

## EXPLANATION OF PLATE XXXVIII.

- Fig. 1. *Limnothelphusa maculata*, gen. et sp. nov. (p. 698). Adult male, general view from above.  $\times 2\frac{1}{2}$  about.
2. Ventral view of the anterior portion, to show the relations of buccal frame, epistome, antennules, and antennæ.
  3. Ventral view of posterior portion of thorax, abdomen removed, showing abdominal appendages and male genital papillæ.
  4. External maxilliped.
  5. Dactylus of walking-leg, to show the nature of the spinules.
  6. Terminal portion of cheliped, showing nature of dentation.
  7. Male abdomen, primitive dorsal view.

Figures 2-7 considerably enlarged.

## Reference Letters.

<i>a.g.</i> Genital aperture.	<i>ep.</i> Epistome.
<i>f.b.</i> Buccal frame.	<i>t.so.</i> Sub-ocular tooth.

### 3. On two Species of Macrurous Crustaceans from Lake Tanganyika. By W. T. CALMAN, B.Sc., University College, Dundee.<sup>1</sup>

[Received April 29, 1899.]

(Plates XXXIX. & XL.)

The Crustaceans collected in Lake Tanganyika by Mr. J. E. S. Moore and placed in my hands for examination comprise specimens of two species of Prawns, one forming the type of a new genus allied to *Caridina*, the other being a probably new species of *Palaemon*.

#### Sub-order MACRURA.

#### Tribe CARIDEA.

#### Family ATYIDÆ.

#### LIMNOCARIDINA, gen. nov.

Rostrum long, compressed, serrated. Carapace with a hepatic spine. Peraeopods without exopods. Carpal joint of first pair slightly excavated distally, that of second pair not excavated. No epipods on any of the thoracic appendages. Gills four in number on each side, corresponding to the first four pairs of peraeopods.

LIMNOCARIDINA TANGANYIKÆ, sp. n. (Plates XXXIX. & XL. figs. 1-2, 4-19).

*Description.*—The rostrum (Pl. XXXIX. figs. 1-2) is very long and slender, gently recurved, varying from about  $1\frac{1}{3}$  to twice the length of the carapace, and extending beyond the antennal scale by  $\frac{1}{3}$  to nearly  $\frac{1}{2}$  its length. There are from 12-15 teeth on its

<sup>1</sup> Communicated by Prof. G. B. Howes, F.Z.S.

upper edge, three (rarely two) of which are behind the orbit. The teeth become more widely spaced distally, and the last one is generally separated by rather less than half the length of the rostrum from the simple, sharply pointed tip. The lower margin of the rostrum bears from 10-20 teeth, which extend quite to the tip. Below the orbit the anterior margin of the carapace is produced into a triangular tooth, but there is no "antennal" spine such as is present in most species of *Caridina*, e.g. in *C. wyckii* (Pl. XXXIX. fig. 3.). A little way back on the side of the carapace, and below the level of the sub-orbital tooth, there is a well-marked "hepatic" spine. The lower anterior corner of the carapace is evenly rounded, and there is no pterygostomial spine.

The peduncle of the antennules (Pl. XXXIX. fig. 4) falls short of the distal tooth on the outer margin of the antennal scale. The first joint is about equal in length to the two succeeding joints together. The basal spine is small and slender, its tip falling short of the distal end of the joint by  $\frac{1}{4}$  the length of the joint. The short spine on the distal end of the first joint reaches to about  $\frac{1}{4}$  the length of the succeeding joint. The ocular peduncle is rather shorter than the first joint of the peduncle of the antennule.

The mandibles (Pl. XXXIX. fig. 5) are somewhat dissimilar on the two sides. The cutting-edge is separated from the molar process by a shallow emargination, within which are set two stout setæ (in *C. wyckii* there is a row of about ten), followed at a little distance by a thick brush of finer setæ just in front of the molar process.

