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CRUSTACEA.

VIII.—COPEPODA.*

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(7 Plates.)

PREFATORY NOTE.

The collection handed to me for examination and report thereon was contained in 163 bottles, the contents of a few of which were in such bad preservation that they were practically worthless for the purpose of identification. The collection of individual species is not a large one, though there were great quantities of the more common species. But few absolutely new forms were found; these comprised a new genus (*Paralabidocera*) and seven new species (*Euchæta similis*, *Stephus antarcticum*, *Xanthocalanus antarcticus* and *X. magnus*, *Haloptilus ocellatus*, *Faroella antarctica*, and *Gaetanus antarcticus*). As such of these copepods as may be considered Antarctic were collected within a small area, I have not deemed it necessary to occupy space by the repetition of individual captures, which would be monotonous and of no particular interest. The drawings have been made by Miss Marion Lees.

The signs used in the following pages are *B* 1 and *B* 2 for first and second basals; *Ri* and *Re* for endopodite and exopodite; *Si* for inner marginal and *Se* for outer marginal spine (or bristle); *Li* for inner and *Le* for outer lobe; *Th* for thoracic somite. As they were first used in Giesbrecht's great work, and have been subsequently often employed by others as abbreviations, the author has thought no excuse necessary for their use here, in order to avoid the constant repetition of the words "exopodite" and "endopodite," etc.

I.

Until the expedition of the 'Belgica' there existed no records of the collection of Copepoda south of Kerguelen, except those of Dr. Brady, which referred to the 'Challenger' collections made from the south of Kerguelen to the pack-ice at 66° 29′ S.

The collections made by the 'Discovery,' the 'Belgica,' and the 'Gauss' form a most important contribution to the planktonology of this southern region, and the

* Owing to the author's absence from England he was unable to see the "revise" of this Report.—Ed.

results of any one expedition cannot properly be appreciated without reference to the others.

The 'Belgica' collections were made S. and S.E. of Peter I. Island, between 69° 48′ and 71° 18′ S., and 81° 19′ and 92° 22′ W., between April 21st and December 6th, 1898, by means of nets lowered through holes in the pack-ice to a depth of 0–500 mètres.

The 'Discovery' collections were made by lowering and raising a vertically actuated net through holes cut in the ice, while the ship was in Winter Quarters.*

The 'Gauss' collections were made from the South of Kerguelen to the winter station in Gauss Bay, Kaiser Wilhelm II. Land, and were of very extensive character, and as the collections were further made throughout the Atlantic traverse of the ship, they afford an opportunity for the comparison of the purely Antarctic fauna with that of the Southern Ocean.

In considering the question of the distribution of the Copepoda of the southernmost area of the Atlantic (the Antarctic region) it is convenient to consider the results of these expeditions together, since any conclusions drawn from the results of the 'Discovery' alone would be incomplete and even misleading. The 'Belgica' collections have been reported upon by Dr. Giesbrecht ("Résultats du Voyage du S.Y. 'Belgica' en 1897–1898–1899"; Rapports Scientifiques, 1902), and the 'Gauss' collections are still under examination, and I only now refer to the results of my examination of that collection in so far as they assist the elucidation of the 'Discovery' results.

From the results of the three expeditions ('North American,' 'Challenger' and 'Vettor Pisani') which, previously to the 'Belgica,' had collected in the Southern Ocean as far south as the pack-ice, Giesbrecht accepts seventeen species as correct, after rejecting a number of species as "ungenügend beschriebenen und nicht zuverlässig genug bestimmten",† *viz.*, *Aetidius armatus* (50° S.), *Calanus finmarchicus* (52°), *Calanus patagoniensis* (47°), *C. propinquus* (64° 37′), *simillimus* (52°), *Centropages brachiatus* (52°), *Clausocalanus arcuicornis* (53°), *Clytemnestra scutellata* (46°), *Drepanopus forcipatus* (53°), *D. pectinatus* (49° 16′), *Metridia boeckii* (45°),

* Mr. Hodgson has supplied me with the following.—Ed.

"Tow-netting in Winter Quarters.

"After the surface of the sea was frozen over there was no means of dragging a tow-net through the water, and as the current seemed sufficiently strong to hold the net out, it was attached to a line about a fathom above a heavy sinker, 28 lbs., and lowered to a depth of ten fathoms, except in special instances or during the summer. This depth was decided on, it having been found that the formation of ice crystals on the nets could be avoided. These crystals formed on the lines down to 5–8 fathoms, according to the season. The nets remained down for twenty-four hours, sometimes longer if the holes could not be visited on account of the weather, or opened on account of some difficulty with the ice. The mouth of the net was always in an approximately vertical position, this was secured by the attachment of the line direct to the ring of the net and the sinker to the other side of the ring."

† The rejected species are, *Acartia denticornis* (52°), *Candacia curta* (50°) and *truncata* (64° 37′), *Eucalanus attenuatus* (47° 25′), *Euchaeta marina* (47° 25′), *Haloptilus aculeatus* (46° 46′), *Heterorrhabdus spinifrons* (50°), *Lucicutia flavicornis* (47° 25′), *Pleuromamma abdominale* (65° 42′), *Copilia stylifera* (66° 29′).—Giesbrecht, 'Belgica' report, p. 5.

Monstrilla grandis (49°), *Oithona similis* (52°), *Paracalanus parvus* (52°), *Rhincalanus nasutus* (52°), *R. gigas* (65° 42′), *Scolecithrix minor* (46° 46′).

This list contains a striking number of forms which are usually associated with more temperate regions, and, as Dr. Giesbrecht remarks, the failure in agreement with the pelagic species of the 'Belgica' is very striking, for only two species are common to all collections. Comparing it with the results of the 'Discovery' the same extraordinary differences are manifest, only four species (*C. propinquus, C. similimus, Clausocalanus arcuicornis, Oithona similis*) being common to both collections.

In the 'Gauss' collections, in the area between Kerguelen and the Winter Station, appear a great number of species in excess of those either of the 'Belgica' or 'Discovery.' Whereas in the 'Belgica' collection occur thirty species, of which nineteen only are pelagic, in the 'Discovery' collection are twenty-four species of pelagic Copepoda; but in the 'Gauss' collection this number is more than doubled, and a number of species occur even in the collections made round about the Winter Station which are not entirely Antarctic, but extend a long way northwards through the deeper waters of the Atlantic Ocean, and have been brought there probably by southern currents. The species determined, however, show but little agreement with the list enumerated above.

The very extensive number of species captured by the 'Gauss' naturalists is probably due to the fact that the tow-nets were used at much greater depths than in the case of either the 'Belgica' or 'Discovery.' In the former, 500 mètres appears to have been the limit, whereas in the latter the collections may be considered to be practically surface collections. If the tow-net had been used at the depths it was employed on the 'Gauss,' viz., to 3,000 mètres, the agreement between the respective captures might certainly have been greater, and the number of species taken greatly increased.

In the 'Gauss' collections appear only six species which agree with any of the species referred to above (viz., *Aetideus armatus, Calanus propinquus* and *C. similimus, Clausocalanus arcuicornis, Oithona similis, Lucicutia flavicornis*), and when it is remembered that in the 'Belgica' collection there are only two species, and in the 'Discovery' only four species, of the twenty-seven species enumerated by Giesbrecht which are in agreement, the conclusion is inevitable either that the captures made by the expeditions mentioned were unusual, or that the identification of species has in some instances been erroneous. That unusual species do appear in these areas, even close to the ice, is shown by the occurrence in the 'Gauss' Antarctic collections of *Corycæus speciosus, Sapphirina metallina, Aetideus armatus, Labidocera acutifrons, Undeuchæta major, Arietellus setosus*, and others; and in the 'Discovery' collection in Lat. 56° 31′ S., Long. 156° 19′ 30″ occurred *Eucalanus subtenuis*, and in Lat. 49° 40′ S., and Long. 172° 18′ 30″ W., *Pleuromamma gracilis*, several young *Candace, Euchæta marina*, and *Centropages violaceus*, which belong undoubtedly to a subtropical or warm temperate area, and are to be regarded as accidental.

While the number of species captured was in each case comparatively small, the number of individuals in any one haul in the case of the 'Discovery' was very great. The rule which appears to hold good for tow-netting in the north part of the North Atlantic, *viz.*, that the further north we go the smaller the number of species, but the immensely increased preponderance of individuals of certain species, certainly holds good as regards the South Polar regions. Immense numbers of the small copepod *Ctenocalanus vanus* appear in some of the hauls, to the almost entire exclusion of any other species, and in other cases the larger copepod *Euchæta antarctica* appears in great preponderance. *Calanus acutus* and, to a lesser extent, *Calanus propinquus* also preponderate largely. Similarly, *Metridia gerlachei* appears in most of the captures.

The collections of the 'Gauss' provide information which is not given by those of the 'Discovery' or of the 'Belgica,' namely, that several species which appear in the Southern Polar Sea also occur in the deeper water of the Atlantic Ocean to the northwards of the Antarctic area. But as this properly belongs to the report of the 'Gauss' collections which I have in hand, I forbear its discussion in this place.

Two questions are suggested by Dr. Giesbrecht in his 'Belgica' report, *viz.*, (1) Does the Antarctic area possess a peculiar fauna? (2) Is the small agreement of the Antarctic copepod fauna with that of the nearest seas due to defective research, or is it that the area of the pack-ice has its own peculiar fauna? and the further questions as to whether the admixture of Polar and Antarctic fauna occurs in the deep ocean, or whether there are physical and biogenetic conditions in the Polar regions which differ from those in the warm seas and prevent such exchange of species, receive some elucidation from the collections of the 'Gauss.'

With regard to the first question, *viz.*, Does the Antarctic area possess its own peculiar fauna? it must be remarked that from the results of the three collections named the typical copepod fauna (pelagic) of this region consists in the following :—

Calanus acutus
„ *simillimus*
„ *propinquus*
Rhincalanus grandis
Euchæta antarctica
„ *austrina*
„ *similis*
Ctenocalanus vanus
Heterorrhabdus austrinus
Euchirella magna
Spinocalanus antarcticus
Metridia gerlachei
Oncea curvata, similis, frigida, notopus, conifera
Scolecithrix glacialis
Oithona similis
„ *frigida*
Gaetanus antarcticus
Haloptilus ocellatus
Paralabidocera hodgsoni
Stephus longipes
„ *antarcticum*
Ectinosoma antarcticum
Microcalanus pusillus

1. Of the Antarctic Copepoda the following are new species and genera :—

Paralabidocera hodgsoni	*Euchirella magna*
Haloptilus ocellatus	*Faroella antarctica*
Stephos antarcticus	*Gaetanus antarcticus*
Euchæta similis	*Xanthocalanus antarcticus*

Calanus simillimus (mentioned briefly by Giesbrecht, *loc. cit.*).

2. The following are species newly described by Dr. Giesbrecht ('Belgica' report), occurring also in the 'Discovery' collection :—

Euchæta antarctica
Stephus longipes
Metridia gerlachei (nearly related to *M. boecki* and *M. lucens*).
Oncea curvata „ „ *O. subtilis*, Giesb.
Rhincalanus grandis „ „ *R. gigas*, Brady.
Harpacticus furcifer „ „ *H. flexus*, Brady.

3. Of species which occur in the North Polar regions there are only the following 'Discovery' species, which bear such slight modification as to be practically identical : *Microcalanus pusillus* (= *Pseudocalanus pygmæus*) ; *Oithona similis.*

4. The 'Discovery' collection would therefore lead us to suppose that, so far as copepod fauna is concerned, there is little resemblance between the characteristic fauna of both Polar regions. In the 'Belgica' collection, *Oncea conifera* and *notopus* ; and in the 'Gauss' collection, *Oncea conifera*, *Gaidius tenuispinus* and *brevispinus*, and *Amallophora magna*, that is, seven species of a total of 55–60 species occurring in the South Polar seas, are all that are identical with the species described by Prof. Sars as collected by Nansen's Norwegian North Polar Expedition. It would not, however, be safe to take this list of Prof. Sars' as the ultimate result of copepod research of the North Polar seas, and other species may yet be found to be identical.

The following table shows the comparative relationship of species of the more frequently occurring genera :—

N. Polar.		S. Polar.
Calanus finmarchicus	replaced by	*C. propinquus*
„ *hyperboreus*		„ *tonsus*
		„ *simillimus*
		„ *acutus*
Metridia longa	replaced by	*M. gerlachei*
		„ *princeps*
Amallophora magna (= *Scaphocalanus acrocephalus*, Sars)		*A. magna*
Scolecithrix brevicornis	replaced by	*S. glacialis*
Xanthocalanus borealis	replaced by	*X. magnus*
		„ *antarcticus*

N. Polar.		S. Polar.
Gaidius tenuispinus „ *brevispinus*	replaced by	*G. tenuispinus* „ *major* „ *antarcticus*
Microcalanus pusillus (= *Pseudocalanus pygmæus*)		*M. pusillus*
Heterorrhabdus norvegicus „ *compactus*	replaced by	*H. australinus* „ *longicornis*
Euchæta norvegica „ *glacialis* „ *barbata*	replaced by	*E. antarctica* „ *australina* „ *similis*
Haloptilus spinifrons	replaced by	*H. ocellatus* „ *spiniceps*
Spinocalanus longicornis	replaced by	*S. antarcticus*
Undeuchæta spectabilis	replaced by	*U. major*
Oithona similis „ *helgolandica* „ *conifera* „ *notopus*	replaced by	*O. similis* „ *curvata* „ *conifera* „ *notopus* „ *frigida*

In the North Polar Sea, as Prof. Sars remarks, besides the few distinctly Arctic species are many which extend southwards to the warmer seas, and the North Polar basin copepod fauna has a pronounced resemblance to that of the North Atlantic basin, the greater number of species being common to both, and some deep-water forms of the Norwegian Sea are often surface forms in the North Polar basin. A few forms regarded as quite southern also occur in the North Polar Sea.

So far as the distribution can be followed from the 'Gauss' collections, it may be said that, of the typical Antarctic fauna its representatives diminish gradually to latitude 40° S. (*i.e.* about the latitude of St. Paul and New Amsterdam) north of which they do not appear, but extend westwards to those stations situated directly south and westward to 10° E. as a limit of the Cape of Good Hope, north of which no typically Antarctic species appears.

North of Kerguelen, *i.e.* 50° S. lat., no Antarctic species appear to extend, while the typically subtropical species of the Indian Ocean extend as far south as latitude 30° S., where their southern extension appears to be arrested. There is thus a barrier between lat. 40° and 50° S. and between long. 10° and 80° E. as indicated by the 'Gauss' collections, at which extension northwards of Antarctic species and southwards of Indian Ocean subtropical species is prevented, or at any rate, does not occur. While the same collections indicate that the Antarctic species extend northwards into the Atlantic Ocean in gradually diminishing numbers, only as far as lat. 40° S., north of which they do not occur, a few typically Atlantic deep-water species find their way into the Antarctic Sea (such are *Heterorrhabdus profundus*, *Labidocera acutifrons*, *Metridia princeps*, *Lucicutia grandis*, *Gaidius major*, *Arietellus setosus*).

Until the 'Gauss' collections are fully examined it is of course rash to say that no

typically Antaretic species ever find their way northwards by way of the deep Atlantic trough, but there is little evidence of it in the many collections made by the 'Gauss' throughout its Atlantic traverse. A certain number of species which are ubiquitous, such as *Oithona similis*, some species of *Oncea*, *Haloptilus longicornis*, *Gaidius tenuispinus* and *major*, and *Gaetanus* (*armiger*, and possibly *caudani*), extend from the Faroe Channel to the southern ocean; but so far as the evidence at present goes, the Antaretic Copepod fauna is distinct from that of the Aretic seas, and the species which are typical of this region, and most numerous, do not extend far into the Southern Atlantic. As no observations have been made of the Copepod fauna of the deep water of the Indian Ocean, it is quite possible that Antaretic species may bear a considerable extension northwards in this direction.

It is curious that no great number of *Harpacticidæ* appear in the collections of the 'Discovery,' only three examples all told of *Harpacticus furcifer*, which is somewhat different from any *Harpacticus* of the northern hemisphere; and only five are described from the 'Belgica' collection by Dr. Giesbrecht, two of which (*H. brevicornis*, *H. chelifer*), are identical with northern species. A fair number of species occur in the 'Gauss' collection, but these have not yet been examined.

The paucity in numbers of the *Harpacticidæ* in the 'Discovery' captures is no doubt due to the mode of collection.

II.

List of Copepods in the 'Discovery' Collection.

Euchæta antarctica.
„ *similis.*
Metridia gerlachei.
„ *princeps.*
Calanus acutus.
„ *propinquus.*
„ *tonsus.*
„ *simillimus.*
Ctenocalanus vanus.
Oithona similis.
„ *frigida.*
Oncea curvata.
Microcalanus pusillus.
Stephus longipes.
„ *antarcticum.*
Xanthocalanus antarcticus.
„ *magnus.*
Paralabidocera hodgsoni.
Rhincalanus grandis
Clausocalanus arcuicornis.
Haloptilus ocellatus.
Faroella antarctica.
Gaetanus antarcticus.
Heterorrhabdus longicornis.

Harpacticus furcifer.

CALANUS (Leach).

