F. A. C. J.

ON A NEW BRACHYUROUS CRUSTACEAN FROM LAKE TANGANYIKA

William A. Cunnington

ON TWO SPECIES OF MACRUROUS CRUSTACEANS FROM LAKE TANGANYIKA

W. T. Calman

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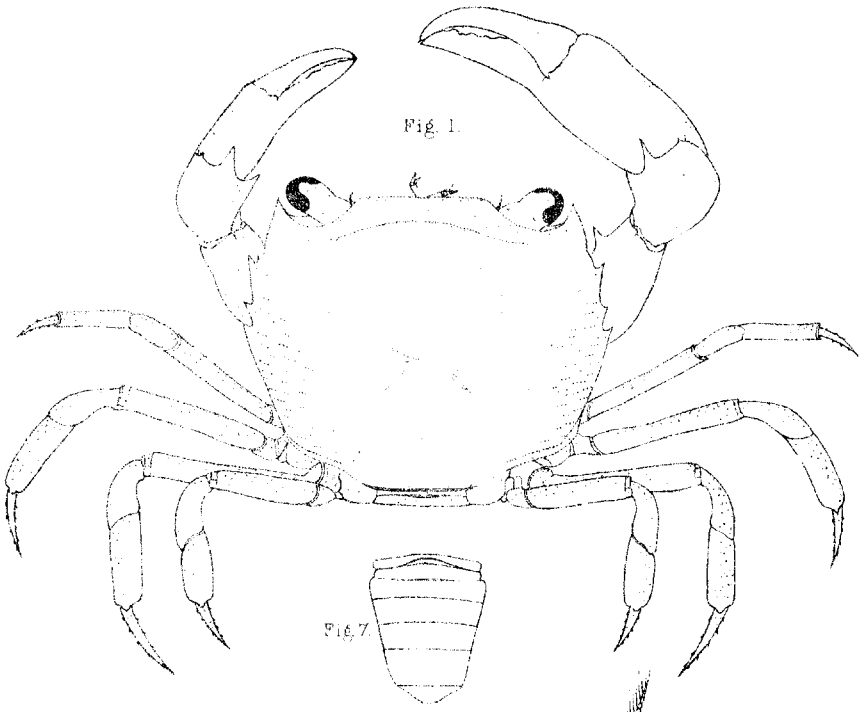


Fig. 1.

Fig. 7.

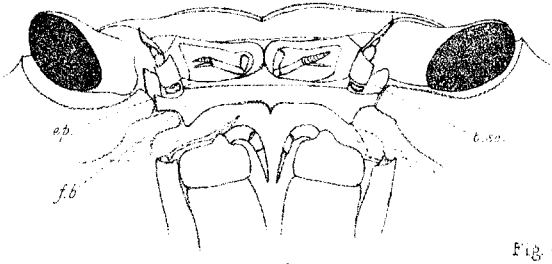


Fig. 2.

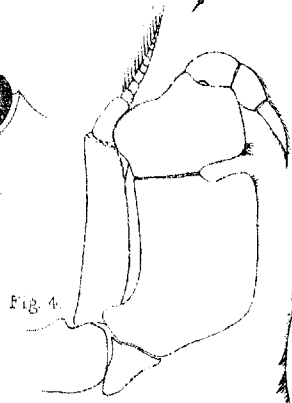


Fig. 4.

Fig. 5.

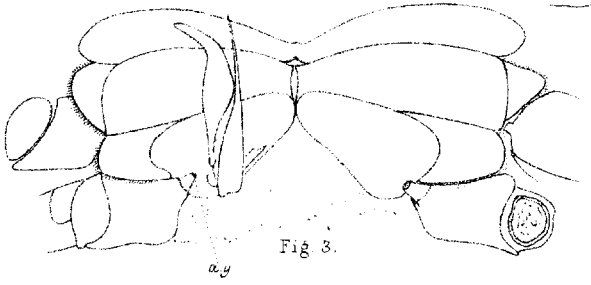
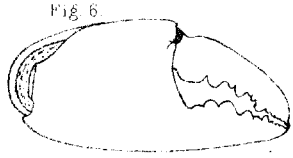


Fig. 3.

Fig. 6.



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LIMNOTHELPHUSA MACULATA.

EXPLANATION OF THE PLATES.

PLATE XXXVI.

Trionyx subplanus, p. 619.

PLATE XXXVII.

Fig. 1. *Typhlops albiceps*, p. 654. Upper and side views of head.
2. *T. floweri*, p. 654. Upper and side views of head.
3. *Cylindrophis rufus*, p. 656.