The first maxillæ (Pl. XXXIX. fig. 6) differ from those of *Caridina*, and such allied genera as *Atya* and *Atyaephyra*, in the smaller size of the two inner lobes, the inner edges of which are much shorter, while the lobe which in these genera represents the exopod is here absent.

The second maxillæ (Pl. XXXIX. fig. 7) also depart somewhat from the type characteristic of the *Atyidae*. In the other members of the family the middle lobe of the endognath (the proximal division of the *lacinia externa* in Boas's nomenclature) is very much expanded, overlapping both the other lobes and presenting a very long, straight, inner edge. In the present form this lobe is much smaller, its inner edge being hardly longer than that of the distal lobe, which it does not overlap. The proximal lobe, as in the other *Atyidae*, is large and is overlapped for a short distance by the middle lobe. The scaphognathite is truncated anteriorly and produced to a point posteriorly, where it bears, as usual in this family, a tuft of very long slender setæ, hooked at the tip but not presenting the curious swelling and tooth near the base which characterize these setæ in *C. wyckii*.

In the first maxilliped (Pl. XXXIX. fig. 8) the exopod tapers gradually from the base with hardly an indication of the external lobe (marked  $\alpha$  by Boas) present in *Caridina* as in most *Eukyphota*. The epipod, rudimentary in *Caridina*, seems to be quite absent.

The third maxillipeds (Pl. XXXIX. fig. 9) extend forward as

far as the end of the first joint of the peduncle of the antennules. There is on the outer surface of the coxal joint a conical curved papilla similar to, but smaller than, the papilla to which the epipod of this appendage, here absent, is attached in *C. wyckii*. The exopod exceeds in length the joint from which it springs. The terminal joint is shorter than the penultimate joint, and presents a remarkable structure (fig. 9*a*). About the middle of its length there is a deep excavation of the inner side, a little beyond which distally stands a stout curved spine; a double row of strong toothed spines smaller than the preceding and gradually diminishing in size, fringe the distal margin of the notch; the oblique posterior or proximal margin is fringed with feathered or pectinate setæ. Beyond the notch, the inner margin of the joint bears a series of 6-7 short spines leading up to the pointed apex of the limb. I am not aware that an arrangement similar to this is found in other *Atyidæ*. In *C. wyckii* there is only a very slight concavity of the inner margin of the joint, clothed with numerous spines and setæ.

The first pair of peræopods (Pl. XL, figs. 10, 10*a*) do not reach to the terminal joint of the third maxillipeds. The ischium and merus are short and subequal. The carpus is conical in shape, rather more than one-half as broad as long, about equal in length to the merus, and slightly longer than the palmar portion of the hand; it is slightly excavated distally on the inner side (fig. 10*a*). The hand is long and narrow, the breadth being about one-third of the length. The fingers are slender, longer than the palm, spoon-shaped, but acutely pointed as seen from the side, instead of truncate as in *C. wyckii*. The opposed margins bear series of small stout spinules increasing in size towards the tip, but there is no strong terminal hook as in *C. wyckii*. The brushes of setæ borne by the fingers are very scanty compared with those of *C. wyckii*.

The second peræopods (Pl. XL, fig. 11) reach forward as far as the tip of the third maxillipeds. The ischium is a little longer than the merus and about equal to the carpus. The latter is cylindrical and only slightly wider distally. The hand is longer than the carpus by one-third the length of the latter, and its breadth is less than one-quarter of its length. The fingers are very long and slender, about twice as long as the palm, sharply pointed, and with scanty terminal brushes.

The third pair of peræopods extend beyond the third maxillipeds when turned forward, and the last pair fall short of them. The dactylus is one-third to two-fifths the length of the propodus. The dactylus of the last pair (Pl. XL, fig. 13*a*) is similar to the preceding two pairs, having only a slightly larger number of spines on its inner margin, the numbers being from 11 to 15 in the case of the third and fourth peræopods, and from 16 to 19 in the last pair. In *Caridina* the dactylus of the last peræopods is longer and bears a much more numerous series of spines than do those of the preceding two pairs. In a specimen of *C. wyckii*, for example, the dactyli of the third and fourth pairs bore 7 and 8 spines

respectively, while the dactylus of the fifth pair was half as long again and had a row of 39 spines.

