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ARTHROPODA

SCHIZOPODA

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WITH EIGHT PLATES

1905

CRUSTACEA.

VII.—SCHIZOPODA.

By W. M. Tattersall, M.Sc.

(8 Plates.)

The collection of 'Discovery' Schizopoda is a large one from the point of view of the number of specimens it contains, considerably over ten thousand, including larvæ, having been collected. By far the majority of these specimens, nearly ten thousand, however, belong to one species, and the total number of species reaches thirteen. The collection is in a generally excellent state of preservation, though many specimens have undoubtedly suffered from being frozen after coming out of the water and from the subsequent thawing before preservation.

In the preliminary notice of this collection (Holt and Tattersall, 1906 (1)*) ten species were noted, of which five were absolutely new, two were only known under manuscript names given to them by Dr. Hansen from the collections of the 'Belgica' Antarctic Expedition, while the remaining three were already described forms.

Since the publication of that notice further material has come to hand, collected on the homeward journey of the 'Discovery.' It contained two species of *Euphausia* not included in the earlier material, one, an immature form which was too young to be specifically identified; the second, a species very close to *E. lucens*, Hansen (= *E. splendens*, G. O. Sars), but which Dr. Hansen has kindly informed me is distinct, and will be described by him in a forthcoming paper. A re-examination of the two specimens which in the preliminary note were referred to *Mysis maxima*, Hansen (MS.), has shown that they represent in reality two very closely allied species, the second of which will also be described by Dr. Hansen in a future work.

Previous to the recent activity in South Polar exploration only three expeditions to the Antarctic had brought back zoological material from which Schizopoda were recorded. Dana (1852) in his great work on Crustacea records two species from Antarctic waters (*i.e.*, south of lat. 60° S.) viz., *Euphausia superba* and *Eucopia australis*.

H.M.S. 'Challenger' in 1874 collected, in the same region, *Euphausia superba*, *E. murrayi*, *E. antarctica*, *Thysanoëssa macrura* and a species of *Pseudomma*, doubtfully referred to *P. sarsi* by Prof. Sars, who described the Schizopoda of that expedition. The second and third species in this list are, however, only synonymous with the first, so that the real total of 'Challenger' Antarctic species is three.

* These dates refer to the list of Memoirs on p. 38.

Mr. Hodgson (1902) described two species as new, *Euphausia glacialis* and *E. australis*, collected by the 'Southern Cross' South Polar Expedition. Both species are synonymous with *E. superba*, Dana, so that previous to 1903 only four Antarctic species of Schizopoda were known, viz., *Eucopia australis*, Dana, *Euphausia superba*, Dana, *Thysanoëssa macrura*, G. O. Sars, and *Pseudomma sarsi*, Will.-Suhm.

Of the recent expeditions to the South Pole, which number seven, the results of the Schizopoda of the French Antarctic Expedition have been published in full, and of the 'Valdivia' Expedition in part only. M. Coutière (1906) notes from the French Antarctic collections, *Euphausia superba*, Dana, *E. similis*, G. O. Sars, *Thysanoëssa macrura*, G. O. Sars, and *Antarctomysis maxima* (Hansen, MS.), a species also recorded in the preliminary note on the present collection.

Preliminary descriptions have been published of two Antarctic *Mysidæ* collected by the 'Valdivia' (Illig, 1906), *Dactylerythrops arcuata* and *Echinomysis chuni*. The first of these is synonymous with a species *Dactylamblyops hodgsoni*, described below.

This completes the bibliography as regards purely Antarctic Schizopoda, though a number of sub-Antarctic species are known.

Ten of the thirteen species collected by the 'Discovery' were taken in Antarctic waters, and when, as we have seen above, the total previously recorded species number seven, it will be recognised that the present collection has added considerably to our knowledge of South Polar species of this group.

The most abundant species in the collection is a small *Euphausia*, *E. crystallorophias*, H. and T., which evidently has its head-quarters under the ice, since all the specimens were collected from ice-holes at Winter Quarters, and none were met with in the open sea. On the other hand, the dominant species of the collections from open Antarctic waters are *Euphausia superba*, Dana, and *Thysanoëssa macrura*, G. O. Sars.

The abundant material of the first-named species has afforded opportunity for some observations on the sexual characters and life history of the species, with the result that four other species, hitherto regarded as distinct from *E. superba*, must now be allocated to its synonymy, having been founded either on characters which are sexual and not specific, or else from immature specimens.

The scarcity of fully grown males of *E. superba* seems worthy of note. This fact seems to be established by the results of the various collections of which we have knowledge, since, so far as I am aware, the only one recorded is Sars' 'Challenger' specimen. M. Coutière (1906), it is true, notes that male specimens were more numerous than females in the collection he examined, but it is equally clear that none were fully grown, since the largest measured only 45 mm., and was in the stage previous to the last moult into completely grown specimens. There are no fully-grown males in the 'Discovery' collections, but to judge from the development of the copulatory apparatus on the first pleopods, many of them must be sexually mature at any rate.

Thysanoëssa macrura, G. O. Sars, too, seems never to have been previously met with in full-grown condition, and but very few of the 'Discovery' specimens can be

said to have reached that state. Still, they afford material for a re-description and figures of the species in the adult state, with some notes on the growth changes.

The Mysidacea consist of eleven specimens, referable to six species. The most interesting of these species is *Hansenomysis antarctica*, an Antarctic representative of a genus hitherto known from but three specimens from Arctic and boreal waters.

The chief interest of the collection lies in the evidence which it may afford as to the similarity or dissimilarity of the fauna at the two poles. There are no species common to the fauna of both polar regions in the collection; but, on the other hand, all the genera save one, *Antarctomysis*, are represented in northern waters by species which are quite distinct from their southern allies.

Exploration of the bottom fauna of the deep waters of the globe, especially in tropical and sub-tropical regions, is as yet only in its infancy, and it is therefore extremely probable that what are now known to be bipolar genera and species will in future be found to be cosmopolitan in their distribution. The Schizopoda were long thought to have in *Lophogaster typicus* a stock instance of a bipolar form, but the gaps in its distribution have been almost completely filled up as a result of recent deep-sea work, and, with the exception of the tropical Atlantic, its range is known to be complete from Norway to the Cape.

Two bipolar species of Mysidæ are known, however—*Boreomysis scyphops*, G. O. Sars, from Arctic waters, and Lat. 50° S., near the Crozet Islands, and *Amblyops crozetti*, from the seas of Greenland and Ian Mayen in the north and the Crozet Islands in the south. They are not known from the intermediate waters.

Of the genera of Antarctic Schizopoda, *Euphausia*, *Thysanoëssa*, and *Eucopia* are world-wide in range, but the northern and southern species are quite distinct, even the hitherto supposedly cosmopolitan *Eucopia australis*, Hansen having shown to contain at least two species, probably three.

Pseudomma, *Hansenomysis*, *Dactylamblyops*, and *Mysidetes* are, as at present known, bipolar genera, but *Pseudomma*, at least, ranges far from both poles, and further exploration will probably extend the known range of the other genera also.

The most interesting case is presented by the genus *Antarctomysis*. It is closely related in structure to the northern species *Michtheimysis mixta* (Lilljeborg), a species inhabiting chiefly the colder waters of the northern hemisphere. The two genera are separated only in the characters of the male pleopods, which are more primitive in the Antarctic form, and neither genus is likely to be found to have a distribution which extends very far from the poles they frequent.

In the preparation of this report I have received much valuable help from many sources. The authorities of the British Museum kindly allowed me to examine and dissect two specimens from the 'Challenger' collections in their charge. To Dr. Calman, of the British Museum, I have been much indebted for information on many points connected with the 'Challenger' material, and he has, also, at my request, furnished me with drawings of various species. Mr. E. W. L. Holt kindly examined

the British Museum material, and provided me with valuable notes as a result, which I have freely used in this report. The Rev. T. R. R. Stebbing, F.R.S., placed two of the type specimens of *Euphausia vallentini* at my disposal, with full permission to dissect them if found to be necessary, while Prof. D'Arcy W. Thompson, C.B., allowed me to examine and retain for some time a small collection of Antarctic Schizopoda from the collections of the Museum at University College, Dundee. I am specially indebted to Dr. Hansen, of Copenhagen, for the most generous and valuable assistance. Not only did he kindly confirm or modify my determinations of the more subtle species of *Euphausia*, but he placed at my disposal his notes and drawings of the male copulatory apparatus of the species of this genus, of which he has made a special study. Without his help I should have failed to recognise that the two specimens of *Antarctomysis* belonged to two distinct species, while I should have recorded as *E. lucens* the new Antarctic species which Dr. Hansen will himself describe. For all this assistance I wish to express my best thanks.

Order EUPHAUSIACEA.

Family EUPHAUSIIDÆ.

Sub-Family Euphausinæ, Holt and Tattersall.

Genus Euphausia, Dana.

Euphausia superba.

(Plate I., Figs. 1–12.)

Euphausia superba, Dana, 1852.
Euphausia superba, G. O. Sars, 1883 and 1885.
Euphausia murrayi, G. O. Sars, 1883 and 1885.
Euphausia antarctica, G. O. Sars, 1883 and 1885.
Euphausia glacialis, Hodgson, 1902.
Euphausia australis, Hodgson, 1902.
Euphausia superba, Holt and Tattersall, 1906 (1).
Euphausia superba, Coutière, 1906.

Localities of captures :—

Lat. 61° 46′ S., long. 141° 12′ E., 16. 11. 01, five specimens, 14–20 mm.
Off Scott Island, 26. 12. 01, two specimens, 15–19 mm.
Lat. 66° 52′ 9″ S., long. 178° 8′ 15″ E., 3. 1. 02, eight specimens, 12–16 mm.
From stomach of *Lobodon carcinophaga*, 3. 1. 02, eleven specimens, 43–47 mm.
Lat. 72° 5′ S., long. 172° 23′ E., 10. 1. 02, eleven specimens, 15–47 mm.
Lat. 72° 10′ 33″ S., long. 172° 26′ 2″ E., 11. 1. 02, ninety specimens, 35–48 mm.
From River Koettlitz, 2. 1. 03, sixty-nine specimens, 13–27 mm.
Lat. 70° 29′ 27″ S., long. 168° 51′ 46″ E., 26. 2. 04, five specimens, 45–47 mm.
None were taken at Winter Quarters from the holes dug in the ice.

The synonymy given here, whereby five supposed distinct species of *Euphausia* are merged into *E. superba*, Dana, is the result of a careful examination of the abundant and valuable 'Discovery' material, aided by a comparison with the 'Challenger' and 'Southern Cross' types (for which I am greatly indebted to Mr. E. W. L. Holt), and the small collection from the zoological museum of University College, Dundee.

Reasons for these views were briefly stated in the preliminary notice of this collection, and the opinions as to the synonymy of this species, as far as they concern *Euphausia antarctica* and *E. murrayi*, have recently been confirmed and adopted by Coutière (1906) as a result of his examination of the collection of the French Antarctic Expedition. A fuller justification for these opinions is given below, together with some notes on the growth changes, and sexual differences.

Female.—This sex has been very well described under the names *E. murrayi* by G. O. Sars (1885), and *E. australis* by Hodgson (1902).

The 'Discovery' specimens present some slight differences from Sars' description, but the examination of his type specimens proves them to be due to errors on Sars' part. They may be noted under their separate heads as follows :—

(1) *Preanal spine.*—Sars states that this spine is wanting in *E. murrayi*, but the type specimen shows it to be distinct, well-developed and simple, but not visible from the side from which Sars took his drawing. All the 'Discovery' specimens show a well-developed simple preanal spine.

(2) *Small blunt spine on the outer distal corner of the first joint of the antennular peduncle.*—This spine is not shown in Sars' figures nor mentioned in his description. It is, however, clearly visible in the type in lateral view, but in dorsal view is quite obscured by the numerous setæ arming the basal joint of the peduncle, which are well preserved and very opaque. The 'Discovery' material conforms to the type in possessing this spine well-developed.

(3) *Terminal spine on the outer margin of the antennal scale.*—Sars mentions this spine in his description as very small, but does not figure it. It is, in fact, not visible in his type from the dorsal aspect, owing to its being slightly ventrally deflexed, and the specimen is so well preserved and rigid, that the pressure necessary to place it dorsal surface uppermost for drawing is not sufficient to straighten out the spine and render it visible in dorsal view.

(4) *Shape of the epimeral plate of the penultimate segment of the pleon.*—Sars both describes and figures the penultimate epimeral plate as acute and triangular, but in the type and the 'Discovery' material, whereas these plates have substantially the same shape as depicted by Sars, the apex in all is bluntly rounded instead of acutely pointed.

(5) *Spinules on the dorsal surface of the telson.* Sars figures and describes three pairs in *E. murrayi*, but, as a matter of fact, the number is subject to variation, an additional pair anterior to the three shown by Sars being frequently noticed. In all

other respects the 'Discovery' material and the 'Challenger' types are in perfect agreement, and the facts noted above establish the identity of the females here referred to *E. superba*, with the species described by Sars as *E. murrayi*. It now remains to show that the differences between *E. murrayi* and *E. superba* are only sexual.

Male.—Under the name *E. superba* Sars has described and figured this sex adequately. The only point in which his description is deficient is the structure and armature of the telson. He figures no dorsal spinules on the telson, and both describes and figures the apex as slightly produced and obtusely pointed. Examination of Sars' type shows that the apex of the telson is clearly broken, so that Sars' figure is in this respect entirely imaginary. In the present material the apex of the telson is much produced and acutely pointed, and the number of dorsal spinules is usually three pairs, but may be four or two, placed as in Sars' figure of the telson of *E. murrayi*. One pair of spinules still remains in Sars' type of *E. superba*, but the others had probably been broken off (or obsolete?).

The most conspicuous difference between *E. superba* and *E. murrayi*, as described by Sars, is the presence in the latter and absence in the former of a lateral denticle on the carapace. But both Sars' *E. murrayi* were females, and his single specimen of *E. superba* a male. In all the females in the present collection, the largest of which is 47 mm. in length, the spine on the lateral margin is large and prominent, and even in a female, 50 mm. in length, in the collection from University College, Dundee, the spine is equally well-developed. I have figured the spine of the latter specimen on Pl. I., Fig. 10. In male specimens, on the other hand, only those which are less than 42 mm. in length have the spine well-developed (*cf.* Pl. I., Fig. 12, taken from a male, 39 mm. in length). In males above 42 mm. up to 47 mm. in length the lateral spine on the carapace is nearly obsolete and persists only as a blunt protuberance (*cf.* Pl. I., Fig. 11, taken from a specimen 45 mm. long, and also Coutière (1906), Pl. II., Fig. 22, taken from a male of the same size). The 'Discovery' collection contains no male specimens exceeding 47 mm. in length, but the 'Challenger' type measures 48 mm. It is well preserved and shows no trace of the lateral spine at all. Obviously, then, the absence of a spine is a sexual character confined to absolutely full-grown males only. The remaining differences between *E. superba* and *E. murrayi* given by Sars are as follows:—

(1) *E. superba* has the antennules considerably more robust than in *E. murrayi* and the lobe from the second joint almost obsolete. This difference is, I think, a purely sexual one, affording a parallel instance to that seen in the northern species, *Nyctiphanes couchi*. Pl. I., Figs. 1 and 2 are taken respectively from male and female specimens of the same size, viz., 45 mm., and from the same bottle. They indicate, clearly, the difference in relative stoutness in the two sexes, and that of the male shows the lobe from the second antennular joint in an intermediate stage of reduction between that of the female and that shown by Sars in his figure of the male *E. superba*, 48 mm. in length.

(2) In *E. superba* the rostrum is shorter and blunter than in *E. murrayi*, and has the margins less deeply concave. This, again, is clearly shown to be a sexual difference in Pl. I., Figs. 1 and 2. The rostrum of the male figured (Fig. 2) is shorter than that of the female, but is still rather more acute than in Sars' figure of *E. superba*. Reduction is probably not complete till a size of at least 48 mm. is attained.

