

any rate *P. beaufortensis* is in my opinion more suitably accommodated in *Pontonides* than in any other genus.

P. maldivensis is not known to live in any particular association; *P. beaufortensis* was found on Gorgonians.

Genus *Balssia*, nov.

The remarkable species described by Balss under the name of *Amphipalaemon gasti* possesses three pairs of terminal spines on the telson and evidently does not belong to *Amphipalaemon* or to the family Anchistiooididae in which, according to Borradaile,¹ that genus is included.

The species is no doubt an aberrant member of the subfamily Pontoniinae and, in the rudimentary character of the exopods of the maxillipeds, resembles *Pontonides*. It differs from this genus, however, in many respects. Both carapace and abdomen are sculptured; the rostral crest extends to the posterior end of the carapace and is armed with large teeth; on either side of the carapace there is a supra-orbital ridge armed with three teeth and further back there are two conspicuous tubercles placed one above the other; mid-dorsally on the first abdominal somite there is a sharp forwardly directed tooth. There is a tubercle on the eye-stalk and a lateral spine on the fifth abdominal somite.

In the sculptured carapace and abdomen *Balssia* bears some resemblance to *Dasycaris*, but it differs in the other points noted above as well as in the rudimentary exopods of the maxillipeds.

Balssia gasti (Balss).

1921. *Amphipalaemon gasti*, Balss, *Mitt. zool. Stat. Neapel* XXII, p. 523, text-figs. 1-8.

Balssia gasti is known from a single specimen only, obtained in the Gulf of Naples on *Corallium rubrum*.

Genus *Coutierea* Nobili.

1901. *Coutierea*, Nobili, *Boll. Mus. Torino* XVI, no. 415, p. 4.

This genus was established by Nobili for Coutière's *Coralliocaris agassizi*,² a species based on a single specimen dredged in 94 fathoms in the vicinity of Barbadoes. The genus is readily distinguished from all other Pontoniinae by the remarkable form of the supra-orbital spines, which are broad and connate with the rostrum, concealing the eyes in dorsal view, by the huge antennal spines and by the presence of a pterygostomian spine. In the areolation of the carapace and abdomen *Coutierea* resembles *Dasycaris* and *Balssia*. The two latter genera, however, do not possess the basal protuberance on the dactylus of the last three legs, which is well marked in *Coutierea*, and they differ also in many other respects.

¹ Borradaile, *Trans. Linn. Soc. (2) Zool.* XVII, p. 405 (1917).

² Coutière, *Bull. Mus. Paris* VII, p. 115, text-figs. (1901).

We know nothing of the oral appendages in this genus. Couière states that the apex of the telson is armed with only two short spines placed close together and it is thus possible that the genus does not belong to the subfamily Pontoniinae.

Genus *Stegopontonia* Nobili.

1907. *Stegopontonia*, Nobili, Mem. Accad. Sci. Torino (2) L.VII, p. 360.

This genus was proposed for *S. commensalis*, Nobili, of which a single specimen, found on the Echinoid, *Echinothrix turcarum*, was obtained in Hao Lagoon, Paumotu Group, Polynesia. *Stegopontonia* differs conspicuously from the related genera in the possession of a double basal protuberance on the dactyli of the last three pairs of legs. The rostrum is depressed, toothless, concave above, and wider near the middle than at the base; the only spine on the carapace is the antennal. Nobili gives no description of any of the mouth-parts or of the telson.

Genus *Coralliocaris* (Stimpson).

1852. *Oedipus*, Dana, U. S. Explor. Exped., Crust. I, p. 572.

1860. *Coralliocaris*, Stimpson, Proc. Acad. Sci. Philadelphia, p. 38.

1917. *Coralliocaris* (excluding subgen. *Onycocaris*), Borradaile, Trans. Linn. Soc. (2) Zool. XVII, p. 381.

Borradaile follows Nobili in recognising two subgenera of this genus, *Coralliocaris* and *Onycocaris*, but the proper position of the two species for which the latter name was proposed (see p. 278) appears to me to be very uncertain. I do not think there is any justification for including them in Stimpson's genus.

Thus restricted the genus *Coralliocaris* forms a compact group of species, all of which so far as is known live in association with madrepore corals. In general facies they agree very closely with *Harpilius*, which has adopted the same habitat, but they are at once distinguished by the presence of a very large basal protuberance on the dactylus of the last three pairs of legs.

Coralliocaris is distinguished from *Conchodytes* by a number of well-marked characters. The rostrum is compressed, dorsally carinate and commonly bears teeth. The antennal spine of the carapace is always present, the hepatic present or absent. The inner lobe of the maxillula is slender and the distal endite of the maxilla is narrow and furnished with setae only at the tip. The dactylus of the last three pairs of legs is provided with a single claw and the basal protuberance, in all the species I have examined, is swollen and hoof-shaped.

Borradaile in his synoptic key separates the species of this genus mainly by the number of rostral teeth. In this character, however, there is much variation. Other and better characters will no doubt be found, but at present the descriptions of several species are very imperfect. Miss Rathbun's *C. atlantica*¹ from the

¹ Rathbun, Bull. U. S. Fish Comm. XX, p. 122, fig. 26 (1902).

West Indies does not belong to *Coralliocaris*; the dactylus of the posterior legs is merely a little swollen and without the large basal process characteristic of the genus. The generic position of *C. quadridentata*, Rathbun, and *C. truncata*, Rathbun,¹ both from the Hawaiian Is., also appears to me doubtful. The dactylus of the posterior legs is described as having "an accessory spinule" in the former and "a supplementary spine" in the latter.

Borradaile (*loc. cit.*, 1917, p. 385) erroneously quotes Miss Rathbun's *C. quadridentata* as "*C. tridentata*" and, as the latter name has already been used by Miers, he substitutes "*C. rathbuni*, n. nom." In his key to the species, however, *C. quadridentata* is used.

The four species which I have myself examined may be separated by the following characters :—

- A.* Hepatic spine absent; first legs not remarkably slender, with fingers little if at all shorter than palm; second legs similar in structure.
- B.* Outer margin of dactylus of second leg semicircular; fixed finger with large molar tooth fitting into cavity in dactylus; ultimate segment of third maxilliped more than 3 times as long as wide; R. 4-6 : 1-2 ...
graminea (Dana).
- B'.* Outer margin of dactylus of second leg not convex; fixed finger with 2 or 3 teeth which do not fit into cavities in dactylus; ultimate segment of third maxilliped not more than twice as long as wide.
- C.* Rostrum usually with 4 or 5 dorsal teeth and 2 ventral; merus of second leg with a series of small teeth at distal end of upper border, dactylus with outer margin abruptly angulate ...
superba (Dana).
- C'.* Rostrum with 1 or 2 dorsal teeth and 1 ventral; merus of second leg unarmed at distal end of upper border, dactylus with outer margin slightly concave ...
venusta, sp. nov.
- A'.* Hepatic spine present; first legs remarkably slender with palm twice as long as fingers; second legs dissimilar in structure; R. 3-6 : 1-3 ...
lucina Nobili.

Coralliocaris graminea (Dana).

- 1852. *Oedipus gramineus*, Dana, *U. S. Explor. Exped., Crust.* I, p. 573, pl. xxxvii, figs. 3a-e.
- 1889. *Oedipus gramineus*, Pfeffer,² *Fahrb. Hamburg. wiss. Anstalt* II, p. 34.
- 1909. *Coralliocaris graminea*, Calman, *Proc. Zool. Soc. London*, p. 706.
- 1915. *Coralliocaris graminea*, Balss, *Denk. math-naturw. Kl. K. Akad. Wien* XCII, p. 26.
- 1917. *Coralliocaris graminea*, Borradaile, *Trans. Linn. Soc. (2) Zool.* XVII, pp. 324, 383.

Other references are given by Borradaile, who—no doubt correctly—includes as a synonym Ortmann's *C. inaequalis*. The more important specific characters are the following :—

The rostrum bears from 4 to 6 teeth on its upper margin and

¹ Rathbun, *Bull. U. S. Fish Comm.* XXIII, iii, p. 920, figs. 69, 70 (1906).

² I have not seen this paper.

1 or 2 on its lower¹; as a rule there are 5 above and 2 below. The hepatic spine of the carapace is absent. The third max-

illiped (text-fig. 96) is short and stout and does not reach the distal end of the merus of the first peraeopod. The exopod reaches beyond the middle of the last segment. The penultimate segment is about 1·5 times as long as wide; the ultimate segment is about 1·3 times the length of the penultimate and is nearly 3·5 times as long as wide.

In the first peraeopods² the merus is a little shorter than the carpus and much stouter, the greatest breadth of the former being about 1·75 times that of the latter. The chela is half as long as the carpus and the fingers are a little shorter than the palm. The second peraeopods (text-fig. 97)

TEXT-FIG. 96.—*Coralliocaris graminea*
(Dana).

Third maxilliped.

are equal or unequal, but are similar in structure. In full-grown specimens the upper border of the merus is strongly convex in lateral view and ends in one or two small spines. The lower border ends, on the outer side, in a large sharp tooth. The carpus bears a large tooth ventrally and the upper portion of the distal margin is cut into a series of 3 to 6 small teeth. The chela is swollen and its breadth near the proximal end is twice as great as at the base of the fingers.³ The palm is twice as long as wide and twice as long as the fingers. The fixed finger (text-fig. 97b) is provided with a large blunt molar tooth which occupies the greater part of the proximal half of its inner edge and the margin in front of this tooth is strongly sinuous. The outer margin of the dactylus forms an almost perfect semicircle; at the base of its inner margin there is a large cavity to receive the molar tooth of the fixed finger.

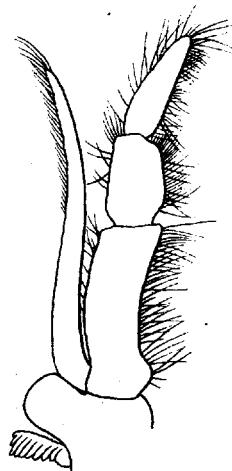
An exceptionally large specimen is 23 mm. in length, with chela 16 mm. in length.

Specimens obtained at Port Blair, when alive, resembled Dana's coloured figure. They were pale green throughout, minutely dotted with yellow and dark brown. In ovigerous females there were red streaks on the sides of the abdomen.

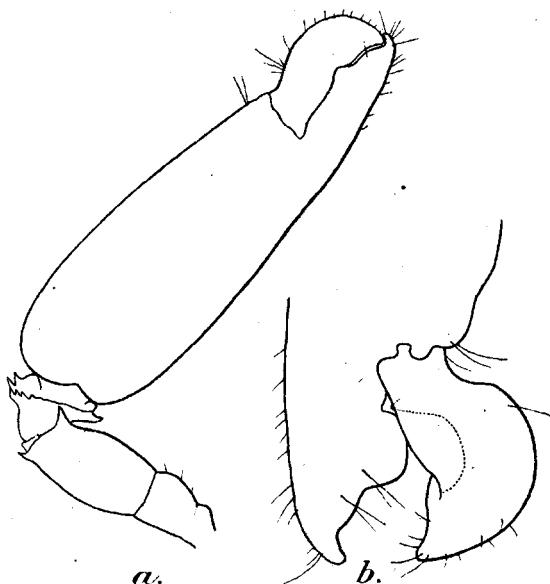
¹ Miers refers to a specimen with only 3 teeth above and none below.

