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Notes on Crustacea Decapoda in the Indian Museum, XV. Pontoniinae.

By

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NOTES ON CRUSTACEA DECAPODA IN THE INDIAN MUSEUM.

XV. PONTONIINAE.

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The Pontoniinae form one of the four subfamilies into which the Caridean family Palaemonidae is divided; the other three are the Palaemoninae, the Desmocaridinae and the Typhlocaridinae. Of the very numerous species known in the family all except three belong to the Palaemoninae and Pontoniinae. The Desmocaridinae comprise only a single species, *Desmocaris trispinosus* (Aurivillius), found in freshwater streams in West Africa, and Sollaud[1] who first drew attention to its peculiar characters regards it as the most primitive known Palaemonid. The Typhlocaridinae include two remarkable blind species, both belonging to the genus *Typhlocaris* Calman,[2] which inhabit waters of subterranean origin in Palestine and Cyrenaica. *Typhlocaris* differs from all other Palaemonidae in the presence of a longitudinal suture in the carapace, resembling that found in certain Penaeidae and in the Thalassinidea.

The Palaemoninae and Pontoniinae are closely related subfamilies, distinguished from the other two by a number of important characters.[3] They differ from one another in two respects. The pleurobranch found in the Palaemoninae above the base of the third maxilliped is invariably absent in the Pontoniinae, with the result that six *large* branchiae are found in the former subfamily as against five in the latter. The telson-tip in the Palaemoninae is usually armed with two pairs of spines and a varying number of plumose setae, whereas in the Pontoniinae there are always three pairs of spines.[4] This character is not an invariable one. There appears to be no real morphological distinction between spines and setae as found at the apex of the telson; in the Pontoniinae the median spines are frequently plumose and I have seen one species of Palaemoninae[5] in which there are three pairs of spines, almost precisely as in the related subfamily.

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[1] Sollaud, *Comptes rendus Acad. Sci. Paris* CLII, p. 913 (1911).

[2] Calman, *Trans. Linn. Soc.* (2) *Zool.* XI, p. 93 (1909); Annandale and Kemp, *Journ. Asiat. Soc. Bengal* (n.s.) IX, p. 245 (1913); Parisi, *Atti Soc. Ital. Sci. nat. Milano* LIX, p. 241 (1920).

[3] The characters of the four subfamilies are summarized by Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 326 (1917).

[4] *Coutierea* is said to possess merely a single pair, but the genus is only known from one specimen. It may prove not to belong to the Pontoniinae.

[5] A remarkable species from South India, allied to *Palaemonetes* and hitherto undescribed.

In working through the large collection of Pontoniinae in the Indian Museum I have derived much assistance from the memoir which Borradaile has recently published [1]; his full lists of references to the species have been most useful to me. On a large number of taxonomic questions, however, I have formed conclusions which differ very widely from those which he has expressed, particularly in regard to the generic subdivision of the group. The latter question, as Borradaile has pointed out, is one of great difficulty. In the course of my work I have repeatedly been struck by the very homogeneous nature of the subfamily as a whole, and it is to this fact that we must turn for an explanation of the apparently trivial characters on which many of the genera have been founded.

The characters used for the generic subdivision of the Pontoniinae contrast very strongly with those employed for the same purpose in certain other families and subfamilies of Caridea. In the Hippolytidae, for example, we find that the genera can be separated by trenchant morphological characters based for the most part on the branchial formula, on the structure of the mandible and on the carpal segmentation of the second peraeopods. We are thus able, in this family, to devise a scheme of classification which should satisfy even the most earnest seeker after phylogenetic truth; we have confidence that our genera form natural groups and that they can be arranged in a manner which will demonstrate their true affinities.

The Pontoniinae present a far more difficult problem. We search almost in vain for important morphological features which will serve to separate the large assemblage of species into natural groups. We are obliged to define our genera on characters of a much inferior order of magnitude and we are often far from certain that they are phylogenetically valid.

This radical difference between two not distantly related groups of Caridea is perhaps to be explained by supposing that the Pontoniinae have succeeded in evolving a structural type that can be adapted without any deep-seated modifications to all needful kinds of environment; whereas the Hippolytidae, with a less useful stock-pattern, must needs undergo drastic change, sometimes assuming the most bizarre forms, in order to equip themselves for particular conditions of life. In this connection it is to be remarked that the Pontoniinae have proved themselves far superior to the Hippolytidae in their ability to accommodate themselves to unusual surroundings.

In subdividing such a homogeneous group as the Pontoniinae it is, I believe, of first importance that the genera should be established on a broad basis and that the characters used in separating them should so far as possible be unequivocal. That the classification of the family has hitherto been greatly lacking in this respect is clear from a study of the literature. As evidence of the confu-

[1] Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 323 (1917).

sion that has prevailed, it may be mentioned that Balss has recently redescribed the type species of *Periclimenes* as a new form of *Urocaris* and that a single species has been described by Schenkel, Nobili, Lenz and Miss Rathbun—all writers of experience—under the names *Ancylocaris brevicarpalis*, *Palaemonella aberrans*, *Harpilius latirostris* and *Periclimenes hermitensis* respectively.

Borradaile's recent system of classification does little to remove the sources of error. The primary divisions in his synoptic key to the genera depend almost wholly upon habit of body. This character appears to me to possess little generic importance and, inasmuch as the subfamily comprises species with every imaginable gradation of form, between the most slender and the stoutest, it is frequently quite impossible to decide on the section to which any particular form should be allocated.

I have attempted in this paper to devise a more workable arrangement. In so doing I have been led to discard *Urocaris*, *Ancylocaris* and *Periclimenaeus* as distinct genera and to merge all the species belonging to them, together with those of Borradaile's subgenera *Falciger*, *Cristiger*, *Corniger* and *Hamiger* under the single name *Periclimenes*. The large assemblage of species thus constituted is divided into three subgenera, *Periclimenes*, *Periclimenaeus* and *Ancylocaris*, which together comprise the majority of known species of the subfamily. Except for *Harpiliopsis*, which is no doubt identical with *Harpilius*, the remaining genera retain their rank; several, however, are inadequately described and one or two may even prove not to belong to the subfamily.

Whether the new grouping in the *Periclimenes* section demonstrates the real affinities of the species better than the old one is a question on which it is difficult to express a decided opinion. It is clear from the manner in which they are combined that many of the characters which are used in the distinction of species must necessarily be convergent in origin and it is impossible to be certain that this is not also the case with some of those to which I have attached generic or subgeneric significance. The new grouping, however, removes some of the obvious anomalies that have hitherto existed and will, I believe, be found convenient in practice. In proposing this new scheme of classification it will be understood that I disagree with much that Borradaile has said regarding the phylogeny of the group and that my views on the way in which the different genera have originated differ very widely from those which he has illustrated in the form of a phylogenetic tree.

The Pontoniinae are for the most part Indo-Pacific in distribution and the subfamily is almost exclusively marine. The only exceptions to the latter statement are *Periclimenes indicus*, *P. demani* and *P. obscurus*, which frequent lagoons of variable salinity on the eastern side of the Indian Peninsula. The two former species are capable of enduring extreme alterations in salinity and both have been found in water that is quite fresh as well as in pure sea-water. *Periclimenes obscurus* has been found both in the sea and in brackish water. The members of the subfamily

occur for the most part in sheltered portions of the littoral zone and are especially abundant in the vicinity of coral-reefs. A small proportion occur in moderate depths, up to 50 fathoms, and a few live in deeper water. The greatest depth from which any Pontoniine is known is 703 fathoms.[1]

The most remarkable feature of the subfamily is the ability its members have shown in forming associations with other animals. In the variety of these associations they excel all other Caridea. Some are found on Sponges, others on Actinians, Alcyonaria and Madrepore corals, a few are to be met with on Asteroids and Echinoids and many live on Crinoids. A considerable number of species occur in the mantle-cavity of Lamellibranch molluscs and some are known from the branchial sac of Ascidians. Many species are, of course, free-living, but the association between a prawn and some other animal can usually be detected only by the collector and unless the facts are carefully noted on the label they are liable to escape notice. I have little doubt that many more species possess these associations than we now realize.

As to the nature of the association we are at present very ignorant. The species that live in Lamellibranchs and in Ascidians find a safe retreat from the perils they would meet outside and through the activities of their hosts are, no doubt, well supplied with food. They are commensals in the strict application of the term and, in so far as they deprive their hosts of a portion of their nutriment, may also be regarded as parasites. In the absence of any evidence that their presence is of advantage to the host, they cannot be called symbiotic in the sense in which the word is generally applied.

The species that live on the giant sea-anemone, *Discosoma*, are probably protected by their host and those that live on Sponges, Alcyonaria, Madreporaria and Echinoderms doubtless obtain the benefit of shelter. The species on *Discosoma* perhaps share the food of their host, but it is not unlikely that those on Alcyonaria feed directly on the polyps and are thus true parasites.

Dr. Asajiro Oka found two remarkable species of *Pontonia* when examining the Indian Museum collection of Tunicates and has pointed out that the size of the prawns indicates that they must have entered the Ascidian in the larval state and grown up to maturity in the branchial sac. In a specimen of *Polycarpa annandalei* Oka, in which the external measurements of the test were 33 mm. × 23 mm. × 19 mm., a male and female of *Pontonia anachoreta*, sp. nov., were found, the prawns being 6·5 and 10·5 mm. in length. From *Ascidia willeyi* Oka, with test 35 mm. × 20 mm. a pair of *Pontonia okai*, sp. nov., 8 and 8·5 mm. in length, was obtained. When it is considered that these Pontoniids are heavily built forms, with one of the chelate legs of the second pair extremely large, it is evident that they could not possibly

[1] A specimen of *Periclimenes laccadivensis* collected by the R.I.M.S. 'Investigator.'

pass through the small apertures in the test of the Ascidian. They are thus, like *Spongicola venusta* in *Euplectella*, perpetual prisoners.

In the course of an extremely interesting note on sex-phenomena in *Pinnotheres*, Orton[1] has pointed out that female crabs are frequently found alone in a mollusc and that males are scarce. This corresponds with my own observations on this and other genera of Pinnotherid crabs in India: single specimens, usually females, are of common occurrence and it is quite exceptional to find two crabs in one mollusc. It is probable, as Orton has pointed out, that the male crabs wander freely and visit the molluscs from time to time in search of females.

Conditions are different with the Pontoniids that live in Lamellibranchs, for in practically every instance a male and female prawn are found together in the same mollusc. From this fact it is perhaps legitimate to infer that, as with the species in Ascidians, the prawns after they are once established in their host never leave it throughout the whole course of their existence.

The animal associations recorded in the Pontoniinae are the following:—

On PORIFERA.

? *Periclimenes impar*, sp. nov.
Pontonia tyrrhena (Petagna).[2]
Typton spongicola Costa.

On COELENTERATA.

On Actiniaria.

Periclimenes brevicarpalis (Schenkel), on *Discosoma.*
,, *inornatus*, sp. nov., on *Discosoma.*

On Madreporaria.

Periclimenes spiniferus de Man.
,, *diversipes*, sp. nov.
Harpilius, probably all species.
Coralliocaris, probably all species.

On Alcyonaria.

Periclimenes investigatoris, sp. nov.
,, *diversipes*, sp. nov.
Dasycaris symbiotes, gen. et sp. nov., on *Pteroeides*
Pontonides beaufortensis (Borr.), on a Gorgonian.
Balssia gasti (Balss), on *Corallium rubrum.*

On ECHINODERMATA.

On Asteroidea.

Periclimenes parasiticus Borr., on *Linckia.*

On Echinoidea.

Periclimenes brocki de Man.
Stegopontonia commensalis Nobili, on *Echinothrix.*

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[1] Orton, *Nature* CVI, p. 533 (1920).

[2] *Fide* Heller. The species usually lives in *Pinna* and it seems to me a little unlikely that it should also occur on sponges.

On Crinoidea.

Palaemonella pottsi (Borr.), on *Comanthus.*
,, *affinis* Zehntner, on *Actinometra.*
" *Palaemonella orientalis* Dana," de Man.
Periclimenes brocketti Borr.
,, *ceratophthalmus* Borr.
,, *cornutus* Borr.
,, *commensalis* Borr., on *Comanthus.*
Pontoniopsis comanthi Borr., on *Comanthus*

In MOLLUSCA LAMELLIBRANCHIATA.

In *Pinna.*
Anchistus inermis (Miers).
,, *miersi* (de Man).
Pontonia tyrrhena (Petagna).
,, *pinnae* Lockington.
Conchodytes biunguiculatus (Paulson).
,, *domestica* (Gibbes).

In *Tridacna.*
Anchistus miersi (de Man).
,, *biunguiculatus* Borr.
,, *spinuliferus* (Miers).
,, *mirabilis* (Pesta).
,, *demani*, sp. nov.
Conchodytes tridacnae Peters.
,, *meleagrinae* Peters.

In *Meleagrina.*
Anchistus miersi (de Man).
Conchodytes meleagrinae Peters.

In *Margaritophora.*
Pontonia margarita Smith

In *Pecten.*
Conchodytes domestica (Gibbes).

In *Spondylus.*
Anchistus miersi (de Man).

In " clamp-shells."
Pontonia brevirostris Miers.

In ASCIDIACEA.
Pontonia flavomaculata Heller, in *Phallusia, Diazona* and *Ascidia.*
,, *ascidicola* Borr.
,, *okai*, sp. nov., in *Ascidia.*
,, *anachoreta*, sp. nov., in *Polycarpa.*

I have been able to include in this paper brief colour descriptions of a number of species which I have observed in the living state. Most of these are based on notes made at Port Blair in the Andaman Is., where the Pontoniid fauna is one of unparalleled richness. Though the colour pattern cannot as a rule be used in taxonomic work, there is no doubt that it is often of specific value

and even when the actual tints are variable the distribution of the pigment is frequently constant. A colour description of *Coralliocaris superba* made at Port Blair agrees in a wonderfully exact manner with the coloured figure published by Dana in 1852; had there been any doubts as to the identity of the species the evidence of colour would have been most helpful.

The colouration of many species of Pontoniinae is very striking and there can be little doubt that in some cases it is protective. Potts[1] has observed that the rather strikingly coloured species which live on Crinoids usually harmonize well with their hosts and a remarkable correspondence with the host in both pigment and pattern was noticed by Col. Alcock[2] in a Pontoniid associated with *Pteroeides*.

But protection will not always supply an explanation. Of the two Pontoniids associated with *Discosoma*, one, *P. inornatus*, is protectively coloured; it is semitransparent, without any pigmentation whatever, and can only be detected with difficulty as it crawls among the short tentacles of the Actinian. The other species, *P. brevicarpalis*, though very closely allied, is pigmented in a most remarkable manner and is probably one of the most gorgeous prawns in existence. By reason of its colour it is always excessively conspicuous. *Periclimenes rex*, another species with very brilliant colouration, is perhaps associated with a red and white sponge and it is possible that the colour, though very bright, is protective.

In addition to the rich collection of the Zoological Survey of India, I have been able, thanks to the courtesy of Prof. Ch. Gravier, to examine a number of undetermined specimens belonging to the Paris Museum. Among other interesting species this collection contains a very remarkable prawn for which I have proposed the new genus *Thaumastocaris*. To Dr. W. T. Calman I am indebted for much assistance while working at the British Museum and to Dr. C. Forster Cooper for the opportunity of examining some of the species described by Borradaile.

The types of the new species, unless otherwise noted, are in the collection of the Zoological Survey of India.

Key to the genera of Pontoniinae.

A. Mandibular palp present, usually composed of two segments [rostrum laterally compressed with conspicuous teeth; dactylus of last three legs (? always) simple].	
B. Second maxilliped with podobranch; first pleopod of male with appendix interna [free-living] ...	*Urocaridella*, p. 122.
B'. Second maxilliped without podobranch; first pleopod without appendix interna [free-living or associated with crinoids]	*Palaemonella*, p. 122.
A'. Mandibular palp absent.	
B. Antennal scale well developed.	

[1] Potts, *Public. Carnegie Inst. Washington*, no. 212, p. 81 (1915).

[2] Alcock, *A Naturalist in Indian Seas*, p. 14 (1902). The species on which this observation was made is *Dasycaris symbiotes*, gen. et sp. nov.

C. Dactylus of last three legs simple or biunguiculate,[1] but without basal protuberance.
D. All three maxillipeds with exopods.
E. Inner lacinia of maxillula narrow; free-living or epizootic on coelenterates or echinoderms.
F. Carpus of first leg not segmented.
G. Carapace not areolated; basal antennular segment normal in form; abdominal pleura usually rounded inferiorly.[2]
H. Rostrum laterally compressed, with conspicuous teeth.
J. Carapace not depressed [free-living or associated with coelenterates or echinoderms] ... ... *Periclimenes*, p. 134.
J'. Carapace depressed, often very strongly [associated with corals] ... *Harpilius*, p. 226.
H'. Rostrum depressed and toothless [associated with crinoids] ... *Pontoniopsis*, p. 239.
G'. Carapace areolated; basal antennular segment greatly attenuated anteriorly; third to fifth abdominal pleura sharply pointed inferiorly [rostrum laterally compressed, with dorsal teeth; associated with alcyonaria] ... ... *Dasycaris*, p. 240.
F. Carpus of first leg segmented [rostrum laterally compressed, with teeth; carapace not areolated; ? free-living] ... *Thaumastocaris*, p. 244.
E'. Inner lacinia of maxillula very broad; endozootic in lamellibranchs or ascidians.
F. Rostrum laterally compressed in distal half, toothless or with small teeth at apex only; dorsal spines of telson very small [living in lamellibranchs] ... ... *Anchistus*, p. 247.
F'. Rostrum depressed, toothless; dorsal spines of telson usually large [living in lamellibranchs or ascidians] ... ... *Pontonia*, p. 259.
D'. Exopods absent from some or all maxillipeds.
E. Rostrum toothless; carapace not sculptured, without supra-orbital crest; no tooth on first abdominal somite; free-living (?), or associated with gorgonians ... ... *Pontonides*, p. 266.
E'. Rostrum with teeth; carapace deeply sculptured, with supra-orbital crest on either side armed with teeth; a mid-dorsal tooth on first abdominal somite; associated with red coral ... ... *Balssia*, p. 267.
C'. Dactylus of last three legs simple or biunguiculate[3] and with a large basal protuberance.
D. Rostrum very long; carapace areolated, with huge antennal and supraorbital spines and with pterygostomian spine; abdominal pleura sharply pointed inferiorly [? free-living] ... *Coutierea*, p. 267.
D'. Rostrum little if at all longer than scale; carapace not areolated, without supraorbital or pterygostomian spines; antennal spine when present short; abdominal pleura inferiorly rounded

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[1] Biunguiculate in *Periclimenes s. str.*, in *Thaumastocaris* and in some species of *Anchistus* and *Pontonia*.
[2] The only exceptions are found in the genus *Harpilius*
[3] Biunguiculate only in *Conchodytes*.

E. Dactylus of last three legs with basal protuberance double [rostrum toothless, concave above; associated with echinoids] ... *Stegopontonia*, p. 268.

E'. Dactylus of last three legs with basal protuberance single.

F. Rostrum laterally compressed, frequently with teeth; inner lacinia of maxillula narrow; dactylus of last three legs with a single claw and a hoof-shaped basal protuberance; living on corals ... ... *Coralliocaris*,[1] p. 268.

F'. Rostrum depressed, toothless; inner lacinia of maxillula very broad; dactylus of last three legs with two claws and flat basal protuberance; living in lamellibranchs ... ... *Conchodytes*, p. 279.

B'. Antennal scale rudimentary.

C. Rostrum present, with or without teeth; distal lacinia of maxilla well developed; all maxillipeds with exopods; dactylus of last three legs biunguiculate [associated (? always) with sponges] ... *Typton*, p. 286,

C'. Rostrum absent; distal lacinia of maxilla rudimentary; second and third maxillipeds without exopods; dactylus of last three legs simple .. *Paratypton*, p. 286.

In this key Nobili's *Onycocaris*, originally proposed as a subgenus of *Coralliocaris*, is not included (see p. 278). I am not convinced that the two species for which it was founded are related to *Coralliocaris*, and as I have not seen either I prefer to leave their position undetermined for the present. The generic position of a number of other species is doubtful[2]; when they are better known it is probable that some modification will be necessary in the generic arrangement here adopted.

Balss' *Bathypalaemonella*[3] evidently does not belong to the subfamily, as it possesses a series of arthrobranchs in addition to five pleurobranchs.

Of the seventeen genera which I recognise *Periclimenes* comprises by far the largest number of species. No less than eight genera are monotypic and the majority of these are known from single specimens only.

In the keys to the species I have followed Borradaile's example and have in each instance inserted the rostral formula. An expression such as R. 11–14 : 2–3 indicates that the teeth on the upper border of the rostrum vary from 11 to 14 and that there are 2 or 3 teeth on the lower border. The length of a specimen, as given in the descriptive parts, represents the distance between the tip of the rostrum and the tip of the telson with the animal extended as nearly as possible in a straight line. The figures in the text, even when forming part of a single text-block, are not necessarily drawn to the same scale.

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[1] Not including *Onycocaris* Nobili.

[2] In my attempts to readjust the generic classification of the subfamily I have found myself greatly handicapped by our inadequate knowledge of a number of species. It is important that we should have fuller knowledge of *Onycocaris*, of the two species from Japan which Balss referred to *Periclimenes* (see p. 138) and of the three forms attributed to *Coralliocaris* by Miss Rathbun (see p. 268).

[3] Balss, *Zool. Anz.* XLIV, p. 598 (1914).

Genus **Urocaridella** Borradaile.

1915. *Urocaridella*, Borradaile, *Ann. Mag. Nat. Hist.* (8) XV, p. 207.
1917. *Urocaridella*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 352.

The presence of the appendix interna on the first pair of pleopods is a very remarkable character of this genus and one in which it differs, I believe, from all other known Caridea. It should be noted, however, that the appendix is to be found on the first pleopods in males only, not in both sexes as implied by Borradaile.

Urocaridella gracilis Borradaile.

1915. *Urocaridella gracilis*, Borradaile, *Ann. Mag. Nat. Hist.* (8) XV, p. 210.
1917. *Urocaridella gracilis*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 352, pl. liii, fig. 2.

This species was described by Borradaile from Suvadiva, Kolumadulu and Haddumati Atolls in the Maldives. It is here recorded from the Orissa Coast, the Andaman Is. and the Mergui Archipelago.

Specimens from the Andamans were transparent when alive with brown speckling and with narrow transverse brown bands at the end of the carapace and on the second and third abdominal somites. There were brown patches in the middle and at the tip of the rostrum, on each side of the first abdominal somite, at the tips of the telson and uropods and at the base of the uropods. The antennules, antennae and all the legs were broadly banded with red.

The largest specimens in the collection are ovigerous females about 30 mm. in length.

2183/7.	Off Chilka Lake, Orissa Coast, 11 fms.	'Investigator,' Jan., 1890.	One.
C 342/1.	Port Blair, Andamans, 2–8 fms.	S. Kemp, Feb., 1915; Feb., March, 1921.	Many.
C 343/1.	Mergui Archipelago, 10 fms., 12°40′ N., 98°26′30″ E.	'Investigator,' Oct., 1913.	Many.
C 344/1.	Mergui Archipelago, 6 fms., 11°17′20″ N., 98°29′40″ E.	'Investigator,' March, 1914.	Three.

The specimens from Port Blair were caught in bottom nets hauled in Ross Channel and at the mouth of Brigade Creek; those from the Mergui Archipelago, none of which are fully adult, were obtained at night in surface nets.

Genus **Palaemonella** Dana.

1852. *Palaemonella*, Dana, *U. S. Explor. Exped., Crust.* I, p. 582.
1917. *Palaemonella*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 356.

Borradaile includes twelve species in this genus, but except for the two originally described by Dana and the three that Borradaile himself named, all require re-examination. In general appearance

the species of *Palaemonella* bear an exceedingly close resemblance to those of *Periclimenes*. The only valid distinction between the two lies in the presence of a mandibular palp in the former genus and its absence in the latter. Unfortunately this character is one to which attention is seldom paid, with the result that the generic position of a number of species is doubtful.

Palaemonella laccadivensis Alcock and Anderson does not possess a mandibular palp and is transferred to the genus *Periclimenes*; in *Periclimenes pottsi* on the other hand this appendage is present and the species is in consequence removed to *Palaemonella*. Borradaile's *Palaemonella tridentata* is in my opinion a synonym of Dana's *P. tenuipes* and Zehntner's *Palaemonella amboinensis* is perhaps synonymous with *Periclimenes brevicarpalis* (Schenkel).

Several species with the dactyli of the last three legs biunguiculate have been referred to *Palaemonella*, but the position of all is uncertain.[1]

The five species that I have myself examined may be distinguished thus:—

A. Hepatic spine present.
  B. Distal margin of carpus of second leg toothed or angulate on its inner aspect, but without a large *subterminal* spine.
    C. Antennal scale strongly narrowed distally, with spine extending far beyond apex; a spine at distal end of merus of second leg.
      D. A vestigial supra-orbital spine; propodus of third leg at most 4·5 times length of dactylus; R. 6–8 : 1–3 ... ... *vestigialis*, sp. nov.
      D'. No vestige of supra-orbital spine; propodus of third leg more than 5 times length of dactylus; R. 7 : 2 ... ... *pottsi* (Borr.).
    C'. Antennal scale not narrowed distally, with spine scarcely extending beyond apex; no spine at distal end of merus of second leg; R. 8 : 3 ... *lata*, sp. nov.
  B'. A large subterminal spine on carpus of second leg [antennal scale narrowed distally, with spine extending much beyond apex; a spine at distal end of merus of second leg]; R. 6–8 : 1–3 ... *tenuipes* Dana.
A'. Hepatic spine absent [no spine at distal end of merus of second leg]; R. 6–7 : 1 ... ... *orientalis* Dana.

Palaemonella vestigialis, sp. nov.

(Plate III, fig. 2.)

The rostrum extends beyond the end of the antennular peduncle and reaches about to the apex of the antennal scale. It varies somewhat in depth and is straight for the greater part of its length with the terminal portion sometimes turned a little upwards. On the upper border it bears from 6 to 8 teeth,[2] usually 7; the pos-

[1] A specimen from Australia which Balss (*K. Svenska Vet.-Akad. Handl.* LXI, no. 10, p. 13, 1921) has doubtfully attributed to Nobili's *Palaemonella biunguiculata* bears only four spines at the apex of the telson and probably belongs to the subfamily Palaemoninae.

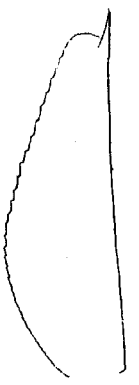
[2] Of thirteen specimens four have 6 dorsal teeth, six have 7 and three have 8.

terior tooth is placed in front of the middle of the carapace, the second is behind the orbit, while the foremost is small and is not far removed from the apex. On the lower border there are from 1 to 3 teeth,[1] usually 2, which are large and placed in the anterior half of the rostral length.

In the position usually occupied in other genera by the supra-orbital spine a small angular prominence or tubercle may be detected and extending downwards from this tubercle to the base of the antennal spine there is a well-defined curved ridge parallel with the orbit. From this ridge the carapace slopes obliquely inwards to the orbital margin, the orbit thus having a broadly bevelled edge. The antennal spine is strong; the hepatic spine is placed behind it, but on a lower level.

The eyes are stout with short, thick stalks. The cornea is a little wider than the stalk and frequently, as in some species of *Periclimenes*, shows two concentric bands of dark pigment. The ocular spot touches the cornea.

The basal segment of the antennular peduncle (text-fig. 2*a*) is broad; the lateral process does not reach the middle of the segment; the terminal spine is rather short and the margin between this spine and the articulation of the second segment is nearly straight. The two distal segments are stout. The free portion of the shorter ramus of the outer flagellum is half or rather less than half the length of the fused basal part, the latter consisting of 8 to 10 segments. The total length of the shorter ramus is equal to or rather less than that of the peduncle. The antennal scale (text-fig. 1) is from 3·3 to 4 times as long as wide, proportionately longest in males, and is strongly narrowed apically. The outer margin is straight or very slightly concave and terminates in a spine which reaches far beyond the end of the lamella.



TEXT-FIG. 1.—*Palaemonella vestigialis*, sp. nov.
Antennal scale of female.

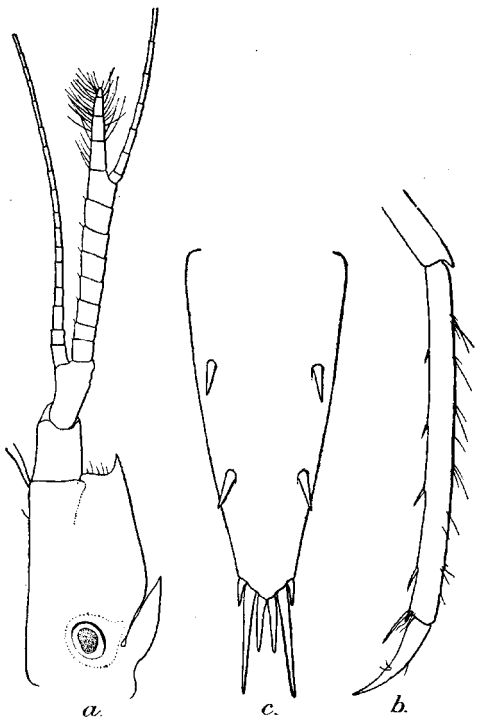
There is a minute arthrobranch at the base of the third maxilliped. The exopod almost reaches the end of the antepenultimate segment and the ultimate segment, excluding the terminal spine, is about three quarters the length of the antepenultimate.

The first peraeopods reach beyond the apex of the antennal scale by considerably more than the length of the chela. The carpus is about equal in length with the merus and is from 1·0 to 1·25 times as long as the chela. The fingers are longer than the palm and are unarmed.

The second peraeopods in adults of both sexes reach beyond the antennal scale by the whole of the chela and carpus. The

[1] Of thirteen specimens two have 1 ventral tooth, ten have 2 teeth and one has 3.

merus bears a strong spine close behind the distal end of the lower margin and is from 5·5 to 6 times as long as wide and from 1·25 to 1·4 times [1] as long as the carpus. The carpus is conical, from 2·8 to 3·2 times as long as its distal breadth, most slender in females. From the distal margin on the inner side there project two small acute processes or teeth, the upper the most conspicuous; the strong subterminal spine found in *Palaemonella tenuipes* is com-



TEXT-FIG. 2.—*Palaemonella vestigialis*, sp. nov.
a. Antennule. *c*. Telson.
b. Last two segments of third peraeopod.

pletely absent (*cf.* text-figs. 7*a* and 7*b*). Behind the distal edge, especially on the upper side, the carpus exhibits a transverse furrow, while the distal edge itself is somewhat dilated. The chela is from 2·3 to 2·65 times as long as the carpus and is proportionately longest in males. The palm is a little swollen, wider than the distal end of the carpus, 3 times as long as its greatest breadth and from 1·3 to 1·5 times as long as the fingers. The fingers have inturned tips, their cutting edges are unarmed distally, but in the proximal half each bears two teeth, those on the dactylus in advance of those on the fixed finger.

The last three pairs of peraeopods are slender; the fifth reach a little beyond the end of the antennal scale. In the third pair

[1] Ab out equal to the carpus in a female from Mahé.

the merus is from 9 to 10 times as long as broad. The propodite bears spinules on its posterior border (text-fig. 2*b*) and is from 3·5 to 4·5 times as long as the dactylus.

The sixth abdominal somite is about 1·5 times the length of the fifth. The spinules on the dorsum of the telson (text-fig. 2*c*) are so arranged as to divide its length into three equal parts.

Large specimens are about 18 mm. in length.

C 394–5/1.	Port Blair, Andamans.	S. Kemp, March, 1915; Feb., 1921.	Four, including TYPES.
C 396/1.	Cheval Paar, Ceylon.	T. Southwell, Nov., 1910.	Five.
7717/6.	Kabusa I., Meigui.	'Investigator,' March, 1887.	One.
398–9/1.	Tor and Ain Musa, Gulf of Suez.	R. B. S. Sewell, 1916.	Three.

I have also seen three specimens from Mahé, Seychelles, belonging to the Paris Museum (Alluaud coll.).

The specimens from Port Blair were found at low water in rock-pools at Aberdeen and in North Bay. The type-specimens are from the former locality.

A male and female from Port Blair, found on a muddy shore near the mouth of Brigade Creek, differ from the specimens described above in the absence of the vestige of the supra-orbital spine and in the longer dactyli of the last three legs. In the third pair the propodite is only from 2·6 to 3 times as long as the dactylus. In the male the merus of the second peraeopod is about 4·5 times as long as wide and the carpus about 2·5 times as long as its distal width. The male possesses three pairs of spines on the back of the telson; but this is no doubt an abnormality as the teeth are not arranged symmetrically.

C 400/1.	Port Blair, Andamans.	S. Kemp, March, 1921.	Two.

The specimens were found among lumps of dead coral on muddy ground.

Palaemonella pottsi (Borradaile).

1915. *Periclimenes* (*Falciger*) *pottsi*, Borradaile, *Ann. Mag. Nat. Hist.* (8) XV, p. 213.
1915. *Periclimenes pottsi*, Potts, *Publ. Carnegie Inst. Washington*, no. 212, p. 82.
1917. *Periclimenes* (*Falciger*) *pottsi*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 374.

I have examined two specimens, both unfortunately in poor condition, brought by Mr. F. A. Potts from the Torres Straits and find that Borradaile was mistaken in referring the species to the genus *Periclimenes*. The mandibular palp is present and is composed of two segments.

The species is very closely allied to *P. vestigialis*, differing as far as I am able to discover only in the following characters:—

(i) There is no vestige of the supra-orbital spine, though the orbit has a bevelled edge as in the allied species.

(ii) The spine at the end of the merus of the second peraeopod is quite terminal in position.

(iii) The dactylus of the last three peraeopods is much shorter, the propodite being from 5·3 to 5·5 times its length.

These characters are not very convincing. It is possible that other distinctive features will be found in the second peraeopods of the male, for I have only seen one detached leg of the second pair in *P. pottsi* and this appears to belong to a female.

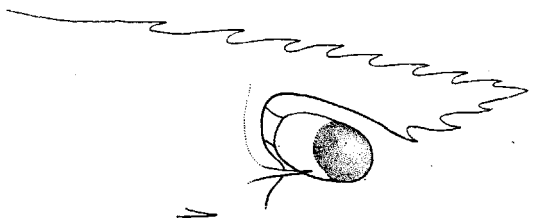
Palaemonella pottsi is purple in colour when alive and is associated with crinoids, whereas *P. vestigialis* is not conspicuously coloured in life and is free-living. There were no crinoids in the localities where the latter species was collected at Port Blair.

The species is known only from the Murray Is. in the Torres Straits.

Palaemonella lata, sp. nov.

This species, which is represented by a single adult male, is closely allied to *P. vestigialis* and *P. pottsi* but differs in the following characters:—

(i) There is no vestige of the supra-orbital spine (text-fig. 3).



TEXT-FIG. 3.—*Palaemonella lata*, sp. nov.
Anterior part of carapace.

(ii) The lateral process of the antennular peduncle is longer, extending beyond the middle of the segment and the terminal spine of the basal segment is also longer, reaching much beyond the middle of the second segment (text-fig. 4*a*).

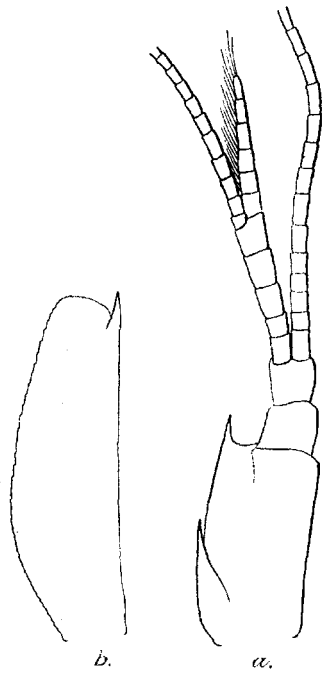
(iii) The outer antennular flagellum is more deeply cleft. The free portion of the stouter ramus is as long as the fused basal part, the latter comprising only 5 segments (text-fig. 4*a*).

(iv) The distal end of the antennal scale is very much broader and the terminal spine reaches scarcely at all beyond the apex of the lamella (text-fig. 4*b*).

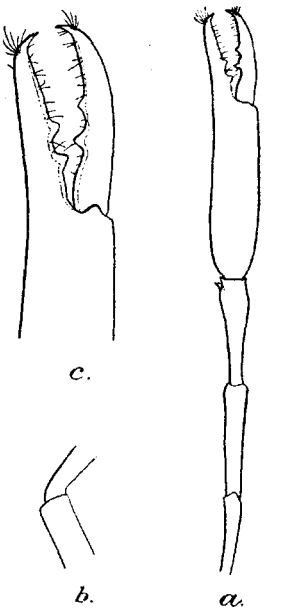
(v) The fingers of the first peraeopod are equal in length with the palm.

(vi) There is no spine at the distal end of the merus of the second peraeopods (text-fig. 5*b*).

In other respects there is little difference. The rostrum reaches beyond the end of the antennular peduncle and is rather



TEXT-FIG. 4.—*Palaemonella lata*, sp. nov.
a. Antennule. *b*. Antennal scale.



TEXT-FIG. 5.—*Palaemonella lata*, sp. nov.
Second peraeopod.
a. In dorsal view.
b. Mero-carpal articulation in lateral view.
c. Fingers.

deep in lateral view. It bears 8 teeth above and 3 below, two of the former being situated on the carapace. The antennal scale is a little more than 3 times as long as wide. The carpus of the first peraeopod is about 1·2 times the length of the chela. In the second peraeopods the merus is a little more than 5 times as long as wide. The carpus bears two conspicuous teeth on the inner side of its distal margin and is slightly less than 4 times as long as its distal breadth. The chela is about 2·5 times as long as the carpus and the palm is nearly 4 times as long as broad. There are two teeth in the proximal half of each finger as in *P. vestigialis*. The last three peraeopods are slender, the fifth reaching well beyond the antennal scale. In the third pair the merus is 10 times as long as wide and the propodus, which bears spinules on its posterior edge, is 3·3 times as long as the dactylus. The telson spines are arranged as in the preceding species.

TEXT-FIG. 6.—*Palaemonella lata*, sp. nov.
Last three segments of third peraeopod.

As in the two preceding species the mandibular palp is composed of two segments, but it differs in that the distal segment is very much shorter than the proximal. This is perhaps merely an abnormality and only one mandible was examined.

The single specimen is about 15 mm. in length. In life it was perfectly transparent except for a few small red chromatophores on the carpus and chela of the second legs.

P. lata is readily distinguished from related species by the broad apex and short terminal spine of the antennal scale and by the absence of the spine at the distal end of the merus of the second peraeopods.

C 401/1. Port Blair, Andamans. S. Kemp, Feb., 1921. One, TYPE.

The specimen was found in a rock-pool at Aberdeen at low water.

Palaemonella tenuipes Dana.

1852. *Palaemonella tenuipes*, Dana, *U. S. Explor. Exped., Crust.* I, p. 582, pl. xxxviii, figs. 3*a–d*.
1898. *Palaemonella tridentata*, Borradaile, *Proc. Zool. Soc. London*, p. 1007, pl. lxiv, figs. 8*a–c*.
1899. *Palaemonella tridentata*, Nobili, *Ann. Mus. civ. Genova* (2) XX, p. 235.
1906. *Palaemonella tenuipes* var. (ann. sp. ?), Nobili, *Ann. Sci. nat., Zool.* (9) IV, p. 70.
1917. *Palaemonella tenuipes* and *tridentata*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, pp. 323, 358.
1921. *Palaemonella tenuipes*, Tattersall, *Journ. Linn. Soc., Zool.* XXXIV, p. 383.
? 1921. *Palaemonella tenuipes*, Balss, *K. Svenska Vet.-Akad. Handl.* LXI, no. 10, p. 14.

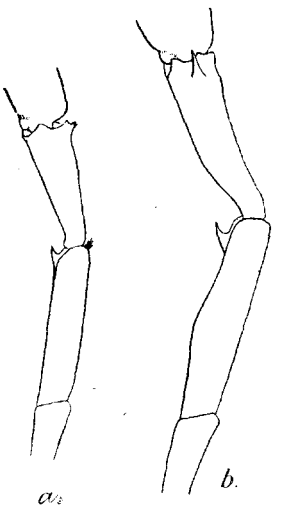
I have examined a single example of this species obtained at Peros Banhos in the Chagos Archipelago. It differs conspicuously form all other species of the genus that I have seen in the possession of a large *subterminal* spine on the upper and inner aspect of the carpus of the second peraeopod in addition to one or two small angular projections on the actual distal margin of the segment. The subterminal spine is clearly shown in Dana's figure.

In determining the specimen in the collection I have derived much assistance from the notes which Tattersall has recently published. I have no doubt that my specimen is specifically identical with those that he examined and I accept his view that they should be referred to Dana's *P. tenuipes*. The identification presupposes a considerable amount of error in Dana's figures, but we have ample evidence that these are not to be trusted in the finer detail now necessary for systematic work on the Macrura.

Tattersall remarks that Borradaile's *P. tridentata* is closely allied to *P. tenuipes* and is doubtfully distinct. I go further and regard the former as a synonym of the latter.

The specimen examined was obtained by Prof. Stanley Gardiner's expedition and was determined by Borradaile as *P.*

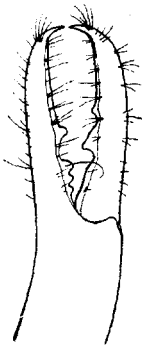
tridentata. Apart from the fact that it possesses only a single tooth on the lower border of the rostrum, it differs conspicuously from Borradaile's figure in the proportions of the segments of the second peraeopods. The merus is longer than the carpus and much longer than the fingers and the carpus is stouter, only about 3·5 times as long as its distal breadth. Tattersall has given a tabular statement of the proportionate lengths of the segments of the second peraeopod, the figures being derived from his own specimens, from Nobili's measurements and from the illustrations by Dana and Borradaile. The corresponding values for my specimen are merus 1·2, carpus 1·0, palm 1·6 and fingers 0·8. In these proportions the specimen agrees fairly well with those that Tattersall and Nobili examined. The shorter palm in Dana's figure may be due to the less well-developed condition of his specimen; the very short merus in Borradaile's figure is, I believe, an error in drawing. In my specimen, which is a male, the lower border of the merus is sinuous, conspicuously convex in the middle; this character is shown in Borradaile's figure and is probably found only in males. The dentition of the fingers is shown in text-fig. 8.



TEXT FIG. 7.—Merus and carpus of second peraeopod viewed laterally from inner side.

a. Palaemonella vestigialis, sp. nov.
b. Palaemonella tenuipes Dana.

Tattersall's notes and the evidence of my specimen, identified as *P. tridentata* by Borradaile himself, all point to the conclusion that only one species of *Palaemonella* with subterminal carpal spine is at present known.



TEXT FIG. 8.—*Palaemonella tenuipes* Dana.

Fingers of second peraeopod.

Dana's specimen came from the Sooloo Sea. Borradaile's original example of *P. tridentata* was obtained at Funafuti in the Ellice Is. and he has since recorded the species under the same name from various localities in the Maldives and the Chagos Archipelago. Nobili has recorded a specimen under the name *P. tridentata*

from Beagle Bay in British New Guinea. Nobili and Tattersall have examined specimens from the Red Sea, the former from Djibouti and other undetermined localities, the latter from Khor Dongonab and Suakin Harbour.

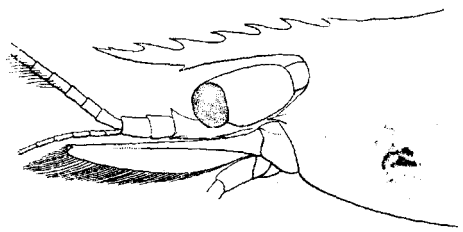
I look on most other records of *P. tenuipes*[1] with suspicion, but those of Stimpson from Ousima in the Loo-Choo Is., of Miss Rathbun from the Hawaiian Is. and of Balss from N. W. Australia are perhaps trustworthy. No reliance can be placed on de Man's record from Amboina as his specimen did not possess either of the second legs and the identity of Ortmann's specimens from Japan and the Maldives appears to me to be extremely doubtful. Zehntner in recording a specimen from Amboina remarks that the colour is entirely black, a fact not noted elsewhere and possibly not true of real *P. tenuipes*. Heilprin's record from the Bermudas cannot be accepted without corroboration.

Palaemonella orientalis Dana.

1852. *Palaemonella orientalis*, Dana, *U. S. Explor. Exped., Crust.* I, p. 583, pl. xxxviii, figs. 4*a–d*.
? 1887. *Palaemonella orientalis*, de Man, *Arch. Naturgesch.* LIII. i, p. 552.

The single specimen which I refer to this species exhibits the following characters:—

The rostrum (text-fig. 9) is slender, straight at the base and a little upturned at the tip; it reaches almost to the end of the antennal scale. On the upper border it bears 7 equidistant teeth, the hindmost placed on the carapace, the next a little in advance of the posterior limit of the orbit, and the foremost small and



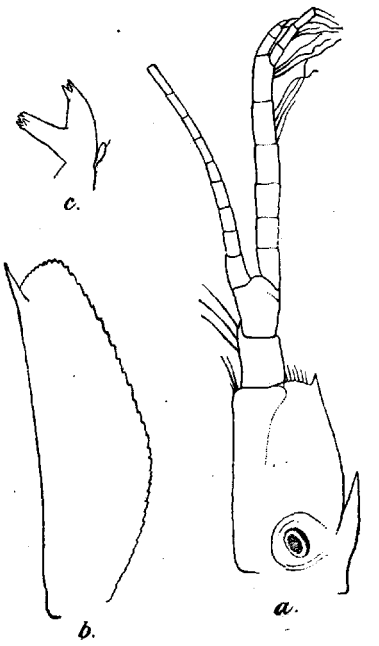
TEXT-FIG. 9.—*Palaemonella orientalis* Dana.
Anterior part of carapace, etc., in lateral view.

situated close to the apex. On the lower border there is a single tooth, placed beneath the fifth of those on the upper edge.

The antennal spine is present, but both the supra-orbital and the hepatic are missing. The eyestalks are swollen and, in the middle, are distinctly wider than the hemispherical cornea. The ocular spot is not visible.

[1] For references see Borradaile, *loc. cit.*, 1917, p. 358.

The lateral process of the antennular peduncle (text-fig. 10*a*) reaches about to the middle of the basal segment. The spine at the outer distal angle of the same segment is short and the margin between this spine and the articulation of the second segment is gently convex. The free portion of the shorter ramus of the outer antennular flagellum is only about one quarter the length of the fused basal part, the latter comprising 6 elongate segments. The antennal scale (text-fig. 10*b*) is narrow at the distal end and widest in the middle; its greatest breadth is a little less than one-third the total length. The outer margin is very slightly concave and terminates in a strong spine which reaches a little beyond the end of the lamella.



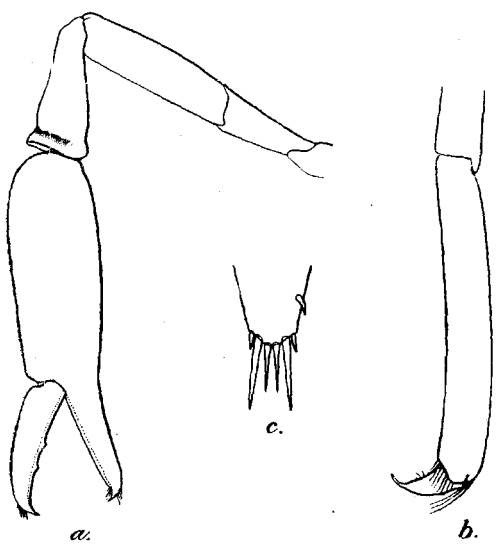
TEXT-FIG. 10.—*Palaemonella orientalis* Dana.
a. Antennule. *b*. Antennal scale.
c. Mandible.

The mandible (text-fig. 10*c*) resembles Dana's figure, but the palp consists only of a single segment, bearing a seta near the apex. The exopod of the third maxilliped reaches only a little beyond the end of the antepenultimate segment. The terminal segment is two-thirds the length of the penultimate. The first peraeopods reach about to the end of the antennal scale. The merus is equal in length with the carpus and about 1·2 times as long as the chela; the palm is a little swollen, and is fully 1·5 times as long as the fingers.

The second peraeopods (text-fig. 11*a*) are equal and reach beyond the scale by rather more than the entire length of the chela. The merus is stout, not more than 3·5 times as long as broad, about one-fifth longer than the carpus; it does not possess a spine at its distal end. The carpus is conical, less than 2·5 times as long as its distal breadth. Anteriorly, on the dorsal side, the carpus is feebly furrowed transversely and the distal margin is reflected outwards. The carpus is a little longer than the fingers and is rather less than two-thirds the length of the palm. The chela is massive; the palm is about 2·5 times as long as broad and is 1·75 times the length of the fingers. The tips of the latter are inturned and their inner margins have blade-like cutting edges; on the dactylus there are two small and obscure teeth.

The last three peraeopods are rather stout. The propodites (text-fig. 11*b*) are unarmed except for a spinule at the distal end of the posterior margin; they are from 4·5 to 5 times the length of the dactyli. The dactylus is broad at the base, simple, strongly curved and is partially concealed by long setae springing from the end of the propodus.

The appendix masculina on the endopod of the second pair of pleopods is fully formed; the specimen thus appears to be an adult male. The sixth abdominal somite is less than 1·5 times the length of the fifth. The telson has the usual three pairs of apical spines, but is unarmed on the dorsal surface except for a single spine on the right hand side placed quite close to the apex (text-fig. 11*c*).



TEXT-FIG. 11.—*Palaemonella orientalis* Dana.

a. Second peraeopod.
b. Last two segments of third peraeopod.
c. Tip of telson.

The single specimen is about 9 mm. in total length. In life it was completely transparent.

The specimen agrees almost exactly with Dana's description and differs but slightly from his figures. The principal discrepancies are that in the Indian specimen the mandibular palp is one-segmented, that the exopod of the third maxilliped does not reach so far beyond the end of the antepenultimate segment and that the second peraeopods are rather longer and a little more slender.

The specimens recorded by de Man differ more considerably. According to his description the first legs are much longer, with the carpus longer in relation to the chela. The second peraeopods are also much longer and the fingers bear teeth and are only half the length of the palm. The dactyli of the last three peraeopods are one-third the length of the propodus.

Dana gives the length of the adult female as 8 lines, while a male examined by de Man was 13 mm. in length; the Indian specimen is thus much smaller than any previously referred to the species.

C 353/1. Port Blair, Andamans. S. Kemp, March, 1915. One.

The specimen was obtained at low water on the reef at the northern end of Ross Island and was not associated with a crinoid.

Dana described *P. orientalis* from the Sooloo Sea. The specimens described by de Man were obtained on a crinoid at Amboina.

Genus **Periclimenes** Costa.

1831. *Pelias*, Roux, *Mém. sur les Salicoques*, p. 25 (*nom. praeocc.*).
1846. *Periclimenes*, Costa, *Cat. Crost. Napoli* (unpaged).
1852. *Anchistia*, Dana, *U. S. Explor. Exped., Crust.* I, p. 577.
1860. *Urocaris*, Stimpson, *Proc. Acad. Sci. Philadelphia*, p. 39.
1861. *Dennisia*, Norman, *Ann. Mag. Nat. Hist*, (3), VIII, p. 278.
1902. *Ancylocaris*, Schenkel, *Verhandl. naturf. Ges. Basel* XIII, p. 563.
1915. *Periclimenaeus* and *Periclimenes* with subgenera *Corniger*, *Cristiger* and *Falciger*, Borradaile, *Ann. Mag. Nat. Hist.* (8) XV, p. 207.
1916. *Periclimenes* subgenus *Hamiger*, Borradaile, *Brit. Antarct. Exped.* 1910, *Zool.* III, p. 87.
1917. *Urocaris*, *Ancyclocaris*, *Periclimenes* and subgenera, *Periclimenaeus*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, pp. 353 *et seq.*
1919. *Periclimenes*, subgenera *Laomenes* and *Cuapetes*, Clark, *Proc. Biol. Soc. Washington*, XXXII, p. 199.

In working through the collection of Pontoniinae in the Indian Museum I have reached conclusions regarding the limits of this genus which, as the above references show, differ widely from those expressed by Borradaile in his recent memoir. That *Anchistia* and *Dennisia* are synonymous with *Periclimenes* has long been well established, but the inclusion of other names in the same category requires explanation.

Almost at the beginning of my work I found the greatest difficulty in distinguishing the three genera *Urocaris*, *Ancylocaris* and *Periclimenes*, and it is evident from the literature that others have found themselves in the same position. In Borradaile's key (*loc. cit.*, 1917, p. 346) the three are placed under primary headings, distinguished for the most part by habit of body. Thus in *Urocaris*: "Body very slender and compressed. Sixth abdominal segment much elongate"; in *Ancylocaris*: "Body moderately stout, not compressed. Sixth abdominal segment short"; in *Periclimenes*: "Body never very slender, or much compressed. Sixth abdominal segment never much elongate." The large assemblage of species which these three genera comprise exhibits a very great range of variation in the form of the body and between the most slender and the stoutest every degree of transition can be found. On these grounds it is quite impossible to distinguish separate genera with any certainty. Borradaile himself is inconsistent, for in *P. parasiticus*, which he retains in the genus *Periclimenes*, the habit of body is extremely slender and the sixth abdominal somite

is decidedly longer than in nearly all the species referred to *Urocaris*.

It remains to be seen whether there are any other characters which will justify the retention of *Urocaris* and *Ancylocaris* as separate genera. The type of Stimpson's *Urocaris* is *U. longicaudatus*, from the West Indies. In this species, as in *P. scriptus* (Risso), the type of Costa's *Periclimenes*, the last three peraeopods have biunguiculate dactyli. Several Indo-Pacific species are closely allied to *U. longicaudatus*, but the latter does not possess the antennal spine of the carapace which is present without exception in all other species hitherto referred to *Urocaris*, *Ancylocaris* and *Periclimenes*. On the closest examination and comparison it does not seem possible to separate a group of species to which the name *Urocaris* can be applied and, if the genus is to be retained, it must be monotypic and characterized solely by the absence of the antennal spine of the carapace. It is very difficult to assess the value of a unique character of this kind; but in view of the clear affinity which exists between *U. longicaudatus* and various other species I am of the opinion that *Urocaris* should be regarded as a synonym of *Periclimenes*. An illustration of the impossibility of distinguishing between *Urocaris* and *Periclimenes*, as usually applied, is to be found in a recent paper by Balss, in which the type of the latter genus is redescribed as a new species of the former.

Ancylocaris was erected by Schenkel for a species, *A. brevicarpalis*, which is now known to be commensal with giant anemones of the genus *Discosoma*. The same species has since been described under a variety of specific names; it was referred to the genus *Palaemonella* by Nobili, to *Harpilius* by Lenz, and to *Periclimenes* by Miss Rathbun. It will be seen from Borradaile's key that *Ancylocaris* in reality differs from *Periclimenes* in only one character —that the carapace of the female is strongly swollen dorsally. This feature is well developed only in large females and a slight swelling of the carapace is not infrequently seen in normal *Periclimenes*. Moreover, in a species described in this paper which is also commensal with *Discosoma*, the carapace is not at all swollen, though in all other respects it shows an extremely close affinity wih *A. brevicarpalis*. There is thus clear proof that the swollen carapace of the female in *A. brevicarpalis* is not a character of generic value. As will be seen further on, the name *Ancylocaris* may be employed in a new sense for a subgenus of *Periclimenes*.