A further difference between the two sexes is brought out by the figures here given, namely, the reduction in the male of the spine on the outer distal corner of the basal joint of the antennular peduncle. It is not visible in dorsal view, being hidden by the slightly projecting anterior margin of the joint, but it still persists as a small blunt protuberance. In the female, on the contrary, it is well-developed, distinctly visible in dorsal view, and acutely pointed throughout life.

A fourth distinction shown in the figures, the absence in the female of the curved setæ on the dorsal surface of the basal joint of the antennules, is due to the accident that in the female from which the figure was taken, these setæ had become broken off. They are, in reality, present, and equally developed in both sexes.

The above detailed description proves, I think, clearly, that *E. superba* and *E. murrayi* are the adult male and female, respectively, of one species which must bear the name *E. superba* Dana.

I also give (Plate I., Figs. 5–9), figures of the mouth organs and endopods of the first two thoracic limbs, to show two characters in which *E. superba* differs from all other *Euphausia* yet described. The first of these points is the narrow and elongate form of the terminal joint of the mandibular palp, with its peculiar armature of four or five terminal strong plumose setæ. In all the other species of the genus (with the exception of *E. antarctica*, Sars, and *E. glacialis*, Hodgson), the terminal joint of the mandibular palp is much shorter and stouter. In the two exceptions just mentioned the mandibular palp is figured by Sars and Hodgson respectively, almost exactly as here given for *E. superba*. This fact first suggested to me that these two species were only developmental stages of *E. superba*, a suggestion fully borne out by the evidence derived from a study of the present collection. The second distinctive character of the appendages is found in the great length of the setæ arming the joints of the thoracic limbs. They are very much longer than in any other species of the genus, and with the character of the mandibular palp serve for recognition of *E. superba* at any stage in its development.

Euphausia superba is the giant of the genus, and the only one of Dana's original four species which is now retained by Hansen (1905 (2)), the other three having been cancelled by that author as unrecognisable.

Some Notes on the development of E. superba.

These notes were made chiefly with a view to confirming the suspicion, aroused by the similarity in mouth organs, that *Euphausia antarctica* and *E. glacialis* were merely developmental stages of *E. superba*. The changes which accompany growth to

maturity concern chiefly the rostrum and the antennules, and these notes refer to these organs more particularly.

The smallest recognisable specimen of *E. superba* measured 12·5 mm. in length. The anterior end is represented in Plate I., Fig. 4. The rostrum is a bluntly rounded triangular plate. The spine on the outer distal corner of the basal joint of the antennule is still larval in character, being much longer than in larger specimens. There is no trace of the lobe from the basal joint of the antennule, but the one from the second joint already shows as a slight membranous projection of the anterior margin. The antennal scale also shows larval characters in that the outer margin is shorter than the inner. Finally, the telson has assumed adult form, but the dorsal spinules immediately anterior to the sub-apical spines are still long and plumose. The lateral spine of the carapace is present, but small. Between 12·5 mm. and 15 mm. the spine on the basal joint of the antennule gradually shortens up and assumes the characters seen throughout adult life. The antennal scale also assumes adult form, and the spinules immediately anterior to the sub-apical spines on the telson lose their plumose character and shorten to adult size. The rostrum, however, still remains obtusely rounded.

The next stage is that described by Sars as *E. antarctica*, and measures 17 mm. The rostrum has now become a broad, acutely pointed triangular plate, while the lobe from the basal joint of the antennules first becomes evident as a slight inflation of the anterior margin. This is shown by Sars in his 'Challenger' Report (Plate XV., Fig. 2). He has, however, overlooked the lobe on the second joint of the antennules, which is now considerably forward in development. The spine on the lateral edge of the carapace is now quite conspicuous.

Sars describes *E. antarctica* as being without lateral denticles. Examination of his type specimen, however, shows that, while the side from which he took his figure is rather damaged and the spine not visible, on the other side the spine is quite conspicuous and perfect. This removes the only serious difference which existed between the young *E. superba* here noted and Sars' description of *E. antarctica*.

The transition from *E. antarctica* at 17 mm. to *E. glacialis*, Hodgson, is simple and obvious. I figure (Plate I., Fig. 3) the anterior end of a typical *glacialis* stage from a specimen 26 mm. in length. The only differences to be noted from the *antarctica* stage are the better development of the antennular lobes and the shortening and broadening of the rostrum, which is still, however, pointed at the apex. The stage figured agrees well with Hodgson's figures and description of *E. glacialis*.

After a length of about 27 mm. the sides of the rostrum gradually become more and more concave till at about 30 mm. the completely adult form is reached. Very little change takes place in either the form of the rostrum or the antennular lobes after a length of 35 mm. has been attained, except, of course, in the changes accompanying the last two or three moults in the male, already noted above. Examination of the

mouth organs at various stages confirms the identification of the specimens with *E. superba.*

This brief *résumé* of the development, I think, justifies the view that *E. antarctica* and *E. glacialis* represent stages in the development of *E. superba*, and must therefore be regarded as synonymous with that species.

It should be mentioned that Hodgson's types of *E. australis* differ in no way from *E. superba* (females), except in being considerably damaged.

Euphausia crystallorophias.

(Plate II., Figs. 1–10 ; Plate IV., Fig. 10.)

Euphausia crystallorophias, Holt and Tattersall, 1906 (1).

Localities of Captures :—

Winter Quarters.

26. 1. 02–8. 3. 02, 1 specimen, 24 mm.
,, ,, 216 specimens, larval.
No. 3 Hole, 52 specimens, larval to 25 mm.
No. 4 Hole, 4572 specimens, larval to 32 mm.
No. 6 Hole, 13 specimens, larval to 25 mm.
No. 8 Hole, 4642 specimens, larval to 32 mm.
No. 13 Hole, 50 specimens, larval.

No specimens were captured either on the outward or homeward journey.

Form, moderately robust.

Carapace (Plate II., Figs. 1 and 2), with a prominent, rather long and acute spine on its lateral margins, a little anterior to the middle, and just above the insertion of the second thoracic limb ; antero-lateral angles terminating in an acute spine ; anterior margins inflated above the eyestalks and produced into a long acute rostrum extending to the visual part of the eye and about half-way along the basal joint of the antennular peduncle ; there is a faint gastro-hepatic groove and a distinct keel runs forward medio-dorsally from the latter into the rostrum.

Pleon (Plate II., Fig. 1) without ridges or dorsal spines ; none of the epimeral plates much produced ; sixth segment about one and a half times as long as the fifth ; preanal spine well developed and usually simple, but in large examples bifid.

Eyes (Plate II., Fig. 1) globose and rather large ; greatest diameter of the cornea exceeding half the length of the last pleon segment ; pigment black.

Antennular peduncle (Plate II., Fig. 2), with the basal joint as long as the second and third joints combined and much wider ; no lobe or lappet ; a row of about twelve long curved plumose setæ set on a ridge on the distal part of its length ; a short stout spine on the outer distal corner, which is more or less concealed by the numerous setæ which arm the outer half of the anterior margin and the distal

half of the exterior margin; a bunch of coupling setæ on the inner distal corner; second joint slightly longer than the third and without a lobe, its anterior margin a little oblique.

Antennal peduncle about equal in length to the basal two joints of the antennular peduncle, the third joint only very slightly shorter than the second.

Antennal scale reaching the centre of the third joint of the antennular peduncle, about three times as long as broad, outer margin entire and terminating in a spine, apex broadly rounded; spine on the outer corner of the basal joint long and slender, extending one-third of the way along the scale, plumose at least on the proximal part.

The mouth parts (Plate II., Figs. 3, 4, 5) are figured for comparison with those of other species. They do not appear to present any striking peculiarities.

First thoracic limb (Plate II., Fig. 6), has the penultimate joint of the endopod longer than either the preceding or ultimate joints; the latter has the lower margin armed with a row of short fine setæ in addition to the longer ones at the apex.

Second thoracic limb (Plate II., Fig. 7), with the terminal joint armed with a row of three (sometimes four) short, rather stout and curved spines on the inner face.

The remaining thoracic limbs have the penultimate joint in all cases longer than the ultimate and slightly longer than the antepenultimate. The following table gives the lengths of the joints of the first six thoracic limbs in millimetres and the total length of the limbs from a specimen 27 mm. long.

Thoracic limb.	Lengths of the joints in mm.						Total length of limb in mm.
	1	2	3	4	5	6	
1	·50	1·11	1·50	·77	1·00	·66	5·54
2	·50	1·22	1·77	1·11	1·22	·50	6·32
3	·66	1·50	1·88	1·22	1·28	·72	7·26
4	·66	1·83	2·05	1·28	1·33	·83	7·98
5	·61	2·00	2·11	1·00	1·05	·66	7·43
6	·55	2·00	2·00	·72	·83	·44	6·54

First pleopod of the male (Plate IV., Fig. 10) with both movable processes on the inner plate of the endopod shorter than the plate itself; distal process feebly curved, bifid at the tip; proximal process expanded at the tip into two lobes not in the same plane, the outer lobe the larger, and wider than long, the inner lobe but little expanded; uncinus of the inner plate of the endopod without secondary spinule.

Telson about one and a half times as long as the last segment of the pleon; apex acutely pointed; sub-apical spines extending for half their length beyond the

apex of the telson and bearing a few minute spinules on their inner margins; dorsal denticles usually in two pairs, the first about half-way towards, the second at the base of, the sub-apical spines.

Uropods reaching to the level of the insertion of the sub-apical spines, the outer very slightly longer than the inner, with a prominent denticle at its outer extremity.

Length of the largest adult specimens of both sexes, 32 mm.

Euphausia crystallorophias approaches most nearly among the species of the genus to *E. similis*, G. O. Sars, but differs (1) in the different shape of the rostral projection, (2) in the shape of the epimeral plates of the fourth and fifth segments of the pleon, (3) in the absence of antennular lobes and lappets.

From *E. splendens*, G. O. Sars (*E. lucens*, Hansen) the present species is distinguished by the greater length of the rostrum and by the absence of antennular lobes and leaflets, the types of *E. splendens*, G. O. Sars, being possessed of a small but distinct antennular lobe. *E. crystallorophias* is an enormously abundant species under the ice, some ten thousand specimens having been taken. None, however, were met with in any other locality except Winter Quarters.

Larvæ of E. CRYSTALLOROPHIAS.

The collection contains individuals in all stages of development from the *Metanauplius* to the adult condition.

The *Calyptopis larvæ* (Plate II., Fig. 8) first appear at the beginning of January and continue in the tow-nettings till nearly the end of February. The hood of the carapace is very obtusely pointed in front and has the margins quite smooth. There is no posterior median spine on the carapace, while the telson has the apical margin lightly emarginate. I can see the beginning of the lateral spine of the carapace at this stage. The largest *Calyptopis* larva measures 3·9 mm.

The *Furcilia* stages (Plate II., Fig. 9) first appear during the last week of February and are abundant all through March. They cease after the first week in April. The emargination of the apex of the telson is most marked during this stage and serves readily to connect it with the early *Calyptopis* larvæ. The spine on the lateral margin of the carapace is now well developed. The size of the *Furcilia* larvæ is from 4·5 mm. to 8 mm.

The *Cyrtopia* larvæ (Plate II., Fig. 10) first occur about the last week in March, and late post-larval stages are still to be had at the beginning of August. The size of this stage is from 8 to 11 mm. The rostral projection is now an acutely pointed triangular plate, but the sides are still but little concave. The final shape of the rostrum is not assumed till the animal is in all other respects like the adult.

At a size of 11 mm. the telson assumes its adult shape, but the pair of spines immediately anterior to the sub-apical spines are still long and plumose. They finally become reduced to adult size when a length of 13 mm. is reached. At this

latter size the species has all the adult characters, except perhaps the rostrum, which has the margins hardly as concave as fully adult specimens. Examples of 13 mm. in length are to be met with in January, and so were presumedly larvæ of the preceding season, from which it would appear that the species takes at least one year, and very probably longer, to reach the final adult size of 32 mm.

EUPHAUSIA TRIACANTHA.

(Plate IV., Figs. 1–3.)

Euphausia triacantha, Holt and Tattersall, 1906 (1).

Locality of capture:—Lat. 66° 52′ 09″ S., long. 178° 08′ 15″ E., 2030 fathoms; one specimen, immature male, 23 mm.

Carapace (Plate IV., Fig. 1), with a single lateral denticle posterior to the centre of the lower margin of the carapace; antero-lateral margins somewhat inflated over the eyestalks, and then produced into a long and very acute rostrum, which extends beyond the eyes and almost to the distal end of the basal joint of the antennular peduncle; a faint keel is present on the carapace behind the rostrum.

Pleon (Plate IV., Fig. 1) with the posterior dorsal margin of the terga of the third, fourth, and fifth segments produced into rather long, slender, very acute and slightly curved median spines; sixth segment rather long, nearly twice as long as the fifth segment without the spine.

Eyes somewhat damaged in the single specimen, but apparently rather small, pyriform in shape.

Antennular peduncle (Plate IV., Fig. 2) bearing on the inner distal corner of the basal joint a well-developed bifid leaflet, the lappets of the leaflet of about equal size; outer corner of the basal joint rounded and adorned with numerous rather long plumose setæ; a row of six curved plumose setæ on the dorsal surface of the basal joint; second joint with a simple acutely spiniform lappet arising from the median anterior margin; third joint slightly narrower and shorter than the second.

Antennal peduncle shorter than the scale, the third joint a little shorter than the second.

Antennal scale reaching very slightly beyond the distal extremity of the second joint of antennular peduncle, broadly oval in shape, about three times as long as broad, apex broadly and obtusely rounded, spine at the distal end of the outer margin small but distinct; spine on the outer distal corner of the basal joint long, slender and smooth.

First pleopods of the male (Plate IV., Fig. 3) obviously not fully metamorphosed, since both the proximal and distal movable processes on the endopod are small and simple, and the uncinus on the middle lobe is without a secondary spinule.

Telson with the portion between and posterior to the sub-apical spines acutely produced and smooth; sub-apical spines extending beyond the apex of the telson,

smooth; dorsal denticles in two pairs, the first situated at about two-thirds of the distance from the base of the telson to the insertion of the sub-apical spines, second pair just above the spines.

Uropods sub-equal in length, rather slender, extending to the level of the insertion of the sub-apical spines of the telson.

Preanal spine small and simple.

A fuller description of this species is not possible, since the single specimen is in bad condition and dissection was not desirable.

The species belongs to that group of the genus with a posterior median dorsal spine on the third segment of the pleon, and is distinguished from the other members of the group by having an equally developed spine on the fourth and fifth segments of the pleon in addition. It presents no very near kinship with any described species of the genus, and from the depth at which it was captured is probably a deep-water form.

EUPHAUSIA VALLENTINI.

(Plate IV., Figs. 4–6.)

Euphausia splendens (*pars*), G. O. Sars, 1885.
Euphausia vallentini, Stebbing, 1900.
Euphausia vallentini, Holt and Tattersall, 1906 (1).

Localities of captures:—Lat. 56° 54′ S., long. 170° 28′ E., two specimens, male and female, 19 mm.

I have carefully compared these two specimens with two of the types from the Falkland Islands which the Rev. T. Stebbing kindly sent me, giving me at the same time full permission to dissect them if necessary. The 'Discovery' specimens are in perfect agreement with the types, and I have nothing to add to Stebbing's description except a note on the copulatory organs on the first pleopod of the male.

In the course of working out this collection the authorities of the British Museum kindly allowed me to examine and dissect two of the 'Challenger' specimens labelled *Euphausia splendens* by Sars. They were from the second of the localities given by Sars on p. 82 of his "'Challenger' Report," viz., "October 21, 1875, South Pacific." It became at once apparent on examination that one of these specimens did not agree with Sars' description, since the antennule was furnished with a large evenly rounded lappet on the basal joint, very conspicuous in lateral view.* Further examination showed that it probably, indeed almost certainly, belongs to the present species. It is true that I could not see the spine on the third pleon segment, but the specimen is in very poor condition, and if, as I suspect to be the case, the spine has been broken off, the scar would be difficult to detect.