In the female, the first pair of pleopods (Pl. XL. fig. 14) have the endopod rather slender, pointed, and more than half the length of the exopod. In the male (Pl. XL. fig. 15), the endopod is a short ovate leaflet about one-quarter the length of the exopod. In nearly all the specimens of both sexes the first pair of pleopods are turned forward, with the exopod lying above and external to the bases of the posterior peræopods. According to F. Müller (Kosmos, ix. 1881, p. 121), this is the position taken by these appendages in the living *Atyoida*, and he states that they serve to protect the entrance to the branchial chamber, the fringe of marginal setæ acting as a sieve to exclude mud, &c.

In the second pleopods of the male (Pl. XL. figs. 17, 17*a*), the *appendix masculina* is a little shorter than the *appendix interna*, and bears a number of stout spines.

The telson (Pl. XL. fig. 18), is about as long as the inner plates of the uropods, with straight sides, tapering to the obtusely pointed tip which bears four spines, two short external and two longer internal, between which latter spring three plumose setæ. On the dorsal surface of the telson are two pairs of spinules. In *C. wyckii* the tip of the telson bears eight spines, and the dorsal surface three pairs of spinules.

The gills are four in number on either side, three pleurobranchs, corresponding to the second, third, and fourth peræopods, and one which I believe to be a pleurobranch (though it is difficult to determine the precise point of insertion) above the first peræopod. There are no epipods on the maxillipeds or peræopods, unless we regard as a rudimentary epipod the small papilla at the base of the third maxilliped described above. In tabular form the arrangement is:—

	mxp. <sup>2</sup>	mxp. <sup>3</sup>	per. <sup>1</sup>	per. <sup>2</sup>	per. <sup>3</sup>	per. <sup>4</sup>	per. <sup>5</sup>	
Pleurobranchiæ...	—	—	1	1	1	1	—	4
Podobranchiæ ...	—	—	—	—	—	—	—	—
Arthrobranchiæ...	—	—	—	—	—	—	—	—
Total .....								4

The statements of various authors as to the branchial formulæ of the genera of *Atyoidæ* are somewhat conflicting, but all agree in giving a larger number of gills and a complete series of epipods as far as the fourth peræopods.\*

\* F. Müller states (*l. c.* p. 121) that in *Atyoida potimirim* the last two pairs of legs are without epipods.

In *C. wyckii*\* and *C. typus* I find the following arrangement:—

	mxp. <sup>2</sup>	mxp. <sup>3</sup>	per <sup>1</sup> .	per. <sup>2</sup>	per. <sup>3</sup>	per. <sup>4</sup>	per. <sup>5</sup>
Pleurobranchiæ.....	—	—	1	1	1	1	1
Arthrobranchiæ.....	—	2†	1	—	—	—	—
Podobranchiæ .....	1	ep.	ep.	ep.	ep.	ep.	—

This agrees with the formula for *Atya*. Claus states that *Troglocaris* lacks the arthrobranch of the first peræopod. According to Boas, *Atyaephyra desmarestii* has no arthrobranch on the first peræopod, and only one on the third maxilliped.

The males are usually somewhat smaller than the females, and have as usual the pleural plates of the abdomen less deep. In the female the two flagella of the antennule are of about equal length, and about twice as long as the peduncle, the outer flagellum being slightly thickened for about two-thirds of its length. In the male both flagella are much elongated, the outer being longer than the inner, and in uninjured specimens measuring more than four times the length of the peduncle, or about one-half the length of the body. The thickened basal part is more distinct than in the female. I have not observed any sexual differences in the armature of the walking-legs or of the maxillipeds, nor in the shape of the anterior margin of the carapace, such as are described by Müller in *Atyoida*.