The species first described by Brady as *Calanus propinquus* has been subsequently described by Giesbrecht, who now concludes ('Belgica' report, p. 16) that the copepod described by himself in 1892 as *C. propinquus* from the S.W. Atlantic, between 37° and 52° S., is not this species, but one closely resembling it, to which he gives the name

C. simillimus. Giesbrecht also suggests that the similarity between the two species leads to the doubt whether *C. propinquus* has such a wide distribution as Brady imagined. This author gave it a distribution throughout all oceans—in the southern Indian, north in the Pacific (to 35° N.), and in the Atlantic to 30° N.*

I have made a careful examination of dissected specimens from the following localities:

Lat. 56° 31′ S. Long. 156° 19′ 30″ E.
Lat. 59° 19′ S. Long. 124° 24′ 30″ W. (28. vi. 04).
Lat. 84° 01′ S. Long. 170° 49′ E.
Lat. 58° 49′ 45″ S. Long. 154° 48′ W. (24. vi. 04).
Lat. 50° 48′ S. Long. 170° 2′ E.

and in these hauls occur many examples of a *Calanus* which answers in all particulars to Giesbrecht's *C. simillimus*. As these have well-developed genital segments, in some cases with spermatophores attached, and differ from *C. propinquus* not only in size, being very much smaller than this species, but also in the proportions of the third and fourth pairs of feet, and the serration and proportions of the fifth pair, there is no doubt that this entirely agrees with the animal briefly described by Giesbrecht; and I think he is correct in regarding it as a species different from *C. propinquus*, and that the distribution of the latter is not so extensive as was imagined by Brady. I therefore describe *C. simillimus* (Giesbrecht) as a different species.

A third species of *Calanus* which does not agree with either of these, being altogether less robust than *C. propinquus*, and constantly much smaller, but at the same time larger than *simillimus*, but with the basals of the fifth pair without any marginal teeth, and the distal margins of the basals of the second to fourth pairs with a row of spines, may probably be *C. tonsus* (Brady), but the description given by this author is of the briefest character, and he gives only two figures, which do not assist in the identification. However, I attach to it Brady's name, as it is probably the animal meant by Brady.

Four species of *Calanus* are found in the 'Discovery' collection:—

1. *Cal. propinquus* (Brady).
2. *Cal. acutus* (Giesbrecht).
3. *Cal. simillimus* (Giesbrecht).
4. *Cal. tonsus* (Brady).

* Lat. 46° 46′ S. Long. 45° 31′ E.
Lat. 64° 37′ S. Long. 85° 49′ E.
Lat. 47° 25′ S. Long. 130° 12′ E.
Lat. 35° 41′ N. Long. 157° 42′ E.
Lat. 40° 3′ S. Long. 132° 58′ W.
Lat. 9° 43′ S. Long. 13° 51′ W.
Lat. 3° 10′ N. Long. 14° 51′ W.
Lat. 37° 17′ S. Long. 53° 52′ W.
Off Kerguelen Island. Brady, *loc. cit.*

1. Calanus propinquus.

(Plate I., figs. 1, 2, 3, 3ª, 4.)

Calanus propinquus, Brady, Rep. 'Challenger' XIX., Copepoda (1883), p. 34.
„ Giesbrecht, Fauna u. Fl. Neap. XIX. (1892), p. 91.
„ Giesbrecht und Schmeil, Das Tierreich, Copepoda (1898), p. 15.
„ Giesbrecht, 'Belgica' Report, p. 16.
„ T. Scott, Trans. Linn. Soc. VI. (1893), p. 25.

The length of this copepod given by Brady is 5·5 mm., by Giesbrecht 4·9–5·3 mm. The majority of the 'Discovery' and 'Gauss' specimens measure under 5 mm. The cephalothorax is rather over three times as long as the abdomen, furcal segments twice as long as broad. Head evenly rounded, without any trace of crest. Head separate from first thoracic segment. Last thoracic segment laterally produced a little, and ending in short points. Anterior antennæ not reaching beyond the furca (thus shorter than described by Giesbrecht, in these specimens). Relative proportions of 24th to 25th segments as 18 : 21.

Second feet	*Re* 3	divided into	proximal portion	24 ;	distal 25.
Third	„	„	„	20 ;	„ 23.
Fourth	„	„	„	36 :	„ 20.

Ri 3 with seven bristles, end saw two-thirds the length of *Re* 3. Fifth feet, *B* 1 with inner margin convex below, concave distally, with thirteen or fourteen teeth, and distally with three teeth, larger than the others. *Ri* 3 with five bristles, two outer, two apical, one inner. This animal is much more robust than the next species (*simillimus*).

The ♂ is about the same size as the ♀, and the chief differences consist in the structure of the fifth feet and shape of the head and thorax. The latter is very like *C. finmarchicus*, the head oval, rounded, and produced, the first thoracic segment with deep indentation between it and the second, and its posterior margin protruded. The anterior antennæ with the basal joints much coalesced. Posterior footjaw with a long, stout, densely-feathered dorsal bristle. Fifth left foot much prolonged, *Re* 1 and 2 elongated, *Re* 3 very short and pyriform shape, with short distal bristle. *Ri* only half the length of *Re*, with respectively 1 : 1 : 6 short weak bristles. Right foot *Ri* nearly as long as *Re*, with 1 : 1 : 6 bristles. *Re* not much more than half as long as *Re* of opposite side. First basal with inner margin armed with seventeen to twenty large teeth ; in its upper part slightly concave, in its lower part slightly convex, the teeth all of pretty much the same size.

2. Calanus acutus.

(Plate I., figs. 9, 10.)

Calanus acutus, Giesbrecht, 'Belgica' Report,* p. 17.

This copepod was first described by Giesbrecht from the Belgian South Polar Expedition, and in the 'Discovery' collection it forms the chief constituent of the South Polar copepod plankton, along with *Euchæta antarctica*.

The majority of the animals I have met with both in the 'Gauss' and 'Discovery' collections are smaller than the size given by Giesbrecht, *viz.*, 4·7–5·3 mm. But few of our specimens reach 5 mm. length, the majority being from 4·5–4·7 mm. The cephalothorax is not quite four times as long as the abdomen, the head divided from the first thoracic segment, the last segment of the latter produced laterally, but with evenly rounded margins and no points. In lateral aspect the head is slightly produced forwards, and more inclined to be oval than rounded. In the dorsal aspect it has a distinct triangular appearance, with slight crest in the mid-line. In its broadest part the thorax is 1·15 mm. broad, that is, three times as long as broad.

The furcal segments are a very little longer than the anal, and nearly twice as long as broad. The anterior antennæ vary in length in different animals, in some being only as long as the furca, in others one or two joints longer, and are distinguished by the comparative length of the last joint, which is about twice as long as the one before it.

In the second feet the *Re* is divided into two portions, proximal = 24; distal = 13.
,, third ,, ,, ,, ,, = 29; ,, = 15.
,, fourth ,, ,, ,, ,, = 15; ,, = 15.

The *Ri* 3 has in the second and third feet eight bristles, in the fourth only seven, and in the fifth only four (with no outer marginal bristle). The end saw of the *Re* 3 of the second feet is shorter than the *Re* 3; in the third and fourth pair longer.

The fifth feet are distinguished by the absence of the outer marginal bristle of the *Ri* 3, and the total absence of teeth or hairs on the inner margin of the first basal. All males appeared to be immature.

3. Calanus simillimus.

(Plate I., figs. 5, 6.)

Calanus simillimus, Giesbrecht, 'Belgica' Report, p. 17.

♀ 2·5–2·9 mm.; cephalothorax, 1·9 mm.; abdomen, ·6 mm. long.

Head separate from first thoracic segment, evenly rounded, without any trace of crest. Head not quite as long as the rest of the thorax (as 18 : 21). Last thoracic

* "Belgica Report" is throughout this monograph used to indicate "Résultats du Voyage du S. Y. 'Belgica' en 1897–1898–1899." Rapports Scientifiques. 1902.

segment laterally produced somewhat and ending in short points. Anterior antennæ about as long as the furca, or about one joint longer.

Genital segment as long as the next two. Furca three times as long as broad, and longer than the anal segment.

Second feet, *Re* 3 divided by the marginal spine into two about equal parts.

Third feet, *Ri* 3 with eight bristles (four outer, two apical, two inner), *Re* 3 divided into two parts, of which proximal : distal = 17 : 13.

Fourth feet, *Re* 3 divided by the marginal spine, proximal : distal = 20 : 11.

Ri 3 with seven *Si* (two outer, two apical, three inner), terminal saw of *Re* 3 only three-quarters as long as *Re* 3.

Fifth feet *B* 1 toothed, with fourteen teeth on the rather convex margin, and at the distal end a slight break in the continuity, with three rather larger teeth somewhat hidden, in front view, by the upper teeth of the marginal surface. *Ri* 3 with five bristles (two inner, thin and short, two apical, and three outer). In the second pair the *Ri* reaches about the end of the *Re* 2, in the third pair to the first inner marginal bristle of the exopodite, and in the fourth pair as far as the second inner marginal bristle, in the fifth pair beyond the origin of the first inner marginal bristle. The endopodites are therefore proportionately larger than in *C. tonsus*, and the third segment of the exopodite is not four times as long as broad.

While this species agrees with *C. propinquus* in many particulars, the proportions of the third and fourth feet differ, also the toothing and convex margins of the basals of the fifth feet, and the size. Many of the examples were quite adult females with spermatophore attached, so there can be no question of their being merely undeveloped examples of *C. propinquus*, and, as before mentioned, this species has a considerable area of distribution in the southern oceans.

4. Calanus tonsus.

(Plate I., figs. 7, 8.)

Calanus tonsus, Brady, Rep. XIX., 'Chall.' Report, p. 34.
„ „ Scott, Tr. Linn. Soc. VI. (1893), p. 25.
„ „ Giesbrecht, Fauna u. Flora Neap. XIX., p. 92.
„ „ Dahl, Verh. Deutsches Zool. Gesells. IV. (1894), p. 77.

Brady's original description of this species is very incomplete, and he merely states that it is "like *C. finmarchicus* and *propinquus*, except that the anterior antennæ are almost devoid of setæ, except on the three apical joints ; the posterior antennæ are like those in *C. propinquus*, the fifth pair without basal teeth, and the first abdominal segment large and tumid. The anterior antennæ are as long as the body . . . . ♀ Size 3·6 mm." He gives only two figures—*viz.*, of the anterior antennæ and the abdomen.

Giesbrecht includes it under the "Unbestimmbare species," remarking that the

first character probably results from the bad preservation of the animals; the second is a character of other members of this genus; and the third point is characteristic of *gracilis* and *robustior*.

Scott merely mentions that "the large and tumid first abdominal segment seems to be a fairly good character" (*loc. cit.*). However, this is not a characteristic of this species any more than of *C. robustior*, and the existence of this species up to the present time therefore must be regarded as extremely doubtful. However, the 'Discovery' collections contain several examples of a copepod, which, if it is not Brady's species, answers fairly well to it so far as his description goes.

♀ 3·5–3·6 mm. long (cephalothorax, 2·75; abdomen, ·75. Body broadest at the end of the first thoracic segment (1·1 mm. broad). Abdomen short, genital segment broad, and one-third broader than the following segment. Furcal segments not quite twice as long as broad, and nearly twice as long as the anal segment. Head evenly rounded, without trace of crest, separate from the first thoracic segment, last thoracic segment only slightly produced, and with rounded margins. Anterior antennæ only reaching the end of the third abdominal segment, the only long bristles on the twenty-third, twenty-fourth, and twenty-fifth segments, the twenty-fourth joint twice as long as the twenty-fifth. Mouth parts resembling *C. finmarchicus*.

Second feet—second basal with four large spines on the distal margin at the inner side. *Re* 3 divided by the external outer spine into proximal and distal portions respectively as 23 : 16. *Ri* 3 with eight bristles. The whole endopodite does not reach beyond the distal margin of *Re* 2. *Re* 3 as large as *Re* 1 + *Re* 2.

Third feet—four large spines on *B* 2 distal inner margin, endopodite reaching a little beyond the distal margin of *Re* 2. *Re* 3 divided into proximal part = 32, distal portion = 16. *Ri* 3 with eight bristles.

Fourth feet—*Re* 3 divided into proximal part = 37, distal = 15; apical saw only seven-ninths as long as *Re* 3. *Ri* with seven bristles only (three inner, two outer, two apical). *B* 2 with one or two spines on distal inner margin.

On the second, third, fourth and fifth feet the outer margin of the second basal is distally armed with a spine; in second–fourth, the *Re* 3 = *Re* 1 + 2, and is about three times as long as broad.

Fifth feet—first basal with straight inner margin without teeth or hairs, *B* 2 with five spines on the distal inner surface. *Ri* 3 with six bristles (two inner, two outer, two apical).

The only *Calanus* with which this shows agreement is, possibly, Brady's *C. tonsus*; but Brady's description is so fragmentary that it may well be another species. It occurred in some numbers at Station, 22·11·01, Lat. 56° 31′ S., Long. 156° 19′ 30″. Such males as were observed were all immature.

RHINCALANUS (Dana).

(Plate II., fig. 6.)

Rhinc. grandis, Giesbrecht, 'Belgica' Rep., p. 18.
? *Rh. gigas*, Brady, 'Challenger' Rep. XIX., p. 42.
„ Scott, 19th Rep. Scotch Fishery Board (1901), p. 237.
„ Giesbrecht, Fauna u. Fl. Neap. XIX. (1892), p. 153.

Rh. gigas was described by Brady as distributed over a very wide area between long. 53° 32′ W.—130° 52′ E. and lat. 36° 44′ S—65° 42′ S. Much doubt has been expressed by Giesbrecht as to the validity of this species, and the figures given by Brady of abdomen and of the whole animal are those, in Giesbrecht's opinion, of immature animals, and this author thinks that Brady's figure of the first feet is really of one of the other pairs of feet.

Scott's specimens (Fair Isle and Firth of Forth) are regarded by Giesbrecht as *Rh. nasutus* (*Th.* 3 and 4 with dorsal or with a lateral spine, as in *nasutus*, and a pair of small dorsal points on the genital segment). Möbius's specimen from the north of Scotland is also identical with *nasutus*. *Rh. nasutus* is very common in the Faroe Channel and seas off the north of Scotland, and occurs abundantly in my collections made in these regions and along the Atlantic trough, west of Ireland, and also appears in the 'Gauss' collections as far south as lat. 20° N., while in the same collections *Rh. grandis* (Giesbrecht) appeared. From the remarks of Sars in "Crustacea of Norway," Vol. IV., p. 15, it might be inferred that *Rh. nasutus* is of rare occurrence in the Northern Ocean ("two specimens were taken east of Iceland, one specimen by Hjort between Scotland and Norway, and it has not yet been found in the immediate vicinity of the Norwegian coast.") However I have taken it in abundance on many occasions throughout the Faroe Channel. It is rather important to establish the identity of Brady's *Rh. gigas*, and of two preserved specimens at the British Museum, which I have examined, one measured 5·8 mm. and another 6·0 mm. Both were immature females with four-jointed abdomen, lateral spines on *Th.* 3 (small), and on *Th.* 4 (large), with none on the fifth segment, resembling *Rh. grandis*, one dorsal spine on the first abdominal segment (no dorsal spines on the thoracic segments), and so far as could be seen without dissection, the first feet had an exopodite of two segments only, and the fifth pair consisted each of only one ramus of three segments. These two animals were, of course, very much smaller than described by Brady (8·5–10 mm.) and were undoubtedly immature, and the species may well be identical with young *Rh. grandis* (Giesbrecht).

Rhincalanus grandis.

Rhincalanus grandis, Giesbrecht, 'Belgica' Rep., p. 18.

♀ 7·2–8·0 mm. Head produced in front, dorsally roughly triangular in shape, with large lateral swellings at the base, rostrum not visible from behind. The cephalothorax is over six times as long as the abdomen, which is composed of three segments. A pair of short spines on the anterior margin of the third thoracic segment, and a pair of strong and longer spines on the fourth segment, differentiate this species from *nasutus*, also the absence of any spines on the abdominal segments. The first pair of feet have the *Ri* and *Re* of only two segments, *Re* three with two marginal spines; other feet (except the fifth) have three-jointed rami.

The fifth pair, of one branch only on each side, with three segments, have on the second segment a long inner marginal bristle, and on the last segment three bristles of nearly equal length, two apical, of which the outer is the thickest and the middle one a little the longest, and one on the inner distal margin. A short spine is present on the outer margin in its upper third. The anterior antennæ are about six joints longer than the furca. Adult males were absent.

These examples are absolutely identical with Giesbrecht's species.

METRIDIA (Boeck).

One of the most remarkable things about Brady's 'Challenger' Copepoda is the omission of mention of any example of this genus from his report. Distributed throughout the Atlantic from the North to the South Pole, and in the Pacific, and throughout the track followed in the Atlantic and Southern Ocean by the 'Challenger,' the absence of mention of any species of this genus is certainly extraordinary. In the northernmost regions *Metridia longa* occurs (Sars, Norwegian North Polar Expedition) throughout the Faroe Channel and the Atlantic trough as far south as Valentia in Ireland; and south of the Wyville Thompson ridge, *M. lucens*, *normani* and *curticauda* (Wolfenden); while south of Lat. 40° and throughout the Atlantic occur *M. curticauda*, *brevicauda*, *princeps* and *venusta*; but south of Kerguelen appears a new and characteristic species, *M. gerlachei*, which replaces all others. This is the representative species of the South Polar seas, and it appears abundantly in the 'Gauss,' 'Discovery,' and 'Belgica' collections, and it is as characteristic of this area as *M. longa* and *lucens* are of the northern cold area. *M. princeps* occurs seldom, and *M. brevicauda* as a straggler, outside its proper area of distribution.

Metridia gerlachei.

Metridia gerlachei, Giesbrecht, 'Belgica' Report, p. 27.

♀ 3·5–3·8 mm., very variable in size, occasionally a little larger and often smaller, but the average of size of examples in the 'Discovery' and 'Gauss' collections is rather less than that given by Giesbrecht for the 'Belgica' specimens. The cephalothorax is one and a half times as long as the abdomen, head separate from first thoracic segment, last segment with rounded margins. The abdomen has the proportional length of its three segments as 9 (genital) : 6 : 4 (anal), and the furca is one-fifth longer than the anal, and three times as long as broad. It is divided into two portions by the outer marginal bristle, of which the proximal is twice the length of the distal.

