THE

VOYAGE OF H.M.S. CHALLENGER.

ZOOLOGY—VOL. XVII.

REPORT

ON THE

SCIENTIFIC RESULTS

OF THE

VOYAGE OF H.M.S. CHALLENGER

DURING THE YEARS 1873-76

UNDER THE COMMAND OF

CAPTAIN GEORGE S. NARES, R.N., F.R.S.

AND THE LATE

CAPTAIN FRANK TOURLE THOMSON, R.N.

PREPARED UNDER THE SUPERINTENDENCE OF

THE LATE

Sir C. WYVILLE THOMSON, Knt., F.R.S., &c.

REGIUS PROFESSOR OF NATURAL HISTORY IN THE UNIVERSITY OF EDINBURGH

DIRECTOR OF THE CIVILIAN SCIENTIFIC STAFF ON BOARD

AND NOW OF

JOHN MURRAY

ONE OF THE NATURALISTS OF THE EXPEDITION

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CONTENTS.

EDITORIAL NOTES.

This Volume contains Parts XLVIII., XLIX., and L. of the Zoological Series of Reports on the Scientific Results of the Expedition.

Part XLVIII. is the Second and concluding Part of the Report on the Isopoda collected during the Expedition, by Frank Evers Beddard, Esq., M.A. (Oxon), Prosector to the Zoological Society of London.

The First Part of the Report was published in 1884 in Volume XI., Zoology, and forms Part XXXIII. of the Zoological Series of Reports.

Part XLIX. is a valuable Systematic Report on the Brachyura collected during the Expedition, by Edward J. Miers, Esq., F.L.S., formerly Assistant in the Zoological Department of the British Museum.

It is to be regretted that Mr. Miers' health did not permit him to revise the proofs of the greater part of the Report as it was passing through the press. Great care was, however, taken to render the text as correct as possible, and fortunately Mr. Miers has been able to look over the Report, and to point out a few errors, before the last sheets were passed for press.

Part L.—The First Part of the Report on the Polyzoa, treating of the Cheilostomata, by George Busk, Esq., F.R.S., was published in 1884 in Volume X., Zoology, forming Part XXX. of the Zoological Series of Reports. The present part forms the second and concluding portion of Mr. Busk's Report on the Polyzoa, and has a very special interest from being the last piece of scientific work accomplished by that distinguished veteran naturalist.

Mr. Busk, though in failing health during the last year of his life, yet struggled manfully amid many infirmities to complete this Report. The last instalment of the Manuscript was received by me on the 16th July last, and Mr. Busk had an opportunity of revising the proofs before his death, on the 10th August. A week or two later Miss Busk returned to me the whole Report for press.

JOHN MURRAY.

CHALLENGER OFFICE, 32 QUEEN STREET,
EDINBURGH, *6th December* 1886.

THE

VOYAGE OF H.M.S. CHALLENGER.

ZOOLOGY.

REPORT on the Isopoda collected by H.M.S. Challenger during the Years 1873-76. By Frank Evers Beddard, M.A. (Oxon), F.R.S.E., F.Z.S., Prosector to the Zoological Society of London.

PART II.

PREFACE.

The first part of my Report on the Isopoda, which deals exclusively with the family Serolidæ, has already been published and forms Part XXXIII. of the series of Reports on the Zoology of the voyage. The present Report contains an account of the species belonging to the other families of Isopoda and completes the description of this group.

I have purposely refrained from giving any detailed description of species already known that were obtained by the Challenger, except in a few cases where it appeared to me that a further description would be of some use as an aid in distinguishing the species from closely allied forms. I have, however, in most cases referred to such species, especially when they occurred in a new locality or at a greater depth than they had been previously known to inhabit; such facts being of course important from the general point of view of the Geographical Distribution of the group.

The collection of Isopoda made during the voyage is very rich in new species and genera, more particularly, as might be expected, in the deep-water forms, of which no less than thirty-eight are new to science. Among the shallow-water species the

greater number of novelties were dredged off Kerguelen and the adjacent islands, the Isopod fauna of which has been hitherto comprised in a very meagre list consisting of only fifteen species; to this I am able to add fifteen new species.

In other parts of the world, with the exception of Australia, dredging in shallow-water proved to be not very productive as regards this group. A great number of species, particularly among the Sphæromidæ, were dredged along the southern and eastern shores of Australia, but most of these species prove to be identical with forms already described by Mr. Haswell. I have to acknowledge my indebtedness to Messrs. Chilton, Miers, and G. O. Sars, for sending me their papers dealing with Isopoda; also to Professor G. O. Sars for kindly forwarding to me drawings of Isopoda collected by him off the coasts of Norway, but only as yet briefly described; to the Rev. T. R. R. Stebbing for the loan of several species described by him, and finally to Mr. G. M. Thomson for a collection of Isopoda from New Zealand, which have proved to be of the greatest assistance in determining several points, which will be referred to in the course of the following pages.

DESCRIPTIONS OF GENERA AND SPECIES.

In the following descriptions I have followed the classification adopted by Professor G. O. Sars in his recently published account of the Crustacea collected by the Norwegian North Sea Expedition, which is as follows :—

Order ISOPODA.

Tribe I. Asellota.

Family Asellidæ.
„ Munnopsidæ.

Tribe II. Valvifera.

Family Iodtheidæ.
„ Arcturidæ.

Tribe III. Chelifera.

Family Apseudidæ.
„ Tanaidæ.

Tribe IV. Flabellifera.

Family Anceidæ.
„ Anthuridæ.
„ Cymothoidæ.
„ Serolidæ.
„ Sphæromidæ.

None of the new species collected by the Challenger are so divergent in structure as not to fit accurately into this system, which appears to me to be in the present state of our knowledge a very convenient one. The following is a complete list of the new species and genera arranged under the families to which they belong.[1]

Tribe I. ASELLOTA.

Family Asellidæ.

Genus *Janira*.

1. *Janira abyssicola*.
2. „ *tristani*.

Genus *Stenetrium*.

3. *Stenetrium haswelli*.

Genus *Iolanthe*, F. E. B.

4. *Iolanthe acanthonotus*.

Genus *Jæropsis*.

5. *Jæropsis marionis*.

Genus *Trichopleon*.

6. *Trichopleon ramosum*.

Genus *Munna*.

7. *Munna maculata*.
8. „ *pallida*.

Genus *Pleurogonium*.

9. *Pleurogonium albidum*.
10. „ *serratum*.
11. „ *minutum*.

Genus *Neasellus*, F. E. B.

12. *Neasellus kerguelenensis*.

[1] I have of course omitted the Serolidæ, for which see Zool. Chall. Exp., part xxxiii.

Genus *Astrurus*, F. E. B.

13. *Astrurus crucicauda.*

Genus *Ischnosoma.*

14. *Ischnosoma spinosum.*
15. ,, *bacillus.*
16. ,, *bacilloides.*

Genus *Acanthomunna*, F. E. B.

17. *Acanthomunna proteus.*

Family Munnopsidæ.

Genus *Munnopsis.*

18. *Munnopsis gracilis.*
19. ,, *australis.*
20. ,, *latifrons.*

Genus *Eurycope.*

21. *Eurycope sarsii.*
22. ,, *novæ-zelandiæ.*
23. ,, *fragilis.*
24. ,, *atlantica.*
25. ,, sp. ?
26. ,, *spinosa.*
27. ,, *intermedia.*
28. ,, *pellucida.*
29. ,, *abyssicola.*

Genus *Ilyarachna.*

30. *Ilyarachna quadrispinosa.*

Genus *Acanthocope*, F. E. B.

31. *Acanthocope spinicauda.*
32. ,, *acutispina.*

Tribe II. VALVIFERA.

Family Arcturidæ.

Genus *Arcturus.*

33. *Arcturus glacialis.*
34. ,, *spinosus.*
35. ,, *anna.*
36. ,, *cornutus.*
37. ,, *spinifrons.*
38. ,, *purpureus.*
39. ,, *brunneus.*
40. ,, *abyssicola.*
41. ,, *myops.*
42. ,, *studeri.*
43. ,, *oculatus.*
44. ,, *americanus.*
45. ,, *stebbingi.*

Genus *Astacilla.*

46. *Astacilla marionensis.*

Tribe III. CHELIFERA.

Family Apseudidæ.

Genus *Apseudes.*

47. *Apseudes antarctica.*

Genus *Typhlapscudes*, F. E. B.

48. *Typhlapseudes curtus.*

Genus *Leiopus*, F. E. B.

49. *Leiopus leptodactylus.*

Family Tanaidæ.

Genus *Tanais.*

50. *Tanais hirsutus.*

Genus *Paratanais.*

51. *Paratanais dimorphus.*

Genus *Typhlotanais.*

52. *Typhlotanais kerguelenensis.*
53. ,, *brachyurus.*

Genus *Neotanais*, F. E. B.

54. *Neotanais americanus.*

Genus *Bathytanais*, F. E. B.

55. *Bathytanais bathybrotes.*

Genus *Leptognathia.*

56. *Leptognathia australis.*

Tribe IV. FLABELLIFERA.

Family Anceidæ.

Genus *Anceus.*

57. *Anceus bathybius.*
58. ,, *latidens.*
59. ,, *gigas.*
60. ,, *tuberculosus.*

Family Sphæromidæ.

Genus *Cymodocea.*

61. *Cymodocea abyssorum.*

Family Cymothoidæ.

Genus *Anuropus*, F. E. B.

62. *Anuropus branchiatus.*

Family Anthuridæ.

Genus *Paranthura.*

63. *Paranthura chiltoni.*
64. ,, *kerguelenensis.*

Tribe I. ASELLOTA.

The group Asellota may be divided as follows :—

A. Posterior thoracic appendages similar in structure to anterior.

1. Asellidæ.

B. Posterior thoracic appendages natatory with dilated penultimate and antepenultimate joints.

2. Munnopsidæ.

Family Asellidæ.

Janira, Leach.

Janira, Leach, Edin. Encycl., vol. vii. p. 434.
Henopomus, Krøyer, Naturhist. Tidsskr., Rk. 2, Bd. ii. p. 380, 1849.
Oniscoda, Latreille, Règne Animal, vol. iv. p. 141.
Asellodes, Stimpson, Marine Invert. Grand Manan, 1853, p. 41.

This genus does not differ very much from *Jæra*. The main points of difference are in the antennæ; the first pair of antennæ have a much longer flagellum and the second pair are distinguished by the possession of a rudimentary exopodite in the form of a setose scale attached to the outer margin of the third joint. As a general rule the first pair of thoracic limbs are prehensile in character, but according to G. O. Sars this is not the case with the female of *Janira breviremis;*[1] the uropoda are as a rule longer and better developed than in *Jæra*. The mandibular palp is stated by Westwood and Spence Bate[2] to be absent, though with a certain reservation, in *Janira maculosa;* it is present in a new species to be presently described (*Janira abyssicola*) which in other respects presents a structure characteristically like that of *Janira*.[3] In the mean time it is evidently advisable to retain the genus *Janira* as distinct from *Jæra* on account of the different form of the antennæ, which is undoubtedly the only well marked character that can be made use of.

One species of *Janira* that will presently be described is interesting on account of its coming from deep water, 1350 fathoms; this species, which I have named *Janira abyssicola*, is not by any means unlike the typical forms of the genus, only differing from them in the total absence of eyes. This difference, evidently resulting from a difference of habitat, is not to my mind sufficient to distinguish this species generically, though in many instances, *e.g.*, *Pleurogonium*, the absence of eyes does imply a generic distinction.

[1] *Vidensk. Selsk. Forhandl.*, 1882, p. 64.
[2] British Sessile-eyed Crustacea, vol. ii. p. 336.
[3] Through the kindness of the Rev. T. R. R. Stebbing I have been able to examine a specimen of *Janira maculosa*, and find that it has a distinct three-pointed palp.

Janira abyssicola, F. E. Beddard.

Janira abyssicola, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 105.

The present species is represented by a single female example from the great depth of 1350 fathoms, off Kandavu, Fiji. It is one of the few species of the genus *Janira* which are known to inhabit deep-water.

The single specimen is mounted in Canada balsam, and owing to its great transparency is somewhat difficult to describe accurately; for the same reason I have not figured the species. The head has a rounded anterior margin, and the eyes are completely absent; the first three segments of the thorax are of about equal length; the next two are very much shorter, about one-half the length of the anterior segments; the sixth segment has an antero-posterior diameter about equal to that of either of the first segments, while the seventh and last segment of the thorax is longer than any. The margins of the thoracic segments are rounded and fringed with short stiff hairs. The abdominal shield is rather longer than broad, and its margin is similarly furnished with hairs.

The *antennules* have the form characteristic of the genus *Janira*, but I am unable to give any details.

In the *antennæ* the third joint has a long scale attached to its outer side, which projects beyond the short fourth joint; the fifth joint is long and stout;[1] the distal joint of the peduncle is longer but rather more slender; the flagellum is of a very great length, much longer than the peduncle; the whole appendage is longer than the body of the animal.

The *mandibles* are furnished with a palp.

The *thoracic limbs* are all similar to one another.

The *uropoda* are long, as long as the abdominal shield; they consist of a short broad basal piece with two long and narrow rami; of these the inner are the stoutest as well as the longest; each has a tuft of longish hairs at its extremity.

Station 175, off Kandavu, Fiji, August 12, 1874; lat. 19° 2′ S., long. 177° 10′ E.; depth, 1350 fathoms; Globigerina ooze; bottom temperature, 36° F.

Janira tristani, F. E. Beddard (Pl. II. figs. 2–5).

Janira tristani, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 105.

Two specimens of this species were dredged off Tristan da Cunha in 100 to 150 fathoms.

I regard the species as belonging to the genus *Janira* with some hesitation as both specimens are imperfect, certain appendages which would largely aid in identifying the genus being missing.

The length is 5 mm.

[1] The only other species which ranges into water deeper than 100 fathoms is *Janira laciniata*, dredged by Sars in the Northern Ocean from a depth of 400 fathoms (see G. O. Sars, *Forhandl. Vidensk. Selsk.*, 1872, p. 92).

The head is broader than long, with very large laterally placed eyes; there is a long spatulate rostrum which projects beyond the end of the second joint of the antennules; on either side of this the anterior margin of the head is depressed for the articulation of the antennules, the antero-lateral margins being again salient, though not projecting so far as the rostrum. The head as well as the rest of the body is very convex.

The width of the body gradually increases up to the third segment of the thorax, thence onwards it does not greatly diminish, so that the body has a cylindrical elongate form.

The first two segments of the thorax are about equal in length; the three succeeding segments progressively diminish in length; the two last segments are again rather longer. The first four have their antero-lateral margin prolonged into a truncated process and the postero-lateral margin also; the margins of all the segments as well as of the abdominal shield are fringed with scattered hairs. The epimera of all the thoracic segments, with the exception of the first, are visible on a dorsal view; in the second, third, and fourth segments the epimera are bilobed (see fig. 2), in the remaining segments they are unilobate.

The abdominal shield is subpentagonal and terminates in a short blunt process.

The *antennules* (fig. 4) have a long flagellum composed of a considerable number of joints; the peduncle consists of four joints; the first is stout and rounded, the second shorter and more slender, the third of about the same length as the second but more slender, the fourth very small.

The *antennæ* are broken off at the third joint in both specimens; the third joint is short, but longer than the two preceding; it is furnished with an articulated scale on the outer side (see fig. 5).

The *mandible* has a three jointed palp.

The *thoracic appendages* (fig. 3) are all similar to each other; the two first joints are stout and rather short, the third is shorter, and the fourth is as stout and of about the same length as the first two; the terminal joint of the limb is very short and biunguiculate.

The under surface of the abdomen (in the female) is entirely covered by the convex operculum.

The *uropoda* are defective, or may possibly be wanting, as there was no trace of them in either specimen.

This species agrees with *Jæra* in the general form of the body, and in the non-prehensile character of the first thoracic appendages.

On the other hand, it agrees with *Janira* in the multiarticulate flagellum of the antennules, and in the presence of a rudimentary exopodite to the antennæ.

It would be no escape from the difficulty to assign this species to the genus *Ianthe*, since the latter appears to be hardly distinguished from *Jæra*, except by the great length of the uropoda, which are like those of *Janira;* and these appendages are, as has

been mentioned, wanting in *Janira tristani;* the possibility, however, that they are really abortive must be borne in mind. I have indicated them in the figure as they were in two small specimens (1 mm. in length) from the same locality, which may possibly belong to the same species.

Station 135c, off Nightingale Island, Tristan da Cunha, October 17, 1873; lat. 37° 25′ 30″ S., long. 12° 28′ 30″ W.; 100 to 150 fathoms.

Stenetrium, Haswell.

Stenetrium, W. A. Haswell, Proc. Linn. Soc. N.S.W., vol. v. p. 478.

Mr. Haswell has described an Isopod which he regards as the type of a new genus, *Stenetrium*, from Sydney Harbour; his description refers to a single male example.

A specimen which I describe here appears to be another representative of this same genus but to belong to a distinct species from that described by Haswell; I refer it to his genus on account of the elongate flattened form of the body which is of uniform diameter throughout, the narrow obliquely placed eyes, the short biramose uropoda, and the large chelæ of the male. Mr. Haswell at first assigned this genus to the Tanaidæ, and it appears in his catalogue of Australian Crustacea (p. 308) as the type of a new subfamily, Stenetrinæ. More lately[1] Mr. Haswell dissents from his former conclusion and refers *Stenetrium* to the Asellidæ; with this conclusion I entirely agree.

In the Challenger specimen the posterior appendages of the thorax are in every case broken off and lost, and as the general shape of the body is decidedly unlike that of the Asellidæ but much more like that of certain Munnopsidæ, particularly *Desmosoma*,[2] I was at first inclined to assign the species to the Munnopsidæ. A careful comparison with Haswell's figures[3] of his species appears to me to show that my own species is referable to Haswell's genus *Stenetrium*, which is distinctly an Asellid and not a Munnopsid.

The genus may perhaps be regarded, like *Macrostylis* and *Ischnosoma*, as in certain respects transitional between the more typical Asellidæ and the Munnopsidæ.

The occurrence of an Australian shallow-water genus in deep water, off the shores of South America, is the more interesting as the two species are but little different.

The characters of *Stenetrium haswelli* necessitate a statement of the generic definition, which is as follows:—

"Body dorso-ventrally compressed; abdomen short with all the segments fused into a single piece. Head with a short rostrum; segments of the thorax subequal. Antennæ inserted on to the anterior margin of the head, internal pair short, external pair long; both with well developed flagellum; outer antennæ with a movable joint attached to third

[1] *Proc. Linn. Soc. N.S.W.*, vol. ix. p. 1010.

[2] *Desmosoma* is one of those species of which Professor Sars has kindly sent me a drawing in order to compare with those collected by the Challenger; its general appearance, apart from the fact that it has no eyes, is strikingly like that of *Stenetrium haswelli*.

[3] *Proc. Linn. Soc. N.S.W.*, vol. ix. pl. li.

joint of peduncle. Mandibles provided with a palp. Maxillipedes expanded, operculiform; first pair of thoracic limbs (in the male only?) with a large prehensile manus, the penultimate joint swollen and subtriangular in form, with a row of serrate spines along the anterior margin which correspond to a row of similar spines upon the last joint; remaining pairs of limbs slender, ambulatory, with a double terminal claw. Caudal appendages biramous, inserted on the border of the shield-like abdomen near the extremity."

The genus *Stenetrium* is closely allied to *Ianthe*, *Asellus*, *Jæra* and *Janira;* it agrees with all these genera in the equality of size of the thoracic segments, differing in this respect from such genera as *Pleurogonium*, *Ischnosoma*, &c.

The genus has, however, been rightly distinguished by Haswell. The main points in which it differs from any of the above mentioned genera are as follows:—from *Asellus* it differs in the presence of two terminal claws on the ambulatory limbs, and in the fact that the male has only one pair of thoracic appendages modified into a prehensile hand instead of two; also, the existence of two free abdominal segments in *Asellus* is a character not found in *Stenetrium*. All the other genera mentioned agree with *Stenetrium* in having two terminal claws, while *Ianthe* and *Janira* show a still farther point of resemblance in the presence of a rudimentary exopodite on the antennæ;[1] *Stenetrium* is distinguished from *Janira*, by the powerful first thoracic limbs of the male, a character which does not appear to be found to so marked an extent in any other Isopod. From *Iolanthe* the latter characteristic sufficiently distinguishes *Stenetrium*, as well as the comparatively flattened depressed body and the form of the abdominal appendages (compare Pl. IV. fig. 13, with Bovallius, *loc. cit.*, pl. iii. figs. 29, 30, 32, 33, 34).

Of this genus four species are now known. Two species, *Stenetrium armatum* and *Stenetrium inerme*, have been described by Haswell from Sydney, Australia, in shallow water; a third species was dredged by Chilton in Lyttelton Harbour, New Zealand, and named by him *Stenetrium fractum;* the fourth species, *Stenetrium haswelli*, will be described in the following pages. It is the only one of the genus known from deep water, and it bears out one generalisation that has been arrived at from a study of the deep sea fauna, viz., that the inhabitants of deep water are larger than their shallow-water allies.

Stenetrium haswelli, F. E. Beddard (Pl. IV. figs. 1–8).

Stenetrium haswelli, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 103.

This species, as already mentioned, is represented by a single example, dredged in 600 fathoms, off the east coast of South America.

[1] This fact has been pointed out by J. E. V. Boas (*Morphol. Jahrb.*, Bd. viii. p. 493 *note*, 1883) in the case of *Janira;* Bovallius (*Bihang til Svensk. Akad. Handl.*, Bd. vi., No. 4, pl. i. fig. 7) has depicted the articulated squame of *Ianthe speciosa*, while Mr. Chilton has noted and figured (*loc. cit.*, pl. xviii. fig. 3*b*), the same structure in *Stenetrium fractum*.

The specimen is a male and measures 16 mm. in length.

The body is everywhere of the same approximate breadth, and is therefore somewhat oblong in shape.

The head is of a smaller diameter than the thoracic segments, it is prolonged between the antennæ into a rostrum, the peculiar shape of which can be understood by an inspection of fig. 1; on either side of this the anterior margin of the head is somewhat curved and projects as a short process to the outside of the insertion of the antennules, the lateral regions of the head are prolonged into a rhomboidal area, the apex of which is directed forwards.

All the segments of the thorax are pretty much of equal length and breadth; the first three segments are slightly crescentic in form, the convex margin being directed forwards; the fourth segment is as nearly as possible straight; the succeeding segments are concave backwards, the depth of the concavity increasing progressively.

The dorsal surface of these segments is perfectly smooth and rather flattened. The lateral margin of the first thoracic segment is prolonged into a curved and somewhat forwardly directed triangular spiny process, the base of which occupies as it were the whole of the lateral margin of the segment; in the second segment there is a very narrow antero-lateral spiny process; the two following segments are similar save that the antero-lateral process is somewhat stouter, and there is also a short postero-lateral process between which the margin of the segment is perfectly straight. In the fifth segment the antero-lateral process becomes much wider, occupying nearly the whole of the lateral margin; in the two remaining segments the lateral process is broad and as wide as the segment itself. The epimera absent in the first segment are elsewhere short; in the second, third, and fourth segments the epimera are bilobed processes projecting outwards from the middle of the lateral margin of the segments; in the fifth, sixth, and seventh segments the free margin of the epimera is rounded, and these structures come to lie at the postero-lateral margin of their segment, becoming also gradually reduced in size in the successive segments.

The caudal shield is about as long as the three last segments of the thorax; it is subquadrangular in outline; its margins, as well as those of the thoracic segments generally, are beset here and there with fine long unbranched hairs as are also the margins of the thoracic segments.

The *eyes* have the peculiar form that is characteristic of the genus; they occupy a narrow oblong area which is set nearly transversely but also somewhat obliquely to the longitudinal axis of the body.

The *antennules* (fig. 2) are made up of four basal joints and a long flagellum, longer than the peduncle; the proximal joint of the antennules is much thicker than the two succeeding ones; of these two the more distal is the longer, the fourth is very short indeed; the proximal portion of the flagellum is not jointed.

The *antennæ* are unfortunately broken off at the fourth joint; the three proximal joints are very short, the third being the longest; this latter bears on the outer side an articulated scale (figs. 3 and 5), which appears to me in all probability to have the significance of an exopodite. The shape of this scale is rather peculiar; it is suboval and folded in the middle line, the margins are beset here and there with long delicate hairs, and the whole structure has thus very much the appearance of a leaf of *Dionæa muscipula*.

The *mandible* has the apex divided into two principal lobes and then again into a number of tooth-like processes; beneath is a closely set tuft of peculiar serrate spines, at right angles to the longer axis of the mandible and parallel to the molar process, which is strong and well developed. The palp is long and three-jointed; the distal joint is oval and flattened and furnished along one edge with a closely set row of rigid hairs, which do not extend quite as far as the articulation of this joint with the preceding; the middle joint is long and stouter at its basal portion, distally it is furnished with a row of hairs like those upon the third joint, and also with two strong spines serrate along one margin.

The *maxillæ* of the first pair consist as usual of two pieces, the upper being the longer and stouter of the two; both are furnished along the cutting edge with numerous slender hairs and stoutish spines; some of these latter are serrate on the upper lobe of the maxilla.

The second pair of *maxillæ* I have not seen.

The *maxillipedes* are not in any way remarkable in their structure; the inner margin of the stipes is provided for a small portion of its extent with a series of round bodies articulated by a narrow stalk, in which no structure could be discerned; they no doubt correspond to the sensory (?) organs having a similar location on the maxillipedes of many Munnopsidæ; the upper extremity of the stipes is truncated and beset with short stiff hairs; the palp is five-jointed, and does not project much beyond the end of the stipes; its joints are fringed along the inner margin with long hairs; the first three joints are broad, the two distal joints muchnarrower.

The *first pair of ambulatory limbs* are extraordinarily long and are modified to form a prehensile hand, the length of the limb, which is figured on Pl. IV. fig. 4, is not much less than that of the body itself. The proximal joint is long and narrow; the three following joints grow shorter, and at the same time wider, towards the extremity of the limb; the outer side of each is prolonged considerably beyond the articulation of the succeeding joint; these joints are abundantly furnished with long slender unbranched hairs; the penultimate joint is greatly swollen and three-sided, the inner and outer margins are convex and beset like the preceding joints with fine slender hairs; the third side is almost straight; at its junction with the inner margin of the limb is a single stout spine; and along the edge is a row of serrate spines, below which are a few fine slender hairs. The distal joint of the limb is short and curved, and of about the same length as

the side of the penultimate joint, which it closely fits; it terminates in a stout spine like that which bounds the inner edge of the penultimate joint, and its inner edge is furnished with serrate spines similar to those upon the penultimate joint.

The other thoracic limbs are slender and small in comparison with the first pair, but as only one of them, the third on the right side, was preserved, it is impossible to speak with certainty. That the specimen is a male is also evident from the condition of the abdominal operculum and the second pair of abdominal appendages.

The *operculum* or first pair of abdominal appendages is displayed in fig. 6 of Pl. IV. Each appendage consists of an oval plate, flattened but convex ventrally, with a straight inner and a curved outer margin; the outer margin of each is fringed with a row of simple hairs which gradually increase in length towards the apex of the limb.

Beneath the operculum are a pair of remarkable appendages, which no doubt serve the function of a penis; they are displayed in fig. 7, but as I have only had one specimen of this species at my disposal I am unable to say whether that figure represents the whole of the appendage, or whether any portion has been detached. Each of these appendages consists of a strong basal joint which is shaped somewhat like a joiner's "square;" the nearly straight outer margin is fringed with a number of short simple hairs; and near to the apex of the limb is given off what apparently corresponds to the endopodite. This consists of two elongated joints which are articulated so as to lie almost parallel with each other and with the basipodite; at the apex of the basipodite are articulated one or two small joints which may represent the exopodite.

Then follow three pairs of lamellar branchial appendages; these are covered over and protected by the exopodites of the first pair, which are stout and much calcified; these are traversed by an oblique suture; the outer round margin, and to a certain extent also the inner straight margin, are fringed with short simple hairs; the endopodite of this limb is the first branchial organ.

The fourth pair of abdominal appendages consists of endopodite and exopodite, the fifth pair of one ramus only; in every case the shape of these limbs is the same—subtriangular with a rounded outer and a straight inner margin; the apex of each is beset with a tuft of long hairs which appear to be plumose.

The terminal pair of abdominal appendages or *uropoda* are displayed in fig. 8 of Pl. IV. They are biramose, the endopodite and exopodite being subequal in size and beset with numerous longish hairs.

This species differs from those already described by Haswell and Chilton in the following points:—

From *Stenetrium fractum*, Chilton,[1] in the greater length of the flagellum of the first

[1] Mr. Chilton's description of the species *Stenetrium fractum* (*Trans. New Zealand Soc.*, vol. xvi. p. 251) is unfortunately rather brief owing to the imperfect condition of the specimen examined by him; hence the points of difference between his species and mine which I have been able to cite are necessarily rather meagre, but I think quite sufficient to discriminate between the two.

pair of antennæ, which is composed of a considerably greater number of joints than in that species; in the form of the first pair of ambulatory limbs, the antipenultimate joint being prolonged beyond the point of articulation of the succeeding joint in *Stenetrium haswelli*, and not so prolonged in *Stenetrium fractum*.

From *Stenetrium armatum* also in the greater length of the flagellum of the antennules, which are stated by Haswell to possess from eight to twelve joints only in that species; in that species also the penultimate joint of the cheliform appendages "is defined by a long acute spine, and armed in addition with a bifid denticle situated about its middle;" there appears to be no trace of this latter in *Stenetrium haswelli*. In his description of *Stenetrium armatum* Haswell makes no mention of a molar process to the mandible, which is certainly present in *Stenetrium haswelli*.

From *Stenetrium inerme*, Haswell's second species, the present is easily to be distinguished by the form of the eyes, which have the narrow oblong form characteristic of the genus; in *Stenetrium inerme* the eyes are said to be rounded; in the antennules of *Stenetrium inerme* the third joint of the peduncle is scarcely distinguishable from the flagellum; in *Stenetrium haswelli* there is no possibility of confounding the third joint of the peduncle with the succeeding flagellum, the joints of which are much shorter as well as narrower.

Station 320, off the Rio de la Plata, February 14, 1876; lat. 37° 17′ S., long. 53° 52′ W.; 600 fathoms; bottom temperature, 37°·2 F.; green sand.

Ianthe, Bovallius.

Ianthe, Bovallius, Bihang til Svensk. Vetensk. Akad., Bd. vi., No. 4.
Ianthe, Studer, Isopoden gesammelt, &c., Abhandl. d. k. Akad. d. Wiss. Berlin, 1883, p. 10 (of memoir).

This genus was founded by Bovallius to include a small species of Isopod from the Arctic Ocean, which with the same general shape as *Janira*, differs from it in the following particulars:—in the great convexity of the body, in the small and distant eyes, the want of an articulated scale on the peduncles of the antennæ, and in the presence of a well developed mandibular palp. In other respects the species *Ianthe speciosa* agrees very closely with *Janira*, the uropoda are large and biramose as in that genus, and both pairs of antennary organs are furnished with a long flagellum. These last named particulars, as also the modification of the first pair of thoracic limbs into a prehensile appendage, serve to separate *Ianthe* from *Jæra*. The general aspect of *Ianthe speciosa*, judging from Bovallius's beautiful illustration, is very unlike the typical form of the genus *Janira*, as represented in such species as *Janira maculosa*, *Janira breviremis*, Sars, and others; but Harger has recently described and figured a new species clearly referable to the genus *Janira*, which bears a very striking resemblance to *Ianthe speciosa*. It has the same double row of spines down the back, a long rostrum, and in both species

the caudal shield is excavated posteriorly, the postero-lateral margins being prolonged beyond the articulation of the uropoda, but in *Ianthe* the excavation is deeper.

Certain species of *Janira* already described by myself in the present Report (p. 6) have a mandibular palp, and the same structure is present in *Janira maculosa*. I cannot therefore admit that the presence or absence of a palp to the mandible is any safe criterion of generic distinction. The only structural feature in which *Ianthe* differs from *Janira* is in the want of an articulated scale—the rudimentary exopodite—upon the antennæ. In pl. i. fig. 7 of his Memoir, Bovallius figures the antenna of *Ianthe speciosa*, and it may be seen from that figure, as well as from the description, that the third joint of the peduncle is furnished with a stout spine on the outer side in a position exactly corresponding with the exopodite. In the figure this spine is represented as being articulated, and in a species presently to be described, I shall refer to a similar spine having an exactly similar position, being fixed to the third joint of the peduncle, and separated from it by a joint. In any case it appears to me to be a matter of impossibility to distinguish exactly between such a spine and the articulated scale of *Janira* or *Stenetrium*.

A second species of Isopod has been referred to this same genus by Studer, in his account of the Isopoda collected by the German exploring vessel "Gazelle." Studer's description of this form rests upon the examination of a single imperfect specimen from Kerguelen. The Challenger during its long stay at Kerguelen obtained a very large number of specimens of this Isopod, which was named by Studer *Ianthe bovallii*. I cannot however, agree with Dr. Studer in regarding this species as closely allied to Bovallius's species. It certainly agrees with it in the general shape of the body even more than is apparent from Studer's figures, since there are two rows of blunt tubercles along the back instead of only a single row as represented by this author. The antennary organs are very different; the first pair of these or the antennules are much more like those of *Jæra* in the shortness of the flagellum, which consists in my specimen of only four or five joints, whereas in *Ianthe speciosa*, as in *Janira*, the flagellum is long: this difference is noted in the figure by Studer. The flagellum of the antenna as correctly figured by Studer is proportionally short; with regard to the rudimentary exopodite there is a conical spine on the third joint which seems to me to be the equivalent of this structure.

The most marked difference, however, apart from the antennules, is the form of the uropoda, which were wanting in Studer's specimen. These are displayed in fig. 8 of Pl. V.; the basal joint is extremely long, the two distal joints short, the endopodite being larger than the exopodite; it has been already mentioned that in *Ianthe speciosa* the uropoda are precisely similar to those of *Janira* in that the two rami are subequal to each other and to the basal joint. Again the first thoracic appendages in neither sex of *Ianthe bovallii* are modified into a prehensile hand. In view of these differences it is in my opinion necessary to distinguish generically *Ianthe bovallii* from *Ianthe speciosa*, and whether there is or is not (in my opinion not) any necessity for a new generic term

to be applied to Bovallius's *Ianthe speciosa*, it is clear that *Ianthe bovallii* cannot be safely referred to any existing genus. I therefore propose to term this genus—

Ianthopsis, n. gen.

Body elongate and having the same general shape as in *Jæra* or *Janira*. Head prolonged anteriorly into a short rostrum. Lateral regions of head as of thoracic segments prolonged into processes; those of the head and the first segment of the thorax, as well as of the three terminal segments of the thorax, are simple; in the second, third, and fourth segments of the thorax the processes are bifid. Abdominal segments fused with deeply serrate margins. Antennules with a very short flagellum, consisting of four or five joints; antennæ three times the length of antennules, with a long flagellum equal in length to the two terminal joints of the peduncle; third joint of the peduncle with a spine which represents the rudimentary exopodite (?). Mandibles furnished with a palp. Thoracic appendages all similar to each other in both sexes, biunguiculate uropoda with a long basal joint and two short rami, the inner longer than the outer.

I have already indicated the differences between this genus and *Janira*, from which it is sufficiently distinguished; it is also allied to Sars genus *Acanthoniscus*, from which, however, it differs by the presence of eyes, by the rudimentary flagellum of the antennules, and by the biunguiculate thoracic appendages (Pl. V. fig. 5).

Iolanthe, F. E. Beddard.

Iolanthe, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 104.

A large Isopod, dredged to the south of Kerguelen in 1675 fathoms, I regard as the type of a new genus. It may be defined as follows :—

Definition.—Head as wide as the first thoracic segment, terminating in front in a long upturned spiny rostrum; eyes absent. Lateral margins of head and of thoracic segments prolonged into long curved spiny processes, which are single in the first and last three segments of the thorax, but supplemented by an additional postero-lateral shorter process in the head and in the middle segments of the thorax. Thoracic segments with a single long median dorsal spine. Abdominal segments fused into a rounded shield with three pairs of shorter lateral spines. Antennules half the length of antennæ, with a long multiarticulate flagellum; antennæ with an articulated spine on the third joint representing the exopodite; (?) mandibles with a palp. Thoracic appendages (in female at least) all similar to each other, biunguiculate. Uropoda as long as the abdominal shield, with an elongate curved basal joint and two extremely short rami, of which the inner is the larger.

Remarks.—This genus is evidently most nearly allied to *Ianthopsis* and *Acanthoniscus*, and it may be that I am wrong in distinguishing it. It differs, however, from the latter in a number of particulars, notably in the biunguiculate thoracic appendages; these appendages in *Acanthoniscus* terminate in a single claw; as this character undoubtedly distinguishes other genera, it is perhaps permissible to make use of it to distinguish *Iolanthe* from *Acanthoniscus*, although the two forms show very great resemblance, particularly in the shape of the uropoda. From *Ianthopsis* the present genus differs in the absence of eyes and in the long straight epimeral spines as well as in the form of the antennules with their long flagellum.

Iolanthe acanthonotus, F. E. Beddard (Pl. IV. figs. 9–14; Pl. V. figs. 1–4).

Iolanthe acanthonotus, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 104.

This species is represented by a single female specimen, dredged to the South of Kerguelen in 1675 fathoms.

It is an extremely large species compared with its allies, measuring 24 mm. in length.

This species is remarkable for the immense length of the spiniform lateral prolongations of the thoracic segments, which is an exaggeration of the characters found in *Ianthopsis bovallii*. In other respects it presents a very close agreement with that species.

The head is as wide as the succeeding segment of the thorax, its margins are prolonged on either side into two spines, of which the anterior is very much the longer; the central region of the head is very convex, while the curved anterior margin is prolonged in the middle line into a long spine, which is directed forwards and upwards. There is no trace of eyes.

The first three segments of the thorax are concave anteriorly and convex posteriorly; the fourth is almost straight, the three posterior segments being concave posteriorly, the amount of the curvature of the segments increasing progressively. The antero-posterior diameter of all the thoracic segments is about equal. In the dorsal median line of each of the thoracic segments is a stout and long vertically directed spine; in the four anterior segments the spine arises near to the anterior margin of the segment; in the three posterior it arises near to the posterior margin. The general surface of the body, including the dorsal and lateral spines, is sparsely covered with long hairs.

The first segment of the thorax as already mentioned is no wider than the head, but the remaining segments of this region are rather wider and subequal. The curvature of the segments, however, causes the outline of the body to be more or less oval, though the posterior segments are in reality fully as wide, measured from tip to tip, as the anterior segments, or even wider. The lateral margins of the first thoracic segment are prolonged on either side into a longish spine, which is distinctly shorter than the anterior of the two lateral spines of the head.

Each of the three succeeding segments has a pair of lateral spines on either side, the anterior being much the longer and curved; in the remaining segments of the thorax only the anterior spine is present, the posterior having become obsolete. The length of the lateral spines increases slightly in the successive segments, being therefore longer in the seventh segment of the thorax than in any of the others.

The spines upon the thorax do not correspond to the epimera, which are very small and lie beneath them; in the three posterior segments the epimera are each furnished with a minute spine.

The segments of the abdomen are fused into a single piece which is almost circular in form; on either side are three spines much shorter than the lateral spines of the thorax; and on either side of the blunt termination of the abdominal shield are two minute tubercles, between which the uropoda are articulated.

The *antennules* (Pl. IV. fig. 10) are rather less than half the length of the antennæ; they measure about 6 mm.

The basal joint is stout and short and somewhat curved; the second is the longest and is much more slender; the third and fourth are very short, the fourth (Pl. V. fig. 3) being extremely minute. The flagellum is about as long as the three distal joints of the peduncle; it is composed of twenty-four joints, the first being very long, and about equal to the next four.

The *antennæ* (Pl. V. fig. 2) measure 13 mm. in length; the flagellum is nearly as long as the peduncle. The two basal joints of the peduncle are very short; the second has a long, spiny process on the outer side; the third is rather longer and has a long spine which differs from that upon the second in being articulated; it probably corresponds to a rudimentary exopodite; the fourth joint of the peduncle is very much shorter again, while the two distal joints are elongated and enlarged.

The *mandibles* are provided with a palp.

The first pair of *maxillæ* are shown in fig. 1 of Pl. V.; there is nothing remarkable in the form of these appendages.

The second pair of *maxillæ* are shown in fig. 4 of the same plate.

The apex of the larger lobe is furnished with four or five stout serrate spines, the middle lobe having three long spines, and the third lobe also three such spines which are not serrate.

The *maxillipedes* (Pl. IV. fig. 11) have a very long and straight stipes; just opposite to the articulation of the palp are five or six sensory processes. The palp is five-jointed; the second joint is the widest and at the same time the longest; the terminal joints are short and narrow.

The *thoracic appendages* are all similar to each other and terminate in two claws (Pl. IV. fig. 12) as in allied genera.

The specimen being a female, the abdominal appendages are covered by a large operculum which is traversed by three longitudinal ridges, one median and two lateral.

The *uropoda* (Pl. IV. figs. 13, 14) are rather peculiar in shape, and recall those of *Ianthopsis bovallii;* the distal joint is extremely long and curved, both its margins are furnished with numerous long simple hairs; the endopodite is proportionately very short, though considerably larger than the minute exopodite.

Station 153, in vicinity of the Antarctic Ice, February 14, 1874; lat. 65° 42′ S., long. 79° 49′ E.; depth, 1675 fathoms; bottom, blue mud.

Jæra, Leach.

Jæra, Leach, Edin. Encycl., vol. vii. p. 434.
Jæridina, Milne-Edwards, Hist. Nat. des Crust., vol. vii. p. 150.
Oniscus, Montagu, MSS.
Asellus, Packard, Mem. Bost. Soc. Nat. Hist., vol. i. 1867, p. 296.

Milne-Edwards in his Histoire naturelle des Crustacés [1] separated the species *Jæra nordmanni* as a distinct genus under the name of *Jæridina*, but, as has been pointed out by Westwood and Spence Bate,[2] the distinction between the two genera, viz., the form of the abdominal opereulum, is in reality only a sexual difference, and the name *Jæra* must therefore be retained as having the priority. Several species of the genus have been described, but many of them rest on insufficient data, and it is a difficult matter therefore to decide how many species should be admitted. As well-characterised species may be mentioned, *Jæra albifrons* and *Jæra nordmanni*, the differences between which have been clearly pointed out by the Rev. T. R. R. Stebbing.[3] *Jæra wakishiana* of Spence Bate [4] appears to be perfectly distinct; *Jæra marina*, *Jæra kröyeri*, and *Jæra baltica* are supposed to be merely synonyms of *Jæra albifrons;* the second of these is figured in the illustrated edition of Cuvier's Règne Animale.[5]

A species described by Lucas [6] under the name of *Jæra longicornis*, but figured by him in the same work as *Jæra deshayesii*, appears to me to be wrongly assigned to the genus *Jæra*. It agrees with *Janira* in the form of the antennary organs, in the prehensile character of the first thoracic appendages, and in the elongated biramose uropoda. This species is considered by Heller [7] to be identical with Grube's [8] *Jæra filicornis*.

An American species (*Jæra copiosa*), described originally by Stimpson, is declared by Harger [9] to be identical with *Jæra albifrons*. This author discusses the synonymy of other species, and arrives at the conclusion that besides the species mentioned above, *Jæra nivalis*, *Jæra maculata*, and *Jæra grönlandica* (Packard) are probably varieties of *Jæra albifrons*.

[1] Tome iii. p. 149.
[2] British Sessile-eyed Crustacea, vol. ii. p. 321.
[3] *Ann. and Mag. Nat. Hist.*, ser. 4, vol. xvii. p. 80, pl. v.
[4] *Proc. Zool. Soc. Lond.*, 1864, p. 667.
[5] Pl. lxx. fig. 1.
[6] Exploration Scientifique de l'Algérie, t. i. p. 66; t. iv., pl. vi. fig. 4.
[7] *Verhandl. d. k. k. zool.-bot. Gesellsch. Wien*, 1866, p. 733.
[8] Die Insel Lussin, p. 75.
[9] Marine Isopoda of New England, U.S. Comm. of Fish and Fisheries for 1878, Washington, 1880, p. 315.

The number of species known, therefore, which can be regarded as distinct, are four, viz., *Jæra albifrons*, *Jæra nordmanni*, *Jæra wakishiana*, and *Jæra pubescens*.

A single species which I refer to this genus is described below; it appears to be identical with *Jæra pubescens*, and differs from those already known principally in the form of the uropoda, which are not so rudimentary as in *Jæra albifrons*, &c.

Jæra pubescens, Dana (Pl. II. figs. 6–10).

Jæra pubescens, Dana, Crustacea, U.S. Explor. Exped., pt. ii. p. 744.

A large number of specimens of a Sphæromid, which I identify with *Sphæroma gigas*, were collected in rock pools at Kerguelen; upon several of these were a number of a minute species of Isopod living in a semiparasitic condition, which I identify with Dana's *Jæra pubescens*. The occurrence of this species at Kerguelen was noted first by S. I. Smith.[1] Dana's specimens were from Patagonia; this species like its host and a number of other species is common to Patagonia and Kerguelen. Dana's specimens were obtained from *Sphæroma lanceolatum*, a Sphæromid which hardly differs specifically from *Sphæroma gigas*.

The general outline of the body is oval; the body gradually increases in breadth up to the third segment of the thorax, and thence hardly decreases until the abdominal shield is reached.

The head is roughly quadrangular, broader than long, with a short blunt rostrum. The eyes are placed some way from the lateral margin of the head; they are small and each consists of two elements only—two crystalline cones (fig. 7), and two only are plainly visible.

The first segment of the thorax is rather longer, although narrower, than the two following, which are subequal, the fourth is shorter again. The lateral margins of the segments are rounded, the second to the fourth being somewhat bilobed; the anterior lobe is fringed with short hairs which are wanting posteriorly.

The abdominal shield is rounded, with a slightly pointed obtuse termination, its lateral margins are fringed with short hairs.

The *antennules* (fig. 8) consist of a large oval basal joint followed by a more slender and shorter joint, then come two shorter joints which are subequal; the flagellum consists of only two joints, of which the first is the largest; they are both furnished with sensory filaments.

The *antennæ* (fig. 9) are about half the length of the body; the flagellum is very considerably longer than the peduncle, and consists of about twenty joints; in the peduncle the first three joints are very short, the fourth longer, the fifth longer again but narrower.

[1] *Bull. U.S. Nat. Mus.*, No. 3, p. 63, 1876.

There is no articulated scale on the outer antenna such as is found in *Janira*.

The *uropoda* (fig. 10) are of considerable size compared with what is usual in this genus; the basal joint is wide; the two rami are narrow but of about equal length with the basal piece; the inner ramus is rather longer as well as thicker than the outer. Both are furnished with numerous long stiff hairs.

Rock Pools, Kerguelen.

Jæropsis, Köhler.

Jæropsis, Köhler, Ann. d. Sci. Nat., sér. 6, t. xix. No. 1.

M. Köhler has described a little Isopod from the Island of Sark, which bears many resemblances to *Jæra*, but which he regards as being the type of a new genus; the name employed by him is significant of the affinities of the Isopod. The general form of the body is that of *Jæra*, with which it also agrees in the rudimentary nature of the terminal abdominal limbs of the uropoda. The main structural feature which distinguishes *Jæropsis* from *Jæra* is to be found in the antennæ, which instead of being long and slender with a well-developed flagellum, are extremely small with a rudimentary flagellum. The single species, which is very minute, measuring only from 2 to 3 mm., is named *Jæropsis brevicornis*.

A species obtained at Marion Island during the voyage of the Challenger appears to me to be referable to this genus, but to be specifically different from *Jæropsis brevicornis*. The description of this new species is as follows :—

Jæropsis marionis, F. E. Beddard (Pl. I. figs. 11–15; Pl. II. fig. 1).

Jæropsis marionis, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 105.

The single specimen of this species, from dredge-mud off Marion Island (100 fathoms), differs very distinctly from the other species of the genus.

The specimen is a male, and measures nearly 4 mm. in length.

The head is large and roughly quadrangular in outline; the anterior margin is prolonged between the antennæ into a rostrum which is deeply notched; the eyes are of fair size (I counted seventeen crystalline cones) and dorsal in position; the lateral margins of the head, which are very much bent down, are serrate.

The general shape of the body is cylindrical, the diameter being everywhere approximately equal; the species is also marked by the great convexity of the middle of the body.

The head is about as long as the first two segments of the thorax taken together; the latter are subequal, the third is slightly shorter, the fourth and fifth subequal and very much shorter again; the two last segments of the thorax are quite as long as the two

first. The segments are separated from each other by deep lateral incisions; the gaps separating the head from the first segment of the thorax and the three posterior segments of the thorax from each other being the widest. The lateral margins of the segments are somewhat truncated and serrate. The serrations of the anterior segments are not so conspicuous as those upon the lateral margins of the head; in the three posterior segments the serrations are directed backwards, as is the case with the abdominal shield. The sterna of the thoracic segments have a median ridge.

The *abdominal shield* is somewhat triangular in outline, terminating behind (Pl. I. fig. 14) in three pointed processes, a median and two lateral. In the furrows which separate these are placed the uropoda. The lateral margins of the caudal shield are strongly serrate.

The *antennules* (Pl. I. fig. 11) are very short; the basal joint is the strongest, its two sides are prolonged beyond the articulation of the second joint; the second joint is shorter as well as narrower than the first; the third and fourth joints of the peduncle decrease progressively in length, they are of about the same breadth and considerably narrower than the second. The flagellum has two joints, the distal being very minute.

In the *antennæ* (Pl. I. fig. 12), the third joint is longer than the two basal joints, the fourth is shorter than the third, the fifth longer; the flagellum is very minute, it only consists of four or five small joints.

The *thoracic appendages* (Pl. I. fig. 13) do not present any marked peculiarities, they are all similar and biunguiculate.

The *uropoda* (Pl. I. fig. 15) are placed close to the extremity of the abdominal shield; each consists of a large and broad basal piece which terminates in an inwardly curved spine, and has a serrate inner margin and two minute rami, of which the inner is the larger.

Station 145, off Marion Island, December 27, 1873; lat. 46° 43′ S., long. 38° 4′ 30″ E.; depth, 140 fathoms; volcanic sand.

Trichopleon, F. E. Beddard.

Trichopleon, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 106.

A single specimen of a deep-sea Isopod, dredged at Station 214, does not conveniently fall within any of the existing genera of Asellidæ. It is characterised as follows:—

Body elongated and oval, diminishing towards both extremities. Frontal margin of head straight and projecting between the antennæ. Eyes absent. Thoracic segments subequal, first four directed forwards with an antero-lateral spine, three posterior directed backwards without any lateral spines. No distinction between epimeral and tergal

region of segments. Abdominal segments all fused to form a single oval piece which terminates posteriorly in a short pointed extremity. Antennules with a long flagellum reaching some way along the terminal joint of the peduncle of the antennæ. Antennæ as long as the body; flagellum longer than the peduncle; third joint of peduncle with a rudimentary exopodite; two last joints of peduncle elongated. Mandibles with a three-jointed palp. Thoracic appendages (in the female) not dissimilar to each other, terminating in a single claw. Uropoda moderately long, biramose, outer ramus one-jointed, inner with a small distal and long proximal joint.

This genus comes nearest perhaps to *Janira*, but is to be distinguished by the uniunguiculate thoracic appendages. The general shape of the body is also unlike *Janira*, though in most other particulars it is hard to find any great differences between the two genera. The presence of a rudimentary exopodite on the antennæ is a feature only found in this genus, in *Janira*, and in *Stenetrium*, where it has the form of a flat scale tipped with fine hairs. In other genera this structure is entirely absent, though, as I have already pointed out (p. 17), a stout spine occupying the same position in *Iolanthe* and *Acanthoniscus* may be its representative.

Trichopleon ramosum, F. E. Beddard (Pl. I. figs. 1–10).

Trichopleon ramosum, Proc. Zool. Soc. Lond., 1886, pt. i. p. 106.

This species, as already mentioned, is represented by only a single individual, dredged to the south of the Philippine Islands in 500 fathoms.

The specimen is an immature female and measures 5 mm. in length; it has been stained in picrocarmine and mounted on a slide in Canada Balsam; the sex was ascertained by an examination of the ovaries, which were darkly stained and very conspicuous in consequence; one of these is shown in fig. 7 of Pl. I.; at the two extremities the ovary is formed of indifferent tissue, in the middle is a single row of ova, each surrounded by a follicular layer in which the constituent cells could not be made out. The oviduct which arises at the end of the posterior third is pear-shaped and opens by a slit-like orifice upon the last thoracic segment but two, near to the attachment of the limbs. There were no traces of brood lamellæ developed in this specimen.

The head is rather narrower but longer than the succeeding segment of the thorax; the insertion of the antennules is marked by a deep notch; between the two antennules the head is prolonged into a frontal process which ends squarely. To the outside of the antennules the lateral region of the head is prolonged forwards, terminating in a blunt rounded process which is almost exactly on a level with the frontal margin of the head. There is no trace whatever of eyes.

The three succeeding segments of the thorax are subequal, the first alone being slightly shorter than the two following; the breadth of all these segments is equal and a trifle greater than that of the head. The antero-lateral margins of these segments are directed forwards and terminate in a short sharp spine; the postero-lateral margin is parallel to the antero-lateral, both being bent forwards at an angle to the transverse axis of the segment.

The fourth segment of the thorax is shorter than any of the preceding, it is considerably wider laterally than dorsally, owing to the fact that its postero-lateral margin is directed backwards; it forms, in fact, the transition between the forwardly directed anterior and the backwardly directed posterior segments; its antero-lateral extremity, as in the case of the preceding ones, is furnished with a spine.

The three posterior segments of the thorax become successively narrower but longer; they are directed backwards instead of forwards and have no antero-lateral spines; the anterior margin of the fifth segment is closely applied to the posterior margin of the fourth, the others are separated by considerable lateral incisions, as are the anterior segments of the thorax. These incisions are, however, far less conspicuous than in such genera as *Pleurogonium*.

The abdominal segments are all fused together to form a single piece, which is about as long as the two last segments of the thorax; it is oval in form but wider anteriorly than posteriorly; between the uropoda the caudal shield is prolonged into a short spiny median process.

There is no trace of any segment intercalated between the last segment of the thorax and the abdominal shield. The margins of the abdomen appear to be fringed with slender hairs. The whole surface of the body, both dorsally and ventrally, is quite smooth and free from tubercles or spines of any description. The median dorsal region of the body is regularly convex, the lateral regions somewhat depressed.

The *antennules* (Pl. I. fig. 2) are about as long as the head and first two segments of the thorax together; the first joint of the peduncle is rounded and rather short and broad, the second is longer but narrower, the third is shorter and narrower again, and the terminal joint of the peduncle is very small indeed. The flagellum consists of about fifteen joints, and extends a little beyond the commencement of the distal joint of the antennary peduncle.

The *antennæ* (see fig. 3) are about equal in length to the body; the flagellum is rather longer than the peduncle.

The two basal joints of the peduncle are extremely short, the third a trifle longer, with an articulated scale on the outer side.

The *mandibles* and *maxillæ* I am unable to describe, as they were concealed by the subjacent *maxillepedes*.

The latter appendages are illustrated in fig. 5. The inner margin of the stipes is furnished with five of the hook-like processes peculiar to these appendages, which alternate in position with those of the corresponding appendage of the opposite side. The palp is five-jointed, the two distal joints being more slender than the three proximal.

The *thoracic appendages* are slender and moderately elongated, they terminate in a single claw. Some of these appendages were defective, but they appear to be all more or less similar. The first pair, or perhaps the first two, differ in that the fifth joint is shorter and stouter than it is in the succeeding appendage (see figs. 8, 9).[1] The first four pairs arise from the antero-lateral margins of their segments, the three posterior pairs from the postero-lateral margin.

The *uropoda* (fig. 6) consist of an elongated, slender basal joint, with which are articulated two rami, the innermost of which is longer as well as stouter than the outer; the inner ramus shows indications of division into two joints.

Munna, Kröyer.

Munna, Kröyer, Naturhist. Tidsskr., Bd. ii., 1839, p. 612.

Definition.—Body of the male in most cases elongated and narrow, that of the female broad and oval. Antennæ narrower in the posterior region of the thorax. Head very broad, and one-fourth or one-fifth of the length of the body. Eyes usually fixed on prominent stalks which project from the side of the head. Antennules about the length of the head, anterior longer than the body, with a flagellum shorter than the peduncle; fourth and fifth joints of the peduncle elongate. Thoracic appendages biunguiculate, the first pair forming short and powerful prehensile appendages, the following six pairs long and slender, gradually increasing in length, and the last three pairs markedly longer than the foregoing. Abdomen without a single anterior segment, free, elongated quadrangular, narrower than the thorax; uropoda in the form of short stumps, or absent.

Remarks.—The affinities of *Munna* are with *Pleurogonium* and its immediate allies, though in having biunguiculate thoracic appendages, this genus is now nearly related to *Jæra*, *Janira*, &c. In all other points, however, except in the presence of well-developed eyes, *Munna* presents very close resemblances to *Pleurogonium*.

Only five species of this genus are at present known, all of which are inhabitants of the shallow water off the coasts of Great Britain, Norway, North America, &c.; in the present Report I have two new species to add, both of which are from shallow water off the Island of Kerguelen; there is a third specimen from the same locality, but it is very small, and I believe is similar, so that I have not thought it advisable to describe it.

[1] The difference has not been rendered so marked in the figures as it ought to have been.

A fourth specimen from Marion Island is also apparently immature. Both the new species are remarkable in certain ways; in *Munna maculata* the male has evidently the same form of body as the female, and is not proportionably elongated, as is the case, for example, with the second species, *Munna pallida;* in this latter the eyes are not elevated upon appreciable stalks as they are in other species of the genus.

Munna maculata, F. E. Beddard (Pl. XI. fig. 14).

Munna maculata, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 98.

A single specimen of this species, which is a male, was dredged in 28 fathoms at Kerguelen.

Although the specimen is a male it does not display the cylindrical form of body which is generally characteristic of that sex, and which is the case, for example, with the next species of this genus to be described.

The present species is large as the genus goes, measuring 4 mm. in length.

The specimen is mounted upon a slide in Canada balsam, and is remarkable for the numerous black pigment spots which cover the body.

The head is about as long as the first two segments of the thorax; its anterior margin is straight and fringed with a row of stiff branched hairs; on either side is a deep notch for the insertion of the antennules; just behind the latter, and from the dorsal surface of the head the eyes take their origin; they are placed at the summit of a moderately long stalk, which is constricted towards its base.

The first four segments of the thorax are subequal and in every case longer than the three posterior, which are also narrower and are curved backwards, as in the typical members of the genus; the thoracic segments have short rounded epimera which are invisible on a dorsal view.

Between the thorax and the abdominal shield, as in other species of this genus and in allied genera such as *Pleurogonium*, there is an intercalated free segment which has not the lateral extension of the foregoing segments.

The abdominal shield is oval in form, and very convex dorsally, it ends in an obtuse rounded extremity.

The *antennules* are about as long as the head and the first segment of the thorax taken together. The two basal joints are very stout, and the two distal joints of the peduncle are subequal and extremely small; the flagellum consists of four joints which are elongated, but gradually decrease in length towards the extremity, the terminal joint being very short; the length of the entire flagellum is about equal to that of the peduncle.

The *antennæ* are very long, about twice the length of the whole body of the animal; the last two joints of the peduncle are very elongate, the terminal joint being the longer of the two; the flagellum is shorter than the peduncle.

The first pair of thoracic appendages are modified into a prehensile hand; they are stouter and shorter than the succeeding appendages of the thorax; the first joint of the limb is rather short and slender, the following joint is of equal length but much stouter; the third joint is much shorter and narrower; in every case these joints are wider at the articulation with the following joints than with the previous; the fourth joint of the limb is extremely large and stout and triangular in form; the distal side forms a cutting margin against which the comparatively small fifth joint plays.

The remaining thoracic appendages are more slender than the first pair but still stout, and their great length is characteristic of the genus; the more posterior pairs of these appendages are considerably longer than the body; the three basal joints are comparatively short and subequal; the fourth joint is long and equally stout, and provided with tufts of spines; the fifth joint is the longest but considerably more slender than the preceding; it is also furnished with tufts of hairs and spines; the sixth joint is very stout and the limb ends in two claws.

The *uropoda* are small conical stumps placed near to the end of the abdominal shield.

Station 149D, off Royal Sound, Kerguelen, January 20, 1874; lat. 49° 28′ S., long. 70° 13′ E.; depth, 28 fathoms; volcanic mud.

Munna pallida, F. E. Beddard (Pl. XI. fig. 15).

Munna pallida, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 98.

The present species is also from Kerguelen, and like the last is represented by a single male individual; this species, however, has the more typical characters of a male in being elongated and of approximately equal breadth throughout.

It affords a transition to such genera as *Jæra* by the structure of the eyes, which are small and not raised upon stalks as in the typical *Munna;* the free abdominal segment, the elongated thoracic appendages with two terminal claws, and the rudimentary conical uropoda show that this species in other respects conforms to the same generic type as the last.

Munna pallida is a smaller species than the last, measuring rather less than 3 mm.; it is pale and transparent and without the black pigment spots of *Munna maculata*.

The head terminates in a straight truncated anterior margin, the lateral notches for the reception of the antennules are deep, the lateral regions of the head are pointed anteriorly and rounded posteriorly; the eyes are conspicuous and placed just behind the antennules; they are quite sessile, not raised on a stalk as is so usual in this genus.

The first segment of the thorax is longer than any of the three succeeding, which are subequal; the lateral margins of these segments are rounded; the epimera which are small are also rounded laterally. The three posterior segments of the thorax gradually

increase in length, the last being the largest and about equal to the anterior segments; these segments are of course curved backwards; their lateral margins are rounded, and the rounded epimera are far more conspicuous than in the anterior segments of the thorax.

The abdominal shield is preceded by a single free segment, as in other species of this and allied genera.

The abdominal shield itself is oval, ending in an obtusely rounded extremity; near to this on either side are articulated the uropoda.

The *antennules* are very much like those of the last species but differ in that the flagellum is only three jointed.

The *antennæ* are unfortunately broken off at the fourth joint. They do not appear to differ from those of other species, so far as regards the basal joints of the peduncle.

Of the thoracic appendages only the third and seventh have been preserved; it is clear, however, from these, that the present species agrees with other species of its genus, in that the posterior are longer than the anterior thoracic appendages. The posterior pair of thoracic appendages are about as long as the body itself.

These appendages are distinguished, like those of other species of the genus, by the great length and slenderness of the fifth joint, which like the preceding is moderately spiny. The terminal joint is short and has two subequal claws.

The *uropoda* are very much like those of the last species, being short conical appendages with a few hairs at the apex.

Kerguelen; depth, 30 fathoms.

Pleurogonium, G. O. Sars.

Pleurogonium (*Pleuracantha*), G. O. Sars, Forhandl. Vidensk. Selsk., 1863, p. 219.

Three small Isopoda from Tristan da Cunha and Kerguelen appear to belong to this genus, which may be defined as follows:—

The anterior region of the body (head and thorax) greatly dilated and depressed, the three posterior segments of the thorax much narrower than the anterior and directed backwards. Head small, obtusely pointed or rounded anteriorly; eyes absent. Abdominal segments fused into an oral pointed abdominal shield, with the exception of the first segment, which remains distinct. Antennæ moderately long, the anterior pair equal to, or shorter than the posterior pair; flagellum of antennules short, two or three jointed. First pair of thoracic appendages stout and cheliform; following appendages similar in structure, but increasing progressively in length; furnished with a single terminal claw. Abdominal operculum of female large, with a sharply pointed apex. Uropoda extremely short, projecting but slightly beyond the margin of the caudal shield, biramose, each ramus composed of a single point, the inner larger than the outer.

The genus *Pleurogonium* (formerly termed by Sars *Pleuracantha*) was founded on specimens from the Christiania Fjord, living at a depth of 10 to 15 fathoms. Since the first description of the genus published in 1865, Dr. G. O. Sars has described the new species *Pleurogonium inerme*[1] and *Pleurogonium spinosissimum*,[2] the type species of the genus being *Pleurogonium rubicundum*. These are all shallow-water forms, not ranging apparently below 100 fathoms.

