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

By

STANLEY KEMP.

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NOTES ON CRUSTACEA DECAPODA IN THE
INDIAN MUSEUM.

XV. PONTONIINAE.

By STANLEY KEMP, Sc.D., Superintendent, Zoological
Survey of India.

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 Sollaud¹ 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 Palaemoninae⁵ in which there are three pairs of spines, almost precisely as in the related subfamily.

¹ Sollaud, *Comptes rendus Acad. Sci. Paris* Cl.II, 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 published¹; 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 Ascidiants. 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 Ascidiants 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*, Orton¹ 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 Ascidiants, 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 symbiotae*, 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*.

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).
 „ *demanii*, 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*, *Diazo-na* 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. Potts¹ 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. Alcock² 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 *Dasykaris symbiotae*, 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] ...
- J'. Carapace depressed, often very strongly [associated with corals] ...
- H'. Rostrum depressed and toothless [associated with crinoids] ...
- 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] ...
- F. Carpus of first leg segmented [rostrum laterally compressed, with teeth; carapace not areolated; ? free-living] ...
- 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] ...
- F'. Rostrum depressed, toothless; dorsal spines of telson usually large [living in lamellibranchs or ascidians] ...
- 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 ...
- 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 ...
- C'. Dactylus of last three legs simple or biunguiculate³ 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] ...
- 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

Periclimenes, p.

134.

Harpilius, p. 226.

Pontoniopsis, p.

239.

Dasycaris, p. 240.

Thaumastocaris, p.

244.

Anchistus, p. 247.

Pontonia, p. 259.

Pontonides, p. 266.

Balssia, p. 267.

Coutierea, p. 267.

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 ... Conchudyttes, 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 biumiculate [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 doubtful²; 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.

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 supraorbital 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. 2a) 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

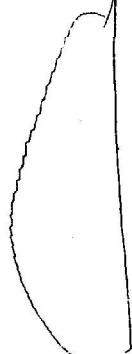
the shorter ramus of the outer flagellum is half or rather less than half the length of the fused basal part, the latter consisting of 8 to 10 segments. The total length of the shorter ramus is equal to or rather less than that of the peduncle. The antennal scale (text-fig. 1) is from 3·3 to 4 times 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.

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

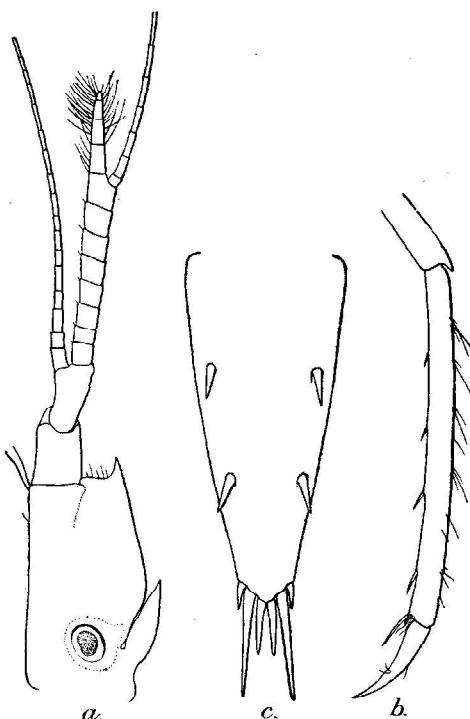
¹ Of thirteen specimens two have 1 ventral tooth, ten have 2 teeth and one has 3.



TEXT-FIG. 1.—*Palaemonella vestigialis*, sp. nov.

Antennal scale of female.

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 times¹ 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 pereopod.

pletely absent (*cf.* text-figs. 7a and 7b). 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 pereopods are slender; the fifth reach a little beyond the end of the antennal scale. In the third pair

¹ About 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. 2b) 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. 2c) 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., Mergui.	'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.
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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 propodeite 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.

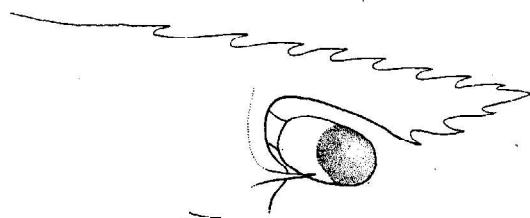
Palaemonella pottsi is purple in colour when alive and is associated with crinoids, whereas *P. vestigialis* is not conspicuously coloured in life and is free-living. There were no crinoids in the localities where the latter species was collected at Port Blair.

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. 4a).

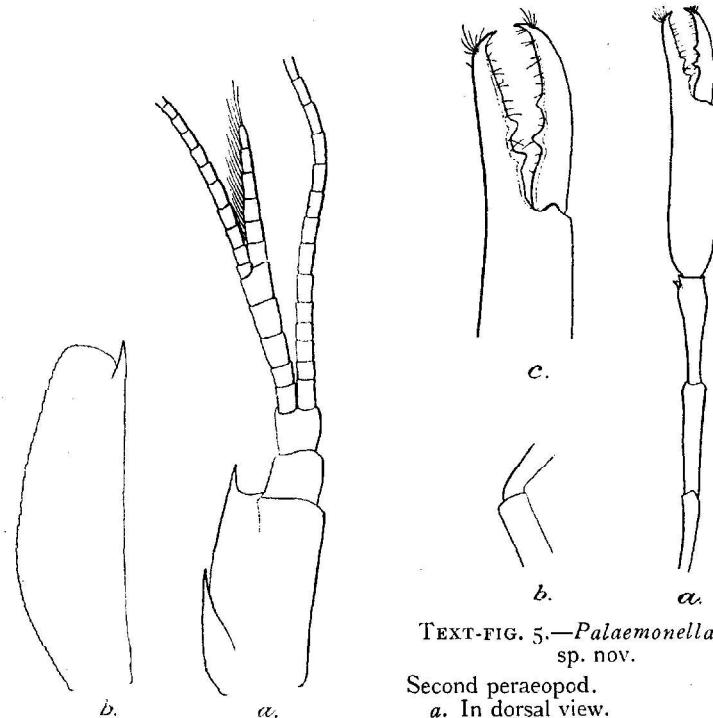
(iii) The outer antennular flagellum is more deeply cleft. The free portion of the stouter ramus is as long as the fused basal part, the latter comprising only 5 segments (text-fig. 4a).

(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. 4b).

(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. 5b).

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 pereiopods.

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. 3a-d.
- 1898. *Palaemonella tridentata*, Borradaile, Proc. Zool. Soc. London, p. 1007, pl. lxiv, figs. 8a-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 from 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 pereiopod 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.

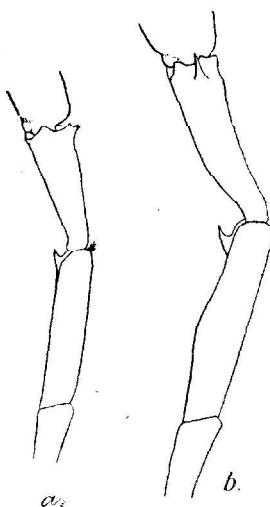
In determining the specimen in the collection I have derived much assistance from the notes which Tattersall has recently published. I have no doubt that my specimen is specifically identical with those that he examined and I accept his view that they should be referred to Dana's *P. tenuipes*. The identification 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



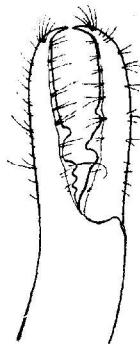
TEXT FIG. 7.—Merus and carpus of second peraeopod viewed laterally from inner side.

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

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.

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.

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*



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

Fingers of second peracopod.

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.

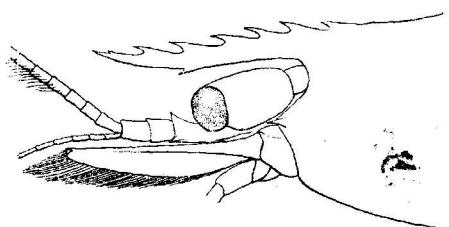
Palaemonella orientalis Dana.

1852. *Palaemonella orientalis*, Dana, U. S. Explor. Exped., Crust. I, p. 583, pl. xxxviii, figs. 4a-d.

? 1887. *Palaemonella orientalis*, de Man, Arch. Naturgesch. III, 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. 10a) 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. 10b) 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.

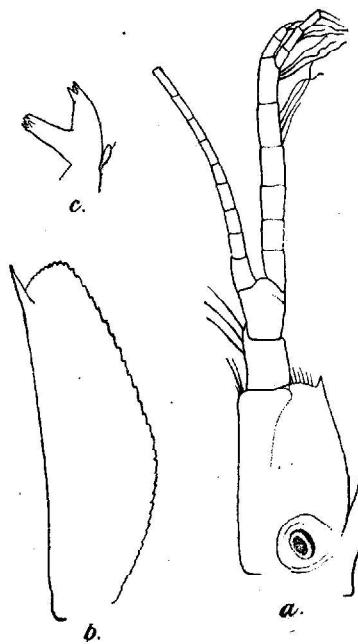
The mandible (text-fig. 10c) resembles Dana's

TEXT-FIG. 10.—*Palaemonella orientalis* Dana.

- a. Antennule.
- b. Antennal scale.
- c. Mandible.