² This pair of legs in my specimens reaches beyond the scale only by the length of the chela. In Dana's figure they are much longer, but this is doubtless an error.

³ The chela is viewed obliquely in text-fig. 97a and the full breadth of the palm is not shown.



C. macrophthalma (Milne-Edwards), as redescribed by Nobili,¹ appears to be closely related to this species, agreeing with it in the stout form of the third maxilliped, in the serration of the distal margin of the carpus of the second leg and in the remarkable form of the dactylus in the same limb. The rostrum, however, bears only 1 tooth above and is unarmed ventrally; the chela of the first leg is less than half as long as the carpus and the spine at



TEXT FIG. 97.—*Coralliocaris graminea* (Dana).
a. Second pereopod. b. Fingers of second pereopod.

the distal end of the upper border of the merus of the second leg is larger than that at the outer distal angle of the lower border.

235/7. Port Blair, Andamans.	A. Alcock, Nov., 1888.	One.
C 423/1. Port Blair, Andamans.	S. Kemp, Feb., 1915.	Fourteen.
C 424/1. Port Blair, Andamans.	R. P. Mullins, June, 1918.	Seven.
C 425/1. Pamban, Gulf of Manaar.	S. Kemp, Feb., 1913.	Four.
7239/10. Seychelles.	H. M. S. 'Alert', Brit. Mus.	One.
1430. 'South Sea.'	Purchased.	One.

I have also seen specimens belonging to the Paris Museum from New Caledonia and Pulo Condore (Harmand coll.).

The species has a wide distribution in the Indo-Pacific region. It has been recorded from the Fiji Is. (Dana), Samoa (Ortmann), the Loyalty Is. (Borradaile), Kagoshima, Japan (Ortmann), Hong

¹ Nobili, Ann. Mus. Univ. Napoli (n. s.) I, 3, p. 3 (1901).

Kong (Stimpson), Ternate (de Man), Christmas I. (Calman), Pulo Edam in the Bay of Batavia (de Man), Coetivy (Borradaile), Seychelles (Miers), Zanzibar (Pfeffer), Dar-es-Salaam (Ortmann), Mozambique (Lenz), Red Sea (Balss). The species lives in association with madrepore corals.

Coralliocaris superba (Dana).

- 1852. *Oedipus superbus*, Dana, U. S. Explor. Exped., Crust. I, p. 575, pl. xxxvii, figs. 2a-f.
- 1915. *Coralliocaris superba*, Balss, Denk. math.-naturw. Kl. K. Akad. Wiss. Wien XCI, p. 26.
- 1917. *Coralliocaris superba*, Borradaile, Trans. Linn. Soc. (2) Zool. XVII, p. 383.
- 1921. *Coralliocaris superba*, Tattersall, Journ. Linn. Soc., Zool. XXXIV, p. 390.

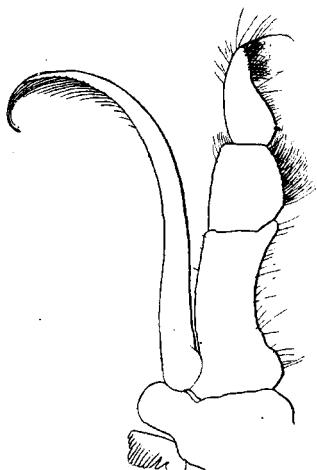
Paulson's *Oedipus dentirostris*, as Nobili has pointed out, is a synonym of this species. Borradaile gives a full list of references.

C. superba agrees with *C. graminea* in the absence of the hepatic spine of the carapace, in the stout form of the third maxilliped and in the possession of a series of small teeth at the distal end of the carpus of the second peraeopod. The principal differences are the following :—

(i) The ultimate segment of the third maxilliped (text-fig. 98) is expanded at the base; the inner margin is sinuous, convex proximally and concave distally. The segment is only twice as long as broad and is little if at all longer than the penultimate.

(ii) The carpus of the first peraeopod is scarcely longer than the merus and its breadth at the distal end is little less than that of the merus.

(iii) The merus of the second peraeopod (text-fig. 99a) is provided with a series of 4 to 6¹ small teeth on the superior part of its distal margin and the tooth at the outer distal angle of the lower border is large and triangular. There is a series of 7 to 10 small teeth¹ on the upper part of the distal border of the carpus.



TEXT-FIG. 98.—*Coralliocaris superba* (Dana).

Third maxilliped.

The chela is less swollen; the palm is usually little less than 3 times as long as wide and is 2·5 to 2·8 times as long as the fingers. The form of the dactylus (text-fig. 99b) is entirely different. The outer margin is straight and abruptly angulate in the middle, while

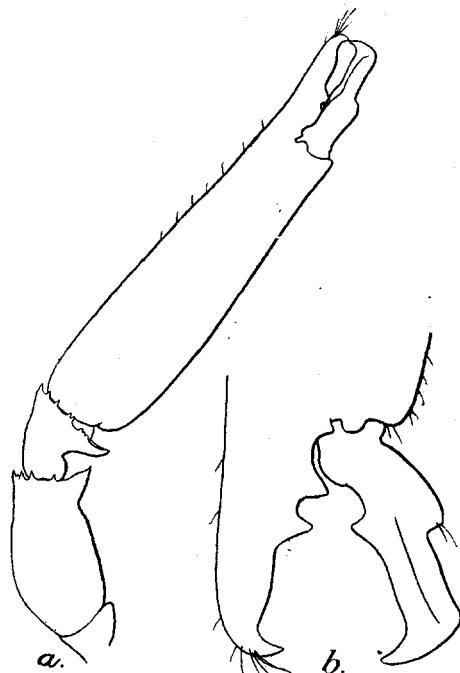
¹ These figures refer to well grown specimens; in young individuals the teeth are less numerous.

on the lower face of the segment in its distal half there is a sharp longitudinal keel. On its inner margin the dactylus bears a single sharp tooth just behind its middle point, which fits between two similar teeth on the fixed finger.

In the specimens I have seen the rostrum bears 4 or 5 dorsal teeth and 2 ventral. The lateral process of the antennule is frequently much longer than in *C. graminea* and sometimes reaches the level of the articulation between the second and third segments.

The largest specimen examined is 21 mm. in length.

In living specimens the carapace and first four abdominal somites, except for a median intrusion from the fifth somite, were



TEXT-FIG. 99.—*Coralliocaris superba* (Dana).

a. Second peraeopod. b. Fingers of second peraeopod.

pure white. The antennal scale, antennules, rostrum, all the legs, the last two abdominal somites and the greater part of the tail-fan were pale brown, dotted with very large dark reddish brown chromatophores, specially conspicuous on the antennal scales and large chelae. At the end of the tail-fan there was a narrow band of deep blue, bordered with white. This description agrees very closely with Dana's coloured figure.

236-9/7. Port Blair, Andamans.	A. Alcock, Nov., 1888.	Four.
C 427/1. Port Blair, Andamans.	S. Kemp, Feb., 1915.	Nine.
C 428/1. Port Blair, Andamans.	R. P. Mullins, June, 1918.	Three.

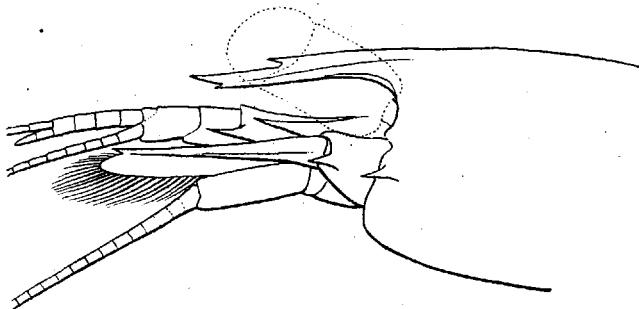
The species is recorded from Tongatabu (Dana), Tahiti (Stimpson), the Bonin Is. (Balss), Christmas I. ? (Calman), the Noordwachter Is. and Pulo Edam in the Bay of Batavia (de Man), the south coast of Arabia (Balss) and from numerous localities in the Red Sea (Nobili, Balss, Tattersall). The species is apparently always found in association with madrepore corals.

Coralliocaris venusta, sp. nov.

The rostrum (text-fig. 100) reaches to the middle or end of the second segment of the antennular peduncle and is directed slightly downwards. In dorsal view it is broad at the proximal end and is dorsally carinate throughout its length; in lateral view it is very slender. In the male there is a single dorsal tooth placed a little in front of the middle point; in the female there are two teeth, the foremost very small, both situated in the anterior third. On the lower border in each specimen there is one small tooth placed close to the apex.

The lower angle of the orbit is acute. There is a strong antennal spine, but the hepatic is absent.

The antennular peduncle reaches to three-quarters the length



TEXT-FIG. 100.—*Coralliocaris venusta*, sp. nov.
Anterior part of carapace, rostrum, etc., of male.

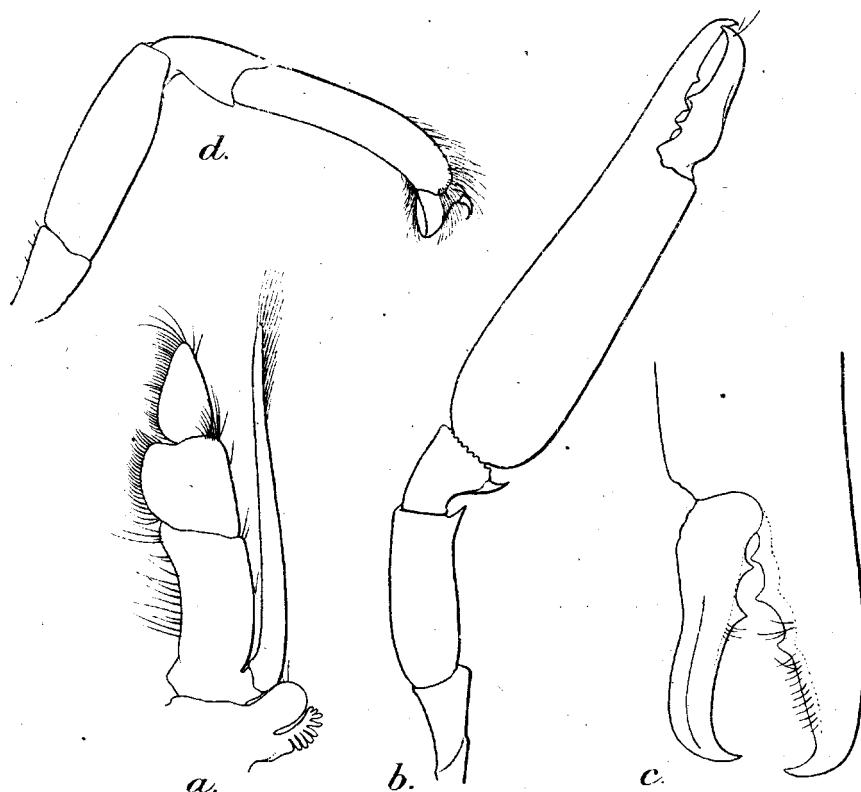
of the antennal scale. The basal segment is broad. In the female the lateral process extends as far as the articulation between the second and third segments and the terminal spine of the outer margin reaches the middle of the third segment; in the male the spines are shorter. The outer margin of the antennal scale is almost straight, terminating in a spine which does not reach the end of the lamella.