The genus *Pleurogonium* comes near to *Munna* in structure, and it is also closely allied to *Leptaspidia*, and to the remarkable genus *Dendrotion*, lately described by Sars; it is more particularly related to these two latter genera, with which it agrees in the uniunguiculate character of the thoracic limbs, those appendages being in *Munna* biunguiculate; the absence of eyes is also a character which *Pleurogonium* shares with *Dendrotion* and *Leptaspidia;* there is, however, no possibility of confounding it with either; in *Leptaspidia* the uropoda are uniramous and one-jointed, while in *Dendrotion* they have altogether disappeared; these appendages in *Pleurogonium*, though rudimentary, are more developed than in *Leptaspidia*, consisting as they do of two rami. The articulation of the antennary organs of *Leptaspidia*, below the cephalic shield, is another among the many characters which distinguish the genus from *Pleurogonium*.

The Challenger obtained three specimens, which appear to be the types of as many new species, belonging to this genus. Two of them, which are described below under the names of *Pleurogonium albidum* and *Pleurogonium serratum*, evidently come very near to Sars's *Pleurogonium rubicundum*, with which they agree in the lateral spines of the anterior thoracic segment; in the latter species, however, the posterior segments of the thorax are not furnished with such spines, which are present in my own species. The anterior prolongation of the head in *Pleurogonium rubicundum* is not found in the two Kerguelen species.

The third new species to be described in the present Report is *Pleurogonium minutum*, which comes nearest to Sars's *Pleurogonium inerme*, being like it without the spiny processes of the epimera; an obvious point of difference between the two species is the long lateral processes of the head in *Pleurogonium minutum*, which are not present in *Pleurogonium inerme*.

Pleurogonium albidum, F. E. Beddard (Pl. III. figs. 7–13).

Pleurogonium albidum, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 101.

The following description of this species is based upon a single female example from Kerguelen, measuring about 3 mm. in length.

The general shape of the body is much like *Pleurogonium rubicundum;* that is, the

[1] *Forhandl. Vidensk. Selsk.*, 1882, No. 18, p. 67.

[2] Beretning om i Sommeren, 1865, foretagen Zoologisk Reise, p. 30; *Archiv f. Math. og Naturv.*, 1877, p. 352.

anterior segments of the body are much broader than the three succeeding segments, as well as longer. The surface of the body is quite smooth, with the exception of a transverse ridge on each of the thoracic segments.

The head is short and almost enclosed by the succeeding segment of the thorax; its dorsal surface, as of the body generally, is very convex, the anterior margin of the head is rounded; the antennules are lodged in a semicircular incision situated at the postero-lateral extremity of the head.

The four anterior segments of the thorax with the head are about as long as the three posterior segments and the abdomen taken together. The first two segments are equal in length and rather shorter than the third and fourth, which are themselves equal. The width of these segments gradually increases up to the third; the fourth segment is not much narrower than the third. The lateral margins of the segments project as rounded elevations; in the second and third segments there is a straight marginal region behind the rounded projection, which in the first and fourth segments occupies the whole of the lateral margin. The epimera of these segments are prolonged into stout spiny processes; in the first segment the epimera are as well-developed as in the succeeding ones.

The three posterior segments of the thorax are separated from each other and from the fourth by deep lateral incisions; their antero-posterior diameter is considerably less than that of the preceding segments and they are also narrower; their width decreases regularly from the fifth to the seventh, but their length increases slightly. On each of these segments, as on the four anterior, there is a median dorsal ridge which ceases some way before the lateral margin of the segment; the lateral margins of the segments are rounded off, and the whole of the lateral regions are directed backwards, all three segments being approximately parallel.

The epimera are more conspicuous on a dorsal view than those of the anterior segments, as they project further outwards; each is prolonged into a spine-like process overlying the articulation of the limbs, which is shorter in these segments than in the anterior.

Between the last thoracic segment and the abdominal shield there is a single free abdominal segment, which is separated by a distinct suture both from the seventh segment of the thorax and from the abdominal shield; it bears a median ridge like that upon the preceding segments, but the lateral regions are not prolonged; the segment is narrower than the abdominal shield. The latter is divided into two regions by a notch at the point where the uropoda are articulated; the anterior region is nearly circular in outline; the posterior region is triangular and terminates in a sharp point; the lateral margin of the posterior region (fig. 12) is slightly serrated, the serrations becoming more marked towards the apex, and fringed like the rest of the abdominal shield with a few slender hairs.

The *antennules* (fig. 8) are of about half the length of the antennæ.

The peduncle consists of the usual four joints, but it is impossible, except by the analogy of other Isopoda, to draw any line of demarcation between what ought to be

considered peduncle and what flagellum ; the first two joints of the peduncle are of equal length, but the second is more slender than the first ; the difference in size between them is, however, much less than is ordinarily the case ; the third joint is very much narrower and shorter than the second, and the fourth smaller still ; the two joints of the flagellum are subequal and a little longer than the terminal joint of the peduncle.

The *antennæ* (fig. 9) have a peduncle consisting of six joints ; the first two are subequal and very short ; the third is rather more than twice the length of the first two taken together ; the fourth is again short, about half the length of the third joint ; the fifth joint is as long as the third and fourth together, and the sixth is longer still but more slender ; the flagellum consists of about eight joints which are elongated but gradually decrease in length towards the extremity ; the flagellum is a little shorter than the terminal joint of the peduncle.

The first pair of thoracic appendages are stouter than the succeeding, and are prehensile ; the proximal joint (see Pl. III. fig. 10) is the longest and at the same time the most slender ; the two following joints are short, stout and subequal ; the following joint is very much broader and at the same time longer than either of the preceding ; the fifth joint is of nearly equal length but narrower ; the distal joint is extremely narrow and curved, and folds back upon the penultimate joint of the limb.

The succeeding pairs of limbs are longer and more slender than the anterior pair and are similar to each other in structure.

The first joint is the longest, the second is not much shorter, the third is of about half the length of the second ; the fourth joint is as long or very nearly as long as the first ; it has a series of spines along the inner margin ; the fifth is much more slender than any of the preceding which are subequal in diameter ; it is about as long as the fourth joint, and like it furnished with a series of stiff hairs ; the terminal joint (fig. 11) is very short and bears a spine about equal to itself in length, as well as a short slender hair which corresponds to the second spine developed here in *Munna*, *Jæra*, &c.

The *operculum* which covers over the gill appendages extends to the very end of the pointed extremity of the abdominal shield.

The *uropoda* (fig. 13) are small and biramose, the inner branch longer and stouter than the outer.

Station 149K, off Christmas Harbour, Kerguelen, January 29, 1874 ; depth, 120 fathoms ; volcanic mud.

Pleurogonium serratum, F. E. Beddard (Pl. III. fig. 14).

Pleurogonium serratum, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 102.

This second species of *Pleurogonium* from Kerguelen does not present many differences from *Pleurogonium albidum*, but appears to belong to a different species.

The single specimen is a female, and is considerably smaller than the single specimen of the last species, measuring about 2 mm. in length.

The head is small and is almost enclosed by the following segment of the thorax; the frontal margin is straighter than in the last species, and the articulation of the antennæ is not so near to the posterior boundary of the head; the hinder margin of the semicircular notch which encloses the basal joint of the antennules is prolonged further outwards, and uniting with the posterior margin of the head, forms a narrow pointed process which extends laterally nearly as far as to the spiny epimeron of the first segment of the thorax.

The thoracic segments are so very like the last species that no particular description appears to be necessary; the epimeral spine of the first segment, however, is much smaller in proportion to the following spines than it appears to be in *Pleurogonium albidum*.

The most characteristic and obvious difference between the two species is in the abdominal shield; this is preceded in the present species, as in *Pleurogonium albidum*, by a free abdominal segment, not produced laterally like the three posterior segments of the thorax. The general shape of the abdominal shield in *Pleurogonium serratum* is like that of *Pleurogonium albidum*, only the posterior termination is blunter; the lateral margins of the caudal shield as far back as the articulation of the uropoda are strongly serrate, the serrations commence gradually, and somewhat behind the boundary line between the abdominal shield and the free abdominal segments; they terminate, however, abruptly just before the articulation of the uropoda; there is no trace of such serrations in *Pleurogonium albidum* except along the posterior extremity of the abdominal shield.

The lengths of the antennules and the antennæ are as 5 : 6; these two pairs of appendages are in fact very nearly equal in length; there is not at any rate the great disproportion between them that has been referred to in *Pleurogonium albidum;* in this respect the present species not only differs from *Pleurogonium albidum*, but is a more typical species of the genus according to its definition by Sars.

The structure of the *antennules* presents no differences from the last species.

The *antennæ* differ from those of *Pleurogonium albidum*, not only in their smaller size, but in the fact that the flagellum is longer than the terminal joint of the peduncle instead of shorter; the two distal joints of the peduncle are also much more slender than the proximal joints. I cannot, however, lay any great stress upon the specific differences indicated by the antennary appendages. The appearance of these appendages was greatly altered by the mounting of the specimen in glycerine jelly.

The *uropoda* are biramose.

Station 149K, off Christmas Harbour, Kerguelen, January 29, 1874; depth, 120 fathoms; volcanic mud.

Pleurogonium minutum, F. E. Beddard (Pl. XI. fig. 13).

Pleurogonium minutum, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 103.

The third new species of this genus was dredged off Tristan da Cunha in 100 to 150 fathoms of water; it is represented by only a single specimen, which, like the other two species, is a female with eggs in the brood cavity.

The specimen measures about 1 mm. in length.

The shape of the body is characteristic of the genus, the anterior region of the thorax comprising the first four segments being broad, and the posterior region narrow in comparison.

The head is rounded anteriorly and is extremely convex like the rest of the body; behind the articulation of the antennæ the lateral margin of the head is prolonged into a short process curved forwards. The antero-posterior diameter of the first four thoracic segments is subequal, and the breadth gradually increases up to the third, which is the widest; the lateral margins of these segments are rounded and they are furnished with short epimera, which are also rounded, and not prolonged into spine-like processes as are the epimera of the two last species, *Pleurogonium albidum* and *Pleurogonium serratum*. The dorsal surface of the body is quite smooth.

The three posterior segments of the thorax have the usual form that is characteristic of the genus; they are furnished with epimera which are evident on a dorsal view, those of the anterior segments being concealed when viewed from above; the epimera are truncated at their free extremity and are not prolonged into spines. Between the last segment of the thorax and the abdominal shield there is a short intercalated segment as in other species of this genus.

The abdominal shield is oval, tapering towards its extremity; at the end of the second third is a notch which marks the articulation of the terminal pair of abdominal limbs; the lateral margin of the abdominal shield for a short space anteriorly to this notch is serrate, but the serrations are not anything like so conspicuous as in the species which I have named *Pleurogonium serratum*.

The *antennules* are practically identical in structure with those of the last two species; the first joint extends a very little way beyond the lateral process of the head.

The *antennæ* are not so much longer than the antennules as they are in *Pleurogonium albidum*, where the proportion in length was as 2 : 1; in *Pleurogonium minutum* the antennæ are not half again as long as the antennules, the proportion being about 6 : 4.

In this respect, therefore, the present species is more typical than *Pleurogonium albidum*, as it is stated by Sars in his definition of the genus that the two pairs of antennary appendages are of about equal length.

The difference of proportionate length between the antennæ of this species and of *Pleurogonium albidum* is brought about by the comparative shortness of the third joint, which is not much longer than the second; the fourth joint is also very short, the fifth is extremely long.

The first pair of thoracic appendages, as in other species of the genus, is modified into a prehensile organ.

Tristan da Cunha, 100 to 150 fathoms.

Neaselllus, F. E. Beddard.

Neaselllus, F. E. Beddard, Narr. Chall. Exp., vol. i. p. 882, fig. 326.

This genus is represented in the Challenger collection by a single small Isopod from Kerguelen.

Generic Character.—Body broad and flattened, wider anteriorly than posteriorly; surface of the body smooth dorsally, fringed laterally with numerous short flattened spines. Head separated by a deep incision from the thorax and extremely wide, eyes absent; the antennæ are situated at the extreme lateral margins of the head. First segment of the thorax larger than any of the following, fused with the second segment except laterally; following segments of the thorax distinct and subequal, separated by deep lateral incisions; all the segments of the thorax, with the exception of the fourth and seventh, with long rounded lateral processes. Abdominal shield rhomboidal, notched at the apex, and laterally where the uropoda articulate. First pair of antennæ much shorter than the second pair, consisting of six joints of which the two distal may be reckoned as flagellum; antennæ with a short flagellum about as long as the distal joint of the peduncle. First pair of thoracic appendages modified into a prehensile limb. Uropoda biramose, very short, like those of *Pleurogonium*.

Remarks.—There can be no doubt that this forms a very distinct generic type. Apart from the remarkable form of this Isopod, the great lateral extension of the head with the antennæ articulated at the extreme lateral margin and its separation by a deep incision from the thorax, is quite a novel character; moreover, the almost complete fusion of the two first thoracic segments is a character quite new to the family to which this genus evidently belongs; in other respects it appears to come nearest to *Pleurogonium* and *Paramunna;* in the articulation of the antennules below the lateral extension of the head this genus recalls *Leptaspidia*,[1] where both pairs of antennary appendages are quite covered by the head, arising altogether from its lower surface.

[1] Westwood and Spence-Bate, Sessile-eyed Crustacea, vol. ii. p. 333.

Neasellus kerguelenensis, F. E. Beddard (Pl. II. fig. 11; Pl. III. figs. 1–6).

Neasellus kerguelenensis, F. E. Beddard, Narr. Chall. Exp., vol. i. p. 882, fig. 326, 1885.

The single specimen belonging to this new species and genus has already been briefly described and figured by myself in a notice of the Isopoda collected during the voyage, published in the first volume of the Narrative. I have also referred to it as to the other new species of Isopoda in a Preliminary Report communicated to the Zoological Society of London.

The extreme length is about 2 mm.

The body is broad and convex; the general outline is pear-shaped owing to the great breadth of the head and of the two anterior segments of the thorax.

The head is immensely extended laterally, and its shape reminds one very forcibly of that of the hammer-headed shark; only about the middle third of the head is articulated with the first thoracic segment, the lateral regions are separated by deep curved incisions; the central region of the head is convex, the lateral regions are flattened; the anterior margin of the head is curved, convex in the middle region and concave laterally; the lateral margins are notched where the antennules articulate; the antennæ are covered over at their insertion. The whole of the anterior and lateral margins of the head are fringed with peculiar spines, which are flattened and somewhat conical in form, often curved; they are placed close together, no interval being left between two adjacent spines; the posterior margin of the head (bordering the lateral incision) is quite smooth and free from spines. The dorsal surface of the head is also quite smooth.

Eyes are completely absent.

The two first thoracic segments are together about equal in length to the head in its middle region. The line of suture which separates these two segments from each other is obliterated except for a short space laterally. The width of both these segments is slightly greater than the width of the head; laterally both of them project as rounded spatulate processes fringed with spines similar to those upon the head; the anterior forward concave margin of the first segment is, like the posterior margin of the head, free from these spines.

The remaining segments of the thorax are subequal in length, and about one-fourth of the length of the conjoined anterior segment; judging from the separated lateral regions of the two first segments, the second of these would be about equal to the following segments.

The third, fifth and sixth segments have long oval lateral processes like those of the anterior segments, and like them also fringed with spines; the diameter of these segments is not less than that of the first two; the lateral regions of the sixth segment are more bent backwards; in the fourth and seventh segments of the thorax the lateral regions do

not project so far laterally, but are similar in structure; the surface of the thorax is quite smooth. Between the last thoracic segment and the abdominal shield there is a distinct segment as in *Pleurogonium*. The shape of the abdominal shield is rhomboidal, with a shallow notch at the posterior extremity and two very deep notches laterally where the uropoda are articulated; the antero-lateral margins are smooth, the postero-lateral margins are beset with spines like the rest of the body except at the lateral and terminal notches.

The *antennules* (Pl. III. fig. 1) are about one-fourth as long as the antennæ, both appendages arise as already stated at the extreme lateral margin of the head, where there is a notch for the basal joint of the antennules; the antennules do not, however, arise entirely from the upper side of the head, being overlapped by the anterior lobe of the lateral region of the head as shown in Pl. II. fig. 11. The basal joint is stouter but shorter than the following joint; the third and fourth are both narrower and shorter than the second joint; the flagellum consists of only two rather elongated joints. The antennules of this species are quite like those of *Pleurogonium* (*cf.* Pl. III. figs. 1, 8).

The *antennæ* (fig. 2) are rather more than half the length of the body.

The basal joint is extremely small, the second joint is short and furnished with a single spine on the outer margin close to its articulation with the third joint; the latter is comparatively long, with a row of spines along the outer margin similar to those which border the body; these only extend along the proximal two-thirds of the joint; the three succeeding joints of the peduncle are much more slender than the basal joints; the fourth is extremely short, the two following elongated. The flagellum is a little longer than the distal joint of the peduncle; its joints are few and elongated.

The mouth appendages I am unable to describe, as they were hidden by the thoracic appendages, except to remark that the mandible is furnished with a palp.

The first pair of *thoracic appendages* (fig. 3) are stouter than the rest and cheliform; the proximal joint has a few spines on the outer margin near to its articulation with the succeeding joint; there were six or seven of them, which decreased in length towards either end of the row. In the succeeding *thoracic limbs* (fig. 4) there are also a few similar spines upon the basal joints; I noticed them in the three following pairs of limbs, but not in the three posterior pairs; in no case, however, were they so numerous as in the cheliform appendages.

The *uropoda* are small and exactly resemble those of *Pleurogonium;* these appendages are displayed in a dorsal and ventral view in figs. 5, 6; they are biramose, and the larger endopodite completely covers the small exopodite when the appendages are viewed from below; the extremity of each of the branches are furnished with a few longish simple hairs.

Station 149K, off Christmas Harbour, Kerguelen, January 29, 1874; depth, 120 fathoms.

Since the above was written I have received from Mr. Dendy a number of other specimens of this species from Station 320 (600 fathoms). They were found upon two species of Sponges, *Esperella lapidiformis*, Ridley and Dendy, and upon *Gellius carduus*, var. *lævis*, Ridley and Dendy. The specimens agreed very closely with the type described above, the only difference being that in one individual there were traces of eyes in the shape of two crystalline cones, together with the corresponding pigmented retinal cells. This forms another instance of a shallow-water species ranging into deep water.

Astrurus, F. E. Beddard.

Astrurus, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 99.

Generic Character.—Body narrow, oval, tapering posteriorly, everywhere densely beset with short spines; head terminating in front in a long bifid rostrum; eyes absent (?); head and four anterior segments of the thorax furnished with a long spine on either side, covered with minute spines, similar to those which cover the body; three posterior segments of thorax with a pair of much smaller spines; abdominal segments with the exception of the first fused into a single piece which is pear-shaped; it terminates behind in four curved short spines arranged like a cross; antennules short; four joints on the peduncle with a two or three-jointed flagellum; antennæ more than half the length of the body; the two distal joints of the peduncle are elongated; the flagellum is about as long as the last joint. Mandibles with a long palp consisting of three joints. Anterior pair of thoracic limbs prehensile in form. Posterior pairs of thoracic appendages elongated; thoracic limbs terminating in a single claw. Uropoda consisting of a single conical joint, very short, with a minute distal joint.

Remarks.—This genus is closely allied to *Munna*, *Paramunna*, *Leptaspidia*, and *Pleurogonium*, it perhaps comes nearest to the two last mentioned genera; it agrees with *Leptaspidia* and *Pleurogonium* in the general shape of the body. With *Leptaspidia*, *Astrurus* corresponds in the form of the antennary organs and of the uropoda; in *Leptaspidia*, however, the thoracic appendages are not so elongated as in *Astrurus*, and in this feature of its organisation the latter genus presents affinities to *Munna* and *Dendrotion*; *Munna*, however, differs from *Astrurus* in having two claws at the termination of the thoracic appendages; there is only one in *Astrurus*, as in *Pleurogonium* and the other genera that have been mentioned; if I am right in describing the two lateral projections of the head with their orange-coloured contents as eyes, this genus will present another strong point of resemblance to *Munna*, and especially to *Acanthomunna*.

Astrurus crucicauda, F. E. Beddard (Pl. V. figs. 9–19).

Astrurus crucicauda, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 100.

This, the only species of the genus, is represented by a very considerable number of specimens dredged in shallow water off the shores of Kerguelen; it is a small species, the largest individuals only measuring 4 mm. in length.

The body is oval in general outline, the anterior region of the thorax being of greater width than the posterior region, the surface of the body is abundantly furnished with spines; the head is narrower than the succeeding segment of the thorax, it is prolonged in front into two long slightly divergent processes, which are rather longer than the head itself. Behind this bifid rostrum on either side the margin of the head is incised for the insertion of the antennules; posterior to the insertion of these, the margin of the head is prolonged laterally into a process which is rather wider at its free extremity than at the base; the general appearance of this process is very like that of the "stalked" eyes of the allied genus *Munna;* in the interior was an orange coloured substance which is of the same tint as the partially disclosed eye-pigments in many Crustacea; the surface of the lateral process is, however, beset with numerous spines, and its extremity ends in a particularly long spine.

The four anterior thoracic segments are of equal or nearly equal length; their breadth gradually increases up to the third, which is the widest; the median region of each segment, which is equivalent to nearly the whole of it, is convex and densely covered with spines, the lateral margins of the segments are prolonged into narrow spiny processes of considerable length, which are themselves covered with spines. In the first two segments these spines follow the general curvature of the segments themselves and are directed forwards; in the third segment they are directed at right angles to the longitudinal axis of the body, and in the fourth segment slightly backwards. The length of the spines is about one-third of the diameter of the body.

Of the three posterior segments of the thorax the first two are subequal in length and shorter than the anterior segments, they decrease gradually in width; the seventh thoracic segment is equally long but narrower again.

The lateral margins of these segments are not furnished with the long processes of the anterior segments of the thorax, only in the fifth and sixth segments one of the small spines which fringe the body is elongated to a greater extent than the rest; on the seventh segment this spine is hardly larger than the surrounding ones.

The abdominal shield is constricted anteriorly, and there is a distinct free abdominal segment; the middle portion is oval; behind the articulation of the uropoda it becomes suddenly narrower, and terminates behind in the peculiar fashion indicated in fig. 18 of Pl. V.; the posterior extremity is formed by four somewhat curved spines arranged with reference to each other like the arms of a starfish, the fifth arm being as it were widened out at the base of attachment to the abdominal shield. The surfaces of this region of

the body are, as elsewhere, covered with short spines, which are here as on the posterior segment of the thorax hooked; the posterior region of the abdominal shield, from the articulation of the uropoda onwards, is smooth and entirely devoid of spines, with the exception of the four terminal spines.

The *antennules* are displayed in fig. 10 of Pl. V.; they consist of a two-jointed peduncle and a five or six-jointed flagellum; in the peduncle the proximal joint is broader as well as shorter than the succeeding joint.

The *antennæ* (fig. 9) are very much longer than the antennules, but not so long as the body; the proximal joints are short and subequal; the two distal joints of the peduncle are of great length, the last being slightly the longest; the flagellum is shorter than either of the two terminal joints of the peduncle; it is composed of twenty or more joints, of which the first is the longest.

The *mandibles* terminate in a bifid masticatory process, each division of which is again divided into two or three teeth; the masticatory edge is also furnished with several denticulated spines; there is a stout molar process; the palp is long and three-jointed, the middle joint is rather the longest; the terminal joint and the distal half of the middle joint are beset with a single row of fine spines; at the extremity of the distal joint, which is somewhat curved, are four or five longish stiff hairs, which decrease gradually in length from before backwards.

One of the *maxillipedes* is represented in fig. 12; the palp is five-jointed, the joints gradually decreasing in width towards the extremity; the inner margin of the stipes is furnished with two processes shown more highly magnified in fig. 13; they evidently correspond to similar structures in other Isopods, especially in the Munnopsidæ.

The first pair of *thoracic appendages* are modified into prehensile limbs; one of these is displayed in fig. 14 of Pl. V.; the proximal joint is long and rather stouter than the succeeding joint, one margin is fringed with a row of hooked spines; the following joints are short, the second rather longer than the third and fourth, which are subequal; the fifth joint is oval and rather swollen, the inner margin, against which the narrow sixth joint rests, has a few slender spines.

The remaining *thoracic appendages*[1] are elongate, particularly the three posterior pairs; the proximal joints are furnished with several rows of spines; the terminal joint of each limb is short and bears a long, curved, slender spine and a short slender hair on the inner side of the former; this arrangement is, however, very different from the two subequal terminal claws that are found in the thoracic appendages of *Munna* and other genera.

[1] In the interior of several of the thoracic appendages, probably lodged in the vascular channels, were occasionally a number of green bodies of varying form, which I take to be parasitic Algæ. I am not aware that the occurrence of parasites of this class have been noted in the Isopoda, though parasitic Infusorians (*Anoplophrya circulans*, Balbiani, *Recueil zool. suisse*, ii., 1885, p. 277), are known from the appendages of *Asellus*. The presence of green bodies presumably coloured by chlorophyll might be useful in determining, in disputed cases, whether a given specimen really came from the bottom or had been caught up by the dredge in the surface waters.

The *uropoda* are rudimentary ; each consists of a somewhat conical piece articulated to the abdominal shield by its broad end; at the free extremity there are a number of long hairs, and a minute articulated scale which appears to me to represent the endopodite; in figs. 16, 17 of Pl. V. the terminal portion of this appendage is shown more highly magnified.

Station 149K, off Christmas Harbour, Kerguelen, January 29, 1874; depth, 120 fathoms.

Ischnosoma, G. O. Sars.

Ischnosoma, G. O. Sars. Beretning om i Sommeren, 1865, foretagen Zoologisk Reise ved Kysterne af Christianias og Christiansands Stifter. Christiania, 1866, p. 34.

The Challenger collection contains two fragments of Isopods, which appear to belong to this genus and to represent two new species of it, as well as a single complete specimen of another species.

This genus was formerly regarded by Sars as belonging to the Munnopsidæ, but it has since been removed by him to the family Asellidæ. In his account of the Isopoda collected by the Norwegian Expedition, Dr. Sars has pointed out that although the general aspect of the Crustaceans belonging to this genus is not unlike that of the Munnopsidæ, the absence of any modification into natatory organs of the three posterior pairs of thoracic appendages is opposed to their being placed in this family. The same is also the case with *Macrostylis*.

The genus is defined by Sars as follows :—

Body elongate and narrow, broadest at first segment of thorax; hinder part of segment four and anterior part of segment five firmly connected, and forming an hour-glass shaped portion which is nearly equal in length to half the body. Head small and rounded, eyes absent. The abdominal segment much longer than broad, constricted at the base, rather dilated towards the apex and obtusely rounded. Upper antennæ projecting a little beyond the first joint of the peduncle of the lower antennæ, six-jointed, the second joint narrow and elongated; lower antennæ slender, longer than the body, the flagellum about equalling the peduncle in length and composed of about nineteen joints. Feet of the first pair short and robust, subprehensile, the antepenultimate joint strongly dilated. Following feet slender and elongated, similar to each other, six-jointed, the last joint forming a claw very elongate in the posterior three pairs of limbs. Caudal appendages simple.

Sars has described two species of this genus, viz., *Ischnosoma bispinosum* and *Ischnosoma quadrispinosum;* the former is distinguished by the presence of a spinous prolongation of the lateral margin of the first thoracic segment; in *Ischnosoma quadrispinosum*, the first and fourth thoracic segments are thus provided, and the uropoda are rudimentary. Two of the species to be described in the present Report are distinguished in the first place by their very large size as compared with the two northern representa-

tives of the genus. *Ischnosoma bacillus* is characterised by the presence of a long lateral spine on the fifth as well as on the fourth segment of the thorax. *Ischnosoma bacilloides* may be distinguished from its congeners, by the fact that both the sixth and fifth segments of the thorax have the lateral spines. Other differences will be pointed out in the course of the following descriptions of these species. The third species, which I have named *Ischnosoma spinosum*, is a near ally of Sars's two species, and differs very considerably from *Ischnosoma bacillus* and *Ischnosoma bacilloides*. The genus as at present known falls into two subdivisions; the northern species *Ischnosoma spinosum*, *Ischnosoma bispinosum*, and *Ischnosoma quadrispinosum* are distinguished by their small size, by the comparatively small size of the fourth and fifth segments of the thorax as compared with the hinder end of the body, and by the great length of the first free abdominal segment. The antarctic species, *Ischnosoma bacillus* and *Ischnosoma bacilloides*, are characterised by their large size, by the great length of the fourth and fifth segments of the thorax, and by the extreme shortness of the free abdominal segment.

Ischnosoma spinosum approaches the genus *Munnopsis* more nearly than any of Sars's species by reason of the fourth thoracic segment, which is much more like the preceding, and is apparently not so elongated as in *Ischnosoma bispinosum* and *Ischnosoma quadrispinosum*. In this species, therefore, as in *Munnopsis*, the thorax consists of two distinct regions, an anterior under portion including the first four segments, and a posterior narrow portion consisting of the three posterior segments of the thorax.

Ischnosoma spinosum, F. E. Beddard (Pl. VI. figs. 1–5).

Ichnosoma spinosum, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 99.

The present species is represented by a single individual which is complete, with the exception of one or two of the thoracic limbs. It resembles Sars's two species, *Ischnosoma quadrispinosum* and *Ichnosoma bispinosum*, much more closely than do either of the other species described here.

The specimen measures about 6 mm. in length and is a female, with short immature ovigerous lamellæ upon the first four thoracic segments.

The anterior region of the body, comprising the head and first four segments of the thorax, is broader than the posterior region but not so long; it equals in length the three posterior thoracic segments, *plus* the single free abdominal segment; the general shape of the body is in fact precisely similar to that of *Ischnosoma quadrispinosum*.[1]

The head is very much narrower and shorter than the first segment of the thorax; the frontal margin is rounded, and at either side, in front of the articulation of the antennules, there is a short projecting lobe fringed with spines; behind this there is a deep semicircular notch where the basal joint of the antennules is fixed; there is no trace of any eyes

[1] G. O. Sars, Norske Nordhavs Exped., &c., pl. xi. fig. 26.

The first segment is much longer than either of the two succeeding segments; at the lateral margin are three long spines of which the anterior is the longest and bears two short branches at its base; the dorsal surface of this segment, as of the body generally, is roughened and tubercular; on the median lateral regions of the dorsal surface are a few spines, of which one on each side is particularly long. The two succeeding segments of the thorax are subequal; on the lateral margin are two spines, of which the anterior is the longer; there are also a few stoutish spines upon the dorsal surface of these segments. The fourth segment is longer, and as usual in this genus broader anteriorly than posteriorly, where it comes into contact with the following segment; it has a few short spines, but no long lateral spines like those of the preceding segments. The fifth segment of the thorax is as usual the longest and somewhat T-shaped, the arms of the T being at the hinder end of the segment where the limbs are articulated. Along the latero-dorsal regions of this segment, in the anterior cylindrical section, are a row of about seven short, stout spines on either side of the body. The epimera of this segment, as of the two following, are visible on a dorsal view; they are short, rounded, and tuberculate, like the rest of the body surface. The sixth and seventh segments of the thorax are very short with rounded margins, and like the preceding segment without any lateral spines.

The first segment of the abdomen is free from the abdominal shield; it is of about the same size as the last segment of the thorax, both being a trifle narrower than the sixth thoracic segment; along the lateral margins are a few short blunt spines.

The abdominal shield has a rather peculiar shape, which is characteristic of the species; the anterior margins form an oval. There is a deep notch just in front of the articulation of the uropoda which are borne upon a short truncated process; the extremity of the caudal shield is prolonged for some way behind the articulation of the uropoda, and terminates abruptly in a straight margin. The dorsal surface has a median and two lateral convexities; the former is bordered by three short spines on either side, and there are a few similar spines scattered over the lateral regions, one being especially prominent just in front of the lateral notch which precedes the articulation of the uropoda.

The *antennules* are rather peculiar in shape (see fig. 2); they consist of a large stout basal joint, with which is articulated an elongated second joint which is considerably narrower, and bears a few long slender hairs upon the inner side; the last of these is very much longer than the rest; at the summit of this is articulated an extremely minute three-jointed flagellum.

The *antennæ* (fig. 3) appear to be shorter than the body, but as a portion of the flagellum was broken off, their exact length cannot be given; the proximal joint is very short, the second long, and both these joints have a number of long, stout, rough spines; the first joint has two of these on the inner side; the second joint has two rows, one on either side

of the joint; there appeared to be three spines on the outer side and only two on the inner; the largest spine of either side was placed just before the articulation with the third joint; this is short, about one-fourth of the length of the preceding; the two distal joints of the peduncle are long and slender, and have, like the third joint, no spines; the last joint of the peduncle is longer as well as more slender than the fourth; the flagellum is multiarticulate.

The first pair of thoracic appendages were stouter and shorter than the following ones. The remaining *thoracic appendages* (fig. 4) are similar to each other; they are long and slender; the posterior pairs are not distinctly longer than the anterior pairs. They are furnished with numerous spines of varying length, which are mainly developed upon the proximal joint of the limb and disappear after the second. The spines are borne upon projections of the limb; the spine itself is distinguishable from the base, which is an outgrowth of the limb, by its transparency and yellow colour; the extremities of many of the lateral spines of the segments are tipped with a minute transparent yellow point in a similar fashion to the spines of the limbs.

The thoracic limbs terminate in a single elongated claw-like joint.

The *uropoda* (fig. 5) consist of a single stout conical joint with a few hairs scattered over its surface.

Ischnosoma spinosum is to be distinguished from its immediate allies, *Ischnosoma bispinosum* and *Ischnosoma quadrispinosum*, by the great development of spines upon the body and the appendages; the numerous other points of difference may be gathered from the foregoing description.

Station 78, off the Azores, July 10, 1873; lat. 37° 26′ N., long. 25° 13′ W.; depth, 1000 fathoms; volcanic mud.

Ischnosoma bacillus, F. E. Beddard (Pl. VI. figs. 6, 7).

Ischnosoma bacillus, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 98.

This very remarkable Munnopsid closely resembles the species next to be described; it consists only of a fragment; the head and the first three thoracic segments are entirely wanting. The second species, which I have named *Ischnosoma bacilloides* on account of its close similarity to *Ischnosoma bacillus*, consists likewise of a fragment which includes precisely the same segments, viz., the four posterior thoracic segments and the abdominal shield.

The name "*bacillus*" was suggested by the rod-like form of the body, which with its elongated segments recalls the form of the body in the "walking-stick insect" *Bacillus*. Although this species, as well as the next, is so imperfect, I have no hesitation in assigning both to the genus *Ischnosoma* by reason of the oval caudal shield with its styliform uropoda and the metamorphosis (in the female) of the first pair of appendages belonging to the

abdomen into a single plate which covers the gills; the extreme length of the thoracic appendages, which are modified to form clawed ambulatory limbs, as well as the gradual decrease in size of the three posterior thoracic segments, are quite in harmony with this identification, which appears to me to be the only one possible.

The fact that in both cases the body had been broken off at the fourth segment of the thorax, suggests that the anterior segments of the thorax were in all probability broader and shorter than those which follow; if this suggestion prove to be correct the species only presents us with an exaggeration of the form of body characteristic of such species as *Ischnosoma spinosum*.

I do not wish to deny that both *Ischnosoma bacillus* and *Ischnosoma bacilloides* may ultimately be shown to be in reality identical; they however present sufficient differences to warrant their distinction as two species, supposing of course that these differences do not prove to be sexual. I am not aware of any other allied form in which such secondary sexual characters are developed.

The single specimen of *Ischnosoma bacillus* has been mounted in Canada balsam on a slide; it measures 10 mm. in length by 1 to 2 mm. in breadth. The length of the several segments which compose the fragment is as follows:—Fourth thoracic 2·5 mm., fifth thoracic 4 mm., sixth and seventh together 1·25 mm., caudal shield 1·25 mm., the above measurements give, at any rate, the right proportion between the several segments.

The fourth segment of the thorax (which unfortunately is the anterior end of the specimen) is like the rest cylindrical in form, widening out somewhat both at its anterior and posterior extremities; more particularly is this the case with the anterior region of the segment which, as shown in the figure (Pl. VI. fig. 6) is of considerable breadth, nearly as broad in fact as the segment is long; the whole segment has, therefore, the shape of a T; the two "arms" of the T are broad at their bases, where the limbs are articulated, beyond the articulation of the limbs they suddenly narrow into a long spine slightly curved forwards; these no doubt represent the epimera.

The fifth segment of the thorax is, as the above measurements imply, considerably the longest; the comparative elongation of this segment is not remarkable, because in the other species (*e.g.*, *Ischnosoma spinosum*, Pl. VI. fig. 1) the fifth segment of the thorax is also the longest. Its form resembles that of the preceding segment, only reversed; the "arms" of the T are at the posterior instead of the anterior extremity of the segment, they are equally long with those of the fourth segment, but the epimeral spine appeared to me to be straighter and not so bent as in that segment; at the point where the fourth and fifth segments articulate with each other the diameter of each is slightly wider than in the middle of the segment.

The sixth and seventh segments of the thorax are very short indeed, and together about equal the caudal shield in length. The sixth segment is the longer of the two;

it is narrower anteriorly and wider posteriorly where the limbs articulate; in neither of these segments are any spiny epimera developed.

The abdominal shield is preceded by a narrow free abdominal segment; it is more or less oval in form and rather wider anteriorly than posteriorly; the anterior region is very convex, the posterior region, which terminates in a somewhat truncated margin, is less so.

As in all other species of the genus the anus opens posteriorly at the extremity and is surrounded by soft folds of tissue. Fig. 9 of Pl. VI.[1] represents the caudal shield, viewed from beneath, to show the large aperture of the anus (*a*); in this as in other species the calcareous bar (*b*), which bounds the anus anteriorly, is in reality the homologue of the ventral plate of the last segment of the abdomen, and is of course not the telson bent downwards.

Several of the appendages have fortunately been preserved intact.

Of the fourth segment of the thorax the left hand appendage is complete; it is shown in fig. 7.

The whole appendage about equals the body of the animal in length; like the succeeding appendages it appears to be almost destitute of hairs or spines; the first two joints are moderately long and subequal; the third is short, rather less than half the length of either of the preceding; the fourth and fifth are long and slender, and the sixth joint forms a slender terminal claw. The appendages of the remaining segments of the thorax are of almost exactly the same shape and of about the same length, so that no special description of them is necessary.

The posterior thoracic appendages of this species, therefore, are like the anterior appendages, and are not modified into foliaceous swimmerets (as in *Munnopsis*). Like the body itself the appendages appear to be very fragile; the integument is very thin and brittle, and evidently much calcified.

The *abdominal appendages* do not present any remarkable features, except their small size, corresponding to the small size of the caudal shield; this being the case the thinness of the test of the animal may facilitate respiration by the general body surface.

The *uropoda* are broken on one side of the body but intact on the other; they are styliform, only consisting of one ramus; the appendage is made up of three joints, a stouter proximal joint, and a more slender distal joint, shorter as well as thinner than the preceding one with which one or two long hairs articulate.

In the figure which illustrates the species (fig. 6) I have indicated the alimentary canal, or rather its contents, to show the comparative transparency of the body.

Station 158, south-west of Melbourne, March 7, 1874; lat. 50° 1′ S., long. 123° 4′ E.; 1800 fathoms; bottom temperature, 33°·5 F.; Globigerina ooze.

[1] This figure refers to *Ischnosoma bacilloides*, but the structures depicted are the same in both species.

Ischnosoma bacilloides, F. E. Beddard (Pl. VI. figs. 8–13).

Ischnosoma bacilloides, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 99.

The present species, like the last, consists only of a fragment, which is fortunately nearly perfect so far as it goes; the fragment corresponds almost exactly to the already described fragment of *Ischnosoma bacillus;* it has lost, however, a portion of the fourth segment of the thorax, corresponding to its epimera, *i.e.*, to the arms of the T in *Ischnosoma bacillus;* so at least I am led to interpret the appearances presented by this region of the body; there is evidently a suture on either side at the anterior end of the segment, but it is not quite certain whether the broken fragments, which during the life of the animal were clearly articulated to the sutural margin, belong to this segment, or whether they are really portions of the segment in front, the fourth segment being in that case without epimera; in the latter case there will be another difference between the two species in addition to those which I shall point out in the following description.

Of this species, as of the last, there was only a single fragment obtained off the west coast of South America in 1450 fathoms; the depth at which this species lives is not widely different from that of Station 158, at which *Ischnosoma bacillus* was obtained (1800 fathoms), and the latitude is nearly the same.

The fragment measures 11 mm. in total length and the proportion of the segments is about the same as in *Ischnosoma bacillus.*

The general aspect of the body, as may be seen by a comparison of figs. 6 and 8, is exactly the same in both species.

The fourth segment of the thorax appears to be similar to that of *Ischnosoma bacillus*, but it is impossible to speak with certainty for the reasons already given.

The fifth segment of the thorax, like that of *Ischnosoma bacillus*, is the longest and has the same form as in that species; the epimeral spines, however, instead of being, as in *Ischnosoma bacillus*, directed outwards at right angles to the longitudinal axis of the body, or at most with a slight forward flexure, are unmistakably bent backwards. The sixth segment, however, presents the most striking difference between the two species, and serves at once to distinguish them; it is in fact provided with long spiniform epimera precisely similar to those upon the segment in front, and like them bent backwards, though at a somewhat greater inclination with the longitudinal axis of the body.

The seventh and last segment of the thorax is similar to that of *Ischnosoma bacillus.*

The *abdominal shield* is rather more circular in form than in the last species, and the distinction between its anterior and posterior regions is therefore more marked; the posterior region of the caudal shield as it approaches its termination is rather bent upwards. The same is the case with *Ischnosoma bacillus.* The abdominal shield is preceded as in that species by a narrow free abdominal segment. Owing to the fact that

this specimen had been kept in alcohol in a tube instead of being mounted upon a slide, the *thoracic appendages* are very much damaged, and in no one instance complete; the basal joints, however, entirely resemble those of *Ischnosoma bacillus*, so that there is little reason to doubt that the appendages were not widely different.

The present species being, unlike the last, a male, I am able to describe the modifications of the abdominal appendages in this sex, which has not yet been done for any species of the genus *Ischnosoma*. I am therefore anxious to discuss them as accurately as possible, seeing that in all probability the following description will be of the genus and not of the species only.

The first pair of abdominal appendages are shown in fig. 11 of Pl. VI.[1] from the inferior surface; these appendages are somewhat narrow and do not of course entirely roof in the cavity of the abdomen, the covering of which is completed by part of the next pair of appendages. At the upper extremity of the operculum are two minute calcified plates which seem to me to represent respectively the basipodite and endopodite of the limb, the outermost piece being the former. The operculum itself, comprising the two exopodites which fit close together but are separated by a distinct groove, is convex on its outer surface; the inner border where each piece comes into contact with its fellow is straight, the outer border curved; the lower margin is slightly incised and on the under surface as shown in the figure there is a transversely elongated aperture.

The second pair of appendages (fig. 10) are modified into a copulatory organ, which is similar in its general appearance to the same appendage in other Asellidæ (*cf. Acanthomunna*, Pl. XII. fig. 13); the penial filament, which is swollen at its base and furnished with an aperture, no doubt serving to conduct the semen, is of very great length, and is attached by a short and narrow curved joint to a large plate which probably represents the protopodite of the limb; attached to the protopodite is a delicate plate which possibly represents the exopodite (*cf. Acanthomunna proteus*, p. 50).

The penial filament and the joint by which it articulates with the rest of the limb represent the endopodite; the exopodite is a thick stout plate which lies in the natural position at the side of the central operculum, it terminates posteriorly in two longish spines of a yellow colour, one arising from the ventral the other from the dorsal side of the joint.

The third pair of appendages consist of a triangular basal joint with which are articulated a long delicate plate terminating in a filament and a thin gill lamella; I have not succeeded in separating the latter, so I have only figured (fig. 12) the basal joint and the filament, which probably corresponds to the exopodite; the latter is of very peculiar shape; it is expanded at its proximal part into an oval widish plate fringed along the outer margin with short slender hairs; it terminates in an excessively attenuated filament which is not so long as the penial filament.

[1] The figure has been inadvertently placed upside down.

I am unable to give any details respecting the two following pairs of appendages save that they are thin plates evidently serving as gills.

The *uropoda* resemble in almost every particular those of *Ischnosoma bacillus*, they are shown in fig. 13 of Pl. VI.

Station 302, south-west of Valparaiso, December 28, 1875; lat. 42° 43′ S., long. 82° 11′ W.; 1450 fathoms; bottom temperature, 35°·6 F.; Globigerina ooze.

Acanthomunna, F. E. Beddard.

Acanthomunna, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 102.

Definition.—Body everywhere densely beset with short slender spines, many of which are branched. Head short and comparatively narrow, furnished with eyes elevated on stalks like those of *Munna;* the general outline of the thorax is oval, the body being widest at the third thoracic segment. The abdominal shield is oval and very convex anteriorly, posteriorly more flattened, and terminating in a truncated and crescentic posterior margin. Antennules with four basal joints of which the third is the longest, and a long multiarticulate flagellum. Mandibles furnished with a palp. First pair of thoracic appendages sub-cheliform, the remaining thoracic appendages are long and slender, the posterior pairs longer than the anterior; the limbs terminate in a single elongated claw, and are spiny. Uropoda defective, articulated to the (apparently) dorsal surface of the caudal shield.

Remarks.—Two specimens of a deep-sea Isopod, belonging apparently to the same species, are referred to this genus; they were dredged in 700 and 1100 fathoms respectively off New Zealand. The genus is remarkable for its dense spiny covering, a condition met with in other deep-sea and cold-water Isopoda; it agrees with *Munna* in the general form of the body, in the elongated thoracic appendages, and especially in the stalked eyes; the structure of the antennules, however, and the presence of only a single elongated claw upon the thoracic appendages are distinctive marks of difference from that genus. In all probability the structure of the uropoda is different; the appendages themselves were unfortunately defective in both specimens, but the large socket upon the dorsal surface of the abdominal shield, which is evidently the point of articulation, seems to me to indicate that these appendages were far less rudimentary than those of *Munna*, and they must in any case be larger.

Acanthomunna proteus, F. E. Beddard (Pl. XII. figs. 7–14).

Acanthomunna proteus, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 103.

The present species is the only representative of the genus. There are two specimens among the Isopoda collected by the Challenger, one from off New Zealand at a depth

of 700 fathoms; the other from the same locality but from deeper water (1100 fathoms). These specimens only differ from each other in colour; the larger specimen (from 1100 fathoms) is of a pale buff colour; the smaller of a rich brown, they are both males. The larger specimen measures about 7 mm., the smaller about 5 mm. in length.

The general shape of the body is much like that in the genus *Munna;* it is covered everywhere with innumerable short slender spines which are of varying size, but nowhere attain any great length; the majority are branched, and the appearance of these spines reminds one very strongly of the spicules of many sponges. A number of the spines from the thorax as well as the abdominal shield are figured on Pl. XII. figs. 8, 8*a*, 8*b*, so that their characteristic form can be seen.

The head is narrower than the following first thoracic segment; it has a pair of lateral eyes placed a little way behind the articulation of the antennæ, and elevated on stalks like those of *Munna*. The thoracic segments gradually increase in width up to the third; the diameter of the fourth segment is equal to that of the third; the remaining segments gradually diminish; the general outline of the thorax is therefore oval; the first three segments of the thorax are concave forwards, the fourth is straight and forms the transition to the three posterior segments of the thorax which are concave backwards. The antero-posterior diameter of the first four thoracic segments is subequal, the fifth is of about half the length of the fourth; the remaining segments gradually diminish, the spines are not scattered irregularly over the surface of the thorax, but are chiefly condensed upon two ridges which traverse the dorsal region of the segment from side to side. On the last three segments of the thorax the spines are confined to the lateral regions of the segments, the dorsal region being perfectly smooth and apparently without a trace of spines.

The epimera are small.

Between the last segment of the thorax and the abdominal shield is a single free abdominal segment. The abdominal shield is spiny, like the anterior region of the thorax, a row of rather long spines marking the lateral margin. The abdominal shield is very convex down to where the uropoda articulate; behind this it suddenly becomes flattened and smooth and terminates in a truncated somewhat excavated posterior margin. The uropoda are articulated just between the posterior and the anterior regions of the caudal shield, apparently on the dorsal surface; the large size of the socket of articulation of these appendages would seem to indicate that they themselves are of considerable size, and perhaps not so rudimentary as is usual in the genera belonging to this family. The anterior region of the caudal shield is divided by furrows into a median and two lateral convexities.

The *antennules* (Pl. XII. fig. 9) have a four-jointed peduncle and a long flagellum; the first joint of the peduncle is short and rounded, the second joint is equally short but more

slender, the third joint is greatly elongated and very slender, the fourth joint is of the same diameter as the third, but extremely short; the flagellum is composed of a very large number of short joints; the first joint of the flagellum is, however, of considerable length, quite as long as the six or seven following joints.

The *antennæ* are, in both specimens, broken off at the third joint, the three remaining joints are short and subequal in length, and furnished with numerous spines, which do not appear, in any case, to be branched like those upon the segments.

The *mandibles* have a well-developed palp.

Of the *thoracic limbs* the anterior pair are much shorter than the rest and subcheliform. The first joint is long and somewhat curved; its surface is comparatively smooth, the two following joints are small and subequal, together somewhat less than the first joint; the inner margin of these joints is armed with a few stout spines; the fourth joint is stout and nearly as long as the first joint; the inner margin has a row of about a dozen stout spines; the fifth joint is much shorter and more slender, and has only a few delicate spines; the last joint of the limb is shorter still and more slender, it terminates in a single short pointed claw.

The remaining thoracic appendages are similar to each other in structure; one of these is shown in fig. 10; they differ principally from the anterior pair of limbs in the comparative shortness of the basal joint, and in the great elongation of the fourth and fifth joints. All these limbs are, in consequence, considerably elongated, but there is a slight difference in length between the more posterior and the more anterior pairs, the former being the longer.

In any of these appendages the first joint is longer than the following joints which are subequal; the fourth and fifth joints are immensely elongated, the latter being the longer as well as the more slender, the proportionate length of these two joints to the other joints of the limb increases in the posterior appendages; the sixth joint is short and bears a single slender claw at its extremity. The limbs are very spiny, more particularly the fourth and fifth joints; the spines are borne on short tubercles and are never branched like those which deck the thorax and abdomen. The appendages are also finely granulated like the general body surface.

In figs. 11, 13, and 14 I have illustrated the three anterior pairs of abdominal limbs (of the male).

The first pair were unfortunately broken in detaching them from the animal. They consist of two flattened, closely applied oblong plates, the lateral margins of which are fringed anteriorly with slender hairs. The posterior extremity of this appendage is shown, more highly magnified, in fig. 12; the postero-lateral margin projects slightly, and this region of the appendages (*b*) is grooved, being evidently rolled up in a scroll-like fashion, the open lips of the groove are beset with slender hairs; anteriorly these hairs are set in tufts, radiating outwards from a common centre. The posterior

and median portion of the appendage also projects in a rounded extremity fringed with comparatively long slender hairs; this part of the appendage forms a somewhat raised pad which is largely covered with delicate (sensory ?) processes, shown at *a*; beneath the integument is a granular mass of tissue (*gb*) in which no structure was discernible, but which may be a nervous ganglion. The above description refers to the appendages when seen from the under surface.

I suppose that these conjoined plates represent the endopodite of the limb; the exopodites are formed by a somewhat oval plate on either side, which completes the roofing in of the infra-abdominal cavity.

The second pair of appendages (fig. 13) are evidently, like the first pair, modified to subserve the generative function; the penial filament is of very great length and projects beyond the termination of the abdomen; at its base it is somewhat swollen and articulates with a stoutish joint, which is again attached by a smaller joint to a thin plate, and this I imagine to represent the protopodite of the limb; the joints at the base of the penial filament, judging by other Isopoda, would represent the endopodite; the basal joint of the limb is long and flattened and somewhat curved, terminating anteriorly and posteriorly in a pointed extremity; its outer margin is fringed with slender hairs.

The exopodite is represented by a slender, soft, conical filament, which is covered for the greater part with short delicate hairs.

Fig. 14 represents one of the third pair of appendages, a portion of which is probably defective; the exopodite (?) consists of two flattened joints fringed along both margins with short slender hairs; the second joint is pointed at its extremity and terminates in a long slender hair; the endopodite is a respiratory lamella, broad and long, with three long plumose setæ at its lower margin; the fourth pair of appendages are entirely respiratory. The *uropoda*, as already mentioned, are defective.

Station 168, off New Zealand, July 8, 1874; lat. 40° 28′ S., long. 177° 43′ E.; depth, 1100 fathoms; bottom temperature, 37·2 F.; blue mud.

Station 169, off New Zealand, July 10, 1874; lat. 37° 34′ S., long. 179° 22′ E.; depth, 700 fathoms; bottom temperature, 40·0 F.; blue mud.

Family Munnopsidæ.

Munnopsis, M. Sars.

Munnopsis, M. Sars., Forhandl. Vidensk. Selsk., 1860, p. 84.

The family Munnopsidæ and the genus *Munnopsis* were instituted by Professor M. Sars for the reception of an Isopod dredged by him in moderately deep water off the coasts of Norway. This species, *Munnopsis typica*, was described in a detailed fashion by Professor M. Sars, the description being accompanied by numerous illustrations; the

same genus and species has been met with since, not only off the coasts of Norway, but also in the Arctic Ocean, by many of the exploring expeditions which have investigated the marine fauna of the extreme north; the species was obtained during the voyage of the "William Barents" in great abundance, and it has been figured by Dr. Max Weber in his account of the Isopoda obtained during that voyage. Dr. Oscar Harger[1] has recorded *Munnopsis typica* from the shores of North America. Three distinct species of Munnopsids, obtained during the voyage of the Challenger, I refer to this genus; two species were obtained from the southern hemisphere and from very deep water; *Munnopsis australis* was dredged at Station 146, off Prince Edward's Island, and *Munnopsis gracilis* considerably further to the east, off the shores of New Zealand, in 1100 fathoms. The third species comes from the northern hemisphere, near to Japan, in 345 fathoms of water; but I am more doubtful about assigning it to this genus. The definition of the genus *Munnopsis* is given below; I have altered it from Sars's original definition so as to include the two species described in the present Report.

Anterior division of the body dilated, posterior suddenly much narrower and linear. Four anterior thoracic segments excavated above, obtusely rounded at the sides; the three following subcylindrical, with short acuminate lateral processes. Abdominal segment elongate, much longer than broad. Antennules with the basal joint large and flattened, the flagellum elongate and multiarticulate; antennæ very long and slender, many times longer than the body; the two last peduncular segments greatly elongated; the flagellum about equal in length to the peduncle; mandibles subtriangular, entire and acuminate at the apex, without a molar process; the palp absent or if present slender; its last joint thick at the base and curved in the form of a hook; of the first four pairs of thoracic limbs the first pair are short; the second pair not much longer, rather robust and subprehensile in the males; the two following pairs greatly elongated and very slender, many times longer than the body, but with the basis, ischium and meros very short; last three pairs of legs natatory, all alike, with the last two segments foliaceous, margined with long slender delicately plumose setæ; abdominal operculum large, nearly covering the whole under surface of the abdomen; suboval, simple in the female, but consisting of three distinct segments in the male, one median and very slender, and two lateral, and furnished within with a peculiar curved organ, terminating behind in a much elongated seta (as in *Eurycope*); caudal appendages slender, simple.

Munnopsis gracilis, F. E. Beddard (Pl. XIV. figs. 9, 10).

Munnopsis gracilis, F. E. Beddard, Proc. Zool. Soc. Lond., 1885, pt. iv. p. 916.

Off the North Island of New Zealand, at Station 168, from a depth of 1100 fathoms, a small *Munnopsis* was dredged among a very large number of specimens of *Eurycope novæ zelandiæ*.

[1] Marine Isopoda of New England, *loc. cit.*, p. 329.

The present species is a true *Munnopsis* by reason of the broad anterior region of the thorax and the narrow posterior region; it agrees closely with *Munnopsis latifrons*, *Munnopsis typica*, &c.

The single specimen is a male and measures 12 mm. in length.

The head is small and is deeply sunk into the first thoracic segment, the region between the antennæ and antennules of either side is wide, as in *Munnopsis typica*, though perhaps not so wide as in *Munnopsis latifrons*.

The first segment of the thorax is very narrow; the second is quite the largest of the four segments; on a lateral view (see Pl. XIV. fig. 9) this segment is seen not only to have a considerably greater antero-posterior diameter than the preceding or the succeeding ones, but also a greater vertical extension; its dorsal surface is strongly arched, and is raised some way above the general body surface.

The third and fourth segments are subequal and each rather smaller than the second; the transverse diameter of the third segment is about equal to that of the second, and here the body of the Crustacean is widest; the fourth segment of the thorax is distinctly narrower; the hinder margin of the third and fourth segments are concave, that of the fourth particularly so.

The rest of the thorax is very much narrower than the anterior region; of the three segments of which it is composed, the first is considerably the longest; the second and third are short and subequal.

The abdominal shield is long and narrow, and terminates posteriorly in two short projections on either side of the median line, to the outside of which the uropoda are attached.

Along the median line of the abdominal shield is a raised convex area, which narrows gradually towards the posterior extremity; on either side of this is the lateral convex area.

This species comes nearer to *Munnopsis typica* than either of the following; an obvious distinction between the two species is the absence in *Munnopsis gracilis* of any spiny processes such as are found on certain of the segments of *Munnopsis typica*; furthermore, the fifth segment of the thorax is distinctly longer than either of the two succeeding ones, though not so markedly so as in *Munnopsis australis*. In *Munnopsis typica* these segments are more equal in length.

The illustrations of this species are from drawings by the late Dr. v. Willemoes-Suhm.

Station 168, off New Zealand, July 8, 1874; lat. 40° 28′ S., long. 177° 43′ E.; depth, 1100 fathoms; bottom temperature, 37°·2 F.; blue mud.

Munnopsis australis, F. E. Beddard (Pl. XIII. figs. 1–11).

Munnopsis australis, F. E. Beddard, Proc. Zool. Soc. Lond., 1885, pt. iv. p. 917.

This species, of which I have been able to study a single example mounted on a slide in Canada balsam, agrees with *Munnopsis typica* in that the three posterior segments of the thorax are considerably narrower than those which precede them; *Munnopsis australis* is in other respects not very dissimilar from *Munnopsis typica*. The present specimen is a female, and was dredged from 1600 fathoms between Prince Edward's Island and the Crozets.

It measures 8 mm. in length, exclusive of course of the enormously elongated antennæ, which measure themselves at least 36 mm.

The head is comparatively narrow in proportion to its length; its general outline is in fact oval, though the anterior margin is straight and abruptly truncated; the region between the insertion of the antennæ is very wide, quite as much so as in *Munnopsis latifrons* and *Munnopsis typica;* a semicircular process extending a little over the articulation of the antennules on each side is shown on fig. 1.

The first segment of the thorax is extremely narrow especially dorsally; it widens out laterally to nearly the width of the succeeding segments of the thorax; the segment closely embraces the head, and is in consequence almost V-shaped, the concavity being of course anterior; the second segment of the thorax is five or six times as long as the first and subequal to the two next; at the second segment the body of this species is broadest, gradually decreasing in breadth both before and after this segment; the shape of the thoracic segments gradually alters from the first to the fourth; the V-shaped form so conspicuous in the first becomes less and less marked in the remaining segments, the fourth being almost straight, with sub-parallel anterior and posterior margins.

All the segments of the thorax are furnished with epimera which, although visible on a dorsal view of the animal, are not large; their margins are not prolonged into spiny processes as they so often are in the species of this family. The remaining segments of the thorax, together with the caudal shield, form a narrow cylindrical section of the body which contrasts very much in this respect with the anterior region, being not more than perhaps one-half its width; the three segments of the thorax, although about equal in width, differ very much from each other in length, that is to say, the anterior segment differs very much from the sixth and seventh; it measures at least three times the length of either of these, which are both short and subequal; I am not certain as to the lines of demarcation between these latter segments, which I could not detect in the specimen.

The abdominal shield is long and narrow and has very much the form of the abdominal shield in *Idothea*. It terminates posteriorly in a somewhat conical process which is upturned; the upper surface appears to be regularly convex.

It has been already stated that the present specimen is a female; the identification of

the sex depends upon the presence of what I believe to be a pair of ovigerous lamellæ attached near to the bases of the third pair of thoracic appendages. One of them is shown in fig. 10; it is a thin plate projecting inwards from the surface of the thorax, just inside of the articulation of the appendage; the shape of the lamella can be understood by an inspection of the figure; it is somewhat concave anteriorly and convex inwards and posteriorly; along the margin are a series of grooves giving to this region a tessellated appearance. I could not find any trace of an ovigerous lamella on any other segments of the body; the remarkable disposition of the ovigerous lamella in *Tanais willemœsii* from Kerguelen, described by the late v. Willemoes-Suhm, and more recently by Studer, prepares us for abnormalities in this respect in Isopoda from that region of the globe; it may be, however, that the other ovigerous lamellæ have not yet appeared owing to the immature condition of the specimen, though this is not generally the case with Isopoda; it is also possible, but not probable, that this structure does not correspond with the ovigerous lamellæ.

The *antennules* (fig. 2) are articulated with the head by a stout basal joint of cylindrical form; the dorsal region of the first joint is prolonged some way beyond the articulation of the next joint, which is considerably smaller; the fourth and fifth joints are very small. The flagellum is long, about three times as long as the basal region of the antennule; it appears to be perfectly smooth proximally and gradually becomes more and more ringed, until it is evidently made up of a number of separate joints; the sensory filaments are restricted to the distal region of the appendage.

The *antennæ*, as already observed, are remarkably long even for a genus which is characterised by the length of the antennæ; the proximal joints are as usual extremely short and subequal in length. The fifth joint measures alone no less than 15 mm. Only the distal one-sixth of the joint is occupied by the muscles, which effect the movement of the succeeding joint (see fig. 3); the latter is comparatively very short; the long flagellum measures in the example before me 17 mm., but the extremity is evidently lost, so that it is impossible to calculate how much longer it was during life; the flagellum shows traces of division into separate joints, which appear to be very long.

The *mandibles* differ somewhat from the typical form of the mandibles of other Munnopsids. The specimen itself is labelled in the handwriting of v. Willemoes-Suhm as a doubtful Munnopsid, and it is possibly these very appendages, which are conspicuous and readily to be made out, which led v. Willemoes-Suhm to hesitate before including the species in the genus *Munnopsis* or its immediate allies.

In fig. 8 of Pl. XIII. I have figured one of the mandibles; it is a conical stout appendage slightly curved inwards towards its fellow; the biting edge is prolonged into a stout tooth distinguishable from the rest of the appendage by its yellow colour, behind which are traces of other teeth in the way of slight crenulations of the margin; the asymmetry between the two mandibles is not very striking; the most remarkable fact,

however, about these appendages is the total absence of any mandibular palp, a fact which at once distinguishes this species from its congeners. It is stated by Sars that the genus *Macrostylis* is characterised, among other peculiarities, by the want of a mandibular palp, which is also occasionally absent in *Ilyarachna* and *Desmosoma*; this fact made me hesitate before including the present species in the genus *Munnopsis*.

The shape of the mandible, apart from the absence of a mandibular palp, is not unlike that of *Eurycope gigantea*, or indeed of *Munnopsis typica*.

The *maxillæ* I am quite unable to describe, as they were hidden by the maxillipedes; the value of the results likely to be obtained by figuring and describing these appendages did not appear to me to be at all commensurate with the injury to the unique specimen which would be caused by unmounting it and teasing out the appendages.

The *maxillipedes* again are unlike the typical form of these appendages in the Munnopsida generally, owing to the unusually large size of the third joints of the palp. One of these appendages is displayed in fig. 9; along the margin of the stipes are two sensory processes.

The *thoracic appendages* of the first four pairs appear to be similar in structure, but I am unable to speak with anything like certainty, because only three of these limbs were preserved, the first and second on the left side and the second only on the right hand side of the body.

The first appendage is displayed in figs. 5 and 6; the first pair of appendages are more slender than the second, but otherwise are more or less similar in form; the first joint in each is the longest, the second is somewhat shorter, and the third is extremely short; this joint and the next two are beset with stiffish hairs, which appear to be proportionately stronger in the first appendage than in the second.

The third and fourth appendages on both sides of the body were broken off close to their articulation; they are evidently larger than the preceding appendages; they also appear to resemble the same appendages in *Munnopsis typica* in the shortness of the proximal joints of the third and fourth thoracic appendages as compared with the two preceding limbs.