I give (Plate IV., Fig. 5) an outline sketch of the rostrum and the basal joint

* Examination of the 'Challenger' types of *E. splendens* shows that this species possesses a small antennular lobe, but it is nothing like so well developed and conspicuous as in *E. vallentini* (*see* Hansen (1905 (2)), Holt and Tattersall (1906 (1), and below, p. 14.)

of the antennule of the 'Challenger' specimen and (Plate IV., Fig. 4) a sketch of the antennule of one of the 'Discovery' examples for comparison with those given by Stebbing (1900). This shows clearly, in my opinion, that all three specimens belong to one species, and that the absence of the spine on the third pleon segment of the 'Challenger' example is the result of accident or possibly an abnormality. The peculiar shape of the antennular lobe is practically the same in the 'Discovery' and 'Challenger' individuals, and only differs from Stebbing's types in degree, a result of more complete growth.

The rostrum of *E. vallentini* is very like that of *E. splendens*, G. O. Sars, but is slightly longer, and the angle formed by its margins a little more acute. Sars may have been misled by the resemblance between the rostra of the two species, which caused him to overlook the marked differences which exist in the antennulæ. Dr. Hansen has seen the 'Challenger' specimen referred to, and agrees with my interpretation of its specific identity.

One of the 'Discovery' *E. vallentini* is a male, but unfortunately the copulatory apparatus on the first pleopods is considerably damaged, so that I am obliged to refer to the 'Challenger' example, which is likewise an adult male, for a description and figure of this apparatus (Plate IV., Fig. 6). The figure represents the inner lobe of the endopodite of the first pleopod of the male. This inner lobe bears internally two movable processes, the inner and more distal of which is feebly curved, slightly overreaching the inner lobe and bifid at the tip. The external and more proximal of the two processes has the distal extremity greatly expanded, the expansion very much broader than long, oblique, and divided into two lobes, the more distal of which is the larger. On the under side of the expansion of the proximal process as viewed in the figure there is a small spine-like process. The inner lobe of the endopodite itself bears a strongly curved uncinus with a small secondary spine near the tip.

Distribution.—Southern Pacific, between New Zealand and Chili ('Challenger'); Falkland Islands (*Stebbing*).

Euphausia, sp.

Locality of capture.—Lat. 57° 25′ 30″ S., long. 151° 43′ E., nineteen specimens, 10–18 mm.

On first looking over these specimens I identified them with *Euphausia splendens*, G. O. Sars (1885), a species which Hansen (1905 (2)) considers to be different from *E. splendens*, Dana, and which he has re-named *E. lucens*. Hansen, in the same paper, notes that *E. splendens*, G. O. Sars, has the first joint of the antennular peduncle without a leaflet, but distally produced above. Holt and Tattersall (1906 (1)) have confirmed this statement by an examination of Sars' type specimens of *E. splendens*, in which they found that in the female type the lobe is quite conspicuous both in lateral and dorsal view; while in the male type, which is considerably smaller than the female, the lobe is less developed, but still easily seen in lateral view. Sars

was therefore in error when he described the antennular peduncle of his *E. splendens* as "more particularly distinguished by the total absence of any dorsal leaflet or lobe." Moreover, it is apparent from what has already been written above in dealing with *Euphausia vallentini* that Sars confused at least two distinct species under the name *E. splendens*. It was subsequent to the publication of the preliminary notice of the 'Discovery' collection that the present specimens came to hand. I therefore appealed to Dr. Calman for further information with regard to the 'Challenger' species, and he very kindly sent me a sketch of the dorsal aspect of the anterior end of both types. From these sketches and Sars' description in the 'Challenger' report I identified the 'Discovery' specimens as *Euphausia splendens*, G. O. Sars = *E. lucens*, H. J. Hansen. Wishing, however, to have confirmation of my identification, I submitted the specimens to Dr. Hansen. who at first was inclined to agree with me that they belonged to *E. splendens*, G. O. Sars. I may, perhaps, be allowed to quote Dr. Hansen's remarks. They read as follows: "*E. lucens* (*splendens*).—I have specimens from the southern Atlantic and the southern Pacific, and in all these the leaflet from first antennular joint is easily seen, triangular, but not acuminate, with the end often a little obtuse. In the material from the Swedish Antarctic expedition I have a large number of specimens which differ only from the Copenhagen specimens in the feature that the antennular leaflet is extremely small (visible as a very small triangular distally obtuse plate when seen from in front . . . .) or rudimentary, but I find it necessary to consider this difference only as a variation" (Hansen, *in litt.*). Then, after some remarks in which he noted that my specimens agree with the latter condition, he concludes by saying that he considers them to belong to the more Antarctic variety of *E. lucens*. In a later communication Dr. Hansen kindly informed me that, after an elaborate study of the copulatory organs on the first pleopods of the males of the genus *Euphausia*, he had found that these two varieties were readily distinguishable in the characters of the male pleopods, and that he proposed to consider them as two species. At the same time he was good enough to send me sketches of the first pleopods of both species for comparison with my own specimens.

The largest 'Discovery' specimen is a male 18 mm. in length, and as far as I can judge, it appears to be quite adult. The copulatory apparatus on the first pleopods agrees exactly with the sketch which Dr. Hansen sent me of the same apparatus in his Antarctic form. It would therefore appear that these specimens belong to Hansen's new Antarctic species. I have not attempted to give a detailed description with figures of this form, since it is quite evident that an accurate diagnosis can only be drawn up from a close study of this species and the true *E. lucens* side by side, and a careful comparison, character by character. There are no specimens of the true *E. lucens* in the 'Discovery' collection, so I leave the descriptions of the two species to Dr. Hansen, who has abundant material for the purpose.

I may mention here that some specimens of an *Euphausia* (labelled *E. splendens*, G. O. Sars) in the small collection of Antarctic Schizopods kindly lent me by Prof.

D'Arcy W. Thompson, from the collections of the University College, Dundee, appear to belong to this species. They were collected in the Antarctic Ocean, the exact locality being uncertain, but it is believed to be in the neighbourhood of the South Shetland Islands.

EUPHAUSIA, sp. ?, juv.

(Pl. IV., Figs. 7–9.)

Localities of captures:—Lat. 49° 40′ S., long. 172° 18′ 30″ W., five specimens, immature, 8–9 mm.

Lat. 58° 49′ 45″ S., long. 154° 48′ W., three specimens, immature, 10 mm.

The specimens from the above two localities all belong to the same species. They were submitted to Dr. H. J. Hansen of Copenhagen, who agreed with my suggestion that they were too young for absolute specific determination. I give here only a brief description, pointing out a few of the characteristic features.

Carapace with a prominent slender denticle on lateral margins just over the base of the third thoracic limbs; antero-lateral margins slightly undulate, only partially concealing the eyestalks and produced into a long, narrowly acute rostrum (Fig. 7) extending almost to the anterior end of the eye and about half-way along the basal joint of the antennules.

Pleon having the third segment provided dorsally on the median posterior margin of the tergum with a slender spine (Fig. 9); sixth segment long and slender, about twice as long as the fifth.

Antennular peduncle (Figs. 7 and 8), with a minute bluntly pointed simple lobe on the inner distal corner of the basal joint; a thin oblique lamella-like ridge running across the third joint from the inner proximal to the outer distal corner and partly continued down the inner side of the second joint.

Antennal scale reaching to about half-way along the terminal joint of the antennular peduncle.

Telson having the portion beyond the sub-apical spines produced into an acute apex with smooth margins; two pairs of spinules present.

Uropods reaching to the level of the insertion of the sub-apical spines.

This species belongs to that section of the genus provided with a spine on the dorsal surface of the third segment of the pleon. Among members of this section it approaches most nearly to *E. gibboides*, Ortmann (1893), but Dr. Hansen has kindly pointed out to me that it differs from that species in the much greater length of the rostrum and its different shape.

The smallest of the specimens, *i.e.* all under 9 mm. in length, have the spine on the third pleon segment still undeveloped, only the two largest ones, 9·5 mm. and 10 mm. in length, showing it fully formed. We have here slight evidence as to the stage in development at which this spine appears. None of the specimens present any larval characters in the form of the telson or antennules. It would appear, then, that

the spine, at any rate in this species, developes late in life, only after the final adult form is reached.

The species was taken on the homeward voyage of the 'Discovery,' in the extreme southern part of the Pacific Ocean between New Zealand and Cape Horn.

Sub-Family Nematoscelinæ, Holt and Tattersall.

Genus Thysanoëssa, Brandt.

Thysanoëssa macrura.

(Pl. III., Figs. 1–12).

Thysanoëssa macrura, G. O. Sars, 1883; *id.* (1885); Ortmann, 1893; Stebbing, 1900; Holt and Tattersall, 1906 (1); Coutière, 1906.

Localities of captures:—

Winter Quarters.

No. 4 Hole, 47 specimens, 7–18 mm.
No. 8 Hole, 40 ,, 8–21 mm.
No. 12 Hole, 2 ,, 7 and 20 mm.

From River Koettlitz, 2. 1. 03, 6 specimens, 9–14 mm.

Outward or Homeward Journey.

Lat. 61° 46′ S., long. 141° 12′ E., 16. 11. 01, 18 specimens, 14–20 mm.
Lat. 57° 25′ 30″ S., long. 151° 43′ E., 20. 11. 01, 35 specimens, 12–22 mm.
Lat. 54° 1′ 15″ S., long. 170° 49′ E., 27. 12. 01, 1 specimen, 6 mm.
Lat. 61° 13′ 30″ S., long. 173° 33′ E., 31. 12. 01, 30 specimens, 12–19 mm.
Lat. 66° 52′ 9″ S., long. 178° 8′ 15″ E., 3. 1. 02, 3 specimens, 8–9 mm.
Lat. 70° 29′ 27″ S., long. 168° 51′ 46″ E., 26. 2. 04, 1 specimen, 28 mm.
Lat. 49° 40′ S., long. 172° 18′ 30″ W., 12. 6. 04, 2 specimens, 8–12 mm.
Lat. 58° 49′ 45″ S., long. 154° 48′ W., 24. 6. 04, 4 specimens, 10 mm.
Lat. 59° 34′ 30″ S., long. 106° 28′ 12″ W., 28. 6. 04, 3 specimens, 7 mm.
Lat. 55° 44′ S., long. 95° 43′ 30″ W., 1. 7. 04, 3 specimens, 6–8 mm.

Form (Fig. 1) of the body rather slender.

Carapace (Fig. 1) with a single rather long slender spine on the lower lateral margin posterior to the middle, just above the origin of the sixth thoracic limb; antero-lateral corners acute and somewhat produced; anterior margins very concave and produced forwards into a long, slender, acute rostrum which reaches beyond the eyes and far beyond the middle of the basal joint of the antennules; there is a low keel on the anterior part of the carapace behind the rostrum, and a very faint gastro-hepatic groove.

Pleon (Fig. 1) rather elongate, narrow and attenuate; segments unarmed; sixth segment equal to or slightly less than the combined lengths of the preceding two;

preanal spine well developed, provided with an external strong tooth and a comb-like row of finer teeth up to twelve in number.

Antennular peduncle (Fig. 2) rather long and slender, considerably longer than half the carapace; basal joint rather flattened, considerably wider than the remaining two joints, bearing on its outer distal corner a rather long and slender spine, its anterior margin somewhat overlapping the basal part of the second joint, fringed with numerous setæ and exhibiting near the inner side a shallow fissure: terminal two joints very long and slender, subequal in length, their combined lengths slightly exceeding that of the basal joint.

Antennal peduncle (Fig. 3) very long and slender, nearly as long as the scale, third joint less than half as long as the second.

Antennal scale (Fig. 3) extending to about midway along the terminal joint of the antennular peduncle, almost five times as long as broad, outer margin terminating in a well-marked spine, inner margin sloping away obliquely towards the apex; spine on the basal joint moderately long, slender and smooth.

Mouth parts (Figs. 4–6) do not offer any marked differences from those of *Thysanoëssa gregaria* as figured by Sars (1885, Pl. XXII).

Second thoracic limbs (Fig. 8), with the endopod remarkably long and well developed, in full-grown specimens equalling nearly three-quarters of the total length of the body from the eyes to the telson; meral joint the longest, extending beyond the tip of the antennular peduncle; carpal joint a little shorter than the meral and more slender, nearly four times the length of the propodal joint, armed with four slender spiniform setæ on the outer margin at the distal extremity, and five similar setæ on the inner distal margin; propodal joint with five long spiniform setæ on the outer and six on the inner margin; terminal joint small, tipped with six spiniform setæ.

The remaining thoracic limbs (figs. 7, 9, 10) not differing greatly from the same limbs in *T. gregaria.*

Copulatory apparatus (Fig. 11) on the first pleopod of the male exhibits a structure very similar to that figured by Sars for *T. gregaria*, except that the distal extremities of the two movable processes on the inner lobe do not seem to be serrate.

Telson slender, apex acutely produced and smooth; sub-apical spines smooth; dorsal denticles two pairs, the first pair just anterior to the centre of the telson, the second pair a little anterior to the insertion of the sub-apical spines.

Uropods exceedingly slender, inner one reaching the apex of the telson, outer slightly shorter.

Length of the largest specimen, 28 mm.

I have thought it well to describe and re-figure this species, since Sars' original description was taken from admittedly young forms, and I cannot find that mature specimens have ever been described and figured. The changes that take place during growth affect principally the rostrum, the second thoracic (or elongate) limb and the preanal spine.

The rostrum is figured correctly by Sars from a specimen, 13 mm. in length. At that stage in development the rostrum is an acutely triangular projection, the sides of the triangle very nearly straight and but little concave. As growth proceeds, however, the sides of the triangular plate become deeply concave and the rostrum assumes the form of a long narrow acutely spiniform projection, as shown in Fig. 2. This gives it something of the form as seen in *T. gregaria*, but it is much longer and more slender than in that species.

Sars describes and figures the preanal spine in his 13 mm. specimen as armed with only two teeth. This is correctly stated for a specimen that size, but increase in size is also accompanied by an increase in the number of teeth in the preanal spine, till in a specimen 28 mm. in length I found the teeth to number twelve in addition to the strong external one. The teeth are, moreover, fine and comb-like, and the whole spine closely resembles that figured by Sars for *T. gregaria*. I have noticed all intermediate stages in the present material. This clearly undermines the value of the preanal spine as a specific character, since the number of teeth is dependent first of all upon age, while individual variation must also be taken considerably into account.

The most considerable changes due to growth are, however, exhibited by the second thoracic limbs. Sars describes them as much smaller than in *T. gregaria*, with the meral joint scarcely reaching beyond the middle of the antennal scale. But the above description and accompanying figures show that the limb is quite as well developed as in *T. gregaria*, and that the meral joint in full-grown individuals actually extends beyond the antennular peduncle. Stebbing (1900) has already called attention to the fact that in specimens of this species from the Falkland Islands the elongate limbs were proportionately longer than in Sars' drawing, but he gives no figures. I find that this statement applies generally to the material in the present collection, even in specimens of the same size as Sars'. Only two exceptions were noted, and in these two specimens the elongate limbs were proportionally as in Sars' figures. I will deal with these two exceptions and Sars' specimen below, but will proceed first to briefly note the changes which take place in these limbs during growth. In two specimens, 8 and 9 mm. in length, the second thoracic limbs are developed about as fully as in Sars' figures. They are considerably less than one-half of the total body-length of the specimens, the meral joint extends very little beyond the centre of the antennal scale, and is about equal to the terminal three joints combined, while the carpal joint is only about twice as long as the propodal.

In specimens from 13 mm. to 18 mm. in length, these limbs are about equal in length to the half of the length of the body, the meral joint extends to the tip of the antennular peduncle, and is a little shorter than the terminal three joints combined, while the carpal joint is now three times as long as the propodal. This is the condition noted by Stebbing in his Falkland Islands specimens. In the full-grown specimen, 28 mm., the elongate limbs measure 21 mm. in length, or three-quarters of

the total body-length. The meral joint extends beyond the tip of the antennular peduncle, and is about one-tenth shorter than the combined lengths of the terminal three joints, while the carpal joint is four times as long as the propodal. It will be seen, therefore, that these changes during growth are quite considerable, and most evident in the elongation of the carpus.