The third maxilliped (text-fig. 101a) is short and stout and does not reach the end of the merus of the first peraeopods. The exopod reaches the tip of the endopod. The antepenultimate segment is shorter than the two distal segments combined. The penultimate segment is scarcely longer than broad and is a little longer than the ultimate. The ultimate is much narrower than the penulti-

mate and is rather less than twice as long as broad. The inner edges of the last three segments and the greater part of the lower face of the penultimate are thickly clothed with hair.

The first peraeopods reach beyond the antennal scale by the chela and the greater part of the carpus. The merus and carpus are moderately stout, the latter slightly longer than the former and 1·7 times the length of the chela. The fingers are almost equal in length with the palm.

The second peraeopods (text-figs. 101**b**, **c**) are a little unequal,



TEXT-FIG. 101.—*Coralliocaris venusta*, sp. nov.

- | | |
|-----------------------------|--|
| <i>a.</i> Third maxilliped. | <i>c.</i> Fingers of second peraeopod. |
| <i>b.</i> Second peraeopod. | <i>d.</i> Third peraeopod. |

but are identical in structure. They extend beyond the scale by the greater part of the chela. The merus is unarmed at the distal end of its upper border, but bears a strong tooth externally at the end of the lower border. The carpus is very short and, as in *C. graminea* and *C. superba*, is provided with a stout ventral tooth. In the female the distal margin of the carpus on its upper and outer aspect is cut into a number of very minute teeth; in the male, which is much smaller, these are not visible. The chela is swollen and is widest near the base. The palm is from 2 to 2·3 times

the length of the fingers; in the female it is rather more than 2·5 times as long as wide, in the male nearly 3 times. The fingers have acute inturned tips. The dactylus (text-fig. 101c) is longitudinally carinate in the distal two-thirds of its lower surface, much as in *C. superba*, but the outer margin is slightly concave and shows no trace of the abrupt angulation found in that species. At its base the dactylus is narrower than the fixed finger. On its inner margin it bears two rather short teeth, the anterior situated a little behind the middle of its length. When the claw is closed these teeth fit between three on the fixed finger; the foremost of the latter is placed a little in advance of the middle.

The last three peraeopods (text-fig. 101d) are stout. The merus is from 2·75 to rather more than 3 times as long as wide. The propodi are strongly curved and the dactyli are provided with a large hoof-shaped basal process and a very slender and strongly curved terminal spine.

The telson is slender with the usual six apical spines. The anterior pair of dorsal spinules, as in the preceding species, is placed in the middle of the telson-length with the posterior pair rather nearer to it than to the apex.

The female, which is ovigerous, is 10·5 mm. in length, the male 6·5 mm.

C. venusta is allied to *C. superba*, but differs in the smaller number of rostral teeth, in the form of the third maxilliped, in the absence of spines at the distal end of the upper border of the merus of the second leg and in the different form of the fingers in the same appendage. Nobili's *C. camerani*¹ from Flamenco I. in the G. of Panama is perhaps also related, but differs in having no tooth at the distal end of the lower border of the merus of the second leg and only a single tooth on the inner margin of the fixed finger.

C 429/1. N.E. Tholayiram Paar, J. Hornell, Feb., Two, TYPES.
Gulf of Manaar. 1914.

The specimens were found on a madrepore coral.

Coralliocaris lucina Nobili.

- 1901. *Coralliocaris lucina*, Nobili, Ann. Mus. Univ. Napoli. (n.s.) I, no. 3, p. 5.
- 1902. *Coralliocaris lamellirostris*, de Man, Abhandl. Senck. naturf. Ges. XXV, p. 842, pl. xxvi, figs. 55, 55a-f.
- 1906. *Coralliocaris lucina*, Nobili, Ann. Sci. nat., Zool. (9) IV, p. 57.
- 1915. *Coralliocaris lucina*, Balss, Denk. math.-naturw. Kl. K. Akad. Wien XCI, p. 26.
- 1917. *Coralliocaris superba* var. *japonica*, and *C. lucina*, Borradaile, Trans. Linn. Soc. (2) Zool. XVII, p. 384, pl. lvi, fig. 23.
- 1921. *Coralliocaris lucina*, Tattersall, Journ. Linn. Soc., Zool. XXXIV, p. 390.

This species is readily distinguished from the three preceding forms by a number of well-marked characters:—

¹ Nobili, Boll. Mus. Torino, XVI, no. 415, p. 3 (1901).

(i) The hepatic spine of the carapace is present.
(ii) The third maxilliped (text-fig. 102) is very slender. The penultimate segment is fully 2·5 times as long as wide and is slightly shorter than the ultimate segment, the latter being about 5 times as long as wide. The exopod does not nearly reach the end of the endopod.

(iii) The first peraeopods are extremely slender. The carpus varies from 1·8 to 2·5 times the length of the chela. The fingers are only half as long as the palm.

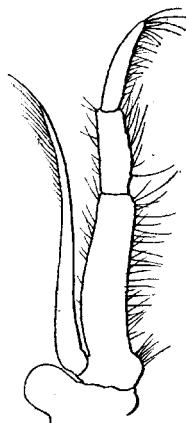
(iv) The second peraeopods are unequal and dissimilar in structure. There is a tooth externally at the distal end of the lower border of the merus, but no terminal spine on the upper border. The carpus does not possess the large ventral tooth found in the preceding species and the superior part of the distal margin is entire. In the larger chela the palm is slender and from 3·5 to 4 times the length of the fingers. The fingers are twisted, so that the chela opens almost vertically instead of horizontally. As in *S. superba* the dactylus is longitudinally carinate on its outer face and is abruptly angulate in the middle of its outer margin. On the inner margin of the dactylus there are 2 or 3 teeth placed near the middle and, when the claw is closed, the cutting edge of the dactylus fits between two slightly oblique crests on the fixed finger, that nearest the base bearing 2 or 3 small teeth. In the smaller chela the fingers are about two-thirds the length of the palm. The fingers have straight unarmed inner margins, but each is externally excavate, so that the whole chela, when viewed from the outer side is spoon-shaped.

In the specimens I have examined there are from 3 to 6 teeth (usually 4 or 5) on the upper border of the rostrum and from 1 to 3 (nearly always 2 or 3) on the ventral border. De Man describes the apex of the telson as armed with 16 to 18 spines—a remarkable feature not known in any other Pontoniid. In most of my specimens only the usual 6 terminal spines are to be found, but I have seen an individual in which there are 9.

The largest specimen examined is about 16 mm. in length.

When alive the species is transparent, with colourless chelae and with the carapace and abdomen longitudinally streaked and speckled with bright red.

It is possible, as de Man has suggested, that this species is the same as Stimpson's *C. lamellirostris*. The description of the latter



TEXT-FIG. 102.—*Coralliocaris lucina*
Nobili.

Third maxilliped (arthrobranch omitted).

is, however, very defective, so that it seems best to retain Nobili's name. The specimens which Borradaile referred to *C. superba* var. *japonica* doubtless belong to this species; his figures agree very closely with specimens I have examined. The only discrepancy is that Borradaile has apparently omitted to notice that his specimens are distinguished from *C. superba* by the presence of the hepatic spine.

8985/6.	Rutland I, Andamans.	'Investigator,' Nov., 1887.	One.
C 430/1.	Port Blair, Andamans.	S. Kemp, Feb., 1915.	Fourteen.
C 431/1.	Port Blair, Andamans.	J. Wood-Mason.	Three.
C 432/1.	Cheval Paar, Ceylon.	T. Southwell, Nov., 1910.	One.
C 433/1.	Red Sea.	Mus. Zool. Napoli.	Two, Co- TYPES.

The species has been recorded from Ternate (de Man), from the S. Coast of Arabia (Balss) and from numerous localities in the Red Sea (Nobili, Balss, Tattersall). Borradaile (*loc. cit.*, p. 324) has recorded the species under the name of *C. japonica* from the Maldives, the Chagos Archipelago and Saya de Malha. Like other species of the genus, *C. lucina* appears to be associated with madrepore corals.

Genus *Onycocaris* Nobili.

1906. *Coralliocaris* subgen. *Onycocaris*, Nobili, *Ann. Sci. nat., Zool.* (9) IV, p. 60.

Nobili has proposed *Onycocaris* as a new subgenus of *Coralliocaris* for the reception of two species, *C. aualitica* and *C. rhodope*, both obtained at Djibouti in the Red Sea. In *C. aualitica* the dactylus of the last three pairs of legs bears a large accessory claw and is denticulate and slightly swollen at the base. In *C. rhodope* the accessory claw is very short, scarcely larger than the denticulations which exist on either side of it and the basal part is not swollen.

I have already expressed the view that those two remarkable species cannot be included, even under a distinct subgeneric heading, in Stimpson's *Coralliocaris*, and with the information we at present possess it appears to me to be impossible to arrive at any satisfactory conclusion regarding their true position. I have been obliged to omit *Onycocaris* from my synoptic key to the genera of the subfamily.

Nobili, as usual, has failed to give any description of the mouth-parts and the two species seem to differ so widely from one another that it may be doubted whether there is any real generic affinity between them. In *O. aualitica* the spine at the distal end of the antennal scale is wanting and the outer margins of the uropods are said to be finely denticulate. These characters do not occur in *C. rhodope*, nor so far as I am aware in any other species of the subfamily.

Genus *Conchodytes* Peters.

1917. *Conchodytes*, Borradaile, *Trans. Linn. Soc. (2) Zool. XVII*, p. 392.

The species of this genus live, probably without exception, in the mantle cavity of lamellibranch molluscs. In the possession of a basal protuberance on the dactyli of the last three legs they resemble *Coralliocaris*, but they are easily distinguished by a number of well-marked characters. The rostrum is depressed and toothless, without a dorsal carina. The lower angle of the orbit is produced, but neither antennal nor hepatic spines occur on the carapace. The inner lobe of the maxillula is very broad and the distal endite of the maxilla is broad and furnished with setae along the whole length of its inner margin. The dactylus of the last three pairs of legs is provided with two curved claws and the basal protuberance is flat, not swollen and hoof-shaped as in *Coralliocaris*.

Borradaile recognises five species of this genus, but one of them, *C. margarita* (Smith),¹ belongs in my opinion to the genus *Pontonia*, in which it was originally described. *Pontonia nippensis*, which Parisi has recently shown to be a true *Conchodytes*, must be added to the genus. If my identification is correct *C. biunguiculatus* is represented in the collection I have examined. This species was described by Paulson from an abnormal specimen in 1875 and has not since been rediscovered.

