

## APPENDIX, No. IV.

- i.—Schizopodous Crustacea from the North-East Atlantic Slope, by  
E. W. L. HOLT and W. M. TATTERSALL, B.Sc.
- ii.—Note on a Genus of Euphausiid Crustacea, by W. T. CALMAN, D.Sc.

## i.—SCHIZOPODOUS CRUSTACEA FROM THE NORTH-EAST ATLANTIC SLOPE.

BY

E. W. L. HOLT AND W. M. TATTERSALL, B.Sc.

## PLATES XV. TO XXV.

## INTRODUCTORY.

We intend by the above title no dissent from the views of Hansen, 1893, and Calman, 1904, of the taxonomic position of the forms which, previous to the pronouncements of these authorities, had been regarded as forming a natural group. The old term has its convenience, not only for brevity of title, but because it goes near to expressing, for the higher crustacea, a bionomic unit, which needs only the Sergestids and certain amphipods to complete it.

Our material consists of collections made (1) by the *Oceana* (Mr. George Murray and Mr. V. H. Blackman) in November, 1898, in deep water west of the southern part of Ireland, at depths reaching to nearly 1,800 fathoms; (2) by Dr. G. H. Fowler in H.M.S. *Research* in July, 1900, off the north part of the Bay of Biscay at depths reaching 2,341 fathoms; (3) by the Department's fishery cruiser *Helga* along the west coast of Ireland at depths between 50 and 1,000 fathoms, at all seasons of the year, but chiefly in the summer months; (4) by the fishing boat *Monica* on and about the mackerel grounds outside the Bofin archipelago, Counties Galway and Mayo, in spring, summer, and autumn since 1900.

The *Monica's* operations barely touch the crest of the slope, which we take as commencing, for the purposes of these notes, at the fifty fathom line, and we shall only notice so much of her catch as consists of organisms obviously belonging rather to the slope than to the littoral area, or as much to each.

The fishing implements by which the various collections were made were of diverse order. The *Oceana* and *Research*, being interested solely in Plankton, never touched bottom with their nets. The former used ordinary open tow-nets, fished horizontally at known depths (as far as such may be with certainty computed) and hauled, still fishing, to the surface. The *Research* used a vertical net, opened and closed by messengers at known depths, and for surface work horizontal open nets. The *Helga* used a horizontal net, opened and closed by messengers, but it contributed nothing to our material. Her efficient nets were ordinary open tow-nets of various shapes and sizes, and, especially, nets and bags of fine material fastened to the "back" of a beam-trawl. These nets, if placed at the point where the swirl from the apex of the ground rope rises through the meshes of the "back," are certain traps for small bottom organisms which may lie in the path of the trawl. A moderate amount of sand in the net will indicate, in experiment, what seems to be the most



favourable position. Placed too far back, the nets get too much sand and often burst. With regard to the open tow-nets used by the *Helga*, it must be understood that in addition to fishing at the depth indicated in the record, the nets were also fishing during their descent and ascent. It does not, therefore, follow that the whole contents of a tow-net came from the depth to which the tow-net was lowered. Indeed, in May and August, 1904, when these open tow-nets were especially successful in their endeavours to capture the actively swimming Euphausians, there is evidence that a considerable portion of the catch was obtained during the ascent of the net. \*

The *Monica* used ordinary tow-nets, mostly fished while she was drifting to her mackerel nets, and a larger tow-net of strong mosquito gauze, towed under sail to and often beyond the bursting strain; but we must confess that our attempts to catch the large active Euphausians, known from the evidence of fish-stomachs to be abundant in the neighbourhood, have not met with much success under sail-power in shallow water.

We divide our notes into two parts, of which the first contains the descriptions of new genera and species and other systematic matter, while the second gives a full list of the species taken, with localities of capture, and a brief note of their distribution. Full particulars of the vertical distribution of the material taken by the *Oceana* and *Research* are, at the request of the collectors, reserved for publication in the Annals and Magazine of Natural History and the Transactions of the Linnaean Society respectively, other items of the collections having already been dealt with in those media.

A list of authorities quoted will be found at the end of our notes. We have not thought it necessary to burden the text with reference to original records of distribution when these have been sufficiently summarised in more general papers of later date.

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## PART I.

### SYSTEMATIC NOTES, WITH DIAGNOSES OF NEW GENERA AND SPECIES.

Everyone who has occasion to deal with material from a little explored district must encounter the same difficulty as ourselves. Existing genera will be found to have been framed to conveniently subdivide the species met with in areas already well observed, and the question will arise, in the tabulation of the results of the first searchings of virgin ground, whether it is better to expand old genera for the reception of new species, or to erect for them new genera. The answer must rest, we believe, on a reasonable appreciation of the finality of the results obtained; for if the exploration be considered to approximate to thoroughness, the expansion of genera to their fullest apparently natural capacity would seem to be an obvious duty. If, however, the region (using the term in its widest sense) has been only in the most imperfect fashion reconnoitred, the provisional expansion of a genus, with certainty of incessant future tinkering, may be deemed to amount to a crime.

In the case with which we have now to deal the majority of the species which we are compelled to inflict upon the list were obtained in a few hauls by fine-mesh nets on the back of a beam-trawl. It is a commonplace that deep-water organisms are largely cosmopolitan, certainly in so far as may concern their generic characters, though species may prove to maintain the horizontal limits of distribution which have been assigned to them. Consequently, if the use of a new method of collecting in the deep water of one particular geographical area, in a few hauls

\* The *Helga* gatherings from deep water in August and November, 1904, have not yet been completely worked out, but a few additions from them have been made to the records in this paper in press.



only, has resulted in the discovery of undescribed forms, it may be taken as certain that the extension of this method or the employment of improved apparatus on the same and on other parts of the sea-floor must inevitably result in the recognition of many other kindred organisms. For this reason, though most of our new material could be accommodated by modification of the existing genera of the Erythrops group, we have decided to abstain from meddling with the diagnoses of such genera. A genus, discarded, as ours inevitably must be, when something like a complete account of the fauna permits a re-arrangement of species, passes out of knowledge and injures nobody; or will, at least, cease to be harmful whenever the fashion of reviving deservedly forgotten names has run its due course.

#### TERMINOLOGY.

At the suggestion of Dr. Calman, to whom we are greatly indebted for assistance in the preparation of this part of our paper, we have discarded the term "maxillipede," and call the anterior thoracic appendage the "first thoracic limb" and its endopodite the "first leg," and so on. The anterior limbs are not, in the Euphausians and Mysids, at all sharply defined in structure from the succeeding, and the existence of a single maxillipede, when class-room memories of the cray-fish call for three, is a nuisance.

Sars in retaining the term "maxillipede" for one pair of appendages (1885), has followed Milne-Edwards in considering that pair as belonging to the cephalon rather than the thorax, but though in Amphipods and Isopods this appendage appears to be part of the "head," it is nevertheless morphologically thoracic.

#### PHYLOGENY.

In *Hypererythrops serriventer* and *Euchaetomera Fowleri* (see pp. 121, 124) the bases of the thoracic limbs bear a well-developed digitiform process (see Pl. XXIII., fig 8). This is clearly an epipodite, presumably a rudimentary gill, and, as Dr. Calman reminds us, furnishes additional evidence of the affinity of the *Mysidae* and *Lophogastridae*. In a less pronounced form an epipodite is present in other of the *Leptomysinae*, as may be seen from Sars' figure (Monog. Mysid. Pl. II., fig. 4) of the under side of an *Erythrops*, but no attention appears to have been hitherto directed to the fact.

Norman has divided into sub-families the genera of *Mysidae* which were known as British in 1892. In continuation we have very briefly defined such new sub-families as are required for the reception of new material.

DIVISION.—**EUCARIDA.**—Calman, 1904.

ORDER **EUPHAUSIACEA.**

FAM. **EUPHAUSIIDAE.**

SUB-FAM. nov. *EUPHAUSINAE.*

Eyes not or only slightly bilobate. None of the legs much longer than their immediate fellows, nor terminating in brushes or claws. Palps of maxillae simple.

GENUS **Euphausia**, Dana.

**Euphausia pellucida**, Dana (1852).

*Euphausia pellucida*, Sars.—1885.

*Thysanopoda bidentata*, Sars.—1882.

Representatives of the species found in the N.E. Atlantic seem to invariably have the pectinations of the antennular comb much more numerous than in the examples figured by Sars in his Challenger Monograph, while the preanal spine is very often simple, even in adults.



One of the *Research* specimens, measuring 26 mm. from tip of rostrum to the end of caudal fan, is the largest of which we have seen a record.

Several females (*Research*, July) were found carrying ova loose among the thoracic legs, which, with their setae, form a sort of basket. Calman (1904) surmises that the nursing period is very brief, and this is borne out by the number of ova and very early larvae, apparently belonging to this species, which we found in the *Research* collection.

*Locality and Distribution*, see p. 133.

### **Euphausia Lanei,\*** sp. n.

PLATE XXIV., Figs. 6-9.

It is necessary to refer a small *Euphausia* to a new species, apparently very closely allied to *E. splendens*, but, in so far as it is possible to institute comparisons between a single probably young specimen and a species described from adult examples, distinguishable by the following minor points.

*Body* generally slender, more so than in *E. pellucida* of same size. *Carapace*, with one lateral denticle, drawn out in front into a small obtuse rostrum, which only reaches one quarter the length of the eyes. The eye-lobes of the carapace are more pronounced and acute than in *E. splendens*. Posterior margin of carapace not so deeply emarginate as in *E. splendens*. *Eyes* as in *E. splendens*. *Antennular peduncle* longer and somewhat slenderer than in *E. splendens*. Basal joint the longest, equal in length to the other two, outer distal corner produced into an acute process which is absent (at least in adults) in *E. splendens*. Digitate leaflet absent. A fascicule of strong setae is present (see fig. 6), the setae more numerous than in *E. splendens*. The distal joint is produced dorsally between the flagella in a pointed process. *Antennal peduncle* much as in *E. splendens*. *Antennal scale* reaching just a little past the second joint of the antennular peduncle, and somewhat narrower than in *E. splendens*, less broadly truncate at tip, and terminated on its outer edge by a spine, which is much more pronounced than in *E. splendens*. Basal spine of scale small, less than one-third the length of scale. *Pleon* narrower than carapace, last segment once and two-thirds as long as preceding one. *Preanal* spine simple. *Telson* and *uropods* of same form and relative lengths as in *E. splendens*. Sub-apical spines of telson as in *E. splendens* and *E. similis*. Length, 10 mm.

*Locality*, see p. 134.

### GENUS **Thysanopoda**. M.—Ed.

#### **Thysanopoda acutifrons**, sp. n.

This form having come to hand after our notes had gone to press, we can only give a preliminary diagnosis, viz:—

All characters almost exactly as in *T. obtusifrons*, G. O. Sars, except—

*Rostrum* broadly triangular, its extremity acute, not extending beyond the eyes, its sides slightly inflated. *Telson* with four pairs of denticles in addition to the large subapical spines, the posterior being immediately above the subapical spines, the anterior about midway between the subapical spines and the origin of the telson. There is no trace of the parallel serrated ridges exhibited by *T. obtusifrons*. The apex of the telson is suddenly constricted and terminates in a slender spinous process. *Preanal spine* well developed and simple. *Colouration* variable; all specimens adorned with much red pigment, some with antennules, antennae, carapace, pleon and caudal fan more or less completely covered

\*D. H. Lane.



with olive-brown chromatophores. *Length* from 9 to 22 mm., the smallest specimen having the antennular peduncle imperfectly developed.

This is probably a small species in comparison with its congeners. It belongs to the section of the genus which is characterised by the absence of a spine on the side of the carapace. Ortmann (1893) considers that Sars overlooked the presence in *T. obtusifrons* of a small spine on the side of the carapace. *T. acutifrons* certainly has none. In the character of the preanal spine it agrees with the forms referred by Ortmann to *T. obtusifrons*.

Except in regard to the rostrum our species would seem to be very closely allied to *T. pectinata*, Ortmann, in so far as the characters of the latter have been defined.

*Locality*, see p. 134.

### GENUS **Nyctiphanes**, G. O. Sars, 1883.

From Sars' remarks in his preliminary notice of the Challenger Schizopoda, it is clear that he founded this genus upon *Nyctiphanes australis*, though he considered his definition wide enough to include the forms then known as *Thysanopoda norvegica* and *T. Couchi*. With the latter, even at the time of issue of the Challenger Report, he had obviously no acquaintance, since he expressed a doubt as to its distinctness from *N. norvegica*.

There is between *N. norvegica* and the two other species a constant difference which we consider to be of generic rank, and we have therefore referred the former to a new genus for which we propose the name *Meganyctiphanes*.

Taking Sars' diagnosis as a basis, the two genera may be easily recognised by the following characters.

### **Nyctiphanes**, G. O. Sars.

Sixth and seventh thoracic limbs in the female without an exopodite. Antennular peduncle considerably stouter in the adult male than in the female.

### GENUS **Meganyctiphanes**, n.

Sixth and seventh thoracic limbs with an exopodite in both sexes. Antennular peduncle scarcely, if at all, stouter in the adult male than in the female.

The important difference is in the absence, in the females of *Nyctiphanes*, of the exopodite of the sixth and seventh limbs. Both the known species, *N. Couchi* and *N. australis*, carry their ova in paired pyriform masses, closely apposed to the bases of these limbs. In the only known species of *Meganyctiphanes*, a most abundant and well-known form, ovigerous females have never been observed, and it seems probable that the differences of exopodites in the females of the two genera are associated with differences of nursing. If the female *M. norvegica* carried her ova as in *Nyctiphanes* her exopodites would be useless and greatly in the way. We suspect that she either nurses them for a brief period in the basket formed by her thoracic limbs and their setae, as is the case with *Euphausia pellucida*, or does not nurse them at all.

For practical purposes the three species, which alone possess the reflexed leaflet at the end of the first joint of the antennular peduncle, may be easily distinguished by the following characters:—

- |  |                       |
|--|-----------------------|
| A. A spine above the origin of telson.   | <i>N. Couchi</i> .    |
| B. No spine above the origin of telson.  |                       |
| i. No denticulation of the lateral edge of the carapace.                             | <i>N. australis</i> . |
| ii. Lateral edge of carapace with a denticulation at about the middle of its length. | <i>M. norvegica</i> . |



## Nyctiphanes Couchi (Bell).

### PLATE XVII.

The only obvious character in which this species differs from *N. australis*, Sars, is in the spine above the telson, which is an acumination of the posterior margin of the shell of the last segment of the pleon, is already well developed at the earliest stage at which generic recognition is possible, and persists throughout life. At no stage of *N. australis*, *vide* the descriptions and figures of Sars, is such an acumination present, nor, as we are entitled to state from the examination of ample material, in *M. norvegica*. Norman gives the length of the species as 15 mm., but it actually reaches at least 17 mm. from tip of rostrum to extremity of telson, and the examination of full-grown specimens permits us to add something to previous knowledge of the species.

Bell's well-known figure represents an ovigerous female, with two pyriform egg-masses depending from her postero-thoracic region by their narrow ends. We have taken a number of ovigerous females, of which Miss Woodward has depicted one, and though the egg masses are paired and pyriform, it is their broad and not their narrow ends which are apposed to the body of the parent, the condition being in fact exactly as in Sars' figures of *N. australis*, though we have not always found the egg-masses of the same size on each side, nor tapering distally to the same extent. They are easily detached, and it seems not impossible that Bell's artist may have dislodged the ova from the parent and, in his attempted restoration of the original condition, drawn them upside-down and separate. In some specimens, however, taken after our figure had been prepared, the egg-masses are much larger and of more uniform diameter throughout, though the basal portion is still the thicker. In one in which the posterior limbs have been widely separate from their fellows, *in articulo mortis*, the egg-masses are far apart distally, but are still quite unlike the condition figured by Bell.

In all full-grown females taken in the spring and summer months (we have none from gatherings at other seasons, except macerated specimens from the stomachs of sea trout) we find the ultimate and penultimate thoracic limbs widely separate, the sex being thus visible at a glance. In some we can find a trace of the glutinous membrane which once contained the spawn, and though this cannot be detected in others we suspect that the separation of the limbs has been in all cases caused by the mechanical pressure of an intervening egg-mass and not by a developmental disturbance of the topographical anatomy.

Norman gives, *as a character of the male*, the presence of a comb-like process at the end of the second joint of the antennular peduncle. Opportunity of examining sufficient material at all stages shows that this is not distinctive of males. It is present in small males, but disappears in large specimens of that sex, whereas in the female it persists to the end of life. In regard to this character we have critically examined over fifty specimens, and the cursory examination of many hundreds for purposes of specific identification has given us no indication that our conclusions, which follow, may be incorrect.

Specimens measuring less than 12 mm., tip of antennular peduncles to tip of telson, have usually no sign of a comb. At a length of 12 mm., the comb begins to make its appearance in either sex, being present in its simplest form as a mere spine-like prolongation of the inner dorsal angle of the distal end of the second segment of the peduncle. This prolongation is somewhat upwardly directed. In further development the prolongation becomes considerably enhanced, and its outer edge becomes inflated, upwardly rotated, and thrown into a slightly backwardly-directed fold at its base, assuming meanwhile a varying number of pectinations of irregular size. The inner faces of the prolongation of each peduncle are closely apposed and their upper parts are at a level slightly above that of the third segment.



Subject to the above general statement as to size of individual, there does not appear to be an exact constancy as to the degree of development of the comb in relation to the total length of the individual, nor have we reason to suppose that successive ecdyses are accompanied by precisely progressive degrees of pectination of the comb. The latter may be fully developed in a male of 12 mm., tip of rostrum to tip of telson, as in the specimen shown in fig. 1, or may still be imperfect. In males of 16 mm. or more, measured from tip of rostrum, there is no comb, and at the most the previously pectinate edge of the integument of the second segment may show a slight arcuation, whereas in females the comb persists to the maximum size attained.

While losing the comb, the antennular peduncle of the large male becomes distinctly larger than that of the female—*e.g.*, in specimens of the two sexes having the same total length of 17 mm., from tip of rostrum, the peduncles have the following measurements:—

	Male.	Female.
Length of second segment,	1.02	.90 mm.
Width „ „ „	.42	.30 „
Length „ third „	.60	.48 „
Width „ „ „	.42	.24 „

In the male the third segment bears at its origin near the inferior internal angle three closely-set spines, a little more than half as long as the segment, forwardly directed and somewhat inflexed, plumose except at the distal extremities. In several examples (male) spines have been observed on the internal ventral edge of the left peduncle, but they do not seem to be of universal occurrence. In both sexes the outer face of the second segment bears a small bunch of setae, and the brush of setae which arises externally to the origin of the flagella does not appear to differ materially in the sexes. In general the antennular differences of the sexes in large specimens are so nearly the same as that depicted by Sars for *N. australis* that his figures would serve for *N. Couchi*.

The copulatory apparatus of the male pleopods does not appear to be more fully developed in large specimens than in the 12 mm. example described by Holt and Beaumont, 1900. The ulterior development of the antennular peduncle is therefore, in all probability, not associated with the attainment of sexual potency. The smallest ovigerous female observed measures 10 mm. from tip of rostrum to the tip of telson; the largest, 16 mm. The largest specimens of the species we have observed measure 17 mm. from tip of rostrum to tip of telson. The size of the egg-mass seems to vary with the size of the parent. In one specimen the ovisac contained naupliid larvae. From the material at our disposal the breeding season would seem to reach its maximum sometime about May.

The mouth parts and thoracic appendages examined in detail call for no special remark in comparison with those of *N. australis*.

The pigment of the eyes is brownish-black. Other pigment is bright scarlet, and may probably be variable according to the degree of expansion of the chromatophores. It is conspicuously present about the mouth-parts and proximal joints of the thoracic limbs, and the luminous organs are brilliantly coloured.

*Locality and Distribution*, see p. 134.

## **Meganyctiphanes norvegica** (M. Sars).

*Thysanopoda norvegica*, M. Sars.

*Nyctiphanes norvegica*, G. O. Sars *et auct.*

### PLATE XVI.

Figures of this species have already been given by Watase (copied by Shipley and MacBride), Koelbel and Zimmer. It is a well-known form, and we figure it chiefly in explanation of the differences which separate it from *N. Couchi*.



*M. norvegica* is a much larger form, attaining at least 40 mm. from tip of rostrum. The carapace has the armature shown in figs. 2-4, whereas in both species of *Nyctiphanes* it is unarmed save for the rostrum.

We can detect in the largest examples examined no obvious difference of size in the antennular peduncles of the two sexes of *M. norvegica*, a condition in marked difference to that exhibited by *Nyctiphanes*. On the other hand the copulatory paraphernalia of the first pleopod of *Meganyctiphanes* are much more highly developed than those of *Nyctiphanes* (see Holt and Beaumont, 1900).

On account of the larger size, the rudimentary gill or epipodite of the first thoracic limb is more conspicuous in *Meganyctiphanes*, but it is about equally developed in *Nyctiphanes*.

Sars and S. I. Smith appear to be acquainted with the larvae, but have not to our knowledge described them. A fairly complete series (with which, as with other Euphausian larvae, we hope to deal fully in a later communication) enables us to say that at no period of growth is there a spine above the telson. As in other Euphausian larvae, the second segment of the antennular peduncle has a blade-like prolongation, but this disappears with other larval characters, and at no period of growth has *Meganyctiphanes* anything comparable to the antennular comb of *N. Couchi*.

The eyes are brownish-black. Other pigment is red—crimson or scarlet by reflected, orange-red by transmitted light—and, with a considerable allowance for variation in expansion and number of chromatophores, may be said to be distributed as follows:—The gastric and hepatic regions are red, and the course of the gut is picked out in red as far back as the end of the second segment of the pleon. There are chromatophores dorsally on the proximal third of the telson, on the last segment of the abdomen, and, in less number, on the fourth and fifth segments and at the origin of the first. The posterior angles of the epimera of all but the last segment are rather conspicuously pigmented. Pigment is present on the eye-stalks and antennular peduncles, in great quantity about the mouth parts, rather abundantly on the proximal joints of the first three thoracic legs, faintly on those of the remainder, very faintly on the basal parts of the first four pleopods. The luminous organs are crimson, purplish by transmitted light.

These notes of colouration were made in comparison with those given above for *N. Couchi* from specimens taken in the same haul. We thought at first that a constant difference of pigmentation could be established, but our conclusion, after the examination of much more material, is that, although *Meganyctiphanes* seems generally to have more red pigment, the two species are so variable in this respect that pigmentation cannot be safely employed for purposes of determination. In any case the red pigment disappears after a few days in alcohol or a few weeks in formol, and is not, for the usual circumstances of determination, of any importance.

BREEDING.—Larvae were taken at the end of June, but since, as appears from the account of distribution, small specimens occur throughout the year, this does not definitely fix the breeding season to the immediately antecedent period. On the 10th May, 1904, Mr. Farran took a number of specimens up to 30 mm. in length at or near the surface at night, together with many large *N. Couchi*, of which the females were ovigerous. In the same gathering are a large number of loose ova, all which we have as yet examined being in a very early stage of development and resembling those of *N. Couchi* in size and appearance. Many of the *Meganyctiphanes* have a few of these ova in their leg-basket, but not in such number or so disassociated from obvious prey as to warrant the conclusion that they are the nurslings of their present possessors. That they are ova of *Meganyctiphanes* is, in spite of their relatively small size, not impossible, but their presence in the midst of prey suggests rather that this form has an indiscriminate appetite than that it takes any care of its progeny.



**Food.**—The examples mentioned above are the only ones in our possession which throw any light on the feeding habit. Many of them have the leg-basket more or less stuffed with prey, including copepods, schizopod or decapod larvae, fragments of *Spirialis*, and other matter which requires further examination. One has the tail of a larval fish, 16 mm. long, in its mouth.

*Locality and Distribution*, see p. 135.

**SUB-FAM. nov. NEMATOSCELINAE.**

Eyes more or less bilobate. Second or third legs elongate, with distal extremity forming a brush or claw.\*

**GENUS *Thysanoessa*, Brandt.**

***Thysanoessa longicaudata* (Kröyer).**

*T. tenera*, Sars.—1882.

*T. longicaudata*, Hansen.—1887.

*T. longicaudata*, Norman.—1892.

**PL. XV.**

*Carapace* with lateral margins entire; rostrum varying somewhat in length, but reaching beyond the middle of the first joint of the antennular peduncle, narrow, lanceolate, slightly keeled. *Antennal scale* reaching beyond the second joint of the antennular peduncle, but hardly beyond the middle of the third joint; apex more or less obliquely truncate. *Eyes* rather large, constriction well marked. *Second legs* having the two distal joints slightly greater in combined length than the preceding; the ultimate joint about half as long (if anything rather more than half as long) as the penultimate, narrow, of equal width throughout, with a tuft of setae at the extremity, and about four to six and five to seven setae on the dorsal and ventral edges respectively. *Pleon* with no distinct keels on the segments, the last equal to, or very slightly less than the combined length of the two preceding. For about 35 specimens which were measured the average length of the last segment compared with the length of the preceding two was as 10 to 11, its postero-dorsal margin entire or (very rarely) produced into an extremely minute acumination.† *Uropods* narrow, the inner longer than the outer, nearly reaching, or even slightly passing, the extremity of the telson (exclusive of lateral spines).

Hansen, 1887, has shown that Kröyer's types of *T. longicaudata* agree with the characters given by Sars for *T. tenera*. Our diagnosis of the few characters concerned aims at uniting in a single species individuals conforming exactly to *T. tenera*, and the forms known to us from more southern latitudes. It may be a question of race, but as Fowler's Faroe specimens seem much like those from the S.W. of Ireland, we do not know where, if anywhere, is to be found the line which, by divergence of characters, sharply separates northern from southern forms. Briefly, *T. tenera*, *sensu stricto*, has the antennal scale more oblique at the apex and in relation to the antennular peduncle somewhat shorter, the rostrum perhaps a little wider, the eyes a little larger, and the inner uropods, in

\* For a key to the genera which we include in this sub-family, see Calman's paper, p. 153, *infra*.

† This affords no possibility of confusion with *T. neglecta*, in which the spine over the telson is always very strongly developed (*vide* Sars, 1882).



relation to the telson, rather distinctly longer than in examples from off the Irish coast. We do not think these differences would warrant us in separating the southern forms even by a varietal name.

Our figures, except that of the leg, were taken from *Oceana* material, and the lateral view shows the most perfect specimen in a large series. It actually has the bud of a second leg, which has been broken off at some previous period, and this is the only attempt at a leg in the whole collection. Had we not found in our own Irish collection one, and in Dr. Fowler's Faroe material several specimens similar in other respects, but still retaining their legs, it would have been impossible to definitely associate our *Oceana* material with *T. longicaudata*. The second legs alone do not furnish a satisfactory means of distinction between this species (which is only known to reach 12 mm.), and small examples of *T. neglecta*, Kr. (= *T. borealis*, G. O. Sars), which grows to 24 mm. While large *T. neglecta* have the ultimate distinctly less than half the length of the penultimate joint, examples comparable in size to *T. longicaudata* have the ultimate joint, in comparison with the latter species, but very slightly shorter, and there is no sufficiently constant difference in the number of setae to be of value.

Our drawings were made before perfect specimens were available, and we use them for publication because they convey the best idea of the species as it usually comes into the hands of the student. *T. longicaudata* is, more than any Schizopod which we know, liable to lose its legs in the net, and a perfect specimen with its bunch of legs looks so much deeper that one does not at first recognise its specific identity with the ordinary stripped example.