The three posterior pairs of thoracic appendages (fig. 7) resemble those of other Munnopsidæ in the modification of the distal joints; these, however, do not seem to be so much widened and flattened as in other species.

The *uropoda* (fig. 11) are short and uniramose; they are two-jointed, the distal joint being longer than the proximal although more slender.

Although I believe I am right in assigning this species to the genus *Munnopsis*, it differs in many important particulars from *Munnopsis typica*. The most striking difference perhaps is in the absence of a mandibular palp; but as this structure is not always constant in a particular genus (it is for example sometimes absent and sometimes present in *Desmosoma*) its absence in *Munnopsis australis* does not necessitate the removal

of that species to another genus. Apart from the absence of a palp the shape of the mandible is by no means unlike that of *Munnopsis typica*. The great length of the fifth segment of the thorax is a character which at once distinguishes this species from *Munnopsis typica* where the three posterior segments of the thorax are about equal. Other points of difference will be apparent on comparing my description and figures of *Munnopsis australis* with those of *Munnopsis typica*.

Station 147, off Marion Island, December 30, 1873; lat. 46° 16′ S., long. 48° 27′ E.; depth, 1600 fathoms; bottom temperature, 34·2 F.; Diatom ooze.

Munnopsis latifrons, F. E. Beddard (Pl. X. figs. 1–4).

Munnopsis latifrons, F. E. Beddard, Proc. Zool. Soc. Lond., 1885, pt. iv. p. 917.

A single female example of this species was dredged to the east coast of Japan, in 345 fathoms.

It is a small species, measuring about 15 mm. in length, but unfortunately rather damaged owing to the soft character of the integuments, which are but little calcified, though brown and opaque, and not transparent as in the remarkable *Eurycope pellucida* (see p. 71).

The head is very large in proportion to the other segments; it is as long as the first three segments of the thorax taken together; as the antennæ and the antennules are comparatively small at the base and widely separated, the frontal region of the head, which is of course bent downwards at right angles to the rest of the head, is very broad, much broader than in any other species known to me; in *Eurycope sarsii*, for example, there is only a very narrow bar separating the bases of the antennæ and representing the frontal region of the head. The upper surface of the head has a tumid, swollen appearance, and is covered with minute punctulations.

The anterior thoracic segments appear, on a dorsal view, to be subequal in size; the lateral regions, however, increase progressively in size from before backwards, the first segment being the shortest and the fourth the longest; the dorsal portion of the segments, as in so many other species, is saddle-shaped, the lateral region of the segments is convex. The epimera are present though small, but are not prolonged into spines as in many species of *Eurycope*.

The three posterior segments of the thorax differ from the same segments in other species by reason of their relative disproportion; the first of these segments is very decidedly the smallest, its antero-posterior diameter not being more than one-third of either of the two remaining segments of the thorax; this statement, however, only refers to the dorsal region of the segment; laterally all three segments are of equal breadth. The sixth and seventh segments of the thorax are, as already mentioned, considerably longer dorsally than the fifth, and are subequal. The surface of these segments is

traversed by numerous shallow lines dividing them into a number of slightly separated convexities.

The posterior margin of the sixth segment is not regularly concave as in other species (*e.g.*, *Eurycope sarsii*), but the line of division between it and the seventh segment runs straight and transverse to the longitudinal axis of the body throughout the dorsal region of the segments; this brings about the equality in size between the last two segments of the thorax.

The abdominal shield was, unfortunately, considerably damaged, so that its shape cannot be described with great accuracy; it appears to be more or less oval in form and truncated at its free extremity; laterally and just in front of the articulation of the long styliform uropoda is a spiny process directed backwards, nearly in the same straight line with the longitudinal axis of the abdominal shield.

The *antennæ* are of great length, measuring 87 mm., six times the length of the body of the animal; the last two joints are the longest, measuring respectively 38 and 42 mm.; they have a few stout spines scattered over the surface; the flagellum is a straight rod not divided at all into joints, it measures only 5 to 6 mm.

The *first pair of thoracic appendages* (fig. 3) form a very distinct prehensile hand; the two basal joints are long and subequal, the third joint is very short, the fourth and fifth are moderately short, the former somewhat swollen, the fifth is bent upon the fourth joint, and there is a small claw-like sixth joint; the inner edge of the third and fourth joint is furnished with numerous spines.

The next three pairs of thoracic appendages were lost.

The three last pairs are natatory and similar to each other. Each of these limbs is of considerable length, about as long as the body; there appears to be, as in *Munnopsis typica*, no terminal claw.

The abdominal operculum covers over the abdomen below.

The *uropoda* (fig. 4) are long and styliform, almost as long as the caudal shield itself; each is composed of two joints, which are furnished with long simple hairs.

I include this species for the present within the genus *Munnopsis*, though I am quite aware that exception might be taken to this view of its affinities; the general form of the body appears to be more that of *Munnopsis* than of any other genus except *Desmosoma;* on the other hand, the posterior segments of the thorax are by no means so narrow relatively to the anterior section of the body as they are in the other species of *Munnopsis*. The form of the uropoda is typical of *Munnopsis*, but also of *Desmosoma*. The very "*prehensile*" character of the first pair of thoracic appendages appears to be peculiar to the species; it certainly is not found in *Eurycope* and *Munnopsis*, and apparently not in the other genera belonging to this family.

Station 232, off Ino Sima Island, Japan, May 12, 1875; lat. 35° 11′ N., long. 139° 28′ E.; depth, 345 fathoms; bottom temperature, 41°·1 F.; green mud.

Eurycope, G. O. Sars.

Eurycope, G. O. Sars, Om en anormal gruppe af Isopoden, Forhandl. Vidensk. Selsk., 1863, p. 208.

Of the fourteen species of Munnopsidæ dredged during the voyage of the Challenger, I have referred eight to the genus *Eurycope*. Certain of these species, viz., *Eurycope novæ-zealandiæ*, *Eurycope fragilis*, *Eurycope intermedia*, and *Eurycope atlantica*, are, I am convinced, rightly placed in this genus. The remaining species I have preferred for the present to include in this genus, until the examination of more specimens enables certain doubtful points in their structure to be determined; a characteristic feature of the genus *Eurycope*, as opposed to *Ilyarachna*, is the form of the posterior thoracic appendages; in *Ilyarachna* the first two pairs of these appendages are entirely similar to those of *Eurycope;* the last pair, however, are not natatory but ambulatory limbs. Such a point as this I have been quite unable to determine in the species referred to, as well as many other anatomical features which distinguish *Eurycope* from *Ilyarachna* and *Desmosoma*, owing to the imperfect condition of the specimens; I do not therefore pretend to fix definitely the systematic position of these species, merely placing them in the genus *Eurycope* as a matter of convenience, and because there is nothing in their organisation, so far as I have been able to study it, which is at variance with such a determination. Sars's definition of *Eurycope* is as follows:—

Body depressed, oval when seen from above, almost equally narrowed at the anterior and posterior extremities. Head moderately large, somewhat projecting between the antennæ, and often furnished with a distinct rostrum. First four segments of the thorax subequal, short, hollowed out above; three posterior segments convex above, larger, but not narrower than the preceding; abdominal segment moderately large, broader than long, obtusely rounded at the extremity. Lower antennæ very slender and greatly elongated, three or four times as long as the body, the flagellum longer than the peduncle. Mandibles powerful in structure; mandibular palp moderately large, three-jointed, last joint swollen at base and curved like a claw. Legs of the first pair much shorter than the rest, narrowed, non-prehensile, the last joint forming a short thick claw; following pairs of legs subequal, very elongated, with a long terminal claw; three posterior pairs of legs natatory, penultimate and antepenultimate joints dilated and compressed, and fringed with numerous plumose setæ; last joint narrow and styliform. Abdominal operculum subpentagonal, with rounded angles, much shorter than the abdominal segment. Caudal appendages short, biramose, with one-jointed branches.

Eurycope sarsii, F. E. Beddard (Pl. XI. figs. 1–12).

Eurycope sarsii, F. E. Beddard, Proc. Zool. Soc. Lond., 1885, part iv. p. 919.

At Station 146, from a depth of 1375 fathoms, two specimens were dredged of a large species of Munnopsid, apparently new to science.

I take the opportunity of naming this species after Professor G. O. Sars, who has so largely increased our knowledge of this as of other families of the Crustacea.

The specimens in question are a male and a female. The female is rather the larger of the two, measuring 24 mm. in length, by 11 mm. in greatest breadth; the difference in length between the two specimens appears to be entirely owing to the fact that the anterior thoracic segments are longer than in the male to make room for the attached ovigerous lamellæ. Otherwise the two sexes appear to present no recognizable differences.

The species was also obtained at Station 147, from a depth of 1600 fathoms.

In no case, unfortunately, are any of the thoracic limbs or the antennæ preserved, a fact which is to be the more regretted, as the modifications of the thoracic limbs are precisely those characters which have largely served Professor Sars as a means of dividing the group into its several genera. It is not the possibly rough handling of the specimens themselves when being transferred to spirit that has injured them in this way; some manuscript notes by Dr. v. Willemoes Suhm state that this species was never dredged with its limbs complete. As it is, in all the specimens, five in number, there are only the first joints of the ambulatory appendages left adherent to the body.

The head segment is about equal in size to that of any of the anterior segments of the thorax.

The first four segments of the thorax are of about the same antero-posterior diameter, the fourth alone being rather narrower than the three which precede it.

The breadth of these segments, their diameter from side to side, progressively increases so that the fourth is the widest; the anterior margin of each is rather concave forwards, the posterior margin convex backwards; the fourth segment, however, has its two margins approximately straight and parallel; the posterior margin is slightly concave instead of convex; this segment, in fact, forms the middle point of the body, in front of it the segments are curved forwards, behind it they are curved backwards.

The upper surface of the body is entirely devoid of spines or tubercles of any kind, which are often characteristic of other species of the genus.

Each of the four anterior thoracic segments is somewhat saddle-shaped, its anterior and posterior margins being produced into a ridge, and the central part between the two ridges depressed; laterally, the posterior ridge widens out into a triangular convex area which occupies the whole of the segment just behind the articulation of the epimera; this convex area does not, however, become fused with the anterior ridge of the segment, but remains distinct from it; the latter terminates on either side in a short, forwardly directed, spiny process, which becomes progressively longer in the segments passing from before backwards, and is indeed hardly visible in the first segment of the thorax.

The epimera of these segments are conspicuous; a transverse line of division, approximately parallel to the transverse axis of body, divides each epimeron into two halves, an anterior and a posterior; the former is produced into a longish spiny

process parallel to that on the tergum; these spines are longer in the successive segments.

The posterior region of the thorax differs from the anterior in the direction of its segments as well as in their form.

Each of the three segments which are comprised in this region of the thorax, are considerably stouter than any of the anterior ones; their margins, instead of being concave forwards, are convex forwards and concave backwards; each segment, in fact, appears as if composed of two approximately straight pieces meeting in the middle line at any obtuse angle; in the last of the three segments the posterior margin is less curved than in either of the preceding segments; this segment comes therefore to be triangular in shape and considerably longer antero-posteriorly than the rest.

The abrupt transition between the fourth and fifth segments of the thorax, which can be understood by an inspection of fig. 1 of Pl. XI., implies a comparatively limited surface of articulation between the two, and, as a natural consequence, the slightest rough handling causes the body to break at this point.

The transverse diameter of the three posterior thoracic segments decreases progressively from before backwards, so that the third is the narrowest; each segment is traversed by a median furrow which divides it into right and left halves; the anterior boundary line of the segment dips in slightly at the commencement of this furrow, which is deeper in the first than in either of the two succeeding segments; the rest of the segment in every case is convex, with the exception of a narrow anterior and posterior boundary line which is flattened and somewhat upturned; the anterior flattened margin is produced at the lateral extremity of the segment into a forwardly directed spiny process like those of the anterior thoracic segments, but longer; these processes are subequal on all the three segments; behind this process the lateral margin of each segment is produced into a minute triangular process at the base of each of the larger spines; between this process and the hinder margin of the segment is situated the epimeron, which is extremely small and decreases in size from before backwards.

The abdominal segments, as in all other species, are fused together to form a shield, at the termination of which the anus opens, so that there is no telson.

The abdominal shield is roughly triangular in outline with convex margins; the lateral margins are produced forwards beyond their junction with the anterior margin into a short spinous process, which corresponds with those of the thoracic segments. The dorsal surface is divided into three areas—two lateral somewhat reniform convexities which commence at the anterior but do not reach the posterior margin of the shield; in the "hilum" of each of these convexities is a minute oval convexity. The surface of these lateral convexities is punctulated.

The middle of the abdominal shield is occupied by a narrow area which is T-shaped,

inasmuch as the lateral convexities do not reach to its extremity; this area is smooth and less convex than the lateral areas.

The posterior portion of the caudal shield is bent downwards in the way indicated in fig. 2, which is a lateral view of the body of this species.

The *antennules* are moderately long and have the ordinary structure.

The *antennæ* are broken off at the fourth joint in all five specimens.

The *mandibles* are displayed in fig. 3; the basal joint is furnished at its tip with numerous strong spines, below which is a tuft of slender hairs; the molar process is beset with numerous hairs; the palp is long and three-jointed; the terminal joint is set with its long axis transverse and is somewhat clawed at the apex, where there are numerous fine hairs.

The *maxillæ* (figs. 4, 5) are much like those of other species.

The *maxillipedes* are shown in fig. 7; the outer plate is rather narrow and somewhat pointed at its extremity where there are a few slender hairs, the stipes alone terminates in a truncated extremity, furnished with numerous serrate spines and slender hairs, these latter extend some way down the inner margin of the joint, along the inner margin are about 10 rounded sensory processes, several of which are shown more highly magnified in figs. 8–10. All the appendages of this species are from v. Willemoes-Suhm's drawings.

Station 147, off Marion Island, December 30, 1873; lat. 46° 16′ S., long. 48° 27′ E.; depth, 1600 fathoms; bottom temperature, 34°·2 F.; Diatom ooze.

Eurycope novæ-zelandiæ, F. E. Beddard (Pl. IX. figs. 1–7).

Eurycope novæ-zelandiæ, F. E. Beddard, Proc. Zool. Soc. Lond., 1885, part iv. p. 918.

This species resembles in many particulars *Eurycope sarsii*, but may be distinguished from it by the spines on the dorsal surface of the body.

It is also a considerably smaller species, the largest examples measuring only 12 mm. in length.

A larger number of individuals of this species was dredged by the Challenger than of any other. It was only met with off the North Island of New Zealand, in 1100 fathoms.

The head is smooth and narrower than the first segment of the thorax.

The thoracic segments gradually increase in width up to the fourth, which is the widest; the first segment is shorter than the succeeding ones which are subequal. These segments are excavated dorsally by a shallow transverse fossa. In the median dorsal line of the second to the fourth segments inclusive is an upright spiny process directed somewhat forwards; this process is longest in the second segment and diminishes in length in the succeeding ones.

Laterally the margins of the third and fourth segments are prolonged into a short forwardly directed spine; the epimera of these, as of the preceding segments, are furnished with two spines similar to that upon the tergum.

The three posterior segments of the thorax are closely appressed together and separated by a considerable interval from the anterior region of the thorax. These segments, together with the abdominal shield, form a pear-shaped region, the apex being directed backwards; these segments, moreover, are convex above, and of equal antero-posterior diameter. They have indications of a pair of dorsal spines, which are well developed in *Eurycope fragilis;* their antero-lateral margins are directed forwards as shown in the figure which illustrates this species (Pl. IX. fig. 1).

The abdominal shield is roughly triangular in form; between its concave anterior border and the concave posterior border of the segment in front is an area traversed by one or two longitudinal furrows; this probably corresponds to the fused terga of the two or three anterior segments of the abdomen.

The abdominal shield terminates posteriorly in an obtusely pointed extremity; anteriorly to this on each side is a short lateral process, situated just above the articulation of the uropoda; the antero-lateral margins of the abdominal shield are slightly prolonged into processes which correspond with those upon the segments in front.

The dorsal surface is convex and divided by two shallow longitudinal furrows into three areas, one median and two lateral.

The *antennules* are of considerable length and consist of five joints and a terminal flagellum. The first joint is much the largest, and, as is usual, is prolonged into a flat process beyond the articulation of the second joint; the second joint is considerably more slender and shorter than the first joint; the third joint is of nearly equal length with the second, but much narrower; the fourth joint is extremely short, the fifth is as long as the third; the flagellum consists of a very large number of joints, which become longer as well as more slender towards its tip.

The *antennæ* are rather more than twice the length of the body, the proximal joints are very short, the two distal joints are of extreme length and subequal.

The *mandibles* (Pl. IX. figs. 3, 4) closely resemble those of *Eurycope sarsii;* the palp is long and three-jointed; the terminal joint is curved in the form of a claw; the cutting edge of the mandible is furnished with five or six tooth-like processes of unequal size among which are a few scattered hairs, below is a thick tuft of slender hairs; the molar process is stout with a blunt edge.

In the first pair of *maxillæ* the inner blade is very slender, with a few slender hairs at its apex and no stout spines like those at the outer blade.

The *maxillipedes* appear to resemble entirely those of *Eurycope sarsii* (see Pl. XI. fig. 7).

The *thoracic appendages*, as in all the other species of this genus, are specialised into two series, the four anterior pairs being ambulatory, the three posterior natatory.

The four anterior pairs gradually increase in length from before backwards, the first being the shortest and the fourth the longest. The measurements in an example chosen at random are as follows:—

First pair 6 mm., second pair 13 mm., third pair 20 mm., fourth pair 25 mm.

The structure of the limbs in every case is nearly identical.

The two basal joints are comparatively short and stout, the third is very short; the fourth and fifth are again long, and the limb terminates in a short pointed joint.

In the first pair of appendages the terminal claw is bent and very short, the fourth and fifth joints are hardly longer than the first; in the succeeding appendages the fourth and fifth joints are very considerably longer than the first, and the terminal joint is long and straight.

The posterior thoracic appendages (fig. 5) have the penultimate and antepenultimate joints flattened and widened, and fringed with long plumose hairs.

The *uropoda* are very minute and biramose; the inner branch is much shorter and more slender than the outer branch, which is still more slender than though equal in length to the basal joint.

Station 168, off New Zealand, July 8, 1874; lat. 40° 28′ S., long. 177° 43′ E.; depth, 1100 fathoms; bottom temperature, 37°·2 F.; blue mud.

Eurycope fragilis, F. E. Beddard (Pl. IX. figs. 8–12).

Eurycope fragilis, F. E. Beddard, Proc. Zool. Soc. Lond., 1885, part iv. p. 920.

A number of individuals from four distinct stations appear to be referable to one species, which differs from those already described. The largest specimen, which is unfortunately greatly damaged, was dredged in the Southern Ocean, from a depth of 1260 fathoms; four other considerably smaller examples were dredged in the Pacific, off the coast of Japan, in 1875 fathoms; another specimen, also small, was dredged in the Southern Ocean at Station 147, and a fourth locality is Station 158, where a single specimen was obtained. The distribution of this species is therefore wider than of any species belonging to this family, with the exception of *Eurycope atlantica*. *Eurycope fragilis* has its nearest allies in *Eurycope intermedia*, *Eurycope novæ-zelandiæ*, and *Eurycope atlantica*, but it may be easily distinguished from both by the long, forwardly curved, lateral spines of the caudal shield; and by the absence of a long spine upon its upper surface, which is characteristic of *Eurycope atlantica* (see p. 66–67, and Pl. IX. fig. 13).

The largest specimen, that from 1260 fathoms (Station 152), measures 30 mm. in extreme length; as it is so damaged, particularly in the region of the thorax, the following description of the species is based upon the other individuals, which are much more perfect. It may be just open to doubt whether the large individual from Station 152 is in reality the same species as the small individuals; as the former is so incomplete I prefer to consider it for the present as really belonging to the same species, especially since it agrees, in all ascertainable characters, with the smaller specimens

from Stations 147 and 237. The distribution, geographical and bathymetrical, of this species is of some little interest, and is, I venture to think, confirmatory of an opinion which I have elsewhere expressed, respecting the distribution of the deep-sea Isopoda.

In my report on the genus *Serolis*[1] I pointed out that the distribution of two species, *Serolis bromleyana* and *Serolis antarctica*, was confirmatory of Gerstaecker's view that, to the south as well as to the north of the equator, the depth at which a species is found increases progressively with its distance from the equator.

The distribution of *Eurycope fragilis* does not bear out this view at all, but does support my own view that the size of the individuals increases as the species passes south. The specimen of *Eurycope fragilis* from Station 152 is three times the size of any of the specimens dredged at Station 237, while the single specimen from Station 147 is not only intermediate in geographical position, but also in size between the other specimens. So possibly with *Eurycope atlantica*, if I am right in assigning the fragment from Station 147 to that species; the individual from the North Atlantic is considerably smaller than that from Station 147; in this instance increase of size is correlated with the increase of depth in the habitat, but I am not inclined to lay any stress upon this relation as it is not borne out in the other species.

The largest specimen, that from Station 152 (1260 fathoms), measures 30 mm. in length; the individual from Station 147 measures 17 mm. in length, that from Station 158 about the same; the largest of the series of small individuals from Station 237 measures only 12 mm.

The following description of the species is, as already stated, based upon these smaller specimens, because they happen to be better preserved than any of the larger individuals.

The head is long, but narrower than the first segment of the thorax; the first four segments of the thorax are subequal in antero-posterior diameter, but increase gradually in breadth; the second, third, and fourth of these segments, or the third and fourth only, have a longish spine in the median dorsal line. The antero-lateral margins of the segments are prolonged into a short, forwardly directed spine, in the third and fourth segments only; the epimera of all these segments are furnished with a long spine, considerably longer than that of the tergum, but following the same general direction; in the first two segments of the thorax there is only one epimeral spine; in the three succeeding segments there is an additional shorter spine.

The three posterior segments of the thorax have the form which is characteristic of the genus; the body of the species is widest at the first of these segments.

On the ventral surface of the thoracic segments are a number of short spines; on each of the first four segments is a single short spine in the median line; these increase in length progressively from the first segment backwards; there are a series of similar spines, but apparently stouter, upon the last thoracic segments, and one short conical

[1] Zool. Chall. Exp., part xxxiii. p. 82.

tubercle upon the median line of the abdominal operculum. The posterior and ventral margin of the abdominal shield has also three strongly marked tubercles, one median and two lateral.

On the dorsal surface of each of the three posterior segments, on either side of the median line, is a longish spine; the lateral margins of the segments are prolonged into a curved spine-like process, which are considerably more conspicuous than those of the anterior segments. They are also longer in the case of the fifth than in either of the two succeeding segments. All these spiny processes upon the thoracic segments are much more marked than in *Eurycope novæ-zelandiæ*. The present species, however, in other respects, comes very near to *Eurycope atlantica*.

The abdominal shield has a characteristic form, which is well displayed in the figure of the species (Pl. IX. fig. 8); the shape of the caudal shield is the best mark of distinction between this species and its immediate allies.

In the present species the abdominal shield is divided into two regions, an anterior and a posterior, by a pair of lateral notches; in front of these the margin of the caudal shield is rounded, and there are a pair of lateral spiny processes some way behind the articulation of the abdominal shield with the thorax. Behind the lateral notches are two long lateral processes, and between them the posterior extremity of the abdominal shield is prolonged into a blunt process. The upper surface of the abdominal shield is divided by furrows into three convexities, two lateral which terminate at the lateral notches, and one median, which is more or less anchor-shaped; it includes the two postero-lateral processes; anteriorly it is continuous for some way across the abdominal shield, which portion forms the cross bar of the anchor; in this region is a single median spine.

The *antennules* (fig. 9) have the usual broad, powerful, basal joint, from the upper surface of which the rest of the appendage arises, at the end of the posterior two-thirds of its length; the second joint is short and somewhat square in shape, the third joint is as long, but narrower and cylindrical, the fourth joint is extremely short. The flagellum is extremely long, gradually narrowing towards its apex; the jointing of the flagellum does not commence at its extreme proximal end.

The *mandibles* are stout and strong, and divided at the extremity into several tooth-like projections; below the extremity is a tuft of fine hairs, and behind this the molar process, which is strong and bent downwards; it is triangular in form, with a smooth oblique cutting edge, on one side of which is a row of fine hairs. The palp (Pl. IX. figs. 10, 12) is four-jointed, the two distal joints are stout and curved.

The *maxillipedes* are displayed in fig. 11; they are closely similar to those of other species.

At Station 168 were dredged a number of small individuals which possibly belong to this species; I cannot be positive about this point as I did not take any actually from the ovigerous cavity of the female; they were obtained at the same haul of the dredge, with *Eurycope novæ-zelandiæ*, but still there may be some doubt whether they

are the young of this species; the uncertainty must be borne in mind in considering the following facts. These specimens are immature, as is shown by the non-development of the terminal segment of the thorax; the most remarkable peculiarity about them is the great length of the lateral prolongations of the caudal shield; these far exceed in length the same process of the adult *Eurycope novæ-zelandiæ*, and in fact resemble the present species and *Eurycope atlantica*, from the former of which these young examples show no very great differences. Fig. 2 of Pl. IX. illustrates the external characters of these young specimens. If they are really the young of *Eurycope novæ-zelandiæ*, the fact will be of interest as tending to show that this species has been derived from a species nearly identical with *Eurycope fragilis*. This will be some evidence in favour of regarding *Eurycope fragilis* as a (comparatively speaking) archaic form, and its very wide distribution, which will be referred to presently, is quite reconcilable with this view.

Station 147, off Marion Island, December 30, 1873; lat. 46° 16′ S., long. 48° 27′ E.; depth, 1600 fathoms; bottom temperature, 34°·2 F.; Diatom ooze.

Station 152, Southern Ocean, February 11, 1874; lat. 60° 52′ S., long. 80° 20′ E.; depth, 1260 fathoms; Diatom ooze.

Station 158, Southern Ocean, March 7, 1874; lat. 50° 1′ S., long. 123° 4′ E.; depth, 1800 fathoms; bottom temperature, 33°·5 F.; Globigerina ooze.

Station 237, off Yokohama, June 17, 1875; lat. 34° 37′ N., long. 140° 32′ E.; depth, 1875 fathoms; bottom temperature, 35°·3 F.; blue mud.

Eurycope atlantica, F. E. Beddard (Pl. IX. fig. 13).

Eurycope atlantica, F. E. Beddard, Proc. Zool. Soc. Lond., 1885, pt. iv. p. 919.

This species is represented by a single specimen, which was dredged in the North Atlantic, from a depth of 900 fathoms.

Eurycope atlantica is very similar to *Eurycope fragilis;* as, however, all the individuals of the latter species agree to differ from the present in a number of small though perfectly constant characters, the separation of the two forms appears to be necessary; the main points of difference are as follows:—

In *Eurycope atlantica* there are two spines on the head, placed on either side of the dorsal median line, and two curved spines, placed one behind the other, upon the caudal shield.

In *Eurycope fragilis* there are no spines upon the head, and only one spine upon the caudal shield, situated not upon the caudal shield itself, but just anterior to it in a region which I imagine to correspond to the anterior abdominal segment. Moreover, the shape of the caudal shield is distinctly different in the two species.

The example of *Eurycope atlantica* only measures 10 mm. in length; the body is rather narrower, but of fairly uniform width; it does not narrow greatly either at the anterior or at the posterior extremity.

The head is very long, equalling the two first segments of the thorax taken together in its antero-posterior diameter; on either side, about halfway between the anterior and posterior margin of the head, is a strong hooked spine; the frontal region of the head, between the attachments of the antennæ, is extremely narrow.

Of the first four segments of the thorax the first is rather shorter than the rest, which are subequal; the three last of these segments are furnished with a longish median spine, as in *Eurycope fragilis*.

The lateral margins of these segments, as in so many other species of the genus, are prolonged into a forwardly directed spine, which is in the present species extremely delicate and slender though not specially long; behind the spine are a number of inconspicuous denticulations, and in the fourth segment one of these latter is especially prolonged and equals the lateral spine in length; in this segment, therefore, there are two instead of only one lateral spine on either side.

The three posterior thoracic segments, as is usual in this genus, differ markedly in their character from the anterior segments of the thorax; they are wide and more convex, and V-shaped; the last of these segments has a straight posterior margin instead of a very concave one, but it includes possibly one at least of the anterior segments of the abdomen; the first two of these segments have each a pair of spines placed one on each side of the dorsal median line; in the third segment there are only faint indications of these spines; laterally each of these segments is prolonged into a flattened, forwardly directed spine.

The abdominal shield has a very peculiar form, which serves to distinguish the species from any other; it is somewhat oval in form and terminates behind in a somewhat obtusely pointed extremity; in front of the articulation of the uropoda are a pair of lateral spines, which are curved forwards in a crescentic shape; in front of these again, but some way behind the antero-lateral margin of the caudal shield, are another pair of lateral spines, straighter than the more posterior pair of spines. The upper surface of the caudal shield is divided into three areas by two longitudinal furrows; the central area is the widest and has a pair of median spines situated one behind the other; the first of these is placed close to the anterior boundary of the abdominal shield and corresponds to a similar spine in *Eurycope fragilis*, the second rather more than halfway down.

The first pair of *thoracic appendages*, like those of other *Eurycope*, are considerably smaller than those which follow.

The *uropoda* consist of a basal joint, which is stouter than the succeeding joint; I did not observe the uropoda to be biramose, but do not wish to speak with certainty on the point; they arise from just underneath the posterior lateral spines of the abdominal shield.

Station 76, off the Azores, July 3, 1873; lat. 38° 11′ N., long. 27° 9′ W.; depth, 900 fathoms; bottom temperature, 40° F.; Pteropod ooze.

Eurycope sp., F. E. Beddard.

Eurycope sp., F. E. Beddard, Proc. Zool. Soc. Lond., 1885, pt. iv. p. 920.

At Station 147, in company with several specimens of *Eurycope sarsii* and one specimen of *Eurycope fragilis*, a fragment of a Munnopsid was dredged which I am inclined to refer to the species just described, viz., *Eurycope atlantica*. As, however, the specimen is so fragmentary, this identification might very easily be questioned, and I therefore describe the specimen by itself and without giving it a name.

The fragment measures 11 mm. in length, and consists of the last three segments of the thorax and about the first half of the caudal shield; two of the thoracic appendages belonging to this region of the body have been preserved; they are characteristically natatory, and like those of other species of the genus *Eurycope*.

The thoracic segments are shaped precisely like those of *Eurycope atlantica*, and like them are furnished with a pair of spines, one on either side of the dorsal median line; the spines of the last segments are quite as conspicuous as those of the first two.

The boundary line between the last segment of the thorax and the abdominal shield is not perhaps quite so distinct as in *Eurycope atlantica;* the abdominal shield has at least three spines, placed medially one behind the other on the dorsal margin; two of these appear to belong to two free segments of the abdomen, which in this species, as in others, are half enclosed by the last segment of the thorax; one is upon the abdominal shield proper.

Station 147, off Marion Island, December 30, 1873; lat. 46° 16′ S., long. 48° 27′ E.; depth, 1600 fathoms; bottom temperature, 34°·2 F.; Diatom ooze.

Eurycope spinosa, F. E. Beddard (Pl. X. figs. 6, 7).

Eurycope spinosa, F. E. Beddard, Proc. Zool. Soc. Lond., 1885, pt. iv. p. 921.

One of the most remarkable Munnopsids obtained by the Challenger is the present species.

It is unfortunately only a mutilated fragment, but sufficient remains to show that it is a member of the family Munnopsidæ, and is the type of a new species of that family, probably referable to the genus *Eurycope*.

It was dredged from 1950 fathoms of water in the neighbourhood of the antarctic ice barrier.

The specimen is a fragment of an immature female, consisting of the head and the first four segments of the thorax; it measures 10 mm. in length.

The most noticeable feature about this species is that it is covered with numerous long and slender spines, an entirely new character in the organisation of the Munnopsidæ.

Apart from the presence of these spines, however, the specimen does not present any great differences from other species of the genera composing the family, as will be apparent from the following description.

The head and the segments of the thorax appear to be subequal in size.

Each of the four segments of the thorax is furnished with a long slender spine in the median dorsal line, situated close to the anterior of the segment; on the head this median spine is absent, but there are a pair of lateral spines situated a little way behind the articulation of the antennæ; these are absent from the first segment of the thorax but present on the other three, and are of equal length with the median spine.

On the epimera are two or three long spines; I am unable to describe them more accurately, as they were broken off in so many instances that it is quite impossible to write with any certainty; the description that I am able to give is as follows:—

On the fourth thoracic segment, on the right side, are three long spines, one dorsal and between the other two; on the three anterior segments were apparently only two such spines, one below the other; on the left side of the body most of the corresponding spines were broken off; they all appear to be placed on the epimera.

The ventral side of the body was comparatively smooth, each of the segments, however, appeared to possess a minute median spine, which was certainly present in the third and fourth segments; these spines are extremely small, and nothing to compare to those on the dorsal surface, which equalled or even exceeded in length the diameter of the body of the creature.

The only pair of appendages apart from the mouth organs which have been preserved are the thoracic limbs of the first pair. These are delicate and slender, much more so than the succeeding limbs, judging from the fragments of them which remain. The first joint is the longest, the second shorter, and the third very short indeed; the fourth joint is slender and somewhat curved, nearly as long as the first joint, the fifth is rather shorter; this appendage has not the characters of a prehensile hand to anything like the extent that it has in *Munnopsis latifrons*.

I include the specimen within the genus *Eurycope*, without wishing to pledge myself in any way to the accuracy of this determination. It is evident from the foregoing description that there are not sufficient data to assign it to any particular genus. The general aspect of the fragment, however, apart of course from the long spines which deck the body, is very like *Eurycope sarsii* and other species of the genus *Eurycope* described in the present Report.

Station 157, Southern Ocean, March 3, 1874; lat. 53° 55′ S., long. 108° 35′ E.; depth, 1950 fathoms; bottom temperature, 32°·1 F.; Diatom ooze.

Eurycope intermedia, F. E. Beddard (Pl. X. fig. 5).

Eurycope intermedia, F. E. Beddard, Proc. Zool. Soc. Lond., 1885, pt. iv. p. 919.

This is a small species, only measuring 9 mm. in length.

The description which follows is based upon a single individual, dredged from the great depth of 2740 fathoms, in the North Pacific.

This species is closely allied to *Eurycope sarsii*, *Eurycope fragilis*, *Eurycope novæ-zelandiæ* and *Eurycope atlantica*, but may be readily distinguished from all these by the shape of the caudal shield, which is rounded behind and has no median spiny process, but a pair of lateral processes just above the articulation of the uropoda. A comparison of Pl. XI. fig. 1; Pl. IX. fig. 8; Pl. IX. fig. 1; Pl. IX. fig. 13; Pl. X. fig. 5, will at once make this difference apparent.

In other respects *Eurycope intermedia* is not unlike any of the four above mentioned species.

Eurycope intermedia is perhaps rather more cylindrical in shape than its immediate allies; the body is widest at the fourth thoracic segment, but does not diminish much in width in front of and behind this segment as in so many other species.

The surface of the head is convex and is strongly marked by the attachments of the muscles.

The four succeeding segments of the thorax are subequal in length; the median portion of each is depressed, the anterior and posterior margin of the segment being raised, the lateral portion of each segment is, however, convex. In the dorsal median line of each segment is a short spine pointing forwards; in this character, therefore, *Eurycope intermedia* differs from its allies; in *Eurycope sarsii* there are no such spines, while in the other three species referred to above it is only the second, third, and fourth segments which have spines. The spines are of approximately equal length on all the segments. The antero-lateral margins of these segments are furnished with spines, with the possible exception of the fourth, where they are, at any rate, very minute.

The epimera of these segments are short, and their free margin is prolonged anteriorly into a slender spine, which is directed forwards; the epimeral spine of the fourth segment is, if anything, rather longer than that of the preceding segments, but the spines are well marked and distinct in all the segments.

The three posterior segments agree very closely in their general form with the corresponding segments of the other allied species; the last of these segments is, however, rather longer than either of the preceding ones.

Each of the segments, as in *Eurycope fragilis*, is furnished with a single pair of short spines, one on either side of the median line; the pair of spines is placed nearer to the anterior than to the posterior margin of the segment. The last thoracic segment has a straighter posterior border than either of the two preceding, which are very markedly convex in front and concave behind.

Between the posterior border of the last thoracic segment and the anterior border of the abdominal shield is a convex area, marked by a transverse furrow, which corresponds (?) to the terga of certain of the anterior abdominal segments.

The shape of the abdominal shield, as already mentioned, serves to distinguish this species at a glance from any of its allies; as in *Eurycope fragilis*, the caudal shield is

notched on either side at the commencement of the posterior third; just beyond the notch is a slight transverse process, which covers over the articulation of the uropoda; these lateral processes are, however, much less distinct than in *Eurycope fragilis;* the termination of the caudal shield is not a blunt spiny process as in that species, but is smooth and rounded off, and there is no spine upon the dorsal surface. The caudal shield is divided by two furrows into a median T-shaped and two lateral convex areas, which are distinctly separated from each other.

The terminal area of the caudal shield is not bent downwards as it is in *Eurycope sarsii,* and more particularly in *Eurycope pellucida.*

The *thoracic limbs* appear to resemble those of *Eurycope novæ-zelandiæ.*

The *uropoda* are biramose, with a more slender exopodite than endopodite; their length is considerable, they are, both actually and relatively, longer than those of *Eurycope sarsii.*

I am bound to say that it is not unlikely that this species, as well as *Eurycope fragilis* and *Eurycope atlantica,* may prove to be but variations of one species. In the meantime, however, I prefer to regard them as distinct, since in a considerable number of specimens of *Eurycope fragilis* from different localities, I have not observed any differences so great as those which separate these supposed species.

Station 252, off the Sandwich Islands, July 12, 1875; lat. 37° 52′ N., long. 160° 17′ W.; depth, 2740 fathoms; bottom temperature, 35°·3 F.; red clay.

Eurycope pellucida, F. E. Beddard (Pl. XIV. figs. 1, 2).

Eurycope pellucida, F. E. Beddard, Proc. Zool. Soc. Lond., 1885, pt. iv. p. 920.

The present species is the largest known. A single specimen only, from Station 218 (1070 fathoms), was obtained by the Challenger, and measures 45 mm. in extreme length by 10 to 12 mm. in breadth.

The large size of the species is not, however, its only peculiarity. It is remarkable for the fact that the integument is almost transparent, and appears to contain but little calcareous matter; the specimen is naturally very soft, and its texture and general appearance is very like that of oiled tissue paper; it is of course difficult to give an idea of this in a figure.

The extreme delicacy of the specimen has unfortunately brought about the loss of the antennæ and of all the thoracic limbs; I find on reference to some MS. notes by the late Dr. v. Willemoes-Suhm, that the specimen, even when first obtained, was broken in this way.

The thinness and transparency of the integument is rendered more striking by the feeble development of the musculature.

In other respects the species is not remarkable, and finds its nearest ally in *Eurycope sarsii.*

The head is rounded and convex dorsally; the insertions of the antennæ and antennules are so close together that there is only a very narrow interval of communication between the frontal region of the head and the posterior region; this is also characteristic of *Eurycope sarsii* and other species.

The frontal margin is slightly convex, the lateral region of the head is quadrangular in shape, and is prolonged downwards and forwards for some way below the attachment of the thoracic limbs.

The first segment of the thorax is very short (antero-posteriorly), and not wider than the head; its anterior margin is formed of two concave areas, and the median triangular process resulting from the union of these fits into a corresponding cavity in the posterior margin of the head; laterally the segment lies completely parallel to the lateral region of the head, and is slightly overlapped in the way shown in the figure (Pl. XIV. fig. 1) by the second segment of the thorax; its appendage is attached at a point considerably below the level of the succeeding appendages of the thorax.

The second and third segments of the thorax are subequal and slightly longer than the first segment; each is ridged anteriorly and posteriorly, the central area of the segment being depressed and saddle-shaped; laterally each of the segments is occupied by an oval convexity, which is larger in the third than in the second segment. The second segment has a concave anterior and a convex posterior margin, the lines being almost straight in the middle of the segment. The third segment is concave anteriorly, but its posterior margin is concave in the middle and convex laterally.

The fourth segment of the thorax is as long as the second and third taken together, it is on the whole similar to those, but the lateral convex areas are larger. The curvature of the anterior and posterior margins are parallel to each other and to the posterior boundary of the segment in front.

All these segments are furnished with short epimera.

The width of the body is greatest at the fourth segment.

The length of the first four segments of the thorax taken together is 5 mm.; the three posterior segments of the thorax measure together 18 mm.

The fifth segment of the thorax is V-shaped, but not so strikingly so as in many allied species, among others *Munnopsis sarsii;* the concave posterior boundary of the segment is much less deeply curved than the anterior convexity; the upper surface of the segment is very convex and is traversed by a longitudinal median furrow which divides it into two areas.

The sixth segment is of approximately the same shape and size as the preceding one.

The seventh segment is distinctly shorter; its anterior and posterior margins are parallel with each other and almost straight.

The epimera of these segments are very short and inconspicuous.

As may be seen in the figure (Pl. XIV. fig. 1) the limbs belonging to these segments

are not given off at corresponding points. The anterior pairs are placed considerably more dorsally than are either of the two hinder pairs.

The abdominal shield is separated from the last segment of the thorax by what appears to be two free abdominal segments. It should have been mentioned that the three posterior thoracic segments are separated from each other by a thickened rim which is conspicuous in the actual specimen by its white opaque colour.

The abdominal shield is ridged along its anterior margin, and the interval which separates it from the posterior ridge of the last segment of the thorax is itself divided into two equal areas by a median ridge-like thickening; this appears to be the boundary between the free abdominal segments; they are extremely narrow, their relative proportion being shown in the figure.

It is impossible to describe with accuracy the shape of the abdominal shield, as it is so soft and impressionable; the accompanying figure, however, is approximately correct; the termination of the abdominal shield is, as it were, bent underneath the body, so that the anus comes to look almost forwards instead of downwards or backwards. The intestine does not run straight to the anus but follows the convex outline of the caudal shield, passing round by its greater curvature.

It was very easy to ascertain the course of the alimentary canal without any dissection; the muscles of the species are so slightly developed that the body cavity appears to be entirely empty save for the presence of the gut, which was conspicuous through being full of dark-coloured food.

The anus is guarded by large flap-valves indicated in fig. 1 of Pl. XIV.

The appendages are only represented by the gnathopods and the abdominal limbs, and by traces of the other appendages.

One *antennule* is nearly perfect; it consists of a stout basal joint giving off a strong pointed process on the outer side, with this are articulated two other smaller cylindrical joints, the third very considerably longer than the second; the flagellum is broken off at the tip and is evidently of some length; the proximal region of the flagellum is not ringed; distally the flagellum is constricted into rings which are (fig. 5) extremely short.

The *antennæ* are only represented by four short basal joints.

Both the antennæ and the antennules of the specimen are directed more upwards than is usually the case; this is shown in the lateral view of the entire Crustacean (fig. 1). The insertion of the antennæ is also rather in front of that of the antennules.

The *mandibles* are stout and powerful and have no trace of a palp.

In the *first pair maxillæ* the upper lobe has the usual form and is provided along its anterior edge with numerous firm, yellowish spines, among which are abundant fine hairs; the lower lobe is densely beset with hairs but has no spines; its extremity is rather pointed.

The *second pair of maxillæ* is very closely similar to the same pair of appendages in *Eurycope sarsii*.

The palp of both *maxillipedes* was entirely wanting in the specimen; but I have little doubt that fig. 2, copied from a drawing left by the late Dr. v. Willemoes-Suhm, represents the maxillipede palp.[1]

The lamina of the maxillipede is somewhat curved at its tip, it is a thin delicate plate. The stipes of the maxillipede has the distal joint furnished with a single row of the peculiar sense organs found in this situation in most Isopoda along the inner margin, these commence at the base of the joint and are continued up nearly to its summit; the distal extremity of the joint is truncate and bears a row of long yellow spines like those of the maxilla, and interspersed among them a number of fine hairs; a projecting portion of the joint, at the inner side, bears three enormously thick knife-shaped spines, behind which is a tuft of slender hairs.

Of the thoracic appendages only stumps are left as indicated in the figure (fig. 1); the first four appendages gradually increase in size, the first being the most slender and the fourth the stoutest. The fifth and sixth pairs of limbs have their basal joints of about equal thickness to those of the fourth pair. The last pair of ambulatory limbs are again more slender.

Reference has already been made to the mode of attachment of these limbs.

The first pair of abdominal limbs are fused to form a tongue-shaped appendage, which covers over the gills. A central ridge marks the union of the two halves as well as the free extremity, which is bifid; the two ends being curved away from each.

The *uropoda* are not present in the specimen and I am inclined to fancy that they may be altogether aborted in this species; there was, at any rate, no trace of any place of articulation.

Station 218, off New Guinea, March 1, 1875; lat. 2° 33′ S., long. 144° 4′ E.; depth, 1070 fathoms; bottom temperature, 36°·4 F.; blue mud.

Eurycope abyssicola, F. E. Beddard (Pl. XIV. figs. 5–8).

Eurycope abyssicola, F. E. Beddard, Proc. Zool. Soc. Lond., 1885, pt. iv. p. 921.

The present species is not unlike *Eurycope pellucida;* it has the same remarkable transparency of body, but its chitinous integument is even less resistent than that of the species last described. The specimen has consequently collapsed altogether, and the figure which illustrates it is copied from a drawing by v. Willemoes-Suhm, which doubtless represents the Crustacean more accurately than any sketch which could now be made. Although the general outline and shape of the individual cannot be properly made out from the alcohol specimen, the appendages are better preserved than those of *Eurycope pellucida;* in addition to the mouth and abdominal appendages, the first

[1] A fragment of an appendage corresponding to this drawing is mounted on a slide and labelled "Munnopsid, 1070 fathoms;" it has doubtless been removed from the present specimen.

ambulatory limb and one of the posterior thoracic limbs have been fortunately preserved, and one of the antennules is perfect.

Eurycope abyssicola appears to be a distinct species from *Eurycope pellucida*, but, owing to its damaged condition, it is difficult to speak with certainty.

There was only one specimen obtained in the North Atlantic, from a depth of 2175 fathoms.

It measures 40 mm. in length.

The head is convex and has the same general form as in the last species.

The first four segments of the thorax are narrow and together measure no more than the fifth segment of the thorax alone; the first four segments increase progressively in length from before backwards.

Of the three posterior segments of the thorax the middle one appears to be rather the largest, while the first and third are subequal.

The abdominal shield is so damaged that it is quite impossible to give any idea of its size or shape.

In the figure of the species (Pl. XIV. fig. 5), the abdominal shield is indicated as in v. Willemoes-Suhm's drawing; he, however, marks it with a dotted line, in order to imply that the real form is doubtful; from an examination of the specimen it appears to me to be more likely that the abdominal shield resembles that of *Munnopsis pellucida;* I have refrained, however, from perpetuating a possible error by a hypothetical figure, and so leave it in the original condition. It will be seen that v. Willemoes-Suhm's drawing departs in one or two other particulars from the very brief description that I have been able to give of this species, but I have preferred to let his drawing stand, as it is undoubtedly more likely to be true than a sketch of my own after the specimen has been kept for so many years.

The *antennule* has a comparatively long flagellum, which would reach back as far as the commencement of the sixth thoracic appendage. The shape of the appendage, at any rate as regards the peduncle, is slightly different from that of the last species the end joint arises from the tip of the first joint instead of from its inner surface; the second joint is also of a different shape, and the third joint is longer than in the last species.

In fig. 8 is represented a structure which perhaps is the end of one of the antennæ, found on the trawl with the specimen. I quote this MS. statement of v. Willemoes-Suhm without any comment.

The *mandibles* have no palp, as in the last species.

The first four thoracic limbs are comparatively slender, the first of these is represented in fig. 7.

The next two thoracic appendages belonging to segments five and six are considerably stouter; of these one of the second pair has been preserved (fig. 6); it has an

enormous foliaceous fifth joint fringed with hairs; the terminal joints of the appendage are evidently lost.

Of the abdominal appendages I could not detect any trace.

Station 68, off the Azores, June 24, 1873; lat. 38° 3′ N., long. 39° 19′ W.; depth, 2175 fathoms; bottom temperature, 36°·2 F.; Globigerina ooze.

Ilyarachna, G. O. Sars.

Mesostenus, G. O. Sars, Om en anormal Gruppe af Isopoden, Forhandl. Vidensk. Selsk., 1863, p. 211.
Ilyarachna, G. O. Sars, Christ. Fjord. Dybvands-Fauna, 1869, p. 44.

A number of very small Munnopsids dredged near Christmas Harbour, Kerguelen, in 120 fathoms, evidently belong to Sars's genus *Ilyarachna*, and are the sole representatives of that genus which were obtained during the voyage of the Challenger; these specimens also happen to be the only Munnopsids that were dredged in shallow water, and like the shallow-water forms of the northern hemisphere are of small size.

The definition of the genus given by Sars is as follows:—

Body hardly depressed, subpyriform from above, pointed posteriorly. Anterior region of body separated from posterior by a deep constriction, everywhere of approximately the same breadth. Head large and broad, truncated in front, with no rostrum; four anterior thoracic segments short, excavated above, with lateral processes directed forwards; three following segments large, convex above, without lateral processes; the last but one hardly narrower than anterior segments, deeply emarginate behind. Abdominal segment narrow, triangular, with a pointed extremity. Upper antennæ short, with a few-jointed flagellum. Mandibles short and stout, not divided at extremity, furnished with an obliquely transverse crest, a narrow molar process with a few setiform spines, palp absent, or small and three-jointed. First pair of legs as in *Eurycope*; second pair differing from the rest, stouter; two following pairs subequal, and often very elongate. Of the posterior thoracic limbs the first two pairs as in *Eurycope*; last pair long and narrow, with scarcely dilated joints and a long curved terminal claw. Abdominal operculum large, nearly completely covering the abdomen with a median crest and numerous marginal setæ. Caudal appendages simple, two-jointed; basal joint large and laminar, with plumose hairs along the margins.

Ilyarachna quadrispinosa, n. sp. (Pl. XII. figs. 2–6).

Several examples of this species were dredged in shallow water (120 fathoms) off Christmas Harbour, Kerguelen; it is a very small species, the largest individual—a female with eggs—only measuring 6 mm. in length.

The head is of the same breadth as the following segments; its antero-posterior diameter is greater laterally than in the middle line; the surface of the head is convex,

and there are a pair of short spines, one on either side of the median line, and situated exactly behind the articulation of the antennules.

The first four segments of the thorax are subequal in length; they increase in width up to the third; the length of the anterior region of the body comprising the head and the first four segments of the thorax is about equal to that of the posterior region. Each of the first four thoracic segments is concave above, the anterior and posterior margins being raised into a ridge; the anterior ridge in all these segments is prolonged into a number of short spines, which have a more or less regular arrangement as follows: there are four principal spines of equal length, which are disposed symmetrically and at equal distances from each other and from the median dorsal line; in the fourth segment of the thorax the spines are less marked owing to the fact that they are placed a little way back from the anterior margin of the segment; they also appear to be more numerous than in the preceding segments; the lateral margins of the segments as well as of their epimera are also spiny.

The three posterior segments of the thorax increase progressively in length,[1] and have the characteristic form of the genus; the first of the segments has a few spines along its anterior margin, but they are wanting on the subsequent segments.

The abdominal shield is triangular in form, the median region is much more convex than the lateral regions, from which it is separated by furrows.

The *antennules* (fig. 3) are very short, not more than one-fifth of the length of the body; they almost touch each other at their insertion on the front margin of the head; the basal joint of the peduncle, as is usual in the Munnopsidæ, is of very great length and breadth compared to the small second joint, which is at the same time the last joint of the peduncle. The flagellum has seven or eight joints, of which the first is extremely long.

The *antennæ* were in every specimen broken off at the fourth joint; the three basal joints are as usual short and stout.

The *mandibles* appear to be without a palp.

In the thoracic limbs the fifth and sixth pairs have the antepenultimate joint extremely broad and flattened; the penultimate joint on the contrary (fig. 6) is extremely narrow and not wider than in the anterior thoracic appendages, which are not modified into natatory limbs; it is, however, like the preceding joint, fringed with long plumose hairs; the second joint of these two limbs has a long spine on the outer side.

The last pair of thoracic appendages are not characteristically natatory limbs; the antepenultimate joint, although to some extent flattened and therefore fitted for swimming, is not nearly so much expanded and flattened as in the case of the fifth and sixth pairs of appendages; this is the principal generic character of *Ilyarachna*, and for this reason I have assigned the present species to that genus.

[1] In the smaller specimens the last segment of the thorax is distinctly smaller than the preceding, doubtless owing to the difference in age of the specimens.

The *uropoda* are extremely small and closely attached to the sides of the abdominal shield near to the posterior termination of the latter. They are figured in position in fig. 4, and one of the appendages, more highly magnified, is shown in fig. 5 of the same plate;[1] the protopodite is of considerable length and bears two rami of which the more distant is the larger, the latter being perhaps only doubtfully the equivalent of the other rami, in which case, the appendages of this species evidently agree very closely with those of other species, since they conform to the generic definition given above.

Station 149H, off Cumberland Bay, Kerguelen, January 29, 1874; lat. 48° 45′ S., long. 69° 14′ E.; depth, 127 fathoms; volcanic mud.

Acanthocope, F. E. Beddard.

Acanthocope, F. E. Beddard, Proc. Zool. Soc. Lond., 1885, pt. iv. p. 922.

Two remarkable Munnopsids, both dredged in deep water in the southern hemisphere, and the types of two distinct species, appear to me to necessitate the creation of a new genus, which may be defined as follows:—

Generic Characters.—General form of the body oval, no marked difference in breadth between the anterior and posterior regions of the thorax. Anterior segments of the thorax increase progressively in length; the posterior segments of the thorax subequal; the general aspect of the thoracic segments as in *Eurycope;* epimera of all the thoracic segments from the second onwards, enormously elongated into curved sickle-shaped spines. The abdominal shield oval, with a long terminal spine as long as or longer than the caudal shield itself, and with two pairs of lateral spines, one more anterior, the second overlying the articulation of the uropoda. Antennæ with the two basal joints furnished with one or two long spines; mandibles divided into several tooth-like processes; molar process stout and powerful, with a blunt edge suitable for crushing, palp small and three-jointed. First pair or first two pairs of legs shorter and more slender than the rest, the two or three following pairs subequal and not greatly elongated. Posterior thoracic appendages natatory, with flattened penultimate and antepenultimate joints, fringed with long plumose setæ. Uropoda long and styliform, three or five-jointed.

Remarks.—The above generic definition necessarily applies to both the species which I include within the genus, but the characters of the two species are, in many respects, very unlike; on the whole *Acanthocope acutispina* comes nearer to the other genera of the family than does *Acanthocope spinicauda*. If it were necessary to assign the former species to any one of the genera already described, it would probably be referred to *Desmosoma*.

One of the most striking characteristics of the genus *Desmosoma*, viz., the shortness of the antennæ, I am unable to verify in the present genus, since in both species the

[1] The drawing has been accidentally reversed; the point of articulation of the appendage is directed towards the lower margin of the plate.

larger portion of these appendages are lost; the general form of the body, apart from the long spiny epimera, appears to be that of *Desmosoma*, while the characters of the thoracic limbs are peculiar to the genus. The characters of *Acanthocope spinicauda* are decidedly more aberrant (that is, compared to other genera) than those of *Acanthocope acutispina;* the great length of the telson and the five-jointed uropoda are perhaps the most remarkable structural features. The anterior thoracic limbs of this species agree much more closely with Sars's description of *Desmosoma*, the first pair being decidedly smaller than the rest, which are subequal; on the other hand, the immense disproportion between the anterior and posterior regions of the thorax is only comparable to a large species, which I have described above (p. 71), under the name of *Eurycope pellucida*, though I have pointed out that the generic identification of that species with *Eurycope* is by no means certain. The distribution of spines on the dorsal surface of the body in *Acanthocope spinicauda* is identical with that of *Eurycope fragilis* and the shape of the caudal shield is, apart from the immensely elongated telson, not very different. The styliform character of the uropoda, not to mention their being composed of six separate joints, prevents me from regarding this species as a *Eurycope*. Although in *Acanthocope spinicauda* the posterior appendages of the thorax have quite the typical form that they have in *Eurycope*, *Desmosoma*, &c., both species of this genus show a certain approach to the Asellidæ in the fact that the penultimate joint is not nearly so fitted for swimming as in those genera, being much narrower; in this respect all the three posterior thoracic appendages are like the terminal pair in the genus *Ilyarachna* (see p. 77). There can be but little doubt that these two species belong to a distinct genus from those already known, but the question is whether they are sufficiently alike to be included in the same genus; for the present I am inclined to unite them on account of the general similarity in outward form.

Acanthocope spinicauda, F. E. Beddard (Pl. VIII. figs. 6–12).

Acanthocope spinicauda, F. E. Beddard, Proc. Zool. Soc. Lond., 1885, pt. iv. p. 922.

This species can be distinguished at once from any other Munnopsid by the extremely long, slender telson, which is about half as long as the remaining portion of the body. It presents other remarkable characters, and is one of the most curious forms of Munnopsidæ obtained during the voyage. A single specimen only was dredged between Kerguelen and Australia in 1800 fathoms, at the same station as produced the remarkable *Ischnosoma bacillus*. The specimen has been stained in picrocarmine and mounted in Canada balsam. The specimen has been somewhat crushed in preparation; the figure, therefore (Pl. VIII. fig. 6), cannot be so accurate as might be wished.

The specimen is a male, measuring 8 mm., inclusive of the long spiniform telson.

As a rule this family of Isopods is not remarkable for the presence of pigment. Many

species, such as *Eurycope pellucida*, are glassy and transparent, or semitransparent, and have no pigment whatever, while those which are coloured, such as *Eurycope sarsii*, appear to owe their coloration, which is diffused and even, to the subjacent muscles. In the present species, which appears to have been nearly transparent during life, there is no pigment recognizable anywhere in the integument, but there are two longitudinal masses of pigment commencing near the head and running down along the back to a little way in front of the caudal shield; careful focussing with a high power made it apparent that there are really four bands of pigment, two dorsal being superposed upon two ventral bands; the extension of these pigmented areas would correspond exactly with that of the hepatic cæca, and in any case the pigment was situated well below the integument, as could be determined by careful focussing; the individual pigment spots were situated at regular distances from each other, and had entirely the appearance of being contained in the interior of uniformly-sized cells.

The pigmented bands were wider in the head, and gradually tapered off towards their posterior extremities; the presence of the pigment spots naturally marked out the limits of the tissue containing them; there appears to me to be but very little doubt that the pigmented areas are in fact the hepatic cæca. I can see no reasons against this view, and in favour of it are (1) the presence of the pigment below the integument; (2) its disposition in four longitudinal bands; (3) the shape of these bands which are wider anteriorly, and taper posteriorly; and (4) the extension of the bands which commence in the head just behind the masticatory stomach and reach to near the tail.

The head is large and squarish in outline; the frontal margin is straight, and there is a wide interval between the insertion of the antennary appendages of either side, as in *Munnopsis latifrons*, &c.

The first segment of the thorax is much the shortest, and is not prolonged laterally; the second and third segments are subequal, and have about three times the diameter (antero-posterior) of the first; the fourth segment is about half as wide again as either of the preceding segments.

Each of these segments has a pair of long, curved, spiniform epimera, which are directed outwards and somewhat forwards; the epimera of the second thoracic are rather longer than those of either of the two succeeding segments, in every case they are fringed with short spines.

In the dorsal median line each of the four anterior thoracic segments has a long upwardly and forwardly directed spine, which arises near to the anterior margin of the segment.

The three posterior segments of the thorax are about equal in length; this region of the thorax is about twice the length of that occupied by the first four segments; the lateral diameter of the fifth segment is greater than that of the two following segments, which decrease progressively.

These segments have the same general form as in *Eurycope sarsii*, &c., but are

furnished with long spiniform epimera, which, like those of the preceding segment of the thorax, are curved forwards, with the exception of the last segment, where they are directed backwards; the epimera, instead of arising above and to the outside of the limbs, as in the second, third, and fourth segments, arise in front of the attachments of the latter. Each of the three posterior segments of the thorax (with the possible exception of the first) has a pair of long spines, one on either side of the dorsal median line, arising on the anterior region of the segment, the sixth segment had on one side of the body a ventral spine arising below the attachment of the limb and exactly underlying the epimeral spine; these are probably present in the other segments, but I did not succeed in seeing them.

The abdominal shield is oval, and terminates in the long spiniform telson.

At the commencement of the abdominal shield is a long, single, median spine on the dorsal surface; a single pair of lateral spines are placed about halfway between the commencement of the shield and the attachment of the uropoda; just in front of the latter are another pair of spines longer than the anterior pair, and like them directed somewhat backwards as well as outwards. Below these and arising just behind the anus are another pair of shorter spines, not more than one half the length of the former; the uropoda are attached exactly between the two spines of each side. These relations are shown in fig. 11.

The *antennules* (Pl. VIII. figs. 6, 7) are comparatively long, nearly as long as the body minus the telson, and are furnished with a very long multiarticulate flagellum, many times the length of the peduncle.

Of the *antennæ* (fig. 8) only the three basal joints have been preserved, these are short and subequal in length; each of the first two is prolonged into a stout spine on either side of its articulation with the succeeding joint; the inner spine is in each case rather longer than the outer spine.

The *mandibles* are complicated and consist of two distinct portions besides the palp.

It must be remembered, however, that the interpretations here given may very possibly be erroneous, as it is naturally rather difficult to study the mouth appendages satisfactorily *in situ*.

On comparing the figure of the mandible of this species with that of *Eurycope sarsii*, it is seen to consist of the same parts, but the masticatory process, which almost exactly resembles in shape the mandible of *Serolis*,[1] is much stouter.

The upper half of the mandible is markedly asymmetrical; the left hand mandible has several teeth-like processes which are wanting in the mandibles of the right side.

The remaining appendages of the mouth do not appear to be in any way remarkable.

The thoracic limbs are, as in the genera *Munnopsis* and *Eurycope*, specialised into an anterior and a posterior series.

[1] *Op. cit.*, Zool. Chall. Exp., part xxxiii. pl. iii. fig. 9.

The former are long clawed ambulatory limbs, which do not present any great discrepancies of size in this species; all four pairs are of approximately the same length and thickness; the structure of these limbs is so like that of other species that I need not particularly describe them.

The last three appendages of the thorax (figs. 9; 10) are swimming legs; the last joint but one of each appendage, and the joint in front of that again, are flattened out and fringed with hairs; the terminal joints of these limbs are narrow and claw-like, so that they possibly subserve the double function of swimming and walking, especially since the penultimate, and to a less extent the antepenultimate, joints are not very wide; not nearly so wide as they are, for instance, in *Eurycope* (see Pl. IX. fig. 5); all the three pairs of appendages are, in fact, closely similar to the last pair of thoracic appendages in the genus *Ilyarachna* (see p. 77).

The *uropoda* (fig. 11) are of extraordinary length, quite as long if not longer than the terminal spine of the abdomen; the appendages are simple and composed of at least five joints, more or less equal in length, and beset with a few scattered hairs.

Station 158, Southern Ocean, March 7, 1874; lat. 50° 1′ S., long. 123° 4′ E.; depth, 1800 fathoms; bottom temperature, 33°·5 F.; Globigerina ooze.

Acanthocope acutispina, F. E. Beddard (Pl. VIII. figs. 1–5).

Acanthocope acutispina, F. E. Beddard, Proc. Zool. Soc. Lond., 1885, pt. iv. p. 923.

This species, which was dredged at Station 302 in 1450 fathoms, is very closely allied to the last, but differs from it in a number of characters sufficient to necessitate its separation as a distinct species. The single specimen is mounted on a slide in glycerine; it is of a uniform dark brown colour.

The extreme length of the specimen is 5 mm.

The head is rounded with an abruptly truncated frontal margin.

The first segment of the thorax is much shorter and narrower than any of the succeeding segments; its lateral margins are rounded and not prolonged into spiny processes. The three following segments gradually increase in width as well as length up to the fourth where the body is widest; their lateral margins are prolonged into very long spiny processes which are slightly curved, the direction of the curvature being anterior. The three posterior segments of the thorax are together rather less in length than the first four segments; there is no great break between the anterior and posterior sections of the body, the general outline being, therefore, as in *Eurycope*, oval; each of the three posterior segments is, as usual, convex forwards and concave backwards, the antero-posterior diameter of these segments is subequal. Like the anterior segments of the thorax they are furnished with long lateral spines curved in a forward direction, though the longitudinal axis of the spine gets to be placed more and more obliquely backwards

with respect to the longitudinal axis of the body in the successive segments. The length of the thoracic spines is very considerable; anteriorly and posteriorly they are nearly equal in length to the diameter of the body; in the middle segments they are about equal in length to half the diameter of the body.