The host of *C. nippensis* is unknown; *C. biunguiculatus* lives in *Pinna*, while, *C. tridacnae* and *C. meleagrinae* are usually associated with the genera of molluscs to which their specific names refer. All the species are closely related to one another and it is difficult to find valid characters for their separation. This is especially true of *C. tridacnae* and *C. meleagrinae* which are perhaps not specifically distinct. The former is apparently restricted to *Tridacna*; the latter is generally found in *Meleagrina* but according to Borradaile sometimes also occurs in *Tridacna*.

The four Indo-Pacific species may be separated by the following characters:—

- A. Basal process of dactylus of last three legs with a small tooth on proximal side; posterior of the two pairs of spines on back of telson situated about midway between first pair and apex.
- B. Antepenultimate segment of third maxilliped less than twice as long as broad; fixed finger of second leg with foremost tooth very broad and low; occupying greater part of distal half; lateral spines of telson tip situated at apex *biunguiculatus* (Paulson).
- B'. Antepenultimate segment of third maxilliped rather more than twice as long as broad; fixed finger of second leg with foremost tooth small and triangular; lateral spines of telson tip shifted forwards on to dorsal surface, not nearly reaching apex *nippensis* (de Haan).

¹ See Addendum, p. 287.

A'. Basal process of dactylus of last three legs without tooth; posterior of the two pairs of spines on back of telson situated much nearer to apex than to first pair.

B. Rostrum reaching end of scale; outer distal angle of basal antennular segment rounded; carpus of first leg as long as or longer than merus ... *tridacnae* Peters.

B'. Rostrum not reaching end of scale; outer distal angle of basal antennular segment acute; carpus of first leg conspicuously shorter than merus ... *meleagrinae* Peters.

The two last-named species, as Borradale has suggested, are perhaps not specifically distinct from one another.

Conchodytes biunguiculatus (Paulson).

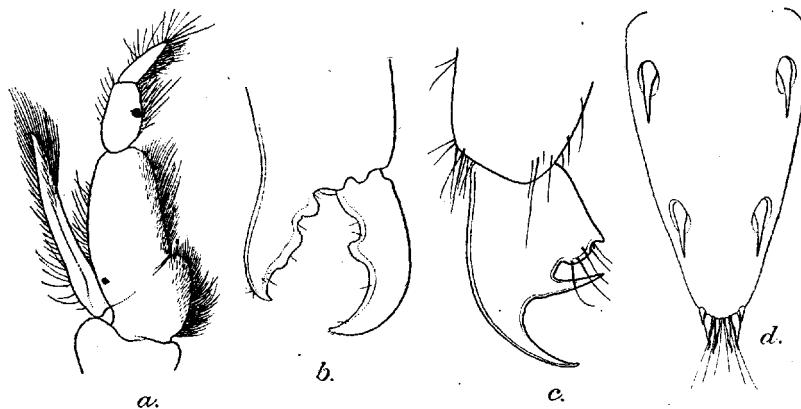
1875. *Pontonia biunguiculata*, Paulson, *Crust. Red Sea*, p. 111, figs. 1, 1a-n.

? 1893. *Pontonia tridacnae*, Henderson, *Trans. Linn. Soc. (2) Zool.* V, p. 438.

? 1905. *Conchodytes meleagrinae*, Pearson, *Ceylon Pearl Oyster Rep.* IV, p. 77.

? 1906. *Conchodytes meleagrinae*, Nobili, *Ann. Sci. nat., Zool.* (9) IV, p. 77 (part).

The specimen figured by Paulson possesses a large protuberance on the outer side of the dactylus of the right second peraeopod, but this, as Nobili has suggested, is probably an individual abnormality. If this be conceded there is little doubt that the specimens which I record here are correctly identified.



TEXT-FIG. 103.—*Conchodytes biunguiculatus* (Paulson).

- | | |
|---------------------------------|---------------------------------|
| a. Third maxilliped. | c. Dactylus of third peraeopod. |
| b. Fingers of second peraeopod. | d. Telson. |

The characteristic features of the species are the following:—

(i) The rostrum is sharply pointed in dorsal view and falls short of the apex of the antennular scale, usually not reaching the end of the antennular peduncle.

(ii) The outer margin of the basal segment of the antennular peduncle terminates in an acute point.

(iii) The antepenultimate segment of the third maxilliped (text-fig. 103a) is broad; its greatest breadth is more than half its length and at the distal end it is conspicuously wider than the penultimate segment. The latter is rather less than twice as long as wide and is a little longer than the ultimate segment.

(iv) The carpus of the first pereiopods is about equal in length with the merus.

(v) There is one tooth on the dactylus of the second pereiopod (text-fig. 103b) and two on the fixed finger, all of which are rounded and, as a rule, finely serrate. The anterior tooth of the fixed finger has the form of a very broad and gently convex lobe.

(vi) The last three pereiopods are comparatively slender. In the third pair the merus is from 3·5 to 4 times and the propodus from 4·5 to 5 times as long as broad. The terminal claw of the dactylus (text-fig. 103c) is bent at an angle of about 45° to the main axis of the segment and the basal protuberance bears a short tooth on its proximal side.

(vii) The dorsal spines of the telson (text-fig. 103d) are very large, fully one-sixth of the total length (terminal spines excluded). The distance between the posterior pair and the apex is equal, or almost equal, to the distance between the two pairs. The lateral apical teeth are comparatively large and are situated at or very near the distal end¹; the intermediate pair is conspicuously stouter than the median.

Large females sometimes reach a length of 35 mm.; males do not exceed 25 mm.

Living specimens are semitransparent and colourless or pale yellowish when alive. Females are closely sprinkled with minute white dots, with the eggs and ovary very dark brown.

4910/10. Andamans.	A. R. S. Anderson.	Thirty-five.
C 434/1. Port Blair, Andamans.	S. Kemp, Feb.,	Twenty-five.
	March, 1921.	

The specimens I have myself found were all obtained in *Pinna bicolor*, Gmelin,² a mollusc which is common at low water in Brigade Creek and on the shore south of Viper I. The same lamellibranch also harbours *Anchistus inermis*, a prawn which is almost identical with *Conchodytes biunguiculatus* in colouration. Practically every large *Pinna* which was opened contained a pair of either the *Conchodytes* or the *Anchistus*, but the two species were never discovered in the same mollusc.

The species was described by Paulson from the Red Sea. I think it probable that the specimens from *Pinna* recorded by Nobili and Pearson from the Red Sea and from Cheval Paar in the G. of Manaar, under the name *C. meleagrinae*, belong to this species. The only other record of a *Conchodytes* from *Pinna* is that of

¹ They are placed further forwards in Paulson's figure than in any specimen I have seen.

² I am indebted to Dr. Baini Prashad for the identification of this species.

Miers,¹ who refers to a dried and imperfect specimen obtained in this mollusc at Keppel I., Port Curtis, Queensland.

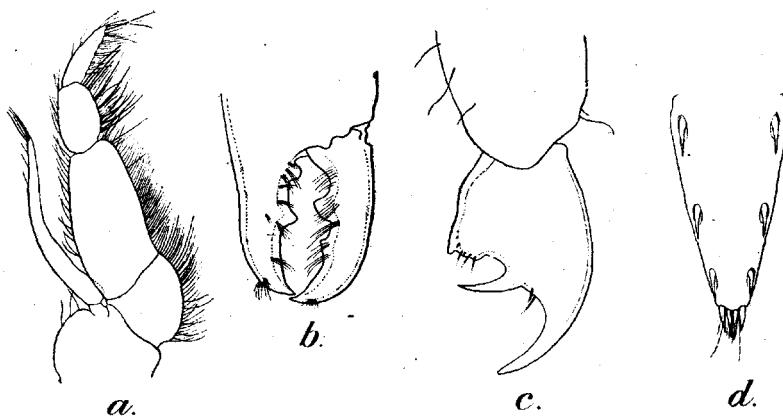
Conchodytes nipponensis (de Haan).

- 1849. *Pontonia nipponensis*, de Haan, in Siebold's *Fauna Japonica, Crust.*, p. 180, pl. xlvi, fig. 8 (*Hymenocera nipponensis* on plate).
- 1914. *Pontonia nipponensis*, Balss, *Abhandl. math.-phys. Kl. K. bayer. Akad. Wiss., Suppl. Bd. II*, p. 53, fig. 33.
- 1917. *Pontonia nipponensis* Borradaile, *Trans. Linn. Soc. (2) Zool. XVII*, p. 391.
- 1919. *Conchodytes nipponensis*, Parisi, *Atti Soc. Ital. Sci. nat. LVIII*, p. 75, text-figs. 5, 6.

The principal characteristics of this species are the following :—

(i) The rostrum is sharply pointed in dorsal view ; it falls short of the apex of the antennal scale, reaching to the base or middle of the second segment of the antennular peduncle.

(ii) The outer margin of the basal segment of the antennular peduncle terminates in an acute point.



TEXT-FIG. 104.—*Conchodytes nipponensis* (de Haan).

- a. Third maxilliped.
- b. Fingers of second pereiopod.
- c. Dactylus of third pereiopod.
- d. Telson.

(iii) The antepenultimate segment of the third maxilliped (text-fig. 104a) is comparatively narrow ; its greatest breadth is less than twice its length and at the distal end it is not much wider than the penultimate segment. The penultimate segment is about 1·6 times as long as wide and is equal in length with the ultimate.

(iv) The carpus of the first pereiopods is equal to or slightly longer than the merus.

(v) In the single specimen examined there is a large tooth, which is apically serrate, in the proximal half of the dactylus (text-fig. 104b) and, in front of it, another tooth,² much lower but more sharply pointed. There are two teeth on the fixed finger,

¹ Miers, *Zool. Coll. H. M. S. 'Alert'*, p. 291 (1884).

² Parisi in his description states that there is only one dactylar tooth.

one at the base which is small, rounded and serrate and another situated in the middle of the finger which is triangular and fits between the two dactylar teeth. The latter is not serrate and is very different from the low broad-based lobe found in *C. biunguiculatus*.

(vi) The last three pereiopods are slightly stouter than in the preceding species. In the specimen examined the merus of the third pair is 3·1 times and the propodus about 4 times as long as wide. The dactylus (text-fig. 104c) is similar to that of the preceding species and bears a short tooth at the proximal end of the basal protuberance.

(vii) The dorsal spines of the telson (text-fig. 104d) are very large, rather more than one-sixth of the total length (terminal spines excluded). The outermost pair of distal spines is shifted forwards on to the dorsal surface of the telson and, though they are very large, their tips do not reach the apex. There are thus in this species three pairs of dorsal spines and two at the tip. The intermediate pair of dorsal spines is situated just behind the middle of the telson and the distance between them and the apex is greater than that which separates them from the anterior pair. Of the two pairs of spines at the apex the outer are slightly stouter than the inner.

The single specimen examined is a male 16 mm. in length. Parisi notes that one of his examples was 23 mm. in length.

C. nippensis is easily distinguished by the unusual position of the outermost terminal spines of the telson. The character is evidently not an individual abnormality as it is shown in Parisi's figure and referred to in his description. Except for the somewhat shorter rostrum the anterior parts of my specimen agree precisely with Balss' figure.