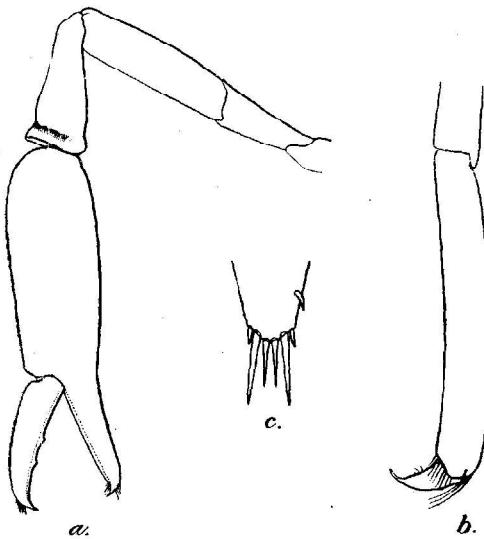
figure, but the palp consists only of a single segment, bearing a seta near the apex. The exopod of the third maxilliped reaches only a little beyond the end of the antepenultimate segment. The terminal segment is two-thirds the length of the penultimate. The first pereiopods reach about to the end of 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 pereiopods (text-fig. 11a) 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. 11b) 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. 11c).



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. *Ancyclocaris*, 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*, *Ancyclocaris* 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 *Ancyclocaris*: "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 with *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. lampes*) 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 *Ancyllocaris* 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	<i>Periclimenes s.s.</i> , p.
Hepatic spine absent	<i>Periclimenaeus</i> , p. 166.
Dactyli of last three peraeopods simple [Hepatic spine usually present]	<i>Ancyllocaris</i> , 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 Borradaile¹ perhaps belong to the *P. grandis* section of *Ancylocaris*, but the description is insufficient.

Anchistia brachialata 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' Expl.*, 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, 4a, 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. neverca* 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. aesopus* 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. neverca* 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 ... *aesopus* (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).
 II. 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 *lunipes*, 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.

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.

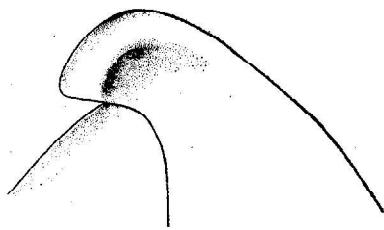
The structure of the apex of the telson and of the mandibular palp (found loose in the tube containing the specimens) afford proof that the species belongs to the Pontoniinae. It must certainly be referred to the genus *Periclimenes* in which, however, by reason of the characters of the basal segment 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. 10a, b.
- 1921. *Urocaris infraspinis*, Schmitt, Univ. Calif. Publ., Zool. XXIII, p. 37, fig. 22.

California, Pacific coast of Mexico.



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

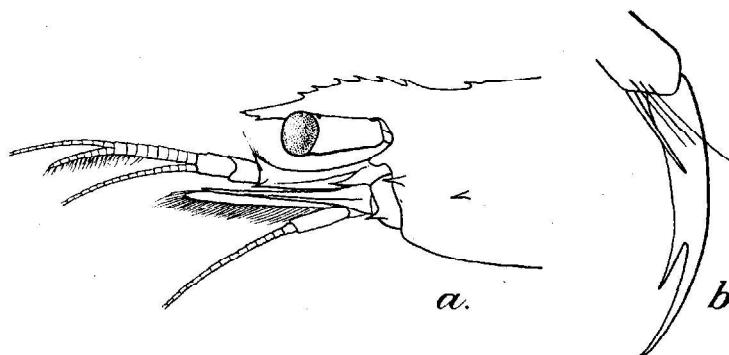
Dorsal parts of third and fourth abdominal somites in lateral view.

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 Ennur 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 pereopod.

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*.

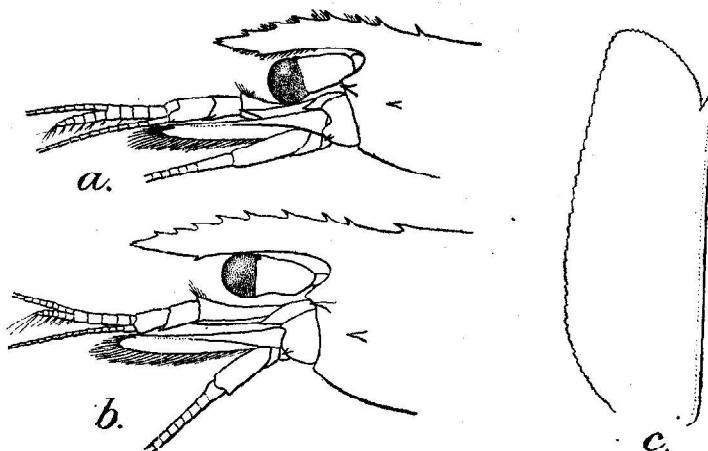
Periclimenes (Periclimenes) obscurus, sp. nov.

The rostrum is longer in females than in males. In the former sex (text-fig. 14b) it extends beyond the end of the antennular peduncle, usually reaching the end of the antennal scale, while in the latter (text-fig. 14a) 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 9¹; 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 teeth¹ 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. 14c) 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.

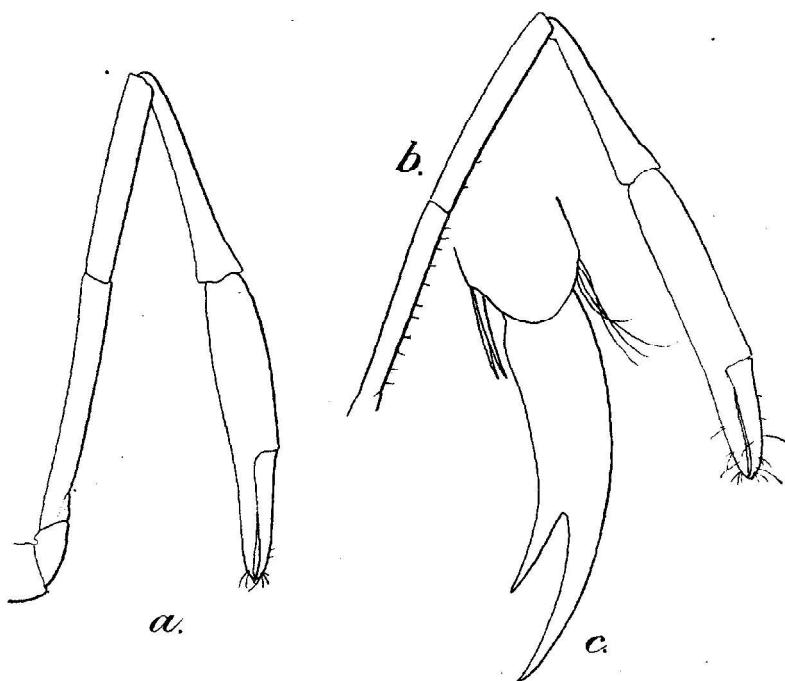
fused portion of the outer antennular flagellum is shorter and composed of only 4 or 5 segments.

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. 15b) the carpus is slightly shorter than, as long as, or rather longer than the palm. In males (text-fig. 15a) 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. 13b and 15c). 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.

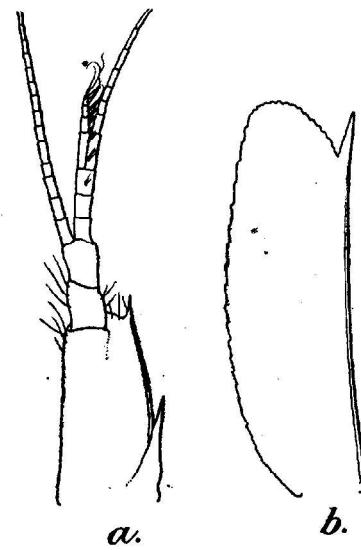
The rostrum is a little longer than the antennular peduncle, but does not reach the end of the antennal scale. The upper margin is convex and in the single specimen examined bears 9 more or less evenly spaced teeth. The hindmost tooth is placed on the carapace behind the orbit but is not separated from 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. 16a) 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. 16b) 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.

The first peraeopods (text-fig. 17a) reach about to the end of the scale. The coxopodite has the usual ventral process and a similar



TEXT-FIG. 16.—*Periclimenes impar*, sp. nov.

- a. Antennule.
- b. Antennal scale.

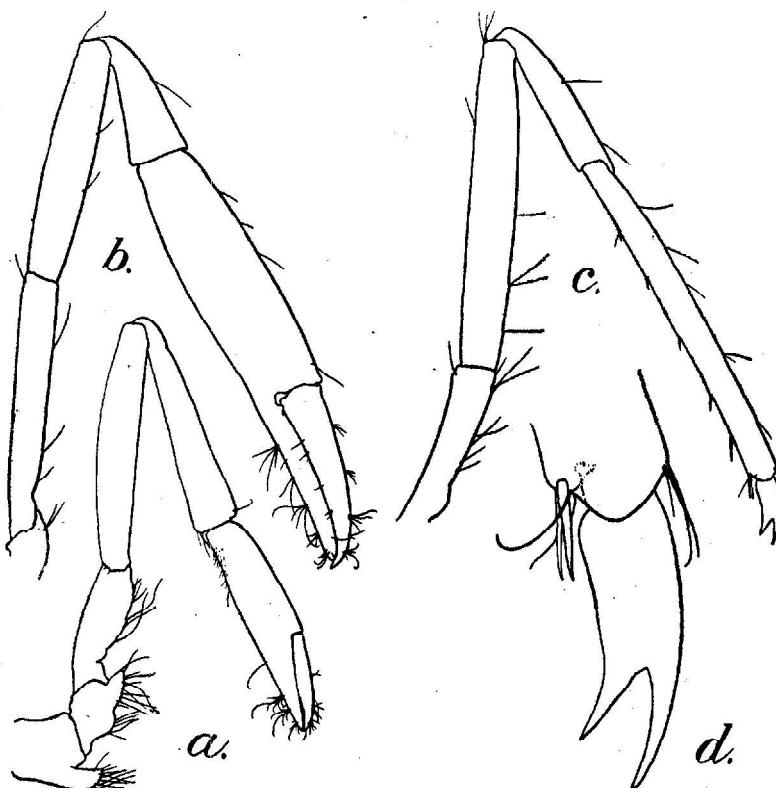
process, much better developed than in allied species, is present on the basipodite. The carpus is equal in length with the chela and is a little shorter than the merus; the fingers are unarmed and are nearly three-quarters the length of the palm.