2. On a new Brachyurous Crustacean from Lake Tanganyika. By WILLIAM A. CUNNINGTON, A.R.C.S.[1]

[Received April 26, 1899.]

(Plate XXXVIII.)

The Crab described in this paper was obtained by Mr. J. E. S. Moore, of the Royal College of Science, from Lake Tanganyika during his visit in the summer of 1896. The specimens were taken in fairly deep water—never less than 60, and from that to 500 feet deep. I have had in all seven individuals to examine, of which three are adult males, two adult females, and the remaining two young ones. All these specimens, Mr. Moore informs me, were taken in Kituta Bay, at the southern end of the Lake, but he has also seen these Crabs near Kinyamkolo, also in the south, and Sumbu, some 100 miles up the western coast. They are often found clinging to *Neothauma*-shells and other objects, and are very active in habit.

Their deep-water habitat is at first sight misleading; but a careful examination shows that from the presence of a post-frontal crest, and from the nature of the external maxillipeds, chelipeds, and ambulatory legs, their characters are distinctly those of the group of the Thelphusidæ, in which, in consequence, they must be placed, although at any rate the majority of its members are mainly terrestrial in habit.

The differences which Mr. Moore's specimens exhibit, however, from any hitherto described form, are sufficiently great, I think, to warrant the institution of a new genus for their reception. I propose the name *Limnothelphusa maculata* for them, as suggesting, in the first place, their habitat, and in the second their characteristic spotted appearance.

This being at present the only known form of its kind, it is not easy to decide which of its characters denote a generic distinction, and which a merely specific. Following, however, as far as

[1] From the Biological Laboratory, R. Coll. Sci. Lond. Communicated by Prof. G. B. HOWES, F.Z.S.

possible the method adopted for the distinction of genera and species in its nearest allies, it may be thus diagnosed:—

LIMNOTHELPHUSA, gen. nov.

Carapace moderately convex, antero-lateral margins arcuated and armed with spines. Front somewhat deflexed, nearly straight, and more than one-third the width of the carapace. Orbits large, with prominent inner subocular tooth. Eyes large, with peduncles short and stout. Second joint of antenna simple, not distorted by deflexed front. Merus of external maxillipeds roughly quadrilateral, the carpus being attached towards its inner front angle. Ambulatory legs considerably compressed.

LIMNOTHELPHUSA MACULATA, sp. nov. (Plate XXXVIII.)

Regions and sutures on carapace moderately marked. Postero-lateral regions exhibiting an irregular series of small, slightly oblique and granular ridges. Post-frontal crest distinct, with median notch and partial lateral interruptions, but not extending to margins. Antero-lateral margins shorter than postero-lateral, armed with 2–3 spines, in addition to that at the outer angle of the orbit. Second joint of antenna extending to under border of front, and bearing a short flagellum. Chelipeds in the male unequal, subequal in the female; merus rather short, trigonous, with spine on inner margin; carpus with two spines on inner margin. Ambulatory legs rather long and slender. Colour (in spirit) light yellowish brown, with dark brown or reddish spots.

Dimensions as follows:—

	mm.
Adult male (largest specimen):	
Length of carapace	12
Breadth of carapace	15·4
Length of larger cheliped ..... about	21·7
Length of second ambulatory leg, about	21
Adult female:	
Length of carapace	11·5
Breadth of carapace	13·6
Length of cheliped ..... about	12·8
Length of second ambulatory leg, about	14·1

While the carapace is here, as throughout the Thelphusine group, broader than long, that condition is somewhat less pronounced, giving an effect of greater squareness. The great relative breadth of the front and size of the orbits are features also specially noticeable, even at first sight. The prominent and distinct condition of the subocular tooth (fig. 2, *t.so.*) seems characteristic, while a crenulated subocular margin forms a further point of difference from other members of the group. The antennules, with their large basal joints, are situated in the normal transverse position, and the antennæ occupy the interior orbital hiatus. The external maxillipeds, while Thelphusine in character,

and having well-developed palp-bearing exopodites, are, as will be seen from fig. 4, certainly distinctive. The respiratory apertures, often so noticeable in its allies, are in *Limnothelphusa* very inconspicuous. In fig. 6 the rather finely dentated condition of the chelipeds may be seen, as also the fact that they end in sharp points tipped with a somewhat transparent yellowish cap of dense chitin. The styliform dactyli of the ambulatory legs, too, are furnished with longitudinal rows of spinules (fig. 5) similarly tipped. That the male genital apertures (*a.g.* fig. 3) are situated on papillæ on the basal joints of the last pair of ambulatory legs may be easily made out on removal of the abdomen. The abdomen itself is in both sexes distinctly seven-jointed (fig. 7), and in the normal manner covers at its base the whole width of the sternum. As is also the case among its nearest allies, the penultimate segment of the abdomen is the longest. Nine pairs of gills of the perfectly normal type are seen on dissection.