It was noted above that Sars' specimen, 13 mm. in length, had the elongate limbs only as well developed as in a specimen 8 mm. long. I have found in the present collection two specimens, 16 and 17 mm. long, in which these limbs were at the same stage of development. They were accompanied by specimens with more fully developed elongate limbs, and I would suggest that the comparative shortness of these legs in the above-mentioned two specimens and in Sars' type is due to their having at some earlier period been broken off and grown again. This is a common occurrence in Decapods, and I should think is by no means rare in Euphausians, especially those with elongate second legs, which must be specially liable to be detached. The re-developed limb is usually shorter than the one it replaces. I believe this explanation to be the correct one in the present instance, though it may be that we have here a case of retarded development. Further slight changes during growth are seen in the proportional length of the last pleon segment, which in very young specimens is slightly longer than the combined length of the preceding two, while in full-grown specimens the reverse is seen, though the differences either way are not great.

The antennular peduncle is a little longer proportionally in full-grown specimens, while the outer uropod likewise approaches more nearly to the length of the inner ones, though even in full-grown specimens it remains slightly shorter than the latter. This account of the growth changes in *T. macrura* reduces considerably the points of distinction formerly supposed to exist between it and *T. gregaria*. The most conspicuous difference is in the proportional length of the last pleon segment, and this distinction would seem to hold throughout life. *T. macrura* is, besides, a much more slender and graceful form than *T. gregaria*, with its parts proportionally attenuated.

Distribution.—*T. macrura* was recorded from several localities in the Southern Ocean, South Atlantic, and Antarctic Ocean by the 'Challenger.' It has since been noted by Stebbing from the neighbourhood of the Falkland Islands, and by Coutière from the collections of the French Antarctic Expedition. These records, together with the list of localities for specimens in the present collection, indicate that the species has a wide range in the waters of the southern temperate and Antarctic regions, but its northern limit would seem to be the 40th parallel of south latitude.

Euphausian Larvæ.

The larvæ listed below could not be referred to any species, and are merely noted here for completeness.

Lat. 57° 25′ 30″ S., long. 151° 45′ E., 21. 11. 01, numerous Euphausian *Metanauplii* and *Calyptopis* larvæ, and two *Furcilias.*

The *Metanauplii* and *Calyptopis* larvæ are characterised by the presence of a short blunt posterior median spine on the carapace. The front part of the latter, which forms the hood over the eyes, appears to have its margin quite smooth. In the majority of the *Calyptopis* larvæ a small spine on the lateral margins of the carapace is clearly present. The apex of the telson is very slightly emarginate. The largest *Calyptopis* larva measures 4 mm. in length.

Lat. 56° 31′ S., long. 156° 19′ 30″ E., 22. 11. 01, seventeen *Calyptopis* and fifty *Furcilia* larvæ.

The *Calyptopis* larvæ belong to the same species as in the preceding lot.

The *Furcilia* larvæ measure from 2·5 to 4 mm. They present no features of note, but from their size they probably belong to a smaller species of adult than the *Calyptopis* larvæ which accompany them. All present a lateral spine on the carapace, and the rostrum is in the form of an acutely produced triangular plate.

Lat. 54° 1′ S., long. 170° 49′ E., 27. 12. 01, numerous *Metanauplii, Calyptopis,* and *Furcilia* larvæ.

All these are apparently stages of one species. The largest *Calyptopis* larva measures 3 mm. and is without a posterior median spine on the carapace. The anterior margin of the hood is smooth; there is a lateral spine on the carapace, and the apex of the telson is very lightly convex. The largest *Furcilia* measures 4·5 mm.

Lat. 61° 13′ 30″ S., long. 173° 33′ E., 31. 12. 01, one *Furcilia* larva, 5 mm., apparently the same species as the following larvæ.

Lat. 63° 4′ 24″ S., long. 175° 47′ 57″ E., 1. 1. 02; numerous *Furcilia* larvæ from 4 mm. to 5·25 mm. in length, and apparently the same species as the preceding larva.

Wood Bay, 22. 2. 04, numerous small *Metanauplii* and *Calyptopis* larvæ, the largest of which measured 2 mm.

Lat. 70° 29′ 27″ S., long. 168° 51′ 46″ E., 26. 2. 04, one late *Cyrtopia* larva, 9 mm. in length, which, from its size, is probably *Euphausia superba.*

Lat. 49° 40′ S., long. 112° 18′ 30″ W., 12. 6. 04; forty-eight larvæ, from *Calyptopis* stage to post-larval form, measuring 5 mm., and probably the larvæ of *Thysanoëssa macrura.*

Order MYSIDACEA.

Family PETALOPHTHALMIDÆ, Czerniavsky.

Petalophthalmidæ, Czerniavsky, 1882.
Petalophthalmidæ, Holt and Tattersall, 1906 (2).

When defining this family Holt and Tattersall, 1906 (2), overlooked the fact that it had been established and defined, albeit rather incompletely, by Czerniavsky (1882) a quarter of a century previously. Czerniavsky, however, had no specimens of any of

the genera of the family before him, but drew up his definition from the descriptions and figures of Willemoes-Suhm (1875). He includes in the family the single type genus, *Petalophthalmus*, Will.-Suhm, with two species—*P. armiger*, Will.-Suhm, and *P. willemoesii*, a new species which he founds for the reception of the female ascribed by Suhm to *P. armiger*.

Faxon and Hansen, however, have since pointed out that the female specimen described by Will.-Suhm is in reality a *Boreomysis*, probably *B. scyphops*, G. O. Sars, so that if this latter view of its identity be adopted, *P. willemoesii* becomes a synonym of *B. scyphops*.

Czerniavsky's definition of the family is inadequate, inasmuch as no reference is made therein to the remarkable characters of the carapace, and the first and second thoracic limbs, while the importance which is given to the supposed characters of the exopods of the thoracic limbs is exaggerated, the difference in development as compared with those of the *Mysidæ* being very slight.

The definition given by Holt and Tattersall, 1906 (2), may, therefore, be adopted with some slight alteration in the characters ascribed to the eyes, rendered necessary by recent discoveries.

Examination of British specimens of *Hansenomysis fyllæ* (Hansen, 1887) has revealed the fact that eyes are, in reality, present in this species. They resemble those described below for the Antarctic species, except that the lappets are much reduced and almost obsolete.

Further, in a new species of *Petalophthalmus*, *P. oculatus*, recently defined by Illig (1906), the eyes are described as well developed, with the cornea bright brown in colour and distinctly facetted.

In the amended definition of the family, therefore, the description of the eyes would read:—*Eyes* (first cephalic appendages) small, either imperfectly developed as lamellar or spiniform organs, without visual elements, or furnished with a distinct cornea in which visual elements are clearly defined and functional.

Genus Hansenomysis, Stebbing.

Arctomysis, Hansen, 1887 (*non* Czerniavsky, 1883).
Hansenomysis, Stebbing, 1893.
Hansenomysis, Holt and Tattersall, 1906 (1 and 2); Tattersall, 1907.

The name *Arctomysis*, given to this genus by Hansen (1887), having been already used by Czerniavsky (1883) for an entirely different form, was changed to *Hansenomysis* by Stebbing (1893). *Arctomysis* Czerniavsky is itself a synonym of *Boreomysis* G. O. Sars.

Of the other three genera belonging to the *Petalophthalmidæ*—*Petalophthalmus*, *Ceratomysis* and *Scolophthalmus*, *Hansenomysis* comes nearest to the last. Both agree in having the first thoracic limbs devoid of exopods and lacking the internal lamelliform meral lobe, and in the presence of well-developed exopods to the second

thoracic limbs. Whereas, however, in *Scolophthalmus* the rostrum is prominent and the eyes are modified into sharp spiniform organs, *Hansenomysis* has the rostrum obsolete and the eyes more or less leaflike.

Males of this genus have not yet been noted, but specimens of that sex of the northern species, *H. fyllæ* (Hansen, 1887), have come into my hands. Detailed examination and description are reserved for a future occasion, but it may be mentioned here that, besides having the pleopods biramous, males also have the basal portion of the inner flagellum of the antennule considerably thickened and adorned with rings of setæ.

Hansenomysis antarctica.

(Pl. V., Figs. 1–19.)

Hansenomysis antarctica, Holt and Tattersall, 1906 (1).

Locality of capture.—Off Coulman Island, 100 fathoms, two specimens, females, 20 mm.

Form (Fig. 1) compact, rather slender, tapering considerably towards the posterior end.

Carapace (Figs. 1 and 3) short, sub-membranous, leaving the last two thoracic segments completely exposed, and part of a third visible behind its posterior emargination; anterior border produced, but very slightly, into a broadly and evenly-rounded but somewhat strongly upturned rostrum; antero-lateral angles evenly rounded and extending forwards as much as the rostrum; cervical sulcus well marked and rather deep, the posterior margin bounded by a conspicuous and rather sharp ridge formed by the carapace. Behind the cervical sulcus is a shield-shaped dorsal area, indicating the attachment of the carapace to the thorax, behind, and on either side of which the wings of the carapace are free. A slight ridge runs from the antero-lateral angles, first downwards and then posteriorly, to meet the cervical sulcus, while a shallow groove runs forward on each side from the dorsal shield-shaped area, thus marking off a hepatic area, on which is a prominent forwardly-directed spine with a broad base. A shallow depression follows the base of the rostrum, and merges on either side into the groove formed by the ridge from the antero-lateral angles. A small blunt and rounded spine is present on the gastric area.

Pleon (Fig. 1) 9 mm. in length, a little longer than the thorax, which measures 8 mm. from the eyes to the posterior margin of the last free segment; segments cylindrical, postero-lateral inferior margins not at all produced as epimera; first segment arcuate in dorsal contour, its anterior margin slightly raised above the level of that of the last thoracic segment, its posterior margin broadly produced, so as to partly cover the second segment, the whole forming a sort of "cap" over the junction of the thorax and pleon; second to fifth segments sub-equal in length and succeedingly narrower; sixth segment narrower than any of the preceding ones, and nearly twice as long.

Eyes (Figs. 1, 2 and 3) small, united at their base into a thick flattened pad, from the anterior part of which proceed two thin, short, sub-triangular, slightly-diverging lappets, which do not reach the middle of the basal joint of the antennular peduncle; visual elements entirely absent.

Antennular peduncle (Fig. 2) short and stout, its three joints sub-equal in length and quadrangular in outline; basal joint, with a single long seta on its internal distal corner, and a more or less continuous submarginal row of setæ across the anterior dorsal region; second joint with about seven long stout plumose setæ on its inner margin and two or three long setæ on the outer distal corner; third joint with about eleven long stout plumose setæ on the inner margin. On the dorsal surface of the basal joint, partly concealed by the eye in dorsal view, is an organ of rather problematical function (Figs. 2, 4 and 5). It appears to consist of a shallow depression bounded by a raised ridge marked with pigment, and overhung by a membranous flap, which apparently rises from its posterior border. The flap only imperfectly covers the depression. In the preliminary notice of this collection it was suggested that this organ might prove to be auditory in function, but under moderately high powers of the microscope no otoliths or even sensory hairs could be distinguished in the shallow pit.

Antennal peduncle longer than the antennular, and considerably more slender; distal joint shorter than the preceding.

Antennal scale (Fig. 2) lanceolate in shape, about three-and-a-half times as long as broad, apex evenly rounded, the whole of the inner margin and distal third of the outer margin setose; proximal two-thirds of the outer margin devoid of setæ, but armed with eleven strong spines, the proximal one of which is the shortest, and is situated at the end of the proximal quarter of the outer margin, the spines increasing in size distally; spine on the outer distal corner of the basal joint short, but prominent.

Mandibles (Fig. 6) with the cutting edge prominent and molar process well-developed and rather long; between the cutting edge and the molar process is a single spine-like seta, and in the left mandible a *lacinia mobilis* in addition; palp (Fig. 7) rather long and powerfully developed, terminal joint shorter than the penultimate, both joints armed on both outer and inner margin with numerous long and rather stout setæ.

First maxilla (Fig. 8) having the outer lobe much larger than the inner, and armed at its apex with about thirteen spines, behind which is a row of five plumose setæ; inner lobe armed at its tip with four long plumose setæ.

Second maxilla (Fig. 9) consisting of the usual three lobes, a two-jointed palp and outer setiferous plate, the setæ arming the appendage being numerous and rather strong.

First thoracic limb (Fig. 10) short and stout, devoid of exopod, but with well-developed epipod; third joint small; fourth joint with numerous setæ and a row of

six short stout spines on its inner margin; fifth joint with three, sixth joint two, and seventh joint four rather long, strong plumose spines on their inner margins as well as numerous setæ.

Second thoracic limbs (Fig. 11) with the endopods longer and rather more slender than the first, exopods well developed; fourth or meral joint produced internally into a large setiferous lamelliform lobe nearly as long as the fifth joint; the latter, the longest joint of the limb, longer than the combined length of the sixth and seventh joints, its outer margin armed with a single seta, the distal half of the inner margin slightly excavate with a row of eight short, closely-set plumose spines and a single long plumose seta on the emarginate portion, and a few long simple setæ, set widely apart, on the proximal portion of the inner margin; sixth joint longer than the seventh, its outer margin armed with a few long setæ, the proximal portion of the inner margin bearing a row of about nine short closely-set plumose spines and a single long plumose seta, the distal portion of the inner margin with a few long simple setæ; seventh joint small, armed with numerous long and rather stout simple setæ.

Third to fifth thoracic limbs (Fig. 12) with the endopods feeble, long and slender; sixth joint slightly longer and more slender than the fifth; seventh joint very small, forming with two strong spines a very minute chela, densely clothed with short fine setæ; the rest of the endopod armed with a few short scattered setæ.

Sixth to eighth thoracic limbs (Fig. 13) with the endopods slightly longer and stouter than those of the three preceding pairs; sixth joint shorter than the fifth; seventh joint small and bearing a long slightly-curved nail, the junction between the nail and seventh joint being indicated by a seta on the inner margin; rest of the endopod feebly armed with short setæ.

Exopods of the second to eighth thoracic limbs well-developed; basal joint long and rather narrow, the outer distal corner rounded; flagelliform part composed of from ten to thirteen joints.

Incubatory lamellæ, seven pairs, situated on the second to eighth thoracic limbs.

Pleopods (Figs. 14 to 18) in the female uniramous, the first pair small, succeeding pairs increasing in size to the fifth pair, which are slightly longer than the sixth segment of the pleon; first four pairs one-jointed; fifth pair two-jointed, the second joint longer than the first; all the pleopods bearing long setæ at the apex.

Telson (Fig. 19) rather massive, longer and a little wider than the last segment of the pleon, dorsally grooved, oblong in shape, slightly wider at the apex than at the base, its margins lightly arcuate; apex truncate or very lightly emarginate, bearing a single median spine with six or seven long spines on either side; lateral margins armed with from twenty-five to thirty fairly long spines arranged more or less in series.

Inner uropods broken in both specimens.

Outer uropods (Fig. 19) nearly twice as long as the sixth segment of the pleon, two-jointed, the terminal joint about one-seventh as long as the basal; outer margin

of the basal joint without setæ, but armed with twenty-one stout spines increasing in size posteriorly.

Length of adult and ovigerous female, 20 mm. from the eyes to the tip of the telson.

Colour of preserved specimens light brown, with a broad band of dark brown pigment across the dorsal surface of the first segment of the pleon and scattered patches of dark pigment on the lateral parts of the carapace, basal joints of the antennules and antennæ and the basal membranous pad of the eyes.

One of the specimens has young, considerably advanced in development, in the incubatory lamellæ.

In both specimens the telson is considerably damaged, and the description and figures have been drawn up from both specimens and fragments of the telsons found along with them. This fact must be borne in mind in dealing with specimens of this species which may be found by future expeditions. It was a matter of considerable surprise and no little interest to find in this collection two specimens belonging to a genus hitherto known only from a single specimen from Greenland and two taken off the cost of Ireland.