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. 17b) the merus and ischium are sub-equal. 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. 17c) bears spinules on its posterior margin and is from 5·5 to 6 times as long as the dactylus. The dactylus itself (text-fig. 17d) 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 Maldives Is.

Periclimenes (Periclimenes) gracilis (Dana).

1852. *Anchistia gracilis*, Dana, *U. S. Explor. Exped., Crust.* I, p. 578, pl. xxxvii, figs. 5a-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 5l it is articulated at the base.

The lamella of the antennal scale is shown to be acutely pointed anteriorly in fig. 5a, 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. 18a) 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. 18b) 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.

- | | |
|---------------------------|---|
| <i>a.</i> Antennule. | <i>c.</i> Last two segments of third peraeopod. |
| <i>b.</i> Antennal scale. | <i>d.</i> 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 pereiopods 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. 18c) 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. 18d) 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.

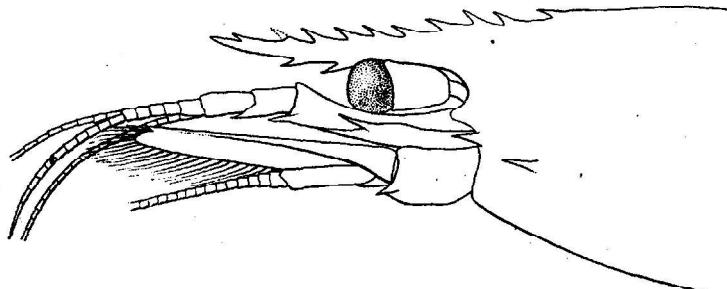
The largest specimen, an ovigerous female, is about 16 mm. in length.

C 349/1. Mergui Archipelago, 62 fms.,	'Investigator,' April, 1913.	Three (two ovig. ♀). TYPES.
$12^{\circ}15'20''N.$		
$97^{\circ}10'10''E.$		

Periclimenes (Periclimenes) laccadivensis (Alcock and Anderson).

- 1894. *Palaemonella laccadivensis*, Alcock and Anderson, *Journ. Asiatic 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



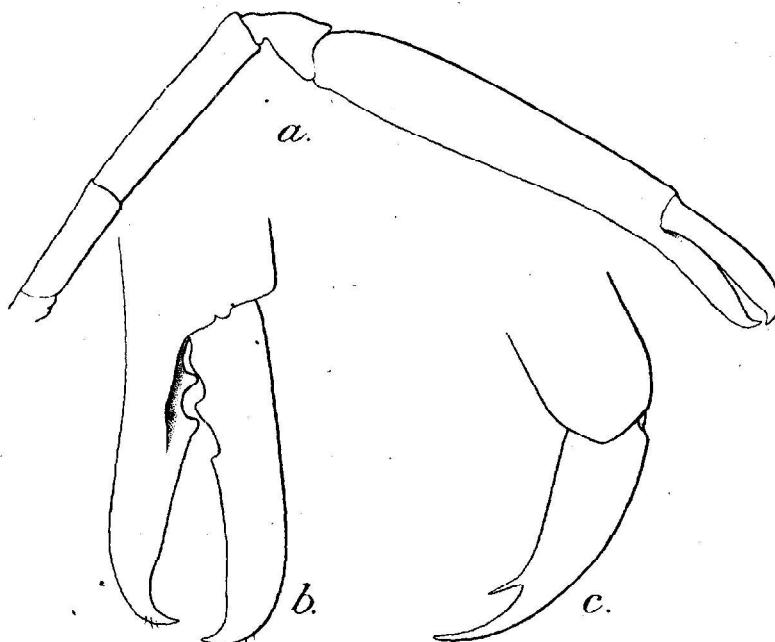
TEXT-FIG. 19.—*Periclimenes laccadivensis* (Alc. and And.).
Anterior part of carapace, rostrum, etc.

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 pereopod. b. Fingers of second pereopod.
 c. Dactylus of third pereopod (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 pereopod is a little longer than the chela. The pereopods of the second pair (text-fig. 20a) 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. 20b)

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 pereiopods 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. 20c) 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.

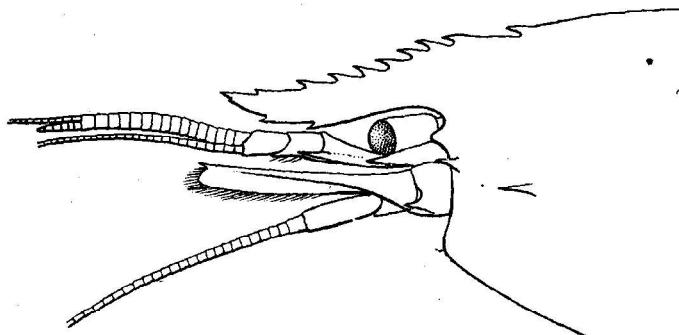
9221/10.	Laccadive Sea, 703 fms., $10^{\circ}47'45''$ N., $72^{\circ}40'20''$ E.	'Investigator,' Nov., 1891.	One, TYPE.
2129-30/10.	Laccadive Sea, 430 fms., $7^{\circ}17'30''$ N., $76^{\circ}54'30''$ E.	'Investigator,' Oct., 1897.	Two, TYPES.

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



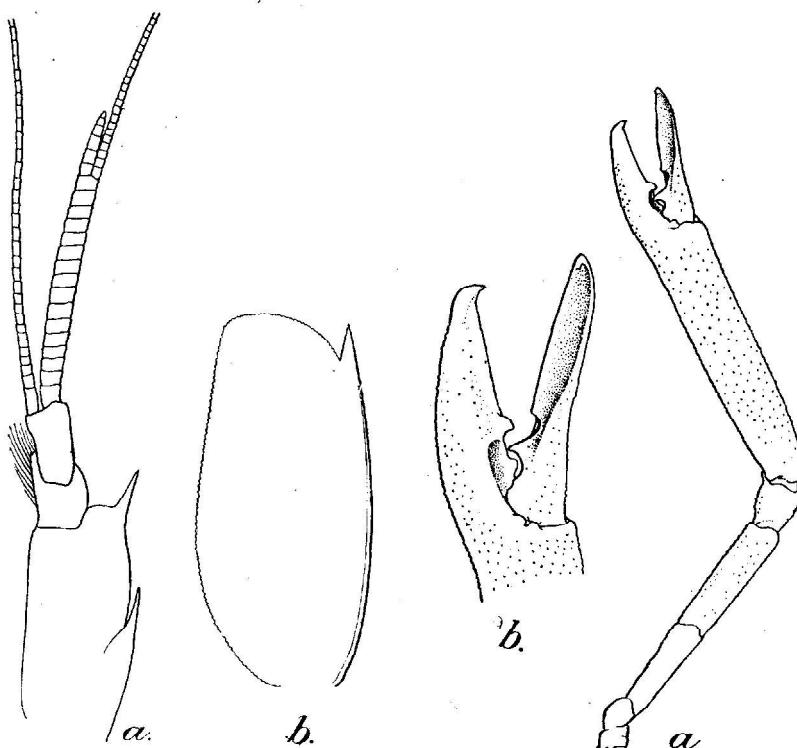
TEXT-FIG. 21.—*Periclimenes alcocki*, sp. nov.

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. 22a) 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. 22b) 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. 23a) are unequal and are closely covered throughout with small tubercles, a remarkable character also found in certain species of the subgenus *Ancylocratis*. 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. 23b) 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.

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.

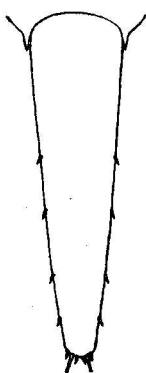
Periclimenes (Periclimenes) lanipes, sp. nov.

(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 9¹ 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 tooth¹ 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.



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

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 antenular 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 pereopods 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 pereopods 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 pereopods 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. laccadensis* and *P. alcocki*, but is easily distinguished by numerous well-marked characters.

C 405/1. Mergui Archipelago, $12^{\circ}48'$ N., $98^{\circ}16'10''$ E., 24 fms. 'Investigator.' One, TYPE.

The other two specimens belong to the Paris Museum and were obtained by M. Hartel 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.

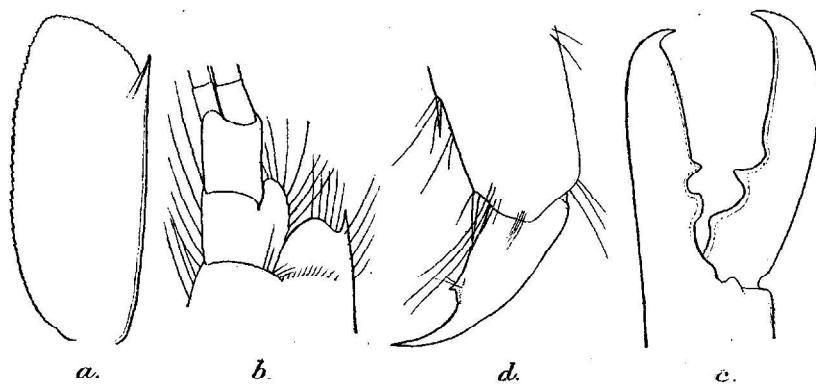
In dorsal view the eyestalk is widest at the base; the cornea is rounded and scarcely wider than the stalk, on which it is set obliquely. The ocular spot is distinct and touches the cornea.