The eggs carried by the females are ovoid in form, measuring about  $\cdot 18 \times \cdot 27$  mm.

Total length of largest specimen (♀), 23 mm.

Many specimens of this form were collected in shallow water.

Comparing the new form with the other genera of *Atyidæ* as revised by Ortmann (Proc. Acad. Nat. Sc. Philad. 1894, p. 397), we find that (like all the other higher *Atyidæ*) it differs from *Xiphocaris*, *Troglocaris*, and *Atyaephyra* in the absence of exopods from all the peræopods. It resembles *Caridina* and differs from *Atya* and *Atyoida* in the fact that the carpus of the second peræopods

\* The formula given by Hickson is incomplete (Ann. Mag. Nat. Hist. (6) ii. 1888, p. 361). Although the number of the epipods (mastigobranchiæ) is given correctly, these organs appear to have escaped his notice, for he figures as "mastigobranchiæ" the long coxal setæ of the peræopods. The true epipods are of a shape similar to those of many other *Caridea*, and like those figured by Joly in *Atyaephyra* and by Müller in *Atyoida*, consisting of a short curved stem directed backward and terminated by a strong hook which grasps firmly the coxal setæ of the next succeeding peræopod.

† It is possible that one of these should be regarded as a pleurobranch. In *Atya* the corresponding gills are certainly arthrobranchs, as stated by Pocock (A. M. N. H. (6) iii. 1889, p. 15). Claus, who does not attach much morphological importance to the place of insertion, assigns these two gills to his series *b* & *c* respectively (Neue Beitr. z. Morph. d. Crust., Arb. Zool. Inst. Wien, vi. 1884, p. 57).

is not excavated distally. It further agrees with the majority of the species of *Caridina* in the compressed and serrated rostrum, which, however, is much longer than in any species except *C. gracilirostris* de Man. It appears to differ from all except *C. singhalensis* Ortm. and *C. brevirostris* Stm. in the absence of a distinct antennal spine on the front of the carapace, and it certainly differs from all the species of *Caridina*, and I believe from all the other *Atyidae*, in the possession of a hepatic spine. The differences noted above in the shape of the first maxilla, the first maxilliped, and especially of the second maxilla, may possibly be of generic importance, as may also the fact that the dactylus of the last peræopods does not differ markedly from those of the preceding pairs.

The most striking and important character, however, is the reduction of the branchial system. This has not been examined (so far as I know) in *Xiphocaris*, but the closely-allied *Troglocaris* possesses eight gills (Claus), *Atyaephyra*, seven (Boas), *Atya scabra* and *Caridina wyckii* and *typus*, nine; while there is no reason to anticipate any very great divergence in the closely-allied *Atyoida* or among the numerous species of *Caridina* which have not been examined in this respect. Further, all the forms hitherto examined possess (with a possible exception, as above noted, in the case of *Atyoida*) a complete series of epipods on the thoracic appendages. In the present form there are only four gills and no epipods at all.

While there appears to be room for a further revision of the *Atyidae* based on a more complete examination of their morphology than that recently given by Örtmann, it seems plain that the form now described stands sufficiently far apart from the other members of the family to require the creation of a new genus for its reception.

#### Family PALÆMONIDÆ.

##### PALÆMON MOOREI, sp. n. (Plate XL. figs. 20-24.)

*Description.*—Rostrum (Pl. XL. fig. 20) horizontal, a little longer than the peduncle of the antennules and equal to or shorter than the antennal scale. The nearly straight upper edge bears 11-13 teeth, of which three are on the carapace, the fourth being just over or a little in front of the posterior margin of the orbit. The distal tooth is close to the tip. The lower margin bears 3-4 teeth, the first being above the end of the first joint of the antennular peduncle. The usual antennal and hepatic spines are present on the carapace, the surface of which is elsewhere smooth. The third maxillipeds extend beyond the peduncle of the antennæ by the length of their last joint. The first peræopods (Pl. XL. fig. 21) extend to or a little beyond the tip of the antennal scales. The carpus is rather longer than the merus, and more than half as long again as the hand.