It may here be pointed out that the extent to which the outer antennular flagellum is cleft—a character to which Borradaile attributes importance—cannot be used, at any rate in the *Periclimenes* group, for the separation of genera. In *Periclimenes* there is a small and rather clearly defined group of species inhabiting water of moderate or great depth and the four known representatives of this group agree among themselves even in a peculiar disposition of teeth in the second pair of chelae. In two of them (*P. latipollex* and *P. laccadivensis*) the outer antennular flagellum is

deeply cleft, with the free portion of the shorter ramus longer than the fused basal part: in a third (*P. lanipes*) the free portion is slightly shorter than the fused part: in the fourth (*P. alcocki*) the flagellum is scarcely cleft at all, the free portion of the shorter ramus being less than one-third the length of the fused basal part.

Urocaris and *Ancylocaris* are thus, in my opinion, to be regarded as synonyms of *Periclimenes*.

As regards the subdivision of the large assemblage of forms included in the genus, it will be observed that Borradaile in 1915 proposed four subgenera, *Ensiger*, *Corniger*, *Cristiger* and *Falciger* and in 1916 added a fifth, *Hamiger*. Two of these terms are preoccupied as genera, and Mr. Austin H. Clark, who does not seem hitherto to have interested himself in carcinology, has felt it necessary to substitute others.

The subgenus *Ensiger* includes only Dana's *Anchistia aurantiaca*, a species of doubtful affinity which has not been examined since 1852. From the original account it is not even certain that the species belongs to the subfamily Pontoniinae, for the telson is described as "a little hairy at tip, with two short spines." Any decision as to the proper position of *Ensiger* must therefore be postponed until the type-species has been rediscovered.

Borradaile refers the great majority of the species which he includes in *Periclimenes* to the subgenera *Cristiger* and *Falciger*. He separates the two (*loc cit.*, 1917, p. 360) by a number of features, but it will be seen that the only absolute criterion for their discrimination lies in the form of the rostrum, which is stated to be convex in the former and straight or concave in the latter. This character is one of very little value. In determining the specimens in the Indian Museum I have made every endeavour to separate the species on the lines which Borradaile advocates, but have been forced to the conclusion that the division he recommends, even if it were possible in practice, tends only to obscure the real affinities of the species. The two Mediterranean species, *P. amethysteus* and *P. scriptus*, are so far as I am aware distinguished from one another only by colour, yet Borradaile refers the former to the subgenus *Falciger* and the latter to *Cristiger*.

The subgenus *Hamiger* is without doubt synonymous with *Periclimenaeus*, the position of which is discussed below.

To the curious little group of species in which the cornea is conoidal and pointed anteriorly Borradaile has applied the subgeneric name *Corniger*; but the character, though an interesting one, does not in my opinion, possess the importance that he attributes to it. In the collection on which this paper is based I have found one specimen with a conoidal cornea; but though in this respect it resembles the forms that Borradaile refers to *Corniger*, it is otherwise very different, for it possesses neither hepatic nor supra-orbital spines. It is unfortunately impossible to draw up a specific description from this individual, as it is without locality and is much damaged, possessing only the first pair of legs. The existence of such a form seems, however, to indicate that the

species with a conoidal cornea do not necessarily form a natural group.

Elsewhere in the genus *Periclimenes* other modifications of the eye are sometimes found. In *P. seychellensis* there is a papilla on the eyestalk and in two of the three species of *Periclimenaeus* the cornea has a circular cup-shaped depression. The evidence we possess at present tends to show that the structure of the eye, when unsupported by other characters, does not afford a valid basis for subgeneric division.

For these reasons I am unable to accept the subgenera proposed by Borradaile. I recommend instead an arrangement in which the primary division is based on the structure of the dactyli of the last three pairs of peraeopods, whether simple or with an accessory lobe or claw. The structure of the dactyli in these limbs is of generic importance in the more highly specialized Pontoniinae and the character is of established value in other Caridea.

Whether the arrangement leads to a natural grouping of the species on a phylogenetic basis, is a question that cannot be answered in the present state of our knowledge. I incline to the view that it does. In some species, however, the additional dactylar claw is reduced to a mere process or lobe,[1] and there is thus a possibility that certain specialized species in which the dactylus is simple may have been derived from forms in which it was once biunguiculate.[2]

In *P. scriptus*, the type-species of *Periclimenes*, the dactyli are biunguiculate, and the subgenus to which this species belongs may thus be termed *Periclimenes s.s.* For the more primitive forms with simple dactylus Schenkel's *Ancylocaris* may be employed, though in a different sense to that in which it has hitherto been used.

Borradaile's *Periclimenaeus*, of which his *Periclimenes* subgen. *Hamiger* is a synonym, is at most a subgenus of *Periclimenes*. In the three known species the dactyli of the hinder peraeopods are biunguiculate, thus resembling *Periclimenes s.s.*, but the hepatic spine of the carapace, which is invariably present in the latter, is here absent. The chelae of the second peraeopods are more massive in *Periclimenaeus* than in *Periclimenes s.s.*, though the species of the latter subgenus exhibit a very great range of variation in this respect.

The characters of the three subgenera that I propose may be summarized thus:—

Dactyli of last three peraeopods biunguiculate or with an accessory process or lobe behind terminal claw.	[139.
Hepatic spine present	*Periclimenes s.s.*, p.
Hepatic spine absent	*Periclimenaeus*, p. 166.
Dactyli of last three peraeopods simple [Hepatic spine usually present]	*Ancylocaris*, p. 167.

[1] e.g., *Periclimenes rex* and *P. noverca*.
[2] Of this *P. frater* is perhaps an example.

Under the subgeneric headings synoptic tables to the majority of the known species will be found. In *Periclimenes s.s.* 20 species are recognised, in *Periclimenaeus* 3 species and in *Ancylocaris* 44 species. The following are omitted from these tables:—

Anchistia aurantiaca Dana, *U. S. Explor. Exped., Crust.* I, p. 581, pl. xxxviii, figs. *2a–d* (1852).

The generic position of this species is very doubtful and it is not certain that it belongs to the Pontoniinae. The mouth-parts have apparently not been examined and the telson is described as "a little hairy at tip, with two short spinules." Dana's specimens were found at the Fiji Is.

Anchistia danae Stimpson, *Proc. Acad. Sci. Philadelphia*, 1860, p. 108.

This species, from Tahiti, will probably never be recognized with certainty. There is no description of the second peraeopods and it is uncertain whether the posterior dactyli are simple or biunguiculate. The specimens doubtfully referred to this species by Borradaile[1] perhaps belong to the *P. grandis* section of *Ancylocaris*, but the description is insufficient.

Anchistia brachiata Stimpson, *loc. cit. supra*, p. 108.

Found at Port Lloyd in the Bonin Is. There is no description of the last three peraeopods.

Anchistia notata Heller, *Crust. 'Novara' Exped.*, p. 109, pl. x, fig. 3 (1865).

Described from a specimen without the second peraeopods obtained at the Nicobars.

Periclimenes parasiticus Borradaile, *Ann. Mag. Nat. Hist.* (7) II, p. 384 (1898) and in Willey's *Zool. Results*, p. 407, pl. xxxvi, fig. 4 (1899); Nobili, *Ann. Mus. civ. Genova* (2) XX, p. 235 (1899).

The description of this species is most inadequate. I examined the type-specimens in the Cambridge Museum, but found that all the legs were missing except those of the first pair. The species was found at New Britain on a black starfish belonging to the genus *Linckia*.

Periclimenes hertwigi and *gorgonidarum* Balss, *Abhandl. math.-phys. Kl. K. bayer. Akad. Wiss.* Suppl. Bd. II, pp. 49-52, text-figs. 28-32 (1914).

Further particulars of these two remarkable species are required before their position can be determined. It is possible, as Borradaile has remarked, that they do not belong to the Pontoniinae.

[1] Borradaile, *Proc. Zool. Soc. London*, 1898, p. 1004, pl. lxiii, figs. 4, 4*a*, *b*.

Periclimenes beaufortensis Borradaile, *Ann. Mag. Nat. Hist.* (9) V, p. 132 (1920).

According to the description this species does not possess exopods on the second and third maxillipeds. It cannot therefore be retained in the genus *Periclimenes*, but belongs in all probability to *Pontonides* (see p. 266).

Periclimenes tenuipes Leach.

Nobili's statement that Leach described a Mediterranean species under this name is erroneous (*v. infra*, p. 223).

Subgenus **Periclimenes**, *sensu stricto.*

The accessory claw or process found on the dactyli of the last three peraeopods in this subgenus is, I presume, to be regarded as a sign of specialization; *Periclimenes s.s.* is thus less primitive than *Ancylocaris*.

The species included in the subgenus exhibit great variation in habit of body. Some, such as *P. longicaudatus* are extremely slender in build, while others, such as *P. lanipes*, are remarkably stout. *P. scriptus*, the type of the subgenus, is intermediate in form, without any strongly marked characters, and it appears to me probable that it is from some such species as this that the remainder have evolved.

P. latipollex, *P. laccadivensis*, *P. alcocki* and *P. lanipes* form a rather distinct section of the subgenus, distinguished by the tooth and socket arrangement in the dentition of the fingers of the second leg. *P. soror* and *P. noverca* differ from all other species of the subgenus in the possession of a series of fine teeth on the edges of the fingers of the first leg. In this they resemble *P. spiniferus*, *P. petitthouarsi* and *P. denticulatus*,[1] which belong to the subgenus *Ancylocaris*. I think it most improbable that there is any real affinity between these two groups of species and regard the similarity in structure of the fingers of the first leg as an instance of convergence.

Certain species possess characters which are unique in the genus: *P. longicaudatus* has no antennal spine, *P. aesopius* has a large compressed tooth on the third abdominal somite and in *P. investigatoris* the lateral process of the antennule is of abnormal length.

[1] The same character is also found in *P. frater*. Borradaile considers this species to be a close ally of *P. soror*, but the dactylus is said to be simple and I have consequently included it in the subgenus *Ancylocaris*. In *P. noverca* the accessory claw of the dactylus is reduced to a mere lobe and it is easy to understand how this lobe might disappear altogether by further modification along the same lines. If Borradaile's views on the relationships of *P. frater* are correct, the species has presumably been evolved from one with biunguiculate dactyli and has no affinity with the more primitive forms included in the subgenus *Ancylocaris*. The position of the species thus requires further consideration.

Key to the species of the subgenus *Periclimenes*.

A. Supra-orbital spine absent.
  B. Antennal spine absent; R. 7–8 : 1–2 ... *longicaudatus* (Stimpson).

  B'. Antennal spine present.
    C. Third abdominal somite produced backwards over fourth in the form of a large compressed tooth; R. 9–11 : 2 ... ... *aesopius* (Bate).
    C'. Third abdominal somite little produced posteriorly.
      D. Fingers of chela of first leg unarmed.
        E. Lateral process of antennular peduncle of normal length, not reaching beyond middle of basal segment.
          F. Second leg with carpus more than one-third length of palm.
            G. One or more upper rostral teeth situated on carapace behind posterior limit of orbit.
              H. Dactylus of last three legs slender, at least 4 times as long as broad.
                J. Posterior dorsal tooth of rostrum separated from next by a wide interval; carpus of second leg much more than half as long as palm.
                  K. Upper border of rostrum very strongly arched, with ventral teeth placed close to apex below or in advance of foremost dorsal tooth; fingers of second leg as long as palm.
                    R. 6–8 : 1–2 ... ... *infraspinis* (Rathbun).
                    R. 9–11 : 1–3 ... ... *indicus* (Kemp).
                  K'. Upper border of rostrum only a little convex, with ventral teeth placed behind foremost of dorsal series; fingers of second leg usually shorter than palm; R. 7–10 : 1–2 ... ... *obscurus*, sp. nov.
                J'. Posterior dorsal tooth of rostrum not separated from second by a wider interval than that between second and third, carpus of second leg about half as long as palm.
                  K. Abdomen transversely banded and blotched with red; R. 8–10 : 2–4 ... ... *scriptus* (Risso).
                  K'. Abdomen longitudinally striped with violet; R. 8 : 4 ... *amethysteus* (Risso).
              H'. Dactylus of last three legs stout, less than 4 times as long as broad [posterior dorsal tooth of rostrum not separated from second by a wider interval than that between second and third]; R. 9 : 2 ... ... *impar*, sp. nov.
            G'. No teeth of upper rostral series situated on carapace behind orbit.
              H. Rostrum deep, downcurved; apex of antennal scale broadly rounded; R. 6 : 1 ... ... *parvus* Borr.
              H'. Rostrum shallow, straight; apex of antennal scale sharply rounded; R. 6 : 1 ... ... *incertus* Borr.

F'. Second leg with carpus one-third or less than one-third length of palm.
G. Rostrum with at most 10 dorsal teeth.
H. Fingers of second leg more than half as long as palm, ? without teeth on inner margins [merus of second leg with tooth at end of lower border]; R. 6 : 1 ... ... *gracilis* (Dana).
H'. Fingers of second leg half or less than half as long as palm, dactylus with a tooth fitting into a cavity in fixed finger.
J. Rostrum straight or upturned; merus of second leg unarmed; last three legs slender with merus unarmed and without thick hair.
K. Fused portion of outer antennular flagellum short; second legs smooth; two pairs of spines on back of telson.
L. Hepatic spine on a level with antennal; dactylus of second leg flanged externally; R. 7–8 : 2–3 ... ... *latipollex*, sp. nov.
L'. Hepatic spine below level of antennal; dactylus of second leg not flanged externally; R. 10 : 2–3 ... ... *laccadivensis* (Alc. and And.).
K'. Fused portion of outer antennular flagellum very long; second legs minutely tuberculate; four pairs of spines on back of telson; R. 9 : 3 ... .. *alcocki*, sp. nov.
J'. Rostrum downcurved; merus of second leg with tooth at end of lower border; last three legs stout, inferior margin of merus with spinules and distal tooth, propodus densely clothed with hair; R. 8–9 : 0–1 ... ... *lanipes*, sp. nov.
G'. Rostrum with 23 dorsal teeth, lower border unarmed ... .. *rex*, sp. nov.
E'. Lateral process of antennular peduncle abnormally long, reaching distal end of basal segment; R. 9 : 1 ... ... *investigatoris*, sp. nov.
D'. Each finger of chela of first leg with inner margin finely pectinate.
E. Second leg with merus unarmed and fingers one-third length of palm; no tooth at distal end of merus of last three legs; R. 11–13 : 0 ... ... *soror* Nobili.
E'. Second leg with merus armed with a tooth at distal end of lower border and with fingers more than half as long as palm; a tooth at distal end of merus of last three legs; R. 7 : 0 ... ... *noverca*, sp. nov.
A'. Supra-orbital spine present; R. 5 : 2... ... *commensalis* Borr.

Periclimenes (Periclimenes) longicaudatus (Stimpson).

1860. *Urocaris longicaudatus*, Stimpson, *Proc. Acad. Sci. Philadelphia*, p. 39.

1900. *Urocaris longicaudata*, Rathbun, *Proc. Washington Acad. Sci.* II, p. 155.
1902. *Urocaris longicaudata*, Rathbun, *Bull. U. S. Fish Comm.* XX, ii, p. 126.
1918. *Urocaris longicaudata*, Hay and Shere, *Bull. U. S. Bur. Fisheries* XXXV, p. 394.

This species, which is the type of Stimpson's genus *Urocaris*, inhabits the West Indies and the adjacent coasts of America as far south as Brazil. The specimens I have examined are from Punta Rassa in Florida.

The anterior margin of the carapace, immediately below the orbit, projects in the form of a long strap-shaped process with rounded apex. This projection is homologous with the less prominent infra-orbital lobe found in many related species and is imperfectly described by Miss Rathbun (*loc. cit.*, 1902) as a 'rounded extra-orbital tooth.' The antennal spine which usually arises from the vicinity of the lower limit of the infra-orbital lobe is completely absent in *P. longicaudatus*, though it appears to be present in all other known representatives of the subgenus *Periclimenes*.

Periclimenes aesopius (Spence Bate).

1864. *Anchistia aesopia*, Spence Bate, *Proc. Zool. Soc. London*, 1863, p. 502, pl. xli, fig. 5.
1917. *Urocaris aesopius*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 354.

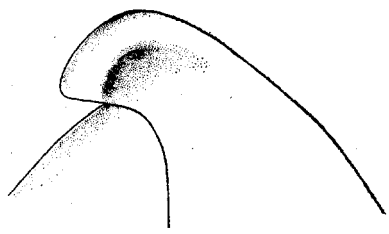
Through the kindness of the authorities of the British Museum I have been able to examine the types of this remarkable species which has apparently not been rediscovered during the past fifty years. There are two specimens, one complete and one which has been dissected and is in a fragmentary condition.

The rostrum is slender and straight, with the ventral portion below the midrib greatly reduced. On the upper margin there are 9 or 11 teeth, the three hindmost placed on the carapace behind the orbit. On the lower margin there are two small teeth near the apex and behind these teeth a fringe of very long plumose setae.

The carapace is prominently angled below the orbit. There are antennal and hepatic spines, the latter on a lower level than the former.[1] The eyes are slender, with stalk fully twice the length of the cornea. The lateral process of the antennule is short, not reaching the middle of the basal peduncular segment. The anterior margin of this segment external to the insertion of the second segment is greatly produced, as shown in Bate's figure, reaching the end of the second segment and extending far beyond the spine that terminates the outer margin. The antennal scale is unusually broad distally; it is about two and a half times as long as wide, with the terminal spine not reaching the end of the lamella.

[1] The position given to these spines in Spence Bate's figure is erroneous.

The first peraeopods reach the end of the scale. The carpus is shorter than the merus and only three-quarters the length of the chela. The fingers are unarmed and are longer than the palm. On the outer edge of the fixed finger there are some tufts of hairs. The second peraeopods reach beyond the scale by almost the entire length of the chela. The merus is unarmed and 1·5 times as long as the carpus. The carpus is conical and about 3 times as long as its distal width. The chela is 2·5 times as long as the carpus and rather more than 4 times as long as wide; the fingers are unarmed, a little shorter than the palm.



TEXT-FIG. 12.—*Periclimenes aesopius* (Sp. Bate).

Dorsal parts of third and fourth abdominal somites in lateral view.

The third peraeopods reach the end of the scale. The propodus in all three pairs is provided with spinules on its posterior border and is about 4 times the length of the dactylus. The dactylus is biunguiculate, with a deep and narrow cleft between the two claws.

The form of the remarkable compressed tooth which projects backwards from the third abdominal somite is shown in text-fig. 12. I know nothing resembling it in any other species of the genus. The sixth abdominal somite is 2·3 times the length of the fifth. The anterior pair of dorsal spinules of the telson are placed in the middle of its length. As usual there are two spines, one of which is movable, at the end of the external margin of the outer uropod.

If the complete specimen were straightened out it would probably be about 24 mm. in length.

The structure of the apex of the telson and of the mandibular palp (found loose in the tube containing the specimens) afford proof that the species belongs to the Pontoniinae. It must certainly be referred to the genus *Periclimenes* in which, however, by reason of the characters of the basal segment of the antennular peduncle and third abdominal somite, it occupies a very isolated position.

The two specimens were found in the Gulf of St. Vincent, S. Australia (Angas coll.).

Periclimenes (Periclimenes) infraspinis (Rathbun).

1902. *Urocaris infraspinis*, Rathbun, *Proc. U. S. Nat. Mus.* XXIV. p. 903.
1904. *Urocaris infraspinis*, Rathbun, *Harriman Alaska Exped.* X. p. 31, text-figs. 10*a*, *b*.
1921. *Urocaris infraspinis*, Schmitt, *Univ. Calif. Publ., Zool.* XXIII. p. 37, fig. 22.

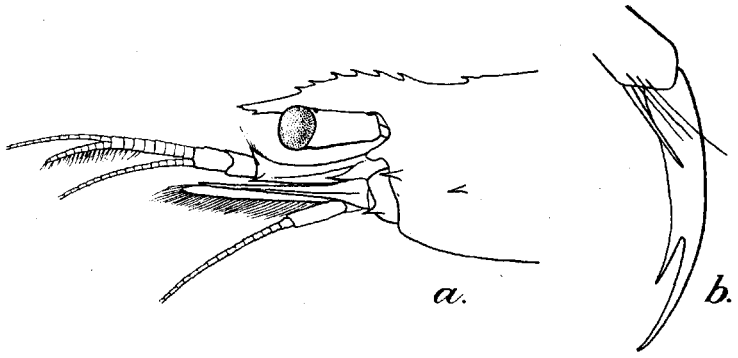
California, Pacific coast of Mexico.

Periclimenes (Periclimenes) indicus (Kemp).

1915. *Urocaris indica*, Kemp, *Mem. Ind. Mus.* V, p. 275, pl. xiii, fig. 9, text-fig. 26.

A comparative statement of the principal differential characters of *P. indicus* and *P. infraspinis* will be found under the above reference (p. 278).

So far as is known at present *P. indicus* is restricted to the coasts of the Indian Peninsula. It is known from the Chilka Lake in Orissa, from Ennûr backwater and the Adyar River near Madras and from Pamban and Kilakarai at the upper end of the Gulf of Manaar. The species is estuarine as well as marine and in places like the Chilka Lake, where there are great seasonal changes in salinity, has been found in fresh water.



TEXT-FIG. 13.—*Periclimenes indicus* (Kemp).
a. Anterior part of carapace and rostrum.
b. Dactylus of fifth peraeopod.

I have no additional records of this species, but give further figures of the rostrum and dactylus of the last leg for comparison with *P. obscurus*.

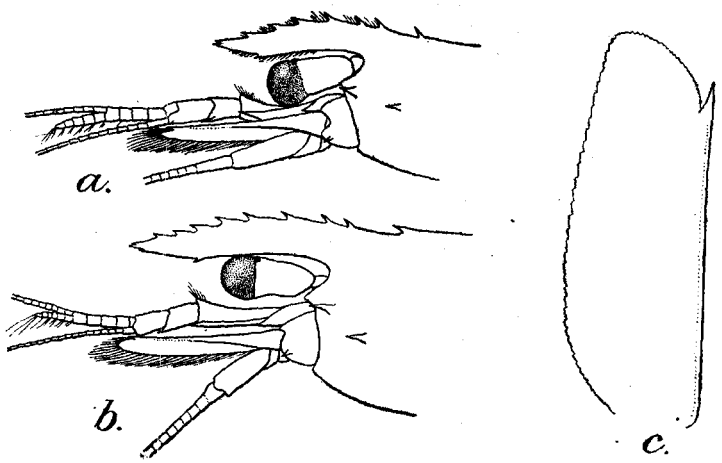
Periclimenes (Periclimenes) obscurus, sp. nov.

The rostrum is longer in females than in males. In the former sex (text-fig. 14*b*) it extends beyond the end of the antennular peduncle, usually reaching the end of the antennal scale, while in the latter (text-fig. 14*a*) it reaches only to the middle or end of the second antennular segment. The upper portion of the blade is convex, but does not take the form of the strongly arched lamella found in *P. indicus*. On the upper border there are from 7 to 10 teeth, usually 8 or 9[1]; the hindmost of these is separated by a considerable interval from the next of the series, but is always situated further forwards than in *P. indicus*. The remaining dorsal teeth are more or less evenly spaced and

[1] Of thirty-three specimens five have 7 dorsal teeth, twelve have 8, twelve have 9 and four have 10.

extend to the tip, the second being above or slightly behind the posterior limit of the orbit. The lower border of the rostrum bears 1, rarely 2 teeth[1] which are rather larger than those of *P. indicus* and occupy a different position. In *P. indicus* there are as a rule 2 very small teeth, the hindmost of which is placed below or in advance of the foremost tooth of the dorsal series, whereas the single tooth usually found in *P. obscurus* is placed much further back, with at least one, often with two or three dorsal teeth in advance of it.

In the antennules and antennae there is little difference between the two species, but in *P. obscurus* the antennal scale (text-fig. 14*c*). is rather less parallel-sided than in *P. indicus* and the



TEXT-FIG. 14.—*Periclimenes obscurus*, sp. nov.

a. Anterior part of carapace of male.
b. The same parts of female.
c. Antennal scale.

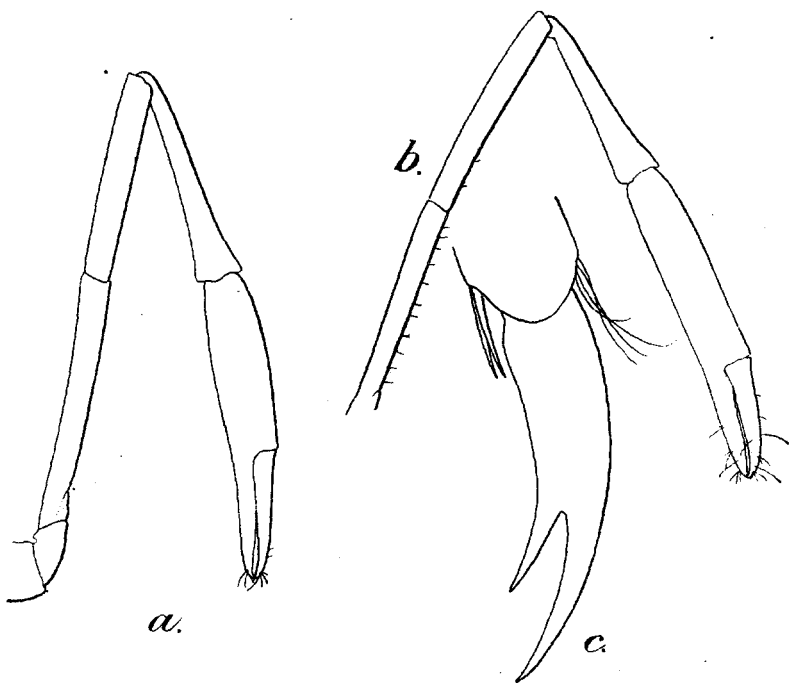
fused portion of the outer antennular flagellum is shorter and composed of only 4 or 5 segments.

The mouth-parts, maxillipeds and first peraeopods do not exhibit any distinctions worthy of note. The second peraeopods are often a little unequal and show much variation in the proportionate lengths of the segments. As in *P. indicus* they are unarmed. In ovigerous females (text-fig. 15*b*) the carpus is slightly shorter than, as long as, or rather longer than the palm. In males (text-fig. 15*a*) it is sometimes longer than the palm, rarely shorter than it, while young individuals not infrequently resemble *P. indicus* in having the carpus as long as the chela. The fingers are as a rule clearly shorter than the palm, thus differing from those of *P. indicus* which are always fully as long as the palm. In young specimens, however, and rarely in full-grown females the dactylus

[1] Of thirty-three specimens thirty-one have a single ventral tooth and two have 2 ventral teeth.

is equal in length with the palm. The fingers are usually unarmed, but sometimes an obscure tooth is found on each, that on the fixed finger in advance of that on the dactylus.

The last three peraeopods are for the most part similar to those of the allied species. The dactylus, however, is shorter; it is from 4 to 4·5 times as long as its basal breadth, whereas in *P. indicus* it is from 5·5 to rather more than 6 times (*cf.* text-figs. 13*b* and 15*c*). No clear distinctions are to be found in the abdomen, telson or uropods.



TEXT-FIG. 15.—*Periclimenes obscurus*, sp. nov.
a. Second peraeopod of a male. *b*. Second peraeopod of a female.
c. Dactylus of fifth peraeopod.

Large specimens reach a length of about 17 mm.

C 345–6/1.	Springhaven, Madras Harbour.	S. Kemp, May, 1918.	Twenty-four, including TYPES.
C 347–1/1.	Ennur backwater, near Madras.	N. Annandale, Sept., 1915.	Nine.

The specimens from Springhaven were taken swimming round buoys and piles encrusted with sponges, hydroids and other marine organisms. Those from Ennur backwater were found in company with *P. indicus*, from which they were easily distinguished by the well-marked rostral characters.

Periclimenes (Periclimenes) scriptus (Risso).

1916. *Urocaris de Mani*, Balss, in Michaelsen's *Beitr. Kennt. Meeresfaun West-afrikas* II, p. 29, text-fig. 10.
1917. *Periclimenes (Cristiger) scriptus*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 362 (*synon.*).

I am unable to find in Balss' description any character which will distinguish his *Urocaris de Mani* from *P. scriptus*, the type of the genus *Periclimenes*.

P. scriptus is common in the Mediterranean and has been found at the Channel Is.; if I am right regarding the identity of the specimen described by Balss its distribution extends southwards along the West African coast to French Congo.

Periclimenes (Periclimenes) amethysteus (Risso).

1826. *Alpheus amethystea*, Risso, *Hist. nat. Europe Mérid.* V, p. 77, pl. iv, fig. 16.
1863. *Anchistia amethystea*, Heller, *Crust. südlich. Europa*, p. 258.
1917. *Periclimenes (Falciger) amethysteus*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 370.

Other references are given by Borradaile. The original description is based entirely on colour and I know of no other character by which the species can be separated from *P. scriptus*. Heller's account of the colouration differs considerably from that given by Risso and the only definite points of distinction appear to be those which I have noted above in the key to the species of the subgenus. At the Oceanographical Museum at Monaco I have examined specimens from Bône, in Algeria, which bore the name *amethysteus*, but was unable to find any difference in structure from *P. scriptus*. The validity of the species must remain uncertain until fresh information based on living material is forthcoming.

P. amethysteus is known only from the Mediterranean.

Periclimenes (Periclimenes) impar, sp. nov.

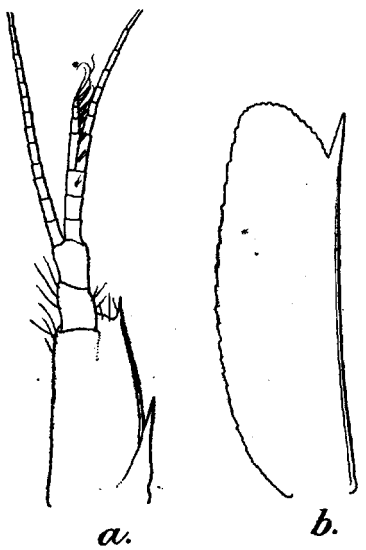
(Plate III, fig. 1.)

This species is allied to the four preceding forms but differs in the much broader dactylus of the last three pairs of legs.

The rostrum is a little longer than the antennular peduncle, but does not reach the end of the antennal scale. The upper margin is convex and in the single specimen examined bears 9 more or less evenly spaced teeth. The hindmost tooth is placed on the carapace behind the orbit but is not separated from the second by a greater distance than that between the second and third. The middle teeth of the dorsal series are the largest. On the lower border there are 2 teeth, placed near the tip, and the margin from the posterior tooth to the base is nearly straight.

There is no supra-orbital spine. The antennal spine is sharp with the hepatic behind it but on a lower level. The eyes are rather stout and the ocular spot touches the cornea.

The lateral process of the antennule (text-fig. 16*a*) reaches about to the middle of the basal segment; the spine at the end of the external margin extends beyond the middle of the second segment. The second and third segments are together less than half as long as the basal segment. The free portion of the shorter ramus of the outer flagellum is longer than the fused part, the latter comprising only 3 segments. The antennal scale (text-fig. 16*b*) is about 3·2 times as long as broad; the outer margin is slightly concave and terminates in a spine which reaches almost to the end of the lamella.



TEXT-FIG. 16.—*Periclimenes impar*, sp. nov.
a. Antennule.
b. Antennal scale.

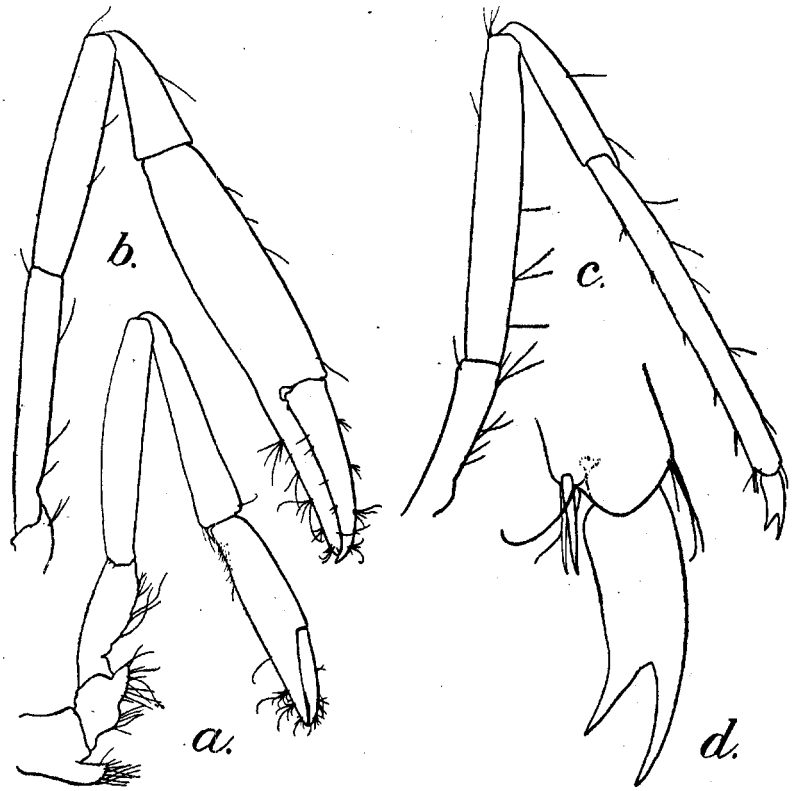
The first peraeopods (text-fig. 17*a*) reach about to the end of the scale. The coxopodite has the usual ventral process and a similar process, much better developed than in allied species, is present on the basipodite. The carpus is equal in length with the chela and is a little shorter than the merus; the fingers are unarmed and are nearly three-quarters the length of the palm.

The second peraeopods are unarmed and are unequal and dissimilar, both reaching considerably beyond the end of the scale. In the larger limb (text-fig. 17*b*) the merus and ischium are subequal. The carpus is conical, about 2·3 times as long as its distal breadth, and is half the length of the palm and rather more than half the length of the merus. The chela is somewhat swollen, with fingers about two-thirds as long as the palm. In the middle of the cutting edge of each finger there is a shallow excavation bounded at either end by a small tooth; the fingers in consequence gape a little when they are closed. In the smaller limb the carpus is much longer, only a little shorter than the palm and three-quarters the length of the merus; it is at least four times as long as its distal breadth.

The third peraeopods reach about to the end of the basal segment of the antennule. The propodus in all the last three pairs (text-fig. 17*c*) bears spinules on its posterior margin and is from 5·5 to 6 times as long as the dactylus. The dactylus itself (text-fig. 17*d*) is biunguiculate with a rather wide excavation between the two claws. It is considerably broader than in any of

the allied species, the length from the base to the bottom of the cleft being only twice the basal breadth.

The sixth abdominal somite is less than twice the length of the fifth. The anterior pair of dorsal spinules of the telson are placed in the middle of its length, the posterior pair midway between the anterior and the apex. The external margin of the outer uropod is ciliated.



TEXT-FIG. 17.—*Periclimenes impar*, sp. nov.

a. First peraeopod. *c*. Third peraeopod.
b. Larger second peraeopod. *d*. Dactylus of third peraeopod.

The species is described from a single ovigerous female about 10 mm. in length.

C 348/1. Port Blair, Andamans, 5 fms. S. Kemp, March, 1915. One, TYPE.

The specimen was found on a sponge of a pinkish colour and was transparent when alive with reddish patches on the abdominal pleura.

Periclimenes (Periclimenes) parvus Borradaile.

1898. *Periclimenes parvus*, Borradaile, *Ann. Mag. Nat. Hist.* (7) II, p. 384.

1899. *Periclimenes parvus*, Borradaile, in Willey's *Zool. Results*, p. 407, pl. xxxvi, fig. 3.

New Britain.

Periclimenes (Periclimenes) incertus, Borradaile.

1915. *Periclimenes (Cristiger) incertus*, Borradaile, *Ann. Mag. Nat. Hist.* (8), XV, p. 210.

1917. *Periclimenes (Cristiger) incertus* Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 364, pl. liii, fig. 7.

I have examined the types of this species and of *P. parvus* and agree with Borradaile that they are specifically distinct. In addition to the characters which he has mentioned, the carpus of the second peraeopod is proportionately longer in *P. incertus* and the apex of the antennal scale more sharply rounded. In both species the foremost pair of spines on the dorsum of the telson is placed at about the middle of its length.

P. incertus was found at the Maldive Is.

Periclimenes (Periclimenes) gracilis (Dana).

1852. *Anchistia gracilis*, Dana, *U. S. Explor. Exped., Crust.* I, p. 578, pl. xxxvii, figs. 5*a–m*.

Judging from Dana's figures this species, the type of the genus *Anchistia*, will fall in the subgenus *Periclimenes*, but its position is a little doubtful, for the accessory tooth on the dactylus of the posterior legs is not mentioned in the description and according to figure 5*l* it is articulated at the base.

The lamella of the antennal scale is shown to be acutely pointed anteriorly in fig. 5*a*, but this is probably an error.

P. gracilis is recorded by Dana from the Sooloo Sea.

Periclimenes (Periclimenes) latipollex, sp. nov.

(Plate IV, fig. 3.)

The rostrum is very slender, straight in its proximal part and trending very slightly upwards at its distal end. It reaches a little beyond the apex of the antennal scale and is armed above with 7 or 8 teeth, of which the posterior 2 or 3 are situated on the carapace behind the orbit. The posterior tooth is not widely separated from the second. Towards the apex the teeth are more distantly spaced than at the base, but in both the specimens with complete rostra the distribution is somewhat irregular. On the lower edge of the rostrum in its distal half there are 3 teeth.

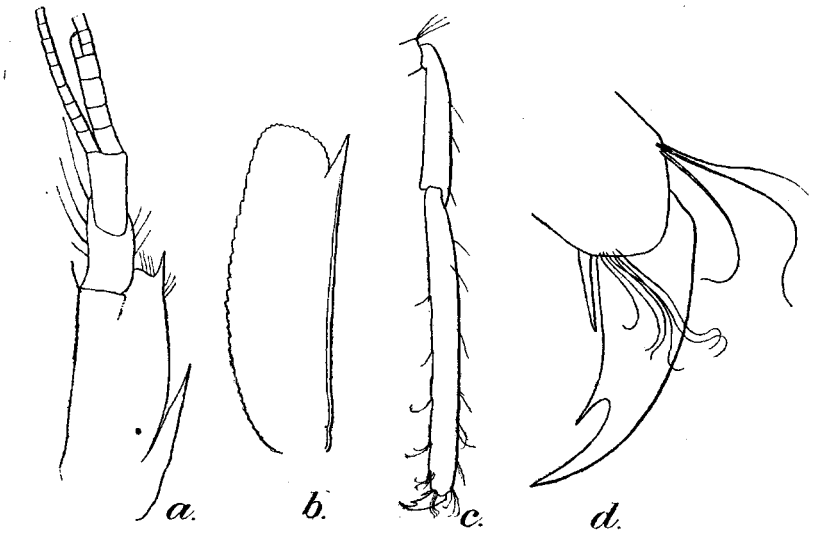
The supra-orbital spine is wanting. The hepatic spine is placed on a level with the antennal. The lobe on the frontal edge forming the lower limit of the orbit is acute. The ocular spot is merged in the cornea and can only be distinguished with difficulty.

The spine at the outer distal end of the basal segment of the antennular peduncle (text-fig. 18*a*) is long; the lateral process reaches about to the middle of the segment. The fused portion

of the outer antennular flagellum is composed of three or four segments and is about two-thirds the length of the free portion of the shorter ramus. The antennal scale (text-fig. 18*b*) is rather more than 3 times as long as wide (in an adult female); its outer margin is slightly concave and terminates in a spine which reaches as far forwards as the lamella.

The third maxilliped bears an arthrobranch; the ultimate segment is considerably shorter than the antepenultimate. The first peraeopod reaches beyond the scale by the length of the fingers. The carpus is much shorter than the merus and slightly shorter than the chela. The fingers are unarmed and about two-thirds the length of the palm.

The second peraeopods are equal or subequal and reach beyond



TEXT-FIG. 18.—*Periclimenes latipollex*, sp. nov.

a. Antennule.
b. Antennal scale.
c. Last two segments of third peraeopod.
d. Dactylus of third peraeopod.

the scale by the whole length of the chela. Both merus and carpus are unarmed. The merus is nearly twice the length of the ischium; the carpus is conical, about 1·5 times as long as broad and scarcely one-fifth the length of the chela. The chela is as long as the three preceding segments combined and much exceeds the carapace-length; the palm is from 2·2 to 2·7 times the length of the dactylus and is from 4·5 to 5 times as long as broad. The fixed finger has a cutting edge armed in its proximal half with three small teeth and on the dactylus there is a cutting edge with a single basal tooth. When the claw is closed the cutting edges do not coincide but slide past each other like the blades of a pair of scissors, the single tooth on the dactylus fitting into a recess in the fixed finger. The tip of each finger is provided with an inturned

claw. On the external side of the dactylus there is a thin blade or flange which runs the whole length of the segment and is somewhat reflected outwards; from certain points of view the dactylus thus appears very broad.

The last three peraeopods are comparatively stout; the third reach beyond the scale by about twice the length of the dactylus. The merus is about 9 times as long as broad. The propodus (text-fig. 18*c*) bears some setae and a few fine spinules on its posterior border and is from about 6·5 to 7 times as long as the dactylus. The latter segment (text-fig. 18*d*) is rather broad and the accessory tooth is small.

The sixth abdominal somite is half as long again as the fifth. The foremost of the two pairs of spinules on the upper surface of the telson is placed a little in front of the middle of the telson-length, the second midway between it and the apex.

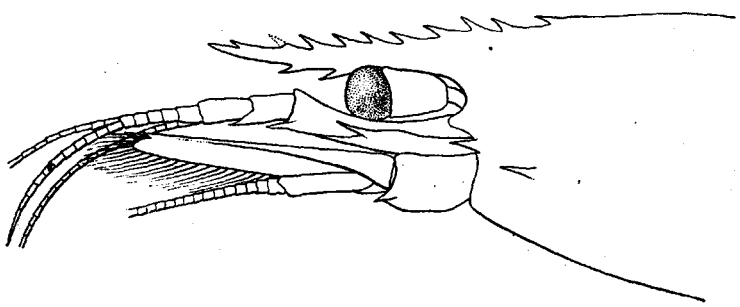
The largest specimen, an ovigerous female, is about 16 mm. in length.

C 349/1.	Mergui Archipelago, 62 fms.; 12°15′20″N., 97°10′10″E.	'Investigator,' April, 1913.	Three (two ovig. ♀). TYPES.

Periclimenes (Periclimenes) laccadivensis (Alcock and Anderson).

1894. *Palaemonella laccadivensis*, Alcock and Anderson, *Journ. Asiat. Soc. Bengal* LXIII, p. 157.
1896. *Palaemonella laccadivensis*, Alcock and Anderson, *Illust. Zool. 'Investigator,' Crust.* pl. xxvi, fig. 4.
1901. *Palaemon (Brachycarpus) laccadivensis*, Alcock, *Cat. Ind. Deep-Sea Crust. Decap. Macrura and Anomala*, p. 138 (*in part*).
? 1906. *Palaemonella laccadivensis*, Rathbun, *Bull. U. S. Fish Comm.* XXIII, iii, p. 925.
1917. *Palaemonella laccadivensis*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 358.

This species, originally described as a *Palaemonella* and subsequently transferred by Alcock to *Brachycarpus*, belongs in reality



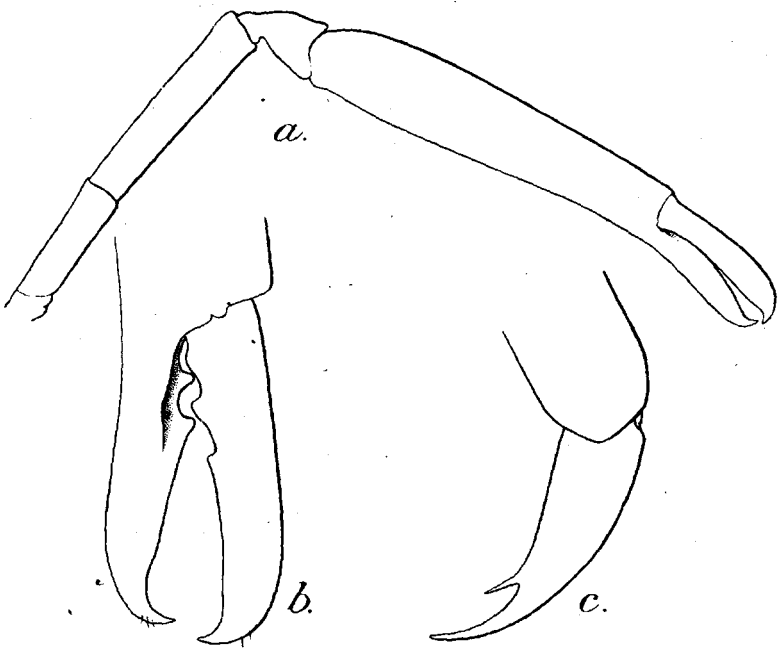
TEXT-FIG. 19.—*Periclimenes laccadivensis* (Alc. and And.). Anterior part of carapace, rostrum, etc.

to *Periclimenes*. The fact that the telson has six terminal spines and that there is no pleurobranch above the base of the third

maxilliped indicates that the species must be referred to the Pontoniinae and, as the mandible does not possess a palp, it cannot be placed in Dana's *Palaemonella*. The dactyli of the last three legs are biunguiculate and the species in all other characters agrees with *Periclimenes s.s.*, as defined in this paper.

Alcock in 1901 recorded four specimens of this species, all of which I have examined. The largest of the four is in my opinion specifically distinct from the other three, and I have described it below under the name of *P. alcocki*.

Periclimenes laccadivensis is very closely related to *P. latipollex*, but is distinguished by the following characters:—



TEXT-FIG. 20.—*Periclimenes laccadivensis* (Alc. and And.).

a. Second peraeopod. *b*. Fingers of second peraeopod.
c. Dactylus of third peraeopod (setae at distal end of propodus omitted).

The rostrum (text-fig. 19) is less slender and is shorter, not quite reaching the end of the antennal scale; it is armed with 10 teeth above and 2 or 3 below. The hepatic spine is situated on a lower level than the antennal. The antennal scale is rather broader, about 2·75 times as long as wide in an ovigerous female, and the distal spine does not reach quite as far forwards as the apex of the lamella. The carpus of the first peraeopod is a little longer than the chela. The peraeopods of the second pair (text-fig. 20*a*) are distinctly unequal, but otherwise resemble those of the related species; the dactylus, however, is not flanged along its outer edge. The armature of the cutting edges of the fingers (text-fig. 20*b*)

is similar and in minor details is variable. There are one or two teeth on the dactylus which fit into a recess in the fixed finger, while on the fixed finger itself there are only two teeth, both rather large, in place of the three found in *P. latipollex.*

The last three peraeopods are rather more slender. In the third pair the merus is about 11·5 times as long as wide and the propodus is 9 times as long as the dactylus. The accessory claw of the dactylus (text-fig. 20*c*) is small and slender; it is sometimes missing, having apparently been broken off.

The three specimens are all ovigerous females. The largest, from which the figure in the *Illustrations of the Zoology of the 'Investigator'* is drawn, is about 27 mm. in length. The specimens are from deep water and have a soft membranous integument.

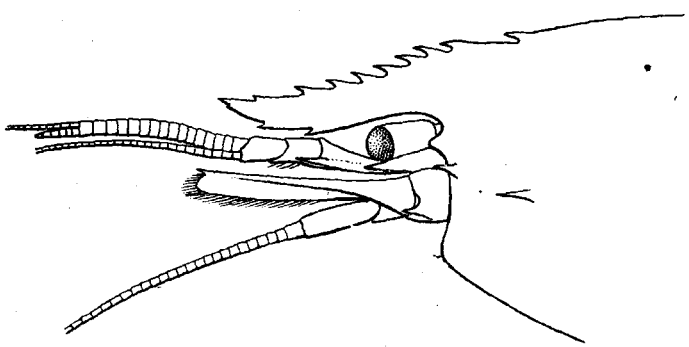
9221/0.	Laccadive Sea, 703 fms., 10°47′45″ N., 72°40′20″E.	'Investigator,' Nov., 1891.	One, TYPE.
2129–30/10.	Laccadive Sea, 430 fms., 7°17′30″ N., 76°54′30″ E.	'Investigator,' Oct., 1897.	Two, TYPES.

The identity of the two specimens recorded by Miss Rathbun (*loc. cit.*) from the Hawaiian Is. appears to me to be doubtful.

Periclimenes (Periclimenes) alcocki, sp. nov.

1901. *Palaemon (Brachycarpus) laccadivensis*, Alcock, *Cat. Ind. deep-sea Crust. Decap. Macrura and Anomala*, p. 138 (*in part*).

This species is represented in the collection by a single large specimen obtained by the 'Investigator' and referred by Alcock to *Palaemon (Brachycarpus) laccadivensis.* It differs from the types of the latter species and from *Periclimenes latipollex* in

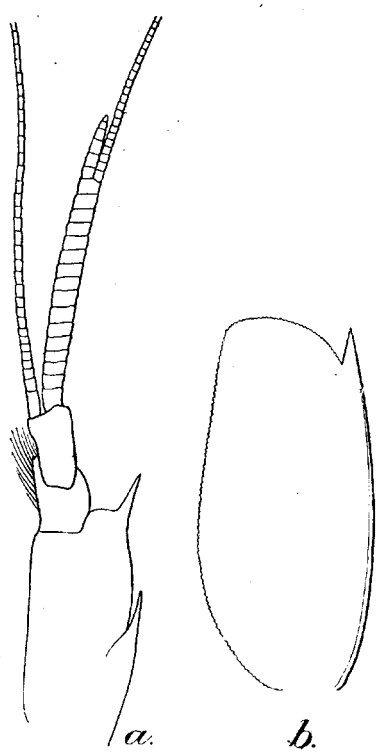


TEXT-FIG. 21.—*Periclimenes alcocki*, sp. nov.
Anterior part of carapace, rostrum, etc.

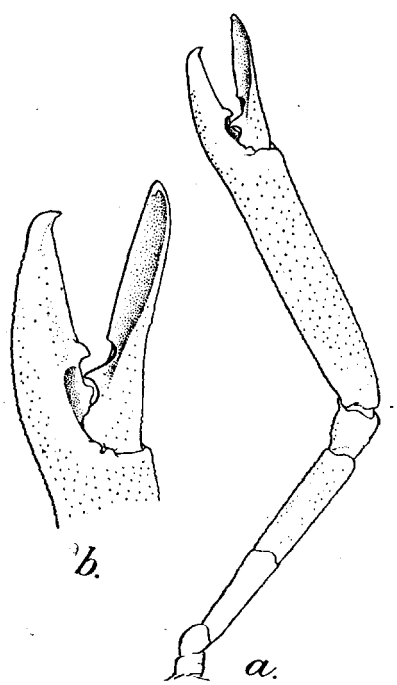
a number of particulars which appear to entitle it to specific distinction. It may be separated from the related forms by the following characters:—

The rostrum (text-fig. 21) is deep and reaches just beyond the end of the antennular peduncle. On its upper margin it bears 9

teeth, of which the foremost and hindmost are rather remote from the rest; three posterior teeth stand on the carapace behind the orbit. On the lower margin there are 3 teeth, the foremost small and placed close to the apex. The hepatic spine is placed on a lower level than the antennal. The two rami composing the outer antennular flagellum (text-fig. 22*a*) are fused basally for a much longer distance than in the related species; the fused portion is 3·5 times as long as the free part of the shorter ramus and consists of 12 segments. The antennal scale (text-fig. 22*b*) is



TEXT-FIG. 22.—*Periclimenes alcocki*, sp. nov.
a. Antennule.
b. Antennal scale.

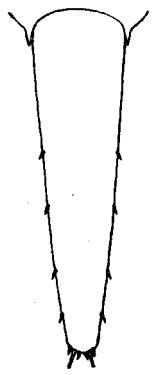


TEXT-FIG. 23.—*Periclimenes alcocki*, sp. nov.
a. Larger second peraeopod.
b. Fingers of same leg.

broader, scarcely more than twice as long as wide; the outer margin is convex and terminates in a spine which reaches nearly to the end of the lamella. The carpus of the first peraeopods is proportionately longer than in either of the related species and is 1·5 times the length of the chela.

The second peraeopods (text-fig. 23*a*) are unequal and are closely covered throughout with small tubercles, a remarkable character also found in certain species of the subgenus *Ancylocaris*. The fingers in both limbs are almost exactly half the length

of the palm and are thus proportionately longer than in the allied forms. In the longer limb the dactylus is conspicuously spatulate (text-fig. 23*b*) and has a single large and sharp tooth in its basal third which fits into a cavity in the fixed finger when the claw is closed. There are two teeth on the fixed finger, one a little behind the middle, which is accommodated in a socket placed in advance of the tooth on the dactylus, and another which is blunt and molariform nearer the base. The smaller chela is similar, but there are two teeth on the dactylus —the posterior blunt and inconspicuous—and one, which is small, on the fixed finger.



TEXT-FIG. 24.—*Periclimenes alcocki*, sp. nov. Telson.

The merus of the third peraeopod is about 8 times as long as broad; the propodus is rather less than 7 times the length of the dactylus. The accessory claw of the latter is small, as in *P. laccadivensis*. The telson (text-fig. 24) differs from that of all other Pontoniinae in the possession of four pairs of dorsal spines in addition to the six which occur at the apex. It is possible that this is merely an abnormality, but the spines are arranged symmetrically on the two sides.

The single specimen, an ovigerous female, is 50 mm. in length.

4789/7. Laccadive Sea, 406 fms. 9°34′57″ N., 75°36′30″ E. 'Investigator,' Jan., 1895. One, TYPE.

As in the preceding species the integument is soft and membranous.

Periclimenes (Periclimenes) lanipes, sp. nov.

(Plate IV, fig. 4.)

The rostrum is strongly curved downwards, with the tip a little upturned. It reaches just beyond the apex of the antennal scale and in lateral view is shallow. On the strongly convex upper border it bears 8 or 9[1] evenly spaced teeth, decreasing in size from behind forwards and with the hindmost situated above or a little behind the posterior limit of the orbit. The lower margin is unarmed, or with a single small tooth[1] placed beneath the seventh or eighth of those on the upper side.

In dorsal view the rostrum is broad at the base, with a carina on either side forming a sort of superciliary ridge over the upper portion of the orbit. The lower limit of the orbit is defined by a

[1] Of three specimens two have 8 dorsal teeth and one has 9; in two specimens the lower margin bears a single tooth and in one it is unarmed.

sharp angle, beneath which there is a strong antennal spine; the hepatic spine is behind the antennal and on a level with it. There is no supra-orbital. Immediately behind the eye the orbital margin is conspicuously depressed, forming a hollow which apparently serves to accommodate the eyestalk when it is directed backwards. The eyes are short and stout, with the cornea hemispherical and not wider than the stalk. The ocular spot touches the cornea.