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. 25b); 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. 25a) 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 pereiopods 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.

- | | |
|---|--|
| <i>a.</i> Antennal scale. | <i>c.</i> Fingers of larger second pereiopods. |
| <i>b.</i> Last two segments of antennule. | <i>d.</i> Dactylus of third pereiopod. |

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. 25c) 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. 25c.

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. 25d) 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

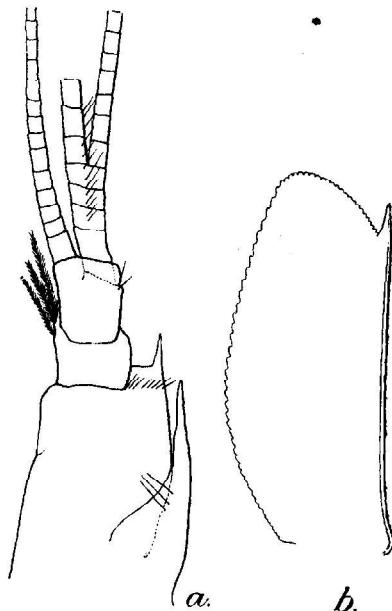
does not reach the apex of the scale. It is quite straight, with slightly convex upper border, and bears 9 dorsal teeth in the single specimen examined. The posterior tooth is placed on the carapace behind the orbit, but is not separated from the second by a greater interval than that between the second 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. 26a) 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. 26b) 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.

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.

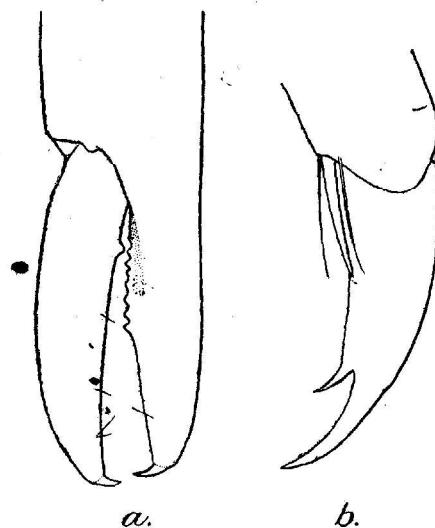
The second peraeopods are unequal, the left much larger than the right and reaching beyond the scale by more than the length of the chela; the two are, however, similar in structure. In the larger the merus is 1·75 times the length of the ischium



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

- a. Antennule.
- b. Antennal scale.

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



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

- a.* Fingers of larger second pereopod.
- b.* Dactylus of third pereopod.

dus 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. 27b) 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 aritennule.

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

The specimen is labelled "found on an Alcyonarian."

Periclimenes (Periclimenes) neverca, sp. nov.

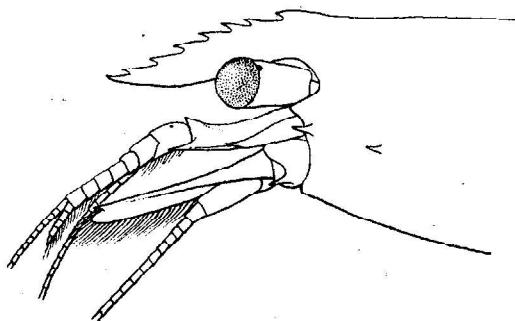
The rostrum (text-fig. 28) reaches a little beyond the end of the antennular peduncle. It is straight, but directed downwards

¹ The merus is too slender in the figure.

the fingers are about two-thirds its length. The fingers (text-fig. 27a) 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.

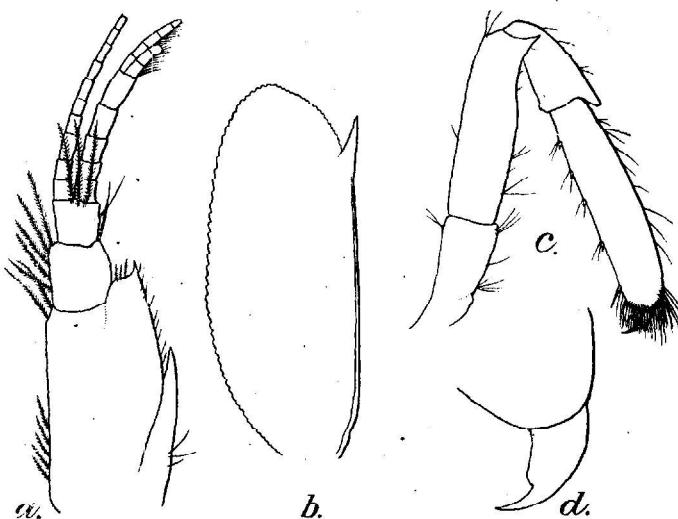
The last three pairs of pereaeopods are rather stout; those of the third pair scarcely reach the tip of the scale. The propo-

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 neverca*, 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.

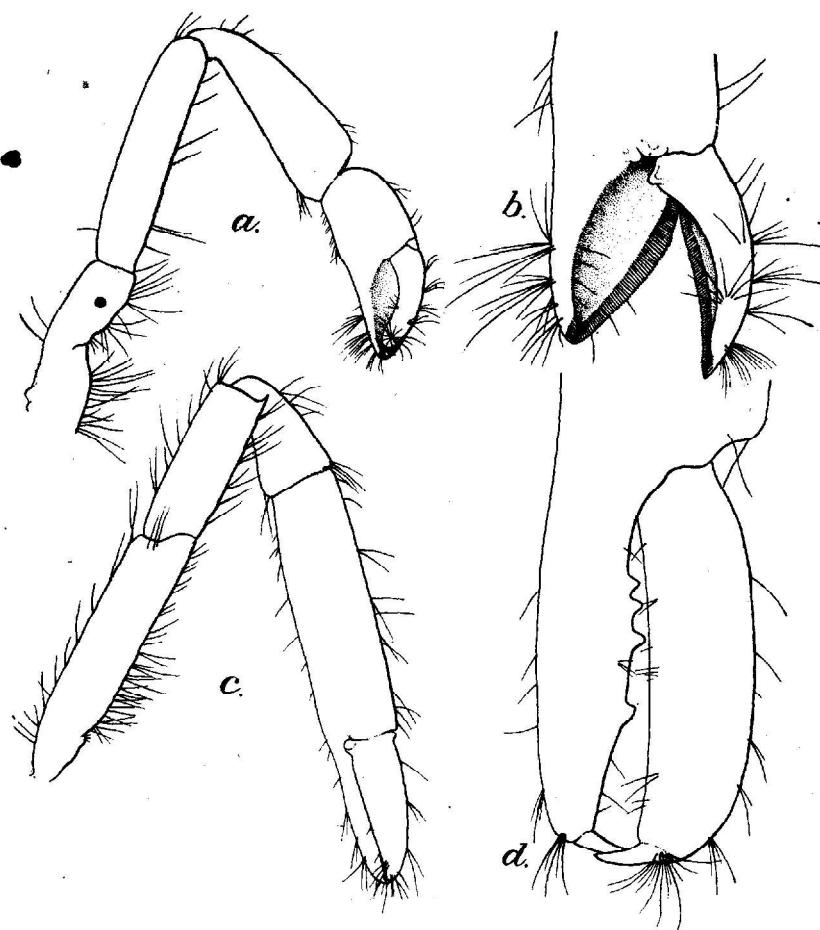


TEXT-FIG. 29.—*Periclimenes neverca*, sp. nov.
a. Antennule. c. Third pereopod.
b. Antennal scale. d. Dactylus of third pereopod (setae omitted).

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. 29a) 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. 29b) is about 2·5 times as long as wide. The outer margin is



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

- | | |
|--------------------------------|---------------------------------|
| a. First pereiopod. | c. Second pereiopod. |
| b. Fingers of first pereiopod. | d. Fingers of second pereiopod. |

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

The first pereiopod (text-fig. 30a) 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. 30b) 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. 30c) 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. 30d) 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. 29c) 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. 29d) 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 propodeite.

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

Periclimenes (*Periclimenes*) commensalis Borradaile.

1915. *Periclimenes (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 ...

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 ...

Two teeth on lower border of rostrum; larger chela with a huge bifid tooth at base, overlapping dactylus; R. 8:2 ...

robustus (Borradaile).

fimbriatus (Borradaile).

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. iv, 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. iv, 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 *Ancyllocaris*.

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 ...

C'. Rostrum deep; merus and carpus of second leg subequal; R. 7 : 3 ...

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

D'. Eye without conspicuous terminal papilla;

R. 7 : 1 ...

C. Rostrum reaching beyond end of antennular peduncle [eye without conspicuous terminal papilla]; R. 6 : 1 ...

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 ...

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 ...

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.

nilandensis Borr.

edwardsi (Paulson).

ceratophthalmus Borr.

cornutus Borr.

amboinensis,¹ de Man.

psamathe (de Man).

longipes (Stimpson).

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 conspicuous¹ 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 ... *kornii* (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.

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. 39b, 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 ...