There can be no doubt that *H. antarctica* is co-generic with *H. fyllæ* (Hansen, 1887). All the distinctive characters of generic importance in the mouth parts and thoracic limbs of the latter are reproduced in *H. antarctica* down to the minutest detail. The points of difference between the two species are, however, sufficiently well-marked and numerous enough to justify specific separation. They may be pointed out as follows :—

H. antarctica is in general build a more robust and less fragile species than *H. fyllæ.*

Antennæ.—In *H. fyllæ* the terminal joint of the peduncle is longer than the penultimate, whereas in *H. antarctica* the reverse obtains.

Antennal scale.—In *H. fyllæ* the outer margin bears only five spines, between which are numerous setæ. In *H. antarctica*, on the other hand, there are eleven spines on the outer margin and no setæ between them.

Telson.—The telson in Hansen's type-specimen was broken, but so much of it as remained showed that the armature consisted of both spines and setæ. In *H. antarctica* the telson is armed with spines only, which are probably more numerous than in *H. fyllæ.* The shape of the telson in both species is also somewhat divergent. That of *H. antarctica* recalls rather markedly the telson of *Petalophthalmus armiger* as figured by Sars in the 'Challenger' Report.

Outer uropods.—H. fyllæ has the outer uropods armed with both spines and setæ, whereas in *H. antarctica* there are spines only present. The spines in *H. fyllæ* number six, while in *H. antarctica* there are twenty-one.

Pleopods.—The type specimen of *H. fyllæ* had only one pleopod remaining. This was one of the third pair, and is described by Hansen as biarticulate. Presumably,

therefore, the fourth and fifth pleopods will likewise be found to be biarticulate when perfect specimens are examined. In *H. antarctica* only the fifth pleopods are biarticulate, the remaining pairs consisting of a single joint only.

The eyes in the genus are described for the first time. They are remarkable chiefly for their small size and degenerate structure, for the complete absence of visual elements, and the subservience, either entirely or in great part, of ophthalmic functions to those of probably a tactile nature.

The cap-like form of the tergum of the first segment of the pleon recalls the somewhat similar form of the third pleon segment in many Carida, and suggests that the posterior part of the body is capable of great ventral flexure. The 'Discovery' expedition is to be congratulated on the finding of this species, by far the most interesting Schizopod in the collection.

Family MYSIDÆ.

Sub-Family Leptomysinæ, Norman.

Genus Pseudomma, G. O. Sars.

Pseudomma belgicæ.

(Plate VI., Figs. 1–8.)

Pseudomma belgicæ, Holt and Tattersall, 1906 (1).

Locality of capture.—Lat. 78° 25′ 40″ S., long. 185° 39′ 6″ E., 300 fathoms, one specimen, immature female, 23 mm.

Form (Fig. 1) compact and moderately stoutly built.

Carapace (Fig. 1) large, less than half the total length of the body, covering laterally all the segments of the thorax, but dorsally exposing the last one behind its posterior emargination; its anterior margin very slightly produced into a blunt, very broadly rounded rostrum; antero-lateral angles rounded; cervical sulcus well marked.

Pleon (Fig. 1), excluding the telson, about half the total length of the body from the eye to the tip of the telson; first four segments subequal in length and slightly longer than the fifth; sixth segment twice as long as the fifth.

Eye plates (Fig. 1) contiguous, exhibiting only a very slight anterior median cleft; each plate subquadrangular or rhomboidal in shape, nearly twice as broad as long, antero-lateral angles rounded, anterior margin nearly straight, no serrations or armature of any kind; no pigment present in preserved specimens; corneal lenses absent, but the ramifications of the optic nerve are clearly visible in dorsal view.

Antennular peduncle (Fig. 1) short and stout, not extending beyond half the length of the antennal scale; basal joint almost entirely covered by the ocular laminæ, a few plumose setæ on each anterior corner; second joint very short, more than twice as broad as long, a few short setæ on the outer distal corner, inner margin with a few longer plumose setæ; third joint longer than either of the other two and slightly

narrower, rectangular in shape, outer margin unarmed, inner margin beset with a few plumose setæ.

Antennal peduncle (Fig. 1) equal in length to the antennular, but more slender; last two joints subequal in length.

Antennal scale (Fig. 1) slightly longer than the last segment of the pleon and twice as long as the antennular peduncle, about three and a half times as long as broad, outer margin entire and terminating in a very strong spine, beyond which the apex of the scale is but slightly produced; spine on the basal joint short and acute.

Mouth parts (Figs. 2, 3, 4, and 5) exhibit no salient points of difference from those of the type species of the genus *P. roseum*, G. O. Sars.

First and second thoracic limbs (Figs. 6 and 7) agreeing in the main with those figured by Sars for *P. roseum*, but a dactylus is distinctly visible among the dense mass of plumose setæ arming the terminal joints, though it is smaller and shorter than the terminal joint; exopods having the outer distal corner of the basal joint round, though produced, and the flagelliform part composed of ten to twelve joints.

Telson (Fig. 8) slightly shorter than the last segment of the pleon, tapering to an evenly rounded apex which is one-third as wide as the base; apex armed with a median pair of plumose setæ and four pairs of strong smooth spines, the innermost and largest of which equals one-sixth of the telson in length; distal half of the lateral margins armed with five shorter spines.

Inner uropods half as long again as the telson, armed with a single long spine in the region of the inner posterior corner of the otocyst.

Outer uropods about twice as long as the telson.

Length of an immature female, 23 mm. By an error the specimen was described in the preliminary report as adult. This is scarcely correct, since the incubatory lamellæ are still only about half developed, so that the adult female probably reaches to nearly 30 mm. The specimen is badly mutilated, the third to the eighth thoracic limbs being entirely absent.

P. belgicæ is far and away the largest species of the genus yet described, none of the other ten known species exceeding 15 mm., whereas adult specimens of this species must reach to nearly 30 mm. It is most nearly related to *P. sarsi* Will.-Suhm, described by Sars (1885) from the 'Challenger' collections for specimens taken at Kerguelen Island. Besides the great difference in size (*P. sarsi* measures only 14 mm., adult specimens), the only other conspicuous difference is in the ocular laminæ. In *P. sarsi* the antero-lateral angles of the eye-plates are serrate, whereas in *P. belgicæ* they are quite smooth. Minor differences in the shape of the antennal scale and telson may also be noted. The antennal scale in *P. sarsi* has the spine terminating the outer margin less strong than in *P. belgicæ*, while the apex of the scale is more produced. The telson in *P. sarsi* has the apex more truncate than *P. belgicæ* and the lateral margins, according to Sars, bear eight short spines. Mr. Holt, however, who has kindly examined the types of *P. sarsi* in the British

Museum, informs me that only five spines are present on the lateral margins, so that the armature of the telson of *P. sarsi* approximates closely to that of *P. belgicæ*.

The only other species of *Pseudomma* having smooth ocular laminæ is *P. australe*, G. O. Sars (1885), from Bass Straits, Australia. The vastly different form of the antennal scale in the latter, however, abundantly distinguishes it from *P. belgicæ*.

Besides the single 'Discovery' specimen, this species is also known from the 'Belgica' collections, and has been described by Hansen in MS. under the name which is here used. It is possible that the mutilated specimen noted by Sars (1885, p. 191) from 1675 fathoms in the Antarctic Ocean may have belonged to this species rather than to *P. sarsi*. Sars notes that it was much larger than the latter.

Genus Dactylamblyops, Holt and Tattersall.

Da tylamblyops, Holt and Tattersall, 1906 (1).
Dactylerythrops, Illig, 1906, *non* Holt and Tattersall, 1905.
? *Amblyops* (*pars*), Ohlin, 1901.
Da tylamblyops, Tattersall, 1907.

This genus was established for the reception of the single rather mutilated specimen of *D. hodgsoni* in the present collection. Since the publication of the preliminary notice of the 'Discovery' Schizopoda, however, two closely allied species have been discovered off the west coast of Ireland (Tattersall, 1907). A clearer idea of the exact relationships of the genus has thus been gained, and while the species referred thereto appear, in the present state of our knowledge, to form a natural group, it is undeniably very nearly allied to *Dactylerythrops*, Holt and Tattersall (1905), to which genus, indeed, the present species was referred by Illig (1906).

The definition of the genus given by Holt and Tattersall, 1906 (1), may therefore be amended as follows:—

Dactylamblyops, Holt and Tattersall.

Characters generally as in *Amblyops*, G. O. Sars, except:—

Eyes placed close together, but not contiguous, more or less pyriform in shape, furnished with distinct and definite peduncles; visual elements imperfectly developed, numerous, reaching to the surface of the eye, and probably directly functional as organs of sight; outer distal corner rounded, and not produced into a digitiform process; a short blunt process always present on the inner and upper surface.

Second thoracic limbs with the endopods not noticeably short, but well developed, and considerably longer than the endopods of the first thoracic limbs.

Telson not very long, triangular in shape, the distal parts of its margins armed with more or fewer spines; median setæ absent.

Type species, *D. hodgsoni*, Holt and Tattersall.

The absence of median setæ from the apex of the telson is not necessarily of generic importance, since the genera *Pseudomma* and *Dactylerythrops* both contain species in some of which these setæ are present, and others in which they are wanting. As, however, all three species at present referred to this genus are without median apical setæ, it is convenient to retain this character in the generic definition.

Dactylamblyops hodgsoni.

(Pl. VI., Figs. 9–16.)

Dactylamblyops hodgsoni, Holt and Tattersall, 1906 (1).
Dactylerythrops arcuata, Illig, 1906.

Locality of capture:—Lat. 66° 52′ 09″ S., long. 178° 08′ 15″ E., 2030 fathoms, one specimen, male, 13 mm.

The single specimen in the collection is considerably damaged, the antennules, antennal scales, and the third to the eighth thoracic limbs being missing. A complete description is therefore not possible, but it is hoped that as many of the characters as can be made out with certainty will suffice for future recognition of the species in collections.

Carapace submembranaceous, covering all the thoracic segments except the last one, anterior margin produced into a blunt, broadly but evenly rounded rostrum projecting between the eyes; cervical sulcus well marked; antero-lateral angles rounded.

Pleon slightly longer than the carapace; first five segments subequal in length; sixth nearly twice as long as the fifth.

Eyes (Fig. 9) small, placed on definite peduncles, not in any way contiguous, pyriform in shape, external angle evenly rounded, a short digitate process arising from the inner dorsal face; visual elements imperfectly developed, apparently represented by numerous minute granular bodies with a refractive centre; a large opaque ganglionic mass, probably the optic nerve, visible in the peduncle, from which a nerve fibre proceeds to the cornea.

Antennal peduncle short, composed of three subequal quadrangular joints.

Antennal scale broken on both sides, but there does not appear to be a spine on the outer corner of the basal joint.

Mouth parts (Figs. 10–13) not differing markedly from those figured by Sars for *Amblyops abbreviata* (1870–79).

First thoracic limbs (Fig. 14) with the endopod substantially of the same form as in *A. abbreviata.*

Second thoracic limbs (Fig. 15) of essentially the same structure as in *A. abbreviata*, but with the endopod apparently much longer, being nearly twice as long as the endopod of the first thoracic limbs.

Genital appendix to the last thoracic limbs of the male terminating in two lobes, the larger of which bears six long setæ, the smaller one being devoid of setæ, but apparently having a covering of very fine hairs.

Pleopods in the male agreeing in all points with those of males of the genus *Amblyops*.

Telson (Fig. 16) not quite as long as the last segment of the pleon, triangular in shape, tapering evenly to a narrowly rounded apex, nearly twice as long as broad at its base; distal half of each lateral margin armed with nineteen spines, increasing in length towards the apex, the terminal ones about one-tenth of the total length of the telson; median setæ absent.

Uropods broken on both sides, but the inner one possesses a single strong spine on the ventral surface at the inner posterior angle of the otocyst.

Length of the single specimen, an apparently adult male, 13 mm.

There can be little doubt, I think, that *Dactylerythrops arcuata*, Illig (1906), is the same species as the present one. Minor differences, it is true, are to be noticed. For instance, the visual elements of the eye in Illig's species are represented as larger and less numerous than in *D. hodgsoni*. It may be that in the former preservation has caused the visual elements to mass in groups of more or fewer lenses, since in the 'Discovery' specimen, as the figure (Fig. 9) shows, the visual elements are not regularly arranged, but more numerous in some places than others, an effect probably due to the mode of preservation.

Moreover, in *D. arcuata*, the telson is not quite so long compared with the breadth at its base as in *D. hodgsoni*, and is furnished with only eighteen spines on each lateral margin. But these differences are insignificant when compared with the general agreement between the two species in most points. One or two characters may be added to the above diagnosis from Illig's description and figures.

Antennular peduncle long and rather stout, last joint the largest and nearly equal to the combined length of the other two.

Antennal scale slightly over-reaching the antennular peduncle, about four times as long as broad, outer margin entire, and terminating in a short spine beyond which the apex of the scale is only slightly produced.

Four species of this genus are now known, *D. sarsi* (Ohlin, 1901), *D. thaumatops* and *D. goniops*, Tattersall (1907), and the present species.

From the other three species, *D. hodgsoni* is at once distinguished by the shape of the eye. In *D. sarsi* the eye is acutely pointed in front; in *D. thaumatops* it is of quite peculiar form, with an outer equatorial membranous ridge, while in *D. goniops* the eye is quadrangular rather than pyriform in shape. Otherwise the four species are rather closely allied and form quite a distinct generic group to themselves.

D. hodgsoni is at present only known from very deep water in the Antarctic Ocean. Illig's specimens were collected over a depth of 4000–5000 metres, while the present specimen was dredged in 2030 fathoms (*ca.* 3700 metres).

Sub-Family Mysidetinæ, Holt and Tattersall.

Genus Mysidetes, Holt and Tattersall.

? *Mysidopsis*, G. O. Sars, 1883 and 1885, *non* G. O. Sars, 1864.
Mysideis (*pars*), Holt and Tattersall, 1905, *non* G. O. Sars, 1869.
Mysidetes, Holt and Tattersall, 1906 (1) and (2).
Metamysidella, Illig, 1906.

A full diagnosis of this genus and a statement of its possible affinities have already appeared, Holt and Tattersall (1906 (2)). While agreeing in most characters with the normal genera of the *Leptomysinæ*, the rudimentary nature of the pleopods of the male offers a feature of sharp distinction from members of that sub-family and has necessitated the establishment of a new sub-family for its reception. In the form of the telson and armature of the inner uropods it approaches rather closely to the genera *Heteromysis* and *Mysidella*, but whereas in the former the third, and in the latter the first, thoracic limbs are peculiarly modified and strongly armed, in *Mysidetes* both these limbs are of normal structure. The external resemblance of females of the present genus to those of *Mysidopsis* and *Mysideis* has already been noted, and a comparative table of their respective characters was given (Holt and Tattersall 1906 (2)). It will suffice here to mention that *Mysidetes* differs from *Mysidopsis*, (1) in having a well-developed molar tubercle to the mandible; (2) in the presence of a setiferous expansion of the inner margin of the basal part of the second maxilla, and (3) in having the endopods of the first thoracic limbs seven-jointed instead of six.

From *Mysideis* it is distinguished by having the endopods of the first and second thoracic limbs of normal stoutness and usual armature, instead of being unusually massive and strongly armed; while from both genera it differs, (1) in having the cleft of the telson armed with spines; (2) in the uropods having a row of spines in their inner edges extending well over half-way down their length, and finally, (3) in having the pleopods of the male rudimentary.

Mysidopsis incisa, G. O. Sars (1885), probably belongs to this genus. It was described in the 'Challenger' Report from a specimen taken off Australia. This specimen is a female much mutilated, and dissection was neither practicable nor desirable. The telson and inner uropods, however, conform to the type found in *Mysidetes*.

The genus *Metamysidella* (Illig, 1906) is undoubtedly synonymous with this genus, though no mention is made in the diagnosis of the character of the pleopods of the male. In all other features the two genera agree absolutely.

Mysidetes posthon.

(Pl. VII., Figs. 1–13.)

