

AUSTRALIAN MUSEUM SCIENTIFIC PUBLICATIONS

McCulloch, Allan R., 1909. Studies in Australian Crustacea. No. 2. *Records of the Australian Museum* 7(4): 305–314, plates lxxxviii–lxxxix. [30 August 1909].

doi:10.3853/j.0067-1975.7.1909.973

ISSN 0067-1975

Published by the Australian Museum, Sydney

nature culture **discover**

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STUDIES IN AUSTRALIAN CRUSTACEA.

No. 2*.

By ALLAN R. McCULLOCH, Zoologist.

(Plates lxxxviii.-lxxxix., and figs. 16, 17.)

CÆNOBITA SPINOSUS, *M. Edwards.*

(Plate lxxxviii., figs. 1-2.)

Pagurus clypeatus, Olivier, *Encycl. Meth. Ins.*, viii., 1812, p. 643, pl. cccxi., fig. 1 (*nec. Cancer clypeatus*, auct.).

Cænobita spinosa, M. Edw., *Hist. Nat. Crust.*, ii., 1837, p. 242. *Id.* Ortmann, *Zool. Jahrb. Syst.*, vi., 1892, p. 318, pl. xii., fig. 24.

Cænobita olivieri, Owen, *Zool. "Blossom,"* 1839, p. 84. *Id.* Dana, *U.S. Expl. Expd., Crust.*, pt. i., 1852, p. 470. *Id.* Heller, *Reise Novara, Crust.*, 1865, p. 82. *Id.* Haswell, *Cat. Austr. Crust.*, 1882, p. 160.

Cænobita brunnea, Dana, *loc. cit.*, p. 470, pl. xxix., fig. 10. *Id.* Haswell, *loc. cit.*, p. 161.

Birgus hirsutus, Hess, *Arch. Nat.*, xxxi., 1865, p. 36, pl. vii., fig. 16.

? *Cænobita perlata*, var. *affinis*, Miers, *Ann. Mag. Nat. Hist.*, (5), v., 1880, p. 372, pl. xiv., fig. 8 (*vide* Ortmann).

Obs.—Ortmann has included under the heading of *C. spinosus* a variety differing from the typical form in having the dactyli of the third left legs less slender, and flattened externally. Following Dana, he determined this variety as *C. olivieri*, Owen, but a reference to the original description and Olivier's figure of that species shows that it has the dactyli rounded and spiny as in the typical *C. spinosus*, and the name therefore cannot be applied to those in which they are smooth and flattened. I therefore propose the new name *variabilis* for the variety in which the two last joints of the third left legs are smooth and flattened externally, and the hand of the larger cheliped is nearly smooth, and with an oblique row of larger granules on its upper exterior surface.

* For No. 1, see p. 51.

The following notes and the accompanying plate show the great range of variation in the characters, usually relied upon to differentiate the species of this genus, as presented by a splendid series of *C. spinosus* from Cape York, N. Australia.

The gastric region may be strongly convex or flattened, and the width of the front varies between 3 and 3.5 in the length of the carapace. The length of the eyes is also variable. The hand of the larger cheliped may be intensely spiny, or the lower portion of the outer surface may be perfectly smooth, and a more or less distinct stridulating ridge on the upper part may be present or absent. The propodus and dactylus of the second and third, or third only, pairs of left legs may be sub-cylindrical and long, or markedly flattened and shorter. If flattened, there is a prominent crest on the upper and lower posterior margins of the dactylus, and sometimes also on the distal portion of the propodus.

Great as these variations seem, they are certainly within the limits of the one species, as I found all my specimens living together under a sheet of bark at Cape York, and they form an unbroken series between the two extremes I have figured. Further, though they would suggest that the variations are due to the age of the individuals (young, *variabilis*; adult, *spinosus*), other specimens in the Museum collection from the north-west coast of Australia, Murray Islands, Torres Straits, the Fiji Islands, and the New Hebrides show that this supposition is incorrect.

As *Birgus hirsutus*, Hess has recorded this species from Sydney. This is, however, certainly wrong, as the genus is confined on the eastern coast of Australia to North Queensland. For the same reason, Heller's record¹ of *C. rugosus*, M. Edw., from Sydney, is incorrect.