These epimeral spines are furnished with four rows, equidistant from each other, of short transversely arranged spines (see fig. 4); proximally these spines are set at right angles to the longitudinal axis of the epimeron, distally they are inclined to it at a less angle; the whole surface of the body is covered with similar spines, which are also found upon the head.

The abdominal shield is oval in outline, it is prolonged behind into a long telson spine which is about equal in length to the shield itself; there are two pairs of lateral spines which are about equal in length to the telson spine; the first pair of these is directed backwards, though its curvature, as in the thoracic epimeral spines, is rather forwards; the last pair is not only directed backwards, but the curvature is backwards. The abdominal shield as well as its lateral and posterior spines are densely covered with short spines like the thorax.

The posterior pair of spines overlies the articulation of the uropoda; another spiny process, not quite so long as the first, springs from behind the articulation of these appendages; it corresponds almost exactly in direction to the dorsal spine.

The *antennules* (Pl. VIII. fig. 5) are very different indeed from those of the last species, but I am unable to give a very accurate representation of them owing to the fact that part of the peduncle is hidden in the specimen. The drawing of these appendages cannot, however, be very far wrong; the only fact that I cannot state for certain is the presence of the fourth joint in the peduncle, and judging from the analogy of the Asellidæ and other Munnopsidæ, it is in all probability present. The basal joint of the peduncle is very large, as is characteristic of the family; the remaining joints are small, the flagellum is extremely short in comparison with that of the last species, and only consists of four somewhat elongated joints.

Of the *antennæ* I have not thought it worth while to give a separate drawing, as they appear to agree so closely with those of the last species, the basal joints of which are shown in fig. 8 of Pl. VIII.; the spines upon the basal joints may perhaps be a trifle longer in proportion; both antennæ are incomplete, like those of *Acanthocope spinicauda*, and have been broken off at the same point.

The *mouth appendages* are obscured, owing to the method of preparation of the specimen, so that I am unable to give any description of them.

The two first pairs of *thoracic appendages* are subequal in length, they are shorter as well as more slender than the succeeding appendages, which are not, however, remarkable for their length, and are nothing like so elongated as are the same appendages in *Munnopsis typica*.

The *three posterior thoracic appendages* are modified in the swimming feet; the basal joint is comparatively long and stout; the two succeeding joints decrease progressively in length; the next joint is long, flattened, and crescent-shaped, the outer margin being thickened; it is fringed on both sides with long plumose hairs; the fifth joint is rather narrower, and apparently not so much compressed and flattened; it is fringed only on the inner side with similar plumose hairs; the distal joint is long and narrow; it terminates in a few longish hairs, and its outer side is closely fringed with very short hairs. The same remarks about the similarity of these appendages to the last thoracic limbs of *Ilyarachna* may be made on this species as on the last.

The *uropoda* (fig. 3) are long and styliform, reaching nearly to the extremity of the telson spine; they appear to be composed of three separate joints, the first and third being subequal and longer than the middle one.

It is evident from the foregoing description that this species presents many points of difference from *Acanthocope spinicauda*; since, however, both species are only represented by a single individual, which happen to be of opposite sexes, it is impossible to say with certainty whether some of the points of difference may not be sexual rather than specific; in the mean time, however, there is no other *Munnopsis* known in which the two sexes differ in so many points and in such points, though the fact that the present species are representatives of a new genus must be borne in mind in considering the question.

Regarding the two individuals as representing two distinct species, the points of difference are shortly as follows.

In *Acanthocope spinicauda* the three posterior thoracic segments taken together are about twice the length of the four anterior.

In *Acanthocope acutispina* the three posterior thoracic segments are shorter than the four anterior. The latter species also differs from the former in the absence of any long tergal plume and in the much greater length of the epimeral spines.

The two species also appear to differ in the relative development of the short spines which beset the general body surface; in *Acanthocope spinicauda* these spines are certainly visible on some of the epimeral spines, but they seem to be confined to the posterior lateral margin of the epimeron.

The most marked point of difference between the two species is in the form of the abdominal shield and of the uropoda.

In figs. 2 and 12 of Pl. VIII. are drawings of the abdominal shield in the two species; in *Acanthocope spinicauda* (fig. 12) the telson is very much longer than it is in *Acanthocope acutispina*, but at the same time the lateral spines are rather shorter in proportion to the length of the abdominal shield than in the last named species. The antennules are also remarkably different; the shortness of the flagellum of *Acanthocope acutispina* contrasts with the very long flagellum of *Acanthocope spinicauda*. The uropoda of *Acanthocope acutispina*, have only three joints; those of *Acanthocope spinicauda* five.

Station 302, south-east of Valparaiso, December 28, 1875; lat. 42° 43′ S., long. 82° 11′ W.; depth, 1450 fathoms; bottom temperature, 35°·6 F.; Globigerina ooze.

Family Arcturidæ.

Arcturus, Latreille.

Arcturus, Latreille, Le Règne Animal, 1829, t. iv. p. 139.

It appears to me to be quite necessary to separate *Arcturus* and *Astacilla*. It is true that the very remarkable elongation of the fourth segment of the thorax in *Astacilla* is an adult condition not met with in the young, as the Rev. T. R. R. Stebbing has pointed out. This is no reason, however, for uniting together the two genera, which differ also in other characters, particularly in the brood cavity which is formed by four pairs of lamellæ in *Arcturus*, and by only one pair developed upon the fourth segment of the body in *Astacilla*. I may also point out another difference, and that is in the hinder thoracic limbs, which are biunguiculate in *Astacilla* and uniunguiculate in *Arcturus*; as this character is evidently of importance in discriminating the genera of Asellidæ it probably should not be ignored in the present case.

The genus *Arcturus* as thus limited is known by only four species exclusive of those to be described in the present Report; these are *Arcturus baffini*, *Arcturus hystrix* and *Arcturus tuberosus*, from the Arctic region, and *Arcturus coppingeri* from Patagonia. To these I am able to add ten new species, most of which are from deep water. Three of the above mentioned species, viz., *Arcturus hystrix*, *Arctura tuberosus*, and *Arcturus baffini*, range into deep water, and the genus so far as it is known at present is characteristically a deep-sea genus.

Arcturus furcatus, Studer (Pl. XXV. figs. 6, 7).

Arcturus furcatus, Studer, Sitzungsb. d. Ges. Naturf. Freunde, Berlin, 1882, p. 57.

The present species has been fully described and figured[1] by Professor Studer, from examples obtained at Kerguelen by the German steam ship "Gazelle." The Challenger acquired a very large number of specimens from shallow water up to 120 fathoms at various localities at Kerguelen, and also further to the south, off Heard Island. In addition to these specimens from shallow water a single specimen was dredged from deep water (1675 fathoms), at the southernmost station, Station 158, close to the Antarctic ice barrier, and this appears to be identical with *Arcturus furcatus*. The occurrence of the same species in deep and in shallow water is most unusual (see p. 158).

Although Professor Studer has defined the characters of this species with great accuracy, I think it worth while to give a short recapitulation in order to compare it with other species.

[1] Isopoden gesammelt während der Reise S.M.S. "Gazelle," &c., *Abhandl. d. k. Akad. d. Wiss. Berlin*, 1885, p. 12 (of Memoir), pl. i. fig. 3.

The specific characters of *Arcturus furcatus* are as follows:—

The length of the largest specimen, a male, is 41 mm., the antennæ measure 44 mm.

It most closely resembles *Arcturus spinosus*, but differs from that species in a number of characters, and is clearly distinct.

The antero-lateral margin of the head (Pl. XXV. fig. 6) is furnished with a short forwardly directed spine which is wanting in *Arcturus spinosus*.

Between the eyes are a pair of long spines, which instead of being nearly parallel to each other in their direction as in the latter species, are inclined outwards nearly at right angles; behind these are a pair of shorter spines, and the hinder region of the head is covered with tubercles.

Of the four anterior thoracic segments the fourth is the longest; each of the segments bears a stout ridge posteriorly, covered with spines and tubercles, which are disposed as in the females of *Arcturus spinosus* (see description, p. 88), the spines are shorter and blunter than in the males of that species and are more abundant; the tubercles between the spines are also better developed.

The most striking difference between the two species is in the abdominal segments and the caudal shield; in *Arcturus spinosus*, as already mentioned, the two sexes differ in the relative development of tubercles in this region of the body; they are much more strongly marked in the female than in the male. In both sexes of *Arcturus furcatus* the abdominal segments and the caudal shield are covered with numerous stout short spines of unequal length, and curved backwards; a comparison of my figures of *Arcturus spinosus* (Pl. XX. figs. 1, 2) with Studer's figure of *Arcturus furcatus* (*loc. cit.*, pl. i. fig. 3) will show this difference, which is very striking and serves at once to distinguish the two species.

Betsy Cove, Kerguelen, January 14, 1874; depth, 7 fathoms; volcanic mud.

Station 149B, off Royal Sound, Kerguelen, January 17, 1874; lat. 49° 28′ S., long. 70° 30′ E.; depth, 25 fathoms; volcanic mud.

Station 149H, off Cumberland Bay, Kerguelen, January 29, 1874; lat. 48° 45′ S., long. 69° 14′ E.; depth, 127 fathoms; volcanic mud.

Station 151, off Heard Island, February 7, 1874; lat. 52° 59′ 30″ S., long. 73° 33′ 30″ E.; depth, 75 fathoms; volcanic mud.

Station 153, Southern Ocean, February 14, 1874; lat. 65° 42′ S., long. 79° 49′ E.; depth, 1675 fathoms; bottom, blue mud.

Arcturus glacialis, F. E. Beddard (Pl. XXI. figs. 1–4).

Arcturus glacialis, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 111.

This new species of *Arcturus* agrees with *Arcturus spinosus* and *Arcturus furcatus* in the extraordinary development of spines upon the carapace and limbs; it comes

nearest to the latter species, but can be distinguished at a glance from either by the fact that the spines are more numerous and more slender.

One example was dredged at Station 153 close to the Antarctic ice barrier, being the southernmost point at which the Challenger took soundings.

The specimen is a female and measures 32 mm. in length; the antennæ were unfortunately broken.

The carapace is densely covered with short slender spines which extend on to the thoracic appendages and uropoda. The spines are of equal length or nearly so, only a few being conspicuously longer than the rest.

The dorsal anterior margin of the head is excavated by a shallow semicircular notch; the lateral margin is straight and its lower angle is not produced into a spine as in *Arcturus furcatus*. Between and in front of the eyes are a pair of long spines, inclined somewhat outwards from each other, but not at so wide an angle as are the corresponding spines of *Arcturus furcatus*. Behind these the surface of the head is convex and bears a single row of spines, of which the two on either side of the median line are considerably longer; in front is another band of small pointed tubercles.

The first four thoracic segments are subequal in length and furnished with abundant spines which are disposed as follows in each segment; the posterior part of the segment is ridged as in so many other species, the ridge widening out laterally to occupy the whole of the segment; this ridge is everywhere closely beset with spines which even in its narrowed sections are disposed in two rows; laterally the number of rows of spines is of course largely increased. On the anterior part of the segment, but some way from its anterior boundary, is a slight ridge bearing a single row of similar spines. In all except the first segment there are a pair of short spines between these two ridges, one on either side of the median dorsal line.

The epimera of these segments (that is, of the three posterior) are short, and so covered by the tergum as to be invisible on a dorsal view; their free margin is beset with spines. As is so generally the case (*cf.* description of *Arcturus spinosus*, p. 89) the epimera of the fourth thoracic segment are prolonged towards the median ventral line into a long curved spine which supports the ovigerous lamellæ.

The three posterior thoracic segments decrease in length from before backwards; the first of them is conspicuously the longest; each is ridged posteriorly; the ridge widens out laterally and comes to occupy the whole of the segment; it is beset with spines which, however, disappear at the dorsal median line. In the ventral median line the first of these three segments has an oval convexity; in the second segment this convexity is also present and terminates anteriorly in a freely projecting sharp spine which is directed forwards; the third segment has two such spines, one in front of the other; the anterior spine is directed forwards, the posterior backwards. Both *Arcturus furcatus* and *Arcturus spinosus* differ from *Arcturus glacialis* in these respects (*cf.* the description

of the former species). The three free abdominal segments are only separated from each other by a suture laterally; dorsally they are completely fused. Each bears a row of spines dorsally, which spread out laterally to occupy the whole of the segment. The first abdominal segment has a pair of short spines on either side of the ventral median line but in front of the anterior extremity of the uropoda; these are directed downwards and are approximately parallel to each other.

The caudal shield is covered with numerous longitudinal rows of spines and pointed tubercles which are directed backwards; on either side of the posterior extremity, and just above the lateral margin, is a long curved spine similar to those found in so many other species. The posterior extremity of the caudal shield is straight, and not bent upwards and pinched in as in *Arcturus spinosus* and *Arcturus furcatus;* the dorsal median line is devoid of spines and bears a longitudinal groove.

The thoracic appendages (figs. 3, 4) are furnished with numerous spines on the posterior of the joints, which decrease in number towards the distal extremity of the limb. The uropoda are also beset with a number of sharp pointed tubercles.

Station 153, Southern Ocean, February 14, 1874; lat. 65° 42′ S., long. 79° 49′ E.; depth, 1675 fathoms; blue mud.

Arcturus spinosus, F. E. Beddard (Pl. XX. figs. 1–11).

Arcturus spinosus, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 110.

Eleven examples of this fine species were dredged in deep water (1375 fathoms), to the west of Kerguelen Island, eight females and three males.

It is very noticeable on account of the great development of spines over the surface of the body, a character which is met with in several other deep-sea species, as well as in certain of the Kerguelen shallow-water *Arcturi*, *e.g.*, *Arcturus furcatus* (*vide* p. 85).

Besides the possession of ovigerous lamellæ by the female and of a penial filament by the male, the two sexes are distinguishable by a number of other small but constant differences.

In the female the anterior portion of the thorax is considerably wider than it is in the male; a difference which is of course correlated with the presence of ovigerous lamellæ in the former sex. The two sexes also differ very considerably in the development of spines upon the body, the females being invariably much more spiny than the males. These distinctions, which are especially marked in the abdominal region of the body, will be considered in detail in the following description of the species.

Length of the largest specimen 48 mm., length of antennæ 60 mm.

The anterior margin of the head is excavated; on either side of the median dorsal line, between and a little in front of the eyes, are a pair of long spines inclined upwards and slightly outwards; behind them, and corresponding to them in position, are a pair

of shorter spines; in the female there is an additional pair of spines shorter still and situated outside of them.

Of the first four thoracic segments the fourth is the longest in the male; in the female all four are subequal. Each of these segments is traversed by a posterior ridge, which is narrow dorsally and only occupies the posterior extreme of the segment; laterally this ridge becomes wider and comes to occupy the whole of the surface; it is here divided by furrows into several convex areas, which are roughened and tubercular, besides bearing long spines. In the first three thoracic segments in the male the ridge bears three pairs of long spines situated at approximately equidistant intervals; the median pair are the shortest and the rest increase progressively in length up to the most laterally placed pair, which are situated just dorsal of the epimera.

The fourth thoracic segment of the male only possess two pairs of long spines upon the tergum, a median pair and lateral pair, situated just above the epimera and considerably anterior to the median pair, owing to the increased length of the segment. The epimera of this segment has also a long spine, which is covered and concealed on a superficial view, by the lateral spine of the tergum. The epimera of the anterior segments have no such a spine.

In the female the first thoracic segment has four pairs of spines, the rest having them as in the male; there are also a number of short sharp spines developed between the principal ones; the lateral margins of the epimera are also furnished, in all these segments, with several short spines, that on the last being the longest. On the fourth thoracic segment, as in *Arcturus glacialis* (p. 87), the epimera are particularly large and project inwards, nearly meeting in the median ventral line; besides the lateral spine they give off a large posterior curved spine, which is closely applied to the ovigerous lamellæ and doubtless contributes towards their support; there are rudimentary equivalents of this spine on the anterior segments.

Each of the first four thoracic segments in both sexes has a short ridge in front of the posterior one, from which arise a single row of tubercles, blunter in the male and sharper in the female; in the first segment this ridge is wider antero-posteriorly than in any of the following segments.

Of the three posterior thoracic segments the first is the longest in both sexes; the posterior portion of each segment is ridged, the ridge being narrow dorsally and wide laterally; it is covered with tubercles, which again are more strongly marked in the female than in the male. On the sides of the tergum, anterior to the ridge in the first, is a single conspicuous tubercle; beneath this, and situated a little behind the articulation of this segment with that in front, is a strong ridge with a sharp forwardly directed edge traversing the ventral side of the segment; uniting the tubercles of either side, at the posterior margin of the segment, is a median V-shaped notch, on either side of which are a pair of short spines; the two remaining segments have a single ridge in

both sexes, the second segment has two pairs of short median ventral spines placed between the appendages, one in front and one at the posterior margin of segment; the third, a very long spine placed relatively further backwards, behind the articulation of appendages instead of in front, and another spine corresponding in position to the anterior pair of the segment in front; these are to be found in both sexes. The epimera of the three posterior thoracic segments have a large lateral spine in both sexes, and a shorter posterior spine behind the articulation of limbs.

The three first abdominal segments are distinct; the first has ventrally, near to the middle line, two pairs of short spines, one behind the other. Dorsally the segments are roughened and tuberculate, the tubercles being stronger in the female; the last free abdominal segment has a lateral spine on either side, placed just on the boundary line between it and the caudal shield; this spine is completely absent in the male.

The caudal shield terminates in a sharp median spine and in two lateral spines considerably longer than the median one, which are curved upwards and directed somewhat outwards; the surface of the caudal shield is covered with rounded tubercles in the male; in the female these tubercles on the side of the caudal shield are produced into short spines, a pair of which, situated just in front of the lateral terminal spines, are longer than the rest; in the male specimen, to which the above description applies, one of these additional spines was present.

Two smaller male examples, one measuring 41 mm., the other 36 mm., in length, presented certain differences from the adult male above described. The development of spines was considerably less; on the head only the anterior pair of spines were present, and on the first three thoracic segments only two pairs of long spines, the median pair being absent; the fourth thoracic segment had only the lateral spines in one specimen (the larger); in the other the dorsal pair were also present. In female examples of a corresponding age and size the spines were in one or two instances somewhat less developed than in the more mature examples; there was nevertheless no possibility of confounding the sexes as regards the secondary character.

The *antennules* (fig. 9) reach two-thirds of the way along the third joint of the antennæ.

The two basal joints of the *antennæ* (fig. 10) are very short; the third joint is nearly three times the length of the two taken together; the fourth and fifth joints are subequal, and each twice as long as the third joint; the flagellum is rather more than half the length of either of the distal joints.

The *thoracic appendages* (figs. 5, 7) in the female have a few short spines on the proximal joints along the posterior surface; in the male (figs. 6, 8) it is only the three last appendages which are thus provided.

The *uropoda* (figs. 2, 4) are tuberculate.

Station 146, off Marion Island, December 29, 1873, lat. 46° 46′ S., long. 45° 31′ E.; depth, 1375 fathoms; bottom temperature, 35°·6 F.; Globigerina ooze.

Arcturus anna, F. E. Beddard (Pl. XIX. figs. 1–5).

Arcturus anna, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 107.

A single female example of this species was obtained in deep water off the east coast of South America.

The specimen measures 37 mm. in length exclusive of the antennæ, which are very long, measuring altogether 64 mm., with the exception of the extreme tip which was broken off.

The head is excavated in front and bears two large lateral eyes of a somewhat triangular form with rounded angles; it is sharply marked off, at least laterally, from the anterior segment of the thorax.

The anterior lateral margin of the head is notched ventrally.

The first four thoracic segments are subequal in length; each is traversed by a ridge which dorsally is narrow and occupies only the posterior portion of the segment; laterally the ridge upon each segment expands in width and comes to occupy the whole of its superficies; in this region the ridge upon the segment is not uniform, but traversed by several shallow furrows which divide it into two or three rounded emminences. At the extreme lateral margin, just before the articulation of the epimera, is a longish stout spine inclined more or less at right angles to the longitudinal axis of the body, and slightly bent downwards; behind are one or two shorter spines along the postero-lateral border; the epimera which are short and not visible on a dorsal view of the animal, are likewise furnished along their free border with one or two spines; these are only conspicuously developed upon the last two of the segments, especially upon the last, where one of the spines equals in length the spine upon the terga, and lies directly beneath it. Each of these first four segments has another slight ridge upon the dorsal surface, placed about half way between the posterior ridge and the anterior boundary of the segments; this ridge is thicker upon the first thoracic than upon any of the succeeding segments; laterally the anterior ridge of each segment disappears and does not come into contact with the widened portion of the posterior ridge.

The three posterior thoracic segments are together equal in length to the third and fourth; of these the first is distinctly the largest. Each is ridged posteriorly, and the ridge widens out laterally to occupy the whole of the segment; it is here divided by a suture passing obliquely from above downwards and backwards into two convex areas; the lower convexity, which is the epimera, bears a stout spine which projects over the articulation of the limbs; the epimera are not visible on a dorsal view; in the most anterior of the three segments the epimera has in addition an equally long spine placed in front of the other, and directed forwards instead of outwards; each segment also has on either side a short lateral spine corresponding to those on the preceding segments but considerably smaller.

There are two completely free abdominal segments, the third being to a large extent fused with the caudal shield; these segments decrease in size from before backwards; the first is as long as any one of the first four thoracic segments, the second is not much shorter, while the third is not more than half as long as the first.

The first abdominal segment is divided into two distinct portions by a circumferential furrow; the anterior portion is considerably shorter, and bears on the ventral side of the segment a short spine on either side, the posterior half of the segment is smooth and convex and has a pair of long, somewhat backwardly curved spines, corresponding to the short ones in front, and situated just in front of the smooth area against which the anterior extremities of the uropoda play; this segment as well as the next has on each side a short lateral spine. The third abdominal segment has on each side a long curved spine situated at the postero-lateral margin of the segment, just in front and on a line with the flattened margin of the caudal shield. The caudal shield has a central convexity bordered by a flattened area which commences just behind the curved spine of the segment in front; the lateral margin is serrate, especially posteriorly, and terminates in a pointed extremity on either side which projects beyond the termination of the central portion of the caudal shield; the latter terminates in a short median spine.

The *antennules* are short, not reaching much beyond the second joint of the antenna.

The joints of the *antennæ* (fig. 5) increase progressively in length, the fourth and the fifth being, however, subequal; the inferior surface of the second joint of each antennæ is a very downwardly pointing spine, as in its near ally *Arcturus cornutus*; the flagellum consists of more than eighteen joints and is longer than the terminal joint of the organ.

The anterior *thoracic limbs* are not markedly longer than the posterior.

The proximal joints of the second, third, and fourth thoracic appendages (fig. 3) are furnished with longish spines, one or two to each joint, like those upon the segments; the posterior thoracic limbs (fig. 4) have no such spine, with the exception of the last, which have a single spine about half way along the proximal joint. The arrangement of the spines upon the thoracic limbs is as follows: the proximal joint has a single spine in the first two of these pairs of appendages and an additional one in the fourth pair of ambulatory limbs; the second and third joints have a single spine, which is not very long, close to the articulation of the joint with the succeeding one.

The free margins of the *uropoda* where they come into contact with each other are serrate (fig. 2).

Station 320, off Rio de la Plata, February 14, 1876; lat. 37° 17′ S., long. 53° 52′ W.; depth, 600 fathoms; bottom temperature, 37°·2 F.; green sand.

Arcturus cornutus, F. E. Beddard (Pl. XIX. figs. 6–12).

Arcturus cornutus, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 108.

This species, also from the deep sea, bears some resemblance to *Arcturus anna*, but is evidently a distinct species, as will be seen from the following description, which refers to a single female example.

The specimen measures 36 mm. in length; the antennæ measure 64 mm.

The proportions therefore agree as nearly as possible with those of *Arcturus anna*.

The margin of the head is excavated in front and dorsally, the lateral margin of the head below in front of the eye is notched; between the eyes are a pair of long forwardly curved spines; behind the eyes a pair of blunt tubercles.

The first three thoracic segments are subequal and a little longer than the fourth. The posterior portion of each of these is occupied by a ridge which is narrow dorsally, but considerably wider laterally; dorsally this ridge is quite smooth and even, but laterally it is divided by an antero-posterior furrow into two principal convex protuberances; the largest of these eminences placed about half way between the dorsal median line and the lateral margin of the tergum is furnished with a long spine; there is also another spine of equal length set upon the lateral margin of the tergum projecting over the epimeron; behind this on the fourth segment is another spine more slender but not quite so long, springing from the lateral margin of the tergum and projecting backwards; there are indications of similar spines upon the anterior segments, but in no case are they more than sharp points which, however, increase in length from before backwards; on the first thoracic segment the more dorsal of the two spines upon the tergum does not accurately correspond in position to that upon the following segments; it is placed relatively behind and below them. The epimera of the second, third, and fourth segments have a single spine near to their posterior margin; the length of this spine increases progressively from before backwards, in the second and third of those segments the margin of the epimeron projects in front of the spine into a broadly conical process which is not represented in the fourth segment.

In front of the posterior tergal ridge, and close to the anterior margin of the segment, is a pair of blunt tubercles united by a slight ridge. The first segment has in addition a single tubercle placed in front again of this ridge, and just on the boundary line between the head and the first thoracic segment.

Of the three posterior thoracic segments the first is a trifle the longest. Each is ridged; the dorsal part of the ridge is narrow, straight in the first, concave backwards in the two last of the segments; laterally the ridge is widened out and bears on either side a single long spine directed outwards and a little backwards. The epimera of these segments are large, and each has a long spine, almost exactly underlying that upon the tergum, directed outwards and rather more downwards; the first of these segments has

in addition another longer anterior spine directed forwards, and almost at right angles to the posterior spine.

Of the three free abdominal segments the middle one is rather the largest, the first is separated by a complete and distinct suture from the second; the second is separated from the third by a suture which is incomplete dorsally, though present at the sides; the third segment is practically fused with the caudal shield. Each segment has a long lateral spine curved somewhat backwards, and corresponding exactly in position with those upon the posterior thoracic segments; that of the third segment is the longest; continuous with this is a row of one or two sharpened tubercles extending nearly across the segment, the median dorsal region being flattened and smooth; the first abdominal segment, although perhaps rather narrower dorsally than the second segment, has a ventral area which is considerably longer; on this are borne two pairs of spines in addition to the lateral spines; the most anterior pair are close to the median ventral line and to the anterior margin of the segment; the posterior pair are very much longer and placed further from the median line and just at the posterior boundary of the segment. The caudal shield is distinctly keeled and terminates in a sharp upturned point; on either side of this is a single row of curved hook-like spines; the lateral margins of the caudal shield are flattened, serrated posteriorly, and end in a sharp spine.

The *antennules* (fig. 8) extend a little way along the third joint of the antennæ.

The two last joints of the *antennæ* are extremely long, the first measuring 20 mm., the second 22 mm.; the second joint has a short spine on the dorsal surface (fig. 9) and a long spine ventrally; the flagellum is nearly as long as the last joint.

The anterior *ambulatory limbs* (fig. 12) have longish spines upon the proximal joints; there are no such spines upon the posterior limbs (fig. 11). The second, third and fourth ambulatory limbs have a long spine upon the second and third joints close to the articulation with the succeeding joints; the two last of these appendages have also a pair of longish spines upon the proximal joint which appear to be wanting in the second ambulatory appendage.

The *uropoda* have two long curved median spines exactly equivalent in position to the posterior pair of ventral spines upon the first abdominal segment; behind are a row of similar but smaller spines, and outside these a row of smaller spines still.

Station 214, off Samboangan, February 10, 1875; lat. 4° 33′ N., long. 127° 6′ E.; depth, 500 fathoms; bottom temperature, 41°·8 F.; blue mud.

Arcturus spinifrons, Beddard (Pl. XXV. figs. 9–12).

Arcturus spinifrons, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 108.

Two examples of this small species were dredged a little to the south of the Fiji Islands from a depth of 600 fathoms.

Both specimens are males, the larger measures 13 mm. in length, the antennæ being 20 mm. in length.

Unlike so many other deep sea species, *Arcturus spinifrons*, has no development of spines upon the carapace with the exception of a single pair on the head; the body is, however, very tuberculate.

The anterior margin of the head is notched in a semicircular fashion; the anterior part of the head is smooth save for two long spines which lie between the eyes; the posterior part of the head is convex and divided by furrows into three prominences, one median and two lateral, which are closely covered with tubercles. The lateral margin of the head, as in *Arcturus anna*, is excavated by a ventral semicircular notch.

The four anterior thoracic segments are equal in size. Each has a posterior ridge which widens out laterally; the anterior margin of the ridge is concave; the lateral regions are separated by a furrow from the median and both are densely covered with tubercles; the epimera are short and inconspicuous, and appear to be smooth or at least not so rough as the terga.

The anterior concave margin of the ridge closely embraces an oval convexity which lies close to the anterior margin of the segment; in the first segment this convexity is divided by a tranverse line of division into two equal halves, each of which bears a single row of tubercles; these regions are also densely tuberculate in the following segments.

The fourth thoracic segment has a row of short tubercles arranged in a semicircle with the concavity directed backwards upon the ventral surface; the dorsal oval convexity is not so large as in the two preceding segments, and has only two tubercles, one at either extremity.

Of the three posterior segments of the thorax, the first is the largest, the second and third being smaller and subequal; each of the segments is traversed by a strong ridge which is covered with tubercles; the first of the segments has a number of short tubercles scattered over the ventral surface, and the two succeeding segments are ridged in the same region.

The segments of the abdomen are comparatively smooth, being only slightly roughened laterally; the caudal shield is smooth with the exception of the lateral margins which are serrate; it terminates in a short median spine.

The *antennules* extend half way along the third joint of the antennæ.

In the *antennæ* the terminal joint is the longest, measuring 6 mm., the penultimate joint measures 5 mm.; the flagellum is of about half the length of the terminal joint.

The *thoracic appendages* are roughened and tuberculate on the proximal joints.

The *uropoda* bear a single median longitudinal row of tubercles.

Station 174c, off Kandavu Island, August 3, 1874; lat. 19° 7′ 50″ S., long. 178° 19′ 35″ E.; depth, 610 fathoms; bottom temperature, 39° F.; coral mud.

Arcturus purpureus, F. E. Beddard (Pl. XXIV. figs. 5–8).

Arcturus purpureus, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 109.

A single specimen of this species was dredged in the North Atlantic at Station 23, from a depth of 450 fathoms.

I have named it *purpureus* on account of the purplish colour which appears to characterise the species, and is very distinct in the spirit-preserved specimen.

It is closely allied to *Arcturus anna* and to *Arcturus cornutus*, but differs sufficiently from both to constitute the type of a new species.

The extreme length of the specimen, which is a female, is 18 mm., the length of the antennæ 31 mm.

On the head between the eyes are a pair of long forwardly curved spines; the hinder portion of the head is occupied by a rounded median convexity; at the antero-lateral margin of the head is a very short forwardly directed spine, beneath which the margin is excavated by a semicircular notch.

Of the first four thoracic segments the fourth is rather the shortest. Each of the segments bears an outwardly directed spine on each side of the body corresponding to the pair on the head, and of about equal length; those on the fourth segment, although broken, appeared to have been originally somewhat shorter; close to the lateral margin of each segment, near to its junction with the epimeron, is another long spine projecting outwards and over the epimeron. The first segment differs from the succeeding ones in having no separate epimeron, and its lateral margin has two spines instead of one, of which the anterior is the longer; they are both directed forwards as well as outwards. The fourth thoracic segment has also a second spine, and its postero-lateral margin inclined downwards and backwards as well as outwards.

Of the three posterior thoracic segments the first is the largest, the two posterior being equal in size; the epimera of all three segments bears a spine directed outwards, and at right angles to the longitudinal axis of the body; that of the first of the three segments is considerably the longest; this segment bears also a pair of spines upon the tergum continuous with those on the segments in front, and exactly overlying that on the epimeron.

The first three segments of the abdomen are separated by distinct sutures; the first and the third of the segments have a pair of long lateral spines; those of the third segment mark the boundary between it and the caudal shield; the first abdominal segment has a pair of short ventral spines placed on either side of the median ventral line, and upon a ridge which forms the posterior margin of the segment; anteriorly the segment is bounded by a similar ridge, but without any distinct spines.

The caudal shield is oval and convex, with a faintly marked, longitudinal carina which terminates in a long spine; the lateral margins of the caudal shield are flattened and

form a ridge like the brim of a hat; on either side are two long curved spines situated at equidistant intervals, and corresponding in position to the lateral spines on the last abdominal segment; the lateral ridge does not terminate in a flattened spine on either side as in so many other species.

The appendages in many cases bear long spines like those upon the body; the *antennæ*, which are very long, have a pair of spines upon the distal extremity of each of the joints; the *anterior thoracic appendages* (fig. 7) are furnished with a number of stout spines upon the proximal joints; the *posterior thoracic appendages* (fig. 8) are smooth and devoid of any such spines.

The *uropoda* are covered with numerous minute granulations but bear no spines.

Station 23, March 15, 1873, off Sombrero Island; lat. 18° 24′ N., long. 63° 28′ W.; depth, 450 fathoms; Pteropod ooze.

Arcturus brunneus, F. E. Beddard (Pl. XXII. figs. 1–4).

Arcturus brunneus, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 108.

This species, like so many other of the deep-sea forms, is extremely spiny; on this account it presents a very strong general resemblance to *Arcturus spinosus* and to *Arcturus purpureus*, but is evidently to be regarded as a distinct species.

The specific name was suggested by the fact that many of the spines, and in one individual the entire body also, were of a dark brown almost black colour.

Four individuals, two males and two females, were dredged near to Kerguelen in 1600 fathoms of water.

The species is small, the largest specimen measuring only 19 mm.

The antennæ are of about the same length as the body.

The head is furnished with two long spines between the eyes and a pair of shorter spines behind them; in the female the posterior pair of spines are distinctly longer than in the male.

The first four segments of the thorax are subequal in length, the fourth being perhaps a trifle the longest. The thoracic segments are raised into a ridge which dorsally only occupies the posterior region of the segment, but laterally becomes much wider and occupies the whole of the sides; on the ridge are planted a number of long straight spines.

On the first segment in the male there are four of these, equidistant from each other, and a minute lateral spine at the extreme lateral margin; in the female (fig. 1) the lateral spines are longer, and there is a small spine between the lateral and dorso-lateral spine behind them; on the second segment in the male the same spines are developed, but the lateral spine, which is placed upon the epimeron, is longer, and there is a minute tubercle between it and the lateral tergal spine; in the female the arrangement of spines is the same,

but the small lateral tubercle of the male has become developed into a long spine. The third and fourth segments of the male have exactly the same spines, with the addition of another spine which replaces the lateral tubercle of the second segment, and a short median dorsal spine; the female is much the same. On the second, third and fourth segments there are in both sexes a single transverse row of longish spines near to the anterior margin of the segment.

Each of the three posterior thoracic segments bears a ridge with a single row of long spines arranged at equidistant intervals; there are three pairs of spines, one pair epimeral, and in the female several shorter ones in addition.

The first abdominal segment has a single row of comparatively short backwardly-curved spines; on the second and third segments these spines become considerably longer, especially the lateral spine on either side which marks the anterior extremity of the caudal shield.

The caudal shield in both sexes is covered with longish curved spines; just above and near to the termination of its lateral margins are an extremely long pair of spines directed outwards and slightly upwards.

The *antennules* extend half way along the third joint of the antennæ.

The first three joints of the *antennæ*, more particularly the third joint, are furnished on the upper surface with spines; there are four or five of these spines on the third joint. The fourth and fifth joints are longer than the third joint; they have no spines, but like the preceding joints, are also beset with numerous fine long hairs; the flagellum is moderately short, barely half as long as the fifth joint, and consists of about seven rings.

The proximal joints of the *thoracic appendages* (fig. 3–6) are furnished with spines.

The *uropoda* are tuberculate in the male and covered with short curved spines in the female.

Station 147, December 30, 1873; lat. 46° 16′ S., long. 48° 27′ E.; depth, 1600 fathoms; bottom temperature, 34°·2 F.; Diatom ooze.

Arcturus abyssicola, F. E. Beddard (Pl. XXI. figs. 5–8).

Arcturus abyssicola, F. E. Beddard, Proc. Zoöl. Soc. Lond., 1886, pt. i. p. 111.

Of this species again only a single specimen was obtained by the Challenger; the specimen is unfortunately mutilated, the abdomen having been broken off and lost. The species is interesting from the fact that it was dredged in water of 2385 fathoms, nearly the greatest depth at which any genus of Isopods is known to live. In other respects it is not remarkable.

The head and thorax measure some 15 mm. in length, the antennæ, which are of great size, 42 mm.

Of the first four thoracic segments the second and third are equal in size, and rather

longer than the first and fourth. Each of the four segments is ridged posteriorly, the ridge being very narrow dorsally and widening out laterally as in other species; at the junction of the tergum with the epimeron is a short blunt lateral tubercle, which overhangs and completely conceals the latter when the animal is viewed dorsally; the epimera, which are extremely short, are produced into a similar tubercle which exactly underlies that of the tergum; on the first segment the tubercle is prolonged into a spine.

The three posterior thoracic segments are shorter than any of the four anterior ones; the first is the longest of the three; on its inferior surface is a transverse ridge which reaches nearly right across the segment and bounds it anteriorly; each of the segments has a posterior ridge; laterally there is a large rounded convexity separated by a shallow furrow from the ridge and from the epimeron; the latter is smooth.

The *antennules* reach about half way along the third joint of the antennæ.

The two basal joints of the *antennæ* are very short; the third is twice the length of the first two; the fourth is half again as long as the third; the fifth is longer still and the flagellum half as long again.

The anterior thoracic appendages (fig. 7) are furnished with one or two short spines upon the proximal joints, the posterior thoracic appendages (fig. 8) have also a few tubercles on the basal joint.

At Station 184, off Cape York, two specimens of an *Arcturus* were dredged at a depth of 1400 fathoms, which appear to belong to the same species, though it is rather difficult to speak with certainty owing to the imperfect condition of the specimen from Station 281, and the fact that the only perfect specimen from Station 184 was a female, while the example of *Arcturus abyssicola*, described above, is in all probability a male, as there were no traces of ovigerous lamellæ. This being the case, it will be better to describe the characters of the specimens without regarding them, for the present at least, as belonging to another species.

The anterior thoracic segments are rather shorter in proportion, but otherwise present pretty much the same characters.

The abdominal segments are convex dorsally; the first has a pair of short tubercles ventrally on either side of the median line; the sides of the segments are rather more roughened than the thoracic segments.

The caudal shield is keeled, and terminates in a blunt spine; it is covered with a few low scattered tubercles.

Station 281, October 6, 1875, near the Low Archipelago; lat. 22° 21′ S., long. 150° 17′ W.; depth, 2385 fathoms; bottom temperature; 34°·9 F.; bottom, red clay.

Station 184, August 29, 1874, between Australia and New Guinea; lat. 12° 8′ S., long. 145° 10′ E.; depth, 1400 fathoms; bottom temperature, 36°·0 F.; bottom, Globigerina ooze.

Arcturus myops, F. E. Beddard (Pl. XXII. figs. 5–8; Pl. XXV. fig. 8).

Arcturus myops, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 106.

The present species differs from any other *Arcturus* at present known by the fact that the eyes are entirely or almost entirely aborted. The two specimens which I include under the above specific name were dredged from a depth of 700 fathoms, off New Zealand. The only trace of eyes left are a pair of rounded elevations on either side of the head, which, as far as could be made out from the examination of a specimen mounted entire in Canada balsam, are not facetted and contain no pigment; the structure of the integument on these ocular convexities displayed no recognisable differences from the integument elsewhere.

The largest of the two individuals measures 10 mm. in length, and appears to be a male; the smaller specimen is of the same sex.

The margin of the head is excavated by a semicircular notch dorsally and anteriorly; the lateral margins are straight.

The first four thoracic segments are subequal in length; each is ridged posteriorly, the ridge as usual widening out laterally to occupy the whole of the segment; in the fourth thoracic segment the ridge is higher dorsally than in the three anterior segments. This ridge in all the segments is closely beset with fine granulations. Anteriorly, between the posterior ridge and the anterior margin of the segment, is a short ridge likewise covered with numerous granulations; the first thoracic segment has two of these ridges.

Of the three posterior thoracic segments the first is the longest; on each is a ridge-like elevation closely beset with granulations. The abdominal segments and the caudal shield are similarly roughened by numerous tubercles, the caudal shield is somewhat oval in form, tapering to its posterior extremity, which is slightly bent upwards.

The proximal joints of the *antennæ* (Pl. XXV. fig. 8) and of all the *thoracic limbs* (Pl. XXII. figs. 7, 8) are furnished with numerous tubercles. The *uropoda* are covered with minute granulations, and close to the inner margin of each of these appendages is a row of sharp-pointed, backwardly-directed tubercles.

Station 169, July 10, 1874, off New Zealand; lat. 37° 34′ S., long. 179° 22′ E.; depth, 700 fathoms; bottom temperature, 40° F.; blue mud.

Arcturus studeri, F. E. Beddard (Pl. XXIII. figs. 1–4).

Arcturus studeri, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 111.

A number of specimens of a small *Arcturus*, from the shores of Kerguelen, form the type of a new species which I dedicate to Professor Studer, who has done so much to increase our knowledge of the fauna of Kerguelen.

It is characterised as follows:—

Extreme length 28 mm., length of antennæ 30 mm.

The head bears dorsally two pairs of long spines, the anterior pair being in advance of the posterior pair which are behind the eyes; there are also a few short spines borne on a ridge which occupies the posterior region of the head and is continuous with the convexities which are topped by the hinder pair of spines; the lateral margin of the head is not a straight line at right angles to the longitudinal axis, but the lower portion is cut away as in *Arcturus purpureus*, &c., and meets the upper portion at an obtuse angle.

The four anterior thoracic segments are subequal, and each has a posterior ridge bearing a number of longer and shorter spines. On the first segment the spines upon the posterior ridge are disposed as follows:—there are a pair of minute tubercles, one on either side of the median line corresponding in position to the spines upon the head; laterally are two long spines equidistant from each other and from the median tubercles; the lateral margin of the tergum is prolonged into two outwardly and downwardly-directed spinous processes, of which the anterior is the longer. In front of the posterior ridge, and about half way between it and the anterior margin of the segment, is a shorter ridge which bears four small blunt tubercles, the two inner ones corresponding exactly in position to the median tubercles of the posterior ridge. On each of the three succeeding segments the number and position of these tubercles is identical; on each of these segments the posterior ridge, like that of the first thoracic segment, has two long spines upon each side of the body; the third and fourth segments have in addition another spine upon each side placed behind and between the two lateral spines; these are also present in rudiment on the two anterior segments, and in fact increase progressively in size from before backwards.

The margin of the epimera is prolonged into three spines, which are extremely short and inconspicuous in the second thoracic segment; in the third segment the two posterior spines are of considerable length; in the fourth the middle one is very long, while the posterior spine is broadened out into a long plate bearing secondary spines along its posterior edge and almost meeting its fellow on the opposite side; these processes are closely pressed against the ovigerous lamellæ, and their function appears to be to support them.

Each of the three posterior thoracic segments has two or three long spines on either side; the epimera are large and terminate inferiorly in two stout spines inclined outwards and downwards, and at an acute angle with each other.

The two anterior abdominal segments each consist of two regions, a narrower anterior and a swollen posterior portion, the former is smooth, the latter beset with spines and tubercles; on the first segment are two particularly long spines, one situated close to the ventral margin of the tergum just in front of the anterior extremity of the uropoda, which abut against the hinder region of this segment; exactly above this is another spine of equal length; on the second abdominal segment is a long spine on either side, placed much more dorsally than in the anterior segment. The third abdominal segment is shorter than the other two, and is closely fused with the caudal shield; it is roughly

tuberculated dorsally and has a long spine on either side, somewhat curved backwards and projecting at right angles, which is placed on a line with the lateral margin of the caudal shield. Ventrally these segments are furnished with spines arranged in the following fashion: the last thoracic segment has a single median spine of considerable length; the first abdominal segment has anteriorly a pair of short spines closely approximated, and on either side of the median line; posteriorly and just in front of the uropoda, the anterior ends of which abut against this segment, are a row of spines, of which two, one on either side, are particularly long, and have been referred to above.

The caudal shield has a dorsal keel which is prolonged posteriorly into a longish curved spine; the whole of its dorsal surface is covered with numerous tubercles pointed at their extremity. The lateral margin of the caudal shield forms a flattened serrate ridge, which terminates posteriorly in a flattened triangular spine on either side.

The proximal joints of the *antennæ*, as well as of the thoracic limbs (figs. 3–4), are furnished with numerous slender short spines; there are a pair of such spines, one upon each antennule, on the first joint; they are particularly abundant on the basal joint of the anterior thoracic limbs; the three posterior pairs of thoracic appendages have one or two such spines.

The *uropoda* are beset with numerous small spiny tubercles, and each has a longish curved spine placed nearly vertically below the long spines on the posterior free abdominal segment.

Station 149B, January 17, 1874, off Royal Sound, Kerguelen; lat. 49° 28′ S., long. 70° 30′ E.; depth, 25 fathoms; volcanic mud.

Station 149H, January 29, 1874, off Cumberland Bay, Kerguelen; lat. 48° 45′ S., long. 69° 14′ E.; depth, 127 fathoms; volcanic mud.

Arcturus oculatus, F. E. Beddard (Pl. XXV. figs. 1–4).

Arcturus oculatus, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 112.

Five specimens of this small species were dredged in shallow water, off Melbourne, South Australia.

The largest measures no more than 6 mm. in length.

The most remarkable point about this species, and one which serves at a glance to distinguish it from any other recorded species of the genus, is the elevation of the eyes on stalks; these are, however, merely prolongations of the body-wall, and are not articulated with it by a joint as in the Decapoda. Nevertheless the approximation to the Decapoda in this respect is of some little interest, and is perfectly unique within the genus. In other respects the present species exhibits no marked divergences from other *Arcturi*, and I have not thought it necessary to separate it generically simply on account of the peculiarities in the peduncles of the eyes.

The frontal margin of the head is broad and truncated; it is not excavated by a semicircular notch as in so many other species.

The first four thoracic segments are subequal in length, they are convex posteriorly, and flatter anteriorly; their surface, as of the body generally, is quite smooth and free from tubercles or spines. In the case of the last three of these segments, the epimera are furnished on each side of the body with a long spine, which is directed outwards approximately at right angles to the longitudinal axis of the body.

The fifth, sixth and seventh segments of the thorax, like the four anterior, possess a long spine upon each epimeron; each of these segments has in addition a lateral spine on either side situated about half way between the dorsal median line and the ventral margin of the tergum, extending outwards from the side of the body in a direction more or less parallel to that of the epimeral spine.

Of the three free segments of the abdomen two are furnished with a long lateral spine, which is absent from the middle one of the three.

The caudal shield is very convex and terminates in the median dorsal line in a short curved spine, as in so many other species of this genus. The lateral margin of the caudal shield is beset with a series of somewhat curved spines which are situated at equidistant intervals from each other; they correspond in position to the spines upon the first and third of the abdominal segments; the lateral margin of the caudal shield terminates in a longish flattened spine on either side, as in *Arcturus anna*.

On either side of the dorsal median line, and close to it, is another row of spines which runs from end to end of the caudal shield.

The *antennules* (Pl. XXV. fig. 2) are of considerable length proportionately to the antennæ; each is made up of four joints which decrease progressively in length from the first to the third; the fourth joint, which bears the olfactory hairs, is about equal in length to the first.

The *antennæ* (fig. 3) have two extremely short basal joints, of which the second bears a longish spine on the dorsal side, close to its articulation with the succeeding joint; the third and fourth joints are of equal length, and four or five times as long as the basal joints taken together; each has a similar spine at its distal extremity; the fifth joint is both longer and narrower than the preceding joints, it has no terminal spine; the flagellum is extremely short, about one-third as long as the terminal joint; it is composed of two segments only, the distal being the longer.

Another characteristic of this species is the great length of the thoracic appendages; of the four anterior pairs the first are as usual shorter than the rest and subcheliform; the second pair has the two proximal joints moderately short and subequal; the first joint has a long spine similar to those upon the thorax placed near to its articulation with the body; the third joint is as long as the two basal joints taken together, its inner margin is fringed as in other species with numerous long hairs; the fourth joint is of entirely

similar size and structure; the fifth joint is more elongated and slender, but similar in other respects; the distal joint forms a long claw, which is no thicker than the hairs which fringe the margins of the preceding joints; it is slightly swollen at its base and then serrate.

The two following pairs of appendages are perfectly similar, save for the fact that the basal joint becomes progressively longer; it is armed with a stout spine as in the preceding limbs.

The three distal thoracic appendages are in every case longer than the anterior pairs. The elongation of the thoracic limbs and the stalked eyes give this species a certain superficial resemblance to *Munna*. These appendages agree with each other and differ from the anterior thoracic limbs in the great elongation of the proximal joint; in the first two pairs of these appendages the proximal joint has a stout spine about halfway along its length.

The second joint is very much shorter, the third a trifle longer, the two together nearly equalling in length the first joint; the fourth and fifth joints are about equal respectively to the second and third, they show at any rate the same proportions; the sixth joint is short and is armed with a single terminal claw; the fourth and fifth joints are armed along the inner margin with stout sharp spines.

The *uropoda* are fringed along the inner margins, where they come into contact with each other, with about four spines which are equidistant, but do not commence until the latter half of the appendage. I did not observe any trace in these appendages of the minute distal joints which occur in other species and represent the endopodite and exopodite of the limb.

Station 161, April 1, 1874, off entrance to Port Philip; lat. 38° 22′ 30″ S., long. 144° 36′ 30″ E.; depth, 33 fathoms; bottom, sand.

Arcturus americanus, n. sp. (Pl. XXIII. figs. 5–8).

A single *Arcturus* dredged to the east of the Strait of Magellan, and the only species of the genus obtained by the Challenger from this locality, appears to be the type of a new species.

It presents certain resemblances to *Arcturus coppingeri* of Miers,[1] from the same region, but unless this form, like *Arcturus baffini*, has two varieties, one with dorsal spines and one where they are absent, there can, to my mind, be no doubt as to their distinctness.

The length of the single specimen, a female, is 21 mm.

The body, as in *Arcturus coppingeri*, is everywhere very densely covered with tubercles, more so than in any other species described in the present Report. The tubercles are, however, not so even as in the former species, a double row along the back being prolonged into stout blunt spines.

[1] Account of the Geological Collection made during the survey of H.M.S. "Alert" in the Strait of Magellan and on the coast of Patagonia, Crustacea, *Proc. Zool. Soc. Lond.*, pt. i. p. 75.

The anterior dorsal margin of the head is excavated by a deep semicircular notch; the lateral margins of the head are straight. The eyes are large and, as is so usually the case in this genus, are triangular in form. The whole surface of the head is closely covered with tubercles, of which two on either side of the median line and rather behind the eyes are larger and more conspicuous than the rest.

The body is broadest at the third thoracic segment; the fourth segment is, however, the longest. Each of the first four thoracic segments is ridged posteriorly; laterally the ridge widens out and comes to occupy the whole of the segment. The lateral margins of the terga project outwards beyond the epimera into a blunt smooth process.

On either side of the dorsal median line the posterior ridge bears two longish blunt spines, which are shorter in the first and fourth segments than in the two middle ones, where they are subequal.

The anterior region of each of these segments is also ridged and tubercular.

The three posterior segments of the thorax are likewise beset with numerous tubercles, a pair of which, one on either side of the dorsal median line, are stouter than the rest but not nearly so marked as are the corresponding spines of the anterior thoracic segments.

The caudal shield is ovoid, and terminates in two moderately long spines which are directed rather outwards; the surface of the caudal shield is beset with numerous tubercles which appear to be rather longer than those which cover the rest of the body; they are pointed and directed backwards.

The *antennæ* have unfortunately lost the flagella; the length of the peduncle is 19 mm.; the last two joints are elongated and increase progressively in length. The basal joints are roughened and tubercular, and the same is the case with the *thoracic limbs* (figs. 7, 8) and *uropoda*.

Station 313, January 20, 1876; lat. 52° 20′ S., long. 67° 39′ W.; depth, 55 fathoms; bottom temperature, 47°·8 F.; sand.

Arcturus stebbingi, n. sp. (Pl. XXIV. figs. 1–4).

This species is only represented by a single individual, a mature female with brood cavity developed; it was dredged in shallow water, 30 fathoms, off Kerguelen. I take the opportunity of dedicating the present species to the Rev. T. R. R. Stebbing, who has paid special attention to this genus.

Arcturus stebbingi cannot be confounded with either *Arcturus furcatus* or *Arcturus studeri*; for in both of these species the body is decked with long and numerous spines; in the present species the body is extremely tubercular, but only a pair of tubercles, on the

head, reach to any length; the antennæ are also considerably shorter relatively than in either of the two other Kerguelen *Arcturi*.

The nearest affinities of this species are with Miers' *Arcturus coppingeri* and with *Arcturus americanus*, from both of which it differs in the absence of the posterior spines upon the caudal shield, in the presence of a pair of spines upon the head, in the shortness of the antennæ and in the very short truncated caudal shield.

The specimen measures about 13 mm. in length: the anterior region of the thorax is extremely broad, as is often the case in the females of this genus (for instance in *Arcturus spinosus*, see p. 89).

The head is extremely short, and the large and prominent eyes are not far removed from its anterior margin; on the dorsal surface, between the eyes, are a pair of stout spines directed upwards but diverging from each other; behind these again, and corresponding to them in position, are a pair of very short spiny tubercles.

The thoracic segments gradually increase in length up to the fourth; there is not, however, much difference in this respect between the third and fourth. In the first three segments the dorsal surface is ridged and covered with strong blunt tubercles, of which two, one on either side of the median line, are particularly marked, at any rate in the second and third segments; in these segments also a prominent process overhangs the articulation of the appendages. The fourth segment is much less strongly ridged than the preceding; it is divided by superficial transverse furrows into three areas of about equal dimensions, the anterior is smooth and the middle area sparsely tuberculate ventrally; between the two is a roughened tuberculate area which overhangs the articulation of the limbs; the posterior region of the segment corresponds to the ridge on the anterior segments. The posterior thoracic segments are ridged and covered with rounded tubercles which are smaller and not so pointed as those of the anterior segments. The abdominal segments and caudal shield are closely beset with similar tubercles; the caudal shield is remarkably short, being hardly longer than the three free abdominal segments; it ends in a blunt somewhat upturned extremity; dorsally and laterally are a pair of pointed short spines.

The *antennæ* measure 9 mm. in length; the two distal joints are elongated and subequal, and like the proximal joints beset with numerous hairs and spines; the flagellum is shorter than the distal joint of the peduncle and is only three-jointed, as in *Astacilla*.

The proximal joints of all the thoracic appendages are roughened and tubercular (figs. 3, 4).

Station 149E, off Kerguelen Islands, January 21, 1874. Off Cape Maclear; depth, 30 fathoms.

Astacilla, Fleming.[1]

Leac[h]ia, Johnston, Edin. Phil. Journ., vol. xiii. (1825) p. 219.
Astacilla, Fleming, Encycl. Brit., ed. 7, vol. vii. p. 502.
Arcturus, Guérin-Méneville, Iconogr. d. Règne anim., t. xxxi. fig. 2, 1829–44.

I have already (p. 85) stated the reasons which necessitate the separation of this genus from *Arcturus*.

Unlike *Arcturus*, *Astacilla* is almost exclusively an inhabitant of the shallow waters, only one species, indeed, *Astacilla granulata*, ranging into deep water. The genus appears to be almost world-wide; it is known from the European and American coasts, from the Cape, from Australia and New Zealand, and in the present Report I have a new species to describe from Kerguelen.

Astacilla marionensis, n. sp. (Pl. XXV. fig. 5).

A single specimen dredged in 100 fathoms, off Marion Island, is the sole representative of this species, which does not present any very salient characters.

Its length is 8 mm. exclusive of the antennæ.

The head is notched anteriorly in the middle line; laterally and below it is prolonged into a short triangular process; the upper surface is very convex between the eyes, the separation between the head and the first segment of the thorax, which is fused with it, is marked by a furrow; this segment and the two following are subequal; the second and third segments have a pair of dorsal tubercles, one close to the median dorsal line, the other about half way between this and the lateral margin of the segment, the more dorsal tubercles are distinctly larger than the lateral ones; the first segment of the thorax appears to have a smaller unpaired median tubercle; the fourth segment of the thorax is greatly elongated, equalling in length the head and first three segments; it has ten or twelve tubercles arranged in pairs on either side of the dorsal median line; the posterior extremity of the segment is marked by a prominent hump on the dorsal surface.

Of the three posterior segments of the thorax the first is rather the largest; the anterior part of each segment is flattened, the posterior part is raised into a prominent ridge which occupies laterally the whole of the segment. On the first segment are a pair of prominent tubercles on either side; the most anterior of these is directed forwards; the posterior tubercle is more dorsal in position and directed upwards; these tubercles appear in the two succeeding segments to be represented by only one in the lateral region, which is much smaller; the epimera of the fifth segment are very much deeper than in the succeeding segments. The first two segments of the abdomen are distinctly separate, the third practically fused with the caudal shield; the first segment is smooth, the second has a pair of tubercles, one above the other, on each side of the body. The caudal shield has the

[1] I have followed Harger (Marine Isopoda of New England, U.S. Commission of Fish and Fisheries Report for 1878, Washington, 1880, p. 363), in retaining the name *Astacilla*.

form characteristic of this genus, it terminates in an elongated obtusely-pointed upturned extremity; on either side above the middle of its extent is a very prominent hooked tubercle curved backwards; the rest of its surface is smooth and free from tubercles.

The *antennules* are as usual very short and reach to the end of the second joint of the antennæ; the proximal joint is broad and stout and has a strong lateral ridge.

The *antennæ* are as long as the head and six anterior thoracic segments. The first joint is extremely minute, the second much longer, the third nearly twice the length of the second; the fourth nearly twice the length of the third; the fifth joint is rather shorter than the fourth. The flagellum is short, and consists of three joints which decrease progressively in length, the first being much the longest. The antennæ appear to be without any hairs.

The four anterior thoracic appendages are all similar to each other, and increase progressively in length.

The three posterior pairs are more or less similar to each other, and differ principally from the anterior thoracic appendages in the shortness of the distal joints in the absence of hairs and in the termination of the limbs in two claws; the distal joints are roughened by the presence of numerous minute tubercles.

The *uropoda* are comparatively smooth.

Two individuals, of which the largest measures 10 mm., were dredged in shallow water off Kerguelen; these specimens are to be distinguished from the ones described above by their intensely dark colour, which is owing to the presence of numerous pigment granules. In other respects they agree so closely that I cannot see any reason for distinguishing them by a different specific name.

Marion Island, 100 fathoms.

Kerguelen, Betsy Cove, surface and shallow water.

Arcturides, Studer.

Arcturides, Studer, Sitzungsb. d. ges. naturf. Freunde, Berlin, April 1882, p. 57.

This genus was founded by Studer for a small Arcturid dredged in shallow water at Kerguelen, by the German exploring ship "Gazelle;" it appears to form an intermediate type between *Arcturus* and *Idothea;* its general aspect is that of the former genus, while the similarity of all the thoracic limbs is a characteristic of *Idothea*.

Arcturides cornutus, Studer.

Arcturus cornutus, Studer, *loc. cit.*

A number of specimens of this species were dredged in comparatively deep water, off Marion Island. Its vertical and horizontal range are therefore extended by the explorations of the Challenger.

Studer's description [1] of the species is so sufficient that I need not redescribe it.

Station 145A, December 27, 1873; lat. 46° 41′ S., long. 38° 10′ E.; depth, 310 fathoms; volcanic sand.

Family Apseudidæ.

Apseudes, Leach.

Apseudes, Leach, Edin. Encycl., vol. vii. (1812), p. 404.
Eupheus, Risso, Hist. d. Crust. d. Nice, 1816, p. 124.
Rhœa, Milne-Edwards, Ann. d. Sci. Nat., xiii. (1828), p. 292.

Of the genus *Apseudes* three distinct species were dredged during the voyage of the Challenger; one of these is apparently a new species and is described in detail below; a second species would seem to be identical with Studer's *Apseudes spectabilis;* both these species are from Kerguelen; the third species, from shallow water off Sydney in Australia, I identify with Haswell's *Apseudes australis.*

There are not a great number of species of this genus known, and the majority of these are from the European seas; a remarkable form is Chilton's *Apseudes timaruvia* from New Zealand;[2] this species differs from all others of the genus by the absence of an exopodite to the antennæ and by the similarity of the fossorial limbs to the succeeding thoracic appendages; it would be interesting to have a little more information respecting this species, which may well, as Mr. Chilton suggests, be the type of a distinct genus.

The new species from Kerguelen described in the present Report does not present any special features of interest.

This genus is, so far as is known, confined to shallow water; no representatives from deep water have been described.

Apseudes antarctica, F. E. Beddard (Pl. XV. figs. 1–3).

Apseudes antarctica, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 114.

Among the Isopoda obtained at the Island of Kerguelen by the German ship "Gazelle," and figured and described by Studer in his account of the collections, is a species of *Apseudes*, named by him *Apseudes spectabilis;* during the Challenger Expedition a single specimen of this species was also obtained at Christmas Harbour, Kerguelen, which agrees so closely with Studer's description and figures that I have not deemed it necessary to redescribe this species in the present Report.

At the same locality a number of specimens of a smaller species of *Apseudes* were

[1] The full description and figures are to be found in *Abhandl. d. k. Akad. d. Wiss. Berlin*, 1883, p. 15, pl. i. fig. 4.
[2] C. Chilton, Additions to the Isopodan fauna of New Zealand, *Trans. N. Z. Inst.*, vol. xv. (1882), p. 146.

dredged, which undoubtedly differ sufficiently from *Apseudes spectabilis* to constitute the type of a new species, which I propose to call *Apseudes antarctica*.

The largest specimen measures 4 mm. in length.

The cephalothorax is long and wide, nearly as long as the first four segments of the thorax taken together, it is prolonged into a sharp-pointed short rostrum, the eyes are well developed, the ocular lobes taper to a point anteriorly, the pointed extremity being slightly bent outwards; nearly half way along the cephalothorax, but nearer to the anterior than the posterior extremity, is a notch which marks the boundary line between the cephalic and thoracic regions.

The free thoracic segments increase in length but decrease in width up to the fourth; there is, however, less difference between the first three than between the third and fourth; the fourth and fifth segments are subequal in length and breadth; the sixth is rather shorter but not perceptibly narrower than the fifth. In the first free thoracic segments the epimera are prolonged into forwardly directed spiny processes; this is not the case with any of the following segments, where the epimera are small and with rounded margins; in this character *Apseudes antarctica* differs from *Apseudes spectabilis*, where all the epimera are furnished with a spine. In the fourth and fifth segments, which as already mentioned are longer than the preceding segments, there are two lateral projections on either side about equidistant from each other and from the epimera. These segments, it might be mentioned, are wider posteriorly than anteriorly; upon the terminal segment of the thorax one of the lateral spines is present on either side.

The abdomen is distinctly narrower than the thorax; its length is about equal to that of the last three segments of the thorax. The first five segments are subequal; they are furnished laterally with short epimera which terminate in a sharp spiny extremity; the length of these increases in the successive segments.

The caudal shield is a little longer than the free anterior abdominal segments; its shape is rather peculiar, and differs from that of *Apseudes spectabilis* in that it is constricted towards the middle of its extent; the uropoda are articulated to salient processes and the caudal shield terminates in an obtusely pointed extremity.

The *antennules* are a trifle longer than the cephalothorax; the first joint of the peduncle is stout and long, and slightly bent inwards; the second joint is rather more slender and very much shorter, only measuring one-third of the length of the basal joint; the two following joints decrease in length as well as in breadth; the outer flagellum is nearly twice the length of the inner, and is composed of eight joints of irregular size, becoming, however, narrower as they approach the distal extremity; the inner flagellum is composed of three slender elongated joints.

The *antennæ* (fig. 2) are not very much shorter than the antennules but considerably more slender; the first joint of the peduncle is short, the second longer; the exopodite

shows indications of being divided into three joints of which the two distal are very short; the third joint of the peduncle is extremely short, the fourth and fifth elongated and subequal. The flagellum is shorter than the peduncle and consists of six joints.