One feature in which the specimens exhibit marked individual variation is the development of spines on the antero-lateral margins of the carapace. The presence of three spines in all is, perhaps, the most common condition; but additional more or less distinct spines may exist between these prominent ones, the culminating condition being that shown on the left side in the largest male specimen (fig. 1). This individual is quite asymmetrical as regards these spines, a well-developed fourth and a suggestion of a fifth occurring on the left border, while the right edge shows only a partially developed fourth. This would suggest that a process either of multiplication or reduction of the lateral spines may be going on here, since the largest specimen shows what would be an extreme condition in either case.

A further individual difference was noticeable between this specimen and most of the others. On examination with a hand-lens, the majority gave the appearance of being strongly haired, particularly in the anterior and lateral regions of both dorsal and ventral faces of the carapace. By removing a small quantity of this apparent "hair," however, and examining it under higher powers, its true nature could at once be seen. Each "hair" consisted of a more or less perfect tubular structure, tapering towards the point of attachment, and containing, apparently, a protoplasmic mass. By treatment on a microscope-slide with a mixture of glycerine and picro-carmine, further internal structure, in the shape of a long and spirally-coiled nucleus, could be made out, this leading to the conclusion that the supposed "hairs" are really an incrustation of some form of tubicolous protozoan, and the presence of various diatoms in certain of the tubes confirms the supposition. More than this it is impossible to record, since the Crabs were not preserved with a view to minute histological investigation. One further interesting fact, however, is that encrusting these tubes in turn there may be clearly observed specimens of a Vorticellid or some closely-allied Infusorian. The fact that the large specimen (fig. 1) was not covered by these

foreign growths is easily accounted for. It is, I understand, the largest individual that Mr. Moore has ever seen, and from its soft texture it had clearly recently undergone ecdysis, becoming for the time free from encrusting organisms.

Affinities.—That this Crab finds its nearest allies among the freshwater group of the Thelphusidæ there can, I think, be little doubt. Of the three sections into which Ortmann has subdivided the group [1], the Pseudothelphusinæ and the Trichodactylinæ may be at once dismissed, as differing most markedly in the character of their external maxillipeds. This excludes the New World forms, leaving only, in the section Thelphusinæ, those typical of the Old World, though occurring also in Australia. The principal points of resemblance to, and difference from, the members of this group, which this Tanganyikan crab presents, may be conveniently stated in tabular form.

Points of resemblance to the Thelphusinæ [2]:—

(1) Presence of distinct post-frontal crest.
(2) Conditions of sutures on carapace.
(3) Form of external maxillipeds.
(4) Character of chelipeds.
(5) Spinuliferous condition of ambulatory dactyli.
(6) Normal seven-jointed nature of abdomen.

Points of difference from the Thelphusinæ:—

(1) Length of carapace more nearly equal to the breadth.
(2) Carapace considerably less vaulted.
(3) Antero-lateral margins relatively longer.
(4) Greater breadth and less deflection of front, with larger size of orbits and eyes.
(5) Second joint of antenna not distorted by deflexed front.
(6) Spotted nature of test.

Two genera only—*Parathelphusa* and *Thelphusa*—are included by Ortmann under the heading Thelphusinæ. Of these, *Parathelphusa* was originally supposed to be typically Indo-Malayan in distribution, but in 1887 A. Milne-Edwards [3] included under this heading several forms originally described as *Thelphusa* from the African continent. The genus *Thelphusa* is widely distributed over all parts of the Old World. By the kindness of Prof. Jeffrey Bell, M.A., I have been permitted to examine the large number of specimens belonging to these two genera in the collection of the British Museum. Among them there are no forms which would seem to be closely allied to *Limnothelphusa*, but so far as general appearance goes the specimens of *Parathelphusa* certainly agree most nearly. The latter have a carapace more elongated in

[1] Zool. Jahrb. (Abth. f. Syst.) Bd. vii. 1894, p. 487.