The eyes of Euphausians are very liable to lose their characteristic shape in the net, and the bilobate condition of the eye in *Thysanoessa* and allied genera is less marked in the young than in the adult,\* while the gills and other characters of the thoracic appendages are, even when they escape destruction, not too tangible in material of small size. Consequently small, more or less bare, hulls of *Thysanoessa* and its allies (except *Stylocheiron*) often give more trouble in determination than is readily imagined.

We do not know anything about the breeding of *Thysanoessa*. Its close structural affinity suggests, but by no means proves, that the ova are carried in the same way as in *Stylocheiron*.

*Locality and distribution*, see p. 138.

### ***Thysanoessa gregaria*, G. O. Sars, 1885.**

Some small examples of *Thysanoessa*, ranging in length from about 7 to about 9 mm., appear to be referable to this species, though exhibiting certain characters which do not exactly harmonise with Sars' diagnosis. The average length of adult females is stated to be 18 mm., males being somewhat smaller, and some, perhaps all, the peculiarities which we have noted, may well be youthful characters.

Some of the specimens are fairly perfect, and it must be understood that in characters which we do not mention below we have failed to detect any divergence from the type.

The segments of the pleon are described as quite smooth above. In our examples the fourth and fifth segments show a very slight depression in the dorsal contour at rather more than two-thirds of the distance from its anterior end, while the posterior part appears to be slightly keeled and very slightly acuminate (in some) at the extremity. There is also, in some, a trace of slight acumination at the extremity of the sixth segment.

The epimera agree well enough with Sars' description, and, in the main, with his figure (Pl. XXI., fig. 8), but the postero-ventral corners are not produced into sharply defined angles, as in the figure referred to.

\* Especially in *T. neglecta*.



The pleopods have the basal joint somewhat wider, and with a more convex anterior outline than is shown in Sars' figure, but this may be simply a difference in the point of view, since the pleopods are often seen in a somewhat oblique position.

The preanal spine is about as large as in the type, but has either only a few very coarse denticulations or none at all. This is certainly a character which varies with the size of the specimen, although the degree of denticulation is not found to correspond exactly with the total length. Sars has shown that the spine makes its first appearance in *Euphausia pellucida* as a simple structure, and we have observed it still undivided in specimens of all sizes.

Judging by Sars' figures (Pl. XII., fig. 9, and Pl. XXII., fig. 26) the dorsal denticles of the telson would appear to vary in position. In the examples which we have examined the denticles agree chiefly with the first-named figure, but some show an intermediate condition.

*Locality and distribution*, see p. 139.

## GENUS *Stylocheiron*, G. O. Sars, 1885.

### *Stylocheiron longicorne*, G. O. Sars, 1885.

*Stylocheiron longicorne*, Sars.—1885.

*Stylocheiron mastigophorum*, Chun.—1888.

*Stylocheiron longicorne*, Ortmann.—1893.

We believe that Sars and Chun based their respective diagnoses on material which is not really capable of specific distinction; but if Chun's view of the matter be upheld on the examination of specimens from the whole area of distribution of the species designated by Sars and Ortmann as *S. longicorne*, our examples must be named *S. mastigophorum*, since they agree more closely with Chun's description than with Sars'.

Sars' type is mounted in Canada balsam, and has only one chela, which happens to be set on edge. It is therefore not of very much value for settling the question, but in the opinion of one of us, who has examined it, our specimens are referable to the same species.

We must, however, call attention to a feature which appears to have escaped the attention of either observer, *viz.*, the variability of the antennal peduncle, both in relative length and in the number and relative length of its articulations. The peduncle is always more than twice the greatest length of the carapace, from tip of rostrum to hindmost lateral margin, measured between verticals, but, consistent to this extent, its length varies not inconsiderably. The number of joints in the Euphausian antennal peduncle is typically three, and this number we find to be constant in *S. longicorne* in so far as regards the articulations which are conspicuous by reason of the inflation of the apposed extremities of the segments, and which we may here term the main articulations. There are, however, in many of our specimens, subsidiary articulations, not accompanied by any disturbance of the contour of the peduncle, but still apparently perfect and not due to accident, which may raise the number of joints to as many as six. The length of the joints defined by main articulations varies by variety of position of these articulations. In most of our specimens the distal main articulation is distal to the extremity of the antennal scale, as in the diagnoses and figures of Sars and Chun. In others it is proximal thereto, a phenomenon which led us to suppose that we were dealing with two species until we chanced upon a specimen (a female of adult size) in which the peduncle of one side was in this respect typical, while that of the other side had the second main articulation short of the extremity of the scale. The variation is, therefore, obviously of no taxonomic importance. It is not correlated with any variation of



other structural features, nor is it, in any of the cases we have noted above, associated with sex or with growth after the attainment of the adult condition.

The maximum length of the species as represented in the collections before us barely attains, between the tip of the rostrum and the extremity of the caudal fan, 10 mm. Males appear to be mature at 7 mm. The smallest ovigerous female which we have seen measures 8 mm. The ova are carried exactly as in Sars' figure of *S. carinatum*, agglutinated in a thin envelope of a gelatinous nature, attached to the ventrum between the sixth and seventh pair of thoracic limbs, and projecting forward between the preceding pairs. They readily escape from their investment. The few clutches which we have seen varied in number (as evidenced by both full and empty spaces in the envelope) from about 10 to about 14, and were in an early stage of development in July, 1900, in the Bay of Biscay. No ovigerous females were taken by the *Oceana* in November, 1898, off the S.W. of Ireland, nor by the *Helga* at any season of the years 1901 to 1903 within fifty miles of the S.W. and W. coasts, within which limit, as will be apparent, the species is not abundant.

With the larvae we intend to deal fully in a future report, but it may be remarked that they were taken from the earliest recognisable stage upwards, both in July and November, while the collections of adult forms in both months include a series of sizes which is sufficiently continuous to make it difficult to form any idea of the seasonal life-history of the species. The fact that the largest specimens occur in the July collections may be of significance in this respect, but may be equally explicable on the ground that the July hauls in the Bay of Biscay were nearer to the centre of distribution than those taken farther north in other months.

The following measurements, in millimetres, of adult specimens may be useful.

No. 2 is one of the largest specimens in our collection; No. 3 is an ovigerous female. We could find no specimen perfect in all respects:—

#### MEASUREMENTS.

	1.	2.	3.
Total length from tip of rostrum to tip of telson,...	8.25	10.4	8.06
Carapace length, ... ..	2.5	3.3	2.4
Length of pleon, excluding telson, ... ..	4.1	5.0	4.0
„ telson, ... ..	.85	.93	.84
„ last segment of pleon, ... ..	1.65	2.2	1.65
„ eye, ... ..	1.0	1.2	.9
„ peduncle of antennule, ... ..	2.75	3.85	2.8
„ antennal scale, ... ..	2.1	2.85	2.2
„ chelate limb, ... ..	7.15	9.3	—
„ antenna (complete), ... ..	—	—	12.1

Locality and distribution, see p. 140.

### **Stylocheiron chelifer, Chun, 1888.**

*Stylocheiron chelifer*, Chun.—1888.

(?) *Stylocheiron abbreviatum*, G. O. Sars.—1885.

Sars regarded his species as of small size, basing it on several individuals not exceeding 8 mm. in length, of which he observes that they



"would seem to be females." Such a statement does not seem to preclude the possibility of their having been immature members of either sex. Ortmann records under Sars' specific name material obtained by the Plankton Expedition, and as he makes no comment as to size, it may be taken to have consisted of equally small specimens. Chun also records the capture of *S. abbreviatum*, but we nowhere find a record of undoubtedly mature examples of that species, nor an explicit statement that its representatives have been compared with *S. chelifer* of the same size. It appears to us by no means improbable that *S. abbreviatum* is only the young (possibly of a local variety not entitled to specific rank) of the species of which the adult is *S. chelifer*, and that Sars, by the paucity and bad preservation of his material, has been betrayed into an inadequacy of description quite foreign to his wont.

In the collections which we have examined occur a number of examples which are certainly *S. chelifer*, but which, in the absence of Chun's observations, we should have referred, with some remark, to *S. abbreviatum*, and we hesitate to affirm the identity of the two species only because our series happens to be defective in the sizes comparable to Sars' types of *S. abbreviatum*.

Chun, in his descriptions of *S. chelifer*, which he regards as attaining a length of 14 mm. (some of ours reach 20 mm.), mentions the characters in which it differs from *S. abbreviatum*. He appears, however, to lay chief stress on the characters of the chelate limbs, and, in part, these distinctions appear to us to be probably not unsusceptible of explanation as phases of growth. We do not understand that he has had the opportunity of comparing a *S. chelifer* of, say, 8 mm. with a supposed adult *S. abbreviatum* of the same size.

Our material is sufficient in larvae and in adults, but the intermediate stages are not represented by perfect specimens. The proportions of the chelate limbs cannot therefore be given throughout the life-history, but we are able to show that the different parts of these limbs undergo considerable developmental modification of proportion.

	Larval <i>S. chelifer</i> , 5.3 mm.	<i>S. abbreviatum</i> , from Sars' figure.	Adult <i>S. chelifer</i> , 20 mm.
Merus or Tibia, . . . . .	100	100	100
Chela, . . . . .	64.15	66	50
Carpus, . . . . .	62.2	55	66
Medio-dorsal length of Carapace, .	75.4	86.1	66
Sixth segment of Pleon, . . . .	56.6	47.3	27

The larva mentioned above has the antennal scale still short, and a large spine on the antennal peduncle, while the last segment of the pleon is, as appears from the table, very elongate. In other respects it has the adult form, and the chela only differs from that of the adult in that the third secondary spine of the dactylus is very minute. It is evident that the length of the carpus as compared with the merus is variable with the size of its possessor; and, as the proportions which we have given for *S. abbreviatum* depend for their accuracy on that of the figure, it is not possible to be certain that the young *S. chelifer* may not pass through a stage practically identical, in regard to proportions of segments of chelate limb, with *S. abbreviatum*. The absence, from Sars' specimen, of the third, presumably still minute, secondary spine of the dactylus is not a feature to which we should have been disposed to attach specific importance; the slender tertiary spine near the base of the dactylus in large *S. chelifer* was not present in the larva.



We subjoin a table, in which the total length of the example is made the unit of comparison:—

—	<i>S. chelifer</i> . Larva of 5·3 mm.	<i>S. chelifer</i> , 8 mm.	<i>S. abbreviatum</i> , 8 mm., from Sars' figure.	<i>S. chelifer</i> , 10·5 mm.	<i>S. chelifer</i> , 20 mm.
Total length, . . .	100	100	100	100	100
Merus or Tibia, . . .	42·7	Wanting.	33	Wanting.	48·2
Carpus, . . . . .	26·6	"	19·6	"	32·5
Chela, . . . . .	27·4	"	21·4	"	23·75
Medio-dorsal length of Carapace	32·2	25·8	27·7	29·2	32·5
Sixth segment of Pleon,	24·2	15·0	15·1	15·5	14·5

On the difficulty of relevant interpolation of measurements taken from a figure among others taken direct from specimens we have already remarked, but it appears that between our *S. chelifer* of 8 mm. and Sars' *S. abbreviatum* of the same size there is no great difference in the proportions of the parts which can be compared. We have, however, so much reason to respect Sars' diagnoses and figures that we prefer to leave it to him to associate *S. chelifer* with *S. abbreviatum*, if such association prove necessary.

The type of *S. abbreviatum*, which one of us has examined, does not help much, as it has lost its chelate limbs. The slight deflection of the tip of the rostrum, noted by Chun as differing from the slightly upturned condition of that process in large *S. chelifer*, is in any case a feature of little moment. In the only other *Challenger* specimen in the British Museum the deflection of the rostrum is obviously the result of accident, and may be so also in the type.

*Locality and distribution*, see p. 141.

#### GENUS *Nematobrachion*, Calman.

##### *Nematobrachion boöpis* (Calman), 1896.

Dr. Calman has kindly dealt with our material in a separate paper, which will be found at page 153 of this Report.

*Locality and distribution*, see p. 140.

#### SUB-FAM. nov. *BENTHEUPHAUSINAE*.

None of the legs much longer than their immediate neighbours. Palps of the maxillae three-jointed.

#### GENUS *Bentheuphausia*, G. O. Sars, 1885.

##### *Bentheuphausia* sp. ?

Dr. Fowler's solitary specimen was taken in a haul of the vertical net between 1,250 fathoms and surface. Unfortunately the messenger, which ought to have closed the net at 500 fath., did not realise its responsibilities, and, as the net was hove thence to the surface as fast as the steam-winch would turn, the contents suffered a good deal. A big *Eucopia*, the only other Schizopod taken, reached our hands in fragments of a few millimetres long, and the *Bentheuphausia* is a mere hull, without carapace and without appendages, except eyes, part of antennules, and caudal fan.



The thing measures 8 mm. from eyes to tip of telson, and is clearly a *Bentheuphausia*; or, if not, belongs to some closely-allied genus hitherto undescribed.

The characters which remain are not exactly in harmony with those of *B. amblyops*, the only known species. In the latter—described, be it remarked, from huge specimens, the largest 48 mm.—the part of the outer uropod distal to the origin of the spine appears to be between a fourth and a fifth of the proximal part. In our specimen the apical part is relatively much shorter. What is left of the antennular peduncle agrees well enough with *B. amblyops*, but the eyes seem to be much more pyriform.

In *B. amblyops* they are narrow, somewhat medially constricted, with a small prominence internal to the visual portion. In our example the prominence and the visual part call for no comment, but the whole appendage, in its present condition, is pyriform, almost globular. It is, however, quite flaccid, and its difference in form from that of *B. amblyops* may perhaps be due merely to maceration.

Even supposing that the differences noted in the several parts are due neither to degree of development nor to imperfect preservation, it is obviously impossible to found a new species on so fragmentary a specimen.

*B. amblyops*, including Willemoes Suhm's material, supposed by Sars to be referable to the same species, is known from the tropical and N. and S. Atlantic and from S. of Australia at depths of 1,000 to 1,800 fathoms, but the specimens may have been obtained during the ascent of the nets through the higher strata. The question of distribution does not therefore affect the possibility of referring Fowler's example to the same species, which, while the above notes were in press, has been recorded on the authority of Sars, from a collection made in the Bay of Biscay (Richard, 1904).

*Locality*, see p. 141.

DIVISION.—**PERACARIDA**.—Calman, 1904.

ORDER **MYSIDACEA**.

FAM. **LOPHOGASTRIDAE**.

GENUS **Gnathophausia**, Willemoes Suhm, 1875.

Section 4 nov., cf. Sections 1-3, Sars, 1885.

Infero-posterior corners of carapace produced into a spine. Dorsal keel interrupted anteriorly. Supra-orbital spine small. Antennal scale not jointed at apex. First thoracic legs with distinctly developed exopodites. Epimeral plates of last segment not united on the ventral face.

**Gnathophausia drepanephora**,\* sp. n.

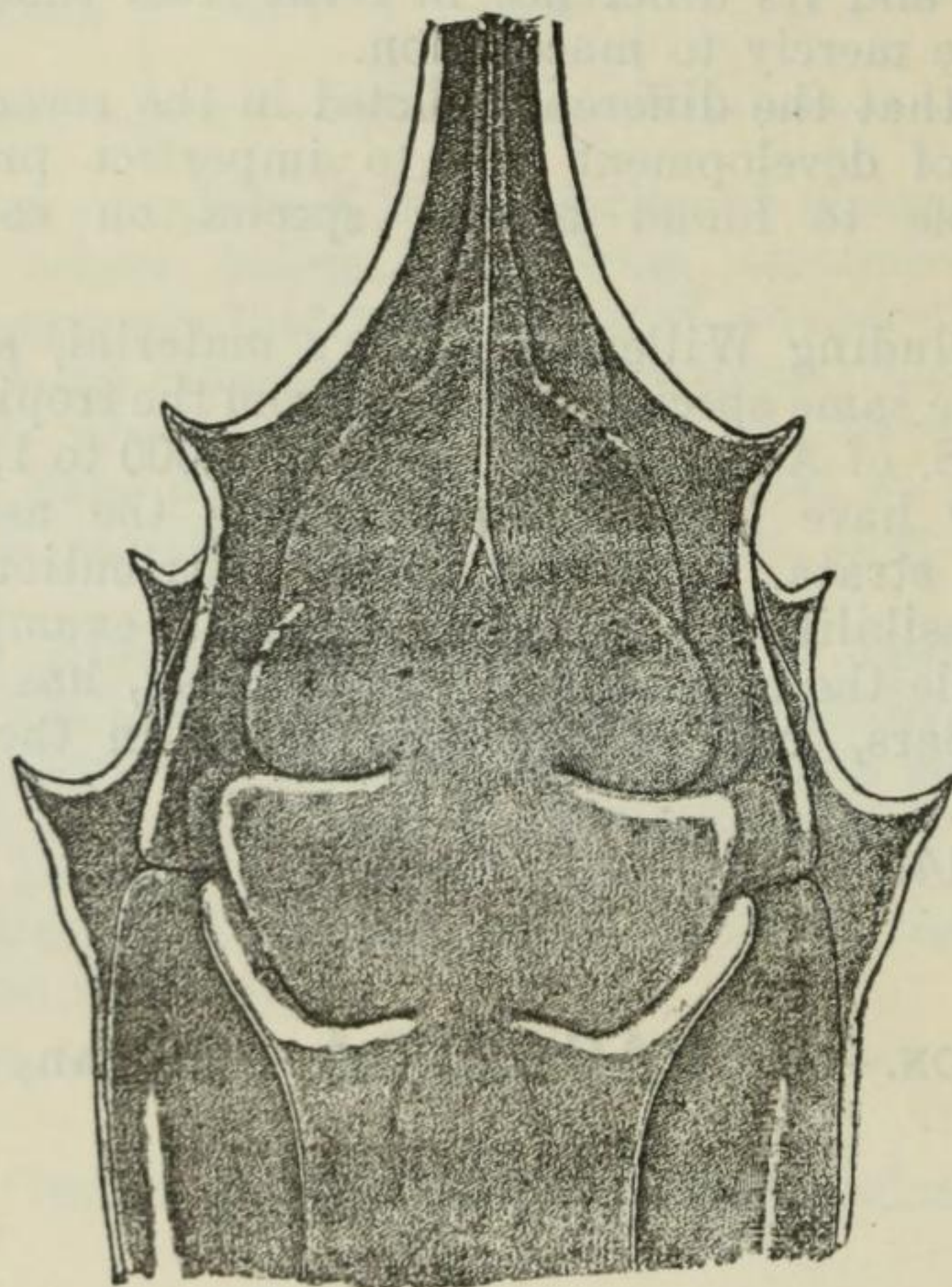
PL. XVIII.

*Form of body* slender. *Carapace* not very large; dorsal spine about as long as first segment of pleon; infero-posterior corners produced into a spine, bluntly serrulate on ventral edge, nearly reaching fourth segment of pleon; upper lateral keel present; dorsal keel unarmed; cervical sulcus rather distinct; rostrum elongate and slender, as long as the carapace without the infero-posterior spines, distinctly denticulate on all three edges; supra-orbital and antennal spines well-defined, but small. Branchiostegal projections of moderate proportions, but distinctly pointed.

\* In allusion to the scythe-like infero-posterior processes of the carapace.



Anterior segments of *pleon* without dorsal spines; epimeral plates produced posteriorly into pointed lappets. *Eyes* very narrow, cornea scarcely at all expanded, pigment (as preserved in formol) rather pale brown. Outer flagellum of *antennule* in male expanded and flattened at the base, which is beset on the inner side with a brush-like fringe of fine curling setae. *Antennal scale* of moderate size, about four times as long as broad, tapering distally and very obliquely truncate; inner angle produced into a sharp point, outer edge with (about) three denticulations distally. *Telson* large and massive, with the terminal spines crescent-shaped and denticulate along the upper face; lateral margins armed for the usual distance with large spines, separated from each other by intervals occupied by a few smaller spines. *Uropods* shorter than telson; the proximal joint of outer uropod terminating externally in a spine about one-fourth as long as the distal joint. *Colouration* red. *Length* 39 mm.



*Gnathophausia drepanephora*,—Carapace.

As appears from Sars' *Challenger* monograph, some of the members of this genus reach a size which, relatively to the rest of the Schizopoda, may be considered enormous. Thus *Gn. ingens*, Dohrn, is known to attain a length of 157 mm., only an inconsiderable fraction being contributed by the rostrum.

Absolutely nothing seems to be known of the ontogeny of the genus, so that it is impossible to tell at what size the full development of the adult characters may be attained; and though one may naturally be inclined to exercise caution in founding a species on an example which, from its small size, may reasonably be suspected of somewhat imperfect development, we do not see what other course is open to us. The species *Gn. gracilis* has been founded by Willemoes Suhm and endorsed by Sars on the evidence of a single specimen of 41 mm., the rostrum being at least as elongate as in our species. One need not wish to err, if at all, in better company. *Gn. gracilis* may, or may not, grow to a large size; but if it does, though some of the characters may well undergo a measure of developmental modification, it is difficult to suppose them capable of being harmonised with those of any of the other known species. The same, perhaps in rather a less degree, is true of *Gn. drepanephora*, but there are indications that the type specimen is at least sexually mature.

*Gn. drepanephora* is at once distinguished from all its known congeners by the combination of two negative characters, viz., the antennal scales



are not jointed, and the epimeral plates of the last segment of the pleon are not confluent.

*Description.*—The single specimen, 39 mm. in length, has no incubatory lamellae. In the example of *Gn. gracilis* of 41 mm., Sars considered the absence of such lamellae to be an indication of the male sex. The specimen on which our species is founded presents, as we think, a more certain proof of its sex. The outer flagellum of the antennule is most distinctly expanded and flattened for about 3 mm. of its basal part, and is beset inwardly in this region with a dense fringe of fine curling setae, but is not separated by any well-defined articulation from the distal part. In the genus *Stylocheiron* the flagellum in the male exhibits a well-defined basal segment, expanded and beset internally with a fringe of setae, no approach to this condition being observable in the female. It appears to us that the condition observed in our *Gn. drepanephora* is of similar sexual significance. Sars appears to have detected no important secondary sexual characters in the species which he describes.

The form of the body (fig. 1) is as slender as in *Gn. gracilis*. The carapace is, in comparison with some members of the genus, rather small, and does not completely cover the last segment of the thorax. Posteriorly it is not unlike that of *Gn. calcarata*, but the dorsal spine is more upturned and the infero-posterior corners are more produced and terminate in longer spines. The latter are only bluntly serrulate on the lower edge. Both lateral keels are well marked, the lower one being closely approximated to the ventral border. The rostrum does not differ materially, in length, shape or armature from that of *Gn. gracilis*. It is a character which appears to us to be likely to undergo modification as growth proceeds, even after the assumption of sexual maturity, so that larger examples (if such exist) of the species may prove to exhibit relatively shorter rostra. The supra-orbital and antennal spines are small; the branchiostegal projections, though only of moderate extent, are most distinctly acuminate, but the margins of all these processes are entire. In considering the possibility of the attainment by our example of the characters of *Gn. calcarata*, in which the processes referred to are much more developed, it is of interest to note that in *Gn. gracilis*, which is hardly larger than *Gn. drepanephora*, the spines are already extremely well pronounced (*cf.* Sars, *loc. cit.*, Pls. IV. and VII). The two anterior segments of the pleon are very slightly keeled on the dorsum, and also transversely sulcate, the contour being thus somewhat irregular. The hinder edges of these segments, and, to a less degree, of the third and fourth, are somewhat upturned. The epimera exhibit only a posterior lappet, produced into a well-defined point except in the anterior part of the last segment, where the lappet is reduced to a denticle. It appears to us to be within the bounds of possibility that the confluence and backward growth of the epimeral plates of this segment, as exemplified in the large individuals of Sars' Section 1, may be a feature of late growth, but of this there is no sort of evidence. In our example the denticles are widely separate.

The eyes are very small and narrow, the ocular papilla occurring as a small spine rather near the distal extremity. In general form they appear similar to those of *Gn. calcarata* and, probably, of *Gn. gracilis* also. In respect of the pigment, which is brown and can hardly be described as dark, *Gn. drepanephora* would appear to differ from its congeners, the visual sense being perhaps imperfectly developed.

We have already alluded to the structure of the basal portion of the outer flagellum of the antennule (Fig. 2). The whole flagellum is at present 22 mm. in length, and must have been a good deal longer. The inner flagellum is somewhat longer than the rostrum.

The antennal scale (Fig. 3) approaches that of *Gn. gigas*, from which, however, it differs in its narrower and more acuminate outline and in the smaller number of the denticulations of the outer edge. The flagellum is about as long as the inner flagellum of the antennule.

Of the oral parts we can only say that the epipodite of the first thoracic leg is well developed, and that the pigmented protuberance of the second maxilla is conspicuous.



The legs appear to us to be relatively somewhat slender as compared with other species.

The telson agrees very closely with that of *Gn. calcarata*. It is about equal in length to the sum of the three preceding segments of the pleon. The lateral margins are evenly arched, and armed, as in *Gn. calcarata*, with large spines separated by intervals of smaller spines. In *Gn. calcarata* the smaller spines are represented by Sars as more numerous, but we have found in similarly armed Schizopods (e.g., *Siriella*) that such a difference is not of specific constancy. The occurrence in *Gn. drepanephora* of several spines (one on the right side, two on the left, nearly opposite the distal ends of the outer uropods) about twice as large as any other, may be a feature of specific moment, though our experience of other forms inclines us to regard it as more probably illustrative of individual variation. The apical crescent appears to us to be exactly similar to that of *Gn. calcarata*.

The outer uropod is characterised by the great development of the spine at the distal end of the outer margin of the proximal joint, the spine being about one-fourth as long as the terminal joint. In *Gn. calcarata* the spine, though perhaps more developed than in the remaining species, is only about one-sixth of the dimension which we have used for comparison. The difference can hardly be explained by difference of age, since the spine is quite inconspicuous in *Gn. gracilis* at 41 mm. The outer margin of the appendage is more inflated than in *Gn. calcarata*.

The colour, after preservation in a weak solution of formol for twelve months, is pinkish, the setae, keels of the carapace, and margins of the integument generally being red.

*Locality*, see p. 142.

## FAM. MYSIDAE.

SUB-FAM. LEPTOMYSINAE, Norman, 1892.

It is reasonable to infer that Norman considered the presence of an antennal scale to be a character of this sub-family. It serves to separate it from the *Arachnomysinae*.

### GENUS *Meterythrops*, S. I. Smith, 1879.

*Parerythrops* (*pars.*), G. O. Sars, 1879.

The genus *Meterythrops* was instituted in 1879 by Smith for the reception of a species, *M. robusta*, found by him off the coast of N. America. The genus, as stated by Smith, appears to combine several characters of *Erythrops* and *Parerythrops*, agreeing with the former in the pleopods of the male and with the latter in the general form of the antennules, antennae, and oral parts. The telson also approaches that of *Parerythrops* very closely.

Sars, however, has included *M. robusta*, the type species of the genus, in his own genus *Parerythrops* without, to our knowledge, in any way modifying his original diagnosis of that genus, which would exclude *M. robusta*, as the first pleopods of the male are *not* as in the female but as in the male of *Erythrops*.

In view of the present additions to the *Erythrops* group, it appears to us convenient to retain Smith's genus, in which the pleopods of the first pair in the male are as in *Erythrops*, reserving for *Parerythrops* those forms which have the first pleopods in both sexes vestigial.

### *Meterythrops picta*, sp. n.

PL. XIX. figs. 5-7, and PL. XXV., figs. 8-9.

