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No. 114

RECORDS OF SOME RARE PONTONIID SHRIMPS FROM
AUSTRALIAN WATERS, WITH REMARKS UPON
THE MOUTHPARTS OF SOME SPECIES
OF THE GENUS PERICLIMENES COSTA, 1844

by

A. J. BRUCE

INVERTEBRATE
ZOOLOGY
Crustacea

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PRINTED IN THE NETHERLANDS

RECORDS OF SOME RARE PONTONIID SHRIMPS FROM
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A. J. BRUCE

Division of Fisheries and Oceanography, CSIRO, Redcliffe, Queensland,
Australia 4020 1)

Recently made collections have indicated that the pontoniid shrimp fauna of the east coast of Australia, including the Great Barrier Reef, is still poorly known. Material obtained by the staff of the Australian Museum from their collections at One Tree Island and Heron Island in the Capricorn Group on the Great Barrier Reef has provided some interesting material new to the Australian fauna and their collections have provided specimens of *Periclimenes lanipes* which were collected by the Fisheries Investigation Ship "Endeavour", but not included in the report on the Decapoda Natantia by Schmitt (1926). With two exceptions the remaining species included in this report are also new to the Australian fauna and four are known only from the original type specimens.

All species belong to genera known to live in association with various other marine invertebrates and where possible these have been identified to specific level. In this report the measurement of carapace length refers to the length from the posterior border of the orbit to the middle of the posterior border in the dorsal midline.

I am sincerely grateful to Dr. R. B. Manning, U.S. National Museum (USNM); Dr. J. C. Yaldwyn and Dr. D. J. G. Griffin, Australian Museum (AM) and Mr. B. Campbell, Queensland Museum (QM) for permission to examine some of the specimens in their collections upon which this report is partly based. Unless otherwise stated, all material examined is from the author's collection.

***Periclimenes soror* Nobili (fig. 1, 5 a-b)**

Periclimenes soror Nobili, 1904: 232; Nobili, 1906: 50, pl. 2 fig. 6; Gordon, 1939: 395-400, figs. 1-3; Jacquotte, 1964: 180-181; Bruce, 1965: 493; Bruce, 1967: 1167.

1) Present address: East African Marine Fisheries Research Organization, P.O. Box 81651, Mombasa, Kenya.

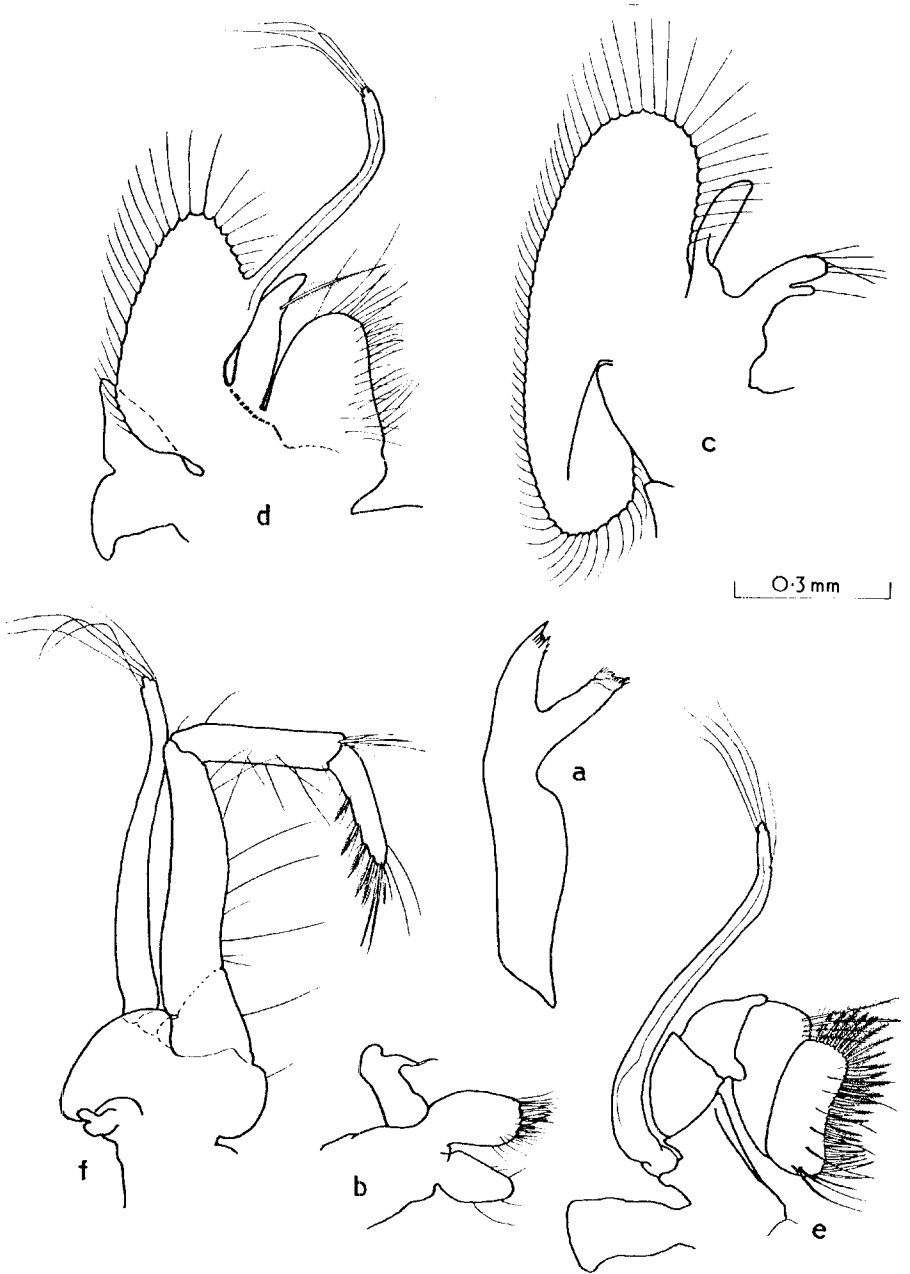


Fig. 1. *Periclimenes soror* Nobili, female. a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped; f, third maxilliped.

Periclimenes (Cristiger) frater Borradaile, 1915: 210; Borradaile, 1917: 324, 364, pl. 53 fig. 6.

Periclimenes (Cristiger) soror Borradaile, 1917: 361 (key), 363.

Periclimenes (Periclimenes) soror Kemp, 1922: 141, 165; Holthuis, 1952: 9, 17, fig. 7; Holthuis, 1959: 194.

Periclimenes (Ancylocaris) frater Kemp, 1922: 170.

Periclimenes bicolor Edmondson, 1935: 10, fig. 3.

Periclimenes (Harpilius) frater Holthuis, 1952: 11.

Material examined. — (1) 4 ♂, 5 ♀ (2 ovigerous), Green Island, Queensland, 16°45'45"S 145°59'15"E; coll. R. G. Pearson, 14 February 1967. (2) 1 ♂, 2 ovigerous ♀, Fairfax Island, Bunker Group, Queensland, 23°23'30"S 152°21'30"E; coll. J. Booth, September 1966, USNM File No. 268780.

Description. — The present specimens correspond well with earlier descriptions of this species. The males have more slender rostra with 9 or 10 dorsal teeth and the non-ovigerous females have 10 to 12 dorsal rostral teeth and the ovigerous females 11 to 13 teeth. There are no ventral rostral teeth.

The mandible is slender and without a palp. The molar process is feebly developed, without distinct teeth and with marginal setose fringes. The incisor process is slender with three acute teeth distally. The maxillula has the upper lacinia unexpanded with a few slender simple spines and numerous setae distally. The lower lacinia in the dissected specimen appears abnormal and is distally truncated and without setae. The palp is well developed, and distinctly bilobed. The lower lobe is elongated and attenuated, with a long tapering seta distally. The maxilla has a stout non-setose palp. The distal endite is bilobed, with the distal lobe much larger than the proximal lobe. The distal lobe bears five long simple setae and the proximal lobe bears only one. The proximal endite is absent, represented by a small rounded swelling on the medial border. The scaphognathite is well developed. All maxillipeds are provided with slender exopods, with four or five plumose setae distally. The first maxilliped has a stout palp bearing a single subterminal plumose seta. The basal endite is large and sparsely setose along its anterior and medial borders. The coxal endite is poorly developed and non-setose, separated from the basal endite by a small emargination only. The caridean lobe is well developed and a bilobed epipod, with acute upper lobe and a slightly posteriorly produced lower lobe, is present. The second maxilliped has a broad terminal segment armed along its anterior and medial margins with a row of stout setae. These setae are non-spinulate on the posterior part of the medial border and strongly spinulated on the anterior part, with intermediate development of spinulation over the intervening region. The anteromedian region of the penultimate segment bears a few long slender plumose setae. The epipod is subrectangular. The terminal

segment of the third maxilliped is 0.7 times the length of the penultimate segment and the combined lengths distinctly exceed the length of the ischiomerus. The basis is indistinctly separated from the ischiomerus. The terminal segment bears a few long slender simple spines distally with isolated spinulate spines along the medial border. The medial border of the carpal and ischiomerus segments bear a few sparse slender, simple setae only. The medial border of the coxa is prominently rounded. A large rounded epipod is present and also a very small rudimentary arthrobranch.

The endopod of the male first pleopod is 2.2 times longer than broad, with a small distal process on the medial side of the slightly expanded distal half, which is devoid of plumose setae, and with five short simple spines along the proximal half of the medial border. The appendix masculina of the second pleopod is distinctly longer and more robust than the appendix interna and bears five simple terminal setae, all of different lengths.

Colouration. — When freshly preserved the larger specimens showed traces of the bicoloured pattern described by Edmondson (1935).

Measurements. — Carapace lengths, ♂ 1.4-1.7 mm, ♀ 1.8-2.0 mm, ovigerous ♀ 2.1-3.1 mm.

Host. — All specimens were obtained from the Crown of Thorns Starfish, *Acanthaster planci* (L.).

Remarks. — The small Green Island female carried 130 undeveloped ova, with a greater diameter of 0.34 mm. The larger clearly carried a much larger number of ova, the egg mass extending anteroventrally to the bases of the second pereopods. These ova, on the point of hatching, had a greater diameter of 0.38 mm.