[2] The term is here used as instituted by Ortmann, though in his scheme of classification he does not refer to the genera *Hydrothelphusa* and *Platythelphusa*.

[3] Ann. Sci. Nat. vii., Zool. t. 4.

proportion, have larger spine-bearing antero-lateral margins, and are considerably more flattened. The front, too, though deflexed[1], is less so than in *Thelphusa*. On the other hand, however, in several of the described species the abdomen of the male is of the so-called "hour-glass" shape[2], while in all one spine only seems to be developed on the carpal joints of the chelipeds, and the second antennal joint is distorted in the common manner. The condition of the chelipeds is, however, in some species of *Thelphusa* strictly comparable with that of *Limnothelphusa*, so that in this respect we may consider the new form as occupying a somewhat intermediate position between these two old-established genera.

Two other little-known genera, however, *Hydrothelphusa* and *Platythelphusa*, must also, I suppose, be included in the group, though they are not mentioned by Ortmann. Of these, the former, from the streams of Madagascar, was first described in 1872[3] by A. Milne-Edwards. The description, however, was very brief, and though he has since[4] given a further account, as well as a figure of the dorsal aspect, our information is still unfortunately very incomplete. The front here, instead of being deflexed, is said to be almost horizontal, while the carapace is considerably flattened and nearly quadrilateral. Only a single tooth, however, is present on the antero-lateral margin, in addition to that at the outer angle of the orbit. With this the description of *Platythelphusa*[4], which actually comes from Lake Tanganyika, agrees in the main, but the antero-lateral margins are, in contradistinction, multi-dentate. Several figures of this form are given, but they are not, unfortunately, all one could wish. The figure of the antennæ suggests that we are dealing with a simple undistorted condition of the joints, such as I have seen nowhere else but in *Limnothelphusa*, but the right and left antennæ do not even agree one with another, according to the drawing. The fourth pair of walking-legs presents a peculiarity in being rather short, while the terminal joints are somewhat flattened and expanded, presumably for swimming purposes. The male of this form is unknown, so that it is to be hoped that Mr. Moore, during his present expedition to Tanganyika, will obtain further material, and so aid in clearing up this unsatisfactory state of our knowledge. Of the mode of life of either of these forms little or nothing can be learnt from the paper, which fact renders it still more difficult

[1] Milne-Edwards's description of the genus *Parathelphusa* (see Ann. Sci. Nat. iii., Zool. t. 20) is exceedingly brief, and as regards the deflection of the front certainly misleading. Using this definition, one might readily conclude that *Limnothelphusa* comes under it, though an actual comparison shows that the resemblance is by no means exact.

[2] Would it not be more satisfactory to keep these forms separate by constituting two new genera or sub-genera, this extremely prominent difference in shape of the male abdomen being made the basis of separation, as indeed has been done by Wood-Mason in his note on the genus (see Ann. & Mag. Nat. Hist. 1876, p. 122)?

[3] Ann. Sci. Nat. v., Zool. t. 15.

[4] Ann. Sci. Nat. vii., Zool. t. 4.

to effect a comparison with the other known types. From this unfortunate lack of information then, though it is difficult to determine the exact relations which these two genera should bear to those more fully known, there can, I think, be no doubt that both are wholly distinct from *Limnothelphusa*. Several features go to prove this: among them the feeble development of the post-frontal crest in both *Hydrothelphusa* and *Platythelphusa*; but perhaps the most conspicuous difference is the greater breadth of the front and larger size of the orbits and eyes in *Limnothelphusa*. In the existence of but one marginal tooth, in association with an almost horizontal condition of the front, we have in *Hydrothelphusa* a rather anomalous feature—a combination, as we shall have reason to see, of a specialized with a primitive character. Thus, while in respect to the condition of the front this form would appear to be closely allied to *Platythelphusa* and *Limnothelphusa*, as regards the nature of the antero-lateral margins, its affinities are rather with the genus *Thelphusa* itself.

Platythelphusa, in the possession of a little deflexed front, of perhaps an undistorted antenna, and of a multi-dentate margin to the carapace, stands clearly related to the only other form which combines these primitive characteristics—this new genus *Limnothelphusa*. More than this, in the present state of our knowledge, it is impossible to say, and which of the two last-mentioned genera may be fairly considered the more primitive further information alone will enable us to judge.