*Form* moderately stout. *Carapace* not much wider than pleon, rostral region obtusely arcuate, posterior margin rather deeply emarginate. *Eyes* large, sub-globose, reaching the level of the second joint of antennular peduncle. *Colour* pale golden brown. *Antennular peduncle* with



the last joint (in immature male) as long as the two preceding; male appendage present (small and with but few setae in the type specimen). *Antennal peduncle* as in *M. robusta*. *Antennal scale* about four times as long as broad, exceeding by about one-third of its length the extremity of the antennal peduncle; external margin slightly curved, its distal half coarsely denticulate with about four teeth rather widely separate; terminal spine of moderate size; apex obtusely rounded, extending slightly beyond the terminal spine. Setae strong. *Endopodite of second thoracic limb*\* somewhat shorter, proportionally, than in *M. robusta*; merus slightly longer than carpus, and bearing only a few setae, on its inner edge; carpus moderately, propodus and dactylus densely, setose, the setae serrated and jointed. *Exopodite of second thoracic limb* shorter than endopodite; tooth of the outer distal angle of basal joint very minute and almost obsolete; flagelliform part composed of ten joints, as also in succeeding limbs. *Endopodites of the remaining thoracic limbs* with tarsus of three joints, and distinct dactylus; tarsus shorter than the proximal joints taken together and barely longer than merus. *Pleon* slightly longer than carapace; sixth segment about twice as long as fifth. *Telson* about as long as sixth segment of pleon; twice as long as wide at base; half as long as outer uropod; triangular, apex narrowly truncate, armed with a median pair of setae and two pairs of spines, of which the inner are about twice and a half as long as the outer, and more than one-third as long as the telson. *Inner uropods* about one and a half as long as telson, no spines on the under side. *Outer uropods* about twice as long as the telson. *Colouration* after preservation—eyes pale golden yellow, general colour of trunk pale brownish yellow, with patches of deep brown in the region of the stomach, and on the posterior part of the thorax.

*Length* of immature male 11 mm.

The species is easily distinguished from its allies by the characters of the antennal scale. Our solitary example is an immature male, and it may be inferred that, though probably smaller than *M. robusta*, the full size is greater than that attained by other Leptomysine genera.

*Locality*, see p. 143.

### GENUS *Katerythrops*, n.

Characters of the pleopods in the adult male uncertain, pleopods of the female unknown. Other characters as in *Meterythrops*, S. I. Smith (*vide supra*), except—

*Antennal scale* considerably reduced in length in proportion to peduncles of antenna and antennule, narrow and feeble, its outer margin naked, entire, terminating in a small spine, setae few, confined to the apex and distal third (approximately) of the inner margin.

*Telson* possibly without the median setae.

The type of the species upon which we found this genus is a young male in which the pleopods are not sufficiently developed to reveal the adult condition. Their condition, however, as will appear, points to the probable agreement of the genus in this respect with *Meterythrops*. The exopodites of the thoracic limbs are larger than in the bottom-haunting genera of the family—*Erythrops*, *Parerythrops*, *Meterythrops*, &c.—and approach the condition found in the pelagic *Euchaetomera*.

### *Katerythrops Oceanae*, g. et sp. n.

PL. XX.

*Form* robust. *Carapace* much wider than the pleon, almost entirely covering the thoracic segments, anterior margin obtusely rounded, cephalic region inflated and posteriorly defined by a well-marked cervical sulcus. *Pleon* with the last segment almost as long as the two preceding segments taken together. *Eyes* small, remote from each other, sub-pyri-form, the proximal part the broader, visual area restricted to less than

\* i.e. the first leg when, as in the original diagnosis of the genus, the first thoracic limb is termed a maxillipede.



the distal half, cornea not so wide as the last joint of the antennular peduncle, pigment after preservation in formalin reddish-buff. *Peduncle of antennule* at least a fifth longer than the last segment of the pleon, proportionally stout, its last joint about equal to the two preceding, beset dorsally between the insertions of the flagella with a bidentate tubercle, of which the denticles are nearly in the same dorso-ventral plane. *Antennal scale* very short, narrow, and somewhat outwardly curved, outer margin entire, naked, terminating in a feeble spine; apex produced considerably beyond the spine, sub-acute, setae confined to the apex and to about the distal third of the inner margin; length of scale more than four times (about 14:3) the greatest width, slightly less than the combined length of the last two joints of the antennal peduncle and but little exceeding the length of the last joint of the antennular peduncle. *Antennal peduncle* long and proportionally stout, combined length of the last two joints greater than that of the last joint of the antennular peduncle. *Exopodites of the thoracic limbs* very well developed, with unusually large flagella. *Endopodites* of the first four pairs moderately long and stout; the tarsus in the third and fourth pairs consisting of three joints, and succeeded by a well-developed dactylus, setae not more plumose than in *Parerythrops*, &c. *Pleopods* of all five pairs biramous in the male, the inner ramus bifid. *Telson* subtriangular, shorter than the last segment of the pleon by about two-sevenths of the length of the latter, its sides entire and slightly inflected; apex narrowly truncate, armed with two pairs of rather slender spines, of which the inner are considerably the longer and stouter; a median pair of setae possibly present. *Outer uropod* the longer, its length, including basal articulation, slightly greater than the combined length of the fifth and sixth segment of the pleon. *Length* of the type specimen, an immature male, 6 mm., including antennular peduncles and uropods.

*Description.*—The type-specimen being, as we consider, immature, the diagnosis has been confined to a few characters, and must be held liable to some slight modification in the proportions of the different parts.

The general form (Figs. 1 and 2) appears to be distinguished from that of the known species of *Parerythrops* and *Meterythrops* by the greater convexity of the dorsal contour of the cephalic region of the carapace.

The eye is extremely small, the visual portion occupying an unusually small proportion of the whole appendage, while the proximal portion is unusually inflated. A minute papilla occurs dorsally at the edge of the cornea.

The antennule offers no peculiarity; it is devoid of any trace of a sexual process.

The antenna is characterised by the reduction of the exopodite or antennal scale, showing in this respect an approach to *Anchialus* and *Caesaromysis*. The endopodite differs from *Parerythrops* and from *Meterythrops* in the proportions of its basal joints. In those forms the three basal joints are short and do not greatly differ in length. In *Erythrops* the proximal joint is greatly reduced, while the median and distal joint are elongate. In the form before us the basal joints agree with *Erythrops* in relative length, but are proportionally much stouter. A somewhat natural inference that the endopodite and exopodite of this appendage vary in development in inverse ratio to each other appears to receive support from the analogy of *Anchialus* and *Caesaromysis*. In the latter (cf. Ortmann, Decap. u. Schizop., Plankt.-Exped., p. 24, Pl. I., Fig. 8c.), in which the scale shows its greatest degree of reduction, the basal joints of the endopodite are enormously developed, while in *Arachnomysis* the scale has disappeared, and the flagellum is enormously developed at the expense of the peduncle. In respect of scale and peduncle, *K. Oceanae* appears to occupy a position intermediate between *M. Picta* and *M. robusta* and the species of *Parerythrops* on the one hand and *Erythrops* on the other. The flagellum is stout and probably long, but is not remarkable in these respects in comparison with the most nearly allied



forms. Fig. 3 shows so much of the appendage from a slightly oblique dorsal view as may be seen without removing the eye.\*

In so far as their characters are distinguishable *in situ*, the oral parts offer no peculiarities likely to be useful in determination.

The same remark applies to the legs, of which only the four anterior pairs remain. The natatory exopods are more strongly developed than in *M. robusta* and the species of *Parerythroptera*. They are shown, in Fig. 1, approximately in their present position, but their extremities are actually directed somewhat more upwardly and inwardly.

The genital appendages are short and somewhat tapering. Their extremities, which appear devoid of setae, being forwardly and inwardly directed between the bases of the last pair of legs.

The pleopods appear to be in a very immature condition, but suffice to show that the species cannot be assigned to the genus *Parerythroptera*, as originally defined by Sars. Until an adult male can be examined it is impossible to affirm that we are right in regarding them as like those of *Meterythroptera*. Each pleopod consists of a short basal joint, giving rise to two processes, (i.) an endopodite, devoid of articulations, but furnished near the base with a short lateral process, each extremity bearing a few setae; (ii.) an exopodite in the form of a short digitiform process, devoid of setae. In the anterior pair the endopodite and exopodite are subequal in length. In the remaining pairs the endopodite is the longer, being, in the fifth pair, more than twice as long as the exopodite (Fig. 2). In adult males of allied forms the endopodite and exopodite are subequal in length, or, in the first pair in *Meterythroptera* and *Erythroptera*, the exopodite is much the longer. The material examined in this group throws no light on the development of the pleopods, but in a series of young males of *Siriella Clausi*, a form in which the pleopods are approximately identical in structure with those of *Meterythroptera*, we find that the endopodite is the more precocious and is biramous and setiferous at the extremities at a period when the exopodite is still devoid of setae. The endopodite is also the longer in early stages, though we have observed no such difference in length as is exhibited in the fifth pair of the form under consideration. The developing endopodite in *Siriella* is more pointed at the extremity than in *K. Oceanae*, but in other respects the conditions are so similar that it appears safe to regard our example as immature.

The telson is much shorter than in *Meterythroptera*. Its lateral margins are nearly straight (Fig. 6). The inner pair of spines are about one-fifth as long as the telson, and are longer and much stouter than the outer pair, of which one is missing in our largest example. Under a high power of the microscope we can detect no trace of a median pair of setae, such as occurs in *Meterythroptera* and in *Parerythroptera*. Its absence may possibly be due to imperfect development, or to damage.

The inner uropods are not much shorter than the outer. No spines are visible on the ventral surface near the inner margin, but may occur at a more advanced stage, as the spinulation of this region has been observed to vary in other forms with the degree of development.

The lateral parts of the carapace are closely speckled with small dark chromatophores, a median line of which occurs also on the telson. Pigment, except in the eyes, is not distinctly visible in any other part, but the gastric region appears dark in colour.

*Locality*, see p. 143.

### GENUS *Hypererythroptera*, n.

Characters of the distal parts of the endopodites of the third to eighth thoracic limbs, and pigment, unknown. Other characters as in *Erythroptera*, G. O. Sars, except—

*Telson* well developed, not unusually short; lateral margins armed with spines; apex broadly truncate, armed with a median pair of setae and about three pairs of spines.

All the *thoracic* and some of the *abdominal segments* in the males armed with median ventral processes.

\* Ortmann's key to the genera of Mysidae (*op. cit.* pp. 2'-22), requires some verbal modification in order to associate the present species with its nearest allies, since the antennal scale is apparently no larger than that of *Anchialus pusillus* (*cf.* Sars, 1885).



**Hypererythrops serriventer**, g. et sp. n.

PL. XXIII. and PL. XXIV., FIG. 4.

*Form* moderately stout. *Carapace* wider in the thoracic than in the cephalic region; anteriorly produced and rounded, but not forming a distinct median linguiform process; produced beneath the eyes into acute angles. *Labrum* with a well-developed blade-like process; a small spinous process immediately in front of it. *Eyes* rather large, set close together, the anterior and posterior margins of their peduncles not noticeably differing in length; colour orange-brown after preservation. *Antennular peduncle* with the basal joint as long as the two remaining, its outer corner produced into a somewhat acute process tipped with three or four setae; middle joint much the shortest of the three; distal joint with a small spine at its inner distal corner, male process of moderate size but very hirsute. *Antennal peduncle* with the proximal joint small, middle joint once and a half times as long as the distal; these last two joints beset at their inner distal angles with a bunch of setae. *Antennal scale* about three times as long as broad; outer margin entire, terminating in a strong spine, the extremity of which is about at the level of the extremity of the peduncle; apex very obliquely truncate, about one-third of the length of the scale being beyond the extremity of the spine; extremity of scale at about the level of that of antennular peduncle. *Mandibles* generally as in *Erythrops*, three-jointed, first joint small, second longer than third and unusually broad, its greatest width being more than half (17:30) of its length; last joint tipped with a fine seta as long as itself. *First and second Maxillae* generally as in *Erythrops*. *First thoracic limb* with endopod as in *Erythrops*, exopod with a small spine at its distal angle, flagelliform part with nine joints. *Second thoracic limb* with endopod proportionally shorter and stouter than in *Erythrops*, carpus much shorter than merus. Exopods of *second and succeeding thoracic limbs* with flagelliform parts of ten joints. *All the thoracic limbs* with small forwardly directed digitiform epipodites on the basal parts. *Ventrum*, in the male only, armed between each of the pairs of thoracic limbs with a forwardly directed sickle-like process, terminating in a stout spine, its posterior or inferior edge beset, except proximally, with short spines; also armed between the first to third pairs of pleopods with short simple spineless processes. *Pleon* distinctly narrower than carapace, the sixth segment about as long as the two preceding taken together. *Pleopods* generally as in *Erythrops*, but with the second to fifth of the male having the lateral lobe of the inner ramus produced inferiorly into a considerable ovoidal slightly pedunculate lamella of about one-third of the length of the whole ramus. *Telson* more than half as long as the inner uropod; its apex broadly truncate but somewhat rounded at the angles, armed with a median pair of setae and with one small and two large spines on either side, the outer spines the longest; lateral margins armed on about the distal three-fourths with a series of about seven to nine spines increasing in length from in front backwards the posterior spine incurved and occupying the angle of the apex. *Inner uropods* somewhat the shorter, unarmed ventrally. *Otocyst* somewhat unusually inflated.

*Length* of adult males and females, 10 mm.

Our material consists of males and females, all of which are either mature or have so nearly attained maturity that we are unable to throw any light on the distinctions which may exist between young and old individuals.

The peduncles of the antennules have the sexual differences which are familiar in *Erythrops*, and the mouth-parts are of the same type as in that genus. The most obvious generic distinction, for present purposes, is found in the telson, which is considerably larger than in *Erythrops*, and has the lateral margins armed with spines.

The peculiar median ventral processes, found, among adults, in the male only, appear worthy to figure in the generic diagnosis. Their func-



tion might be more obvious if we had any means of knowing the characters of the thoracic legs, but only one specimen in our material possessed even the two anterior legs, and these are not very different from those of *Erythrops*.

The thoracic median ventral processes (see fig. 8) are all much alike in size and shape. They do not project, ventrally, below the bases of the endopodites of the limbs, but their extremities pass in front of the limbs between which they arise. The terminal spines are comparatively large and stout, and those of the inferior or posterior edge, which are in part set in more than one row, are stout though very short. Among Mysidean spines they are unusually deciduous, the appendages in some specimens being wholly stripped of spines, though their facets of attachment are clearly visible.

The abdominal median processes are simple, laterally compressed and small in the first to third segments of the pleon. In posterior segments they may be traced as papillae, which we have not thought worthy of note in the specific diagnosis.

Sars has figured, in an immature female ascribed to *Erythrops serrata*, a series of apparently homologous structures between the thoracic limbs. They are narrowly pedunculate globular processes set with radiating spikes. The author does not mention them except, very briefly, in his discussion of the genus, and we have not been able to find them in a fairly large collection of immature and mature Irish *E. serrata*. The phenomenon is not likely to be of a pathogenic character, and we hazard the suggestion, with the respect due to Sars, that the example in which they were found may belong to some species very closely related to *E. serrata*, but otherwise unknown.

Structures apparently homologous with those which, in *Hypererythrops*, we term epipodites, are shown by Sars in the same figure, but they are depicted as simple proliferations of the base of the limb rather than as distinctly digitiform processes, such as are shown in our fig. 8. Epipodites are found in even better development in *Euchaetomera Fowleri* (see p. 123).

The characters of the second to fifth pleopods of the male *H. serriventer* require somewhat more prolix notice than is compatible with specific diagnosis. Taking a typical *Erythrops* pleopod, the condition of the species before us would be achieved by the addition to the ordinary simple digitiform lobe of the endopodite, with its terminal setae, of a sub-pedunculate lamella arising from its inferior surface. Consideration of the generic value of such a departure from the condition of the known *Erythrops* group may be safely deferred until it be met with in other forms, as yet safe from the zoological pillory.

*Locality*, see p. 144.

### GENUS *Dactylerythrops*, n.

Characters, as far as they can be diagnosed in the absence of the thoracic limbs, generally as in *Meterythrops*, S. I. Smith, except—

*Eyes* small, with distal processes, visual elements imperfectly developed.

*Telson* sub-triangular; apex narrowly truncate, armed with a pair of spines on either side of a pair of setae; lateral margins armed with a few spines distally.

### *Dactylerythrops dactylops*, g. et sp. n.

#### PL. XXII.

*Form* robust. *Carapace* of nearly even width throughout, anteriorly gibbous, anterior margin obtusely rounded, posterior margin somewhat emarginate. *Eyes* small, remote from each other, their inner faces bound to the anterior margin of the head by a wide membranous integument: visual elements in the form of six to eight plates set in mosaic about a central pyriform body; distal extremities produced into digitiform flexible processes about as long as the visual parts. *Antennular peduncles* with the distal joint much the longer; much more robust in the male than in



the female. Male appendage very hirsute. *Antennal scale* about three and a half times as long as broad; outer margin slightly curved, terminating in a spine of moderate size; apex rather obtusely rounded, produced considerably beyond the spine of outer margin, reaching or slightly exceeding the level of the distal extremity of antennular peduncle. *Basal joint of antenna* wide and massive, distal joint of peduncle of flagellum the longer, reaching to about the distal third of antennal scale. *Mouth organs* (as far as can be made out in the absence of dissection) as usual for *Meterythrops*.<sup>\*</sup> *Thoracic limbs* (of which the endopodites are all wanting) with the flagellate parts of the exopodites nine-jointed; male appendages well-developed, but of moderate length; female with two pairs of incubatory lamellae. *Pleon* with the first five segments sub-equal, the sixth about one and a half times as long as the fifth. *First pleopods* in the male with the inner rami bifurcating into two narrow sub-equal processes, without any conspicuous basal enlargement. *Telson* sub-triangular, about as long as the sixth segment of pleon, apex narrowly truncate, beset with a central pair of setae and a pair of spines on either side. The inner spines are three or more times as long as the outer and about as long as the telson. Lateral margins entire, except distally, where there are about three small spines on either side. *Outer uropods* with the extremities somewhat squarely truncate. *Inner uropods* but little shorter than the outer, armed inferiorly with a single spine near the posterior end of the otocyst. *Colouration* not noted when the specimens were taken. One retains a crimson spot on the cephalic part of the carapace. *Length* of mature male and female 9 mm.

The characters of the eyes and telson serve to readily distinguish this species from its nearest allies (*Meterythrops*, &c.). It is evidently quite a small form, since the range in size of mature examples in this group is inconsiderable.

The appearance of the ocular processes suggests a tactile function, since they seem to have a central core continuous with the nervous part of the eye, though, in view of their position, it is difficult to imagine what useful purpose they could serve. It is possible that they are only spinous in function, as seems to be probably the case in *Paramblyops* and some other forms. So far as can be judged from optical section, the eyes can be of little value for visual purposes, while the fold of integument which binds them to the central part of the head must render them practically immobile.

The species is known from three examples—one taken in a tow-net attached to a dredge fished at 199 fath., and two, in a tow-net on the back of the trawl at 382 fath. The dredge certainly did not seem to have spent much time on the bottom, and the tow-net on the trawl was of course fishing more or less during the ascent of the trawl. It may be significant that no specimens were found among numerous Mysids, Amphipods, &c., in a tow-net on the trawl at 199 fath., which got filled with sand and (it may be presumed) bottom-haunting organisms only.

While obviously differing in form from *Euchaetomera*, *Dactylerythrops* rather closely resembles *Katerythrops*, which is only known as pelagic, and equally resembles *Meterythrops*, apparently a bottom genus.

*Locality*, see p. 143.

## GENUS *Parerythrops*, G. O. Sars.

### *Parerythrops obesa*, G. O. Sars.

The characters which separate *P. obesa* from *P. abyssicola* are not of a very tangible nature, apart from the size of the eyes, as to which one has to depend on Sars' figures rather than on his text. In the examples of 7 to 10 mm. which we refer to this species, the diameter of the faceted part of the eye is nearly equal to the length of the telson, *i.e.*, about as 12 to 13. In *P. abyssicola* the telson is depicted as relatively much longer.

*Locality and distribution*, see p. 144.

<sup>\*</sup>One of our specimens shows a peculiar abnormality in the mandibular palp, that structure being branched on the right side while the left side is quite normal.



GENUS **Euchaetomera**, G. O. Sars.

This genus appears to be very closely allied to *Erythrops*, with which it agrees in the general characters of the male pleopods. The most striking differences are found in the feeble and lamellar character of the telson, which is devoid of large spines on the apex, and in the partly bilobate structure of the eyes. The ciliation of the setae of the thoracic legs, from which the generic name is derived, would seem to be noteworthy only in the type species, *E. typica*. It does not appear to be of a nature to attract attention in *E. tenuis*, and in the species described below it is hardly more noticeable than in *Erythrops*. The legs, however, are very slender, and in general structure *Euchaetomera*, as compared with other members of the *Erythrops* group, is distinctly pelagic in character.

**Euchaetomera Fowleri**, sp. n.

PL. XXIV., FIGS. 1—3.

*Form* slender. *Integuments* thin and diaphanous. *Carapace* with the anterior margin forming a very obtuse angle in the rostral region, its apex considerably posterior to the origin of the peduncles of the eyes; its posterior margin not deeply emarginate. *Eyes* large, closely apposed, sub-rhomboidal and slightly bilobate, their functional facets confined to an anterior part, with long retinal elements, and a postero-lateral part with short retinal elements; these parts deeply pigmented, the pigment dark brown after preservation, the remainder of the eye being pale brown, with facets vestigial and probably functionless. *Antennular peduncle* about one and a half times as long as the eye, distal joint as long as the two preceding, male appendage densely setose in the adult; internal flagellum very long, the proximal joints remarkably setose. *Antennal peduncle* nearly as long as antennular peduncle, its last joint shorter than the preceding. *Antennal scale* slightly curved, about five times as long as broad, extending for about one-seventh of its length beyond the antennular peduncle; external margin entire, terminating in a very feeble spine; apex obliquely truncate, extending beyond the spine. *Thoracic limbs* in the male with well-developed exopodites, the basal part terminating in a minute spine; flagelliform part with eleven joints, and, in the last three pairs of limbs, of about five-sixths of the length of the carapace. *Pleon* somewhat narrower than the carapace, with the first five segments sub-equal, the sixth considerably longer than the two preceding segments. *Telson* short, its lateral margins slightly arcuate and unarmed; apex slightly arcuate, its exterior angles armed with two closely-set short slender spines; median setae not closely apposed, somewhat less distant from each other than from the angular spines. *Outer uropods*, including basal articulation, about once and a half times as long as the sixth segment of pleon; narrow, with the apices obliquely truncate and hardly at all rounded; setae somewhat widely separate, about eleven on the outer margin. *Inner uropods* considerably shorter than outer; otocyst very large, extending to or beyond the extremity of the telson; distal part narrow, the apex rounded; no spines on the inferior surface; no denticulations on the inner edge.

*Length* of adult male and female 9 mm.

*E. Fowleri* is very closely allied to *E. tenuis*, described by Sars from the S. Pacific off Chili. It is, however, readily distinguished by three characters—(i.) the eyes have no dark pigment except at the anterior and postero-lateral functional parts; (ii.) the rostrum, if it can so be called, is much more obtuse in *E. Fowleri*; (iii.) the telson has two distinct, if minute, spines at each angle, and the setae arise at a considerable distance from each other.

In both the specimens taken by Dr. Fowler the setae of the telson are represented only by prominences which mark their origin. The telson of one specimen (a female) is in bad condition and appears to have been shrivelled up, so that the nature of the angular spines cannot be deter-



mined. In the male the telson is in good condition, and at the left angle are seen two minute slender spines, which arise close to each other. The outer spine curves inwards, so that its distal part comes to lie in nearly the same vertical plane as the inner. Of the spines of the right angle only the outer remains, but the base of the inner is visible. The condition is quite different from that of *E. tenuis*, in which there appears to be only a denticulation, and not a true spine, at each angle of the telson.

In the two specimens two thoracic limbs remain, the first and second. They are very slender, as compared with *Erythrops*, and have the carpus as long as the merus.

The exopods only of the remaining thoracic limbs of the male are present, and they are in every way normal in structure.

The posterior thoracic limbs of the female specimen appear to be arrested in their development. The endopodite consists of five joints (including the small dactylus) very imperfectly defined, the penultimate joint, which corresponds to the future tarsus, being still unjointed. The tip of the dactylus is rounded and transparent. The flagellum of the exopod is likewise devoid of articulations, and the whole limb is devoid of setae.

Well developed epipodites, such as we describe for *Hypererythrops serriventer*, are present in this species as well.

We are unable to say whether this condition of the development of the legs in the female is normal for this species or not, owing to the endopodites of the legs in the male having broken away. But it may be noticed that the female has well-developed incubatory lamellae, and the male, which is of exactly the same size, has the brush of setae on the antennules remarkably well-developed. Moreover, in the male the exopodites of all the limbs are well developed.

Beyond noting the shape, Sars devotes no special attention to the eyes of *E. typica* and *E. tenuis*, but it is probable that their structure is the same as that of *E. Fowleri*, in which the absence of pigment from the non-functional parts of the faceted area enables the visual elements to be clearly seen in optical section. They do not appear to differ in any important particular of internal structure from the eye of *Stylocheiron*, as described by Chun (1896). Among known Mysids *Euchaetomera* is the only genus in which such a sub-division of the visual elements has been observed. It occurs in several genera of *Euphausiidae*, presumably in all which have bilobate eyes, such as *Thysanoessa*, *Nematoscelis*, *Nemato-brachion* and *Stylocheiron*, and in *Phronima* among amphipods. The taxonomic value of this character is therefore of no apparent moment, while its bionomic import is rendered doubtful by the existence of normal crustacean eyes in such pelagic forms as the *Sergestidae*, *Euphausia* and immediate allies among *Euphausiidae*, *Katerythrops* (if truly pelagic) among *Mysidae*, and numerous pelagic genera of amphipods.

*Locality*, see p. 144.

### GENUS *Paramblyops*, n.

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

*Carapace* of moderate size, produced anteriorly in subtriangular form, in part occluding the eyes.

*Eyes* imperfectly developed, without visual elements, rather flattened, outer angles rather acutely produced.

*Telson* with the apex broadly truncate.

*Amblyops* has the carapace large (*magnum*). If sufficiently large to really merit generic stress in *Amblyops*, it is not so in *Paramblyops*. The telson in the type species of the latter lacks the median setae, but this character is perhaps hardly worth mention in generic diagnosis.

But for the inconvenience of, at present, meddling with Sars' definition of *Amblyops*, that genus might be easily expanded to admit *Paramblyops*, which is in general character merely an *Amblyops* with the anterior margin of the carapace produced into a rostral hood. Its resemblance in this respect to the *Calyptopis* larva of an Euphausian is suggestive, but there is little probability of phylogenetic kinship in the evolution of the



two conditions. A development of protective armature in compensation for loss of sight is familiar enough, and the diversity of means by which the same end may be accomplished in closely allied forms is illustrated by comparison of *Paramblyops* with *Pseudomma*. In both the front dorsal margin is provided with an edge of fine denticulations, but whereas in the former these are of the carapace, the eyes contributing nothing but a small spinous process not impossibly tactile rather than protective in function, in *Pseudomma* the denticulate edge is furnished by the eyes themselves, flattened and united into a broad shield extending beyond the carapace, but not, in the known species, presenting any considerable pseudo-rostral proliferation.