L'. Form slender; rostrum straight, upper border strongly convex with foremost tooth not placed close to apex, R. 5-7 : 0-2 ...

F'. Rostrum very shallow in lateral view; two spines at distal end of basal antennular segment; R. 6 : 1 ...

H'. Carpus of first leg about half length of chela; R. 6 : 3 ...

F'. Each finger of first leg with a conspicuous comb of spines [two spines at distal end of basal antennular segment]; R. 12 : 0 ...

B'. Hepatic spine absent.

C. Second legs shorter than first; R. 5 : 0 ...

C'. Second legs longer than first; R. 6 : 2 ...

inornatus, sp. nov.

diversipes, sp. nov.

brocketti Borr.

compressus Borr.

frater Borr.

brevinaris Nobili.

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 ...

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

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 ...

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 ...

G'. Carpus of first leg less than 1.5 times as long as chela; chela of second leg

spiniferus de Man.

petitthouarsi (Audouin).

denticulatus Nobili.

agagi, sp. nov.

- 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 ...
{ R. 6-7 : 3-4 ... *elegans* (Paulson).
- 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 ... *holmesi* Nobili.
- 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 ... *amymone* de Man.
- C*. Hepatic spine absent ... *demani* Kemp.
- B'*. Supra-orbital spine absent. *lifuensis* Borr.
- 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 (Aneylocaris) 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. 9a, 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. 10a, b.

Male Atoll, Maldives, on red and brown crinoid.

Periclimenes (Aneylocaris) amboinensis (de Man).

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

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 *Ancyllocaris*. 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 (Ancyllocaris) psamathe (de Man).

1902. *Urocaris psamathe*, de Man, *Abhandl. Senck. naturf. Ges.* XXV, p. 816, pl. xxv, figs. 51, 51a-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 *Ancyllocaris*, 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 (Ancyllocaris) 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.

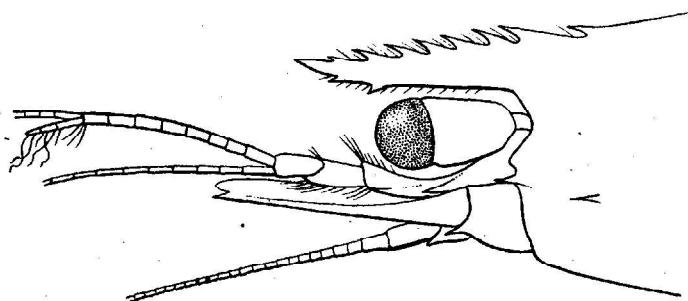
Periclimenes (Ancyllocaris), leptopus sp. nov.

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.



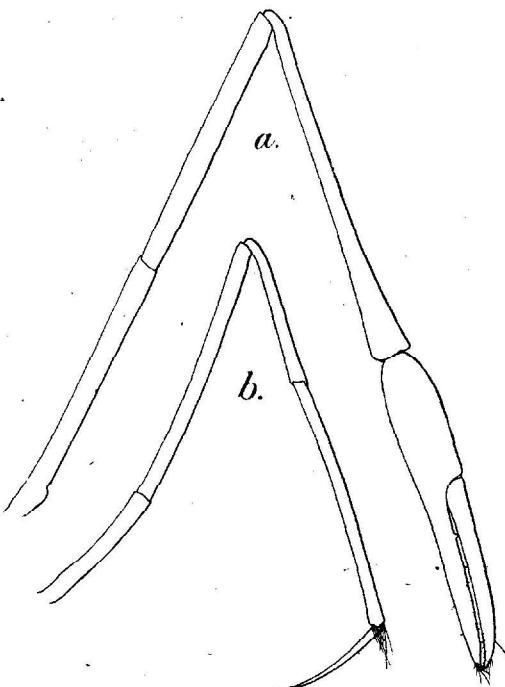
TEXT-FIG. 32.—*Periclimenes leptopus*, sp. nov.
Antennal scale.

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. 33a) 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. 33b) 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. 351/1. Port Blair, Andamans.

S. Kemp, Feb.,

Three (two ovig.),

1915.

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. 34a), 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.

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. 34b). The second and third segments are rather slender and subequal.

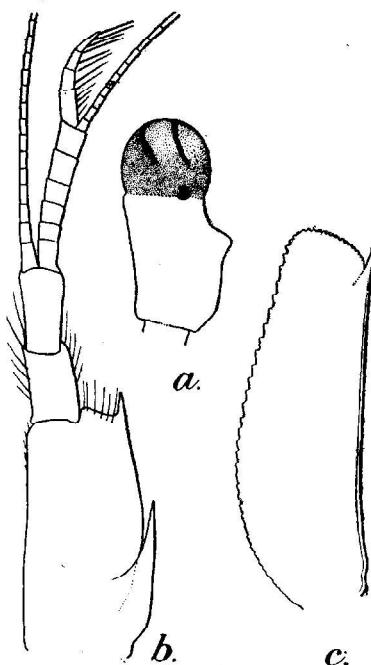
The free portion of the shorter ramus of the outer antennular flagellum is about two-thirds the length of the fused basal part, the latter comprising from 5 to 7 segments. The antennal scale (text-fig. 34c) is 3, or rather more than 3 times as long as wide. The outer margin is usually a little concave and ends in a spine which reaches almost or quite to the end of the lamella.

The third maxilliped bears on arthrobranch; the ultimate segment is about two-thirds the length of the penultimate. The first peraeopods (text-fig. 35a) 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. 35b) 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. 35c) 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



TEXT-FIG. 34.—*Periclimenes seychellensis*
Borradaile.

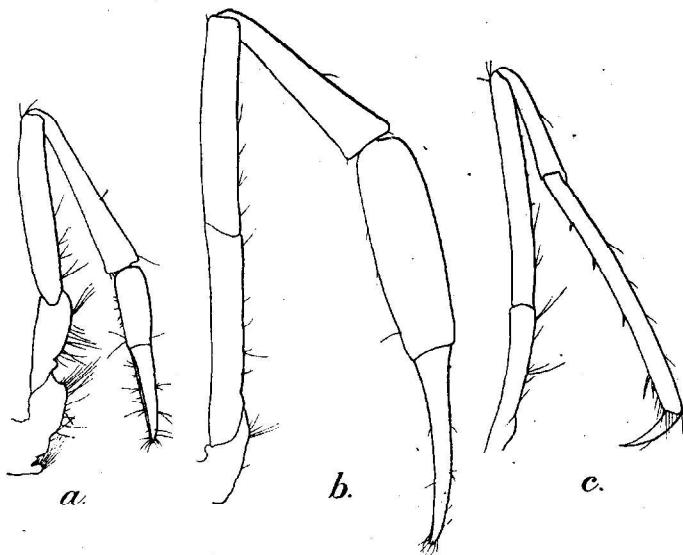
a. Eye. b. Antennule.
c. Antennal scale.

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	F 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.

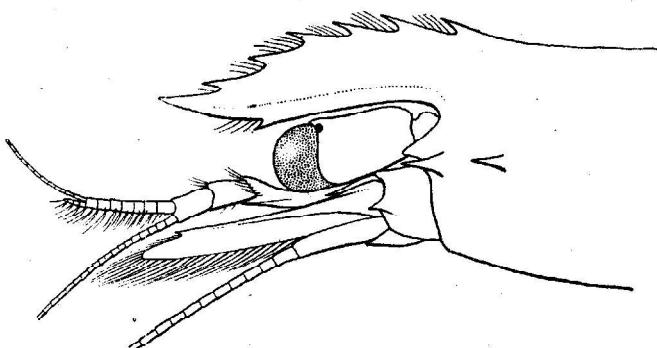
The species is known from the West Indies, Yucatan, Florida and the Bermudas. The specimens I have seen are from the last named locality.

Periclimenes (Ancylocaris) tenellus (Smith).

1882. *Anchistia tenella*, Smith, *Bull. Mus. Comp. Zool. Harvard X*, p. 55, pl. ix, fig. 1.
 N. W. Atlantic, $32^{\circ}7' \text{N.}$, $78^{\circ}37'30'' \text{W.}$, 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 anten-



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

nular peduncle; sometimes it is shorter, reaching only to the end of the first segment, sometimes longer, reaching the end of the

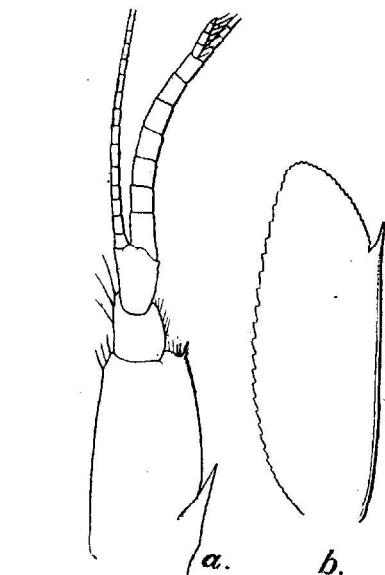
peduncle. The upper portion of the blade is strongly arched and the rostrum is consequently deep in lateral view; the lower margin is straight at the base and slightly convex near the tip. On the convex upper border there are from 5 to 7 teeth,¹ most commonly 6. The hindmost of these is usually situated 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. 37a) 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. 37b) 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.

There is a small arthrobranch on the third maxilliped. The first pereiopods (text-fig. 39a) 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



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

- a. Antennule.
- b. Antennal scale.