The second peræopod of a male specimen (Pl. XL. fig. 22) is about two-thirds the length of the body, and the distal end of the merus extends to beyond the middle of the antennal scale. The carpus

is equal in length to the merus, somewhat expanded distally, where the breadth is about one-fifth of the length. The hand is rather wider than the distal end of the carpus, not perceptibly compressed (the two diameters are about as 5 : 6), a little less than twice the length of the carpus. Palm shorter than the carpus, and rather shorter than the fingers. Fingers straight, meeting along their whole length; inner margins with smooth cutting-edges, without any trace of teeth save a single very minute tubercle near the base of the dactylus. The surface of the whole limb bears widely-scattered very minute setæ; on the distal part of the carpus and on the inner side of the palm are a number of small spinules. The succeeding pairs of peræopods are long and slender, the fourth pair extending beyond the antennal scale. The dactylus is nearly one-third the length of the propodus.

End of telson (Pl. XL. fig. 24) with a sharp median point, longer than the outer but shorter than the inner pair of terminal spines.

Seven specimens, most of them very imperfect, are in the collection; only one of the large chelæ is preserved. One specimen is a female carrying ova. The species was dredged at a depth of 50 feet.

Length of largest specimen (♂), 25 mm.

Length of ovigerous female, 23 mm.

Length of specimen figured (♂), 18 mm.

Length of 2nd peræopod of same, 11.5 mm.

The very large number of closely-allied species included in the genus *Palaemon*, and the very great differences (as yet only partly elucidated) which may exist between individuals of the same species of different ages and sexes, render it somewhat hazardous to attempt to define a new species from such scanty material. The presence of an ovigerous female in the collection shows that the species is one of the smallest, if not the very smallest species of the genus. On the other hand, we cannot be quite certain that the single male specimen upon which our description is mainly based has attained its full development in the characters of the chela<sup>1</sup>.

Assuming, however, for the present that this is the case, the species will fall into the group *Eupalaemon* as defined by Ortmann (Zool. Jahrb., Abth. f. Syst. v. 1891, p. 696), in which the second peræopods are cylindrical, while the equality of the merus and carpus of these appendages and the characters of the telson will bring it into proximity with such species as *P. scabriculus* Heller and *P. endchensis* de Man. *P. niloticus* Roux, the only species known from North Africa, is somewhat similar to the present form, but, so far as can be judged from the more or less defective figures and descriptions of Roux (Ann. Sc. Nat. xxviii. 1833, p. 73,

<sup>1</sup> Since this paper was read I have received several additional and better preserved specimens of both sexes from Mr. Moore's collections. They agree in all essential points with the description given above.

. vii. f. 2) and Klunzinger (Zeitschr. f. wiss. Zool. xvi. 1866, p. 357, pl. xx.), appears to present distinctive characters. Both these authors figure the rostrum with a very convex upper edge. Klunzinger gives the number of serrations as  $\frac{9-13}{1-2}$ , Roux figures  $\frac{11}{5}$ . According to the figures of both authors, however, not more than one tooth appears to be behind the orbit. Both show the carpus of the 2nd peræopod to be distinctly shorter than the merus, and much more than half the length of the hand. Klunzinger's figure of the chela shows it to be more slender, with the palm less inflated and the fingers longer than in our species.