### ***Paramblyops rostrata*, g. et sp. n.**

#### PL. XXI.

*Form* moderately stout. *Carapace* wider than pleon, posteriorly emarginate, not covering the last thoracic segment; the whole of the anterodorsal margin produced in subtriangular form and depressed, the sides inflexed; the apex or rostrum longer in the female than in the male, reaching in a dorsal view to about the middle of the antennal scale in the latter, and to about the distal third of the scale in the former sex;\* its edges finely denticulate except at the extremity. *Eyes* without visual elements, rather small, sub-fusiform, partly occluded by carapace, somewhat flattened, very minutely scaled or hispid anteriorly, produced distally into short spine-like processes. *Antennular peduncles* with the first joint produced rather acutely at its outer distal corner, the tip of the process bearing a bunch of setae, middle joint small, last joint longer and stouter than the preceding, much longer and stouter in the male than in the female, furnished in the male with an appendage of the usual form, but (in our material) devoid of the usual brush of setae. *Antennae* with a pair of spines on the outer face of the basal joint. *Antennal scale* four times as long as broad, outer margin terminating in a short stout spine, apex obtusely truncate, not extending beyond the terminal spine. *Labrum* produced into a blade-like process about as long as the rostral prolongation of the carapace. *Mouth parts* as in the genus *Amblyops*, except that the mandibular palp is not as setose. *First thoracic legs* as in *Amblyops abbreviata*. *Second thoracic legs* somewhat stouter and relatively shorter than in *Amblyops abbreviata*, with the merus a little longer than the carpus, the latter somewhat expanded distally; propodus small and densely setose, nail distinct, exopod with the basal joint produced at its outer distal angle into an acute spine, the flagelliform part of nine joints. The remaining *Thoracic legs* long and slender, the tarsus shorter than the merus, three-jointed, and terminated by a distinct nail; exopods of the remaining thoracic legs similar to that of the second leg. *Pleon* longer than the carapace, the first five segments sub-equal, the sixth about as long as the two preceding ones taken together.

*Pleopods* rudimentary in the female, all natatory and biramous in the male, the inner ramus of the first pair short, non-articulate, nearly devoid of setae on the distal parts; inner rami of all the pairs with a lateral basal lamina. *Telson* very massive and strongly armed, about as long as the last segment of the pleon, apex widely truncate, its breadth equal to a quarter of the length, armed with five pairs of spines, the median pair very small, the second pair from the inside very little longer than the median pair and slightly serrate at their bases, the outer three pairs of spines long and very stout, the median of the three pairs being slightly the longest. Lateral margins armed with about fourteen to sixteen short stout spines. *Outer uropods* about one-fourth longer than the telson. *Inner uropods* but little shorter than the outer ones, armed inferiorly with a single minute spine at the level of the posterior end of the otolith.

*Length*, about 10 mm.

*Locality*, see p. 144.

\*The deflection of the rostrum appears to be somewhat variable, and of course affects the apparent length of the structure in a dorsal view.



GENUS **Pseudomma**, G. O. Sars.**Pseudomma calloplura**,\* sp. n.

This new species having come to hand after our notes had gone to press, only a brief preliminary diagnosis can be given here, viz:—

*Form* much as in *P. roseum*, sublinear in dorsal view, generally compact. *Carapace* obtusely rounded in front, emarginate behind. *Pleon* longer than the carapace, with the last segment one and a half times as long as the preceding. *Antennule* with the usual setose appendage in the male. *Antennal scale* about five times as long as broad, extending for nearly half its length beyond the antennular peduncle; outer margin entire and terminated in a short spine, tip of scale not extending beyond the terminal spine of the outer margin. *Eyes* in the usual form for the genus, of two rectangular lamellae devoid of pigment and visual elements, antero-lateral and lateral edges with about twenty small teeth. *Labrum* produced into an acutely pointed process. *First thoracic legs* much as in *P. roseum*, but the merus relatively shorter and the carpus rather longer. *Second thoracic legs* more slender than in *P. roseum*, merus longer than carpus, propodus short, dactylus distinct, not so densely armed with setae as in *P. roseum*. *Remaining legs* missing. *Pleopods* normal in structure. *Telson* about as long as the last segment of the pleon and a little shorter than the inner uropods, apex rounded and armed with three pairs of long strong spines, each spine being itself 'feathered' with short setae; lateral edges of the telson armed with twelve or thirteen small spines on the distal two-thirds of their length. The median setae usually present at the apex of the telson in species of *Pseudomma* are wanting in this species. *Outer uropod* about one quarter longer than the inner, which is slightly longer than the telson.

*Length* 10 mm.

*Colour* of preserved specimens white with a rosy red patch on the carapace behind the eyes.

*Locality*, see p. 145.

This *Pseudomma* differs from all the other species of the genus, except the following, *P. Theeli* (Ohlin, 1902) and *P. parvum* (Vanhöffen, 1898), in the form of the antennal scale. The telson is distinguished by the absence of median setae and by the plumose character of the terminal spines. *P. parvum* has no median setae, but the terminal spines, though of the same number as in *P. calloplura*, appear to be simple. It is a Greenland form from 193 fathoms, and is only known from Vanhöffen's very brief diagnosis of the characters of the antennal scale and telson.

**Pseudomma Kemp**i,† sp. n.

This form, like the preceding came to hand after our paper was in proof. The species, in its most obvious characters, very closely resembles *P. calloplura*.

*Antennal scale* about three times as long as broad, its apex not extending beyond the terminal spine of the external margin. *Eye-plate* hispid, denticulations confined to the antero-lateral margins. *Pleon* with the sixth segment as long as the two preceding taken together. *Telson*, without the terminal spines, about as long as the sixth segment of the pleon; and with the apical spines (about one-sixth of its length) extending to about the extremity of the inner uropods; in shape rather narrowly linguiform, apex sub-truncate, beset with two pairs of rather slender slightly curved naked spines, of which the inner pair is the longer, also with a pair of median denticles, or with a single bifid denticle, and with a pair of plumose setae arising from the dorsal surface a little in front of the denticles; lateral margins, from the level of the hind end of the octoyst, each with about 28-30 spines, increasing in length towards the apex. *Inner uropod* with a single long slender spine at the inner posterior corner of the otocyst. *Length* of adult female, 11 mm.

Our material consists of several females taken in 1901, but overlooked until recently owing to the mislaying of the tube in which they were preserved.

*Locality*, see p. 145.

\* In reference to the plumose spines of the apex of the telson.

† S. W. Kemp.



GENUS **Mysideis**, G. O. Sars, 1864.

**Mysideis insignis**, G. O. Sars.

(?) *Mysidopsis hibernica*, Norman, 1892.

PL. XXIV., FIG. 5.

Our specimens were at first regarded as examples of *Mysidopsis hibernica*, diverging somewhat from Norman's types in the characters of the telson. Re-examination has shown them to be *Mysideis insignis*, and to this species must also, probably, be referred the imperfect specimen assigned to *M. hibernica* by Holt and Beaumont (1900).

In externally visible characters the description of *M. hibernica* separates that form from *M. insignis* only in regard to the telson, of which the apex shows but a very slight indentation, while no median setae are described. The number and description of the lateral spines, given as "twenty . . . of equal size," would be held by no one as specifically excluding forms in which the number, as in our material, ranges from eighteen to twenty-five, and in which the size of the spines *inter se* is somewhat variable.

In our examples the cleft of the telson, though always more than a mere indentation, is variable in extent, and never very deep. Moreover, the median setae arise from the ventral face of the cleft, so that when they are broken off no trace of them is to be seen from the usual (dorsal) point of view of the observer.

To us it seemed improbable that forms so closely allied by external characters as *M. hibernica* and *M. insignis* could really belong to different genera. We therefore applied to Canon Norman, who, with his usual prompt kindness, re-examined his types and informed us that in the characters of the mouth parts and in the presence of the median setae of the telson *M. hibernica* is a *Mysideis*. He has also sent us his types, the male of which has the pleopods as in *M. insignis*. As he observes, the largest of them is 16 mm., whereas *M. insignis* in Norwegian waters reaches 25 mm. The male type of *M. hibernica*, though fully mature, measures only 15 mm., and our own examples of *M. insignis* do not exceed 20 mm. Unfortunately, some of them got dried up before they were critically examined, and the only mature male sufficiently perfect for comparison in regard to sexual characters measures 16 mm.

While it is possible that *M. hibernica* is a valid species, constantly distinguishable from *M. insignis* by its smaller size and by the absence of a distinct cleft of the telson, we incline strongly to the belief that it is at most a smaller southern race of *M. insignis*, in which the telson may or may not be distinctly cleft. It is worthy of note that Canon Norman took a specimen which he determined as *M. insignis* in the same haul as his types of *M. hibernica*. This, as he tells us, must have been "elsewhere than in its proper place" at the time when he was writing his diagnosis of *M. hibernica*: it agrees with *M. hibernica* except in having a slightly greater emargination of the telson. We have two examples of 9 and 11 mm., of which the first has the telson absolutely devoid of terminal emargination, while the second agrees in this respect with Norman's male type; but another, of 6 mm., has the cleft already well developed. It follows that, if *M. insignis* and *M. hibernica* are to be regarded as synonyms, the condition of the apex of the telson cannot be shown to vary constantly with the size of the individual.

*Locality and distribution*, see p. 146.

**Mysideis (?) Farrani**,\* sp. n.

This form having been received after our notes had gone to press, only a brief preliminary description can be given here, viz. :—

*Body* moderately robust. *Carapace* with a very slight obtuse rostrum; only slightly emarginate posteriorly. *Pleon* longer than the carapace, the first five segments subequal, the last segment one and a half times as long as the fifth. *Eyes* large, pigment red. *Antennal* scale lanceolate, about four to five times as long as broad, extending for a little way

\* G. P. Farran.



beyond the antennular peduncle, setose all round. *First thoracic legs* with the propodus smaller than carpus, nail distinct, limb generally well armed with plumose setae. *Second thoracic legs* with the merus as long as the carpus and propodus combined, latter shorter than carpus, nail distinct, the limb armed with plumose setae on the last three joints. *Remaining thoracic legs* with the tarsus three-jointed and shorter than the preceding joint, dactylus distinct. *Exopods* of the thoracic limbs well developed, with the outer distal corner of the basal joint rounded, flagelliform part composed of nine joints. *Telson* as long as the sixth segment of the pleon, and two-thirds the length of the inner uropod, gradually tapering to the extremity, which is one-third as wide as the width at the base, apex truncate with a semi-elliptical cleft about one-fifth the length of the telson, the cleft armed with a few very small spines at apex and on sides; extremity of telson on each side of the cleft armed with one short and one long spine, the short spine on the inside; lateral margins of telson with about twenty small spines on the distal two-thirds. *Inner uropod* one and a half times as long as the telson, inner edge armed with about twenty-five spines. *Outer uropod* a little longer than the inner, with setae all round. *Length* of female, 15 mm.

*Locality*, see p. 146.

In the absence of male specimens it is not possible to refer this species with certainty to the genus *Mysideis*. It appears, indeed, from the characters of the mouth parts, in so far as we have yet studied them, that a new genus may have to be erected for its reception.

#### SUB-FAM. nov. ARACHNOMYSINAE.

Differing from *Leptomysinae* in the absence of an antennal scale.

#### GENUS *Chunomysis*,\* n.

*Form* rather stout. *Carapace* short, gibbous, armed with spines on anterior margin, with a single spine on each lateral margin at the origin of the thoracic part. *Pleon* distinctly arched, its segments armed posteriorly with spines, of which some are upwardly or forwardly directed. *Peduncle of antenna* armed with a spine but destitute of a scale. *Cephalon* not unusually elongate, no perceptible interval between cephalic and thoracic appendages. *Mandibular palp* three-jointed. *Second maxilla* destitute of paragnath. *Telson* short, lamellar, feebly armed. *Incubatory lamellae* of female, two pairs.

The types, two examples of the species which follows, have the antennal flagella broken off at the first joint. Supposing the flagella to be greatly elongate, and the posterior thoracic legs, which are wanting, to be spider-like in character, the genus would differ from *Arachnomysis*, Chun, only in the absence of perceptible interval between the cephalic and thoracic appendages.\*\*

#### *Chunomysis diadema*, g. et sp. n.

PL. XIX., FIGS 1—4. PL. XXV., FIGS. 1—7.

*Form* robust. *Carapace* much wider than pleon, not covering all the thoracic segments; deeply emarginate on its posterior border, anterior border evenly rounded and armed with seven long, slightly depressed, and curved spines, set in the form of a crown. Lateral edges of the carapace bearing at the origin of the thoracic part a short stout and blunt spine. *Eyes* large, reaching to the end of the second joint of the antennular peduncle, their peduncles short, subtriangular in horizontal section. Colour of visual part orange brown after preservation. *Antennular peduncle* about one-quarter the length of the carapace; last joint as long as the preceding two, much stouter and thicker than either of the others. *Antennal peduncle* more slender than the antennular peduncle, and in dorsal view completely hidden by the latter. *Antennae* devoid of scale but armed on the basal joint with a long spine, which reaches nearly to the centre of the last joint of the peduncle.† *Mandible*

\* Prof. C. Chun.

\*\* A third specimen recently obtained has the flagella and legs as in *Arachnomysis*.

† A similar spine in place of a scale is found on the antenna of *Arachnomysis Leuckarti*, to which the present species is very closely allied in all its structures.



very strong, palp three-jointed, basal joint the longest, stout, armed on the inner edge with strong setae, a fascicule of which also occurs on the inner distal angle of the joint; next joint smaller and more slender than the first joint, feebly armed with setae; last joint longer than the second but shorter than the first, robust, and strongly armed with numerous setae on the inner edge, which setae are densely plumose. There is one long and strong seta at the tip of the last joint of the palp. Cutting edge not equally developed on both sides, the left side having more teeth than the right. *Maxillae* as in *Arachnomysis*, except that here the paragnath of the second maxilla would appear to be absent (see Chun). *First thoracic limb* very robust and strongly armed, joints short, broad and stout, fifth joint rather more expanded than in *Arachnomysis* and more setose, sixth joint much smaller than fifth. *Second thoracic leg* feeble and slender, basal joint broad and flat, next two small and narrower than basal, merus long and narrow, carpus equal in length to the merus and of similar structure; propodus small; dactylus rather longer than propodus; both the two last-named joints beset with numerous plumose setae.\* *Exopodites* of all the thoracic limbs with a spine on the outer distal angle of the basal joint. Flagelliform part composed of eight or nine joints. *Pleon* arched, narrower than the carapace. First five segments subequal, last about equal in length to the preceding two. First five segments armed on their posterior border with spines, some of which are forwardly directed. Sixth segment with the posterior angle of epimera produced into a spine. *Telson* short, feeble, about three-fifths of the length of the last segment of the pleon, and as long as its breadth at the base, lateral margins entire, apex feebly armed with two pairs of short spines, the innermost pair the longer and setiform, but not plumose. *Outer uropods* about two and a half times as long as the telson. *Inner uropods* very little shorter than the outer. Their ventral surfaces naked. Female with two pairs of *incubatory lamellae*, the posterior pair being very large and extending as far as the posterior border of the second segment of the pleon. *Colouration*, of preserved specimens, yellowish brown.

*Length*, rostral spine to end of telson, 8 mm.

*Male* unknown, our material consisting of two females.

The short gibbous carapace, and strongly arched pleon give the species a most characteristic appearance. We suppose that the male may have more strongly developed antennular peduncles than the female, furnished, as in *Arachnomysis*, with a profuse brush of setae. The spinulation may probably vary somewhat in individuals, and as between the sexes. In both our examples it is as shown in Fig. 1, but the length of the downwardly curved processes of the anterior margin of the carapace is greater than appears in a dorsal view. Any considerable variation in length in these, and any variation at all in number, is most improbable, while the spine of the lateral edge of the carapace will probably always be found somewhat broader and blunter than in our figure, which makes the spine look a little more slender than in the original.

Variation in the spines of the segments of the pleon is much more probable, since the specific constancy of such structures varies with their abundance. Our specimens have forwardly directed median spines, which rise well above the level of their segments, only on the first two segments. The median spines of the third and fifth segments project boldly, but are not forwardly directed. The occasional occurrence of a median spine on the fourth segment seems probable. The lateral spines on the first five segments are so irregular that we must trust to our figure for their explanation.

The telson is a feeble thing, as in *Euchaetomera*, very thin and flexible, with a pair of median apical processes almost too slender to rank as spines, yet not plumose like the median setae of the *Leptomysinae*.

The two examples were caught in a net fished at the bottom (and thence to the surface), and in the absence of the posterior thoracic limbs, the condition of the telson, which, for some reason obscure to us, seems to be

\*A portion of the fifth leg remains, and shows the 'Kegelformige' bristles seen in *Arachnomysis*.



usually stout in bottom mysids, furnishes the only evidence we have of the probably pelagic habitat of the species.

*Locality and distribution*, see p. 146.

SUB.-FAM. nov. **BOREOMYSINAE**.

Outer uropods with their outer margins interrupted and set with a few small spines not far from the base. A more or less distinct suture extending from the point of interruption towards the opposite margin, but not completely dividing the uropod into basal and distal joints.

Female with seven pairs of incubatory lamellae.

Other characters as in *Leptomysinae*, Norman.

GENUS **Boreomysis**, G. O. Sars, 1869.

**Boreomysis arctica**, (Kröyer).

As we record a very considerable extension of range on the evidence of a single small specimen\*, it is necessary to note any divergence exhibited by the latter.

Sars' descriptions and figures are taken from specimens of 25 and 27 mm. Ours measures only 10 mm. The front margin of the carapace is rather more widely arched than in the figure of the adult, but the rostral projection is the same, and there is no trace of lateral denticles (such as occur in *B. tridens*). In the lateral armature of the telson the spines show a slightly more marked tendency (as compared with Sars' drawings) towards arrangement in series of several smaller divided by single larger ones, but slight variation in this respect is common. The inner uropods do not appear to have any spines, which is not remarkable having regard to the small size; these spines being of late development in all Mysids which we have had occasion to examine in this regard, and, when their number is small, of rather variable occurrence even in adults.† Other characters being quite satisfactory, there seems to be no risk of a false record. See note, p. 148.

*Locality and distribution*, see p. 147.

**Boreomysis microps**, G. O. Sars, 1885.

It may be well to note the one or two minor points in which the single example which we refer to this species differs from the description given by Sars. The antennal scale of our specimen, in other respects exactly as in Sars' figures, projects beyond the antennular peduncle by at least one-third of its length, whereas in Sars' example it projects only by one-quarter of its length. The exopods of the thoracic legs are decidedly larger in our example than Sars' figures would indicate, while the endopods would seem to have a relatively longer dactylus.

*B. microps* may be distinguished from its congeners by three well-marked characters:

(i.) by the eye, which is small and fusiform in shape, with the cornea not at all expanded and occupying a very small part of the eye.

(ii.) by the last segment of the pleon, which is remarkably elongate and exceeds in length the two preceding segments combined.

(iii.) by the telson, which is unusually slender, and has the edges armed with a series of prominent spines between which are numerous small denticles, the number of the latter between each spine increasing posteriorly. The apical cleft of the telson is small and has a very curious dilation at the top (*vide* Sars, 1885, Pl. xxxiii. fig. 10).

The number of spines on the inner margin of the inner uropods would appear to be two, though it is impossible to be absolutely certain of this point owing to the rather damaged condition of these appendages. The *Challenger* example measured 24 mm., while ours is 21 mm. in length. Both specimens were females, the male being as yet unknown.

*Locality and distribution*, see p. 148.

\* A second, taken while these notes were in proof stage, agrees with the first.

† e.g. One of our large *B. tridens* has two on one side, one on the other. This is not due to accident, as the uropod is big enough to show the scar if one spine had been broken off.



## PART II.

## LOCALITY AND DISTRIBUTION.

The different forms which we have temporarily re-united as Schizopods fall into two main categories, of which one comprises wholly pelagic forms, while the other accounts for those which dwell at or near the bottom. None of them, as one may presume from their form, actually crawl on the bottom like crabs, but some seem to keep as near it as their structure allows, and when we speak of a species as belonging to the bottom we merely intend to imply that it does not, to our belief, make any considerable ascent. The proof of this is most difficult. A horizontal net, which can be opened and closed at a known depth, and fished there with sufficient rapidity to catch such active forms, is not within our experience. Vertical nets, worked through sections of really deep water, act excellently, but in moderately deep water have not scope enough to catch much between particular depths. Serial open tow-nets catch more than any other kind, but the contents of the lower ones are obviously difficult to assign with certainty to particular strata, even when they consist of organisms not met with in the upper nets. Dealing with minute creatures, such as Copepods, which must be caught by any net that comes their way, it is easily discovered that density of distribution varies immensely at times within quite narrow horizontal limits, and much more may this be supposed to be the case with larger and less numerous organisms, which, moreover, possess sufficient activity and perceptive power to make effort to avoid the net. It will be understood, therefore, that our conclusions in regard to vertical distribution are given with considerable reserve, and we may remark that the lists published by the International Bureau show that much more work is required before we can obtain an adequate knowledge of the movements of even well-known shallow water forms. To what extent vertical movements, whether of truly pelagic animals which never touch bottom, or of those which seem normally to live on the bottom, may ultimately prove to depend upon light or darkness, storm or calm, temperature, or factors hitherto untabulated, is still quite uncertain, but in the case of at least one species, Dr. Fowler's work will be found to have made a substantial advance to this end.

We have used the term Atlantic Slope in the title in perhaps too wide a sense, having more regard to the organisms with which we are dealing than to exact physical conditions. Fifty fathoms of water practically eliminate the littoral Mysids, while the *Oceana* and *Research* collecting areas fairly continue those of the *Helga* to the abyss. The actual exploration of the bottom, however, stops for the present at 454 fath., and is confined to the work of the *Helga*, and to such records as are available from the Norwegian coast. The North Sea, though including in its northern part water of considerable depth, we have considered as outside the area of our notes, and we refer to it only in the case of species which have also come under our notice from the outer coast-line of the Atlantic.

In considering horizontal distribution we are not here so much concerned with the general habitat of the truly oceanic forms as with their occurrence on the fringe of their general haunts. We shall therefore attempt no discussion of the various Atlantic "streams" enumerated by Ortmann and others. Much can be said against the retention of such divisions as Norman's "British Area," which, to avoid confusion, we call the "British and Irish Area,"\* and it may be supposed that no one uses it except for convenience. But, on the other hand, when it is said that an oceanic form ought not to be classed as British on account of an occasional occurrence near the western coast-line, one is compelled to inquire what reason there is to regard the occurrence as exceptional. Frequently it will be

\* We use the term in a compound sense and not in recognition of a separate Irish marine area. The western boundary, which alone concerns these notes, is the 1,000 fath. line.



found that attempts to collect the animal, under circumstances conducive to success, in the off-shore part of the area have been about as infrequent as the captures, and that in fact we have no reason to say that we know anything about the pelagic inhabitants of our coasts, save in the narrow strip of shallow water to which collecting is ordinarily confined. Yet, especially in research dealing with drift-net fisheries, the normal and even the occasional pelagic tenants of the seaward zone have an obvious import.

Turning to bottom forms, such as appear to be the majority of the Mysidae, limited, with due allowance for latitude, to certain depths and to certain conditions of the sea floor, the territorially-named areas have a more apparent reason for existence, since they graphically display the observed limits of range on the shores or slope of the ocean, and since, in the case of a bottom-haunting form, the capture of even a single specimen strongly presumes the normal occurrence of the species in the neighbourhood. Even more than in the case of pelagic forms, breaks in continuity of horizontal record are found to coincide with discontinuity of exploration, so that deduction of factors of distribution based on existing data must necessarily be most tentative.

Questions of temperature, current, drift, &c., are now receiving an attention which has never been bestowed upon them before, and we think it well to defer consideration of these for the present, as they may be more satisfactorily handled when the work has reached a more advanced stage, and in connection with the fauna as a whole, rather than with a particular unit. It may suffice to note that in the case of the bottom Mysids of the Slope the range of temperature from their northern to their southern observed limit seems so wide that except in so far as it may be consistently inimical to less hardy competitors, it does not appear to be a factor of importance. Again, at least off the Irish shore, the upper limit of observed vertical distribution is not marked off from shallower water by any sharp difference. Depths, however, as far as is at present known, seem to present for each species much the same barriers throughout the horizontal range.

Of truly oceanic forms, the following will, by ordinary usage, be admitted to the British and Irish list:—

*Euphausia pellucida*, West of Ireland\* and English Channel (International).

*Euphausia similis*, English Channel (International).

*Euphausia Lanei*, sp. n., West of Ireland.

*Thysanopoda acutifrons*, sp. n., West of Ireland.

*Nematobranchion boöpis*, West of Ireland.

*Thysanoessa gregaria*, West of Ireland.

*Stylocheiron longicorne*, West of Ireland.

*Stylocheiron chelifera*, West of Ireland.

*Gnathophausia zoëa*, West of Ireland.

*Eucopia australis*, West of Ireland.

*Katerythrops Oceanae*, sp. n., West of Ireland.

*Thysanoessa longicaudata* and *Nematoscelis megalops* do not appear to have been previously recorded from the Irish part of the Atlantic coast.

*Chunomysis diadema* is a new species from the West of Ireland, possibly oceanic in range. *Anchialus typicus*, which must be added to the British list on the authority of International records from the Channel, is a species at least in part pelagic and perhaps truly oceanic.

Of apparently bottom-haunting forms the following may be added to the list:—

*Meterythrops robusta*, West of Ireland.

*Meterythrops picta*, sp. n., West of Ireland.

*Dactylerythrops dactylops*, g. et sp. n., West of Ireland.

*Hypererythrops serriventer*, g. et sp. n., West of Ireland.

*Paramblyops rostrata*, g. et sp. n., West of Ireland.

*Pseudomma roseum*, West of Ireland.

\* Noted by Holt and Beaumont, 1900.



*Pseudomma calloplura*, sp. n., West of Ireland  
*Pseudomma Kempi*, sp. n., West of Ireland.  
*Amblyops abbreviata*, West of Ireland.  
*Mysideis* (?) *Farrani*, sp. n., West of Ireland.  
*Boreomysis arctica*, West of Ireland.  
*Boreomysis tridens*, West of Ireland.  
*Boreomysis megalops*, West of Ireland.

The previously known members of this section of the list occur at similar depths in Norwegian waters, and Norman in 1892 predicted that they would be found on our western coasts as soon as the latter were explored.

*Gnathophausia drepanephora* and *Euchaetomera Fowleri* are new oceanic species, taken respectively in deep water off the West of Ireland (outside the British and Irish area) and to the north of the Bay of Biscay.

*Boreomysis microps*, a species hitherto known only from a single specimen taken by the *Challenger* at the other side of the Atlantic, and below recorded from the West Coast of Ireland, cannot be added to the British List since the place of capture lies outside the British and Irish area. The circumstances of capture point to its being, at least in part, oceanic.

It may be noted that the following species (of which the first is now added to the Irish list) are shown by the International lists to have occurred at, or over, depths of 50 fath., in localities facing the Atlantic slope without the intervention of land:—

*Boreophausia inermis*, *Erythrops elegans*, *Erythrops Goesii*, *Leptomysis gracilis*, *Schistomysis ornata*, *Gastrosaccus spinifer*, *Siriella norvegica*, *Siriella crassipes*.

Some of these are common West of Ireland forms, but we have only met with them so far in water of less depth. *Lophogaster typicus*, a deep-water form, is already known on the Slope from Norway to the south of Ireland, and *Schistomysis spiritus*, mostly found in shallower water, has been recorded from more than 50 fath. on our S.W. coast.

## FAM. EUPHAUSIIDAE.

SUB-FAM. *EUPHAUSINAE*, H. & T.

