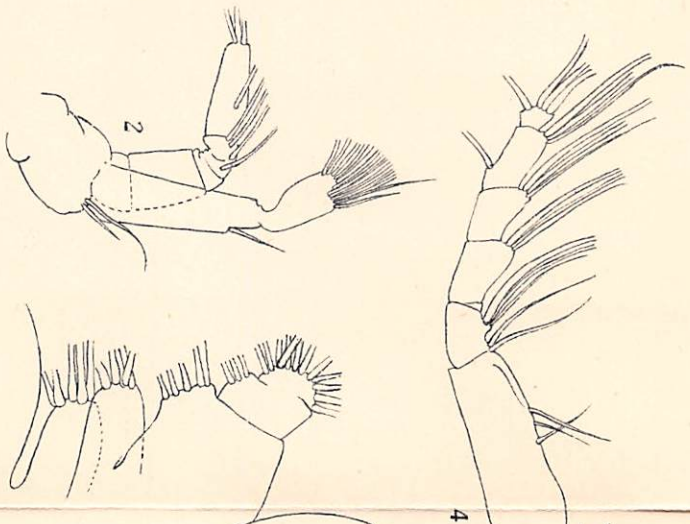
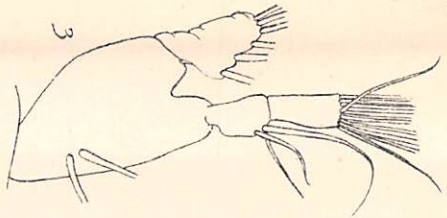
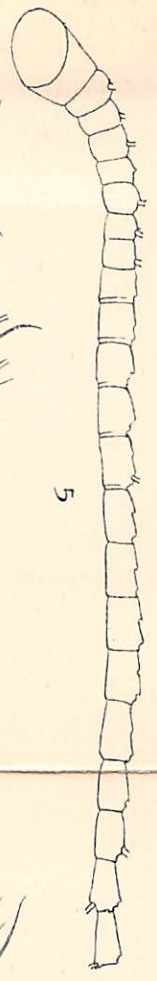
| | | | | | | |
|----------------|----------------|---|----|----|----|------|
| | | <i>Candacia rotundata</i> , Wolfenden. | | | | |
| Fig. 15.—Male, | fifth feet, | .. | .. | .. | .. | × 61 |
| | | <i>Bathypontia elongata</i> , G. O. Sars. | | | | |
| Fig. 16.—Male, | first antenna, | .. | .. | .. | .. | × 26 |
| Fig. 17. ,, | fifth feet, | .. | .. | .. | .. | × 44 |

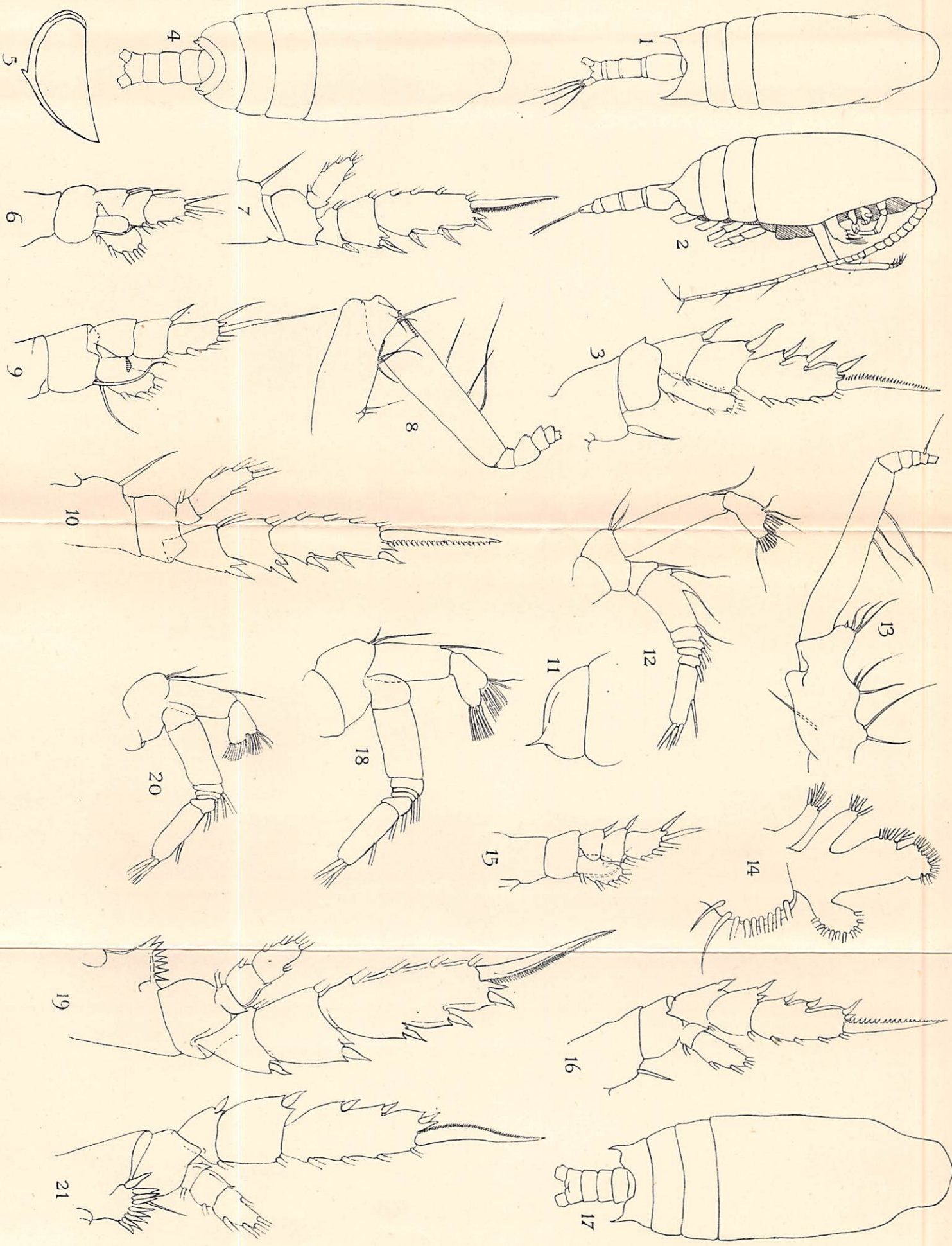
PLATE X.