C 43571. Misaki, Japan.

N. Annandale, 1915
(Misaki Lab.).

One.

Although this species is here recorded for the fourth time, we are still without information as to the mollusc in which it lives.

The species is known only from Japan. De Haan gives no definite locality for his specimens: those recorded by Balss and Parisi were from Sagami Bay.

Conchodytes tridacnae Peters.

1917. *Conchodytes tridacnae*, Borradaile, *Trans. Linn. Soc. (2) Zool.* XVII, p. 393.

The specimens that I refer to this species agree in the following points:—

(i) The rostrum in dorsal view is rather bluntly pointed and reaches to or a little beyond the end of the antennal scale.

(ii) The outer margin of the basal segment of the antennular peduncle (text-fig. 105a) is distally rounded and not acutely produced as in the other Indo-Pacific species of the genus.

(iii) The antepenultimate segment of the third maxilliped is about 2·5 times as long as wide and at the distal end is not much

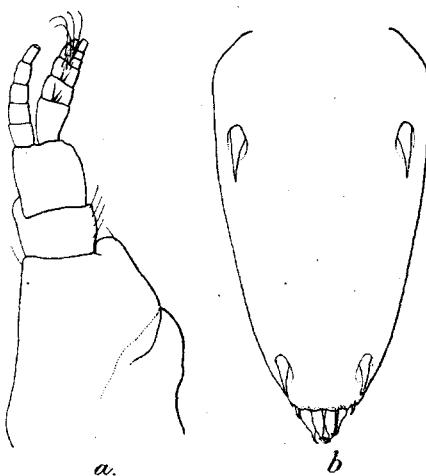
wider than the next segment. The penultimate segment is about twice as long as wide and is considerably longer than the ultimate segment.

(iv) The carpus of the first peraeopods is equal to or longer than the merus.

(v) There is a rounded tooth which is frequently serrate on the inner margin of the dactylus just behind its middle point. On the fixed finger there are two teeth, both of which are frequently low and inconspicuous. The proximal tooth is sometimes serrate; the distal tooth is small, never broad at the base as in *C. biunguiculatus*, and is occasionally acute.

(vi) The last three peraeopods are stout. In the third pair the merus is from 2·5 to 3 times and the propodus from 2·75 to 3 times as long as wide. The terminal claw of the dactylus is bent at right angles to the main axis of the segment and its basal protuberance is rounded, without a tooth on the proximal side.

(vii) The dorsal spinules of the telson (text-fig. 105b) are small, only about one-ninth the total length (terminal spines excluded). In females the distance between the posterior pair and the apex is usually from one-third to one quarter,¹ in males from one-third



TEXT-FIG. 105.—*Conchodytes tridacnae* Peters.

a. Antennule.
b. Telson.

to two-fifths the distance between the anterior and posterior pairs. The outermost terminal spines are very small and are placed at the apex; the intermediate spines are not conspicuously stouter than the median.

The largest Indian specimen is a female 27 mm. in length; a female from the Torres Straits is 34 mm. in length. In an extremely young individual, about 7·5 mm. in length, the accessory spine on the dactylus of the last three peraeopods is not developed.

Specimens obtained at Port Blair were semitransparent when alive. In females the carapace and abdomen were thinly sprinkled with small white chromatophores, with similar red chromatophores on the rostrum and anterior parts of the carapace. The

¹ The only exception is a large female from the Torres Straits in which the distance between the posterior teeth and the apex is slightly more than half that separating the two pairs.

eggs and ovary were orange or orange-red. In males the white chromatophores were usually absent and the red less numerous.

C 436-7/1. Port Blair, Andamans.	S. Kemp, March, 1915; Feb., 1921.	Thirteen.
C 438/1. Cherbaniani Reef, Laccadives.	'Investigator,' Oct., 1891.	Four.
7421/10. Torres Straits.	Brit. Mus.	One.

All the specimens were found in *Tridacna*. At Port Blair they were obtained on the shores of Aberdeen and North Bay in molluscs chiselled out of solid coral rock. The prawn was comparatively scarce and was found in only a small proportion of shells that were opened.

C. tridacnae is apparently found only in *Tridacna*, but in view of Borradaile's statement that *C. meleagrinae* sometimes occurs in this genus of molluscs it is difficult to determine the distribution of the species with accuracy from the numerous published records. The species is in all probability widely distributed in the Indo-Pacific region.

Conchodytes meleagrinae Peters.

1917. *Conchodytes meleagrinae*, Borradaile, *Trans. Linn. Soc. (2) Zool. XVII*, p. 393.

The question of the validity of this species and of the characters by which it may be separated from the very closely allied *C. tridacnae* has been discussed by Borradaile. I have myself seen only four specimens of *Conchodytes* from *Meleagrina* and two of these are in bad condition. They differ from *C. tridacnae* in two of the characters mentioned by Borradaile: the rostrum does not reach the end of the antennal scale and the carpus of the first pereaeopod is conspicuously shorter than the merus. The third maxilliped is, however, similar in length to that of the related species and does not nearly reach the end of the scale.

The specimens also differ from *C. tridacnae* in the following points: (i) the outer margin of the basal segment of the antennular peduncle terminates acutely; (ii) the ultimate segment of the third maxilliped is a little longer, about equal in length with the penultimate; (iii) the last three pereaeopods are rather more slender—the merus of the third pair is from 3·2 to 3·5 times and the propodus from 3·5 to 4·3 times as long as wide; (iv) the dorsal spinules of the telson are proportionately a little longer and the posterior pair is placed further forwards, the distance between the posterior pair and the apex being, in both sexes, slightly more than half the distance which separates the two pairs.

These characters combined with those derived from the proportionate length of the rostrum and the carpus of the first leg are sufficient, if constant, to justify the retention of two distinct species.

The specimens I have examined are all small, the largest being only 21 mm. in length.

C 439/1. Port Blair, Andamans.	S. Kemp, Feb., 1915.	Two.
C 440/1. Andamans.	A. R. S. Anderson.	Two.
1417. Upolu, Samoa.	Purchased.	One.

All the specimens from the Andamans were found in *Meleagrina* and it is from this genus of molluscs that the species has generally been recorded. Borradale notes, however, that it sometimes occurs in *Tridacna*. There is no note of the mollusc in which the Samoan specimen was found. The species is probably one of wide distribution in the Indo-Pacific region.

Genus *Typton* Costa.

1917. *Typton*, Borradale, *Trans. Linn. Soc. (2) Zool.* XVII, p. 394.

Borradale gives a full list of references to this genus and to the two species which belong to it. *Typton* is readily distinguished from all other Pontoniinae except *Paratypton* by the rudimentary character of the antennal scale.

In *T. spongicola*, which is found in sponges in the Mediterranean and western parts of the English Channel, the rostrum is spine-like and toothless and there is a pair of very long supra-orbital spines. In *T. bouvieri*, which is known only from Djibouti in the Red Sea, the rostrum is short, with 2 or 3 teeth on its upper edge, and there are no supra-orbital spines. In both species the dactylus of the three posterior legs is biunguiculate, but without a basal process.

Genus *Paratypton* Balss.

1914. *Paratypton*, Balss, *Zool. Anz.* XLIV, p. 83.

1915. *Paratypton*, Balss, *Denk. math.-naturw. Kl. K. Akad. Wien* XCII, p. 27.

This genus agrees with *Typton* and differs from all other Pontoniinae in the rudimentary condition of the antennal scale. It differs from *Typton* in a number of characters, of which the most important are (i) the complete absence of the rostrum, (ii) the absence of exopods from the second and third maxillipeds and (iii) the simple dactylus of the last three peraeopods. The distal endite of the maxilla is well developed in *Typton*, but quite rudimentary in *Paratypton*.

The only known species of the genus, *P. siebenrocki* Balss, is recorded from the Red Sea, the south coast of Arabia and Samoa. It appears probable from its structure that it is parasitic or symbiotic in its habits, but of this nothing is known.

ADDENDUM.

Prof. Ch. Gravier has recently sent me for examination a number of Macrura from the Gulf of California collected by M. L. Diguet. Among them I find two species of *Pontonia* which I identify as *Pontonia margarita* Smith¹ and *Pontonia pinnae* Lockington² (*nec* Ortmann). Of the former there are numerous specimens, obtained "dans l'huître perlière"; of the latter a single pair obtained in *Pinna rugosa*.

Miss Rathbun,³ when describing *Pontonia californiensis* remarks.—"This is the only *Pontonia* described from the west coast of North America, the *P. margarita* of Smith being a *Conchodytes*." These statements call for correction, for *P. margarita* is in my opinion correctly placed in the genus *Pontonia* and *P. pinnae* was recorded by Lockington in 1879 from the Gulf of California. Schmitt,⁴ in his valuable treatise on Californian Decapoda mentions only *P. californiensis* and Borradaile,⁵ who also appears to have overlooked Lockington's species, follows Miss Rathbun in referring *P. margarita* to the genus *Conchodytes*.

In *P. margarita* the dactylus of the last three legs is broader than usual, with the two claws strongly curved; it thus bears a strong resemblance to *Conchodytes* but lacks the large basal process which is characteristic of that genus.

P. margarita and *P. pinnae* are closely allied forms, but may be distinguished by the following characters:—

P. margarita Smith.

Basal breadth of rostrum about half its length.
Eyes larger, almost reaching antennal spine when extended laterally.
Large chela with palm scarcely more than one and a half times as long as broad.
Dactylus of last three legs very broad, with accessory claw strongly curved and directed slightly backwards.
Spines on dorsum of telson large; posterior pair almost equidistant between anterior pair and apex.
Size smaller, 20-28 mm.
Lives in *Margaritophora fimbriata*.

P. pinnae Lockington.

Basal breadth of rostrum about equal to its length.
Eyes smaller, not nearly reaching antennal spine when extended laterally.
Large chela with palm twice as long as broad.
Dactylus of last three legs less broad with accessory claw almost straight and directed obliquely forwards.
Spines on dorsum of telson small; posterior pair much nearer to apex than to anterior pair.
Size larger, 36-42 mm.
Lives in *Pinna rugosa*.

In the specimens of *P. pinnae* which I have examined the carapace is much more strongly arched in lateral view than in *P. margarita* and in the ovigerous female the rostrum projects downwards at an angle of 45°.

P. californiensis Rathbun, which I have not seen, appears to be easily distinguished from both the above species by the very

¹ Smith, in Verrill, *American Naturalist* III, p. 245 (1869).

² Lockington, *Bull. Essex Inst.* X, p. 163 (1879).

³ Rathbun, *Harriman Alaska Exped.* X, p. 34 (1904).

⁴ Schmitt, *Univ. Calif. Publ., Zool.* XXIII, p. 38 (1921).

⁵ Borradaile, *Trans. Linn. Soc. (2) Zool.* XVII, p. 394.

slender rostrum, the shorter carpus of the first leg, the form of the fingers of the second leg (which gape and are devoid of large teeth) and by the position of the spines on the telson. In all three species the dactylus of the last three legs is biunguiculate.