Mysidetes posthon, Holt and Tattersall, 1906 (1).

Localities of captures:—Off Coulman Island, 100 fathoms, one specimen, male, 25 mm.

Winter Quarters, 5. 6. 02. 56 fathoms, one specimen, female, 23 mm.

Winter Quarters, 29. 8. 03. No. 12 Hole, 25–30 fathoms, three specimens, two females and one male, 21 mm.

General form (Fig. 1) compact and moderately robust.

Carapace (Fig. 1) leaving the last segment of the thorax exposed posteriorly; antero-lateral margins produced into a short obtuse rostrum not extending beyond the eyestalks; antero-lateral corners rounded, cervical sulcus well marked.

Pleon (Fig. 1) longer than the carapace; first five segments sub-equal in length; sixth segment about once and a half to twice as long as the fifth.

Eyes (Fig. 1), large, globose; pigment brown.

Antennular peduncle (Fig. 2) much shorter than the antennal scale; basal joint longer than the terminal joint, and having its outer corner produced beyond the distal extremity of the second joint, the produced part tipped with four or five long setæ; second joint small; third joint almost square in shape; antennular brush in the male rather small and feebly hirsute.

Antennal peduncle (Fig. 3) slightly shorter and more slender than the antennular, and little more than half as long as the scale; third joint shorter than the second.

Antennal scale (Fig. 3), lanceolate in shape; between four and five times as long as broad; setose all round; a minute second joint at the apex; a spine on the outer distal corner of the basal joint.

Mandibles (Fig. 4) with a well-developed molar process and cutting edge; palp (Fig. 5) with the second joint somewhat expanded and armed with long setæ on both margins; third joint not much expanded, a row of strong plumose setæ on the lower edge, and two very strong simple spine-like setæ at the tip.

Second maxillae (Fig. 7) with the setiferous expansion of the basal joint well developed.

Endopods of the first thoracic limbs (Fig. 8) of about the same build as in the genus *Mysidopsis*, but seven-jointed; masticatory lobe well developed; inner margins of the proximal four joints armed with numerous plumose setæ; sixth joint bearing a well-developed nail and beset with numerous plumose setæ.

Endopods of the second thoracic limbs (Fig. 9) very similar to those of *Mysidopsis*; longer than the first; sixth joint armed with numerous plumose setæ, but in the specimen dissected I was unable to detect a nail, though it may have been broken off.

Endopods of the third thoracic limbs (Fig. 10) with the merus longer than the tarsus; latter composed of six joints; nail well developed and longer than the last joint of the tarsus.

Endopods of the remaining thoracic limbs become successively longer and more slender from the fourth to the eighth; the increase in length takes place chiefly in the ischial joint; the number of joints in the tarsus of the endopods also increases in the more posterior limbs; in one specimen there were six joints in the tarsus of the third limb, six in the tarsus of the fourth, ten in the tarsus of the seventh, and twelve in the tarsus of the last limb.

Genital appendix (Fig. 11) on the last thoracic limb of the male exceedingly long and slender, equal in length to the first three joints of the limb to which it is attached.

Pleopods (Fig. 12) similar in both sexes, consisting of a single ramus bearing proximally and externally a rather large process tipped with setæ.

Telson (Fig. 13) a little longer than the last segment of the pleon, and more than twice as long as broad at its base; cleft at the apex for nearly a quarter of its length, cleft rather wide, its margins armed with about eighteen teeth on each side; the apex of each lobe of the cleft armed with a pair of spines, the inner one the shorter; lateral margins armed throughout their whole length with about seventy spines, which become arranged in series towards the apex.

Inner uropods slightly longer than the telson, with a row of moderately slender and long spines on its inner ventral margin, varying in number from twenty-six to twenty-eight, and extending from the otocyst to near the apex; spines not arranged in series, but increasing in size distally. In some specimens the spines extend further down the uropod than in others.

Outer uropods about half as long again as the inner.

Length of an adult female with embryos in the brood pouch, 21 mm.; of an apparently adult male, 25 mm. A second female with embryos in the brood pouch measured 23 mm.

It is not a little interesting that this genus should have been discovered almost simultaneously in the northern and southern hemispheres, *M. farrani*, Holt and Tattersall (1906 (2)) having just been described when the 'Discovery' collections came to hand.

M. posthon is a more stoutly built form than *M. farrani*, and is further distinguished from the latter in the following characters:—

Antennules.—*M. farrani* has not the outer corner of the basal joint of the peduncle produced nearly as much as in *M. posthon.*

Thoracic limbs.—The tarsus of the endopods in *M. posthon* is composed of six to twelve joints, while in *M. farrani* there are only four.

Genital appendix to the last thoracic limb of the male is much longer and more slender in *M. posthon* than in *M. farrani.*

Pleopods.—The lateral lobe is less developed in *M. farrani* than in *M. posthon.*

Telson.—In *M. farrani* the cleft is armed with only about thirteen spines, whereas in *M. posthon* there are about thirty-six. In the former, moreover, the lateral margins of the telson are armed with not more than twenty-six spines, not arranged in series, and situated only on the distal two-thirds of the margin. In *M. posthon* the lateral margins are armed throughout the entire length with about seventy spines, arranged, at any rate, distally in series. The whole telson in *M. farrani* is more slender than in *M. posthon.*

The spines on the inner uropods of *M. posthon* appear to be somewhat longer than in *M. farrani.* I have already expressed the opinion that the genus *Metamysidella* of Illig is synonymous with *Mysidetes.* The type species of the former, *M. kerguelensis,* Illig (1906), is, however, a much smaller species than *M. posthon,* measuring only 10 mm. in length. It is otherwise closely allied to the latter, but differs in having the antennular peduncle almost equal in length to the antennal scale and in the details of the armature of the telson.

If *Mysidopsis incisa,* G. O. Sars (1885), should in future be found referable to the genus *Mysidetes,* as seems probable, it differs from the present species in size, in having fewer joints in the tarsus of the thoracic limbs, and in the details of the armature of the telson.

I should mention here that I do not attach too great an importance to the difference in size between *M. kerguelensis* and *Mysidopsis incisa* as compared with *M. posthon* as a specific character, for I have found both males and females of *M. farrani* quite sexually mature at 15 mm. (judging from the characters of the antennular brush in the male and the incubatory lamellæ in the female), while the species, fully grown, reaches to 28 mm. in total length.

Sub-Family Mysinæ.

Genus Antarctomysis, Coutière.

Mysis, Holt and Tattersall, 1906 (1).
Antarctomysis, Coutière, 1906.

This genus has been recently established by Coutière for the reception of the species briefly noted as *Mysis maxima,* Hansen (MS.), in the preliminary notice of this collection.

There can be little doubt as to the correctness of the reasons which have led to its formation, since the biramous character of the fifth pair of pleopods in the male offers a character of undoubted generic value, as distinguishing *Mysis maxima* from the genus *Mysis* (*sens. stricto*). The genus *Hemimysis* has the fifth pair of pleopods in the male biramous and natatory, but the third pair are only imperfectly biramous, the outer ramus being very minute and single-jointed, whereas in *Antarctomysis* the third pair resemble the fifth in having both rami multiarticulate and setose.

I became aware, only after the plates illustrating this report had been printed, that the two specimens of *Antarctomysis* in the 'Discovery' collections, referred in the preliminary note to one species *A. maxima*, in reality belong to two distinct but very closely allied species. On my appealing to Dr. Hansen, he very kindly sent me some notes and sketches of *A. maxima*, and a second species of the genus discovered by him in a collection which he is engaged in working out. These notes and drawings placed the matter beyond doubt, the larger of my two specimens clearly belonging to Hansen's second species. I note the species here, and give the points of distinction, but leave a full description and name to Dr. Hansen. The drawing on Pl. VIII., Fig. 1, was taken from the real *A. maxima*, but the remaining figures on the plate represent the appendages of the second species, which, at the time, I took to be *A. maxima* also. They will probably be of use, however, in illustrating how closely allied the two species are when they are compared with the figures given by Coutière (1906) of the true *A. maxima*.

Antarctomysis maxima.

(Pl. VIII., Fig. 1.)

Mysis maxima (*pars*), Holt and Tattersall, 1906 (1).
Antarctomysis maxima, Coutière, 1906.

Locality of capture.—Winter quarters, 5. 6. 02, D-net hole, 56 fathoms, one specimen, immature male, 33 mm.

Coutière (1906) has recently described this species in great detail from mature examples collected by the French Antarctic Expedition. I have practically nothing to add to his description, but since no figure of the entire animal was given by him, my drawing on Pl. VIII., Fig. 1 may be useful.

Coutière does not mention the spines arming the inner ventral edge of the inner uropod. They extend from the posterior inner corner of the otocyst to the extreme tip of the uropod, and posteriorly, at least, are arranged in series of twos, threes and occasionally fours. The species would appear to be circumpolar in distribution, since, besides the single specimen in the 'Discovery' collection, it has been taken by the French, Swedish and Belgian Antarctic expeditions; by the two former, in considerable numbers.

Antarctomysis sp.

(Pl. VIII., Figs. 2–12.)

Mysis maxima (*pars*), Holt and Tattersall, 1906 (1).

Locality of capture:—Lat. 78° 25′ 40″ S., long. 185° 39′ 6″ E., 300 fathoms, one specimen, immature male, 40 mm.

This species is so closely allied to *A. maxima* that I only became aware that it was distinct when too late to properly illustrate it. The figures 2–12 on Plate VIII. were taken from the appendages of this specimen.

The species will be fully described and named by Dr. Hansen, so here I will merely note the points of distinction between it and *A. maxima.*

(1) *Eye.*—In *A. maxima* (Pl. VIII., fig. 1) the eye is large and the visual elements occupy a large part of the outer side of the eye-stalk, so that in dorsal view the inner eye-stalk proper is much longer than the outer, and in external lateral view very little of the latter is visible. In the present form the eye is smaller and narrower than in *A. maxima,* the visual elements occupy the terminal part of the eye-stalk only, so that the inner and outer margins of the latter are subequal in length, and in external lateral view practically the whole of the eye-stalk is visible.

(2) *Rostrum.*—In *A. maxima* the angle contained by the antero-lateral margins of the carapace which form the rostrum is equal to or slightly greater than a right angle, so that in lateral view the antero-lateral margins are not very oblique. The tip of the rostrum is produced into a very small spine.

In the new species the angle of the rostrum is considerably less than a right angle, so that the antero-lateral margins of the carapace in lateral view are very oblique. The apex of the rostrum is bluntly rounded.

(3) *Antenna.*—In *A. maxima* the basal joint of the antenna, from which the antennal scale and peduncle arise, bears two spines ventrally, one at each of the outer and inner distal corners. In the new form, only the one on the outer distal corner is present, the inner corner being rounded.

(4) In *A. maxima* the tarsus of the third to the eighth thoracic limbs is seven to eight-jointed (excluding the nail); in the present species the tarsus is six to seven-jointed, so that the two distal joints before the nail are proportionately longer than in *A. maxima* (*cf.* Pl. VIII., Fig. 8, with Coutière (1906), Pl. I., Fig. 11).

In other characters the two species are practically identical.

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EXPLANATION OF THE PLATES.

PLATE I.

Euphausia superba.

FIG. 1.—Male, 45 mm., dorsal view of anterior end × 10.
FIG. 2.—Female, 45 mm., dorsal view of anterior end × 10.
FIG. 3.—"*Glacialis*" stage, dorsal view of anterior end × 15.
FIG. 4.—Late Cyrtopia stage, dorsal view of anterior end × 30.
FIG. 5.—Mandibular palp × 13.
FIG. 6.—Second maxilla × 13.
FIG. 7.—First maxilla × 13.
FIG. 8.—First thoracic limb, endopod × 9.
FIG. 9.—Second thoracic limb, endopod × 9.
FIG. 10.—Lateral spine on carapace of female, 50 mm. × 30.
FIG. 11.—Lateral spine on carapace of male, 45 mm. × 30.
FIG. 12.—Lateral spine on carapace of male, 39 mm. × 30.

PLATE II.

Euphausia crystallorophias.

FIG. 1.—Male, lateral view of entire animal × 6.
FIG. 2.—Female, dorsal view of anterior end × 15.
FIG. 3.—Mandibular palp × 30.
FIG. 4.—First maxilla × 30.
FIG. 5.—Second maxilla × 30.
FIG. 6.—First thoracic limb × 20.
FIG. 7.—Second thoracic limb, endopod × 20.
FIG. 8.—Calyptopis larva × 40.
FIG. 9.—Furcilia larva × 20.
FIG. 10.—Cyrtopia larva × 20.

PLATE III.

Thysanöessa macrura.

FIG. 1.—Female, 28 mm., lateral view × 6.
FIG. 2.—Female, dorsal view of anterior end × 10.
FIG. 3.—Antennal scale and peduncle × 15.
FIG. 4.—Mandibular palp × 30.
FIG. 5.—First maxilla × 30.
FIG. 6.—Second maxilla × 30.
FIG. 7.—First thoracic limb, endopod × 30.
FIG. 8.—Second thoracic limb, endopod × 15.
FIG. 9.—Seventh thoracic limb, endopod × 30.
FIG. 10.—Rudimentary eighth thoracic limb × 60.
FIG. 11.—Endopod of the first pleopod of the male × 60.
FIG. 12.—Endopod of the second pleopod of the male × 60.

PLATE IV.

Euphausia triacantha.

FIG. 1.—Male, lateral view × 6.
FIG. 2.—Male, dorsal view of anterior end × 20.
FIG. 3.—Inner lobe of the endopod of the first pleopods of the male to show copulatory apparatus × 80.

Euphausia vallentini.

FIG. 4.—Outline of antennular peduncle of 'Discovery' specimen × 20.
FIG. 5.—Outline of rostrum and basal joint of antennular peduncle of 'Challenger' specimen × 30.
FIG. 6.—Inner lobe of the endopod of the first pleopods of the male in 'Challenger' specimen, to show copulatory apparatus × 80.

Euphausia sp, juv.

FIG. 7.—Dorsal view of anterior end of specimen, 10 mm. × 60.
FIG. 8.—Lateral view of antennular peduncle of the same specimen × 60.
FIG. 9.—Spine on the third segment of the pleon of the same specimen × 20.

Euphausia crystallorophias.

FIG. 10.—Inner lobe of the endopod of the first pleopods of the male, to show copulatory apparatus × 80.

PLATE V.

Hansenomysis antarctica.

FIG. 1.—Female, dorsal view × 10.
FIG. 2.—Enlarged view of anterior end × 23.
FIG. 3.—Side view of anterior end × 23.
FIG. 4.—Dorsal view of peculiar antennular organ × 70.
FIG. 5.—Side view of same × 70.
FIG. 6.—Mandible × 20.
FIG. 7.—Mandibular palp × 20.
FIG. 8.—First maxilla × 20.
FIG. 9.—Second maxilla × 20.
FIG. 10.—First thoracic limb × 20.
FIG. 11.—Second thoracic limb, endopod × 10.
FIG. 12.—Third thoracic limb, endopod × 10.
FIG. 13.—Sixth thoracic limb, endopod × 10.
FIG. 14.—First pleopod × 20.
FIG. 15.—Second pleopod × 20.
FIG. 16.—Third pleopod × 20.
FIG. 17.—Fourth pleopod × 20.
FIG. 18.—Fifth pleopod × 20.
FIG. 19.—Telson and uropods × 20.

PLATE VI.

Pseudomma belgicae.

FIG. 1.—Female, dorsal view × 10.
FIG. 2.—Mandible × 30.
FIG. 3.—Mandibular palp × 30.
FIG. 4.—First maxilla × 30.
FIG. 5.—Second maxilla × 30.
FIG. 6.—First thoracic limb, endopod × 13.
FIG. 7.—Second thoracic limb, endopod × 13.
FIG. 8.—Telson × 20.

Dactylamblyops hodgsoni.