LEANDER SERENUS, *Heller*.

(Plate lxxxix., figs. 9-12.)

Leander serenus, Heller, Reise Novara, Crust., 1865, p. 110, pl. x., fig. 5. *Id.* Haswell, Cat. Austr. Crust., 1882, p. 195.

Palæmon affinis, Bate, Chall. Rep., Zool., xxiv., 1888, p. 782, pl. cxxviii., fig. 5 (*nec. P. affinis*, M. Edw.).

Carapace smooth and polished. The rostrum is very variable in shape, being either broad or narrow, and its upper margin may be almost straight, or else bent upwards towards the tip. It is armed with six to nine nearly equidistant teeth above, and three

¹Heller—Reise Novara, Crust., 1865, p. 82.

or four below, those near the apex generally placed near one another, so as to give it a bi- or tridentate appearance; the posterior two or three teeth are placed over the anterior part of the carapace. The antennal and branchiostegal spines are well developed, the latter being placed rather behind the vertical of the other, but overlapping the anterior border of the carapace.

Antennular peduncles not quite so long as the rostrum, their flattened outer portions armed each with a terminal and median spine. The two external flagella are united for about one-third the length of the thickened flagellum, the outer margin of which is obscurely serrated. The basal joint of the antennal peduncle with a strong external spine; the flagellum about as long as the entire body.

The external maxillipeds extend a little beyond the antennal peduncles, and their exopods are large and reach to the ends of the ante-penultimate joints.

The first pair of legs are very slender and reach a little beyond the tip of the scaphocerite. The second pair are large and cylindrical, and, when fully developed, extend almost as far as the tip of the inner antennular flagellum. The merus does not reach so far forward as the end of the scaphocerite. The carpus is thickened distally, and is slightly longer than the palm, its length varying a little with age. The palm is swollen and one-third longer than the fingers.

The three posterior pairs of legs are subequal in length, slender, cylindrical, and, with the exception of a row of minute spinules on the lower border of the propodus, are unarmed. Short brushes of setæ overhang the bases of the dactyli, and there are scattered bristles on the carpus and propodus of each leg.

The telson terminates in an acute spine, on either side of which is a long internal and short external one, both being movable. Two pairs of spinules are placed on the hinder half of the upper surface.

Obs.—Miers² regarded *L. serenus* as a variety of *L. intermedius*, but it is readily distinguished from that species by the branchiostegal spine being placed on the margin of the carapace, and by the different proportions of the carpus and propodus of the second legs.

There can be no doubt that the specimens from Port Jackson determined by Spence Bate as *Palæmon affinis*, M. Edw., are not

²Miers—Zool. Rep. "Alert," 1884, p. 295.

that species, as was suggested by Ortmann,³ but are identical with the above. The late Mr. F. E. Grant, when in England, compared Victorian specimens of *L. serenus* with the "Challenger" specimens and found them to be identical.

Hab.—I have collected this species in rock-pools at Rat Island, Port Curtis, and around Sydney, and there are specimens in the Australian Museum collected by Mr. J. Gabriel in Port Phillip, Victoria.

LEANDER LITOREUS, *sp. nov.*

(Fig. 16.)

Obs.—Compared minutely with *L. serenus*, this species appears to be distinguished by the following important characters alone.

The two external flagella of the antennules are united only at their bases, six or seven joints being joined, while twenty-seven or more form the free portion of the thickened flagellum, which is distinctly serrated on its outer edge.

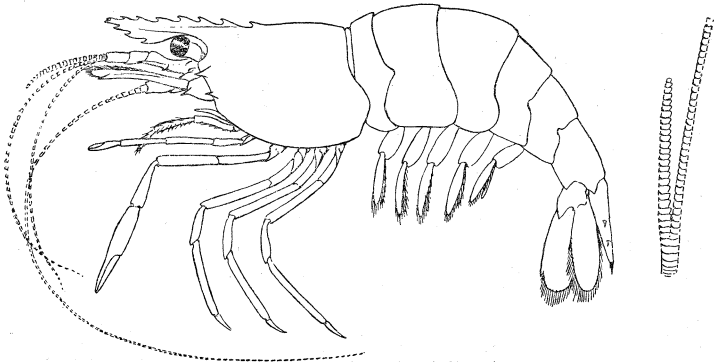


Fig. 16.