This species has been previously reported in association with *Acanthaster planci* (L.) (cf. Bruce, 1965), based upon specimens from Zanzibar. Other hosts are *Culcita*, *Protoreaster* and *Linckia*. The Green Island specimens were obtained from the aboral aspect of the host and all were obtained from a single specimen.

The mandible has been previously described by Gordon (1939), and Holthuis (1952) has provided illustrations of the mouthparts other than the second and third maxilliped. In the present specimens the extremity of the incisor process bears a large lateral tooth and a smaller medial tooth separated by three small teeth and with two small denticles on the distal inner margin proximally to the medial tooth. The upper lacinia of the maxillula bears fewer spines and the palp is more distinctly bilobed. Holthuis does not figure the plumose seta on the palp of the first maxilliped, but in other respects the mouthparts correspond closely to the previous descriptions.

The endopod of the male first pleopod is generally similar to the des-

cription given by Gordon (1939), but the distomedial process is more strongly developed and the basal spinules appear more robust. The spines at the distal end of the appendix masculina are also more numerous.

Distribution. — Previously recorded from Jibuti, Gulf of Aden; Tulear, Madagascar; Egmont Reef, Seychelle Islands; Sanoer, Bali; Sipankot, Sulu Islands; Noumea, New Caledonia and Oahu, Hawaiian Islands. This species has not been previously recorded from Australia.

***Periclimenes commensalis* Borradaile (fig. 2)**

Periclimenes (Cristiger) commensalis Borradaile, 1915: 211; Borradaile, 1917: 361 (key), 364.

Periclimenes commensalis Potts, 1915: 82.

Periclimenes (Periclimenes) commensalis Clark, 1921: 628; Kemp, 1922: 141, 166; Holthuis, 1952: 8, 53-56, figs. 18-19; Barnard, 1958: 16, fig. 4A; Miyake & Fujino, 1968: 400, 403-406, 431, fig. 2, e-g.

Material examined. — (1) 1 ovigerous ♀, origin unknown; QM unregistered. (2) 1 ovigerous ♀, Heron Island, Capricorn Group, Queensland, coll. I. Bennett, 20 December 1962; AM Reg. No. P. 16120. (3) 1 ovigerous ♀, Bribie Passage, Moreton Bay, Queensland, trawled, 2 fm., R.V. "Marelda"; coll. D. Ada, 2 May 1969. (4) 1 juv. Myora, North Stradbroke Island, Moreton Bay, Queensland, 2 ft below LWN; coll. A. J. Bruce, 9 July 1960.

Description. — The Queensland Museum specimen lacks the left second pereopod and ambulatory pereopods, but is otherwise in good condition and agrees well with earlier descriptions. The rostrum is slightly deeper than in Holthuis' illustration (1952) but is similarly provided with six dorsal and two ventral teeth. It extends anteriorly to the middle of the terminal segment of the antennular peduncle. The supraorbital spine is small but distinct and the hepatic spine is large and stout. The basal segment of the antennule bears a strong distolateral spine. The anterior border is produced in advance of the distolateral spine and bears two small acute teeth. The cornea of the eye is oblique and globular.

The mandible is without a palp. The molar process is robust with several stout teeth posteriorly and a fringe of stout setae anteriorly. The incisor process is slender, with three small acute teeth. The maxillula has a broad upper lacinia, tapering distally and bearing a row of slender spines distally with setae along the distoposterior border. The lower lacinia is robust and bears numerous setae distally and along the posterior margin. The palp is well developed, bilobed and with a short stout tapering seta distally on the lower lobe. The maxilla has a stout palp with a row of five long slender simple spines along its medial border. The distal endite is well developed, simple, broad and truncate distally with a fringe of numerous simple setae. The proximal endite is absent and represented by a low pro-

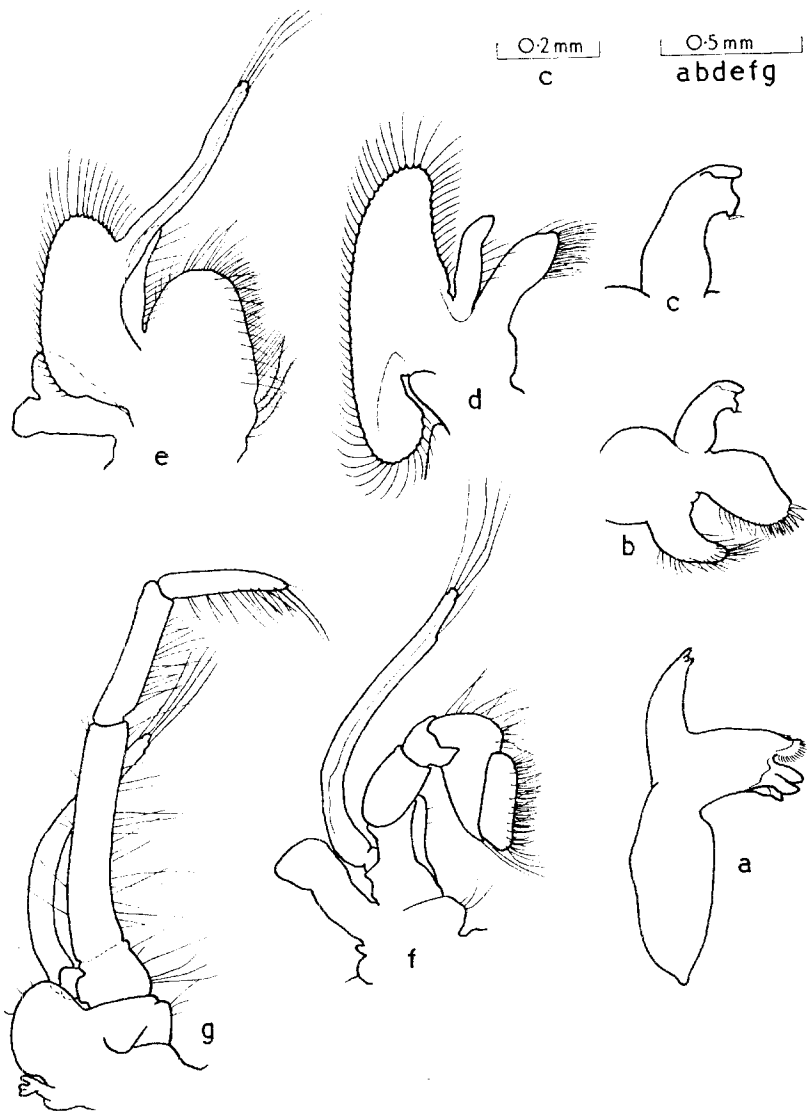


Fig. 2. *Periclimenes commensalis* Borradaile, female. a, mandible; b, maxillula; c, palp of maxillula; d, maxilla; e, first maxilliped; f, second maxilliped; g, third maxilliped.

tubercle on the proximal medial border. The scaphognathite is well developed and narrow. All maxillipeds are provided with exopods, which are moderately developed, with four or five terminal plumose setae. The palp is long and slender with a row of eleven long slender simple setae along the medial border. The basal endite is large, broad and rounded with numerous, relatively sparse, slender simple setae along the distal and medial borders. A feeble indentation of the medial border separates the basal from the coxal endite, which is feebly developed and bears three long plumose setae. The caridean lobe is well developed and a small bilobed epipod is also present. The second maxilliped shows no special features. The small terminal segment bears a fringe of very slender, finely spinulose setae along the medial border. The anteromedial lobe of the penultimate segment is large and rounded with numerous long slender simple setae. The epipod is subrectangular. The terminal segment of the third maxilliped is 0.86 times the length of penultimate segment and the terminal and penultimate segments are together subequal to the length of the ischiomerus and basis, which is only indistinctly separated from the antepenultimate segments. The medial border is sparsely provided with long slender simple setae. A large rounded epipod and a very small feebly lamellate arthrobranch is also present.

The first pereopod is moderately slender and extends to the tip of the scaphocerite. The carpus is slightly longer than the merus. The fourth thoracic sternite lacks a slender median process but is provided with a broad transverse plate with a small median notch ventrally. The right second pereopod is robust, with the distoventral angle of the merus and the anterior margins of the carpus unarmed. The palm is subcylindrical and subequal to the fingers which are slightly curved. The cutting edges of both fingers lack any distinct teeth but are minutely serrated throughout their lengths. The propodus of the third ambulatory pereopod bears serrated spines distally and the dactylus shows the strong anterior spinule and a small posterior accessory tooth as previously reported. The posterior lateral angle of the sixth abdominal segment is acute but the posterior ventral angle is bluntly rounded. The telson is slender, with the small anterior pair of dorsal spines slightly behind the middle of the telson length, and the posterior pair half way between the anterior pair and the posterior margin. The lateral border of the basipodite of the uropod is not acutely produced. The rami are slender and slightly exceed the tips of the telson spines.

The Moreton Bay and One Tree Island specimens are similar but intact. The rostrum bears $7/2$ and $6/2$ teeth respectively. The chelae of the second pereopods are equal and similar.

Colouration (of specimens from *Zygometra microdiscus*). — Generally

semi-transparent with an orange yellow rostrum and a yellow median dorsal stripe with a narrow transparent median streak over carapace. Dorsolaterally the carapace is a diffuse zone of dark brown. A narrow line of bright yellow runs posteriorly across the upper branchiostegite, with a broader band extending posteriorly from the anterolateral angle of the carapace, enclosing a band of dark brown, with another band of dark brown across the lower branchiostegite. The abdomen bears a median dorsal stripe of brown, with narrow yellow margins anteriorly, which extends over the telson. A narrow line of yellow, continuous with that on the carapace, extends posteriorly along the length of the abdomen to the posterior ventral angle of the sixth segment. A broader band of yellow extends across the central part of the first three pleura. Intermediate and inferior zones are dark brown. The ventral surface of the abdomen bears a pair of broad submedian yellow stripes. Medial side of antennal peduncle dark brown, lateral part of basal segment yellow. Medial half of scaphocerite, lateral border and basicerite yellow, continuous with upper lateral yellow band of carapace. Eyestalk yellow, dark brown anteriorly. First pereopods pale yellow. Second pereopods bright yellow along the lateral aspect and dark brown along medial surfaces, with orange fingers. Ambulatory pereopods pale yellow. Bases of thoracic limbs dark brown, sternites yellow. Pleopods brown with yellow endopods. Uropods bright yellow. Ova drab olive brown.