| | | | | | | |
|------------------|----------------------------|--|----|----|----|-------|
| | | <i>Paroithona parvula</i> , gen. et sp. nov. | | | | |
| Fig. 1.—Female, | dorsal, | .. | .. | .. | .. | × 157 |
| Fig. 2. ,, | cephalon, lateral, | .. | .. | .. | .. | × 157 |
| Fig. 3. ,, | genital segment and furca, | .. | .. | .. | .. | × 433 |
| Fig. 4. ,, | first antenna, | .. | .. | .. | .. | × 433 |
| Fig. 5. ,, | second antenna, | .. | .. | .. | .. | × 680 |
| Fig. 6. ,, | maxilla, | .. | .. | .. | .. | × 433 |
| Fig. 7. ,, | first foot, | .. | .. | .. | .. | × 433 |
| Fig. 8. ,, | second foot, | .. | .. | .. | .. | × 433 |
| Fig. 9. ,, | second maxillipede, | .. | .. | .. | .. | × 433 |
| Fig. 10. ,, | mandible, | .. | .. | .. | .. | × 433 |
| Fig. 11. ,, | first maxillipede, | .. | .. | .. | .. | × 433 |
| Fig. 12. ,, | third foot, | .. | .. | .. | .. | × 433 |
| Fig. 13. ,, | fourth foot, | .. | .. | .. | .. | × 433 |
| | | <i>Oncaea obscura</i> , sp. n. | | | | |
| Fig. 14.—Female, | second antenna, | .. | .. | .. | .. | × 400 |
| Fig. 15. ,, | second maxillipede, | .. | .. | .. | .. | × 400 |
| Fig. 16. ,, | mandible, | .. | .. | .. | .. | × 573 |
| Fig. 17.—Male, | second maxillipede, | .. | .. | .. | .. | × 270 |
| Fig. 18.—Female, | maxilla, | .. | .. | .. | .. | × 573 |
| Fig. 19. ,, | second foot, | .. | .. | .. | .. | × 280 |
| Fig. 20. ,, | third foot, endopodite, | .. | .. | .. | .. | × 400 |
| Fig. 21. ,, | fourth foot, endopodite, | .. | .. | .. | .. | × 400 |
| Fig. 22.—Male, | abdomen, | .. | .. | .. | .. | × 253 |
| Fig. 23.—Female, | abdomen, | .. | .. | .. | .. | × 253 |
| Fig. 24. ,, | first antenna, | .. | .. | .. | .. | × 270 |
| | | <i>Oncaea exigua</i> , sp. n. | | | | |
| Fig. 25.—Female, | abdomen, | .. | .. | .. | .. | × 125 |
| Fig. 26. ,, | dorsal, | .. | .. | .. | .. | × 72 |
| Fig. 27. ,, | second antenna, | .. | .. | .. | .. | × 340 |
| Fig. 28. ,, | fourth foot, | .. | .. | .. | .. | × 466 |
| Fig. 29. ,, | first maxillipede, | .. | .. | .. | .. | × 466 |
| Fig. 30. ,, | second maxillipede, | .. | .. | .. | .. | × 466 |

PLATE XI.

| | | | | | | |
|-----------------|---------------------|----------------------------------|----|----|----|-------|
| | | <i>Lubbockia brevis</i> , sp. n. | | | | |
| Fig. 1.—Female, | dorsal, | .. | .. | .. | .. | × 120 |
| Fig. 2. ,, | second foot, | .. | .. | .. | .. | × 287 |
| Fig. 3. ,, | third foot, | .. | .. | .. | .. | × 287 |
| Fig. 4. ,, | second maxillipede, | .. | .. | .. | .. | × 253 |
| Fig. 5. ,, | second antenna, | .. | .. | .. | .. | × 287 |
| Fig. 6. ,, | fourth foot, | .. | .. | .. | .. | × 287 |
| Fig. 7. ,, | first foot, | .. | .. | .. | .. | × 287 |
| Fig. 8. ,, | first maxillipede, | .. | .. | .. | .. | × 287 |
| | | <i>Oncaea exigua</i> , sp. n. | | | | |
| Fig. 9.—Female, | second foot, | .. | .. | .. | .. | × 467 |
| Fig. 10. ,, | first foot, | .. | .. | .. | .. | × 467 |
| Fig. 11. ,, | third foot, | .. | .. | .. | .. | × 467 |





1-3, *Chiridius gracilis*.