The lateral process of the antennular peduncle reaches about to the middle of the basal segment; the distal spine of this segment is very long, reaching the articulation of the second and third segments. The free portion of the shorter ramus of the outer flagellum is a little shorter than the fused part, the latter comprising 4 or 5 segments. The antennal scale is very broad, only twice as long as wide. The outer margin is slightly convex and terminates in a large tooth which reaches almost or quite as far forwards as the apex of the lamella.

The third maxilliped bears a small arthrobranch. The exopod reaches the end of the antepenultimate segment and the last segment is three quarters the length of the penultimate.

The first peraeopods reach beyond the scale by more than the length of the chela. The carpus is a little longer than the merus and considerably longer than the chela. The fingers are a little shorter than the palm and are spatulate, without teeth or spines on their inner edges.

The second peraeopods are stout and reach beyond the antennal scale by fully half the length of the chela. The merus is scarcely more than 2·5 times as long as wide and bears a strong spine at the distal end of its lower border. The carpus is conical and very short, about as long as broad and half as long as the merus; it bears no spines but is fringed with setae anteriorly and is deeply notched on the inner side of its distal margin. The heavy chela is also clothed with setae, sparsely at the proximal end, but densely in the vicinity of the fingers. The palm is 2·5 times as long as broad and is rather more than twice the length of the fingers. The fingers have inturned tips and on the inner edge of the dactylus in its proximal half there is a large acute tooth. The fixed finger is sometimes unarmed, sometimes with a small tooth in advance of that on the dactylus and with three or four serrations at the proximal end. When the claw is closed the fingers slide past one another like the blades of a pair of scissors and the large dactylar tooth is received into a socket in the fixed finger.

The last three peraeopods are stout; the third pair reaches beyond the scale by more than the length of the dactylus, the fifth reach the middle of the scale. In each pair the inferior edges of the ischium of merus are thickly set with soft hairs. The lower border of the merus ends in a strong tooth, behind which there are a few spinules. The propodus is stout and is densely clothed with long woolly hairs, which, at the distal end, are so thick

as to conceal the dactylus. The dactylus itself has a small tooth on the posterior margin and is strongly curved and only about one-sixth the length of the propodus.

The sixth abdominal somite is very little longer than the fifth. The anterior of the two pairs of dorsal spines on the telson is situated in the middle of its length; the posterior pair is a little nearer to the apex than to the anterior pair. The external margin of the outer uropod is ciliated.

The largest of the three specimens, an ovigerous female, is about 13 mm. in length.

This species is clearly allied to *P. latipollex*, *P. laccadivensis* and *P. alcocki*, but is easily distinguished by numerous well-marked characters.

C 405/1.	Mergui Archipelago, 12°48′ N., 98°16′10″ E., 24 fms.	'Investigator.'	One, TYPE.

The other two specimens belong to the Paris Museum and were obtained by M. Heartel at Mozambique in water 20–25 m. deep.

Periclimenes (Periclimenes) rex, sp. nov.

(Plate V, fig. 5.)

The rostrum extends beyond the end of the antennular peduncle but does not reach the tip of the antennal scale. It is extremely deep in lateral view and is very strongly curved downwards. The convex upper border is serrated like a saw and in the single specimen examined, bears 22 small equidistant teeth, with one additional tooth placed far back on the carapace and widely separated from the rest. The lower border is unarmed and is strongly convex in its distal half.

There is no supra-orbital spine. The lower limit of the orbit is drawn out into a narrow pointed process, beneath which is the antennal spine. The hepatic spine is large and placed on a lower level than the antennal.

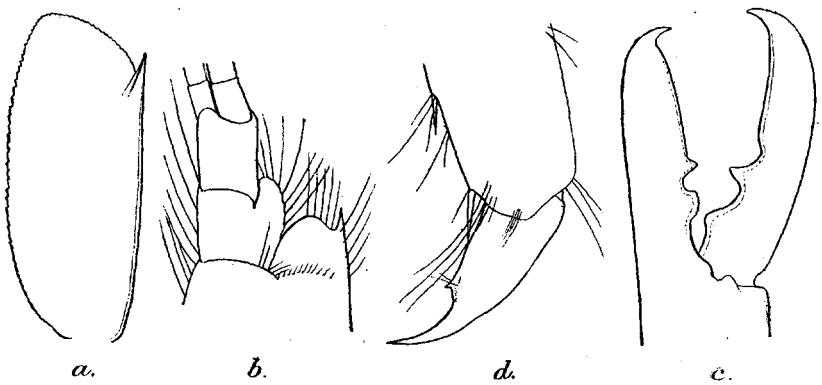
In dorsal view the eyestalk is widest at the base; the cornea is rounded and scarcely wider than the stalk, on which it is set obliquely. The ocular spot is distinct and touches the cornea.

The antennular peduncle reaches only to about two-thirds the length of the antennal scale. The basal segment is very broad with a short lateral process. The distal margin external to the insertion of the second segment is produced anteriorly as a rounded lobe (text-fig. 25*b*); this lobe bears the customary terminal spine on the outer side of its apex and extends almost as far forwards as the articulation between the second and third segments. The external margin of the second segment is similarly produced beyond the insertion of the third segment. The free portion of the shorter of the two rami composing the outer antennular flagellum is about half the length of the fused part, the latter comprising 7 segments. The antennal scale (text-fig. 25*a*) is

broad, about twice as long as wide; its outer margin is convex and terminates in a spine which fails to reach the end of the lamella.

The third maxillipeds are stout and reach nearly to the end of the basal antennular segment. They possess a small arthrobranch and the ultimate segment is about two-thirds the length of the penultimate. The first peraeopods are unusually heavy and reach beyond the scale by rather more than the length of the fingers. The merus is a little longer than the carpus and is about 5 times as long as broad. The carpus is 4 times as long as its distal breadth and is a little shorter than the chela. The fingers bear tufts of setae and are broadly spatulate, rather shorter than the palm.

The second legs are markedly unequal in the single specimen examined. The left leg, which is the larger, reaches beyond the



TEXT-FIG. 25.—*Periclimenes rex*, sp. nov.

a. Antennal scale.
b. Last two segments of antennule.
c. Fingers of larger second peraeopods.
d. Dactylus of third peraeopod.

scale by the whole length of the carpus and chela, the smaller leg by the chela only. The merus of the larger limb is rather less than 4 times as long as wide and bears a blunt tooth at the distal end on the lower side; it is about 2·2 times the length of the carpus. The carpus is conical, scarcely longer than its greatest breadth and has a deep and narrow excavation on the upper side of its distal margin. The chela is fully 1·5 times the length of the carapace and is 2·25 times as long as the merus. The palm is rather less than 4 times as long as wide and is 2·5 times the length of the fingers. The fingers (text-fig. 25*c*) have yellow inturned claws at their tips and are beset with a multitude of fine hairs.[1] On the inner edge of the dactylus at the base there is a large tooth which bears against a grinding surface at the proximal end of the dactylus, and in front of this, a little behind the middle point, there is a sharp conical tooth with a rounded excavation on either side. On the fixed finger there is a sharp tooth near the middle

[1] Not shown in text-fig. 25*c*.

point and behind it a semicircular excavation followed by a broad lobe with small denticulations on its summit. The smaller limb is closely similar, but the teeth on the fingers are less well developed.

The three posterior pairs of peraeopods are short and stout. The third reach the tip of the rostrum, the fifth the end of the merus of the first pair. The propodites bear some fine hairs but are without spinules on their posterior margins. In the third pair the merus is about 6 times and the propodus about 7 times as long as wide. The dactylus (text-fig. 25*d*) is broad and is less than a quarter the length of the propodus. The accessory dactylar spine is greatly reduced.

The sixth abdominal somite is about 1·5 times the length of the fifth. The anterior pair of spinules on the dorsum of the telson is placed at about the middle of the telson length, and the posterior pair midway between it and the apex. The terminal spines are short.

The single individual in the collection is an adult male about 21 mm. in length.

When living, the specimen was most gorgeously pigmented. The general colour was bright red; on the carapace there was a very large transverse diamond-shaped patch of pale fawn with closely aggregated cream spots, the whole patch circumscribed by deep red. The rostrum was red with minute spots of white and of white ringed with black. On each abdominal somite there was a transverse pale dorsal patch similar to that on the carapace, the patches on adjacent somites being confluent with one another. The last abdominal somite and telson were entirely pale fawn with cream-coloured spots. The cornea was red and the eyestalks red with whitish spots. The antennal scale was pale red, similarly spotted, and with the tip broadly margined with deep purple. The first two pairs of legs were red with the distal ends of the merus and carpus and the whole of the fingers purple. The last three legs were entirely rich purple, while the pleopods were red.

Periclimenes rex seems to hold an isolated position in the subgenus, but is perhaps distantly related to the *P. laccadivensis* section. By the form and armature of the rostrum it is readily distinguished from all other known forms.

C 402/1. Port Blair, Andamans, 8 fms. S. Kemp, March, 1921. One male, TYPE.

The specimen, together with a single chela of a second individual, was found in Ross Channel, near the southern end. In the same haul of the net fragments of a red sponge with white tips were taken, the similarity in colouration suggesting that the prawn and the sponge were possibly associated with one another.

Periclimenes (Periclimenes) investigatoris, sp. nov.

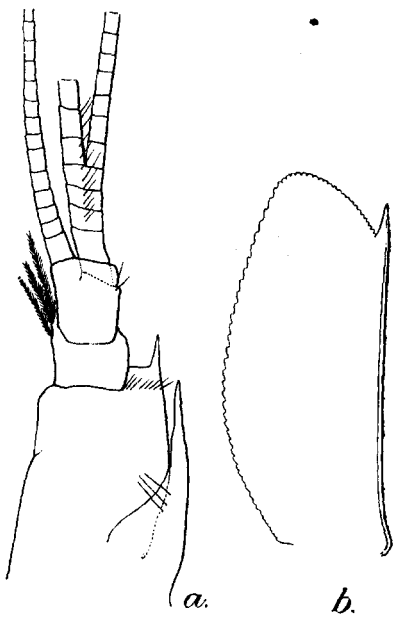
(Plate V, fig. 6.)

A species of rather stout build. The rostrum is deep; it extends a little beyond the end of the antennular peduncle but

does not reach the apex of the scale. It is quite straight, with slightly convex upper border, and bears 9 dorsal teeth in the single specimen examined. The posterior tooth is placed on the carapace behind the orbit, but is not separated from the second by a greater interval than that between the second and third; the second tooth is placed immediately above the posterior limit of the orbit. The sixth, seventh and eighth teeth are larger than the rest; the foremost is extremely small and placed close to the apex. The lower margin is strongly convex and bears a single tooth situated below the penultimate of those forming the dorsal series.

There is no supra-orbital spine. The antennal spine is sharp, with the hepatic placed behind it on a lower level. The eye is stout, with the ocular spot touching the cornea.

The basal segment of the antennular peduncle (text-fig. 26*a*) is broad; the spine forming the lateral process is of exceptional length, reaching as far forwards as the articulation of the second segment. The terminal spine of the outer margin is also very long, reaching the base of the third segment. The second and third segments are short and broad and the fused portion of the outer flagellum is composed of only four segments. The antennal scale (text-fig. 26*b*) is not quite 2·5 times as long as wide; the outer margin is straight and terminates in a strong tooth which does not reach the end of the lamella.



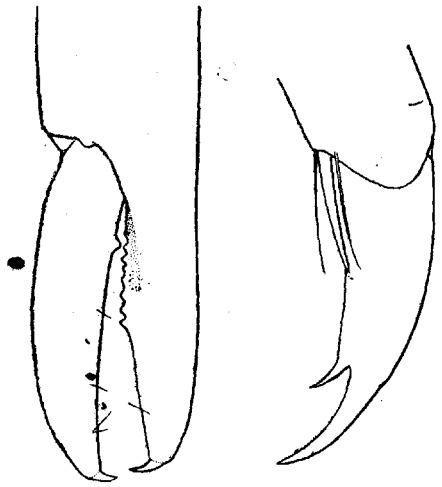
TEXT-FIG. 26.—*Periclimenes investigatoris*, sp. nov.

a. Antennule.
b. Antennal scale.

The antepenultimate segment of the third maxilliped is somewhat twisted and the ultimate segment is shorter than the antepenultimate. The first peraeopods reach beyond the end of the scale by the length of the chela. The carpus is shorter than the merus and about equal in length with the chela; the fingers are unarmed and shorter than the palm.

The second peraeopods are unequal, the left much larger than the right and reaching beyond the scale by more than the length of the chela; the two are, however, similar in structure. In the larger the merus is 1·75 times the length of the ischium

and is less than 4 times as long as wide.[1] There are no spines on either merus or carpus. The carpus is conical, more than 1·5 times as long as wide. The palm is 3 times as long as broad and the fingers are about two-thirds its length. The fingers (text-fig. 27*a*) have large apical claws which cross one another when the claw is shut. The cutting edge of the fixed finger bears a series of small teeth in the proximal half of its length and there is one rather larger tooth in the basal third of the dactylus. The smaller limb of the same pair is similar, but the carpus is twice as long as wide and the fingers almost as long as the palm and without teeth.



TEXT-FIG. 27.—*Periclimenes investigatoris*, sp. nov.

a. Fingers of larger second peraeopod.
b. Dactylus of third peraeopod.

The last three pairs of peraeopods are rather stout; those of the third pair scarcely reach the tip of the scale. The propodus bears setae on its posterior margin; in the third and fourth pairs it is about 4·5 times the length of the dactylus and in the fifth pair about 6 times. The dactylus (text fig. 27*b*) is curved, rather slender and with a small accessory tooth.

The sixth abdominal somite is fully one and a half times the length of the fifth. The telson bears the usual two pairs of dorsal spinules, the first a little in advance of the middle, the second nearer to the first than to the apex. The external margin of the uropod is ciliated.

The above description is based on a single ovigerous female 15 mm. in length.

P. investigatoris is easily distinguished from any other species in the same subgenus by the great length of the spine forming the lateral process of the antennule.

C 350/1.	Persian Gulf, 13 fms., 29°20' N., 48°47' E.	"Investigator," Oct., 1905.	One, TYPE.

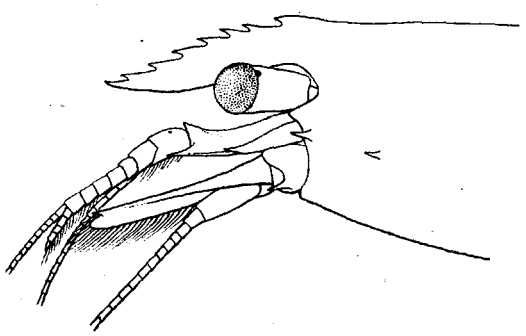
The specimen is labelled "found on an Alcyonarian."

Periclimenes (Periclimenes) noverca, sp. nov.

The rostrum (text-fig. 28) reaches a little beyond the end of the antennular peduncle. It is straight, but directed downwards

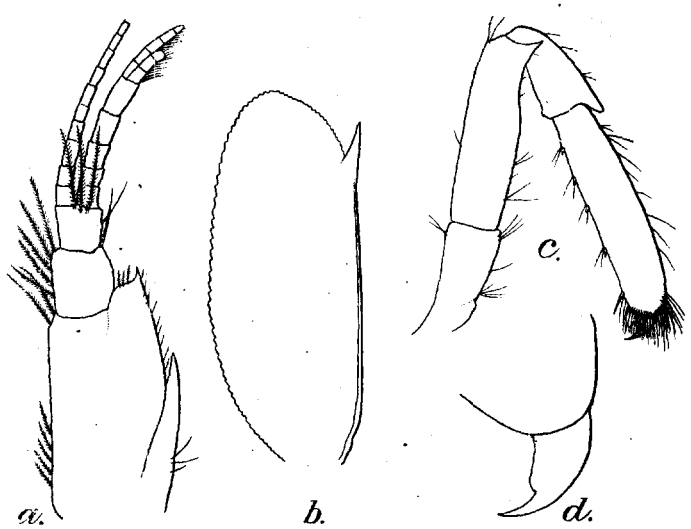
[1] The merus is too slender in the figure.

and is rather shallow in lateral view. On the upper border there are, in the single specimen examined, 7 equidistant teeth, the hindmost well in front of the posterior limit of the orbit. The lower border is slightly convex and is unarmed.



TEXT-FIG. 28.—*Periclimenes noverca*, sp. nov.
Anterior part of carapace, rostrum, etc.

There is no supra-orbital spine. The lower limit of the orbit is acute. The antennal spine is strong, with the hepatic placed behind it on a slightly lower level. The eyes are rather slender.



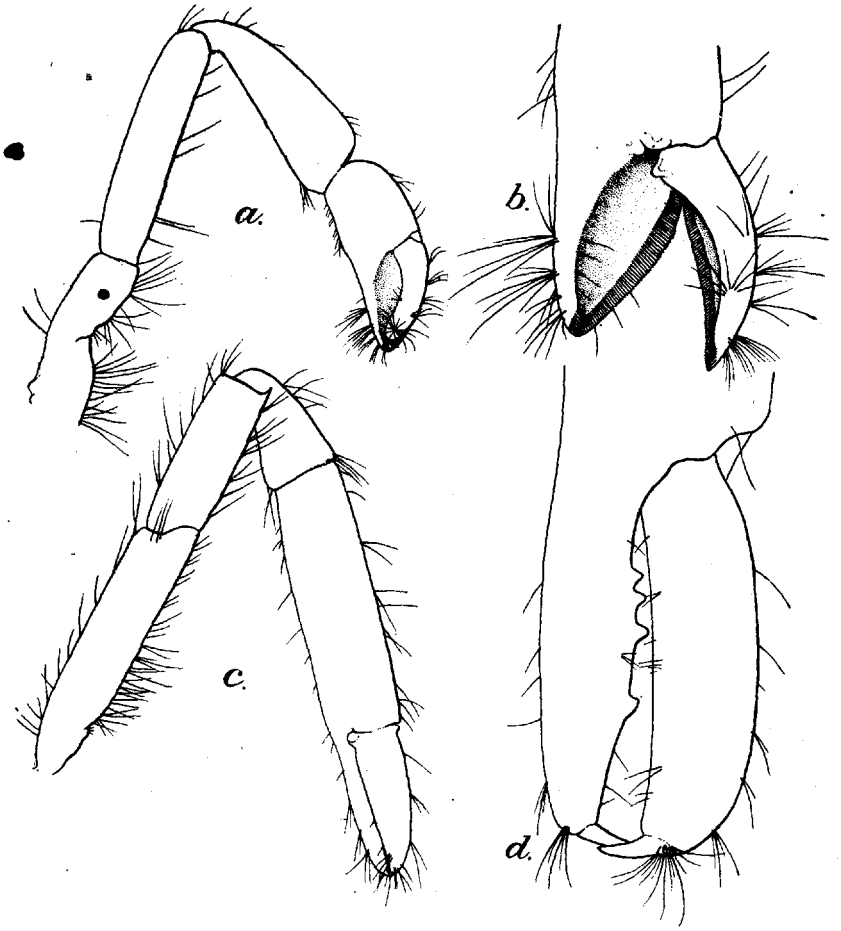
TEXT-FIG. 29.—*Periclimenes noverca*, sp. nov.

a. Antennule.
b. Antennal scale.
c. Third peraeopod.
d. Dactylus of third peraeopod (setae omitted).

The ocular spot is confluent with the cornea, which is hemispherical and a little wider than the stalk.

The lateral process of the antennular peduncle (text-fig. 29*a*) reaches beyond the middle of the basal segment; the anterior margin of this segment is greatly produced externally, the spine

reaching beyond the middle of the second segment. The free portion of the stouter of the two rami composing the outer flagellum is rather more than half the length of the fused portion, the latter comprising 5 segments. The total length of the stouter ramus is less than the length of the peduncle. The antennal scale (text-fig. 29*b*) is about 2·5 times as long as wide. The outer margin is



TEXT-FIG. 30.—*Periclimenes noverca*, sp. nov.

a. First peraeopod.
b. Fingers of first peraeopod.
c. Second peraeopod.
d. Fingers of second peraeopod.

straight and ends in a spine which does not reach as far forwards as the very broadly rounded apex of the lamella.

The first peraeopod (text-fig. 30*a*) is unusually stout and reaches a little beyond the end of the antennal scale. The carpus is conspicuously shorter than the merus and is only 3 times as long as its distal breadth. The chela is very nearly as long as the carpus. The fingers (text-fig. 30*b*) are equal in length with the

palm; each is broadly spatulate with the inner margin finely pectinate throughout.

The left second leg is missing in the single specimen examined, The right (text-fig. 30*c*) reaches beyond the antennal scale by less than half the length of the chela. The merus is about 3 times as long as wide and only two-thirds the length of the ischium; it bears a strong tooth at the distal end of the lower border. The carpus is short and conical, two-thirds the length of the merus and about 1·6 times as long as its distal breadth. The chela is about 3·6 times the length of the carpus; the palm is a little more than 3 times as long as wide. The fingers (text-fig. 30*d*) are rather more than half the length of the palm and have inturned tips; the dactylus is unarmed, but there are four small teeth on the fixed finger. There are long sparse hairs on all the segments.

The three posterior legs (text-fig. 29*c*) are short and stout; the third reach about to the end of the antennal scale. The merus in this pair is nearly 3·5 times as long as wide and bears a strong tooth at the distal end of its lower border; the propodus is 4·5 times as long as wide and from 5·5 to 6 times as long as the dactylus. The propodus bears spinules on its posterior margin and at the distal end is thickly clad with hairs that partially conceal the dactylus. The dactylus (text-fig. 29*d*) is small and curved, with the accessory claw found in most species of the subgenus replaced by a conspicuous rounded lobe.

The sixth abdominal somite is scarcely longer than the fifth. The anterior of the two pairs of spines on the dorsum of the telson is placed at about the middle of its length, the second pair midway between the first and the apex.

The single specimen is an ovigerous female about 16 mm. in length.

P. *noverca* is closely related to Nobili's *P. soror*, but is distinguished, as shown below, by a number of well-marked characters.

The type and only known example of this species was found at New Caledonia and is the property of the Paris Museum.

Periclimenes (Periclimenes) soror Nobili.

1904. *Periclimenes soror*, Nobili, *Bull. Mus. Paris*, X, p. 232.
1906. *Periclimenes soror*, Nobili, *Ann. Sci. nat., Zool.* (9) IV, p. 50, pl. ii. fig. 6.

This species, which I have not seen, agrees with *P. noverca* and differs from all other members of the subgenus *Periclimenes* in possessing a comb of fine teeth on each finger of the first peraeopod. According to Nobili's description it differs from the allied species in the following points:—

(i) There are 11–13 teeth on the upper margin of the rostrum.

(ii) The tooth at the outer distal angle of the basal antennular segment is short.

(iii) The first peraeopods are more slender, with carpus 4 times as long as its distal breadth.

(iv) The merus of the second leg is equal to or slightly longer than the ischium and does not bear a spine at the distal end of its lower border.

(v) The fingers of the second leg are only one-third the length of the palm.

(vi) The lower border of the merus of the last three legs does not end in a tooth.

(vii) The dactylus of the last three legs is provided with a small accessory spine and is only one-ninth the length of the propodite.

P. soror was described from Djibouti in the Red Sea.

Periclimenes (Periclimenes) commensalis Borradaile.

1915. *Perclimenes (Cristiger) commensalis*, Borradaile, *Ann. Mag. Nat. Hist.* (8) XV, p. 211.
1915. *Periclimenes commensalis*, Potts, *Publ. Carnegie Inst. Washington*, no. 212, p. 82.
1917. *Periclimenes (Cristiger) commensalis*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 364.

I have examined the type of this species and think that Borradaile is mistaken in stating that there are two spines at the distal end of the basal antennular segment. The margin between the outer spine and the articulation of the second segment is somewhat more produced than usual, but is rounded and does not end in a spine. *P. frater*, Borradaile, which I refer to the subgenus *Ancylocaris*, appears to be the only species of the genus in which two spines occur in this position.

The accessory tooth on the dactyli of the last three peraeopods is small and inconspicuous in this species.

P. commensalis was found by Mr. Potts on *Comanthus annulatus* at the Murray Is., Torres Straits.

Subgenus **Periclimenaeus** Borradaile.

1915. *Periclimenaeus*, Borradaile, *Ann. Mag. Nat. Hist.* (8) XV, p. 207.
1916. *Periclimenes* subgen. *Hamiger*, Borradaile, *Brit. Antarct. Exped.* 1910, *Zool.* III, p. 87.
1917. *Periclimenaeus*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII. p. 377.

The species of this subgenus resemble those of *Periclimenes* s.s. in having the dactyli of the last three peraeopods biunguiculate, but differ in the absence of the hepatic spine of the carapace. The second peraeopods are unequal and dissimilar and the chela of the larger limb is always very massive.

The status of the subgenus is precarious. The three species referred to it appear to form a natural group, but the only unequivocal point of distinction from *Periclimenes* s.s. is the absence of the hepatic spine. If, as is not improbable, a species is discovered which lacks this spine, but possesses affinities with *Periclimenes* s.s. rather than with *Periclimenaeus*, the latter subgenus

will have to be abandoned. It will not be possible to distinguish the subgenus in a satisfactory manner by the form of the second peraeopods, as these limbs exhibit a very wide range of variation in *Periclimenes* s.s.

Borradaile in proposing *Hamiger*, a new subgenus of *Periclimenes*, for his *P. novae-zealandiae*, seems to have overlooked the fact that the species is closely related to the members of his *Periclimenaeus*. *P. novae-zealandiae* differs from the two species referred to the latter genus only in minor details of rostrum and chela which are clearly no more than specific.

Key to the species of the subgenus *Periclimenaeus*.

No teeth on lower border of rostrum; inner edges of fingers of larger chela provided with a knob fitting into a socket.
- Two posterior teeth of upper rostral series situated on carapace; larger chela with knob on dactylus and socket on fixed finger; fringes of setae on legs not remarkably long; R. 9:0 ... ... *robustus* (Borradaile).
- No teeth of upper rostral series situated on carapace; larger chela with knob on fixed finger and socket on dactylus; fringes of setae on legs remarkably long; R. 4-7:0 ... ... *fimbriatus* (Borradaile).

Two teeth on lower border of rostrum; larger chela with a huge bifid tooth at base, overlapping dactylus; R. 8:2 ... ... *novae-zealandiae* (Borradaile).

Periclimenes (Periclimenaeus) robustus (Borradaile).

1915. *Periclimenaeus robustus*, Borradaile, *Ann. Mag. Nat. Hist.* (8) XV, p. 213.
1917. *Periclimenaeus robustus*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 378, pl. lv, fig. 20.

Amirante I., 29–39 fms.

Periclimenes (Periclimenaeus) fimbriatus (Borradaile).

1915. *Periclimenaeus fimbriatus*, Borradaile, *Ann. Mag. Nat. Hist.* (8) XV, p. 213.
1917. *Periclimenaeus fimbriatus*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 379, pl. lv, fig. 19.

Mulaku Atoll, Maldives. Providence I., 39–50 fms.

Periclimenes (Periclimenaeus) novae-zealandiae (Borradaile).

1916. *Periclimenes* (*Hamiger*) *novae-zealandiae*, Borradaile, *Brit. Antarct. Exped.* 1910, *Zool.* III, p. 87, text-fig. 4.

7 mi. E. of N. Cape, New Zealand, 70 fms.

Subgenus **Ancylocaris** Schenkel.

I include under this subgeneric name all those species of *Periclimenes* in which the dactylus of the last three legs is simple, without the additional claw or process found in *Periclimenes* s.s. and in *Periclimenaeus*.

As a primary character in dividing the large number of species which the subgenus contains I have employed the presence or absence of a spine or tooth at the distal end of the merus of the second peraeopod. De Man has found that a similar character in the third peraeopod is of great value in the genus *Alpheus*. I think it probable that a primary separation on these lines is at least as likely to demonstrate the true relationships of the species as any other, but the principal specific characters are combined in so many different ways that it is impossible in the present state of our knowledge to determine which indicate affinity and which are examples of convergence. The key which follows must therefore be regarded as artificial.

Key to the species of the subgenus *Ancylocaris*.

Section I. Merus of second leg without a spine or tooth at distal end of lower border.

A. Supra-orbital spine present [hepatic spine present].
  B. Cornea hemispherical.
    C. Rostrum shallow; merus of second leg longer than carpus; R. 9 : 4 ... ... *nilandensis* Borr.
    C'. Rostrum deep; merus and carpus of second leg subequal; R. 7 : 3 ... ... *edwardsi* (Paulson).
  B'. Cornea conoidal, more or less pointed distally.
    C'. Rostrum not reaching end of antennular peduncle.
      D. Eye with conspicuous terminal papilla; R. 4 : 0 ... ... *ceratophthalmus* Borr.
      D'. Eye without conspicuous terminal papilla; R. 7 : 1 ... ... *cornutus*[1] Borr.
    C'. Rostrum reaching beyond end of antennular peduncle [eye without conspicuous terminal papilla]; R. 6 : 1 ... ... *amboinensis*,[1] de Man.
A'. Supraorbital spine absent.
  B. Hepatic spine present.
    C. Rostrum reaching far beyond end of scale; carpus of second leg twice as long as chela; R. 6 : 0 ... ... *psamathe* (de Man).
    C'. Rostrum not reaching beyond end of scale; carpus of second leg little if at all longer than chela.
      D. Second legs excessively long, ischium almost reaching end of scale (? in males only); fingers of second leg scarcely one quarter length of palm; R. 7 : 0 ... ... *longipes* (Stimpson).
      D'. Second legs rarely long, ischium not nearly reaching end of scale; fingers of second leg at least one-third as long as palm.
        E. Carpus of second leg more than half as long as palm.
          F. Distal spine of antennal scale reaching to or beyond end of lamella.
            G. Carpus of second leg conspicuously longer than palm; dactylus of last three legs nearly one half as long as propodus.

[1] In this species the second legs are unknown; it is assumed from its structural resemblance to *P. ceratophthalmus* that it falls in this section of the genus.

H. Second leg with carpus slightly longer than chela, fingers unarmed or with one minute tooth and much longer than palm; R. 8–9 : 2 ... *leptopus*, sp. nov.

H'. Second leg with carpus shorter than chela, fingers shorter than palm with large teeth; R. 8–9 : 4–5 ... *calmani* Tattersall.

G'. Carpus of second leg equal to or shorter than palm; dactylus of last three legs less than one third length of propodus.

H. A small papilla on eyestalk; carpus and chela of first leg subequal; second leg with carpus as long as palm and palm about as long as fingers; R. 7–9 : 2–5 ... ... *seychellensis* Borr.

H'. No papilla on eyestalk; carpus of first leg longer than chela; second leg with carpus shorter than palm and palm fully twice as long as fingers; R. 7–9 : 2–3 ... ... *americanus* (Kingsley).

F'. Distal spine of antennal scale not nearly reaching end of lamella.

G. Rostrum very shallow, downcurved, with 3 posterior dorsal teeth placed on carapace; last three legs extending far beyond scale; R. 9 : 3 ... .. *tenellus* (Smith).

G'. Rostrum deep or moderately deep, straight, with at most 1 posterior dorsal tooth placed on carapace; last three legs not extending beyond scale.

H. Upper border of rostrum very strongly convex, ventral tooth placed behind foremost dorsal tooth; R. 5–7 : 0–2 ... ... *diversipes*, sp. nov.

H'. Upper border of rostrum straight, ventral tooth in advance of foremost dorsal tooth; R. 5 : 1 ... ... *potina* Nobili.

E'. Carpus of second leg less than half as long as palm [distal spine of antennal scale not nearly reaching end of lamella].

F. No conspicuous[1] comb of spines on fingers of first leg.

G. Rostrum with at least ten dorsal teeth; sixth abdominal somite more than twice length of fifth; R. 10–13 : 3 ... *korni* (Lo Bianco).

G'. Rostrum with at most eight dorsal teeth; sixth abdominal somite less than twice as long as fifth.

H. Carpus of first leg longer than chela.

J. Rostrum deep in lateral view; a single spine at distal end of basal antennular segment.

K. Carapace of female greatly swollen dorsally; telson with dorsal spines very small, both pairs situated in distal half of its length; R. 5–7 : 0–2 ... *brevicarpalis* Schenk.

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[1] Under the microscope fine incisions may sometimes be detected in the cutting edges of the fingers of the first leg in *P. diversipes* (text-fig. 39*b*, p. 182).

K'. Carapace of female not swollen; telson with dorsal spines well developed, anterior pair situated in middle or in proximal half of its length.
L. Form stout; rostrum bent downwards, upper border almost straight with foremost tooth placed very close to apex; R. 6-8 : 0-2 ... *inornatus*, sp. nov.
L'. Form slender; rostrum straight, upper border strongly convex with foremost tooth not placed close to apex, R. 5-7 : 0-2 ... ... *diversipes*, sp. nov.
J'. Rostrum very shallow in lateral view; two spines at distal end of basal antennular segment; R. 6 : 1 ... ... *brocketti* Borr.
H'. Carpus of first leg about half length of chela; R. 6 : 3 ... *compressus* Borr.
F'. Each finger of first leg with a conspicuous comb of spines [two spines at distal end of basal antennular segment]; R. 12 : 0 ... ... *frater* Borr.
B'. Hepatic spine absent.
C. Second legs shorter than first; R. 5 : 0 ... *brevinaris* Nobili.
C'. Second legs longer than first; R 6 : 2 ... *pusillus* Rathbun.

Section II. Merus of second leg with a spine or tooth at distal end of lower border.

A. Each finger of first leg with a conspicuous comb of spines [hepatic spine present].
B. Supra-orbital spine present [other characters as in *P. petitthouarsi*]; R. 6-9 : 2-5 ... ... *spiniferus* de Man.
B'. Supra-orbital spine absent.
C. Merus of second leg with one spine below, carpus with two terminal spines, inner margin of each finger with a large oval pit; R. 6-9 : 3-5 *petitthouarsi* (Audouin).
C'. Merus of second leg with four spines below, carpus with three terminal spines, inner margin of each finger with a series of small denticles; R. 7 : 3 ... ... *denticulatus* Nobili.
A'. Fingers of first leg without a comb of spines.
B. Supra-orbital spine present.
C. Hepatic spine present.
D. Distal spine of antennal scale projecting far beyond end of lamella.
E. Rostrum shallow; last three legs long and slender, third pair with merus at least 11 times as long as broad, fifth pair reaching beyond scale.
F. No conspicuous terminal spine on inner side of carpus of second legs.
G. Carpus of first leg at least 1·75 times as long as chela; chela of second leg in males not more than 1·25 times, in females equal to or a little shorter than carpus; R. 7-9 : 1-3 ... ... *agag*, sp. nov.
G'. Carpus of first leg less than 1·5 times as long as chela; chela of second leg

more than 1·3 times as long as carpus in both sexes; R. 6–7 : 2–3 ... *proximus*, sp. nov.

F'. A conspicuous terminal spine on inner side of carpus of second leg.

G. Rostrum usually with 8 or more dorsal teeth; carpus of second leg of male about equal to or shorter than merus; R. 7–9 : 2–4 ... ... *andamanensis*, sp. nov.

G'. Rostrum with 6 or 7 dorsal teeth; carpus of second leg of male conspicuously longer than merus; R. 6–7 : 2 *suvadivensis* Borr.

E'. Rostrum moderately deep; last three legs stouter, third pair with merus at most 10 times as long as broad, fifth pair not reaching end of scale.

F. No spine at distal end of carpus of second leg; R. 7–8 : 3 ... ... *ensifrons* (Dana).

F'. At least one spine at distal end of carpus of second leg.

G. Only one spine at distal end of carpus of second leg, situated on inner side.

H. Foremost pair of dorsal spines of telson situated in anterior half of telson-length; R. 6–10 : 2–5 ... *grandis* (Stimpson).

H'. Both pairs of dorsal spines of telson situated in posterior half of telson-length; R. 6 : 4 ... ... *vitiensis* Borr.

G'. Two spines (at least in males) at distal end of carpus of second leg, one on inner side and one above.

H. Carpus of second leg 3 to 6 times as long as distal breadth; propodus of last three legs with spinules on posterior border.

J. Carpus of second leg of male about 6 times as long as wide, slightly longer than merus; R. 7 : 2 ... ... *affinis* Borr.

J'. Carpus of second leg of male not more than 4·5 times as long as wide, shorter than merus.

R. 6–8 : 3–5 ... *elegans* (Paulson).
R. 6–7 : 3–4 ... *holmesi* Nobili.

H'. Carpus of second leg (in female) scarcely 2·5 times as long as distal breadth; propodus of last three legs without spinules on posterior border; R. 8 : 3 ... ... *amymone* de Man.

D'. Distal spine of antennal scale not projecting beyond end of lamella [a terminal spine on inner side of carpus of second leg]; R. 7–9 : 1–3 ... ... *demani* Kemp.

C'. Hepatic spine absent ... ... *lifuensis* Borr.

B'. Supra-orbital spine absent.

C. Hepatic spine present.

D. Rostrum reaching far beyond antennal scale with at least 6 ventral teeth; R. 9–12 : 6–9 *tenuipes* Borr.

D'. Rostrum reaching little if at all beyond antennal scale with at most 2 ventral teeth.

E. Antennular peduncle reaching beyond antennal scale, its last two segments extremely long and slender; no ventral teeth on rostrum; R. 6 : 0 ... ... *longimanus* (Dana).

E'. Antennular peduncle not reaching end of antennal scale, its last two segments of normal proportions; at least one ventral tooth on rostrum.
F. Rostrum with at least 9 dorsal teeth; carpus of second leg unarmed.
G. Carpus and merus of second leg equal in length and longer than palm; propodus of third leg little more than twice as long as dactylus; R. 11 : 2 ... *digitalis*, sp. nov.
G'. Carpus of second leg very much shorter than either merus or palm; propodus of third leg fully 4 times as long as dactylus; R. 9-10 : 1 ... *brocki* (de Man).
F'. Rostrum with only 6 dorsal teeth; carpus of second leg with distal spine [carpus and palm of second leg subequal]; R. 6 : 2 ... ... *rotumanus* Borr.
C'. Hepatic spine absent; R. 3–4 : 1 ... *gerlachei* Nobili.[1]

Periclimenes (Ancylocaris) nilandensis Borradaile.

1915. *Periclimenes* (*Falciger*) *nilandensis*, Borradaile, *Ann. Mag. Nat. Hist.* (8) XV, p. 211.
1917. *Periclimenes* (*Falciger*) *nilandensis*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 372, pl. liv, fig. 13.

S. Nilandu Atoll, Maldives.

Periclimenes (Ancylocaris) edwardsi Paulson.

1875. *Anchistia edwardsi*, Paulson, *Crust. Red Sea*, p. 114, pl. xvii, fig. 2.
1906. *Anchistia edwardsi*, Nobili, *Ann. Sci. nat., Zool.* (9) IV, p. 53.

Red Sea.

Periclimenes (Ancylocaris) ceratophthalmus Borradaile.

1915. *Periclimenes* (*Corniger*) *ceratophthalmus*, Borradaile, *Ann. Mag. Nat. Hist.* (8) XV, p. 211.
1917. *Periclimenes* (*Corniger*) *ceratophthalmus*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 365, pl. liv, figs. 9*a*, *b*.

Male Atoll, Maldives, on crinoid.

Periclimenes (Ancylocaris) cornutus Borradaile.

1915. *Periclimenes* (*Corniger*) *cornutus*, Borradaile. *Ann. Mag. Nat. Hist.* (8) XV, p. 211.
1917. *Periclimenes* (*Corniger*) *cornutus*, Borradaile. *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 365, pl. liv, figs. 10*a b*.

Male Atoll, Maldives, on red and brown crinoid.

Periclimenes (Ancylocaris) amboinensis (de Man).

1887. *Anchistia amboinensis*, de Man, *Arch. Naturgesch.* LIII, i, p. 546, pl. xxii*a*, figs. 2, 2*a*,*b*.

[1] This species belongs to the genus *Harpilius*, but is included here as it is very likely to be confused with members of the subgenus *Ancylocaris*.

Both this species and *P. cornutus* were described from specimens in which the second peraeopods were missing; it is thus not altogether certain that they are properly referred to the subgenus *Ancylocaris*. They appear, however, to be closely related to *P. ceratophthalmus*, in which the merus of the second peraeopod is unarmed. *P. amboinensis* was described from Amboina.

Periclimenes (Ancylocaris) psamathe (de Man).

1902. *Urocaris psamathe*, de Man, *Abhandl. Senck. naturf. Ges.* XXV, p. 816, pl. xxv, figs. 51, 51*a–j*.
1917. *Urocaris psamathe*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 323.

I have examined a specimen of this species in the Cambridge Museum and am able to state that it does not possess a mandibular palp. *P. psamathe* must thus be referred to the subgenus *Ancylocaris*, in which, however, by reason of the remarkable character of the rostrum and second peraeopod, it occupies a very isolated position.

The species was described from Ternate and has since been recorded by Borradaile from N. Male Atoll in the Maldives and from Diego Garcia in the Chagos Archipelago.

Periclimenes (Ancylocaris) longipes (Stimpson).

1860. *Urocaris longipes*, Stimpson, *Proc. Acad. Sci. Philadelphia*, p. 39.

Stimpson remarks that the end of the ischium of the second leg in this species reaches almost to the apex of the antennal scale; it is thus probable that this leg is proportionately even longer than in such extreme forms as *P. agag* and *P. tenuipes*. Stimpson's specimen was no doubt a male and, on analogy with other long-limbed species, it may be expected that the female does not possess such an inordinate length of leg. The species was found near Ousima I. at a depth of 20 fathoms.

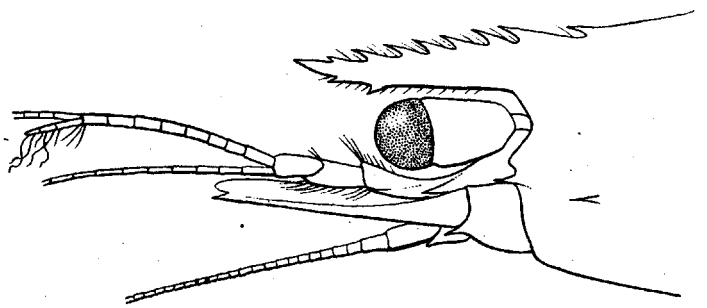
Periclimenes (Ancylocaris), leptopus sp. nov.

A species of slender habit with long legs. The rostrum (text-fig. 31) is straight and reaches to the end of the second or middle of the third segment of the antennular peduncle. It is armed above with 8 or 9 teeth,[1] the hindmost of which is separated by a considerable interval from the next of the series and is situated on the carapace behind the posterior limit of the orbit. On the lower margin there are 2 teeth, smaller than those on the upper margin and situated in the anterior third of the rostral length, beneath the two foremost of those comprising the dorsal series.

There is no supra-orbital spine. The hepatic and antennal

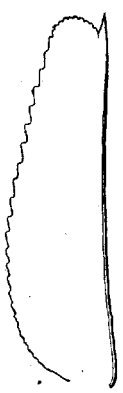
[1] In two specimens there are 8 teeth and in one 9.

are both sharp and are situated nearly on a level with one another. The eyes are large and stout, slightly flattened dorso-ventrally, and the ocular spot is confluent with the cornea.



TEXT-FIG. 31.—*Periclimenes leptopus*, sp. nov.
Anterior part of carapace, rostrum, etc.

The basal segment of the antennular peduncle is broad; the terminal spine of the outer margin is short and the lateral process reaches about to the middle of the segment. The two rami composing the outer antennular flagellum are fused for a distance almost equal to the total length of the peduncle, the fused portion consisting of 8 to 10 elongate segments. The free portions of both rami are extremely short. The antennal scale (text-fig. 32) is narrow, nearly 4 times as long as wide. The outer margin is slightly concave and terminates in a spine which reaches a little beyond the apex of the lamella.



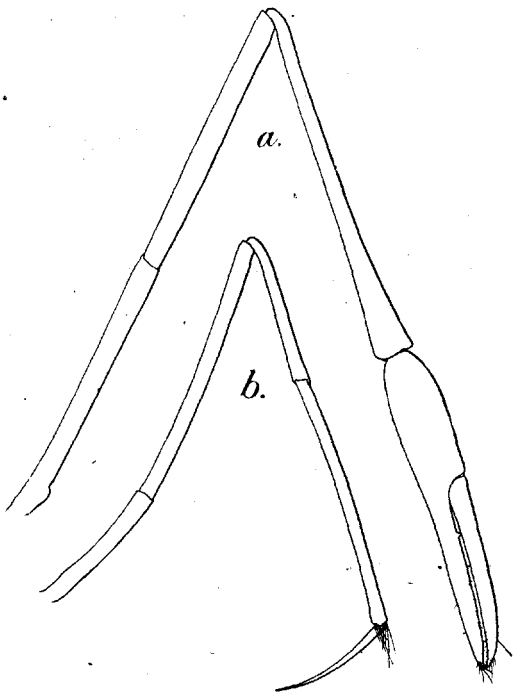
TEXT-FIG. 32.—*Periclimenes leptopus*, sp. nov.
Antennal scale.

The ultimate segment of the third maxilliped is scarcely more than three-quarters the length of the penultimate. All the peraeopods are very slender. The first pair reaches beyond the scale by the length of the chela. The carpus is a little shorter than the merus and a little longer than the chela; the fingers have simple cutting edges and are about one-fifth longer than the palm.

The second peraeopods (text-fig. 33*a*) extend beyond the scale by the whole length of the chela and carpus. All the segments are unarmed. The carpus considerably exceeds the length of the carapace (rostrum excluded); it is longer than the merus in the proportion of 4 to 3 and is fully 2·5 times as long as the palm. Its breadth at the distal end is about one-tenth its length. The chela is intermediate in length between the merus and carpus and the breadth of the palm is rather more than one-third its length. The fingers are straight with terminal claws that cross

one another when the chela is shut; they are without teeth on their cutting edges and are nearly 1·5 times as long as the palm.

The last three peraeopods are extremely slender. The third pair (text-fig. 33*b*) reaches beyond the apex of the scale by two-thirds the length of the propodus, the fifth by about half the length of the propodus. There are some setae at the distal ends of the propodites, but no spinules on their posterior margins. The dactylus in each pair is very slender, simple, slightly curved and almost half the length of the propodus.



TEXT-FIG. 33.—*Periclimenes leptopus*, sp. nov.
a. Second peraeopod. *b*. Third peraeopod.

The sixth abdominal somite is about 1·5 times the length of the fifth. The anterior pair of dorsal spinules of the telson is placed a little in front of the middle point. The intermediate pair of apical spines is very long, about one-third the length of the telson. The outer uropod is nearly three times as long as wide.

The largest specimen is an ovigerous female about 12½ mm. in total length.

P. leptopus is easily distinguished by the proportions of the segments of the second peraeopods and by the comparatively great length of the dactyli in the last three peraeopods.

C. 354/1. Port Blair, Andamans. S. Kemp, Feb., 1915. Three (two ovig.), TYPES.

The specimens were caught in Brigade Creek in a net hauled over a bottom composed of decaying vegetation at a depth of 2–5 fathoms.

Periclimenes (Ancylocaris) calmani Tattersall.

1921. *Periclimenes calmani*, Tattersall, *Journ. Linn. Soc., Zool.* XXXIV, p. 385, pl. xxvii, fig. 11; pl. xxviii, figs. 14–15.

The characters given for this species in the key on p. 169 are not all included in the description referred to above. Dr. Tattersall has, however, kindly informed me that the spine at the distal end of the antennal scale reaches to or very slightly beyond the apex of the lamella and that the dactylus of the last three peraeopods is simple. As in *P. leptopus* the dactylus of these limbs is very long, about two-fifths the length of the propodus.

The species was described by Tattersall from the Sudan coast.

Periclimenes (Ancylocaris) seychellensis, Borradaile.

(Plate VI, fig. 7.)

1915. *Periclimenes (Falciger) seychellensis*, Borradaile, *Ann. Mag. Nat. Hist.* (8) XV, p. 212.

1917. *Periclimenes (Falciger) seychellensis*, Borradaile. *Trans. Linn. Soc.* (2) *Zool.* p. 375, pls. liv, lv, figs. 14 *a–i*.

The rostrum reaches to, or a little beyond the apex of the antennal scale and is deep in lateral view with a concave upper border. Dorsally it bears from 7 to 9 teeth,[1] usually 8. The two hindmost teeth are situated on the carapace behind the orbit and are separated by a rather wide interval, the first being only a little in advance of the middle of the carapace. On the lower border there are from 2 to 5 teeth,[2] usually 3 or 4. The foremost teeth, both dorsally and ventrally, are placed close to the tip.

The supra-orbital spine is absent; the hepatic is present and is situated on a lower level than the antennal.

The eyes are rather slender, with hemispherical cornea. On the upper and anterior aspect of the stalk there is a small conical papilla, situated close to the cornea but separated from it by a shallow excavation. The development of the papilla is a little variable; as a rule it is quite conspicuous (text-fig. 34*a*), occasionally it is small and rarely it is almost indistinguishable, though the excavation is always distinctly seen when the eye is viewed from the proper angle. The ocular spot touches the cornea and is large. The cornea itself is traversed by two parallel wavy bands of dark pigment which are conspicuous in life and can often be detected in well preserved specimens.

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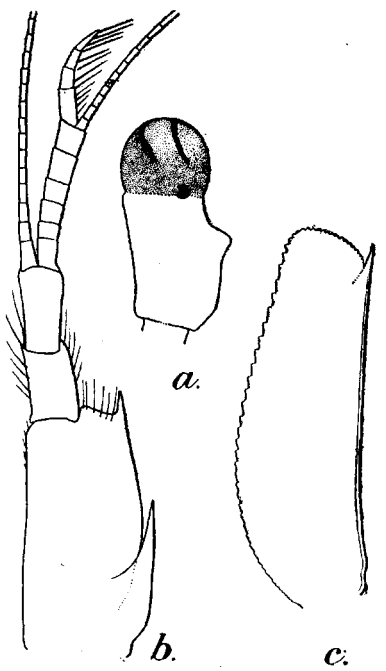
[1] Of sixty specimens seven have 7 dorsal teeth, forty have 8 and thirteen have 9.

[2] Of sixty specimens one has 2 ventral teeth, nineteen have 3, thirty-four have 4 and six have 5.

The lateral process of the antennule reaches to the middle of the basal segment and the terminal spine of this segment is well developed (text-fig. 34*b*). The second and third segments are rather slender and subequal. The free portion of the shorter ramus of the outer antennular flagellum is about two-thirds the length of the fused basal part, the latter comprising from 5 to 7 segments. The antennal scale (text-fig. 34*c*) is 3, or rather more than 3 times as long as wide. The outer margin is usually a little concave and ends in a spine which reaches almost or quite to the end of the lamella.



TEXT-FIG. 34.—*Periclimenes seychellensis* Borradaile.
a. Eye. *b*. Antennule.
c. Antennal scale.

The third maxilliped bears on arthrobranch: the ultimate segment is about two-thirds the length of the penultimate. The first peraeopods (text-fig. 35*a*) reach about to the end of the antennular peduncle. The merus, carpus and chela are subequal in length and the fingers, which are unarmed, are about 1·25 times the length of the palm.

The second peraeopods (text-fig. 35*b*) are shorter than usual, extending beyond the scale by not more than half the length of the chela. There are no distal spines on the merus or carpus. In large specimens the carpus is a little shorter than the merus and equal to or slightly shorter than the palm; in smaller individuals the carpus is proportionately rather longer. The palm is a little inflated and is as long as or a trifle longer than the fingers. The fingers have inturned tips and straight cutting edges, with one or more small teeth at the proximal end.

The last three pairs of peraeopods (text-fig. 35*c*) are slender and short, the third reaching by only a dactylus-length beyond the eye. The propodus bears a series of slender spines, frequently arranged in pairs, on its inferior margin and is from 3·5 to 4 times the length of the dactylus. The dactylus is moderately curved and is simple.

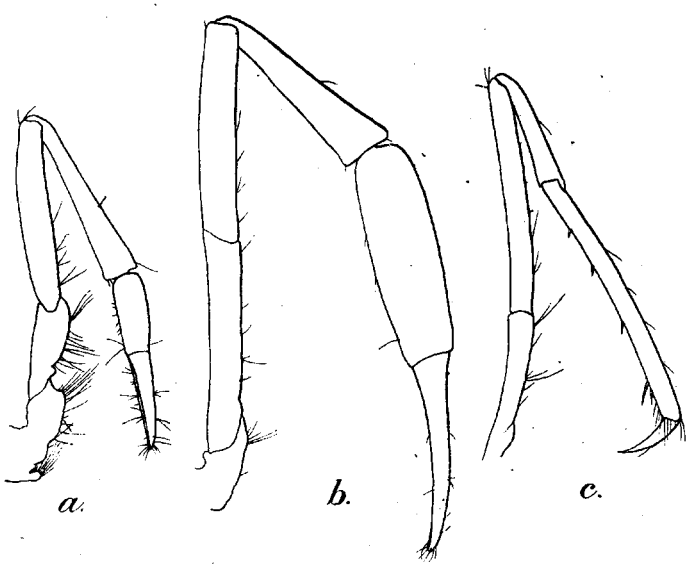
The sixth abdominal somite is 1·5 times the length of the fifth. The two pairs of dorsal spines on the telson are large and are placed so as to divide its length into three equal parts. The

apex of the telson is sharply pointed and the intermediate pair of terminal spines is long.

Large females from the Gulf of Manaar reach a length of about 19 mm. Those I have seen from other localities are smaller, none exceeding 14 mm.

Specimens from the Andaman Is., when alive, were closely mottled with pale buff, lichen-green and brown.

Borradaile does not mention the curious papilla on the eye-stalk, but I have examined his type-specimens and find that it is present.



TEXT-FIG. 35.—*Periclimenes seychellensis* Borradaile.
a First peraeopod. *b*. Second peraeopod.
c. Third peraeopod.

The specimens in the collection are from the following localities:—

C 355/1.	Ain Musa, G. of Suez.	R. B. S. Sewell, 1916.	One.
C 356/1.	Tor, G. of Suez.	ditto	Ten.
C 357/1.	Kilakarai, G. of Manaar.	S. Kemp, Feb., 1913.	Nineteen.
C 358/1.	Pamban, G. of Manaar.	ditto	Fifteen.
C 359/1.	Port Blair, Andamans.	S. Kemp, Feb., 1915; Feb., March, 1921.	Many.

The species was described by Borradaile from Praslin, Seychelles.

The great majority of the specimens in the collection are ovigerous females. In the localities where I myself have found it, the species was taken among weeds in shallow water.

Periclimenes (Ancylocaris) americanus (Kingsley).

1878. *Anchistia americana*, Kingsley, *Proc. Acad. Sci. Philadelphia*, p. 96.
1882. *Anchistia americana*, Kingsley, *Bull. Essex Inst.* XIV, p. 109 pl. ii, fig. 10.
1901. *Periclimenes americanus*, Rathbun, *Bull. U. S. Fish Comm.* XX, ii, p. 121.