Measurements. - Carapace length (1) 2.7 mm, (2) 2.6 mm, (3) 2.2 mm.

Hosts. - - All specimens were obtained from crinoids, identified as follows: (1) *Comanthina belli* Carpenter, 1888; (2) unidentified; (3) *Zygometra microdiscus* (Bell).

Remarks. - - Through the kindness of Dr C. B. Goodhart, I have been able to examine the types of *Periclimenes (Cristiger) commensalis* Borradaile, which have been deposited in the collections of the Museum of Zoology, Cambridge. There are two specimens, one badly damaged and an almost intact ovigerous female. Both specimens were collected from Mabuag in the Torres Straits. The ovigerous female is now designated as the lectotype. Dr. Goodhart (in litt.) has subsequently confirmed the presence of minute serrations upon the cutting edges of the fingers of the single remaining second pereopod.

The presence of serrations upon the cutting edges of the fingers of the second pereopods was first reported by Bruce (1966), in *Periclimenes novaecaledoniae* Bruce. It is now clear that this species and *P. commensalis* are very closely related, but they may be readily separated by the presence of a supraorbital spine in *P. commensalis*. The presence of minute serrations on the cutting edges of the fingers was not reported in specimens of *P.*

commensalis from the Palau Islands, but low obscure teeth were present proximally (Miyake & Fujino, 1968).

The mandible and maxillula have been described and illustrated by Holthuis (1959). The molar process in the present specimens is very similar to the previous description but the incisor process bears fewer teeth. The maxillula also corresponds closely to Holthuis' figure.

The ova are 0.44 mm in the greater diameter and the Queensland Museum specimen carried seventy-four.

Periclimenes commensalis has not been previously reported in association with crinoids of the genera *Comanthina* or *Zygometra*. Previous host records were from *Comanthus timorensis* (J. Müller) (Potts, 1915).

Distribution. — Previously only reported from Delagoa Bay, Moçambique; Flores, Lesser Sunda Islands; Mabuag, Torres Straits, and Ngardarak Reef, Palau Islands.

Periclimenes lanipes Kemp (figs. 3, 4, 5 c-d)

Periclimenes (Periclimenes) lanipes Kemp, 1922: 141, 156-158, pl. 4 (fig. 4); Holthuis, 1952: 9.

Material examined. — (1) 3 ♂, 5 ♀ (3 ovigerous), 3 juveniles, 25 miles SE of Double Island Point, Queensland; F.R.V. "Endeavour"; AM Reg. No. E. 4498.

Description. — The specimens agree well with the description given by Kemp (1922). The rostrum is depressed in all specimens and the lamina is rather deeper in adult specimens than in juveniles. The number of rostral teeth varies as follows: males 9-10/0-1, non-ovigerous females 9-10/1, ovigerous females 9-11/1, juveniles 7-9/0-1. The ventral tooth is always small and in some cases minute. The rostral midrib is broadly expanded posteriorly, where it forms a distinct supraorbital ridge. The inferior orbital angle is slightly produced and broad and rounded. The hepatic and antennal spines are robust and acute. The abdominal pleura are rounded. The posterior lateral process of the sixth segment is strongly produced and acute and the posterior ventral angle is blunt. The anterolateral spine of the basicerite is particularly long and slender.

The mandible is without a palp. The molar process is robust with several acute teeth and some small fringes of setae. The incisor process is slender and bears three small acute teeth distally. The maxillula has a moderately broad upper lacinia with a notched lateral border and eight simple spines distally. The lower lacinia is slender and sparsely setose. The palp is normally developed, feebly bilobed, with a short hooked seta at the tip of the lower lobe. The maxilla has a stout, well developed palp, setose along its proximal lateral border. The distal endite is bifid with the distal lobe distinctly longer

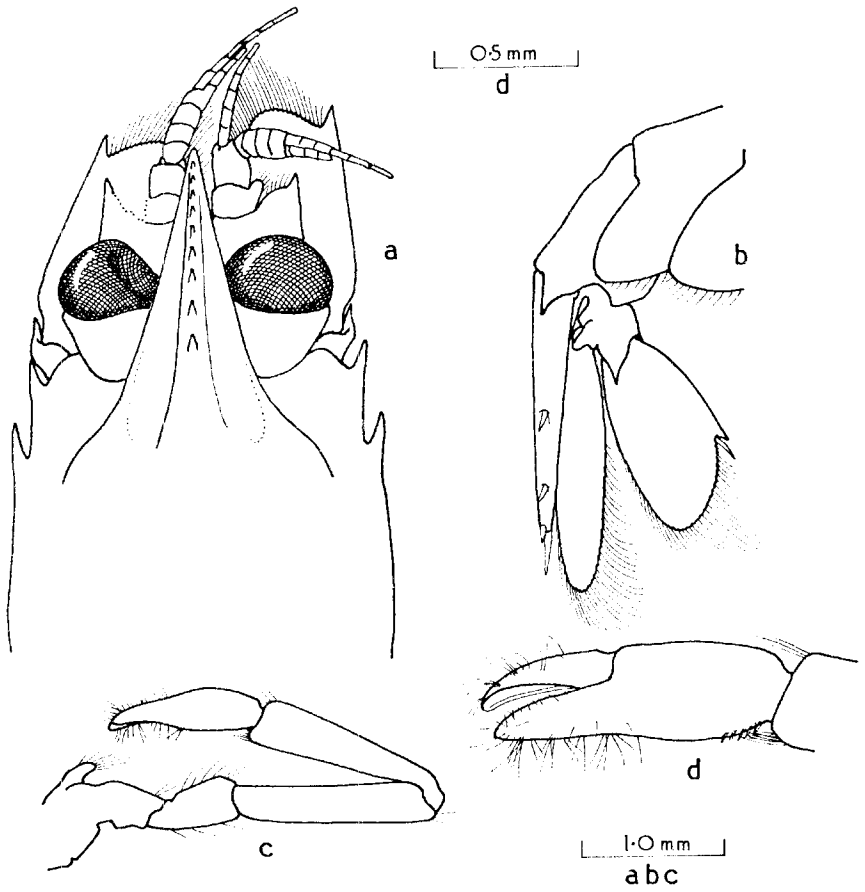


Fig. 3. *Periclimenes lanipes* Kemp, female. a, anterior carapace and antennae; b, posterior abdominal segments and caudal fan; c, first pereiopod; d, chela of first pereiopod.

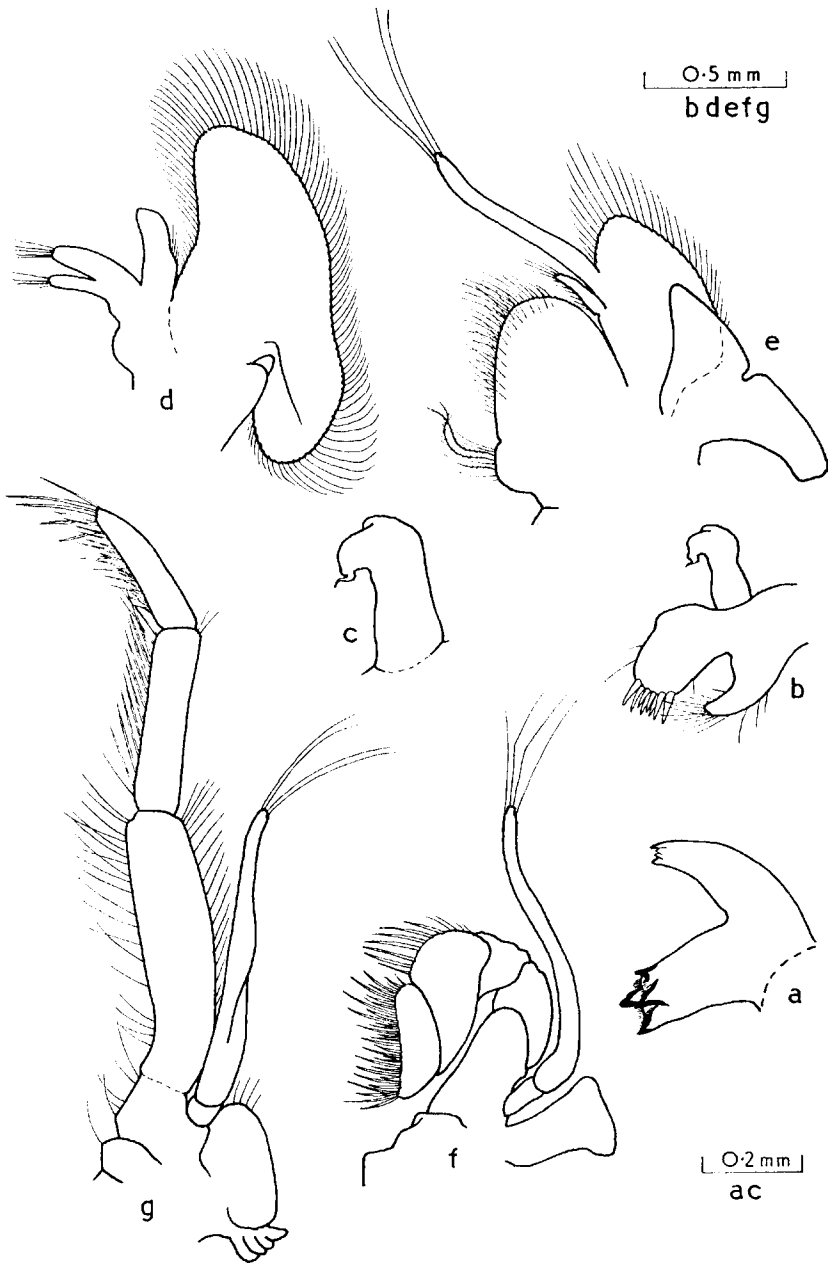


Fig. 4. *Periclimenes lanipes* Kemp, female. a, molar and incisor processes of mandible; b, maxillula; c, palp of maxilla; d, maxilla; e, first maxilliped; f, second maxilliped; g, third maxilliped.

and more robust than the proximal lobe. Each lobe bears a few simple setae at its extremity. The proximal endite is represented by a rounded swelling. The scaphognathite is broad. The maxillipeds are provided with small slender exopods, each bearing four plumose distal setae only. The palp of the first maxilliped is small and slender and setose terminally and along the medial border. The caridean lobe is moderately well developed. The large rounded basal endite, which has a fringe of simple setae along its distal and medial borders, is separated by a small notch from the small coxal endite, which bears a few short simple setae and two long plumose setae. The epipod is well developed and bilobed. The distal lobe is acute and the posterior lobe is elongated posteriorly and distally truncated. The second maxilliped is of normal type. The distal segment is broad with numerous simple spines along the medial border and similar but longer spines are present on the rounded antero-medial border of the penultimate segment. The epipod is sub-rectangular, with the distolateral angle slightly produced, and without a podobranch. The third maxilliped has the basis indistinctly separated from the ischiomerus. The terminal segment is about 0.8 of the length of the penultimate segment, and the terminal and penultimate segments are together subequal to the length of the mero-ischio-basal segment. The medial border of the endopod is provided with simple setae of increasing length and robustness distally. A large rounded epipod is present and a small tri-lamellar arthrobranch.