GENUS *Euphausia*, Dana.

### *Euphausia pellucida*,

*Helga*.

Inside Porcupine Bank, 175 fath., end of June, 1901, midwater tow-nets at dusk.—Three, 4 to 7 mm.

77 mi. off Achill, 382 fath., August, 1901, tow-net on trawl.—One 11 mm., and (?) one, damaged.

60 mi. off Achill, 199 fath., August, 1901, tow-net on trawl—Eleven, largest 14 mm. Tow-net on dredge.—Four, 10 to 12 mm.

50 mi. off Tearaght, 320 fath., February, 1903, tow-net at 100 fath.—Four, 7 to 14 mm.

50 mi. off Cleggan Head, 120 fath., July, 1903, tow-net on trawl.—Fragments.

40 mi. off Cleggan Head, 96 fath., August, 1903, bottom tow-net.—One, 7 mm.

Also in several hauls in August, 1904, off the Mayo coast, at depths between 1,000 to 200 and 0 fath.; once in the surface net and in November, 1904, off the Mayo and Kerry coasts, in hauls from 600 and 350 to 0, and in a tow-net on the dredge at 244 fath.

*Occana*, November, 1898.

In twenty-four hauls out of a total of thirty which caught schizopods. The hauls were made at from 270 to 1,770 fath., the nets fishing from those depths to the surface. None of the specimens reach the full size of the species.



*Research, July, 1900.*

The most abundant species in the collection, represented by specimens of 5 to 26 mm., and, we think, by many larvae and ova which we have not examined in such detail as to permit of their being definitely referred to *E. pellucida*.

Dr. Fowler's hauls, carried through twenty-four hours in an admirably methodic manner, only possible, we suspect, under the White Ensign, demonstrate most clearly that this species, in ocean waters, rises at night and sinks by day. The details we may properly reserve for our fuller discussion of his results in *Trans. L. S.* It suffices now to mention that while *E. pellucida* was most abundant at 250 fath. and less, one was certainly taken as low as 750 fath.

*Distribution.*—Oceanic, in all the oceans, in Mediterranean, but, though known to range as far north as Norway in the Atlantic, not Arctic, nor Antarctic. Evidently of general but not abundant occurrence in that part of the oceanic margin which is honoured by inclusion in the British and Irish area. The International lists, which, up to the present date, contain only one record, viz., from the surface, English Channel, between Plymouth and coast of France, in Feb., 1903,—seem to offer fairly strong evidence that the species rarely if ever penetrates into the North Sea.

### **Euphausia Lanei, H. & T.**

The single specimen occurred in August, 1901, in a tow-net on the trawl at 199 fath., 60 mi. off Achill—a circumstance which affords no clue to the normal habitat of an apparently oceanic form.

The International lists contain a record of the occurrence of *E. similis*, at the surface, off Scilly, in February or March, 1903. It is a form obviously distinct from *E. Lanei*, and is previously known from the South Atlantic, S.E. of Buenos Ayres (*Challenger*), off the Cape of Good Hope (Schott), and off N. Brazil (Ortmann). The circumstances of capture recorded by Schott and Ortmann indicate that it belongs to the upper strata of the ocean.

### GENUS **Thysanopoda**, M.—Ed.

#### **Thysanopoda microphthalma (?) G. O. Sars, 1885.**

*Research.*

An advanced larva, probably referable to this species, occurs in a gathering made between 100 fath. and surface.

*Distribution.*—Sargasso Sea and Tropical N. Atlantic (*Challenger*), Indian Ocean (Wood Mason), Greenland Seas (Ortmann), and Faroë Channel (Fowler). The species is apparently widely distributed throughout the North Atlantic Ocean.

#### **Thysanopoda acutifrons, H. & T.**

*Helga.*

50 mi. N. by W. (magn.) of Eagle Island, Co. Mayo, 1,000+ fath., August, 1904, large tow-net, 1,000 to 0 fath.—Five, 9 to 14 mm.

40 mi. same course, 750 fath. Same date and net, 750 to 0 fath.—Twelve, 10 to 14 mm.

Same position and depth, November, 1904, large tow-net, 600 fath.—Six, 14 to 22 mm.

### GENUS **Nyctiphanes**, G. O. Sars, 1883.

#### **Nyctiphanes Couchi (Bell).**

This is one of the few N.E. Atlantic representatives of the family which, though essentially pelagic, appear to be non-oceanic. The deepest water in or over which we have taken it is 300 fathoms, off the coast of



Mayo, from which depth a tow-net attached to the trawl-head lifted a single specimen. There were none in the nets on the "back" of the trawl net, which probably catch only benthic species; so, if our *Nyctiphanes* came from the bottom on that occasion, members of its species were certainly not abundant there. Without recapitulating a long list of captures, it may suffice to say that *N. Couchi* is frequently brought to hand on the W. coast of Ireland from water of less than 100 fathoms deep. Nets, except huge coarse-mesh tow-nets, fished at night, it is skilled to avoid, but during the spring and early summer it may constantly be found in the stomachs of sea-trout taken at night in surface drift-nets on the Cleggan fishing-grounds, and in so fresh condition that it must certainly be common at night at or near the surface at depths which often do not exceed 20 fathoms. It is in fact a creature of the coast, rather than of the oceanic slope, but cannot be altogether excluded from the Fauna of the latter.

Often taken with the young of *M. norvegica*, we have never found it in company with examples of the latter exceeding 30 mm. Occasionally we have found it, in surface hauls made at night, in company with *Thysanoessa neglecta*. Its breeding period, as evidenced by the ovigerous females which have fallen into our hands, is in the spring and summer months.

*Distribution.*—Paucity of record is, we imagine, largely due to failure to distinguish this species from *M. norvegica*, but such surmise does not account for its absence from the Norwegian list, as Sars would certainly have noted it had it occurred in Norse waters. It is known from the Firth of Tay and from the coast of Denmark in the North Sea, and must certainly occur in other parts of that region. Its occurrence on the W. coast of Scotland is not recorded, but may be presumed. We have seen that it is common on the W. coast of Ireland. It occurs in the Irish Sea and at least in the western part of the English Channel, both at sea and within Plymouth Sound. We know of no record from the Atlantic coast south of the Channel, but the Euphausians of that region do not seem to have been much studied. It would seem to be absent from the Mediterranean.

## GENUS *Meganyctiphanes*, H. & T.

### *Meganyctiphanes norvegica* (M. Sars).

Previous records, with such as we are able to add, seem to warrant the generalisation that this species, though going far to sea and penetrating to depths of some hundreds of fathoms, is not truly oceanic. Though it occurs on both sides of the North Atlantic, it does not seem to have been recorded from the central parts nor from the Arctic fringe of this area.

Fowler considers that in its adult condition it is not a surface form, and this contention is not disturbed by any material which we have examined.

Tolerant of a very considerable range of temperature, it seems unable to exist at a depth of more than 500 fath., whether from considerations of pressure or lack of suitable food; while it thrives at less than 100 fath. on the W. of Scotland, and is at times abundant near the E. coast of Ireland at 60 to about 20 fath. At such small and moderate depths adults, and probably all stages, spend at least a part of their time actually at the bottom, but where the species sets seawards from the Atlantic slope it becomes purely pelagic. Whether the individual found far at sea over several thousand fathoms of water ever again returns to suitable soundings is a question that we have no present means of solving, but from a comparison of sizes we are inclined to suspect that the off-shore shoals are recruited from the neighbourhood of the land.

The lists published by the International Bureau include a number of records of the species, on which we have drawn for our summary of distribution. No mention is made of the size of individuals, and of their



vertical distribution; it is only possible to say that while captures were made at the surface and in the upper strata, none were made under circumstances which prove the species to have been actually at the bottom.

As compared with *N. Couchi*, *Meganyctiphanes* is, on our western coast, a more seaward form. Its occurrence, even in the young condition, on the Cleggan fishing grounds is not frequent, and may sometimes, by the presence of salps and the like, be clearly associated with a general inward movement of ocean water. In particular its absence from the menu of the sea-trout, an enthusiastic student of the coastal *Euphausiidae*, serves to demonstrate its general exclusion from the immediate neighbourhood of land on this coast.

The following list enumerates the occurrences of *M. norvegica* in the nets of the *Helga* and *Monica* on the west coast of Ireland. They are arranged roughly in the order of remoteness from nearest land.

Porcupine Bank, 91 fath., end of June, 1901, tow-net on dredge and bottom tow-net.—Twenty larvae, 4 to 8 mm., several young, 10 to 17 mm.

Inside Porcupine Bank, 120 fath., same date, tow-net on dredge.—Seven larvae, sixty young, 7 to 16 mm.

Inside Porcupine Bank, 175 fath., same date, at dusk, bottom tow-net.—One young, 12 mm. Midwater tow-net.—Sixteen young, 7 to 12 mm. Surface tow-net.—Two young, 18 and 20 mm.

60 mi. W. of Achill Head, end of August, 1901, 199 fath., tow-nets on trawl-beam and dredge.—Over eighty, 11 to 23 mm.

50 mi. W. of Cleggan Head, Co. Galway, 116 to 120 fath.

August, 1902, bottom tow-net.—One.

July, 1903, bottom tow-net.—Number not recorded.

„ „ tow-net on trawl.—Thirty.

„ „ tow-net on trawl.—Four, 11 mm., one, 26 mm.

40 mi. W. of Cleggan Head, 90 fath., bottom tow-net.—Three.

30 mi. W. of Cleggan Head, 72½ fath., July, 1903, tow-net at 60 fath.—Twelve. Midwater tow-net.—Two.

20 mi. W. of Cleggan Head, 72½ fath., July, 1903, surface tow-net.—One.

40 mi. N. by W. (magn.) of Eagle Island, Co. Mayo, 750 fath., August, 1904, surface net.—Thirty-six.\*

About 15 mi. from Inisbofin and Achill, about 70 fath., May, 1904, 6 ft. triangular net at night, between 15 fath. and surface.—Many, 19 to 30 mm.

About 5 mi. W.S.W. of Shark (an island of the Inisbofin group), July, 1903, about 60 fath., tow-net.—Many, 4 to 10 mm.

Cleggan mackerel ground, outside and about Inisbofin and neighbouring islands, about 20 to 50 fath.—taken on several occasions, viz. :—

Tow-nets, July, 1900 and 1901.—Small specimens.

August, 1903.—Six, 10 mm., eighteen, 11 mm.

October, 1903.—Few, small.

September, 1900 and 1902.—Few, small.

Stomachs of mackerel, herring, and gurnard. Occasionally in February to May, and in August, 1902 and 1903.

Cleggan Bay and immediately seawards, about 5 to 15 fath., tow-nets.—A few, small, in October and November, 1903.

Some gatherings yet remain to be examined, but none which can seriously affect the evidence offered by the above list. All the tow-nets mentioned are open nets and may have taken their catch either at the depth to which they were sunk or on their way to the surface, except in the case of "tow-nets on trawl" (not trawl-beam). These, we think, do not fish except when the trawl is on the ground, as at other times they lie against the net and have little chance of catching anything. It follows that the list comprises only two captures, both at about 120 fath., 50

\* There are also some deep-water records for November, 1904, off the coasts of Mayo and Kerry, but the gatherings are not yet completely sorted.



miles off land, which seem to have been certainly made at the bottom. At the 199 fath. station, where numerous specimens were found in tow-nets on trawl-beam and dredge-bridles, none got into the nets on the "back" of the trawl, so the species cannot have been abundant actually on the bottom. However, near the same place, Holt and Beaumont found a number in the stomach of *Pristiurus melanostoma* at 154 fath. *Pristiurus* is, one may suppose, a ground-feeding fish. These last were specimens of fair size, as are those taken in the big triangular net at night in May, 1904, whereas all others mentioned in the above list are small, or at least short of the full size.\* The probable explanation is that the species, when large, is too agile for ordinary tow-nets, especially in the day time, and did not happen to be on the ground worked by the trawl. There is only a single record from the surface tow-net worked during daylight.

The *Oceana*, working towards the 1,000 fath. line off the S.W. of Ireland in November, encountered the species in one haul only, viz., in a tow-net fished at 650 fath., and thence to the surface (52°45'5" N. ; 12°27' W.). None were found in the more westerly gatherings.

The *Research* in July in the N. part of the Bay of Biscay, with soundings of 1,219 to 2,341 fath., took the species in considerable numbers from 19 to 35 mm. in length, but only at night, and only in the upper 100 fathoms, though not, with certainty, at less than 25 fath. from the surface. What became of it during the day time is hard to say, unless it remained near the surface and saw the nets well enough to dodge them.

*Distribution*.—N. Siberia, Spitzbergen, Jan Mayen, Greenland, Coast of Norway, Farøe Channel, Shetland, Orkney, E. and W. of Scotland, N. of North Sea, Skagerack, Kattegat, Ireland (but not yet observed on S.E.), Bay of Biscay, Portugal, N.E. America.

#### GENUS *Boreophausia*, G. O. Sars.

#### *Boreophausia inermis* (Krøyer).

Though not previously recorded from Irish waters, we have taken this species frequently at various points on the west coast, but not at or above any depth greatly exceeding 50 fath. It is at times an important food of mackerel, herring, and sea trout on this coast. We have also taken it in the Irish Sea.

*Distribution*.—Greenland, Norway, Farøe Channel, N., E. and W. of Scotland, English Channel, N.E. America.

We can find no record which definitely assigns *B. inermis* to a deep-water habitat, but it is mentioned in the International lists from a net worked between about 750 fath. and the surface. It seems probable that it occurs, when found at any considerable distance from the shore, only in the upper strata.

#### SUB-FAM. *NEMATOSCELINAE*, H. & T.

#### GENUS *Thysanoessa*, Brandt.

#### *Thysanoessa neglecta* (Krøyer).

*T. borealis*, G. O. Sars, 1882.

Though ranging far to sea and over considerable depths, this is not an oceanic species and is not represented in the collections of the *Oceana* and *Research*.

In the *Helga* collections on off-shore grounds its seaward limits are represented by captures at 199 fath., 60 mi. off Achill, and 120 fath., 50 miles off Cleggan Head. It occurs in *Helga* gatherings at 40, 30, and 20 miles off Cleggan Head, and is fairly common in the *Monica* tow-nets

\* This applies to, *inter alia*, specimens of which we have not given dimensions in the list.



from the mackerel grounds, practically at all seasons of the year, but most commonly in winter, and ranges at times into coastal waters of quite inconsiderable depth. We know of its occurrence at the surface only from hauls made at night, and during daylight it seems to frequent the bottom or its neighbourhood.

It may be classed as one of the occasionally important items in the food of the mackerel, and is also captured by the spur dog (*Acanthias vulgaris*).

In general the habitat on the Irish coast presents a close affinity to that of *Nyctiphanes Couchi*, but, from the evidence of tow-nets and fish-stomachs, the two forms do not consort together to any great extent.

*Distribution*.—Norway, from Finmark South; in deep water off the Norwegian coast in the upper strata, Farøe Channel (upper strata), Shetland, Skagerack, parts of the Irish and Scottish coasts, north part of North Sea, Bay of Biscay, N.E. America.

We do not know of a record from the southern part of the North Sea, English Channel, St. George's Channel, or Irish Sea. Caullery's deep water record from the Bay of Biscay is based on mangled specimens and requires confirmation.

### ***Thysanoessa longicaudata* (Krøyer).**

*T. tenera*, G. O. Sars, 1882.

#### *Helga*.

Porcupine Bank, 91 fath., end of June, 1901, bottom tow-net.—

Eighteen, 5 to 8 mm., one about 12 mm.\*

Inner edge of Porcupine Bank, 120 fath., June, 1901, tow-net on dredge.—Five larvae (presumably of this species).

Inside Porcupine Bank, 175 fath., end of June, 1901, mid-water tow-nets, at dusk.—Seventeen, 8 to 11 mm.

77 miles off Achill, 382 fath., August, 1901, tow-nets on trawl.—Eight, 8 to 10 mm.

60 miles off Achill, 199 fath., August, 1901, tow-nets on dredge.—Three 9 mm., one 10 mm.

30 miles off Tearaght, ca. 120 fath., tow-net at 20 fath.—One.

50 miles of Tearaght, Co. Kerry, November, 1904, large tow-net, 350 fath.—Seven, 9 mm.

48 miles off Tearaght, November, 1904, tow-net on trawl, 337 fath.—One, 9 mm.

50 miles N. by W. (Magn.) of Eagle Island, Co. Mayo, 1,000+ fath., August, 1904, tow-net 1,000 to 0 fath.—Fourteen.

40 miles same course and date, 750 fath., tow-net 750 to 0 fath.—Twenty.

Also in August, 1904, in tow-nets on trawl, at 112 and 180 fath., off Co. Galway.—Ten and three

#### *Oceana*.

The most abundant in number of all forms taken by the *Oceana*, but exceeded in prevalence in hauls by *E. pellucida* and *S. longicorne*, which each occur in twenty-four hauls, to twenty in which *T. longicaudata* is represented. The nets in which it was taken were fished at 500 to 1,770 fath., and from those depths to the surface. It seems to have been absent from the upper strata, since nets fished at depths of 270 to 500 fath. caught other schizopods.

*Distribution*.—Occasionally taken in company with other northern forms on the British coast of the North Sea, this species is better known from the Northern and Arctic parts of the Atlantic from Europe across to the warm water of the "Gulf-stream." It is, therefore, a truly oceanic species of the North and Arctic Atlantic. Fowler (1903), who has given a rather full account of its then known distribution, says it has "no more right to be regarded as a 'British' species than an occasional *Veleva* or

\* This is the only specimen which we have seen with the slight acumination over telson mentioned in our diagnosis (see p. 107). The elongate limb happens to be present and is as in *T. tenera*.



*Ianthinā* brought up by the North Atlantic drift to our shores." With this we agree, since the ocean has no politics, but the *Helga* and *Oceana* records show that the southern extension of its range is very considerable, and suggest, from the several years over which the records are spread, that it is a normal range and not, on the occasion of each capture, due to some exceptional circumstances of drift.

The International lists give, up to Feb., 1904, only a few records, of which the most southerly is from the northern part of the North Sea. The species occurred chiefly at the surface, or in upper strata.

We have remarked, in the systematic part of our notes, on the differences which appear to exist between Irish and Norwegian examples. Further work may demonstrate a limit of range and character between northern and southern forms.

The *Oceana* records, as we have seen, apparently eliminate the species from the upper waters during the period of the cruise. The *Helga* records, limited to comparatively shallow waters, present occurrences of the species at or above mid-water (soundings 175 fath.), and at or above 20 fath. (soundings 120 fath.), but the surface nets took none, even at night. An oceanic form, fringing on the margin, must necessarily be found at depths which do not harmonise with its ordinary haunt over the abyss to which it properly belongs.

### ***Thysanoessa gregaria*, G. O. Sars.**

The small specimens, which we have referred with some remark (see p. 108) to this species, were taken by the *Oceana* on either side of the 1,000 fath. line in nets fished at from 500 to 1,710 fath., and from those depths to the surface.

The *Research* collections comprise four larvae, apparently referable to this species, taken between 100 and 75 fath. and the surface.

*Distribution*.—Oceanic, North, Equatorial, and South Atlantic; Mediterranean; Pacific, Japan to Australia.

### GENUS ***Nematoscelis*, G. O. Sars.**

#### ***Nematoscelis megalops*, G. O. Sars.**

##### *Helga.*

Inside the Porcupine Bank, 175 fath., end of June, 1901, mid-water tow-net.—One, 14 mm.

50 mi. N. by W. (magn.) of Eagle Island, Co. Mayo, August, 1904, 1,000+ fath., large tow-net 1,000 to 0 fath.—Two.

40 mi. same course and date, 750 fath., same net, 750 to 0 fath.—Two.

81 mi. W. of Eagle Island, Co. Mayo, 220 fath., August, 1904, tow-nets on trawl.—One.

40 mi. N. by W. of Eagle Island, Co. Mayo, November, 1904, large tow-net, 600 fath.—Five, 14 to 18 mm., Twelve, 7 mm.

##### *Research.*

Rather abundant, especially at night, in nets hauled from 100 fathoms and less to the surface. It appears, but it is not with certainty shown, to rise at night, but only one was taken in an actual surface net. Its deepest occurrence is between 400 and 300 fath., if some mangled specimens have been rightly named by us. Proceeding upwards we next find it in a net hauled between 150 and 50 fath., during the day time.

*Distribution*.—Apparently oceanic, occurring in both North and South Atlantic. Though taken on the coast of Great Britain, as well as on the Irish slope, the rarity of its observation on the latter, in spite of fairly assiduous netting, suggests that it does not normally approach our shores. We have, however, taken it in the Irish Sea on one occasion. The northern limit of its range appears to be the Irming Sea between Greenland and Iceland. Southwards it is not known from beyond the sub-tropical region.



GENUS **Nematobrachion**, Calman.**Nematobrachion boöpis** (Calman).*Helga.*

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,000+ fath., August, 1904, tow-net 1,000 to 0 fath.—Three.

40 mi. same course and date, 750 fath., tow-net 750 to 0 fath.—Two.

50 mi. W. of Tearaght, 237 fath., August, 1904, bottom tow-net.—One.

40 mi. N. by W. (magn.) of Eagle Island, Co. Mayo, November, 1904, large tow-net, 600 fath.—Three, 11 to 18 mm.

*Research.*

One specimen in each of seven hauls, of which all but two were carried to the surface. Two specimens are demonstrated to have occurred between 500 and 250, and between 250 and 150 fath. respectively. One was in 100 fath. or less. Another may have been anywhere between 1,250 and 0; the remainder between 350 to 250 and 0 fath.

*Distribution.*—Otherwise known only from a single specimen taken in an open net at 1,020 fath. off the S.W. coast of Ireland. Evidently oceanic, and not at all likely to be restricted to the small part of the N. Atlantic from which it is at present known.

GENUS **Stylocheiron**, G. O. Sars.**Stylocheiron longicorne**, G. O. Sars.

*S. mastigophorum*, Chun, 1888.

*Helga.*

60 mi. off Achill, 199 fath., August, 1901, tow-net on trawl.—Two adult.

50 mi. off Tearaght, 320 fath., February, 1903. Tow-net at 50 fath.—One, 5 mm.

50 mi. off Tearaght, Co. Kerry, November, 1904, large tow-net, 350 fath.—Six, 6 to 9 mm.

40 mi. N. by W. (magn.) of Eagle Island, Co. Mayo, November, 1904, large tow-net, 600 fath.—One, 15 mm.

Also in August, 1904, 200 fath., off Co. Galway, in tow-net from bottom to surface.—One.

*Océana.*

In twenty-four out of thirty hauls, in open tow-nets, fished at depths of from 270 to 1,770 fath., and thence to surface. Occurs in stations on either side of the 1,000 fath. line.

*Research.*

Of very frequent occurrence in hauls between 100 fath. or less and surface, but cannot be definitely referred to any depth greater than 50 fath., though some of the nets in which it was taken started their course much deeper. Only taken actually at the surface at night.

*Distribution.*—Oceanic, apparently of the upper strata. North and South Atlantic, not known from north of a line drawn from the north of Ireland to the United States, but extending as far south as the Cape of Good Hope. Mediterranean.

Though apparently abundant over deep water west and south west of Ireland and in the Bay of Biscay, absence from the International lists seems to show that it does not range further towards the north-eastern coast of Europe.



**Stylocheiron chelifer**, Chun.? *S. abbreviatum*, G. O. Sars.*Helga*.

40 mi. N. by W. (magn.) of Eagle Island, Co. Mayo, November, 1904, large tow-net, 600 fath.—One, 15 mm.

*Oceana*.

In a net fished at 1,410 fath., and thence to the surface, in lat.  $52^{\circ} 18' 1''$  N., long.  $15^{\circ} 53' 9''$  W.—One, very large.

*Research*.

In seven hauls, between 100 to 75 fath. and surface, in the Bay of Biscay.

*Distribution*.—Oceanic, apparently in the upper strata. North Atlantic and Mediterranean, and if, as we suppose, identical with *S. abbreviatum*, Sars, South Atlantic and Pacific. Ireland to the subtropical region seems to be the extent of its known Atlantic range from north to south.

SUB.-FAM. **BENTHEUPHAUSINAE**, H. & T.GENUS **Bentheuphausia**, G. O. Sars.**Bentheuphausia** sp. (?)*Research*.

A single mutilated specimen in a haul between 1,250 fath. and surface.

*Distribution*.—*B. amblyops*, though known from very few specimens, appears to range through the oceans. Though almost certainly excludible from the fauna of the upper strata, there is nothing to show its precise vertical habitat.

FAM. **LOPHOGASTRIDAE**.GENUS **Lophogaster**, M. Sars.**Lophogaster typicus**, M. Sars.*Helga*.

50 mi. W. of Cleggan Head, 120 fath., *ca.*, August, 1903, tow-net on trawl.—One.

*Distribution*.—Atlantic, Norway to Cape of Good Hope; Mediterranean.

GENUS **Gnathophausia**, Willemoes Suhm, 1875.**Gnathophausia zoëa**, Willemoes Suhm, 1875.*Gnathophausia zoëa*, G. O. Sars, 1885.*Helga*.

77 mi. off Achill, 382 fath., August, 1901, tow-net on trawl-head.—Two, 25 and 38 mm.

40 mi. N. by W. (magn.) of Eagle Island, Co. Mayo, November, 1904, large tow-net, 600 fath.—Two, 26 mm.

*Distribution*.—Oceanic, in North and Tropical Atlantic, and in South Pacific; known from a few *Challenger* records from open nets fished at depths from 660 to 1,850 fathoms, and fishing to the surface.

Our specimens, far short of the full size, show that the species ranges, at least at times, into comparatively shallow water. So large a form, even if numerous, is likely to evade tabulation by the nets which can ordinarily be used in deep-water work.



**Gnathophausia drepanephora**, H. & T.

*Oceana*, Lat.  $52^{\circ} 27' 6''$  N., Long.  $15^{\circ} 40'$  W.

The only known specimen was taken in a net fished at 1,770 fath., and thence to the surface.

FAM. **EUCOPIIDAE**, G. O. Sars,

GENUS **Eucopia**, Dana.

**Eucopia australis**, Dana.

*Helga*.

77 mi. off Achill, 382 fath., August, 1901, tow-net on trawl.—One, 19 mm.

50 mi. N.W. by N. of Eagle Island, Co. Mayo, 1,000+ fath., August, 1904, tow-net 1,000 to 0 fath.—One.

40 mi. N. by W. (magn.) of Eagle Island, Co. Mayo, November, 1904, large tow-net, 600 fath.—Five, 25 mm.

*Oceana*.

In three hauls at depths from 500 to 1,710 fath., and thence to surface. None of the specimens are of full size.

*Research*.

In six hauls, from which it appears that the species was taken at least as low as 750, and at least as high as 200 fathoms. Probably 100 to 1,000 fath. include the strata in which it occurred, with some margin each way. One example, represented by fragments, may have been nearly full-grown. The rest are small.

*Distribution*.—Oceanic, in all the oceans; Antarctic, but not so far recorded as Arctic. Possibly ranging to 2,500 fath., its vertical distribution cannot with certainty be extended beyond the limits ascertained by the *Research*. Evidently not a surface form.

The material which we have taken or received has always been preserved in formaline, a medium which suits other schizopods well enough even for considerable periods. *Eucopia*, however, has such a flimsy integument that, if specimens suitable for museum purposes are desired, it should be hardened as soon as taken.

FAM. **MYSIDAE**.

SUB-FAM. **LEPTOMYSINAE**, Norman.

GENUS **Erythrops**, G. O. Sars.