Neither of the species described in this paper can be depended on as throwing any light on the general question of the origin of the Tanganyika fauna. The genus *Palæmon* contains about 50 species, of which only two are said to be marine. It is closely allied to *Leander*, in which, conversely, the marine species greatly predominate, while both genera have numerous allies among the littoral fauna. Whatever bearing the genus *Palæmon* may have on the more general problem of the origin of freshwater faunas, the number of its species, their wide distribution, and lastly the imperfect nature of the specimens from which the present species is described (precluding any conclusion as to its nearest specific affinities) all render it incapable of serving us towards the settlement of the special problem of Tanganyika.

*Limnocaridina* belongs to the *Atyidae*, a circumtropical family of freshwater forms whose probably somewhat distant allies are supposed by Ortmann to be found in the deep-sea *Acanthephyridæ*. It is a near ally of *Caridina*, an extensive genus, of which one species is known from the West Indies, while the rest occupy countries bordering on the Indian Ocean from S. Africa to Australia; one species occurs in the Nile and the rivers of Algeria. One species, *C. wyckii*, has a range extending from East Africa to Queensland and Celebes. It is noteworthy from the point of view of the present case that *Caridina* is not known to occur in West Africa. Our form from Tanganyika is in the meantime an isolated species, and the characters that it presents are not those of a primitive type, but rather of a somewhat specialized form.

#### EXPLANATION OF THE PLATES.

##### PLATE XXXIX.

- Fig. 1. *Limnocaridina tanganyika*, g. et. sp. n., ♀, p. 704.  
 2. " " " " Carapace and rostrum.  
 3. *Caridina wyckii* (Hickson), p. 705. Anterior part of carapace.  
 4. *Limnocaridina tanganyika*, p. 704. Peduncle of antennule.  
 5. " " " Mandibles.  
 6. " " " First maxilla.  
 7. " " " Second maxilla.  
 8. " " " First maxilliped.  
 9. " " " Third maxilliped. 9a. Terminal joint of third maxilliped.

## PLATE XL.

- Fig. 10. *Limnocaridina tanganyikæ*, p. 704. First peræpod, outer side.  
 10 a. First peræpod, inner side.
- |     |                         |         |  |
|-----|-------------------------|---------|--|
| 11. | "                       | "       | Second peræpod.  |
| 12. | "                       | "       | Dactylus of fourth peræpod.  |
| 13. | "                       | "       | Fifth peræpod. 13 a. Dactylus of same.   |
| 14. | "                       | "       | First pleopod of female.   |
| 15. | "                       | "       | First pleopod of male.   |
| 16. | "                       | "       | Second pleopod of female.  |
| 17. | "                       | "       | Second pleopod of male. 17 a. <i>Appendix masculina</i> and <i>App. interna</i> of same. |
| 18. | "                       | "       | Tail-fan.  |
| 19. | "                       | "       | Apex of telson.  |
| 20. | <i>Palæmon moorei</i> , | p. 709. | Carapace, ♂.   |
| 21. | "                       | "       | First peræpod (more highly magnified).   |
| 22. | "                       | "       | Second peræpod.  |
| 23. | "                       | "       | Fourth peræpod.  |
| 24. | "                       | "       | Apex of telson.  |

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June 6, 1899.

Dr. HENRY WOODWARD, F.R.S., Vice-President,  
 in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of May 1899:—