The merus and carpus of the first pereopod are subequal, equal to one and a half times the length of the chela, in which the fingers are slightly shorter than the palm and distinctly subspatulate. The coxa bears a small

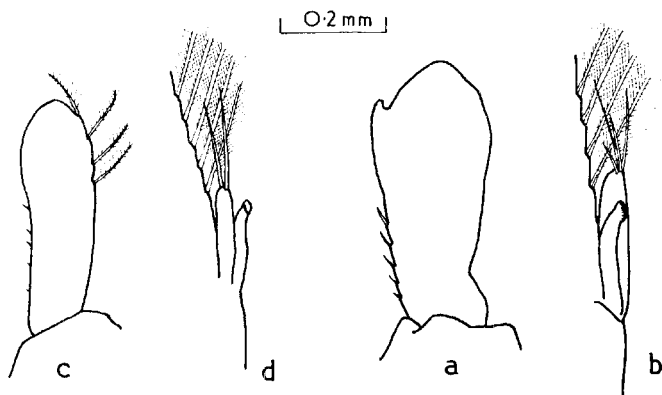


Fig. 5. a, b, *Perichlimes soror* Nobili, male. a, endopod of first pleopod; b, appendix interna and appendix masculina of second pleopod. c, d, *Perichlimes lanipes* Kemp, male. c, endopod of first pleopod; d, appendix interna and appendix masculina.

slender median process. The fourth thoracic sternite lacks a median process. The second to fifth pereopods and pleopods are as previously described. The basipodite of the uropod bears a long acute distolateral process. The distolateral tooth of the uropod and the adjacent mobile spine are particularly well developed. The endopod of the male first pleopod is a little more than three times longer than broad and slightly expanded distally. The proximal half of the medial border bears five short feeble simple spines and the distal half of the lateral border bears four feebly developed plumose setae. The appendix masculina of the male second pleopod distinctly exceeds the appendix interna and bears two long simple terminal setae only.

Colouration. — No data.

Measurements. — Carapace lengths, males 1.8-2.3 mm; ovigerous females 2.7-3.1 mm; non-ovigerous females 1.3-1.5 mm.

Host. — Numerous specimens of the ophiuroid *Euryale aspera* Lamarck were obtained from the same "Endeavour" stations as the specimens of *Periclimenes lanipes*. It seems reasonable to assume that this echinoderm was the host for these shrimps (Miss E. Pope, personal communication).

Remarks. — This species has been previously reported in association with the ophiuroids *Astroboa nigra* Döderlein, *Astroglymna sculptum* (Döderlein) and *Euryale purpurca* Mortensen.

It is the only Indo-West-Pacific pontoniid shrimp known to live in association with ophiuroid echinoderms.

The form of the endopod of the first and appendices of the second male pleopod have not been previously described. The process on the medial side of the endopod of the first pleopod, frequently found in related species of *Periclimenes* is lacking.

Distribution. Previously known only from the Mergui Archipelago and Moçambique. Now reported for the first time from Australia.

***Periclimenes noverca* Kemp (fig. 6)**

Periclimenes (*Periclimenes*) *noverca* Kemp, 1922: 141, 162-165, figs. 28-30; Holthuis, 1952: 9.

Material examined. — (1) 1 adult ♀, Bowen Island, Queensland; coll. E. H. Rainford; undated; QM No. W. 198.

Description. — The single specimen agrees well with the description given by Kemp (1922). The tip of the rostrum, which is slightly depressed, reaches the anterior margin of the antennular peduncle. There are twelve dorsal teeth present along the dorsal margin, with the most posterior tooth situated just in front of the posterior margin of the orbit. The ventral border is convex and without teeth. The antennal spine is slender and acute

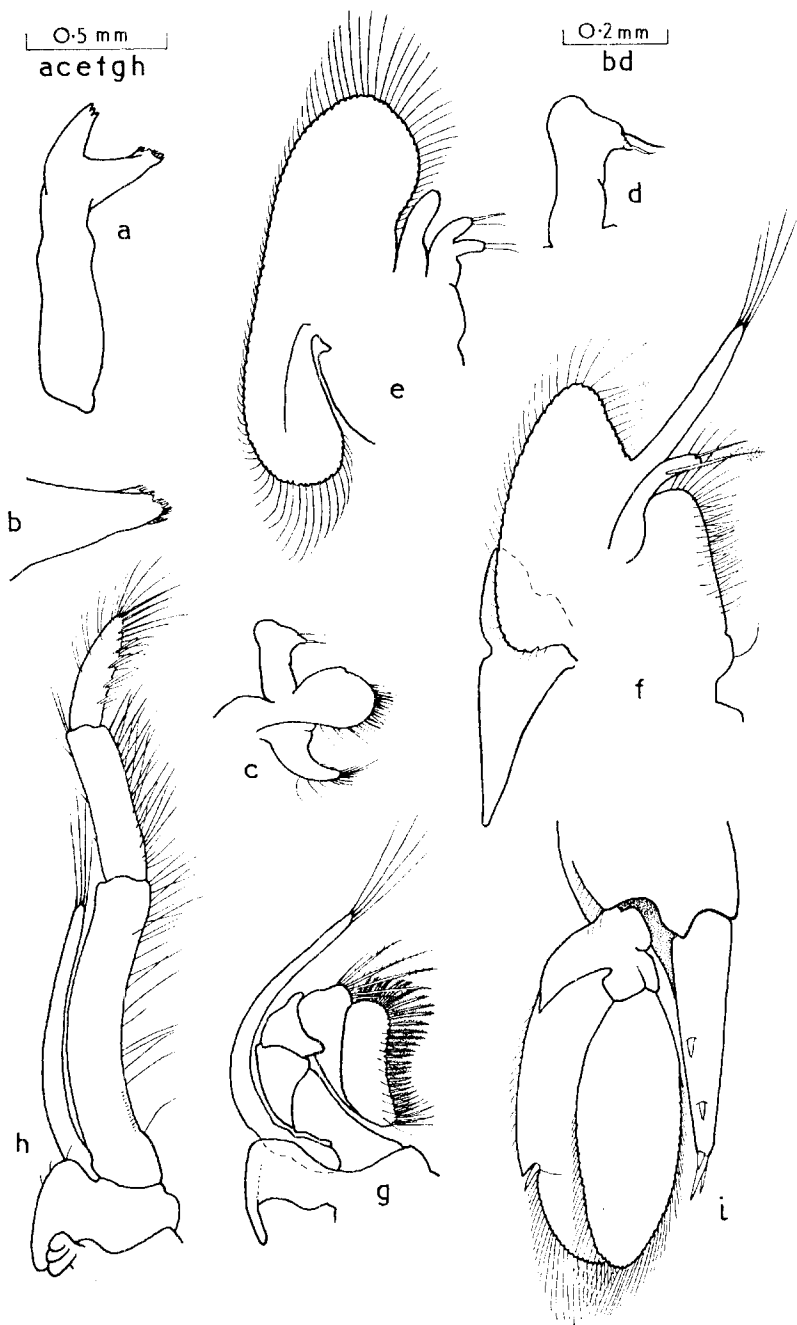


Fig. 6. *Periclimenes noverca* Kemp, female. a, mandible; b, molar process of mandible; c, maxillula; d, palp of maxillula; e, maxilla; f, first maxilliped; g, second maxilliped; h, third maxilliped; i, telson and uropod.

and arises from the anterior margin of the carapace well below the acute inferior orbital angle. The antennae are as in the holotype.

The mandible is without a palp. The molar process is slender with feebly developed processes and a marginal fringe of setae. The incisor process is also slender and bears three acute teeth distally. The maxillula has a broad upper lacinia, with a notched upper border and a fringe of simple setae distally. The lower lacinia is slender and bears numerous slender distal setae. The palp is well developed, not bilobed, with single stout setae medially and a small slender seta laterally. The maxilla has a stout non-setose palp. The distal endite is bifid, bearing two small subequal lobes. The distal lobe bears three simple setae and the proximal lobe bears two. The proximal endite is lacking and is represented by a low medial projection. The scaphognathite is well developed, broad and rounded anteriorly. The maxillipeds are all provided with small slender exopods, each with four plumose distal setae only. The first maxilliped has a well developed long, slender palp with a simple terminal seta and a longer plumose subterminal seta. The caridean lobe is well developed. The large, narrow basal endite is sparsely fringed with simple setae along its distal and medial borders and is separated by a small notch from the coxal endite, which bears only a single seta. The epipod is well developed and bilobed. The anterior lobe is triangular and the posterior lobe is acutely elongated posteriorly. The second maxilliped is of normal type. The distal segment is broad and bears a row of stout medial serrated spines along its medial and anterior margins. The anteromedial angle of the penultimate segment is feebly developed and bears several long sparsely plumose setae. The posterolateral angle is strongly produced. The third maxilliped has the basis fused to the ischiomerus. The terminal segment is about 0.85 times the length of the penultimate segment and the terminal and penultimate segments together are slightly shorter than the mero-ischio-basis. The medial border of the endopod is feebly setose, with simple setae increasing in length and robustness distally. At the proximal end of the ischial region there is a longitudinal row of very short spines close to the medial border. A large rounded epipod is present and a small bilamellar arthrobranch.