The shape of the head and thorax is in this species characteristic, the back being extremely gibbous, and the head with very bold curve, which makes it easily recognisable at sight from any other species of this genus. The anterior antennæ are comparatively short and do not reach beyond the genital openings. The first and second segments are coalesced; the eighth, ninth, tenth, eleventh, have only faint indications of separation; the thirteenth and fourteenth joints are not so clearly divided as the others. There are strong teeth on one, two, three, five, seven (one each), those of the third, fifth, seventh joints the strongest, and directed straight forwards. The æsthetasks are numerous.

The endopodites of the second pair of feet have the usual excavation and hook process on the first segment, but in this species the inner hook is exceedingly strong. In the fourth pair the end saw is only two-fifths of the whole length of the *Re* 3 (shorter than in Giesbrecht's examples).

The fifth pair consists on each side of three segments, but the distal segment is more or less completely divided into two, the division however is not complete. The two basal joints are of about the same length and breadth, each as broad as a little over half the length. The third joint, however, is not more than four-fifths as long as the basals, and only half the breadth. The second joint bears one short distal bristle, the last joint one outer marginal bristle in the proximal half, and three distal bristles, of which the innermost is the longest and thickest, the outermost the shortest.

Metridia princeps.

(Plate III., figs. 3, 4, 5.)

Metridia princeps, Giesbrecht, Atti Line. Rend., Ser. 4, v. 5, p. 24.
„ „ „ Fauna u. Fl. Neap. XIX., p. 340.
„ „ „ Farran, Ann. Rep. Fish. Ireland 1902–03, Pl. II. App. II. (1905).
? Metridia macrura, Sars, Bull. du Mus. Oceanog. Monaco, 1905, no. 10, p. 7.

Though only one example of this species occurred in the 'Discovery' collection, it was frequent in the 'Gauss' collection, not only at several Atlantic stations, but also

at the southernmost stations. Northwards it ranges to the west coast of Ireland, and, as has been mentioned, has an extreme southern distribution. Giesbrecht's description was given from only one specimen, and compared with Sars', very briefly described, *M. macrura*.

M. princeps, Giesbrecht.	*M. macrura*, Sars.
Cephalothorax one and a half times as long as the abdomen	Tail about as long as the anterior division
Anterior antennæ extend beyond the furea	Longer than the body
Short teeth on 1, 2, 4, 5, and 6, the 2nd the longest	Only feeble traces of the strong teeth of *princeps*
Genital segment longer than both the following	?
Anal segment half as long as the preceding one	?
Furea twice as long as anal, and 5 times as long as broad	About as long as the two preceding segments
	5th feet like *princeps*, but less unequal
Size 8·5 mm.	Size 10·50 mm.

Of the many examples which have come under my notice I find that the relative sizes of the abdominal segments and furea are subject to some variation, thus :—

1.	G.S.	30.	Ab.	2,	16.	Anal	6.	Furca	28	long,	3	broad. Size 8·15 mm.
2.	,,	28.	,,		16.	,,	8.	,,	25	,,	3	,, ,, 8 mm.
3.	,,	27.	,,		16.	,,	7.	,,	23	,,	3	,, ,, 8 mm.
4.	,,	22.	,,		11.	,,	4.	,,	12	,,	2	,, ,, 6 mm.

The genital segment is thus always twice as long as the two succeeding segments, the anal is not more than half the preceding segment, the furca is generally longer than the two preceding segments, and usually from seven to nine times longer than broad. The teeth on the antennæ are weak, and entirely resemble the figure given by Giesbrecht in Plate 33, fig. 3 (*op. cit.*).

It is difficult to resist the conclusion that these are one and the same species, and not two different species. The male was not described by either Giesbrecht or Sars, but I have met with several examples.

♀. The largest adults were from 8–9 mm. in length.

The body is very transparent, the head evenly rounded, cephalothorax (4·15–4·5 mm. long, abdomen 4·0 mm. long), only slightly longer than the whole abdomen, and a little over one-third as long as broad.

The genital segment is larger than the next two, the anal not more than half as long as the preceding, often much more than the combined length of the two preceding segments and 6–9 times as long as broad, and divided into two portions by the marginal bristle, of which the proximal is to the distal as 8 : 5. The right furcal segment is sometimes a little longer than the left. Anterior antennæ at least three joints longer than the furea, the basal joints broad, with short teeth on the basal seven joints, of which those on the first two joints are the largest. The

distal joints taper and are very slender. Proportional length of joints of anterior antennæ :—

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
12	4	5	5	5	5	14	6	9	9	12	12	13	13	14	14	15	10	9	10	10	7	3

The eighth and ninth joints are quite coalesced, but in some there is a weak line of division.

The second pair of feet have each the characteristic hooks on *Ri* 1, and the outer one is the longest. The surface of the second basal is beset with short spines, but not the *Re* 1. The third feet are normal and with shortened end saw. The fifth pair each consist of four segments, of which the basal is greater than the second, this longer than the third, and third longer than the fourth and terminal segment. The first joint has on its surface a considerable bunch of long stiff hairs (as in *princeps*), the second joint has a long stiff feathered bristle on the outer distal margin, and the third joint has a short upright spine on the outer distal margin, in all specimens (not on the inner side as figured by Giesbrecht), and the end joint has three rather long fine bristles, of which the innermost is the longest. The spine on the third joint was in one example replaced by two very short spinules on the right foot, while none were present on the left side.

♂ 5·8–6 mm. long (cephalothorax 3·25 mm. Abdomen 2·3 mm. long).

Relative lengths of the abdominal segments = 14, 10, 10, 4, and the furcal segments 13. The left furcal segment is a little the largest and thickest, and six times as long as broad, and three times as long as the short anal segment.

The anterior antennæ extend for about three joints beyond the furca, as in the female, and the left one is a clasping organ with weak joint between the seventeenth and eighteenth segments. The segment beyond the elbow is very long and thin, and as long as the next two distal joints. There are four joints beyond the elbow. The conjoined first and second (basal) joints have two strong teeth, the distal one the largest and curved slightly forwards. The fourth joint has a smaller tooth. Fifth feet: The right foot with very long first joint, the second short, but with very strong, broad-based curved and long hook, the third joint nearly twice as long as the second, and the fourth and end joint a long simple spoon-process twice as long as the third. In the left foot the first joint is very small, the second nearly twice as long, the third a short joint, the fourth a very long simple curved spoon-shaped process. On the inner margin (proximal) of the fourth, of the third, and the distal foot of the second are fine hairs. Both feet are of nearly similar length.

EUCHAETA (Philippi).

Two representatives of this genus appear in the 'Discovery' collections—*E. antarctica*, and another which appears to have constant differences, and to which I have attached the name *E. simulis*. I do not in this collection find any example of

Giesbrecht's species *E. austrina*, though I have found it in the 'Gauss' collections. *E. antarctica* appears in many stages, extensive captures consisted wholly of immature specimens, but there are many adult examples. Many males appear amongst these, and while the females are very distinctively different, I am not able to discriminate between those males, as to which definitely belong to *antarctica*, and others which might belong to *similis*. Both species are very closely allied, and differ very considerably from the large species of the northern cold seas, *viz.*, *norwegica*, *glacialis* and *barbata*.

Euchaeta antarctica.

(Plate IV., figs. 5, 6.)

Euchæta antarctica, Giesbrecht, 'Belgica' Report, p. 21.

This is one of the most abundant copepods in the 'Discovery' collection, appearing in all stages of growth, and in some samples almost to the exclusion of other species.

Size of adult examples 7·6 mm.–8 mm. Head evenly rounded, without frontal prominence and with short rostrum directed forwards. Last thoracic segment with rounded margins, produced forwards and with a bunch of hairs on each side. The abdominal segments have the postero-distal margins armed with rather strong bluntly conical and striated teeth, and the two middle segments have on the ventral side bunches of long hairs. The furca and bristles are the same as in *E. similis*. The genital protuberance occupies the lower half of the segment, its upper margin is not deeply concave like *similis*, but the whole swelling is directed downwards, and its upper margin is slightly convex. Above the genital swelling is a secondary prominence, which in the ventral aspect is seen to consist of two valve-like chitin thickenings. The lower part of the protuberance has two lateral lobes, the upper are small, and above this a prominent horn directed straight forwards and never absent in adult specimens of *E. antarctica*, making it quite characteristic of the species.

In the ventral aspect the appearance is quite different from that of *similis*. The genital opening is oval, almost round, with lateral cushions, and above the upper edge of the genital opening guarded by a chitin ridge, is the horn.

The whole swelling is quite symmetrical, rather conical, and occupies quite the lower part of the segment.

The first pair of feet have the outer margin very concave above and very convex below, with a bunch of hairs on the *Rc* 1, and a long seta. The seta of *Re* 2 is also very long and thin. The *Rc* 3 is only half the length of the coalesced *Re* 1 and 2.

In the second pair the *Re* 1 has a very short *Se*, that of *Re* 2 is very long and more than twice as long as the *Se* 1 of *Rc* 3.

In *Rc* 3, the *Se* 1 does not reach the origin of *Se* 2, the *Se* 2 does not quite reach the end of the segment, and is three times as long as *Se* 3 and twice as long as *Se* 1. The *Se* 1 and 2 are very greatly curved and almost sickle-shaped.

In the fourth pair the *Re* 3 is not three times as long as broad (16 : 6). The anterior antennæ are a little longer than the cephalothorax.

The ♂ is a little smaller than the ♀, and presents the same sexual differences as in other *Euchaetae*. The bunches of hairs on the last thoracic segment, so prominent in the ♀, are absent in the ♂.

The first feet have a three-jointed exopodite, the outer margin of which is not so concavo-convex as in the ♀, and its *Se* are short.

In the second pair, the *Se* of the exopodite are also smaller, the *Se* of *Re* 2 only reaching the origin of the *Se* 1 of *Re* 3 ; the *Se* 2 of *Re* 3 being little more than half the length of the distal part of the segment. The fifth feet are characteristic. The penultimate segment of the left foot is prolonged on the upper margin into a strongly toothed process, and has a setose conical unhaired process on the distal margin, the last segment into a long process, narrow and with a strong bunch of hairs at the distal extremity, and with a large conical and strongly haired process. (This process is sometimes nearly as long as the principal process of the penultimate joint.)

The first basal is short, the second basal long, and with very small and rudimentary endopodite.

The right foot has short first basal, very broad second basal, long first and second *Re* (which are coalesced), and with the last segment blunt and rounded.

Euchaeta similis.

(Plate IV., figs. 1, 2, 3, 4.)

This species occurs plentifully in the same samples in which *E. antarctica* is present. For a long time I regarded them as merely different stages in the history of the same animal, but the careful examination of a great number of individuals from different tow-nettings proves the constancy of the points of difference between the two, and as many of the *E. antarctica* and *E. similis* have spermatophores or egg sacs attached, I have come to the conclusion that, though so very similar in most characters, the two species must be separated on account of the invariably different characters of the abdomen and genital segment.

E. similis is constantly rather larger than *E. antarctica*, 8·6 mm.–8·8 mm., and more robust, the head flat and rostrum small, but strong and directed forwards and rather upwards. The cephalothorax is two and a half times as long as the abdomen. The last thoracic segment is produced forwards, slightly triangular shaped, with evenly rounded margin, no spine, but a bunch of long hairs on each side. The abdominal segments, of which the genital is twice as long as the next, are covered with fine hairs, nowhere with large bunches, and the posterior distal margins have only very small teeth, not large, as in *antarctica*. Furca with, on each side, a very short dorsal bristle, the ventral accessory bristle not geniculated at the base, though bent outwards, its length not more than about half of the two long tail bristles (next to the innermost).

Genital segment with very prominent genital tubercle, occupying half the segment, (the lower half only), directed slightly upwards in lateral aspect, with apparently three lobes, an upper and lower, each large with small middle lobe, and without any eminence on the upper part (of the ventral surface) of the segment as in *antarctica*, and also invariably without the ventral horn which is so characteristic of *antarctica*. In the ventral aspect the genital tubercle appears to be obliquely placed, directed downwards towards the left, the vulva guarded by two prominent flaps of which the right one is below the left one. The whole tubercle occupies more of the left than the right side of the segment, which in the dorsal view is only slightly swollen at each side.

The first and second pairs of feet and the number of bristles on the maxilla are the same as in *antarctica*.

While the female is so distinctly different from that of *E. antarctica* I am unable to find similar distinction in the males. Both kinds appear frequently to occur together in the same sample, and all the males appear to be alike.

ONCEA (Giesbrecht).

Oncea curvata.

Oncea curvata, Giesbrecht, 'Belgica' Report, p. 42.

According to Giesbrecht, this species differs from *O. subtilis* in the following points: Length, 0·6–0·8 mm., the body lengthened, the three segments posterior to the genital are about as long as broad, and comparatively longer than in any other *Oncea* species except *subtilis* (in which they are longer than broad), all three segments together are shorter than the genital (in *subtilis*, the genital segment is only a little longer than the two succeeding segments), the furca is as long or a little longer than the anal segment (in *subtilis* shorter). The posterior antennæ in both kinds are similar, the maxillipedes, however, differ; the terminal hook which, in *subtilis*, is thin and unarmed, is strong and beset with pretty long teeth on the concave side, in *curvata*. The swimming feet are similar in both species, except that in *curvata* the proximal outer marginal bristle on *Ri* 3 occurs in all four pairs, while it is absent in *subtilis*, and the lancet-shaped apical bristle of the fourth foot is in *curvata* longer than in *subtilis*.

The few examples that occur in the 'Discovery' collections are smaller than Giesbrecht's examples, none being more than ·56 mm. in total length (♀s with egg sacs attached).

The genital segment is a little longer than the next three segments, the fureal and anal segments of the same length, the second abdominal segment as long as broad, and rather larger than the third segment, the relative lengths of Ab. 2 : 3 : 4 and furca being as 4 : 3 : 4 : 4, the latter nearly three times as long as broad.

In the posterior antennæ, the first basal joint is the largest, and the inner margin of the second basal has a few fine teeth; the distal segment has three proximal bristles

of unequal length, the middle one very short, and distal to it, a comparatively long and slightly armed bristle, terminally four long and two shorter bristles.

The maxillipede is armed with a strong claw bristle, denticulated on the inner margin, and the second basal has two comparatively stout bristles, the proximal of which is armed with wide-apart bristles.

In the fourth pair of feet the apical bristle of the exopodite is longer than the third exopodite segment by one-third of its length.

The agreement, therefore, between this species and Giesbrecht's examples is very close, the only difference being one of size, and there is no doubt that the two species are identical.

STEPHUS.*

Möbianus, Giesbrecht, Fauna u. Fl. Neap. XIX. (1892), p. 205.
Stephos, Th. Scott, 10th Rep. Scotch Fishery Board, Vol. X. (1892), p. 245.
Stephus = Stephos, Giesbrecht, 'Belgica' Rep., p. 20.
Stephos, Sars, "Crustacea of Norway," Vol. IV. (1903), p. 61.

Since Giesbrecht described the genus *Möbianus*, which was subsequently identified with *Stephos* (Scott), several other examples of the same genus have been described. Scott himself recorded three specimens, *viz.*, *S. minor*, *S. fultoni*, and *S. gyrans*, supposing the latter to be identical with Giesbrecht's *Möbianus gyrans*.

Sars has described two new species from Norway, *viz.*, *S. lamellatus* and *Scotti*, which latter is again identical with *Stephos gyrans* Scott (not Giesbrecht). Giesbrecht's species (*gyrans*) is said by Sars to differ in the asymmetrical last thoracic segment and genital segment, the latter with "a number of irregularly arranged spiniform processes not found in any of the northern species," the last feet of the male also differing from *S. scotti*.

The 'Belgica' report contains yet another species described by Giesbrecht as Antarctic, *viz.*, *S. longipes*. This species recurs also in both the 'Gauss' and 'Discovery' collections, and in the latter I find a further and considerably larger example, to which I have given the name *antarcticum*.

As these descriptions are scattered over six different volumes, I think it may be of service to bring them together here.

1. S. GYRANS.

S. gyrans, Giesbrecht, Fauna u. Fl. Neap. XIX. (1892), p. 205; Giesbrecht, u. Schmeil, Das Tierreich, Copep., p. 29.

Furca longer than broad, anterior antennæ reaching to end of genital segment, genital segment with a curved hook on ventral side, shorter hook on dorsal, fifth feet

* The author, in agreement with Sars, prefers the name originally given to the genus by Scott, but it is perhaps better to observe the ordinary rule.—ED.

in female, end segment rather curved and broad basally ; in male, left foot with several long appendages, right foot, thin appendages at end and rest foliate ; size = 0·8–1 mm. (Naples.)

2. S. SCOTTI.

S. gyrans, Scott, Nineteenth Rep. Scotch Fishery Board (1901), p. 237.
S. scotti, Sars, "Crustacea of Norway," Vol. IV., p. 63.

Slender ; cephalothorax symmetrical ; genital segment without spines, furca longer than broad, anterior antennæ reach end of abdomen 2, *Re* of posterior antennæ twice as long as *Ri*. ♀, fifth, with denticles on last segment, which is elongated and pointed ; ♂, fifth, penultimate joint of left foot tumefied, last segment with about half a dozen short processes ; last joint of right foot with long, sickle-shaped process. Size = ·85–·95 mm. (Loch Fyne ; Norway.)