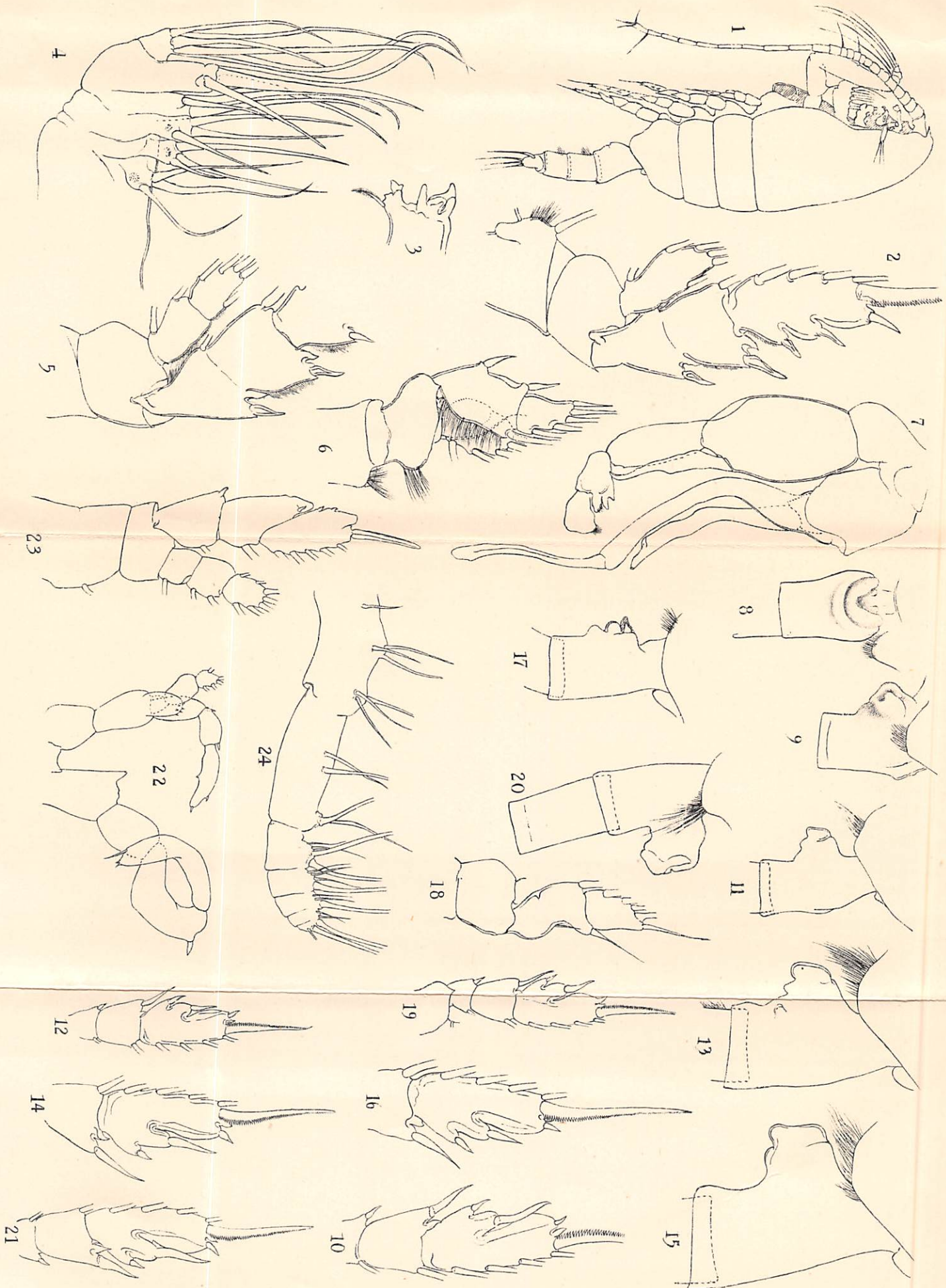
4-8, *Gaidius parvispinus*.

9, 10, *Gaidius affinis*.

11-17, *Gaidius validus*.

18, 19, *Euchirella Wolfendeni*.

20, 21, *Euchirella obtusa*.

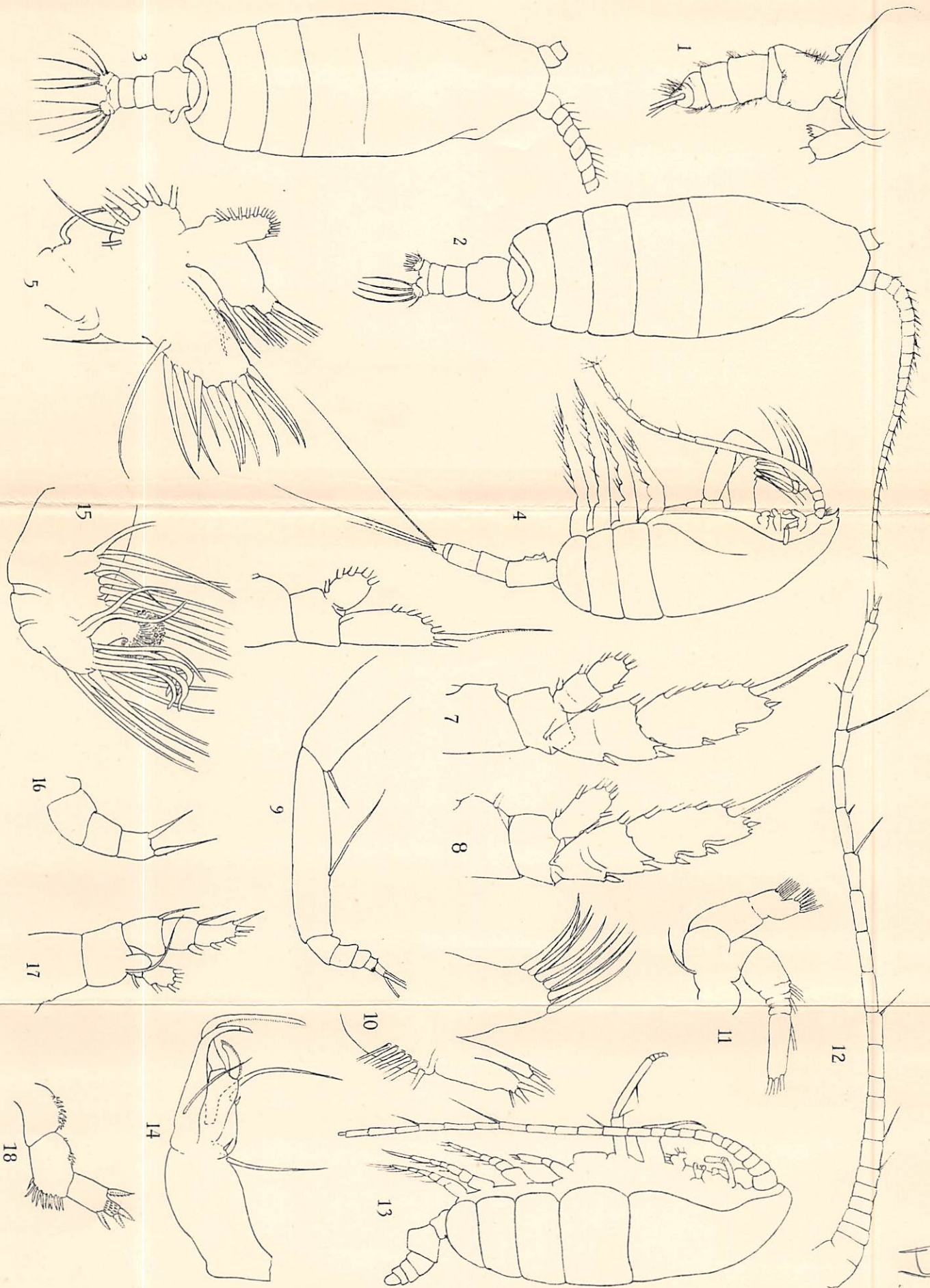


1-6, *Valdiviella insignis*.
13, 14, *Euchaeta barbata*.