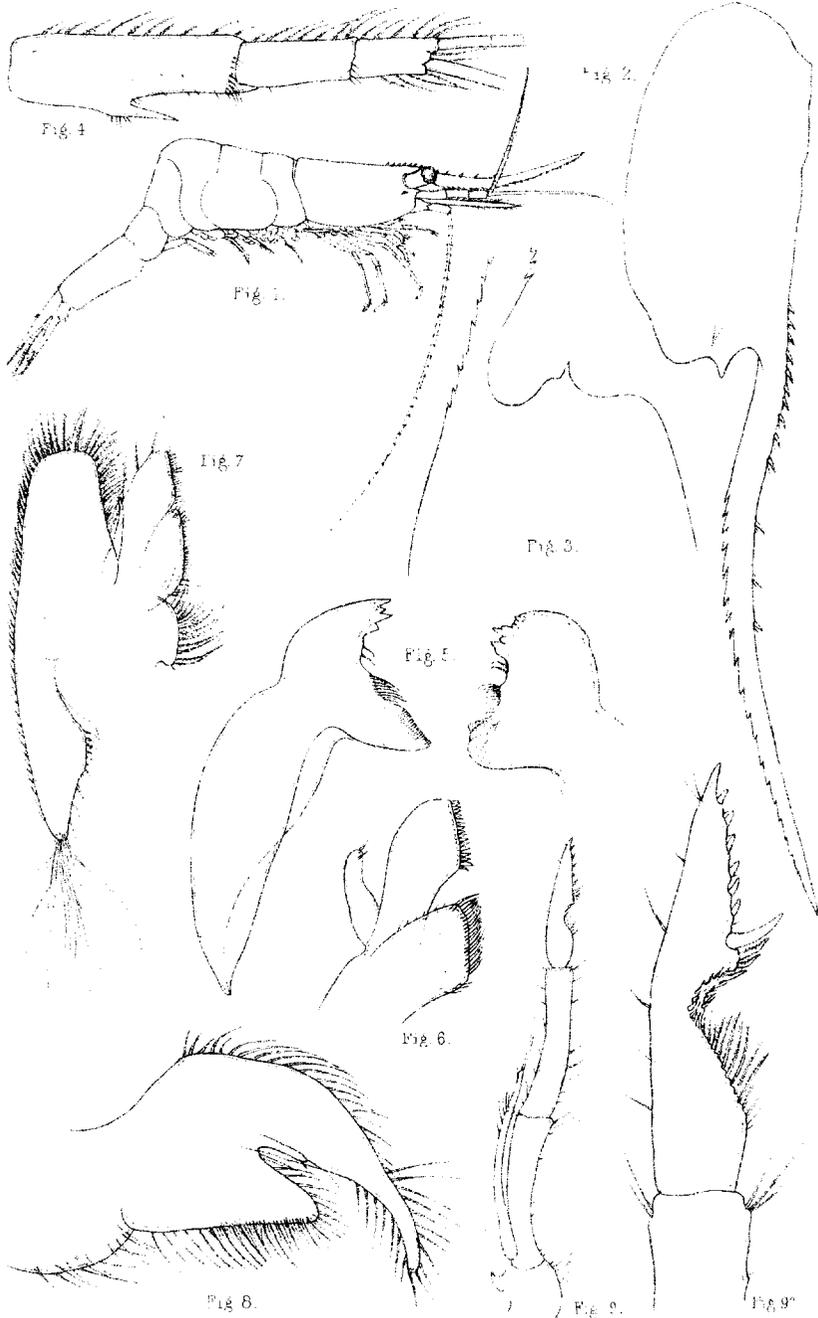
The total number of registered additions to the Society's Menagerie during the month of May was 95, of which 47 were by presentation, 7 by purchase, 36 were received on deposit, and 5 were born in the Menagerie. The total number of departures during the same period, by death and removals, was 110.

Among the additions may be specially noticed:—

1. A fine young male of the Mountain Zebra (*Equus zebra*), purchased May 6th, and making a pair with the female acquired by the Society on May 4th, 1898, from the Amsterdam Gardens.

2. An example of the curious Musk Duck (*Biziura lobata*) from Australia, purchased May 30th, of which specimens have been previously exhibited only on one occasion (see P. Z. S. 1882, pp. 311-455).