The *chelipedes* are very stout and strong; the first joint is the stoutest and longer than the two following joints; the third joint is as usual very inconspicuous, the fourth joint is as long as the basal joint of the limb but rather more slender, the chelæ are very powerful; the upper margin of the penultimate joint is furnished with a stout spine; distal to this is a prominent convex area beset with short tubercles from the side of each of which arises a short stiff hair; the distal region of the joint is short and pointed, and overlaps the corresponding extremity of the sixth joint.

The *fossorial limbs* are furnished with a slender short three-jointed exopodite, which is probably also represented in the chelipedes though I did not find it.

The first joint is stouter than the corresponding joint in the following appendages, and longer than any of the succeeding joints; the three following joints are comparatively short and subequal, together equalling in length the basal joint; the distal extremity of the last of these joints has a few stout spines; the penultimate joint of the limb is rather slender and much shorter than the preceding joint; it has four or five stout spines along the inner margin; the distal joint of the appendage is a long curved claw, one-third longer than the penultimate joint.

The remaining thoracic appendages (fig. 3) do not differ materially in structure, but they are in every case more slender than the fossorial limbs.

The abdominal appendages are all present and similar to those of other species.

The *uropoda* are as long as the whole abdomen together with the two last segments of the thorax; that is to say, when measured from the attachment of the appendage to the extremity of the endopodite. The basal joint is stout and extends a little way beyond the end of the caudal shield.

The exopodite consists of six joints, the distal ones being much more elongated than the proximal. The endopodite is of very great length and has twenty or twenty-one joints.

Station 149H, off Cumberland Bay, Kerguelen, January 29, 1874; lat. 48° 45′ S., long. 69° 14′ E.; depth, 127 fathoms; volcanic mud.

Typhlapseudes, F. E. Beddard.

Typhlapseudes, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 115.

Definition.—Body depressed, wider anteriorly, gradually narrowing towards the posterior extremity; head segment broad, about as long as the two following taken

together, produced in front into a short sharp rostrum ; ocular lobes minute, triangular, pointed ; eyes entirely absent. First free segment of the thorax with minute epimera prolonged anteriorly into a spine ; remaining thoracic segments with rounded epimera, extremely minute.

Abdominal segments narrower than thoracic, first five subequal, sixth greatly elongated, terminating in a short conical process.

First pair of antennæ with unequally sized flagella, the outer being the longer ; rudimentary exopodite of antennæ short, consisting of a single longish joint, setose at its extremity. Chelæ strong and stout, equally so in both sexes ; the second pair of thoracic appendages much stouter than the following, modified into fossorial limbs ; both these appendages without the rudimentary exopodite. Abdominal limbs well developed, the exopodite divided into ~~ten~~ two joints. Uropoda defective, but apparently elongated and multiarticular, like those of *Apseudes* and the other genera of the family.

Remarks.—This genus, on account of its biflagellate antennules and antennæ furnished with an exopodite, is evidently one of the family Apseudidæ, with which it also agrees in the modification of the second pair of thoracic limbs. It cannot, however, be assigned to any of the three genera which represent that family ; from *Apseudes* the present genus differs in having no exopodite to the first two pairs of thoracic appendages ; the absence of the rudimentary exopodite in the first two thoracic appendages allies *Typhlapseudes* to *Parapseudes*, from which it differs in that all the abdominal appendages are present, only the first four and the uropoda being developed in *Parapseudes*. The remaining genus *Sphyrapus* cannot be confounded with the present, differing as it does in having no rudimentary exopodite to the antennules, but in having an exopodite developed upon the first pair of thoracic limbs ; it agrees, however, with *Typhlapseudes* in having the exopodite of the abdominal limbs biarticulate. Other differences will be apparent from a perusal of the following description of *Typhlapseudes nereus*, the only species at present known.

Typhlapseudes nereus, F. E. Beddard (Pl. XV. fig. 4).

Typhlapseudes nereus, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 115.

This species is represented by a number of individuals dredged in the North Atlantic, from a depth of 450 fathoms.

The average length of the species is about 10 mm.

The body is flattened and depressed, smooth, without any covering of hairs even on the abdomen ; it is wider anteriorly and gradually narrows to the posterior extremity.

The head and the first segment of the thorax, which are of course fused together

and form a cephalic shield, is flattened in front, but convex laterally and behind. The frontal margin projects as a short sharp rostrum; behind the insertion of the antennary organs is a triangular ocular lobe pointed in front; it has no trace of any optic structures; behind this again is another shorter, triangular, pointed process; more posteriorly the lateral margins of the cephalic shield are convex outwards.

The free thoracic segments diminish gradually in breadth, but increase in length up to the fifth; the sixth is not only narrower but shorter than the fifth. They are all furnished with very minute epimera, those of the first segment are larger and project anteriorly in the form of a short spine. The lateral margins of all but the first two segments are furnished with a short spine very broad at its base, which is situated about half way between the articulation of the limbs and the anterior margin of the segment; in the sixth (and last) segment of the thorax this spine is almost obsolete. In the ventral surface of the thoracic segments is a median spine.

In the female the first four of the free thoracic segments have ovigerous lamellæ.

Of the abdominal segments the first pair are subequal, but diminish gradually in breadth; they are furnished with small epimera, terminating in a pointed extremity and directed backwards.

The terminal segment of the abdomen equals in length any four of the anterior abdominal segments; it is cylindrical in form, becoming gradually wider towards the extremity; it terminates in a truncated straight posterior margin, and in the middle line in a short oval prolongation.

The *antennules* are stouter as well as longer than the antennæ; they are about as long as the cephalothoracic shield and the first segment of the thorax taken together. The basal joint is long and stout, the second joint is very much shorter, the third and fourth shorter still; from the last joint of the peduncle arise the two flagella, of which the outer is longer as well as stouter than the inner; the outer flagellum is made up of ten joints, of which the first is very much the longest; it diminishes gradually in width towards the extremity; the inner flagellum has four or five narrow elongated joints.

The *antennæ* have a five-jointed peduncle and a flagellum about as long as the last two joints. The first joint of the peduncle is short, the second long, with a short, cylindrical, setose exopodite articulated at its extremity; the third joint is very short, the fourth and fifth long and subequal.

I have not a sufficient amount of material at my disposal to give an accurate account of the mouth appendages.

The *chelæ* are not remarkable in any way except for the absence of an exopodite; they appear to be perfectly similar in both sexes, and agree very closely with those of the genus *Sphyrapus* (female), &c. The first joint is very much stouter than any of the succeeding joints; the second is short and narrow and bears a spine on the inner

side just before its articulation with the next joint, which is extremely minute and might easily be overlooked; it is wedged in between the second and third joints, and is only apparent on the inner side of the limb. The fourth joint is longer and stouter and has a number of hairs along the inner margin. The two "fingers" cross at their extremity; they are serrate along the margins which come in contact.

The *fossorial limbs*, which form the second pair, are much longer and stouter than the succeeding abdominal limbs. The first joint is long and curved, the second is very minute, the third and fourth are subequal and rather less than one-half of the length of the basal joint; the first two joints have no spines, the third has a single strong spine on the inner margin, just before it articulates with the succeeding joint, and a tuft of hairs on the corresponding opposite side; the fourth joint has two strong spines on the inner and a single spine on the outer side, besides hairs and more slender spines; the fifth is shorter than either of the preceding, its inner margin is fringed with five stout spines, increasing in length towards the extremity of the joint, and two strong spines besides more slender ones on the outer side; the terminal joint of the limb is elongated and claw-like, toothed along the inner margin. These appendages like the preceding have no exopodite, and they do not differ in the two sexes to any appreciable extent.

The succeeding thoracic appendages are similar to each other and very much more slender than the preceding limbs; the proportionate length of the joints is, however, the same, the second being, as in the fossorial limbs, extremely minute. The spines with which the terminal joints of these limbs are ornamented are also more slender than those of the second pair of thoracic appendages.

The *abdominal appendages*, with the exception of the uropoda, are similar to each other; all the five pairs consist of an elongated basal joint and of two subequal, rather shorter setose rami; the exopodite is divided by a suture into two joints.

The *uropoda* are short and biramose, with an elongated basal joint and two rami, the outer is the shorter.

Station 23, off Sombrero Island, March 15, 1873; lat. 18° 24′ N., long. 63° 28′ W.; depth, 450 fathoms; Pteropod ooze.

Leiopus, F. E. Beddard.

Leiopus, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 116.

Body depressed and extremely narrow and elongated, wider anteriorly than posteriorly. Head prolonged in front into a long pointed rostrum; ocular lobes long, triangular, pointed, eyes absent. First free segment of thorax with epimera prolonged anteriorly into a spine, remaining segments with small epimera, which in the last

three are produced into a short spine. Abdominal segments comparatively elongated, first pair subequal; last segment very long and cylindrical, terminating in a rounded median projection. First pair of antennæ with unequally sized flagella, the outer much longer than the inner; second pair of antennæ with a rudimentary exopodite, setose; chelæ extremely slender, with a minute three-jointed exopodite; fossorial limb stout and strong, also with a rudimentary exopodite. Abdominal limbs well developed, with a two-jointed exopodite; uropoda long, with a multiarticulated endopodite and exopodite, the former considerably longer than the latter.

This genus is closely allied to the last, and is as it were an exaggerated likeness of it; the slenderness of the body is more marked in the present genus, the rostrum and the various spines which exist along the sides of the body in the last genus are here much more strongly marked.

The remarkable form of the chelæ and the presence of an exopodite on these and the following pairs of appendages serve, however, to distinguish *Leiopus* from *Typhlapseudes;* the latter character connects *Leiopus* more closely with *Apseudes*, but the extreme slenderness of the chelæ is peculiar to the genus.

As in *Typhlapseudes* there appears to be no great distinction in *Leiopus* between the males and females.

Leiopus leptodactylus, F. E. Beddard (Pl. XV. figs. 5–12; Pl. XII. fig. 1).

Leiopus leptodactylus, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 116.

This species is represented by a large number of individuals, dredged in the North Atlantic from a depth of 1000 fathoms.

The largest specimens attain a length of 13 mm.

The body is flattened, depressed, extremely elongated and narrow, it is wider anteriorly and gradually diminishes posteriorly.

The cephalothorax, comprising the head and the first segment of the thorax, is rather more than twice the length and about equal in breadth to the first free segment of the thorax. The head is prolonged in front into a long rostrum; laterally are the two ocular lobes which are large and conspicuous and pointed anteriorly; there is no trace of any eyes. Behind the ocular lobes are two longish spiny processes which represent the epimera of the first thoracic segment; they, as well as the ocular lobes and the rostrum are much more developed than in the last species. The dorsal surface of the head is convex anteriorly as well as posteriorly by reason of the paired postero-lateral convexities.

The first segment of the thorax is as wide as the head, the following segments decrease in width, the first of them suddenly, the rest more gradually; the length of these segments increases up to the fourth, the fifth being subequal in length to the fourth, and the sixth rather shorter.

The first free segment has well-developed epimera, prolonged anteriorly into a spine; the three last segments of the thorax have also epimera, which are prolonged into a short spine; in these segments, however, the spine is directed backwards instead of forwards as in the first segment; the intermediate segments have short epimera without any spines; upon all the free thoracic segments, with the exception of the first, are a pair of longish lateral spines, situated between the articulation of the limbs and the anterior margin of the segment. These have been also described as existing in some of the segments, at least, of *Typhlapseudes*, but in the present species they are present upon all and very much longer.

The length of the abdomen is rather less than one-half of the length of the entire body; the first five segments are subequal in length and do not appear to decrease in breadth, or, if they do so, it is imperceptibly; the postero-lateral regions are more prolonged outwards than in the last species, and the spines overlying the articulation of the limbs are better developed than in *Typhlapseudes*. The terminal segment of the abdomen is longer than the last three taken together; it is cylindrical in form, with straight lateral margins; it is somewhat widened out posteriorly.

On the ventral surface of all the thoracic and abdominal segments, with the exception of the last, is a median spine situated rather nearer to the anterior than to the posterior margin of the segment. I have already referred to the presence of a similar series of spines in *Typhlapseudes*, but in that genus they are almost confined to the thoracic segments, being extremely minute upon the abdomen.

The *antennules* are rather long, measuring about as much as the cephalothorax and first two free thoracic segments taken together.

The first joint of the peduncle is the longest and stoutest, it is slightly curved like an S; the three remaining joints of the peduncle decrease gradually in size; there are two flagella, of which the inner is very much shorter, as well as more slender than the outer flagellum; it consists of about six elongated joints. The outer flagellum is longer than the peduncle; it is made up of very numerous joints—I counted twenty-seven in one specimen—which are longer but more slender distally.

The *antennæ* (Pl. XV. fig. 6) are hardly so long as the first joint of the peduncle of the antennules. The peduncle is about equal in length to the flagellum; the first joint is short and stout and has a longish projection on the inner side; the second joint is much more slender but longer; on the outer side it is prolonged beyond the articulation of the succeeding joint, and on this prolongation is placed the movable exopodite, which is distinctly three-jointed, the basal joint being much longer than the two distal joints; the third joint of the peduncle is extremely short, the two following joints are long and subequal; the flagellum is composed of about four slender joints.

The *mandibles*.—One of these appendages is shown in fig. 1 of Pl. XII.; the extremity is divided into two slightly divergent processes which are of a dark brown colour, and

consist of several closely approximated conical tooth-like processes; just below this is a lobe which bears at its extremity a tuft of strong though rather slender spines which are in every case bifid at their extremity; the molar process projects downwards nearly at right angles with the rest of the appendage; it terminates in a blunt cutting edge which is finely grooved on one side.

The palp arises just above the point at which the molar process joins the body of the appendage; it is three-jointed, the middle joint being the longest; the terminal joint is crescentic in outline; from the straight lower margin are given off a series of hairs which are shorter towards the articulation of the joint; the hairs at the apex of the joint are very long; the second joint is fringed with a row of moderately long hairs for the distal one-third.

The *first pair of maxillæ* (Pl. XV. fig. 7) have, as appears to be invariably the case in the Isopoda, two well-developed masticatory lobes, of which the anterior is considerably the larger; the extremity of this is fringed with a row of stiff stout hairs, above which is a long, soft, spine-like process which may serve the function of a tasting organ; above this again and fringing the upper margin of the joint are a few short slender hairs; the lower lobe is oval in form, the distal margin being fringed with a few stiff hairs; the palp of this appendage is, as in other Apseudidæ, well developed and three-jointed; the proximal and distal joints are subequal and much longer than the very short median joint; three or four long, slender, simple hairs spring from the apex of the terminal joint.

The *second pair of maxillæ* (fig. 8) are faintly divided at their extremity into three lobes, of which the upper is again subdivided into two; this lobe lies on a different plane from the others; on the outer margin are two long hairs; the masticatory edge is furnished with similar but shorter hairs; the middle lobe is fringed with stout spines similar to those upon the masticatory edge of the mandible. The third and lowest lobe, which does not project nearly so far forwards as the others, is fringed with a dense array of stout, simple, straight spines, between which are a number of short slender hairs.

The *maxillipedes* (fig. 9) do not present any features of particular interest. The palp is long and four-jointed, the second joint being very considerably the largest. As in other Apseudidæ this appendage has an exopodite, which, however, I am not able to figure, as it was destroyed in teasing out the mouth appendages; its distal joint is oval and fringed with fine hairs; the second joint is stout but smooth. I presume that there is a third basal joint, but I am not able to describe it.

The *chelipedes* (fig. 10) are rather remarkable in form, and appear to be similar in both sexes; I could not, at any rate, detect any marked difference in the form of these organs in eight individuals, which probably include representatives of both sexes.

The chelipedes, and also the following pair of appendages, viz., the fossorial limbs, are furnished with a minute three-jointed setose exopodite. The hand of the chelipedes is extremely elongated and slender, and the other joints share in this slenderness, which gives these appendages a very unusual form, inasmuch as they are generally extremely

stout in the Apseudidæ, as well as in the Tanaidæ. The basal joint of the limb is rather the stoutest, and furnished on the outer side with a sharp spiny process placed at the commencement of the distal third of the joint; the second joint is extremely minute, the third about half the length of the basal joint, and articulated with the succeeding joint by a very oblique suture; the following joint is the longest of the whole limb, and is furnished along the inner margin with sparsely-set, long, slender hairs; the fingers of the hand are long and slender, and parallel to each other, both being curved downwards instead of crossing each other at the tip as is more usual.

The *fossorial limbs* (fig. 11) are stout and strong, very much more so than any of the succeeding appendages. The distal joint is the longest as well as the stoutest, and is curved in an S-shape; at the distal extremity on the inner side is a spiny process similar to that of the chelipedes, not an articulated spine like those which are developed along the distal joints of the limbs; close to the articulation of the joint with the body are two similar backwardly directed spiny outgrowths; in front of these arises the exopodite. The second joint of the limb is extremely small, though not so inconspicuous as in the chelipedes. The third joint is nearly as long as the first but more slender; at its distal extremity are a row of stout hairs; the two following joints are short, subequal and compressed; the inner margin of both is furnished with a row of eight or nine stout spines set in indentations of the margin of the joint; on the opposite side are a number of more slender spines similar to those upon the third joint. The distal joint of the limb is a stout curved spine. The five succeeding pairs of appendages are similar to each other, and are much more slender than the fossorial limbs. The first joint is the longest, it is curved in a somewhat S-shaped fashion, and is slightly but not markedly stouter than the succeeding joints; the second joint is extremely small, the three following joints are subequal, each rather more than one-third of the length of the basal joint; the inner margin of these joints is fringed with a row of slender spines; the distal joint of the limb is an elongated slender claw.

These appendages differ principally from the fossorial limb in the equality of the third, fourth and fifth joints, and in the length of the terminal claw; also, of course, in the slenderness and delicacy of the whole limb, as well as of the spines with which they are armed.

The *abdominal appendages* (fig. 12) are similar to those of the last species, the first five pairs are similar; the exopodite is rather narrower than the endopodite, and is distinctly two-jointed. The basal joint of the limb is longer as well as stouter than either of the rami.

The *uropoda* were incomplete in every specimen; enough was left, however, to show that they agree with those of the genus *Apseudes* in being extremely long and multi-articulate; the endopodite has many more joints than the exopodite.

Station 78, off the Azores, July 10, 1873; lat. 37° 26′ N., long. 25° 13′ W.; depth, 1000 fathoms; volcanic mud.

Family Tanaidæ.

Tanais, Milne-Edwards.

Tanais, Milne-Edwards, Résumé d. Ent., p. 182, 1829.
Anisocheirus, Westwood, Ann. d. Sci. Nat., t. xxvii., 1832.
Zeuxo, Templeton, Trans. Entom. Soc. Lond., vol. i. p. 203, 1836.
Crossurus, H. Rathke, Nova Acta Acad. Cæs. Leop.-Carol. Nat. Cur., vol. xx. p. 35, 1843.

Two different species were obtained by the Challenger that are referable to the genus *Tanais*, as redefined by Sars; one of these was noticed by the late Dr. v. Willemoes-Suhm for the peculiarity that the eggs are carried by the female in two sacs attached to the bases of the last thoracic limbs, much after the fashion of a Copepod; the ovigerous lamellæ of the anterior thoracic segments remain undeveloped. This particular species has been lately described by Dr. Studer and named *Tanais willemoesii*. A second species of the genus was dredged, also in shallow water, off Prince Edward Island.

Tanais willemoesii, Studer.

Tanais sp., Suhm, Proc. Roy. Soc. Lond., vol. xxiv. p. 590.
Tanais willemoesii, Studer, Isopoden gesammelt, etc., Abhandl. d. k. Akad. d. Wiss. Berlin, 1883, p. 24 (of Memoir).

A very large number of specimens of this species were dredged off Kerguelen Island in shallow water; as, however, the species has been recently carefully described by Studer, it is hardly worth while to recapitulate his description here. This is the species to which the late Dr. v. Willemoes-Suhm referred in his Preliminary Report in the following words :—

"A *Tanais* having a length of about 17 millims. is very common, and though not deviating by any means from the typical species of the genus, it has a peculiarity connected with its propagation; for the females, instead of having breeding-lamellæ, as the other species of the genus have, carry their eggs, like Copepods, in small cutaneous sacs attached to the genital opening at the base of the fifth pair of pereiopods. These sacs extend as the development goes on, and attain a diameter of 3–4 millims. Professor Wyville Thomson having discovered among the echinoderms of Kerguelen Land many forms which do not undergo any metamorphosis, but develop in pouches of their parents, this peculiarity in *Tanais* deserves to be noted, not exactly as comparable to those facts, but as an anomaly in the group to which the animal belongs."

Among the individuals collected by the Challenger there were a large number of females, some with fully developed egg-bags filled with eggs, and others in which these structures were still rudimentary; in no case, however, were there any observable traces of ovigerous lamellæ on any segments other than the fourth.

Station 149K, off Christmas Harbour, Kerguelen, January 29, 1874; lat. 48° 40′ S., long. 69° 6′ E.; depth, 45 fathoms; volcanic mud.

Tanais hirsutus, F. E. Beddard (Pl. XVI. fig. 9).

Tanais hirsutus, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 116.

This species is represented by a considerable number of specimens dredged off Prince Edward Island, in 50 to 150 fathoms.

The length of the largest specimen is about 9 mm.

The body is elongated, the anterior region is wide, the posterior thoracic segments narrower; the last thoracic segment and the first three abdominal segments are again wider, after which the body narrows towards the termination.

The head and first segment of the thorax form a quadrangularly shaped piece; the anterior margin is notched on either side of the short obtuse rostrum for the articulation of the antennæ; external to the articulation of the latter are the ocular lobes, which are somewhat projecting and rounded; eyes are present and well developed; the antero-lateral angle of the cephalothorax is formed by a rounded projection to the outside of the ocular lobes; behind this the lateral margins of the cephalothorax are almost straight, only slightly divergent, the posterior region of the head being wider posteriorly than anteriorly; the dorsal surface of the cephalothorax is convex and swollen. The two first free segments of the thorax are short and subequal, and about as wide as the cephalothorax; the third segment is narrower but longer, about as long as the first two taken together; the two following segments increase progressively in length; the first of these is about twice the length of the preceding segment, their diameter is a trifle less than that of the preceding segment The last thoracic segment is wider than the preceding but a little shorter; the first three segments of the abdomen are wider as well as longer than the following; they are subequal to each other in length and only a little shorter than the last segment of the thorax; the first abdominal segment is rather wider than the last segment of the thorax, the second wider still, the third shorter again; the two following segments are very short as well as narrow; the terminal segment of the body ends in a blunt rounded extremity.

The *first pair of antennæ* consist of three principal joints; the basal joint is the longest and stoutest, the second is shorter and more slender; the third joint is longer than the second but more slender; the palp is represented by two or three minute joints; the distal extremities of the joints of the peduncle are surrounded by a dense circle of fine hairs, plumose, and of great length.

The *second pair of antennæ* resemble the first almost entirely in structure but are rather shorter; the rudimentary flagellum appears to be absent; they are densely beset with fine hairs. The cutting edge of the *mandibles* is furnished with two teeth, the molar processes are strongly developed and stouter than the extremity of the mandible; the palp is absent.

The *chelæ* are stout and strong; the next three thoracic limbs are subsimilar, and

considerably more slender than the three posterior pairs, which are stout. This difference between the anterior and posterior thoracic appendages is extremely well marked.

As is usual in the genus *Tanais* the fourth and fifth appendages of the abdomen are aborted; the three first pairs are well developed; they consist of a triangular basal joint, and two rami which are broad and crescentic in form and fringed with numerous long hairs.

The *uropoda* are of unusual length; they are longer than the abdomen; each consists of about twelve joints, the basal joint being much the longest and stoutest; the distal joints gradually decrease in diameter but increase slightly in length.

This species appears to be a true *Tanais* by reason of the abortive fourth and fifth pairs of abdominal appendages; it differs, however, from the typical species in the specialization, as regards size, of the thoracic limbs, and in the great length of the uropoda; this last character is found in *Tanais willemoesii* though hardly to so marked a degree.

Off Prince Edward Island; depth, 50 to 150 fathoms.

Typhlotanais, G. O. Sars.

Typhlotanais, G. O. Sars, Revision, &c., Archiv f. Math. og Nat., vol. vii. p. 33.

This genus comes nearest to *Paratanais*, and is chiefly to be distinguished from it by the complete absence of eyes.

It contains a large number of species, most of which have been at present but briefly described. I am not, therefore, perfectly satisfied as to the distinctness of the two following species, which I describe as new with a certain reservation.

The occurrence of the genus at Kerguelen is interesting, as it has hitherto been only known from the North Sea and the Mediterranean. The depth at which *Typhlotanais brachyurus* (see p. 123) was dredged far exceeds the range of the genus as hitherto known.

Typhlotanais kerguelenensis, F. E. Beddard (Pl. XVI. figs. 1–3).

Typhlotanais kerguelenensis, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 117.

The individuals of this species measure up to 3 mm. in length.

The cephalothorax is short and wide; it is prolonged between the antennæ into a short pointed triangular process; on either side of the cephalothorax, external to the articulation of the antennules, the cephalothorax ends in an acutely pointed process, which is, however, not segmented off and shows no trace of any ocular structures.

The first segment of the thorax is rather shorter than the rest, which are subequal, diminishing slightly towards the posterior end of the body; the lateral margins of those

segments are nearly straight. The first segment of the thorax has a compressed, forwardly directed, curved spine which arises from the middle of the ventral surface of the segments; there is a trace of a similar process on the second segment, which is, however, merely a slight elevation and not a spiny process; the point at which the thoracic limbs articulate varies in the successive segments; in the first they arise from a point close to its anterior border; in the second they arise a little further back, and in the third at about the middle; the three posterior thoracic appendages arise close to the posterior boundary of their respective segments.

The abdomen is about as long as the two last segments of the thorax taken together.

The first five segments are short and subequal; the terminal segment is longer and ends in an obtusely pointed extremity.

The *antennules* (fig. 2) are about as long as the cephalothorax; they have the normal structure, the first joint being the longest and stoutest; the second joint is very short, the third longer.

The *antennæ* are shorter than the antennules as well as more slender; the two basal joints are short and subequal, the third joint is long and curved from above downwards; the flagellum consists of two, one, the distal joint, being very rudimentary.

The *chelipedes* are chiefly remarkable for the slenderness of the hand; one of these appendages is shown in fig. 3, where this peculiarity is rendered apparent.

Of the *ambulatory limbs* the first pair are rather longer than the two following pairs; the three anterior pairs of thoracic appendages differ from the three posterior pairs in being much more slender.

The *uropoda* are biramose; the basal joint is short and stout; the outer of the two rami is more slender than the inner, and consists of only one joint, which is furnished at the free extremity with a single long seta; the inner joint is stouter than the outer, and is distinctly biarticulate; the distal joint, which is shorter than the proximal, bears a tuft of hairs at its extremity. In another specimen both branches of the uropoda are distinctly biarticulate.

A single specimen of a species of *Typhlotanais* was dredged in the North Pacific from a depth of 2050 fathoms in company with the next species *Typhlotanais brachyurus*; the specimen was mounted on a slide in Canada balsam during the Expedition. I find it impossible to distinguish this individual from those dredged at Kerguelen by any very distinctly marked characters; at the same time the condition of the specimen does not enable me to speak with great certainty, which is all the more to be regretted, as the occurrence of the same species in very deep and in shallow water is a rare occurrence.

Station 246, Mid North Pacific, July 2, 1875; lat. 36° 10′ N., long. 178° 0′ E.; depth, 2050 fathoms; bottom temperature, 35°·1 F.; Globigerina ooze.

Station 149H, off Cumberland Bay, Kerguelen, January 29, 1874; lat. 48° 45′ S., long. 69° 14′ E.; depth, 127 fathoms; volcanic mud.

Typhlotanais brachyurus, F. E. Beddard (Pl. XVI. fig. 7).

Typhlotanais brachyurus, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 117.

From the same station which yielded *Bathytanais bathybrotes* (a species presently to be described) three specimens of a Tanaid were dredged, which evidently belong to a different species, by reason of the elongated body and the complete absence of eyes. This species appears in fact to belong to the genus *Typhlotanais*.

The length of the largest specimen is 8 mm.

The cephalothorax is hardly longer than the first free thoracic segments; it is produced between the eyes into a short pointed rostrum; the ocular lobes are entirely absent.

The segments of the thorax are greatly elongated and narrow; the first segment is one-third less than either of the two following, which are equal; the fourth segment is hardly shorter than the third; the fifth and sixth segments decrease regularly in length, the fifth being about as long as the first.

In a second specimen the proportional length of the several segments was as nearly as possible the same. The first pair of appendages are attached close to the anterior extremity of its segment; the second and third pairs move progressively a little further back, but the difference in position is very slight, and is only just recognisable; the third pair are attached near the middle of the segment as is the case with other species. The three posterior pairs of appendages are attached close to the posterior margin of their segment. There is no ventral spine on the first free segment.

The abdomen is short, not so long as the last two segments of the thorax taken together; the five anterior segments are subequal; the sixth is as long as the last three.

The *antennules* are rather shorter than the cephalothorax; in all the three specimens they present characters which are usually confined to the females in this and allied genera; that is to say, they consist of three joints, of which the basal is the stoutest; the second joint is considerably shorter than the third.

The *antennæ* are a little shorter and more slender, and likewise consist of three joints, of which the middle one is the longest.

The *chelipedes* are short and stout; the distal extremity of the penultimate joint is furnished with three or four blunt tubercles just before its termination in a sharp point which overlies the extremity of the sixth joint.

Of the remaining thoracic appendages the three anterior are more slender than the three posterior; in the latter the basal joint is extremely large and swollen.

All the abdominal appendages are present.

The *uropoda* are biramose, the exopodite being rather shorter than the endopodite; the latter is two-jointed; the exopodite consists only of a single joint.

Station 246, Mid North Pacific, July 2, 1875; lat. 36° 10′ N., long. 178° 0′ E.; depth, 2050 fathoms; bottom temperature, 35°·1 F.; Globigerina ooze.

Neotanais, F. E. Beddard.

Neotanais, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 117.

Definition.—Body elongated and narrow, everywhere of approximately the same diameter. Cephalothorax slightly projecting between the antennæ; ocular lobes present but extremely minute, oval, pointed anteriorly. First pair of antennæ (in the male) with a three-jointed peduncle and a flagellum of four joints. Second pair of antennæ more slender but of equal length, with a five-jointed peduncle and a short four-jointed flagellum. Mandibles with the usual structure, with a slender extremity and a stout molar process. Chelæ very stout, the distal section of the penultimate joint extremely broad with a toothed margin anteriorly terminating in the usual slender hooked extremity; last joint much more slender than the corresponding portion of the fifth joint. Succeeding thoracic appendages similar to each other, the first only somewhat more slender and shorter than the rest. Abdominal appendages all present. Uropoda extremely long, with an eight-jointed endopodite and a small two-jointed exopodite.

Remarks.—I have thought it necessary to institute a new genus for two small Tanaids, one dredged in the Atlantic off the coast of South America, in 1900 fathoms, the other also in the Atlantic but further to the north, and in 1252 fathoms. This genus comes nearest to *Heterotanais*, Sars, but differs in the great length of the endopodite of the uropoda and in the fact that the chelæ are fully developed and of the normal structure in the male; as in *Heterotanais* the exopodite of the uropoda is distinctly two-jointed, and this character distinguishes both genera from *Leptochelia*, Dana, as also do the form of the chelæ in the male. A well-marked characteristic of this genus is the specialisation of the thoracic appendages into an anterior and posterior series; in the three anterior thoracic appendages the distal joint is a simple, elongated, somewhat curved claw; in the posterior appendages this terminal joint is furnished at its extremity with a circlet of stout spines and a long, mesially placed, slender hair.

Neotanais americanus, F. E. Beddard (Pl. XVI. figs. 4–6).

Neotanais americanus, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 118.

The present species is the only representative of this new genus; the specific as well as the generic characters depend upon the examination of two male specimens, each of which measures about 6 mm. in length.

The body is depressed and elongated, everywhere of approximately the same diameter. It is smooth both dorsally and ventrally, with no hairs or spines.

The cephalothorax is pear-shaped, narrower anteriorly and wider posteriorly; it is about as long as the first two segments of the thorax taken together; the anterior margin

terminates in the middle line in a very short, blunt rostrum; on either side of the shallow excavations which lodge the basal joints of the antennules are the minute but separate ocular lobes; these are rounded, oval in front, the anterior end being pointed and prolonged; there was no trace of any ocular structures. The first free thoracic segment is shorter, rather more than half the length of the four succeeding segments, which are subequal; the last thoracic segment is shorter than the foregoing; each of these segments is rather narrower anteriorly where it articulates with the segment in front; the general shape of the segment is short, oblong, with rounded angles; this does not apply to the first or to the last free segment of the thorax, which are broader than they are long.

The five anterior segments of the abdomen are equal in length and in diameter, only the first one being a trifle longer than the rest.

The terminal segment of the abdomen is longer and wider than the rest; it has a pair of lateral projections with which the uropoda articulate; posteriorly it is rounded and a minute median triangular process projects from the extremity; on either side of this the posterior margin of the abdomen is slightly concave.

The *antennules* (fig. 5) are considerably stouter than the antennæ; the peduncle has three joints, of which the proximal one is much the longest and stoutest; it is furnished with a tuft (three or four) of slender spines on the outer side, near to its articulation with the second joint; the second joint is about one-fourth of the length of the first, and like it has a tuft of slender spines occupying a similar position to those of the basal joint, and one slender hair-like spine upon the opposite side; the third joint of the peduncle is stouter again, with one or two short slender spines upon the inner as well as the outer margin, just before its articulation with the flagellum; the latter consists of four joints, of which the first is very much the longest, as well as broader than the succeeding joints; each of the three distal joints is furnished with a single olfactory hair.

The *antennæ* (fig. 6) are considerably more slender and shorter than the antennules; the peduncle consists of five joints; the basal joint is short and oval, much stouter than any of the succeeding joints, which are of equal thickness; the second joint is moderately long, the third stouter, the fourth and fifth subequal to each other and to the second joint; the flagellum has four joints, which decrease gradually in diameter, the first being the widest; the first joint of the flagellum is also the longest, the two middle ones are shorter and subequal, the fourth shorter still, and provided at its extremity with a tuft of fine hairs.

As the only specimen was mounted on a slide in Canada balsam it is impossible to describe, in a detailed manner, the mouth appendages, which do not appear, so far as could be seen, to present any marked differences from those of other species.

The *chelæ* are short and very stout; the second joint is particularly stout as compared with the others; the third joint as usual is very small, a portion of the fourth coming to articulate directly with the second; in the fifth joint the palm is

straight for the first half, the margin being fringed with fine, closely-set denticles; the distal half is furnished with blunt tooth-like processes, and is bent downwards at an oblique angle; it terminates in a short pointed extremity which is bent upwards; towards the distal extremity are a few slender hairs scattered here and there; the finger gradually narrows towards its termination in a curved pointed extremity; the inner margin is provided with a number of low tooth-like processes, each terminating in a sharp point which is directed forwards.

The remaining thoracic limbs are more or less similar to each other; there is no difference in size between the anterior and posterior series, but a slight difference in structure; the proximal joint is very long, the second extremely short; the third is about half the length of the proximal joint, the fourth and fifth are rather shorter and subequal; the terminal joint of the limb has the form of a long slender spine; the inner margin of the penultimate joint has a row of stout spines, of which the distal one or two are serrate, on the opposite side of the joint are a number of more slender, hair-like spines; the antipenultimate joint has a similar structure, but the spines are not so strong; the distal joints are nearly smooth, having only a very few slender hairs developed at the point of articulation with the succeeding joints. The above description applies to the first three pairs of ambulatory limbs. The fourth, fifth, and sixth pairs of thoracic appendages differ slightly in their structure from the anterior pairs; this difference mainly concerns the terminal joint of the limb, which is considerably more elongated than in the anterior appendages; it terminates in a fringe of short spines and mesially in a long slender spine which is of about half the length of the joint.

On the abdomen all the appendages are present, but they present no special features of interest, with the exception of the uropoda, which have a typical structure.

The basal joint of the uropoda is very stout and long, and with it articulates the minute two-jointed exopodite, as well as the long slender endopodite which is made up of eight separate joints, all of which have tufts of hairs near to their articulation with the succeeding joints. Both the endopodite and the exopodite end in a tuft of slender hairs; the length of the uropoda is nearly equal to that of the abdomen.

Another example of this species was dredged in the North Atlantic from a depth of 1250 fathoms; it presents certain slight differences from the above described species; these differences have reference to the proportionate length of the thoracic segments; seeing, however, that the two specimens come from widely distant localities, it appears to be unnecessary to found a specific distinction between the two individuals, at least for the present. The present specimen is stouter and more robust than the last, but of equal length; the cephalothorax is nearly as long as the first three segments of the thorax taken together, the thoracic segments gradually increase in length up to the fourth; the fifth and sixth segments are subequal and about as long as the third.

The following table will illustrate the varying proportions in the length of the segments in the two individuals :—

	Cephalothorax.	Th. 1.	Th. 2.	Th. 3.	Th. 4.	Th. 5.	Th. 6.
Individual from Station 323, . .	34	10	20	20	21	21	14
Individual from Station 45, . .	45	12	16	19	23	19	19

Station 45, S.E. of New York, May 3, 1873 ; lat. 38° 34′ N., long, 72° 10′ W.; depth, 1240 fathoms ; bottom temperature, 37°·2 F.; blue mud.

Station 323, off the River Plate, February 28, 1876 ; lat. 35° 39′ S., long. 50° 47′ W.; depth, 1900 fathoms ; bottom temperature, 33°·1 F.; bottom, blue mud.

Leptognathia, G. O. Sars.

Leptognathia, G. O. Sars, Revision, &c., Archiv f. Math. og Nat., vol. vii. p. 40.

In his revision of this group of Isopods Professor Sars has included several new species, as well as certain other species described by Lilljeborg and others under the genera *Tanais*, *Paratanais* and *Leptochelia*, within a new genus which differs from any of the above named in the following particulars.

The eyes are absent. The mandibles are extremely feeble in structure, whence the name *Leptognathia*, and the antennæ are four-jointed in the female; in the latter character *Leptognathia* approaches *Cryptocope*, *Haplocope*, *Strongylura* and *Anarthrura;* it differs from any of these, however, in the fact that the abdominal appendages are present and well developed in the female ; in the above mentioned genera these appendages are either absent or very feebly developed in the female sex.

A single specimen, which I refer without hesitation to this genus, was obtained during the Challenger Expedition off the shores of Kerguelen, in comparatively shallow water (120 fathoms), thus extending the range of the genus (hitherto only known from the North Sea, Mediterranean, and Atlantic shores of America) into the Southern Hemisphere.

Leptognathia australis, n. sp. (Pl. XVI. fig. 8).

This species is probably new, but agrees very closely with *Leptognathia longiremis*, which has been recently fully described by Professor Sars in his account of the Crustaceans collected during the Norwegian North Sea Expedition (p. 78). As far as I can make out from a comparison of his description and figures with the single specimen

dredged by the Challenger, the main difference between the two species is in the greater elongation of the middle thoracic segments of *Leptognathia australis*, and in the absence of serrations on the distal joints of the chelipedes. These differences, as well as others which will be referred to in the course of the following description, seem to me to be sufficient to distinguish the species.

Leptognathia australis as already mentioned is represented in the Challenger collection by a single specimen, an ovigerous female; it measures about 4 mm. in extreme length.

The body is extremely narrow and elongated, the proportions between the cephalothorax, thorax, and abdomen are as follows:—Cephalothorax 6, thorax 19, abdomen 8; the proportions of *Leptognathia longiremis*, measured from Sars's figure (pl. vii. fig. 18), are 5, 16, 8; it is evident, therefore, that in *Leptognathia australis* the thoracic region comprising the free thoracic segments is proportionately longer than in the other species.

The cephalothorax is longer than the first free segment of the thorax, but not as long as the first two segments taken together; as the single specimen was mounted on a slide so as to be seen from the side, I am unable to describe the shape of the cephalothorax; eyes are, however, completely absent.

The first segment of the thorax is shorter than any of the following three, which are subequal and about half again as long as the first segment; the fifth segment is shorter than the fourth, but a little longer than the first; the last segment of the thorax is shorter than any of the others, with the exception of the first, which it equals in length. The thoracic segments are separated from each other by well-marked constrictions.

The point of insertion of the ambulatory appendages appears to be characteristic in many Tanaids; in the present species the first pair are articulated close to the anterior extremity of their segment; the second, third, and fourth pairs at about the middle of their respective segments; the two last pairs are articulated a very little nearer to the posterior margin of their segments, the last a little more than the first, but still roughly in the middle of the segment, not definitely at its posterior extremity as in *Typhlotanais kerguelenensis*. The ovigerous lamellæ are developed along the thorax as in other species.

The *abdomen* is altogether about as long as the two last segments of the thorax and one-half the fourth segment; the terminal segment is rather longer than the two preceding, and ends in an obtuse rounded extremity.

The *antennules* are not so long as the cephalo-thoracic shield, they are four-jointed, the joints decreasing progressively in width as well as in length.

The *antennæ* are of about the same length as the antennules; this structure is entirely similar to that of the same appendage in *Paratanais*.

The *chelipedes* are stout and robust in structure; the first joint is the longest, with

the exception of the fourth, which is subequal to it; the second joint is extremely short, the fingers of the hand are stout and not greatly elongated, their extremities cross.

The *ambulatory limbs* appeared to me to fall into two distinct series as in *Paratanais*, the anterior three pairs being more slender than the posterior; also the posterior appendages are rather more spiny than the anterior, as is stated by Sars to be the case in *Leptognathia* generally.

The *abdominal appendages* are quite normal in structure and are all fully developed.

The *uropoda* are about twice the length of the terminal segment of the abdomen; they are biramose, both rami being biarticulate; the outer branch is two-jointed but very slender, not being longer than the basal joint of the limb, its extremity is furnished with a single long hair; the inner branch is quite three times as long as the outer, as well as being considerably thicker, the proximal joint is rather stouter as well as longer than the distal.

Station 149H, off Cumberland Bay, Kerguelen, January 29, 1874; lat. 48° 45′ S., long. 69° 14′ E.; depth, 127 fathoms; volcanic mud.

Paratanais, Dana.

Paratanais, Dana, U.S. Expl. Exped., Crust., vol. ii. p. 779.

This genus differs from *Tanais* in the following particulars: (1) in the antennules which differ in the two sexes, being better developed in the males than in the females; (2) in the greater size of the three posterior thoracic appendages as compared with the three anterior; (3) in the full development of all the abdominal limbs; (4) in the short biramose uropoda, each ramus being two-jointed.

In his Revision of the Tanaids[1] Sars only allows two species, one of which (*Paratanais forcipatus*, Spence Bate and Westwood) is a European form, while *Paratanais elongatus*, Dana, is a native of the Sooloo Islands.

During the voyage of the Challenger a considerable number of small Tanaids which appear to me to belong to this genus, were dredged at Kerguelen, in shallow water. They agree with it in every particular except in the extremely marked sexual dimorphism; not merely are the antennæ different in the two sexes but the chelæ are extraordinarily divergent in structure. This great discrepancy makes me hesitate before including all the individuals in the same species; the reasons, however, which appear to me to necessitate this step are, firstly, that the chelæ do frequently exhibit sexual differences in this as well as in other genera; and, secondly, that all the individuals with peculiarly modified chelæ are, judging from the antennules, males, while those specimens with chelæ of the normal form are invariably females. I believe, therefore, that I am right in simply regarding this species as exhibiting in a very marked degree a dimorphism in the form of the chelæ.

[1] *Archiv f. Math. og Nat.*, Bd. vii. (1882), p. 32.

Paratanais dimorphus, F. E. Beddard (Pl. XVII. figs. 1–8).

Paratanais dimorphus, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 119.

A very large number of a small species of Tanaid were dredged off Christmas Harbour, Kerguelen, which appear to me to belong to the genus *Paratanais*. Some of these individuals presented the ordinary characters of the genus, but others were found to differ in the elongation of the cephalothorax, and in the peculiar structure of the chelipedes, which will be described more minutely immediately; these latter specimens, however, judging from the greater development of the antennules, are males, while the specimens with normal chelipedes appear to be as invariably females. For this reason, and because the two series of individuals were of about the same size, and were obtained at exactly the same locality, I am inclined to suppose that they are merely the males and females of the same species, which is thus characterised by a marked sexual dimorphism. I am bound to state, however, that the only mark of sex which was discoverable in these specimens is the varying structure of the antennules;[1] but this is perhaps sufficient in the absence of other data to determine the sex with certainty; and if these individuals are not respectively the males and females of the same species, it is at least a very remarkable coincidence, that of one species only males should have been obtained, and of the other only females.

Description of the Female.—The female (fig. 2) presents no very remarkable characters, and it would indeed be hard to define the species, if it were not for the male which is so extraordinarily different.

The female specimens measure about 3 mm. in length.

The cephalothorax projects very slightly between the bases of the antennules, the eyes are large and oval, and have the normal position and structure; the length of the cephalothorax is greater than that of the three following free segments of the thorax.

The first free segment of the thorax is very short, the second about half as long again; the third and fourth continue to increase progressively in length; the fifth segment is very slightly longer, and the sixth decidedly shorter than the fourth.

The abdomen is rather longer than the last two segments of the thorax, the segments of which it is made up are equal, with the exception of the terminal segment, which is longer than the rest.

The *antennules* are shorter than the cephalothorax; the first joint is the longest, the second and third are very much shorter and subequal, the terminal joint being if anything shorter than the preceding.

The *antennæ* are a trifle shorter than the antennules, and are five-jointed, the three

[1] In several, but not in all, instances ovigerous lamellæ were present in the specimens which, on account of the antennæ, would be regarded as females. Similarly, in certain of the supposed males, I could plainly see the paired genital apertures on the last segment of the thorax.

basal joints are short and subequal; the fourth joint is much longer, rather longer than any two of the preceding, and curved; the distal joint is short.

The *chelipedes* are stout and have the usual structure.

Of the *thoracic appendages* the three posterior differ from the three anterior in having the basal joint stout and swollen; the three anterior pairs of ambulatory limbs are slender.

All the *abdominal appendages* are present, and well developed.

The *uropoda* are biramose, each branch consisting of two joints; the outer branch is more slender than the inner.

Description of the Male.—The male specimens (fig. 1) are of about the same length as the female.

The cephalothorax is long and rather narrow, and is prolonged into a slight obtuse process at its anterior extremity. The cephalothorax equals in length the first three segments and half of the fourth segment. The eyes are large and oval.

The first free segment of the thorax is the shortest; the second segment is nearly twice the length of the first; the third is half again as long as the second, the fourth and fifth are subequal, and about half again as long as the third; the last segment of the thorax is shorter than the fourth and fifth, and about as long as the third; the lateral margins of the segments are rounded, and the transverse diameter is greatest in the middle and diminishes anteriorly and posteriorly, so that the segments are separated by a well-marked constriction, the first free segment is separated from the cephalothorax by a conspicuous notch, but it is not narrower anteriorly; the last thoracic segment is closely applied to the first abdominal segment, and is narrower anteriorly, but gradually increases in width posteriorly.

The abdomen equals in length the last two thoracic segments; the first five segments are subequal in length and diminish imperceptibly in width from before backwards; the terminal segment of the abdomen equals the two anterior in length; it terminates in a rounded extremity.

The *antennules* (fig. 5) are about equal in length to the cephalothorax; the basal joint is long and stout, and much longer than the rest of the appendage; the two following joints decrease progressively in length and in breadth; the two distal joints of the appendages are each somewhat longer than the third, but narrower.

The *antennæ* (fig. 5) are shorter and more slender than the antennules; the basal joint is very short, the two following are somewhat longer and subequal; the fourth joint is much the longest and is about equal to the two last taken together; the appendage terminates in two short slender joints which appear to represent the flagellum.

The *maxillipedes* are shown in fig. 6; each is furnished with a long four-jointed palp.

The most characteristic appendages of the male *Paratanais dimorphus* are, however, the *chelipedes*; they appear to be not unlike the chelipedes of the genus *Leptochelia* in general form, but are rather more massive; this species, however, cannot be classed in the

genus *Leptochelia* on account of the form of the uropoda; in *Leptochelia* the uropoda are biramose, but the outer branch is rudimentary and one-jointed, while the inner branch is multiarticulate; in the present species they are characteristically similar to those of *Paratanais*. The antennules of the male *Leptochelia* have a far larger flagellum (five to nine joints) than is to be found in this or other species of the genus *Paratanais*. In figs. 3, 4 of Pl. XVII. the chelipedes are shown in two different positions; the most remarkable feature about this appendage is the "hand," which is extremely large and of an unusual structure; the distal joint or "finger" is immensely elongated and reaches back as far as the second joint of the appendage when in a condition of rest; the fifth joint has as usual a long prolongation which forms the lower limb of the forceps; this region of the fifth joint is, however, not rigidly connected with the proximal portion, but is freely movable upon it by means of an articulation; when the limb is not being used for prehensile purposes this joint appears to take the position indicated in fig. 4; it lies back along the fourth joint, and is covered by it; the distal joint of the limb lies back parallel to this, so that the whole appendage comes to have a superficial similarity to the corresponding appendage in many other Isopods, such as, for example, *Serolis*. At the point of articulation with the proximal region of the fifth joint the distal portion is narrow, afterwards it is wide and uneven, and along the inner margin projects into two tooth-like processes of which the distal is the longer; the extremity of the joint is pointed and curved upwards.

The remaining *thoracic appendages* are like those of the female, and are specialized into two series; the three anterior pairs are more slender than the three posterior pairs.

All the *abdominal appendages* are present; the five anterior pairs (fig. 8) have the normal structure, consisting of a stouter basal joint and two flattened rami fringed with long hairs.

The *uropoda* (fig. 7) are longer than the terminal segment of the abdomen; they are biramose, each of the rami being distinctly two-jointed; the exopodite is, however, more slender than the endopodite. The structure of those appendages is therefore quite in accord with the systematic position assigned to the species.

Station 149H, off Cumberland Bay, Kerguelen, January 29, 1874; lat. 48° 45′ S., long. 69° 14′ E.; depth, 127 fathoms; volcanic mud.

Bathytanais, n. gen. ?

In my third preliminary notice on the Challenger Isopoda[1] I described a species from deep water in the North Pacific, under the name of *Paratanais bathybrotes*. Since then I have examined a large number of individuals from Port Jackson, which seem hardly to differ specifically. As there were a large number of individuals there were probably

[1] *Proc. Zool. Soc. Lond., loc. cit.*

males as well as females among them, though I am bound to say that I did not discover any decided evidence of a difference of sex, unless the elongation of the abdomen marks the males in this species as it does in the genus *Leptognathia*.[1] This being the case, the four-jointed antennules and antennæ in both sexes will perhaps be considered to constitute a generic character.

In no genus are these appendages four-jointed in both sexes, though frequently (*e.g.*, *Leptognathia*, *Cryptocope*) they are four-jointed in the female. Professor Sars, in his Revision of the Tanaids, mentions that in *Haplocope*, *Strongylura*, and *Anarthrura*, the antennules of the female are four-jointed, but he makes no statements respecting the males of these genera. This present genus, however, cannot be confounded with either of the three, since it possesses distinctly separate ocular lobes, which are wanting in the genera above referred to.

Bathytanais bathybrotes, F. E. Beddard (Pl. XVII. figs. 9–14).

Paratanais bathybrotes, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 119.

This species is represented by a single individual from the great depth of 2050 fathoms. Judging from the antennules it is a female, though there were no other marks of sex to decide the point conclusively. The specimen measures about 4 mm.

The general shape of the body is elongated and narrow as in other species of the genus. The surface of the body appears to be perfectly smooth.

The cephalothoracic shield is about as long as the first two segments of the thorax, it is narrower anteriorly than posteriorly, and projects as a wide, obtusely pointed, rostral process. The ocular lobes are present though small and pointed anteriorly, they contain an abundance of reddish-brown pigment, and the vitreous bodies of the eyes were also plainly visible through the integument. This is one of the few deep-sea species in which eyes are well developed.

The first free segment of the thorax is rather shorter than the rest, which are subequal.

The length of the abdomen is about one-fourth of the length of the entire body; the five proximal segments are short and subequal, the first alone being a trifle longer than the rest; the terminal segment of the abdomen is longer; it is rounded and bent down at the extremity.

The *antennules* (fig. 11) have a very characteristic form; the basal joint is as long as the rest of the appendage, and is extremely wide and flattened, much more so than in any other Tanaid known to me; the following joint is short and wide, the third joint of the peduncle is no longer but is narrower than the preceding; the flagellum consists of a single joint somewhat conical in form, the narrow end being the distal. At the extremity

[1] G. O. Sars, Revision af Gruppen Isopoda, Chelifera, &c., *loc. cit.*, p. 40.

of the flagellum is a tuft of exceedingly long slender hairs which are quite twice the length of the whole appendage; as in other Tanaids there appear to be no auditory hairs upon the last joint of the antennule, and perhaps this fact is in favour of regarding the last joint as belonging to the peduncle and not representing the flagellum, which in that case would be absent.

The *antennæ* (fig. 12) are rather shorter than the antennules, but like them appear to consist of only four joints, five being the usual number found in this appendage in other Tanaids. The first joint is wide and flattened, and is prolonged on the inferior surface for some way beyond the articulation of the second joint, in fact, as far as its distal extremity; the second joint is altogether smaller than the first joint but has the same general form; it is widened and flattened and projects on the ventral side for a short distance beyond the third joint; the latter is of about the same length as the preceding joint, but narrow and cylindrical; the distal joint of the appendage is short and narrows towards its termination.

A large number (fourteen) of individuals dredged in 2 to 10 fathoms, in Port Jackson, appear to me to be hardly distinguishable from this species, which thus is an example of the very unusual occurrence of a species which is common to very shallow water and to the great abysses; such instances in the Isopoda are so extremely rare that I am inclined to doubt whether there has not been some mistake made with reference to the specimen alleged to be from Station 246, 2050 fathoms; at any rate, for the present, it appears necessary to regard the fact of its occurrence in very deep water with a certain reserve.[1]

Among the specimens dredged in shallow water at Sydney there are two series of individuals which I imagine to be males and females respectively; in certain individuals the abdomen is distinctly longer than in others, and as this sexual difference occurs in *Leptognathia* it is probably a mark of sexual distinction in the present species; it is the only one, at any rate, that I could detect. There is absolutely no difference in the structure of the antennules; they are perfectly similar in all the fourteen individuals.

Station 246, Mid North Pacific, July 2, 1875; lat. 36° 10′ N., long. 178° 0′ E.; depth, 2050 fathoms; bottom temperature, 35°·1 F.; Globigerina ooze.

Port Jackson, 2 to 10 fathoms.

[1] It must be remembered, however, that a species of *Typhlotanais*, labelled on a slide during the Expedition from Station 246, is apparently identical with *Typhlotanais kerguelenensis;* hence there is some independent evidence from analogy, in favour of supposing that no mistake has been made with respect to the occurrence of *Bathytanais bathybrotes* in deep water as well as shallow.

Family Anceidæ.

Anceus,[1] Risso.

Gnathia, Leach, Edin. Ency., vol. vii.
Anceus, Risso, Crust. d. Nice, p. 51, 1816.
Praniza, Leach, MSS.

Anceus bathybius, F. E. Beddard (Pl. XVIII. fig. 1–7).

Anceus bathybius, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 119.

Only a single representative of this genus, was dredged in deep water, and it consists merely of a single fragment comprising the head and the thorax; the abdomen has entirely disappeared.

The specimen is a male, and measures about 10 mm. in length.

The head is squarish in outline and terminates anteriorly in a long obtusely pointed rostrum, which has a tuft of hairs at its free extremity; the dorsal surface of the head is traversed by several shallow furrows. Eyes are completely absent. The first three of the free thoracic segments are much shorter than the two following, but of about equal width; the first segment is shorter than the two next, which are subequal; the fourth is about equal in length to the second and third taken together; the fifth is rather longer again. The surface of the body is smooth and unmarked with spines or tubercles.

The *antennules* are about as long as the rostrum; they consist of three basal joints and a flagellum of five joints; the two proximal joints of the peduncle are short, the distal joint is about equal in length to the two basal joints taken together. In the flagellum the first joint is extremely minute, the second rather long, the three following joints progressively decrease in length, the terminal joint being again extremely minute.

The *antennæ* are longer than the antennules; the peduncle is four-jointed; the first joint is moderately long, the second shorter; the third and fourth joints are of considerable length, the fourth being the longest; the flagellum is short, about equal in length to the last joint of the peduncle; it consists of about six short slender joints.

The *mandibles* have the usual structure characteristic of the males of this genus; in the present specimen they were extended forwards parallel with the longitudinal axis of the body, and reached to a point rather beyond the end of the rostrum; these appendages are shown in fig. 1, 2, each is somewhat bent and terminates in a blunt tooth; from the inner side nearly halfway down is another tooth-like projection.

[1] There seems to be some difference of opinion as to the correct name to be applied to this genus; I have here followed Westwood and Spence Bate. I imagine that, strictly speaking, a new name ought to be employed, since *Gnathia* and *Anceus* were applied to the male only and *Praniza* to the female. I am unwilling, however, to create a new generic term for so well-known an animal.

The *maxillæ* appear to be unrepresented.

The *maxillipedes* (fig. 3) are like those of other species; the outer margin of the four joints of the exopodite are fringed with long branched hairs, the inner margin of the same joints are delicately pilose, as also the broad basal joint of the appendage and the endopodite; the latter terminates in a subacute point; just before the extremity are a row of eight of the peculiar bodies that are found in this situation in most Isopoda; these are shown more highly magnified in fig. 4; the denticulate margins of the swollen dorsal extremities of these structures are particularly distinct and suggest that they serve to interlock the appendage with its fellow of the opposite side.

The *first pair of thoracic appendages*[1] (fig. 5), as in other species, are modified into an operculum, which extends to the extremity of the rostrum, and of course entirely covers the subjacent mouth appendages; each of these appendages, which are closely apposed in the middle line, consists of five joints; the two proximal joints are short and rounded; the third joint is the most important in the whole limb, the two distal joints are short (there is evidently a terminal joint missing). Both margins of this appendage are densely pilose; the outer margin of the third joint has a row of widely-separated, long, plumose hairs like those which fringe the maxillipedes; these were continued in one instance for a short distance on to the fourth joint; the upper and inner margins of the three terminal joints are fringed by two rows of entirely similar hairs.

Of the remaining thoracic limbs one of each of the four pairs were present; the two anterior pairs of limbs differ from the posterior in being very much more slender than the latter.

One of the anterior appendages is figured in Pl. XVIII. fig. 6. The proximal joint is the longest, the two next subequal in length and each of about one half the length of the proximal joint; the next joint is a little shorter as well as more slender; the fifth joint is longer and narrower, while the terminal joint is the shortest and armed with a claw at its extremity. The distal joints of the appendages are furnished along the inner margin with strong spines as well as with long slender hairs.

The third and fourth pairs of ambulatory limbs (fig. 7) are very much the same in structure, but the joints of which they are composed, that is to say, the three proximal joints, are much stouter and stronger than in the more anterior thoracic appendages; the distal joints are much more slender than the proximal joints, and are, in fact, very similar to those of the preceding appendages; the fourth joint is rather more swollen, and the

[1] On both of these appendages, or rather inside them, in the second and third joints along the inner margin were a number of round, granular, nucleated bodies, which I believe to be the eggs of a parasitic Nematode, as there was in each appendage a young worm, evidently a Nematode, curled up among the eggs. I think it worth while to record this fact, as it is a remarkable situation in which to find these parasites. Dr. v. Willemoes-Suhm has spoken of a species of *Gordius* which he found parasitic in a deep-sea shrimp curled up under the carapace (*Proc. Roy. Soc.*, vol. xxiv. p. 572), and I have myself called attention to a parasitic (?) Nematode which frequents the body of *Scrolis nexra* (Zool. Chall. Exp., part xxxiii. p. 60, note). The present is another instance of the occurrence of these parasites in deep-sea Crustacea.

limb thereby acquires a prehensile character, as the terminal joints are bent back upon the somewhat dilated fourth joint.

Station 76, July 3, 1873; lat. 38° 11′ N., long. 27° 9′ W.; depth, 900 fathoms; bottom temperature, 40° F.; Pteropod ooze.

Anceus gigas, F. E. Beddard (Pl. XVIII. figs. 8–10).

Anceus gigas, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 120.

This species is represented by half a dozen individuals, male and female, dredged at a depth of 127 fathoms off Cumberland Bay, Kerguelen.

It is remarkable for being quite the largest species of the genus at present known, the largest specimens measuring as much as 16 mm. in length; the females are hardly smaller than the males.

The head is rough and tubercular, especially laterally, where the surface is separated by transverse furrows into two folds; the anterior margin of the head is comparatively straight, only broken by three minute processes, one of which is in the middle; the eyes are well developed, and the antero-lateral margin of the head beyond the eyes projects forward.

The central region of the head is depressed.

Between the concave posterior border of the head and the first complete free thoracic segment a small crescentic segment is interpolated, which does not reach to the lateral margins of the body; this represents an anterior thoracic segment. The three first segments of the thorax increase gradually in length, the first being the shortest; the lateral regions of these segments are much roughened, the dorsal regions smooth; these segments are convex above in the middle line; the third segment is convex above posteriorly, and flattened anteriorly.

The two posterior segments of the thorax are as usual very much longer than those which precede them; the fourth segment is about as long as the second and third taken together, the fifth rather longer but narrower than the fourth. The dorsal surface of these is smooth and tumescent, being beset with scattered hairs. In both segments the region just overlying the articulation of the appendages which corresponds with the epimeron is, like the same part of the anterior segments, roughened.

Between the fifth free segment of the thorax and the abdomen there appears to be an intercalated segment which is similar in shape to the succeeding abdominal segments, but is without epimera or appendages; it has a distinct sternum.

The *abdomen* is narrow and short, as in all the other species of this genus; it measures in length rather more than the fifth segment of the thorax. The first five segments are equal in diameter, increasing slightly in length from before backwards; well-developed sickle-shaped epimera are present on all these segments, they are much bent down so as

to be almost invisible on a dorsal view; the epimera are articulated by a distinct suture with the terga, and for about one-third of their length pass outwards approximately in the same direction as the terga of the segments; the rest of the epimera is bent downwards quite at right angles to the proximal region; the upper (outer) margin is somewhat concave; the terminal segment of the abdomen is itself rather shorter than the foregoing, but has a greatly elongated telson spine, rounded at the extremity; it has no epimera, the terminal appendages or uropoda being articulated at its extreme lateral margin.

The *antennules* are short, with a four-jointed peduncle; the two proximal joints are short, the third very long, the fourth joint extremely small and rudimentary; the flagellum has four joints, and is not so long as the third joint of the peduncle.

The *antennæ* are nearly twice the length of the antennules; the peduncle is five-jointed, with three very short basal joints and two long distal joints; the flagellum is rather longer than the distal joint and has eight joints.

The *mandibles* terminate in a pointed extremity; the basal region is much broader and projects on the inner side where it is denticulate.

The *maxillæ* as in other species appear to be absent.

The *maxillipedes* resemble very closely the corresponding appendages of *Anceus bathybius*, but the endopodite is shorter in proportion and does not project far along the second joint of the palp.

The operculiform *first pair of thoracic appendages* (Pl. XVIII. fig. 10) again resemble very closely those of *Anceus bathybius*, but differ from those of other species, for instance those recently described by Sars from the Norwegian Expedition,[1] in having six well-developed joints.

The two basal joints are comparatively short, the third is greatly elongated, the fourth and fifth are very short and subequal, while the sixth joint is extremely minute. The inner margin of the second, third, and fourth joints is fringed with long plumose hairs, which are absent on the two last joints. The penultimate joint is almost covered with stout hairs on its inner half.

The remaining *thoracic appendages* are similar to each other; they are stout clawed limbs.

The penial process is double.

The abdominal appendages are not so purely respiratory as in *Anceus stygius*, that is to say, both endopodite and exopodite are fringed with long plumose hairs.

The *Praniza* form of this species (fig. 9) is represented by a number of individuals rather smaller than the males; two large specimens have the characters of mature females, the middle segments being tumid and swollen. A very considerable number of smaller immature specimens are also contained in the Challenger collection; these may be the larval forms of the present species, or they may belong to the next species, *Anceus tuberculosus*.

[1] *Loc. cit.*, p. 85.

The adult *Praniza* measures about 12 mm. in length; the colour is whitish, and the integuments are thin and translucent, besides being smooth and free from the sculpturing which ornaments the body of the male.