This species is related to *P. seychellensis*, but differs in the following points:—(i) the rostrum is shallow and its upper border is nearly straight; (ii) there is no papilla on the eyestalk; (iii) the antennal scale is proportionately narrower; (iv) the first peraeopods are much longer, extending beyond the scale by the length of the chela; (v) the carpus of these legs is conspicuously longer than the chela; (vi) the second peraeopods are much longer, extending beyond the scale by the whole of the carpus and chela; (vii) the carpus in these legs is shorter than the palm and the fingers are less than half as long as the palm; (viii) the last three peraeopods are much longer, the third reaching beyond the scale by nearly half the length of the propodus.

The species is known from the West Indies, Yucatan, Florida and the Bermudas. The specimens I have seen are from the last named locality.

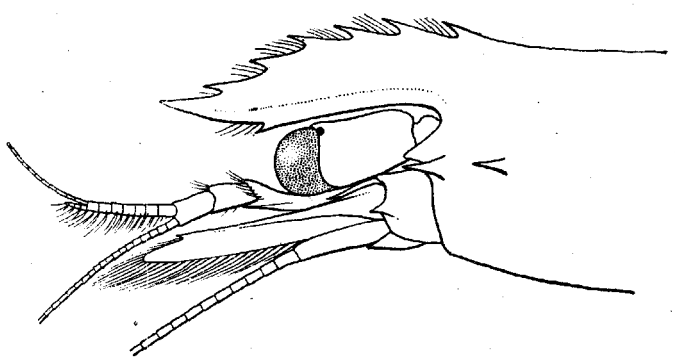
Periclimenes (Ancylocaris) tenellus (Smith).

1882. *Anchistia tenella*, Smith, *Bull. Mus. Comp. Zool. Harvard* X, p. 55, pl. ix, fig. 1.

N. W. Atlantic, 32°7′ N., 78°37′30″ W., 229 fathoms.

Periclimenes (Ancylocaris) diversipes, sp. nov.

The rostrum (text-fig. 36) varies considerably in length. Usually it reaches to the end of the second segment of the antennular peduncle; sometimes it is shorter, reaching only to the end of the first segment, sometimes longer, reaching the end of the

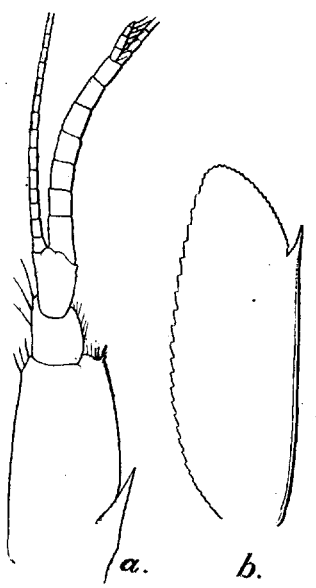


TEXT-FIG. 36.—*Periclimenes diversipes*, sp. nov.
Anterior part of carapace, rostrum, etc.

peduncle. The upper portion of the blade is strongly arched and the rostrum is consequently deep in lateral view; the lower margin is straight at the base and slightly convex near the tip. On the convex upper border there are from 5 to 7 teeth,[1] most commonly 6. The hindmost of these is usually situated on the carapace behind the orbit and is not separated by any considerable interval from the next of the series. On the lower border there are from 0 to 2 teeth,[2] usually 1. The precise position of the ventral teeth is variable; the single tooth which the majority of specimens possess is situated below the ultimate or penultimate member of the dorsal series.

There is no supra-orbital spine. The hepatic spine is placed some distance behind the antennal and is on a level with it. The eye is moderately stout, with the stalk wider than the cornea. The ocular spot is placed close to the cornea but is separate from it.

The lateral process of the antennule (text-fig. 37*a*) reaches to the middle of the basal segment; the distal tooth of the outer margin is slender. The free portion of the shorter ramus of the outer flagellum is much less than half the length of the fused portion, the latter comprising 7 to 9 segments. The antennal scale (text-fig. 37*b*) is from 2·5 to 2·75 times as long as wide; the outer margin is straight, terminating in a spine which is far exceeded by the narrowly pointed apex of the lamella.



TEXT-FIG. 37.—*Periclimenes diversipes*, sp. nov.

a. Antennule.
b. Antennal scale.

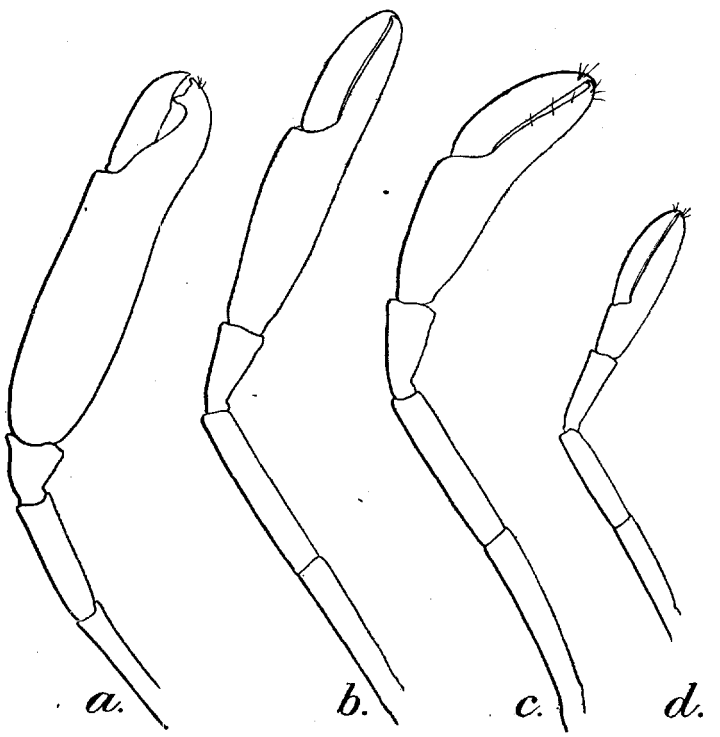
There is a small arthrobranch on the third maxilliped. The first peraeopods (text-fig. 39*a*) reach about to the end of the antennal scale. The carpus is about equal in length with the merus and is from 1·3 to 1·6 times as long as the chela. The fingers bear some tufts of setae and are almost or quite as long as the palm. They are somewhat spatulate; under all ordinary magnifications their cutting edges appear to be entire, but when viewed under a high power of the microscope the edge is sometimes seen to be

[1] Of ninety-six specimens twenty-seven have 5 dorsal teeth, forty-eight have 6 and twenty-one have 7.

[2] Of ninety-six specimens nineteen have no ventral teeth, seventy-five have 1 ventral tooth and two have 2 teeth.

divided by fine incisions into series of blunt-tipped teeth (text-fig. 39*b*).

The second peraeopods are usually unequal and are remarkable in that they exhibit four distinct types of structure within the limits of the species. The segments are always unarmed. In type *a*, the most highly developed form (text-fig. 38*a*), the limb may reach beyond the scale by more than half the length of the chela. The carpus is conical, little longer than broad and not much more than half the length of the merus. The chela is from 2·7



TEXT-FIG. 38.—*Periclimenes diversipes*, sp. nov.
The four types of second peraeopod.

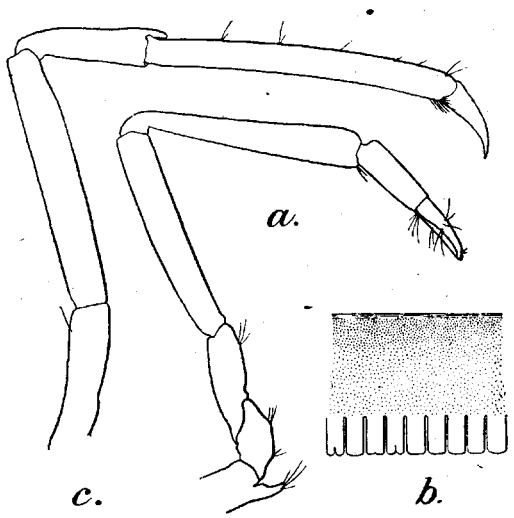
to 3·3 times as long as the merus and the fingers are less than half the length of the palm. The dactylus is normal in form with straight or nearly straight cutting edge and an inturned tooth at the tip. The fixed finger is very strongly curved and is provided at the apex with a short chisel edge with a blunt tooth at either end, opposed to the distal part of the dactylus. Owing to the strong curvature of the dactylus the fingers gape considerably when the claw is closed.

The second peraeopod of type *b* (text-fig. 38*b*)[1] may be nearly as large as type *a*. The carpus is more slender and the

[1] The chela is viewed a little obliquely and its full breadth is consequently not shown.

chela is at most twice the length of the merus; the fingers are both normal in form and are about two-thirds the length of the palm. Type *c* (text-fig. 38*c*)[1] is closely similar to type *b*, but the fingers are equal in length with the palm. The whole limb is smaller and is frequently not so long as the first peraeopod. Type *d* (text-fig. 38*d*) differs widely from any of the others; it is shorter than the first peraeopod and just as slender. The carpus is very slender, more than 2·5 times as long as wide and the fingers are twice or rather more than twice as long as the palm. On the inner face of the chela in types *b*, *c* and *d* the fingers tend to be hollowed out or spooned and this feature is particularly noticeable in *d*. I give below, at the end of this description, some notes on the different ways in which these four types of second peraeopod are combined to form a pair.

The last three pairs of peraeopods are rather slender; the third pair (text-fig. 39*c*) reaches to or a little beyond the end of the antennular peduncle. The propodus bears some fine setae, but except for one, rarely two, at its distal end the posterior edge is devoid of spinules. The dactylus is moderately stout, simple and curved; it is from one-third to one-fourth the length of the propodus.



TEXT-FIG. 39.—*Periclimenes diversipes*, sp. nov.
a. First peraeopod.
b. Cutting edge of finger of first peraeopod, very greatly enlarged.
c. Third peraeopod.

The sixth abdominal somite is about 1·7 times the length of the fifth. The anterior of the two pairs of dorsal spinules of the telson is situated a little behind the middle of its length; the posterior pair is midway between the anterior pair and the apex.

Adult specimens do not exceed 11 mm. in length; those from the Andamans are decidedly smaller than those from the Gulf of Manaar. In life the species is transparent, sometimes with short streaks of red pigment on the eyestalk, carapace, sides of abdomen and pleopods.

P. diversipes is closely related to Nobilis *P. piotina* and to *P. inornatus*, sp. nov.; the differences are explained below (pp. 184 and 194).

[1] The carpus is sometimes rather more slender than in this figure.

C 364–5/1.	Kilakarai, Gulf of Manaar.	S. Kemp, Feb., 1913.	Forty-four, including TYPES.
C 366/1.	Port Blair, Andamans.	S. Kemp, March, 1915; March, 1921.	About one hundred.

In the Gulf of Manaar the species was caught at low water by working a hand-net among corals belonging to the genus *Montipora*. At Port Blair it was obtained by precisely similar methods from a large Alcyonarian belonging to the family Alcyonidae. When the net was worked elsewhere no prawns were captured and this fact leads me to believe that there is a real association between the Carids and the Coelenterates on which they were found.

The diversity of form in the second peraeopods is a very remarkable feature of this species. The largest specimens, as noted above, are from the Gulf of Manaar and of these the great majority are ovigerous females. The collection from this locality has unfortunately suffered damage and only a comparatively small number of individuals possess both the second peraeopods. The collection from Port Blair contains very few ovigerous specimens; the majority are young and it is possible that the characters of the second legs would undergo modification with further growth.

In specimens in which both the second legs are present the combination of structural types which go to form a pair is as follows :—

Types of structure found in a pair.[1]	NUMBER OF SPECIMENS.	
	G. of Manaar.	Andamans.
aa	3	1
bb	...	2
bc	5	30
bd	3	...
cc	...	60
cd	4	...
dd	2	...

Legs of types *b* and *c* show a certain amount of variation and it is sometimes a little difficult to distinguish between them. Those of types *a* and *d*, on the other hand, appear to be very constant; they show little variation and can always be recognised at a glance.

Legs of type *a* are invariably associated with those of type *d* and the specimens which possess this combination are all ovigerous

[1] The letters in this column refer to the description on pp. 181, 182 and to the figures in text-fig. 38.

females. The numbers are unfortunately low but there are numerous detached legs of type *a* in the Manaar collection.

Type *b* is most commonly associated with type *c*; the combination occurs in both collections and the specimens are often ovigerous. From the Andamans there are two examples of *bb*, both females, and from the Gulf of Manaar a few *bd*, all males.

Legs of type *c*, when not combined with *b*, are associated with *d* or with another limb of type *c*. The combination *cc* appears only in the Andaman collection, where it is very abundant in males and young females; *cd* is found in the Manaar collection in one male and three ovigerous females.

The combination *dd* is found only in two males from the Gulf of Manaar.

Although the specimens on which these observations are based are numerous, any speculations on the significance of this remarkable diversity in the form of the legs would at present be unprofitable. Further large collections of adults are necessary to provide more accurate data and valuable clues may be expected from field observations and from a knowledge of the relations that exist between the prawn and its hosts I will only remark here that I regard it as almost certain that legs of type *c* in course of growth reach type *b* and that it is not improbable that type *b* may develop into type *a*.

One point remains to be mentioned—the very curious differences between the two collections of specimens. The combination *cc*, to which the majority of the Andaman specimens belong, is not represented in the Manaar series, while type *d*, found in a large proportion of specimens from the latter locality, occurs only in one individual (in the combination *ad*) from the Andamans. Had it not been for this last specimen I should have been doubtful whether the Andaman form did not belong to a separate race or subspecies. On the information available I am satisfied that all are properly attributed to a single species. The only difference between the two sets of specimens lies in the types of second peraeopod which are combined to form a pair. This may be concerned with the different hosts on which the two series were found and it will be noticed that all four types of leg occur in both collections.

Periclimenes (Ancylocaris) potina Nobili.

1905. *Periclimenes potina*, Nobili, *Bull. Mus. Paris* XI, p. 159.
1906. *Periclimenes potina*, Nobili, *Bull. sci. France Belgique* XL, p. 44, pl. iii, fig. 8.

This species appears to be related to *P. diversipes* but, according to Nobili's description, is distinguished by the form of the rostrum and the proportions of the segments of the second peraeopod. The upper portion of the rostrum is not strongly arched, the posterior dorsal tooth is not situated on the carapace and the single tooth on the lower border is in advance of the foremost on the upper border. The carpus of the second peraeopod

is scarcely more than a quarter the length of the chela and the fingers are longer than the palm. In specimens of *P. diversipes* in which the carpus is very short, the palm is always longer than the fingers.

P. potina was described by Nobili from three specimens obtained in the Persian Gulf, 16°35′ N., 54°26′ E., on floating brown seaweed.

Periclimenes (Ancylocaris) korni (Lo Bianco).

1903. *Anchistia kornii*, Lo Bianco, *Mitt. zool. Stat. Neapel* XVI, p. 250, pl. vii, fig. 13.
? 1910. *Periclimenes korni*, Kemp, *Journ. Marine Biol. Assoc.* VIII, p. 411.

Near Capri, Mediterrannean, about 600 fathoms. ? Bay of Biscay, 412 fathoms.

Periclimenes (Ancylocaris) brevicarpalis (Schenkel).

(Plate VI, fig. 8.)

? 1880. *Nicht bestimmte Palaemonide*, Richters, in Möbius' *Meeresfauna Mauritius*, pl. xviii, fig. 10.
? 1893. *Palaemon* sp., Saville-Kent, *Barrier Reef of Australia*, p. 145, col. pl. ii.
? 1894. *Palaemonella amboinensis*, Zehntner, *Rev. suisse Zool.* II, p. 206, pl. ix, figs. 27, 27*a*.
1898. *Bithynis* sp., Coutière, *Bull. Mus. Paris* IV, p. 198.
1902. *Ancylocaris brevicarpalis*, Schenkel, *Verh. naturf. Ges. Basel* XIII, p. 563, pl. xiii, figs. 21*a–m*.
1904. *Palaemonella aberrans*, Nobili, *Bull. Mus. Paris* X, p. 233.
1905. *Harpilius latirostris*, Lenz, *Abhandl. Senck. naturf. Ges.* XXVII, p. 380, pl. xlvii, figs. 14, 14*a–c*.
1906. *Ancylocaris aberrans*, Nobili, *Bull. sci. France Belgique* XL, p. 52, pl. iv, figs. 9, 9*a*, *b*.
1906. *Ancylocaris aberrans*, Nobili, *Ann. sci. nat., Zool.* (9) IV, p. 64.
1914. *Periclimenes hermitensis*, Rathbun, *Proc. Zool. Soc. London*, p. 655, pl. i, figs. 1–3.
1916. *Ancylocaris aberrans*, Kemp, *Rec. Ind. Mus.* XII, p. 389.
1917. *Ancyclocaris aberrans, latirostris, hermitensis, brevicarpalis*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, pp. 355, 356.

Four specific names have been applied to brilliantly coloured Pontoniine prawns which are found living in association with giant anemones belonging to the genus *Discosoma*, but it appears to me improbable that more than one such species is at present known.

Borradaile, who has summarized the characters by which the four described forms are distinguished, remarks on the difficulty of separating them and suggests that some will eventually have to be united. This is the more probable since the species, being assigned to four different genera, were originally described without any thought of comparison with one another.

A series of specimens from Indian waters shows that the differential characters employed by Borradaile do not possess specific value. Though the normal variation is not great, it is

sufficient to account for all or nearly all the differences he has noted. The descriptions themselves do not indicate other features of any importance and it is clear that if Nobili's *aberrans*, Lenz's *latirostris* and Miss Rathbun's *hermitensis* are to be retained as distinct, it must be by reason of fresh and hitherto undisclosed characters.

While in Paris in 1920 I was unable to examine the type of Nobili's *Palaemonella aberrans* from Djibouti, as the specimen had unfortunately been mislaid; but, through the courtesy of Prof. Ch. Gravier, I was able to see the female from Bahrein I. in the Persian Gulf which Nobili subsequently referred to the same species. In the figure of this specimen (*loc. cit.*, 1906, pl. iv, fig. 9) the dorsal swelling of the carapace is very greatly exaggerated, and the statement that a podobranch occurs on the second maxilliped is erroneous.

P. brevicarpalis in my estimation is a species of very wide distribution, extending from the Red Sea and east coast of Africa to the Santa Cruz Is. in Oceania. I have examined a specimen from the last named locality and have compared examples from the Torres Straits with the series in the Indian Museum collection. I am convinced that all belong to a single species.

The rostrum varies considerably in length. As a rule it reaches to or a little beyond the end of the antennular peduncle; rarely it is shorter, sometimes extending only to the middle of the second peduncular segment. In lateral view it is deep, with convex upper and lower margins and at the apex it is sometimes a trifle upturned. On the upper margin there are from 5 to 7 teeth[1] usually 6, which are for the most part evenly spaced. In about half the specimens the posterior dorsal tooth is situated a little behind the back of the orbit; in most of the others it is immediately above this point, while very rarely it is placed further forward. The distal upper tooth is not so near to the tip as to give it a bifid appearance. On the lower margin there are 1 or 2 teeth,[2] nearly always 1; these are scarcely smaller than those on the upper margin and are situated in the distal third of the rostral length. Very rarely specimens are found with the lower border unarmed.

The strong curvature or swelling of the dorsum of the carapace is only seen in large females; in males, and in females that are small or of moderate size, there is scarcely an indication of it.[3]

---

[1] Of fifty-one specimens fifteen have 5 dorsal teeth, thirty-two have 6 and four have 7.

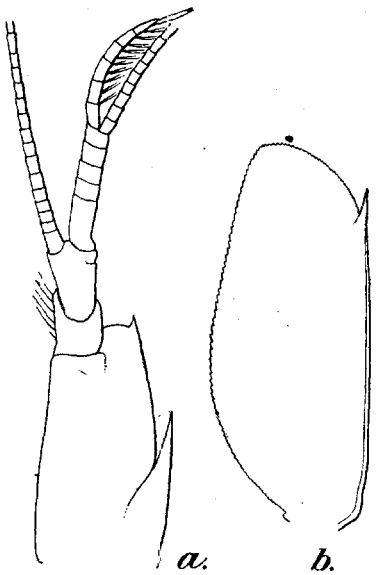
[2] Of fifty-one specimens one has the ventral margin unarmed, forty-six have 1 ventral tooth and four have 2 teeth.

[3] Only fourteen of the sixty-two specimens in the collection possess this swollen carapace. That the feature is not shown in Schenkel's figure is sufficiently explained by his statement,—"der Cephalothorax war wie es scheint etwas aufgetrieben, namentlich auf der Oberseite; leider hat er sich, der Weichheit des Tegumentes halber, nicht gut conserviert." In Nobili's figure, as I have remarked above the character is greatly exaggerated.

The antennal and hepatic spines are well developed, the latter being on a much lower level than the former.[1]

The eye is small and slender. In dorsal view the stalk is swollen at the base and broader than the hemispherical cornea.[2] There is a small ocular spot, placed close to the cornea but isolated from it.

The lateral process of the basal segment of the antennule (text-fig. 40*a*) reaches a little beyond the middle of the segment. Distally the basal segment projects beyond the articulation with the second and bears a small spine externally. The free portion of the shorter ramus of the outer flagellum is rather longer than the fused part, the latter consisting of 5 to 9 segments, most commonly 5 or 6. The outer margin of the antennal scale (text-fig. 40*b*) is slightly convex, terminating in a small spine which does not reach nearly as far forwards as the somewhat pointed apex of the lamella. In large specimens the scale is rather less than 2·5 times as long as wide.



TEXT-FIG. 40.—*Periclimenes brevicarpalis* (Schenkel).

a. Antennule.
b. Antennal scale.

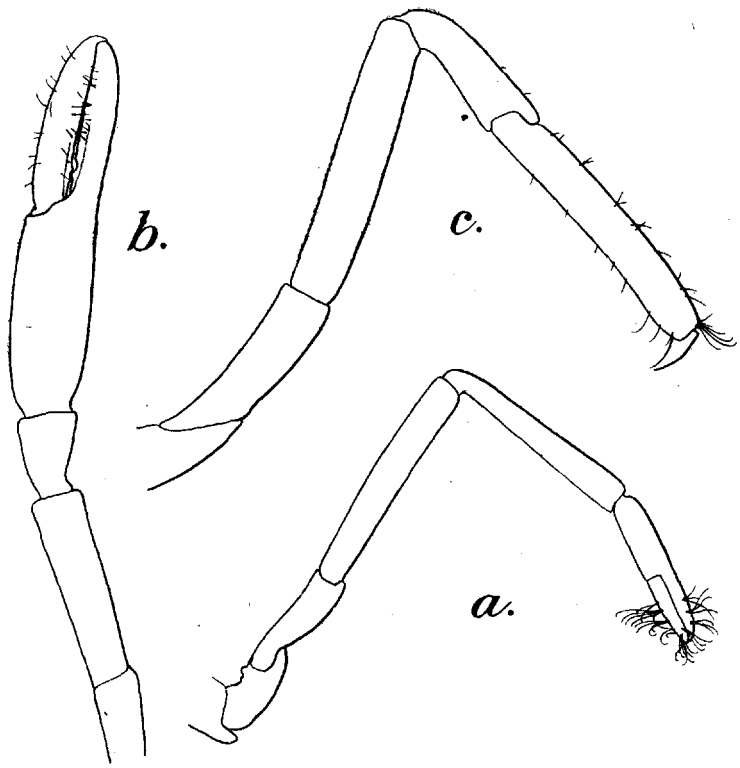
The second maxilliped does not possess a podobranch. The third maxilliped is short and slender; it bears an arthrobranch and the exopod reaches to the middle of the penultimate segment. The ultimate segment is a little shorter than the penultimate.

The first peraeopods (text-fig. 41*a*) reach beyond the end of the scale by fully half the length of the chela. The merus is slightly longer than the carpus, the carpus distinctly longer than the chela; the fingers are unarmed and are about equal in length with the palm. The second peraeopods (text-fig. 41*b*) may reach beyond the scale by the whole of the chela and carpus in adult males; in females and young males they are slightly shorter. The legs of a pair are similar both in structure and size and except that they are longer in the male, there is no difference between the sexes.

[1] Nobili's remark that the hepatic spine is placed further forwards in his specimens than in Schenkel's is not borne out by his figures or by his specimen from the Persian Gulf.

[2] In the figure the eye is greatly fore-shortened with the result that the cornea appears broader than the stalk.

There are no teeth on ischium, merus or carpus. The merus is nearly twice the length of the ischium and is equal to or a little longer than the palm. The carpus is short and conical, about 1·5 times as long as wide, with a deep notch on the inner side of the distal margin. The chela is large and in adults is about 5 times as long as broad. The fingers are at least two-thirds the length of the palm and have incurved tips and a cutting edge extending throughout their length. In adult males there are teeth in the proximal



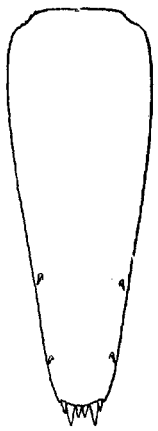
TEXT-FIG. 41.—*Periclimenes brevicarpalis* (Schenkel).
a. First peraeopod. *b.* Second peraeopod.[1]
c. Third peraeopod.

third of the opposed margins, two on the dactylus and three or four on the fixed finger. These teeth are absent or inconspicuous in females.

The last three peraeopods (text-fig. 41*c*) are similar, the third reaching to or a little beyond the apex of the antennal scale. All are comparatively stout, with some setae but no spinules on the propodus; the latter segment is from 4·5 to 5 times as long as the dactylus. The dactylus itself is simple, broad at the base and curved.

[1] Less magnified than the other figures.

The sixth segment of the abdomen is about 1·5 times the length of the fifth. The telson (text-fig. 42) is rounded above with two pairs of very small and inconspicuous dorsal spines. These spines are placed further back than usual, the foremost pair being situated much behind the middle of the telson. The terminal spines are unusually short. The outer uropod is scarcely more than twice as long as broad. At the distal end of its outer margin there is, as usual, a movable spine separating the ciliated and non-ciliated portions of the margin; but the fixed spine commonly found immediately in front of this movable spine is absent.



TEXT-FIG. 42.—*Periclimenes brevicarpalis* (Schenkel). Telson.

The largest specimen I have seen is a female 31 mm. in length.

The literature contains a number of references to the marvellous colouration of this species when alive and to its association with anemones of the genus *Discosoma*. Saville-Kent (*loc. cit.*, 1893) has given a coloured drawing of a prawn found on *Discosoma haddoni* which is perhaps intended for this species, but the figure is extremely poor. Coutière (*loc. cit.*, 1898), who refers to the prawn as *Bithynis* sp., says of specimens subsequently described by Nobili as *Palaemonella aberrans*,—"Un Palémonidé du genre *Bithynis* Dana mérite une mention spéciale par son habitat et sa coloration. Il est absolument transparent, mais se signale par quelques anneaux d'un violet pâle sur les appendices et l'abdomen, et surtout par des taches d'un blanc nacré éclatant, occupant la région stomacale tout entière, le coude de l'abdomen, l'extrémité des rames caudales et les épimères du deuxième segment. Ce magnifique Crustacé se tient obstinément dans la zone de protection que circonscrit une grande Actinie assez commune dans les flaques profondes qui séparent les madrépores. Étalé sur le sable, le disque oral de l'Actinie, de couleur blanchâtre, armé d'un très grand nombre de courts tentacules urticants, atteint souvent 0 m. 30 de diamètre. *Bithynis* se tient dans ce circle, nageant à peu de distance au-dessus, souvent par couples, et se laisse assez aisément capturer à l'aide d'une éprouvette pleine d'eau que l'on descend doucement sur l'animal."

Lenz (*loc. cit.*, 1905) describes the colour thus,—"Voeltzkow gibt die Farbe im Leben als wasserhell an. Beine an den Gelenk stellen dunkelblau, Körper dunkel und hell, mit rotbraunen und dunkelgelben Flecken; Scheren an den Seiten mit weissem Längsstreifen. Augenstiele weiss." This description does not agree well with my own observations.

Miss Rathbun (*loc. cit.*, 1914) has described the colour of a

specimen preserved in formalin and I have myself (*loc. cit.*, 1916) given a brief account of the colouration of the species when describing a Hippolytid which is also associated with *Discosoma*.

The following colour description was drawn up from an ovigerous female obtained in the Gulf of Manaar :—

The entire prawn, except for certain pigmented areas noted below, was almost completely transparent. The colouration of the ventral side could clearly be seen in dorsal view and the nerve-cord was distinctly visible. On the upper side of each eyestalk there was a white stripe which was continuous from side to side beneath the base of the rostrum. There was a large pure white patch on either side of the carapace and the gonad and associated organs were invested with a membrane covered with large closely-set white spots, clearly visible in dorsal view.

The hepatic regions and lower muscular portions of the carapace were dull venetian red. On the sides of each of the first three abdominal somites there was a large oval patch of glistening white, heavily outlined in black, which extended on to the sternum, and there was a broad band of the same colour on the posterior edge of the last abdominal somite and on the anterior half of the telson and uropods. In the latter half of the telson and of each uropod there was a brilliant eyespot; that on the telson was light orange bordered with black, while that on each uropod was similar, but with the orange centre shading distally to dark purple. All the other appendages, except the pleopods, were strongly suffused with blue, which was specially dark at the distal ends of the merus, carpus and palm of the second legs and formed a transverse band across the fingers. The cornea was grey and the eggs sage green.

It is evident from other notes, made by Col. Alcock on Gt. Coco I. and by myself at Port Blair, that there is very considerable variation in colour. The white patches on the abdomen were outlined in black in the specimen described above; but, just as frequently, they are bordered with orange, deep blue, or, according to Coutière, pale violet, while the eyespots in the tail-fan may be yellow in the centre, verging to red at the periphery and circumscribed with deep red-brown. In the distribution of the pigment, however, there appears to be little variation in specimens of the same sex and age.

Males lack the two white spots on the carapace and the membrane which invests some of the internal organs is without pigment. In young specimens the pigmentation is less well developed than in adults.

The appearance of this magnificently coloured prawn crawling and swimming in the immediate vicinity of the anemone is a sight not readily forgotten. That the colouration is in no degree protective is evident from the above description. The large white patches render it very conspicuous and I have already (*loc. cit.*, 1916) drawn attention to the remarkable fact that similar white patches or bands are a characteristic feature of the colour pattern of a Hippolytid and two species of fish which are also associated with *Disco-*

soma at Port Blair. Much careful observation in the field is necessary before we can come to any conclusions regarding the significance of the colour pattern or the exact nature of the relations that exist between the prawn and the anemone.

At Port Blair *P. brevicarpalis* was found at low water, either beneath the fringe of tentacles of the anemone, crawling on the disc or swimming in the immediate vicinity. I have not myself seen it enter the mouth of the anemone, though it is not improbable that it may do so. On several occasions, both at Port Blair and in the Gulf of Manaar the species has been taken in nets hauled in shallow water. I think that its occurrence under these conditions is to be explained by the assumption that the net passed over an anemone in its passage along the bottom. I have frequently seen the anemone at Port Blair in 10 feet of water.

The following specimens are in the collection of the Zoological Survey of India :—

C 360/1.	Kilakarai, G. of Manaar.	S. Kemp, Feb., 1913.	Two.
9299/6.	Spike I., Andamans.	'Investigator,' Nov., 1888.	One.
2966–70/7. 2984–90/7.	Gt. Coco I., Andaman group.	'Investigator,' Nov., 1890.	Twelve.
C 361-2/1.	Port Blair, Andamans.	S. Kemp, Feb., March, 1915; Febr., 1921.	Forty-five.

In the British Museum I have examined specimens from Murray I., Torres Straits (Potts coll.) and a much damaged individual from Singapore (Bedford and Lanchester coll.). In the Paris Museum I have seen the specimen from Bahrein I. in the Persian Gulf, recorded by Nobili as *Ancylocaris aberrans*; also one from Pulo Condore (Germain coll.) labelled "corps gélatineuse, taches jaunes," and one from Vanikoro in the Santa Cruz group, Oceania, labelled "sur actinie."

The species is recorded from Zanzibar, Kokotoni and Bawi in E. Africa (Lenz), from Djibouti in the Red Sea (Nobili), from Bahrein I., Persian Gulf (Nobili), from Macassar (Schenkel) from Hermite I., N.W. Australia (Rathbun) and from the Torres Straits (Borradaile). The specimens figured by Richters from Mauritius and by Saville-Kent from the great Barrier Reef of Australia probably also belong to this species.

Periclimenes (Ancylocaris) inornatus, sp. nov.

This species is closely allied to *P. brevicarpalis* and is also found in association with anemones of the genus *Discosoma*. The two species differ in the following particulars :—

P. brevicarpalis Sch.	*P. inornatus*, sp. nov.
Rostrum with 5 to 7 dorsal teeth, the foremost not placed close to apex.	Rostrum with 7 or 8 dorsal teeth, the foremost placed close to apex and often giving it a bifid appearance.
Carapace greatly swollen dorsally in adult females.	Carapace not swollen dorsally.
Hepatic spine of carapace situated on a much lower level than antennal.	Hepatic spine of carapace situated nearly on a level with antennal.

P. brevicarpalis Sch. .

Dactylus of second peraeopod at least two-thirds as long as palm.

Dorsal spines of telson very small, both pairs situated in distal half of its length.

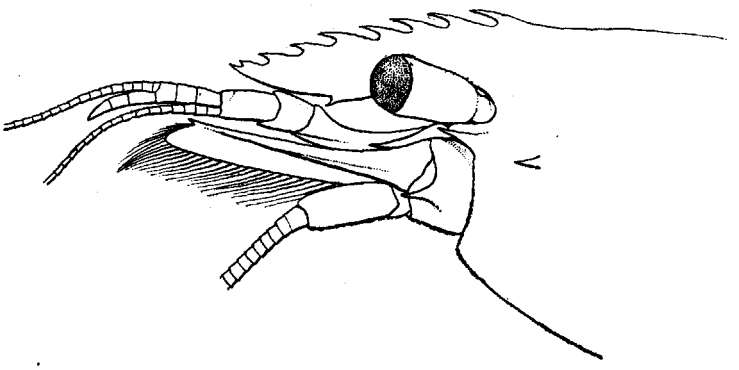
Brilliantly coloured when alive.

P. inornatus, sp. nov.

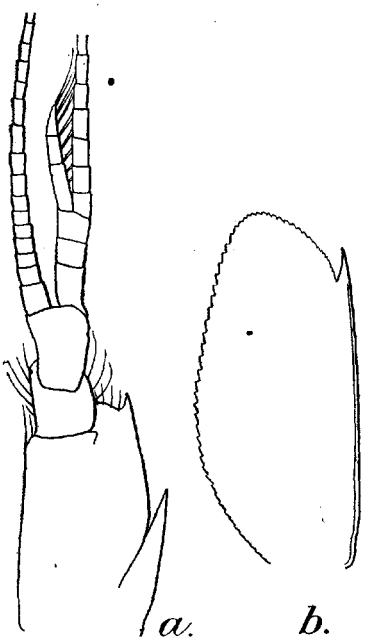
Dactylus of second peraeopod not more than half as long as palm.

Dorsal spines of telson large, anterior pair situated in proximal half of its length.

Without colour when alive.



TEXT-FIG. 43.—*Periclimenes inornatus*, sp. nov. Anterior part of carapace, rostrum, etc.



TEXT-FIG. 44.—*Periclimenes inornatus*, sp. nov.
a. Antennule. *b*. Antennal scale.

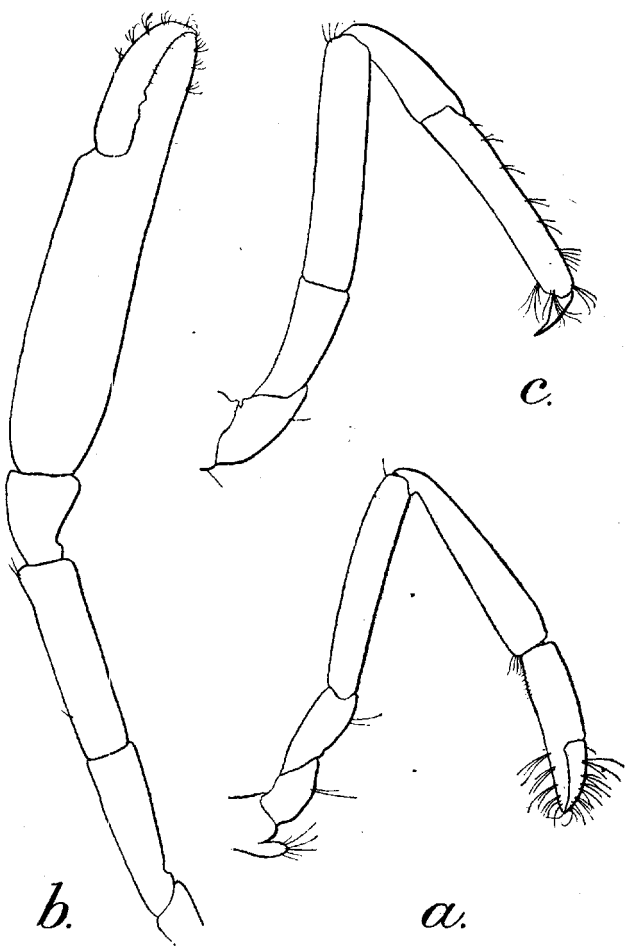
The rostrum is bent downwards and reaches to or a little beyond the end of the antennular peduncle (text-fig. 43). The upper margin is very slightly convex; the dorsal teeth[1] are evenly spaced, with the posterior tooth, as in the allied species, behind, above or a little in front of the hinder limit of the orbit. The single ventral tooth usually found[2] is small and situated beneath the fifth or sixth of those on the upper margin.

The eye is less slender than in *P. brevicarpalis*, but possesses an ocular spot as in that species. The fused part

[1] Of twenty specimens one has 6 dorsal teeth, eleven have 7 and eight have 8.
[2] Of twenty specimens one has no ventral teeth, eighteen have 1 tooth and one has 2 teeth.

of the outer antennular flagellum (text-fig. 44*a*) is almost or quite as long as the free portion of the shorter ramus and comprises 3 segments only. The antennal scale (text-fig. 44*b*) is about 2·25 times as long as broad.

There is no arthrobranch on the third maxilliped. The proportionate lengths of the segments of the peraeopods are much

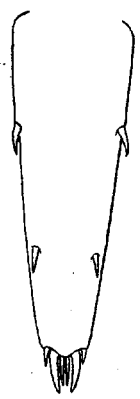


TEXT-FIG. 45.—*Periclimenes inornatus*, sp. nov.
a. First peraeopod. *b*. Second peraeopod.
c. Third peraeopod.

the same as in the related species but the first and last three pairs are stouter (text-figs. 45*a*, *c*) and the fingers of the second pair are never more than half the length of the palm (text-fig. 45*b*). In large specimens the fingers of the second pair are provided with teeth on the proximal half of their inner margins; on the dactylus there are two or three recurved teeth and on the fixed

finger four or five of irregular disposition. The dactyli of the last three peraeopods are simple and rather stout.

The dorsal spines of the telson (text-fig. 46), by their size and position, afford a ready means of distinguishing the species from *P. brevicarpalis*. The terminal spines also are longer. The outer uropod is nearly 2·5 times as long as broad, with a single movable spine near the end of its outer margin as in the allied species.



TEXT-FIG. 46.—*Periclimenes inornatus*, sp. nov. Telson.

The largest specimen is an ovigerous female about 17 mm. in length.

In life the species is almost completely transparent with a faint brownish tinge and with transparent eggs. It can only be detected with difficulty as it crawls among the short tentacles of the anemone.

In many of its characters *P. inornatus* resembles *P. diversipes*. The latter, however, is a much more slender species, with highly arched rostrum and with the foremost dorsal tooth not placed so near the apex. The fused part of the outer antennular flagellum is much longer than the free part of the shorter ramus and is composed of 7 to 9 segments, and the antennal scale is narrower and more sharply pointed distally. The second peraeopods of type *b* in *P. diversipes* are not unlike those of *P. inornatus*, but the fingers in this type are always more than half the length of the palm.

C 363/1.	Port Blair, Andamans.	S. Kemp. March, 1915.	Eighteen, including TYPES.
2991–2/7.	Gt. Coco I., Andaman group.	'Investigator,' Nov., 1890.	Two.

On both occasions the species was found on anemones of the genus *Discosoma* in company with *P. brevicarpalis*.

Periclimenes (Ancylocaris) brocketti Borradaile.

1915. *Periclimenes* (*Falciger*) *brocketti*, Borradaile, *Ann. Mag. Nat. Hist.* (8) XV, p. 212.

1917. *Periclimenes* (*Falciger*) *brocketti*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 374, pl. lv, fig. 15.

Male Atoll, Maldives, on brown crinoid.

Periclimenes (Ancylocaris) compressus Borradaile.

1915. *Periclimenes* (*Falciger*) *compressus*, Borradaile, *Ann. Mag. Nat. Hist.* (8) XV, p. 212.

1917. *Periclimenes* (*Falciger*) *compressus*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 373, pl. lv, fig. 18.

Saya de Malha.

Periclimenes (Ancylocaris) brevinaris Nobili.

1905. *Periclimenes borradailei*, Nobili, *Bull. Mus. Paris.* XI, p. 159.
1906. *Periclimenes brevinaris*, Nobili, *Bull. sci. France Belgique* XL, p. 42, pl. iii, figs. 7, 7*a*.

Nobili in his description of this species speaks of the spines on the carapace as the "antennale" and "branchiostégale," but judging from his figure the former is merely the acute lower angle of the orbit, while the latter is the antennal spine. If I have interpreted the description accurately *P. brevinaris* lacks a hepatic spine and is related to Miss Rathbun's *P. pusillus*. In *P. brevinaris* the second peraeopods are shorter than the first, a character also found in some forms of *P. diversipes*.

The species is known only from a single specimen, obtained on the pearl-oyster banks in the Persian Gulf in 10–12 fathoms of water.

Periclimenes (Ancylocaris) pusillus Rathbun.

1906. *Periclimenes pusillus*, Rathbun, *Bull. U. S. Fish Comm.* XXIII, iii, p. 921, fig. 71.

Oahu, Hawaiian Is.

Periclimenes (Ancylocaris) spiniferus de Man.

1902. *Periclimenes petitthouarsi* var. *spinifera*, de Man, *Abhandl. Senck. naturf. Ges.* XXV, iii, p. 824.
1917. *Periclimenes (Falciger) spiniferus*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 369, pl. LII.

Other references are given by Borradaile. In the series of specimens that I have examined there are from 6 to 9 teeth on the upper border,[1] usually 6 or 7, and from 2 to 5 on the lower border,[2] usually 3 or 4.

This species and *P. petitthouarsi* differ from all other Pontoniids in the curious armature of the fingers of the second chela. A pit or socket in one finger, for the reception of a tooth borne on the other finger, is not an uncommon arrangement in the subfamily; but in *P. spiniferus* and the related species each finger bears a large oval cup-shaped depression, the two cups being opposed to each other when the claw is shut. Tattersall remarks that a similar arrangement is found in *P. calmani*,[3] but judging from his figure he has misunderstood the structure in *P. spiniferus*. The cutting edges of the fingers in *P. calmani* appear to be quite normal and to bear teeth separated by rather deep notches, just as in *P. demani* and many other species of the genus.

In all well-preserved specimens a ring of black pigment may be seen on the upper side of the cornea. Adult males, when living, are for the most part semi-transparent with minute red and white

[1] Of sixty-eight specimens twenty-one have 6 dorsal teeth, forty-five have 7, one has 8 and one has 9.

[2] Of sixty-eight specimens three (young) have 2 ventral teeth, thirty-eight have 3, twenty-five have 4 and two have 5.

[3] Tattersall, *Journ. Linn. Soc., Zool.* XXXIV, p. 386 (1921).

dots. On the anterior part of the carapace (sometimes on the posterior parts also) there are oblique or transverse bands of white dots, broadly outlined with deep carmine or black and the eyestalks are striped with the same colour. The distal ends of the merus, carpus and palm of the second peraeopods are suffused with orange or orange red and beyond this suffusion a white patch is frequently found. The fingers are spotted with black and often have a blue tinge. The other legs are finely dotted with red or reddish brown and with white. At the distal ends of the telson and each uropod there is a white spot and the setae of the uropods are sometimes dark blue at the base.

C 367–8/1.	Pamban, G. of Manaar.	S. Kemp, Feb., 1913.	Sixty-three.
9184/6.	Off Sentinel I., Andamans, 20 fms.	'Investigator,' Jan., 1888.	Two.
C 369/1.	Port Blair, Andamans.	S. Kemp, March, 1915.	Five.
C 370/1.	Samoa.	Purchased.	One.

The species has been recorded from Tamative Reef, Madagascar (Lenz), from Chagos Archipelago, Coetivy, the Seychelles and the Maldives (Borradaile), from Pulo Edam in the B. of Batavia, Amboina and Ternate (de Man) and from Tahiti (Heller). The species is usually, if not always, found on madrepore corals.

Periclimenes (Ancylocaris) petitthouarsi (Audouin).

1825. *Palaemon petitthouarsi*, Audouin, *Explic. somm. des planches de Crust.*, p. 91, in Savigny's *Descr. Égypte*, pl. x, fig. 3 (1809).
1915. *Periclimenes Petitthouarsii*, Balss, *Denk. math.-naturw. Kl. K. Akad. Wien* XCI, p. 25.
1917. *Periclimenes (Falciger) petitthouarsi*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 369.
1921. *Periclimenes petitthouarsi*, Tattersall, *Journ. Linn. Soc., Zool.* XXXIV, p. 385.

For other references see Borradaile. In the series of specimens I have examined there are from 6 to 9 teeth on the upper border[1] of the rostrum, usually 7 or 8, and from 3 to 5 on the lower border,[2] usually 4. The ring of black pigment noticed in *P. spiniferus* on the upper side of the cornea is also present in this species.

C 371/1. Tor, G. of Suez. R. B. S. Sewell, 1916. Twenty-three.

The species is abundant in the Red Sea and has been recorded by Nobili[3] from the vicinity of Arzana I. in the Persian Gulf. I have examined specimens from this last locality, belonging to the Paris Museum.

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[1] Of twenty-two specimens one has 6 dorsal teeth, fourteen have 7, six have 8 and one has 9.

[2] Of twenty-two specimens four have 3 ventral teeth, seventeen have 4 and one has 5.

[3] Nobili, *Bull. sci. France Belgique* XL, p. 42 (1906).

Periclimenes (Ancylocaris) denticulatus Nobili.

1906. *Periclimenes Petitthouarsi* var. *denticulata*, Nobili, *Bull. Mus. Paris* XII, p. 257.
1907. *Periclimenes Petitthouarsi* var. *denticulata*, Nobili, *Mem. Accad. Sci. Torino* (2) LVII, p. 358.

Gatavake, Polynesia.

The species of the *P. grandis* group.

The following eleven species are very closely allied and belong to what may be termed the *P. grandis* group. They agree (i) in the possession of supra-orbital and hepatic spines, (ii) in the narrow antennal scale with distal spine far outreaching the end of the lamella, (iii) in the unarmed fingers of the first peraeopod, and (iv) in the presence of a spine at the distal end of the merus of the second peraeopod.

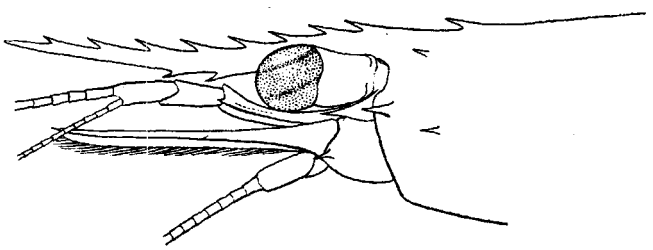
The species of this group are more difficult to identify than any others of the subfamily. Many of the characters depend on the proportions of various segments of the legs, which are never very easy to determine and there is considerable variation within the limits of a species. The proportions of the segments of the second legs undergo remarkable alteration with growth, especially in males, and are usually very different in adults of the two sexes.

In view of these difficulties I have thought it best to avoid the comparative method of description and, at the risk of becoming tedious, to give a detailed account of each of the species I have examined.

Periclimenes (Ancylocaris) agag, sp. nov.

(Plate VII, fig. 9.)

The rostrum (text-fig. 47) is slender; it reaches to or a little beyond the end of the antennal scale and is longer than the



TEXT-FIG. 47.—*Periclimenes agag*, sp. nov.
Anterior part of carapace, rostrum, etc.

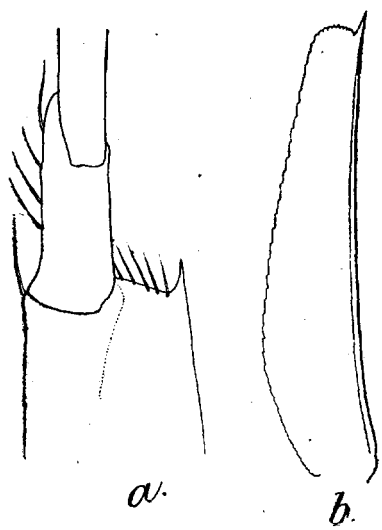
carapace. At the base it is straight, but it is a little upturned in its distal half. On the slightly concave upper border it bears from 7 to 9 teeth, nearly always 8 or 9.[1] The posterior tooth is rather

[1] Of twenty-seven specimens two have 7 dorsal teeth, twelve have 8 and thirteen have 9.

widely separated from the others and is placed on the carapace, the second being immediately above the orbit, the foremost near the tip and the rest more or less evenly spaced. On the lower border there are from 1 to 3 teeth, nearly always 2,[1] placed at about the middle of the rostral length.

The supra-orbital spine is conspicuous. The lower orbital angle is rounded, with the antennal spine below it; the hepatic is placed behind the antennal but on a lower level. The eyes are large and somewhat depressed. The cornea is wider than the stalk and usually shows traces of two concentric bands of dark pigment. The ocular spot touches the cornea.

The basal segment of the antennular peduncle has a short lateral process and the terminal spine (text-fig. 48*a*) is short, reaching little beyond the articulation of the second segment; the margin between the spine and the articulation is nearly straight. The second and third segments are slender. The free portions of the two rami composing the outer antennular flagellum are extremely short; the fused portion comprises some 9 to 11 segments. In the male the total length of the stouter ramus is not much less than that of the peduncle, in the female it is proportionately rather shorter. The antennal scale (text-fig. 48*b*) is nearly 5 times as long as wide; the outer margin is slightly concave, ending in a spine which extends far beyond the lamella. The apex of the lamella is broader than in most of the related species.



TEXT-FIG. 48.—*Periclimenes agag*, sp. nov.
a. Part of antennular peduncle.
b. Antennal scale.

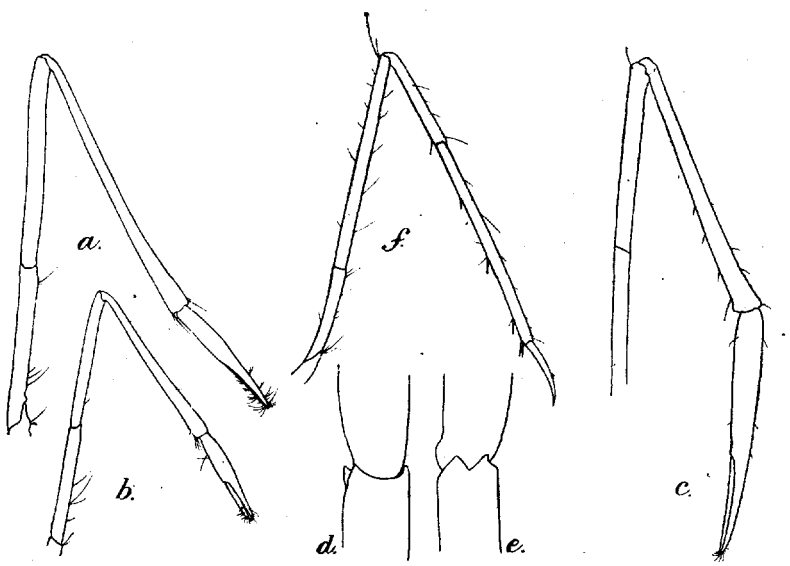
The third maxilliped bears a small arthrobranch. The exopod reaches the end of the antepenultimate segment, the latter bearing a few short spines on its outer margin. Excluding the terminal spine the ultimate segment is about three-quarters the length of the penultimate.

The first peraeopods (text-figs. 49*a*, *b*) are long and slender; in adult males the mero-carpal articulation reaches at least to the end of the second antennular segment. The carpus in adult males

[1] Of twenty-seven specimens one has 1 ventral tooth, twenty-four have 2 teeth and two have 3.

is fully 14 times as long as its distal breadth and may be nearly 1·5 times as long as the merus. In females the carpus is about 11 times as long as broad and 1·3 times the length of the merus. In large males the carpus is twice or rather more than twice the length of the chela, in small males and females about 1·75 times. The fingers are about equal in length with the palm and are unarmed.

The second peraeopods in large males reach beyond the scale by the chela, carpus and a considerable portion of the merus and are from 7 to 8·5 times the length of the carapace. The whole limb is



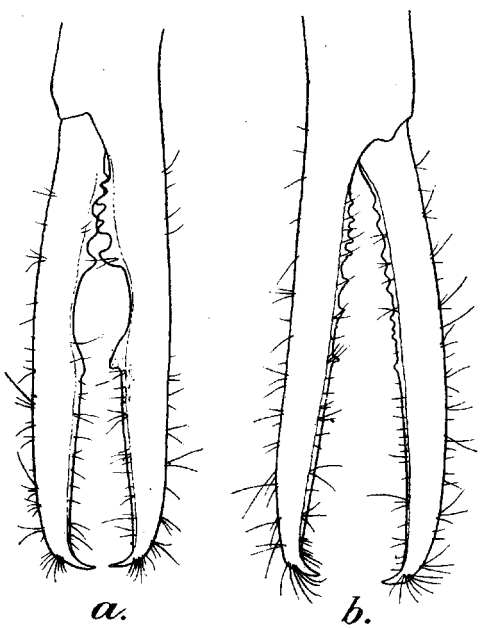
TEXT-FIG. 49.—*Periclimenes agag*, sp. nov.

a. First peraeopod of male.
b. First peraeopod of female.
c. Second peraeopod of female (less highly magnified than *a*, *b* or *f*).
d. Carpo-propodal articulation of right second peraeopod of male, viewed from above.
e. The same, viewed from the inner side.
f. Third peraeopod.

covered with minute asperities, visible only under the microscope. The ischium bears a small tubercle at the distal end of the lower margin. The merus is from 10 to 14 times as long as wide,[1] with a strong distal spine on the lower side; it is from 1·3 to 2 times as long as the ischium and about three-quarters the length of the carpus. The carpus is from 12 to 15 times as long as its distal breadth in large males,[2] from 10 to 12 times in small males. There is no conspicuous terminal spine on the inner side of the carpus; the distal end of the segment, viewed from the inner side shows two angular projections (text-fig. 49*e*) and one of these when seen from

[1] In measuring the breadth the spine at the distal end is not reckoned.
[2] The carpus is too slender at the distal end in plate vii, fig. 9.

above has the appearance of a short blunt tooth (text-fig. 49*d*). In this respect there is a marked difference between *P. agag* and certain related species such as *P. andamanensis* (*cf.* text-figs. 57*a*, *b*, p. 207) in which there is a sharp and prominent spine in this position. The chela is from 1·1 to 1·25 times the length of the carpus; the palm in the largest males is 2·5 times, in medium-sized specimens 1·9 times and in the smallest 1·6 times the length of the fingers. The fingers show great variation in form; frequently the cutting edges are straight and meet throughout their length when the claw is closed, bearing a series of small teeth in the proximal half or two-thirds of their length (text-fig. 50*b*). Often, however, there is a



TEXT-FIG. 50.—*Periclimenes agag*, sp. nov.
Fingers of second peraeopod of adult males.
a. Excavate type. *b*. Non-excavate type.

rounded excavation in each cutting edge a little behind the middle, with the result that a gap, sometimes almost circular in outline, is seen when the claw is shut (text-fig. 50*a*). The excavation in each finger is limited at either end by a tooth and a series of 3 to 6 teeth is found between the gap and the base of the fingers. Males are not dimorphic in the structure of the fingers for specimens occur in an intermediate stage of development, with the notches in the fingers shallow and inconspicuous. In all large males which possess both the second legs the chelae of a pair are closely similar in structure.