The second pair of legs are much shorter, reaching in my largest specimen only a trifle beyond the thickened antennular flagellum. The carpus is much thickened distally and is shorter than the palm, and does not extend to the tip of the scaphocerite. The palm is thick and swollen, and is not much longer than the fingers.

Four specimens from rock-pools on the coast near Sydney. Largest specimen measuring 39 mm. from the tip of the rostrum to that of the telson.

³Ortmann—Zool. Jahrb. Syst., v., 1890, p. 521.

From *L. natator*, M. Edw., to which this species is closely allied, it is distinguished by the different proportions of the joints of the second pair of legs and in having a greater number of joints in the thickened antennular flagellum.

LEANDER INTERMEDIUS, *Stimpson*.

(Plate lxxxix., figs. 13-14.)

Leander intermedius, Stimpson, Proc. Acad. Nat. Sci. Phil., xii., 1861, p. 41. *Id.* Haswell, Cat. Austr. Crust., 1882, p. 195. *Id.* Ortman, Zool. Jahrb. Syst., v., 1890, p. 523. *Id.* Grant in Sayce, Vict. Nat., xviii., 1902, p. 155.

Carapace smooth and polished. Form of the rostrum variable, straight or bent upwards and extending nearly or quite as far forward as the scaphocerite. There are six to nine teeth above and four or five below, those near the apex placed so close together as to give the tip a bi- or trifold appearance. The posterior two or three teeth are placed over the anterior part of the carapace. The antennal and branchiostegal spines are well developed, the latter being placed well behind the vertical of the other, and at some distance from the anterior margin of the carapace.

The antennular peduncles are not so long as the rostrum, and the outer margin of their flattened portion is armed with a terminal and median spine. The two external flagella are united for rather more than one-third the length of the thickened flagellum, the outer margin of which may be obscurely serrated. The basal joint of the antennal peduncle has a strong spine at its outer angle, and the flagellum is about as long as the entire body.

The external maxillipeds extend a little beyond the antennal peduncles, and their exopods are large and reach to the ends of the ante-penultimate joints.

The first pair of legs are very slender and reach to, or a little beyond the tip of the scaphocerite. The second pair are more slender than those of *L. serenus* and are somewhat shorter, the end of the carpus in my largest specimen being but little in advance of the tip of the rostrum. The carpus is thickened distally and is much longer than the palm, being, in young specimens, equal to the length of the whole hand. The palm is swollen, and is only a little longer than the fingers.

The three posterior pairs of legs are very slender, and the fifth pair is rather longer than the third. Except for a row of spinules

on each propodus, they are unarmed, but there are short brushes of setæ overhanging the bases of the dactyli, and scattered bristles on the carpus and propodus of each leg.

The telson terminates in an acute spine, on either side of which is a long internal and short external one, both of which are movable. Two pairs of spinules are placed on the hinder half of the upper surface.

Obs.—This species is readily distinguished from its allies by the position of the branchiostegal spine. From *L. serenus* it further differs by having the second pair of legs shorter, and the palm being much shorter than the carpus. The ambulatory legs are also more slender than in that species.

Hab.—Common in Port Jackson, where it is found on weedy bottoms. It is also recorded by Miers⁴ from King George's Sound, S. W. Australia, and Tasmania. His specimens from Ovalau, Fiji Group, probably do not belong to this species, and those from Port Molle, Queensland, are possibly *L. serenus*. Grant records it from Port Phillip, Victoria.

RHYNCHOCINETES RUGULOSUS, *Stimpson*.

(Plate lxxxix., figs. 1-8.)

Rhynchocinetes rugulosus, Stimpson, Proc. Acad. Nat. Sci. Phil., xii., 1860, p. 36. *Id.* Haswell, Cat. Austr. Crust., 1882, p. 180.

The surface of the whole body is roughened by very fine and close-set lines which sometimes support a short but dense pubescence. In large specimens these lines are also present on the appendages, but in smaller ones they appear smooth.