I also take this opportunity of exhibiting a careful drawing by Mr. Smit of the head of the Carunculated Bell-bird (*Chasmorhynchus niveus*) now living in the Insect-house (obtained by purchase

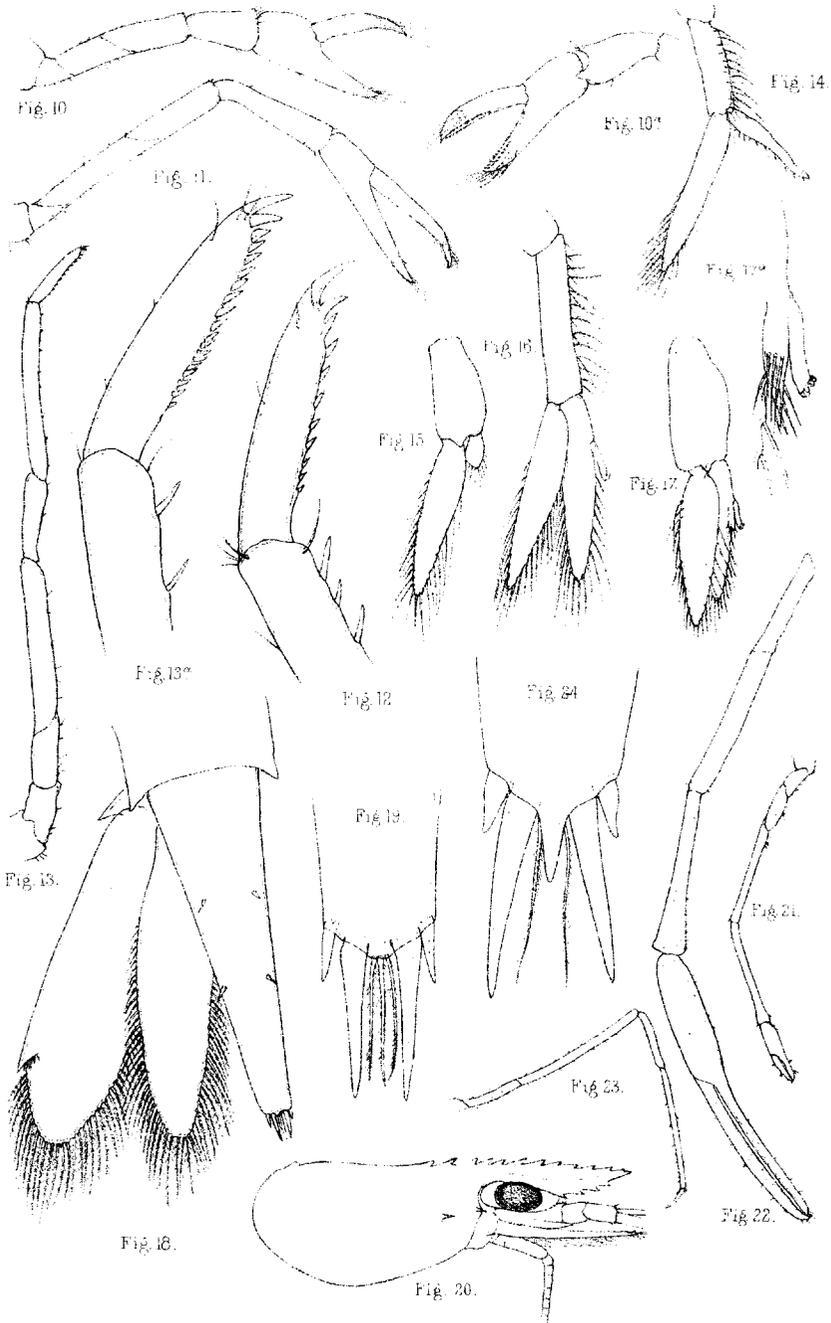


W. T. : del.

J. T. Remise Revid. Lith. Edin'

Figs. 1, 2, 4-9, LIMNOCARIDINA TANGANYIKÆ.  
Fig. 3, CARIDINA WYCKII.





W. T. C. del.

J. T. Rennie Reid, Lith. Edin'

Figs. 10-19, LIMNOCARIDINA TANGANYIKÆ.  
Figs. 20-24, PALÆMON MOOREI.