In adult females the second peraeopods (text-fig. 49*c*) are much shorter than in large males. The carpus is from 1·3 to 1·5

times the length of the merus and is equal to, or a little longer than the chela. The palm is about 1·4 times the length of the fingers, which are unarmed or with very small and inconspicuous teeth near the base.

The last three pairs of peraeopods are long and very slender (text-fig. 49*f*). In adult males the mero-carpal articulation of the third pair reaches almost or quite to the end of the basal antennular segment. In both sexes the fifth pair reaches beyond the end of the antennal scale by fully the length of the dactylus. The merus of the third pair is from 16 to 18 times as long as broad in adult males, 13 to 14 times in females. The propodites bear a few slender spinules on their posterior edges; in the male they from 3 to 3·3 times the length of the dactylus, from 2·7 to 3 times in the female. The dactylus is simple and curved, with a few setae in the middle of the anterior margin; it is very slender, from 7 to 8 times as long as its basal breadth.

The sixth abdominal somite is about 1·7 times the length of the fifth.[1] The foremost pair of dorsal spinules of the telson are placed in the anterior third of its length, the second pair midway between the first and the apex. The intermediate apical spines are very long.

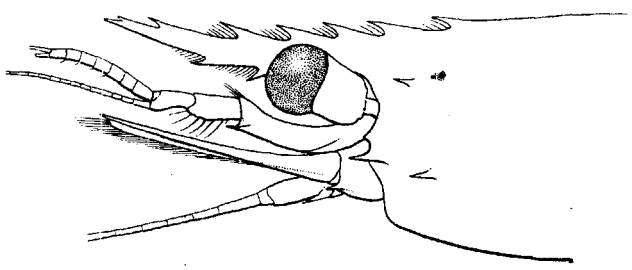
Large specimens are about 16·5 mm. in length.

C 374–6/1.	Port Blair, Andamans; 4–8 fms.	S. Kemp, Feb., 1915; Feb., March, 1921.	Thirty-five, including TYPES.

All the specimens were found in Ross Channel on a bottom composed mainly of small corals and sponge-encrusted stones.

Periclimenes (Ancylocaris) proximus, sp. nov.

The rostrum (text-fig. 51) is slender and reaches almost to or a little beyond the apex of the antennal scale. It is a little up-



TEXT-FIG. 51.—*Periclimenes proximus,* sp. nov.
Anterior part of carapace, rostrum, etc.

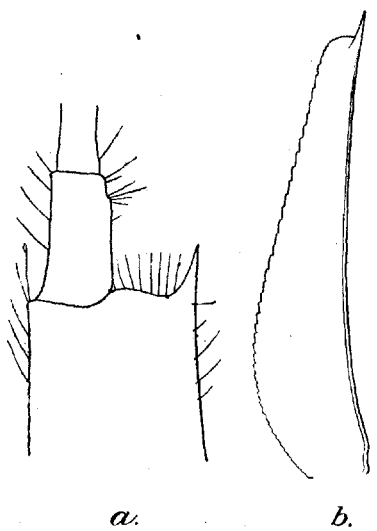
turned in its distal third and bears on the slightly concave upper margin 6 or 7 large teeth, usually 7.[2] The posterior tooth is placed on the carapace and is rather more distant from the second than the second is from the third; the remainder are more or less evenly

[1] It is too short in plate vii, fig. 9.
[2] Of twenty-one specimens four have 6 dorsal teeth and seventeen have 7.

spaced and the seventh tooth, when present, is much smaller than the rest and placed quite close to the apex. On the lower border there are 2 or 3, nearly always 2 teeth,[1] which are large and placed in advance of the middle of the rostrum.

Supra-orbital, antennal and hepatic spines are present as in *P. agag*. The eyes are large and depressed; the cornea is wider than the stalk and in freshly preserved specimens usually shows two concentric rings of dark pigment. The ocular spot touches the cornea.

The basal segment of the antennular peduncle has a short lateral process, not reaching the middle of the segment; its terminal spine is long, reaching the middle of the second segment, and the margin between the base of this spine and the articulation is gently convex (text-fig. 52*a*). The two distal segments are slender. The free portion of the stouter ramus of the outer antennular flagellum is very short; the fused portion consists of 7 to 11 segments. The total length of the stouter ramus is considerably less than that of the peduncle. The antennal scale (text-fig. 52*b*) is from 4·5 to 5·8 times as long as wide and is proportionately longest in large males. The scale is very narrow at the apex. The outer margin is strongly concave and terminates in a spine which far outreaches the end of the lamella.



TEXT-FIG. 52.—*Periclimenes proximus*, sp. nov.
a. Part of antennular peduncle.
b. Antennal scale.

The third maxilliped bears a small arthrobranch. The exopod reaches the end of the antepenultimate segment, the latter bearing one or two spines on its outer edge. The ultimate segment, excluding the terminal spine is about two-thirds as long as the penultimate.

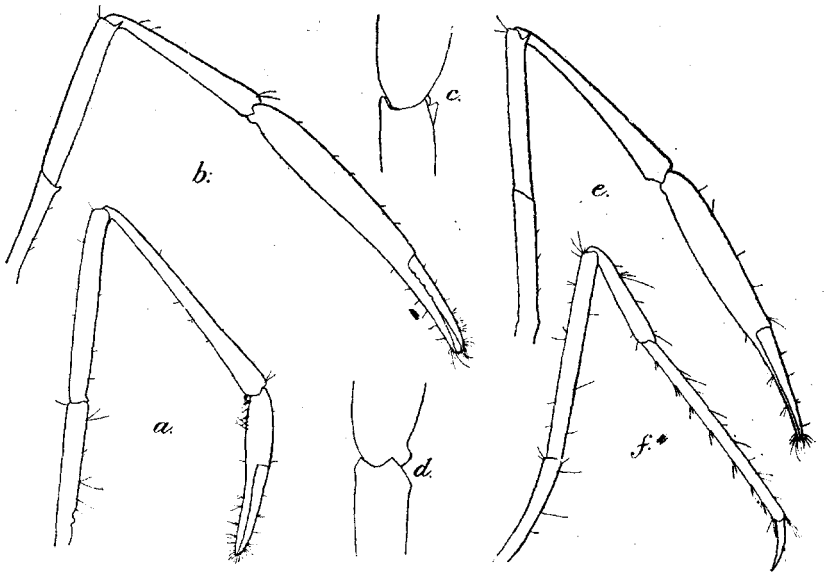
The mero-carpal articulation of the first peraeopods reaches the end of the second segment of the antennular peduncle in adult males, not quite so far in females. The carpus in adults of both sexes is from 1·2 to 1·3 times the length of the merus and about 1·4 times the length of the chela (text-fig. 53*a*). The limb is stouter than in *P. agag*; in an adult male the carpus is 10 times as long as

[1] Of twenty-one specimens twenty have 2 ventral teeth and one has 3.

its distal breadth, in an adult female 8·5 times. The fingers are longer than the palm and are unarmed.

The second peraeopods bear a conspicuous subterminal spine on the lower side of the merus. In large males they may be as much as 6 times the length of the carapace, extending beyond the scale by more than the length of the carpus and chela. The legs of a pair are equal or subequal and similar in structure. As in *P. agag* the second legs of males are closely covered with minute asperities only visible under a microscope.

In large males (text-fig. 53*b*) there is a conspicuous tubercle



TEXT-FIG. 53.—*Periclimenes proximus*, sp. nov.

a. First peraeopod of male.
b. Second peraeopod of male.
c. Carpo-propodal articulation of right second peraeopod of male, viewed from above.
d. The same, viewed from the inner side.
e. Second peraeopod of female.
f. Third peraeopod.

at the distal end of the lower border of the ischium. The merus is from 7·0 to 8·0 times as long as broad. The carpus is from 1·0 to 1·2 times as long as the merus and from 7·0 to 8·0 times as long as its distal breadth. The distal end of the carpus is similar in structure to that of *P. agag* and does not bear a conspicuous spine on the inner side (text-figs. 53*c*, *d*). The chela is from 1·4 to 1·7 times the length of the carpus; the palm is about 5 times as long as wide and from 1·95 to 2·2 times the length of the fingers. In all the males examined, the fingers meet throughout their length when the claw is closed.[1] Each is armed in the proximal half

[1] The number of large specimens in the collection is small; it is very probable that more highly developed males with gaping fingers remain to be discovered.

with a series of 4 to 8 small teeth, very irregular in their size and disposition.

In a small male the carpus is only about 6 times as long as its distal breadth, while the chela is 1·7 times its length. The palm is rather more swollen than in large males, about 4·5 times as long as broad.

The female differs conspicuously from that of *P. agag* in that the chela is always definitely longer than the carpus. In an ovigerous specimen (text-fig. 53*e*) the carpus is 7·5 times as long as its distal breadth and 1·25 times as long as the merus. The chela is 1·4 times as long as the carpus, with palm 1·6 times as long as the fingers.

The last three pairs of peraeopods are slender; the fifth reach to or a little beyond the end of the antennal scale. In the third pair (text-fig. 53*f*) the merus is from 11·5 to 12·5 times as long as wide. The propodite bears conspicuous spinules on its posterior border and is from 3·5 to 4·0 times as long as the dactylus. The dactylus is slender and curved, with a few setae in the middle of its anterior margin, and is from 5 to 6 times as long as its basal breadth.

The sixth abdominal somite is rather less than 1·5 times the length of the fifth. The telson resembles that of *P. agag*.

The largest specimen is a male, about 17·5 mm. in length.

I have no notes on the colouration of living specimens as the differences between this and other closely related forms were not noticed in the field. In specimens, however, which have only been a few months in alcohol a bright red spot is to be seen at the end of the carpus of the second leg and a narrow red band across the fingers of the same appendage. This colouration is not found in any of the allied species.

The principal differences between *P. proximus* and *P. agag* may be summarized thus:—

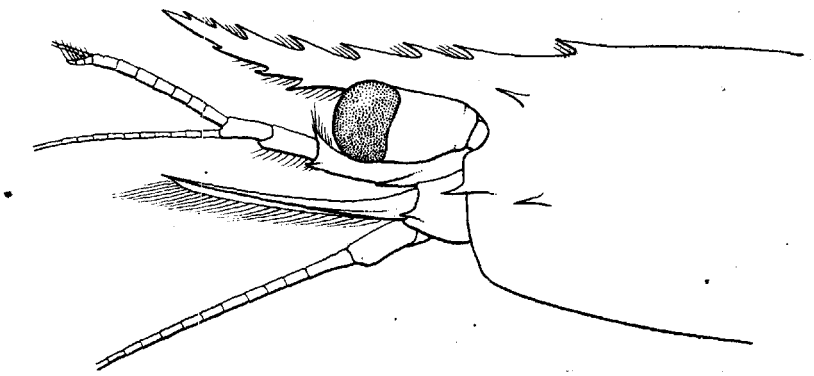
P. proximus, sp. nov.	*P. agag*, sp. nov.
Rostrum with 6 or 7 dorsal teeth.	Rostrum usually with 8 or 9 dorsal teeth.
Carpus of first peraeopods less than 1·5 times length of chela.	Carpus of first peraeopods in females and young males 1·75 times, in adult males twice the length of chela.
Chela of second peraeopods in males from 1·4 to 1·7 times length of carpus.	Chela of second peraeopods in males 1·1 to 1·25 times length of carpus.
Chela of second peraeopods in females conspicuously longer than carpus.	Chela of second peraeopods in females equal to or a little shorter than carpus
C 377–9/1. Port Blair, Andamans, 4–8 fms.	S. Kemp, March, 1915; Feb., March, 1921. Twenty-two, including TYPES.

The specimens were found in Ross Channel in company with *P. agag* and *P. andamanensis*.

Periclimenes (Ancylocaris) andamanensis, sp. nov.

This species differs conspicuously from the two preceding in the presence of a conspicuous distal spine on the inner side of the carpus of the second peraeopods.

The rostrum (text-fig. 54) is slender and reaches to or a little beyond the apex of the antennal scale. It is straight in its proximal half but trends upwards distally. On the slightly concave upper border it bears from 7 to 9 teeth, nearly always 8 or 9;[1]

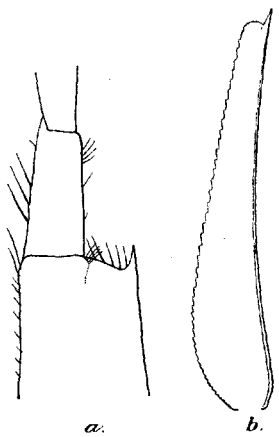


TEXT-FIG. 54.—*Periclimenes andamanensis*, sp. nov.
Anterior part of carapace, rostrum, etc.

the hindmost of these is situated on the carapace and is separated by a rather wide interval from the second, which is placed above the hinder limit of the orbit. The rest of the teeth are more or less evenly spaced, extending to the tip. On the lower border there are 2 or 3 teeth, most commonly 2,[2] placed a little in advance of the middle of the rostrum.

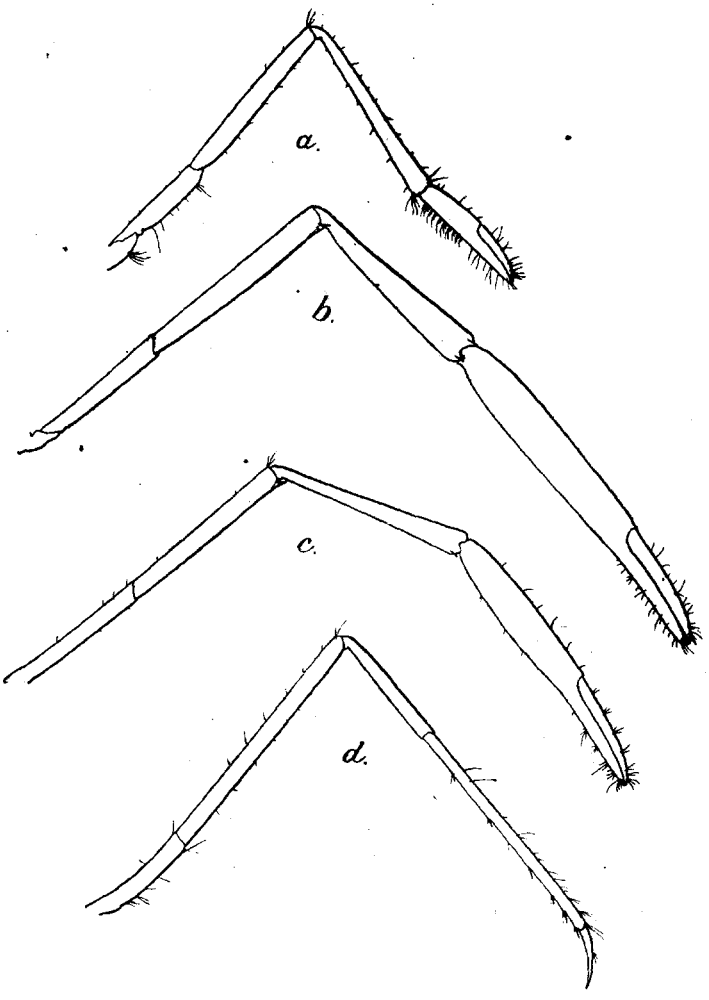
The supra-orbital, antennal and hepatic spines resemble those of the preceding species. The eyes also are similar but usually show only one faint band of dark pigment on the cornea.

The basal segment of the antennular peduncle has a short lateral process; the distal spine of the outer margin is very short (text-fig. 55*a*), it extends little beyond the articulation between the first and second segments and the spine and the articulation is almost straight



TEXT-FIG. 55.—*Periclimenes andamanensis*, sp. nov.
a. Part of antennular pedun
b. Antennal scale.

ments are slender. The free portions of the rami composing the outer antennular flagellum are very short. The fused portion comprises some 8 to 11 segments and the total length of the stouter ramus, in males, is a little longer than the peduncle. The antennal scale is from 5 to 5·5 times as long as wide and is very



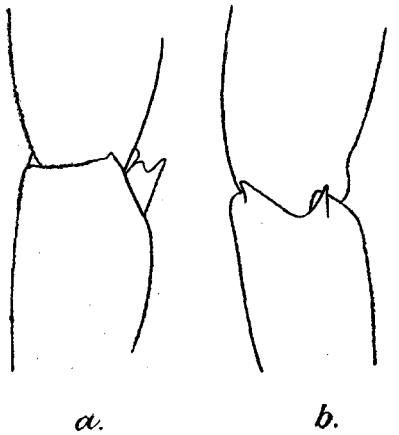
TEXT-FIG. 56.—*Periclimenes andamanensis*, sp. nov.

a. First peraeopod. *c*. Second peraeopod of female.
b. Second peraeopod of male. *d*. Third peraeopod.

...x. The outer margin is concave with the termi-
...ing the end of the lamella.
...sembles that of the preceding species.

1·1 times as long as the merus, from 7 to 10 times as long as its distal breadth and from 1·4 to 1·7 times as long as the chela; it is proportionately longest and most slender in adult males. The fingers are about equal in length with the palm and are unarmed.

The second peraeopods of adult males (text-fig. 56*b*) extend beyond the antennal scale by the chela, carpus and a portion of the merus and may be as much as 6 times the length of the carapace. They do not show the minute asperities with which the second legs of the two preceding species are covered and there is no tubercle at the distal end of the ischium. The merus bears the usual strong spine at the distal end of the lower border and, in adults, is from 8 to 9 times as long as broad. In all well grown males the merus is very slightly longer than the carpus, from 1·05 to 1·1 times its length; in small males the merus and carpus are equal or the latter is a shade the longer. The carpus is from 6 to 7 times as long as its distal breadth in adults, but in young males is more slender, sometimes as much as 9 times as long as wide. The carpus always bears a conspicuous spine on the inner side of its distal margin and in large males there is in addition a small acute projection or tooth on the upper and inner aspect (text-figs. 57*a*, *b*). The chela is from 1·8 to 2·2 times the length of the carpus in adults, in young specimens 1·5 times or even less. The palm in large specimens is about 6 times as long as wide; in adults it is from 1·8 to 2·1 times as long as the fingers, in young males proportionately shorter, from 1·5 to 1·7 times. The fingers resemble those of *P. agag*; in some specimens they are excavate on their inner margins, in others they meet throughout their length when shut and bear a series of small teeth in their proximal two-thirds.



TEXT-FIG. 57.—*Periclimenes andamanensis*, sp. nov.

a. Carpo-propodal articulation of right second peraeopod of male, viewed from above.
b. The same, viewed from inner side.

In females (text-fig. 56*c*) the second peraeopods are more slender and proportionately shorter than in adult males. The carpus is equal to or a little longer than the merus and is 8 to 9 times as long as its distal breadth. As in males the carpal spine is conspicuous. The chela is from 1·35 to 1·6 times as long as the carpus, with the palm about 1·4 times the length of the fingers. The fingers have some inconspicuous teeth in the proximal half.

The last three pairs of peraeopods (textfig. 56*d*) are long and slender; the fifth pair reaches to or a little beyond the end of the antennal scale. The merus of the third pair is about 15 to 16 times as long as broad in adults. The propodus bears some slender spinules on its posterior edge and is from 2·7 to 3·6 times as long as the dactylus, proportionately longest in large males. The dactylus is simple and curved, with a few setae on the middle of its anterior margin; it is from 7·5 to 8 times as long as its basal breadth.

The sixth abdominal somite is about 1·7 times the length of the fifth. In the arrangement of the spines the telson resembles that of *P. agag*.

A large male is about 19 mm. in length.

Periclimenes andamanensis agrees with *P. proximus* and differs from *P. agag* in the comparatively stout first and second legs and in the greater length of the chela of the second legs, as compared with the carpus, in adults of both sexes. From both species it is distinguished by the presence of the carpal spine. It also differs from *P. proximus* in the greater number of upper rostral teeth, in the proportionate lengths of merus, carpus and chela in the second leg of the adult male and in the rather more slender legs of the last three pairs. Other minor differences will be found on comparison of the two descriptions given above.

C 380–1/1.	Port Blair, Andamans, 4–8 fms.	S. Kemp, Feb., 1915; Feb., March, 1921.	Many.

The specimens were found in Ross Channel in company with *P. agag* and *P. proximus*. The types bear the number C 380/1.

Certain additional specimens obtained on muddy ground at the inner end of Port Blair are tentatively referred to *P. andamanensis*, but differ in certain characters which will perhaps prove to possess at least varietal value. Of the nine specimens eight are females and one a young male.

The only points in which these specimens differ from the above description are as follows:—

The rostrum is less shallow and bears as a rule 9 dorsal teeth and 3 ventral.[1] The ovigerous females are larger than any typical *P. andamanensis* that I have seen, with the carpus of the second peraeopods decidedly stouter, from 5·5 to 6 times as long as its distal breadth. The chela also is longer in relation to the carpus, about 1·8 times its length. In the last three legs the dactylus is considerably longer than in typical specimens. In large females the propodus of the third pair is only 2·25 times and in the young male only twice the length of the dactylus. The dactylus is also rather more slender from 8 to 9 times as long as its basal breadth in females, 11 times in the young male.

[1] Of eight specimens one has 8 dorsal teeth, six have 9 and one has 11; seven specimens have 3 ventral teeth and one has 4.

In other respects there is practically no difference between the two sets of specimens. The young male resembles typical specimens of the same size and sex in the proportions of the segments of the second peraeopods. The carpus is about 7 times as long as its distal breadth and is a trifle longer than the merus; the cheła is 1·5 times as long as the carpus. In females the carpus is a little shorter than the merus and, in all the specimens, the carpal spine is conspicuous. The merus of the third leg is 12 to 13 times as long as broad in females, 17 times in the young male.

In the absence of fully developed males it is not possible to identify the specimens with certainty, but the material examined seems to point to the conclusion that the muddy ground at the inner end of Port Blair is inhabited by a special variety of *P. andamanensis*.

The largest female is about 18 mm. in length.

C 382–3/1. Port Blair, Andamans, 3–5 fms. S. Kemp, Feb., March, 1921. Nine.

The specimens were obtained off Viper I. and at the mouth of Brigade Creek on a bottom composed of mud and decaying vegetation.

Periclimenes (Ancylocaris) suvadivensis Borradaile.

1915. *Periclimenes (Falciger) suvadivensis*, Borradaile, *Ann. Mag. Nat. Hist.* (8) XV, p. 212.

1917. *Periclimenes (Falciger) suvadivensis*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 375, pl. lv, fig. 16.

I have examined the types of this species and find that Borradaile was mistaken in supposing that they do not possess a supraorbital spine. The species thus finds a place in the *P. grandis* section and is extremely closely allied to *P. andamanensis*. Unfortunately I was not able to make a critical comparison of the two forms and the only characters that I can now give for the separation of the two species are that (i) the upper rostral teeth (6 or 7) are less numerous in *P. suvadivensis* than is customary in *P. andamanensis* and (ii) that the carpus of the second peraeopods in adult males is conspicuously longer than the merus in the former species, whereas in the same sex of the latter the merus is longer than the carpus.

The species was described from specimens taken at Suvadiva Atoll in the Maldives.

Periclimenes (Ancylocaris) ensifrons (Dana).

1852. *Anchistia ensifrons*, Dana, *U. S. Explor. Exped., Crust.* I, p. 580, pl. xxxviii, figs. 1*a–g*.

1899. *Periclimenes ensifrons*, Nobili, *Ann. Mus. civ. Genova* (2) XX, p. 234.

1907. *Periclimenes ensifrons*, Nobili, *Mem. Accad. Sci. Torino* (2) LVII, p. 359.

Nobili (1907) has examined two young specimens of this species from Polynesia and has pointed out that they differ from

those to which de Man and other authors have applied the name in the absence of the spine at the distal end of the carpus of the second peraeopods. In this respect his specimens agree with Dana's description "carpus long, not armed or acute at apex." According to Nobili de Man's specimens probably represent a variety of Dana's species, but with this I am unable to agree.

For *P. ensifrons*, as applied by de Man, Stimpson's name *grandis* may be employed. This species differs from true *P. ensifrons* in possessing the carpal spine on the second legs and also in the proportions of the merus and carpus of the same limb. In *P. ensifrons* the carpus is decidedly longer than the merus (see Dana's figure and Nobili's measurements), whereas in *P. grandis* the merus in males is longer than, and in females equal to or a little longer than the carpus.

P. ensifrons was described from the Straits of Balabac, North of Borneo and is recorded by Nobili from Beagle Bay, New Guinea and from the lagoons of Amanu and Fakahina in Polynesia. There does not appear to be any evidence that it occurs in the western part of the Indo-Pacific region.

Periclimenes (Ancylocaris) grandis (Stimpson).

(Plate VII, fig. 10.)

1860. *Anchistia grandis*, Stimpson, *Proc. Acad. Sci. Philadelphia*, p. 39.
1887. *Anchistia ensifrons*, de Man, *Arch. Naturgesch.* LIII, i, p. 545.
1887. *Anchistia ensifrons*, Müller, *Verh. naturf. Ges. Basel* VIII, p. 471.
1894. *Anchistia ensifrons*, Ortmann, *Jenaisch. Denkschr.* VIII, p. 16.
1902. *Periclimenes ensifrons*, de Man, *Abhandl. Senck. naturf. Ges.* XXV, p. 826.
1905. *Periclimenes vitiensis*, Pearson, *Ceylon Pearl Oyster Rep.* IV, p. 78.
1905. *Periclimenes ensifrons*, Lenz, *Abhandl. Senck. naturf. Ges.* XXVII, p. 80.
1906. *Periclimenes ensifrons*, Nobili, *Ann. Sci. nat., Zool.* (9) IV, p. 49.
1915. *Periclimenes ensifrons*, Balss, *Denk. math.-naturw. Kl. K. Akad. Wien* XCI, p. 26.

The rostrum reaches to or a little beyond the end of the antennal scale. In lateral view it is deep, more so in females than in males; it is straight at the base but in its distal half is directed upwards, the upper margin being thus slightly concave. The dorsal teeth are from 6 to 10 in number,[1] nearly always 7 or 8. The posterior tooth stands on the carapace and is separated from the next by a rather wide interval; the second is placed above or a little behind the posterior limit of the orbit; the foremost is very close to the apex and often gives it a bifid appearance. In the precise distribution of the teeth there is, as usual, some variation; frequently, and especially in males, four teeth are placed rather close together above the eye, one or two near the apex and one midway between the two groups. On the lower border there are from

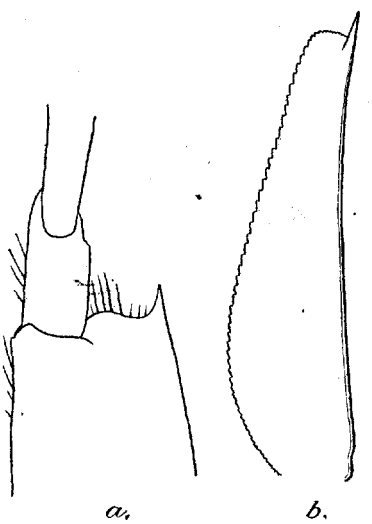
[1] Of eighty-four specimens one has 6 dorsal teeth, forty have 7, thirty-nine have 8, three have 9 and one has 10.

2 to 5 teeth,[1] usually 2 or 3; these teeth are large and the foremost is always placed behind the most anterior of those on the upper border.

Supra-orbital, antennal and hepatic spines are present; the hepatic is placed rather close behind the antennal, but on a lower level. The lower limit of the orbit is defined by a blunt angulation of the frontal margin.

The eyes are stout. The cornea is hemispherical and wider than the stalk; in life it is traversed by two concentric bands of dark pigment and these may frequently be seen in preserved material. The ocular spot is distinct and confluent with the cornea.

The lateral process of the antennule is short, not reaching the middle of the basal segment. The spine at the distal end of the outer border of this segment is stout, but does not reach to the middle of the second segment; the margin between the spine and the articulation is strongly sinuous (text-fig. 58*a*). The two distal segments are slender. The outer antennular flagellum is cleft for only a very short distance, the fused basal portion comprising 10 to 13 segments. In both sexes the total length of the outer ramus is considerably less than that of the peduncle. The antennal scale (text-fig. 58*b*) is narrow at the apex and is from 3·9 to 4·3 times as long as broad in adults; in young specimens it is more slender, sometimes as much as 5 times as long as broad. The outer margin is concave and ends in a spine which projects far beyond the end of the lamella.



TEXT-FIG. 58.—*Periclimenes grandis* (Stimpson).
a. Part of antennular peduncle.
b. Antennal scale.

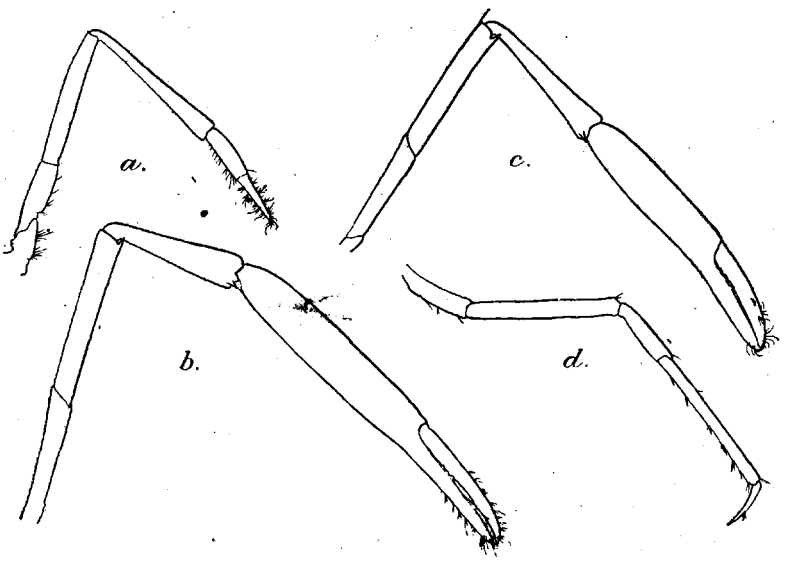
The third maxilliped bears a small arthrobranch and reaches about to the end of the basal antennular segment. The antepenultimate segment is somewhat curved and bears from 1 to 3 slender spines on the outer margin; the exopod reaches a little beyond its distal end. The ultimate segment is three-quarters the length of the penultimate.

The first peraeopods (text-fig. 59*a*) reach beyond the antennal

[1] Of eighty-four specimens thirty-four have 2 ventral teeth, thirty-seven have 3, eleven have 4 and two have 5.

scale by the length of the fingers. The carpus is a little longer than the merus, from 7 to 8 times as long as its distal breadth and from 1·35 to 1·5 times the length of the chela. The fingers are unarmed and are about as long as the palm.

The second peraeopods are equal; as in the forms already described they are much longer in males than in females and the proportions of the segments differ widely in the two sexes. In adult males (text-fig. 59*b*) they reach beyond the scale by the entire length of the chela and carpus. The merus is from 1·25 to 1·35 times the length of the carpus and is from 6 to 6·5 times as long as wide; it bears a conspicuous spine at the distal end of the lower margin. The carpus bears a curved, forwardly directed spine on



TEXT-FIG. 59.—*Periclimenes grandis* (Stimpson).

a. First peraeopod.
b. Second peraeopod of male.
c. Second peraeopod of female.
d. Third peraeopod.

the inner side of the distal border and is from 4 to 5 times as long as its greatest breadth, excluding the spine. The chela in well-grown specimens is from 2 to 2·5 times the length of the carpus. The palm is about 4·5 times as long as wide and is from 1·6 to twice the length of the fingers. The cutting margins of the fingers are excavate in the middle so that an oval gap is left when the claw is closed. In front of this excavation there is a single tooth on each finger, that on the dactylus being in advance of the other. Behind the excavation there is a large tooth on the fixed finger, succeeded by a variable number of smaller teeth and there is a series of medium-sized teeth, usually 4 or 5, on the proximal part of the dactylus. The tips of the fingers are inturned. The excavation in the fingers is to be seen only in very large males; usually both

chelae show a similar development, but I have seen one specimen in which the gap was present in one chela only.

In the female (text-fig. 59*c*) the merus is rather more slender, about 6·5 to 7·0 times as long as wide and equal to or a little longer than the carpus. The carpus is from 5 to 5·25 times as long as its distal breadth and, as in the male, bears a conspicuous distal tooth on the inner side. The chela is from 1·6 to 1·8 times the length of the carpus. The palm is equal to, a little longer or little shorter than the carpus and is from 1·3 to 1·6 times as long as the fingers. The fingers have inturned tips and may be provided with small inconspicuous teeth on the proximal half or third of their cutting edges.

The last three peraeopods are moderately slender; the fifth do not reach the apex of the antennal scale. In the third pair (text-fig. 59*d*) the merus is from 9 to 10 times as long as broad. The propodus bears long spinules on its posterior margin and is from 2·8 to 3·3 times as long as the dactylus. The dactylus is simple and slightly curved with a few setae on its anterior margin; its length is from 6 to 6·5 times its basal breadth.

The sixth abdominal somite is about 1·5 times the length of the fifth. The dorsal spines of the telson are so arranged as to divide its length into three equal parts.

The largest specimen, a male, is about 23 mm. in length.

Specimens from the Gulf of Manaar were almost completely transparent when alive, minutely speckled with red and blue. In some individuals a blue patch was visible at the ends of the merus and carpus of the second legs and a brownish red patch on the outer side of the propodus.

Stimpson's description agrees in every particular with the large males that I have examined, except that the chela of the second legs is said to be nearly three times the length of the carpus with fingers less than half the length of the palm. The assumption that Stimpson described a more fully developed male than any I have seen will fully account for these discrepancies.

In many respects *P. grandis* agrees with *P. andamanensis*. It differs, however, in its deeper rostrum, in the stronger spine at the distal end of the first antennular segment, in the much stouter merus and carpus of the second legs of the male and in the shorter and stouter legs of the last three pairs. The merus of the third legs is only 10 to 11 times as long as wide in *P. grandis*, from 15 to 16 times in *P. andamanensis*.

C 384/1.	Kilakarai, G. of Manaar, 0–2 fms.	S. Kemp, Feb., 1913.	Many.
C 385/1.	Pamban, G. of Manaar.	S. Kemp, Feb., 1913.	One.
C 386/1.	Cochin backwater, near Ernakulam, S. India.	F. H. Gravely, Sept., 1914.	Thirteen.
C 387/1.	N. Cheval Paar, Ceylon.	T. Southwell, Nov., 1910.	Six.
C 338/1.	Paway I., Mergui Archipelago.	'Investigator,' Feb., 1914.	Two.

The species was very common in the Gulf of Manaar, among weeds in shallow water and also on the coral reefs.

The species was described from Ousima I. (Stimpson) and has been recorded from Ternate and Pulo Edam (de Man), Trincomalee (Müller), Cheval Paar (Pearson), Zanzibar (Lenz), Dar-es-Salaam (Ortmann) and the Red Sea (Nobili, Balss).

Periclimenes (Ancylocaris) vitiensis Borradaile.

1898. *Periclimenes vitiensis*, Borradaile, *Ann. Mag. Nat. Hist.* (7) II, p. 383.
1899. *Periclimenes vitiensis*, Borradaile, *Proc. Zool. Soc. London*, p. 1005, pl. lxiv, figs 6*a*, *b*.
1899. *Periclimenes vitiensis*, Nobili, *Ann. Mus. civ. Genova* (2), XX, p. 234.
1917. *Periclimenes vitiensis*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XXII, p. 371 (part).

This species is very closely related to *P. grandis*. I have examined the type, an ovigerous female in the Cambridge Museum, but my work at that time was not sufficiently advanced to enable me to make full use of the opportunity. I noted, however, that in the telson of the type specimen both pairs of dorsal spines are situated in the posterior half, whereas in the specimens I have referred to *P. grandis* the foremost pair is situated in the anterior half. The position of these spines affords a valuable specific character in some species of *Periclimenes* (*cf. P. brevicarpalis* and *P. inornatus*) and I conclude, therefore, that *P. vitiensis* is possibly a distinct species. The specimens from Coetivy in the Seychelles subsequently referred by Borradaile to *P. vitiensis* should be re-examined, for it is not improbable that they belong in reality to *P. grandis*.

P. vitiensis was described by Borradaile from Viti Levu, Fiji.

Periclimenes (Ancylocaris) affinis Borradaile.

1915. *Periclimenes* (*Falciger*) *affinis*, Borradaile, *Ann. Mag. Nat. Hist.* (8) XV, p. 211.
1917. *Periclimenes* (*Falciger*) *affinis*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 372, pl. liv, fig. 11.

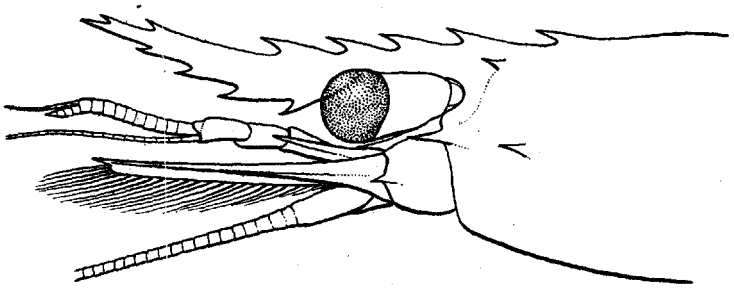
This species appears to be closely related to Paulson's *P. elegans*, which is described below. According to Borradaile's description and figures it differs (i) in its straighter rostrum, armed with only 2 teeth below, (ii) in the greater proportionate length of the first peraeopods which outreach the antennal scale by the chela and half the length of the carpus, and (iii) in the much more slender and proportionately longer carpus of the second peraeopods, about 6 times as long as wide according to the figure and a little longer than the merus.

P. affinis is recorded from Salomon I. in the Western Indian Ocean.

Periclimenes (Ancylocaris) elegans (Paulson).

1875. *Anchistia elegans*, Paulson, *Crust. Red Sea*, p. 113, pl. xvii, figs. 1, 1*a–h*.
1906. *Anchistia elegans*, Nobili, *Ann. Sci. nat., Zool.* (9) IV, p. 52.

The rostrum (text-fig. 60) is rather deep, especially in females, and reaches to or a little beyond the end of the antennal scale. It is straight at the base, but in its distal half is directed upwards.

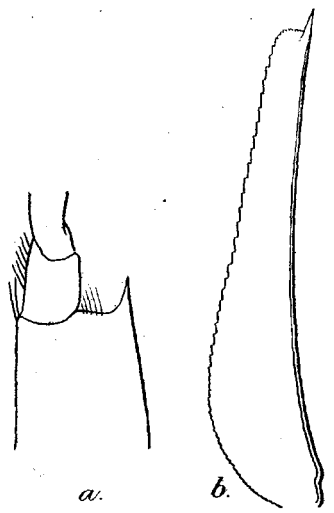


TEXT-FIG. 60.—*Periclimenes elegans* (Paulson).
Anterior part of carapace, rostrum, etc.

On the concave upper border there are from 6 to 8 teeth,[1] nearly always 7 or 8. The teeth are arranged much as in *P. grandis*, but the distinction into two groups is sometimes even more clearly marked than in that species. On the lower border there are from 3 to 5 teeth,[2] nearly always 3 or 4.

In the spines of the carapace and the eyes the species resembles *P. grandis*. A single band of dark pigment is frequently seen on the cornea.

The antennules also resemble those of *P. grandis*, but the terminal spine of the basal segment is rather longer, reaching almost or quite to the middle of the second segment, and the margin between this spine and



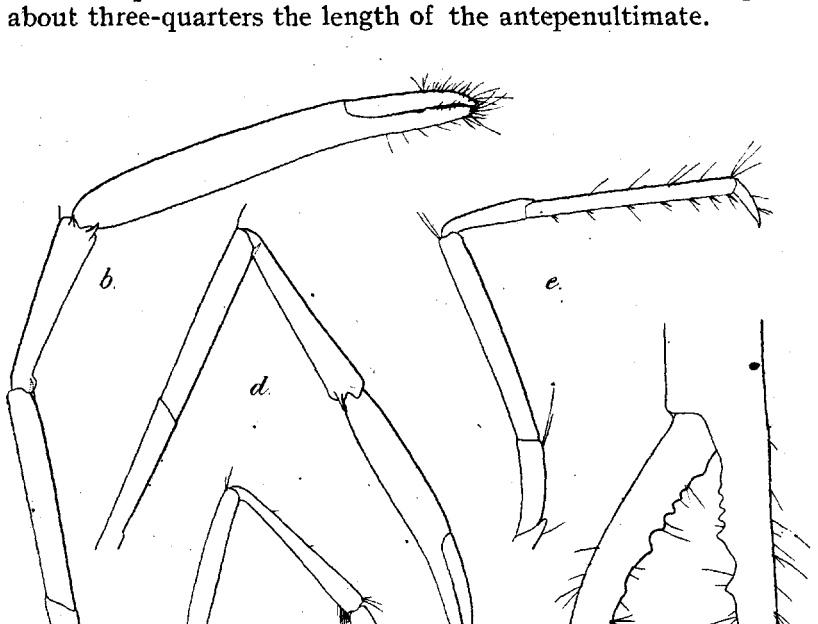
TEXT-FIG. 61.—*Periclimenes elegans* (Paulson).
a. Part of antennular peduncle.
b. Antennal scale.

[1] Of fifty specimens two have 6 dorsal teeth, thirty-six have 7 and twelve have 8.

[2] Of fifty specimens thirty-one have 3 ventral teeth, eighteen have 4 and one has 5.

the articulation is less clearly sinuous (text-fig. 61*a*). In both sexes the stouter ramus of the outer flagellum is shorter than the peduncle. In its distal third the antennal scale is rather more narrowed than in *P. grandis* and its outer margin more strongly concave; it is from 4·5 to nearly 5·5 times as long as wide (text-fig. 61*b*).

The third maxilliped possess a small arthrobranch; the antepenultimate segment bears from 1 to 4 spines on its outer edge and the exopod reaches about to its end. The ultimate segment is about three-quarters the length of the antepenultimate.



TEXT-FIG. 62.—*Periclimenes elegans* (Paulson).

a. First peraeopod. *c*. Fingers of same.
b. Second peraeopod of male. *d*. Second peraeopod of female.
e. Third peraeopod.

The first peraeopods (text-fig. 62*a*) reach beyond the antennal scale by about half the length of the chela. The carpus is from one-ninth to one-twelfth longer than the merus and is from 7 to 7·5 times as long as its distal breadth and from 1·2 to 1·4 times as long as the chela. The fingers are equal to or a little shorter than the palm and are unarmed.

The second peraeopods are equal. In males they extend beyond the antennal scale by the length of the carpus and chela. In none of the specimens I have seen do the legs present the rugose appearance described by Paulson. In males (text-fig. 62*b*) the merus is from 6 to 7 times as long as broad, with the usual spine

at the distal end of the lower margin; it is from 1·2 to 1·3 times as long as the carpus. The carpus is from 4 to 4·5 times as long as its distal breadth and bears two stout spines at the distal end, one on the inner side and one on the upper and inner aspect; inferiorly the distal end projects a little, producing the appearance of a tooth when seen in lateral view. The chela is from 2 to 2·5 times the length of the carpus and the palm is from 1·9 to 2·4 times as long as the fingers. The fingers (text-fig. 62*c*) frequently but not always show an excavation in the middle of their cutting edges as in *P. grandis*. Some specimens have comparatively large teeth on the fingers while others have only a few very small teeth.

In the female (text-fig. 62*d*) the merus of the second peraeopod is from 1·0 to 1·3 times as long as the carpus and is from 7 to 7·5 times as long as wide. The carpus varies from 4 to 5·5 times as long as its distal breadth; the spine on the inner side is well developed and frequently an acute process or short spine can be seen on the upper and inner aspect, corresponding to the second spine found in the male. The chela is from 1·4 to 2·1 times the length of the carpus, with palm from 1·3 times to twice[1] as long as the fingers. The fingers bear small teeth in the proximal half of their inner margins.

The last three peraeopods are stout; the fifth, when extended forwards, fall far short of the apex of the antennal scale. In the third pair (text-fig. 62*e*) the merus is from 7·5 to 8·5 times as long as broad; the propodite bears a series of spinules on its posterior edge and is from 3·5 to 4 times as long as the dactylus. The dactylus itself is simple, very slightly curved, and generally with one or two long setae in the middle of its anterior margin; its length is only from 4 to 4·5 times its basal breadth.

The last abdominal somite and telson agree with those of *P. grandis*.

The largest specimen, a male, is about 24 mm. in length.

Although the above account differs in some respects from Paulson's description (as translated by Nobili) and from his figures, I have little doubt that the identification is correct and that the discrepancies are mainly due to errors in the original account. A single adult male collected by Major R. B. Seymour Sewell in the Red Sea, belongs almost without question to Paulson's species and this individual is indistinguishable from specimens obtained in the Andamans. The specimen which Balss has recorded as *P. elegans* from St. John's I. in the Red Sea[2] apparently does not belong to this species as the spine on the carpus of the second leg is said to be absent.

C. 389–90/1. Port Blair, Andamans. S. Kemp, March, 1915; Feb., March, 1921. Many.

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[1] In exceptionally large females only.

[2] Balss, *Denk. math.-naturw. Kl. K. Akad. Wien*, XCI, p. 26 (1915).

C 391/1.	East I., Andamans.	A. R. S. Anderson, 1898.	Two.
C 392/1.	Koweit Harbour, Persian Gulf.	R. B. Lloyd, Oct., 1905.	Two.
C 393/1.	Tor, Sinaitic Peninsula, Red Sea.	R. B. S. Sewell, 1916.	One.

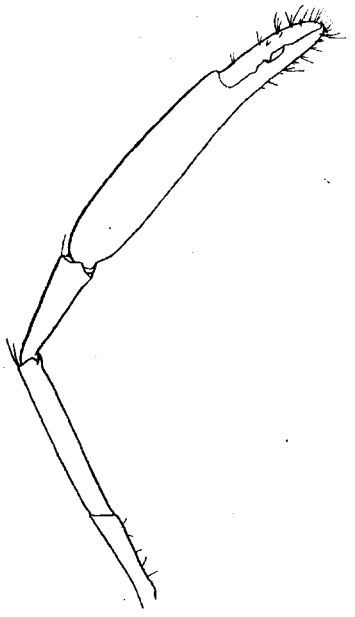
At Port Blair the species is abundant at low water in pools on the coral beach; it was found on Ross I., and on the shores of Aberdeen and North Bay, and was never obtained by dredging.

The species has hitherto been known only from the Red Sea.

var. **dubius**, Borradaile.

1915. *Periclimenes* (*Falciger*) *dubius*, Borradaile, *Ann. Mag. Nat. Hist.* (8) XV, p. 211.

1917. *Periclimenes* (*Falciger*) *dubius*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 373, pl. liv, fig. 12.



TEXT-FIG. 63.—*Periclimenes elegans*, var. *dubius*, Borradaile.

Second peraeopod of male.

Certain specimens from Madras Harbour differ from typical *P. elegans* only in the proportionately stouter carpus of the second peraeopods in males (text-fig. 63). In adults of this sex the carpus is only 3 times as long as its distal breadth and in females barely 4 times. This is the only difference I can find and I do not regard the two forms as specifically distinct. So far as I can understand from the published account Borradaile's name *dubius* is correctly applied to these specimens.

C 460/1.	Madras Harbour.	S. Kemp, May, 1918.	Six.

Periclimenes (Ancylocaris) holmesi Nobili.

1900. *Anchistia tenuipes*, Holmes (*nec* Borradaile), *Occas. Papers California Acad. Sci.* VII, p. 216.

1904. *Periclimenes tenuipes*, Rathbun, *Harriman Alaska Exped.* X, *Crust.*, p. 34, text-figs. 12*a*, *b*. [p 5.

1907. *Periclimenes holmesi*, Nobili, *Ann. Mus. Univ. Napoli* (2) XXI,

1921. *Periclimenes tenuipes*, Schmitt, *Univ. California Publ., Zool.* XXIII, p. 39, figs. 24*a*, *b*.

This, the only species of *Periclimenes* known from the Pacific Coast of America, is very closely related to *P. elegans*; in the description which Holmes has given and in the additional notes and figures supplied by Miss Rathbun I am unable to find any differences worthy of note. In view of the widely distant localities in which the two forms have been found, it seems unlikely that they are specifically identical, but this can only be determined by actual comparison of specimens.

P. holmesi is known only from the Californian Coast, extending from Santa Catalina I. to the Gulf of California.

Periclimenes (Ancylocaris) amymone de Man.

1902. *Periclimenes amymone*, de Man, *Abhandl. Senckenb. naturf. Ges.* XXV, p. 829, pl. xxv, figs. 53*a–g*.

In this species, which I have not seen, the legs are conspicuously stouter than in any of the related species. In the female on which de Man's detailed description is based the carpus of the second peraeopod is only about 2·4 times its distal breadth with the merus 1·6 times its length. In the third pair the merus is only 6 times as long as broad and the propodite is five times as long as the dactylus. The dactylus is short and stout, scarcely more than 3 times as long as its basal breadth. *P. amymone* also differs from all related species in the absence of spinules on the posterior border of the propodite of the last three pairs of legs.

The species is recorded from Ternate.

Periclimenes (Ancylocaris) demani Kemp.

1915. *Periclimenes demani*, Kemp, *Mem. Ind. Mus.* V, p. 279, pl. xiii. fig. 10, text-figs. 27 *a–i*.

This species is related to *P. grandis*, but differs from it and from all other species in the same section of the genus in the structure of the apex of the antennal scale: the spine which terminates the outer margin reaches only to, or to a very small extent beyond the apex of the lamella (text-fig. 64). It also differs from *P. grandis* in having the carpus of the second leg of the male as long as the merus and in the proportionately shorter chela, always less than 1·5 times the length of the carpus and in the longer and more slender legs of the last three pairs. As in *P. grandis* the anterior of the two pairs of spines on the dorsum of the telson is placed in the proximal half of the telson-length.

TEXT-FIG. 64.—*Periclimenes demani* Kemp.
Antennal scale.

C 514/1. Jack and Una Is., Mergui Archipelago. 'Investigator,' Dec., 1913. One.

P. demani was hitherto known only from the Chilka Lake in Orissa and from the Adyar R. and Ennur backwater near Madras. In the Chilka Lake it has been found living in water ranging in specific gravity from 1·000 to 1·0265.

Periclimenes (Ancylocaris) lifuensis Borradaile.

1898. *Periclimenes lifuensis*, Borradaile, *Ann. Mag. Nat. Hist.* (7) II, p. 384.
1899. *Periclimenes lifuensis*, Borradaile, in Willey's *Zool. Results*, p. 405, pl. xxxvi, figs. 1*a–c*.

I have seen the type of this species in the Cambridge Museum, but have not dissected it to examine the mandible. It is the only known species of the genus in which the supra-orbital spine is present and the hepatic absent.

The antennal scale is not much narrowed apically; the outer margin is concave and the terminal spine extends beyond the apex of the lamella. The merus of the second peraeopods bears a spine at the distal end of the lower margin. Only one of the posterior legs is in existence; it is very stout, with the propodus only about 4 times as long as broad and with the dactylus simple, strongly curved and partially concealed by thick hairs. The telson bears two pairs of dorsal spines, placed rather close together near the middle of its length.

P. lifuensis is known only from Lifu in the Loyalty Is.

Periclimenes (Ancylocaris) tenuipes Borradaile.

(Plate VIII, fig. 11.)

1898. *Periclimenes tenuipes*, Borradaile, *Ann. Mag. Nat. Hist.* (7) II, p. 384.
1899. *Periclimenes tenuipes*, Borradaile, in Willey's *Zool. Results*, p. 406, pl. xxxvi, figs. 2*a–f*.
1899. *Periclimenes tenuipes*, Nobili, *Ann. Mus. civ. Genova* (2) XX, p. 235.
1904. *Periclimenes borradailei*, Rathbun, *Harriman Alaska Exped.* X, *Crust.*, p. 34.
1907. *Periclimenes borradailei*, Nobili, *Ann. Mus. Univ. Napoli* (n.s.) II, no. 21, p. 5.
1915. *Periclimenes* (*Falciger*) *kolumadulensis*, Borradaile, *Ann. Mag. Nat. Hist.* (8) XV, p. 213.
1917. *Periclimenes* (*Falciger*) *borradailei* and *kolumadulensis*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, pp. 372, 376, pl. lv, fig. 17.

The rostrum varies greatly in length; in the specimens I have examined it is from 1·6 to twice the length of the carapace, while in the large male described by Borradaile as *P. kolumadulensis* it is said to be 2·5 times the length of the carapace. The rostrum is very slender, straight at the base, but with the distal half bent obliquely upwards. It bears from 9 to 12 teeth (nearly always 10 or 11) [1] on the upper border; the posterior tooth is placed on the

[1] Of thirty-two specimens two have 9 dorsal teeth, twelve have 10, seventeen have 11 and one has 12.

carapace, but is not widely separated from the next, which is either above or a little behind the posterior limit of the orbit. In most specimens the upper teeth are arranged in two groups, the five proximal teeth being separated by a marked interval from the four or five distal, with or without a single isolated tooth between the two. On the lower border in the anterior two-thirds there are from 6 to 9 teeth (usually 7 or 8),[1] extending close up to the apex.

The carapace is obtusely angled at the lower limit of the orbit. The antennal spine is strong and is flanked by a short carina; the hepatic is behind it, but on a lower level. There is no supra-orbital spine.

The eyes are large and somewhat depressed, with the cornea wider than the stalk. The ocular spot touches the cornea.

The basal segment of the antennular peduncle bears a short lateral process; the outer margin terminates in a sharp spine which does not reach the middle of the next segment. The second and third segments are slender, but the whole peduncle is not long, scarcely reaching beyond the middle of the antennal scale. The free portion of the shorter ramus of the outer antennular flagellum is extremely short; the fused part is longer than the peduncle and is composed of some 12 to 15 segments. The antennal scale in full grown specimens is from 6·5 to 7 times as long as wide and is very narrow distally. The outer margin is strongly concave and the terminal spine projects far beyond the apex of the lamella.

The third maxillipeds do not reach the end of the antennular segment; the ultimate segment is about two-thirds the length of the antepenultimate.

The mero-carpal articulation of the first peraeopods reaches the end of the antennular peduncle. The carpus is about 1·5 times the length of the merus, and is from 2 to 2·75 times as long as the chela. The fingers are a little longer than the palm and are unarmed.