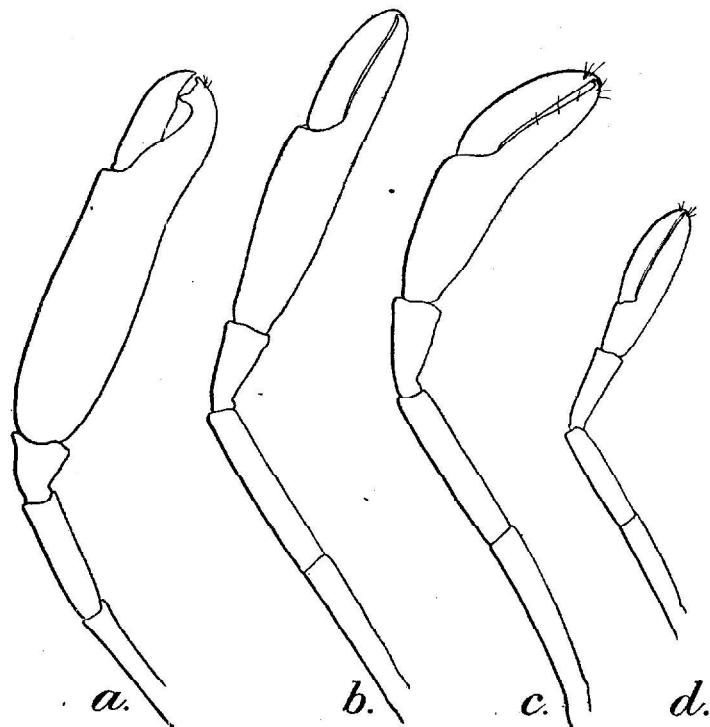
their cutting edges appear to be entire, but when viewed under a high power of the microscope the edge is sometimes seen to be

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. 39b).

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.

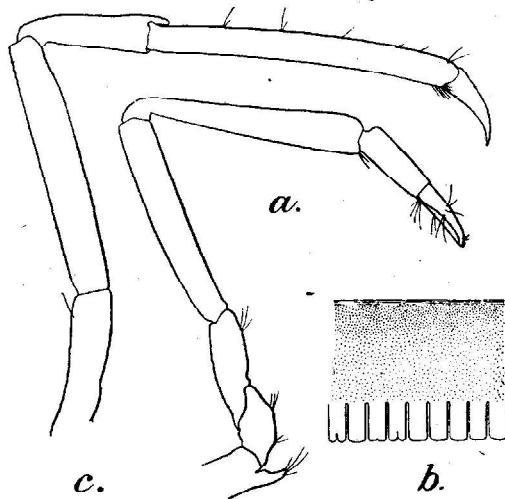
The second peraeopod of type *b* (text-fig. 38*b*)¹ may be nearly as large as type *a*. The carpus is more slender and the

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.

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



TEXT-FIG. 39.—*Periclimenes diversipes*, sp. nov.

- a.* First peraeopod.
- b.* Cutting edge of finger of first peraeopod, very greatly enlarged.
- c.* Third peraeopod.

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. pictina* 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 Alcyoniidae. 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.
<i>ad</i>	3	1
<i>bb</i>	...	2
<i>bc</i>	5	30
<i>bd</i>	3	...
<i>cc</i>	...	60
<i>cd</i>	4	...
<i>dd</i>	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 XI_e, 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, Mediterranean, 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, 27a.
- 1898. *Bithynis* sp., Coutière, *Bull. Mus. Paris* IV, p. 198.
- 1902. *Ancylocaris brevicarpalis*, Schenkel, *Verh. naturf. Ges. Basel* XIII, p. 563, pl. xiii, figs. 21a-m.
- 1904. *Palaemonella aberrans*, Nobili, *Bull. Mus. Paris* X, p. 233.
- 1905. *Harpilius latirostris*, Lenz, *Abhandl. Senck. naturf. Ges.* XXVII, p. 380, pl. xlvi, figs. 14, 14a-c.
- 1906. *Ancylocaris aberrans*, Nobili, *Bull. sci. France Belgique* XL, p. 52, pl. iv, figs. 9, 9a, 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 undiscovered 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 teeth¹ 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. 40a) 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. 40b) 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.

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. 41a) 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. 41b) 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.

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

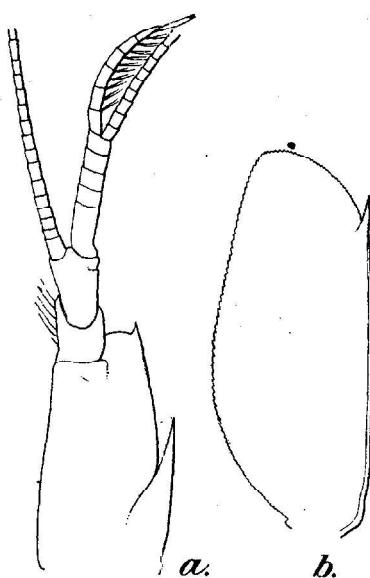
- a. Antennule.
- b. Antennal scale.

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.

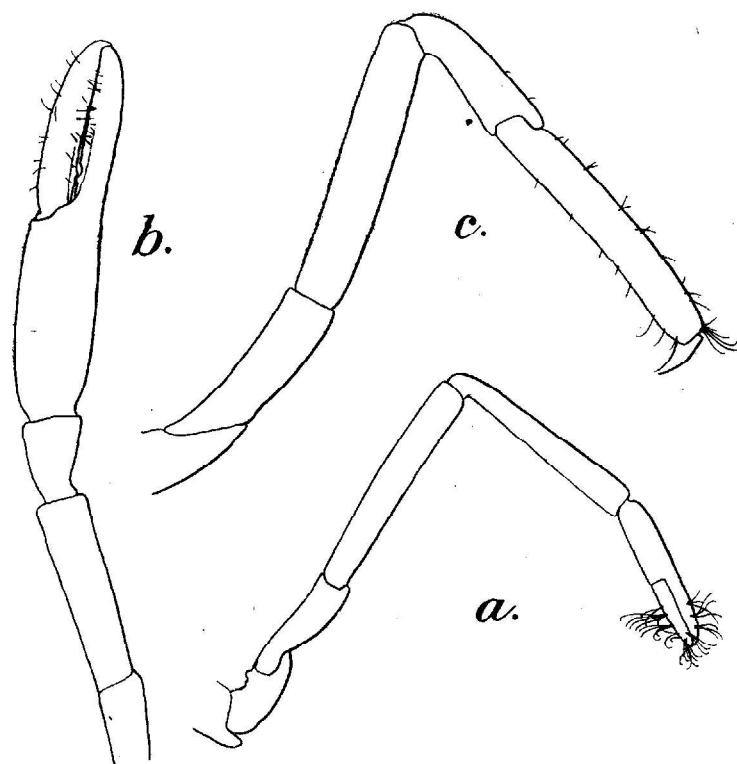
The first peraeopods (text-fig. 41a) reach beyond the end of the scale by fully half the length of the chela. The merus is slightly longer than the carpus, the carpus distinctly longer than the chela; the fingers are unarmed and are about equal in length with the palm. The second peraeopods (text-fig. 41b) 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. 41c) 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.

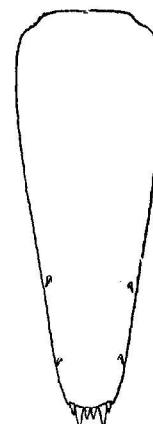
The sixth segment of the abdomen is about 1·5 times the length of the fifth. The telson (text-fig. 42) is rounded above with two pairs of very small and inconspicuous dorsal spines. These spines are placed further back than usual, the foremost pair being situated much behind the middle of the telson. 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.

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 cercle, 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



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

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 *Discosoma*.

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.	Gt. Coco I., Andaman group.	'Investigator,' Nov., 1890.	Twelve.
2984-90/7.			
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 *Ancyllocaris 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 (Ancyllocaris) inornatus, sp. nov.

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

P. brevicarpalis Sch.

Rostrum with 5 to 7 dorsal teeth, the foremost not placed close to apex.

Carapace greatly swollen dorsally in adult females.

Hepatic spine of carapace situated on a much lower level than antennal.

P. inornatus, sp. nov.

Rostrum with 7 or 8 dorsal teeth, the foremost placed close to apex and often giving it a bifid appearance.

Carapace not swollen dorsally.

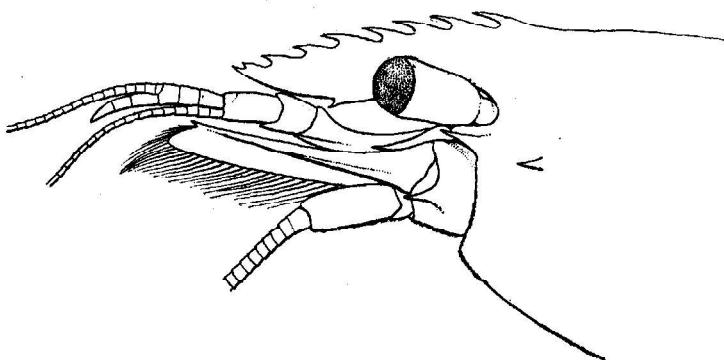
Hepatic spine of carapace situated nearly on a level with antennal.

P. brevicarpalis Sch. .

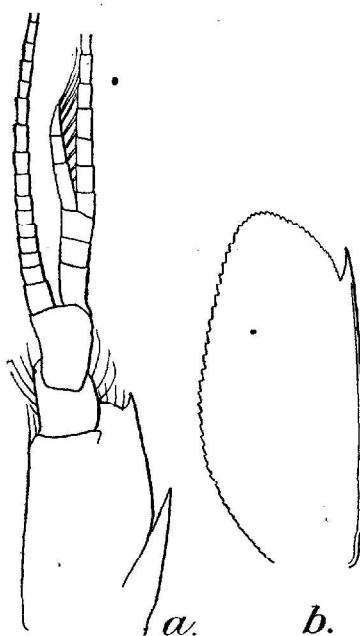
Dactylus of second peraeopod at least two-thirds as long as palm.
Dorsal spines of telson very small, both pairs situated in distal half of its length.
Brilliantly coloured when alive.