The first pereopod is as previously described but fails to reach the anterior margin of the lamella of the scaphocerite. The coxa is provided with a distinct medial setose projection. The fourth thoracic sternite lacks a median process. Both second pereopods are present and are similar, but the left chela is larger and more robust than the right (43:36). The fixed finger of the left chela bears four subequal teeth and the right three. The cutting edges of the dactyli are otherwise entire. The distal meral spine is

distinct on second to fifth pereopods. The spines on the posterior borders of the propods of the ambulatory pereopods appear rather more robust than in Kemp's illustration but are otherwise similar. The telson is short and broad, reaching to about two thirds of the length of the exopod of the uropod. The anterior pair of dorsal spines situated at the middle of its length and the posterior pair distinctly closer to the tip than to the anterior pair. The intermediate terminal telson spines are long and slender, equal to about a quarter of the telson length. The basal segment of the uropod has the posterolateral border produced to form a long acute process. The lateral border of the exopod is setose, short and convex and terminates with a large acute triangular tooth and a robust mobile spine at about two thirds of the length of the segment.

Colouration. — No data.

Measurements. — Carapace length 3.8 mm.

Host/Habitat. — No data.

Remarks. — The rediscovery of *Periclimenes noverca* shows that this species is closely related to other echinoderm commensals, particularly *P. soror* and *P. lanipes*.

Distribution. Previously known only from the holotype, which was obtained from New Caledonia. Now reported for the first time from Australia.

Parapontonia nudirostris Bruce

Parapontonia nudirostris Bruce, 1968: 1149-1157, figs. 1-5.

Material examined. — (1) 1 ♂, 1 ovigerous ♀, Heron Island, Capricorn Group, Great Barrier Reef, Queensland; coll. I. Bennett; 20 December 1962; AM Reg. No. P. 16119. (2) 1 ovigerous ♀, One Tree Island, Capricorn Group, Great Barrier Reef, Queensland, 40 ft.; coll. F. H. Talbot; 11 October 1968; AM, unregistered. (3) 1 ♂, Myora, North Stradbroke Island, Moreton Bay, Queensland, 2 ft below LWN; coll. A. J. Bruce; 9 July 1969.

Description. — The specimens agree closely with the previously published description. In the smaller female the lateral borders of the rostrum are less sinuous than in the holotype and in the larger female they are concave. The supraocular spines are slightly more acute. The acute epistomal horns are well developed in all specimens. The cornea in the Heron Island and Myora specimens is distinctly conoidally produced distally but in the One Tree Island specimen the cornea is quite globular and without any trace of a distal conoidal process.

Colouration. — The specimens (1) were a "uniform red all over body and appendages, with black cornea" and (2) were noted as being "rusty red in life". In the Myora specimen (3) the colouration was "dark purple red

dorsally and almost black laterally with a very fine white line extending longitudinally posteriorly from the antennal spine. The lateral border of the scaphocerite, the antennular flagella and the lateral part of the exopod of the uropod were mottled with transparent patches. The lower part of the branchiostegite was also feebly mottled. Appendages purple red except for transparent antennal flagellum. Cornea black".

Measurements. — Carapace lengths (1) ♂ 3.1 mm; ♀ 4.2 mm; (2) ♀ 4.4 mm; (3) ♂ 3.2 mm.

Host. — All specimens were obtained from crinoids. The host for (3) was identified as *Tropiometra afra afra* (Hartlaub) but the hosts for (1) and (2) have not been identified.

Remarks. — The presence of a conoidal corneal process in the Heron Island and Myora specimens, as described in the original material, and its absence in the One Tree Island specimen, is remarkable. The specimens are exactly comparable in all other features and there is no doubt that they belong to the same species. The conoidal corneal process, which was used by Borradaile as a subgeneric character for *Corniger*, 1915, has not been shown to be variable in any other species of pontoniid shrimp. It may be found only in the genera *Periclimenes* Costa, and *Dasycares* Kemp.

Distribution. — Previously known only from the specimens from Noumea, New Caledonia. Now reported for the first time from Australia.

***Ichnopontonia lophos* (Barnard)**

Philarius lophos Barnard, 1962: 242-243, fig. 2.

Ichnopontonia lophos Bruce, 1966: 484-589, figs. 1-5.

Material examined. — (1) 4 ♂, 5 ovigerous ♀, Great Palm Island, near Townsville, Queensland, 3.3-5.0 m; coll. J. Bloomfield; 26 February 1969. (2) 5 ♂, 4 ovigerous ♀, Orpheus Island, near Townsville, Queensland, 5.0-6.6 m; coll. J. Bloomfield; 27 February 1969. (3) 2 ♂, 2 ovigerous ♀, Fantome Island, near Townsville, Queensland, 2.4-3.3 m; coll. J. Bloomfield; 27 February 1969.

Description. — The present specimens closely resemble the Indian Ocean specimens previously described (Bruce, 1966). In the males the number of dorsal rostral teeth varies from 9 to 12. In the females there are 10 or 11 teeth only. For the males the mean is 10.45 (S.D. \pm 0.87) and for the females 10.36 (S.D. \pm 0.47).

Colouration. — No data.

Measurements. — Carapace lengths (1) ♂ 1.1-2.1 mm, ♀ 2.1-2.5 mm; (2) ♂ 1.4-2.0 mm, ♀ 2.1-2.3 mm; (3) ♂ 0.7-2.0 mm, ♀ 2.3-2.4 mm.

Host. — *Galaxea fascicularis* (L.).

Remarks. — Twelve specimens of the host coral *Galaxea fascicularis* were examined for their pontoniid shrimp commensals. Each sample contained

specimens of *Ischnopontonia lophos*, with only a single exception, which contained the pair of specimens of *Anapontonia denticauda* also reported in this paper. Out of the eleven colonies with specimens of *Ischnopontonia lophos*, eight contained a pair of shrimps consisting of a single male and ovigerous female. In two other corals there was (a) a single male and (b) a single ovigerous female. In these specimens it is probable that the partner was lost in each case during the collection of the coral, which is frequently difficult to collect without damage. In one of the largest coral specimens there were two males and two ovigerous females. This specimen measured about 10×15 cms. The smallest specimen examined was approximately 6×9 cms. It may be noted that the shrimp *Platycaris latirostris* Holthuis, which is commonly present in the coral *Galaxea fascicularis* with *Anapontonia denticauda* and *Ischnopontonia lophos*, was not found in the specimens examined. Further it may be recorded that each *Galaxea* colony also contained specimens of the alpheid shrimp, *Racilius compressus* Paulson.

In the dentition of the rostrum the mean number of teeth is 10.41 with a standard deviation of ± 0.81 . The Australian specimens therefore more closely resemble specimens from the western Indian Ocean (10.24 ± 2.4) rather than specimens from the Malayan region (10.88 ± 1.0).

Ova were removed from ten females and the number ranged from 78 to 266 with a mean of 156, being greater in the larger specimens. The greater diameter of the ovum ranged from 0.52 mm (undeveloped) to 0.63 (advanced).

Distribution. Previously known from Zanzibar, Tanzania; the Comoro Islands; Aldabra, Farquhar and the Seychelle Islands; Singapore and Pulau Perhentian Besar, Malaya. Now reported for the first time from Australia.

Anapontonia denticauda Bruce (fig. 7)

Anapontonia denticauda Bruce, 1966: 505-507; Bruce, 1967: 3-12, figs. 1-4.

Material examined. — (1) 1 ♂, 1 ovigerous ♀, Orpheus Island, Palm Islands, near Townsville, Queensland, 15-20 ft.; coll. J. Bloomfield; 27 February 1960.

Description. — In general the specimens show a close agreement with the original description but some points of variation may be noted. The male has fourteen teeth along the dorsal margins of the rostrum and carapace, and the female has sixteen. These numbers fall within the range noted for western Indian Ocean specimens but the teeth in the Australian specimens appear larger and more projecting. The exopod of the uropod in the female bears five long teeth on each side and in the male there are three long teeth on the right uropod and four on the left uropod. The adult western Indian Ocean specimens had up to seven lateral teeth on the exopod of the uropod

although juveniles from Zanzibar had as few as three teeth in this position.

Colouration. — In fresh formalin-preserved material the female has scattered small red spots over the surface of the thoracic and abdominal ovary, at the base of the eyestalks, the bases of the antennal peduncles, as narrow streak down the pleura of the second to fourth segments, generally over the

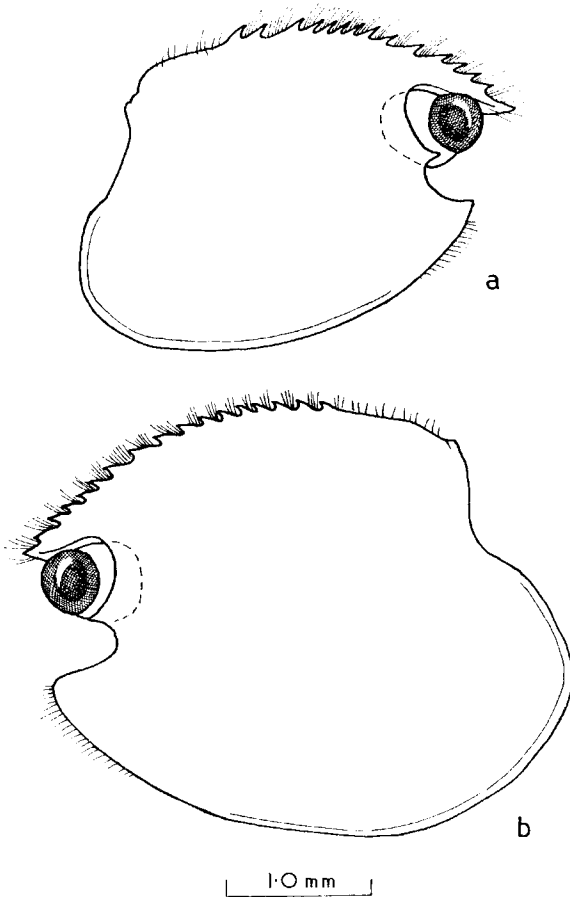


Fig. 7. *Anapontonia denticauda* Bruce. a, male carapace; b, female carapace.

fifth pleuron and along the lower part of the sixth abdominal segment, the basipod and exopod of the uropod and the proximal half of the endopod. The tips of the fingers of the second pereiopod are orange brown and the ambulatory pereiopods pale yellow. The rest of the shrimp appears to have been transparent. Ova greenish olive.