The second peraeopods in males may outreach the rostrum by the whole of the chela and carpus and a portion of the merus, they are from 5·5 to 7·5 times as long as the carapace. The legs forming a pair are, as a rule, equal and similar in structure. There is a strong spine at the distal end of the merus on the lower side. In the largest male the merus is about 6·5 times as long as wide. The carpus is 1·4 times as long as the merus; it is slender at the base but is suddenly dilated in its distal third, the length being about 7·5 times the distal breadth. On the inner side of the carpus at the distal end there is a small obscure tooth, much as in *Periclimenes agag*. The chela is about 1·25 times the length of the carpus; the palm is 5 times as long as broad and about 1·9 times the length of the fingers. In smaller males the limbs are more slender, with the carpus much less dilated at the distal end. In one such male the merus is 8 times as long as broad and the carpus

[1] Of thirty-two specimens four have 6 ventral teeth, sixteen have 7, eleven have 8 and one has 9.

13 times as long as broad, 1·5 times as long as the merus and a little longer than the chela. The palm in this specimen is 1·3 times the length of the fingers. In the smallest male in the collection the carpus is as much as 1·4 times as long as the chela.

The series of specimens in the collection comprises a number of individuals which, in the proportions of the segments of the second peraeopods, are intermediate between those described above, indicating quite clearly that the differences are due to progressive growth. The second legs of very large males appear to develop in a phenomenal manner, as in the Hippolytid genus *Saron* and in *Palaemon*.

In ovigerous females the second peraeopods are from 4·5 to 5·7 times as long as the carapace. The carpus is from 1·5 to 1·8 times as long as the merus and from 1·2 to 1·4 times as long as the chela. The palm is about 1·3 times the length of the fingers.

In the second peraeopods of some large males each finger is conspicuously excavate in its proximal half. In other males no trace of this excavation is visible; the fingers meet throughout their length when the claw is closed and are armed only with a series of very small teeth, most conspicuous at the proximal end. Specimens in intermediate stages, with the gape in the fingers poorly developed, are not uncommon. As a rule the fingers in both legs of a pair are similarly formed, but I have seen a specimen in which one chela only possessed gaping fingers, as in the type of Borradaile's *P. kolumadulensis*. In large females the fingers sometimes exhibit a small excavation, similar to that seen in some large males but less well developed.

The last three legs are extremely long and slender, the fifth reaching to or a little beyond the rostrum. The merus of the third pair is from 20 to 26 times as long as wide. The propodus is from 4·5 to 5·5 times the length of the dactylus; it bears some short spinules on its posterior edge and shows traces of subdivision into 5 to 7 subsegments. The dactylus is simple, curved, and with a few setae in the middle of its anterior margin; it is from 6·5 to 7·5 times as long as its basal breadth.

The sixth abdominal somite is about one-third longer than the fifth. The foremost pair of dorsal spinules on the telson are situated in the anterior half of the telson, the second pair rather further from the foremost than from the apex. The intermediate apical spines are very long.

The largest specimen, a male, is about 22 mm. in length.

The species is characteristically coloured when alive. The carapace and abdomen are semitransparent, with a few narrow oblique streaks of white and red on the former and mid-dorsal and lateral red stripes on the latter. On the rostrum, at the junction of the middle and distal thirds, there is a band of dark red pigment; in front of this the rostrum is entirely sulphur yellow, while behind it on the inferior half there is a streak of the same colour. The tip of the telson and the basal portions of the uropodial setae are bright red. The eyestalk has two white longitu-

dinal streaks and some red speckling. On the first legs there is a sharply defined red spot at the distal ends of the ischium, merus and carpus. Between the bases of the first legs there is a bright red sternal spot. On the second legs there is a similar spot at the distal end of the ischium and a large red patch at the end of the merus. The carpus is sulphur yellow throughout, the colour extending on to the base of the chela which is otherwise dull red. The eggs are pale grey, when eyed with a bright blue eyespot.

Borradaile's descriptions of *P. tenuipes* and *P. kolumadulensis* are both inadequate and I suspect that the figures of the former are erroneous in several particulars. Re-examination of the types is necessary before the synonymy given above can be regarded as beyond doubt. From the description I have given it will be seen that the range of variation is very great and that the characters which Borradaile gives in his account of *P. kolumadulensis* are insufficient for the distinction of two species. Seeing that the type-specimen of *P. tenuipes* was damaged it is unfortunate that Borradaile contented himself with a mere record of the additional examples obtained by Prof. Gardiner at Haddumati Atoll.

Two misconceptions appear to have arisen regarding the proper name of this species. Miss Rathbun (*l.c.*, 1904) proposed *P. borradailei* under the impression that the name *tenuipes* was preoccupied by Holmes. Holmes' species was, however, not described until 1900. Nobili (*l.c.*, 1907) has stated that Leach described a species from the Mediterranean under the name *Periclimenes tenuipes* and that Heller erroneously regarded *Brachycarpus biunguiculatus* as synonymous with this form. These statements apparently led Borradaile in 1917 to abandon his *P. tenuipes* in favour of *P. borradailei*.

The paper by Nobili was, I believe, written during the distinguished author's last illness. It is most unfortunate that it should even have been published, for it is evident from internal evidence that it is the product of a disordered mind. The Palaemonid gill-formulae which are given in the paper obviously have no relation to the real facts and the illustrations of the mouthparts of *Brachycarpus* can only be regarded as mythical. Leach does not seem ever to have described *Periclimenes tenuipes* and the species is not referred to by Heller, nor is it a fact, as stated by Nobili, that in his work on the Red Sea Decapoda he himself proposed the name *P. borradailei* for Borradaile's *P. tenuipes*.

P. tenuipes may therefore stand as the name of this species, while for the form described by Holmes Nobili's *P. holmesi* may be employed.

C 461–5/1.	Port Blair, Andamans, 4–8 fms.	S. Kemp, Feb., 1915, Feb., Mch., 1921.	Thirty-five.
5525/9.	Off Ceylon, 34 fms., 6°01' N., 81°16' E.	'Investigator.'	One.

I have also seen two specimens belonging to the Paris Museum from Mahé in the Seychelles (Alluaud coll.). The specimens from Port Blair were all obtained in Ross Channel on a bottom composed mainly of small corals and sponges.

P. tenuipes was originally described from New Britain and has since been recorded by Nobili from Beagle Bay in New Guinea and by Borradaile from Haddumati Atoll in the Maldives and, as *P. kolumadulensis*, from Kolumadulu Atoll in the same group.

Periclimenes (Ancylocaris) longimanus (Dana).

1852. *Anchistia longimana*, Dana, *U. S. Explor. Exped., Crust.* I, p. 579, pl. xxxvii, figs. 6*a*, *b*.

This species, of unknown locality, is easily distinguished from all other known members of the genus by the extraordinary length of the antennular peduncle. It reaches well beyond the antennal scale and the ultimate segment, according to Dana's figure, is 6 times as long as wide.

Periclimenes (Ancylocaris) digitalis, sp. nov.

(Plate VIII, fig. 12.)

The rostrum reaches slightly beyond the end of the antennal scale. It is straight at the base, but a little upturned in its distal third. On the upper border, in the single specimen examined, there are 11 teeth; of these the two hindmost are situated on the carapace behind the orbit and the posterior tooth is separated from the next by a rather considerable interval. The remaining teeth are large and evenly spaced except for the foremost, which is small, placed near the tip, and rather remote from the next of the series. On the lower border there are 2 teeth, placed just in front of the middle of the rostral length.

The carapace bears sharp hepatic and antennal spines, the former on a lower level than the latter. The lower limit of the orbit is defined by an acute process and there is a conspicuous ridge close behind the orbital margin and parallel with it. Superiorly this ridge ends in a minute tubercle which is probably a vestige of the supra-orbital spine, inferiorly it ends in the antennal spine. The ridge is almost exactly similar to that found in *Palaemonella vestigialis* but is rather more sharply defined.

The eye is large with the cornea spherical and wider than the stalk. The ocular spot is visible, but is partly confluent with the cornea.

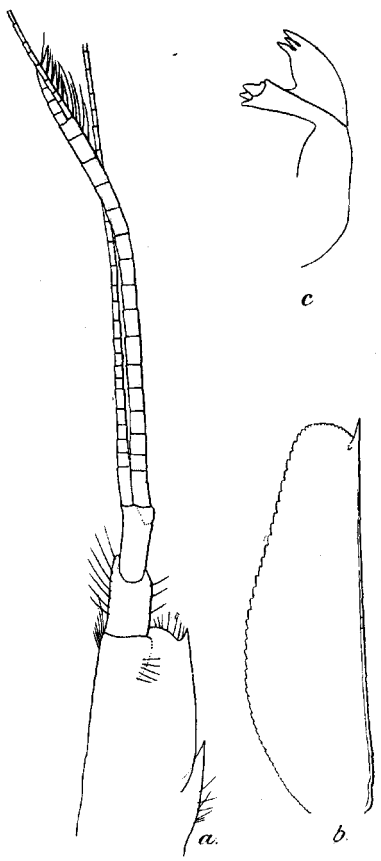
The lateral process of the basal segment of the antennular peduncle (text-fig. 65*a*) reaches barely to the middle of the segment; the terminal spine of the outer margin is short and the margin between this spine and the articulation of the second segment is convex. The outer flagellum is cleft for only a very short distance; the fused basal part comprises 16 segments and is longer than the peduncle. The antennal scale (text-fig. 65*b*) is a little more than 3 times as long as broad; the outer margin is straight

or very slightly concave and ends in a strong spine which projects a trifle beyond the end of the lamella.

The exopod of the third maxilliped reaches nearly to the end of the antepenultimate segment, the latter bearing a series of 8 short spines on its outer edge. The ultimate segment is two-thirds the length of the penultimate.

The first peraeopods reach beyond the antennal scale by the chela and fully half the length of the carpus. The carpus is a little longer than the merus and fully 1·4 times the length of the chela. The fingers are longer than the palm and are unarmed.

The second peraeopods in the single female examined are equal and very slender, reaching beyond the scale by the chela, carpus and one-third the length of the merus. The merus bears a spine at the distal end of its lower border; it is rather more than 11 times as long as broad and is exactly equal in length with the carpus. The carpus is unarmed and is nearly 9 times as long as its distal breadth. The chela is almost 1·25 times the length of the carpus or merus. The palm is 4·5 times as long as wide and 1·3 times as long as the fingers. The fingers have inturned tips; their cutting edges are entire distally, but in the proximal third are provided with a few small teeth.



TEXT-FIG. 65.—*Periclimenes digitalis*, sp. nov.
a. Antennule. *b*. Antennal scale.
c. Mandible.

The last three peraeopods are all very slender. The fifth reach beyond the scale by the dactylus and more than half the propodus. In the third pair the merus is about 18 times as long as wide. The propodus is entirely devoid of spinules on its posterior margin and is scarcely more than twice the length of the dactylus. The dactylus itself is simple, slightly curved and extremely slender, about 14 times as long as its basal breadth.

The sixth abdominal somite is about 1·5 times as long as the fifth. The telson bears two pairs of dorsal spines, so arranged as to divide its length into three more or less equal parts. The outer margin of the external uropod is ciliated.

The single specimen is an ovigerous female about 22 mm. in length.

In the possession of a post-orbital ridge this species, as already noted, bears a close resemblance to *Palaemonella vestigialis*; the mandible, however, is devoid of a palp (text-fig. 65*c*). In the genus *Periclimenes* it does not appear to have any close allies.

C 404/1. Port Blair, Andamans, 3–5 fms. S. Kemp, Feb., 1921. One, TYPE.

The specimen was caught off Viper I. on a bottom composed of mud and decaying vegetation.

Periclimenes (Ancylocaris) brocki (de Man).

1887. *Anchistia Brockii*, de Man, *Arch. Naturgesch.* LIII, i, p. 548, pl. xxii*a*, figs. 3, 3*a–d*.
1917. *Periclimenes* (*Cristiger*) *brocki*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 324.

I have examined a specimen from Suvadiva Atoll in the Maldives, determined by Borradaile and have nothing to add to de Man's detailed description. The species was described from Amboina.

Periclimenes (Ancylocaris) rotumanus Borradaile.

1898. *Periclimenes rotumanus*, Borradaile, *Proc. Zool. Soc. London*, p. 1005, pl. lxiv, figs. 5, 5*a*, *b*.
1899. *Periclimenes rotumanus*, Nobili, *Ann. Mus. civ. Genova* (2) XX, p. 235.

I have seen the type of this species in the Cambridge Museum; the second peraeopods are now missing. The species is recorded from Rotuma in the S. Pacific (Borradaile) and Beagle Bay, New Guinea (Nobili).

Genus **Harpilius** Dana.

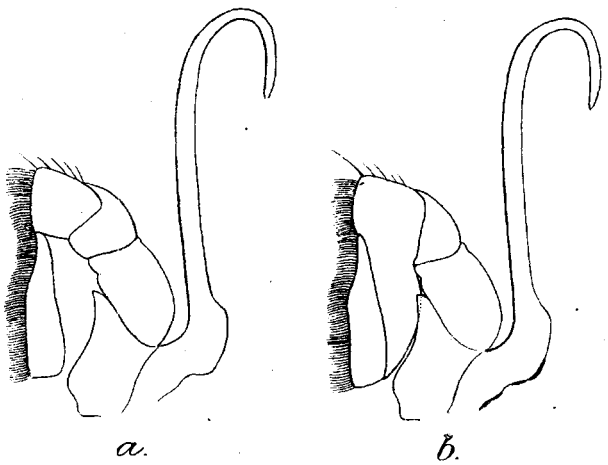
1852. *Harpilius*, Dana, *U. S. Explor. Exped., Crust.* I, p. 575.
1917. *Harpiliopsis* and *Harpilius*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, pp. 379, 380.
1921. *Harpilius*, Tattersall, *Journ. Linn. Soc., Zool.* XXXIV, p. 338.

This genus is very closely related to *Periclimenes*, agreeing with it in all important structural characters and differing only in its more clumsy and depressed form. In habit of body there is, moreover, considerable variation; of the species I have myself examined *H. beaupresi* and *H. depressus* are very strongly depressed, while in *H. lutescens* and *H. gerlachei* this feature is much less pronounced.

In *Harpilius* the distal spine of the basal antennular segment is usually very long, the antepenultimate segment of the third

maxilliped is often broadened, the second peraeopods are heavily built with the distal end of the merus flattened or hollowed beneath to accommodate the carpus when the limb is folded, and the last three peraeopods are stout, without spinules on the propodus and with a simple strongly hooked dactylus. The combination of these characters gives the species a very distinct facies, though a parallel to each may be found in the genus *Periclimenes*.

Most if not all the species of the genus are found in association with corals and there can be little doubt that they are specially adapted to life in this environment: the depressed form and stout legs with hooked dactyli are obviously well suited to an existence among the branching stems of a madrepore colony. In general appearance *Harpilius* bears a close resemblance to *Corallio-caris*, the species of which are found in similar situations.



TEXT-FIG. 66.—Second maxilliped of *Harpilius lutescens*, Dana.
a. As shown by Dana.
b. With some of the errors corrected.

Tattersall has already questioned the validity of the genus *Harpiliopsis* and I endorse all that he has said. Borradaile's reasons for establishing the new genus are indeed remarkable. Apart from the supposed absence of the arthrobranch on the third maxilliped in *Harpilius*, the difference between this genus and *Harpiliopsis* lies in the form of the second maxilliped. Of *Harpilius* Borradaile has seen no specimens and his description of the appendage is derived from Dana's fig. 4*f* of *H. lutescens*. In his generic description of *Harpilius* he says "second maxilliped .... with last joint posterior to preceding joint" and adds that "the second maxilliped of the type *Harpilius* is so remarkable that no species which does not share this peculiarity can be retained in the genus."

It is, of course, evident at first sight that Dana's figure is erroneous and that the narrowly triangular terminal segment,

instead of being attached only by its apex (obviously an impossible arrangement), is joined in normal fashion to the propodus, the free edge of the latter being almost entirely concealed by the overlying ischium and merus. The erroneous division of the propodus into two segments is also seen in the figure of *Oedipus superbus* on the same plate. I give here (text-fig. 66) a copy of Dana's figure, together with another in which the more important errors have been eliminated. The latter does not differ in any noteworthy feature from the normal type.

One of the specimens I have seen I doubtfully refer to *H. lutescens*. This individual has a normal second maxilliped and, as in *H. beaupresi* and *H. depressus*, possesses an arthrobranch on the third maxilliped. In *H. gerlachei*, as Tattersall has pointed out, this gill is suppressed and the species is otherwise peculiar in the absence of the hepatic spine. Tattersall has suggested that a new genus may be required for the species, but with this I am unable to agree and think that if any change is to be made it should be in the direction of merging *Harpilius* in *Periclimenes*.

Owing to inadequate original description the recognition of Dana's *H. lutescens*, Stimpson's *H. depressus* and of the form which Ortmann called *Anchistia spinigera* is attended with much difficulty, and the possibilities of erroneous identification in this paper are enhanced by the fact that the specimens I have seen are all from the western part of the Indo-Pacific region while the descriptions are based on material found much further to the east.

The species of *Harpilius*, as I understand them, may be separated by the following characters :—

A. Hepatic spine present.
  B. Antero-lateral angles of carapace rounded; ischium of second leg with at least one spine situated at distal end of lower border, merus with spine at distal end of upper border, fingers with 1 to 3 large teeth.
    C. Antennal spine remote from lower orbital angle and flanked by a carina; hepatic spine on same level as antennal; antepenultimate segment of third maxilliped 3 times as long as broad; ischium of second leg with 3 distal spines, 1 above and 2 below, carpus with dorsal spine, 1 tooth on dactylus and 2 on fixed finger; R. 4–7 : 2–4 ... ... *beaupresi* (Audouin).
    C'. Antennal spine close to lower orbital angle, without carina; hepatic spine on much lower level than antennal; antepenultimate segment of third maxilliped 6 times as long as broad; ischium of second leg with 1 distal spine placed inferiorly, carpus without dorsal spine, 2 teeth on dactylus and 3 on fixed finger.
      D. Merus and palm of second leg each 3 times as long as broad; posterior pair of dorsal spines of telson placed much nearer to anterior pair than to apex; R. 5–7 : 2–5 ... ... *depressus* Stimpson.
      D'. Merus and palm of second leg each 5 times as long as broad; posterior pair of dorsal spines of telson placed midway between anterior pair and apex; R. 7 : 4 ... ... var. *gracilis*, nov.
  B'. Antero-lateral angles of carapace rectangular; ischium of second leg unarmed, merus without spine at

distal end of upper border, fingers with 5 or more small teeth [antepenultimate segment of third maxilliped about 3 times as long as broad].

C. Hepatic spine remote from frontal margin of carapace; last three legs stout, propodus of third pair 4 times as long as broad, at distal end nearly twice as broad as dactylus; R. 7 : 1-2 ... *lutescens* Dana.

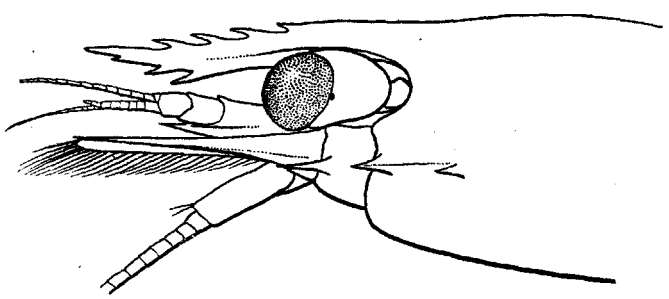
C'. Hepatic spine situated on frontal margin of carapace; last three legs more slender, propodus of third pair 7 times as long as broad, at distal end scarcely broader than dactylus; R. 7–9 : 1–2 ... *consobrinus* de Man.

A'. Hepatic spine absent [ischium of second leg unarmed, merus without spine at distal end of upper border; antepenultimate segment of third maxilliped 3 times as long as broad]; R. 3–5 : 1 ... ... *gerlachei* Nobili.

Harpilius beaupresi (Audouin).

1825. *Palaemon beaupresii*, Audouin, *Explic. somm. des planches de Crust.*, p. 91, in Savigny's *Descr. d'Egypte*, pl. x, fig. 4 (1809).
? 1891. *Anchistia spinigera*, Ortmann, *Zool. Jahrb., Syst.* V, p. 511, pl. xxxvi, fig. 23.
? 1901. *Anchistia spinigera*, Lenz, *Zool. Jahrb., Syst.* XIV, p. 434.
1915. *Harpilius Beaupresii*, Balss, *Denk. math.-naturw. Kl. K. Akad. Wien* XCI, p. 26.
1917. *Harpiliopsis beaupresi*, Borradaile, *Trans. Linn Soc.* (2) *Zool.* XVII, pp. 324, 379, pl. lv, fig. 21.
1921. *Harpilius beaupresi*, Tattersall, *Journ. Linn. Soc., Zool.* XXXIV, p. 389, pl. xxviii, fig. 8.

Borradaile, who gives numerous other references, separates this species from *H. depressus* merely by the proportions of the antepenultimate segment of the third maxilliped. If, however, I have identified Stimpson's species correctly, the two differ in a number of important characters.



TEXT-FIG. 67.—*Harpilius beaupresi* (Audouin). Anterior part of carapace, rostrum, etc.

The principal characters of *A. beaupresi* are the following:—

(i) The rostrum is rather shallow with from 4 to 7 dorsal teeth (usually 4 or 5) and 2 to 4 (usually 2 or 3) ventral. The posterior dorsal tooth is placed on the base of the rostrum in advance of the hinder limit of the orbit. The midrib of the rostrum is continuous with the orbital margin (text-fig. 67).

(ii) The antennal spine is remote from the lower orbital angle

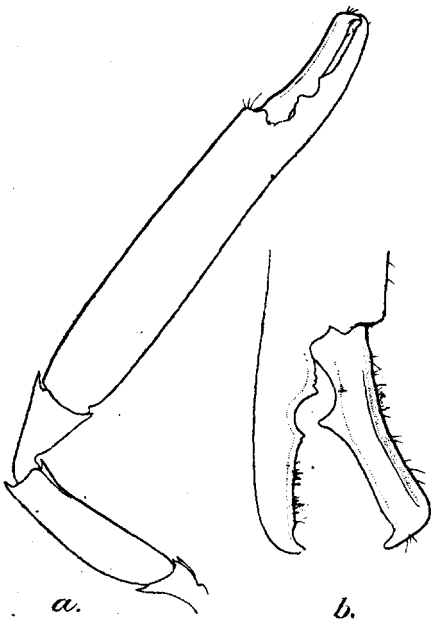
and is supported by a carina which extends backwards to a point immediately above the base of the hepatic spine. The hepatic and antennal spines are about on a level with one another and the antero-lateral angle of the carapace is rounded.

(iii) The spine on the outer side of the second segment of the antenna is very long. The terminal spine of the antennal scale reaches almost as far forwards as the apex of the lamella.

(iv) The antepenultimate segment of the third maxilliped is broad, scarcely more than 3 times as long as wide.

(v) The first peraeopod is slender, with carpus about 8 times as long as its distal breadth and with fingers more than half as long as the palm.

(vi) In the second peraeopod (text-fig. 68) the ischium bears three distal spines, one above and two, which are smaller, below. The merus has a strong spine at the distal end of its upper border; the lower border ends in a sharp spine on the outer side and in a rounded lobe on the inner side. The carpus has a sharp spine on the upper and outer aspect of the distal margin and an acute process, sometimes spiniform, on its lower side. The outer margin of the dactylus is straight or slightly concave and on the lower surface of the segment there is a sharp longitudinal carina. There is a large triangular tooth on the inner margin of the dactylus a little behind its middle point and at the base a rounded protuberance. The tooth fits between two teeth on the fixed finger, the hindmost of which is broad and frequently exhibits a serrated edge. The palm is about 2·5 times as long as the fingers.



TEXT-FIG. 68.—*Harpilius beaupresi* (Audouin).
a. Second peraeopod.
b. Fingers of same.

(vii) In the third pair of peraeopods the merus is about 3·2 times as long as wide. The propodus is much narrower than the merus, about 6·5 times as long as wide, and at the distal end very little broader than the dactylus.

(viii) The pleura of the fourth and fifth abdominal somites are acutely pointed infero-posteriorly.

(ix) The anterior of the two pairs of dorsal spines on the telson is placed a little behind the middle. The posterior pair is midway between the anterior pair and the apex.

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

Thanks to the excellence of Savigny's figures the identity of this species is beyond all doubt Richters' *Pontonia* (*Harpilius*) *dentata*, as de Man and Borradaile have suggested, is no doubt synonymous.

Borradaile regards Ortmann's *Anchistia spinigera* as a synonym of *H. depressus*, but while it may be true that the specimens he himself recorded under the former name in 1898 and 1899 belong to Stimpson's species, it does not seem probable that this is also true of those which Ortmann and Lenz have described. Both these authors refer to the presence of three spines at the distal end of the merus of the second leg and this character, so far as I am aware, occurs only in *H. beaupresi*. On the other hand Ortmann states that the dactylus of the second leg bears two teeth and the fixed finger three and this applies to *H. depressus* rather than to *H. beaupresi*. Further information is necessary before the position of Ortmann's species can be decided.

The specimens of *H. beaupresi* in the Zoological Survey of India are from the following localities:—

7240/10.	Aden.	Brit. Mus.	One.
C 407/1.	Tor, Gulf of Suez.	R. B. S. Sewell, 1916.	Eight.
C 408/1.	Port Blair, Andamans.	J. Wood-Mason.	Five.
C 459/1.	Port Blair, Andamans.	S. Kemp, March, 1915.	One.

The specimen from Aden had been determined by Miers as *Anchistia petitthouarsi* (Audouin).

I have also seen specimens belonging to the Paris Museum from Mahé in the Seychelles (Alluaud coll.) and from Massouah, Red Sea (Raffray coll.).

The species has been recorded from numerous localities in the Red Sea (Audouin, Heller, Paulson, Nobili, Balss) from the Chagos Archipelago and the Maldives (Borradaile) and from Pulo Edam near Batavia (de Man). If Ortmann's *Anchistia spinigera* is synonymous the species extends further east to Samoa (Ortmann) and Laysan (Lenz).

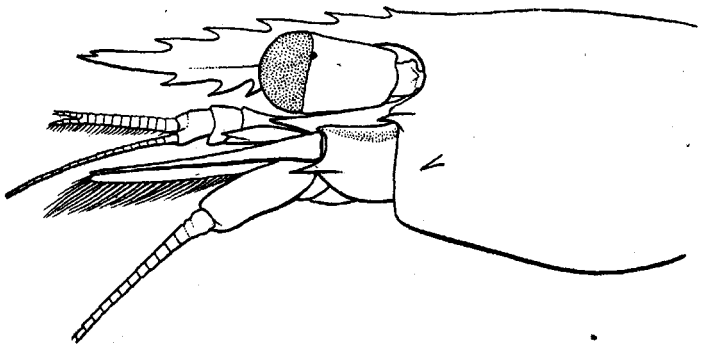
Harpilius depressus Stimpson.

1860. *Harpilius depressus*, Stimpson, *Proc. Acad. Sci. Philadelphia*, p. 38.
1898. *Periclimenes spinigerus*, Borradaile, *Ann. Mag. Nat. Hist.* (7) II, p. 383.
1899. *Periclimenes spinigerus*, Borradaile, in Willey's *Zool. Results* p. 405.
1903. *Harpilius depressus*, Rathbun, *Bull. U. S. Fish Comm.* XXIII, iii, p. 920, text-fig. 68.
1915. *Harpilius depressus*, Balss, *Denk. math.-naturw. Kl. K. Akad. Wien*, XCI, p. 27.
1917. *Harpiliopsis depressus*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 380, pl. lvi, fig. 22.

Harpilius depressus was described by Stimpson from the Hawaiian Is. and I am not altogether certain that the form which occurs on the Indian coast is correctly referred to the same species. The specimens examined differ from the original description in two particulars: there is no difference between the sexes in the form of the third maxilliped and the fingers of the second peraeopod are always more than half the length of the palm. Stimpson's description is very brief and his account of the spines on the segments of the second leg is inadequate. Further information on the form occurring in the Hawaiian Is. is necessary before the name of the Indian form can be regarded as beyond doubt.

The principal characters of the specimens to which I apply the name are the following:—

(i) The rostrum is deeper than in *H. beaupresi* and bears 5 to 7 teeth above (usually 6 or 7) and 2 to 5 below (usually 3 or 4). The posterior dorsal tooth is placed at the base of the rostrum in



TEXT-FIG. 69.—*Harpilius depressus* Stimpson.
Anterior part of carapace, rostrum, etc.

advance of the hinder limit of the orbit. The midrib of the rostrum is continuous with the orbital margin (text-fig. 69).

(ii) The antennal spine is placed close to the lower orbital angle and is not supported by a carina. The hepatic spine is placed on a much lower level than the antennal and the postero-lateral angle of the carapace is rounded.

(iii) The spine on the outer side of the second segment of the antenna is very long. The terminal spine of the antennal scale does not reach as far forwards as the distal end of the lamella.

(iv) The antepenultimate segment of the third maxilliped is broad, about 6 times as long as wide.

(v) The first peraeopod is rather stouter than in *H. beaupresi*. The carpus is less than 6 times as long as its distal breadth and the fingers are less than half as long as the palm.

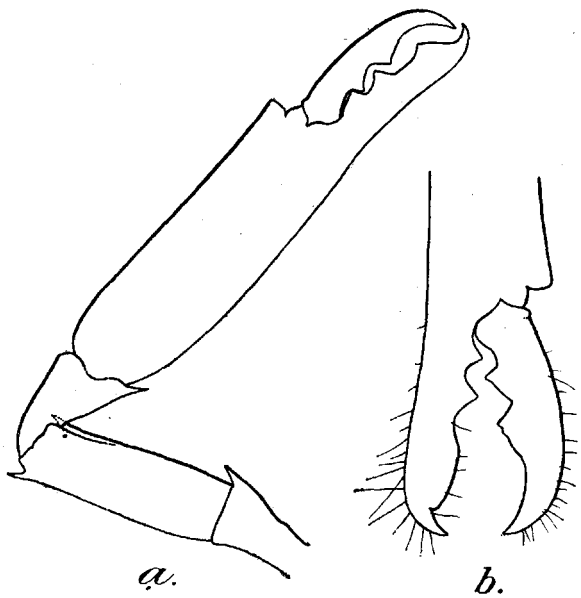
(vi) In the second peraeopod (text-fig. 70) the ischium bears a single spine, which is large and placed at the distal end of the lower border. The merus is closely similar to that of *H. beaupresi*. The carpus has one spine only placed on the lower side.

The outer margin of the dactylus is convex and the segment does not possess the longitudinal carina seen in *H. beaupresi*. There are two large teeth on the dactylus fitting between three on the fixed finger. The teeth on the latter occupy the whole length of the inner margin and the foremost is often broadly rounded. The palm is rather less than twice as long as the fingers.

(vii) In the third pair of peraeopods the merus is rather more than 3·5 times as long as wide. The propodus is much narrower than the merus and is from 5·5 to 6 times as long as wide; at the distal end it is not broader than the dactylus.

(viii) The pleura of the fourth and fifth abdominal somites are acutely pointed infero-posteriorly.

(ix) The anterior of the two pairs of dorsal spines on the



TEXT-FIG. 70.—*Harpilius depressus* Stimpson.
a. Second peraeopod. *b*. Fingers of another specimen.

telson is placed in the middle of its length. The posterior pair is placed very much closer to the anterior pair than to the apex.

The largest specimen examined is about 24 mm. in length.

In life the species was closely and elegantly striped with deep blue on a pale grey ground. There was a narrow mid-dorsal stripe of bright yellow on the third abdominal somite and a similar stripe close to the inferior margins of the first three pleura. The tail-fan was transparent olive-green, the uropods were blotched with blue and with milk-white tips. The chelae of the second legs were finely dotted and suffused with green, with yellowish fingers; the basal segments and the other legs were spotted with blue, the dactyli of the last three pairs being reddish. The eggs were pale brown.

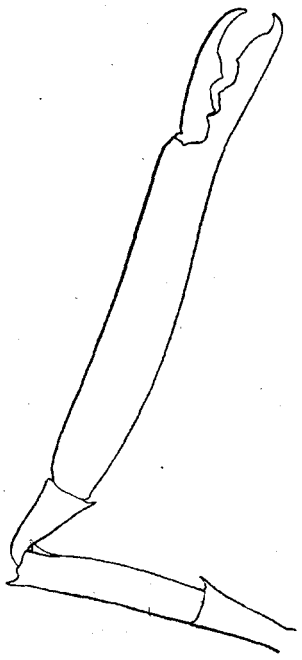
C 410/1. Madras Harbour, 4-5 fms. S. Kemp, May, 1918. Five.

H. depressus was described by Stimpson from the Hawaiian Is. and has since been recorded from that locality by Miss Rathbun. It has also been recorded by Borradaile from Rotuma and the Loyalty Is. (as *P. spinigerus*) and from the Chagos Archipelago, the Maldives, Minikoi and the Seychelles, and by Balss from numerous localities in the Red Sea.

var. **gracilis**, nov.

A single specimen in the collection differs conspicuously from the remainder in its much more slender form. It differs from typical *H. depressus* of the same sex in the following particulars:—

H. depressus, typical form.	*H. depressus* var. *gracilis*.
Antennal scale less than 3 times as long as wide and not longer than carapace.	Antennal scale 3·5 times as long as wide and considerably longer than carapace.
Second peraeopod (text-fig. 70) with both merus and palm about 3 times as long as wide. Palm rather less than twice as long as fingers.	Second peraeopod (text-fig. 71) with merus 5 times and palm 5·5 times as long as wide. Palm 2·5 times as long as fingers.
Third peraeopod with merus about 3·5 times and propodus 5·5 to 6 times as long as wide.	Third peraeopod with merus fully 4·5 times and propodus 7 times as long as wide.
Anterior dorsal spines of telson placed about in the middle of its length; posterior pair much closer to anterior pair than to apex.	Anterior dorsal spines of telson placed much behind the middle of its length; posterior pair almost equidistant between anterior pair and apex.



TEXT-FIG. 71.—*Harpilius depressus* var. *gracilis*, nov.
Second peraeopod.

In all other respects the variety closely resembles the typical form. The rostrum is deep in lateral view and reaches nearly to the end of the antennal scale; it bears 7 teeth above and 4 below. The hepatic spine is present and situated on a lower level than the antennal, precisely as in typical *H. depressus*.

The differences in the proportions of the chela are very striking and it is possible that the specimem deserves full specific recognition; of this, however, I find it difficult to be certain with the small number of specimens which are available. It will be noticed that, apart from the attenuated form of certain appendages, the only character by which the variety can be distin-

guished is the position of the spines on the back of the telson.

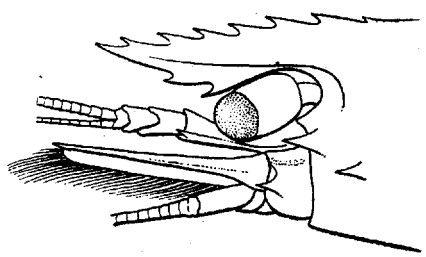
The specimen is 16 mm. in length.

3252/10. Andamans. 'Investigator.' One, TYPE.

? Harpilius lutescens Dana.

? 1852. *Harpilius lutescens*, Dana, *U. S. Explor. Exped., Crust.* I, p. 576, pl. xxxvii, figs. 4*a-h*.
? 1901. *Harpilius lutescens*, Nobili, *Ann. Mus. Univ. Napoli* (n.s.) I, 3, p. 3.
? 1906. *Harpilius lutescens*, Nobili, *Ann. Sci. nat., Zool.* (9) IV, p. 63.
? 1915. *Harpilius consobrinus*, Balss, *Denk. math.-naturw. Kl. K. Akad. Wien*, XCI, p. 27.
1921. *Harpilius depressus*, Tattersall, *Journ. Linn. Soc., Zool.* XXXIV, p. 389, pl. xxviii, fig. 7.

Dr. Tattersall has very kindly allowed me to examine the specimen from the Red Sea which he recently recorded under the name of *Harpilius depressus*. I find that this specimen is specifically distinct from those which I refer to *H. depressus* and agrees less closely with Stimpson's description. The second leg has one spine at the distal end of the merus on its lower side, but none on the ischium and carpus, and on the inner margin of each of the fingers there is a series of five small teeth. Of *H. depressus* Stimpson says, "Pedes secundi grandes, laeves; ischii, meri, carpique apicibus dentibus spiniformibus armatis; manu carapace duplo longiore, digitis palma dimidia brevioribus, intus forte 2-3-dentatis."



TEXT-FIG. 72.—? *Harpilius lutescens* Dana. Anterior part of carapace, rostrum, etc.

Dr. Tattersall's specimen bears a very close resemblance to *H. consobrinus*, but differs from de Man's exhaustive description in a few points which appear to have specific value. I attribute it with considerable doubt to *H. lutescens*, the identification presupposing a large amount of error in Dana's figures.

The principal characters of the specimen are as follows:—

(i) The rostrum is deep and bears 7 teeth above and 2 below. The posterior dorsal tooth is situated on the carapace behind the orbit. The midrib of the rostrum is not continuous with the orbital margin, but curves round the orbit in the form of a sharp carina some distance behind the margin proper (text-fig. 72).

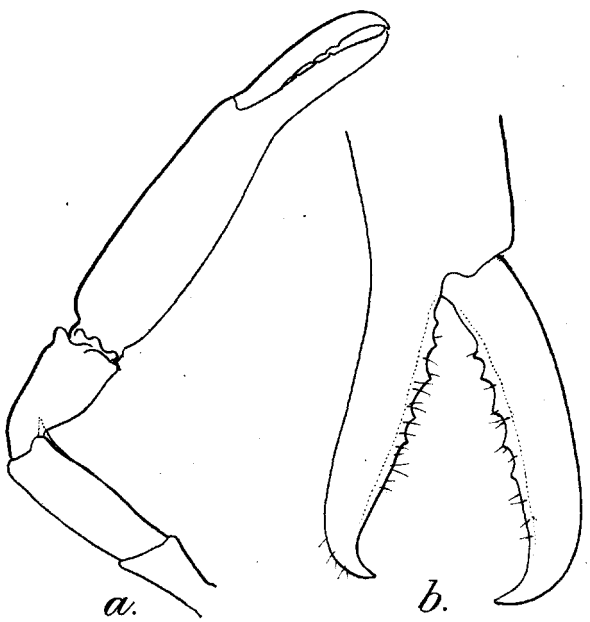
(ii) The antennal spine is placed close to the lower orbital angle and is not supported by a carina. The hepatic spine is situated below the level of the antennal and the antero-lateral angle of the carapace is sharply rectangular.

(iii) The spine on the outer side of the second segment of the antenna is short. The terminal spine of the antennal scale projects well beyond the distal end of the lamella.

(iv) The antepenultimate segment of the third maxilliped is slightly more than 3 times as long as broad.

(v) The carpus of the first peraeopod is about 7·5 times as long as its distal breadth and the fingers are very little shorter than the palm.

(vi) In the second peraeopod (text-fig. 73) the ischium is unarmed. The merus has no spine at the distal end of the upper border; the lower border ends in a spine on the outer side and in a rounded lobe or process on the inner side. The carpus is unarmed. The fingers are bent slightly inwards in relation to the



TEXT-FIG. 73.—? *Harpilius lutescens* Dana.
a. Second peraeopod. *b*. Fingers of second peraeopod.

palm and each bears in the proximal two-thirds of its inner margin a series of 5 small teeth. The palm is less than twice the length of the fingers.

(vii) The last three peraeopods are stout. In the third pair (see Tattersall's fig. 7) the merus is 4 times as long as wide. The propodus is as broad as the merus and is barely 4 times as long as wide.[1] At the distal end the propodus is nearly twice as broad as the dactylus.

(viii) The pleura of the fourth and fifth abdominal somites are not acutely pointed infero-posteriorly.

[1] It is a little too broad in Tattersall's figure.

(ix) The anterior of the two pairs of dorsal spines on the telson is placed a little behind the middle of its length. The posterior pair is midway between the anterior pair and the apex.

The specimen bears a very close resemblance to *H. consobrinus*. The following are the only points of any significance in which it differs from de Man's fully detailed description :—

(i) The carina behind the orbital margin is not mentioned by de Man.

(ii) The hepatic spine is set far back from the frontal margin of the carapace.

(iii) The fused portion of the outer antennular flagellum is composed of 11 segments.

(iv) The carpus of the second peraeopod does not exhibit on its upper side the "scharfe kante" referred to by de Man; this, however, is not shown in his figures. The palm is slightly more than 1·5 times the length of the fingers, whereas in *H. consobrinus* it is less than 1·2 times. Except that there are only 5 teeth on each finger, the second leg agrees closely in all other respects with de Man's descriptions and figures.

(v) The last three peraeopods are much stouter. In *H. consobrinus* the merus of the third leg is 5 times and the propodus 7 times as long as wide. The breadth of the dactylus is scarcely more than half the distal breadth of the propodus, whereas according to de Man's figure the two are almost equally broad in *H. consobrinus*.

(vi) De Man speaks of three pairs of dorsal spines on the telson in *H. consobrinus*, but this is perhaps merely an abnormality.

The specimen differs from Dana's figures in a number of points, particularly in the deeper rostrum and in the much stouter carpus and shorter fingers of the second leg. The figures, as de Man has pointed out, are doubtless erroneous in many respects, but the specimen agrees with them and differs from *H. consobrinus* in the position of the hepatic spine.

The specimen from the Red Sea, which Nobili records without comment as *H. lutescens*, presumably belongs to the same species as that which I have examined. Nobili, however, when writing in 1906, appears not to have been aware that de Man had given the name *H. consobrinus* to the specimens he formerly described as *H. lutescens*. The specimens which Balss has recorded from the Red Sea as *H. consobrinus* also probably belong to this species.

Harpilius lutescens was described by Dana from a specimen obtained at Tongatabu in Polynesia. If my identification is correct its distribution extends westwards to the Red Sea.

Harpilius consobrinus de Man.

1887. *Harpilius lutescens*, de Man, *Arch. Naturgesch.* LIII, i, p. 536, pl. xxii*a*, fig. 1.

1902. *Harpilius lutescens*, de Man, *Abhandl. Senck. naturf. Ges.* XXV, p. 836, pl. xxvi, fig. 54.

Ternate and Noordwachter Is.

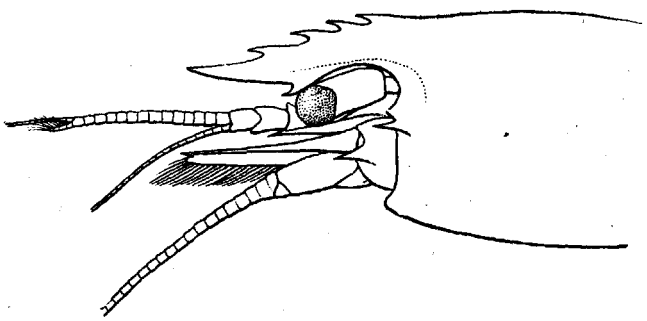
Harpilius gerlachei Nobili.

1905. *Harpilius Gerlachei*, Nobili, *Bull. Mus. Paris* XI, p. 160.
1907. *Harpilius Gerlachei*, Nobili, *Bull. sci. France Belgique* XL., p. 45, pl. iv, figs. 10, 10*a*.
1915. *Harpilius Gerlachei*, Balss, *Denk. math.-naturw. Kl. K. Akad. Wien* XCI, p. 27.
1921. *Harpilius gerlachei*, Tattersall, *Journ. Linn. Soc., Zool.* XXXIV, p. 390, pl. xxviii, fig. 9.

This species is readily distinguished from all other members of the genus by the absence of the hepatic spine of the carapace. It also differs from all, with the possible exception of *H. consobrinus*, in the absence of an arthrobranch on the third maxilliped.

The principal characters of the species are as follows:—

(i) The rostrum is rather shallow and bears from 3 to 5 teeth above, usually 4, and 1 below. The posterior dorsal tooth is placed near the base of the rostrum in advance of the hinder



TEXT-FIG. 74.—*Harpilius gerlachei* Nobili.
Anterior part of carapace, rostrum, etc.

limit of the orbit. The midrib of the rostrum is not continuous with the orbital margin, but curves round the orbit in the form of an ill-defined crest some distance behind the margin proper (text-fig. 74).

(ii) The antennal spine is placed close to the lower orbital angle and is not supported by a carina. The hepatic is absent. The antero-lateral angles of the carapace are a little produced, but rounded.

(iii) The spine on the outer side of the second segment of the antenna is short. The terminal spine of the antennal scale projects well beyond the distal end of the lamella.

(iv) The antepenultimate segment of the third maxilliped is a little more than 3 times as long as broad.

(v) The carpus of the first peraeopod is from 5 to 5·5 times as long as its distal breadth and the fingers are little more than half the length of the palm.

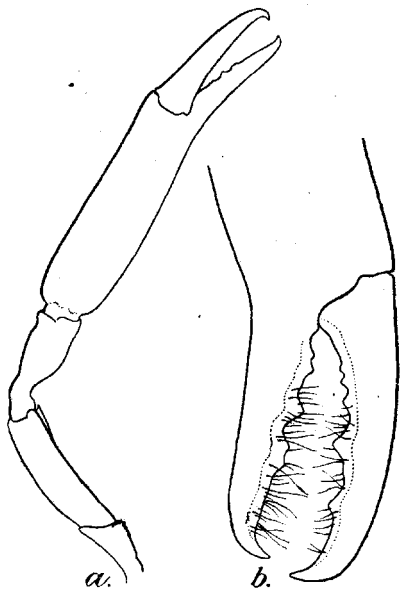
(vi) In the second peraeopod (text-fig. 75) the ischium is unarmed. The merus has no spine at the distal end of the upper border; the lower border ends acutely on the outer side and in a rounded lobe or process on the inner side. The carpus is unarmed.

The fingers are armed in the proximal three quarters of their length with from 3 to 7 teeth, very irregular in their size and distribution. The palm is less than twice the length of the fingers.

(vii) In the third pair of peraeopods the merus is about 3·5 times as long as wide. The propodus is as broad as the merus and is about 4·5 times as long as wide; at the distal end it is very little broader than the dactylus.

(viii) The pleura of the fourth and fifth abdominal somites are not acutely pointed infero-posteriorly.

(ix) The anterior of the two pairs of dorsal spines on the telson is placed behind the middle of its length. The posterior pair is midway between the anterior pair and the apex.



TEXT-FIG. 75.—*Harpilius gerlachei* Nobili.
a. Second peraeopod.
b. Fingers of second peraeopod.

The largest specimen examined is a female about 18 mm. in length.

The telson of one of the specimens is abnormal, bearing 5 teeth on one of the lateral margins and 3 on the other.

C 412-3/1.	Pamban and Kilakarai, Gulf of Manaar.	S. Kemp, Feb., 1913.	Four.

The specimens were all obtained on madrepore coral. Those examined by Nobili were found to the north-east of Arzana I. in the Persian Gulf, "parmi les polypiers." Tattersall's specimens are from a coral reef at Khor Dongonab in the Red Sea and those recorded by Balss are from the Gulf of Suez, the Red Sea and the S. Coast of Arabia.

Genus **Pontoniopsis** Borradaile.

1915. *Pontoniopsis*, Borradaile, *Ann. Mag. Nat. Hist.* (8) XV, p. 207.
1917. *Pontoniopsis*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 377.

This genus, of which I have seen no specimens, was erected by Borradaile for a single species, *P. comanthi*, found on crinoids in the Torres Straits. It appears to be very closely related to *Periclimenes* and *Harpilius*, but differs in its depressed and toothless rostrum, which is lanceolate in dorsal view. Supra-orbital and hepatic spines are wanting and the dactyli of the last three legs are simple.

Genus **Dasycaris**, nov.

Rostrum long, laterally compressed, with teeth. Carapace laterally compressed, sculptured, with regions well-defined; antennal and hepatic spines present, each flanked by a strong carina. Antennular peduncle with basal segment greatly narrowed distally; antennal scale well developed. Mandible without palp; inner lacinia of maxillula narrow: all maxillipeds with exopods, the second without podobranch, the third slender. Carpus of first peraeopod not divided into subsegments. Last three pairs of peraeopods with strongly hooked dactylus, without basal protuberance and without accessory claw. Pleura of third, fourth and fifth abdominal somites drawn out inferiorly into long acute processes.

Type and only known species,—*Dasycaris symbiotes*, sp. nov.

This genus is proposed for a remarkable Pontoniine prawn found on Alcyonaria belonging to the genus *Pteroeides*. In most of its characters the genus resemble *Periclimenes*, but the carapace is sculptured, the basal segment of the antennular peduncle is strongly narrowed distally and some of the abdominal pleura are produced inferiorly and end in very sharp spinous processes. The dactylus of the posterior legs appears simple under low magnifications, but when stained and examined under a high power it is seen to possess a pit on the posterior margin, through which a fleshy process can apparently be protruded.

In certain species of *Harpilius* (*H. beaupresi* and *H. depressus*) the pleura of the fourth and fifth abdominal somites are acutely produced infero-posteriorly, though not to the same extent as in *Dasycaris*. In *Harpilius*, however, the carapace is depressed and not sculptured and the basal antennular segment is very broad.

In some respects *Dasycaris* resembles Nobili's little known genus *Coutierea*. The latter, however, is a much more extreme form, with a pterygostomian spine on the carapace and with abnormally developed antennal and supra-orbital spines. In *Coutierea*, moreover, the dactylus of the posterior legs bears a basal protuberance, indicating affinity with *Coralliocaris* and *Conchodytes* rather than with the *Periclimenes* group of genera.

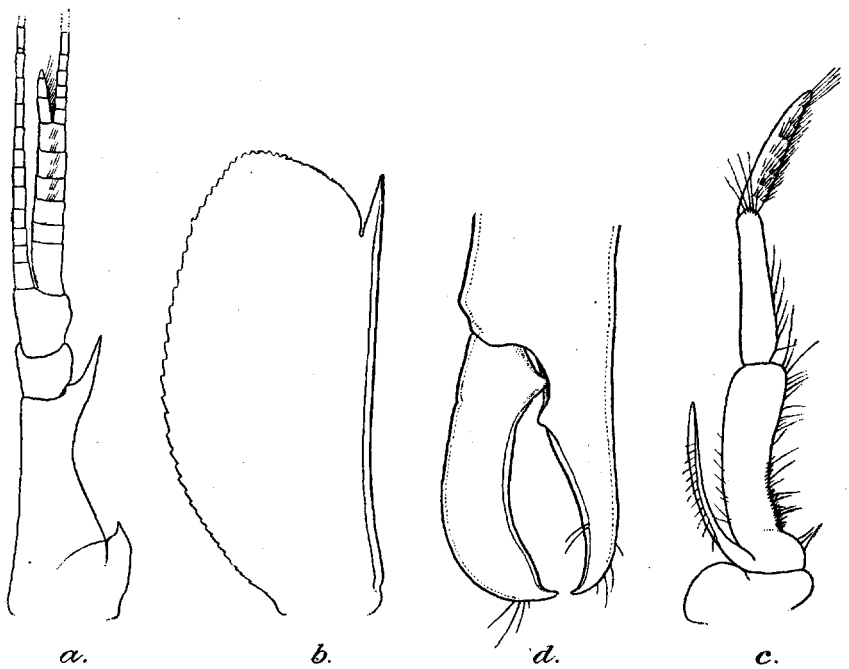
Dasycaris symbiotes, sp. nov.

(Plate IX.)

The rostrum reaches to the end of the second segment of the antennular peduncle in the female, to the end of the third segment in the male. It is straight, very slightly upturned at the tip and is extremely shallow in lateral view. It bears above 5 sharp teeth; of these the three posterior are placed close together, with two situated behind the posterior limit of the orbit, while the foremost is little, if at all, in front of the middle of the rostral length. The lower border is unarmed. Behind the rostrum in the middle of the carapace there is another sharp tooth, widely separated from the posterior of those forming the rostral series; this tooth forms the

termination of a sharp carina which commences in the posterior quarter of the carapace.

The lower limit of the orbit is defined by an acute angulation of the frontal margin. The supra-orbital spine is absent. The antennal spine is large, with the hepatic placed behind it on the same level; both spines are supported by strong carinae. The surface of the carapace is uneven; a blunt ridge runs backwards from the lower orbital angle and is separated from the antennal and hepatic spines by a well-marked furrow. There is a similar furrow above this ridge and a large shallow depression on the gastric



TEXT-FIG. 76.—*Dasycaris symbiotes*, sp. nov.

a. Antennule. *c*. Third maxilliped.
b. Antennal scale. *d*. Fingers of second peraeopod.

region. The upper limit of the branchial cavity is defined externally by a groove and an irregular fold.

The eyes are rather slender. The cornea is hemispherical and scarcely wider than the stalk and there is no trace of the ocular spot.

The basal segment of the antennular peduncle (text-fig. 76*a*) is externally concave and is remarkably narrow in its distal third; its least breadth is only one quarter its length excluding the terminal spine. The lateral process does not reach the middle of the basal segment and consists of a comparatively broad plate with an acute termination; it thus differs considerably from that of *Periclimenes* in which the whole process has the form of a simple spine. The

terminal spine of the outer margin is very sharp and long, extending beyond the end of the second segment. The second and third segments are broad and the length of the two combined is scarcely more than half that of the basal segment. The free part of the stouter of the two rami composing the outer flagellum is about one-third the length of the fused basal portion, the latter comprising 6 segments. The total length of the shorter ramus is less than that of the peduncle.

The antennal scale (text-fig. 76*b*) scarcely reaches beyond the end of the antennular peduncle. It is only about 2·2 times as long as broad and the outer margin, which is very slightly concave, ends in a spine which reaches almost as far forwards as the broadly rounded apex of the lamella.

The third maxilliped (text-fig. 76*c*) bears a foliaceous epipod. The exopod does not reach the end of the slightly curved antepenultimate segment. The ultimate segment is as long as the penultimate.

The first peraeopods are slender and reach beyond the antennal scale by the chela and a portion of the carpus. The chela is a little longer than the carpus and the merus a little longer than the chela. The carpus is about 6 times as long as wide. The palm is 4 times as long as wide and is twice as long as the fingers. The fingers bear some short hairs, but their inner margins are unarmed.

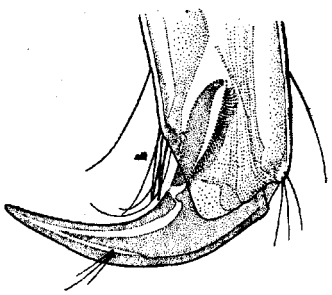
In the male specimen the second pair of peraeopods is very unequal; in the female one leg only, apparently the larger of the two, is present.

The larger limb extend beyond the antennal scale by the whole length of the chela and carpus and is covered with minute tubercles. The merus is longer than the ischium and is broadest distally, the lower border ending in a strong tooth. The carpus is very short, scarcely longer than broad; it is little more than one-third the length of the merus and is unarmed. The chela is about 2·75 times the length of the merus; the palm is about 3·5 times as long as wide and is from 2·2 to 2·5 times as long as the dactylus. The dactylus is heavy, with strongly convex outer border (text-fig. 76*d*); at the base of its inner margin it is provided with a large acute tooth which fits into a cavity in the fixed finger. In front of this cavity the fixed finger bears a small tooth. In the distal two-thirds of their length the inner margin of each finger is entire, the margin is, however, a little concave with the result that a small gap is left when the claw is closed. The tips are inturned and cross one another.