**Erythrops serrata**, G. O. Sars.

*Helga*.

60 mi. off Achill, 199 fath., August, 1901; very numerous both in tow-net on trawl with sand and in tow-net on dredge, 5 to 10 mm.

Also taken on several occasions at 50 mi. off Cleggan Head, 116 to 220 fath.

*Distribution*.—Norway, West Finmark to Christiania Fjord, 30 to 200 fath.; coasts of Scotland and Ireland; Denmark.

This seems to be a bottom species. Though perhaps properly belonging to the Atlantic slope, it is by no means confined thereto, ranging into the North Sea and occurring abundantly in the Irish Sea. So far as we are aware there is no record which proves its capture except at or in the immediate neighbourhood of the bottom. It is only mentioned in the International lists from a capture between bottom and surface.



GENUS **Meterythrops**, S. I. Smith, 1879.

**Meterythrops robusta**, S. I. Smith, 1879.

*Parerythrops robusta*, G. O. Sars, 1879.

*Helga*.

60 mi. off Achill, 199 fath., August, 1901, tow-net on trawl, with sand.—Six, not full grown.

*Distribution*.—Norway—East Finmark, and Lofoten only; N.E. America, 60 to 150 fath.; Kara Sea, Spitzbergen, and Greenland.

Our record extends the vertical as well as the horizontal range, and the circumstances of capture assign the species to the bottom. The absence from Sars' gatherings in the more southern waters of the Norwegian coasts may be due to its large size and presumable activity, though forms at least as large were taken.

**Meterythrops picta**, H. & T.

*Helga*.

77 mi. off Achill, 382 fath., August, 1901, tow-net on trawl-head.—One, 13 mm., immature male.

Presumably a bottom species, but not proved to be so by circumstances of capture.

GENUS **Katerythrops**, H. & T.

**Katerythrops Oceanae**, H. & T.

*Oceana*.

Lat.  $52^{\circ} 27' 6''$  N., Long.  $15^{\circ} 40'$  W., in a net fishing at 1,470 fathoms, and thence to surface.—One.

Lat.  $52^{\circ} 20'$  N., Long.  $15^{\circ} 7' 9''$  W., in a net fishing at 560 fathoms, and thence to surface.—One.

*Distribution*.—Evidently one of the few known pelagic Mysids, and, from its absence from the *Helga* collections, probably oceanic. The *Oceana* gatherings, made with open tow-nets, prove only that it was taken at least as far from the bottom (over 1,700 fath.) as the records show. The absence of all schizopods from nets fished at less than 270 fath. seems capable of an explanation not complimentary to the efficiency of the nets.

GENUS **Dactylerythrops**, H. & T.]

**Dactylerythrops dactylops**, H. & T.

*Helga*.

77 mi. off Achill, 382 fath., August, 1901, tow-net on trawl-head.—Two, male and female.

60 mi. off Achill, 199 fath., August, 1901, tow-net on dredge.—One male.

It is perhaps significant that no specimens were detected in the sandy gathering from "back" of trawl at 199 fath., nor at 382 fath., except in the tow-net on trawl-head, which is of course in front of the ground-rope, and only assisted, if at all, in the capture of bottom forms by the disturbance caused by the trawl bridles. The species was, however, certainly rare on the ground traversed, and may well have been represented in the sandy gatherings by some of the unrecognisable fragments which formed a large proportion of the latter.

We regard it as a bottom species, but have evidently not happened on its local centre of distribution.



GENUS **Hypererythrops**, H. & T.**Hypererythrops serriventer**, H. & T.*Helga.*

60 mi. off Achill, 199 fath., August, 1901, tow-nets on trawl and dredge.—About twenty, 5 to 10 mm.

40 mi. off Tearaght, Co. Kerry, November, 1904, 244 fath., tow-net on dredge.—Four, 6 to 9 mm.

Several were in the tow-net of sand on "back" of trawl, but more in the tow-net on dredge. Apparently a bottom species.

GENUS **Parerythrops**, G. O. Sars.**Parerythrops obesa**, G. O. Sars.*Helga.*

60 mi. off Achill, 199 fath., August, 1901, tow-net on dredge.—Four, 7 to 10 mm. *ca.*

40 mi. N. by W. (magn.) of Eagle Island, Co. Mayo, 670 fath., November, 1904, large tow-net, 600 fath.—One, 5 mm.

*Distribution.*—Norway, West Finmark to Christiania Fjord, 50 to 250 fath.; S.W. of Ireland (off the Skelligs), 52 to 62 fath., a single specimen, rather imperfect (Holt and Beaumont).

If chiefly a bottom form, we have not found it in recognisable condition in the large gathering made by tow-nets on the trawl back at 199 fath., fished at the same time as the dredge. It cannot, therefore, have been very abundant on the ground at the time, and, though shown to extend southwards, its absence from a number of hauls with suitable apparatus and at apparently suitable soundings, suggests that it is not a common form on the Irish part of the Atlantic slope. The 600 fath. net was never within less than 70 fath. of the bottom.

GENUS **Euchaetomera**, G. O. Sars, 1885.**Euchaetomera Fowleri**, H. & T.*Research.*

An adult male and female in two hauls from 250 and 200 fath., respectively, to the surface in the Bay of Biscay.

Obviously pelagic and oceanic, the species is only known from the above record. Its nearest relative, *E. tenuis*, is a Pacific form.

GENUS **Amblyops**, G. O. Sars.**Amblyops abbreviata**, G. O. Sars.*Helga.*

48 mi. off Tearaght, 337 fath., November, 1904, tow-net on trawl.—Twelve, 12 to 15 mm.

54 mi. off Tearaght, 454 fath., November, 1904, tow-net on trawl.—Two, 15 mm.

*Distribution.*—Norway—Lofoten to Christiania Fjord, 100-300 fath.

GENUS **Paramblyops**, H. & T.**Paramblyops rostrata**, H. & T.*Helga.*

77 mi. off Achill Head, 382 fath., August, 1901, tow-net on trawl.—One,

60 mi. off Achill, 199 fath., August, 1901, tow-nets on trawl and dredge.—About seventy, 9 to 10 mm., and many fragments.

81 mi. W.  $\frac{1}{2}$  N. Eagle Island, Co. Mayo, August, 1904, 220 fath., tow-nets on trawl.—One, 7 mm.



40 mi. off Tearaght, Co. Kerry, November, 1904, 244 fath., tow-net on dredge.—Eight, 6 to 8 mm.

Near last, 337 fath., November, 1904, tow-net on trawl.—One, 6 mm.

Most of these were found in the tow-net of sand from the "back" of the trawl. It is evidently a bottom species.

Also taken in August, 1904, in tow-net on trawl at 220 fath., off Co. Galway, and 75 mi. off Fastnet, 181 fath., May, 1904.

#### GENUS **Pseudomma**, G. O. Sars.

##### **Pseudomma roseum**, G. O. Sars.

###### *Helga.*

60 mi. off Achill, 199 fath., August, 1901, tow-nets on trawl and dredge.—Over a hundred, 5 to 11 mm.

50 mi. off Cleggan Head, 120 fath., July, 1903, mosquito-net on trawl.—Two, 5 and 7 mm. One adult, fragmentary.

40 mi. off Tearaght, Co. Kerry, November, 1904, 244 fath., tow-net on dredge.—Thirteen, 6 to 9 mm.

*Distribution.*—Norway, from extreme north (W. Finmark) to south, 100 to 450 fath. North America, Nova Zembla, West Greenland seas. Definitely relegated by its occurrence in numbers in sand in the Achill trawl tow-net to a bottom habitat, the species may be expected to extend along the Atlantic slope to a point considerably south of Ireland. An International record from the coast of Norway mentions it in a net which was fished from about three fathoms off the bottom upwards.

##### **Pseudomma calloplura**, H. & T.

###### *Helga.*

77 mi. off Achill Head, 382 fath., August, 1901, tow-net on trawl.—One.

60 mi. off Achill Head, 199 fath., August, 1901, tow-net on dredge.—Eight; tow-net on trawl.—Four.

48 mi. off Tearaght, 337 fath., November, 1904, tow-net on trawl.—Eight, 6 to 10 mm.

40 m. off Tearaght, 244 fath., November, 1904, tow-net on dredge.—Twelve, 6 to 10 mm.

##### **Pseudomma Kempfi**, H. & T.

###### *Helga.*

77 mi. off Achill Head, 382 fath., August, 1901, tow-net on trawl.—Seven.

#### GENUS **Mysidopsis**, G. O. Sars.

##### **Mysidopsis didelphys**, Norman.

###### *Helga.*

60 mi. off Achill, 199 fath., August, 1901, tow-net on trawl.—Over thirty, 7 to 13 mm. Tow-net on dredge. Twenty-two, 6 to 12 mm.

50 mi. off Cleggan Head, 120 fath., July, 1903, tow-net on trawl.—Two.

Off Co. Galway, 112 fath., August, 1904, tow-net on trawl.—Three.

*Distribution.*—Norway (from Lofoten southwards), 30 to 150 fath.; Denmark; Shetland; east and west coasts of Scotland; north-east coast of England; west coast of Ireland.

Our specimens from the tow-net on trawl off Achill were mixed up with sand and must have come from the bottom. A capture at 62 to 52 fath. off the Skelligs, Co. Kerry, in 1890, was, almost certainly, also effected at the bottom.



The species seems therefore to range on our western coast from about 50 to about 200 fathoms, and we know of no record to prove that it ever leaves the neighbourhood of the bottom.\* Its occurrence, however, in the North Sea and at so small a depth as 30 fath. in Norway, seems to mark it as a form not essentially belonging to the Atlantic slope, and susceptible, by means of suitable methods of observation, of reference to a considerably greater range than that which can at present be assigned to it.

GENUS **Mysideis**, G. O. Sars.

**Mysideis (?) Farrani**, H. & T.

*Helga.*

54 mi. off Tearaght, 454 fath., November, 1904, tow-net on trawl.—Nine, 10 to 15 mm.

48 mi. off Tearaght, 337 fath., November, 1904, tow-net on trawl.—Three, 12 mm.

**Mysideis insignis**, G. O. Sars.

*Helga.*

60 mi. off Achill, 199 fath., August, 1901, tow-net on dredge.—One, 6 mm., one, 12 mm., five, about 15 to 20 mm.

40 mi. off Tearaght, Co. Kerry, November, 1904, 244 fath., tow-net on dredge.—One, 9 mm.

*Distribution.*—Norway,—West Finmark to Christianiafjord, 100-300 fath.; S.W. Ireland,—Off Skelligs, 62-52 fath.; off Valentia, 112 fath. (Norman *in litt.*).

The dredge to which the *Helga* tow-net was attached presented no certain evidence of having been actually on the bottom, though it probably was for part of the time. The species does not appear among those taken at the same time in the tow-nets on the trawl, so there is no absolute certainty of its vertical locus of capture. We regard it, however, as a bottom species.

SUB-FAM. **ARACHNOMYSINAE**, H. & T.

GENUS **Chunomysis**, H. & T.

**Chunomysis diadema**, H. & T.

*Helga.*

77 mi. off Achill, 382 fath., August, 1901, tow-net on trawl-head.—Two adult females, not ovigerous.

Our specimens are too imperfect in the matter of legs and antennae to admit of comparison with the obviously pelagic *Arachnomysis*, but the feeble lamellar telson is such as is not known to us in any Mysid which can definitely be referred to a bottom habitat. The circumstances of capture, on the trawl-head, are quite different from those which we suppose to obtain in captures in nets on the trawl (*i.e.*, on the "back" of the trawl net), and do not preclude capture above the bottom.

We think this is a pelagic species of the ocean, but perhaps not of the highest strata. Wandering into the comparatively shallow area of the coast, it may well have been taken at or near the bottom. Our captures of such non-benthic forms as *Euphausia pellucida* and *Stylocheiron longicorne* in bottom nets on the Slope present the necessary illustration.

\* An International record, between Shetland and Orkney, proves its occurrence at least two and a half fathoms from the bottom.



SUB-FAM. *GASTROSACCINAE*, Norman.GENUS *Haplostylus*, Kossmann.***Haplostylus Normani* (G. O. Sars).***Helga.*

Porcupine Bank, 91 fath., end of June, 1901, tow-net on dredge.—Thirteen, 3 to 7 mm., one 12 mm., ovigerous female.

50 mi. off Cleggan, 116 to 120 fath., July, 1903, tow-net on trawl.—Three, 8 mm.

*Distribution.*—British Islands to Mediterranean. The species extends, as shown above, to the 100 fathom-line, but, from the majority of records, is littoral rather than of the Atlantic Slope, though not found in very shallow water. It was taken by the *Porcupine* off Rockall.

It is chiefly known to us from hauls which seem to locate it in the neighbourhood of the bottom, but an International record proves its occurrence at the surface, off Weymouth, in February, 1904, over water of from about 28 to 53 fathoms.

SUB-FAM. *BOREOMYSINAE*, H. & T.GENUS *Boreomysis*, G. O. Sars.***Boreomysis arctica* (Kröyer).***Helga.*

77 mi. off Achill, 382 fath., August, 1901, tow-net on trawl.—One, 10 mm.

48 mi. off Tearaght, 337 fath., November, 1904, tow-net on trawl.—One, 8 mm.

75 mi. off Fastnet, 181 fath., May, 1904, tow-net on trawl.—One, 15 mm.

*Distribution.*—Jan Mayen, Lofoten to Christiania Fjord, 200 to 400 fath.; North Sea, Greenland, and N.E. America. Presumably extending southwards, at suitable depths and on suitable ground, from its northern observed limit to Ireland.

We have alluded (p. 130) to the characters of two specimens which, though small, seem clearly referable to this species. See note, p. 148.

***Boreomysis tridens*, G. O. Sars.***Helga.*

54 mi. off Tearaght, 454 fath., November, 1904, tow-net on trawl.—Nine, 15-25 mm.

77 mi. off Achill, 382 fath., August, 1901, tow-net on trawl.—One male, 26 mm., one ovigerous female, 28 mm.

*Distribution.*—Norway—Lofoten, Trondjhem and Vestfjords, 300 to 400 fath. Presumably extending between Norway and Ireland at suitable soundings.

***Boreomysis megalops*, G. O. Sars.***Helga.*

60 mi. off Achill, 199 fath., August, 1901, tow-net on trawl, with sand.—Ten, 10 to 17 mm., and many fragments. Tow-net on dredge.—About one hundred and thirty, 9 to 15 mm.

Inner edge of Porcupine Bank, 175 fath., end of June, 1901, tow-net on dredge.—One, 5 mm., apparently referable to this species, but too young for certain determination.

50 mi. off Cleggan Head, 120 fath., July, 1903, tow-net on trawl.—Two, very small, one adult.

*Distribution.*—Norway, west coast and West Finmark, 80 to 200 fath., and presumably thence, at suitable soundings, to the Irish coast, where it is evidently common.



**Boreomysis microps**, G. O. Sars.*Helga.*

50 mi. N. by W. (magn.) of Eagle Island, Co. Mayo, 1,000+ fath., August, 1904, large tow-net 1,000 to 0 fath.—One, female, 21 mm.

The net in which our solitary example was captured was an open one, and therefore fishing both during the descent to and ascent from 1,000 fath., at which it worked. The specimen may, therefore, have been caught anywhere between the surface and 1,000 fathoms. All that is certain is, that it was obtained at least some considerable distance from the bottom (which on the chart was shown to be several hundred fathoms below the greatest depth reached by the net). The circumstances of its capture, therefore, point to its being, at least in part, pelagic, in which respect it would seem to differ from its congeners, which are apparently all bottom haunting forms. The method of capture of the Challenger example is not stated, but the depth at the station at which it was taken was 1,250 fathoms.

*Distribution.*—The Challenger obtained a single individual of this species south of Nova Scotia, in lat.  $42^{\circ} 8' N.$ , long.  $63^{\circ} 39' W.$  It has not since been obtained. The present record, therefore, considerably extends the geographical range of the species.

SUB-FAM. *MYSIDELLINAE*, Czerniavsky.GENUS **Mysidella**, G. O. Sars.**Mysidella typica**, G. O. Sars.*Helga.*

50 mi. off Cleggan Head, 116 to 120 fath., July, 1903, tow-net on trawl.—Two, adult.

Same place, depth and net, August, 1903.—Five, adult.

*Distribution.*—West Norway, 50 to 150 fath.; S.W. Ireland, 52 to 62 fath.\*; W. of Ireland, as above, and presumably from Norway to Ireland at suitable soundings.

So small a species is very likely to escape notice, and we expect that if any means reasonably calculated to effect its capture are employed, it will be found to extend into the North Sea and English Channel, as well as southwards of its present known range. It does not seem to enter the Irish Sea.

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\* In 1890 and 1904.

*Boreomysis arctica*, see pp. 130 and 147.

In February, 1905, a number of adult specimens, undoubtedly belonging to this species, were taken off Tearaght, Co. Kerry.



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## EXPLANATION OF PLATES XV. TO XXV.

## PLATE XV.

*Thysanoessa longicaudata* (Kröyer).

- Fig. 1. Dorsal view.
- Fig. 2. Lateral view.
- Fig. 3. Lateral view of antennular peduncle, enlarged.
- Fig. 4. Antennal scale, enlarged.
- Fig. 5. Leg of the second pair, enlarged.

## PLATE XVI.

*Meganyctiphanes norvegica* (Sars).

- Fig. 1. Female. Lateral view.
- Fig. 2. Carapace, lateral view.
- Fig. 3. Carapace, dorsal view.
- Fig. 4. Carapace, dorsal view, slightly flattened.

## PLATE XVII.

*Nyctiphanes Couchi* (Bell).

- Fig. 1. Male. Lateral view.
- Fig. 2. Ovigerous female. Lateral view.
- Fig. 3. Antennular comb of female, enlarged.

## PLATE XVIII.

*Gnathophausia drepanephora*, sp. n.

- Fig. 1. Male. Lateral view.
- Fig. 2. Base of antennular flagellum of male, enlarged.
- Fig. 3. Antennal scale, enlarged.

## PLATE XIX.

*Chunomysis diadema*, g. et. sp. n.

- Fig. 1. Female. Dorsal view.
- Fig. 2. Antennal peduncle. Lateral view.
- Fig. 3. Telson (of another specimen), enlarged.
- Fig. 4. Telson (of Fig. 1), enlarged.

*Meterythrops picta*, sp. n.

- Fig. 5. Immature male. Dorsal view.
- Fig. 6. Telson, enlarged.
- Fig. 7. Male process of antennule, enlarged.



## PLATE XX.

*Katerythrops Oceanae*, g. et sp. n.

- Fig. 1. Immature male. Dorsal view.
- Fig. 2. Immature male. Lateral view.
- Fig. 3. Antennal scale with peduncle, enlarged.
- Fig. 4. Endopodite of the leg of the 1st pair, enlarged.
- Fig. 5. Pleopod of the 1st pair, ventral view, enlarged.
- Fig. 6. Telson, enlarged.

## PLATE XXI.

*Paramblyops rostrata*, g. et sp. n.

- Fig. 1. Male. Dorsal view.
- Fig. 2. Female. Dorsal view of anterior end.
- Fig. 3. Rostrum, enlarged.
- Fig. 4. Eye, enlarged.
- Fig. 5. Antennal scale, enlarged.
- Fig. 6. Leg of 2nd pair, enlarged.
- Fig. 7. Endopodite of one of the posterior thoracic legs (5th?), enlarged.
- Fig. 8. Telson, enlarged.

## PLATE XXII.

*Dactylerythrops dactylops*, g. et sp. n.

- Fig. 1. Female. Dorsal view.
- Fig. 2. Female. Dorsal view of anterior end.
- Fig. 3. Lateral view of eye, enlarged.
- Fig. 4. Dorsal view of eye, enlarged.
- Fig. 5. Pleopod of the 1st pair, enlarged.
- Fig. 6. Telson, enlarged.

## PLATE XXIII.

*Hypererythrops serriventer*, g. et sp. n.

- Fig. 1. Male. Dorsal view.
- Fig. 2. Male. Dorsal view of anterior end.
- Fig. 3. Antennal peduncle and scale, enlarged.
- Fig. 4. Mandible, enlarged.
- Fig. 5. 1st Maxilla, enlarged.
- Fig. 6. 2nd Maxilla, enlarged.
- Fig. 7. Leg of the 1st pair, enlarged.
- Fig. 8. Processes on the ventrum of the male, with the base of the last thoracic leg showing the epipodite, and the male copulatory organ.
- Fig. 9. Telson, enlarged.

## PLATE XXIV.

*Euchaetomera Fowleri*, sp. n.

- Fig. 1. Male. Dorsal view.
- Fig. 2. Leg of the 2nd pair, enlarged.
- Fig. 3. Extremity of the telson, enlarged.



*Hypererythrops serriventer*, g. et sp. n.

Fig. 4. Leg of the 2nd pair, enlarged.

*Mysideis insignis*, G. O. Sars.

Fig. 5. Telson, enlarged.

*Euphausia Lanei*, sp. n.

Fig. 6. Basal joint of antennular peduncle, enlarged.

Fig. 7. Leg of the 1st pair, enlarged.

Fig. 8. Leg of the 2nd pair, enlarged.

Fig. 9. Extremity of the terminal joint of the leg of the 2nd pair, still further enlarged.

## PLATE XXV.

*Chunomysis diadema*, g. et sp. n.

Fig. 1. Mandible, enlarged.

Fig. 2. Cutting edge of right mandible, further enlarged.

Fig. 3. Cutting edge of left mandible, enlarged.

Fig. 4. 1st maxilla, enlarged.

Fig. 5. 2nd maxilla, enlarged.

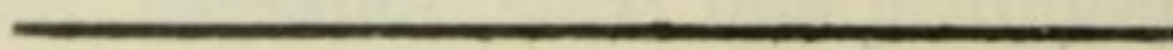
Fig. 6. Leg of the 1st pair enlarged.

Fig. 7. Leg of the 2nd pair, enlarged.

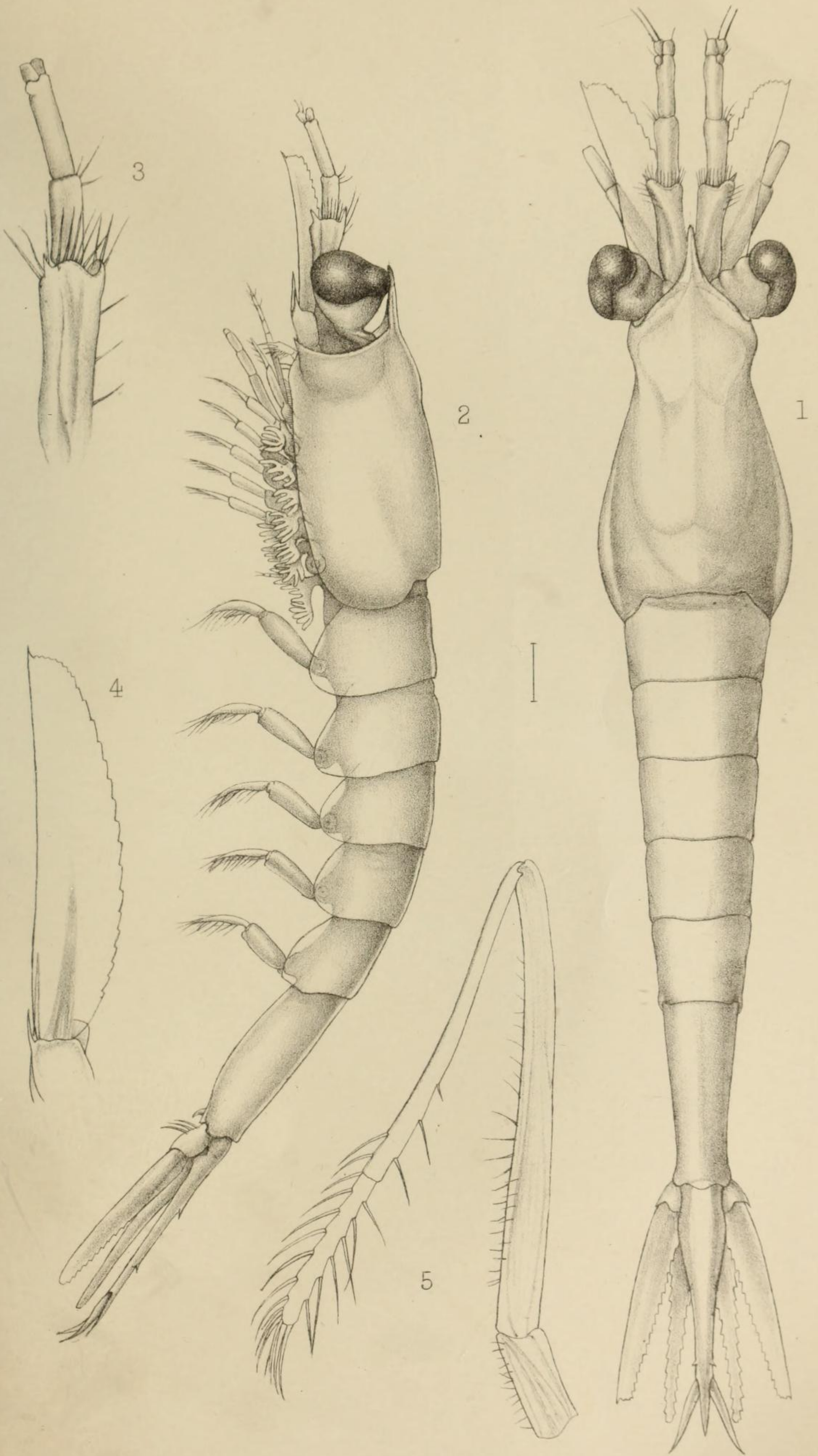
*Meterythrops picta*, sp. n.

Fig. 8. Leg of the 1st pair, enlarged.

Fig. 9. Leg of the 2nd pair, enlarged.







E.W.L. Holt del.  
G.M. Woodward lith.

West, Newman imp.