Measurements. — Carapace length, ♂ 1.8 mm, ♀ 2.2 mm.

Host. — *Galaxea fascicularis* (L.).

Remarks. — As has been previously noted, this species appears to be naturally rare, even where the host coral occurs in abundance. The present specimens were obtained from a series of twelve host corals which were examined for commensal shrimps. Although all colonies were rather stunted, apart from the colony containing the *Anapontonia*, all corals were found to contain at least one pair of *Ischnopontonia lophos* (see above) and *Racilius compressus* Paulson. Colonies of *Galaxea fascicularis* examined by the author at Heron Island in 1966 did not contain any specimens of *Anapontonia*.

In this genus, the distolateral spine of the scaphocerite is unusually robustly developed, and in the preserved specimens, removed from the coral, was found to be strongly abducted so as to be at a right angle to the axis of the body. It seems probable that this spine is also part of the mechanism which, in conjunction with the uropods, enables the shrimp to jam itself between the corallites of the host when disturbed.

Distribution. — Previous records only from Zanzibar and the Comoro Islands in the western Indian Ocean. Now reported for the first time from Australia.

Anchistioides willeyi (Borradaile) (fig. 8)

Palaemonopsis willeyi Borradaile, 1899: 410, pls. 36, 37, fig. 7.

Amphipalacmon willeyi Nobili, 1901: 5; Borradaile, 1917a: 407, pl. 59 fig. 13.

Amphipalacmon gardineri Borradaile, 1915: 209; Borradaile, 1917a: 407, pl. 59 fig. 11.

Amphipalacmon cooperi Borradaile, 1915: 209; Borradaile, 1917a: 407.

Anchistioides willeyi Gordon, 1935: 344, figs. 23a, 24a; Holthuis, 1952: 214, 215, figs. 106, 107.

Material examined. — (1) 1 ovigerous ♀, One Tree Island, Capricorn Group, Great Barrier Reef, Queensland, Australia; December, 1962; AM Reg. No. P. 16121.

Description. — The single specimen has been broken across between the third and fourth abdominal segments and the posterior portion is preserved. The specimen agrees well with data already provided by Gordon (1935) and Holthuis (1952). The rostrum is well developed with six dorsal and three ventral teeth. No teeth dorsally on the proximal third or the distal third. The postorbital tubercle is bluntly rounded and not strikingly conspicuous. The posterior lateral angle of the sixth abdominal segment bears a short acute spine and the ventral angle is acute. The distal spine of the scaphocerite is short, stout and acute, but scarcely exceeds the anterior margin of the lamella, which is angularly produced and almost rectangular. The coxa of the first pereopod is without a median setose lobe and the fourth thoracic segment is without a median process. The second pereopods

have the fingers slightly longer than the palm. The cutting edges are entire throughout their length, with 8-9 small rounded teeth medially on the proximal half and a pair of long slender mobile setae on the distal half. A distinct fossa is present proximally on the dactylus. The third pereiopods bear a fringe of plumose setae along the dorsal borders of the ischium and merus. The carpus is distinctly shorter than the propodus (35:30), which

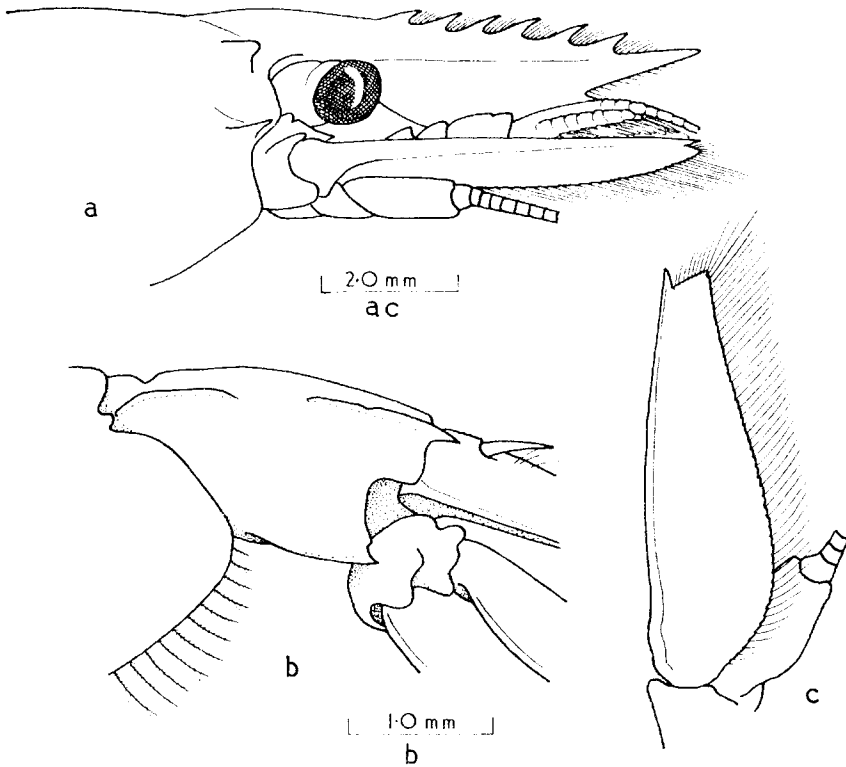


Fig. 8. *Anchistioides willeyi* (Borradaile), female. a, anterior carapace and antennae; b, sixth abdominal segment, lateral; c, scaphiocerite.

bears paired terminal and subterminal spines. The dactylus is about 0.22 of the length of the propodus and bears a small acute accessory spine. The fourth and fifth pereiopod are similar but shorter and more slender.

Colouration. — Noted as “completely transparent in life”.

Measurements (in mm). — Length of carapace and rostrum, 15.6; postorbital carapace length, 9.5; carapace length/rostral length, 1.55; palm of chela of second pereiopod, 4.7; fingers of chela of second pereiopod, 5.5; fingers/palm of second pereiopod, 1.17; carapace/chela of second pereiopod, 1.07.

Host. — No data.

Remarks. — The separation of *A. australiensis* (Balss) from this species is noted under that species. The present species appears to be of a generally smaller size and is known to be associated with sponges, although the host of the present specimens was not recorded.

Distribution. — Previously known only from the Maldive Archipelago (Borradaile, 1915, 1917), Borneo Bank, the Sulu Archipelago and the Aru Islands (Holthuis, 1952) and New Britain (Borradaile, 1899). Now reported for the first time from Australia.

***Anchistioides australiensis* (Balss) (fig. 9)**

Amphipalacmon australiensis Balss, 1921: 11-13, figs. 3-6.

Anchistioides australiensis Gordon, 1935: 315, figs. 23d, 24d.

Material examined. — (1) 1 ♂, off Bensbach River, New Guinea; 5 fms; R.V. "Oshorn Maru"; coll. D. J. Tuma, December 1968.

Description. — The rostrum is well developed with a long slender edentate tip as shown in Balss's illustration. There are seven slender acute dorsal teeth and three ventral teeth. The proximal sixth is without teeth, which extend over the adjacent half, while the distal third is without teeth. The postorbital spine is very large and acute, projecting anteriorly. The antennal spine is also very well developed. The posterior lateral angle of the sixth abdominal segment bears a long slender acute spine, supported anteriorly by a carina. The posterior ventral angle is also acutely produced and projects posterolaterally. The telson lacks dorsal spines but bears a pair of small lateral terminal spines, a pair of larger, short, stout, intermediate spines and a pair of intermediate setae. The scaphocerite is elongated with a convex lateral border terminating in a long slender acute spine. The lamella is not produced distally but blends gradually with the medial side of the distal spine. The mouthparts correspond closely to the illustrations given by Holthuis (1952) for *A. willeyi*. It may be noted that in the third maxilliped the basis is fused with the ischiomerus and there is a well developed arthrobranch with many lamellae. The first pereopod shows no special features and the coxa lacks a median setose process. The fingers are densely setose and the cleaning setae are particularly well developed. The fourth thoracic sternite is unarmed. The second pereopods have the fingers distinctly longer than the palm. The second pereopods show no differences from those of *A. willeyi*. The third pereopod shows a dense fringe of long setae on the dorsal borders of ischium to propodus with a similar fringe on the ventral sur-