FIG. 9.—Eye, external lateral view × 20.
FIG. 10.—Mandible × 40.
FIG. 11.—Mandibular palp × 40.
FIG. 12.—First maxilla × 40.
FIG. 13.—Second maxilla × 40.
FIG. 14.—First thoracic limb, endopod × 27.
FIG. 15.—Second thoracic limb, endopod × 27.
FIG. 16.—Telson × 20.

PLATE VII.

Mysidetes posthon.

FIG. 1.—Female, dorsal view × 13.
FIG. 2.—Antennular peduncle × 18.
FIG. 3.—Antennal peduncle with antennal scale × 18.
FIG. 4.—Mandible × 18.
FIG. 5.—Mandibular palp × 18.
FIG. 6.—First maxilla × 18.
FIG. 7.—Second maxilla × 18.
FIG. 8.—First thoracic limb, endopod × 18.
FIG. 9.—Second thoracic limb, endopod × 18.
FIG. 10.—Third thoracic limb, endopod × 18.
FIG. 11.—Genital appendix of male × 18.
FIG. 12.—First pleopod × 24.
FIG. 13.—Telson × 18.

PLATE VIII.

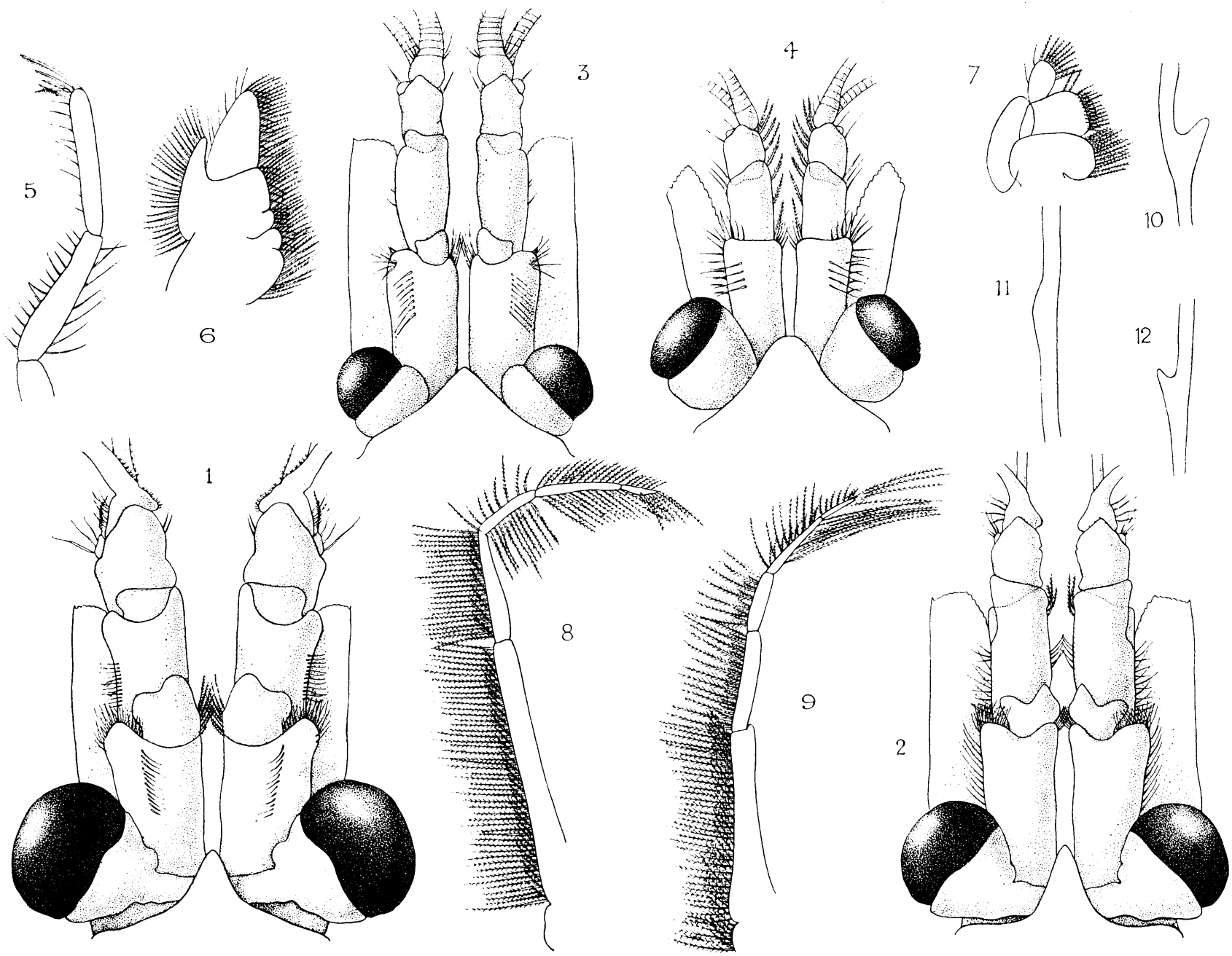
Antarctomysis maxima.

FIG. 1.—Immature male, dorsal view × 6.

Antarctomysis sp.

FIG. 2.—Mandible × 20.
FIG. 3.—Mandibular palp × 20.
FIG. 4.—First maxilla × 20.
FIG. 5.—Second maxilla × 20.
FIG. 6.—First thoracic limb, endopod × 8.
FIG. 7.—Second thoracic limb, endopod × 8.
FIG. 8.—Third thoracic limb × 8.
FIG. 9.—Second pleopod of the male (immature) × 15.
FIG. 10.—Third pleopod of the male (immature) × 15.
FIG. 11.—Fourth pleopod of the male (immature) × 15.
FIG. 12.—Fifth pleopod of the male (immature) × 15.

INDEX OF GENERA AND SPECIES.



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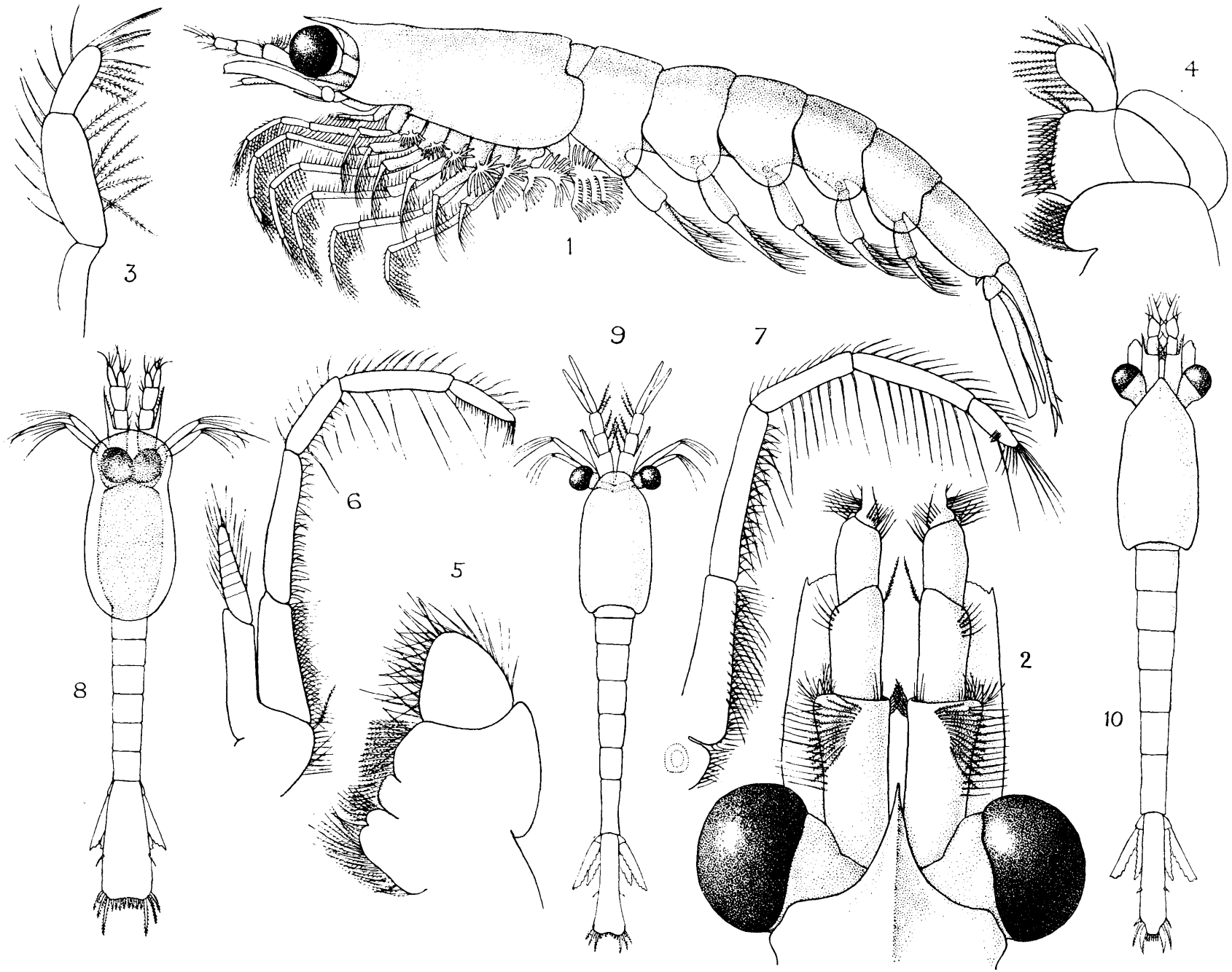
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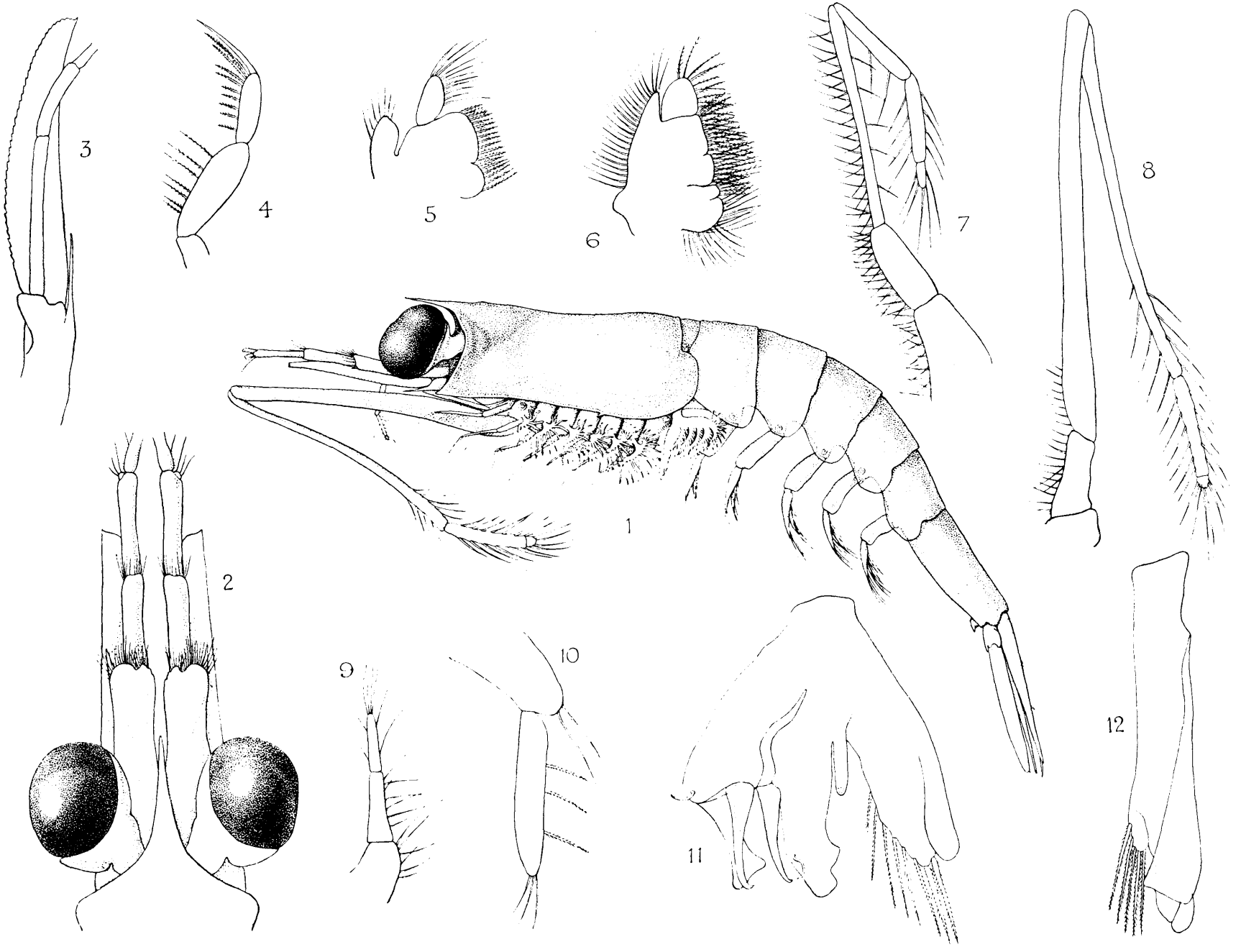