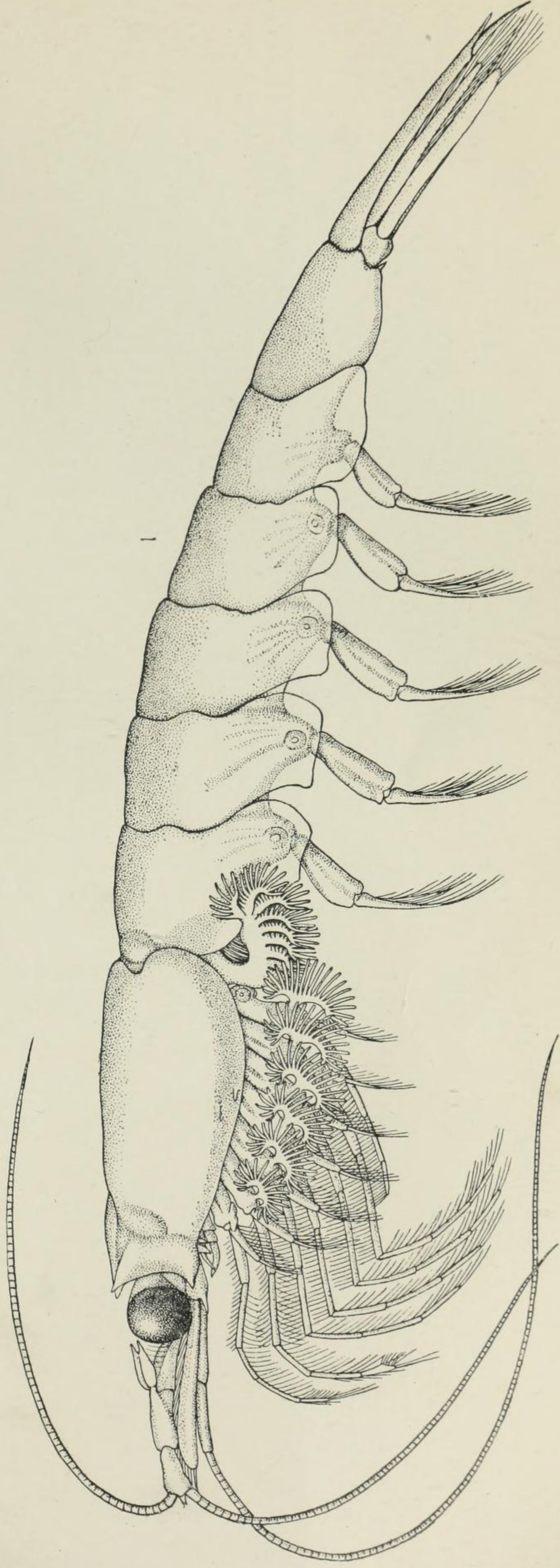
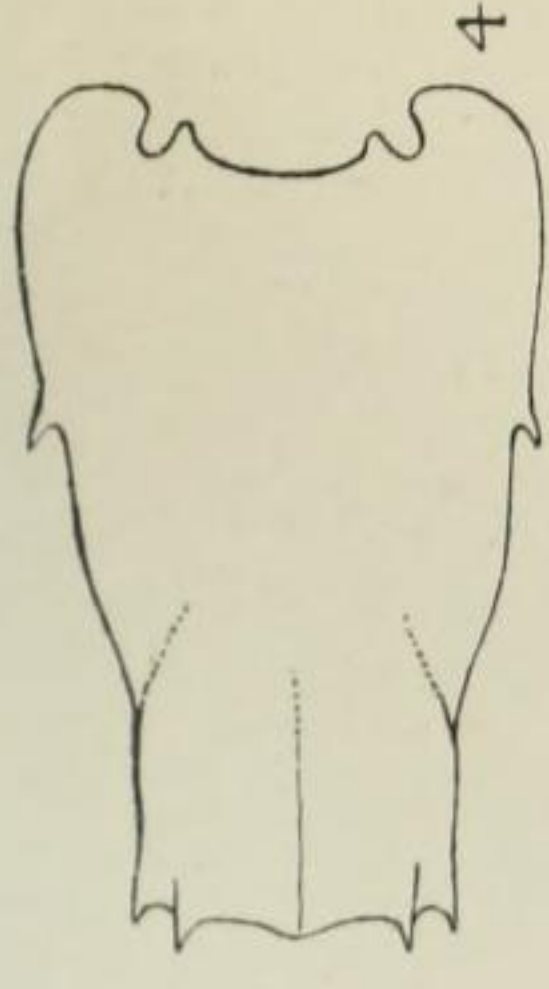
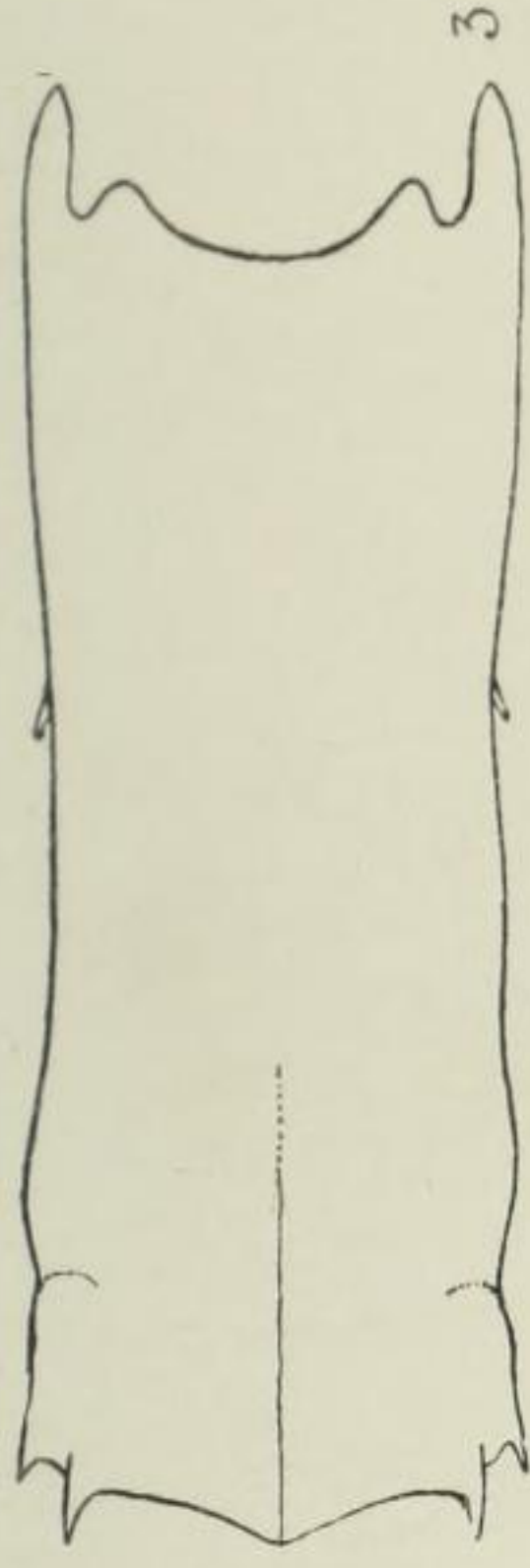
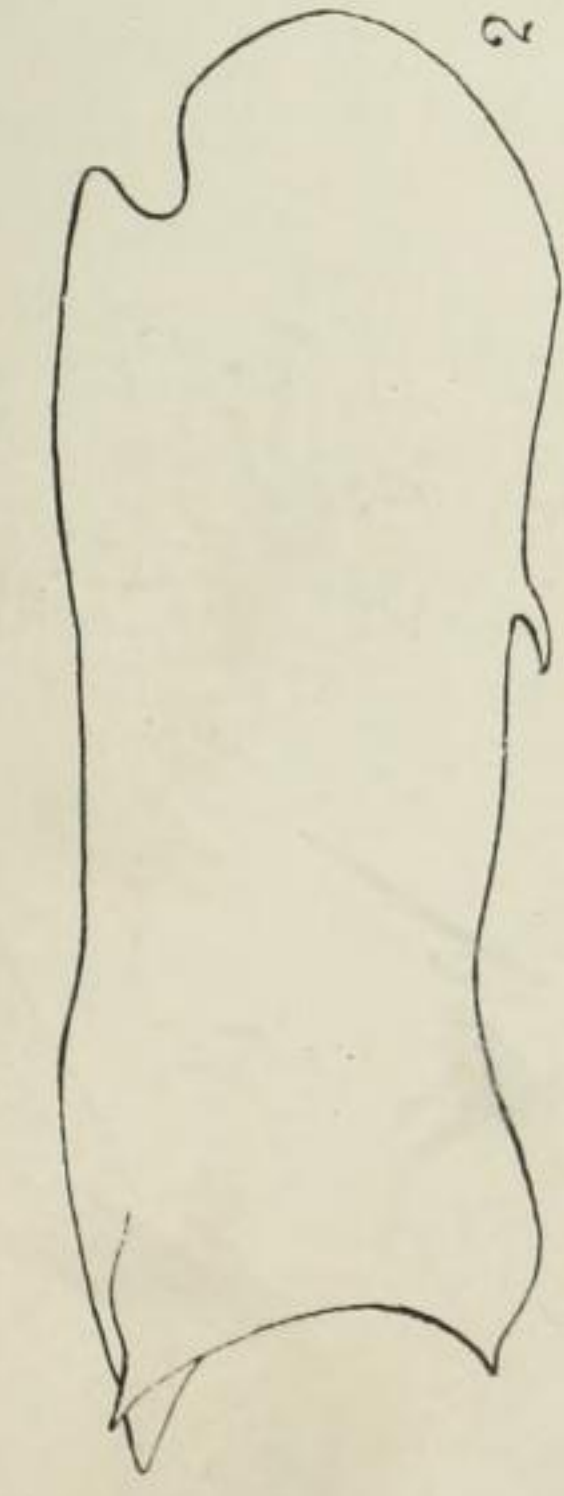
*Thysanoessa longicaudata*







Pl. XVI.



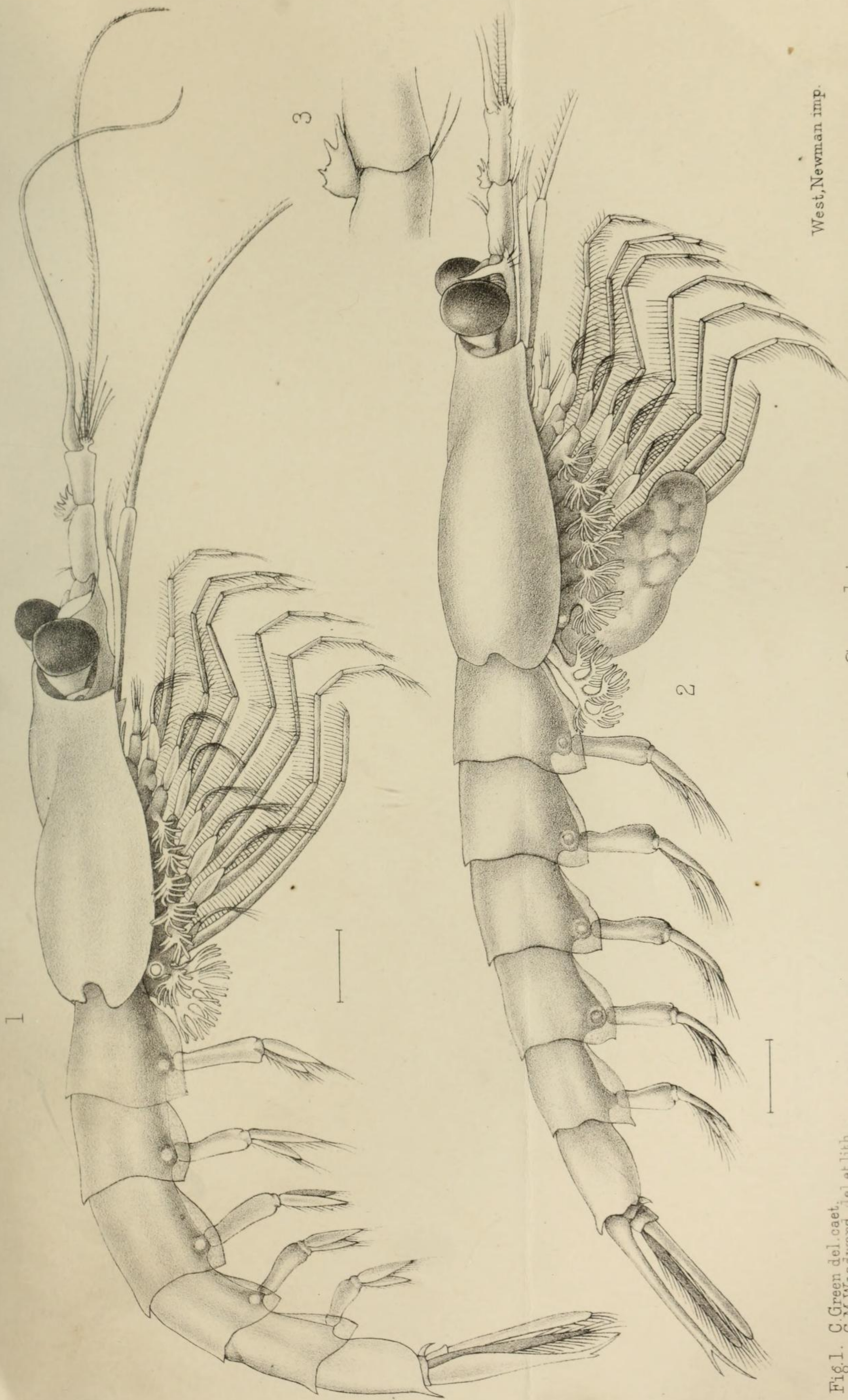
G. M. Woodward del.

*Meganyctiphanes norvegica*.









West, Newman imp.

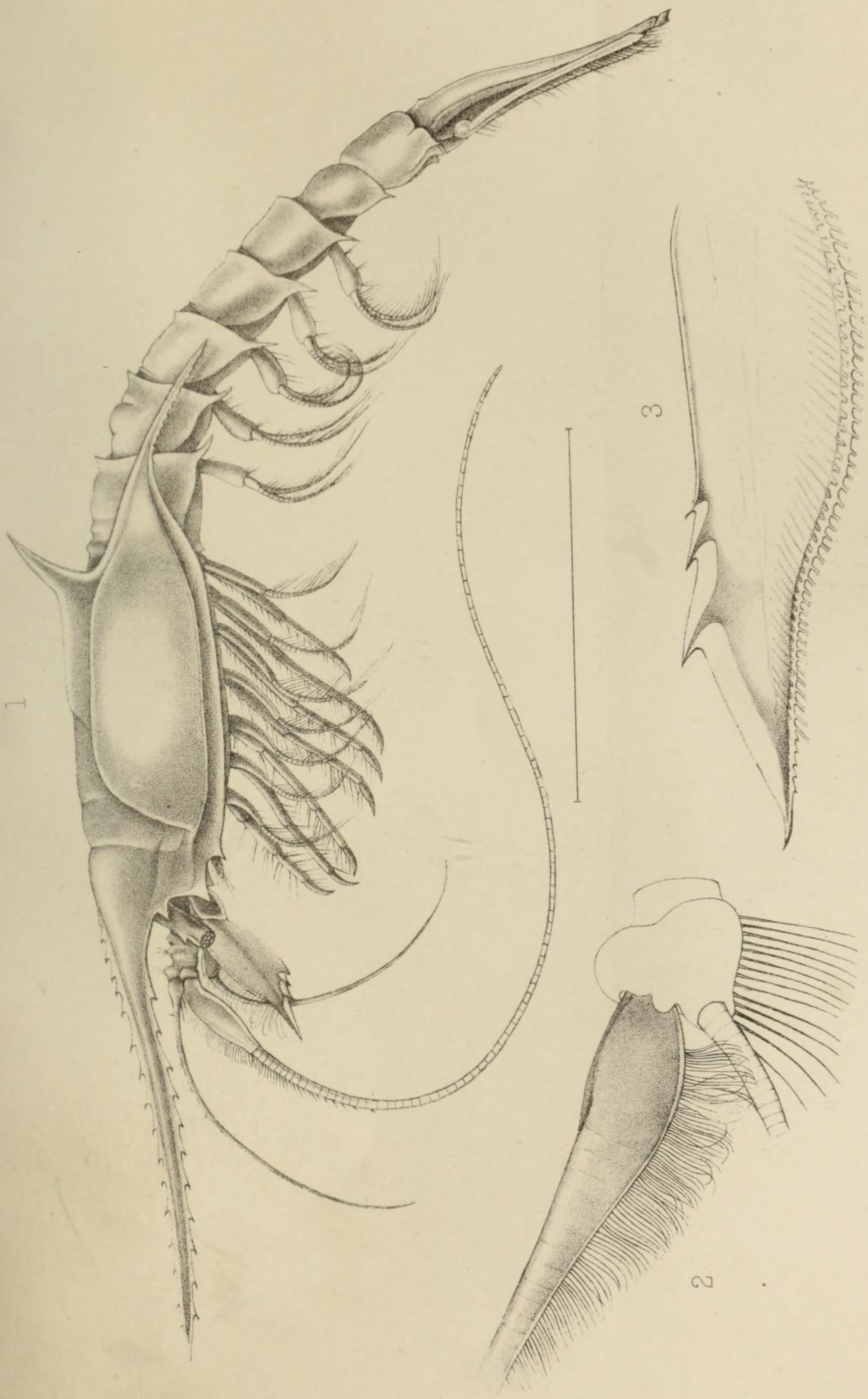
Fig. 1. C. Green del. caet.  
C. M. W. del. et lith.







West, Newman imp.



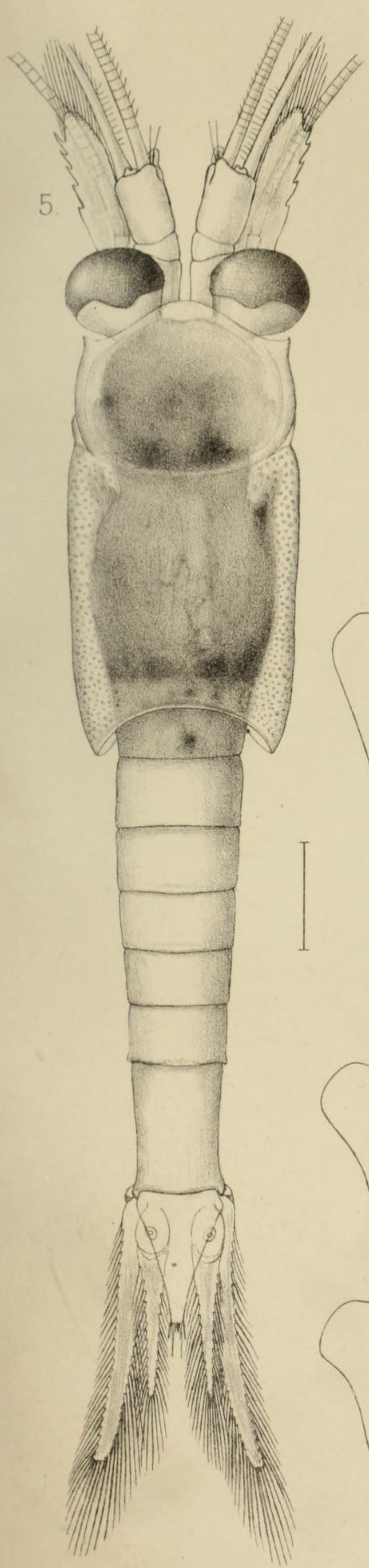
Gnathophausia drepanophora.

Fig. 1. C Green, caet. E.W.L.H.del.  
G.M.Woodward lith.



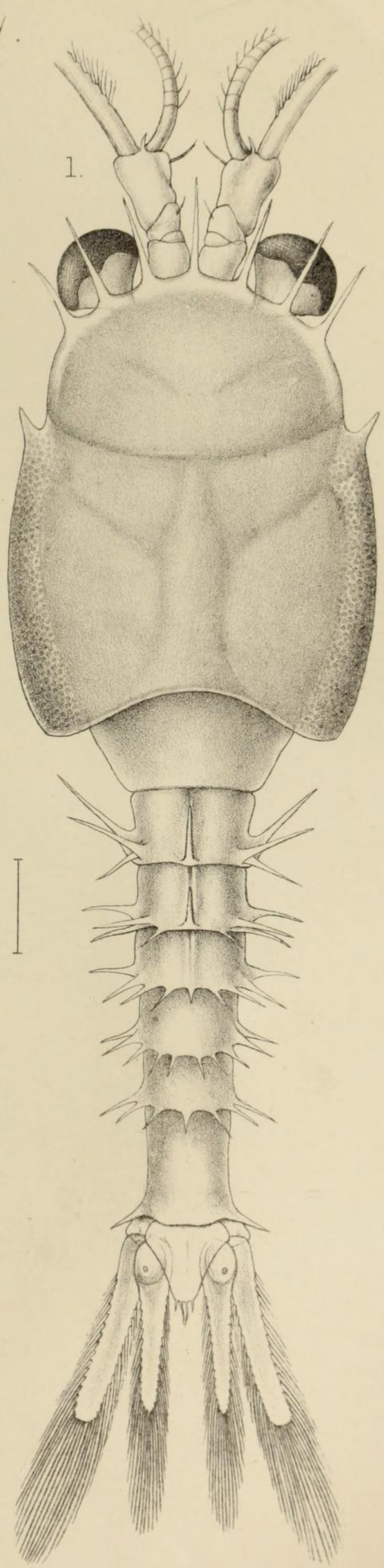
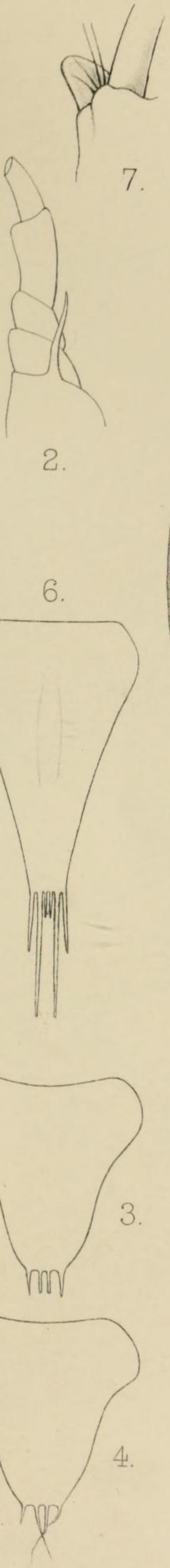






G.M.Woodward del.et lith.

*Meterythrops picta*.



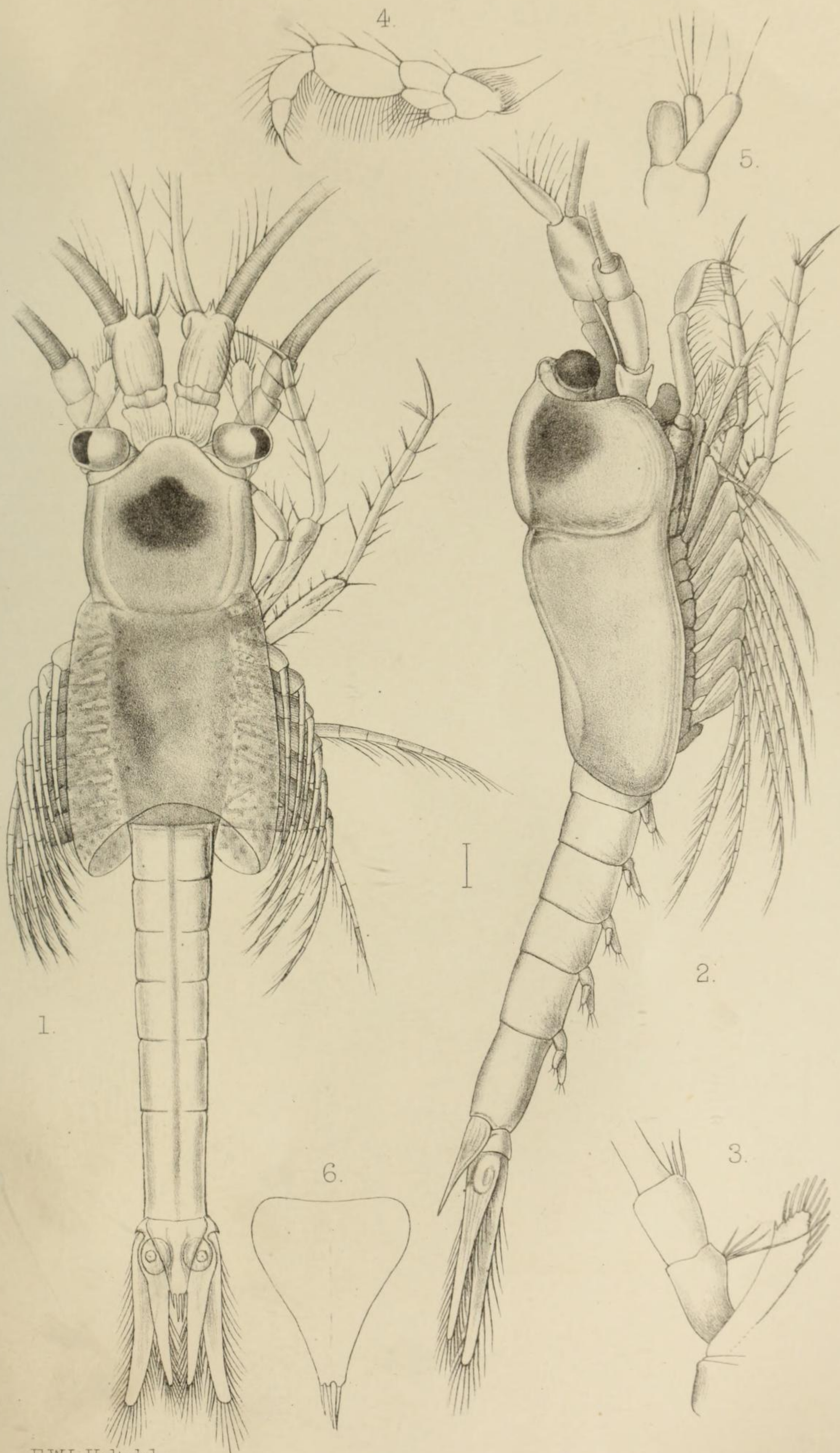
West, Newman imp.

*Chunomysis diadema*.









E.W.L.Holt del.  
G.M.Woodward lith.

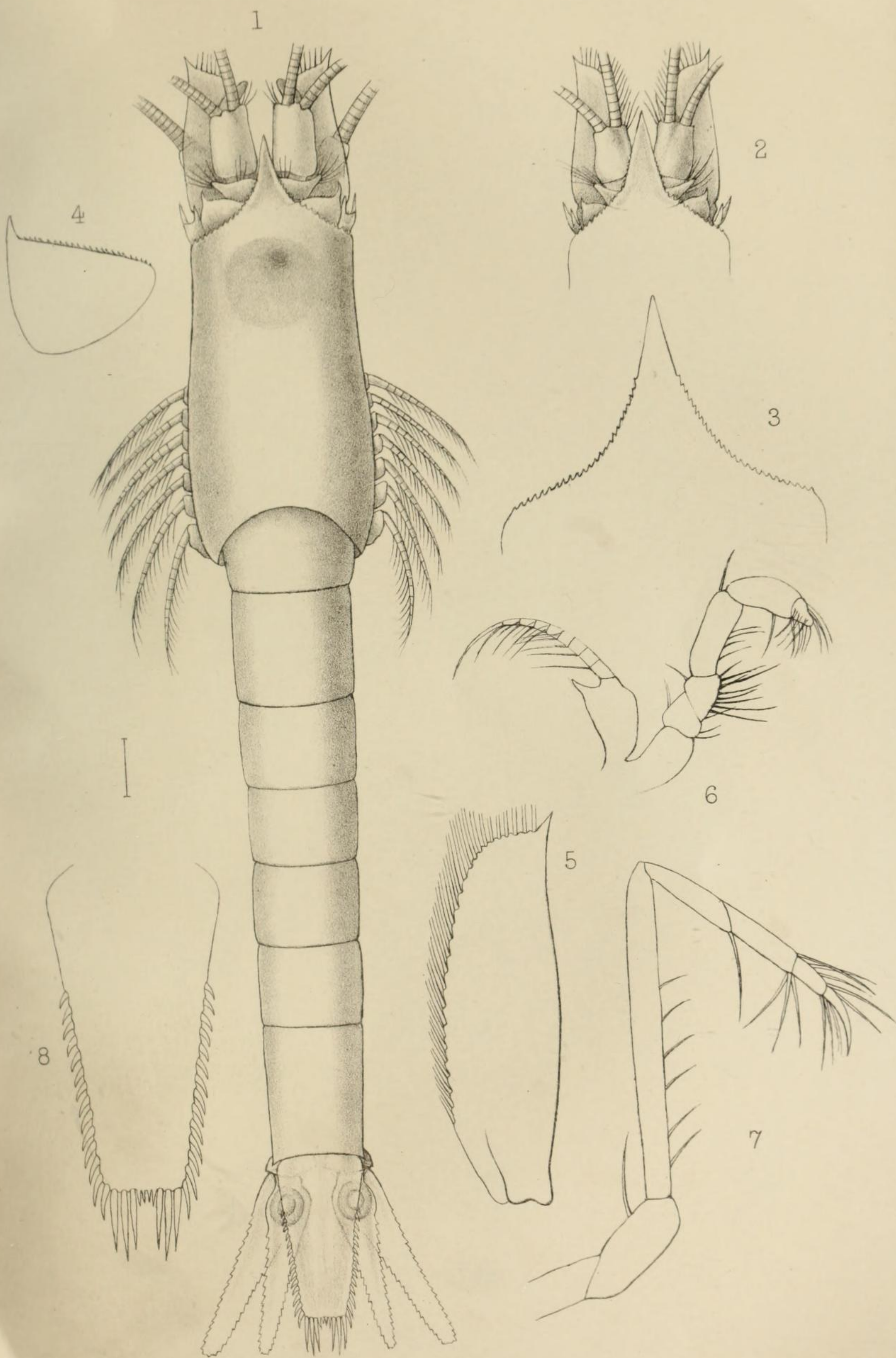
West, Newman imp.