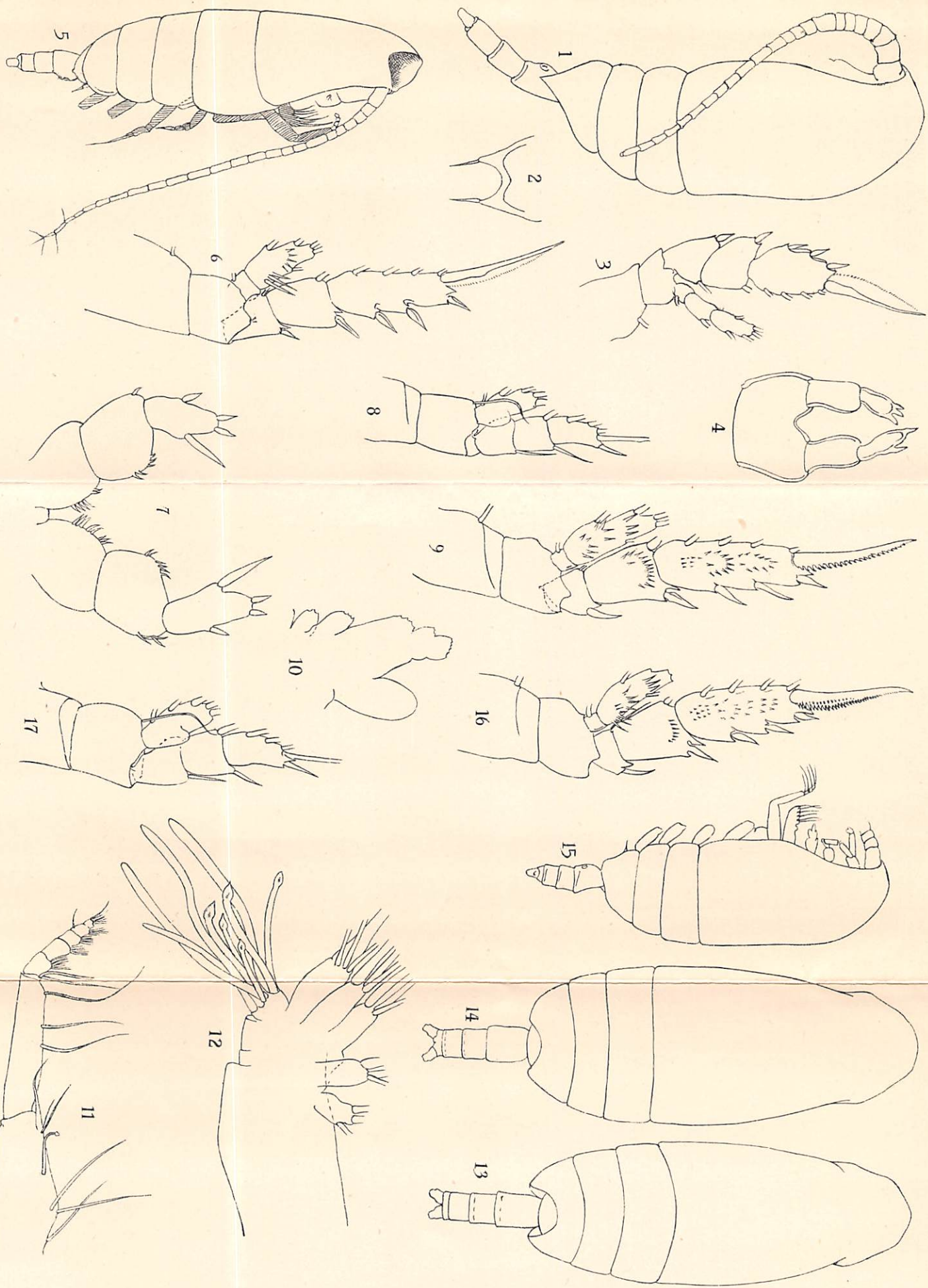
7, *Gaidius notacanthus*.
15, 16, *Euchaeta Sarsi*.

8-10, *Euchaeta rubicunda*.
17-19, *Euchaeta bisinuata*.