The carapace is armed with six large spines; one at the base of the rostrum and a second behind it, a pair of supraocular and a pair of antennal spines. The antero-lateral angle of the carapace is also armed with a minute spinule. The rostrum reaches a trifle beyond the scaphocerite and is inclined upwards towards the end, but its extreme tip is directed downwards. The upper margin bears two large teeth on the posterior half and five or six smaller ones distally, the last being the tip of the rostrum. There are eleven to thirteen teeth on the lower margin, which increase in length backwards to the eighth, those following being shorter and broader, and the last two recurved inwards.

⁴Miers—Zool. Rep. "Alert," 1884, p. 295.

The antennular peduncles reach to about the middle of the rostrum, and the shorter flagellum a little way beyond its tip. The flattened basal portion is armed on the outside with a long slender spine, and the joints of the peduncle are provided with brushes of short stiff setæ.

The basal antennal joint has a strong spine on its outer angle. The scaphocerite is long and narrow, the flattened portion being obliquely truncate from the tip. The flagellum is a little shorter than the whole body.

The mandibles have a short cylindrical molar process and a large toothed cutting edge. The palp is three-jointed, the last joint and distal portion of the second being densely setose.

The first maxillæ are three-branched, the median branch being the longest and with a double row of teeth on its edge. The superior branch is curved and terminates in a short bristle, and the inferior is rounded with setose margins.

The second maxillæ consist of five plates and a slender, twisted, median process. The two outer plates forming the branchial fan are the largest, and the hinder one terminates in extremely long setæ. All the other plates have their inner margins setose.

The first maxillipeds have also two outer fan-plates, which, however, are not setose. A long jointed lash extends from the inner angle of an oblong, setose plate. The median process is jointed to a thickened basal portion, both being setose.

The basal joint of the second maxilliped supports a small leaf-like plate externally, and a long jointed lash springs from the second. The last joint is large and reflexed upon the others, its distal portion being thickened and set with two opposing clusters of bristles which are more numerous than those on the hinder part of the joint.

The external maxillipeds are very large and setose, and reach beyond the scaphocerite. The merus has a spine at its distal end, and the last joint bears about six black thorns at its tip. The exopod reaches to the end of the merus.

The first pair of legs are comparatively short and thick, and reach beyond the antennal peduncle. The upper margin of the merus ends in a strong spine. The fingers are tipped with three or four black points which interlock when closed. There is a patch of short hairs on the lower surface of the palm.

The second legs are slender and reach beyond the first. Beyond the black thorns on the tips of the fingers they are unarmed.

The ambulatory legs vary somewhat with age, being shorter and thicker in smaller than in larger specimens. The first is the longest and reaches to or beyond the scaphocerite. The ischium is armed with a spinule, and there are three more on the lower exterior margin of the merus. The carpus has two spinules, and the lower margin of the propodus bears a row of minute spiniform setæ. The dactylus also has some teeth on its lower edge. There are scattered setæ on the end of the merus and on the following joints. All three pairs of ambulatory legs are similar, except in length.

The telson has three pairs of spinules on its upper surface, and ends in an acute point, on either side of which are three spinules, the median being the longest.

Obs.—*Rhynchocinetes rugulosus* is a common species around Sydney, inhabiting dark crevices between rocks and in weedy pools. It is very beautifully marked when alive with streaks and dots of a bright blue colour on a darker ground. There are also specimens in the Australian Museum collection from Lord Howe Island.

According to Stimpson, the anterior part of the rostrum in the type specimens was tridentate. In all that I have seen there are five or six teeth at the tip of the rostrum. My specimens being from the same locality as the types, however, places their identification beyond doubt.

Rhynchocinetes typus, M. Edw., is included in the Australian fauna on the authority of Miers,⁵ who wrote in the Catalogue of New Zealand Crustacea that it was found also on the coasts of Australia and Chili. I have not seen this species, and think that he probably confused it with *R. rugulosus*, Stimp., which, however, appears to be readily distinguished by having fewer teeth on the upper and lower margins of the rostrum.

¶ Having sent Miss M. J. Rathbun a tracing of my figure of *R. rugulosus* for comparison with specimens of *R. typus*, she has very kindly favoured me with the following notes.