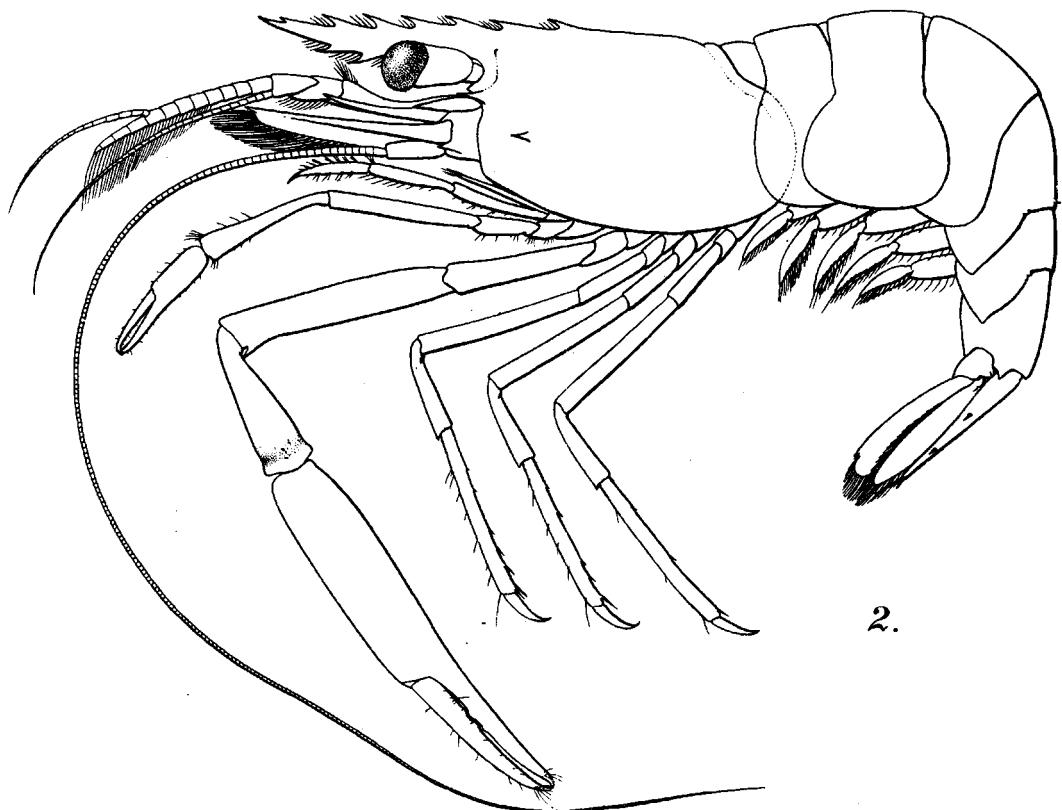
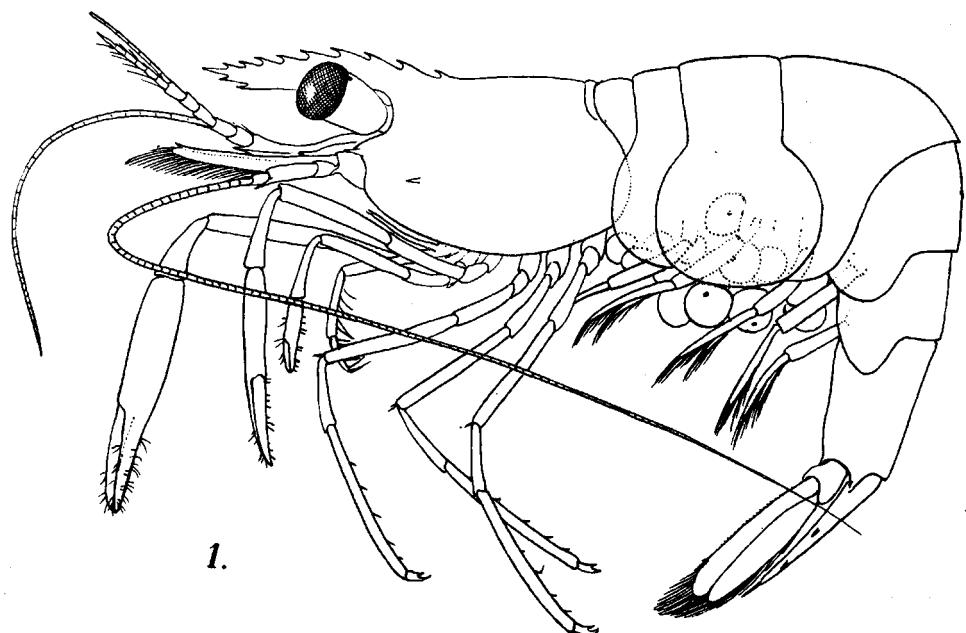
P. californiensis is known only from Santa Cruz I., California; *P. pinnae* only from the Gulf of California¹ and *P. margarita* from the Gulf of California and the Gulf of Panama.

¹ The specimens I have seen are from Los Angeles Bay, one of the original localities.

EXPLANATION OF PLATE III.

FIG. 1.—*Periclimenes (Periclimenes) impar*, sp. nov., from a specimen about 10 mm. in length.

FIG. 2.—*Palaemonella vestigialis*, sp. nov., from a specimen about 18 mm. in length.



G. M. Woodward &
A. Chowdhary del.

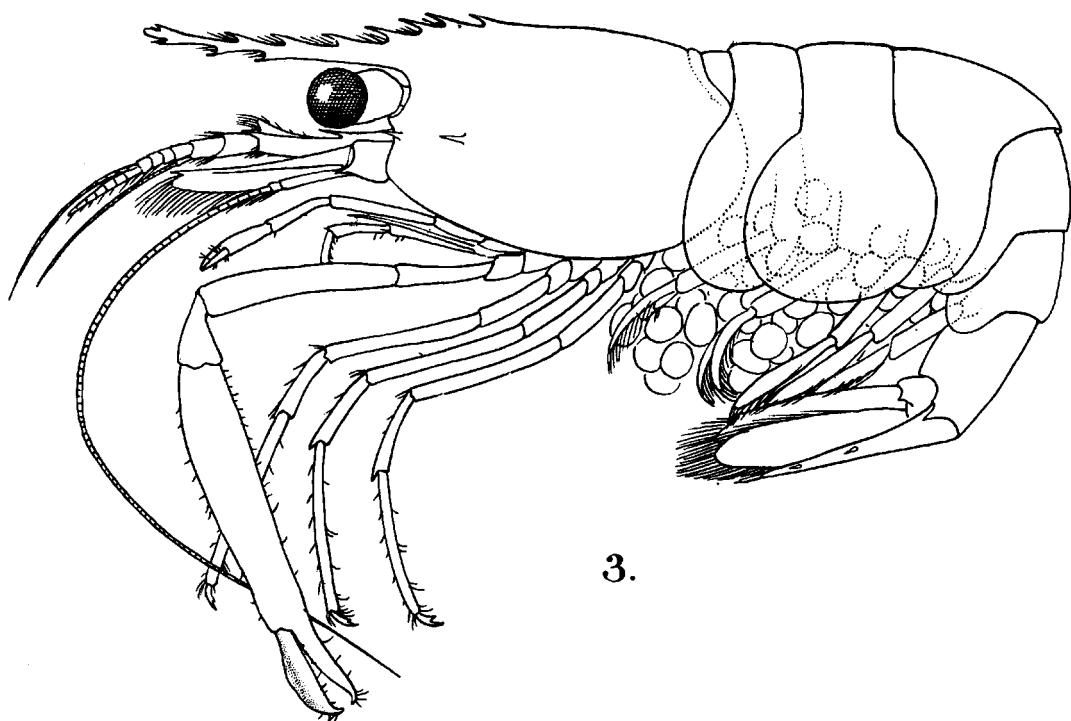
Fig. 1. *Periclimenes impar*, sp. nov.

Fig. 2. *Palaemonella vestigialis*, sp. nov.

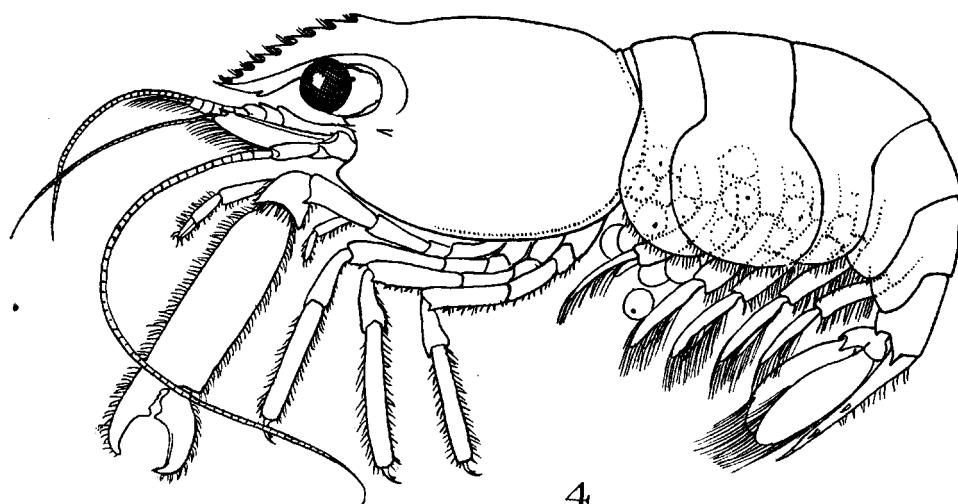
EXPLANATION OF PLATE IV.

FIG. 3.—*Periclimenes (Periclimenes) latipollex*, sp. nov., from a specimen about 16 mm. in length.

FIG. 4.—*Periclimenes (Periclimenes) lanipes*, sp. nov., from a specimen about 13 mm. in length.



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G. M. Woodward del.