*Katerythrops Oceanae*.









G.M. Woodward del. et lith.

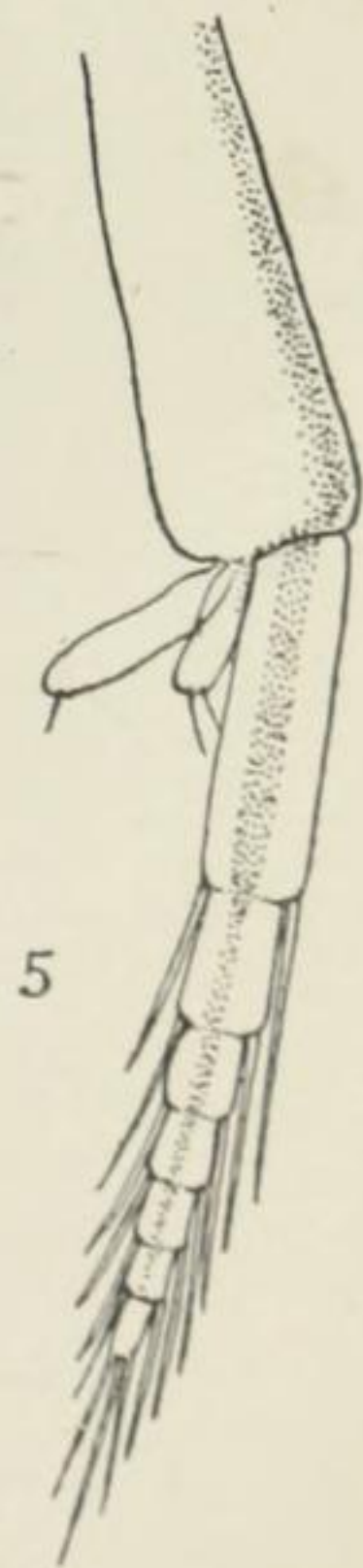
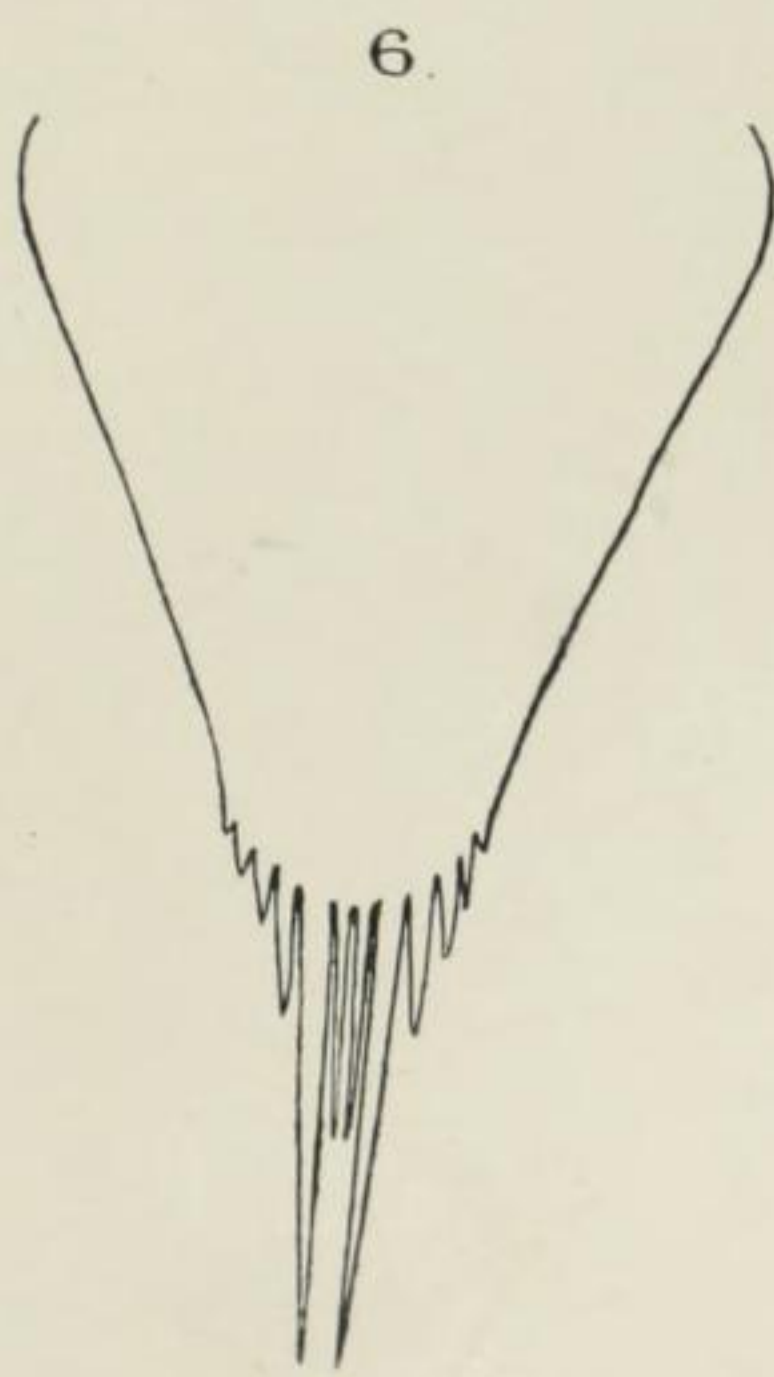
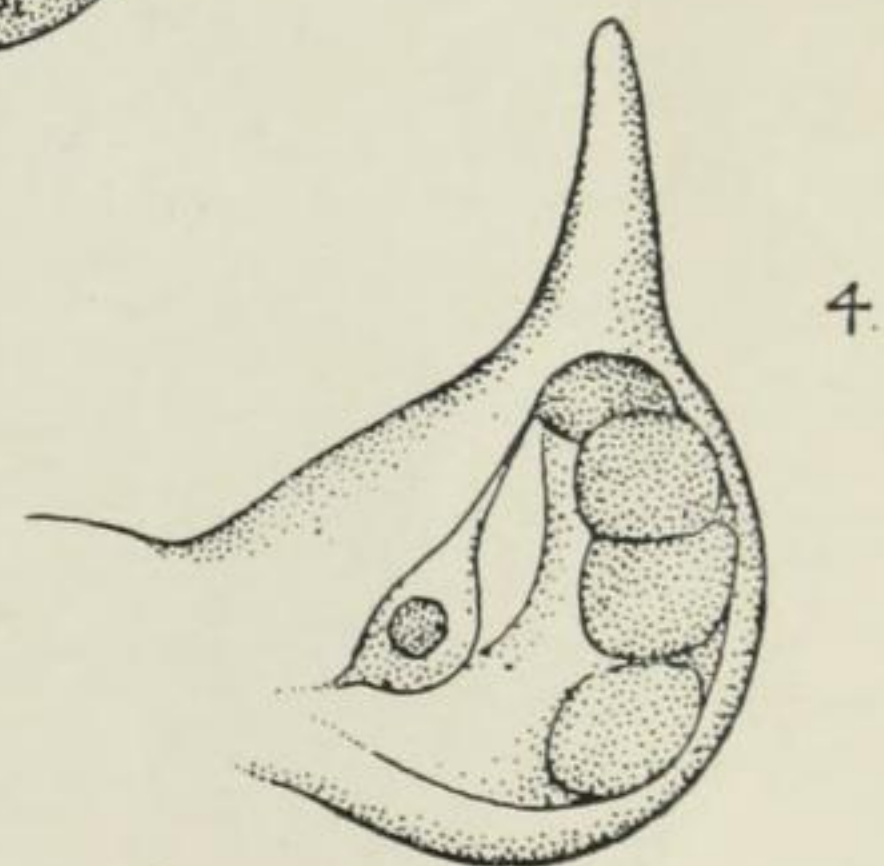
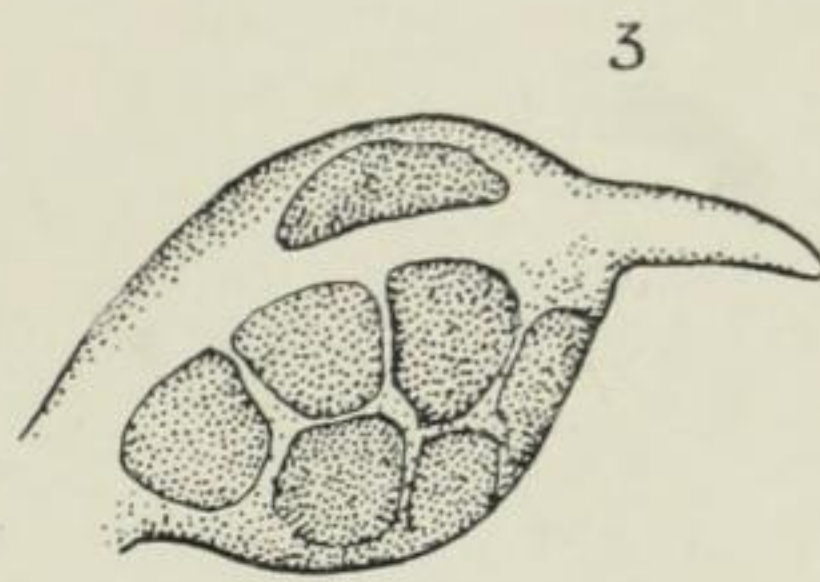
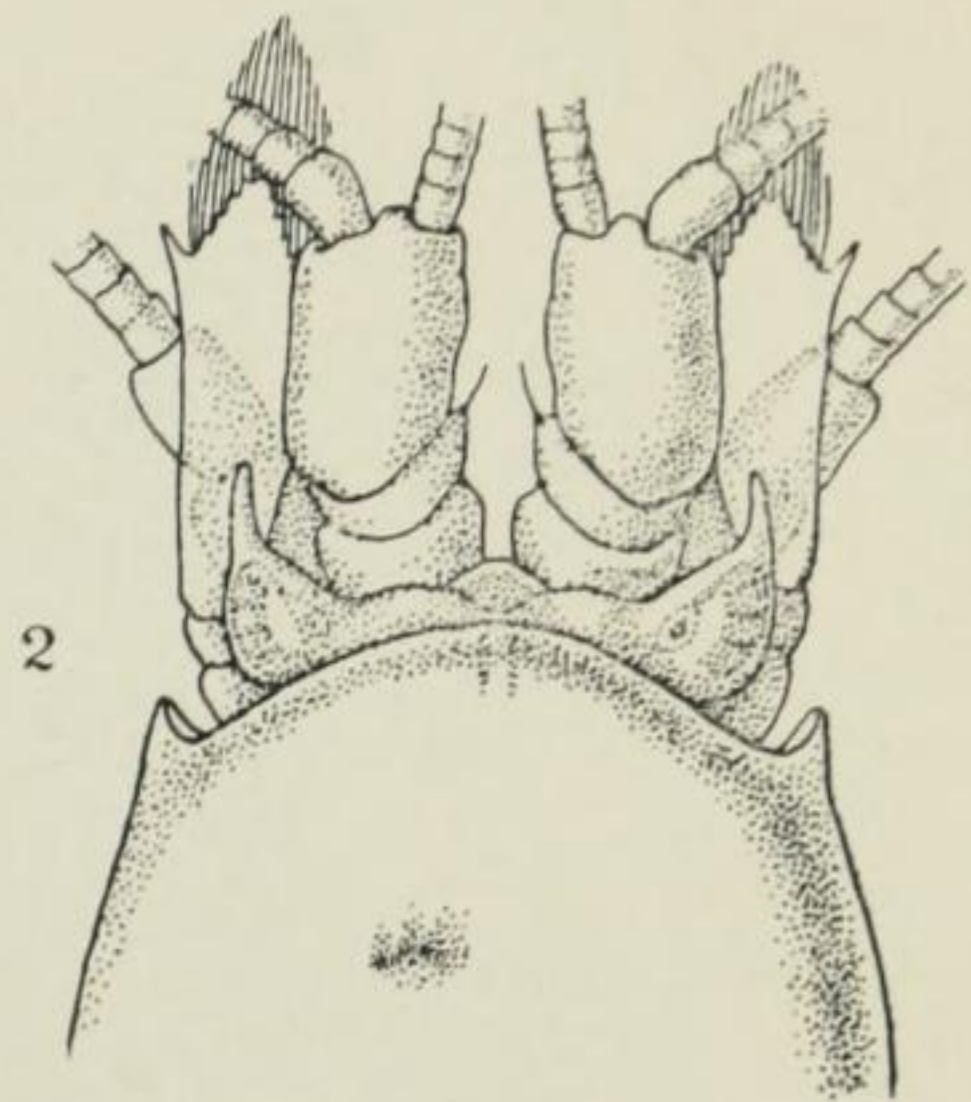
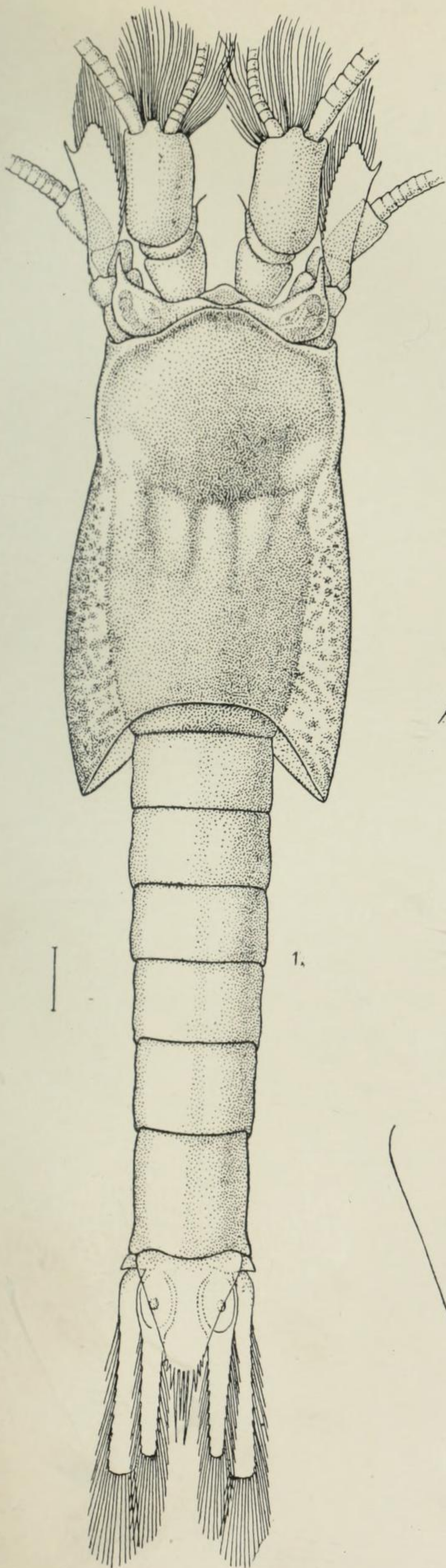
West, Newman imp.

*Paramblyops rostrata*.







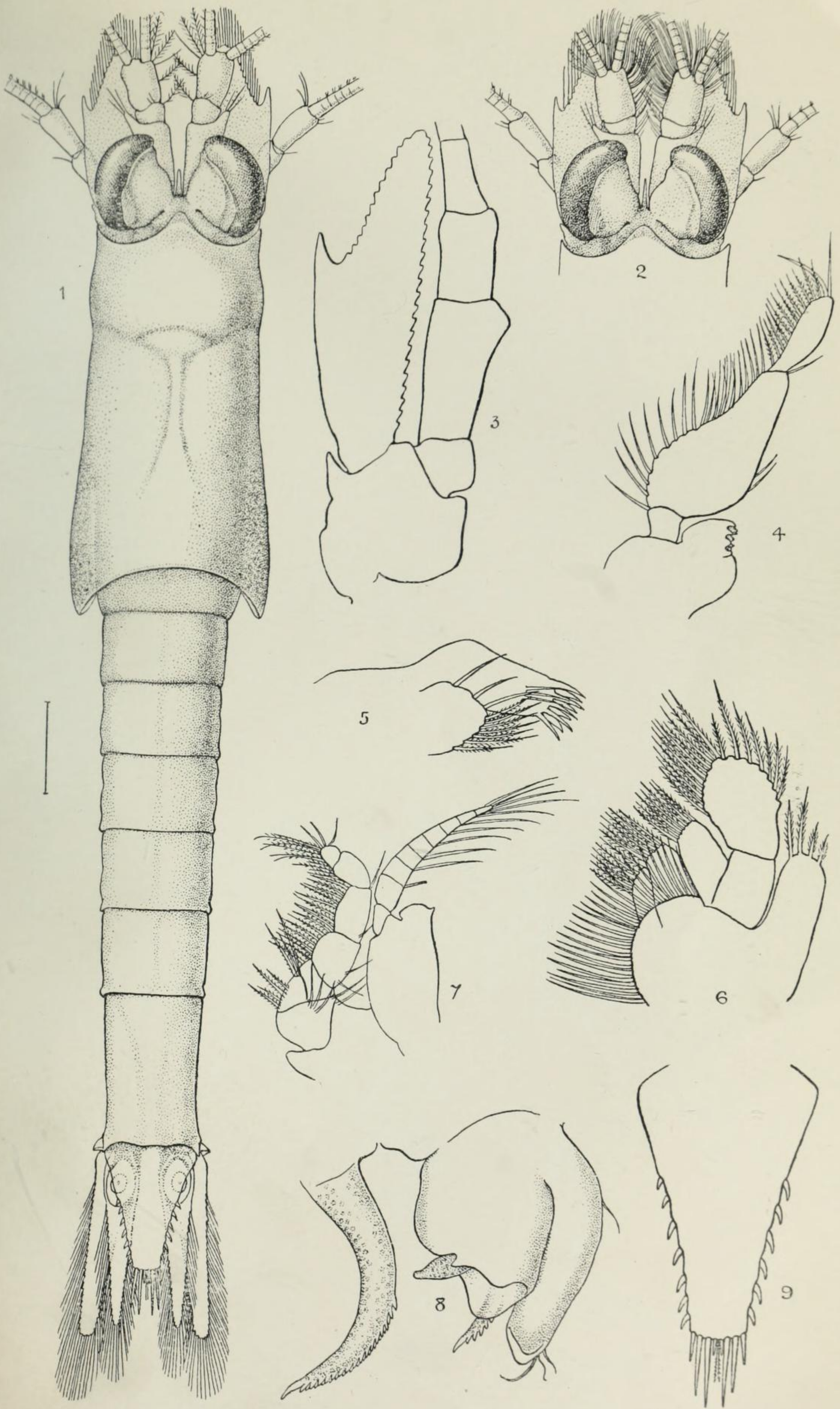


*Dactylerythropterus dactylops.*







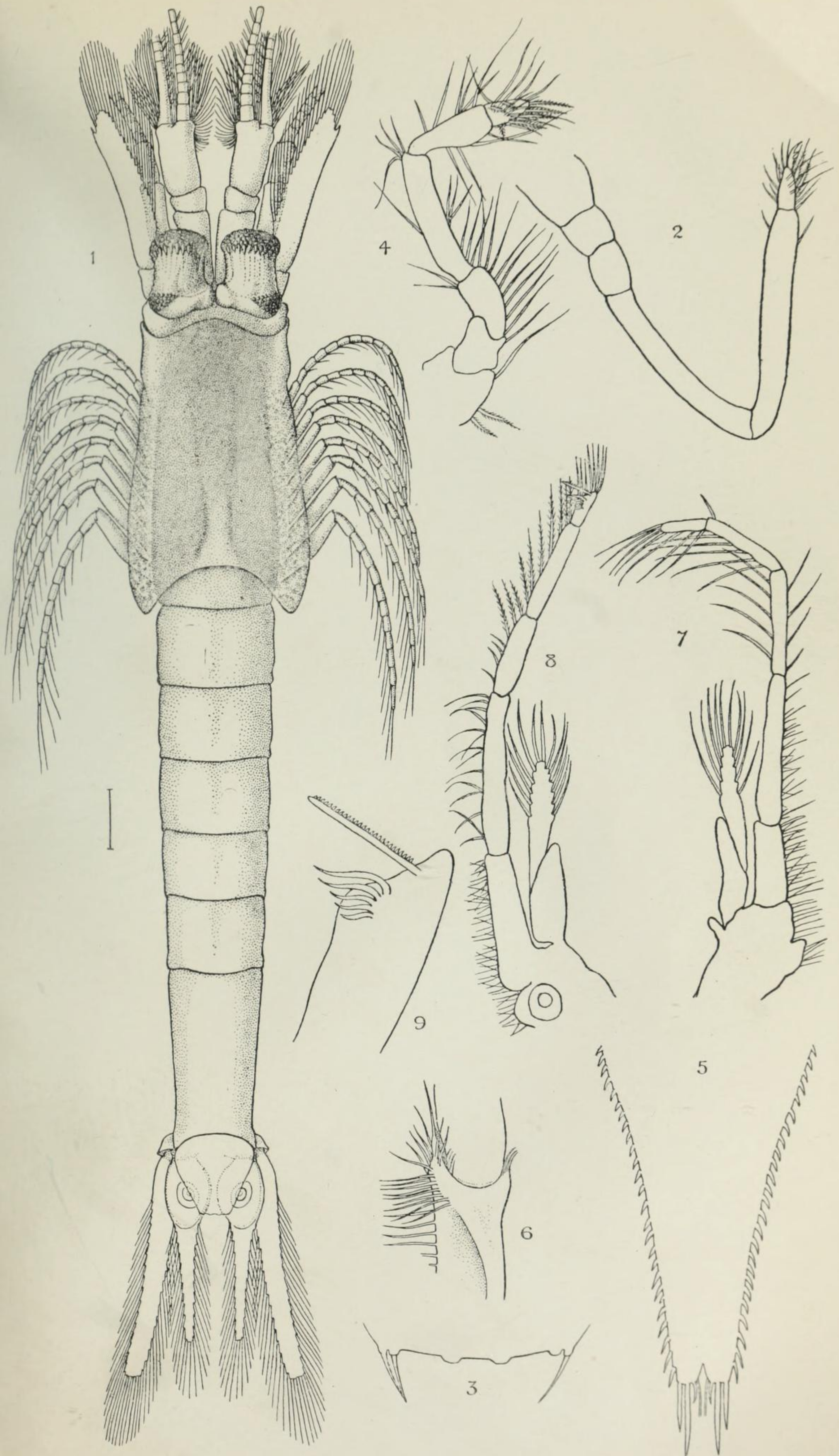


*Hypereretrythrops serriventer.*







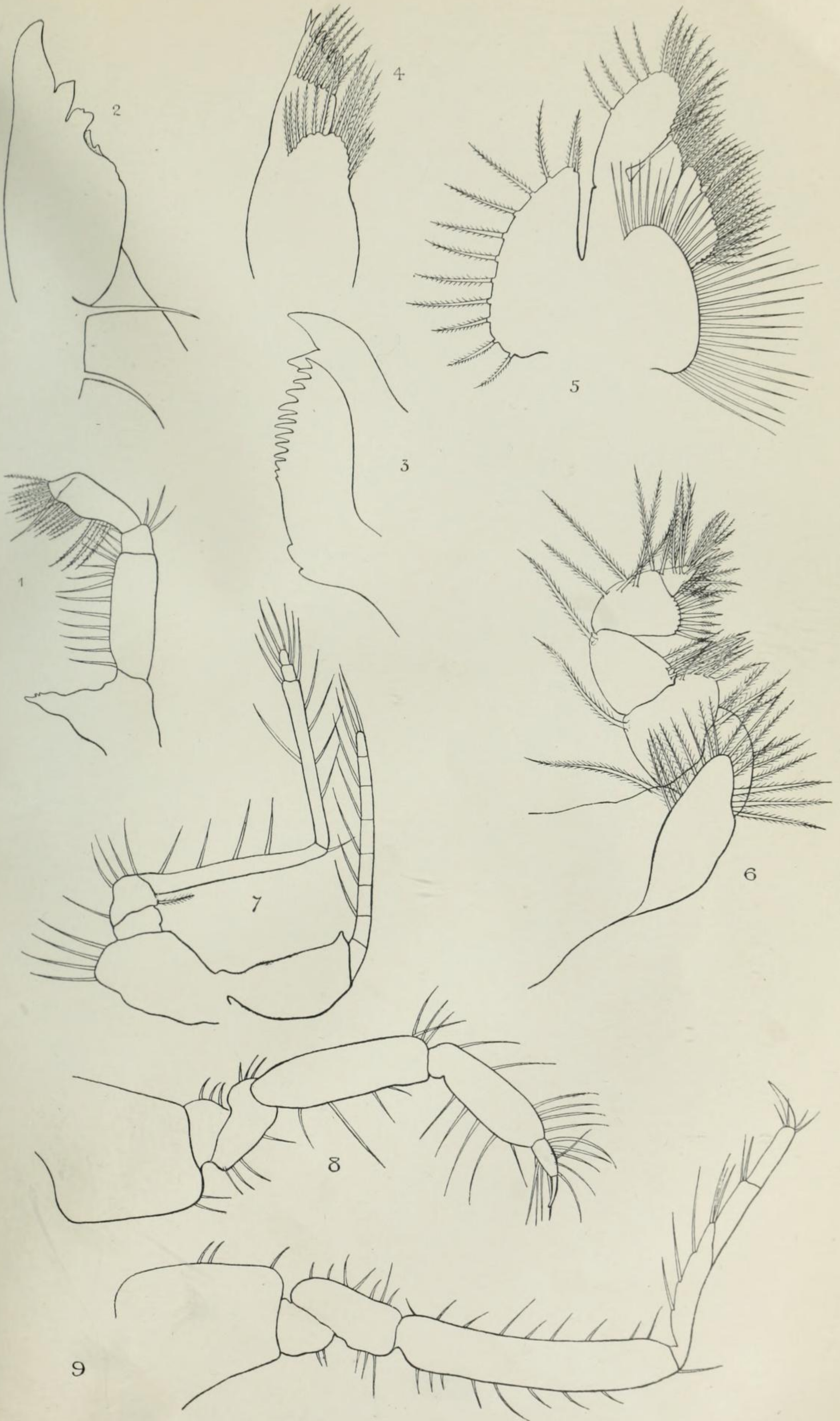


1-3. *Euchaetomera* Fowleri. 4. *Hypererythrops* serriventer.  
5. *Mysideis* insignis. 6-9. *Euphausia* Lanei.









W. M. Tattersall del.

1-7. *Chunomysis diadema*.  
8-9. *Meterythropus picta*.