The rostrum has seven or eight spines above, near the tip, and they occupy a greater space than in *R. rugulosus*; there are nineteen spines below. Maxillipeds longer and more slender; antennal scale not reaching the last segment of the maxilliped. Carpus of the first leg less than half as long as the propodus, and equal to the dactylus in length; margins of the palm not convex. Second leg very little longer than the first; propodus about four-fifths as long as the carpus and not stouter than that joint.

⁵Miers—Cat. Crust. N. Zealand, 1876, p. 77.

ALOPE AUSTRALIS, *Baker*.

Alope palpalis, Haswell, Cat. Austr. Crust., 1882, p. 193 (*nee* White).

Alope australis, Baker, Trans. Roy. Soc. S. Austr., xxviii., 1904, p. 154, pl. xxx., figs. 1-7.

Obs.—This is a very common species in rock-pools near Sydney. Mr. W. A. Baker has kindly compared specimens from here with his types, and confirms my identification. He adds that he has overlooked the division of the ischium and merus of the second pereopoda into two joints each, they being obscure in his specimens.

Mr. G. M. Thomson has also compared others with those used by him when writing upon *A. palpalis*, White,⁶ and he has favoured me with the following notes and sketches of the rostrum of both species.

The rostrum of *A. australis* (fig. 17, 1) is shorter than that of the New Zealand species, and is armed with six teeth above, as against 3-4-5 teeth in *A. palpalis* (fig. 17, 2-3). It is also a much smaller species, the largest specimens being one and a half inches long, while *A. palpalis* attains two or three inches in length. *A. australis* is marked with darker spots and bars, while *A. palpalis* is of a uniform whitish colour.

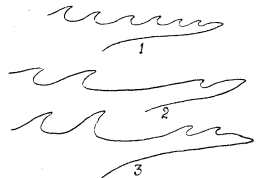


Fig. 17.

The rostrum of *A. australis* is also subject to some variation, some of my specimens having only four or five teeth; but they are always equally spaced and not separated by wide gaps as in the figures of *A. palpalis*. It should also be noted that *A. australis* also fades to a uniform white after long preservation in spirits.

A. palpalis is therefore not an Australian species.

METAPENEUS MONOCEROS, *Fabricius*.

Penæus monoceros, Haswell, Cat. Austr. Crust., 1882, p. 200.

Metapeneus monoceros, Alcock, Cat. Ind. Dec. Crust., pt. iii., 1906, p. 18, pl. iii., fig. 7.

Penæus, sp., Whitelegge, Proc. Roy. Soc. N.S. Wales, xxiii., 1890, p. 225; Whitelegge in Ogilby, Edible Fish. and Crust. N.S. Wales, 1893, p. 203.

Obs.—The specimens recorded by Whitelegge as an undescribed species of *Penæus* are identical with the above. Though stated

⁶Thomson—Trans. Linn. Soc., (2), viii., 1903, p. 440, pl. xxviii., figs. 3-12.

to be the commonest species offered for sale, he adds that it is abundant at certain seasons only, and he informs me that all his specimens were secured at the fish-markets by Mr. J. D. Ogilby.

This species has not been previously recognised from N.S. Wales, though Haswell records it from the Endeavour River, Queensland.

EUCRATE DORSALIS, *White*.