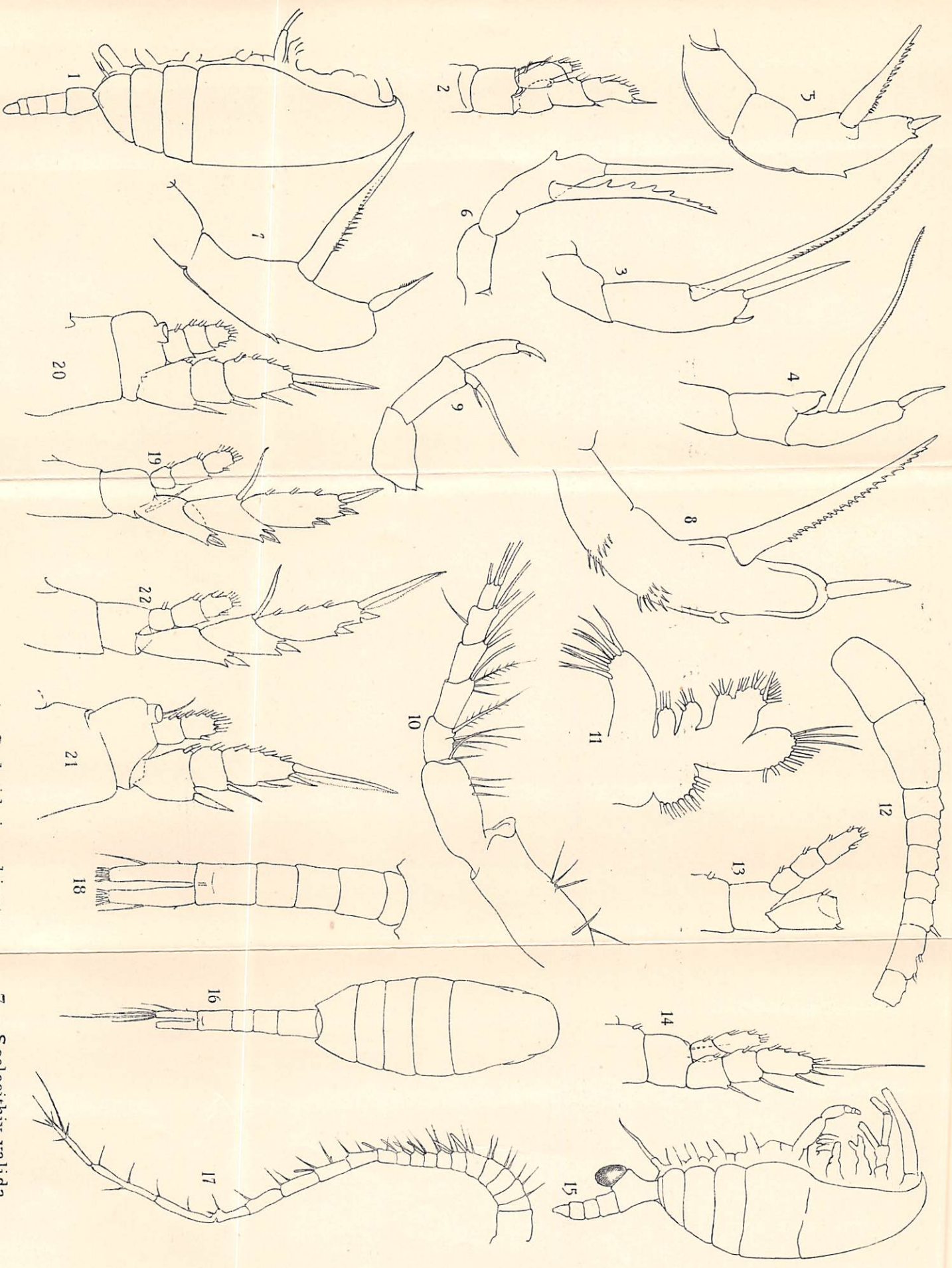
11-12, *Euchaeta Scotti*.
20-21, *Euchaeta quadrata*.



1,2, *Euchirella obtusa*. 3, *Euchirella Wolfendeni*. 4, *Euchaeta bisinuata*. 5, *Valdiviella insignis*.
 6-14, *Chiridiella macrodactyla*. 15-17, *Xanthocalanus typicus*. 18, *Xanthocalanus pinguis*.



1-4, *Undinella brevipes*. 5-7, *Celphalophanes refulgens*. 8-13, *Scolecithrix globiceps*. 14-17, *Scolecithrix valida*.



1-4, *Scolecithrix gracilipes*.

5. *Scolecithrix robusta*.

6. *Scolecithrix echinata*.

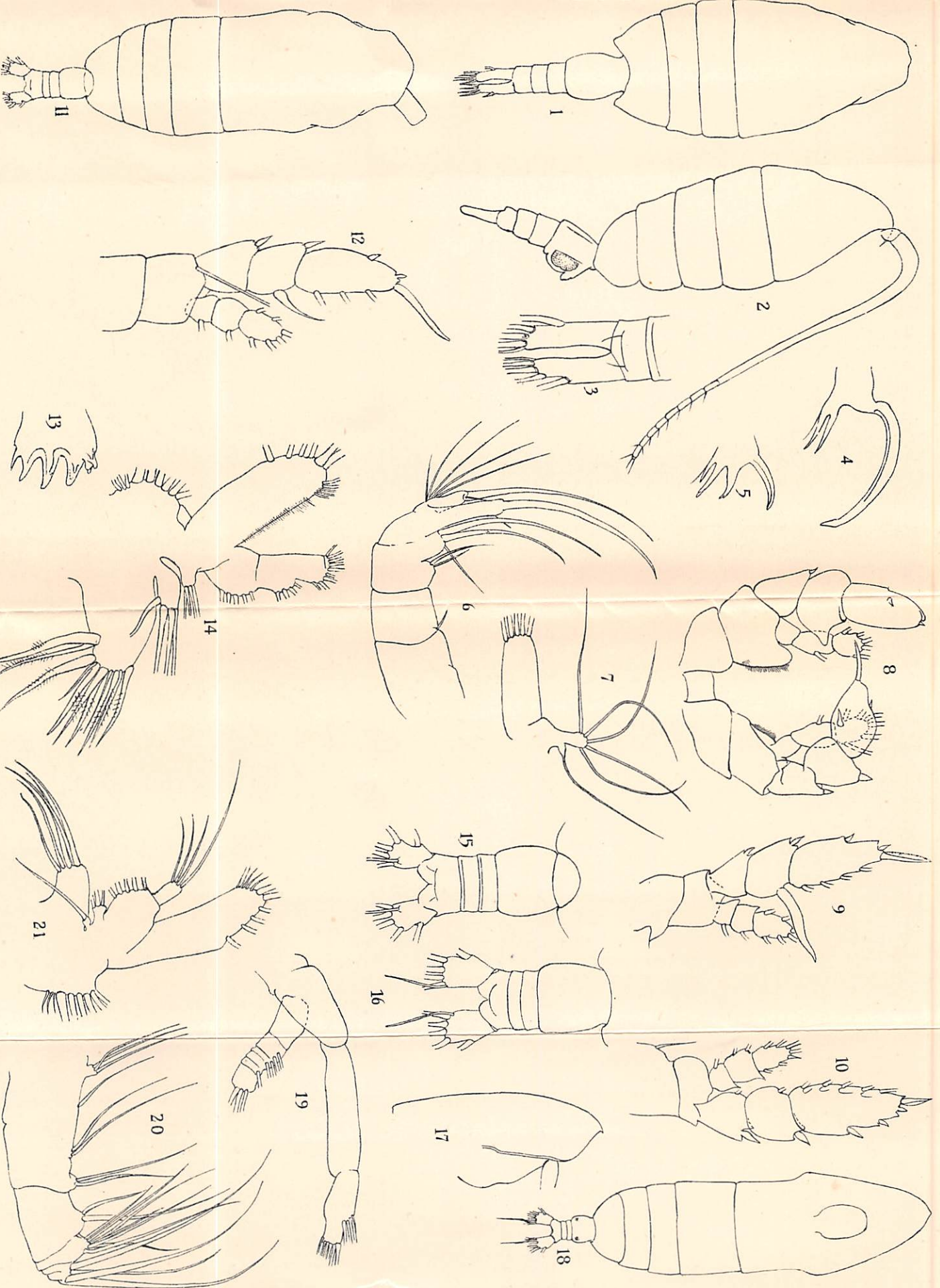
7. *Scolecithrix valida*.