3. S. MINUS.

S. minor, Scott, Tenth Rep. Scotch Fishery Board, 1892, p. 245.

Robust, cephalothorax symmetrical ; genital segment without spines, anterior antennæ about as long as the thorax, furca as long as broad, fifth feet in ♀ with elongated last segment with two little lateral spinules ; in ♂, right foot a long foliate joint at end, left foot with two digitiform processes at end, penultimate joint only slightly tumefied. Size = 0·74 mm. (Firth of Forth.)

4. S. LAMELLATUM.

S. lamellatus, Sars, "Crustacea of Norway," Vol. IV., p. 62.

Short and robust, last segment asymmetrical ; right side longest, genital segment unsymmetrical and rounded prominence on right side, but no spines ; furca about as long as broad, anterior antennæ reach to furca, branches of posterior antennæ equal ; fifth foot in ♀, last joint elongated, with fine spine midway ; in ♂, left foot with much tumefied penultimate segment, with proximally a long spine, and last joint with a number (about nine) of leaf-like appendages ; right foot not foliate, but last joint with three or four short, rounded appendages. Size = 1 mm. (Norway.)

5. S. FULTONI.

S. fultoni, Scott, Ann. and Mag. Nat. Hist., 7th series, Vol. I. (1898), p. 185.

Cephalothorax symmetrical ; genital segment with spine and hook ventrally. Fifth feet in ♀ are larger and broader (knife-like) than the other, which is pointed ; in ♂ right foot with elongated penultimate segment and short, strong, foliate end segment ; left foot, penultimate segment tumefied, extremity with five or six leaf appendages, and bifid claw. Size = 1 mm. (Clyde.)

6. S. LONGIPES.

S. longipes, Giesbrecht, 'Belgica' Rep., p. 20.

Cephalothorax symmetrical; genital segment swollen laterally and roughly triangular-shaped, anterior antennæ not reaching end of thorax, no spines on genital segment; fifth feet in ♀ last segment elongated, curved (foliate), with external spine half as long as in ♂; right foot with two middle segments very elongated, ending distally in curved hook not articulating; left foot without tumefied segment, two middle elongated, last shorter with knob and spine, but no processes. Size ·8–·9 m. (Antarctic). ('Discovery' and 'Gauss' collections. Wolfenden.)

7. S. ANTARCTICUM.

Robust, cephalothorax a little unsymmetrical, right side prolonged; genital segment swollen laterally, with bunch of spine-like bristles each side; furca as broad as long; anterior antennæ reach to Ab. 2; *Re* of posterior antennæ longer than *Ri*. Fifth feet in ♀ right side longest, each with three end spines, innermost hook-like; in ♂, right with third joint elongated and club-shaped distally, with a large, roughly triangular plate, and last joint a strong, curved hook; left foot, no tumefied segment, and last joint with distally a short-stalked haired knob, no appendages. Size = 1·75–2 mm. ('Discovery' collection.)

STEPHUS LONGIPES.

(Plate V., figs. 1, 2, 3.)

Stephus longipes, Giesbrecht. 'Belgica' Rep., p. 20.

♀ ·75–·80 mm. ♂ ·65–70 mm. Cephalothorax rather more than twice as long as the abdomen; head separated from first thoracic segment, but all segments very difficult to determine, owing to the indistinctness of the lines. Last thoracic segment with rounded margins and symmetrical. Abdomen in the female four, in the male five segments, furcal segments only as long as the anal, as broad as long, and with rounded margins, each with four tail bristles and a short fifth inner marginal bristle. Genital segment in the female as long as the next two, laterally with roughly triangular swellings, and in its greatest breadth, broader than long. Anterior antennæ not as long as the thorax, and of twenty-three joints, the first, second, eighth and ninth coalesced, with few bristles, the longest on the seventh and eighteenth joints, but well supplied with long æsthetasks.

Posterior antennæ with exopodite about one-third longer than the endopodite. Posterior foot-jaw with rather thick first basal and *B* 1 : *B* 2 : *Ri* as 8 : 7 : 6; mandibles with broad-ended masticatory plate, one pointed outer tooth, with considerable space between it and the middle stout comparatively broad teeth, and three pointed inner teeth.

First feet *Ri* = 1, *Re* = 3; no *Se* on *Re* 1, and very short *Se* on *Re* 2.

Second fect *Ri* = 2, *Re* = 3.

Third and fourth feet *Ri* and *Re* = 3.

Fifth, each of three segments, two basal, each short and comparatively thick, terminal segment longer and thinner, prolonged, with a stout curved hook with short bristles on the upper margin and an external marginal thin and short bristle.

The male is rather smaller than the female, the abdomen has five segments, the mouth organs are as in the female, but the fifth feet are transformed into clasping organs, that of the right side of four segments, the left of five. The second and third segments of the left are elongated, the distal segment short and broadened out, the distal extremity ending in a spine, and at the opposite side a short knob process, apparently without marginal hairs.

The right foot with short broad second basal, and two distal very elongated and thin segments, with a long thin sickle-shaped process at the end, which appears to be a continuation only of the joint above it, and though forming an elbow, does not articulate.

In the general structure this small Copepod bears great resemblance to the species *Stephus antarcticum*, which, however, is twice as large; the fifth feet in the female as well as the male are different, and the two species are therefore quite distinct.

Stephus antarcticum.

(Plate V., figs. 4, 5, 6, 7, 8.)

♀ 1·85–2·0 mm. long, cephalothorax about three times as long as abdomen, and in its broadest part distal of the middle line one-third as broad as long. Head evenly rounded, a little produced in front, but without trace of rostrum, a weak line indicating its division from the first thoracic segment. Last two segments of the thorax imperfectly divided, and last segment a little unsymmetrical; on the right side a little longer than on the left, produced into a round-ended margin, on the left side more acutely pointed, which is most marked in lateral view. Abdomen of four segments respectively proportioned: genital segment, 2 : 3 and anal as 20 : 13 : 8 : 8; furcal segments as long as the anal, and as broad as long. Genital segment laterally swollen in the upper part (genital protuberances) and again slightly swollen laterally in its lower part, with on each side a bunch of rather long spines, none dorsally. Furca with four tail setæ on each side, outer margins haired and with, on each side, a short lateral spine instead of the usual bristle, and on the ventral side a very short accessory bristle. Of the tail bristles, the two middle ones are much the longest and thickest, and those of the right side more so than those of the left.

Anterior antennæ reach in both sexes to about the end of the second abdominal segment, having twenty-four segments, the eighth and ninth coalesced. In the posterior antennæ the exopodite is longer than the endopodite. The mandibles with branches

nearly of same length, masticatory plate with strong teeth. The posterior foot jaws with first and second basal and *Ri* in proportion of 24 : 11 : 20 ; maxillæ, *B* 2 with 5 ; *Re* with 10 ; *Ri* 1 with 4, *Ri* 2 with 3, *Ri* 3 with six bristles, *Li* 2 and 3 present, and *Le* 1 with eight bristles.

The first feet have one jointed *Ri* and three jointed *Re*, without *Se* on *Re* 1.

The second feet have two jointed *Ri* and three jointed *Re*.

The third and fourth feet have both rami three-jointed.

Fifth feet comparatively large, that of the right side a little longer than the left. Each of three segments, of which the two basals are equal in size, but the last segment on the right foot is a little longer than in the opposite foot. Each has terminally three spiny processes, the innermost comparatively thick, curved, and hook-like, and with hairs only on the outer margin. The two outer spines are neither much more than half the length of the inner one, and only half as thick.

The ♂ is a little smaller, 1·75 mm., and of slenderer build ; the asymmetry of the last thoracic segment is only slight, and on neither side is it so prolonged as in the female. The abdomen consists of five segments, the first segment is more laterally swollen than in the female, and is broader than long ; the second and third segments about equal in length, and much longer than the anal, which is very short. The antennæ, oral organs and feet are the same as in the female, with the exception of the fifth pair, which are converted into two extraordinary appendages. Arising from a common basal, the right leg possesses four segments, the left five segments. In the right leg the first joint is short and rather broad, the second elongated, rather longer and thicker than the third, which is a long thin joint with club-shaped distal extremity, and having attached to the joint it makes with the last appendage a broad, rather triangular plate covered with fine hairs and a few rather strong spines. The last joint is represented by a comparatively strong and large curved appendage, armed along its inner margin with short stiff bristles, these two terminal appendages resembling an awkward-looking pair of shears.

The left foot, of five segments, has the first and second comparatively shorter but broader than the third and fourth. The fifth segment short and broad at the distal end, has externally a short curved tooth-like ending of the distal margin, and at the inner end an upright knob-shaped appendage, strongly armed all over, and especially at the base of the stalk, with short stiff bristles.

The fifth feet of the ♂ and ♀ possess no near resemblance to similar organs in any other species of *Stephus* ; the size of the animal, moreover, is comparatively large for any representative of this genus, and it must therefore be regarded as a new species. Several examples occurred in two or three of the ' Discovery ' collections.

PARALABIDOCERA.

There is no mention of any example of the genus *Labidocera* in Giesbrecht's 'Belgica' report. In the 'Discovery' collection there are a great number of specimens of an animal superficially resembling *Labidocera*, but which does not agree with any known species of that genus, though bearing some relation to *L. wollastoni*. Between 60° and 70° S. *Labidocera acutifrons* appears in the 'Gauss' collection, but is absent from either the 'Discovery' or 'Belgica' collections, and this genus is thus very sparingly represented in the Antarctic area. The copepod referred to below differs distinctly from any known *Labidocera* in the character of the swimming feet of the female and the five-jointed abdomen of the male, and the fifth pair of feet, and I have thought it better to create a genus for it.

Characters of the genus.—Very similar in appearance to *Labidocera*, but a total absence of "ocelli," and of very unsymmetrical shape, the swimming feet without spines on the last segment of the exopodite, and the male abdomen of five segments.

Paralabidocera hodgsoni.

(Plate VI., figs. 1–13.)

♀ 1·55–2 mm.; ♂ 1·6 mm. long. The head is evenly rounded, produced forwards a little, and in front are two delicate rostral filaments. There is no trace of eyes, either dorsal or ventral, but in some males there are two dark spots laterally on the head, and in a few females a dark pigmented spot on each side, which may possibly have been ocelli. But considering the mode of preservation, which included freezing and thawing, and a long sojourn in spirit, these organs may very well have been present at some time, and subsequently vanished. The head is quite without any trace of side hooks, and separated from the first thoracic segment; last two segments coalesced and produced on each side into lateral expansions, but bluntly ended. Abdomen of three segments, the genital with large lateral outgrowths, and also dorsally and ventrally swollen a little; spines entirely absent; next segment also laterally enlarged, and anal segment small; furcal segments a little unsymmetrical, the right a little longer and broader than the left; all tail bristles comparatively short, consisting of four apical and one lateral marginal (situated a little distal of the middle), all slightly thickened at the base. There is also a small accessory dorsal furcal bristle on each side. Anterior antennæ shorter than the cephalothorax and with only twenty-two distinct joints, very densely covered with long bristles.

Proportional Length of Antennal Joints.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
10	10	2	4	1½	1	2	3	3	8	4	4	4	6	6	6	6	7	5	10	6	3½

Posterior antennæ with *Ri* much longer than *Re*, the former with six long bristles on the first segment, and seven and six bristles on the distal segment. *Re* very indistinctly segmented, the proximal joint very elongated.

Mandibles with *Ri* longer than *Re*, *B* 2 with one marginal bristle, masticatory plate broad, with one rather large tooth and a good space between it and the next five conical short teeth.

Maxilla with *B* 2 and *Ri* bent outwards; *B* 2, *Ri*, and *Re* coalesced and almost indistinguishable; *Li* 1 with seven rather long and stout hooks and two shorter bristles; *Li* 2 a large lobe with three bristles, *Li* 2 with one bristle; *Ri* indistinctly segmented on the outer margin with five apical bristles; *Re* scarcely segmented, with only two bristles; *Le* 1 with seven long and very thick bristles, and three shorter bristles.

Anterior foot jaws with lobes much compressed, and terminal five bristles longer than the proximal and also much thicker.

Posterior foot jaw very similar to that of *Anomalocera*. *B* 2 is short, but rather thick, and with one short bristle; *Ri* short, unsegmented, with only three terminal and short bristles.

One to four pairs of feet, with *Ri* of only two, *Re* of three segments. In the first pair the external marginal setæ of *Re* are long and thin, in the others the external spines are short, and in all there is only one marginal spine (apical) on *Re* 3.

First pair of feet, *B* 1 and *B* 2 with only slightly convex inner margin and no *Si*. *Re* 1 longer than *Re* 2 + *Re* 3, outside margin haired and long marginal bristle. *Re* 2 and *Re* 3 with similarly long marginal bristles. *Se* = 1 : 1 : 2 and *Si* = 1 : 1 : 5. *Ri* 2 nearly twice as long as *Ri* 1 and with 5 *Si*.

In the second pair *B* 2 is broader than long, the inner margin convex and without hairs or bristles; *B* 1 is also without *Si*. *Ri* 1 prolonged, *Ri* 2 shorter (as 7 : 10). *Ri* 1 with 2 *Si*, *Ri* 2 with 7 *Si*.

Re 1 : 2 : 3 as 11 : 6 : 9, with respectively 1 : 1 : 1 : *Se*, that of *Re* 1 the largest and of *Re* 3 the smallest; the end saw about two-thirds as long as the whole *Re*; a small curved spine distal margin of *Re* 3 just external to the saw. 5 *Si* on *Re* 3.

3rd feet. *B* 1 and *B* 2 without bristles or hairs, *Ri* as in the preceding pair, *Re* as in the preceding pair and with 1 : 1 : 1 *Se* only.

4th feet. *B* 1 and *B* 2 as before. *Ri* 1 with three *Si*, *Ri* 2 with only six *Si*. The three joints of *Re* rather more equal in length, *Se* 1 : 1 : 1 as in the other feet. *Ri* 1 is more elongated than in the other feet and twice as long as *Ri* 2.

In the second to fourth pairs the *Ri* is more than half as long as the *Re* and extends beyond the distal margin of *Re* 2. In all feet the number of external marginal spines is certainly peculiar, the usual rule being three marginal spines on the *Re* 3, so that the animal differs from any true *Labidocera*.

The 5th feet consist of a common basal and one ramus on each side of two segments *B* 2 and *Re*. *Ri* represented only by a spine. The first and second basals are

nearly equal in length and each about as broad as long. The second basal segment has at its distal inner margin a very stout articulating spine, *Ri* four-fifths as broad as this joint is long. On its outer surface, near the distal and outer end, is a delicate bristle. The third segment is nearly twice as long as the second basal, tapers to a point, and just below the distal end is a delicate little bristle. Near the end of the joint and on the inner side is a very stout broad-based spine, not articulating, and nearly half as long as the whole segment. Frequently the foot of one side is a little longer than of the other.

The whole animal is very unsymmetrical, especially in the shape of the last thoracic segment and the genital segment of the abdomen. The characters of the swimming feet, as to proportions, *and especially as to the absence of spines on the last joint of the exopodite*, and the absence of anything like the usual ocelli of *Labidocera*, are points which appear to remove it from that genus. The abdomen of most females is more or less enveloped in a mass of colourless, structureless membrane. The ♂ is distinctly five-jointed in the abdomen, whereas in *Labidocera* this is four-jointed. The right anterior antenna especially also differs from other species. From the characters of the female feet and the abdomen of the males I have thought it justifiable to create a new genus for this animal. I name the species after Mr. Hodgson, the naturalist of the 'Discovery' Expedition.

♂ smaller than the ♀ (1·6 mm). Cephalothorax with head separate from next segment, two dark lateral spots, but not ocelli, in front of the head. Abdomen little more than half as long as the thorax. Head evenly rounded, without side hooks, last thoracic segment rounded and not produced. Abdomen of undoubtedly five segments, of which the second is about as long as the third and fourth together, the first is very short, the fourth is twice as long as the anal, which is a short segment; the furcal segments, of which the right is a little larger than the left, are twice as long as broad and three times the length of the anal segment.

Right anterior antenna a clasping organ, the middle joints swollen, the joint before the elbow with a marginal row of small teeth and with only two distinct segments beyond the elbow, of which the distal is very long and thin (over three times as long as broad), and in its distal part carrying on the inner margin a very long spine tapering to a fine whip-like extremity, but broad in its basal portion. This appendage is half as long again as the whole joint. The joint immediately distal to the elbow has on its margin proximally a short but thick spine. I find it very difficult in any of the specimens, of which there are several, to agree with any degree of accuracy upon the exact number of segments in this antenna owing to the fact of its being curled up in every case. First to fourth feet and mouth organs as in the female.

5th feet, powerful clasping organs, the right one of four segments, the left of three, with a common basal. The first segment of the right foot has on its inner margin a small knob projection, the second has two short, thick spines, the third a fine spine, and the last joint is curved into a strong hook, without any appendages.

The first joint of the left foot has a short spine on the external margin, and the last joint is broad proximally and foliaceous, and on its inner surface is a row of fine bristles, with three or four stiff and longer than the rest.

EUCALANUS (Dana).

That any species of *Eucalanus* should be found at extreme southern latitudes is certainly curious. *E. elongatus* certainly occurs south of lat. 40°, and about 40° W. long., 'Gauss' collection; and in the 'Discovery' collection I have found about half a dozen examples of a *Eucalanus* which I regard as a variety of *E. subtenuis* or *mucronatus*. This occurred at station marked 21. x. 01, lat. 57° 25½′ S., long. 151° ¾′ E., and station lat. 56° 31′ S., long. 156° 19′ 30″, 22. xi. 01; in both cases a long distance outside the Antarctic Circle.