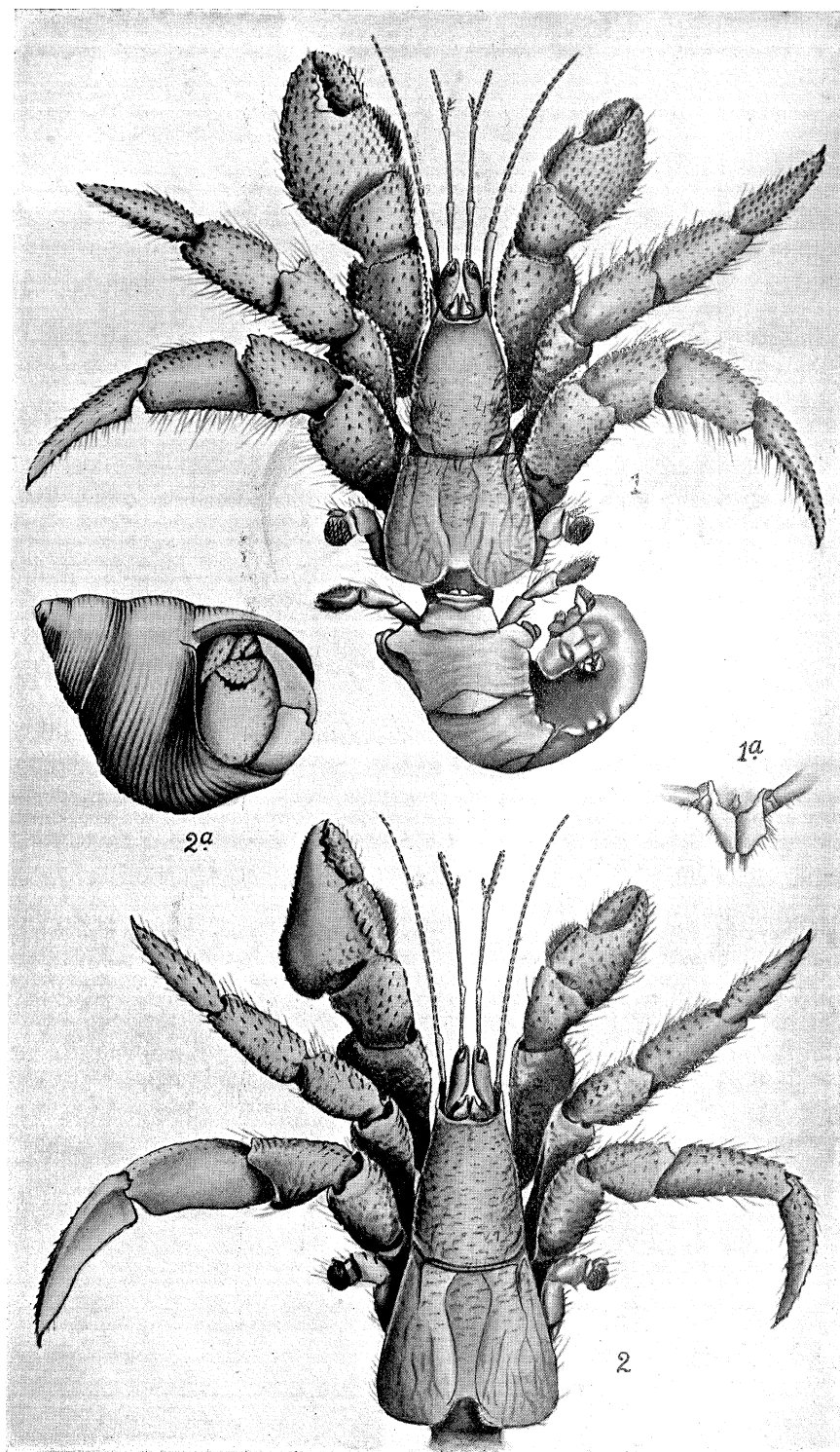
Cancer (Galene) dorsalis, White, Proc. Zool. Soc., 1848 (1849), p. 144, Annulosa pl. vi.

On page 58 of the present volume I unfortunately described this species under the new name *E. hamiltoni*. Though no definite locality is given, White states that his specimen was obtained by Mr. John MacGillivray during the voyage of the "Rattlesnake," and it therefore probably came from N. Eastern Australia.

EXPLANATION OF PLATE LXXXVIII.

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AUSTRALIAN CRUSTACEA.

- Fig. 1. *Cenobita spinosus*, M. Edwards.
,, 1A. ,, ,, coxæ of the fifth legs of the male.
,, 2. ,, ,, var. *variabilis*, McCulloch.
,, 2A. ,, ,, ,, in shell of *Turbo*.