In the smaller second leg the tooth at the distal end of the merus appears to be absent and the carpus is nearly twice as long as wide and rather less than half the length of the merus. The chela is 1·65 times the length of the merus, with fingers unarmed and slightly less than half the length of the palm.

The three posterior peraeopods are stout; the third reach beyond the antennal scale by the length of the dactylus. The merus is about 4·5 times as long as broad and is 2·3 times the length of the car-

pus. The propodus is conspicuously curved, about 6 times as long as broad and 3 times the length of the dactylus; at the distal end of the lower border there are two pairs of spinules. The dactyli have the form of strong hooks and are about 3 times as long as their basal breadth. The dactyli appear simple under low magnifications, but when stained and mounted and viewed under a high power a pit or pore can be detected on the interior side near the base (text-fig. 77). In this pit a fleshy process is lodged and this process is continuous with striated muscle tissue at the base of the dactylus. From the structure of the parts it seems probable that the process can be protruded through the pit. Examination of living material is necessary before the function of the process can be determined accurately; it is possible that it acts as a pad and helps the prawn to retain a grip on the host.



TEXT-FIG. 77.—*Dasycaris symbiotes*, sp. nov Dactylus of third peraeopod, from a stained preparation.

The abdominal somites are smooth. In both sexes the pleura of the third, fourth and fifth somites are produced inferiorly to long sharply pointed processes. In the male the pleura of the first two somites are pointed at their posterior angles, while in the female the pleura of these somites are rounded, with a small pointed projection in the middle of the lower margin of the second. The sixth somite is rather more than 1·5 times the length of the fifth; posteriorly it bears a sharp spine on either side of the base of the telson. The telson is shorter than the uropods and possesses two pairs of dorsal spines; the foremost of these is placed a little in front of the middle point of the telson, while the second pair is rather nearer to the first than to the apex. The terminal telson spines are short.

The female specimen is 13 mm. in length, the male about 9·5 mm.

With the female there is a note by Col. Alcock which reads,—"Transparent grey with dark points on a Pteroeid of exactly similar colour." In *A Naturalist in Indian Seas*, p. 113, Col. Alcock further says,—"Another zoophyte that we often dredged was *Pteroeides elegans* (or a species intimately close to it), one of the sea-pens, of a grey colour profusely marked with little, blackish rings. In its leaves three small species of crustaceans are accustomed to hide, all of whom are coloured and spotted exactly like the living citadel in which they dwell." One of the other crustaceans associated with the *Pteroeides* is an Alpheid, but what the third is I do not know.

1729/7.	2½ miles E.S.E. of Santapilli Lt., near Vizagapatam, Madras Coast, 15-17 fms.	'Investigator,' Feb., 1890.	One ♀, TYPE.
C 406/1.	3 miles E.S.E. of Kabusa Is., Mergui, 12°44′30″ N., 97°55′30″ E., 35 fms.	'Investigator,' Oct., 1913.	One ♂, TYPE.

Alcock's notes refer to the female obtained at the first of these localities. The labels of the male do not indicate that it was found in any particular association.

Genus **Thaumastocaris**, nov.

Rostrum well developed, laterally compressed, with large teeth. Carapace laterally compressed, not sculptured. Basal segment of antennule broad; antennal scale well developed. Mandible without palp; inner lacinia of maxillula narrow; all maxillipeds with exopods, the second without podobranch, the third slender. Carpus of first peraeopods divided into a number of subsegments. Last three peraeopods with dactylus biunguiculate, but without basal process. Pleura of abdominal somites rounded inferiorly.

Type and only known species,—*Thaumastocaris streptopus*, sp. nov.

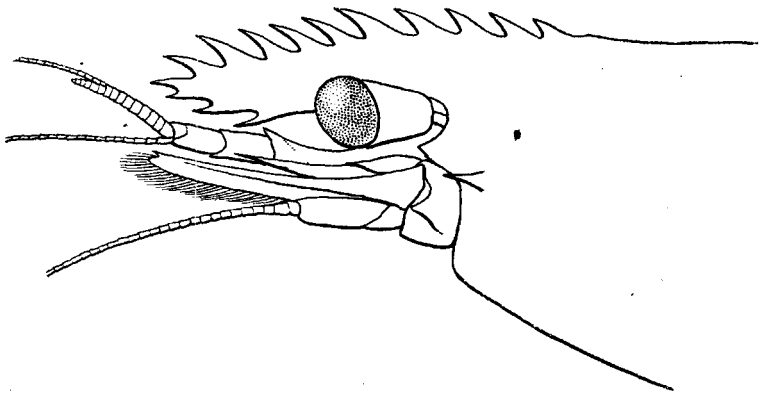
This genus is proposed for a Pontoniine prawn from New Caledonia belonging to the Paris Museum which is remarkable for the fact that the carpus of the *first* pair of peraeopods is divided into a number of subsegments. In this curious feature it differs, I believe, from all Macrura hitherto known.

The carpus of the second peraeopod is frequently segmented in Caridea and the character is of value in distinguishing certain of the families into which the tribe is divided. Much less significance is, however, to be attributed to the occurrence of the same feature in the first peraeopod of *Thaumastocaris*, for it is by this feature alone that it can be distinguished from *Periclimenes*. In *Thaumastocaris* the hepatic spine is absent and the dactylus of the last three legs biunguiculate. In these points it resembles *Periclimenaeus* and I have no doubt that it is in this subgenus or in the closely related *Periclimenes s.s.* that it finds its nearest allies. It is not easy to decide how much importance should be attributed to a unique character such as that on which this genus is founded; it is possible that its affinities would be more clearly shown by regarding it merely as a subgenus of *Periclimenes*.

Thaumastocaris streptopus, sp. nov.

The rostrum (text-fig. 78) reaches to the end of the antennal scale and is deep in lateral view. The upper border is straight and in the single specimen examined bears a series of 10 closely set teeth which increase in size from behind forwards and are all very large; the three posterior teeth are situated on the carapace behind the

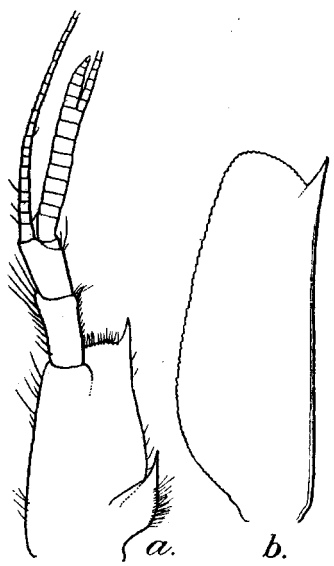
orbit. The lower border is convex and bears three smaller teeth in its distal half.



TEXT-FIG. 78.—*Thaumastecaris streptopus*, sp. nov.
Anterior part of carapace, rostrum, etc.

The carapace is smooth, without trace of areolation or sculpture. The orbital angle is acute; below it there is a sharp antennal spine, but both supra-orbital and hepatic are missing. The eyes are large; the ocular spot is merged in the cornea and the breadth of the cornea is greater than that of the stalk.

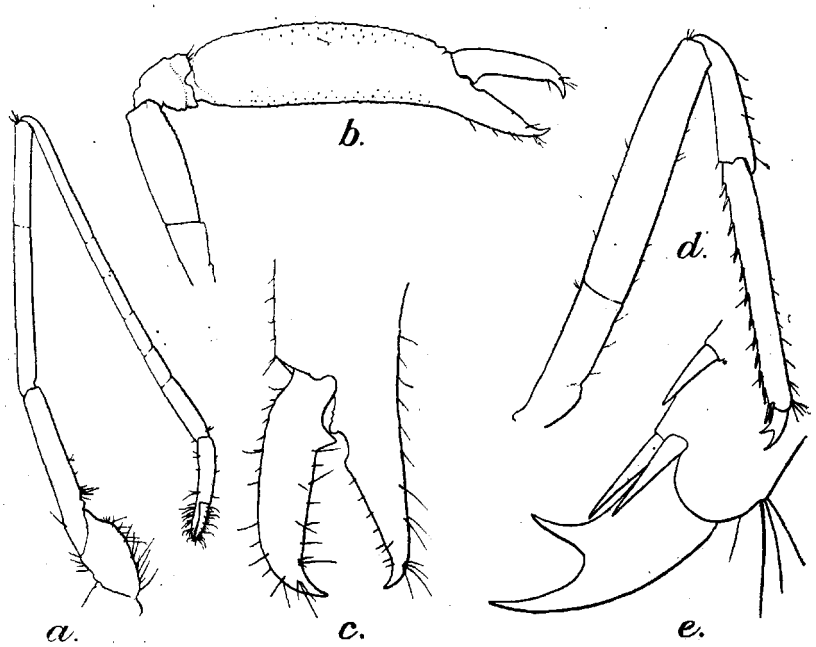
The antennular peduncle (text-fig. 79*a*) extends nearly to the end of the antennal scale. The lateral process does not quite reach the middle of the basal segment; the spine at the outer distal angle is long and the margin between this spine and the articulation of the second segment is a little convex. The free portion of the shorter of the two rami composing the outer antennular flagellum is much shorter than the fused part, the latter comprising 9 segments. The antennal scale (text-fig. 79*b*) is not quite 3 times as long as wide; the outer margin is slightly concave and terminates in a spine which reaches almost to the end of the lamella.



TEXT-FIG. 79.—*Thaumastocaris streptopus*, sp. nov.
a. Antennule.
b. Antennal scale.

The distal endite of the maxilla, as in most Pontoniinae, is divided into two lobes. The third maxilliped extends to the middle of the second antennular segment and is slender. It possesses a small arthrobranch and the exopod does not reach the distal end of the antepenultimate segment. The ultimate segment is less than two-thirds as long as the penultimate.

The first peraeopods (text-fig. 80*a*) are very long and slender: the mero-carpal articulation reaches to the end of the basal antennular segment. The merus is about 14 times as long as wide and is divided by a rather obscure articulation into two subsegments, the distal about two-thirds the length of the proximal. The car-



TEXT-FIG. 80.—*Thaumastocaris streptopus*, sp. nov.

a. First peraeopod. *c*. Fingers of second peraeopod.
b. Second peraeopod. *d*. Third peraeopod.
e. Dactylus of same.

pus is very slender, about 1·35 times as long as the merus and 3·6 times as long as the chela. It is divided by transverse or oblique articulations into six subsegments, the order of which, when arranged according to length is 1, 6, 3, 2, 4, 5. The first subsegment is twice as long as the sixth, the second, third and fourth are subequal and the fifth, which is the shortest, is about 2·5 times as long as wide. The chela is slender, with fingers unarmed and little more than half the length of the palm.

Judging from the size of the basal segments the second peraeopods do not differ greatly in size, but only the left limb (text-fig. 80*b*) is present in the unique specimen. It extends beyond the

antennal scale by the greater part of the chela. The merus is rather less than 3 times as long as wide; it is conspicuously tuberculate along its lower border, but does not bear a distal tooth. The carpus is a little longer than broad and is about half the length of the merus. Its surface is somewhat uneven and it bears one obscure tubercle on its upper surface and two beneath. There is an excavation in the anterior margin on the inner side and the border above this excavation is obscurely crenulate. The chela is about 3 times as long as the merus and the fingers are a little less than half the length of the palm. The palm is nearly 3 times as long as wide and is rather closely covered with conspicuous tubercles except on the middle of its inner face. The fixed finger is bent at an obtuse angle to the palm. There is a large triangular tooth at the base of the dactylus which fits into a socket in the fixed finger (text-fig. 80*c*). In the proximal third of the fixed finger there are two teeth separated by a shallow excavation; the anterior of these is blunt and little developed, the posterior is broad and crenulate on the summit. The tips of the fingers are inturned and cross one another when the claw is closed.

The last three peraeopods are stout; the third (text-fig. 80*d*) reach a little beyond the antennal scale, the fifth to the end of the basal antennular segment. In the third pair the merus is 5·5 times as long as wide and the propodus is 5·5 times as long as the dactylus. In the third and fourth pairs the posterior margin of the propodus is thickly furnished with spinules along its entire length; in the fifth pair the spinules are restricted to the distal end. The dactylus (text-fig. 80*e*) is broad and biunguiculate, with the accessory claw large.

The pleurobranchs as in other Pontoniinae are five in number, one being situated above the base of each peraeopod.

The sixth abdominal somite is short; it bears a strong spine on either side of the base of the telson and one at each postero-lateral angle. The telson is flattened above, with two pairs of large dorsal spines. The anterior pair is situated well in advance of the middle, while the posterior pair is midway between the anterior pair and the apex. At the tip of the telson there are as usual 6 spines, the intermediate pair the longest. The median pair is unusually slender.

The species is described from a single male about 24 mm. in length.

The specimen is the property of the Paris Museum. It was obtained in August 1890 at Noumea in New Caledonia by Abbé Cullieret.

Genus **Anchistus** Borradaile.

1898. *Anchistus*, Borradaile, *Ann. Mag. Nat. Hist.* (7) II, p. 387.
1917. *Anchistus*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 387.

The genera *Anchistus* and *Pontonia* comprise species which have adopted a more secluded mode of life than any of those contained in the preceding genera. The species of *Anchistus* live in the mantle-

cavity of lamellibranch molluscs, those of *Pontonia* in a similar situation or in the branchial sac of ascidians. In both genera the prawns probably enter their hosts when larvae and never leave them throughout the whole period of their lives (*vide* p. 117).

The structural changes which they have undergone in response to this remarkable environment are not great. The species are more or less depressed in habit of body and, except for the occasional presence of the antennal, all the spines of the carapace have disappeared; the second legs are very heavy, frequently unequal, and without spines on the ischium, merus or carpus To each of these characters a parallel can be found in other genera of the family. The only structural feature of unequivocal value is afforded by the inner lacinia of the maxillula, which is very broad and densely covered with hair.[1] In this respect *Anchistus* and *Pontonia* agree with *Conchodytes*—which also lives in lamellibranchs—and differ from all other genera of Pontoniinae in which the maxillula has been described.

The characters available for separating *Anchistus* from *Pontonia* are very slight, though there can be little doubt that the genera constitute two natural groups of species. In *Anchistus* the rostrum is laterally compressed in its distal half and frequently bears small teeth at or near the apex. The two distal segments of the third maxilliped[2] are always slender and are not twisted as in the related genus. The dactylus of the last three legs is either simple and strongly hooked, or is scoop-shaped with the distal part of the anterior border bent inwards, and with an accessory tooth. Minor distinctions are to be found in the last abdominal somite and telson. The former is bluntly produced on either side of the telson and with the postero-lateral corners more or less rounded, whereas these four angles are sharply acute or spinous in *Pontonia*. In *Anchistus* the dorsal spines of the telson are very small and inconspicuous, in *Pontonia* they are usually large.

The distal endite of the maxilla, as in some species of *Pontonia* and most *Periclimenes* is divided into two lobes.

Borradaile recognises five species of this genus and also includes, though with some doubt, Milne-Edwards' *Pontonia armata*. This species can never be identified with certainty from the brief description which has been published, and the same remark also applies to *A. spinuliferus* (Miers). Pesta's *Marygrande mirabilis* is no doubt an *Anchistus*; but the author seems to have confused two distinct species in drawing up his specific description.

I have myself seen four species of *Anchistus*, two of which appear to be undescribed. They are distinguished by the following characters:—

A. Rostrum toothless; antepenultimate segment of third maxilliped very broad, contrasting strongly in width with two distal segments; chela of first leg with its lateral edges

[1] See Borradaile's figs. 25*e* and 26*e* *loc. cit.*, 1917.

[2] Borradaile distinguishes *Anchistus* from *Pontonia* by the slenderness of these two segments; they are, however, equally slender in some species of *Pontonia*.

produced and bent downwards, the lower surface thus being deeply channelled; dactyli of last three legs simple, less than half as broad at base as distal end of propodus ... *inermis* (Miers).

A'. Rostrum with teeth at or near apex; antepenultimate segment of third maxilliped rather slender, not contrasting strongly in width with two distal segments; chela of first leg normal in form; dactyli of last three legs little narrower at base than distal end of propodus.

B. Dactyli of last three legs normal in form, simple and consisting of a broad basal portion and a slender curved apical claw; basal segment of antennular peduncle with a short tooth at distal end of outer margin [antennal spine present] ... ... *gravieri*, sp. nov.

B'. Dactyli of last three legs scoop-shaped with distal part of upper border reflected inwards, biunguiculate; basal segment of antennular peduncle without terminal tooth.

C. Rostrum more or less pointed with teeth on upper border near apex; antennal spine present; dactyli of last three legs with sharp accessory claw and very minute and inconspicuous spinules ... ... *miersi* (de Man).

C'. Rostrum squarely truncate with teeth only at the apex; antennal spine absent; dactyli of last three legs with short blunt accessory claw and large spinules ... ... *demani*, sp. nov.

Anchistus inermis (Miers).

1884. *Harpilius inermis*, Miers, *Rep. Zool. Coll. H.M.S. 'Alert,'* p. 291, pl. xxxii, fig. B.
1894. *Pontonia pinnae*, Ortmann, *Denk. med.-naturw. Ges. Jena* VIII, p. 16. pl. i, fig. 3.
1906. *Pontonia pinnae*, Nobili. *Ann. Sci. nat., Zool.* (9) IV, p. 65.
1907. *Pontonia pinnae*, Nobili, *Bull. Sci. France Belgique* XL, p. 49, pl. iv, figs. 11–11*b*.
1917. *Anchistus inermis* and *Pontonia pinnae*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, pp. 388, 391.
1921. *Anchistus inermis*, Tattersall, *Journ. Linn. Soc., Zool.* XXXIV, p. 391, pl. xxvii, fig. 4.

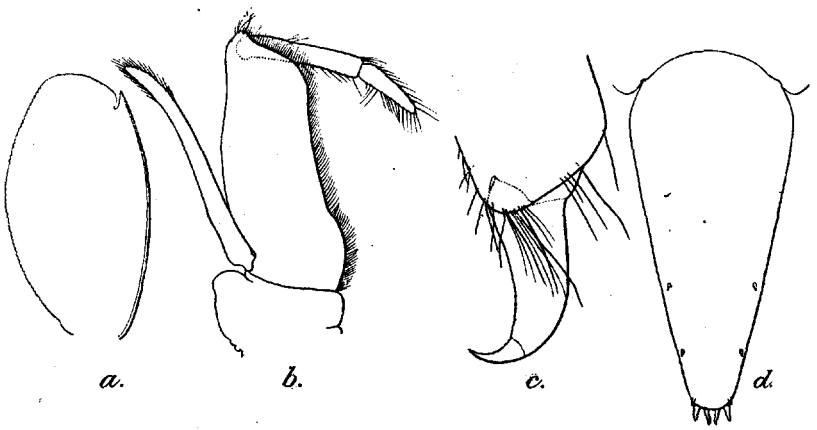
Other references are given by Borradaile. The principal characters of the species are as follows:—

The rostrum is directed downwards, toothless and with the apex broadly rounded in lateral view. The lower limit of the orbit is defined by an acute projection from the frontal margin of the carapace; the antennal spine is either altogether absent or is represented merely by a minute pointed process. The basal segment of the antennular peduncle is produced distally on its outer side in the form of a convex lobe, the outer margin terminating in a short spine. The fused portion of the outer antennular flagellum comprises 5 segments. The antennal scale (text-fig. 81*a*) is broadly oval and little narrowed anteriorly; the strongly convex outer border terminates in a rather small tooth which does not reach the distal end of the lamella.

The antepenultimate segment of the third maxilliped (text-fig. 81*b*) is longer than the two distal segments taken together and is very broad; its least breadth is more than three times that of the penultimate segment. The lower margins of the basis and ischium of the first peraeopods are heavily fringed with setae. The carpus

is a little longer than the merus and nearly twice as long as the chela; the fingers are much shorter than the palm. The structure of the chela, as Tattersall has pointed out, is very peculiar.[1] The edge, both on its outer and inner side, is produced to form a sort of flap which is bent downwards and is thickly fringed with long setae on its margin. The chela is thus deeply hollowed in a longitudinal direction when viewed from below and in a transverse section the lower surface would be semicircular (see Tattersall, *loc. cit.*, fig. 4).

The second peraeopods are unequal, either the right or left limb may be enlarged. In the larger of the two the merus is from 2·0 to 2·4 times as long as broad; the carpus is very short, only one-sixth to one-eighth the length of the chela and the fingers are a little more than half the length of the palm. The dactylus



TEXT-FIG. 81.—*Anchistus inermis* (Miers).

a. Antennal scale.
b. Third maxilliped.
c. Dactylus of third peraeopod.
d. Telson.

is strongly convex externally. On the inner margin it bears in its basal half a very large triangular tooth and a rounded knob close to the articulation; when the claw is closed both the tooth and the knob are received into a large socket in the fixed finger. The inner margin of the fixed finger is obtusely produced in the middle and in the basal half, on a crest which borders the socket on its upper side, there are usually from 3 to 6 small denticles, the foremost placed at the summit of the obtuse prominence referred to above. In all well-developed specimens the distal half of each finger is internally concave. The fingers of the smaller limb are similar, but the tooth on the dactylus is usually less well developed.

In the last three peraeopods the propodus is without spinules on its posterior edge. The dactylus (text-fig. 81*c*) is strongly hooked, with the terminal claw bent at right angles to the proxi-

[1] The character is not sexual as suggested by Tattersall.

mal portion. It is extremely slender, the basal breadth being only about half that of the distal end of the propodus.

The apex of the telson (text-fig. 81*d*) is generally armed with six spines. The two forming the median pair are more slender than the intermediates; the outermost are very short and inconspicuous and are occasionally missing. The dorsal spines are very small and are sometimes absent. When present the anterior pair is placed behind the middle of the telson, with the posterior pair midway between the first pair and the apex.

An exceptionally large female is about 39 mm. in length; the majority of the specimens examined do not exceed 26 mm.

Living specimens vary in colour from pale straw to bright orange yellow. In females the entire body and legs are covered with minute white dots and the eggs are pale straw, yellow, orange or brown. Males are semitransparent and lack the white dots found in the female.

Dr. W. T. Calman has been kind enough to compare certain specimens which I sent him with the holotype of Miers' *Harpilius inermis*. He writes that the type "agrees exactly with your Indian specimens in the form of the chela of the first leg and in the dorsal spinules of the telson (these are very small, near the decurved lateral edge, and easy to overlook), as well as in all other characters that I can see. I think there can be no doubt that your specimens belong to Miers' species."

Tattersall is doubtless right in his suggestion that Ortmann's *Pontonia pinnae*[1] is synonymous with this species. The only point of difference concerns the proportionate length of the palm and fingers of the second peraeopod as shown in the figure. On this no reliance can be placed, as Ortmann's figures are usually inaccurate. I have examined specimens belonging to the Paris Museum which were obtained at the same locality in the Persian Gulf as those which Nobili recorded as *Pontonia pinnae* and find that they are typical *A. inermis*.

C 415/1.	Port Blair, Andamans.	S. Kemp, Feb., March, 1921.	Thirty-four.
C 441/1.	Andamans.	A. R. S. Anderson.	Nine.
C 442/1.	Paway I., Mergui Archipelago.	'Investigator,' Feb., 1914.	Two.
C 416/1.	Cheval Paar, Ceylon, 6 fms.	T. Southwell, Jan., Feb., 1911.	Four.
C 458/1.	Pamban, G. of Manaar.	S. Kemp, Feb., 1913.	Five.

I have also seen specimens belonging to the Paris Museum from the Pearl banks S.W. of Arzana I. in the Persian Gulf, obtained in *Pinna* (Bonnier and Pérez coll.) and from Vanikoro, in the Santa Cruz group, Polynesia.

The specimens from Port Blair were all obtained in the mantle-cavity of species of *Pinna*, a mollusc which occurs in abundance at low water at Brigade Creek and on the shore south of Viper I.

[1] The specific name used by Ortmann was preoccupied by Lockington in 1879 (see Addendum, p. 287).

Every large *Pinna* which was opened contained a pair of prawns belonging either to this species or to *Conchodytes biunguiculatus*. One pair of *A. inermis* was found in *Pinna nigrina* Lam., one pair in *P. vexillum* Born. and the remainder in *P. bicolor* Gmelin.[1] The specimens from Pamban were also obtained in *Pinna*.

The species was described by Miers from a specimen obtained in *Pinna* at Porte Molle in Queensland. It has been recorded from Shark Bay, W. Australia, in *Pinna* (Miers); from the Monte Bello Is., N.W. Australia, in *Pinna* (Rathbun); from Penang, "taken from the infra-branchial chamber of a large Gastropod"[2] (Lanchester); from Trincomali in Ceylon (Müller); from the Ceylon Pearl banks (Pearson); from the Persian Gulf Pearl banks, in *Pinna* (Nobili)[3]; from Dar-es-Salaam, in *Pinna* (Ortmann)[3]; and, in the Red Sea, from Djibouti (Nobili)[3] and Suakin Harbour, in *Pinna* (Tattersall).

Anchistus mirabilis (Pesta).

1911. *Marygrande mirabilis*, Pesta, *Zool. Anz.* XXXVIII, p. 571, text-figs. 1–5.
1913. *Marygrande mirabilis*, Pesta, *Denk. math-naturw. Kl. K Akad. Wiss. Wien* LXXXIX, p. 675, text-figs. 31, 32.

Pesta appears to have confused two forms when describing this species. The dactylus of the posterior legs is described and figured as simple, but he includes as a variety of the same species a form in which it is biunguiculate (*v.* Pesta, 1913, text-figs. 31*d*, *e*). Judging from the species of *Anchistus* that I have seen it does not seem possible that these two types of dactylus can be found in one and the same species.

The form with simple dactylus is closely related to Miers' *A. inermis*, from which, so far as can be ascertained from Pesta's account, it differs only in the less depressed rostrum with apex more pointed in lateral view. These characters are insufficient and re-examination of Pesta's specimens is necessary before it is possible to reach any definite conclusions regarding the identity of the species. That it is not synonymous with Miers' species may be inferred from the fact that it was found in the mantle-cavity of *Tridacna gigas*, whereas *A. inermis* is apparently always associated with *Pinna*.

Pesta's specimens were obtained at Samoa.

Anchistus gravieri, sp. nov.

The rostrum (text-fig. 82) reaches to the end of the second segment of the antennular peduncle and is directed downwards. In lateral view it is rather deep, but obliquely truncate terminally

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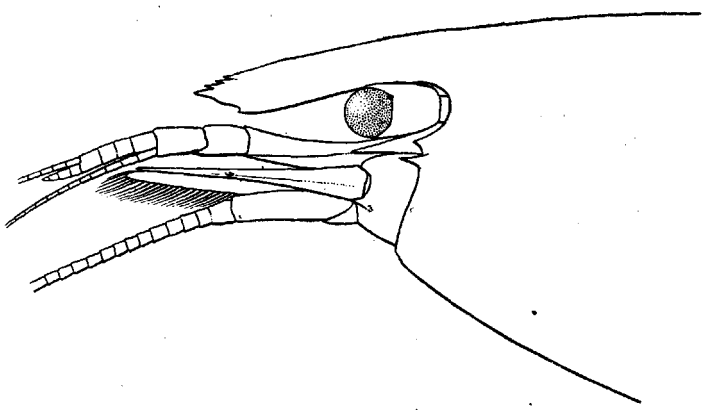
[1] I am indebted to Dr. Baini Prashad for the identification of the species of *Pinna*.

[2] This is, I believe, the only record of a Macruran from a Gastropod and is doubtless an error.

[3] Recorded as *Pontonia pinnae*.

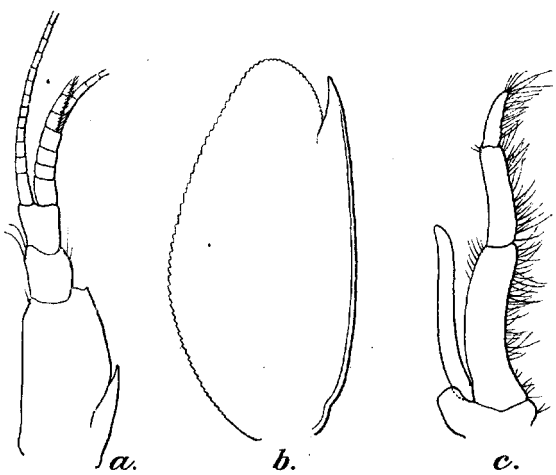
with the apex sharply pointed. On the upper edge close to the tip there are three sharp teeth, placed close together with setae in the interstices. On the lower border there is a small denticle placed



TEXT-FIG. 82.—*Anchistus gravieri*, sp. nov.
Anterior part of carapace, rostrum, etc.

near the distal end beneath the hindmost tooth on the upper edge.

The lower limit of the orbit is acutely produced and there is in addition a strong antennal spine. The cornea is a little narrower



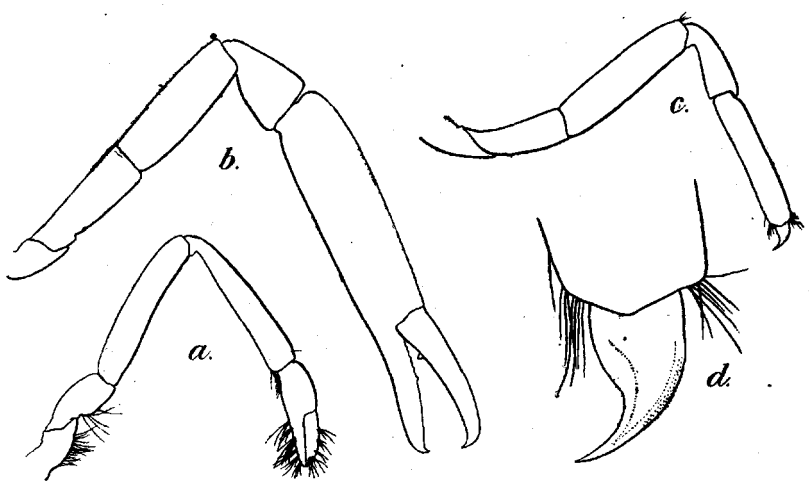
TEXT-FIG. 83.—*Anchistus gravieri*, sp. nov.
a. Antennule. *b*. Antennal scale.
c. Third maxilliped.

than the stalk and the black ocular spot is distinct. The basal segment of the antennular peduncle is produced on the outer side of the articulation of the second segment much as in *A. inermis*, and the outer margin ends in a small tooth (text-fig. 83*a*). The

fused portion of the two rami composing the outer antennular flagellum consists of 4 segments. The antennal scale is strongly narrowed distally (text-fig. 83*b*); the outer margin is convex and terminates in a large spine which does not reach as far forwards as the sharply rounded distal end of the lamella.

The antepenultimate segment of the third maxilliped (text-fig. 83*c*) is slender, as in *A. miersi*, and does not contrast strongly in width with the two terminal segments; in length it is slightly greater than these two segments combined.

The first peraeopods (text-fig. 84*a*) reach beyond the antennal scale by the chela and half the length of the carpus. There are a few setae on the lower borders of the basis and ischium. The merus and carpus are equal in length, each 1·5 times as long as the chela. The palm is normal in form, without the curious structure seen in *A. inermis*; the fingers bear tufts of setae and



TEXT-FIG. 84.—*Anchistus gravieri*, sp. nov.

a. First peraeopod. *c*. Third peraeopod.
b. Second peraeopod. *d*. Dactylus of same.

are somewhat spatulate, unarmed and longer than the palm.

In the single specimen examined only the right leg of the second pair is present (text-fig. 84*b*). It reaches beyond the antennal scale by rather more than the length of the chela. The merus is 3 times as long as wide and about 1·5 times as long as the carpus. The carpus is conical, about two-thirds as broad as long and one quarter the length of the chela. The palm is 1·75 times the length of the fingers. In the dentition of the fingers the species resembles *A. inermis*; the dactylar tooth is, however, smaller and the inner edge of the fixed finger is not angulate and bears six small denticles in the proximal half.

The merus of the third leg (text-fig. 84*c*) is 4 times as long

as wide, that of the fifth 4·5 times. The propodus in all three is without spinules on its posterior edge. The dactylus (text-fig. 84*d*) is simple and short, broad at the base, and with a slender terminal claw which is bent at an angle of 45° to the main axis of the segment. The telson is similar to that of *A. inermis*.

The single specimen is about 20 mm. in length.

With this species I have associated the name of Prof. Ch. Gravier, to whom I am indebted for the opportunity of examining a most interesting collection of unnamed Pontoniinae belonging to the Paris Museum. *A. gravieri* is distinguished from *A. inermis* (i) by the presence of teeth on the rostrum, (ii) by the strong antennal spine, (iii) by the shape of the antennal scale, (iv) by the slender antepenultimate segment of the third maxilliped, (v) by the form of the chela of the first peraeopod and (vi) by the broad-based dactyli of the last three peraeopods. *A. spinuliferus* can never be recognised with certainty from Miers' wholly inadequate description; it appears, however, to differ from the species described above in its unarmed rostrum. In *A. mirabilis* (Pesta) the rostrum is also unarmed and the proportions of the segments of third maxilliped are different. *A. miersi*, *A. demani* and *A. biunguiculatus* are easily distinguished by the form of the dactylus of the last three legs.

The single specimen examined is from Vanikoro, one of the Santa Cruz Is. in Polynesia, and is the property of the Paris Museum. The label does not indicate that the individual was found in the mantle-cavity of a lamellibranch.

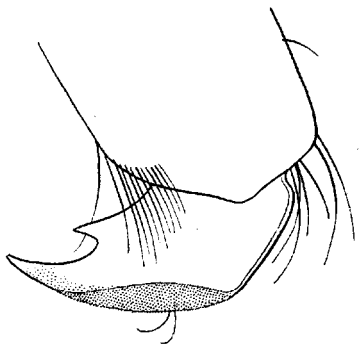
Anchistus miersi (de Man).

1888. *Harpilius Miersi*, de Man, *Journ. Linn. Soc., Zool.* XXII, pl. xvii, figs. 6–10.
1906. *Anchistus miersi*, Nobili, *Ann. Sci. nat., Zool.* (9) IV, p. 63.
1917. *Anchistus miersi*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 388, pl. lvi, fig. 25.
1921. *Anchistus miersi*, Tattersall, *Journ. Linn. Soc., Zool.* XXXIV, p. 391.

Borradaile quotes other references. De Man has given an excellent description of this species and I have little to add to what he has said. The types of the species are in the collection of the Zoological Survey of India. In the specimens I have seen there are four or five teeth on the upper border of the rostrum near the apex and one or two very small denticles on the lower side. In a young individual, about 11 mm. in length, an obsolete tooth can be seen at the distal end of the outer margin of the basal antennular segment; but in well-grown specimens no trace of this tooth remains. The antennal scale is anteriorly narrowed, much as in *A. gravieri*.

The second peraeopods vary somewhat in proportions and in the dentition of the fingers. In a specimen from Batavia the carpus, as in the types, is conspicuously longer than broad and the palm is only about 1·5 times the length of the fingers. There

are two rather small teeth on the proximal part of the inner margin of the dactylus[1] and 8 or 9 small denticles on the proximal half of the fixed finger. In a specimen from Pulo Condore the carpus is as broad as long and the palm is nearly twice the length of the fingers: there is only one large tooth at the base of the dactylus[1] and 5 denticles on the fixed finger. The distal part of the upper border of the dactylus of the last three legs is bent inwards the segment thus forming a sort of scoop (text-fig. 85). There is a large tooth on the posterior margin. On the reflected part near the tip of the dactylus there are a number of extremely minute spinules, only visible under a high power of the microscope. The lateral margins of the telson are armed with two pairs of very small spines arranged in the same way as in *A. inermis*.



Text-fig. 85.—*Anchistus miersi* (de Man). Dactylus of third peraeopod.

8238/6.	Elphinstone I., Mergui Archipelago.	J. Anderson, March, 1887.	Two, TYPES.
C 418/1.	Port Blair, Andamans.	S. Kemp, Feb., 1921.	One, young.

The specimen from Port Blair, which is only 11 mm. in length, was found in a *Tridacna* on the shore at Aberdeen. It was almost transparent when alive, with large sparsely distributed red chromatophores.

I have also seen specimens belonging to the Paris Museum from Batavia (Reynaud coll.) and from Pulo Condore (Germain coll.). The specimen from the latter locality was found in *Tridacna*.

A. miersi has been recorded from Mangareva in the Gambier Is. in the pearl oyster (Nobili), from Funafuti in the Ellice Is. (Whitelegge), from the D'Entrecasteaux Is., British New Guinea, in *Tridacna squamosa* (Borradaile), from Elphinstone I. in the Mergui Archipelago (de Man), the Maldives (Borradaile), the Seychelles (Borradaile), from the vicinity of Arzana I. in the Persian Gulf, in *Spondylus* (Nobili), from the Red Sea, in *Pinna* (Nobili) and from Suakin Harbour, in *Pinna* (Tattersall).[2] The species has thus been recorded from four different genera of lamellibranchs.

Anchistus demani, sp. nov.

This species is closely related to *A. miersi*, but is distinguished by the following characters:—

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[1] In addition to the rounded knob near the articulation.

[2] Tattersall states that Henderson has recorded the species from the coasts of India, but I have not been able to find the reference.

A. miersi (de Man).

Rostrum apically pointed in lateral view, with 4 or 5 small teeth on upper border near tip and sometimes with 1 or 2 denticles on lower border.

Antennal spine of carapace present.

Dactylus of last three peraeopods scoop-shaped; apex slender and sharply pointed; accessory spine sharp and conspicuous; reflected portion of upper margin with fine microscopic spinules (text-fig. 85).

Distance between the two pairs of dorsal spinules of telson (when present) about equal to distance between posterior pair and apex.

Larger, ovigerous females 25 mm. or more in length.

A demani, sp. nov.

Rostrum squarely truncate at apex in lateral view, the upper end of the truncate margin armed with 2 or 3 small teeth (text-fig. 86).

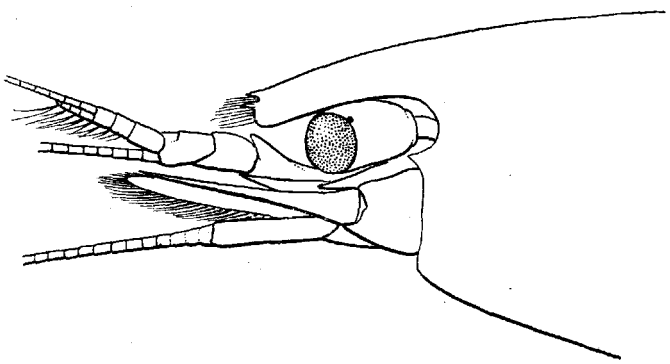
Antennal spine of carapace absent.

Dactylus of last three peraeopods scoop-shaped; apex broader and less sharply pointed; accessory spine very blunt and inconspicuous; reflected portion of upper margin entirely covered with rather coarse spinules (text-fig. 88).

Distance between the two pairs of dorsal spinules of telson more than twice the distance between posterior pair and apex (text-fig. 87*h*).

Smaller, ovigerous females 10 mm. in length.

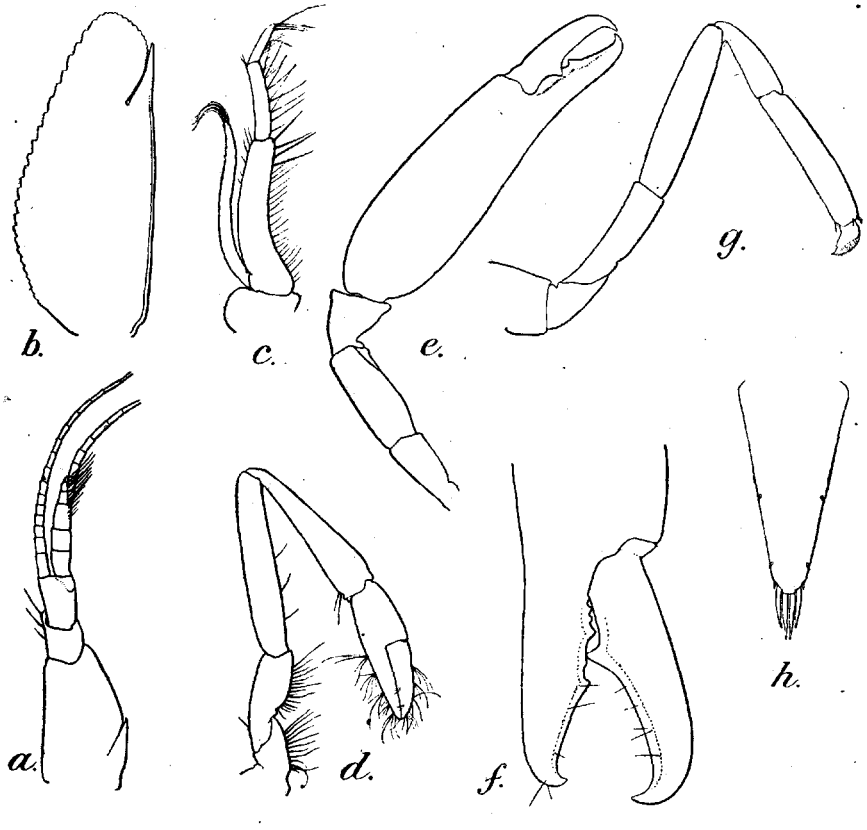
In other respects the species closely resembles *A. miersi*. The distal end of the basal segment of the antennular peduncle (text-



TEXT-FIG. 86.—*Anchistus demani*, sp. nov.
Anterior part of carapace, rostrum, etc.

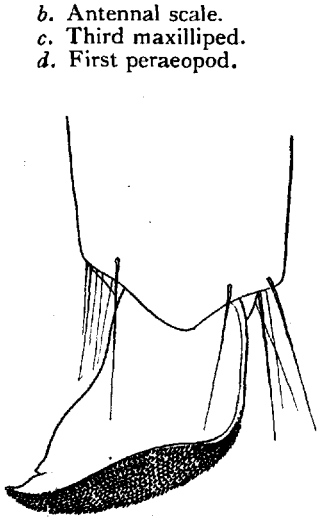
fig. 87*a*) is produced externally beyond the articulation of the second segment and the outer margin does not end in a spine. The fused portion of the outer flagellum is short and is composed of only 3 segments, as against 5 or 6 in *A. miersi*. The antennal scale (text-fig. 87*b*) is strongly narrowed distally and the antepenultimate segment of the third maxilliped (text-fig. 87*c*) is little broader than the distal segments.

In the first peraeopods (text-fig. 87*d*) the carpus is shorter than the merus and about one-sixth longer than the chela, the fingers are longer than the palm. The second peraeopods are unequal. In the larger of the two (text-fig. 87*e*) the merus is 2·5 times as long as broad; the carpus is little more than half the length of the merus and is as broad as long. The palm of the larger limb is 2·5 times the length of the merus and is twice or rather more than twice as long as the fingers. The dactylus (text-fig. 87*f*) bears a large triangular tooth in its proximal third and a knob close to the articulation; the fixed finger has a series of 4



TEXT-FIG. 87.—*Anchistus demani*, sp. nov.

a. Antennule.
b. Antennal scale.
c. Third maxilliped.
d. First peraeopod.
e. Second peraeopod.
f. Fingers of second peraeopod.
g. Third peraeopod.
h. Telson.



TEXT-FIG. 88.—*Anchistus demani*, sp. nov.
Dactylus of third peraeopod.

or 5 small teeth in its proximal half. In the smaller limb the dentition is similar, but the palm is only about 1·5 times as long as the fingers. The merus of the third peraeopod (text-fig. 87*g*) is 5 times, that of the fifth peraeopod 5·5 times as long as broad. As in other species of the genus the propodites in all three pairs are without spinules on their posterior edges.

The three specimens examined are from 9 to 10 mm. in length: one is an ovigerous female.

Two of the specimens, which were found together in a large *Tridacna*, were transparent when alive and dotted all over with pale green chromatophores. The female bore green eggs. The third specimen also found in *Tridacna*, was transparent with red chromatophores; it differs structurally from the other two in the cornea of the eye, which is blacker and distinctly wider than the stalk.

The affinity of this small species with *A. miersi* is clearly shown by the similarity in structure of the dactyli of the last three legs. Borradaile's *Anchistus biunguiculatus* also possesses biunguiculate dactyli, but their detailed structure has not been described. In this species, however, the rostrum is toothless and the fixed finger of the second peraeopod is straight and is much shorter than the dactylus which is strongly hooked at the end. In *A. miersi* and *A. demani* the fingers are of equal length and both have inturned tips.

C 419/1.	Port Blair, Andamans.	S. Kemp, March, 1915.	Two, TYPES.
C 420/1.	Port Blair, Andamans.	S. Kemp, Feb., 1921.	One.

The specimens were all obtained from *Tridacna*, found at low water on the shore at Aberdeen.

Genus **Pontonia** Latreille.

1917. *Pontonia*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XXII, p. 389.

This genus comprises species which live either in the mantle cavity of lamellibranch molluscs or in the branchial sac of ascidians.

In structure *Pontonia* closely resembles *Anchistus*, with which it agrees in the very broad and hairy inner lacinia of the maxillula. The species of *Pontonia* are, however, rather more depressed in habit and the rostrum, though it may be dorsally carinate and with a small ventral keel near the tip, is always toothless and never exhibits the strong lateral compression found in the related genus. The two distal segments of the third maxilliped are frequently but not always broad and the plane of their greatest breadth, as in *Conchodytes*, is more or less at right angles to that of the preceding segment. This curious disposition is brought about either by a twisting of the antepenultimate segment or by a torsion at the articulation between the penultimate and antepenultimate segments. The dactylus of the last three legs is simple and not strongly hooked, or biunguiculate, sometimes with a series of spines along the posterior margin. There is a tooth or spine at the distal end of the last abdominal somite on either side of the base of the telson and the postero-lateral angles are acutely produced. The dorsal spines of the telson are usually large.

The antennal spine, as in *Anchistus*, is present or absent. The distal endite of the maxilla is divided into two lobes in the typical species, *P. tyrrhena*, but is slender and undivided in the Indian forms.

Borradaile distinguishes the genus from *Anchistus* by the greater proportionate breadth of the two distal segments of the third maxilliped; they are, however, slender in at least one species of *Pontonia.*[1] His statement in the generic diagnosis that the dactylus of the last three legs is simple is evidently a *lapsus calami*, for it is biunguiculate in *P. tyrrhena* and in the majority of the species.

Nobili[2] has pointed out that Forskål's *Cancer custos*[3] was obtained in a species of *Pinna* in the Red Sea and that the name cannot be applied, as it frequently has been, to the Mediterranean species more properly known as *Pontonia tyrrhena.* On the Indian coasts two Pontoniine prawns are found in *Pinna*, viz. *Anchistus inermis* (Miers) and *Conchodytes biunguiculatus* (Paulson). Both of these, if my identifications are correct, also occur in the Red Sea, but Forskål's description is too indefinite to enable us to decide which was the original of his *C. custos.* Nobili, moreover, is of the opinion that the name *custos* is preoccupied by Forskål's own use of the term on p. 89 of his work in reference to a *Pinnotheres.*

To the genus *Pontonia* Borradaile assigns ten species, but of these Ortmann's *P. pinnae*, as Tattersall has suggested, is synonymous with *Anchistus inermis*, while Parisi has pointed out that *P. nipponensis* de Haan belongs to the genus *Conchodytes.* Two species from the W. Coast of America are to be added to the genus: *P. pinnae* Lockington[4] (*nec* Ortmann), which Borradaile appears to have overlooked, and *P. margarita* Smith[4] which he refers to the genus *Conchodytes.*

Only four species have hitherto been recorded from the Indo-Pacific region, viz. *P. brevirostris* Miers[5] from the Seychelles in "clamp shells," *P. ascidicola* Borradaile[6] from New Britain in a ascidian, *P. minuta* Baker[7] from S. Australia, a species of unknown association, and *P. quadratophthalma*, also of unknown association, recently described by Balss[8] from N.W. Australia.

I have seen only two Indo-Pacific species of this genus, both of which appear to be undescribed. They are related to *P. ascidicola* and were found lodged in the branchial sac of simple ascidians. Dr. Asajiro Oka, who found these specimens when examining the Indian Museum collection of Tunicata, remarks that judging from their size they "must have entered the body of the host as larvae and grown up there to maturity.[9]"

The six Indo-Pacific species of *Pontonia* may be distinguished by the following characters:—

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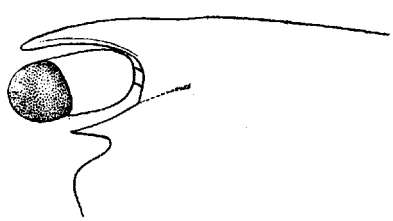
[1] *P. okai*, sp. nov.
[2] Nobili, *Bull. sci. France Belgique* XL, p. 49 (1907).
[3] Forskal, *Descr. Anim.*, p. 94 (1775).
[4] See Addendum, p. 287.
[5] Miers, *Zool. Coll. H.M.S. 'Alert,'* p. 562, pl. li, fig. B (1884).
[6] Borradaile, in Willey's *Zool. Results*, p. 409, pl. xxxvi, figs. 6*a*, *b* (1902).
[7] Baker, *Trans. R. Soc. S. Australia* XXXI, p. 189, pl. xxiv, figs. 9–12 (1907).
[8] Balss, *K. Svenska Vet.-Akad. Handl.*, LXI, no. 10, p. 15, text-fig. 7 (1921).
[9] Oka, *Mem. Ind. Mus.* VI, p. 2 (1915).

A. Dactylus of last three legs simple.[1]	
B. Rostrum reaching only to middle of eyes; last two segments of third maxilliped together fully as long as antepenultimate segment	*brevirostris* Miers.
B'. Rostrum twice as long as eyes; last two segments of third maxilliped together much shorter than antepenultimate segment	*minuta* Baker.
A'. Dactylus of last three legs biunguiculate and with a number of spines on its posterior margin.	
B. Rostrum well developed; eyes normal in form.	
C. Penultimate segment of third maxilliped 4 times as long as wide and more than twice as long as ultimate; carpus of first leg not longer than chela; dactylus of last three legs with 11–13 spines behind biunguiculate apex	*okai*, sp. nov.
C'. Penultimate segment of third maxilliped 2·5 times as long as wide and 1·5 times as long as ultimate; carpus of first leg longer than chela; dactylus of last three legs?	*ascidicola* Borr.
C''. Penultimate segment of third maxilliped less than twice as long as wide and shorter than ultimate; carpus of first leg not longer than chela; dactylus of last three legs with 4–6 spines behind biunguiculate apex	*anachoreta*, sp. nov.
B'. Rostrum rudimentary; eyestalks flattened with inner margins contiguous, bearing cornea at outer distal angle	*quadratophthalma* Balss.

Pontonia okai, sp. nov.

The rostrum (text-fig. 89) is toothless, broad at the base and very slender at the apex which is acute in both dorsal and ventral views. Dorsally it is carinate throughout the greater part of its length, but there is no suggestion of a ventral keel. It is curved downwards and is a little shorter than the eyes, reaching about to the middle of the basal antennular segment.



TEXT-FIG. 89.—*Pontonia okai*, sp. nov. Anterior part of carapace, rostrum and eye.

The carapace is considerably depressed. It bears only an antennal spine and the lower limit of the orbit is not angulate. The eyes are short, with cornea slightly narrower than the stalk; the ocular spot appears to be absent.

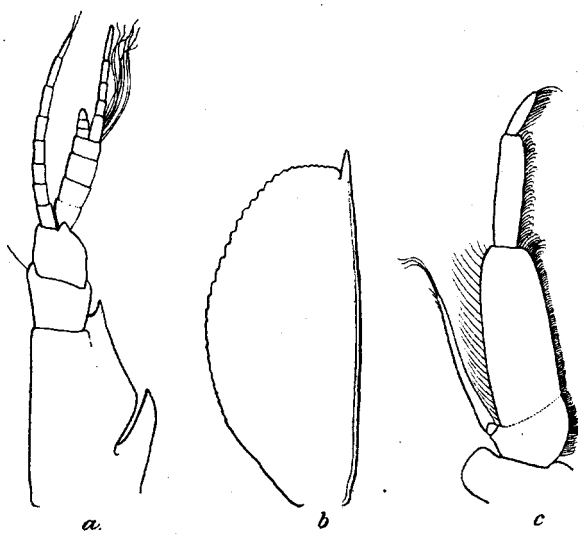
The antennular peduncle (text-fig. 90*a*) is a little shorter than the antennal scale. The basal segment is broad at the base with a large lanceolate lateral process which reaches the middle of its length. The outer margin in front of the process is slightly concave and ends in a stout tooth which reaches beyond the middle of the second segment. The second segment is broader than long, the third about the same length and as broad as long. The free portion of the stouter ramus of the outer flagellum is extremely short and the fused portion comprises 3 or 4 segments. The

[1] In *P. minuta* described as "simple—or perhaps a little bifid at the tip."

terminal segment of the antennal peduncle reaches nearly to the end of the antennular peduncle. The antennal scale (text-fig. 90*b*) is a little more than twice as long as broad; the outer margin is very slightly convex, terminating in a spine which reaches beyond the end of the lamella.

The incisor-process of the mandible ends in 5 teeth and on the inner side near the apex there is a series of 5 or 6 spinules.

The third maxilliped (text-fig. 90*c*) reaches the end of the scale; the exopod is slender and does not reach the distal end of the antepenultimate segment. The latter is about 2·75 times as long as wide; it contrasts strongly in breadth with the two terminal segments and is rather longer than the two combined. The penultimate segment is slender, rather less than 4 times as long as wide and more than twice as long as the ultimate segment. The inner edges of the three distal segments are thickly fringed with hooked hairs which retain debris.

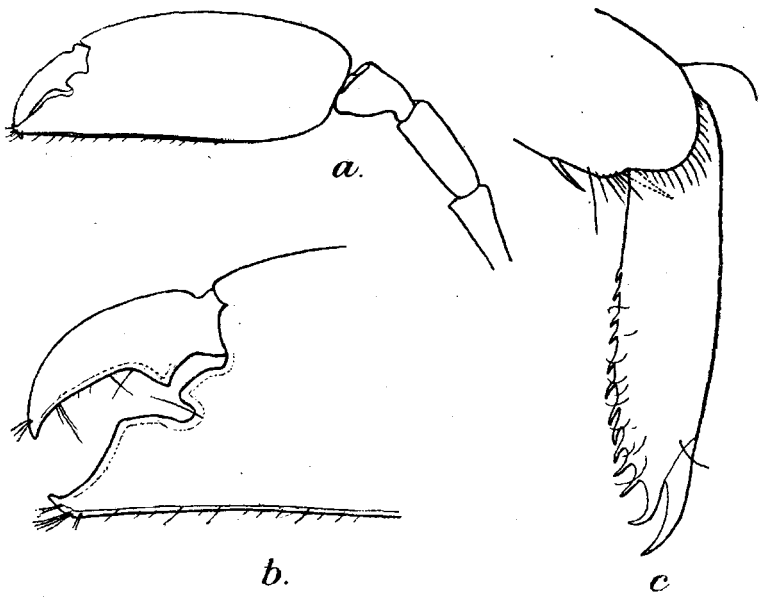


TEXT-FIG. 90.—*Pontonia okai*, sp. nov.
a. Antennule. *b*. Antennal scale. *c*. Third maxilliped.