The head is triangular in outline owing to the projection of the mouth appendages, which converge to a point some way in front of the anterior margin of the head itself; the latter is straight and slightly in advance of the articulation of the antennæ. The eyes are large, oval, and occupy the sides of the head.

The first segment of the thorax is smaller than either of the two following, but it is not so rudimentary as in the male. The two following segments are subequal, with rounded lateral margins.

The three next segments are completely fused together and form a swollen area as in other species of this genus; the integument is thin and but little calcified, with the exception of an oval plate closely applied to the third segment, and three lateral hard pieces, to which are articulated the three pairs of appendages belonging to these segments.

The abdominal segments have their epimera compressed, and as it were tucked away under the body, as in the male.

The thoracic limbs are more slender than in the males.

Station 149H, off Cumberland Bay, Kerguelen, January 29, 1874; depth, 127 fathoms; volcanic mud.

Anceus tuberculosus, F. E. Beddard (Pl. X. figs. 8–12; Pl. XVIII. fig. 12).

Anceus tuberculosus, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 120.

A second species of *Anceus*, dredged at Kerguelen, cannot be confounded with *Anceus gigas*.

It is represented by two males and one female, the largest (male) specimen measures only 5 mm. in length. The two male specimens differ slightly from each other, more particularly in colour, but they are evidently referable to one and the same species.

The head is prolonged in the middle line into a short rostrum, which is squarish and truncated in form, with a slightly concave anterior extremity; for a short space on either side of the rostrum the anterior margin of the head is quite straight; it then slopes backwards and forms a jutting projection in front of the eyes; the dorsal surface of the head is very convex behind and flattened, sloping downwards and forwards in front; the posterior convexity is divided into two by a median furrow; the dorsal surface of the head, especially posteriorly, is covered by many large, roughened tubercles. The posterior margin of the head is concave.

The first free segment of the thorax, which is represented by a semicircular tergal plate following the head, is covered like it with a series of tubercles, which are, however, limited to the anterior convex region of the segment.

The remaining segments of the thorax increase in length up to the fifth; their width increases up to the third, and thence diminishes gradually though not to any marked extent.

The three anterior segments of the thorax, including the rudimentary first segment, are subequal in length as well as breadth to the head; the second has a row of tubercles across the median region, the third has a few similar tubercles; the other segments of the thorax as well as the abdomen are smooth and free from any tubercles although hairy in places. Just posterior to the articulation of the limbs in the third segment, that is to say along the postero-lateral margin of that segment, is a short conical spine; the antero-lateral margin of the succeeding segment has two such spines close together, the outer being the larger. Between the third and fourth segments is a considerable break, a deep lateral incision dividing them; the postero-lateral margin of the fourth has a stout mammilla-like process which answers to the postero-lateral spine of the third. The fourth segment is separated by a moderately deep incision from the fifth, which is closely applied to the sixth, the two together forming almost a continuous piece, though the line of suture is evident enough; the fifth segment is, as usual in this genus, divided by a median longitudinal furrow into right and left halves; the lateral margin of the fifth segment is divided by constrictions into three areas, of which the median overlies the articulation of the limbs; the sixth segment is divided by transverse constrictions into three projecting areas, beneath the posterior of which the limbs belonging to this segment arise; the postero-lateral margin of this segment, as of the fourth segment, is prolonged into a process. Between the sixth segment of the thorax and the first segment of the abdomen is intercalated a small segment of about the same length and width as any of the succeeding segments of the abdomen; it differs from them, however, in not being furnished with epimera; nor has it any trace of appendages; the rudimentary condition of this segment, which appears to be equally rudimentary in all species of the genus, is an embryonic character, inasmuch as this segment in other Isopoda is the last to appear (*cf.* description of young of *Eurycope novæ-zealandiæ*, p. 63).

The *abdomen* measures a little more than one-fourth of the entire length of the body; the segments of which it is composed gradually increase in length up to the fifth; they are furnished with well-developed sickle-shaped epimera quite separate from each other; those of the first abdominal segment are considerably smaller than of those which follow; the epimera stand out from the body and are not compressed as in *Anceus gigas;* the terminal segment of the abdomen has no epimera, and it terminates in a peculiarly notched extremity.

The *antennæ* (Pl. X. figs. 8, 9), resemble those of the preceding and other species of the genus in almost every particular; in both pairs of appendages, however, the flagellum appeared to be a joint shorter than in *Anceus gigas*.

The *mandibles* differed slightly in the two individuals; in one specimen they are much as is shown in fig. 10 of Pl. X.; in the other specimen (Pl. XVIII. fig. 12), the denticulations along the inner margin are absent, their place being taken by a single broad triangular process.

The *thoracic appendages*, those that form the ambulatory limbs, are subsimilar; one of these appendages (the sixth of the right side) is displayed in fig. 11 of Pl. X.; the proximal joint has a stout spine on the outer margin, the following joints have shorter but similar spines on the inner margin; there is some difference in the number, size, and position of these spines in the different pairs of appendages.

The *abdominal appendages* (Pl. X. fig. 12), are all similar to each other with the exception of the last pair; they consist of a stout, basal joint, into which are articulated a flattened, tongue-shaped endopodite and exopodite, the latter being the shorter; there appear to be no setæ present upon these appendages.

The *uropoda* differ from these appendages in being somewhat stouter and in having serrate margins fringed with long hairs; the endopodite reaches nearly to the end of the telson, the exopodite not so far; in one specimen the telson spine was rather shorter than in the other, and the uropoda therefore reached quite to its extremity.

Station 149H, off Cumberland Bay, Kerguelen, January 29, 1874; depth, 127 fathoms; bottom, volcanic mud.

Station 149C, Royal Sound, Kerguelen; depth, 30 fathoms, from dredge; bottom, volcanic mud.

Anceus latidens, F. E. Beddard (Pl. XVIII. fig. 11).

Anceus latidens, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 120.

A single male specimen of this small *Anceus* was dredged in 7 fathoms in Flinders Passage, North Australia.

The specimen measures 2·5 mm.; it is of a rich brown colour, darker in parts.

The head is squarish in outline, being about as broad as it is long; the posterior margin of the head forms two curves, meeting in the middle line, where there is a deep incision which is continued forwards for some way in the shape of a median furrow between the two lateral convexities of the head, which are evenly convex above; in front of the eyes is a short, somewhat outwardly directed, spiny process, which marks the antero-lateral boundary of the head. The anterior margin of the head is prolonged in the middle line into three short blunt protuberances, of which the middle one is the longest. The surface of the head is covered with numerous small rounded tubercles, which are entirely absent for a space around the posterior median furrow.

The first segment of the thorax is as usual extremely short, and does not extend any further laterally than the lateral margin of the head; the two following segments are

short and subequal, with rounded lateral margins; the dorsal surface of all these segments has numerous tubercles similar to those upon the head, which become rather less numerous, though they do not disappear, in the median line. The fourth thoracic segment is separated by a considerable interval from the third, the interspace being occupied by chitinous integument which is apparently not calcified; this segment is tuberculate like the others, but not quite to so great an extent; its anterior margin is slightly concave in the middle line, like the posterior margin of the head. The two following segments differ from the anterior segment of the thorax in being perfectly smooth dorsally; the first of these segments is divided into right and left halves by a median longitudinal furrow as in other species; the sixth segment projects on either side beyond the terminal border of the segment; between this segment and the first segment of the abdomen is an oval sclerite, which probably, as has been suggested by Dohrn,[1] represents the seventh thoracic segment. On the ventral side these posterior (fifth and sixth) segments of the thorax are as in other species uncalcified or incompletely calcified.

The first five segments of the abdomen are subequal; their lateral margins are furnished with sickle-shaped epimera, which are directed downwards, as in *Anceus gigas*, and not outwards, as for instance in *Anceus tuberculosus*. The terminal segment of the abdomen ends in a finely pointed extremity.

The *antennules* have the ordinary structure; the two basal joints are short and subequal; the third joint is as long as both together, but more slender, the fourth joint is very minute; the flagellum is four or five-jointed, and shorter than the peduncle.

The *antennæ* have a peduncle consisting of four joints; the first two are rather short and subequal, the third longer, and the fourth longer still; the distal joints have a few fine hairs along the outer margin; the flagellum is about as long as the last joint of the peduncle, and has six joints; it gradually tapers towards the extremity.

The *mandibles* have the form depicted in fig. 11; the inner margin is extremely prominent, and is bent with numerous crenulations. I am unable to describe the *maxillipedes* as they were entirely concealed by the first pair of legs.

The latter are very much like those of *Anceus stygius* described and figured by Sars, and indeed like the majority of species; they consist of a large basal joint, at the extremity of which is a small oval joint; at the distal extremity of this is a minute tubercle which represents the third joint; this description may be compared with that of the same appendages in *Anceus bathybius*. The remaining thoracic appendages are subsimilar. The basal joint is stout and fringed along the inner margin with rows of short spines, which are also found upon the more distal joints; the three following joints are moderately stout and gradually decrease in length; the distal joint is as long as the second joint but narrow, the short terminal joint bears a single claw; a few slender hairs are developed upon all the joints.

[1] Entwickelung und Organisation von Praniza (Anceus) maxillaris, *Zeitschr. f. wiss. Zool.*, Bd. xx., 1869.

The *abdominal appendages* have the usual form; both rami appear to be setose, the outer more so than the inner; the uropoda extend beyond the termination of the abdomen and are very setose.

Flinders Passage, North Australia; depth, 7 fathoms.

Family Anthuridæ.

Paranthura, Spence Bate.

I describe two species here, one of which, *Paranthura chiltoni*, would be referable to Harger's genus *Ptilanthura*,[1] since the antenna in the male has a many-jointed swollen flagellum with numerous hairs. The same is the case with specimens which I believe to be Stimpson's[2] *Anthura catenula;* in this species the palp of the antennules in the male is twelve to fourteen-jointed, in the female quite rudimentary, and three to four-jointed. A species described by Haswell[3] under the name of *Paranthura crassicornis* has the same peculiarity. The occurrence of this family in deep water is noted here for the first time. The description of the specimen from Kerguelen is, I am afraid, rather meagre, but the specimen being immature, it was difficult to select its distinctive specific characters. The description, however, will emphasize the occurrence of the genus in shallow water at Kerguelen, whence it was only known from an incidental notice by the late Dr. v. Willemoes-Suhm under the name of *Anthura*.

Paranthura chiltoni, n. sp.

I dedicate this species to Mr. Charles Chilton, who has done so much valuable work among the New Zealand Isopoda.

The single specimen measures 17 mm. in length.

The head is oval in contour, rather shorter than the first thoracic segment; it is prolonged into a rostrum between the antennules; laterally it extends beyond the insertion of these appendages; eyes are completely absent.

The segments of the thorax increase progressively in length up to the fourth, the fifth is about equal in length to the fourth, the sixth and seventh successively diminish in length. The first two segments are broader anteriorly than posteriorly; the middle segments are oval, being widest in the middle; these differences in form are owing to the shifting position of the thoracic appendages, the segments being widest where these are attached. The first three pairs of appendages are articulated close to the anterior margin of their segments, the fourth, fifth and sixth at the middle of the segment, the two posterior pairs being moved a little nearer to the posterior end; the appendages of the

[1] New England Isopoda, Rep. U.S. Fish. Com., Washington, 1880. [2] *Proc. Acad. Nat. Sci. Philad.*, vol. vii., 1885.

[3] On some new Australian Marine Isopoda, *Proc. Linn. Soc. N.S.W.*, vol. v. p. 478.

last segment are articulated close to its posterior boundary. The abdomen is rather more than one-fourth of the length of the thorax; the first segment is a little longer than any of the four following which are subequal; the terminal segment is of course longer, and ends in a flattened scale-like telson, which is rounded at its free extremity.

The *antennules* are furnished with a long flagellum, but it is difficult to indicate precisely the limits of flagellum and peduncle. The basal joint is stout, and the longest of the whole appendage; the second joint is much shorter, the third a little longer than this, and the fourth very short but of equal diameter; then follows the flagellum, the proximal joints of which do not differ from the distal joints of the peduncle; the first joint is the largest, the remaining nine decrease gradually in width, but increase slightly in length towards the extremity. The antennules are altogether longer than the head.

The *antennæ* are shorter than the foregoing appendages; the peduncle is five-jointed; the basal joint is very short, the second joint is the longest, and is excavated along its outer and inferior border, apparently to make room for the dilated proximal joint of the antennules; the following joints are short and stout, the distal joint being the longest and most slender; the flagellum is four-jointed and very slender, the proximal joint is the longest, the others progressively but very gradually diminish in length; the last joint is tipped with a bundle of fine hair-like setæ.

The first pair of *thoracic appendages* are chelate; the second and third pairs are also chelate, but more slender than the anterior pair, the remaining appendages similar to each other and without a dilated penultimate joint. First pair of abdominal appendages serrate along the inner margin and a part of the outer; remaining pairs with long plumose hairs. *Uropoda* of the characteristic form, overlapping the posterior abdominal segment and telson; the outer ramus is square and truncated at its extremity; the inner ramus is two-jointed, serrated, and furnished with a few short hairs along the inner margin.

Station 169, off New Zealand, July 10, 1874; lat. 37° 34′ S., long. 179° 22′ E.; depth, 700 fathoms; bottom temperature, 40° F.; blue mud.

Paranthura neglecta, n. sp.

This species is represented by a single specimen from Kerguelen; I imagine the specimen to be immature from the absence of a seventh thoracic segment.

The length of the specimen is 6 mm.

The head is furnished with a pair of lateral eyes, each containing eleven or twelve facets; the head is produced laterally beyond the insertion of the antennules; it is about equal in length to the following thoracic segments, which are themselves subequal.

The attachment of the thoracic appendages appears to be much the same as in the

last species; the anterior three pairs are attached close to the anterior border of their segments, the two middle pairs close to the middle, and the posterior pair at the posterior extremity of its segment.

The abdomen is one-fifth of the length of the thorax; the first segment is rather longer than the three following, which are subequal, the segment is about equal in length to the first.

The *antennules* are more slender and shorter than the antennæ, and are much shorter than the head; they are four-jointed, the basal joint being the longest and stoutest; the three distal joints are subequal in length but diminish progressively in width.

The *antennæ* are shorter than the head but considerably longer and stouter than the antennules. The basal joint is excavated in the same fashion as in *Paranthura chiltoni* in the stoutest and largest joint; the following joint is extremely short, the two following longer, the more distal being the longer of the two; the terminal joint of the appendage is short and narrow and bears a dense tuft of hairs at its free extremity.

The *thoracic appendages* are specialised in the usual way, as in the last described species for example.

Station 149H, off Cumberland Bay, January 29, 1874, Kerguelen; depth, 127 fathoms; volcanic mud.

Family Sphæromidæ.

There is perhaps no family of the Isopoda in which the makers of new species and genera have run riot to the extent that they have in the Sphæromidæ; and the explanation of this is that the sexual dimorphism of many species is so pronounced that the males and females have often been assigned to different genera. So very many species and genera have been described, and in many cases so imperfectly, that it becomes a matter of the greatest difficulty to discriminate between new species and those that have already received a name, if not an adequate description. The family is evidently in need of a revision; but since this would be beyond the scope of the present work, it is hoped that in criticising the following new species the difficulties attending the study of this section of the Isopoda will be borne in mind.

Gerstæcker in his account of the Isopoda, in vol. v. of Bronn's Klassen und Ordnungen des Thierreichs, has associated together many genera regarded by naturalists, or at least regarded by some naturalists, as distinct; he includes within the genus *Sphæroma*, *Zuzara*, *Cycloidura*, *Isocladus*, and refers *Dynamene* to *Cymodocea* and *Cilicæa* to *Nesæa*; with this alteration I thoroughly concur, but would further associate *Nesæa* and *Cilicæa* with *Cymodocea*; the chief distinction between the two former genera and the latter is in the form of the uropoda, and I shall have occasion to show, in the course of

the following pages, that in certain Sphæromids the males only are furnished with uropoda, in which the exopodite is long and curved, the endopodite being fixed, and rudimentary, while in the females both endopodite and exopodite are subequal; the genus *Cilicæa* is distinguished from *Nesæa*, or at least is supposed to be distinguished, by the long spine into which the median dorsal region of the anterior abdominal segments is prolonged. This, however, has been shown by Mr. Haswell to be, at least in one species,[1] a sexual character, the spine being entirely absent in the female; some species of *Cilicæa* have uropoda like those of *Cymodocea*, while in others the exopodite of the uropoda is alone fully developed. But a more striking argument, perhaps, as to the impossibility of making the form of the uropoda a basis of generic distinction, is to be derived from the study of a new deep-sea species described in the present Report (p. 150); of this species, which I have named *Cymodocea abyssorum*, there are two specimens, one a male and the other a female; they were obtained at the same Station, and agree so exactly in every detail of their structure, except in the form of the uropoda, that I cannot but regard them as belonging to the same species; in the male the uropoda are like those of the typical *Nesæa*, while in the female the two rami are equally developed, as in *Cymodocea*. M. Hesse[2] has also brought forward very strong arguments in favour of regarding many supposed generic distinctions as being merely sexual differences.

Mr. E. J. Miers, in his account of the Crustacea dredged by the "Alert," has referred to the probability that *Nesæa latreillei* is probably only the male of *Cymodocea*.

I am able to confirm this supposition by the examination of a series of this species in the Challenger collection. The specimens were obtained at Station 190, and consist of one fully developed male, several females, and one young male, in which the dorsal spine is just beginning to make its appearance, though the uropoda have equal rami like the female; in the fully developed male the fixed endopodite is rudimentary, while the exopodite is a long, stout, curved joint.

All the specimens were obtained at the same haul of the dredge, and are so alike in other respects that I cannot but regard them as belonging to one and the same species.

The genera *Isocladus* of Miers, and *Zuzara* of Milne-Edwards, have been distinguished from *Sphæroma* by the presence of a long spiny out-growth of the last segment of the thorax; I have lately received, through the kindness of Mr. G. M. Thomson, specimens of *Isocladus armatus* from New Zealand, in some of which this spine was present and in others absent. Mr. Thomson expressed to me in a letter his suspicions that this difference might in reality prove to be sexual, in which case there would be no necessity to remove the species from the genus *Sphæroma;* a careful examination of the specimens forwarded has convinced me that Mr. Thomson's suspicions are correct, and that it is only the male which has a dorsal spine, the female being a

[1] *Cilicæa hystrix*, *Proc. Linn. Soc. N.S.W.*, vol. vi. p. 185.

[2] *Ann. d. Sci. Nat.*, ser. 5, t. xvii.

typical *Sphæroma;* it must be remembered, however, that *Sphæroma* (*Isocladus*) differs from *Cilicæa* in that the dorsal spine is developed from the terminal segment of the thorax, while in *Cilicæa* it is an outgrowth of the abdomen; hence, there is no possibility of confounding these genera, although, on a superficial view, the similarity is great.

There are no reasons at present for supposing that *all* the species of the genera *Cymodocea* and *Sphæroma* exhibit this sexual dimorphism—in fact *Sphæroma gigas* certainly does not; but this is no reason for separating generically those forms with a well-marked sexual dimorphism from those without any great sexual differences, unless we have here a case of protective mimicry analogous to that exemplified in many Butterflies; for the present, therefore, it appears to me to be necessary to regard *Cymodocea*, *Nesæa* and *Cilicæa* as synonymous; I shall describe a new species under the generic title of *Cymodocea*.

The family Sphæromidæ is almost universally distributed, and is according to Gerstæcker more specially characteristic of the temperate regions, though found sparingly everywhere else. It is pre-eminently a shallow-water family, only one species, *Cymodocea abyssorum*, being found in the great depths of the ocean. It is interesting to note that in this species there are certain structural peculiarities analogous to those exhibited by *Bathynomus* and *Anuropus* (see p. 152), which may perhaps be the result of the habitat; the fourth and fifth pairs of abdominal limbs are in all Sphæromidæ modified into respiratory organs, the endopodite taking on this function more particularly, while the exopodite remains thin and membranous and serves as an operculum; in *Cymodocea abyssorum* both endopodite and exopodite are respiratory in structure, having the form of complicated folded plates. This fact, however, perhaps loses a good deal of its significance since exactly the same condition is met with in *Amphoroidea*, while *Anuropus* has no shallow-water allies in which there is a similar hypertrophy of the respiratory lamellæ. In *Amphoroidea typica* the fourth and fifth pairs of abdominal appendages are described and figured by Milne-Edwards as being exactly similar in structure to the one of *Cymodocea abyssorum*, and in *Amphoroidea falcifer*,[1] from New Zealand, I have myself observed precisely the same modification of their structure.

The eyes of *Cymodocea abyssorum* are white in colour, owing to a complete absence of pigment, a character frequently met with in deep-sea Isopoda.

Ceratocephalus, White, MS.

Ceratocephalus, White, MS., Woodward, Art. Crustacea, Encycl. Brit., ed. 9, p. 659.
Bregmocerella, Haswell, Proc. Linn. Soc. N.S.W., vol. ix. p. 1004.

This genus of Sphæromidæ has been described almost simultaneously by two different writers. Dr. Woodward, in his article Crustacea, published in the 9th edition of the

[1] A species kindly forwarded to me by Mr G. M. Thomson.

Encyclopædia Britannica, has written a short description, accompanied by figures, of a small Isopod from Flinders Island, Bass Strait, under the MS. name given by White.

There appears to be no doubt that *Bregmocerella*, a new genus lately instituted by Haswell, is identical with *Ceratocephalus*, and it is necessary, therefore, to cancel Haswell's name, as *Ceratocephalus* has evidently the priority. Both descriptions, which are very brief, refer only to the male. As the Challenger obtained a great number of specimens, including females, I have thought it worth while to give a more detailed description of this Sphæromid, which is to be distinguished from any of its allies by the long "horns" upon the head and the greatly elongated antennæ; in other respects *Ceratocephalus* does not depart far from the structure characteristic of the Sphæromidæ.

Ceratocephalus grayanus, White, MS.

Ceratocephalus grayanus, White, MS., Woodward, Art. Crustacea, Encycl. Brit., ed. 9, p. 659.
Bregmocerella tricornis, Haswell, Proc. Zool. Soc. N.S.W., vol. ix. p. 1004.

This species is represented by a large number of individuals from Port Jackson, and from localities further to the south, at Station 161. The individuals from Port Jackson are all of small size, the largest specimen measuring 17 mm., including the rostrum. Three specimens were dredged at Station 161, two of which measure as much as 28 mm. in length; apart from the larger size of the latter there is no difference between the individuals from the two Stations, at least no difference that would seem to necessitate their separation as distinct species.

This species exhibits a well-marked sexual dimorphism.

The males are distinguished from the females by the possession of three long horns, projecting from the anterior region of the body, of which there are only the faintest indications in the females. The antennules of the male are longer than in the female; other differences will be apparent from the following description of the two sexes.

Description of the Male.—The body is capable of being contracted into a ball as in the genus *Sphæroma*. The head is narrower than the first segment of the thorax and only a very little longer; the dorsal surface is much sculptured. Anteriorly the head is prolonged into a long spine, which is wide and triangular at the base and gradually narrows towards the extremity, becoming slightly thickened just at its extreme end; the spine does not project straight from the head but is curved upwards; it arises from the inferior surface of the head, its posterior extremity being excavated for the upper lip; on the dorsal surface of the head, just above the spine and lying between the antennary appendages, is a deep depression; from the margins of this two ridges, one on either side, pass to the eyes and form the anterior margin of the head; in front and to the inside of the eyes this ridge gives off a strong spine on either side, not more than half the length of the median spine; each of these spines is somewhat curved; the proximal half is

directed forwards and somewhat outwards, it then takes a sudden bend outwards and downwards.

The first segment of the thorax is longer but not wider than any of the succeeding; the dorsal surface is sculptured like the head, but there is an oval median area which is smooth or only faintly pitted; laterally the segment is widened and projects forward below the eyes, as well as backwards; this region of the segment, which corresponds to the epimera, is granulose and covered with hairs; the three following segments are short and subequal, they are smooth dorsally or covered with minute punctulations; the epimera are rounded at their free extremities, granulose and hairy; the fifth thoracic segment has the same structure as the preceding, but the epimera are longer and project a trifle further outwards from the sides of the body; the sixth segment is longer than the preceding, and the seventh slightly longer again; the epimera of the sixth segment are as large as those of the fifth, the epimera of the seventh segment are small, in both cases they resemble the anterior epimera in being granulose and hairy. All the abdominal segments are free, or at least only partially fused; the first segment is represented by a crescentic plate closely applied to the concave posterior border of the seventh segment of the thorax; it is not developed laterally; the second and third segments are fused in the middle line, but become free laterally and are prolonged into epimera; the conjoined segments are extremely short in the middle line but longer laterally; the fourth segment is the longest mesially, but its lateral regions are about equal to any of the preceding segments; the fifth segment is extremely short dorsally, and apparently becomes fused laterally with the preceding segment. The four anterior segments of the abdomen are smooth in the dorsal region, but covered with small rounded tubercles and hairs laterally, like the thoracic segments; the fifth segment is, however, granulose throughout.

The caudal shield is triangular in outline; it terminates posteriorly in a short, stout, pointed process; on the dorsal surface are two prominent lateral convexities; the whole of the dorsal surface of the caudal shield is covered with innumerable rounded tubercles, which become gradually larger towards the summit of the lateral convexities; the anterior region between the two convexities is almost smooth.

The *antennules* articulate with the head by a very broad basal joint, then follows a short and narrow joint; the third and last joint of the peduncle is elongated; the flagellum is nearly as long as the peduncle.

The *antennæ* are enormously elongated, reaching back to nearly the end of the body; they articulate with the head by a very short basal joint; the three remaining joints of the peduncle are long, increasing in length progressively; the flagellum is rather longer than the peduncle and consists of some twenty-eight stout joints.

The *mandibles* are stout, with a slender three-jointed palp.

The *first pair of maxillæ* consists of two lobes; the anterior is the stouter.

Description of the Female.—None of the female specimens at my disposal were so large as either of the two male specimens described above. The body is much smoother, and the sculpturing on the head and first segment of the thorax is entirely absent. In place of the long spines of the male are very faintly marked projections which occupy a similar position.

The segments of the thorax are similar to those of the male and are smooth dorsally, but granulated upon the epimera.

The segments of the abdomen are somewhat differently disposed; the first segment of the abdomen is similar to that of the male; the next three segments, however, form a single piece mesially, but are distinctly separated laterally. The caudal shield is exactly like that of the male.

The antennæ are not quite so long as in the male, but are otherwise similar.

The first abdominal appendage, as in other Isopoda, differs by the absence of the penial filament.

Station 161, off entrance to Port Philip, April 1, 1874; lat. 38° 22′ 30″ S., long. 144° 36′ 30″ E.; depth, 33 fathoms; bottom, sand.

Station 163B, off Port Jackson, June 3, 1874; lat. 33° 51′ 15″ S., long. 151° 22′ 15″ E; depth, 30 to 35 fathoms; bottom temperature, 63° F.; hard ground.

Cymodocea, Leach.

Cymodocea darwini, Cunningham.

Cymodocea darwini, Cunningham, Trans. Linn. Soc. Lond., vol. xxvii.

This species, first noticed by Cunningham, has been recently fully described by Studer from the same locality, viz,, the shores of Patagonia. During the Challenger Expedition several specimens were dredged off Kerguelen Island. This species, therefore, forms another instance of those which are common to Patagonia and Kerguelen.

Station 149H, off Cumberland Bay, Kerguelen, January 29, 1874; depth, 127 fathoms; volcanic mud.

Cymodocea abyssorum, F. E. Beddard (Pl. VII. figs. 6–12).

Cymodocea abyssorum, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 114.

This species is represented by two examples, dredged in 1070 fathoms, off New Guinea.

One of these specimens is a male and the other a female; the male is rather the larger of the two, measuring 14 mm. in length, while the female measures 11 mm.; besides this difference in size the two sexes are to be distinguished by the form of the

uropoda; in the female (fig. 7) the two rami are subequal; in the male (fig. 6) the fixed endopodite is rudimentary, and the exopodite is a long, curved, spine-like joint. It will be noticed that this difference of sex, and in the present specimen it undoubtedly is merely a difference of sex, represents what has been by many regarded as a generic distinction.

Both specimens are of a pale light-brown colour; the surface of the body is more or less tubercular; the general form of the body is characteristic of the genus, except in its extreme flatness; I have represented this in fig. 8, which is a lateral view of the Crustacean.

The head is rather short and is bounded in front by a prominent ridge, which projects in the middle line as a short rostrum; the eyes are rather small and rounded; they are, however, inconspicuous from their white colour.

The first segment of the thorax is larger than any of the following; the five following segments are subequal and are furnished laterally with curved epimera; the epimera of the fourth segment are larger, and those of the last of these segments are more distinctly hooked at their extremity than any of the foregoing. The sixth segment of the thorax is of equal antero-posterior diameter with the preceding segments, its epimera are, however, rudimentary and do not extend nearly so far laterally as the epimera of the foregoing and the following segments.

The abdomen consists of four free segments and a caudal shield; in the female I could not observe more than three free abdominal segments; the first and fourth segments of the abdomen in the female are very short and rudimentary, and have no lateral extension; the two middle segments are distinct from each other dorsally, laterally they are fused and project outwards in a large epimeron, which reaches as far as those of the thoracic segments, but instead of being like them, sickle-shaped with a curved anterior and straight posterior margin, they are square in outline and truncated at the extremity. The antero-lateral regions of the caudal shield are prolonged into epimera of a precisely similar form; the caudal shield is triangular in outline, and has two prominent, blunt, median tooth-like processes situated one behind the other. Inferiorly it is excavated for the reception of the abdominal appendages, the excavation being surrounded by a flattened rim.

The *antennules* are of about equal length with the antennæ but rather more slender; the peduncle has three joints and the joints increase progressively in length, they are smooth; the flagellum is many-jointed and about equal in length to the peduncle.

The *antennæ* have a three-jointed peduncle; the basal joint is long and stout, the second joint of equal diameter, but rather shorter; the third joint is much more slender and about equal in length to the second; the flagellum is multiarticulate and shorter than the peduncle.

The abdominal appendages of the first five pairs have been referred to above (p. 147);

the fourth and fifth are entirely respiratory, as in the genus *Amphoroidea*. This is the case with both sexes.

The *uropoda* in the male (fig. 12) consist of a short fixed endopodite and a long curved exopodite, which is very considerably longer than the caudal shield; in the female (fig. 11) the uropoda are of a different shape; the two rami are subequal; the outer movable ramus is narrower than the inner ramus, which is flattened out and pointed at its extremity.

Station 218, off New Guinea, March 1, 1875; lat. 2° 33′ S., long. 144° 4′ E.; depth, 1070 fathoms; bottom temperature 36°·4 F.; blue mud.

Family Cymothoidæ.

Anuropus, F. E. Beddard.

Anuropus, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i. p. 112.

Definition.—Body very convex, smooth, without any hairs or spines. Head small, without any trace of eyes. Thoracic segments subequal, furnished with well-developed epimera except on the first segment, where they are fused with the tergum. Abdomen narrower than thorax; abdominal segments short and subequal, sixth segment larger and rounded, flattened. Antennules very short, consisting of a basal joint and a swollen, elongated, curved, distal joint; antennæ slender and well developed, with a four-jointed peduncle and a flagellum of equal length. Thoracic appendages subsimilar, short and stout, with a powerful terminal claw. Abdominal appendages all similar, consisting of a short basal joint and two expanded foliaceous rami.

Remarks.—This genus is quite the most remarkable that was obtained during the voyage; it is represented only by a single individual from deep water (1070 fathoms) in the Western Pacific, off New Guinea. In its general form there is no marked discrepancy from other genera of Cymothoidæ, to which family the present species is evidently to be referred. The most remarkable divergence in structure, and one which is clearly correlated with its habitat, is the modification of the abdominal appendages of the last pair. One of the principal characteristics of the group Isopoda is the metamorphosis of one or more pairs of the abdominal appendages into respiratory organs; the number of pairs of limbs which are thus modified, and their form, is typical of different families. But in no one genus or family do all the abdominal limbs serve the function of respiratory organs; at least the terminal pair are modified into the rudimentary, styliform or flattened appendages, which latter form together with the extremity of the abdomen a powerful "caudal fin" the principal agent of progression. The present genus, therefore, in that the terminal pair of abdominal appendages are precisely similar to the foregoing limbs, evidently subserving like them the function of respiration, is quite unique not only in the

family to which it belongs, but in the Isopoda generally; it is true that in certain forms (*e.g.*, *Phryxus*) degraded by parasitism, there is a similarity between the abdominal appendages, but such a case does not interfere with the truth of the general statement that has just been made, which only refers to perfectly developed forms.

There is an interesting analogy between the structure of *Anuropus*, as regards its respiratory organs, and that of a deep-sea Isopod lately described by Professor A. Milne-Edwards.[1]

In *Bathynomus giganteus*—a colossal Isopod measuring 9 inches in length—the respiratory organs are very remarkable and unlike anything that has been met with in other Isopoda except in *Cepon* and *Ione*. "It appears," says M. Milne-Edwards, "that the respiratory apparatus of an ordinary Isopod is insufficient to fulfil the physiological needs of *Bathynomus*, and that the development of special organs of a greater functional power has been rendered necessary. The abdominal limbs, which ordinarily in this group constitute the sole branchial apparatus, form in *Bathynomus* a kind of opercular system, beneath which are found the real respiratory organs or branchiæ." These structures are, in fact, represented by a series of branched outgrowths of the abdominal wall, which contain abundant blood spaces, as has been proved by injection. The branched appendages of the genera *Cepon* and *Ione* are quite rudimentary as compared with those of *Bathynomus*.

Now, in *Anuropus* the same need for increased respiratory power has been satisfied in a different way. Instead of the development of accessory branchial organs, as in *Bathynomus*, an additional pair of abdominal appendages have been pressed into service as gills. *Anuropus* is, therefore, more typically Isopodan in structure than *Bathynomus*, and, indeed, presents us with an exaggeration of a character which is common to the group, and forms an important item in its definition.

It is evident from these two instances that there is a need for increased respiratory surface in deep-sea animals, and, not to go into a detailed summary of facts, I may remind the reader that the dorsal processes of some of the curious deep-sea Holothurians described by Dr. Hjalmar Théel are probably analogous. It is well known that the percentage of oxygen is less in the bottom waters than at the surface, and hence has arisen the need to make the most of the failing supply of this gas. I have carefully examined the other Isopoda with a view to discover if there were present any other modifications of a like nature to those which occur in *Bathynomus* and *Anuropus*. In a deep-sea Sphæromid described above under the name of *Cymodocea abyssorum*, the branchial organs are more fully developed than in the majority of species belonging to that family. In the typical Sphæromidæ, as is well known, only the fourth

[1] *Comptes rendus*, January 1879. There is a figure (two-thirds the natural size) of this most remarkable form in a work by M. Filhol, lately published, and entitled La vie au fond des mers; see p. 148 for description.

and fifth pairs of abdominal limbs are respiratory; in the fifth pair both the inner and outer ramus are thin-walled, delicate, much folded lamellæ, in the fourth pair it is only the endopodite of the limb which has this peculiar structure, the exopodite being a flat hard plate which covers over the subjacent lamellæ and serves as a protective operculum. In *Cymodocea abyssorum*, however, the fourth pair of appendages exactly resembles the fifth pair; there is no operculum, both exopodite and endopodite are folded gill-plates. This feature, although it may be correlated with the habitat of the Crustacean, is not so noteworthy, since it occurs in the shallow-water genus *Amphoroidea* according to Milne-Edwards;[1] and I have been able myself to verify his statements by an examination of *Amphoroidea falcifer*, a New Zealand form, which I have had the opportunity of studying through the kindness of Mr. G. M. Thomson.

Possibly the delicate integument of certain deep-sea Munnopsids is a modification brought about by a similar need for increased respiration. In other Isopoda I can detect no obvious evidence which would point to a need for increased respiratory power. This is one of the most puzzling facts about the deep-sea Isopodan fauna, that whereas some forms, such as *Anuropus* and *Bathynomus*, show an evident modification in relation to their habitat, others show no traces of any such modification and are indistinguishable in these respects from shallow-water forms. As in the case of the presence or absence of eyes in the deep-sea Isopoda discussed below (p. 163) it may be that these special modifications indicate a remote period of immigration into deep water.

Anuropus branchiatus, F. E. Beddard (Pl. VII. figs. 1–5).

Anuropus branchiatus, F. E. Beddard, Proc. Zool. Soc. Lond., 1886, pt. i, p. 113.

The single specimen of this species measures 70 mm. in length.

The body is extremely convex, more particularly in the thoracic region.

The head is small and rounded, with a short median rostrum; there is no trace of any eyes; the anterior region of the head is deeply grooved for the insertion of the antennary organs, the ventral margin of the head is ridged below, and in the middle line it is prolonged into an upwardly directed process which exactly corresponds in direction to the rostrum; the two do not, however, meet, but are separated by a space about equal to the basal joint of the antennules.

The thoracic segments increase progressively in length from before backwards up to the sixth; the seventh is a little shorter than the sixth.

All the segments with the exception of the first are furnished with separate epimera.

The abdomen is distinctly narrower than the thorax, the first five segments are subequal; their lateral margins are rounded and overlap, the antero-lateral region of the

[1] Hist. Nat. Crust., t. iii. p. 222, pl. xxxii. fig. 9.

segment being somewhat hollowed for this purpose. The terminal segment of the abdomen, including the telson, is a broad plate almost circular in outline; the anterior region, which represents the tergum of the sixth segment, is convex and marked off from the flattened telson; the latter has a faint median longitudinal carina which is grooved, and there are also a pair of lateral carinæ.

The *antennules* (see fig. 3) are stout and swollen and consist of only two joints; the basal joint is almost spherical and very small, the distal joint is much longer and is slightly curved upwards; it terminates in a pointed extremity.

The *antennæ* have a more normal structure; the peduncle consists of four joints; of these the two first are short and subequal, the third is very long, longer than the two basal joints taken together, the fourth joint of the peduncle is also elongated but shorter than the third; the flagellum is nine-jointed.

The *mandibles* are very powerful appendages; the cutting-edge is chisel-like and coloured of a dark brown; there is a three-jointed palp.

The *maxillæ of the first pair* are not remarkable in their structure; they are two-lobed; the cutting-edge is fringed with stout brown coloured spines.

The *maxillæ of the second pair* are two-lobed.

The *maxillipedes* (see fig. 4) are remarkable on account of their very rudimentary structure; they appear to consist of only two joints; the basal joint, which articulates with the head, is elongated from side to side at its articulation, but narrower distally; the distal joint is smaller, and oval in form; both appendages had the same structure, and I am therefore inclined to think that it is all that is really represented in the species, and that there is nothing defective in the specimen.

The *thoracic appendages* increase in size up to the sixth pair; I am unable to say anything about the size of the seventh pair of limbs, as they were defective.

The first pair of appendages are cheliform; the basal joint is the longest and stoutest, and is grooved on its inferior surface for the reception of the rest of the limb, which can be folded back like the blade of a penknife; the second, third, and fourth joints are very short and decrease progressively in size; the fifth joint is longer, and is oval and swollen; the sixth joint is a comparatively slender spine which can be bent back upon the penultimate joint.

In the second pair of appendages the third and fourth joints are proportionately longer; I am unable to say whether these appendages are chelate, as the distal joints of the limb were missing.

The remaining appendages are not chelate; they differ from the first pair in the greater length of the second, third, and fourth joints, in the extreme slenderness of the fifth joint, and in the minute terminal claw which represents the sixth joint. The basal joint of these appendages is longitudinally excavated as in the case of the first pair.

The *abdominal appendages* are all similar to each other; there is no difference in structure between the last pair and the first.

Each consists (fig. 5) of a short basal joint, with which are articulated two broad foliaceous rami, which have a rounded outer margin and a straighter inner margin.

Station 218, between New Guinea and Admiralty Islands, March 1, 1875; lat. 2° 33′ S., long. 144° 4′ E.; depth, 1070 fathoms; blue mud.

THE ISOPODAN FAUNA OF DEEP WATER.

The following observations on the Isopodan fauna of the deep sea are mainly a recapitulation of the details that have been already given in considering the several families of Isopoda represented in the Challenger collection. It may be useful, however, to bring together these scattered facts, and to compare them with what is already known from the investigations of Sars and others.

Before stating the facts and discussing the various conclusions that may be arrived at from their study, it is evidently necessary to determine what is the boundary line between "shallow" and "deep" water.

In his Report on the Challenger Echinoidea, Agassiz divides the ocean into three territories: (1) littoral, up to about 100 fathoms; (2) continental, to 500 fathoms; and (3) abyssal, all the greater depths.

I do not propose in the present section to consider in detail the littoral forms, but I shall of course indicate those continental and abyssal species which also occur in the shallow waters.

Since so many of the species described by Professor Sars range from extremely shallow water up to 300 fathoms, and since so few (only ten) exceeded those limits, I shall, for the purpose of shortening my Table, commence with the 300 fathoms limit, not including those species that just touch that line. It appears to me, in fact, from a consideration of the bathymetrical distribution of the Isopoda, that the 300 fathoms line marks approximately the boundary between what may be termed deep-sea species and shallow-water species.

BATHYMETRICAL TABLES.

In the following Tables those species which are referred to more than once are marked with a number or series of numbers corresponding to the other tables in which they will be found to occur.

Table I.—300 to 500 fathoms.

Munnopsis typica, Sars, shallow water.
„ *latifrons*, F. E. B.
Eurycope gigantea, Sars, continental; II.
Eurycope cornuta, Sars, shallow water.
Ilyarachna longicornis, Sars, shallow water.
Anceus hirsutus, Sars, continental.

Anceus robustus, Sars, continental.
Arcturides cornutus, Studer, shallow water.
Arcturus baffini, Westwood, shallow water.
„ *hystrix*, Sars.
„ *tuberosus*, Sars.
„ *purpureus*, F. E. B.
„ *cornutus*, F. E. B.
Astacilla granulata, Sars, shallow water; II.
Janira laciniata, Sars.
Trichopleon ramosum, F. E. B.
Typhlapseudes nereus, F. E. B.
Cryptocope vöringii, Sars; II.
Paranthura norvegica, Sars, shallow water.
Serolis antarctica, F. E. B.; III.
„ *bromleyana*, F. E. B.; II., III.
Acanthoniscus typhlops, Sars.
Nannoniscus bicuspis, Sars, continental; II., III.

Table II.—500 to 1000 fathoms.

Eurycope atlantica, F. E. B.
„ *gigantea*, Sars, continental; I.
Arcturus spinifrons, F. E. B.
„ *anna*, F. E. B.
„ *myops*, F. E. B.
Astacilla granulata, Sars, shallow water; I.
Stenetrium haswelli, F. E. B.
Ischnosoma quadrispina, Sars.
Anceus bathybius, F. E. B.
„ *stygius*, Sars; III.
Paranthura chiltoni, F. E. B.
Nannoniscus bicuspis, Sars, continental; I.
Cryptocope vöringii, Sars; I.
Acanthomunna proteus, F. E. B.; III.
Serolis neæra, F. E. B.; IV.
„ *gracilis*, F. E. B.
Bathynomus giganteus, M.-E.

Table III.—1000 to 2000 fathoms.

Munnopsis gracilis, F. E. B.
„ *australis*, F. E. B.
Eurycope sarsii, F. E. B.
„ *novæ-zelandiæ*, F. E. B.
„ *spinosa*, F. E. B.
„ *fragilis*, F. E. B.
„ *pellucida*, F. E. B.
Acanthocope spinicauda, F. E. B.
„ *acutispina*, F. E. B.
Arcturus furcatus, Studer, shallow water.
„ *glacialis*, F. E. B.
„ *spinosus*, F. E. B.
„ *brunneus*, F. E. B.
„ *abyssicola*, F. E. B.; IV.
Iolanthe acanthonotus, F. E. B.
Janira abyssicola, F. E. B.
Ischnosoma bacillus, F. E. B.
„ *bacilloides*, F. E. B.
„ *spinosum*, F. E. B.
Leiopus leptodactylus, F. E. B.
Serolis antarctica, F. E. B.; I.
„ *bromleyana*, F. E. B.; I., II.
Sphyrapus serratus, Norman.
Neotanais americanus, F. E. B.
Cymodocea abyssorum, F. E. B.
Acanthomunna proteus, F. E. B.; II.
Anuropus branchiatus, F. E. B.
Anceus stygius, Sars.
Glyptonotus megapterus, Sars.

TABLE IV.— 2000 fathoms and upwards.

Eurycope abyssicola, F. E. B.
„ *intermedia*, F. E. B.
Arcturus abyssicola, F. E. B.; III.
Bathytanais bathybrotes, F. E. B., shallow water.
Typhlotanais sp., F. E. B.
„ *brachyurus*, F. E. B.
Serolis neæra, F. E. B.; II.

It is clear from the above tables, that as the depth increases there is less similarity between the Isopodan fauna, and that of shallow water.

In Table I., from 300 to 500 fathoms, there are twenty-three species recorded; of these no less than eleven or nearly one-half also range into shallow water, in many instances into such insignificant depths as 50 fathoms; six of these species on the other hand are also found in greater depths, but of these six, only three extend into the shallower regions of the ocean; nine are peculiar.

In Table II., from 500 to 1000 fathoms, there are seventeen species; three of these are found both in Table I. and in shallow water, and another is found in Table I. but not in shallow water, three other species range into greater depths; ten are peculiar to depths of from 500 to 1000 fathoms.

In Table III., from 1000 to 2000 fathoms, there are twenty-nine species, of which, however, five were dredged in water of from 1000 to 1070 fathoms, and therefore only just fall within the limits assigned. Only a single species is also an inhabitant of shallow water; three range into less depths, and one into greater depths.

In Table IV., there are seven species, of which four only exceed by a few fathoms the limits assigned to this table, two range into less depths, another (perhaps two) into shallow water, while three are only to be found in this table.

In passing from the lesser to the greater depths, there is evidently, as has been stated above, a decreasing number of species that are common to these depths and to shallow water; but it is impossible to draw an absolute line of division which would separate an abyssal from a shallow-water fauna; the two overlap each other throughout; it may be safely stated, however, that the greater the depth at which a given Isopod occurs, the less chance there is of its being also an inhabitant of shallow water and *vice versâ*. It will also be seen from the above tables that the largest number of deep-sea species occur in Table III., that is, in depths of from 1000 to 2000 fathoms, and of these species twenty-four are peculiar to that zone, including six distinctive genera. In the very great depths there is a great falling off in the number of species.

There is no trace of any zone that is without its Isopod fauna; from 345 fathoms up to 2740 fathoms species were dredged continuously; there is nowhere a break of more than 100 fathoms.

From the tables I may also deduce a list of abyssal genera, which is as follows :—

Munnopsis.†
Eurycope.†
1 *Acanthocope.*
Arcturus.†
Glyptonotus.†
Astacilla.†
Stenetrium.†
Janira.†
2 *Anuropus.*
3 *Bathynomus.*
Serolis.†
Ischnosoma.†
4 *Acanthomunna.*
5 *Trichopleon.*
*Nannoniscus.**
6 *Iolanthe.*
Paratanais.†
Typhlotanais.†
7 *Sphyrapus* (?)
Cryptocope.†
8 *Neotanais.*
9 *Leiopus.*
Paranthura.†
Cymodocea.†
Anceus.†
*Neasellus.**

The above list includes all those genera that are found in depths of 500 fathoms and more. Those that are marked with an asterisk (*) are also found in the continental zone, while those to which a dagger (†) is appended are found in the littoral zone. It appears, therefore, that the nine numbered genera are, as far as at present known, absolutely confined to deep water. This table, however, does not indicate those genera that are characteristically abyssal, that is those in which the majority of species inhabit the greatest depths; *Ischnosoma* is characteristically a deep-sea form; only one species (*Ischnosoma bispinosum*) is found in shallow water up to 300 fathoms; the remaining four species are all inhabitants of very deep water. In the genus *Eurycope* about one-half of the known species are abyssal; two of the four species of *Munnopsis* are abyssal, and very nearly all the species of the genus *Arcturus*. On the other hand, *Cymodocea*, *Astacilla*, *Stenetrium*, *Janira*, *Paranthura*, *Typhlotanais*, *Cryptocope*, and *Paratanais* are genera which are almost exclusively confined to the littoral area, one species only of each (two of *Typhlotanais*) descending into the great depths; of the remaining genera, *Glyptonotus* and *Nannoniscus*, only two species of each are at present known, so that it is hardly worth while drawing attention to the fact that they are equally distributed in the greater and lower depths. *Anceus* has two abyssal species and a very large number of shallow-water forms; of *Serolis* four species (25 *p. c.*) range into the abyssal waters.

The only species known to me which are common to the abyssal and littoral region are—

Arcturus furcatus, a few fathoms and 1675 fathoms,
Bathytanais bathybrotes, a few fathoms and 2050 fathoms,

though as already mentioned a great number of species are common to the littoral and

continental zone. Only six species are common to the continental and abyssal zone; these are—

Nannoniscus bicuspis, 191–1163 fathoms.
Eurycope gigantea, 260–658 fathoms.
Cryptocope vöringii, 350–778 fathoms.
Astacilla granulata, 290–620 fathoms.
Serolis antarctica, 400–1600 fathoms.
Serolis bromleyana, 410–1975 fathoms.

The Isopod fauna of the abyssal regions may therefore be said to be fairly distinct from that of the shallower waters, since it includes nine distinct genera besides a number of others which are characteristic, and since only seven species out of a total of forty-two ascend into less depths. Of the nine peculiar genera, two, viz., *Bathynomus* and *Anuropus*, are certainly to be regarded as the types of subfamilies.

The continental region, including depths of 100 to 500 fathoms, includes the following genera :—

*Munnopsis.**†
*Eurycope.**†
*Ilyarachna.**
*Desmosoma.**
*Arcturus.**†
*Astacilla.**†
*Anceus.**†
*Serolis.**†
*Janira.**†
*Jæropsis.**
*Munna.**
Nannoniscus.†
*Pleurogonium.**
*Ischnosoma.**†
*Macrostylis.**
*Synidothea.**
*Acturides.**
*Paranthura.**†
*Ægа.**
*Apseudes.**
1 *Typhlapseudes.*†
2 *Astrurus.*
Neasellus.
*Paratanais.**
*Typhlotanais.**†
*Tanais.**
*Leptognathia.**
*Cymodocea.**
3 *Acanthoniscus.*
*Cryptocope.**†

There are only three peculiar genera, the remaining twenty-seven being found in shallower water, and in the abyssal region; the asterisk (*) indicates those that are also found in shallow water, the dagger (†) those that extend their range into the abyssal zone; fourteen range into both these regions, one genus, *Nannoniscus*, is only found in deeper water, while the remaining eleven range only into the shallower depths.

I cannot pretend to give anything like a complete list of the shallow-water genera,

because in many cases, particularly among the Sphæromids, carcinologists are by no means agreed as to the limits of particular genera. The following genera, however, among others, appear to be, as far as is at present known, peculiar to the littoral zone :—

Asellus.	*Anthura.*
Jæra.	*Haliophasma.*
Paramunna.	*Sphæroma*, and allied genera.
Dendrotion.	*Ceratocephalus.*
Idothea, and other allied genera.	Many genera of Cymothoidæ.

At any rate it may be safely stated that there are more genera peculiar to the littoral zone than either to the continental or abyssal; the continental zone is evidently a transitional area combining to a certain extent the characters of the abyssal and littoral zones, its own special peculiarities being but feebly marked. Seeing, however, that out of the thirty genera assigned to this region, twenty-five are also found in shallow water, and only fourteen in deeper water (thirteen of these being genera which are also found in shallow water), it appears to me to be almost unnecessary to regard this transitional zone in considering the bathymetrical distribution of the Isopoda. The older division of the marine fauna into two sections, the deep-sea fauna and the shallow-water fauna, fixing the limit between them at about 300 fathoms, appears to me to meet the requirements of the case. All the abyssal genera which are found in shallow water at all are met with in depths of less than 100 fathoms, with the sole exception of *Nannoniscus*, which, being only represented by a single species, cannot be considered to form an important exception. Looking at the matter from this point of view, we shall have eleven peculiar genera of the abyssal fauna, and only four species out of sixty-five which are common to this zone and to the shallower waters.

Mr. John Murray and M. Renard have lately expressed the opinion that "dredgings near the shores of continents in depths of 1000, 2000 or 3000 fathoms are more productive, both in species and individuals, than dredgings at similar depths several hundred miles seaward"; and also that "among the few species dredged in the abyssal areas furthest removed from land, the majority show archaic characters, or belong to groups which have a wide distribution *in time* as well as over the floor of the present oceans." It will be interesting to see how far these conclusions, deduced from a study of other deep-sea invertebrata, are applicable to the Isopoda. With regard to the first question, I find on reference to the list of deep-water forms of Isopoda that there are twenty-five that were dredged in the neighbourhood of continental land, and twenty-two at a long distance from any continental land, though most frequently in the vicinity of land, *e.g.*, at Kerguelen, while four species are found in both habitats. As regards number of species, therefore, the distribution of the deep-sea Isopoda does not lend any strong support to

the above quoted opinion, though it does not on the other hand render it inapplicable to this group. So very few of the deep-sea species of Isopoda were dredged in any numbers that I cannot say much respecting the number of individuals in the neighbourhood of continents as compared with the number dredged at Stations far distant from any continent; such facts as are at my disposal do not indicate any very marked distinction in this respect; *Eurycope novæ-zelandiæ*, *Serolis bromleyana*, *Serolis neæra*, *Serolis gracilis*, *Typhlapseudes nereus*, and *Arcturus myops*, are represented by a considerable number of individuals, and all these species frequent the neighbourhood of continents; on the other hand, *Eurycope sarsii*, *Arcturus spinosus*, *Arcturus brunneus* and *Leiopus leptodactylus* are true "abyssal" forms, and are also comparatively abundant in individuals. Here again the balance of evidence supports Messrs. Murray and Renard, but not in a striking way.

With regard to the supposed archaic character of the deep-sea fauna the facts at my disposal do not permit of any positive statements.

GEOGRAPHICAL DISTRIBUTION OF DEEP-SEA ISOPODA.

One of the most important results of the recent explorations of the deep sea has been to show that it is impossible to mark out any definite regions of the ocean comparable to the terrestrial distributional provinces; the same genus, and even the same species, is often represented by individuals in the most widely separated areas; and this is explained by the similar conditions which must obtain at great depths in all parts of the ocean. Among the Isopoda no great stress can be laid upon the occurrence of the same genus in regions of the ocean widely remote from each other, because among the shallow-water forms many, not to say most genera, are universally distributed; more important results can evidently be attained by considering the distribution of particular species rather than genera. Bearing in mind the very limited knowledge, comparatively speaking, which we at present have of the deep-sea fauna, the occurrence of five species over a wide tract of the earth's surface is more important than it would appear to be if we judged only by percentages.

The most widely distributed species is *Eurycope fragilis*, which ranges from the North Pacific, near to Japan, as far south as lat. 60° S., close to the Antarctic ice-barrier, and to the neighbourhood of the Crozets.

Two species of *Serolis*, viz., *Serolis antarctica* and *Serolis bromleyana*, have been referred to in the first part of my Report as having a wide horizontal distribution; the former was dredged off the coast of South America, just under the equator, and again in the neighbourhood of the Crozets; the latter ranges from off the coasts of New Zealand and Australia to the vicinity of the Antarctic continent. *Neotanais americanus* inhabits regions so far removed as Station 45, off New York, and Station

323, off Buenos Ayres. *Arcturus abyssicola* was dredged in the western limits of the Pacific, off North Australia, and in the middle of that ocean near to the Low Archipelago. I might add to this list *Ischnosoma bacillus*, dredged between Australia and Kerguelen, which is represented by a very closely allied if not identical species, *Ischnosoma bacilloides*, at Station 302, off the east coast of South America, and also *Eurycope atlantica*, dredged in the North Atlantic, which has at least a close ally in a species obtained near the Crozets. It is hardly worth while to refer to species which were dredged so near to each other as Stations 146 and 147, or Stations 168 and 169.

The following is a list of the Stations at which deep-sea Isopoda were met with :—

Station 23. *Arcturus purpureus, Typhlapseudes nereus.*
Station 45. *Neotanais americanus.*
Station 68. *Eurycope abyssicola.*
Station 76. *Anceus bathybius, Eurycope atlantica.*
Station 78. *Ischnosoma spinosum, Leiopus leptodactylus.*
Station 120. *Serolis gracilis.*
Station 122. *Serolis antarctica.*
Station 146. *Eurycope sarsii, Serolis antarctica, Arcturus spinosus.*
Station 147. *Eurycope sarsii, Serolis antarctica, Eurycope atlantica* (?), *Munnopsis australis, Eurycope fragilis, Arcturus brunneus.*
Station 152. *Eurycope fragilis.*
Station 153. *Arcturus furcatus, Arcturus glacialis, Iolanthe acanthonotus.*
Station 156. *Serolis bromleyana.*
Station 157. *Eurycope spinosa.*
Station 158 *Eurycope fragilis Acanthocope spinicauda, Ischnosoma bacillus.*
Station 168. *Munnopsis gracilis, Eurycope novæ-zelandiæ, Serolis bromleyana. Acanthomunna proteus.*
Station 169. *Serolis bromleyana, Acanthomunna proteus, Arcturus myops, Paranthura chiltoni.*
Station 174. *Arcturus spinifrons.*
Station 175. *Janira abyssorum.*
Station 184. *Arcturus abyssicola.*
Station 214. *Trichopleon ramosum.*
Station 218. *Eurycope pellucida, Anuropus branchiatus, Cymodocea abyssorum,*
Station 232. *Munnopsis latifrons.*
Station 237. *Eurycope fragilis.*
Station 246. *Typhlotanais abyssorum, Typhlotanais* sp., *Bathytanais bathybrotes.*
Station 252. *Eurycope intermedia.*

Station 281. *Arcturus abyssicola.*
Station 302. *Acanthocope spinicauda, Ischosoma bacilloides.*
Station 318. *Serolis neæra.*
Station 320. *Serolis neæra, Stenetrium haswelli, Arcturus americana.*
Station 323. *Neotanais americanus.*

It appears from the above list that the deep-sea Isopoda are distributed very unevenly over the floor of the ocean, and that there are long stretches of ocean where no species at all were found; these are the whole of the Central and Southern Atlantic, and the Central and Western Pacific.

I have bracketed together those Stations which are only separated by a very short interval, and this will show that, in most instances where Isopoda were met with, they were represented by a considerable variety of forms. More particularly to be noticed are Stations 146 and 147, Stations 168 and 169, Station 153, Station 158, Station 218, Stations 320 and 323, and Station 246.

The accompanying map illustrates the distribution of the deep-sea Isopoda.

SPECIAL PECULIARITIES OF THE DEEP-SEA ISOPODA.

It has been long known that the deep-sea Crustacea, as well as other deep-sea animals, are commonly blind, but the puzzling fact that this is by no means universally the case has exercised the ingenuity of naturalists; the well-known theory of abyssal light has been brought forward as an explanation of the persistence of eyes in certain forms.

Among the Isopoda thirty-four of the deep-sea species are totally blind, and three others, viz., one species of *Eurycope* and two of *Ischnosoma*, only represented by fragments, may in all probability be added to this list; in four species, viz., three species of *Serolis*[1] and *Cymodocea abyssorum*, the eyes are evidently degenerate; in eighteen species, on the other hand, there are well-developed eyes.

The significance of these facts, however, is not apparent from the statistics; they will require to be examined more closely. In the first place, it is noteworthy that of the eleven peculiar deep-sea genera only two, viz., *Acanthomunna* and *Bathynomus*, have eyes; of the remaining species, seven belong to genera of which the shallow-water representatives, so far as is known at present, invariably possess eyes;[2] these two series of facts are evidently of considerable importance.

On the other hand, the remaining eighteen, included in the genera *Munnopsis*, *Eurycope*, *Ischnosoma*, *Typhlotanais*, and *Cryptocope*, belong to genera which are invariably blind, even when occurring in quite shallow water; the significance of these

[1] See Part I. of my Report, Zool. Chall. Exp., pt. xxxiii.
[2] This includes those species with imperfect eyes, evidently on the way to disappearance.

facts is therefore not so great. Although the number of deep-sea species which have well-developed eyes is so large, they nearly all (all except three) belong to the two allied genera *Arcturus* and *Astacilla*, which thus form almost the only exception to the general statement that the deep-sea Isopoda are blind. It must not be forgotten that certain genera, *e.g.*, *Pleurogonium*, which are confined to shallow water are blind.

It is extremely difficult to conceive of any reason for this great difference. Why should the species of one genus retain their eyes after migrating into the deeper waters while the species of another genus lose them? Possibly the explanation of these anomalies is to be sought for in considering the length of time that has elapsed since the migration of the different species into the abyssal regions of the ocean.

It will be, I hope, apparent to any one who has studied that portion of this Report which deals with the description of species, that the peculiar deep-sea genera are well marked as such, and it may be supposed, therefore, that they are old inhabitants of the deeper waters, consequently they have had time to lose their eyes; on the other hand, the deep-sea *Arcturi* are not widely different from their shallow-water allies, and perhaps therefore have only recently become a part of the abyssal fauna; these two assumptions appear to me justifiable, but it is, on the other hand, evidently a pure assumption to suppose that the deep-sea species of *Janira*, *Serolis*, &c., have been just sufficiently long inhabitants of the deep for the eyes to have become rudimentary or to have disappeared.

It is commonly stated that the deep-sea fauna comprises many species which are larger than their shallow-water representatives. This is certainly the case with the Isopoda. I need hardly allude to the appropriately-named *Bathynomus giganteus*,[1] which is by far the largest species of the order at present known; there are no other instances of deep-sea Isopoda which attain to so colossal a size, but in many families the deep-sea forms are decidedly larger than the shallow-water. Among the Asellidæ, *Stenetrium haswelli* is larger than any of the three shallow-water species of this genus; *Iolanthe* is a large Isopod compared with the size which other Asellidæ reach; the deep-sea species of *Eurycope* are in many cases much larger than the species known to inhabit the shallow water, and I have already referred to the large size of two at least of the deep-sea species of the genus *Serolis*. Many of the deep-sea *Arcturi* are of large size, but, on the other hand, certain shallow-water forms, such as *Arcturus baffini* and *Arcturus furcatus* are fully as large; it must be noted, however, that both these species range into deep water. Two deep-sea species of *Ischnosoma*, viz., *Ischnosoma bacillus* and *Ischnosoma bacilloides*, are very much larger than the single species, *Ischnosoma bispinosum*, which is known from shallow water.

A very noticeable feature in the organisation of the deep-sea Isopoda is the extremely great development of spines upon the body; this character is found in very many of the different families which inhabit the deeper waters. The deep-sea *Arcturi* are more

[1] See p. 152.

particularly noticeable. Among the species enumerated above, *Arcturus spinosus*, *Arcturus glacialis*, *Arcturus purpureus*, and *Arcturus brunneus* are clad with extremely long spines, while the same development is found, though in a less degree, in *Arcturus anna* and *Arcturus spinifrons;* only three deep-sea species out of the ten dredged by the Challenger are unprovided with spines.

The family Munnopsidæ are quite as characteristically a part of the deep-sea fauna as the genus *Arcturus*, but they do not exhibit this peculiarity to anything like so marked a degree. There is only one species which is distinguished by the presence of numerous spiny outgrowths of the integument, viz., *Eurycope spinosa*, though in many others, such as the genus *Acanthocope*, the species *Eurycope fragilis* and *Eurycope atlantica*, the epimera and a single row of spines along the back are unusually developed.

In my account of *Serolis* I have referred to the length and spiny characters of the epimera in three out of the four deep-sea species, which contrasts very markedly with the flattened, sickle-shaped epimera of those species which inhabit the shore.

The characters of the deep-sea Asellidæ bear out the general truth of what has been said above respecting the Isopodan fauna of the deep sea. The genera *Acanthoniscus*, *Acanthomunna*, and *Iolanthe* are quite as remarkable for the development of spines as many of the deep-sea *Arcturi*.

This modification of structure is not, however, confined to the deep-sea species; it is found in quite as marked a degree in *Arcturus furcatus* and *Arcturus studeri* and in other species of the genus *Arcturus;* it will be noticed, however, that these species are inhabitants of the colder regions, and, indeed, it would appear that there is some connection between temperature and the development of spines upon the body. It is more or less true in other groups of the Crustacea that the very spiny forms are either deep-sea, or, if shallow-water, are from the Arctic or Antarctic shores, where the conditions of temperature are not so widely different.

APPENDIX.