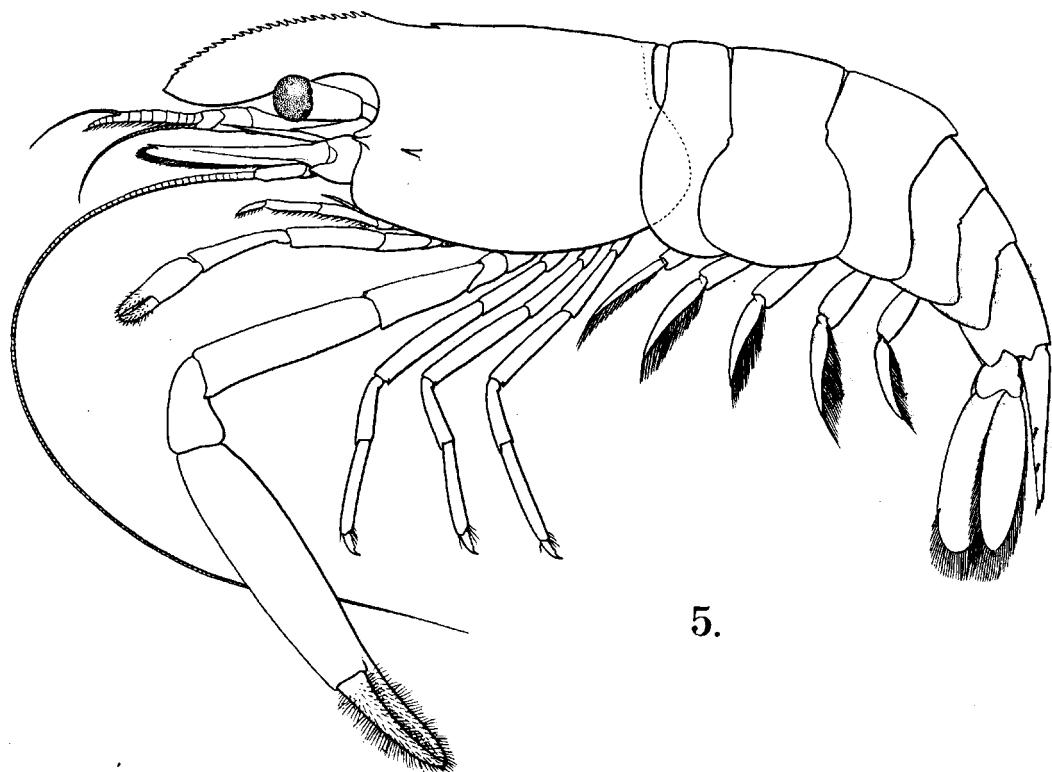
Fig. 3. *Periclimenes latipollex*, sp. nov.

Fig. 4. *Periclimenes lanipes*, sp. nov.

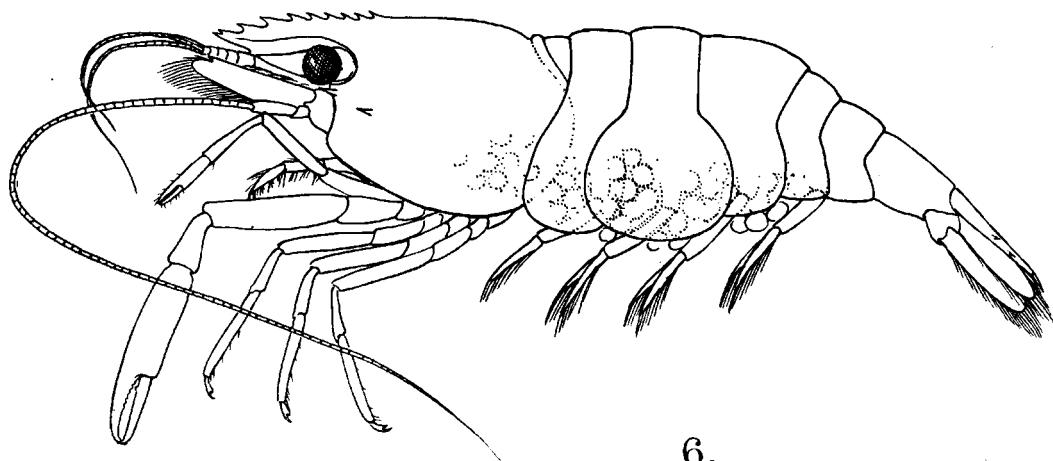
EXPLANATION OF PLATE V.

FIG. 5.—*Periclimenes (Periclimenes) rex*, sp. nov., from a specimen about 21 mm. in length.

FIG. 6.—*Periclimenes (Periclimenes) investigatoris*, sp. nov., from a specimen about 15 mm. in length.



5.



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G. M. Woodward &
A. Chowdhary del.

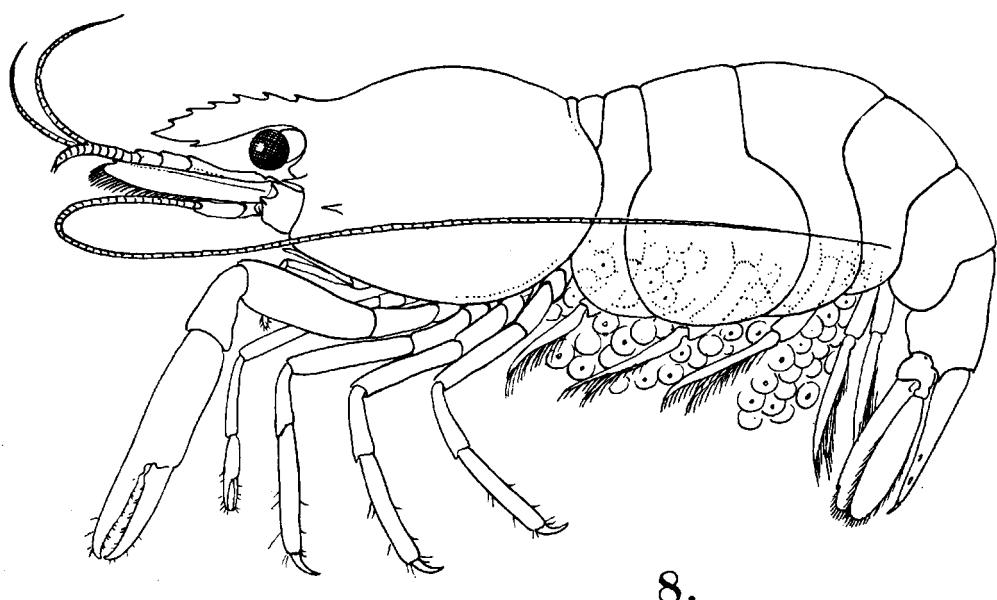
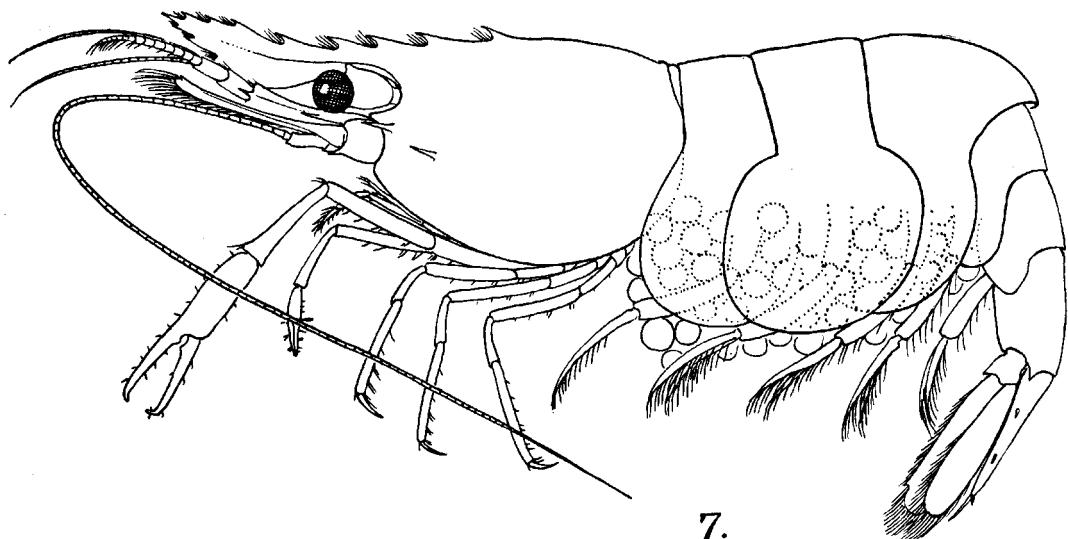
Fig. 5. *Periclimenes rex*, sp. nov.

Fig. 6. *Periclimenes investigatoris*, sp. nov.

EXPLANATION OF PLATE VI.

FIG. 7.—*Periclimenes (Ancylocaris) seychellensis* Borradaile,
from a specimen about 18 mm. in length.

FIG. 8.—*Periclimenes (Ancylocaris) brevicarpalis* Schenkel,
from a specimen about 28 mm. in length.



G. M. Woodward del.

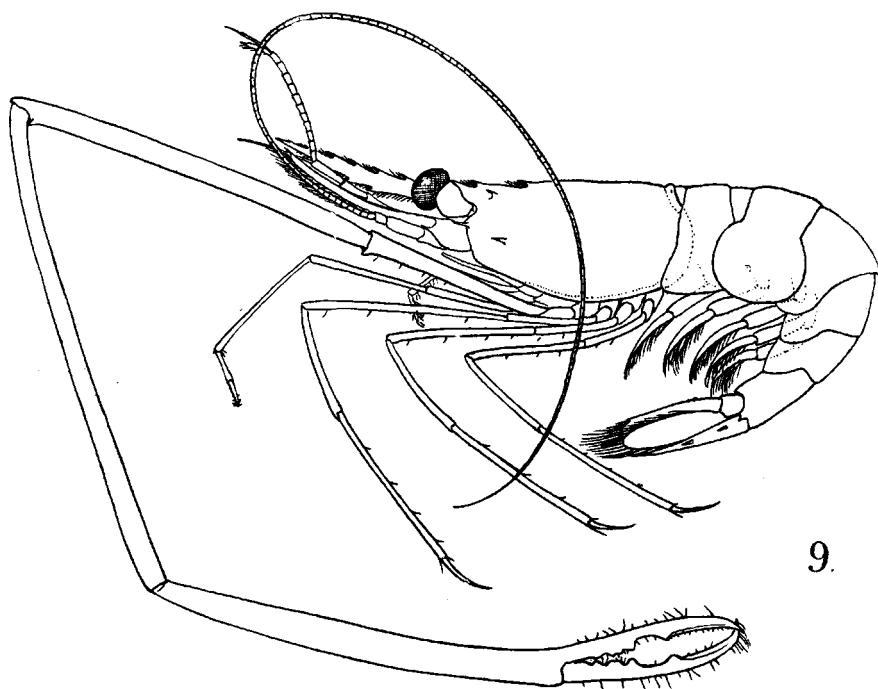
Fig. 7. *Periclimenes seychellensis* Borradaile.

Fig. 8. *Periclimenes brevicarpalis* Schenkel.