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 teeth¹ 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 found² is small and situated beneath the fifth or sixth of those on the upper margin.

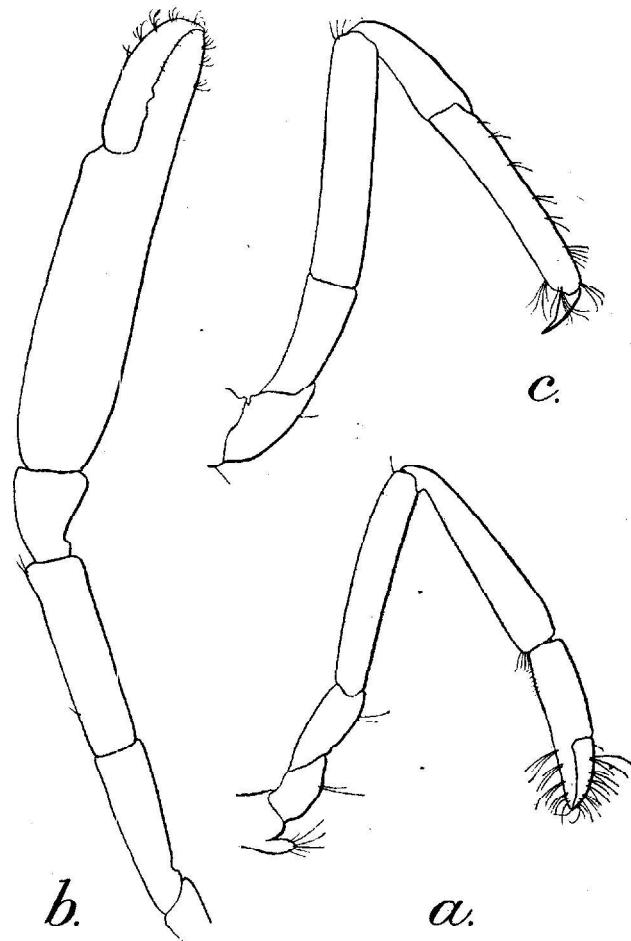
The eye is less slender than in *P. brevicarpalis*, but possesses an ocular spot as in that species. The fused part

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. 44a) is almost or quite as long as the free portion of the shorter ramus and comprises 3 segments only. The antennal scale (text-fig. 44b) 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. 45a, c) and the fingers of the second pair are never more than half the length of the palm (text-fig. 45b). 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.

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,

Eighteen, includ-

1915.

ing TYPES.

2991-2/7. Gt. Coco I., Andaman

'Investigator,' Nov.,

Two.

group.

1890.

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.

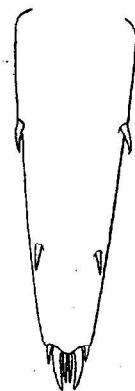
Male Atoll, Maldives, on brown crinoid.

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.



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

Telson.

Periclimenes (Ancylocaris) brevinaris Nobili.

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

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., Andaman, 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 (*Ancylocardis*) *petitthouarsi* (Audouin).

- 1825. *Palaemon petitthouarsi*, Audouin, *Explic. somm. des planches de Crust.*, p. 91, in Savigny's *Descr. Egypte*, 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 border¹ 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 Nobili³ from the vicinity of Arzana I. in the Persian Gulf. I have examined specimens from this last locality, belonging to the Paris Museum.

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.

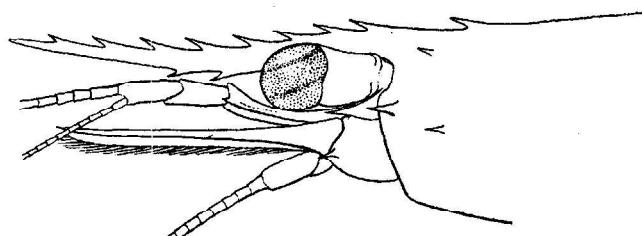
The species of this group are more difficult to identify than any others of the subfamily. Many of the characters depend on the proportions of various segments of the legs, which are never very easy to determine and there is considerable variation within the limits of a species. The proportions of the 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.

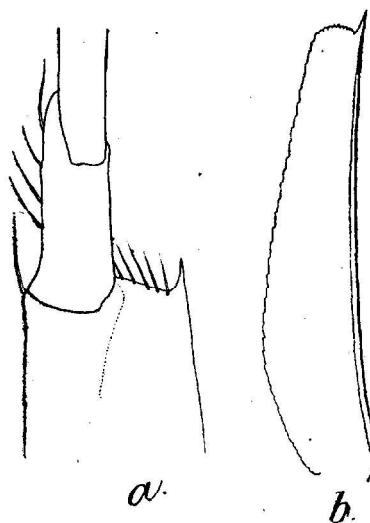
carapace. At the base it is straight, but it is a little upturned in its distal half. On the slightly concave upper border it bears from 7 to 9 teeth, nearly always 8 or 9.¹ The posterior tooth is rather

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. 48a) 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. 48b) is nearly 5 times as long as wide; the outer margin



TEXT-FIG. 48.—*Periclimenes agag*, sp. nov.

- a. Part of antennular peduncle.
- b. Antennal scale.

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.

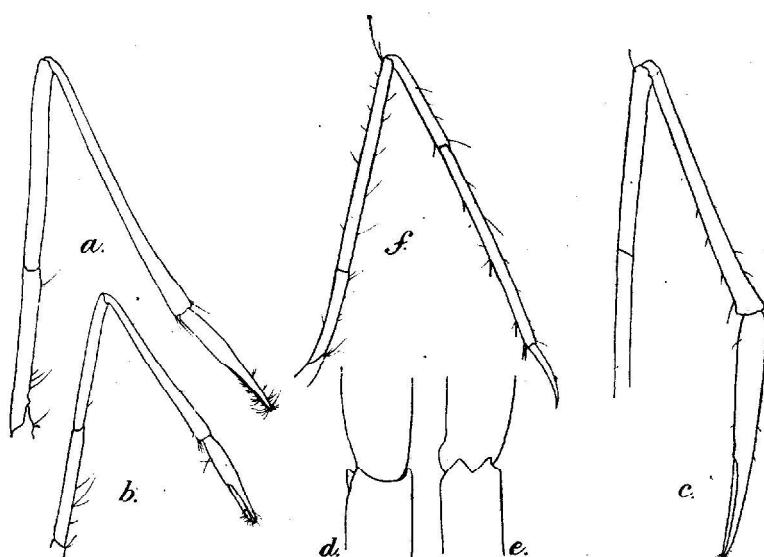
The third maxilliped bears a small arthrobranch. The exopod reaches the end of the antepenultimate segment, the latter bearing a few short spines on its outer margin. Excluding the terminal spine the ultimate segment is about three-quarters the length of the penultimate.

The first pereiopods (text-figs. 49a, 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 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.

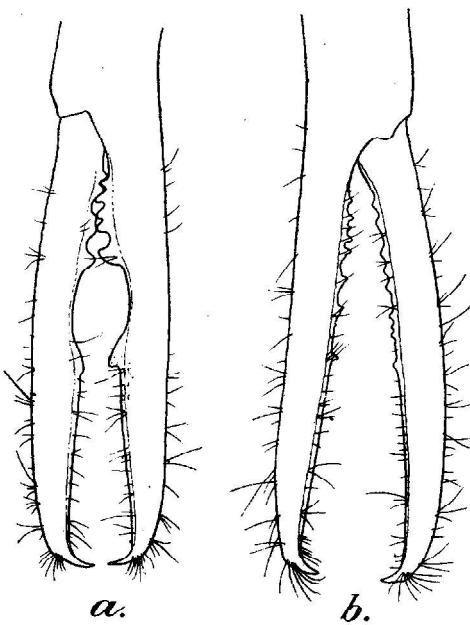
- a. First peraeopod of male.
- b. First peraeopod of female.
- c. Second peraeopod of female (less highly magnified than a, b or f').
- d. Carpo-propodal articulation of right second peraeopod of male, viewed from above.
- e. The same, viewed from the inner side.
- f. Third peraeopod.

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. 49e) 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. 49d). In this respect there is a marked difference between *P. agag* and certain related species such as *P. andamanensis* (cf. text-figs. 57a, 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. 50b). Often, however, there is a



TEXT-FIG. 50.—*Periclimenes agag*, sp. nov.
Fingers of second pereopod 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. 50a). 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 pereopods (text-fig. 49c) 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. 49f). 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.

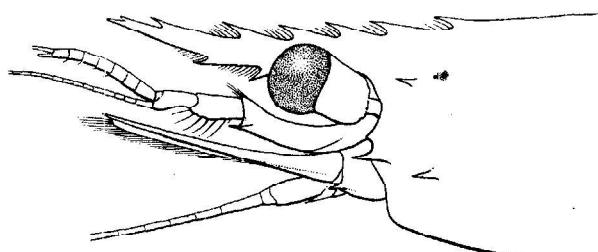
Large specimens are about 16·5 mm. in length.

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

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.