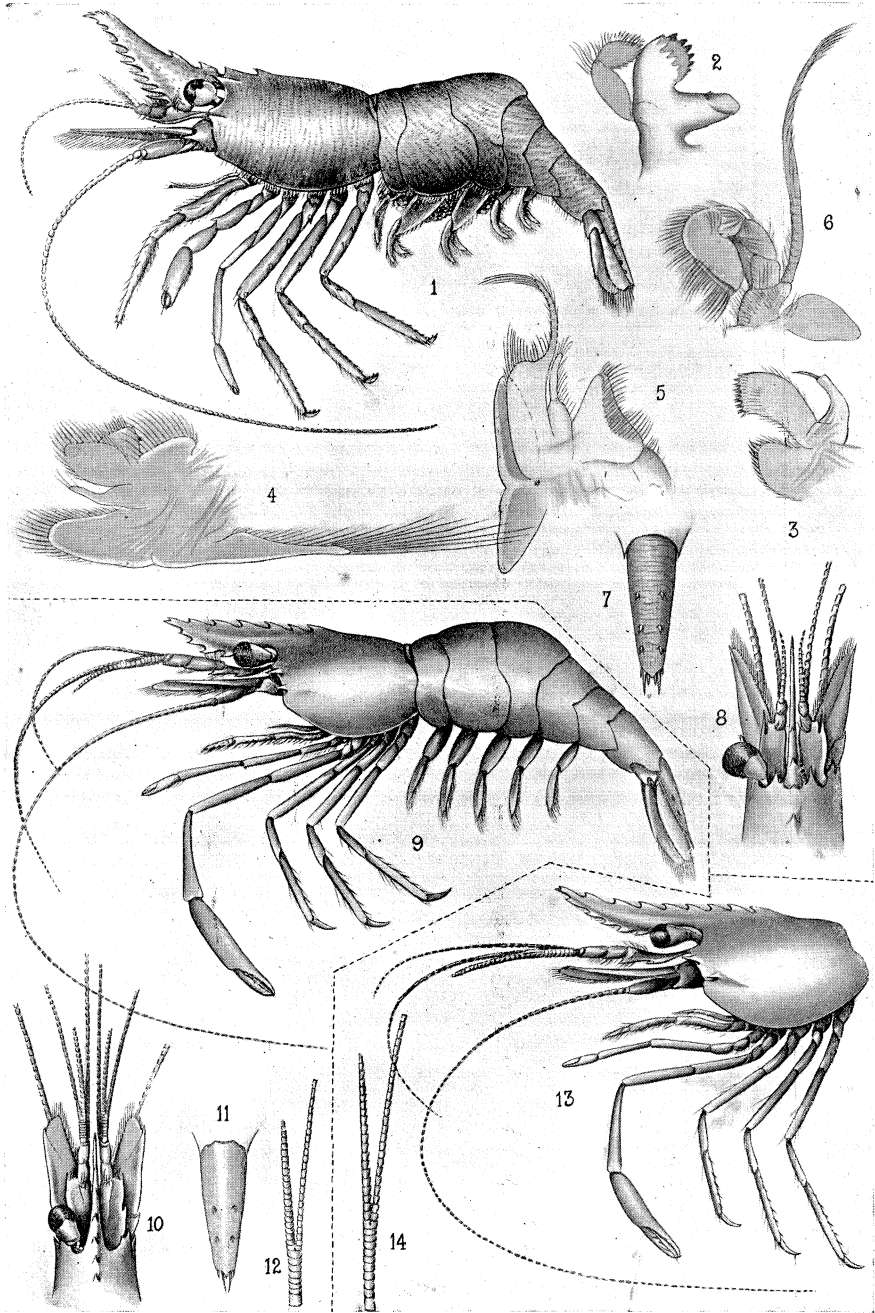


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EXPLANATION OF PLATE LXXXIX.

AUSTRALIAN CRUSTACEA.

- Fig. 1. *Rhynchocinetes rugulosus*, Stimpson.
" 2. " " mandible.
" 3. " " first maxilla.
" 4. " " second maxilla.
" 5. " " first maxilliped
" 6. " " second maxilliped.
" 7. " " telson.
" 8. " " dorsal view of anterior portion of the
carapace and appendages.
" 9. *Leander serenus*, Heller.
" 10. " " dorsal view of anterior portion of the carapace
and appendages.
" 11. " " telson.
" 12. " " antennular flagellum.
" 13. *Leander intermedius*, Stimpson.
" 14. " " antennular flagellum.



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