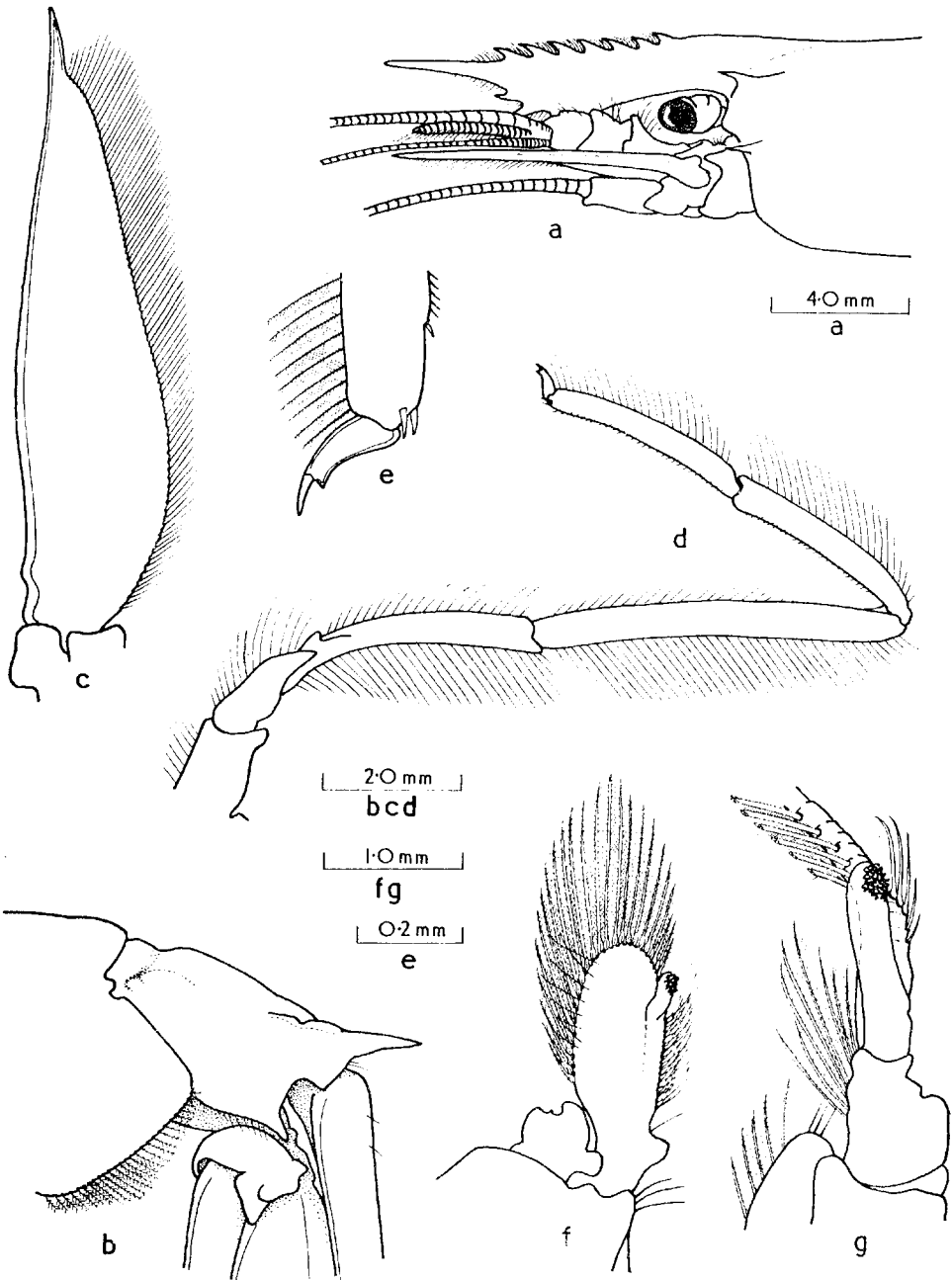


Fig. 9. *Anchistioides australiensis* (Balss), male. a, anterior carapace and antennae; b, sixth abdominal segment; c, scaphocerite; d, fifth pereiopod; e, dactylus of fifth pereiopod; f, endopod of first pleopod; g, appendix interna and appendix masculina of second pereiopod.

faces of ischium and merus, but with a row of numerous short setae along the carpus and propodus ventrally. The carpus is slightly shorter than the propodus. The dactylus is about 0.16 of the length of the propodus, and bears a small acute accessory tooth.

Colouration. — Transparent when freshly preserved, with pinkish tinge. Cornea black.

Measurements (in mm). — Total body length, 50.0; length of carapace and rostrum, 23.5; postorbital carapace length, 13.0; rostral length/carapace length, 1.23; palm of chela of second pereiopod, 5.4; fingers of chela of second pereiopod, 7.0-8.0; fingers of second pereiopod/palm, 1.38; chela of second pereiopod/carapace, 1.01.

Host. — No data.

Remarks. — In her review of the genus *Anchistioides*, Gordon (1935) considered that *A. australiensis* (Balss) was probably a synonym of *A. willeyi* (Borradaile) and this course was subsequently followed by Holthuis (1952), who reported that the description of *A. australiensis* was based upon not yet fully grown specimens of *A. willeyi*, of total length of 16 and 24 mm. The large size of the present specimen leaves no doubt that it is fully grown as it is the largest specimen of *Anchistioides* of any species yet reported. It corresponds closely to Balss's description and illustrations and indicates that *A. australiensis* is a valid, although apparently rare, species. It is interesting to note that the present record is not far from the locality where the original specimens were collected.

In addition to the specimen of *A. willeyi* described in this report, a further twenty-seven specimens, mainly from the Indian Ocean and South China Sea, were also available for comparison. The largest ovigerous female amongst these specimens had a postorbital carapace length of 9.3 mm and the largest male, 8.0 mm, both well below the size of the present specimen of *A. australiensis*, and all lacked the long slender edentate tip of the rostrum, and the long spinous process at the posterolateral angle of the sixth abdominal segment. The postorbital process is also less acute or blunt and the anterior margin of the lamella of the scaphocerite is angularly produced. The eye in *A. australiensis* also appears to be distinctly smaller than in *A. willeyi*.

The absence of dorsal spines on the telson is attributed to an individual anomaly rather than a characteristic of the species as these spines are present in the type specimens.

Anchistioides australiensis will probably be found to be a commensal of sponges but there is at present no information concerning its association or habitat.

Distribution. — Previously known only from two immature specimens collected from 20 fms at Cape Jaubert, Western Australia.

ON THE MOUTHPARTS OF THE
PERICLIMENES SPECIES DESCRIBED HERE

The mouthparts of numerous species of the genus *Periclimenes* have now been described (Holthuis, 1952; Kubo, 1940) and are of particular interest in view of the commensal habits that have been developed by most of the species of this genus. The four species noted in the present report are all very closely related and are all known to live in association with echinoderm hosts (Bruce, 1965). Although the mouthparts conform to the general characteristics of the genus, a very wide range of variation in the smaller morphological features is readily detected upon close examination. These smaller details are probably intimately associated with the feeding habits of the shrimps and will be an important factor in preventing the spread of the species concerned away from their normal hosts. The species of *Periclimenes* reported upon are able to associate with a variety of hosts at specific or generic level. Generally hosts are restricted to the genera of certain families and, with one possible exception, hosts of different classes are not colonized by a single species. In the case of the present species, *P. soror* and *P. noverca* are restricted to asteroid associations, *P. lanipes* to ophiuroids and *P. commensalis* to crinoids.

The mouthparts of the echinoderm associates may be first conveniently compared with those of *Periclimenes elegans* (Paulson), a free-living, actively predatory species of the genus. *P. elegans* represents the unspecialized development of the mouthparts and closely resembles the condition found in the most closely related palaemonine relations of the Pontoniinae. This species differs in having a more heavily built mandible with a stout molar process bearing strong teeth and few setae. The incisor process is much broader and with stouter distal teeth. The maxillula is generally similar but the upper lacinia is not broadened and bears more numerous and stouter spines distally. The palp is bilobed but the lower lobe lacks a terminal seta. The palp of the maxilla is more stout and the distal endite more strongly developed, deeply divided into two large, subequal lobes. There is no trace of the proximal endite. The scaphognathite is broad but strongly narrowed anteriorly; the posterior lobe is large. The exopods of the maxillipeds are better developed, flattened rather than cylindrical in section and with numerous plumose setae distally. The palp is relatively feebly developed. The basal and coxal endites are large and well developed and clearly separated by a deep notch. The coxal endite is densely setose.

The caridean lobe is distinctly small but a very large epipod is present. In the second maxilliped the terminal segment is very small and narrow, while the penultimate segment is large with a heavily spinulated anteromedial border. The combined lengths of the terminal and penultimate segments of the third maxilliped, which are heavily spinose, are far greater than the length of the antepenultimate segment and the basis is quite distinct from the ischiomerus. The coxa bears an acute process on its medial border and a small epipod laterally. A small arthrobranch with numerous lamellae is also present.

The morphological differences between the mouthparts of the eclinoderm commensals may now be detailed. The mandible is particularly slender in *P. soror* and relatively stout in *P. commensalis*, with *P. noverca* and *P. lanipes* in intermediate positions. The molar process of *P. soror* is provided distally with fringes of fine setae whereas in *P. commensalis* large blunt teeth and stout setae are present. *P. noverca* generally resembles *P. soror* while *P. lanipes* is more like *P. commensalis*. The incisor processes are generally similar in the four species.

In the maxillula the upper lacinia varies from a narrow form with an entire anterior margin in *P. soror*, and a broadened form with an entire anterior margin in *P. commensalis*, to a broadened form with a notched anterior margin in *P. lanipes* and more markedly, in *P. noverca*. The armament of the distal end of the upper lacinia varies from numerous very slender feebly spiniform setae in *P. noverca*, or a intermixture of spines and setae in *P. soror* and *P. commensalis*, to a series of stout spines in *P. lanipes*. The lower lacinia is unfortunately abnormal in one dissected specimen, but in the three remaining species this feature shows variations only in shape, being relatively stout in *P. commensalis* and slender in *P. noverca*. The palp of the maxillula is strongly bilobed in *P. soror*, feebly bilobed in *P. lanipes* and *P. commensalis* and simple in *P. noverca*. The lower lobe may be short and truncated as in *P. lanipes* and *P. commensalis*, slightly elongated as in *P. noverca* or considerably elongated as in *P. soror*. Where the lower lobe is short it bears a small ventral hooked seta but in the elongated type a long slender terminal seta is present. *P. noverca* is exceptional in that a single additional seta is present arising from the anterior aspect of the lower lobe.

The palp of the maxilla is relatively slender in *P. soror* and *P. noverca*, in which it is non-setose. In *P. commensalis* it is slightly stouter, and bears a row of long simple setae along its medial border. In *P. lanipes* it is most robust and bears a short row of simple setae on the proximal half of the lateral border. In all species the distal endite is well developed but only

in *P. commensalis* is it simple, where it bears a well developed fringe of setae. In *P. soror*, *P. noverca* and *P. lanipes* the endite is deeply bifid. The two lobes are well developed and of similar length in *P. lanipes* where the distal lobe is slightly more robust than the proximal lobe. In *P. noverca* the two lobes are small and subequal and in *P. soror* the upper lobe is well developed but the lower lobe is short and small. In all three species the endites are very feebly setose. In all four species the lower endite is absent, but in two, *P. soror* and *P. lanipes*, it is represented by a small rounded marginal eminence. In *P. noverca* and *P. commensalis* an elongated low expansion is present in this position. The scaphognathite is particularly narrow in *P. commensalis* and broad in *P. lanipes*. In *P. noverca* the anterior lobe is slightly expanded and in *P. lanipes* it is rather tapered anteriorly.