Additional Note on Typhlotanais brachyurus.

I have already (*supra*, p. 123) described this Isopod from three specimens dredged at Station 246, which were mounted on a slide during the expedition. I have since received a number of other specimens found during the examination of the deposit from the same locality, which agree in structure with the first received specimens, and must be referred to the same species. The latter specimens were in every case enclosed in a tube averaging about 14 mm. in length; the animals themselves are considerably shorter than the tube which they inhabit, and were usually found at one end where the base of the tube is rather narrower than at the other end. The tube is shaped somewhat like the shell of *Dentalium*, being slightly curved, and narrower at one extremity than the other.

The tubes are of a darkish brown colour and are very tough; they are composed of fine mud, enclosing larger particles, and occasionally, on the outside, shells of *Globigerinæ;* the mud is compacted together by a tough secretion which seems to have no structure. When the Crustacean is extracted by cutting up the tube longitudinally its cut edges become folded in. It is possible that the tube is not manufactured by the Crustacean but has been originally formed by some Annelid. Against this supposition may be urged the fact that the tubes were more or less uniform in size, and were exactly fitted to the elongated body of the Crustacean, the wider anterior-portion serving to render the movements of the chelipedes possible, and also to lodge the wider cephalothorax; the tapering form of the tube in fact corresponds to the tapering form of the Isopod. Moreover the formation of a tube-like dwelling is known to occur in other Tanaids as well as in many Amphipoda. There is a general account given in Bronn's Klassen und Ordnungen des Thierreichs[1] of the tube dwellings of certain Tanaids and Amphipoda, to which reference may be made for information on the subject.

Ischnosoma thomsoni, n. sp.[2] (woodcut, fig. 1).

The single specimen of this species measures 6 mm. in length; it is a male.

The anterior region of the body, comprising the head and first four segments of the

[1] Bd. v. Abth. ii. Lief. 16, 17, p. 435.

[2] Named after Mr. G. M. Thomson, well known for his work among the New Zealand Crustacea, particularly Isopoda.

thorax, is considerably shorter than the posterior region, the proportion being about $7\frac{1}{2} : 11$; the anterior part of the body is also rather broader.

The *head* is rather shorter, and narrower than the first segment of the thorax; its dorsal surface is convex and comparatively smooth; the lateral margins of the head are

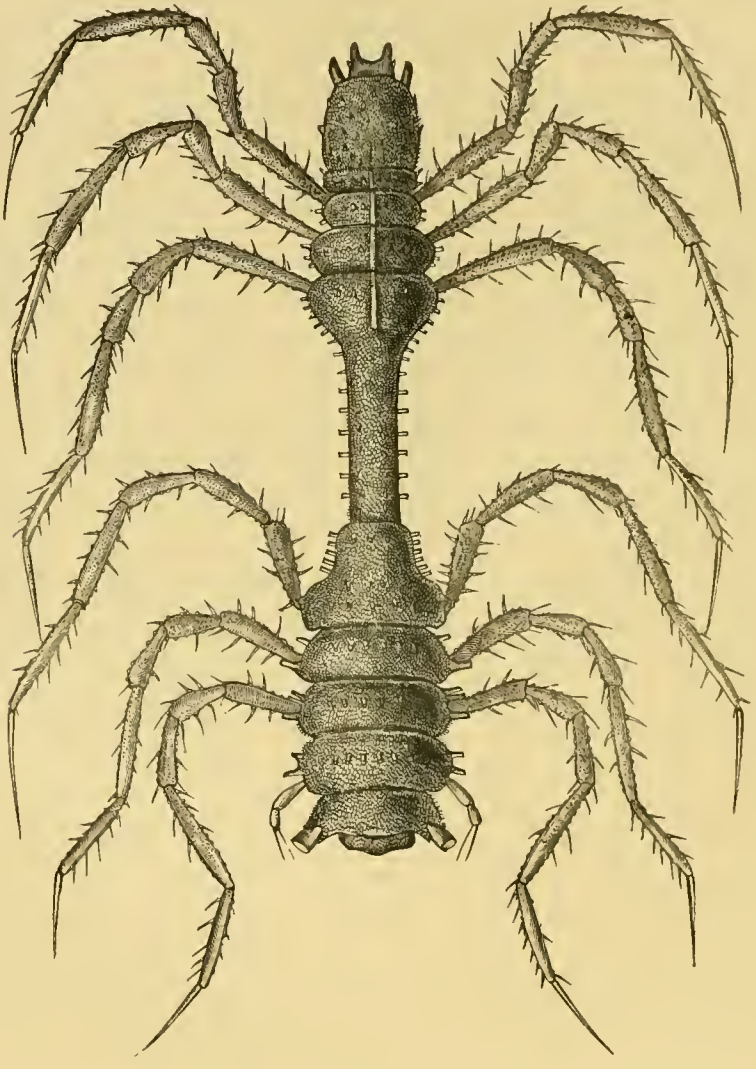


Fig. 1.—*Ischnosoma thomsoni*, n. sp.

deeply notched for the insertion of the basal joint of the antennules. The anterior margin is rounded and convex in the middle line. Eyes are completely absent as in all other species of this genus.

The three first segments of the thorax are approximately equal in size, the second being a trifle shorter than either of the other two. The dorsal surface of these segments

is convex and roughened by numerous minute tubercles; towards the posterior boundary of each segment is a single row of short blunt spines. The lateral regions of the segments have four projecting spines on each side, which are arranged in pairs one above the other; the most anterior and dorsal of these spines is in every case the larger; the spines are blunt and comparatively short.

The fourth segment of the thorax has the form characteristic of other species of this genus; it is wider anteriorly than posteriorly; the anterior part of the segment is as wide as the foregoing segments, while the posterior part is of the same diameter as the extremely elongated and narrow fifth segment; the dorsal surface is furnished with a single row of short tubercles near to its posterior margin, and also a few tubercles scattered over the anterior region. Along the lateral margin of the segment are about eight spines, similar to those which fringe the lateral margins of the anterior segment.

The fifth segment of the thorax is as long as the four anterior segments taken together; the anterior part of the segment is elongated and narrow, the whole segment resembling in shape the corresponding segment in other species of the genus. Along the lateral margin is a row of about sixteen blunt spines, which pass uninterruptedly from one end of the segment to the other; there is also a double row of similar but less numerous tubercles on the dorsal surface; the dorsal and lateral tubercles are of about the same size and about equal in length to the dorsal tubercle of the preceding segments. The hinder part of the segment has a median longitudinal ridge, which is continued on to the succeeding segments of the thorax.

The sixth and seventh segments are very short and subequal in antero-posterior diameter; the breadth of the sixth segment is somewhat less than that of the posterior part of the fifth segment; the seventh segment is narrower still. The anterior margin of the segments is convex, the posterior margin concave. The dorsal region of the segment is beset with a few scattered tubercles, and the lateral margins have also a number of short spines which are like those of the fifth segment, and much shorter than those upon the three first segments.

The *abdomen* is oval in form, and, as in other species, provided with a median convexity which runs nearly to its extremity. The anterior part of the abdomen is separated off from the rest and forms a distinct free abdominal segment. This segment is divided from the rest of the abdomen by a notch on either side, in front of which is a pair of short spines. The lateral regions of the abdomen have on either side three short spines, one being placed just in front of the point of articulation of the uropoda. The abdomen terminates a little way behind the uropoda in a bifurcate extremity, as shown in the accompanying figure (woodcut, fig. 1).

There are no traces of the *antennules* or *antennæ*, except the large basal joint of the former appendages.

The *thoracic appendages* are very similar to those of *Ischnosoma spinosum*, the joints

being furnished as in that species with numerous slender spines inserted on tubercular projections of the limb.

The *uropoda* consist of a single short conical joint.

This species is evidently more nearly allied to *Ischnosoma spinosum* than to either of the two species, *Ischnosoma quadrispinosum* and *Ischnosoma bispinosum*, described by Sars. It agrees with the former species in the great development of spines upon the lateral regions of the thoracic segments. The specimen described here is a male, and it is therefore possible that it is really the male of *Ischnosoma spinosum*. So little is at present known with respect to this interesting genus, all the species having been described from single specimens, that it is impossible to settle this point. For the present I shall regard this species as distinct.

The points in which it differs from *Ischnosoma spinosum* are very numerous. In the first place the fifth segment of the thorax is relatively as well as actually longer than in that species. The lateral spines of the thoracic segments are much longer, as well as more slender, and sharper at their extremities in *Ischnosoma spinosum* than in *Ischnosoma thomsoni;* similarly the spines upon the thoracic appendages are better developed in the former than in the latter species; on the other hand, the fourth segment has a row of lateral spines in *Ischnosoma thomsoni* which are absent in *Ischnosoma spinosum*. The head is considerably smaller in proportion in *Ischnosoma spinosum*, and the tuft of short spines placed anteriorly to the antennules, which are characteristic of that species, are wanting in *Ischnosoma thomsoni*.

The most salient difference between the two species is, however, in the form of the abdominal shield and the uropoda.

In *Ischnosoma spinosum* the posterior extremity of the caudal shield is truncated, and the uropoda, which are curved and cylindrical in form, with a pointed extremity, project beyond it.

In *Ischnosoma thomsoni* the abdomen ends in a prominent bifurcate extremity, and the uropoda, which are more flattened, do not reach nearly as far as the extremity.

In the former species there are a pair of very short spines (omitted in my previous description, but illustrated in the figure) at the end of the abdomen, but these are similar to the spines upon the thoracic limbs, being clear and transparent, and fixed on a short projection of the calcareous integument.

The occurrence of this species at Station 246 extends the range of the genus into the North Pacific; the depth is greater than that which the genus has been previously known to inhabit.

Station 246, July 2, 1875; lat. 36° 10′ N., long. 178° 0′ E.; depth, 2050 fathoms; bottom temperature, 35°·1 F.; bottom, Globigerina ooze.

Macrostylis, Sars.

Macrostylis, Sars, Forhandl. Vidensk. Selsk., 1863.

A single specimen, dredged in 2050 fathoms at Station 246, appears to be referable to this genus, which is defined by Sars as follows :—

"Body narrow, tapering posteriorly. Head large, the frontal margin projecting between the antennæ. Antennules also very short, antennæ long, the flagellum shorter than the base. Mandibular palp absent. The two first thoracic segments short; the third much larger; the fourth with pointed lateral processes; the fifth, sixth, and seventh segments of equal size, separated by deep lateral incisions and with pointed lateral processes. The two first pairs of ambulatory limbs short, with a strong terminal claw ; the third larger and very powerful, with the joints expanded and furnished with numerous spines; the fourth pair again small and slender; the fifth to the seventh pairs with the joints hardly dilated, increasing progressively in length. Abdomen large, swollen in the middle, terminating in a blunt extremity. Uropoda long and slender, simple, two-jointed, the terminal joint short.

The occurrence of this genus in very deep water is another instance of the range of Arctic littoral genera into deep water (see p. 159).

Macrostylis latifrons, n. sp. (woodcut, fig. 2).

The single specimen of this species measures 5 mm. in length. The shape is cylindrical, slightly wider at the anterior than at the posterior extremity.

The *head* is separated from the first thoracic segment by a very marked constriction; in general shape it is semicircular, the anterior margin being convex, the posterior straight. The postero-lateral angles are very sharp.

The *thorax* consists of the usual seven free segments; of these the first three are so closely united together that they appear on a superficial examination to be absolutely fused ; this, however, is not the case. The first two segments are subequal, with concave anterior and convex posterior border; the anterior border is exactly parallel to the posterior in both segments ; the lateral margin of the segments is perfectly straight, parallel to the long axis of the body, and there is hardly any notch between the successive segments. The third thoracic segment is larger than either of the foregoing; its concave anterior border follows closely the convex posterior border of the segment in front; the posterior border of the third segment is straight.

The fourth segment of the thorax is separated from the third by a deep lateral notch, as are also the remaining segments from each other. The fourth segment is rather shorter than any of the succeeding, but a little longer than either of the two first; its anterior and posterior margins are approximately straight and parallel to each other.

The three remaining segments are subequal; the anterior part of the segment is narrow and forms a constricted portion, connecting the segment with the one in front; the lateral regions are wider posteriorly, and their lateral margin slopes outwards and backwards; the postero-lateral angle of each segment is furnished with a short sharp spine.

The *abdomen* is elongated, and slightly wider anteriorly than posteriorly; it is separated by a constriction from the segment in front. The abdomen terminates posteriorly in an obtusely rounded extremity, in front of which, on each side, is the

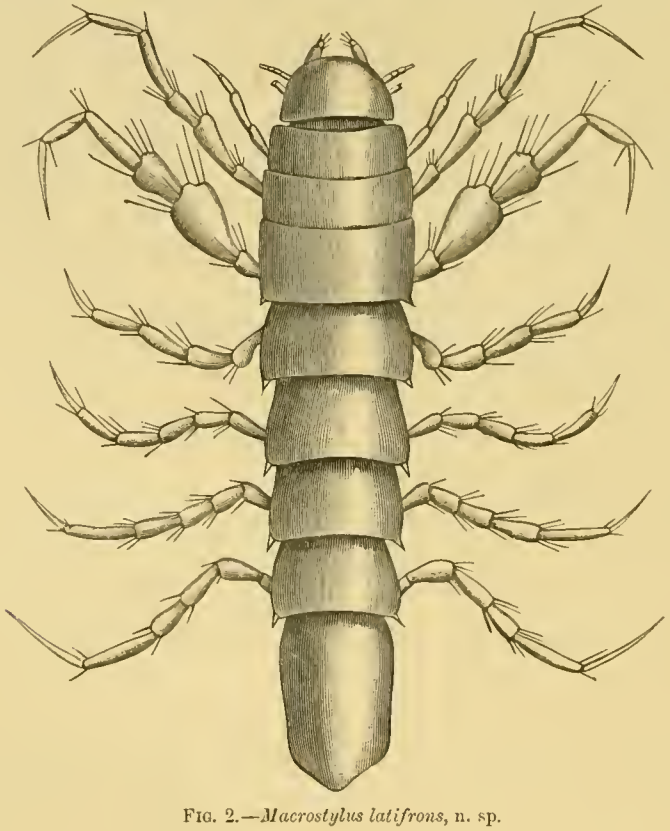


Fig. 2.—*Macrostylus latifrons*, n. sp.

articular surface of the uropoda. The length of the abdomen is about equal to that of the two preceding segments of the thorax. Its lateral margins are smooth. *Eyes* are completely absent.

The *antennules* are articulated close to the antennæ on the antero-lateral margin of the head; the appendages are very short, being about one-half the diameter of the head itself at the point where they are articulated. The basal joint is the stoutest, and there are five joints altogether, of which three may be allowed to the flagellum; the distal joints are very much more slender than the proximal. The terminal joint bears a single olfactory hair.

The *antennæ* are broken off short on both sides of the body.

The *mandibles* appear to be without a palp.

The *thoracic appendages* agree with the generic description given above. The abdominal appendages are covered over by the operculiform first pair, which form a single plate as in allied forms.

The *uropoda* are entirely wanting.

Station 246, July 2, 1875; lat. 36° 10′ N., long. 178° 0′ E.; depth, 2050 fathoms; bottom temperature, 35°·1 F.; bottom, Globigerina ooze.

ADDITIONAL NOTE.

Besides the new species described in this Report there are a few Parasitic Isopoda, which I have not had time thoroughly to investigate and which may or may not be new to science. These are for the most part Bopyrids parasitic under the carapace of both Schizopods and Decapods, and a few have been referred to by Professor Sars in his Report on the Schizopoda, already published.

One species, apparently belonging to the genus *Hemioniscus*, was found in the larval stage attached to *Serolis cornuta*, on the dorsal surface of some of the anterior segments. It is, I believe, a rare occurrence to find an Isopod parasitic on an Isopod, at any rate only one instance is mentioned in Bronn's Klassen und Ordnungen des Thierreichs, where a full list of the parasitic forms and their distribution is given.

TABLE OF CONTENTS.

PLATE I.

Figs. 1–10. Trichopleon ramosum.

Fig. 1. Female, dorsal view.

Fig. 2. Peduncle and a portion of flagellum of antennule.

Fig. 3. Basal joints of antenna.

Fig. 4. A portion of the surface of the body, highly magnified, to show the sculpturing.

Fig. 5. Maxillipede.

Fig. 6. Uropod.

Fig. 7. Ovary with oviduct, and orifice of latter.

Fig. 8. Thoracic appendage of first pair.

Fig. 9. Thoracic appendage of sixth pair.

Fig. 10. Portion of fifth joint of same appendage; more highly magnified.

Figs. 11–15. Jæropsis marionis.

Fig. 11. Antennule.

Fig. 12. Antenna.

Fig. 13. One of the thoracic appendages.

Fig. 14. Posterior extremity of body.

Fig. 15. Uropod.

PLATE I.

Minlern Bros lith.

1—10 TRICHOPLEON RAMOSUM, Beddard. 11—15. JÆROPSIS MARIONIS, Beddard

PLATE II.

PLATE II.

Fig. 1. Jæropsis marionis.

Fig. 1. Dorsal view of the animal.

Figs. 2–5. Janira tristani.

Fig. 2. Female. dorsal view.

Fig. 3. One of the sixth pair of thoracic appendages.

Fig. 4. Basal joints and part of flagellum of antennule.

Fig. 5. Basal joints of antenna.

Figs. 6–10. Jæra pubescens.

Fig. 6. Dorsal view of the animal.

Fig. 7. Eye, consisting only of two elements.

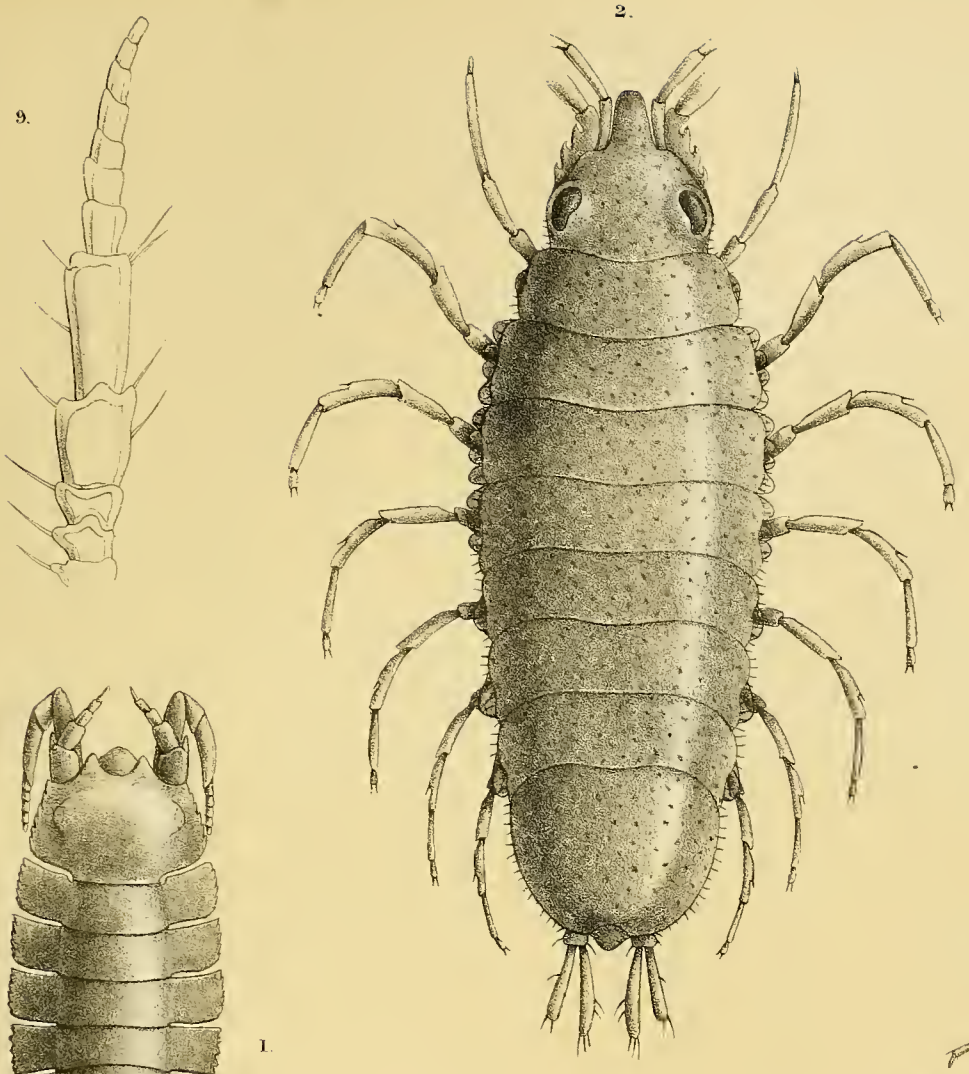
Fig. 8. Antennule.

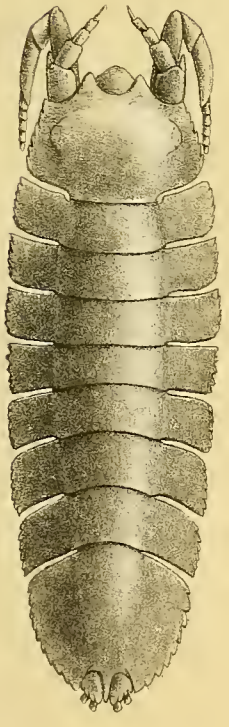
Fig. 9. Antenna, peduncle and part of flagellum.

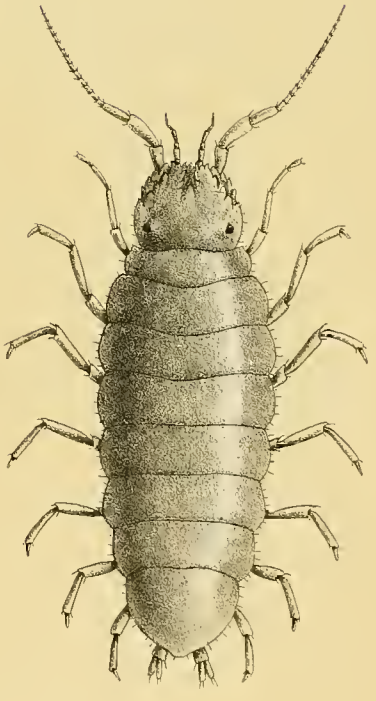
Fig. 10. Uropod.

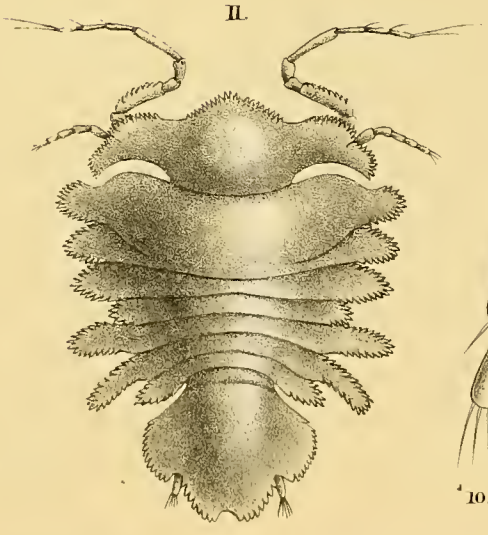
Fig. 11. Neasellus kerguelenensis.

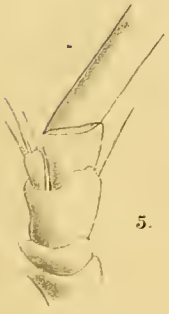
Fig. 11. Dorsal view of the animal.

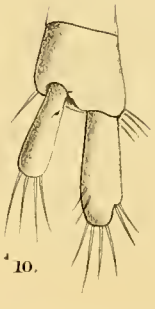












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1. JÆROPSIS MARIONIS, Beddard. 2–5. JANIRA TRISTANI, Beddard.
6–10. JÆRA PUBESCENS, Dana. 11. NEASELLUS KERGUELENENSIS, Beddard.

PLATE III.

PLATE III.

Figs. 1–6. Neasellus kerguelenensis.

Fig. 1. Antennule.

Fig. 2. Antenna.

Fig. 3. One of the first pair of thoracic limbs.

Fig. 4. One of the second pair of thoracic limbs.

Figs. 5, 6. Uropod, dorsal and ventral view.

Figs. 7–13. Pleurogonium albidum.

Fig. 7. Female, dorsal view.

Fig. 8. Antennule.

Fig. 9. Antenna.

Fig. 10. One of the first pair of thoracic limbs.

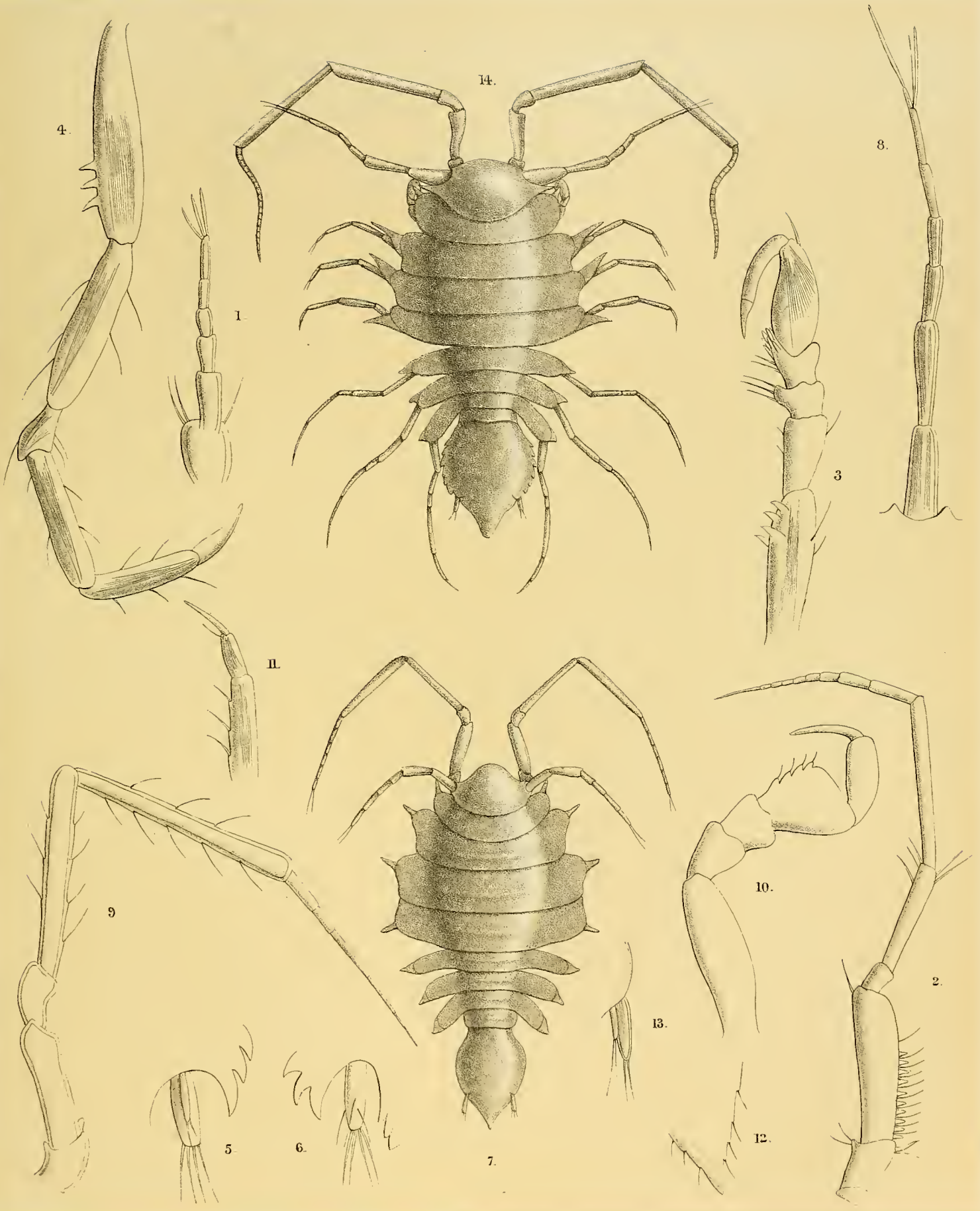
Fig. 11. Distal joints of one of the succeeding thoracic limbs.

Fig. 12. Terminal extremity of abdominal shield.

Fig. 13. Uropod.

Fig. 14. Pleurogonium serratum.

Fig. 14. Dorsal view of the animal.



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1—6. NEASELLUS KERGUELENENSIS, Beddard. 7—13. PLEUROGONIUM ALBIDUM, Beddard.
14 PLEUROGONIUM SERRATUM, Beddard.

PLATE IV.

PLATE IV.

Figs. 1–8. Stenetrium haswelli.

Fig. 1. Male, dorsal view.

Fig. 2. Antennule.

Fig. 3. Basal joints of antenna.

Fig. 4. One of the first pair of thoracic appendages.

Fig. 5. Rudimentary exopodite of antenna.

Fig. 6. First pair of abdominal limbs.

Fig. 7. One of the second pair of abdominal limbs.

Fig. 8. Uropod.

Figs. 9–14. Iolanthe acanthonotus.

Fig. 9. Female, dorsal view.

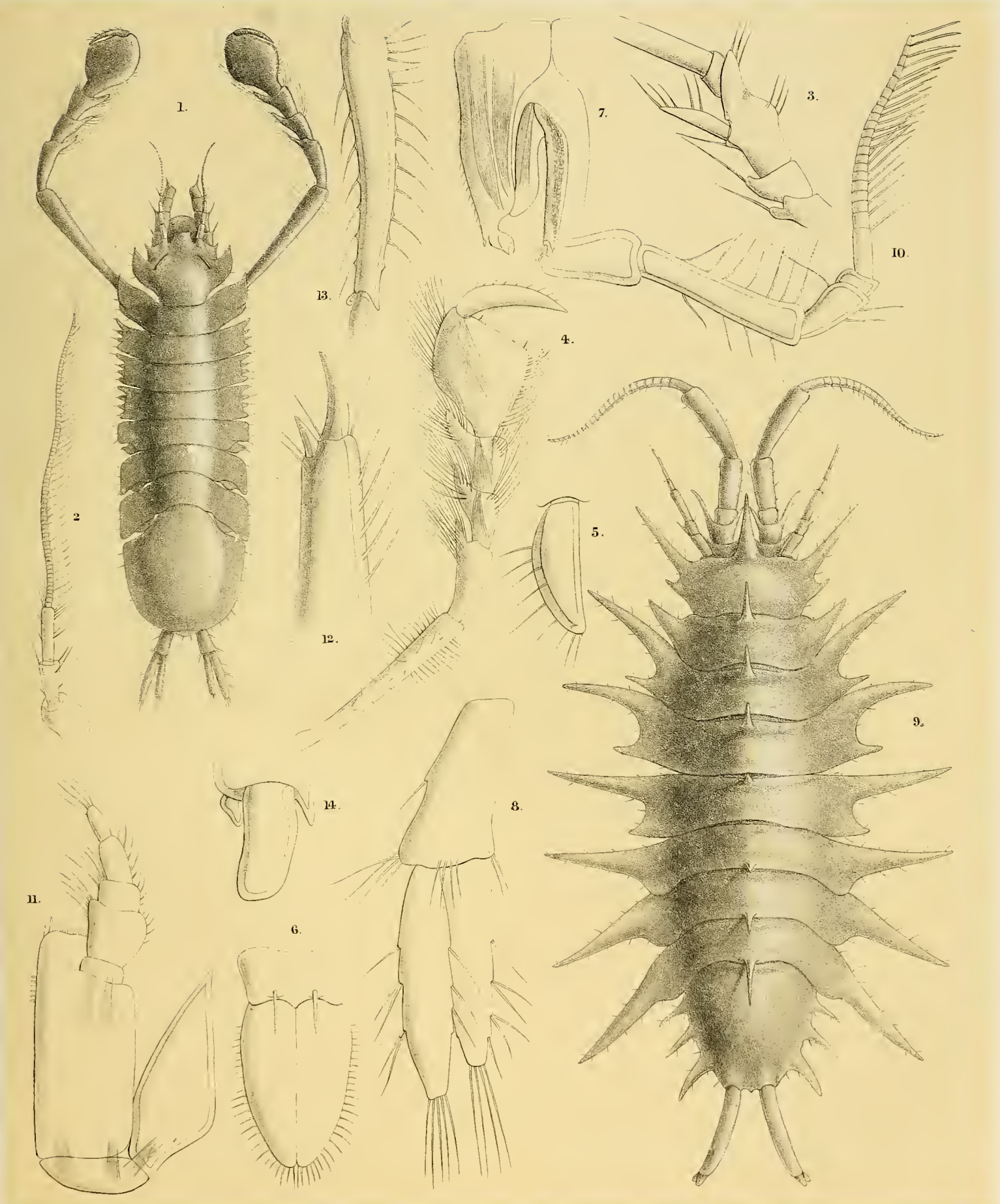
Fig. 10. Antennule.

Fig. 11. Maxillipede.

Fig. 12. Distal extremity of one of the thoracic limbs.

Fig. 13. Uropod.

Fig. 14. Exopodite and endopodite of uropod; more highly magnified.



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1-8. STENETRIUM HASWELLI, Beddard. 9-14. IOLANTHE ACANTHONOTUS, Beddard.

PLATE V.

PLATE V.

Figs. 1–4. Iolanthe acanthonotus.

Fig. 1. Maxilla of first pair.

Fig. 2. Antenna.

Fig. 3. Extremity of antennule, to show sensory hairs.

Fig. 4. Maxilla of second pair.

Figs. 5–8. Ianthopsis bovallii

Fig. 5. Extremity of one of the thoracic limbs.

Fig. 6. First pair of abdominal limbs, from above.

Fig. 7. First pair of abdominal limbs, from below.

Fig. 8. Uropod.

Figs. 9–19. Astrurus crucicauda.

Fig. 9. Male, from above.

Fig. 10. Antennule.

Fig. 11. Basal joints of antenna.

Fig. 12. Maxillipede.

Fig. 13. Processes on inner side of maxillipede; more highly magnified.

Fig. 14. One of the first pair of thoracic appendages.

Fig. 15. Distal extremity of one of the succeeding thoracic limbs.

Fig. 16. Uropod.

Fig. 17. Extremity of uropod; more highly magnified and divested of hairs.

Fig. 18. Extremity of abdominal shield.

Fig. 19. Toothed spines from maxilla.

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1–4. IOLANTHE ACANTHONOTUS, Beddard. 5–8. IANTHOPSIS BOVALLII, (Studer).
9–19, ASTRURUS CRUCICAUDA, Beddard.

PLATE VI.

PLATE VI.

Figs. 1–5. Ischnosoma spinosum.

Fig. 1. Male, from above.

Fig. 2. Antennule.

Fig. 3. Antenna.

Fig. 4. One of the thoracic appendages.

Fig. 5. Uropod.

Figs. 6–7. Ischnosoma bacillus.

Fig. 6. Fragment of female example. The alimentary canal is indicated by its dark granular contents.

Fig. 7. One of the posterior thoracic appendages.

Figs. 8–13. Ischnosoma bacilloides.

Fig. 8. Fragment of male specimen.

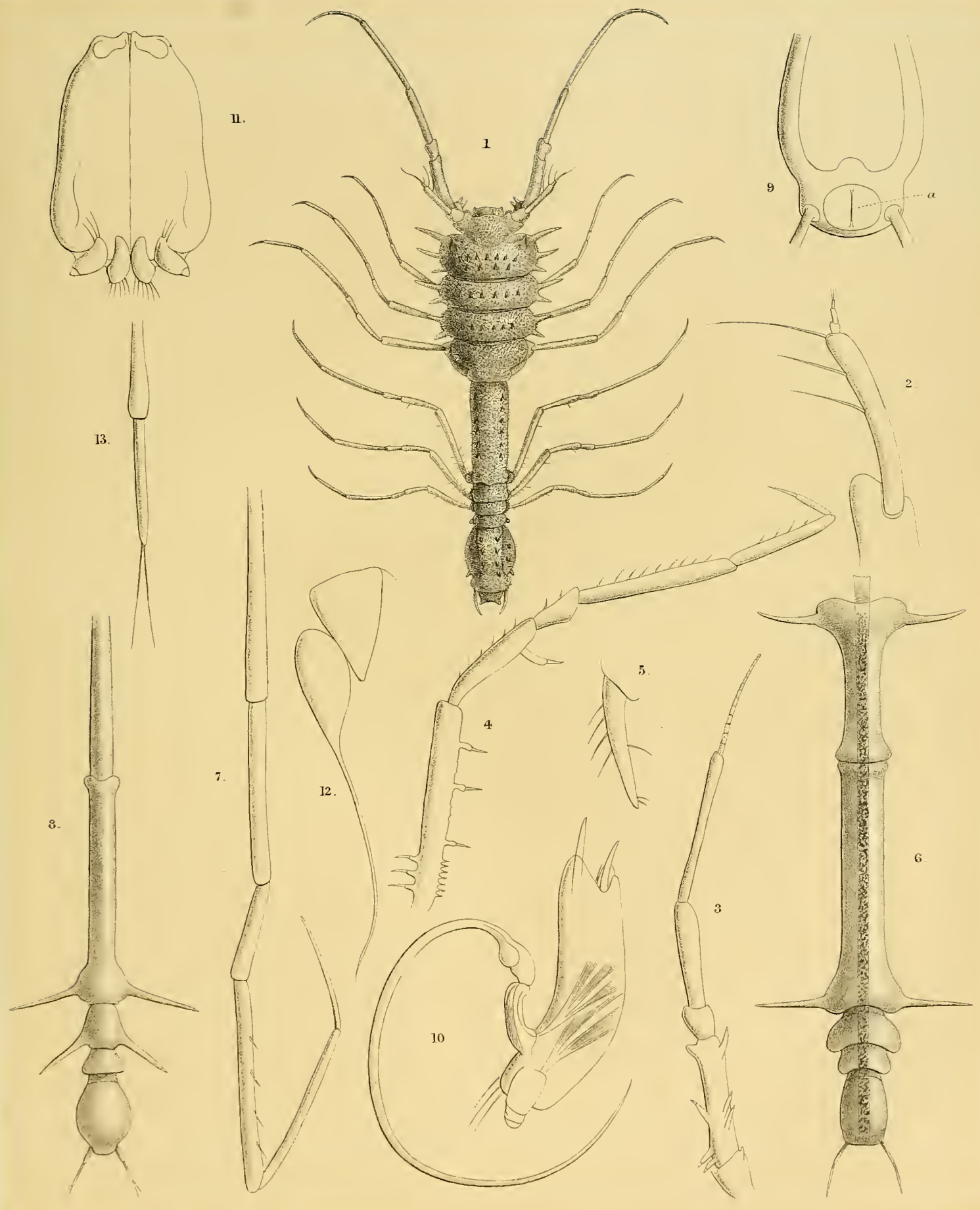
Fig. 9. Abdomen from beneath; *a*, anal flaps.

Fig. 10. One of the second pair of abdominal limbs, with long penial filament.

Fig. 11. First pair of abdominal appendages.

Fig. 12. Part of one of the third pair of abdominal limbs.

Fig. 13. Uropod.



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1–5. ISCHNOSOMA SPINOSUM, Beddard. 6–7 ISCHNOSOMA BACILLUS, Beddard.
8–13. ISCHNOSOMA BACILLOIDES, Beddard.

PLATE VII.

PLATE VII.

Figs. 1–5. ANUROPUS BRANCHIATUS.

Fig. 1. Dorsal view.

Fig. 2. Lateral view.

Fig. 3. Front view of head and anterior thoracic segments, to display antennary appendages.

Fig. 4. Ventral view of head and anterior thoracic segments.

Fig. 5. One of the abdominal limbs.

Figs. 6–12. CYMODOCEA ABYSSORUM.

Fig. 6. Male, from above.

Fig. 7. Female, from above.

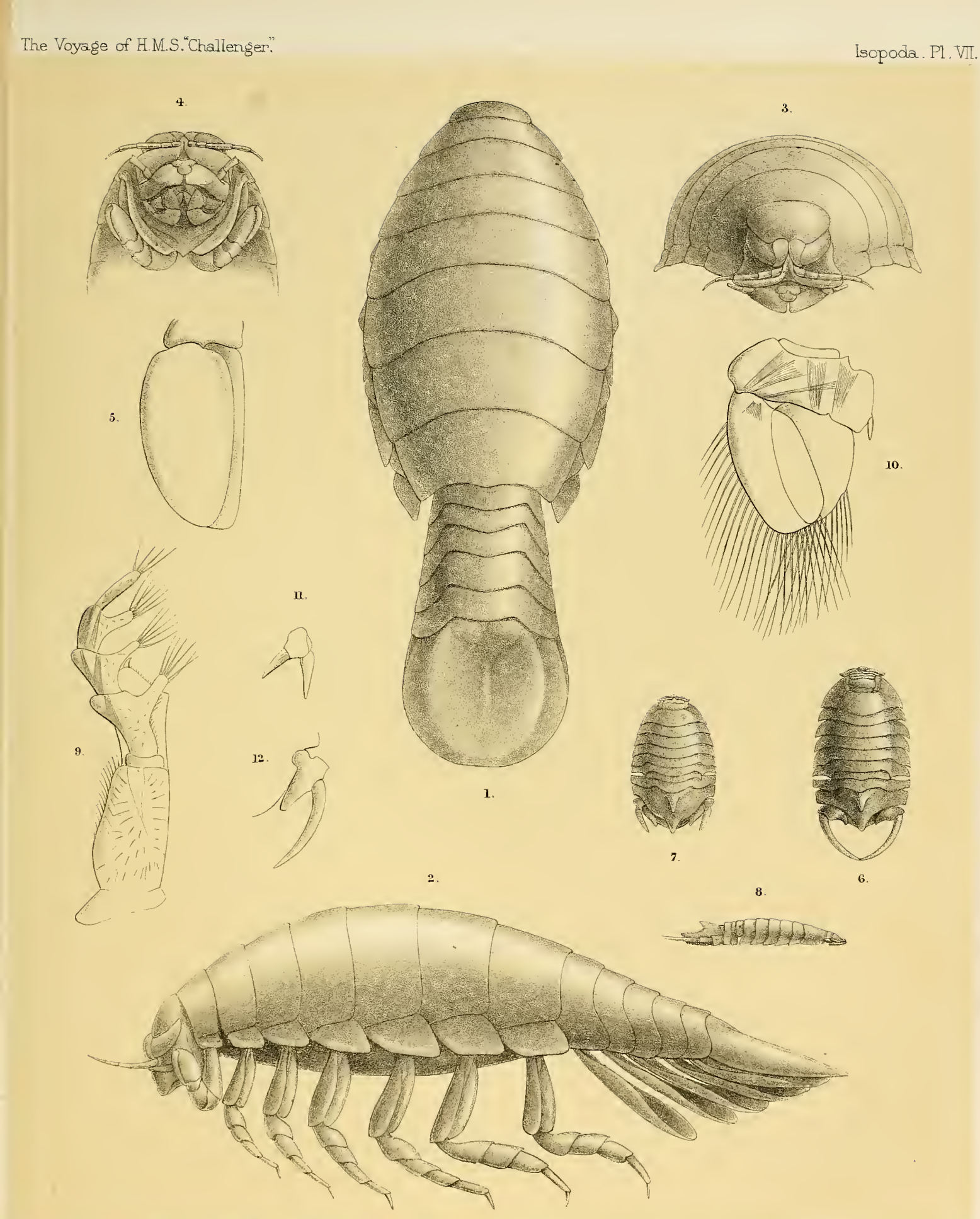
Fig. 8. Male, lateral view.

Fig. 9. One of the maxillipedes.

Fig. 10. One of the abdominal appendages of the second pair.

Fig. 11. Uropod of female.

Fig. 12. Uropod of male.



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1—5. ANUROPUS BRANCHIATUS, Beddard.

6—12. CYMODOCEA ABYSSORUM, Beddard.

PLATE VIII.

PLATE VIII.

Figs. 1–5. Acanthocope acutispina.

Fig. 1. Dorsal view.

Fig. 2. Abdominal shield.

Fig. 3. Uropod.

Fig. 4. One of the spiniform epimera.

Fig. 5. Antennule.

Figs. 6–12. Acanthocope spinicauda.

Fig. 6. Dorsal view.

Fig. 7. Portion of antennule.

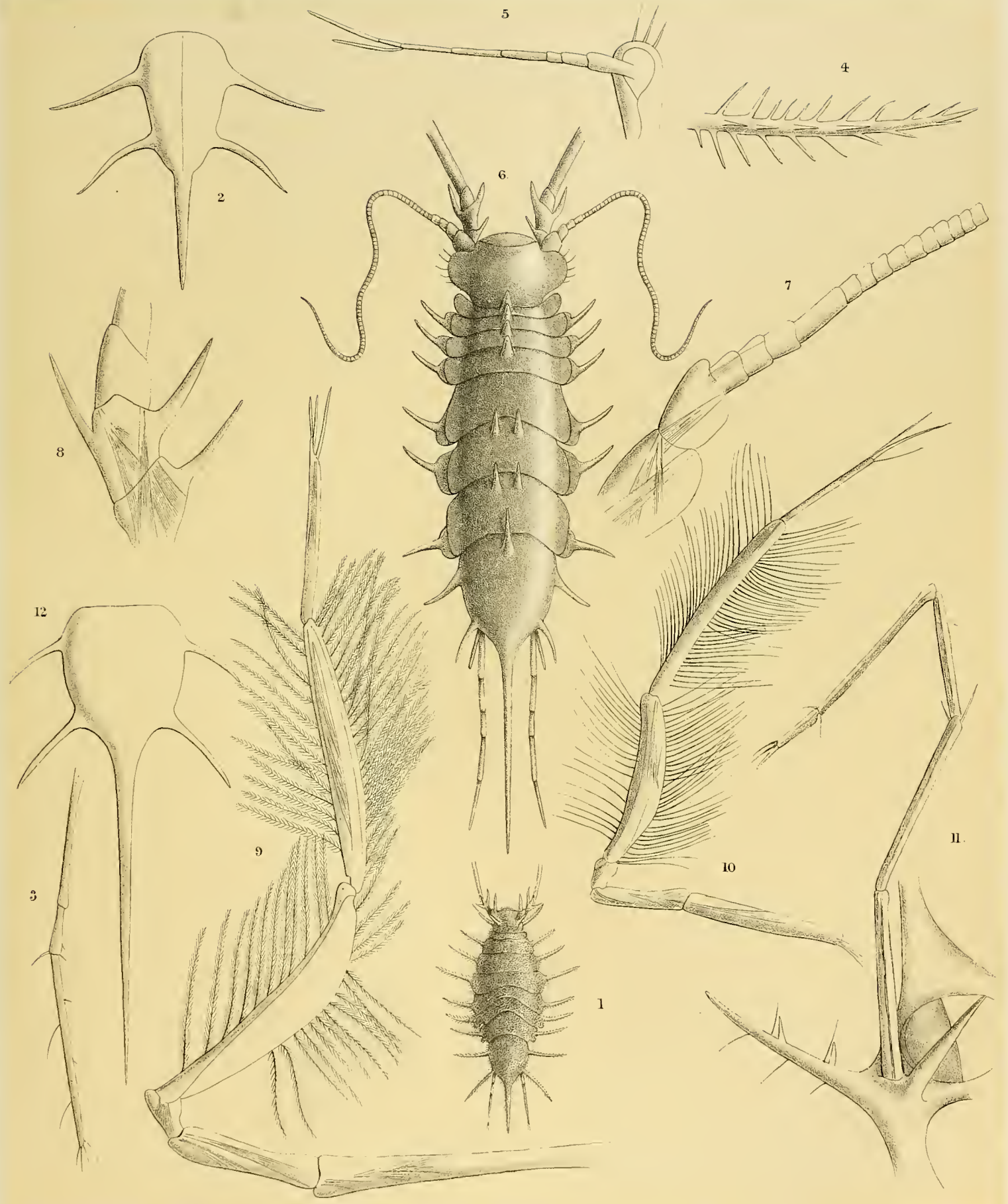
Fig. 8. Basal joints of antenna.

Fig. 9. One of the posterior pairs of thoracic limbs.

Fig. 10. One of the following pair of thoracic limbs; more highly magnified.

Fig. 11. Termination of abdominal shield, with uropod.

Fig. 12. Abdominal shield.



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1—5. ACANTHOCOPE ACUTISPINA, Beddard. 6—12. ACANTHOCOPE SPINICAUDA, Beddard.

PLATE IX.

PLATE IX.

Figs. 1–7. Eurycope novæ-zelandiæ.

Fig. 1. Female, dorsal surface.

Fig. 2. Young of this species or of *Eurycope fragilis*.

Fig. 3. Mandible.

Fig. 4. Extremity of mandible; more highly magnified.

Fig. 5. One of the posterior thoracic appendages.

Figs. 6, 7. Dorsal and ventral aspect of first pair of abdominal appendages of male.

Figs. 8–12. Eurycope fragilis.

Fig. 8. Female, dorsal view.

Fig. 9. Antennule.

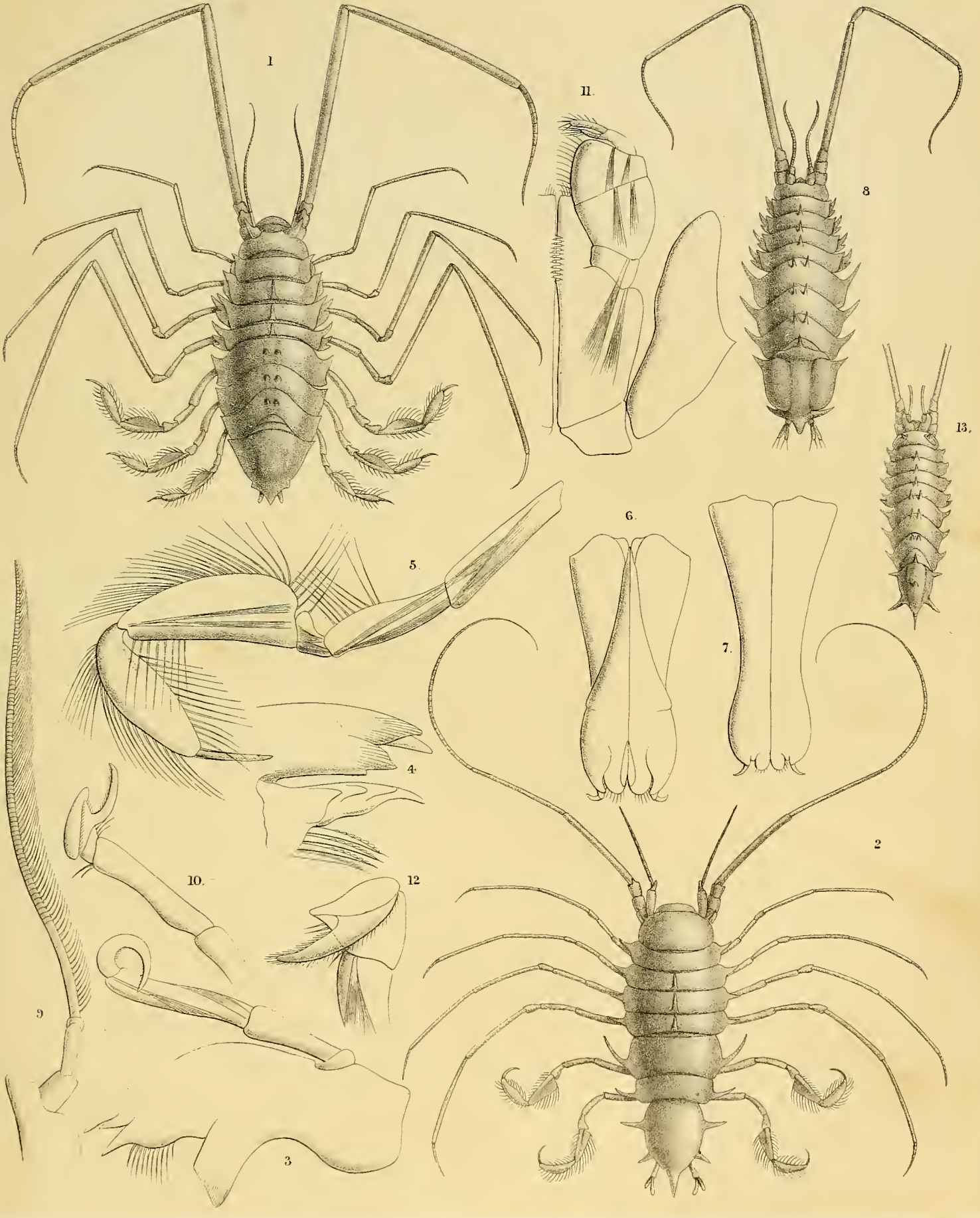
Fig. 10. Palp of mandible.

Fig. 11. Maxillipede.

Fig. 12. Distal joints of mandibular palp; more highly magnified.

Fig. 13. Eurycope atlantica.

Fig. 13. Dorsal view of the animal.



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1—7. EURYCOPE NOVÆ ZELANDIÆ, Beddard. 8—12 EURYCOPE FRAGILIS, Beddard.
13. EURYCOPE ATLANTICA, Beddard.

PLATE X.

PLATE X.

Figs. 1–4. MUNNOPSIS LATIFRONS.

Fig. 1. Female, dorsal aspect.

Fig. 2. Antennæ.

Fig. 3. One of the first pair of thoracic appendages.

Fig. 4. Uropod.

Fig. 5. EURYCOPE INTERMEDIA.

Fig. 5. Dorsal aspect.

Figs. 6, 7. EURYCOPE SPINOSA.

Fig. 6. Dorsal aspect.

Fig. 7. Lateral aspect.

Figs. 8–12. ANCEUS TUBERCULOSUS.

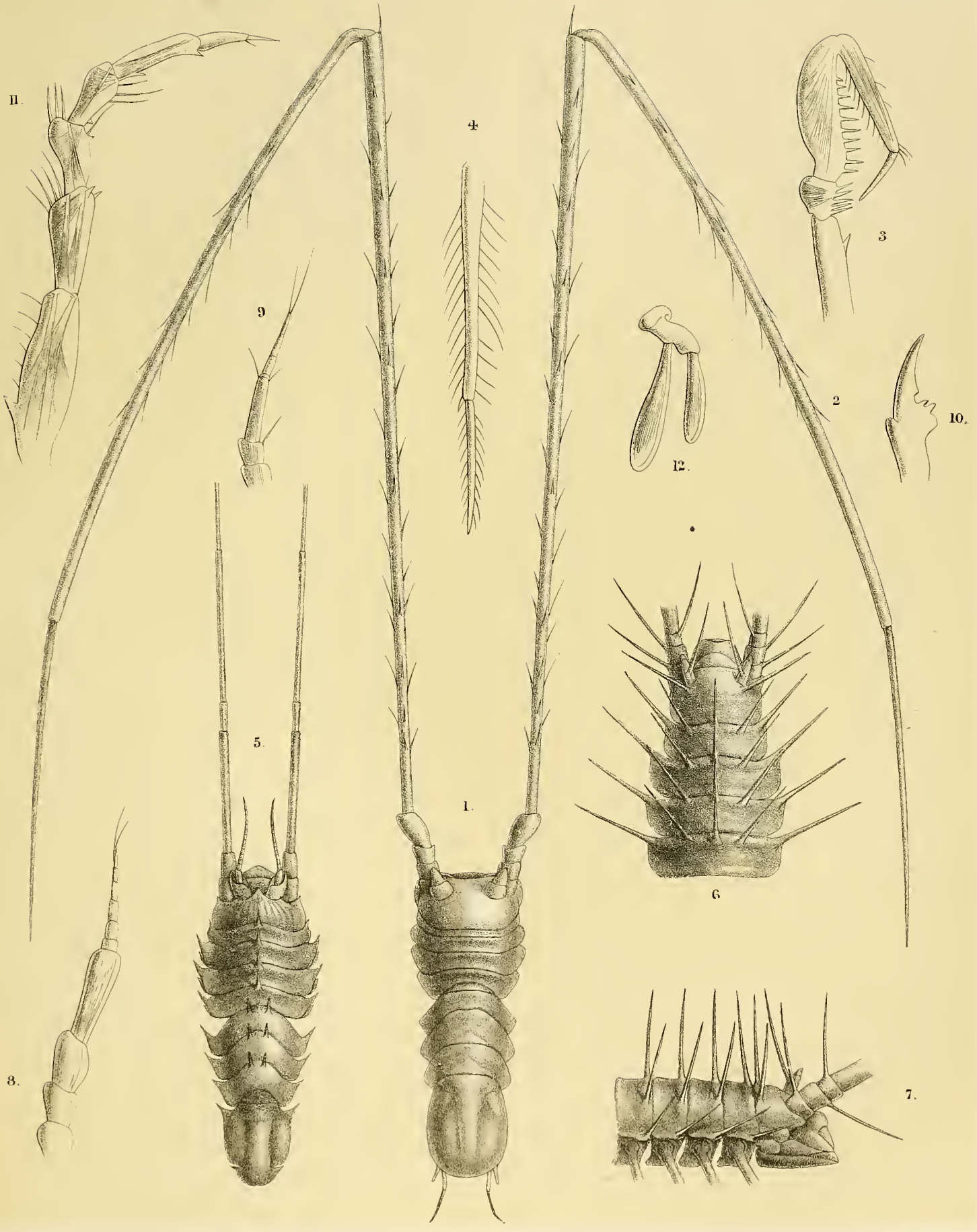
Fig. 8. Antenna.

Fig. 9. Antennule.

Fig. 10. Mandible.

Fig. 11. One of the thoracic limbs.

Fig. 12. One of the abdominal limbs.



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1–4. MUNNOPSIS LATIFRONS, Beddard. 5. EURYCOPE INTERMEDIA, Beddard.

6–7. EURYCOPE SPINOSA, Beddard. 8–12. ANCEUS TUBERCULOSUS Beddard.

PLATE XI.

PLATE XI.

Figs. 1–12. Eurycope sarsii.

Fig. 1. Female, dorsal aspect.

Fig. 2. Female, lateral aspect.

Fig. 3. Mandible.

Fig. 4. One of the first pair of maxillæ.

Fig. 5. One of the second pair of maxillæ.

Fig. 6. Maxillipede.

Fig. 7. Inner margin of maxillipede; more highly magnified.

Figs. 8–10. Sensory (?) organs along inner edge of maxillipede; very highly magnified

Fig. 11. Lower lip.

Fig. 12. Upper lip.

(Figs. 3–12 are from drawings by the late Dr. v. Willemoes-Suhm.)

Fig. 13. Pleurogonium minutum.

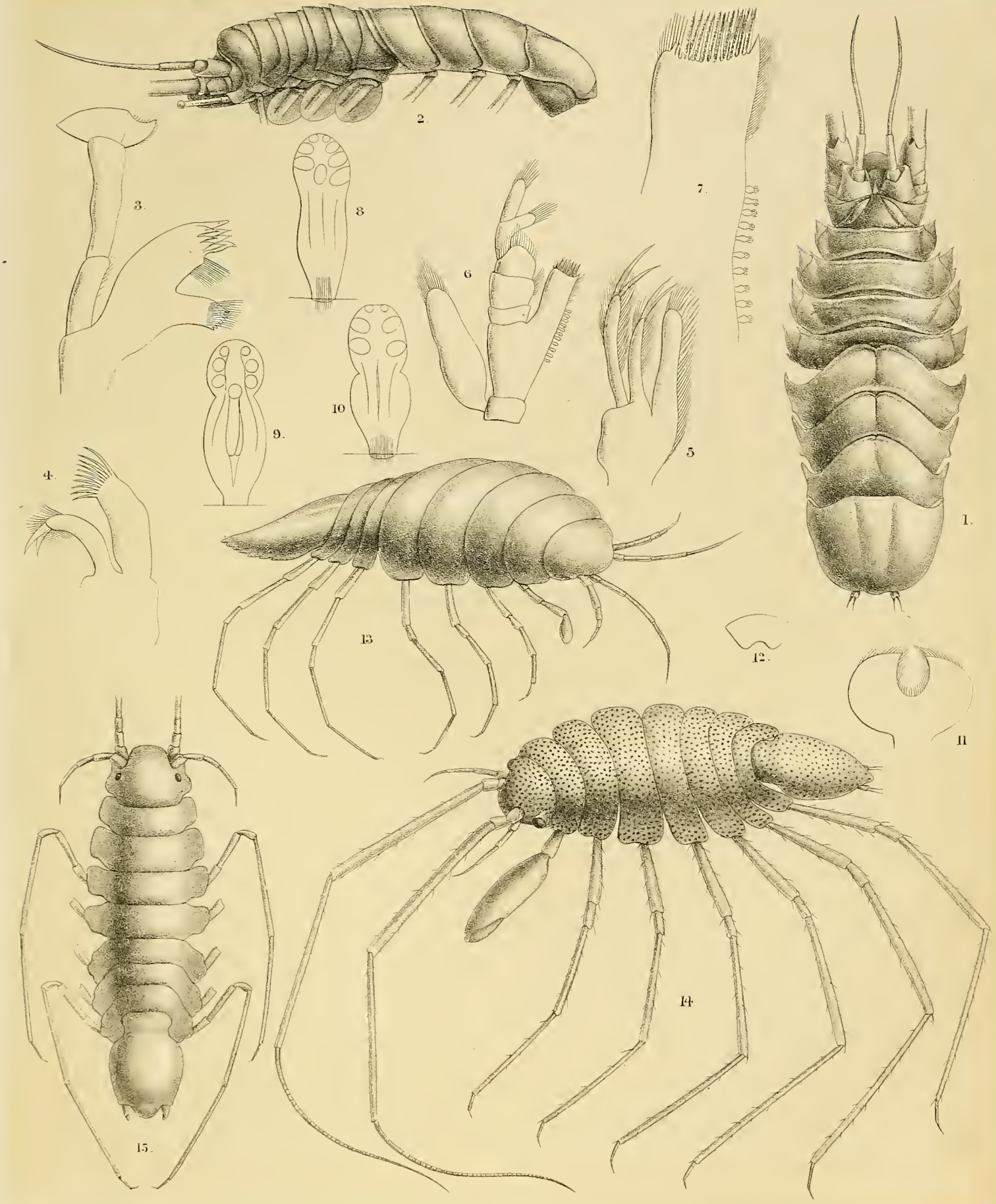
Fig. 13. View from above and partly from the left side.

Fig. 14. Munna maculata.

Fig. 14. View from above and partly from the left side.

Fig. 15. Munna pallida.

Fig. 15. Dorsal aspect.



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1–12. EURYCOPE SARSII, Beddard. 13. PLEUROGONIUM MINUTUM, Beddard.
14. MUNNA MACULATA, Beddard 15. MUNNA PALLIDA, Beddard.

PLATE XII.

PLATE XII.

Fig. 1. Leiopus leptodactylus.

Fig. 1. Mandible.

Figs. 2–6. Ilyarachna quadrispinosa.

Fig. 2. Female, dorsal aspect.

Fig. 3. Antennule.

Fig. 4. Terminal region of abdomen.

Fig. 5. Uropod.

Fig. 6. One of the posterior thoracic appendages.

Figs. 7–14. Acanthomunna proteus.

Fig. 7. Male, dorsal aspect.

Figs. 8, 8*b*. Branched spines covering the body.

Fig. 9. Antennule.