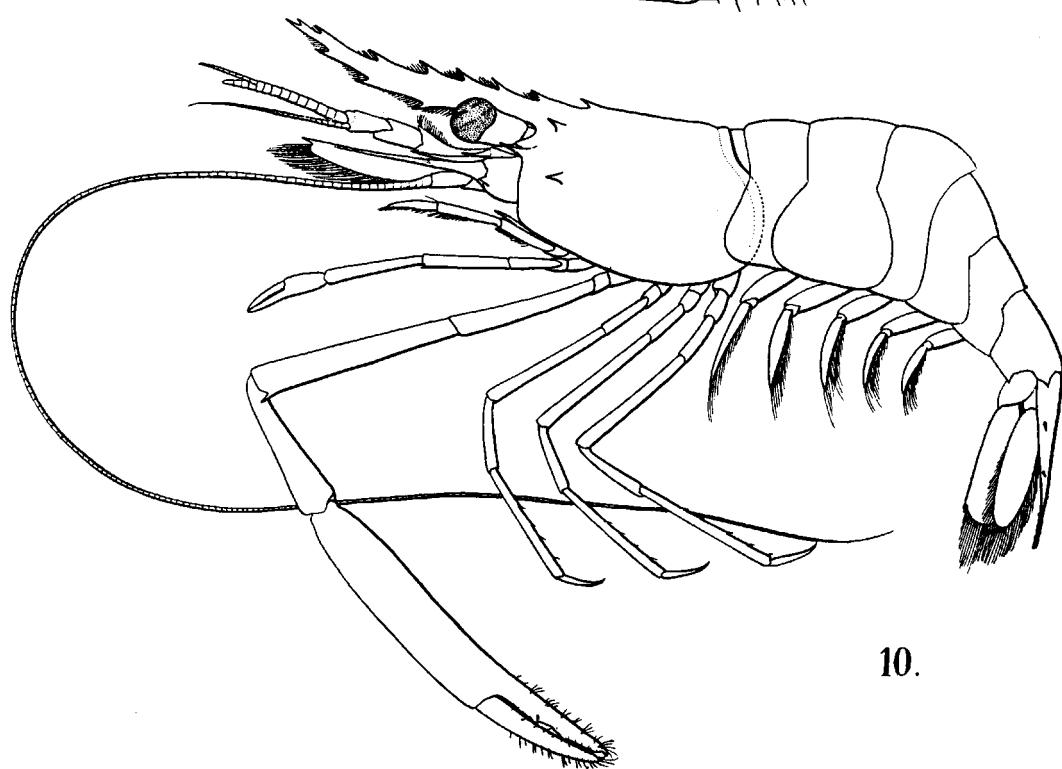
EXPLANATION OF PLATE VII.

FIG. 9.—*Periclimenes (Ancylocaris) agag*, sp. nov., from a specimen about 16 mm. in length.

FIG. 10.—*Periclimenes (Ancylocaris) grandis* (Stimpson), from a specimen about 20 mm. in length.



9.



10.

G. M. Woodward &
A. Chowdhary del.

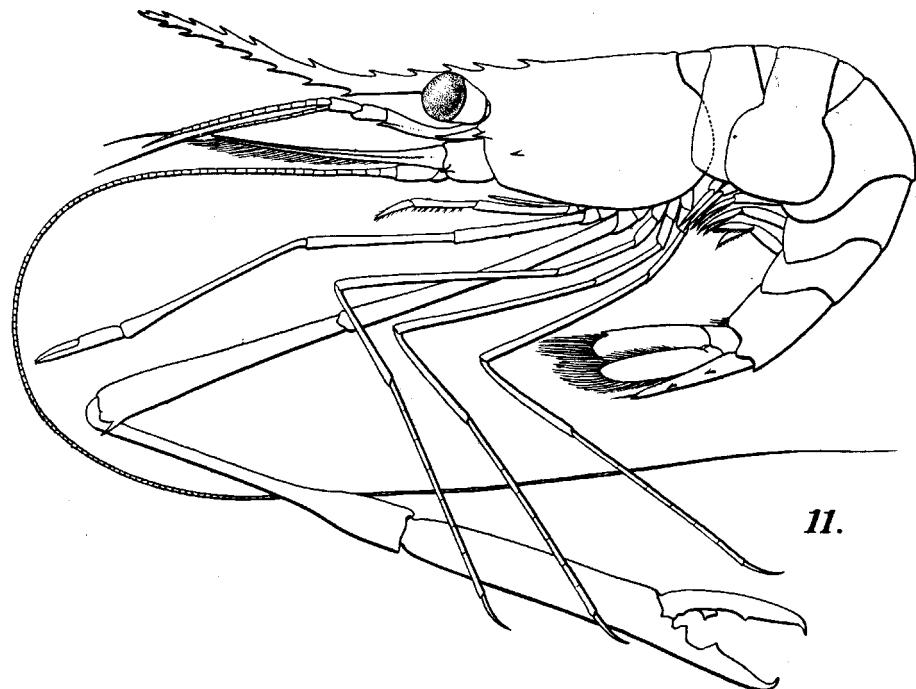
Fig. 9. *Periclimenes agag*, sp. nov.

Fig. 10. *Periclimenes grandis* (Stimpson).

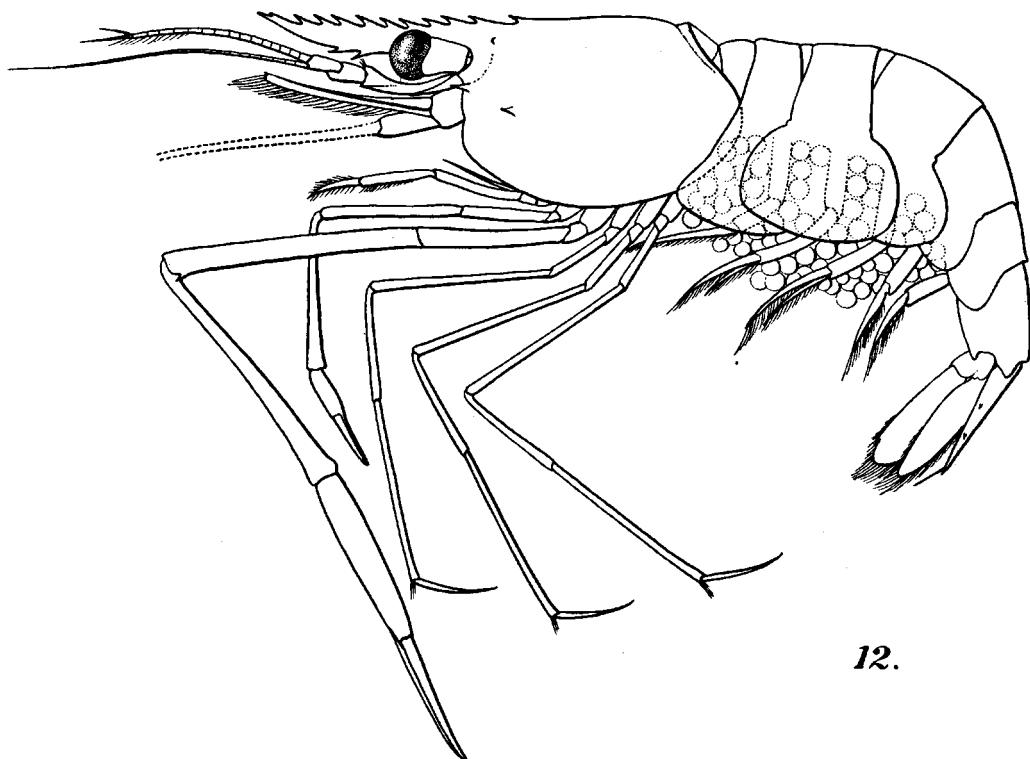
EXPLANATION OF PLATE VIII.

FIG. 11.—*Periclimenes (Ancylocaris) tenuipes* Borradaile,
from a specimen about 22 mm. in length.

FIG. 12.—*Periclimenes (Ancylocaris) digitalis*, sp. nov., from
a specimen about 22 mm. in length.



11.



12.

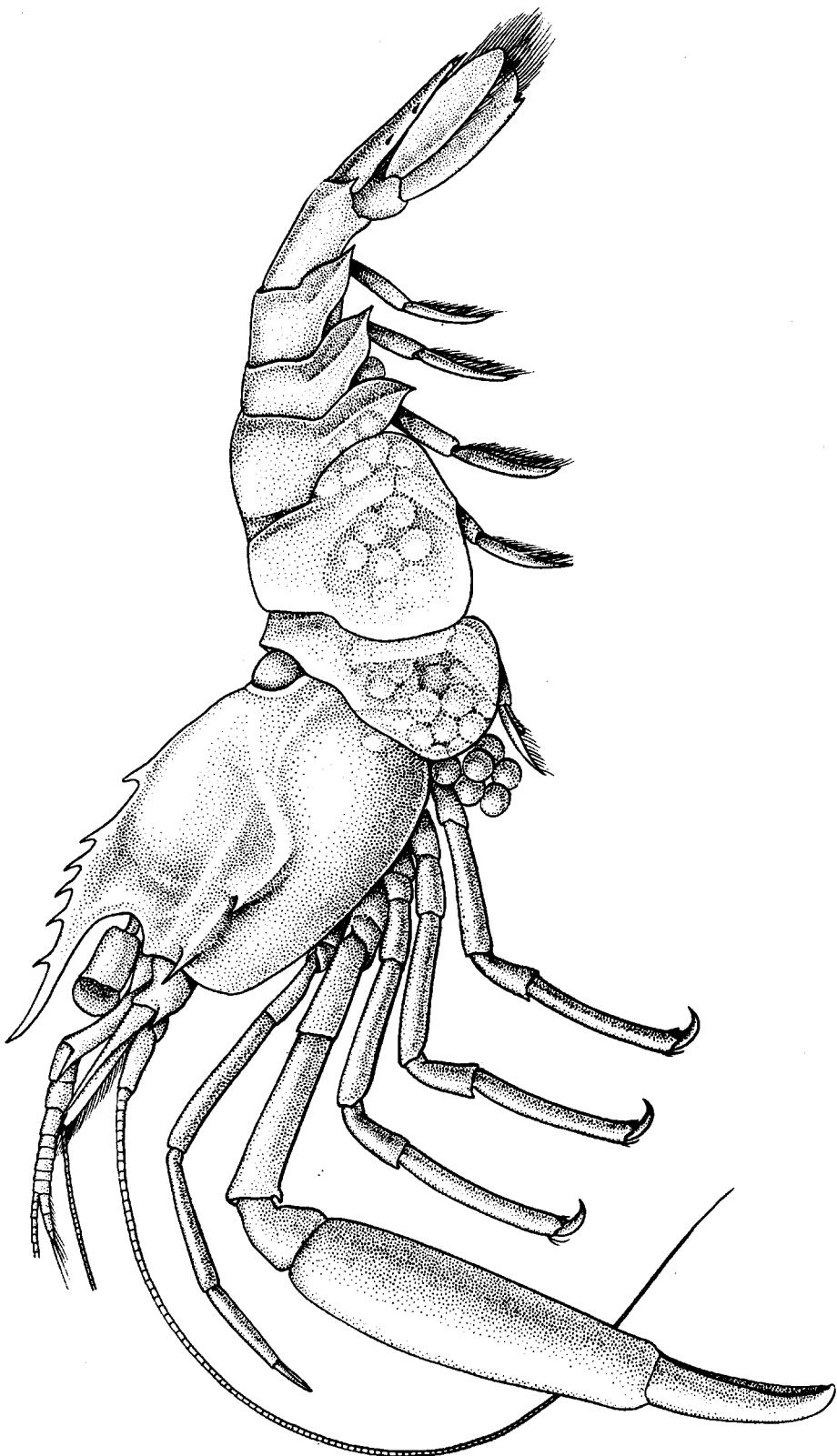
A. Chowdhary del.

Fig. 11. *Periclimenes tenuipes* Borradaile.

Fig. 12. *Periclimenes digitalis*, sp. nov.

EXPLANATION OF PLATE IX.

Dasycaris symbiotes, gen. et sp. nov., from a specimen about
13 mm. in length.



Daycaris symbiotae, gen. et sp. nov.

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