The ♀ (no males were found) is 4 mm. long. The head is very triangular, elongated, and produced in front into a blunt point slightly bent downwards; there are lateral swellings as in *attenuatus*, the part behind is not, however, indented. The last thoracic segment is rounded. The abdomen has three segments, and one tail bristle on the left side is a little thicker and longer than the rest. The genital segment is laterally swollen and broader than long. Posterior antennæ with first and second joints of the exopodite coalesced, the first joint of the endopodite about three times as long as broad, and about the same length as *Ri* 2. The mandibles with very short *Ri*, the proximal part about three times as long as the distal, the whole *Ri* very much shorter than the distal part of the basal, and with four bristles and two short marginal bristles. Maxilla, *B* 2 with five, *Ri* 1 with four, *Ri* 2 with four, *Ri* 3 with five bristles. With some resemblance to *E. subtenuis*, *pileatus*, and *mucronatus*, it is larger than any of them. The five bristles on the *B* 2 of the maxilla cause it to differ from either *mucronatus* or *subtenuis*, and it has considerable differences from *pileatus* in size, posterior antenna and mandible. The shape of the head is certainly not that of *subtenuis*, nor is it so triangular and pointed as *mucronatus*.

CTENOCALANUS (Giesbrecht).

Ctenocalanus vanus.

Ctenocalanus vanus. Giesbrecht, Atti Acc. Lincei Rend., Ser. 4, 1888, p. 335.
„ „ „ Fauna u. Fl. Neap. XIX. (1892), p. 194.

This is extremely abundant in the 'Discovery' collections, but does not differ in any material particular from the species well known in the Atlantic. Its range of distribution is very great, extending from the Faroe Channel (Wolfenden) throughout the Atlantic to the southernmost parts of the Antarctic area, *i.e.* to the ice region.

CLAUSOCALANUS (Giesbrecht).

Clausocalanus arcuicornis.

Clausocalanus arcuicornis. Giesbrecht, Atti. Acc. Lincei Rend., Ser. 4., vol. 4, p. 334.
„ „ Giesbrecht, Fauna u. Fl. Neap. XIX. (1892), p. 50.
„ „ Giesbrecht u. Schmeil, Das Tierreich, p. 27.

That this species should occur so far south is rather peculiar. It was found in the collections made at :—

Lat. 49° 40′ S.	Long. 172° 18′ 30″ W.
Lat. 55° 44′ S.	Long. 95° 43′ 30″ W.
Lat. 56° 12′ 45″ S.	Long. 136° 18′ 30″ W.
Lat. 57° 25½′ S.	Long. 151° 43′ E.
Lat. 58° 49′ 45″ S.	Long. 154° 48′ W.
Lat. 59° 19′ S.	Long. 120° 24′ 30″ E.
Lat. 63° 5′ S.	Long. 175° 43′ E.
Lat. 84° 01′ S.	Long. 170° 49′ E.

and does not differ essentially from the species common in the Atlantic. It has a considerably greater range than was thought, since I can record it from the Irish coast to nearly the Antarctic Circle.

GAETANUS (Giesbrecht).

Gaetanus antarcticus.

(Plate III., fig. 6.)

Gaetanus antarcticus, Wolfenden, Plankton Studies, Part I. (1905), p. 7.

Size 8 mm. The body is very robust and dorsally very gibbous. The head and first thoracic segment are coalesced, and together much longer than all the rest. The last thoracic segment carries two short stout curved spines, directed backwards. The head is in its upper part quite square, and with short stout curved spine, directed a little forwards. The abdomen is not a quarter the length of the cephalothorax.

Anterior antennæ not as long as the body, of twenty-three segments, with the eighteenth, nineteenth and twenty-first segments longer than the twentieth, and all joints with very few setæ. *Ri* of the posterior antennæ more than half the length of *Re*. Posterior foot jaws with lamellar process on the first basal.

Maxillæ ; *Li* 2 and *Li* 3, each with four bristles ; *B* 2 with five, *Ri* small and two-jointed. *Re* small, and less than half the length of *B* 2.

First feet, *Re* of three segments with three marginal spines, the segmentation being complete ; *Ri* of only one segment.

Second feet, *Ri* distinctly two-jointed.

Third and fourth feet, *Ri* and *Re* of three joints each. *B* 2 of the fourth feet with tubal bristles as in *Gaidius*.

The extraordinary size of this animal makes it the largest known species of *Gaetanus*. It occurred once only in the 'Discovery' collection, and also appeared in the 'Gauss' collection, and is probably Antarctic in its habitat. Several new species of *Gaetanus* have been described recently, and it may serve some useful purpose to recapitulate here the different species discovered since Giesbrecht and Schmeil's last work (Tierreich, 1898).

1. Gaetanus major.

G. major, Wolfenden, Proc. Zool. Soc., London, Feb. 3, 1903, in Dr. Fowler's paper.
„ Farran, Ann. Rep. Fish. Ireland, 1902–03, Part II., App. II., 1905.

Size 5 mm. and over. Anterior antennæ larger than the body by about one joint; lamellar appendage of posterior foot jaws absent; *Re* of first feet of three segments, and with three *Se*. Cephalic spine short, and as in *G. armiger*.

2. Gaetanus caudani.

Gaetanus caudani, Canu, Ann. Univ. Lyon, V. 26, 1896.
„ „ Wolfenden, Jour. Mar. Biol. Assoc., 1904, p. 24.
„ (?) *pileatus*, Farran, *ibid.*

Like *G. miles*, but anterior antennæ only one-and-half times as long as the body; lamella of posterior foot jaw like that of *G. miles*. *Re* of first feet, three segmented basals of fourth feet with tubal bristles, 5 mm. and over. Canu's original description was of one immature ♂. Farran's were also immature specimens.

3. Gaetanus holti.

Gaetanus holti, Farran, *ibid.*
„ *latifrons*, Sars, Bull. Mus. Monaco, No. 26, March, 1905.
„ *longispinus*, Wolfenden, Plankton Studies, Part I. (1905), p. 7.

Cephalic spine strong and directed backwards with long interval between the frontal part and base of the horn. Anterior antennæ not as long as the body-spines of the last thoracic segment, strong, long, and directed backwards. Small lamella on posterior foot jaw. First feet with three segments and three *Se*. Fourth feet with basal tubal bristles. Size 4·74 mm.

4. Gaetanus antarcticus.

Gaetanus antarcticus, Wolfenden, Plankton Studies, Part I. (1905), p. 7.

Thorax gibbous, very stout short curved cephalic spine directed forwards, head square, not like *G. armiger*. Abdomen short and thick, not a quarter of whole length.

Anterior antennæ not as long as the body. Posterior foot jaw with lamella. *Re* of first feet with three segments and three *Se*. Fourth feet with tubal bristles. Size 8 mm.

5. Gaetanus minor.

Gaetanus minor, Farran, Ann. Rep. Fish. Ireland, 1902–03, P. II., App. II. (1905), p. 34.

Cephalic spine as in *G. armiger*, long slender spines of last thoraeic segment. Anterior antennæ reaching only to genital segment. First feet with *Re* of two segments and only two *Se*. Second feet with one-jointed *Re*. Size 2·4 mm.

6. Gaetanus robustus.

Gaetanus robustus, Sars, Bull. Mus. Océanographique Monaco, no. 26 (1905), p. 11.

Robust, eephalothorax a little swollen in middle. Cephalic spine small, curved, or sometimes absent. Spines of last thoraeic segment very strong and divergent. Abdomen thick and about one-third of whole length. Anterior antennæ scareely as long as the body. Size 8 mm. (? possibly the same as *G. antarcticus*, but the deseription of *G. robustus* is insufficient.)

7. Gaetanus inermis.

Gaetanus inermis, Sars, *op. cit.*, p. 12.

Body very thick, anterior division swollen. No trace of cephalic spine, last segment of thorax rounded and without spines. Abdomen very short, not a quarter of whole length. Anterior antennæ not longer than body. Structure of other parts not different from other species of this genus (?) Size 6·30 mm.

(In the absenee of cephalic and thoracie spines, whieh are constant in this genus, this is probably not a *Gaetanus*.)

8. Gaetanus curvicornis.

Gaetanus curvicornis, Sars, *op. cit.*, p. 11.

Body like *G. miles* (Giesbrecht), short curved cephalic spine. Spines of last thoracie segment moderately large and divergent. Very short abdomen only a quarter the whole length. Anterior antennæ scareely longer than the body. Size 4·35 mm.

9. Gaetanus kruëppi.

Gaëtanus kruppi, Giesbrecht, Mitt. Zool. St. zu Neapel, XVI. (1903), p. 202.

Like *G. armiger*, but larger, *viz.*, 3·6–4 mm. long, thorax shorter. Anterior antennæ reach three joints beyond furca, twenty-second segment longer than in *G. armiger*. Feet like *G. miles*. ♂ 3·7 mm. long, thoraeic spines shorter than ♀ and antennæ shorter than body. *Se* of *Re* 2 of first foot rudimentary ; fourth feet without tubal bristles. Fifth feet *Ri* of one segment, *Re* of right foot of two ; of left, of three segments. Mediterranean.

XANTHOCALANUS (Giesbrecht).

There are only two examples of this genus in the 'Discovery' collection. Since the publication of Giesbrecht and Schmeil's "Copepoda" (in "Tierreich") the genus has received many additional species. To the originally described species, *viz.*, *X. agilis* and *X. minor* (Giesbrecht), are now added *X. borealis* (Sars), *X. propinquus* (Sars), *X. muticus* (Sars), *X cristatus* (Wolfenden), *X. suberistatus* (Wolfenden), *X. simplex* (Wolfenden), *X. magnus* (Wolfenden), *X. calaminus* (Wolfenden), *X. atlanticus* (Wolfenden), *X. greeni* (Farran), *X. pinguis* (Farran), and *X. obtusus* (Farran); and, as they are described in scattered publications, it may be well to recapitulate the characters here.

1. X. agilis.

X. agilis, Giesbrecht, Fauna u. Fl. Neap. XIX. (1892), p. 286.

Size 2·4; furcal segments broader than long, abdominal segments very hirsute; anterior antennæ reaching end of furca; fifth feet three segments, beset with spines and teeth, and with three apical teeth.

In the ♂ only one (the left) foot five-jointed. (Mediterranean.)

2. X. subagilis.

X. subagilis, Wolfenden, Jour. Mar. Biol. Assoc., VII. (1904), p. 118.

Size 2·6 mm., resembling *X. agilis*, but abdominal segments not hirsute.

Fifth feet with three segments, the basal with strong teeth, the middle with only hairs, the distal spinulose and with three long apical spines.

♂ with a pair of fifth feet nearly equal, the right of four, the left of five segments. (Mull of Galloway.)

3. X. borealis.

X. borealis, Sars, Crustacea of Norway, Vol. IV., p. 46.

Size 3·50 mm.; furcal segments as broad as long, anterior antennæ reach end of genital segment; fifth feet of three segments, proximal two, with teeth on inner margin; last with two apical and two lateral spines.

♂ with a pair of fifth feet left of five segments, right very short and of only three segments. (Polar Seas. Norway.)

4. X. propinquus.

X. propinquus, Sars, *loc. cit.*

Size 1·75 mm.; furcal rami longer than broad; anterior antennæ slender and reaching only to second abdominal segment, posterior antennæ with *Re* much longer

than *Ri*; fifth feet of three segments, last much smaller than proximal two, only basal with marginal teeth, end segment with three short outer and one long inner spine.

♂ a pair of fifth feet, the right very rudimentary and short, of three segments. (Polar Sea. Norway.)

5. X. CRISTATUS.

X. cristatus, Wolfenden, Jour. Mar. Biol. Assoc., 1904, p. 119.

Size 5·0 mm.; head triangular and with prominent crest, anterior antennæ reaching to end of furca; fifth feet of three segments, all densely spinulose, with two short apical spines. ♂ not known. (West of Ireland.)

6. X. SUBCRISTATUS.

X. subcristatus, Wolfenden, Plankton Studies, Part II. (1906), p. 31.

Size 7·0 mm.; head with crest, abdomen very hirsute, furcal segments very short, anterior antennæ reaching end of genital segment; fifth feet three segments, the distal long and tapering, with two short apical spines; all these segments densely spinulose. ♂ not known. (South Polar Sea.)

7. X. MAGNUS.

X. magnus, Wolfenden, *op. cit.*, p. 32.

Size 8·8 mm.; head rounded, not clearly separated from next segment; furcal segments very short, anterior antennæ reaching the genital segment; abdominal segments very hirsute; fifth feet of three segments, very small; all segments very spinulose, with two apical and two lateral spines on the last segment. ♂ not known. (South Polar Sea.)

8. X. SIMPLEX.

X. simplex, Wolfenden, *op. cit.*, p. 30.

Size 1·45 mm.; whole surface of thoracic segments covered with fine prickles, anterior antennæ very short, posterior antennæ with *Re* nearly twice as long as *Ri*; anterior foot jaws with only vermiform processes, posterior foot jaws with long, thin *B* 2 without bristles; fifth feet very small, of common basal and two segments, the distal one very small, with two apical spines on the left and only one on the right foot. ♂ unknown. (West of Ireland.)

9. X. CALAMINUS.

X. calaminus, Wolfenden, *op. cit.*, p. 34.

Size 5·5 mm.; furcal segments as broad as long, posterior antennæ with rami of equal length; anterior foot jaw with powerful toothed hook on fourth lobe, and two slenderer hooks on fifth lobe; brush and vermiform processes; posterior foot jaw short and stout, the bristles of the endopodite very peculiar and like quills, with broad chitin expansion with serrated edge; fifth feet very small, of three segments; distal segment with short apical and two short marginal spines. (Bay of Biscay.)

10. X. ATLANTICUS.

X. atlanticus, Wolfenden, Jour. Mar. Biol. Assoc., April, 1904.

Size 2·5 mm. ; anterior antennæ much shorter than thorax and very thick basally, abdominal segments prickly and hirsute, feet very spinulose ; fifth of three segments, distal the largest, with four large articulating spines, two apical, two lateral ; all segments very spinulose ; fureal rami as broad as long, and *Re* of posterior antennæ much longer than *Ri*. (West of Ireland.)

11. X. OBTUSUS.

X. obtusus, Farran, Ann. Rep. Fish., Ireland, 1902–03, pt. ii., App. II. (1905), p. 40.

Size 2·4 mm. Fureal rami little longer than broad, anterior antennæ reach genital segment, feet very spinulose. Fifth feet, three segmented, spinulose, and with two terminal and two lateral spines on last segment ; second joint longest, and spinulose on both margins. (Atlantic. Ireland.)

12. X. PINGUIS.

X. pinguis, Farran, Ann. Rep. Fish., Ireland, 1902–03, pt. ii., App. II. (1905), p. 40.

Size 4·5 mm. Head imperfectly separated from thorax ; lateral processes of last segment blunt ; fureal segments slightly longer than broad ; anterior antennæ short, not as long as thorax ; rami of posterior antennæ short and broad ; feet spinulose. Fifth feet of three segments, and two lateral and two apical end spines ; surface of third and margins of first (inner) and second (outer) spinulose. (Atlantic. Ireland.)

13. X. GREENI. X. MUTICUS.

X. greeni, Farran, Ann. Rep. Fish., Ireland, 1902–03, pt. ii., App. II. (1905), p. 40. *X. muticus*, Sars, Bull. Mus. Monaco.

Size 5·30–6 mm. ; last two segments of thorax united, last segment with obtusely triangular margins ; fureal segments short, broader than long ; anterior antennæ little longer than body. Fifth feet small, two-jointed (Sars), or three-jointed (Farran), without spines on inner margin ; last joint with three small apical spines. (Atlantic. Ireland.)

14. X. TYPICUS.

Amallophora typica, Scott, Tr. Linn. Soc. (2), VI. (1894), p. 54.

Only the ♂ known ; 2·7 mm. long ; anterior antennæ, twenty segments ; right fifth foot short and three segments, left like that of *X. agilis*.

Xanthocalanus antarcticus.

(Plate VII., figs. 10, 11.)

♀ 2·5 mm. long (cephalothorax 2·0 mm., abdomen 0·5 mm. long). Abdomen, therefore, only one-fourth as long as the thorax. Head rounded and rather oval in front, with bifid rostrum, composed of two chitinous plates each with a long and rather thick filament. Head separate from first thoracic segment, last two segments separate, and distal segment on each side produced into lappets ending in rather pointed but rounded margins. Furcal segments half as long again as broad. In the middle, the thorax is broad, about half as broad as long. Abdominal segments with row of pectinations laterally, and over whole dorsum at the margin of the very short anal segment. Anterior antennæ twenty-four segments, and short, only reaching to the end of the cephalothorax.

Posterior antennæ with *Re* a little longer than *Ri*.

Mandibles, *Ri* and *Re* about equal; *B* 2 with three marginal bristles; *Re* elongated and narrow, with seven bristles. Maxilla, *B* 2 and *Ri* elongated and narrow, imperfectly segmented; *B* 2 with four, *Ri* 1 with 1, *Ri* 2 and 3 with six bristles, *Li* 1 nearly twice as long as broad, with long, thin hook bristles. Anterior foot jaws with very convex *B* 2, the proximal margin of the basals much embayed. Strong toothed and curved hook on the last lobe; a number of brush processes, with small heads, and two vermiform processes distally.

Posterior foot jaws, having proportionately *B* 1 : *B* 2 : *Ri* = 40 : 30 : 20, the second basal about three and a half times as long as broad, and a brush process on the first basal.

1st feet *Ri* = 1 segment. *Re* = 3 segments with three long, thin marginal spines.

2nd feet *Ri* = 2 segments, *Re* = 3 segments. *Ri* 2 with a strong corona of spines.

3rd feet with a few delicate spines on surface of *Re* 2.

4th feet *Ri* = 2 segments, *Re* = 3 segments. *Ri* 2 with a few spines on the outer margin. The exopodites of the 3rd and 4th feet not spinulose.