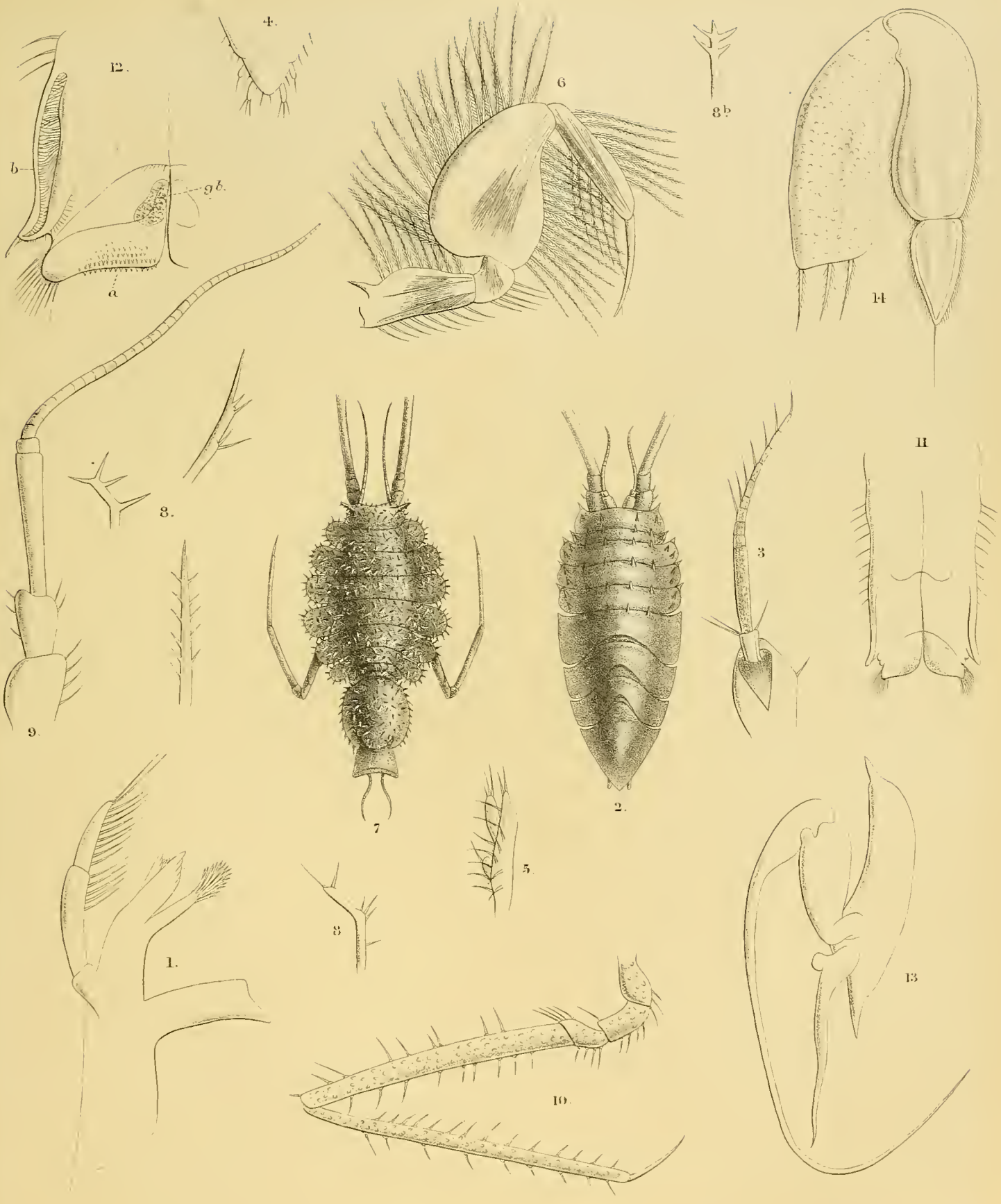
Fig. 10. One of the thoracic limbs.

Fig. 11. One of the first pair of abdominal appendages.

Fig. 12. Distal region of same appendages; more highly magnified. *a*, sensory (?) processes; *gl*, ganglionic mass; *b*, sensory hairs.

Fig. 13. One of the second pair of abdominal appendages, with penial filament.

Fig. 14. One of the third pair of abdominal appendages.



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1. LEIOPUS LEPTODACTYLUS, Beddard. 2—6. ILYARACHNA QUADRISPINOSA, Beddard.
7—14. ACANTHOMUNNA PROTEUS, Beddard

PLATE XIII.

PLATE XIII.

Munnopsis australis.

Fig. 1. Female, dorsal aspect.

Fig. 2. Antennule.

Fig. 3. Antenna, the distal extremity broken.

Fig. 4. Distal joints of first thoracic limb.

Fig. 5. Second thoracic limb.

Fig. 6. Terminal joints of same appendage; more highly magnified.

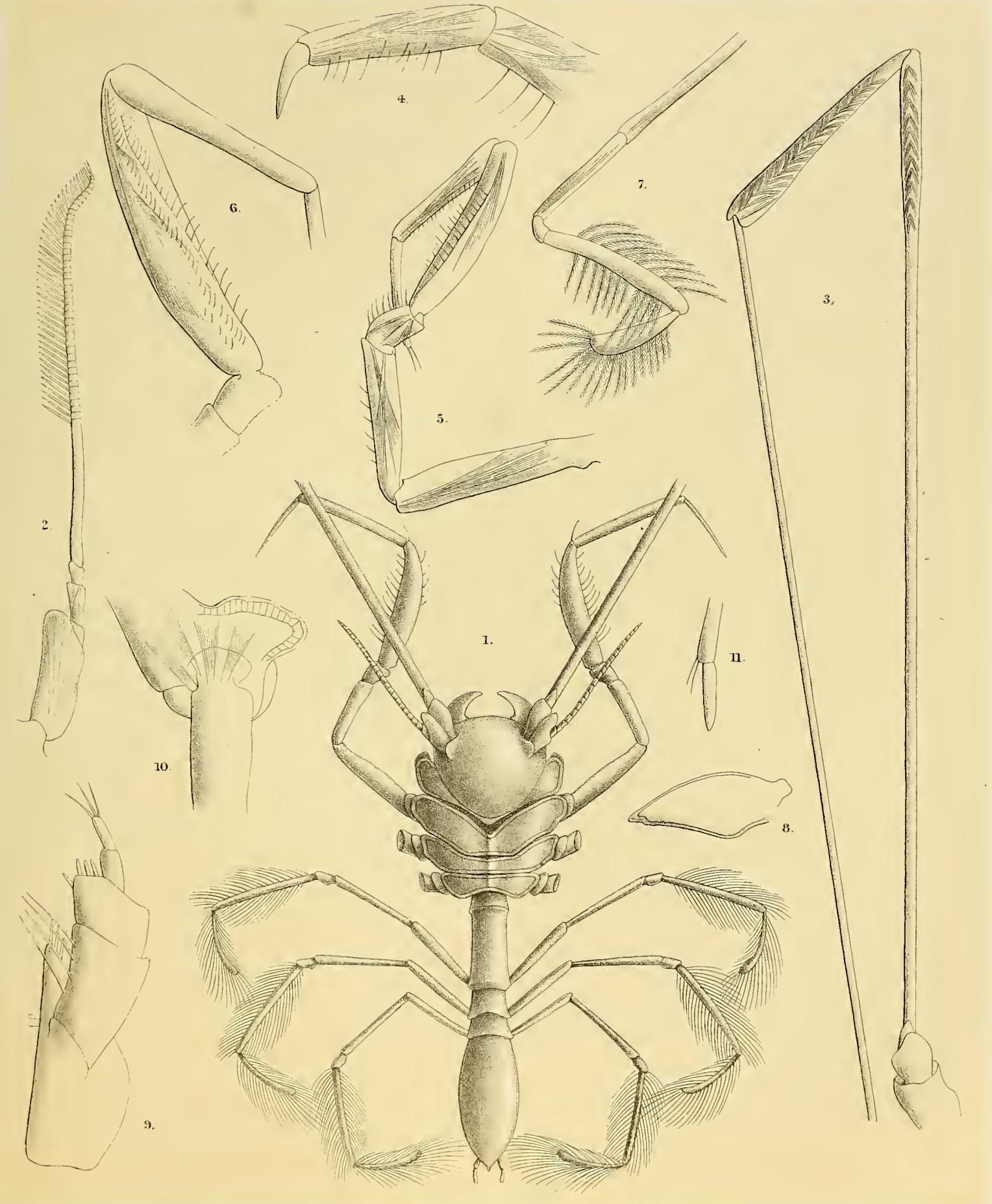
Fig. 7. Fifth thoracic limb.

Fig. 8. Mandible.

Fig. 9. Maxillipede.

Fig. 10. Point of attachment of one of the thoracic limbs with ovigerous lamella (?).

Fig. 11. Uropod.



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MUNNOPSIS AUSTRALIS, Beddard.

PLATE XIV.

PLATE XIV.

Figs. 1–4. Eurycope pellucida.

Fig. 1. Male, lateral view.

Fig. 2. Palp of maxillipede.

Fig. 3. Peduncle and part of flagellum of antennule.

Fig. 4. Portion of flagellum; more highly magnified.

Figs. 5–8. Eurycope abyssicola.

Fig. 5. Female, lateral view.

Fig. 6. Distal joints of fifth thoracic limb.

Fig. 7. One of the first pair of thoracic appendages.

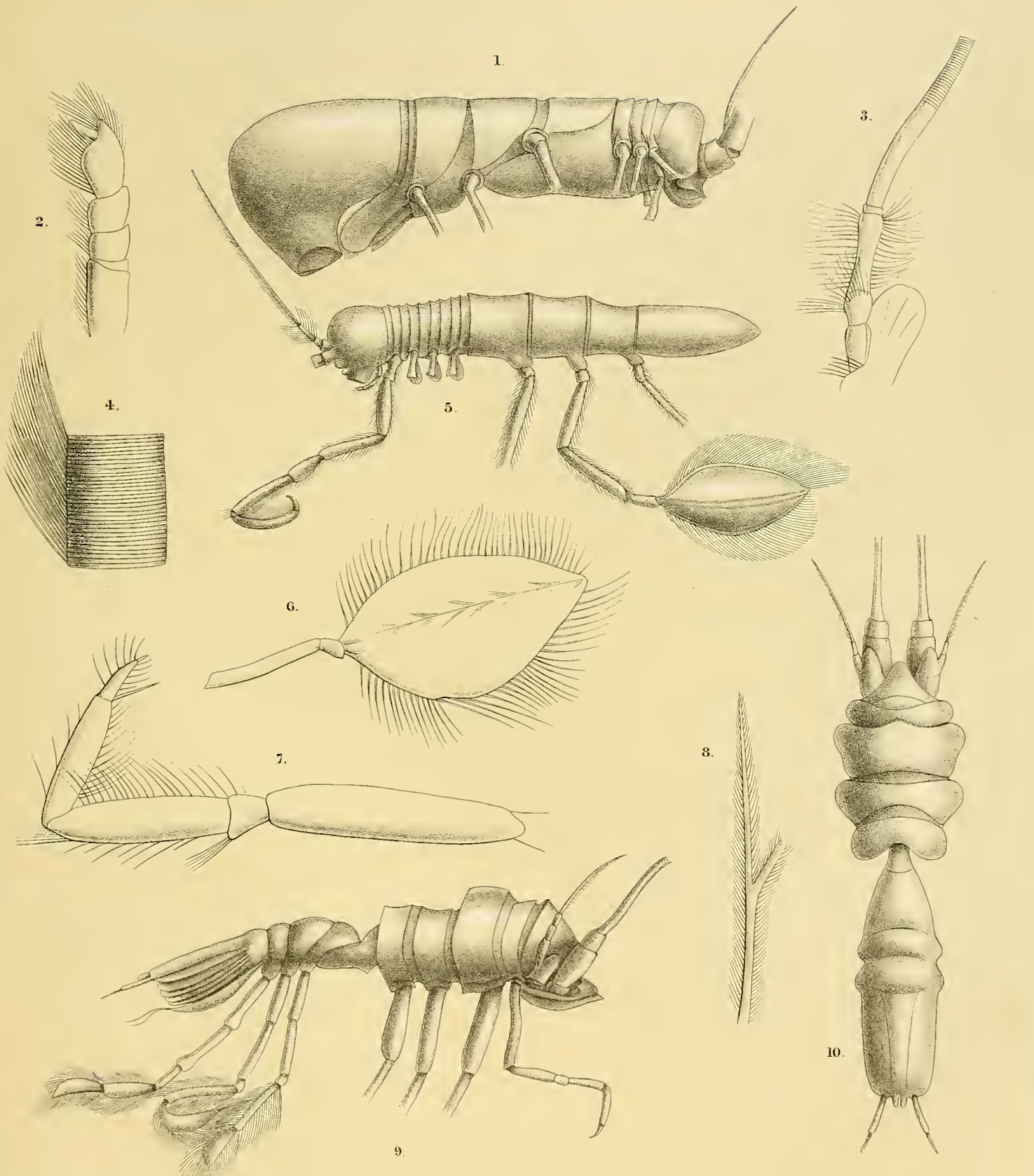
Fig. 8. Distal region of antenna.

Figs. 9, 10. Munnopsis gracilis.

Fig. 9. Lateral aspect.

Fig. 10. Dorsal aspect.

(Figs. 1, 2, 5, 8, 9, 10, from drawings by the late Dr. v. Willemoes-Suhm.)



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1—4. EURYCOPE PELLUCIDA, Beddard. 5—8. EURYCOPE ABYSSICOLA, Beddard.
9.10. MUNNOPSIS GRACILIS, Beddard.

PLATE XV.

PLATE XV.

Figs. 1–3. Apseudes antarctica.

Fig. 1. Dorsal aspect.

Fig. 2. Antenna.

Fig. 3. One of the third pair of thoracic appendages.

Fig. 3*a*. Forceps of the first pair of thoracic appendages.

Fig. 4. Typhlapseudes nereus.

Fig. 4. Dorsal aspect.

Figs. 5–12. Leiopus leptodactylus.

Fig. 5. Dorsal aspect.

Fig. 6. Antennule.

Fig. 7. One of the first pair of maxillæ.

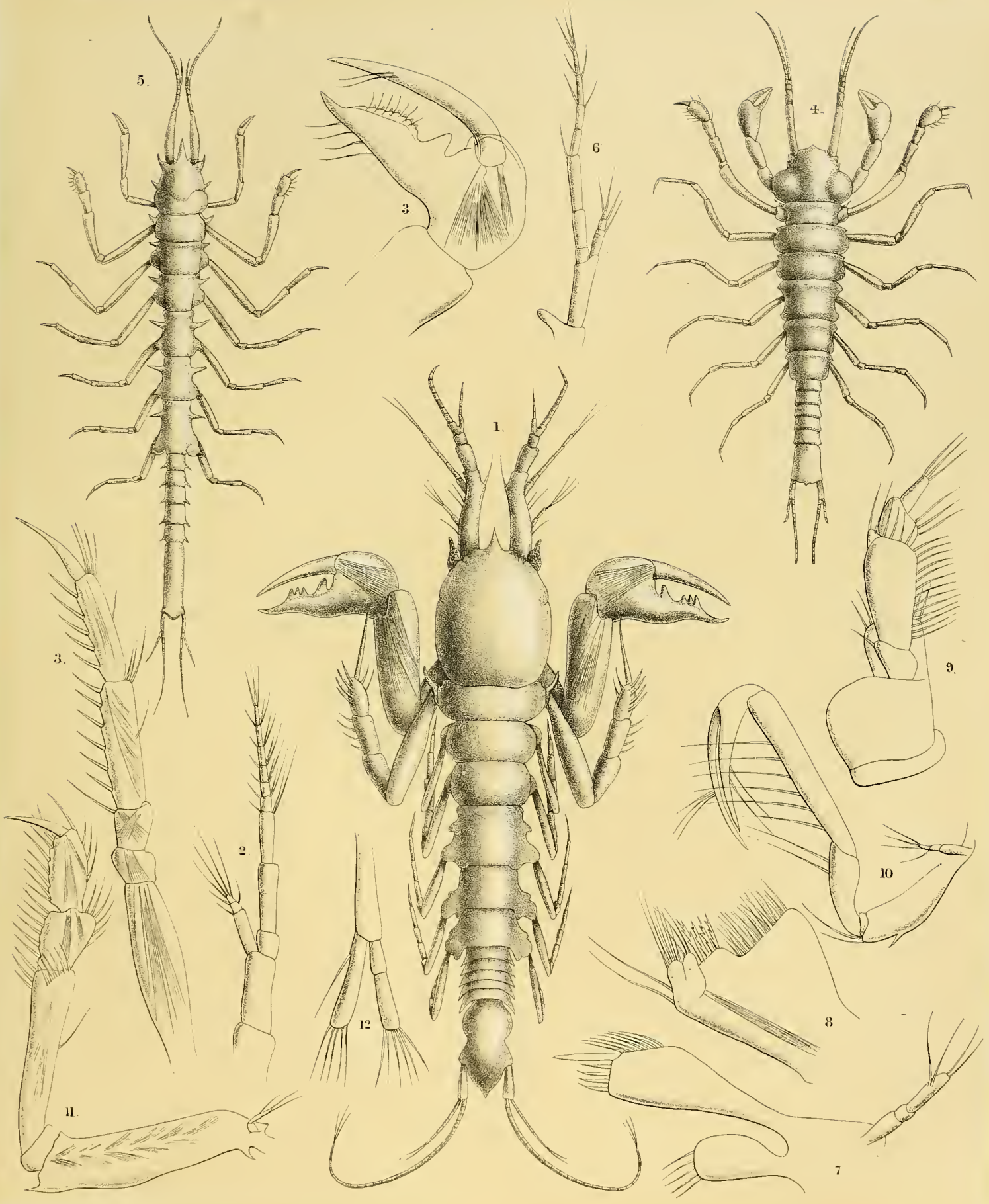
Fig. 8. One of the second pair of maxillæ.

Fig. 9. Maxillipede.

Fig. 10. Chelipede.

Fig. 11. One of the fossorial limbs.

Fig. 12. One of the abdominal limbs.



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1–3. APSEUDES ANTARCTICA, Beddard. 4. TYPHLAPSEUDES NEREUS, Beddard.
5–12. LEIOPUS LEPTODACTYLUS, Beddard.

PLATE XVI.

PLATE XVI.

Figs. 1–3. Typhlotanais kerguelenensis.

Fig. 1. Lateral aspect.

Fig. 2. Antennules and cephalic segments, from above.

Fig. 3. Chelipede.

Figs. 4–6. Neotanais americanus.

Fig. 4. Male, dorsal aspect.

Fig. 5. Antennule.

Fig. 6. Antenna.

Fig. 7. Typhlotanais brachyurus.

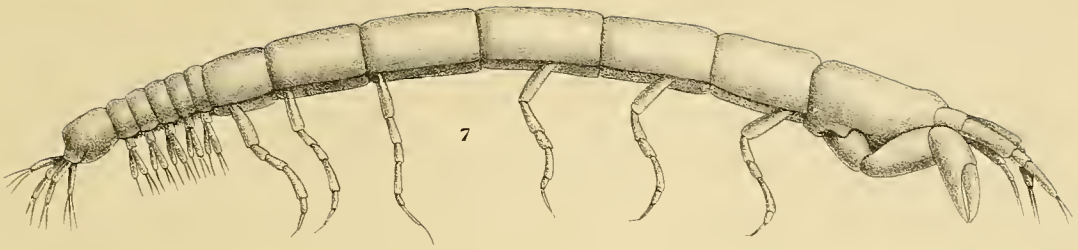
Fig. 7. Lateral aspect.

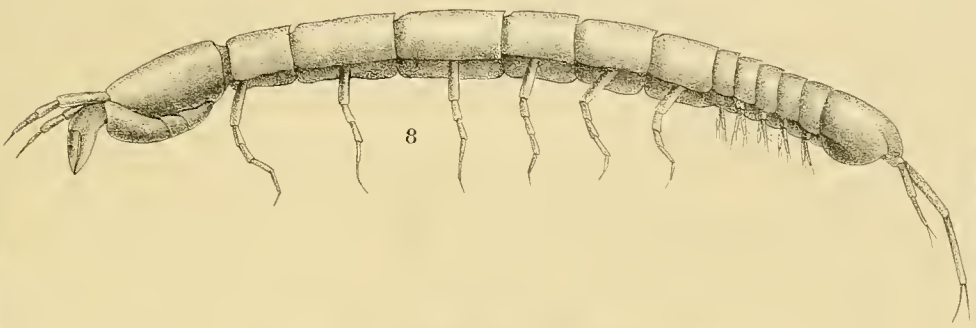
Fig. 8. Leptognathia australis.

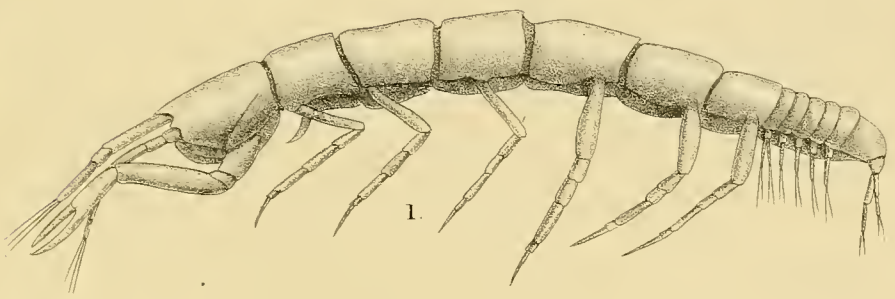
Fig. 8. Lateral aspect.

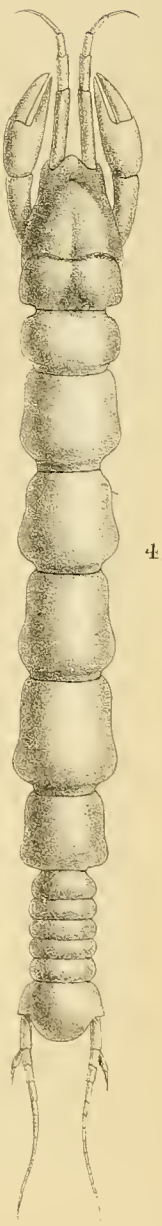
Fig. 9. Tanais hirsutus.

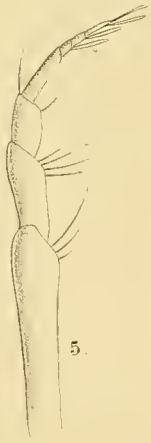
Fig. 9. Dorsal aspect.

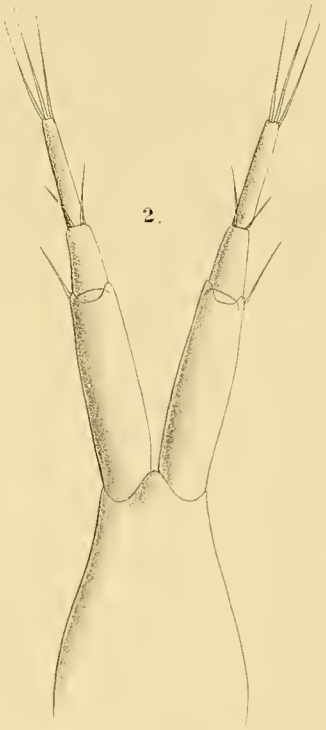












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1-3 TYPHLOTANAIS KERGUELENENSIS, Beddard. 4-6. NEOTANAIS AMERICANUS, Beddard. 7 TYPHLOTANAIS BRACHYURUS, Bedd
8. LEPTOGNATHIA AUSTRALIS, Beddard. 9. TANAIS HIRSUTUS, Beddard.

PLATE XVII.

PLATE XVII.

Fig. 1–8. Paratanais dimorphus.

Fig. 1. Male, dorsal aspect.

Fig. 2. Female, lateral aspect.

Fig. 3. Chelipede of male.

Fig. 4. Chelipede in position of rest.

Fig. 5. Cephalic segment of male, showing antennules and antenna

Fig. 6. Maxillipedes.

Fig. 7. Uropod.

Fig. 8. One of the abdominal appendages.

Figs. 9–14. Bathytanais bathybrotes.

Fig. 9. Male, seen from above and also from the side.

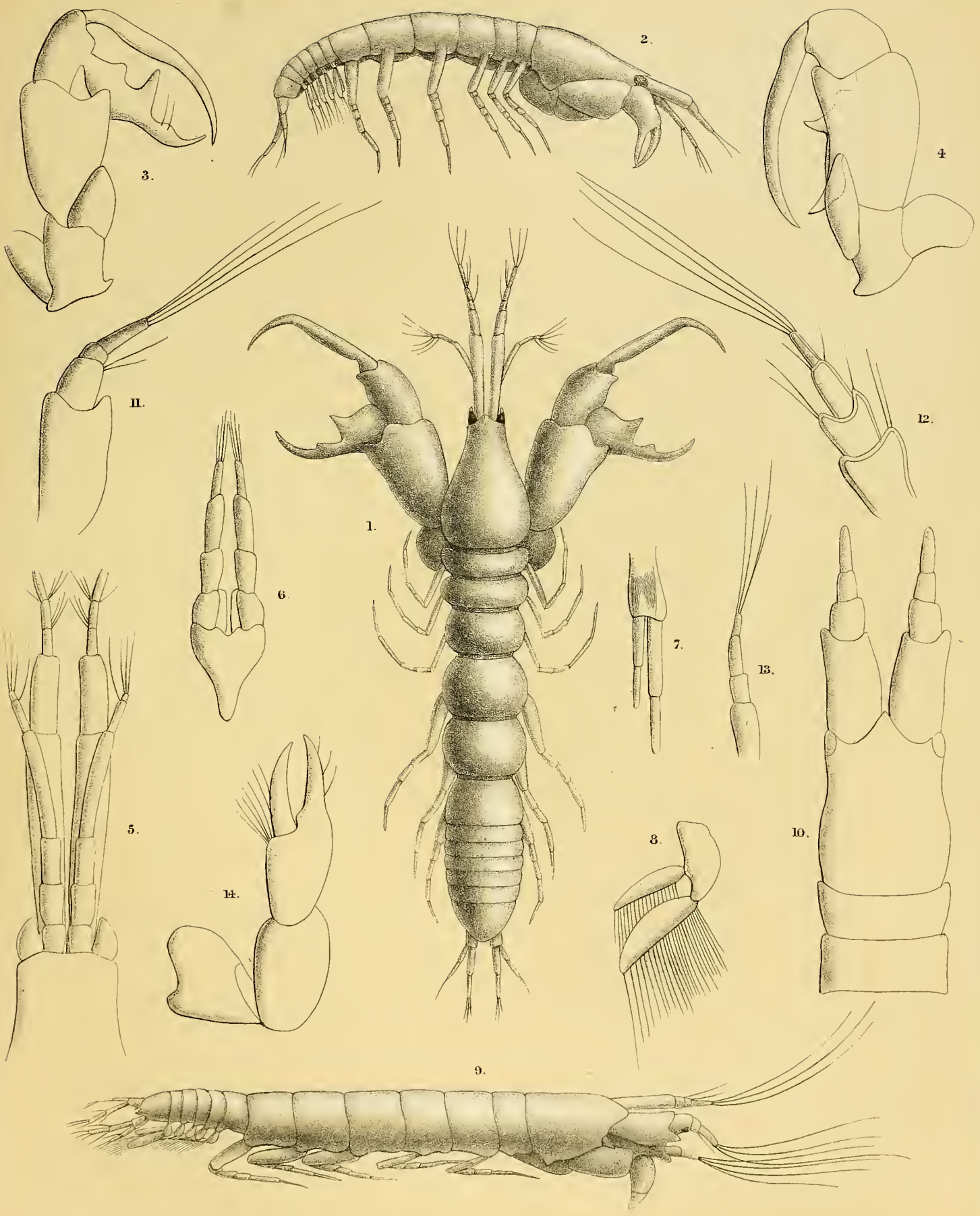
Fig. 10. Cephalic segments with antennules.

Fig. 11. Antennules.

Fig. 12. Antenna.

Fig. 13. Antenna, dorsal aspect.

Fig. 14. Chelipede.



Mintern Bros. lith.

1—8. PARATANAIS DIMORPHUS, Beddard.

9—14. BATHYTANAIS BATHYBROTES, Beddard.

PLATE XVIII.

PLATE XVIII.

Figs. 1–7. Anceus bathybius.

Fig. 1. Unique fragment, dorsal aspect.

Fig. 2. Cephalic region, from below.

Fig. 3. Maxillipede.

Fig. 4. Sensory processes of maxillipede; more highly magnified.

Fig. 5. First thoracic appendage.

Fig. 6. One of the anterior pairs of thoracic limbs.

Fig. 7. One of the posterior pairs of thoracic limbs.

Figs. 8–10. Anceus gigas.

Fig. 8. Male, dorsal aspect.

Fig. 9. Female, dorsal aspect.

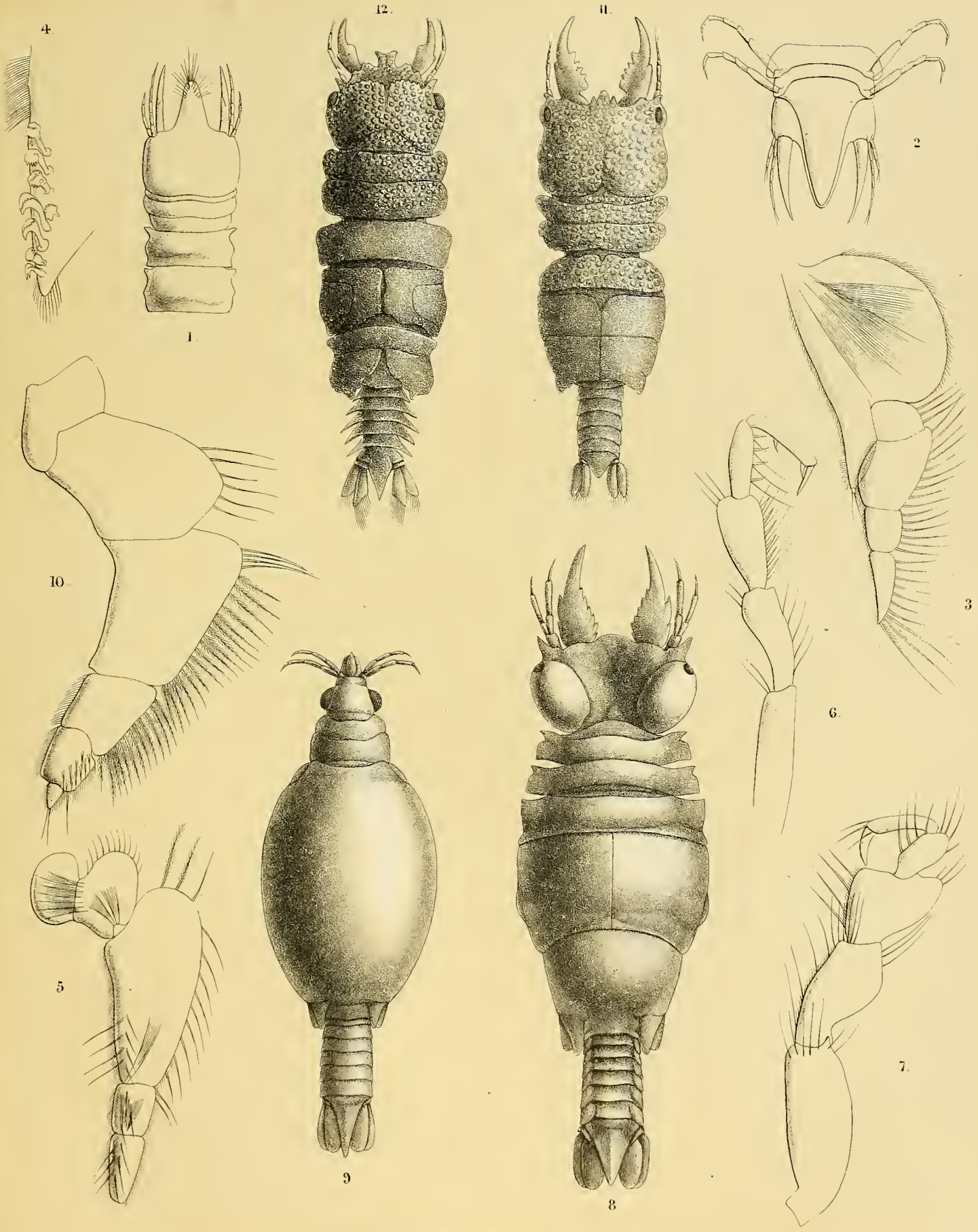
Fig. 10. First thoracic appendage of male.

Fig. 11. Anceus latidens.

Fig. 11. Dorsal aspect.

Fig. 12. Anceus tuberculosus.

Fig. 12. Dorsal aspect.



Mintern Bros. lith.

1—7. ANCEUS BATHYBIUS, Beddard.
11. ANCEUS LATIDENS, Beddard.
8—10. ANCEUS GIGAS, Beddard
12. ANCEUS TUBERCULOSUS, Beddard.

PLATE XIX.

PLATE XIX.

Figs. 1–5. ARCTURUS ANNA.

Fig. 1. Female, dorsal aspect.

Fig. 2. Female, lateral aspect.

Fig. 3. One of the anterior thoracic appendages.

Fig. 4. One of the posterior thoracic appendages.

Fig. 5. Basal joints of antenna.

Figs. 6–12. ARCTURUS CORNUTUS.

Fig. 6. Female, dorsal aspect.

Fig. 7. Female, lateral aspect.

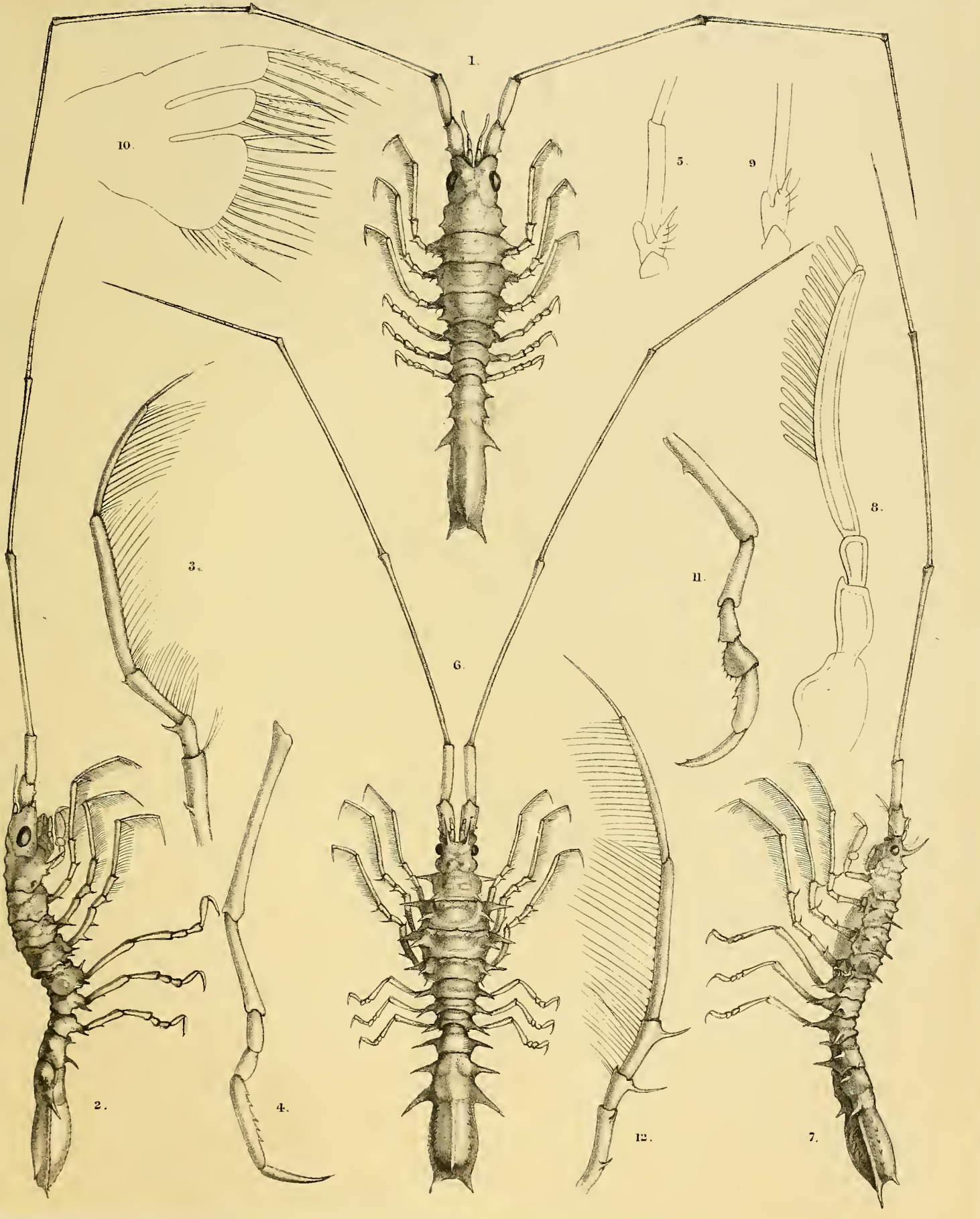
Fig. 8. Antennule.

Fig. 9. Basal joints of antenna.

Fig. 10. One of the second pair of maxillæ.

Fig. 11. One of the posterior thoracic appendages.

Fig. 12. One of the anterior thoracic appendages.



P. Smit del et lith.

Mintern Bros imp

1–5. ARCTURUS ANNA, Beddard.

6–12. ARCTURUS CORNUTUS, Beddard.

PLATE XX.

PLATE XX.

Figs. 1–11. Arcturus spinosus.

Fig. 1. Male, dorsal aspect.

Fig. 2. Male, lateral aspect.

Fig. 3. Female, dorsal aspect.

Fig. 4. Female, lateral aspect.

Fig. 5. One of the posterior thoracic limbs of female.

Fig. 6. One of the posterior thoracic limbs of male.

Fig. 7. One of the anterior thoracic appendages of female.

Fig. 8. One of the anterior thoracic appendages of male.

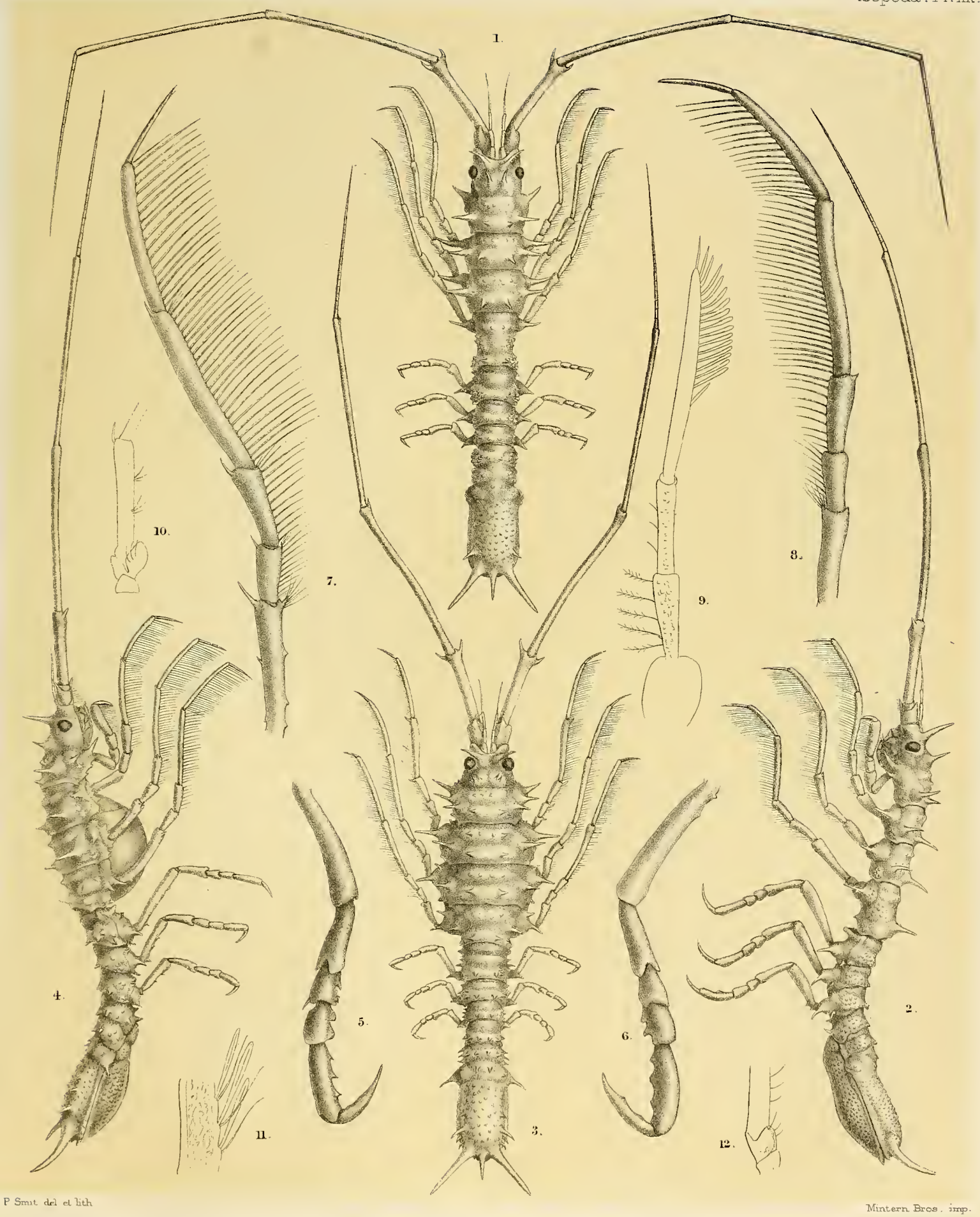
Fig. 9. Antennule.

Fig. 10. Basal joints of antenna.

Fig. 11. Portion of flagellum of antennule; more highly magnified.

Fig. 12. Arcturus baffini.

Fig. 12. Basal joints of antenna.



P Smit del et lith

Mintern Bros. imp.

1–11. ARCTURUS SPINOSUS, Beddard. 12. ARCTURUS BAFFINI, Sabine.

PLATE XXI.

PLATE XXI.

Figs. 1–4. ARCTURUS GLACIALIS.

Fig. 1. Female, dorsal aspect.

Fig. 2. Female, lateral aspect.

Fig. 3. One of the anterior thoracic limbs.

Fig. 4. One of the posterior thoracic limbs.

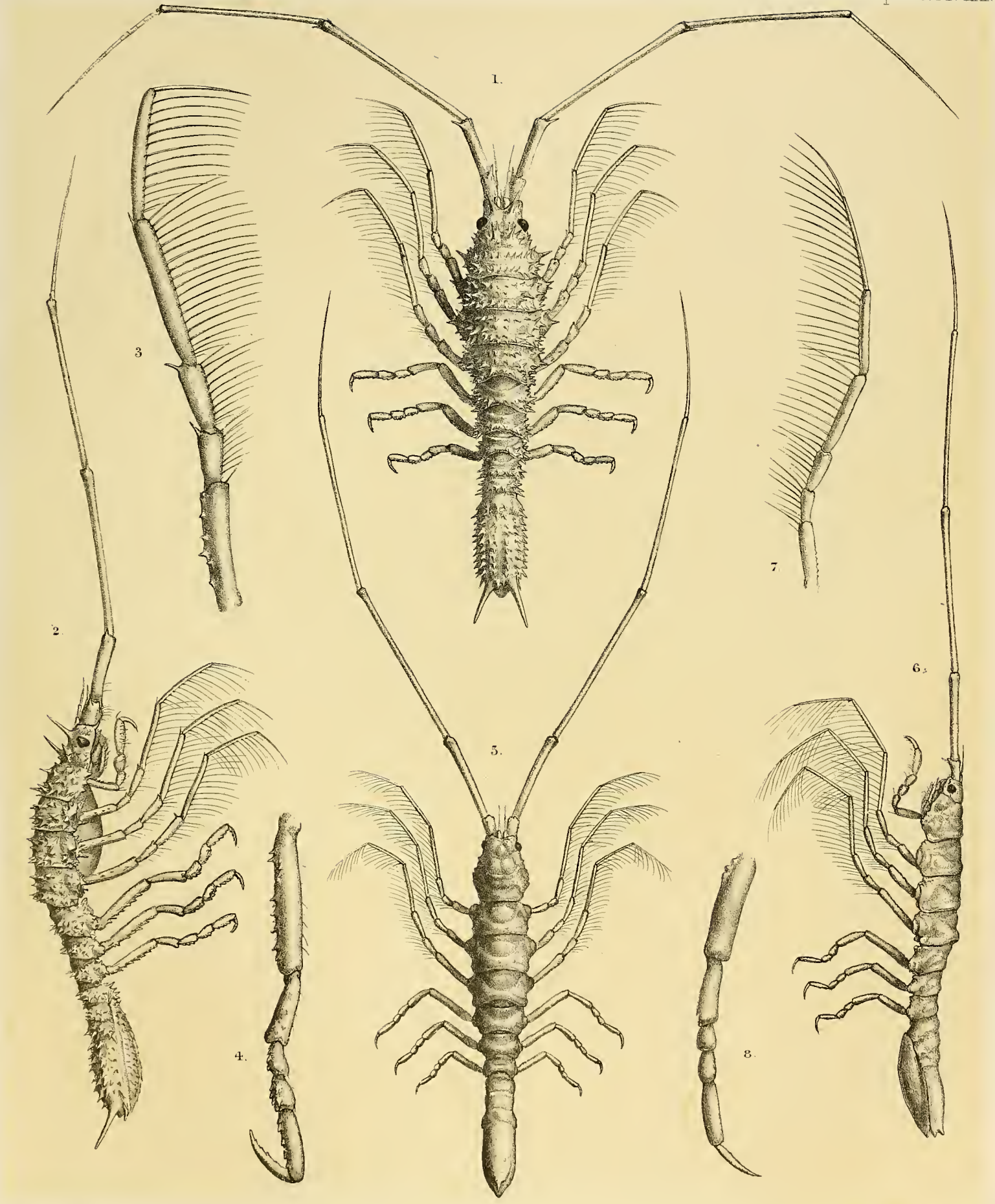
Figs. 5–8. ARCTURUS ABYSSICOLA.

Fig. 5. Male, dorsal aspect.

Fig. 6. Male, lateral aspect.

Fig. 7. One of the anterior thoracic appendages.

Fig. 8. One of the posterior thoracic appendages.



P. Smit del et lith.

Mintern Bros. imp.

1—4. ARCTURUS GLACIALIS, Beddard.

5—8. ARCTURUS ABYSSICOLA, Beddard.

PLATE XXII.

PLATE XXII.

Figs. 1–4. Arcturus brunneus.

Fig. 1. Female, dorsal aspect.

Fig. 2. Female, lateral aspect.

Fig. 3. One of the anterior thoracic appendages.

Fig. 4. One of the posterior thoracic appendages.

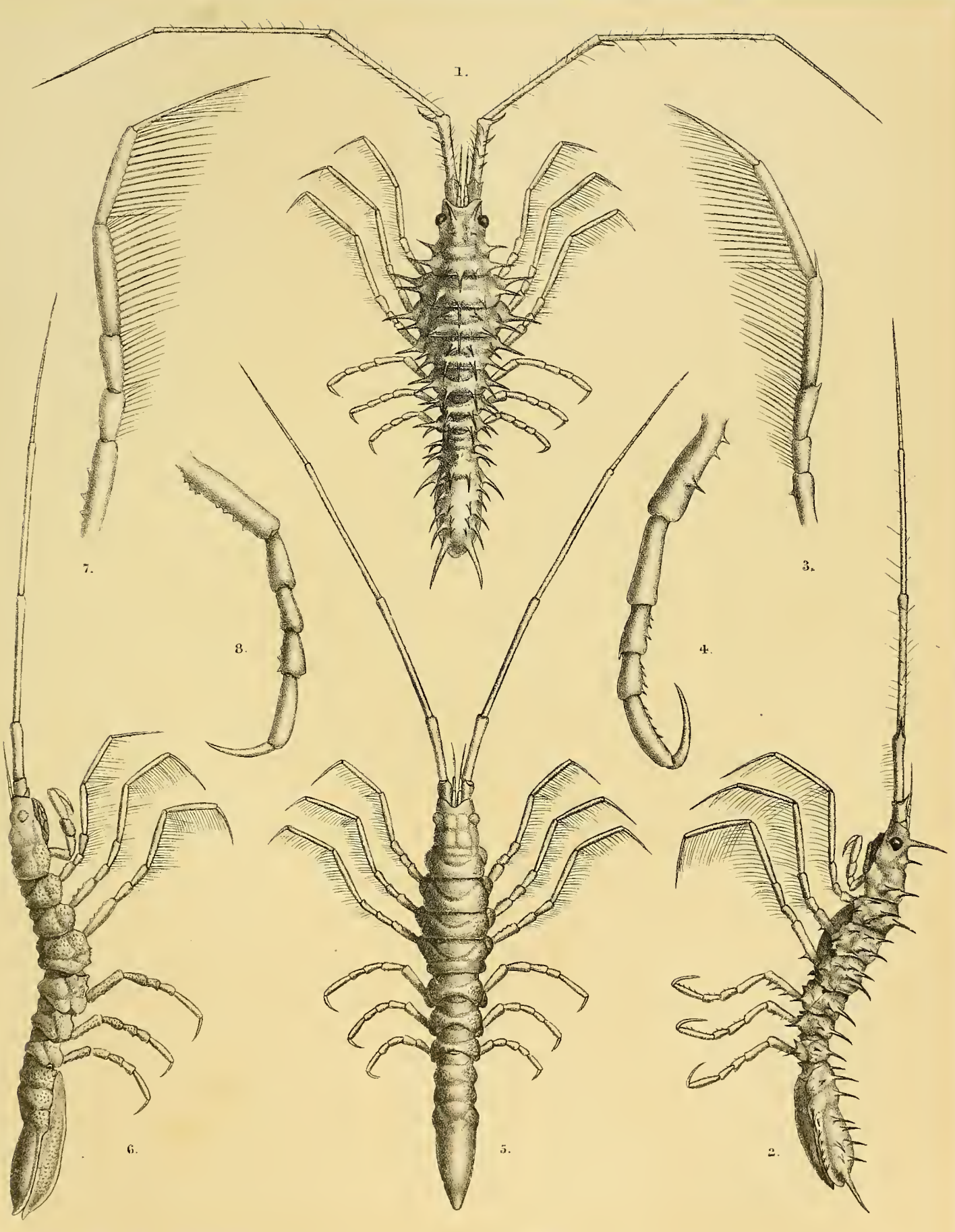
Figs. 5–8. Arcturus myops.

Fig. 5. Male, dorsal aspect.

Fig. 6. Male, lateral aspect.

Fig. 7. One of the anterior thoracic appendages.

Fig. 8. One of the posterior thoracic appendages.



P. Smit del et lith.

Miltern Bros. imp.

1–4. ARCTURUS BRUNNEUS, Beddard.

5–8. ARCTURUS MYOPS, Beddard.

PLATE XXIII.

PLATE XXIII.

Figs. 1–4. Arcturus studeri.

Fig. 1. Male, dorsal aspect.

Fig. 2. Male, lateral aspect.

Fig. 3. One of the anterior thoracic appendages.

Fig. 4. One of the posterior thoracic appendages.

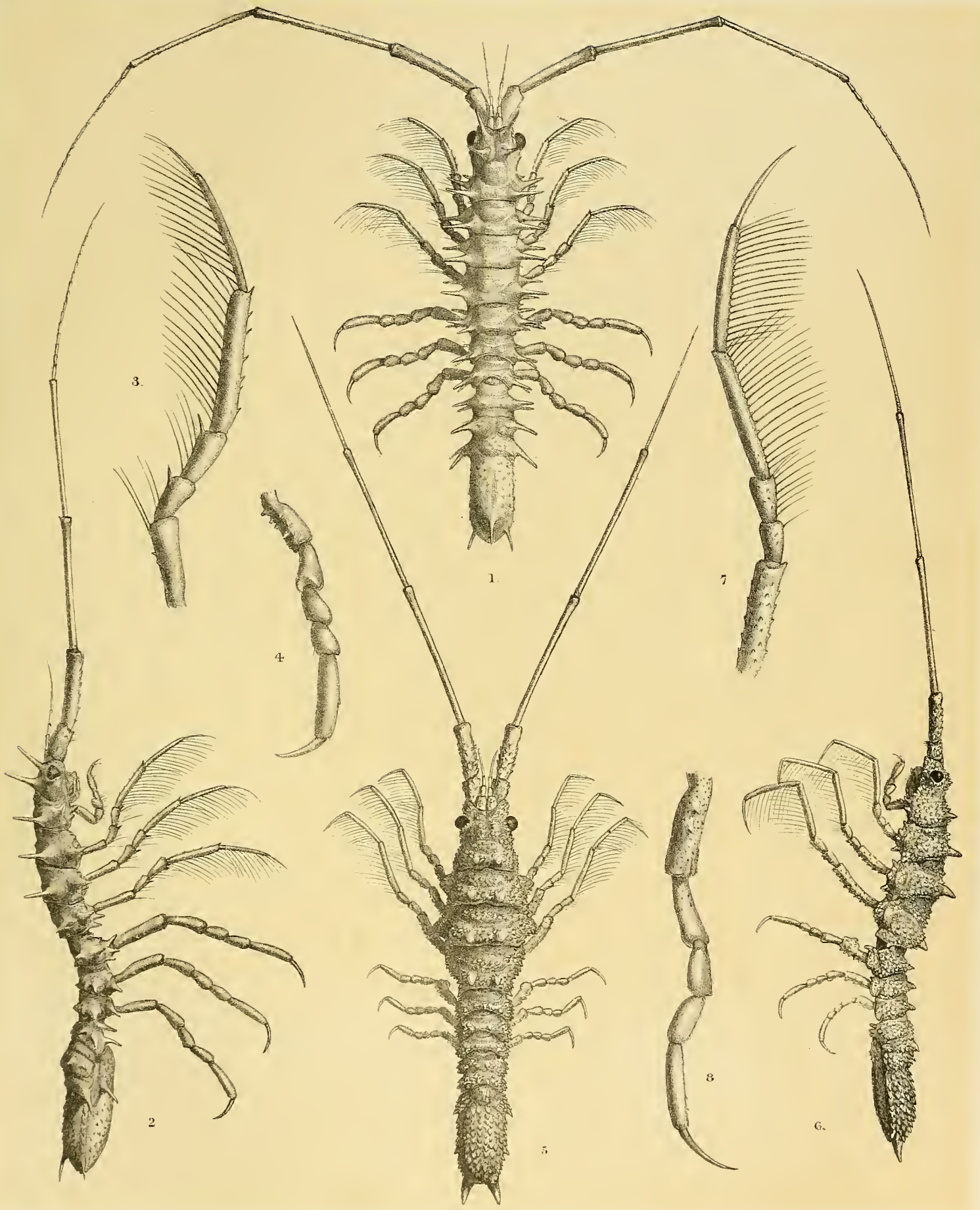
Figs. 5–8. Arcturus americanus.

Fig. 5. Dorsal view.

Fig. 6. Lateral view.

Fig. 7. One of the anterior thoracic appendages.

Fig. 8. One of the posterior thoracic appendages.



P. Smit del et lith.

Mintern Bros imp.

1–4. ARCTURUS STUDERI, Beddard

5–8. ARCTURUS AMERICANUS, Beddard.

PLATE XXIV.

PLATE XXIV.

Figs. 1–4. Arcturus stebbingi.

Fig. 1. Dorsal aspect.

Fig. 2. Lateral aspect.

Fig. 3. One of the anterior thoracic appendages.

Fig. 4. One of the posterior thoracic appendages.

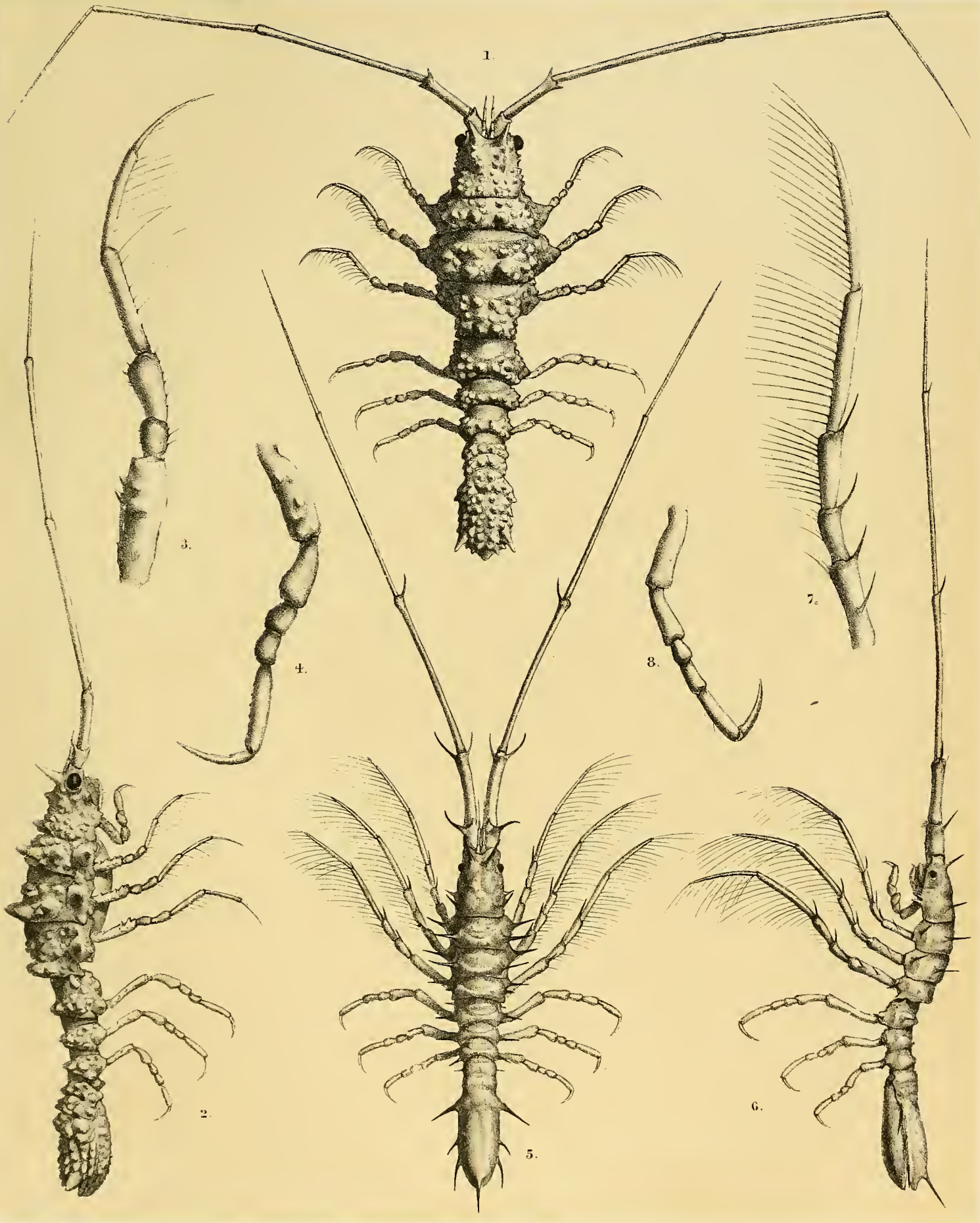
Figs. 5–8. Arcturus purpureus.

Fig. 5. Dorsal aspect.

Fig. 6. Lateral aspect.

Fig. 7. One of the anterior thoracic limbs.

Fig. 8. One of the posterior thoracic limbs.



P. Smit. del. et lith.

Mintern Bros. imp.

1–4 ARCTURUS STEBBINGI, Beddard.

5–8 ARCTURUS PURPUREUS, Beddard.

PLATE XXV.

PLATE XXV.

Figs. 1–4. Arcturus oculatus.

Fig. 1. Female, lateral aspect.

Fig. 2. Antennule.

Fig. 3. Stalked eye and antenna.

Fig. 4. Portion of one of the joints of antenna.

Fig. 5. Astacilla marionensis.

Fig. 5. Lateral aspect.

Figs. 6, 7. Arcturus furcatus.

Fig. 6. Head and proximal joints of antenna.

Fig. 7. Head and proximal joints of antenna, ventral aspect.

Fig. 8. Arcturus myops.

Fig. 8. Antenna.

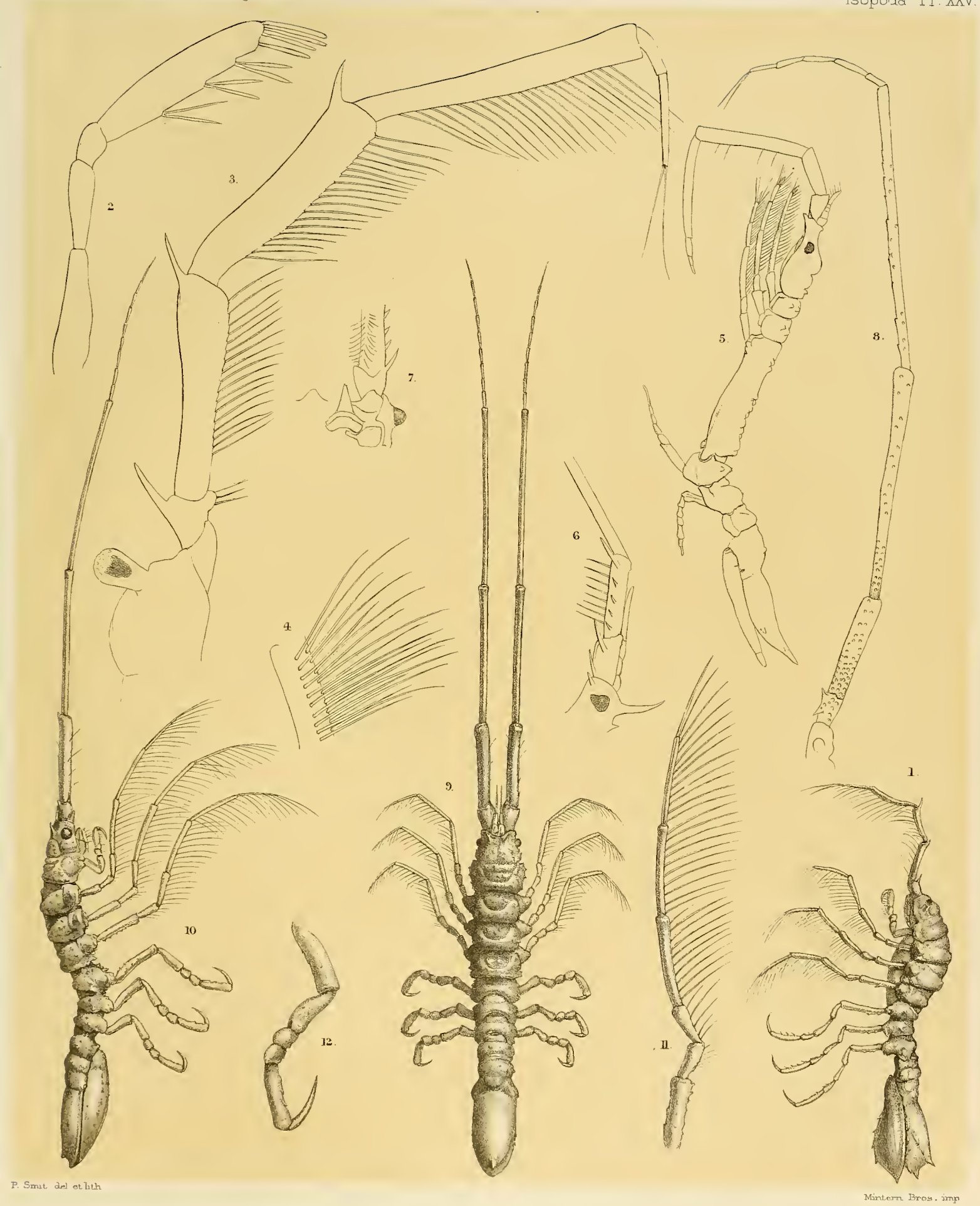
Figs. 9–12. Arcturus spinifrons.

Fig. 9. Dorsal aspect.

Fig. 10. Lateral aspect.

Fig. 11. One of the anterior thoracic limbs.

Fig. 12. One of the posterior thoracic limbs.



P. Smit del et lith.

Mintern Bros. imp.

1–4. ARCTURUS OCULATUS, Beddard. 5. ASTACILLA MARIONENSIS, Beddard. 6–7 ARCTURUS FURCATUS, Studer.
8 ARCTURUS MYOPS, Beddard. 9–12. ARCTURUS SPINIFRONS, Beddard.


TRACK OF
H.M.S.CHALLENGER
Dec^r. 1872 to May 1876.
Shewing the Dredging and Trawling Stations
Serolidæ + Arcturidæ. ○ Anopsidæ.
△ Tanaidæ & Apsendidæ. □ Idotheidæ.
A divided figure indicates that several species were found at the locality, the number being indicated by the parts into which the figure is divided.
Halifax
New York
Bermuda
Azores
Lisbon
Gibraltar
Madeira
Canary Is.
Cape Verde Is.
St Paul
Fernando Noronha
Abrolhos
Bahia
Rio de Janeiro
Montevideo
Valparaiso
Monte Video
Strait of Magellan
Falkland Is.
Kerguelen I.
Heard I.
Crozet I.
St Edwards
Hong Kong
Manilla
Sandwich I.
New Hebrides
Fiji Is.
Tongatabu
Kermadec Is.
Sydney
Melbourne
New Zealand
Juan Fernandez
Valparaiso
Engraved by Kelly & Sons

Bermuda