The first peraeopod reaches beyond the scale by almost the whole length of the chela. The carpus is about three-quarters the length of the merus and is slightly shorter than the chela; the fingers are about the same length as the palm. There are dense tufts of setae on the fixed finger.

The second peraeopods are very large, unequal and dissimilar. The ischium in both legs bears a short tooth at the distal end of its lower border. In the larger limb (text-fig. 91*a*) the merus is 2·5 times as long as wide; the carpus is shorter than the merus and is very narrow at the base. The chela is swollen and very heavy and bears a few sparse hairs. The palm is about 2·5 times the length of the merus or fingers and is about twice as long as

wide. The chela is carinate on its lower edge from the middle of the palm to the tip of the fixed finger. The finger-tips cross one another when the claw is closed; at the base the fixed finger is twice as broad as the dactylus. The dactylus (text-fig. 91*b*) has a very large triangular tooth in the proximal half of its inner margin. There are two large teeth on the fixed finger. The foremost of these is very large and obtuse, the hindmost smaller, more acute and pointing forwards, the two being separated by a deep and narrow notch. When the claw is closed the dactylar tooth partially overlies the posterior tooth of the fixed finger. In the smaller second peraeopod the merus is a little broader, with more strongly convex borders; the palm is only 1·3 times the length of the merus or fingers. As in the larger limb the fixed finger is twice as broad as the dactylus, but the fingers are unarmed on the inner



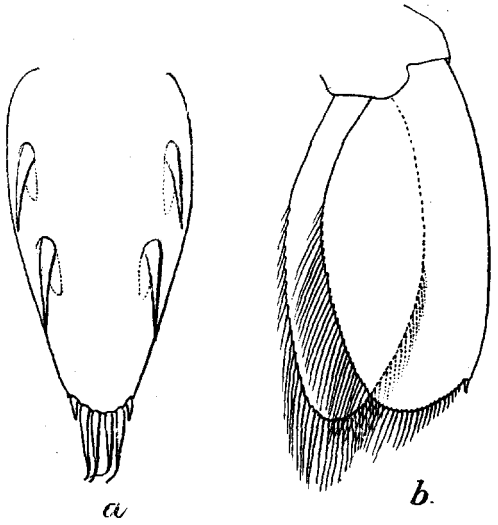
TEXT-FIG. 91.—*Pontonia okai*, sp. nov.
a. Large second peraeopod. *b*. Fingers of same.
c. Dactylus of third peraeopod.

margin except for three very obscure teeth at the proximal end, one on the dactylus and two on the fixed finger.

The last three peraeopods are long and slender. The third pair reaches beyond the scale by half the length of the propodus the fifth by the length of the dactylus. The merus is from 6 to 6·5 times as long as wide; the propodus bears a few spinules on its posterior border and is from 3·7 to 4·3 times as long as the dactylus. The dactylus (text-fig. 91*c*) is straight and slender, more than 4 times as long as wide; it is apically biunguiculate and the large terminal claw appears to be articulated. Behind the two distal claws there is a series of 11 to 13 spines which are short and

broad where they begin, in the proximal third of the posterior border, and become longer and more slender as they approach the apex.

Excluding the terminal spines the telson (text-fig. 92*a*) is less than twice as long as its basal breadth; it bears two very large dorsal spines on either side. The median and intermediate apical spines are subequal and much longer than the outer. The outer uropod (text-fig. 92*b*) is shorter than the inner, with the spine that



TEXT-FIG. 92.—*Pontonia okai*, sp. nov.
a. Telson. *b*. Uropods.

terminates the outer border placed close to the distal end.

A single pair of specimens of this species has been examined. The male is about 8·0 mm. is length and the female 8·5 mm.

The species is related to Borradaile's *P. ascidicola*, the description of which is very meagre, but differs conspicuously in the proportions of the two ultimate segments of the third maxilliped. In *P. ascidicola*, also, the carpus of the first leg is longer than the chela and the fingers of the smaller second leg are said to be provided with teeth just as in the larger limb of the pair.

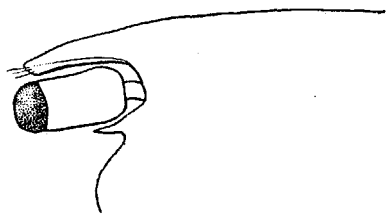
C 421/1.	Off C. Negrais, Burma, 15°25′ N., 93°45′ E., 40–49 fms.	'Investigator,' Nov., 1909.	Two, TYPES.

The specimens were found by Dr. Asajiro Oka when working at the collection of Tunicata belonging to the Indian Museum. He discovered them in the branchial sac of the type-specimen of *Ascidia willeyi*, Oka.

Pontonia anachoreta, sp. nov.

This species is closely allied to *P. okai* and also lives in ascidians. It differs from the description given above only in the following points:—

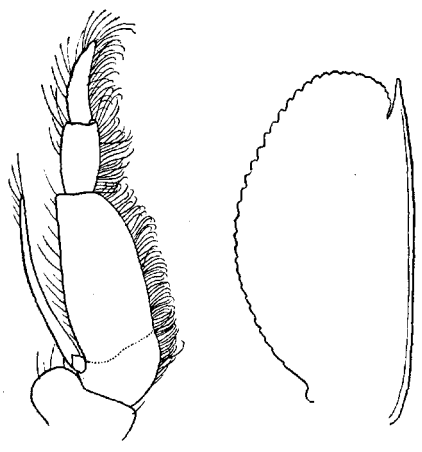
The apex of the rostrum is rather blunt in lateral view and is provided with one or two terminal setae (text-fig. 93).



TEXT-FIG. 93.—*Pontonia anachoreta*, sp. nov. Anterior part of carapace, rostrum and eye.

The antennal scale is rather broader, slightly less than twice as long as wide, and the terminal spine does not extend beyond the apex of the lamella (text-fig. 94*a*).

The antepenultimate segment of the third maxilliped (text-fig. 94*b*) is little more than twice as long as wide and the proportions of the two ultimate segments are conspicuously different. The penultimate segment is about 1·7 times as long as wide and is shorter than the ultimate segment.



b. *a*.

TEXT-FIG. 94.—*Pontonia anachoreta*, sp. nov.
a. Antennal scale.
b. Third maxilliped.

The fingers of the first peraeopod are considerably longer than the palm.

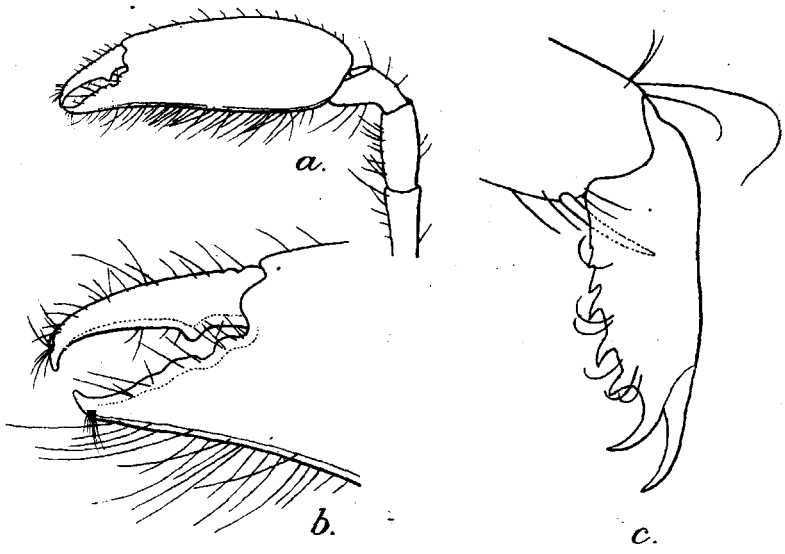
The second peraeopods do not possess a tooth at the distal end of the lower border of the ischium. The chela of the larger limb (text-fig. 95*a*) is sharply carinate on the lower side throughout its length and is here thickly fringed with very long setae. The dactylus (text-fig. 95*b*) has a large tooth, as in *P. okai*, but the fixed finger is unarmed in its distal half and bears at the base two bluntly rounded teeth separated by a broad notch. The chela of the smaller limb is fringed with long setae on its lower border. The fingers have inconspicuous teeth at the base, much as in the related species; their inner margins are, however, concave they gape widely when the claw is closed and their length is almost or quite equal to that of the palm.

The merus of the last three peraeopods is rather stouter, from 5 to 5·5 times as long as broad The dactylus (text-fig. 95*c*) is broader, from 3 to 3·5 times as long as wide and bears only from 4 to 6 spines in addition to the two distal claws. The terminal claw, as in *P. okai*, is apparently articulated.

The telson, excluding the terminal spines, is more than twice as long as its basal breadth, but is otherwise closely similar to that of the related species.

A single pair of specimens has been examined; the female is about 10 mm. in length and the male about 6·5 mm.

In *P. ascidicola*, according to Borradaile's figure the penultimate segment of the third maxilliped is about 2·5 times as long as



TEXT-FIG. 95.—*Pontonia anchoreta*, sp. nov.
a. Larger second peraeopod. *b*. Fingers of same.
c. Dactylus of third peraeopod.

wide and nearly 1·5 times the length of the ultimate segment. It is thus intermediate in form between *P. anachoreta* and *P. okai*.

C 422/1. Off Madras Coast, 20 fms. 'Investigator.' Two, TYPES.

The specimens were found by Dr. Asajiro Oka in an ascidian which he has described under the name of *Polycarpa annandalei*.

Genus **Pontonides** Borradaile.

1917. *Pontonides*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 387.

This genus was established by Borradaile for *Pontonia maldivensis*,[1] a species found at Fadiffolu Atoll in the Maldives, which is remarkable for the absence of exopods from all three pairs of maxillipeds.

Periclimenes beaufortensis, Borradaile,[1] from Beaufort in North Carolina, appears from the description to be a related form, but with exopods absent from only the first two pairs of maxillipeds. In both species the rostrum is toothless, but in *P. maldivensis* the segments of the third maxilliped are broad, whereas in *P. beaufortensis* the appendage is described as moderately slender. The dactylus of the last three legs is simple in both species. For the present at

[1] Borradaile, *Ann. Mag. Nat. Hist.* (9) V, p. 132 (1920).

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 Anchistioididae 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.

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[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. Coutière 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) LVII, 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).

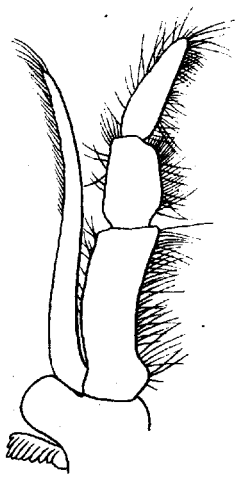
1852. *Oedipus gramineus*, Dana, *U. S. Explor. Exped., Crust.* I, p. 573, pl. xxxvii, figs. 3*a–e*.
1889. *Oedipus gramineus*, Pfeffer,[2] *Jahrb. Hamburg. wiss. Anstalt* II, p. 34.
1909. *Coralliocaris graminea*, Calman, *Proc. Zool. Soc. London*, p. 706.
1915. *Corolliocaris graminea*, Balss, *Denk. math-naturw. Kl. K. Akad. Wien* XCI, 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 lower[1]; as a rule there are 5 above and 2 below. The hepatic spine of the carapace is absent. The third maxilliped (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.



TEXT-FIG. 96.—*Corolliocaris graminea* (Dana).
Third maxilliped.

In the first peraeopods[2] 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) 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. 97*b*) 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.

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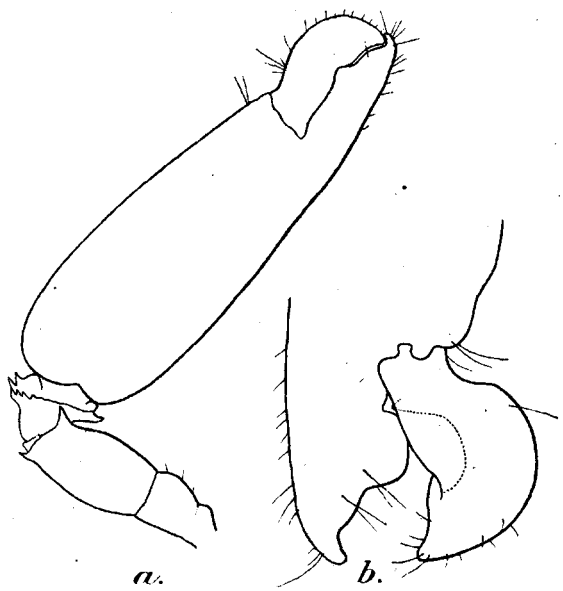
[1] Miers refers to a specimen with only 3 teeth above and none below.

[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. 97*a* 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 peraeopod. *b.* Fingers of second paraeopod.

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.

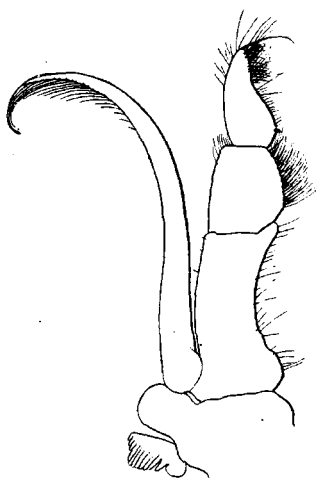
Coralliocaris superba (Dana).

1852. *Oedipus superbus*, Dana, *U. S. Explor. Exped., Crust.* I, p. 575, pl. xxxvii, figs. 2*a–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.



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

(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. 99*a*) is provided with a series of 4 to 6[1] 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 teeth [1] on the upper part of the distal border of the carpus. 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. 99*b*) is entirely different. The outer margin is straight and abruptly angulate in the middle, while

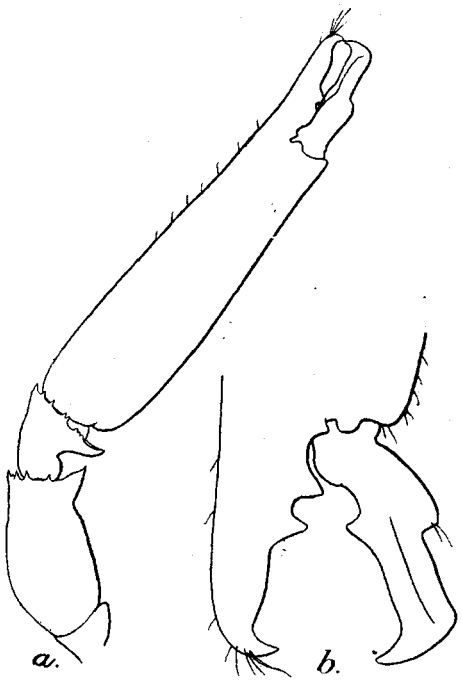
[1] These figures refer to well grown specimens; in young individuals the teeth are less numerous.

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.

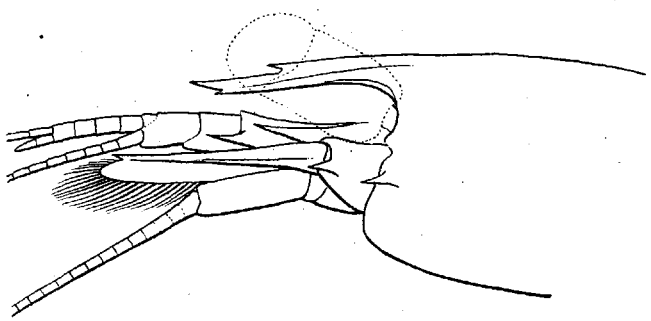
The species is recorded from Tongatabu (Dana), Tahiti (Stimpson), the Bonin Is. (Balss), Christmas I. ? (Calman), the Noordwachter Is. and Pulo Edam in the Bay of Batavia (de Man), the south coast of Arabia (Balss) and from numerous localities in the Red Sea (Nobili, Balss, Tattersall). The species is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

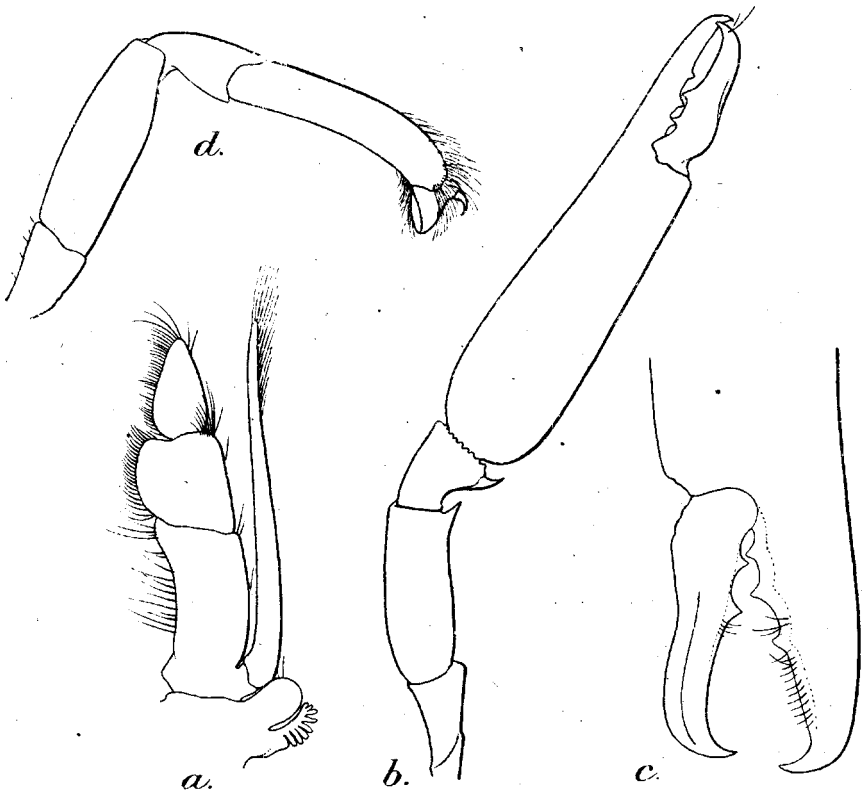
of the antennal scale. The basal segment is broad. In the female the lateral process extends as far as the articulation between the second and third segments and the terminal spine of the outer margin reaches the middle of the third segment; in the male the spines are shorter. The outer margin of the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

The third maxilliped (text-fig. 101*a*) 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.

a. Third maxilliped.
b. Second peraeopod.
c. Fingers of second peraeopod.
d. 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. 101*c*) 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. 101*d*) 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, Gulf of Manaar. J. Hornell, Feb., 1914. Two, Types.

The specimens were found on a madrepore coral.

Coralliocaris lucina Nobili.

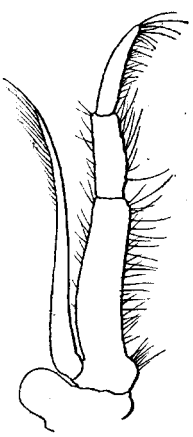
1901. *Coralliocaris lucina*, Nobili, *Ann. Mus. Univ. Napoli.* (n.s.) I, no. 3, p. 5.
1902. *Coralliocaris lamellirostris*, de Man, *Abhandl. Senck. naturf. Ges.* XXV, p. 842, pl. xxvi, figs. 55, 55*a–f*.
1906. *Coralliocaris lucina*, Nobili, *Ann. Sci. nat., Zool.* (9) IV, p. 57.
1915. *Coralliocaris 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.



TEXT-FIG. 102.—*Coralliocaris lucina* Nobili.
Third maxilliped (arthrobranch omitted).

(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

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 nipponensis*, 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. nipponensis* 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 ... ... *nipponensis* (de Haan).

[1] See Addendum, p. 287.

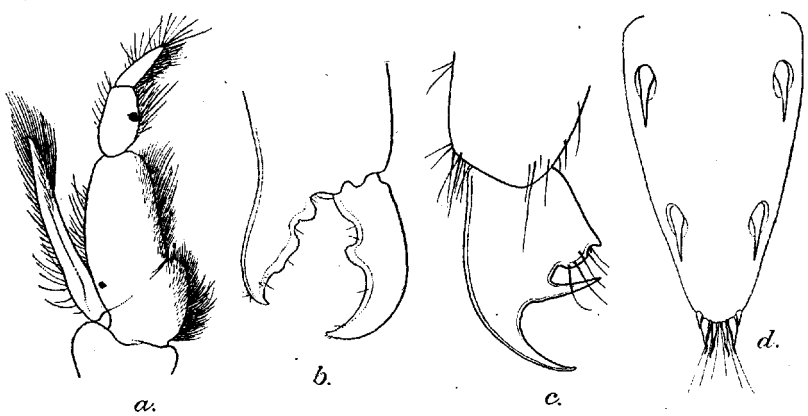
A'. Basal process of dactylus of last three legs without tooth; posterior of the two pairs of spines on back of telson situated much nearer to apex than to first pair.
B. Rostrum reaching end of scale; outer distal angle of basal antennular segment rounded; carpus of first leg as long as or longer than 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 Borradaile has suggested, are perhaps not specifically distinct from one another.

Conchodytes biunguiculatus (Paulson).

1875. *Pontonia biunguiculata*, Paulson, *Crust. Red Sea*, p. 111, figs. 1, 1*a-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.
b. Fingers of second peraeopod.
c. Dactylus of third 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 antennal 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. 103*a*) 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 peraeopods is about equal in length with the merus.

(v) There is one tooth on the dactylus of the second peraeopod (text-fig. 103*b*) 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 peraeopods 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. 103*c*) 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. 103*d*) 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 end[1]; 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., March, 1921.	Twenty-five.

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.

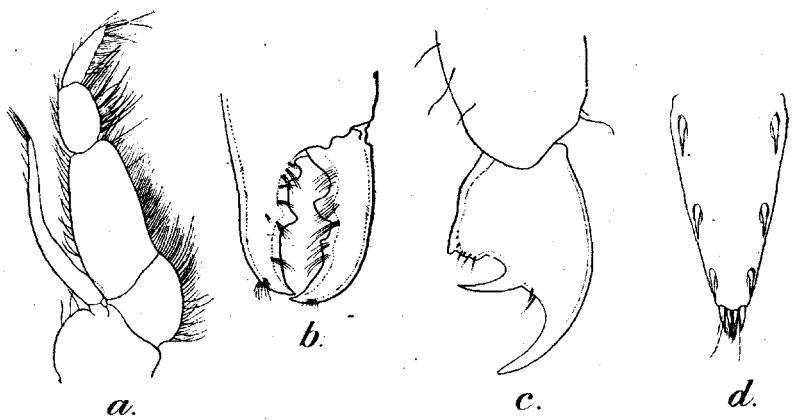
Conchodytes nipponensis (de Haan).

1849. *Pontonia nipponensis*, de Haan, in Siebold's *Fauna Japonica, Crust.*, p. 180, pl. xlvi, fig. 8 (*Hymenocera niponensis* 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. *c*. Dactylus of third peraeopod.
b. Fingers of second peraeopod. *d*. Telson.

(iii) The antepenultimate segment of the third maxilliped (text-fig. 104*a*) 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 peraeopods 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. 104*b*) 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.

ohe 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 peraeopods 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. 104*c*) 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. 104*d*) 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. nipponensis 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 435/1.	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. 105*a*) is distally rounded and not acutely produced as in the other Indo-Pacific species of the genus.

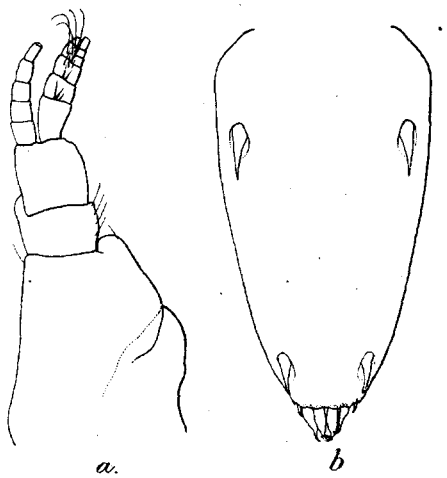
(iii) The antepenultimate segment of the third maxilliped is about 2·5 times as long as wide and at the distal end is not much

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.



TEXT-FIG. 105.—*Conchodytes tridacnae* Peters.
a. Antennule.
b. Telson.

(vii) The dorsal spinules of the telson (text-fig. 105*b*) 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 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 peraeopod 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 peraeopods 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. Borradaile 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*, Borradaile, *Trans. Linn. Soc.* (2) *Zool.* XVII, p. 394.

Borradaile 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* XCI, 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* Smith[1] and *Pontonia pinnae* Lockington[2] (*nec* Ortmann). Of the former there are numerous specimens, obtained "dans l'huitre 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.	*P. pinnae* Lockington.
Basal breadth of rostrum about half its length.	Basal breadth of rostrum about equal to its length.
Eyes larger, almost reaching antennal spine when extended laterally.	Eyes smaller, not nearly reaching antennal spine when extended laterally.
Large chela with palm scarcely more than one and a half times as long as broad.	Large chela with palm twice as long as broad.
Dactylus of last three legs very broad, with accessory claw strongly curved and directed slightly backwards.	Dactylus of last three legs less broad with accessory claw almost straight and directed obliquely forwards.
Spines on dorsum of telson large; posterior pair almost equidistant between anterior pair and apex.	Spines on dorsum of telson small; posterior pair much nearer to apex than to anterior pair.
Size smaller, 20-28 mm.	Size larger, 36-42 mm.
Lives in *Margaritophora fimbriata*.	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

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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.

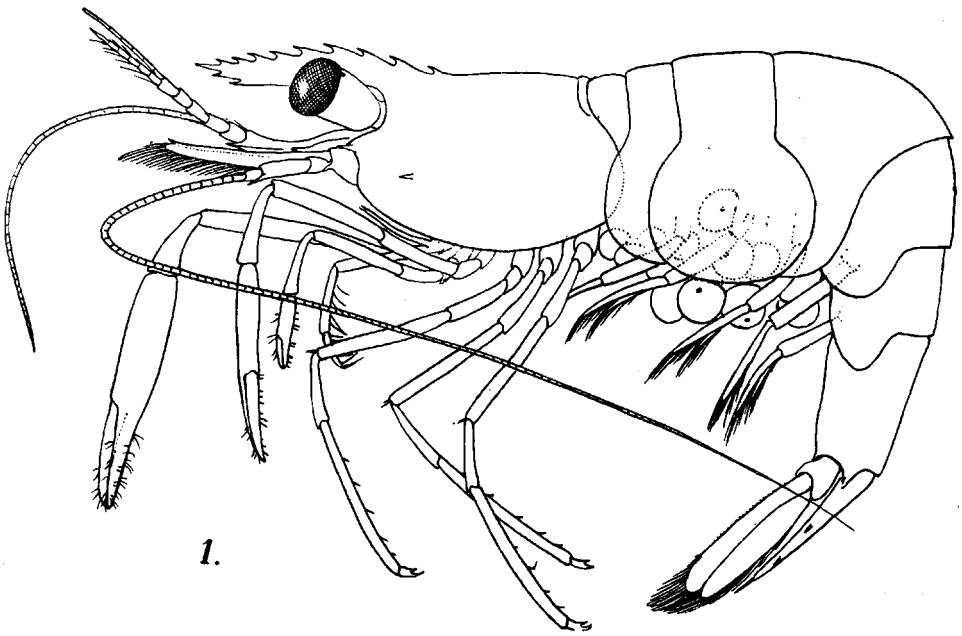
P. californiensis is known only from Santa Cruz I , California ; *P. pinnae* only from the Gulf of California [1] and *P. margarita* from the Gulf of California and the Gulf of Panama.

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

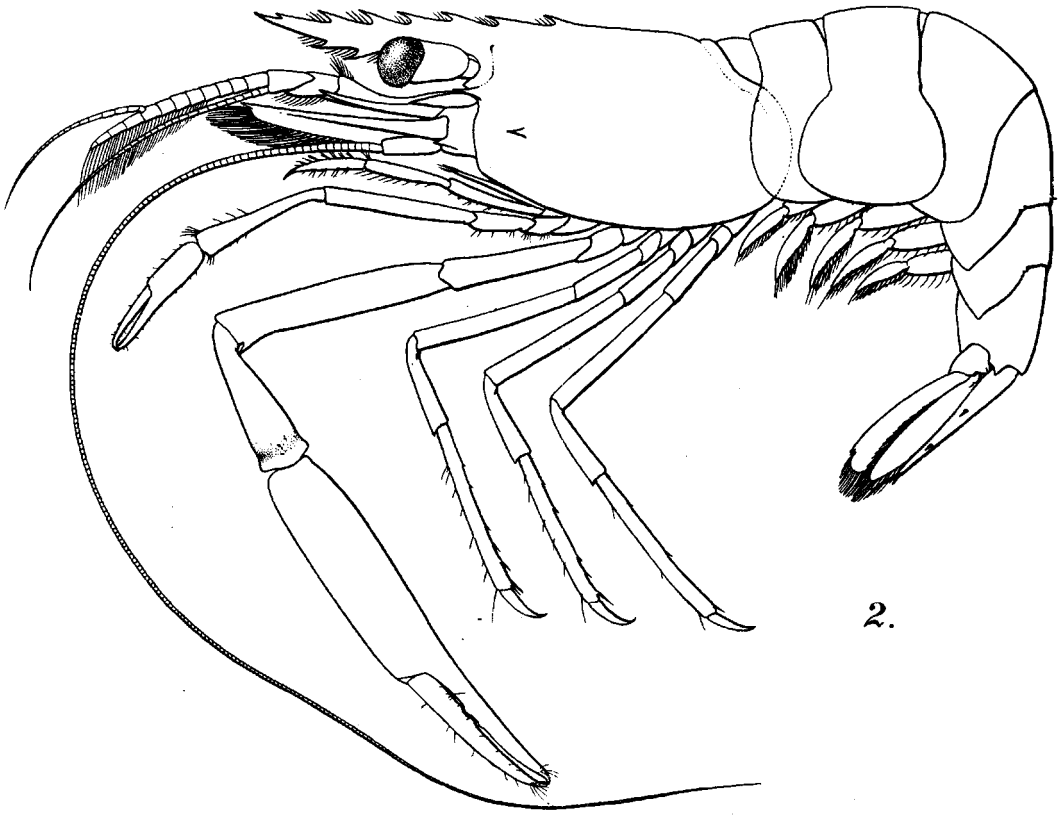
Explanation of Plate III.

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.



1.



2.

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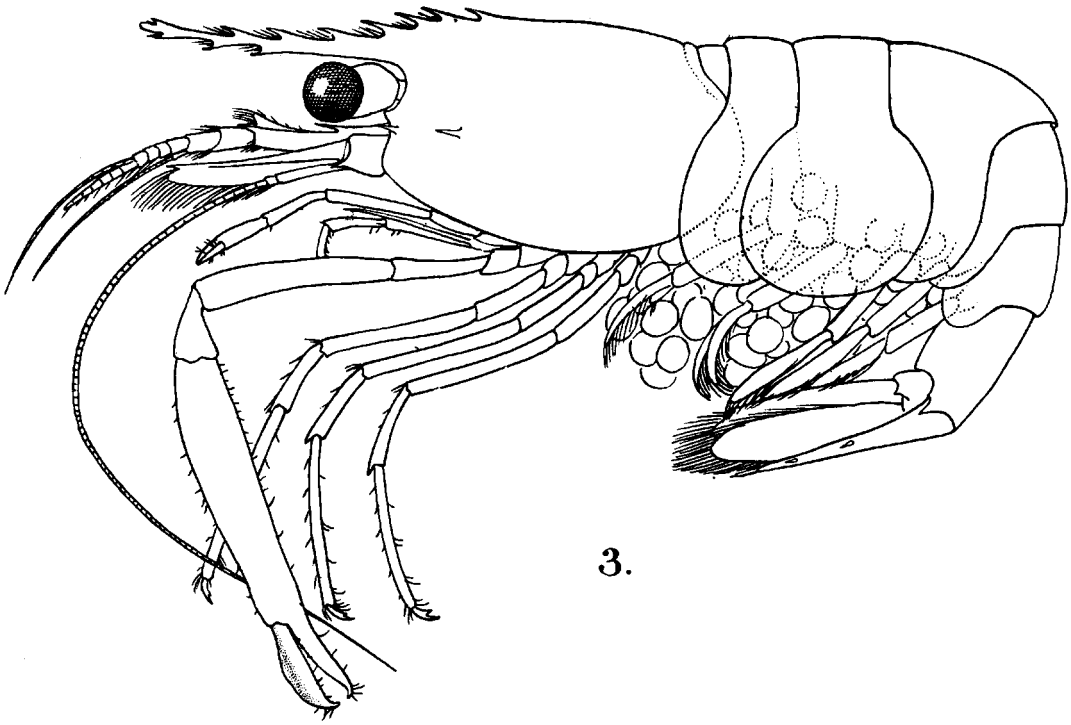
Fig. 1. *Periclimenes impar*, sp. nov.

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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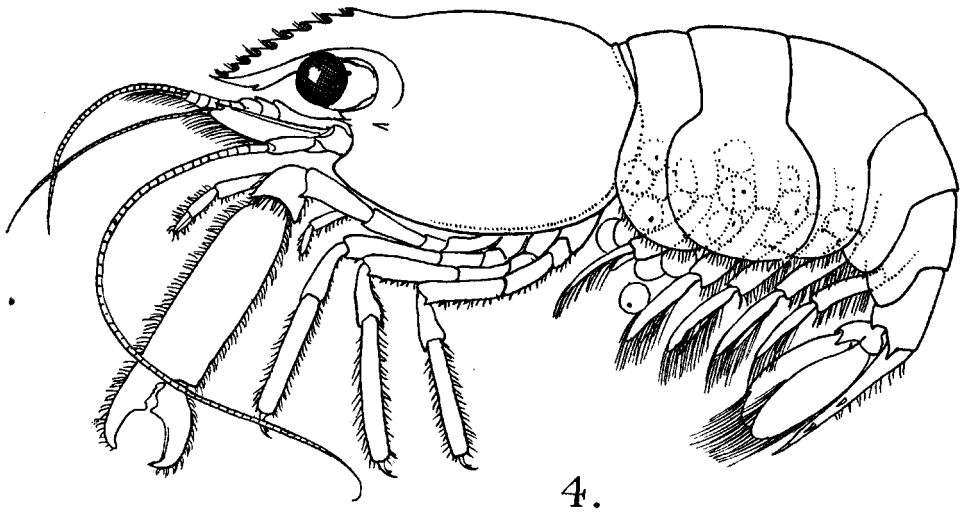

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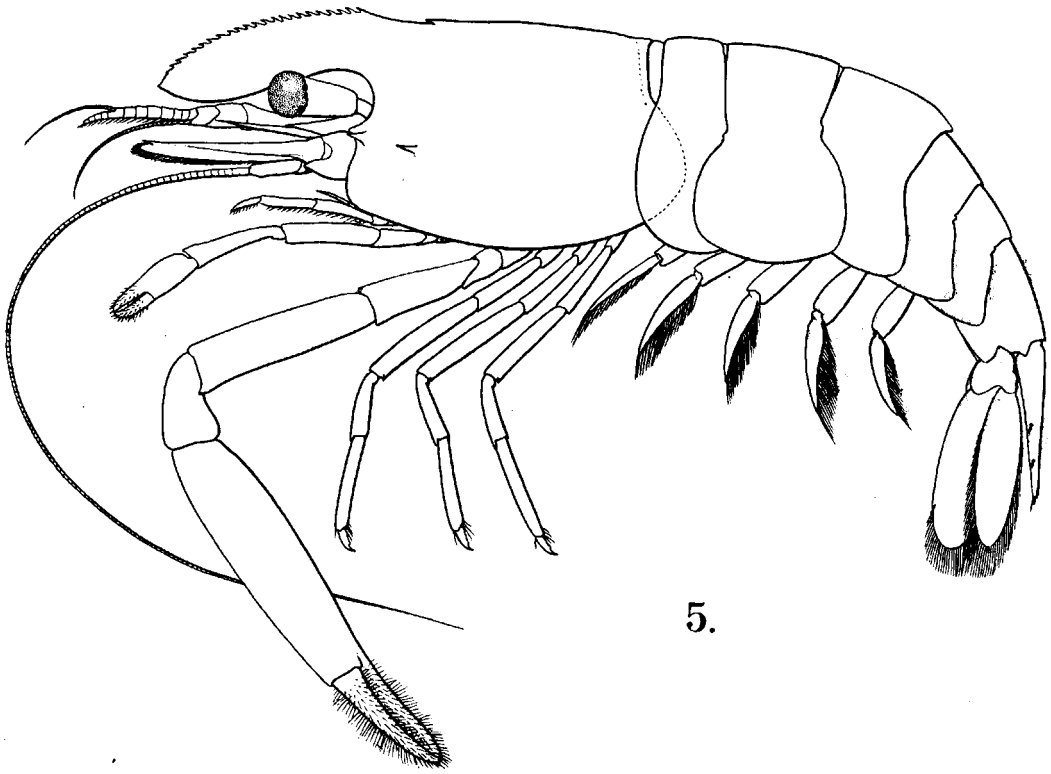
Fig. 3. *Periclimenes latipollex*, sp. nov.

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.



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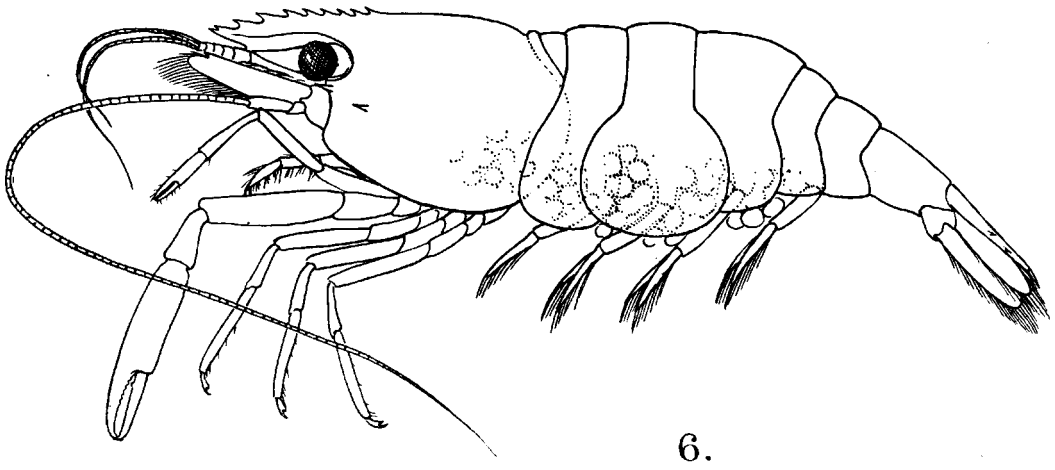

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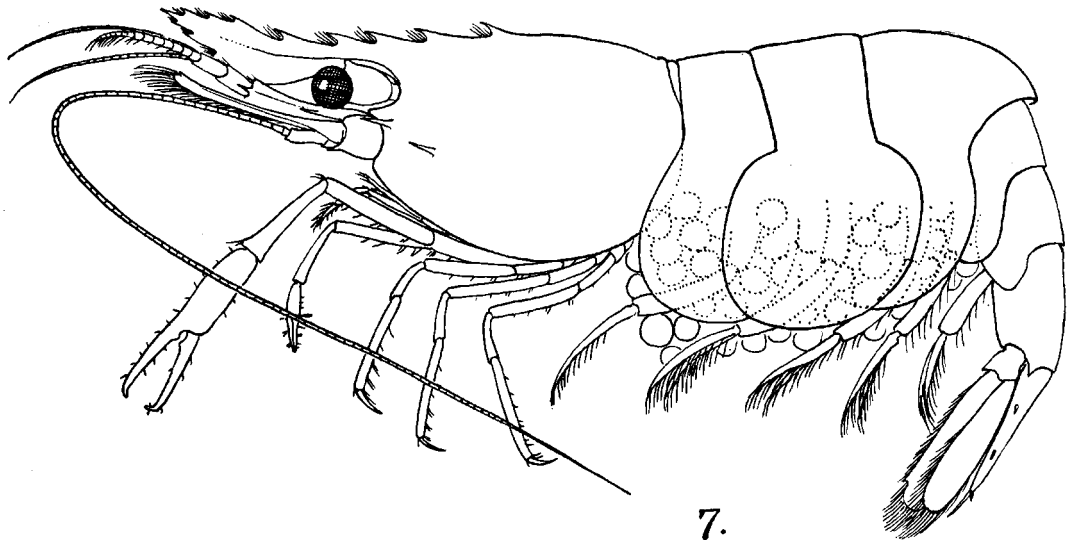
Fig. 5. *Periclimenes rex*, sp. nov.

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.



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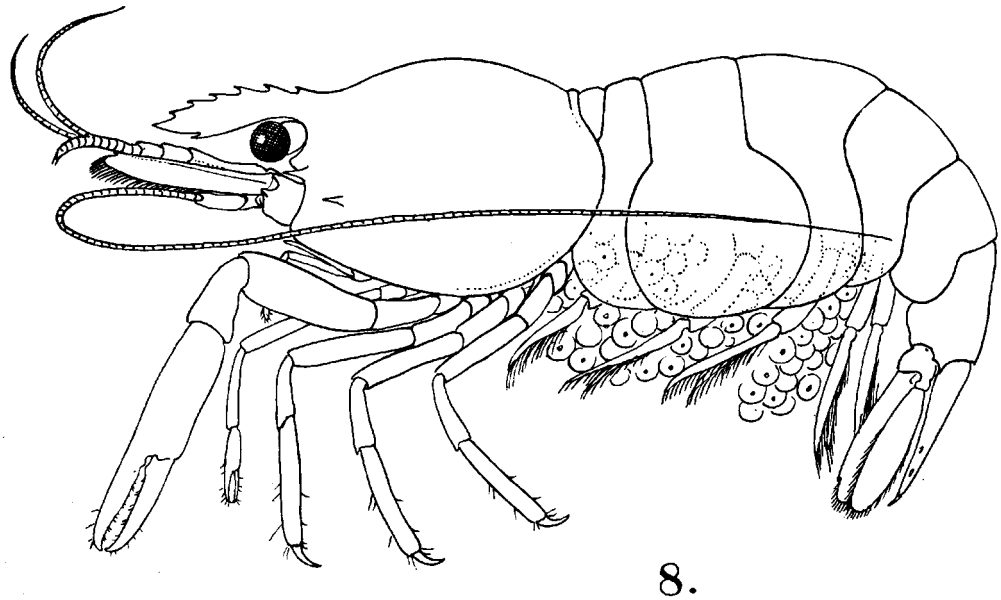

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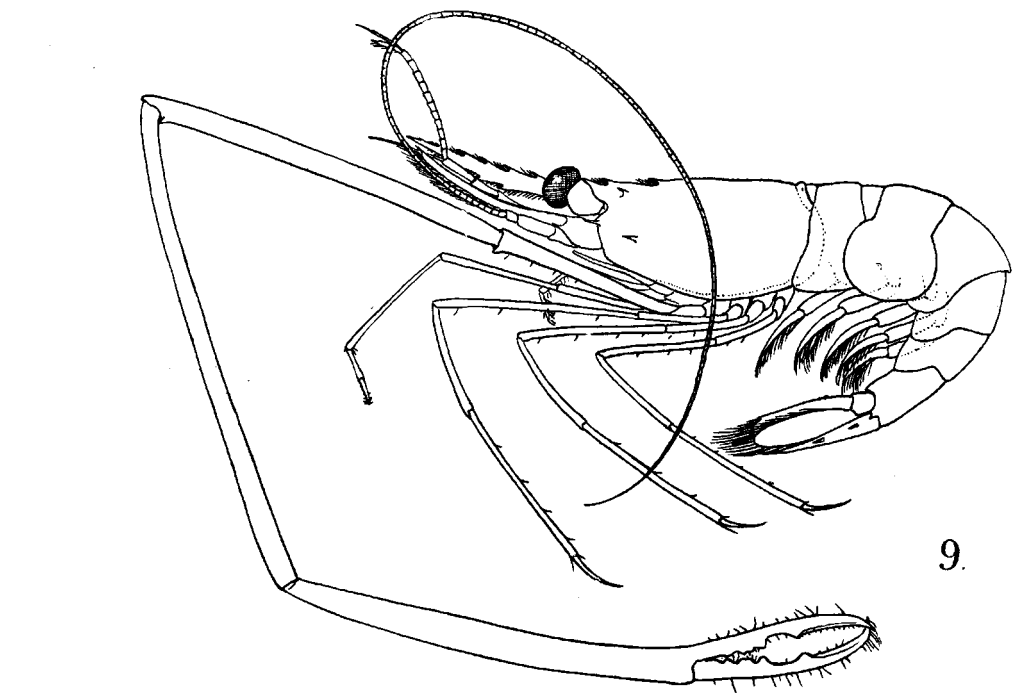
Fig. 7. *Periclimenes seychellensis* Borradaile.

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.



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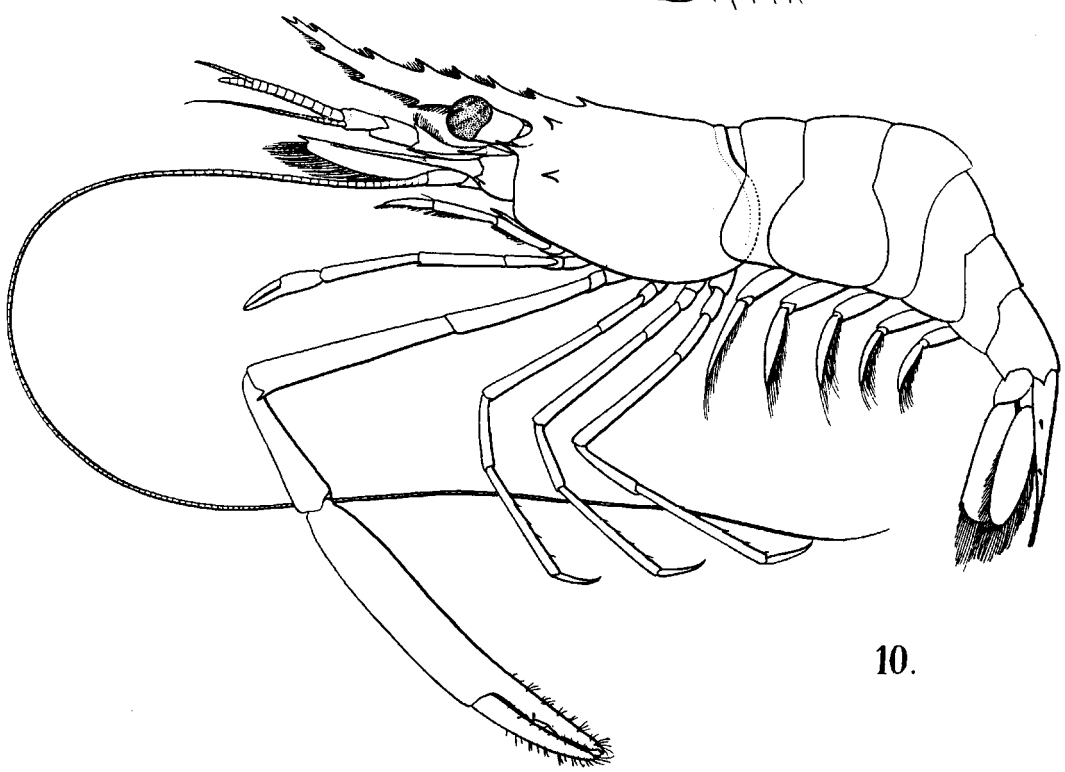

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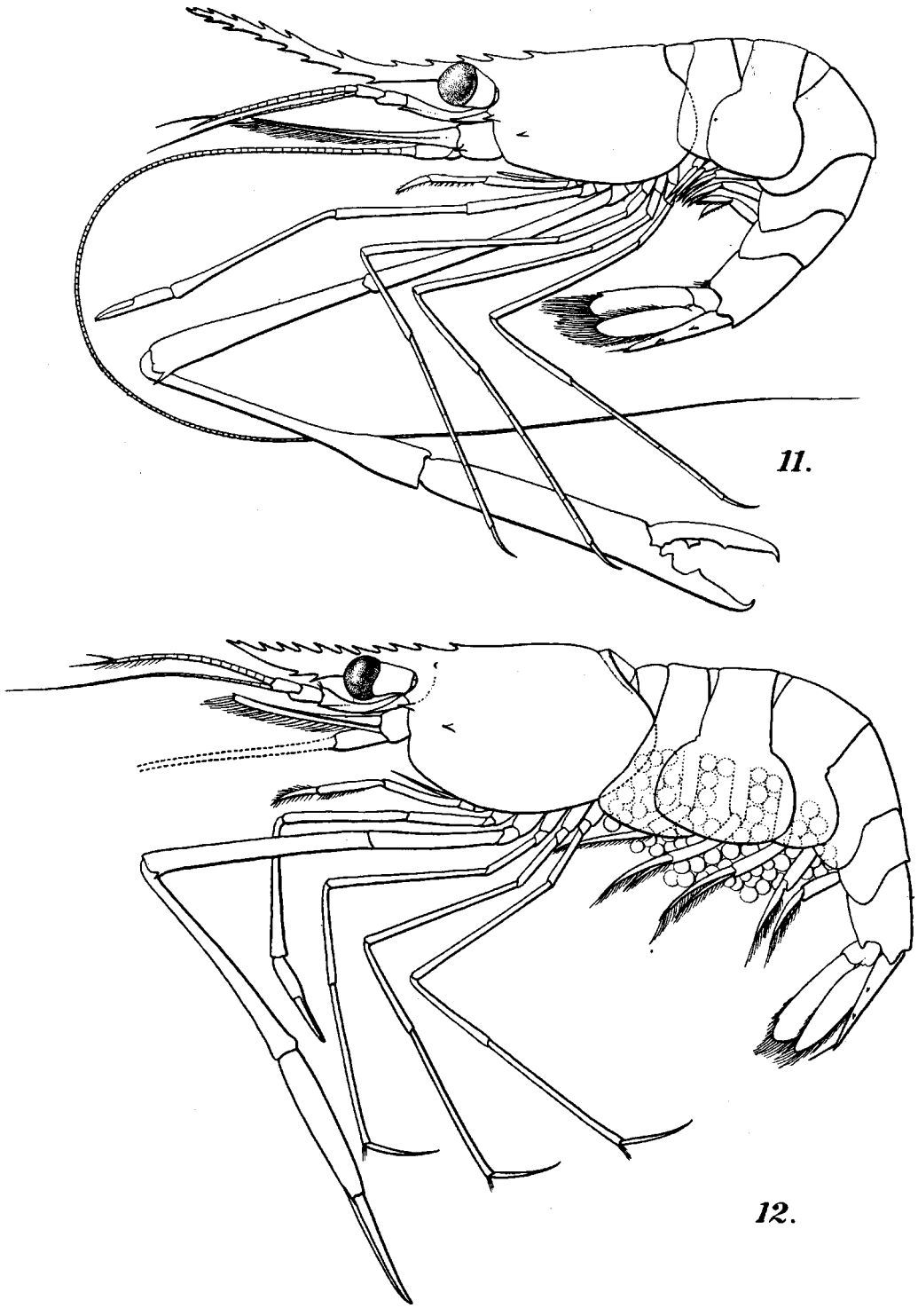
Fig. 9. *Periclimenes agag*, sp. nov.

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.

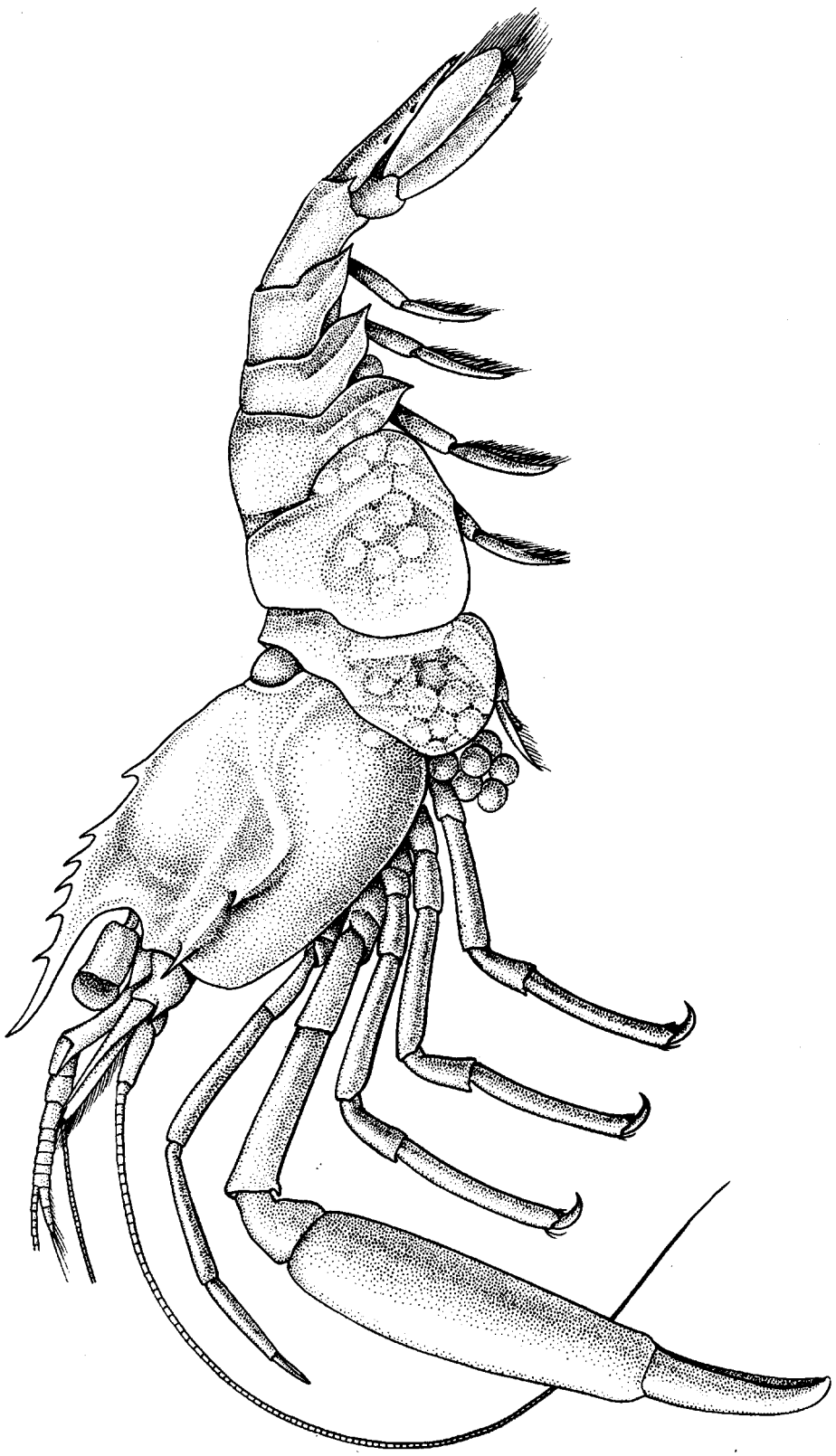


A. Chowdhary del.

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.



Dayscaris symbiotes, gen. et sp. nov.

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