5th feet small. A common basal and each three segments; the first segment rather longer and broader than the second, with convex inner margin, and several (about eight or nine) strong teeth on the margin; the second segment with two or three shorter spines on the proximal part of the convex inner margin; the third segment with two short apical, and one outer and one inner marginal spines—four in all—each articulating with the segment, and on the inner margin a bunch of small teeth. A cluster of five spines on the distal surface of the last segment, and two very small spines on the outer margin of the middle segment distally. No spines on the surface of the two proximal joints.

Xanthocalanus magnus.

(Plate VII., figs. 1–9.)

Xanthocalanus magnus, Wolfenden, Plankton Studies, Part II. (1906), p. 32.

♀ 6·0 mm. long. Head dorsally with line of separation from the first segment, rounded and without any trace of crest; produced in front into a chitinous lamella with two pointed rami. Last thoracic segment on each side a little produced. Abdomen short, the cephalothorax being three and a half times its length. Genital segment protuberant ventrally and longer than the next two, anal segment very small, and furcal segments much longer than the anal.

Anterior antennæ, reaching about the end of the genital segment, of twenty-four segments, with thick basal joints, the eighth and ninth coalesced, the last segment very small. Posterior antennæ with *Ri* longer than *Re*, the first joint of the latter with strong rounded projection of the lower and inner margin. The masticatory plate of the mandibles with strong teeth, the two outer longer than the inner ones, which are short and all of the same size. Anterior foot jaws short, but strongly built, the outer margin very convex, the last lobe bearing a very strong thick basally and curved sickle-shaped hook, tapering distally; all the bristles of *Ri* represented by sensory brush and vermiform appendages. The posterior foot jaws somewhat extended, the first basal comparatively thick and with a brush appendage, the second basal elongated and thin, with very short marginal bristles; *Ri* also elongated, the first and second joints long, and its bristles comparatively short. Maxillæ very like the preceding species, but *B* 2 with five, *Ri* with ten bristles, *Re* elongated and narrow.

1st feet, *Re* with three distinct segments and three external spines; *Ri* only one segment.

2nd feet, *Re* of three broad segments very spinulose on the surface, and with short external marginal spines, *Ri* of two segments with prominent bunches of spines on the surface of *Ri* 2.

3rd and 4th feet, each ramus of three segments, the surfaces spinulose.

5th feet small, of three segments more or less covered, especially the last segment and margins, with comparatively long, spine-like bristles; the terminal segment with two short terminal and two very short marginal spines, not articulating.

This is an adult female, and resembles the animal I have described as *Xanthocalanus magnus* (Plankton Studies, Feb., 1906) so closely that I think they must be regarded as the same animal. The 'Gauss' animals are, however, very much larger (up to 8·8 mm.), but the only essential differences which I can detect are the much greater size of the latter, the rather more pointed dorsum of the head, and the more hirsute abdominal segments. In these collections I have found many examples which appear to differ only in size, and I am inclined to think that this 'Discovery' example is merely a smaller one of the same species. The 5th pair of feet are strikingly different from the northern species.

HETERORRHABDUS (Giesbrecht).

Only one specimen of this genus occurs in the 'Discovery' collection, which is only what might be expected from the fact that the collection is practically only epiplanktonic, whereas *Heterorrhabdus* is without doubt one of the most confirmed deep-water genera of Copepoda. The species *H. austrina* (Giesbrecht), which occurs in the 'Belgica' and 'Gauss' collections, is absent from those of the 'Discovery,' and the only specimen of the genus occurring in the latter is, I think, referable to *H. longicornis*.

Heterorrhabdus longicornis.

Heterochæta longicornis, Giesbrecht. Atti. Acc. Linc. Rend., Ser. 4, v. (1889) p. 811.
„ „ „ Fauna u. Fl. Neap. XIX. (1892), p. 373.
„ „ Wolfenden. Jour. Mar. Biol. Assoc., Vol. VII. (1904) p. 124.
? Heterochæta major, Dahl. Verh. d. Zool. Gesells., 1894, p. 79.
Heterorhabdus major, Wolfenden. Plankton Studies, Part I. (1905), p. 11.

I first described the male of *H. longicornis*, hitherto unknown, in 1902. Since then I have found it frequently throughout the Atlantic, extending to the Antarctic area. Dahl's description of *H. major* is very scanty, and the only essential point of difference between it and *longicornis* appears to be one of size. The specimen in the 'Discovery' collection is a ♂ of 4·5 mm. length, but there is no essential difference between it and smaller males from the Faroe Channel. I suggest therefore that Dahl's *H. major* is really *H. longicornis*, and I now think that the species which I described in "Plankton Studies" as *H. major* may best be described as *H. longicornis* (Giesbrecht).

The diagnostic points of *H. major* (Dahl) are, according to this author, "anterior antennæ very long, the posterior foot-jaw with only weak median bristles; the penultimate lobe of the anterior foot-jaw a long 'tap' lobe, the mandible teeth but little differing in thickness, nearly the same distance apart; the exopodite of the third feet like those of the second and fourth, the size over 5 mm. long."

Except as to size, it will be observed that none of these points differ from those of *H. longicornis*, the largest examples of which are not, however, more than 3·5 mm. long in the North Atlantic.

The 'Discovery' specimen is a ♂ of 4·5 mm. length, the anterior antennæ several joints (about six) longer than the whole body; the geniculating antennæ with six joints beyond the elbow. The right furcal segment is much longer than the left. The fifth lobe of the anterior foot-jaw has a very thick-based stout curved hook, without teeth or bristles except for a few bristles at the proximal end; the lobe itself is very large. The two other bristles are long and thin. The sixth lobe has a long and thin hook, also uncombed. The bristles of *Ri* are extremely long. The posterior foot-jaw has a long thin second basal, three times as long as broad, and only two weak bristles in the middle. The mandible has a large simple conical tooth on the outside, and

these outer teeth are not in either mandible thickened. The third feet resemble the fourth. The right fifth foot has a long upright process on *B* 2, haired marginally ; the *Re* 2 broad and with a marginal protuberance on which are two or three short teeth and a small bunch of hairs, flattened long spine distal to it. *Re* 3 a long curved spoon-shaped segment, with a stout-based apical spine, shorter spine on the inner aspect ; the right *Ri* with the second segment elongated and narrow, the third segment comparatively broad and short, the inner marginal bristle of *Ri* 2 thickened.

The left foot has a haired marginal projection as *B* 2, *Re* 3 with a long stout apical spine, three-quarters as long as the segment, and with a short marginal spine on the inner side, *Ri* 2 broad, with thickened bristle. A specimen of *H. longicornis* from the Faroe Channel measured 3·5 mm. long ; Esterly records it from Diego, California, 3 mm. long. The Southern Ocean species evidently reaches a much greater length (4·5 mm.).

FAROELLA (Wolfenden).

In the course of my cruising in the Faroe Channel in 1901 I captured a copepod which differed from any known species, to which I originally gave the name *Pseudœtideus multiserrata*, in the paper read at the British Association, 1902. In 1903 appeared Sars' supplement, in which he described a new genus, *Ætidiopsis*, which appeared to be the same animal ; and as I had already recognised that this copepod was distinctive from others closely allied (*Pseudœtideus*, *Chiridius*, *Gaidius*), I had created for it a new genus, *Faroella*. My paper had been in the printers' hands for some time when Professor Sars' supplement appeared with the description of *Ætidiopsis*. Consequently I do not know to which name priority should be given, nor do I feel yet certain that the genus described briefly by Sars is identical with the *Faroella* described by me in the *J. M. B. Ass.* of 1904. Certainly the *Faroella* of the Antarctic Sea has some differences, and I therefore retain the name for the genus which I originally gave, more especially as Professor Sars, who has examined some Irish specimens, states, as I am informed, that they are not identical with his.

Faroella antarctica.

(Plate II., figs. 1, 2, 3, 4.)

♀ ♀ size 4·3 mm. (cephalothorax 3·3 mm., abdomen 1·0 mm.). The fore-body is therefore over three times as long as the abdomen. The head and first thoracic segment are united, the two last segments of the thorax separate, the anterior segment over twice as long as the four last segments ; the most posterior of these is well defined from the one in front, small, and laterally prolonged into stout spines which are about three-quarters as long as the genital segment. In dorsal aspect the head is rather triangular-shaped, and on each side below the level of the posterior antennæ, laterally expanded. In the lateral aspect the head is evenly rounded, oval, and with stout two-pointed

rostrum directed forwards, with slight curve downwards, the rostral spines not at all divergent, as in Sars' picture of *Ætidiopsis*. The whole cephalothorax is studded with fine and closely-set prickles. Abdomen of four segments, slender, the genital only a little larger than the next, with strong ventral protuberance, $> Ab\ 2 > Ab\ 3 > Ab\ 4$. Furcal segments as long as the anal, and twice as long as broad. Tail bristles four on each side, with very short and delicate ventrally placed accessory bristles. Anterior antennæ reaching just beyond the end of the genital segment, the first two joints comparatively large and as long as the next five joints, the combined eighth and ninth joint as long as the two joints either proximal or distal to it, the eighteenth and nineteenth joints longer than those proximal or distal, and the twenty-fourth separate from the twenty-fifth. All joints only sparingly setiferous.

Posterior antennæ with exopodite a little longer only than the endopodite.

Anterior foot-jaws with the outer margin of the basal only a little convex, the fifth lobe longer than the four proximal and nearly equally-sized lobes, the *Ri* small but distinctly segmented. Each lobe with three bristles, two each on the first, second, third, and one on the fourth, being stout, long, and with wide apart stiff marginal bristles. Bristles of *Ri* long, not feathered, but slightly serrated marginally.

Posterior foot jaws having proportionately $B\,1 : B\,2 : Ri = 10 : 12 : 5$. $B\,2$ therefore a little longer than $B\,1$, and over twice as long as *Ri*; $B\,1$ two and a half times as long as broad, with two small lobes with respectively two and three short bristles; $B\,2$ four times as long as broad, its marginal bristles very small and distal of the middle. *Ri* short and distinctly five-segmented.

Maxillæ, *Le* 1 with nine bristles and its outer margin nearly straight; $B\,2$ with five, and not segmented from *Ri* with thirteen bristles; *Le* 2 a small lobe, but without bristles; *Re* small, longer than broad, and with ten bristles; *Li* 1 with nine large hooks and four bristles; *Li* 2 and 3 well-formed lobes.

First feet. *Ri* one-jointed; *Re* three-jointed, with three long thin marginal spines.

Second feet. *Ri* two-jointed, *Ri* 1 short, *Ri* 2 very elongated, and nearly four times as long as *Ri* 1. The whole *Ri* only extends to the distal end of *Re* 2. On the distal part of the surface of *Ri* 2 is a bunch of fine hairs; *Re* 3 is as long as *Re* 1 + 2, and its end saw is longer than the *Re* 3 and beset with a great number (exceeding fifty) of closely-set teeth, of which those in the middle are the largest.

Fourth feet. *Ri* and *Re* of three segments each. *Ri* proportionately longer than in the other feet, and the third segment as long as *Ri* 1 + 2, and a little over three times as long as broad, with fine hairs on the surface distally. *Re* 3 much longer than *Re* 1 + 2 and over three times as long as broad. Its end saw three-quarters as long as the *Re* 3, and with over fifty closely-set teeth. No fifth feet.

The chief points in which this Antarctic species differs from that of the northern seas are in its greater size, the greater strength of the rostrum, the rather different body proportions, and the more equal size of the rami of the posterior antennæ. The

chitin everywhere in the cephalothorax is almost covered with prickles, and the whole animal is more robust.

MICROCALANUS (Sars).

Microcalanus pusillus.

(Plate II., fig. 5.)

Microcalanus pusillus, G. O. Sars, Crustac. of Norway, IV. (1903), p. 156.
Pseudocalanus pygmæus, Sars, Norwegn. N. Polar Expdn., Vol. V. Crustacea, 1900.
„ „ Giesbrecht, 'Belgica' Report, p. 20.

Sars originally described a small Calanoid, *Pseudocalanus pygmæus*, from Nansen's Polar Expedition, which he subsequently re-named *Microcalanus*, and included in the new genus a second and still smaller form of *M. pusillus*. Giesbrecht described a small Calanoid from the Antarctic seas, which agreed generally with Sars' Polar species, except for very small differences, *e.g.* the length of the anterior antennæ, and the length of the outer marginal spines of the exopodites of the feet. The size varied, mostly from 0·7–0·75 mm.; some were even smaller. *P. pygmæus*, Sars (= *M. pygmæus*, Sars), is a little longer, *viz.* ·86 mm. (Sars).

The 'Discovery' collection contains many examples of a very small Calanoid which agrees so closely with Sars' *M. pusillus*, that I regard them as identical; and Giesbrecht's *Pseudocalanus pygmæus* must, I think, be also regarded as identical. This small Calanoid is one of the few examples of complete agreement in form and structure between the Polar and Antarctic forms, and on that ground is of interest.

The female is 0·60 mm. long. Cephalothorax two and a half times longer than the abdomen; the head and first segment united, the former evenly rounded and with short, delicate rostrum; the greatest breadth not quite half the length; the last thoracic segment with rounded and only slightly produced margins; abdomen of four segments. The genital segment is nearly twice as long as the next, which is rather larger than the distal segment, and the anal as long as the segment preceding it. Furcal segments as long as the anal and longer than broad, with four short terminal bristles. The genital segment is very swollen laterally, but symmetrical, and rather tumid ventrally.

Anterior antennæ reaching about the end of the genital segment, and of twenty-three joints.

Posterior antennæ with *Re* about one-third longer than the *Ri*.

Mandibles with *Ri* much longer than *Re*, both rami fully segmented. Masticatory plate with strong cutting teeth seven or eight in number, and distally nearly half as broad as long.

Anterior foot jaws with five well-formed lobes, of *Calanus* type, with well-segmented *Ri*.

Posterior foot jaws with segments proportionately *B* 1, *B* 2, *Ri* = 9, 8, 9. *Ri* elongated and thin, with five distinct segments.

First feet, *Ri* of one, *Re* of three segments, the first without *Se*; *Ri* with four *Si*.

Second feet, *Ri* of two, *Re* of three segments; no *Si* on *B* 1 or *B* 2.

Fourth feet, *Ri* and *Re* of three segments each. The end saw extremely long, and longer than the whole *Re*, broad and coarsely serrated marginally.

In the second to the fourth feet the *Re* 3 has three outer marginal spines. No fifth feet.

The few males present were apparently immature.

HALOPTILUS (Giesbrecht).

One species of this genus appears to be characteristic of the Antarctic fauna, since it is present in very many of the 'Gauss' samples, but curiously enough, occurred only once in the 'Discovery' collection. It is large, and distinguished at a glance from any other examples of the genus by the prominent black ocellus dorsally placed, an organ not possessed by any other species of *Haloptilus*.

Haloptilus ocellatus.

(Plate III., figs. 1, 2.)

Haloptilus ocellatus, Wolfenden, Plankton Studies, Part I. (1905), p. 14.

♀, of length, from the end of the frontal spine to the end of the furca, 8·75 mm., with cephalothorax over five times as long as the abdomen; the conjoined head and first segment much longer than the remaining segments of the anterior body (about one-third); the last two segments of the cephalothorax united, and with rounded margins. On the second segment, in the centre of the dorsum, or a little to the right of the centre, is a prominent and very black rounded pigmented ocellus, standing out in clear contrast to the rest of the very transparent animal. The frontal spine is long, tapering, and usually a little curved downward, and often laterally, towards the tip. The distance from the tip of the spine to the base of the anterior antennæ is equal to the distance between the latter and nearly to the distal end of the second cephalic segment. Abdomen of four segments, with the anal as long as the two preceding, and the furcal segments over twice as long as broad.

Anterior antennæ a little longer than the whole animal, reaching beyond the furca by about three or four joints, and sparingly setiferous.

Posterior antennæ with endopodite very long and exopodite very short, the latter of six joints, with doubtful division of the last, which would be the seventh joint, the basal or first segment very long, and nearly as long as the joints distal to it. *Re* not

more than one quarter as long as *Ri* 1. *Re* 1 elongated and seven or eight times as long as broad.

Anterior foot jaws with a rather stout, but unarmed hook on the fifth lobe, not longer, however, than the other bristles.

Posterior foot jaws thick, with *Ri* of similar thickness to *B* 2, and of five segments; the five stout curved hook bristles of nearly equal length, the two terminal only a little the longest and thickest.

Mandibles with *Ri* very long and *Re* only as long as *Ri* 1; masticatory plate with outer stout, broad-based, conical and curved tooth; three pointed short teeth internal to it, rather like *H. mucronatus*.

Maxillæ.—First inner lobe with six bristles, of which only two of the distal ones are stout hooks; second inner lobe with one stout long bristle; third inner lobe with one stout elongated and two short thin bristles; *B* 2 about as broad as long, with four elongated and thick bristles and one thin, short proximal bristle, *Ri* longer than broad, and about three-quarters as long as *B* 2 and only half its width, and with five bristles; *Re* very long, twice as long as *Ri* + *B* 2, and nearly twice as long as broad, with eleven bristles, of which the three innermost are short and thin.

All feet with three jointed rami, *Re* of fifth pair only five-sevenths as long as *Re* of fourth pair; *Ri* of fifth pair only as long as *Re* 1 + 2; *Re* 3 longer than *Re* 1 + 2, twice as long as broad, with three inner bristles, two outer spines, and end spine nearly as long as the last segment. I have not yet seen the ♂ of this species.

OITHONA (Baird).