8 *Scolecithrix globiceps*

9-15 *Temoronia mayumbænsis*.

16-20, *Lucicutia lucida*.

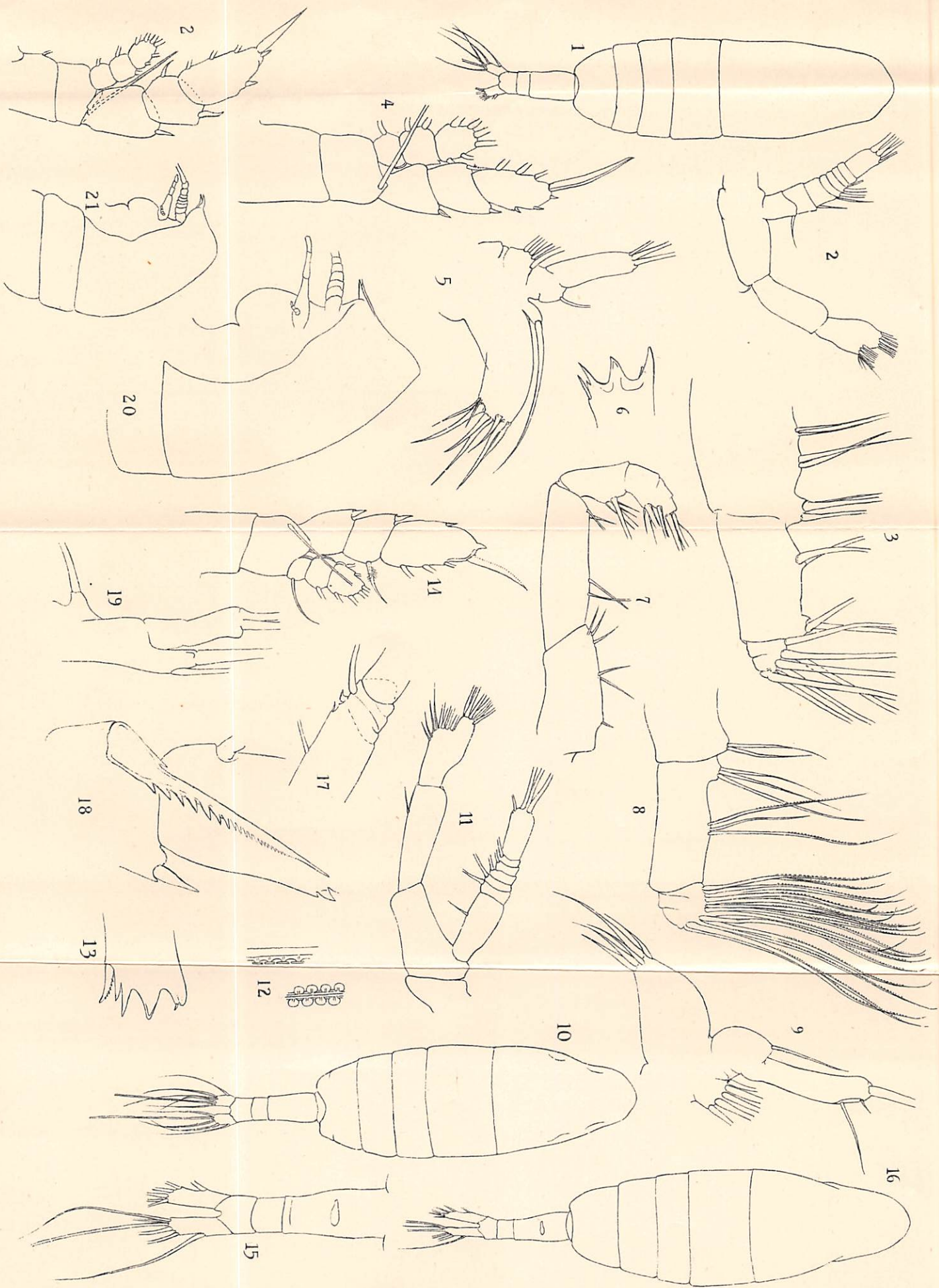
21, 22. *Lucicutia longiserrata*.