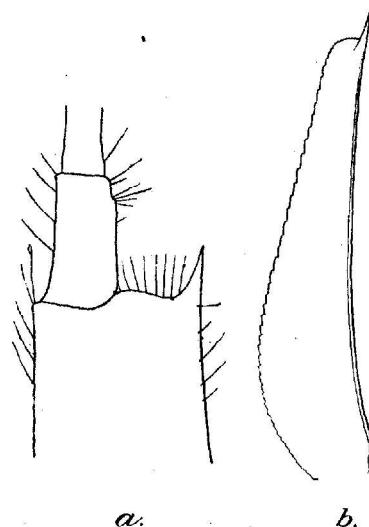
² Of twenty-one specimens four have 6 dorsal teeth and seventeen have 7.

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. 52a). 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. 52b) 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 out-



TEXT-FIG. 52.—*Periclimenes proximus*, sp. nov.

- a. Part of antennular peduncle.
- b. Antennal scale.

reaches the end of the lamella.

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.

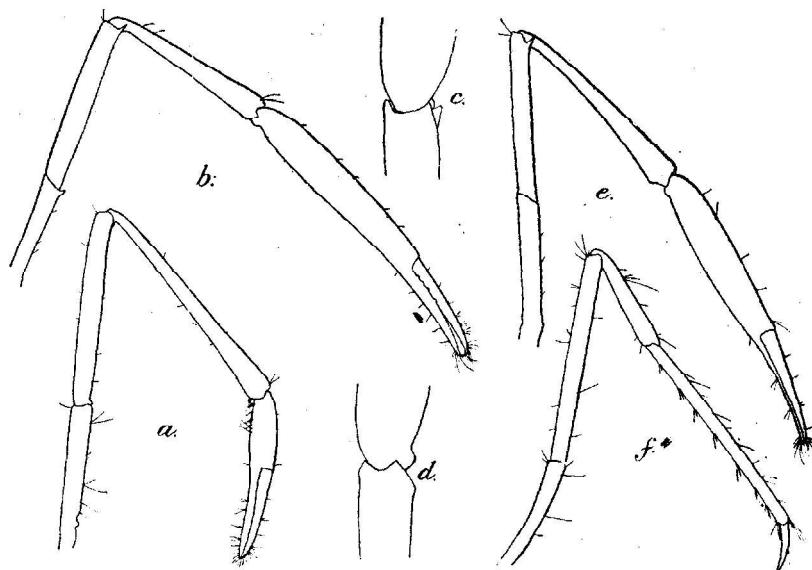
The mero-carpal articulation of the first pereiopods reaches the end of the second segment of the antennular peduncle in adult males, not quite so far in females. The carpus in adults of both sexes is from 1·2 to 1·3 times the length of the merus and about 1·4 times the length of the chela (text-fig. 53a). 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. | d. The same, viewed from the inner side. |
| b. Second peraeopod of male. | e. Second peraeopod of female. |
| c. Carpo-propodal articulation of right second peraeopod of male, viewed from above. | 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. 53e) 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. 53f) 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.

Rostrum with 6 or 7 dorsal teeth.
Carpus of first peraeopods less than 1·5 times length of chela.

Chela of second peraeopods in males from 1·4 to 1·7 times length of carpus.
Chela of second peraeopods in females conspicuously longer than carpus.

C 377-9/1. Port Blair, Andamans, 4-8 fms.

P. agag, sp. nov.

Rostrum usually with 8 or 9 dorsal teeth.
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 1·1 to 1·25 times length of carpus.
Chela of second peraeopods in females equal to or a little shorter than carpus

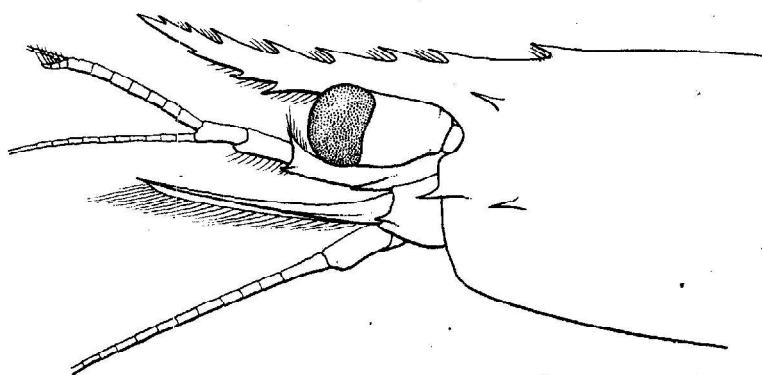
S. Kemp, March, Twenty-two, in-
1915; Feb., March, cluding TYPES,
1921.

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

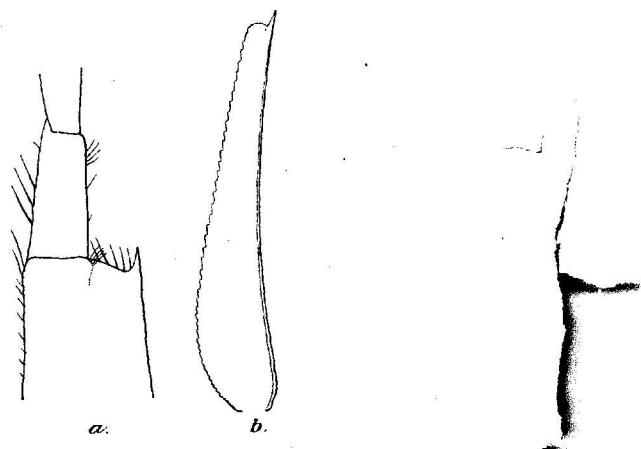


TEXT-FIG. 54.—*Periclimenes andamanensis*, sp. nov.
Anterior part of carapace, rostrum, etc.

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.

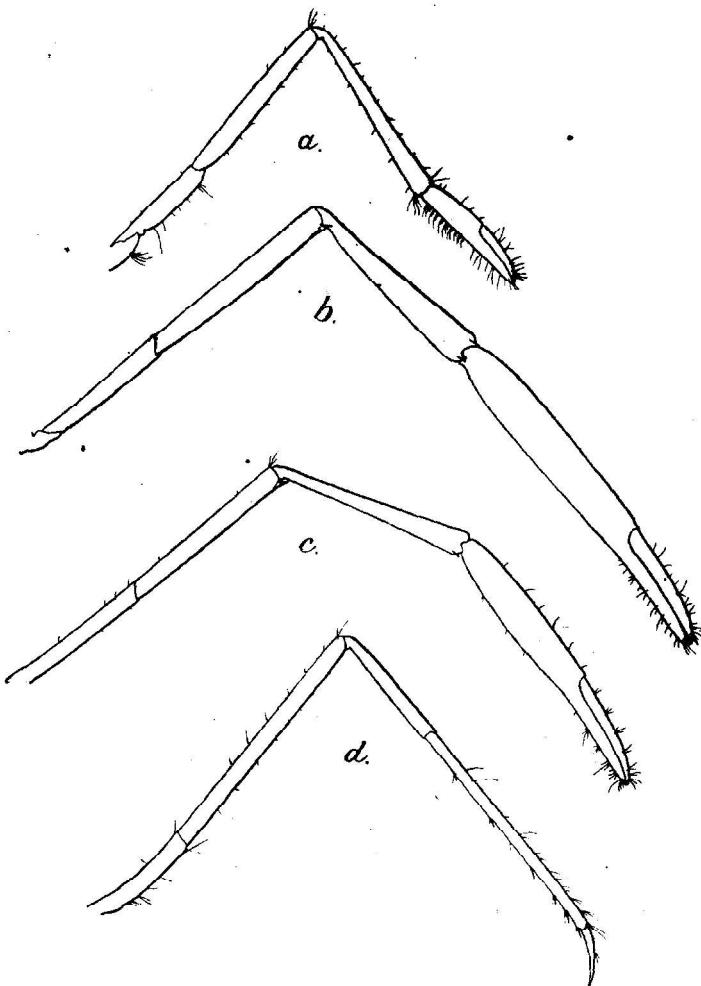
The basal segment of the antennular peduncle has a short lateral process; the distal spine of the outer margin is very short (text-fig. 55a), it extends little beyond the articulation between the first and second segments and the spine and the articulation is almost straight.



TEXT-FIG. 55.—*Periclimenes andamanensis*,
sp. nov.

- a. Part of antennular peduncle.
- b. Antepenal 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.

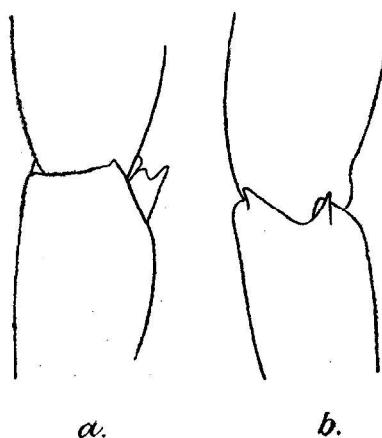
First peraeopod. c. Second peraeopod of female.
Second peraeopod of male. d. Third peraeopod.

x. The outer margin is concave with the terminating the end of the lamella.
x. Assembles 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. 56b) 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. 57a, 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.

In females (text-fig. 56c) 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.



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.

The last three pairs of peraeopods (textfig. 56d) 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; Many.
Feb., March, 1921.

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 chela 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 382-31. Port Blair, Andamans, S. Kemp, Feb., Nine.
3-5 fms. March, 1921.

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. IV, fig. 16.

I have examined the types of this species and find that Borradaile was mistaken in supposing that they do not possess a supr orbital 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. 1a-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.
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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.