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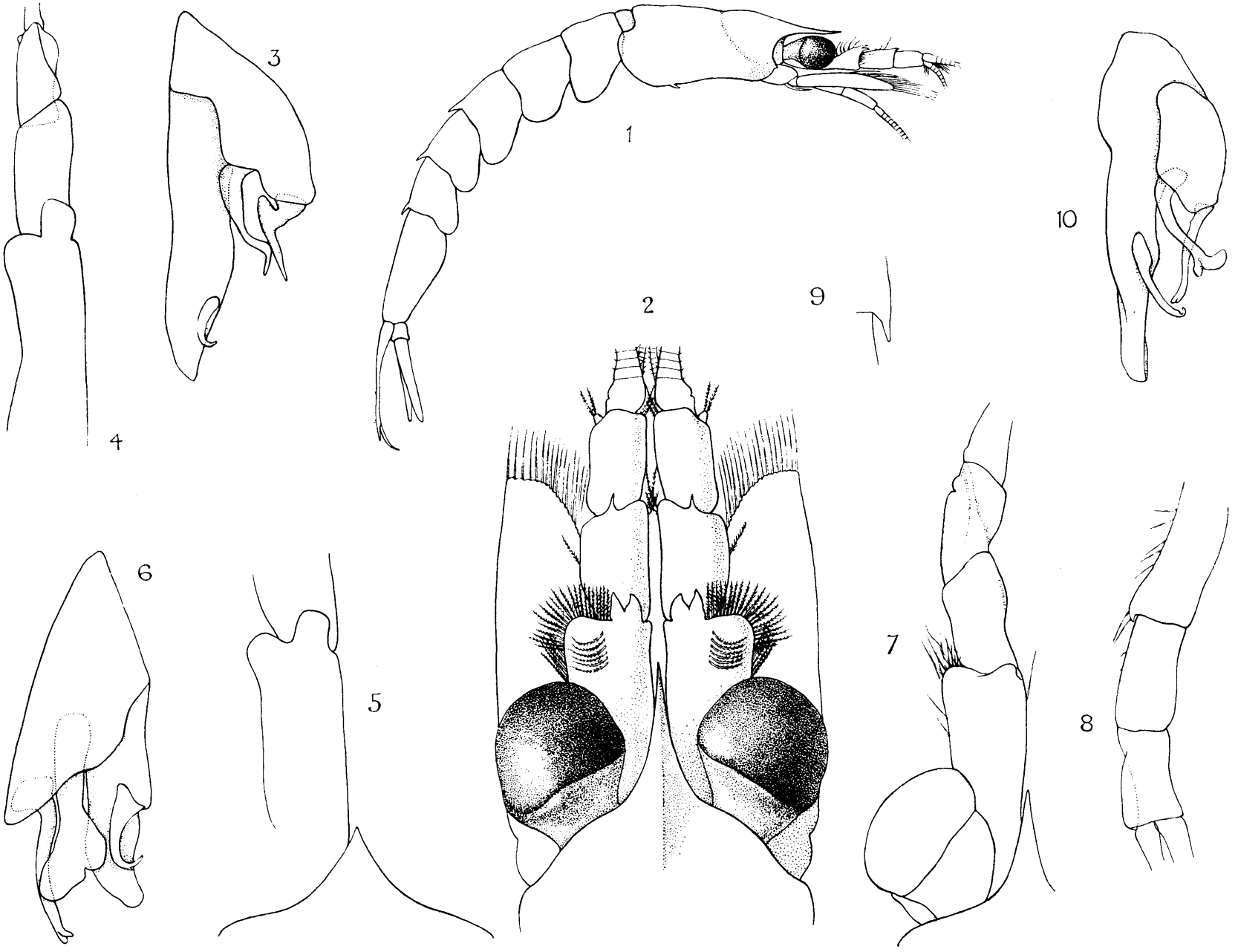
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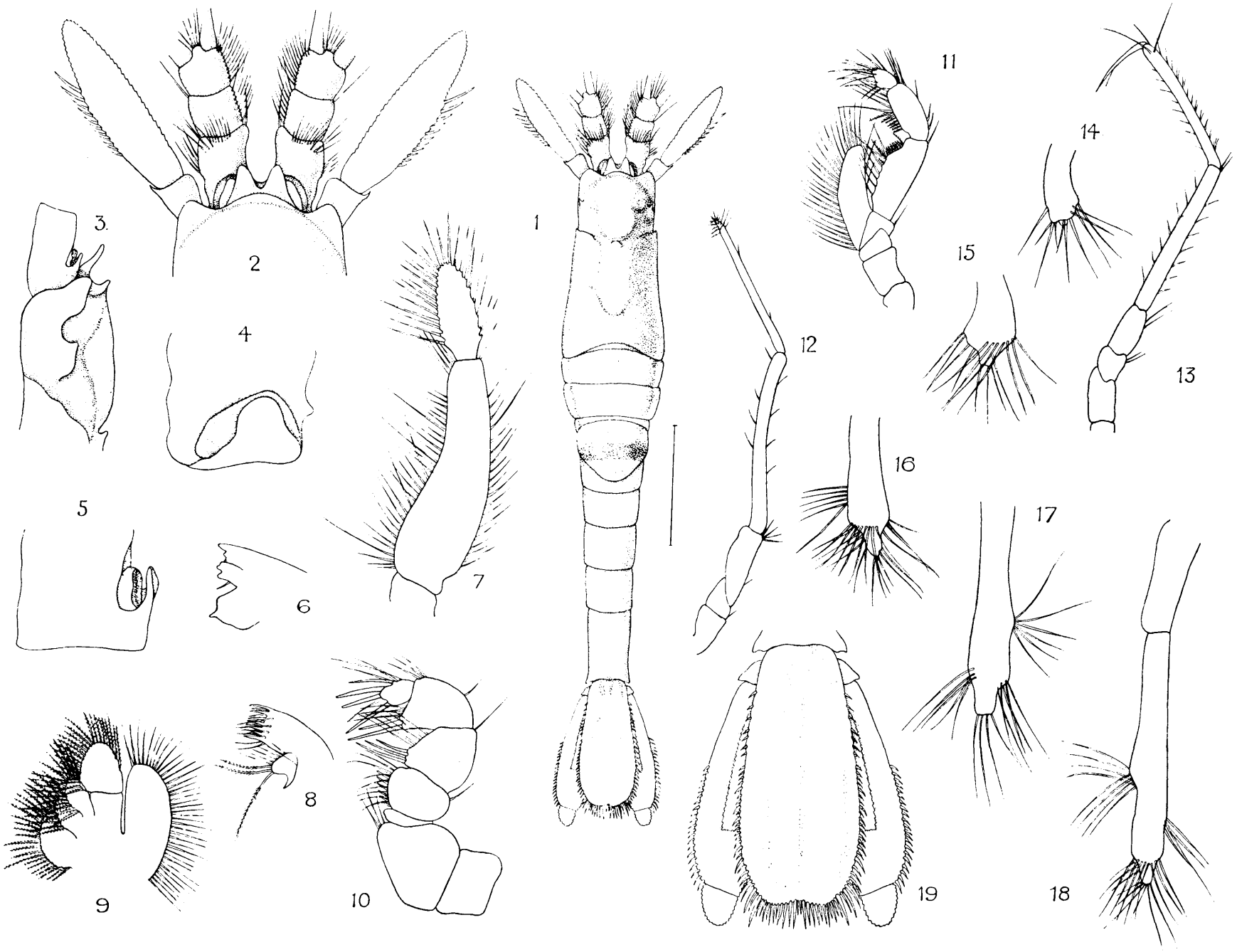

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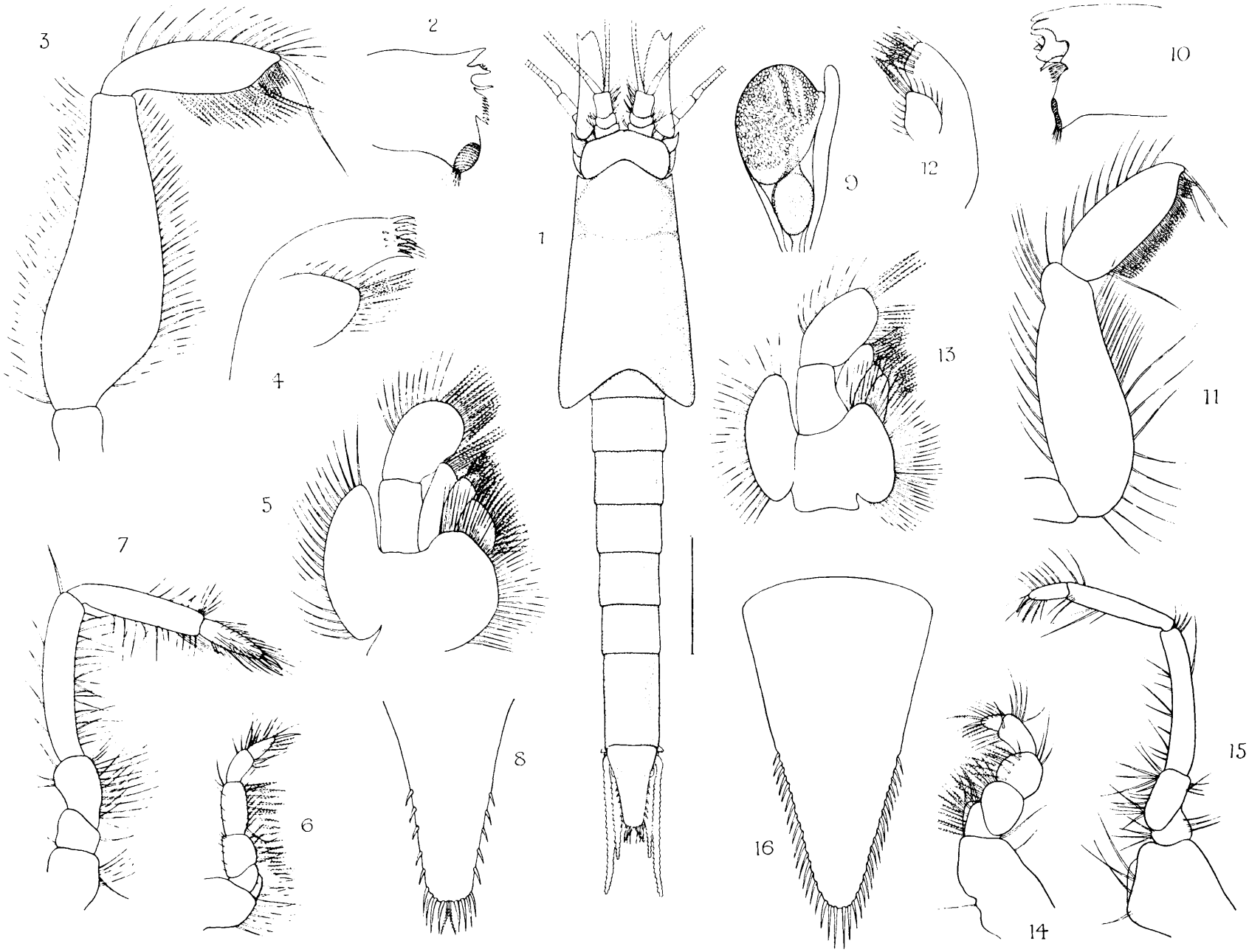

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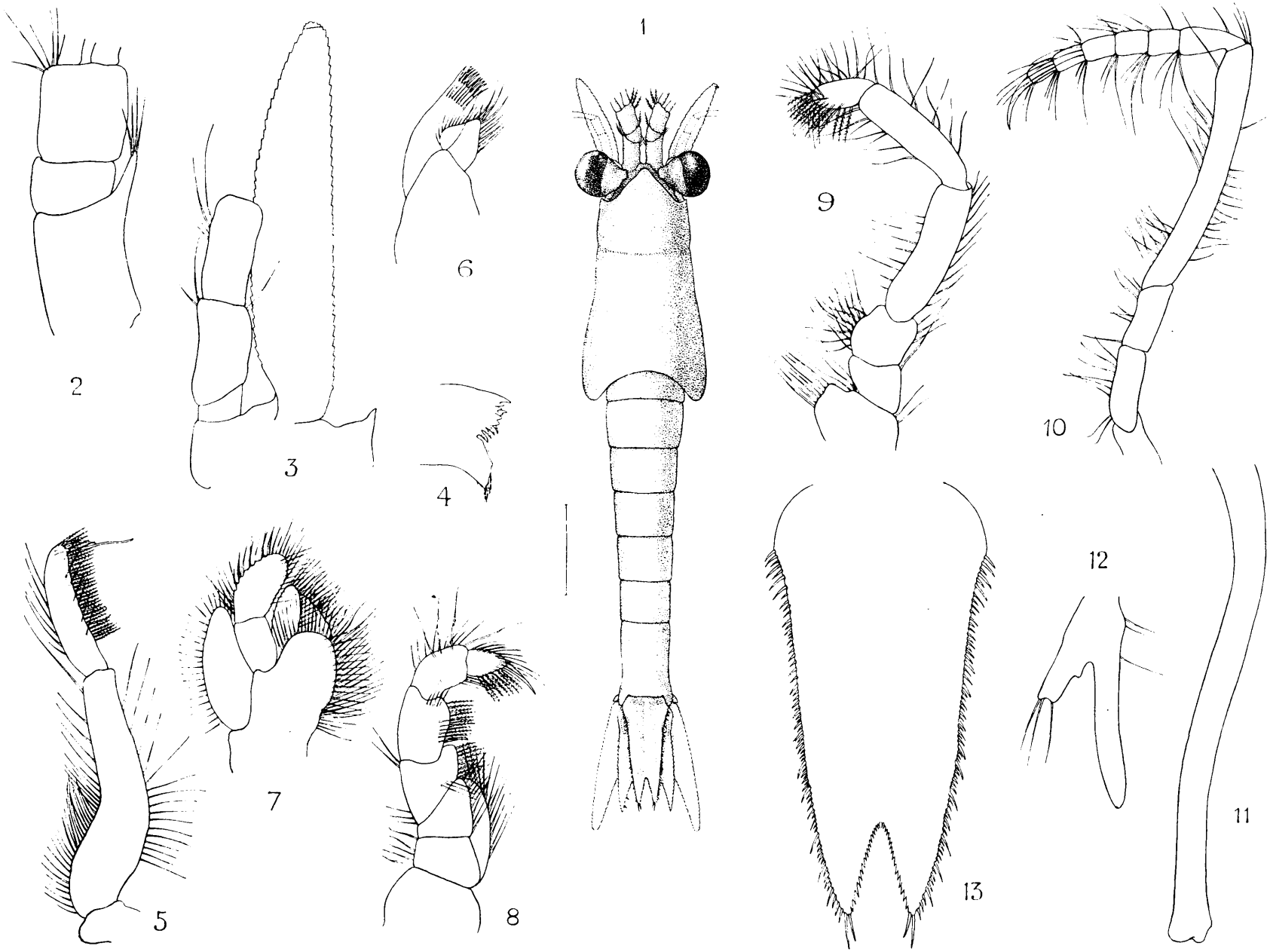
Figs. 1-8. Pseudomma belgicae. Figs. 9-16. Dactylamblyops hodgsoni.



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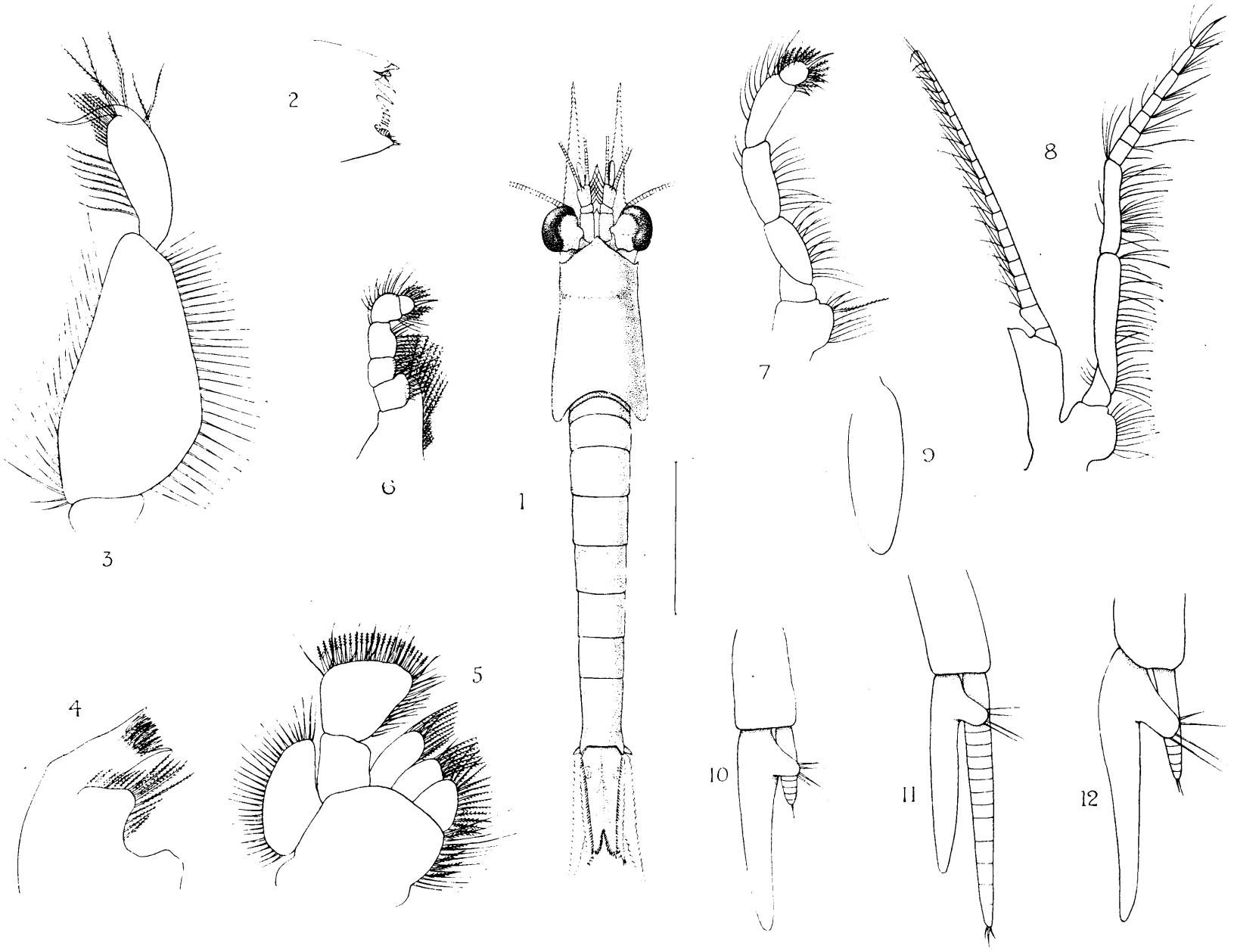

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Fig. 1. Antarctomysis maxima.

Figs. 2-12. Antarctomysis sp.