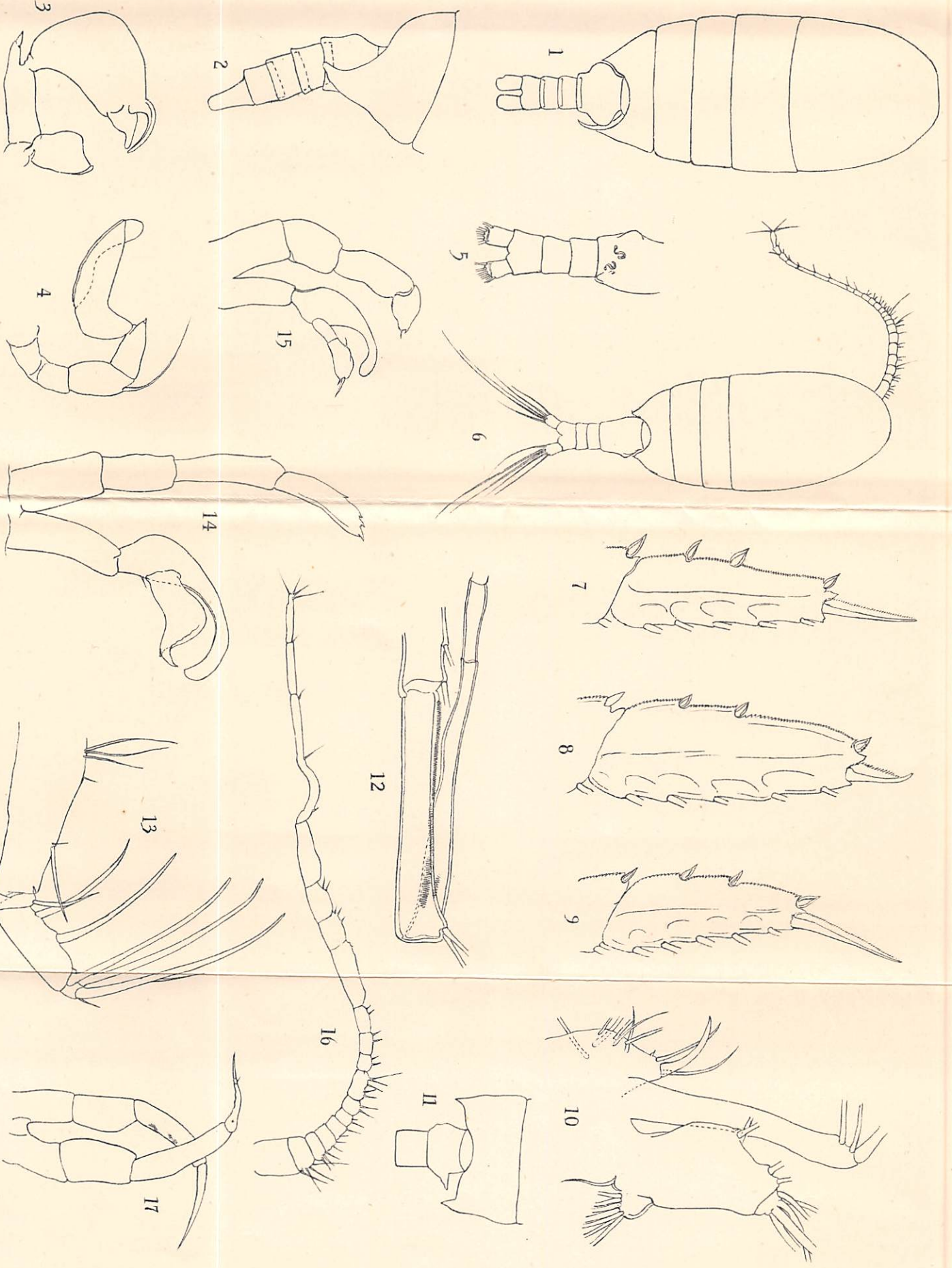
1-10, *Heterorhabdus robustus*.

11-15, *Haloptilus fons*.

16-21, *Haloptilus tenuis*.



1-6, *Augaptilus facilis*.
 7-14, *Augaptilus similis*.
 15-19, *Augaptilus anceps*.
 20, *Augaptilus horridus*.
 21, *Augaptilus Ratrayi*.
 22, *Haloptilus tenuis*.