On the first maxilliped the palp is large and stout in *P. soror*, long and slender in *P. noverca*, shorter in *P. commensalis* and small and feebly developed in *P. lanipes*. In *P. soror* a single large subterminal seta is present, in *P. noverca* a similar plumose seta and an additional terminal simple seta. In *P. commensalis* a sparse row of long simple setae is present along the medial border and in *P. lanipes* a similar row of numerous medial and terminal setae is present. The basal endite is broad in *P. commensalis* and *P. lanipes* and comparatively narrow in the other two species, where it is also relatively less heavily setose. In *P. lanipes* the coxal endite is comparatively clearly demarcated and bears several long plumose setae. Similar setae are present in *P. commensalis* where the endite is feebly indicated. In *P. noverca* the feebly developed endite bears only a single seta and in *P. soror* the endite is scarcely distinguishable and devoid of setae. In all species the caridean lobe is well developed and it is relatively larger in *P. noverca* than in the other species. The epipod is small in *P. commensalis* and generally rounded and feebly bilobed. In *P. soror* it is distinctly bilobed with an acute anterior lobe and the posterolateral angle of the posterior lobe slightly produced. In *P. lanipes* the epipod is similar but the posterior lobe is markedly produced and distally truncated. In *P. lanipes*, however, the posterior lobe is even more strongly produced and is distally acute.

The second maxilliped has the terminal segment relatively small and narrow in *P. lanipes* and *P. commensalis* and larger and broader in *P. noverca* and particularly *P. soror*. In the latter species the anterior and medial margin is provided with a row of stout spines which bear dense rows of spinules along the anterior and posterior margins. In *P. lanipes* these spines are more numerous, less stout and without spinulation. In *P. commensalis* these spines are slender and more numerous still. The

anteromedial region of the penultimate segment is feebly enlarged in *P. soror* and *P. noverca* and bears a few long plumose setae only. In *P. commensalis* it is slightly enlarged with numerous long slender setae and in *P. lanipes* it is strongly enlarged, bearing a row of stout spines. The epipod is subrectangular in *P. commensalis*, with the posterolateral angle slightly produced in *P. lanipes* and *P. soror* and markedly produced in *P. noverca*.

In the third maxilliped the antepenultimate segment is broad in *P. lanipes*, less broad in *P. noverca* and *P. soror* and slender in *P. commensalis*. A longitudinal submarginal row of short erect setae is present proximally on the medial border in *P. noverca* but is not found in the three other species. Also in *P. noverca* the basis cannot be distinguished from the ischiomerus but it is indistinctly separated in *P. soror*, *P. noverca* and *P. commensalis*. The endopod is sparsely setose in *P. soror* with a few stout spinulate spines on the terminal segment. In the other species the setae are more numerous and spinulate spines are absent. In *P. lanipes* the lateral border of the antepenultimate segment bears numerous long setae, a feature absent from the other species. The exopod fails to exceed the length of the antepenultimate segment in all species except *P. soror*. The coxa bears an oval epipod in each species, smallest in *P. noverca*, largest in *P. soror* where it is more elongated or in *P. commensalis* in which it is broadened. The medial border of the coxa forms a large rounded lobe in *P. soror* with small rounded projections only in *P. noverca* and *P. lanipes* and a truncated border in *P. commensalis*. In *P. lanipes* a well developed small arthrobranch is present. In *P. noverca* the arthrobranch is rather smaller, feebly developed in *P. commensalis* and rudimentary in *P. soror*.

The numerous small morphological differences in the mouthparts of the four species of *Periclimenes* indicate that each species is specialized, especially when compared with the mouthparts as found in a less specialized species such as *P. elegans*. Such specialization must be presumed to be in association with the type of food utilized by the shrimps as derived from its association with the host animal. As yet there is no information concerning the food or feeding habits of the commensal species of *Periclimenes*, which may involve a variety of methods. It may be noted that, when the circumstances of collection are known, the commensal species are apparently never caught in a free-living condition away from their hosts, which might be the case if the host was used solely as a source of shelter, with the shrimp leaving it periodically to obtain its food independently. The development of restricted feeding habits and subsequently specialized modifications in the feeding appendages will be an important

factor in the speciation of related forms leading to a high degree of specificity in shrimp/host relationships.

ACKNOWLEDGMENTS

I am particularly grateful to Dr. J. C. Yaldwyn for helpful comments upon the draft of this paper. I am also grateful to Miss A. M. Clark for the identification of many of the crinoid hosts of the shrimps reported upon.

RESUMÉ

Les détails de l'incidence dans les eaux australiennes de neuf espèces rares de crevettes pontoniides sont donnés, avec des notes sur les conchères et les hôtes. Sept espèces n'avaient pas encore été trouvées en Australie et quatre espèces ne sont connues que par les spécimens typiques originaux. Les parties buccales de quatre espèces proches de *Perichimenes* sont décrites en détail et les différences morphologiques sont comparées et leur importance est discutée.

LITERATURE CITED

- BALSS, H., 1921. Stomatopoda, Macrura, Paguridea und Galatheidea. Results of Dr E. Mjöberg's Swedish scientific expeditions to Australia, 1910-13. XXIX. — K. Svenska Vetensk. Akad. Handl., **61**: 1-21, figs. 1-12.
- BARNARD, K. H., 1962. New records of marine crustacea from the East African region. — *Crustaceana*, **3**: 239-245, figs. 1-2.
- BORRADAILE, L. A., 1899. On the Stomatopoda and Macrura brought by Dr Willey from the South Seas. In: WILLEY, A. Zoological results based on material collected from New Britain, New Guinea, Loyalty Islands and elsewhere, collected during the years 1895, 1896 and 1897, **4**: 395-428, pls. 36-39.
- , 1915. Notes on Caridea. — *Ann. Mag. nat. Hist.*, (8) **15**: 205-213.
- , 1917. On the Pontoniinae. The Percy Sladen Trust Expedition to the Indian Ocean in 1905, under the leadership of Mr J. Stanley Gardiner. — *Trans. Linn. Soc. London (Zool.)*, (2) **17**: 323-396, pls. 52-57.
- , 1917a. On Carides from the western Indian Ocean. The Percy Sladen Trust Expedition to the Indian Ocean in 1905, under the leadership of Mr J. Stanley Gardiner. — *Trans. Linn. Soc. London, (Zool.)*, (2) **17**: 397-412, pls. 58-59.
- BRUCE, A. J., 1965. Notes on Indo-Pacific Pontoniinae. X. *Perichimenes cristimanus* sp. nov., a new pontoniid shrimp from Singapore. — *Ann. Mag. nat. Hist.*, (13) **8**: 487-493, figs. 1-2.
- , 1966. Notes on some Indo-Pacific Pontoniinae. XI. A re-examination of *Philarius lophos* Barnard, with the designation of a new genus, *Ischnopontonia*. — *Bull. Mar. Sci. Univ. Miami*, **16**: 584-598, figs. 1-5.
- , 1967. Notes on some Indo-Pacific Pontoniinae. III-IX. Descriptions of some new genera and species from the western Indian Ocean and South China Sea. — *Zool. Verh., Leiden*, **87**: 1-73, figs. 1-29.
- , 1968. A report on some pontoniid shrimps from New Caledonia. — *Bull. Mus. Hist. nat. Paris*, (2) **39** (6): 1148-1171, figs. 1-10.
- CLARK, A. H., 1921. A monograph of the existing crinoids. I. The comatulids. (2). — *Bull. U.S. Nat. Mus.*, **82**: i-xxv, 1-770, figs. 1-949, pls. 1-57.
- EDMONDSON, C. H., 1935. New and rare Polynesian Crustacea. — *Occ. Pap. Bishop Mus. Honolulu*, **10**: 1-38, figs. 1-11, pls. 1-2.
- GORDON, I., 1935. On new or imperfectly known species of *Crustacea Macrura*. — *Journ. Linn. Soc. London, (Zool.)*, **39**: 307-351, figs. 1-27.

- , 1939. Redescription of *Periclimenes soror* Nobili (Crustacea Decapoda). — Ann. Mag. nat. Hist., (11) **4**: 395-400, figs. 1-3.
- HOUTHUIS, L. B., 1952. The Decapoda of the Siboga Expedition. Part XI. The Palaemonidae collected by the Siboga and Snellius Expeditions with remarks on other species. II. Sub-family Pontoniinae. — Siboga Exped. Mon., **39** (a¹⁰): 1-252, figs. 1-110, 1 tab.
- , 1959. Results of the re-examination of the type specimens of some species belonging to the subfamilies Pontoniinae and Palaemoniinae (Crustacea, Decapoda Macrura). — Zool. Meded. Leiden, **36**: 193-200, 1 fig.
- JACQUOTTE, R., 1964. Notes de faunistique et de biologie marine de Madagascar. II. Décapodes nageurs associés aux échimodermes dans la région de Tuléar (sud-ouest de Madagascar). — Rec. Trav. Station mar. Endonne, Bull., **32**: 179-182.
- KEMP, S., 1922. Notes on Crustacea Decapoda in the Indian Museum. XV. Pontoniinae. — Rec. Indian Mus., **24**: 113-228, figs. 1-115, pls. 3-9.
- KUBO, L., 1940. Studies on Japanese palaemonoid shrimps. II. Pontoniinae. — Journ. Imp. Fish. Inst. Tokyo, **34**: 31-75, figs. 1-36.
- MACNAE, W. & M. KALK, 1958. A natural history of Inhaca Island, Mozambique: i-vi, 1-163, figs. 1-30, pls. 1-11.
- MIYAKE, S. & T. FUJINO, 1968. Pontoniid shrimps from the Palau Islands (Crustacea, Decapoda, Palaemonidae). — Journ. Fac. Agric. Kyushu Imp. Univ., **10**: 399-431, figs. 1-8.
- NOBILI, G., 1901. Decapodi e Stomatopodi Eritrei del Museo Zoologico dell'Università di Napoli. — Annu. Mus. zool. Univ. Napoli, **1**: 1-20.
- , 1904. Diagnoses préliminaires de vingt-huit espèces nouvelles de Stomatopodes et Décapodes Macroures de la Mer Rouge. — Bull. Mus. Hist. nat. Paris, **10**: 228-238.
- POTTS, F. A., 1915. The fauna associated with the crinoids of a tropical coral reef; with especial reference to its colour variations. — Pap. Dept. mar. Biol. Carnegie Inst., **8**: 73-96, figs. 1-7, pl. 1.
- SCHMITT, W. L., 1926. Report on the Crustacea Macrura (families Penaeidae, Campylonotidae and Pandalidae) obtained from the F.I.S. Endeavour in Australian seas. — Zool. Res. Fish. Exp. 'Endeavour', **5**: 300-381, pls. 57-68.