Two species of this genus occur in these collections, one of which, *viz.*, *Oithona similis*, is of world-wide distribution, and occurs with great frequency in Antarctic collections; the other, to which the name *Oithona frigida* has been given by Giesbrecht (and which has been fully described by him in the 'Belgica' report, *vide ante*), occurs very sparingly in the 'Discovery' collection.

HARPACTICUS (Dana).

Harpacticus furcifer.

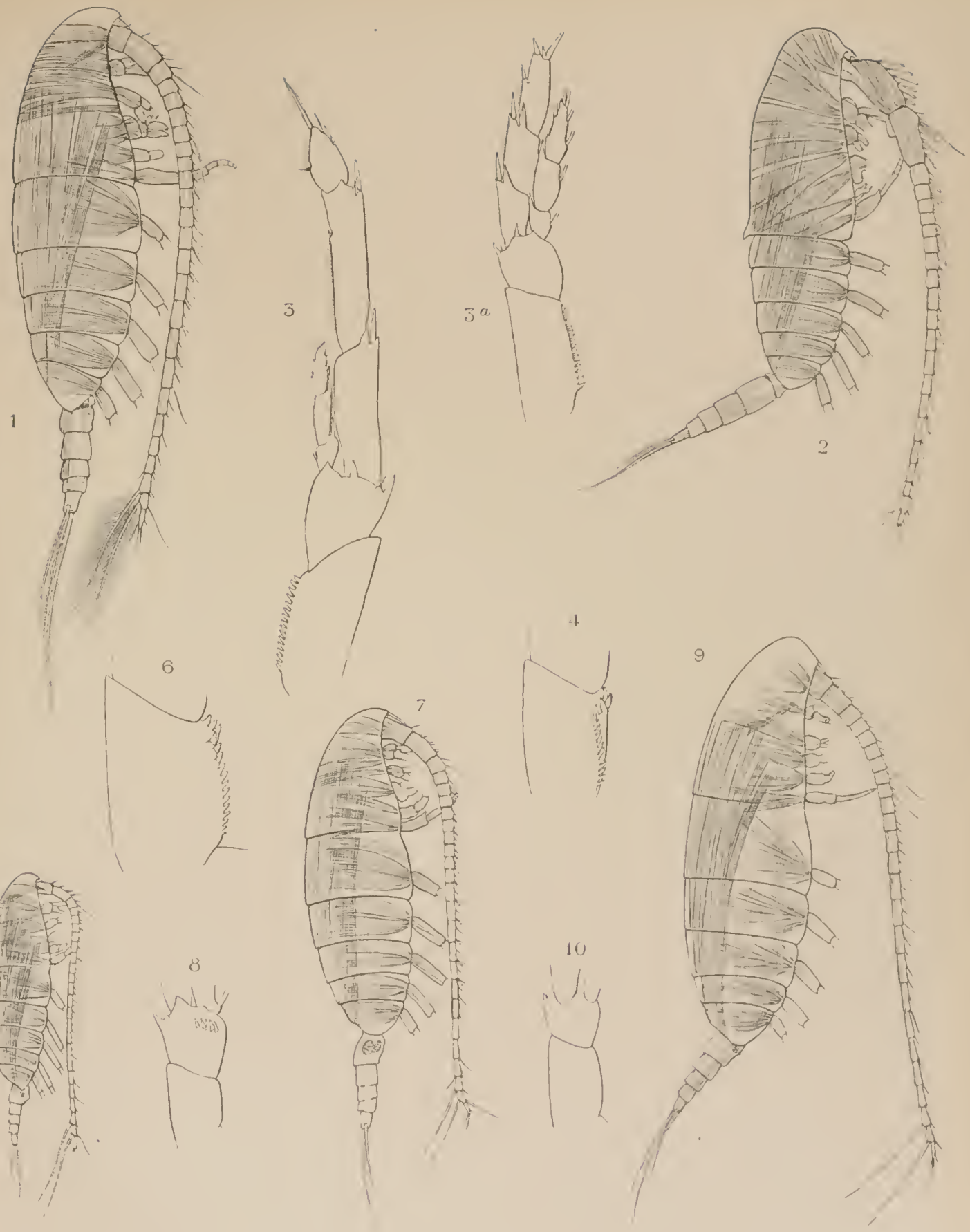
Harpacticus furcifer, Giesbrecht, 'Belgica' Report, p. 37.

The ♀ of this species was first described by Giesbrecht in the 'Belgica' report; and in the 'Discovery' collection, marked 4. i. 02. W.Q., occurred three specimens of the male, though female examples were conspicuously absent.

The ♀, according to Giesbrecht, is 1·55 mm. long; the rostrum small, the series of points on the abdominal segments not numerous, the furca as long as both last abdominal segments, narrowing distally and about three times as long as broad; the

anterior antennæ nine-jointed, the exopodite of the posterior antennæ like *H. chelifer*, but smaller, the second basal of the mandible like *H. brevicornis* (= *H. fulvus*), and the exopodite scarcely half as long as the endopodite; both rami of the maxillæ are about equal; the first lobe of the anterior foot jaws has three bristles, the fourth lobe is long, and its hook short, the posterior foot jaw is much thinner and weaker than in *H. chelifer* and *H. brevicornis* and more like *H. flexus*. The first feet have thin and weak terminal claws, both rami of only two segments, and the endopodite is short, the joints of both branches being broader than in *flexus*; the endopodites of the second and fourth feet are larger in proportion to the exopodites than in *chelifer* and *brevicornis*, and in the fourth pair reach to the middle of the last joint of the exopodite; the bristles on the second endopodite joint are, however, two, instead of one as in *chelifer*; the last joint of the fifth feet is comparatively small, and is scarcely half so broad as this; its last joint has five, the process of the basal joint, four bristles.

The striking feature of *H. furcifer* is the length of the furcal segments, which are usually very short in this genus, and though related to *H. flexus*, it differs in the size, which, in the latter species, is only ·64 mm. in length, compared with 1·5 in *H. furcifer*.

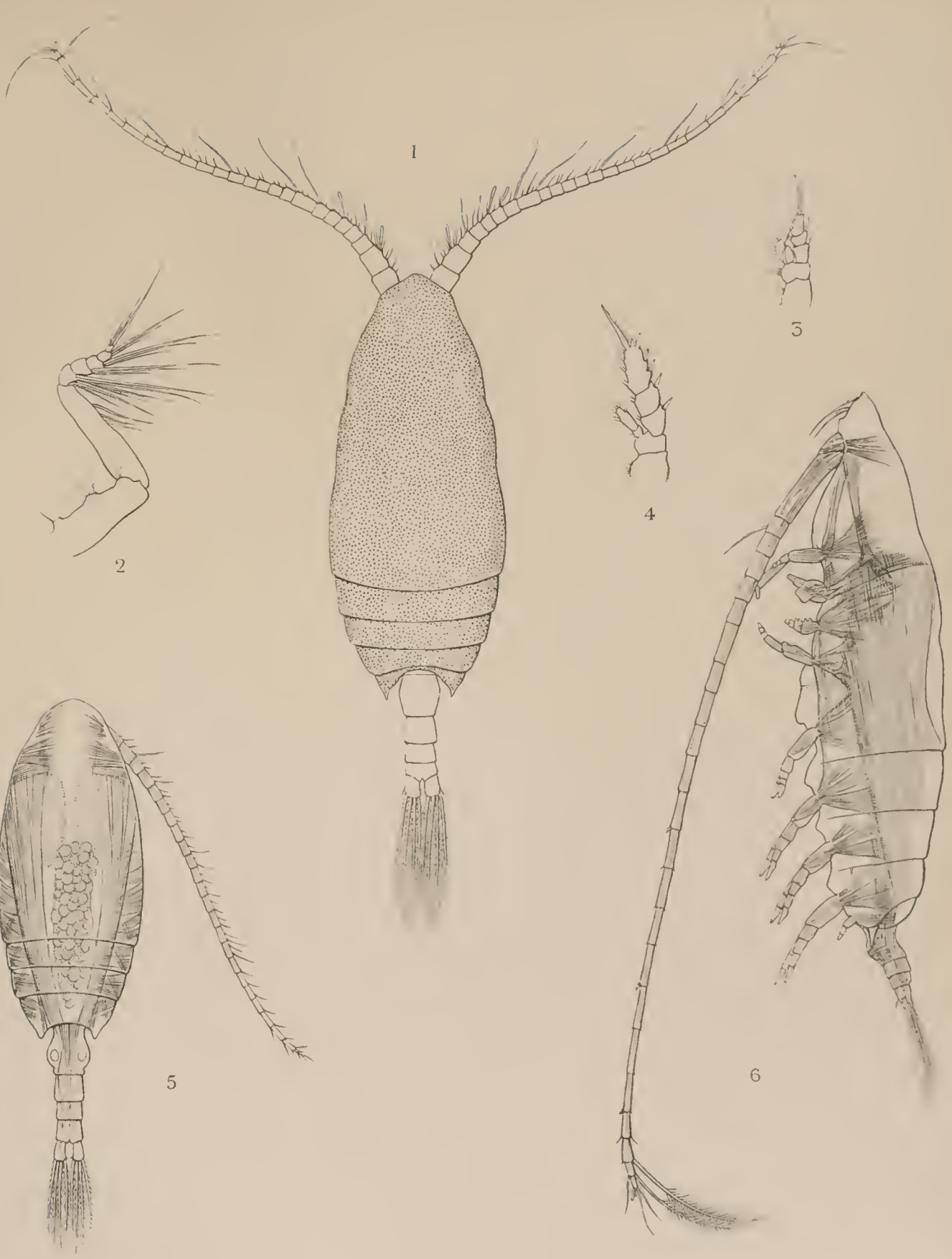


Antarctic (Discovery) Exp.

Marion Lees del. Buttle worth sc

Copepoda pl. 1.

Calanus propinquus (1—4)
.. simillimus (5, 6).
.. tonsus (7, 8)
.. acutus (9, 10)



Antarctic (Discovery) Exp.

Marion Lees del. Butterworth ac

Copepoda pl. II.

Faroella antarctica (1-4). Microcalanus pusillus (5).
Rhinocalanus grandis (6).

EXPLANATION OF THE PLATES.

PLATE I.

Calanus propinquus, fig. 1. Whole animal, ♀. Oc. 3, obj. 2 in.
„ „ fig. 2. Whole animal, ♂. Oc. 3, obj. 2 in.
„ „ fig. 3 and 3a, ♂. 5th pair of feet. Oc. 3, obj. ½ in.
„ „ fig. 4. ♀. Basal joint of 5th foot. Oc. 3, obj. ½ in.
„ *simillimus*, fig. 5. Whole animal, ♀. Oc. 3, obj. 2 in.
„ „ fig. 6. Basal joint of 5th foot. Oc. 3, obj. ¼ in.
„ *tonsus*, fig. 7. Whole animal, ♀. Oc. 3, obj. 1 in.
„ „ fig. 8. Basal joints of 5th foot, ♀. Oc. 3, obj. ¼ in.
„ *acutus*, fig. 9. Whole animal, ♀. Oc. 3, obj. 2 in.
„ „ fig. 10. Basal joints of 5th foot, ♀. Oc. 3, obj. ½ in.

PLATE II.

Faroella antarctica, fig. 1. ♀, whole animal. Oc. 3, obj. 2 in.
„ „ fig. 2. ♀, Posterior foot-jaw. Oc. 3, obj. 1 in.
„ „ fig. 3. ♀, 1st foot. Oc. 3, obj. 1 in.
„ „ fig. 4. ♀, 2nd foot. Oc. 3, obj. 1 in.
Microcalanus pusillus, fig. 5. ♀, whole animal. Oc. 3, obj. ½ in.
Rhincalanus grandis, fig. 6. ♀, whole animal. Oc. 3, obj. 2 in.

PLATE III.

Haloptilus ocellatus, fig. 1. ♀, whole animal. Oc. 3, obj. 2 in.
„ „ fig. 2. 5th foot, ♀. Oc. 3, obj. 1 in.
Metridia princeps, fig. 3. Whole animal, ♀. Oc. 3, obj. 2 in.
„ „ fig. 4. 5th pair of feet, ♀. Oc. 3, obj. ½ in.
„ „ fig. 5. 2nd pair of feet, ♀. Oc. 3, obj. 1 in.
Gaetanus antarcticus, fig. 6. ♀, whole animal. Oc. 3, obj. 2 in.

PLATE IV.

Euchæta similis, fig. 1. ♀, whole animal. Oc. 3, obj. 2 in.
„ „ fig. 2. ♀, 1st foot. Oc. 3, obj. 1 in.
„ „ fig. 3. ♀, 2nd foot. Oc. 3, obj. 1 in.
„ „ fig. 4. ♀, abdomen and genital segment. Oc. 3, obj. 2 in.
„ *antarctica*, fig. 5. ♀, abdomen and genital segment. Oc. 3, obj. 2 in.
„ „ fig. 6. ♀, abdomen, lateral view. Oc. 3, obj. 2 in.

PLATE V.

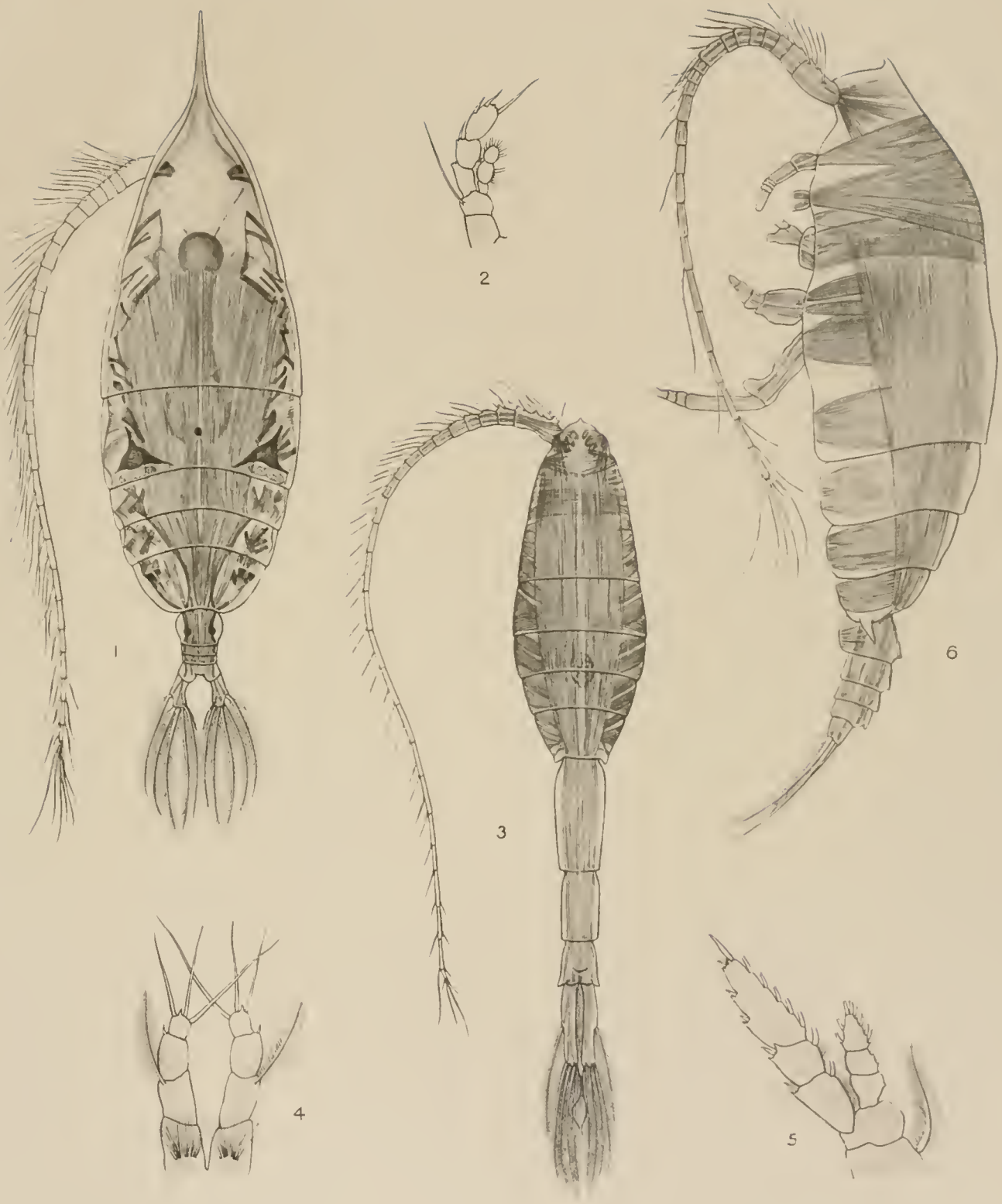
Stephus longipes, fig. 1. Whole animal, ♂. Oc. 3, obj. ½ in.
„ „ fig. 2. Whole animal, ♀. Oc. 3, obj. ½ in.
„ „ fig. 3. Whole animal, ♀. Oc. 3, obj. ½ in.
„ *antarcticum*, fig. 4. Whole animal, ♀. Oc. 3, obj. 1 in.
„ „ fig. 5. Whole animal, ♀, dorsal. Oc. 3, obj. 1 in.
„ „ fig. 6. 5th feet, ♀. Oc. 3, obj. ½ in.
„ „ figs. 7, 8. 5th feet, ♂. Oc. 3, obj. ½ in.

PLATE VI.