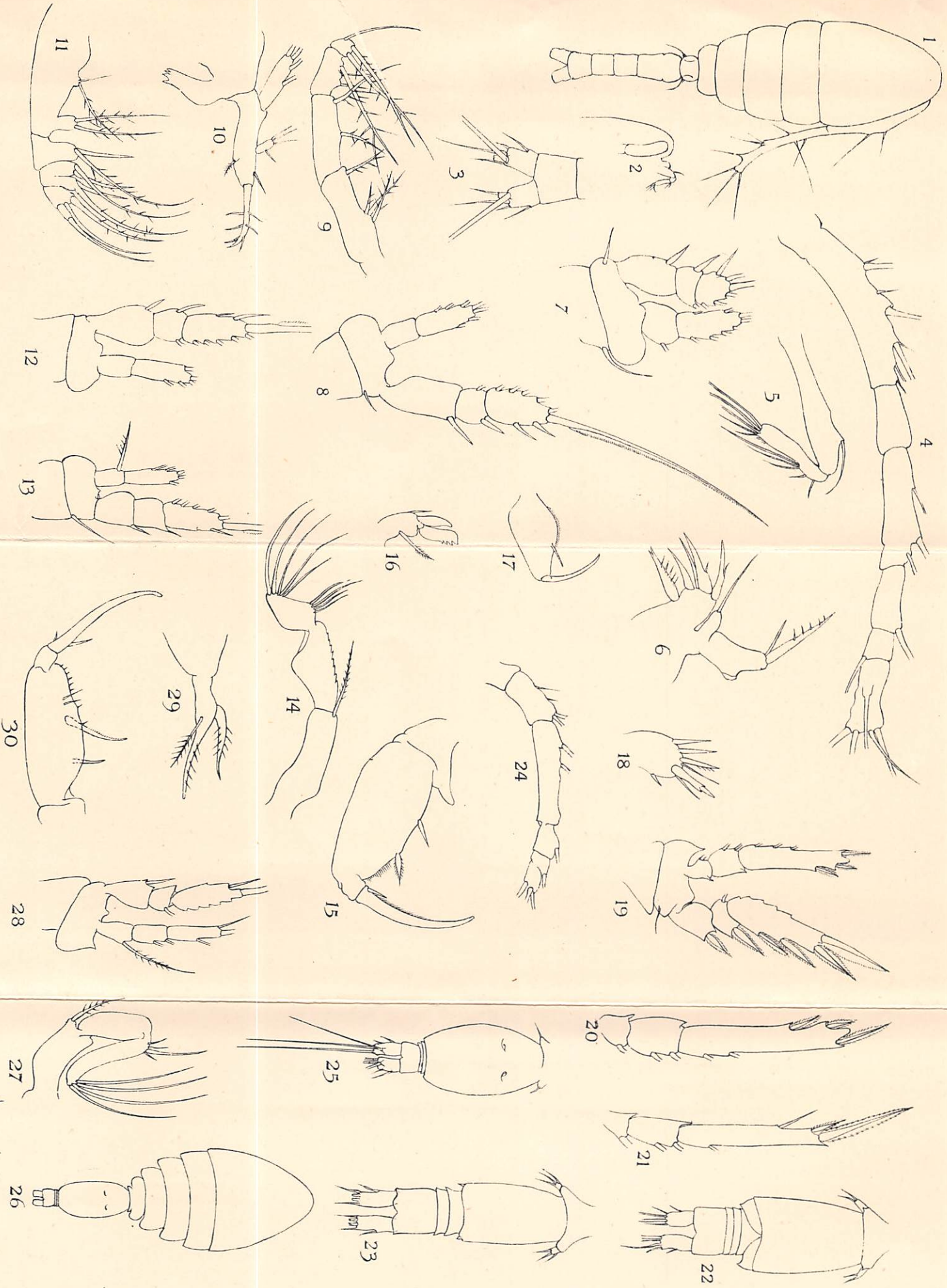


1-4, *Phylllopus impar*.

5, 6, *Phylllopus Helgae*.

7-14, *Candacia gracilimana*.

15, *Candacia rotundata*.

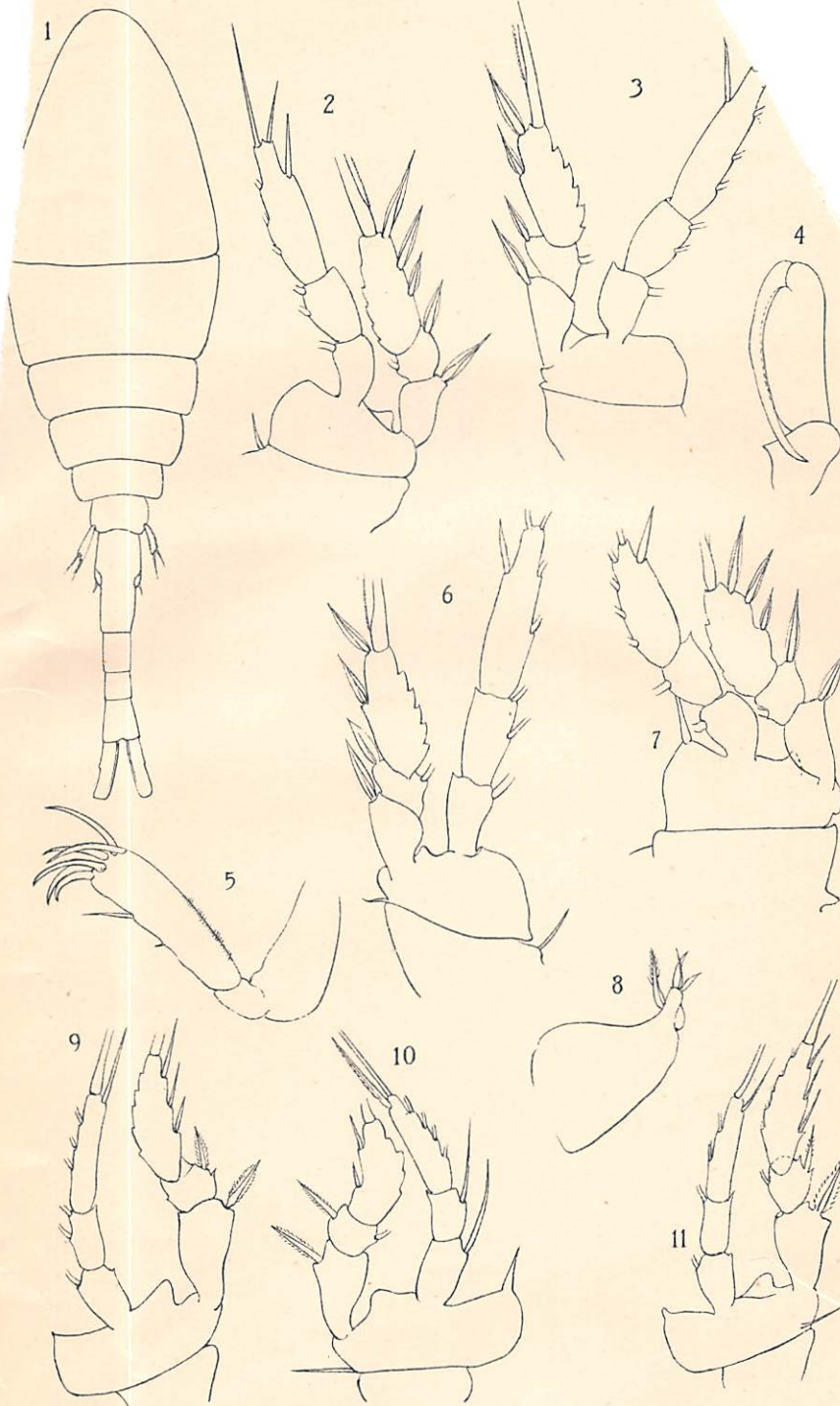


1-13. *Paroithona parvula*.

14-24. *Oncaea obscura*.

25-30. *Oncaea exigua*.

'06.



1-8. *Lubbockia brevis*. 9-11. *Oncaea exigua*.

G. P. F. del.

1888 Weller & Graham, L^{tho}. Litho. London.