Of the manner in which this form attained its present distribution in Lake Tanganyika there are two possible views. Either from a land Thelphusan it has become converted gradually into a wholly aquatic type, or it may have entered the lake more or less directly from the sea, in those early times when, as has been suggested [1], the connection between them was far more close than at present. It is generally accepted that the Land-Crabs have descended from ancestors with a littoral habit, so that there would be no direct objection to the supposition that this creature has merely retained its primitive aquatic character, rather than regained it after adaptation to a terrestrial mode of existence. We can only come to a conclusion on this head by estimating how far the general structure of the animal suggests simplicity on the one hand, or, on the other, specialization. The arched or vaulted condition of the branchial regions of the carapace in *Thelphusa* is evidently a specialization in connection with aerial respiration. That such prominent vaulting does not here exist is not surprising, but though it is perhaps conceivable that this character, once attained, might be lost again on change of environment, it is, I think, more probable that such a condition was never reached by *Limnothelphusa*. Again, as regards the less prominent deflection of the front in the latter, the condition appears rather primitive than secondarily acquired; while the simple nature of the second antennal joint, as compared with that of *Thelphusa*, which so

[1] Q. J. M. S. vol. xli. p. 303.

much suggests a distortion produced by the frontal downgrowth, also supports this view. The greater number of spines occurring on the antero-lateral margins is a further feature, capable, however, of two possible interpretations. The carapace in but few species of *Thelphusa* bears more than one, and that a less prominent spine. If, then, we are dealing with a multiplication of marginal spines, we have an indication of greater specialization than that met with in *Thelphusa*, an indication contrary to the tendency of the other evidence. The other possible explanation, then, that a reduction towards the extreme condition of *Thelphusa* is in progress, would seem far more probable; and it is a noticeable fact that the marine and littoral Crabs, from which we may suppose this form has been derived by comparatively slight modifications, are far more spinous than any of the modern terrestrial or fluviatile forms. Thus, while *Platythelphusa* and *Limnothelphusa* would appear to be the most primitive of these Old World genera, *Parathelphusa*, in the less pronounced arching of the carapace and the more numerous lateral spines, would come as intermediate between them and the most specialized condition of *Thelphusa*.

On the causes which have contributed to the present-day distribution of these genera, a word or two may be said. It is no very recent conception that Madagascar and, through this island, the south of Africa itself, was perhaps at some remote period connected in a tolerably close manner with India. The present fauna of Madagascar, which shows marked Oriental affinities, bears this out; and from considerations of geological facts, particularly as regards the possession of a common flora in Carboniferous times, Dr. Blanford [1], following Suess and Neumayr, is inclined to regard the idea of a great continent, embracing Australia, India, and South Africa, as by no means improbable. The evidence for such a land-connection is not confined to beds of quite such ancient date, however, for both in Jurassic and Cretaceous times the fauna of the two areas is distinctly suggestive of this same continuity. If, then, we may imagine the ancestral *Thelphusa* as living on the shores of this early continent, in which the present Lake Tanganyika was represented as a narrow bay or fiord, it is not unreasonable to suppose that while *Limnothelphusa*, and perhaps *Platythelphusa*, staying in the lake, retained most nearly the ancestral characters, *Hydrothelphusa* and *Parathelphusa* [2], still largely aquatic in habit, would resemble them more nearly than *Thelphusa*, many species of which spend most of their time upon land.

It is of course difficult to tell how far any one character, or even collections of characters, may be primitive or adaptive, or again, whether an intermediate stage of greater specialization might not be attained and lost again on change of surroundings. On the whole, however, I conclude that this Crab presents rather lowly characters in the group to which it belongs.

[1] Anniversary Address to the Geological Society, 1890.
[2] Wood-Mason, *loc. cit.* p. 122.

EXPLANATION OF PLATE XXXVIII.

Fig. 1. *Limnothelphusa maculata*, gen. et sp. nov. (p. 698). Adult male, general view from above. ×2½ 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.

a.g. Genital aperture.	*ep.* Epistome.
f.b. Buccal frame.	*t.so.* Sub-ocular tooth.

3. On two Species of Macrurous Crustaceans from Lake Tanganyika. By W. T. Calman, B.Sc., University College, Dundee.[1]

[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 *Palæmon*.

Sub-order MACRURA.

Tribe Caridea.

Family Atyidæ.

Limnocaridina, gen. nov.

Rostrum long, compressed, serrated. Carapace with a hepatic spine. Peræopods 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 peræopods.

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 1⅓ to twice the length of the carapace, and extending beyond the antennal scale by ⅓ to nearly ½ its length. There are from 12–15 teeth on its

[1] Communicated by Prof. G. B. Howes, F.Z.S.