Paralabidocera hodgsoni, fig. 1. ♀, last thoracic segment and abdomen. Oc. 3, obj. ½ in.
„ „ fig. 2. Whole animal, ♀. Oc. 3, obj. ½ in.
„ „ fig. 3. 5th foot, ♀. Oc. 3, obj. ½ in.
„ „ fig. 4. 4th foot, ♀, exopodite. Oc. 3, obj. ½ in.
„ „ fig. 5. 1st foot, ♀. Oc. 3, obj. ½ in.
„ „ fig. 6. 2nd foot, ♀. Oc. 3, obj. ½ in.
„ „ fig. 7. Posterior antennæ, ♀. Oc. 3, obj. ¼ in.
„ „ fig. 8. Maxilla, ♀. Oc. 3, obj. ¼ in.
„ „ fig. 9. Mandible, ♀. Oc. 3, obj. ¼ in.
„ „ fig. 10. Anterior foot-jaw, ♀. Oc. 3, obj. ¼ in.
„ „ fig. 11. Terminal lobes of post-footjaw, ♀. Oc. 3, obj. ¼ in.
„ „ fig. 12. Whole animal, ♂. Oc. 3, obj. ½ in.
„ „ fig. 13. 5th feet, ♀. Oc. 3, obj. ½ in.

PLATE VII.

Xanthocalanus magnus, fig. 1. Whole animal. Oc. 3, obj. 2 in.
„ „ fig. 2. Rostrum. Oc. 3, obj. 1 in.
„ „ fig. 3. Posterior foot-jaw. Oc. 3, obj. 1 in.
„ „ fig. 4. Anterior foot-jaw. Oc. 3, obj. ½ in.
„ „ fig. 5. Posterior antenna. Oc. 3, obj. 1 in.
„ „ fig. 6. Maxilla. Oc. 3, obj. ½ in.
„ „ fig. 7. 1st foot. Oc. 3, obj. 1 in.
„ „ fig. 8. 2nd foot. Oc. 3, obj. 1 in.
„ „ fig. 9. 5th foot. Oc. 3, obj. ½ in.
„ *antarcticus*, fig. 10. 5th foot. Oc. 3, obj. ¼ in.
„ „ fig. 11. Posterior foot-jaw. Oc. 3, obj. ½ in.

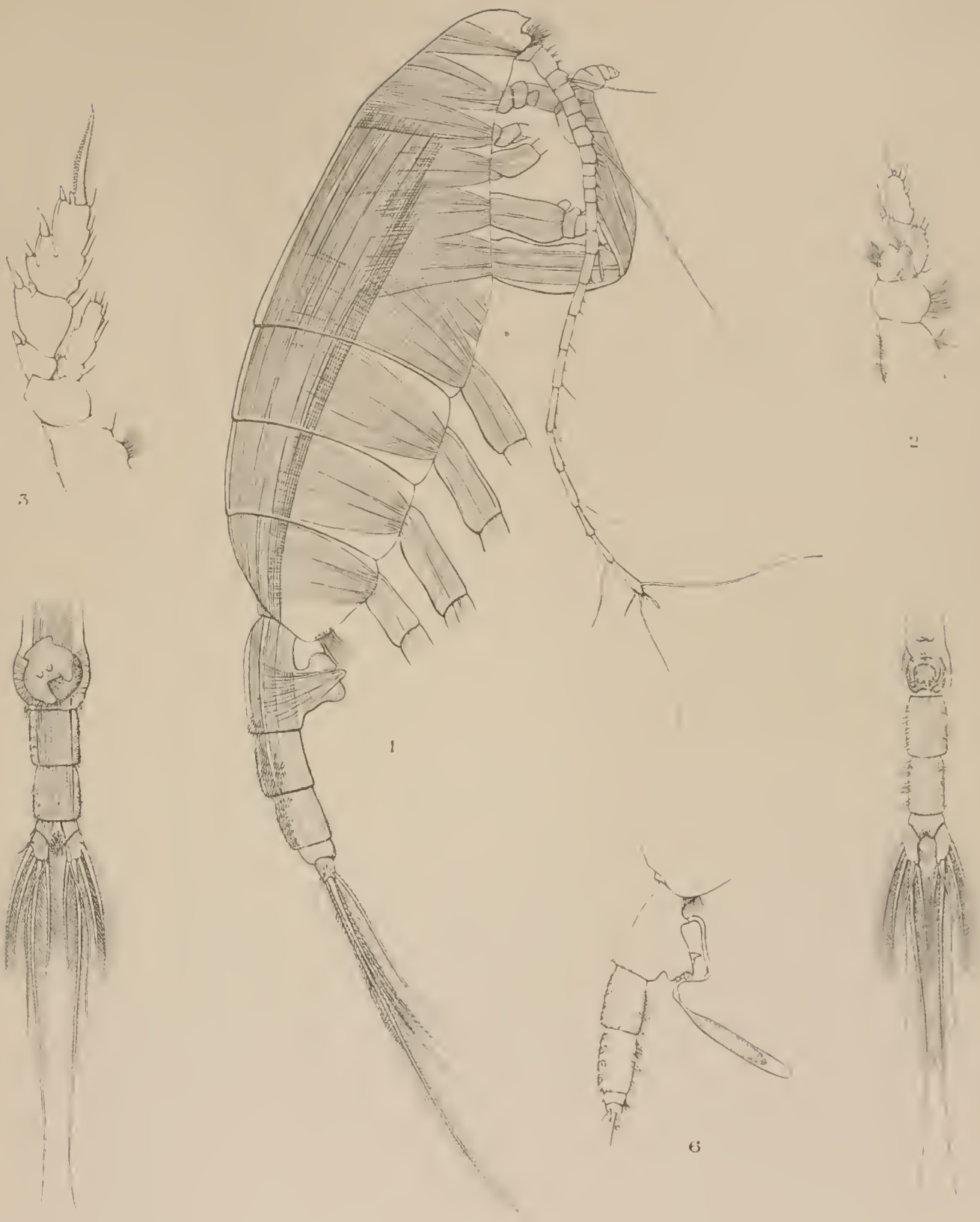


Antarctic (Discovery) Exp.

Marion Lees, del. Butterworth, sc

Copepoda pl. III.

Haloptilus ocellatus (1, 2).
Metridia princeps (3—5).
Gaetanus antarcticus (6).

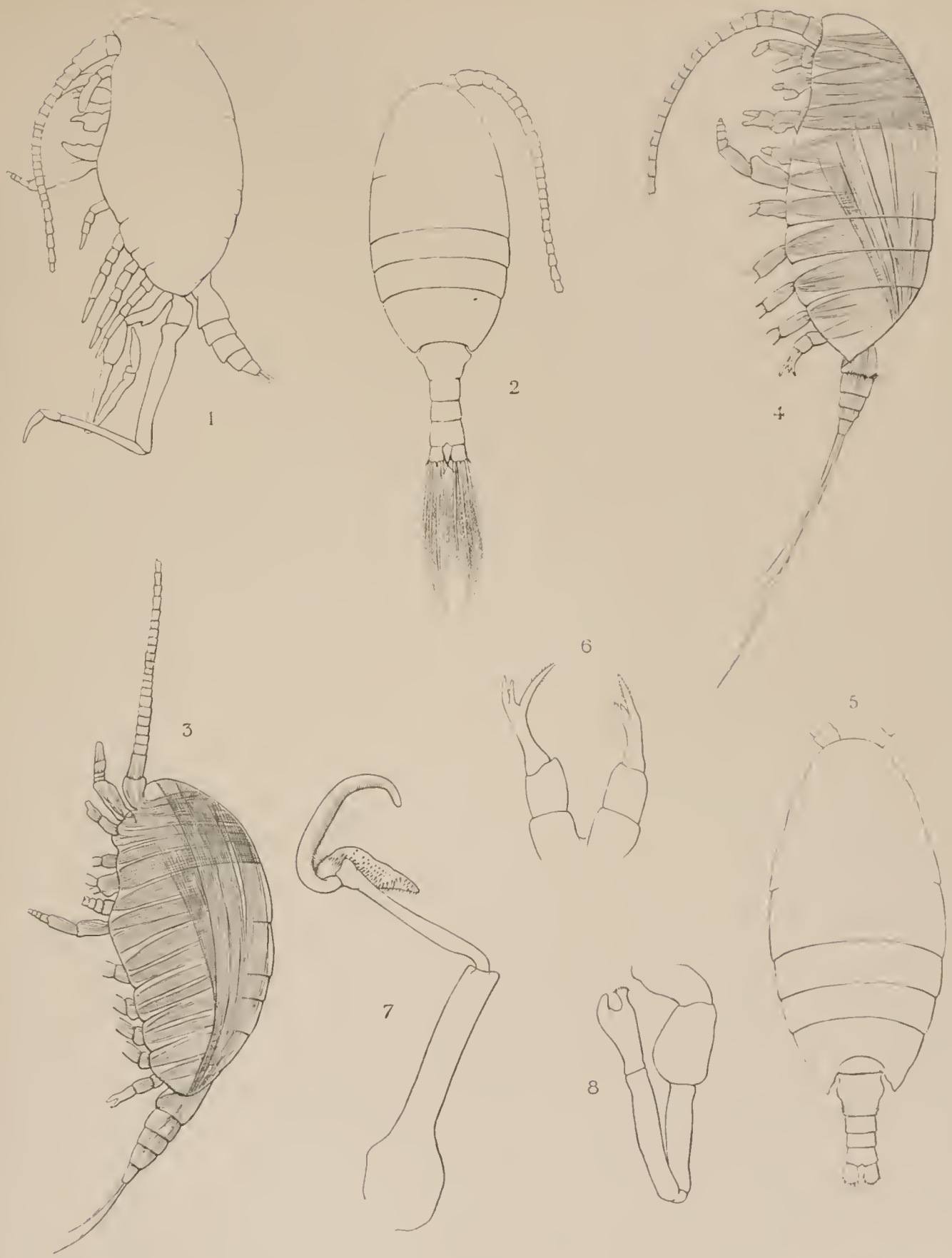


Antarctic (Discovery) Exp.

Marion Lees del. Butterworth sc.

Copepoda pl. IV.

Euchaeta similis (1–4)
" antarctica (5, 6)

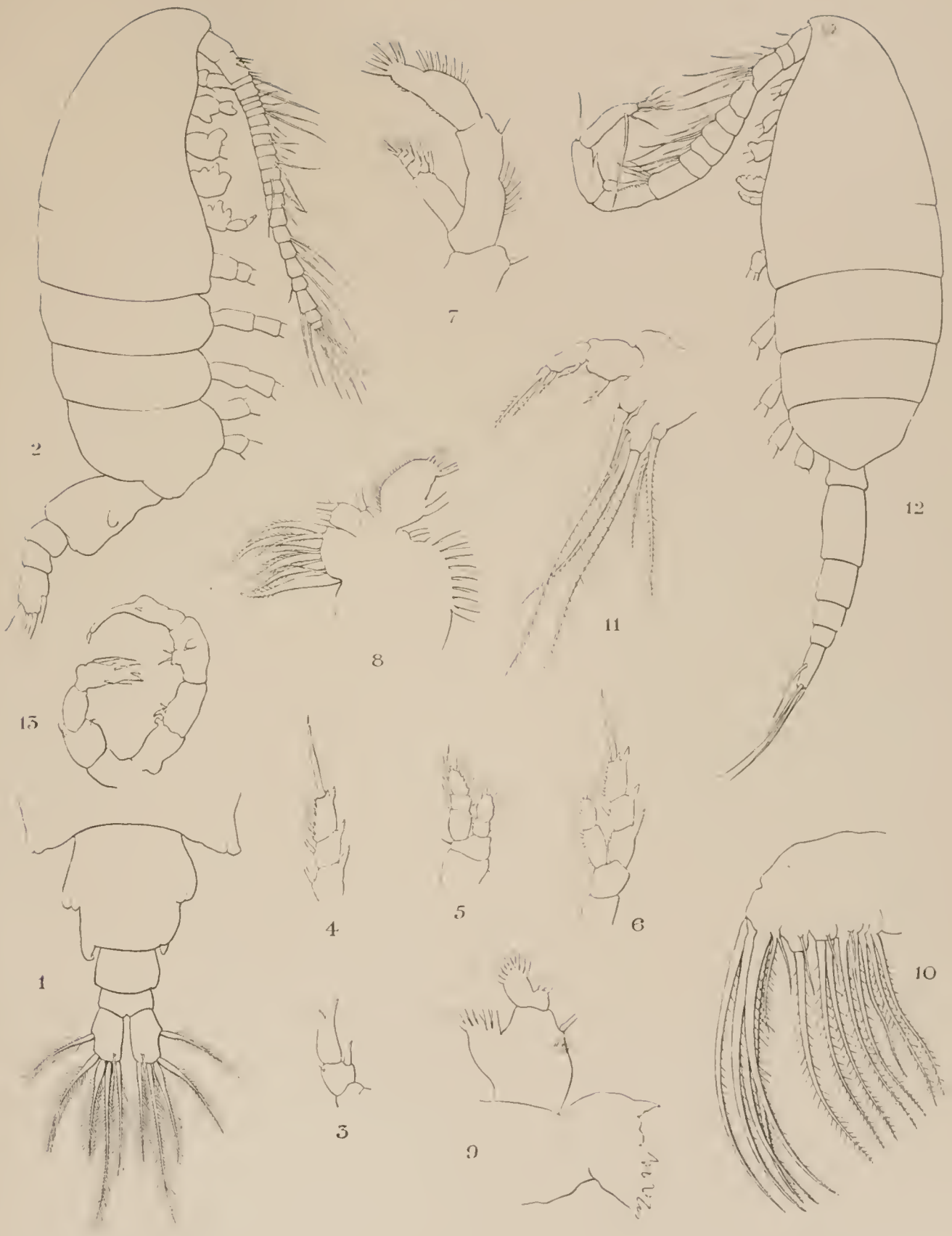


Antarctic (Discovery) Exp.

Marion Lees del. Winterwolth sc

Copepoda pl. V.

Stephus longipes (1—3).
" antarcticum (4—8).

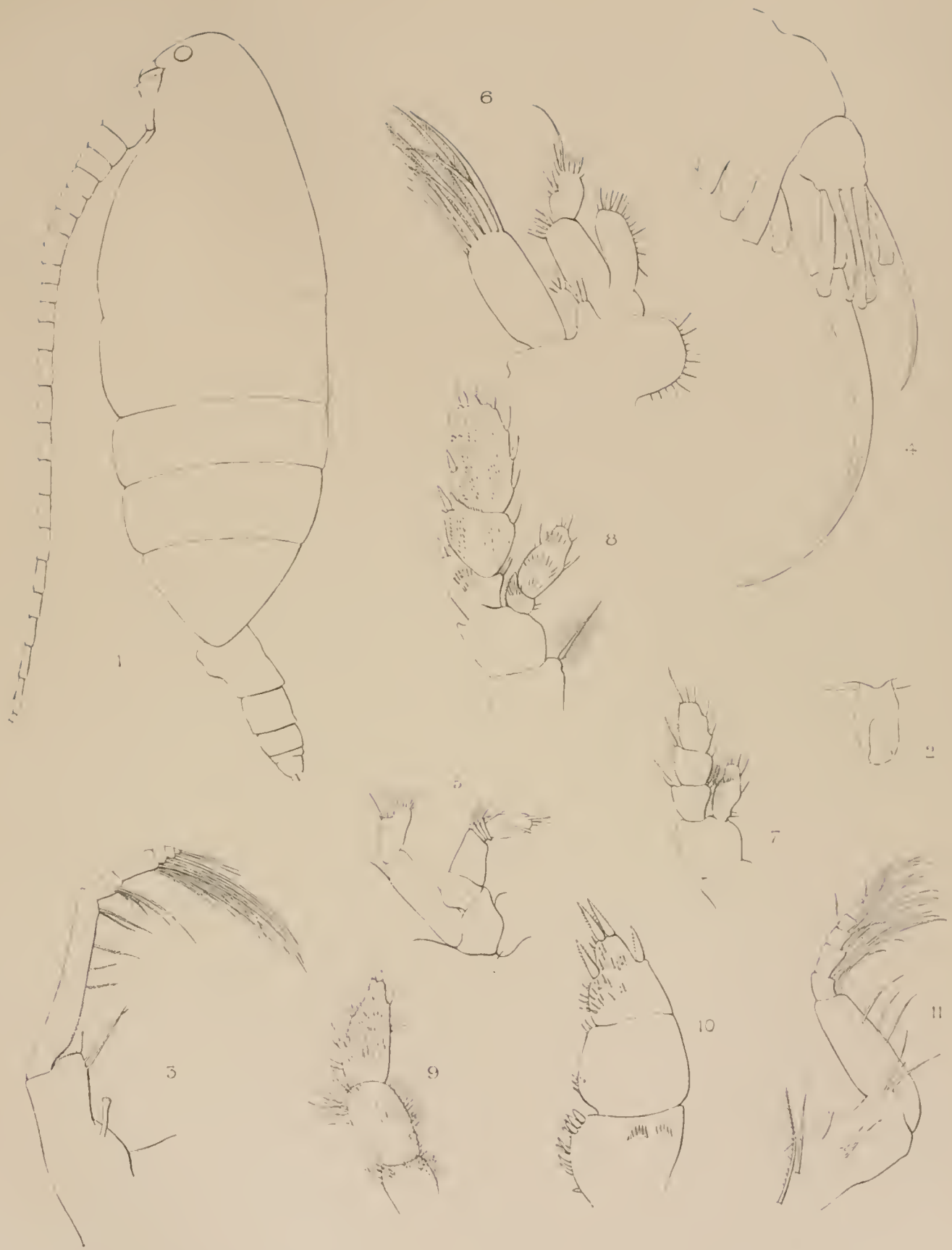


Antarctic (Discovery) Exp.

Marion Lees del Butterworth sc

Copepoda pl. VI.

Paralabidocera.



Antarctic (Discovery) Exp.

Marion Lees del. Butterworth sc.

Copepoda pl. VII.

Xanthocalanus magnus (1—9)
" antarcticus (10, 11).