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SOME CORAL REEF PONTONIINE SHRIMPS FROM VIETNAM

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Abstract

Records are provided of 25 species of pontoniine shrimps from the coral reefs of Vietnam. Few carideans have been previously reported from Vietnamese seas and all species, except *Anchistus miersi* De Man, *Coralliocaris graminea* and *Periclimenes brevicarpalis* (Schenkel), are now recorded there for the first time, although most are common and well-known Indo-West Pacific species. Most of the species reported are commensals of corals or bivalve molluscs. Many more species associated with other types of host, or free-living, may be expected to occur in Vietnamese waters. The fauna of Vietnam is compared with those of Hong Kong and Singapore.

Introduction

The shrimp fauna of Vietnam has attracted very little scientific attention, and few pontoniine shrimps from that country have been reported in the scientific literature. The only citations located are those of Kemp (1922), who reported the occurrence of *Anchistus miersi* (De Man), *Coralliocaris graminea* (Dana), and *Periclimenes brevicarpalis* (Schenkel), all from Pulo Con Dua (Pulo Condore). The pontoniine faunas of both Singapore and Hong Kong are comparatively well known, having been initiated by the studies of Lanchester (1900) and Stimpson (1860), respectively and augmented considerably in more recent times (Johnson 1961, 1979; Bruce 1979, 1982, 1990a, 1992). Almost 60 species are known collectively from the three regions, but less than half have been collected from any single locality. Both Hong Kong and Singapore represent restricted sites and habitats that have now been long subjected to intense human interference. Their present faunas may well represent their actual and probably diminishing fauna, but the long coastline of Vietnam may be expected to provide a much great diversity in due course when studied in more detail.

The present collection was made by Dr T.A. Britaev and Dr Y.Y. Dgebuadze by snorkel and SCUBA in 1985–87, supported by the Institute of Evolutionary Animal Morphology and Evolution, Moscow, and Marine Research Institute of Vietnam, Nha Trang, and 1989–90, by the Soviet-Vietnamese Tropical Research Centre, and consists primarily of species from branching coral hosts and bivalve molluscs. The collections were made mainly at Tam, Tre and Mung Islands, off Nha Trang. The specimens reported upon are deposited in the collections of the Northern Territory Museum, Darwin. A parallel collection has been placed in the collection of the Zoological Collection, Moscow State University.

Restricted synonymies only are provided, with fuller details being available in Holthuis (1952). Carapace length (CL) refers to the postorbital carapace length.

Systematic Account

Anchistus australis Bruce

Anchistus australis Bruce, 1977: 56–62, figs 7–9.

Material examined. (i) 1 male, 1 ovig. female, Tre Island, stn. 19, 3 m, 7 March 1990, NTM Cr.008374.

and a detached ambulatory pereiopod. The rostrum has three minute denticles distodorsally and the first pereiopod chela has non-cannulate fingers and palm.

Host. Pinna sp., [Mollusca: Pinnidae].

Distribution. Type locality: Gillet Cay, Swain Reefs, Great Barrier Reef. Also known from the Ryukyu Islands, Japan; One Tree and Heron Islands, Capricorn Islands, Great Barrier Reef and Seram Island, Indonesia.

Anchistus custos Forsskål

Cancer custos Forsskål, 1775: 94.
Harpilius inermis Miers, 1884: 291, pl. 32 B.
Anchistus inermis - Borradaile, 1898:387.
Anchistus custos - Holthuis, 1952: 105–109, figs. 86–89.

Material examined. (i) 1 male, 1 ovig. female, Tre Island, stn. 2, 2 m, 13 February 1987, NTM Cr.008378. (ii) 1 male, 1 ovig. female, Tam Island, stn. 5, 2 m, 20 February 1987, NTM Cr.008376. (iii) 2 juv., Tre Island, stn. 6, 2–4 m, 25 February 1987, NTM Cr.008377. (iv) 1 male, 1 ovig. female, Tre Island, stn. 13, 26 March 1990, NTM Cr.008379. (v) 1 male, 1 ovig. female, *idem*, NTM Cr.008484.

Remarks. The specimens are typical of this well-known, common and widely-distributed species.

Host. All specimens were found in association with *Pinna* sp. or *Pinna bicolor* Chemnitz [Mollusca: Pinnidae].

Distribution. Type locality: Al-Luhayyah, Yemen. Otherwise recorded from the Red Sea to Mozambique, Japan to South Australia, east to Palau, Caroline Islands and the Fijian Islands.

Anchistus demani Kemp

Anchistus demani Kemp, 1922: 256–259,figs. 86–89.

Material examined. (i) 1 male, Tre Island, stn. 12, 24 December 1988, NTM Cr.008380. (ii) 1 ovig. female, Tam Island, stn. 12, 6 January 1989, NTM Cr.008381.
Remarks. The specimens agree closely with previous descriptions.

Host. Tridacna maxima Lamarck [Mollusca: Tridacnidae].

Distribution. Type locality: Port Blair, Andaman Islands. Also reported from Kenya, Zanzibar, Madagascar, Comoro Islands, Seychelle Islands, Malaysia, Indonesia, Thailand, Great Barrier Reef and New Caledonia.

Anchistus miersi De Man (Fig. 3A)

Harpilius miersi De Man, 1888: 274, pl. 17, figs. 6–10.
Anchistus miersi - Borradaile, 1898: 387.

Material examined. (i) 1 male, 1 ovig. female, Tre Island, stn. 7, 1.5–2 m, 29 November 1985, NTM Cr.008382. (ii) 2 juv., Tre Island, stn. 12, 24 December 1988, NTM Cr.008383. (iii) 1 male, *idem*, NTM Cr.008384. (iv) 1 male, Tre Island, stn. 12, 5 January 1989, NTM Cr.008385. (v) 1 male, 1 ovig female, *idem*, NTM Cr.008386. (vi) 1 male, 1 ovig. female, *idem*, NTM Cr.008387. (vii) 1 male, 1 ovig. female, Tre Island, stn. 15, 11 January 1989, NTM Cr.008388. (viii) 1 ovig. female, Tam Island, stn. 4, 9 February 1989, NTM Cr.008389. (ix) 1 ovig. female, Tam Island, stn. 4, 10 February 1989, NTM Cr.008391. (x) 1 male, *idem*, NTM Cr.008392. (xi) 1 male, *idem*, NTM Cr.008393. (xii) 1 male, 1 ovig. female, Rua Island, stn. 1, 16 February 1989, NTM Cr.008394. (xii) 1 male, 1 ovig. female, Mui Nam, Tre Island, 3 m, 28 February 1990, NTM Cr.008395. (xiv), 1 male, 1 ovig. female, Tre Island, stn. 19, 3 m, 7 March 1990, NTM Cr.008411. (xv) 1 ovig. female, Tre Island, stn. 4, 9 March 1990, NTM Cr.008412. (xvi) 1 ovig. female, Cape Hoi, Cam Ranh Bay, 12 March 1990, NTM Cr.008413. (xvii) 1 male, 1 ovig. female, Tre Island, stn. 12, 19 March 1990, NTM Cr.008414. (xviii) 1 male, 1 ovig. female, Tre Island, stn. 20, 3 m, 28 March 1990, NTM Cr.008415.

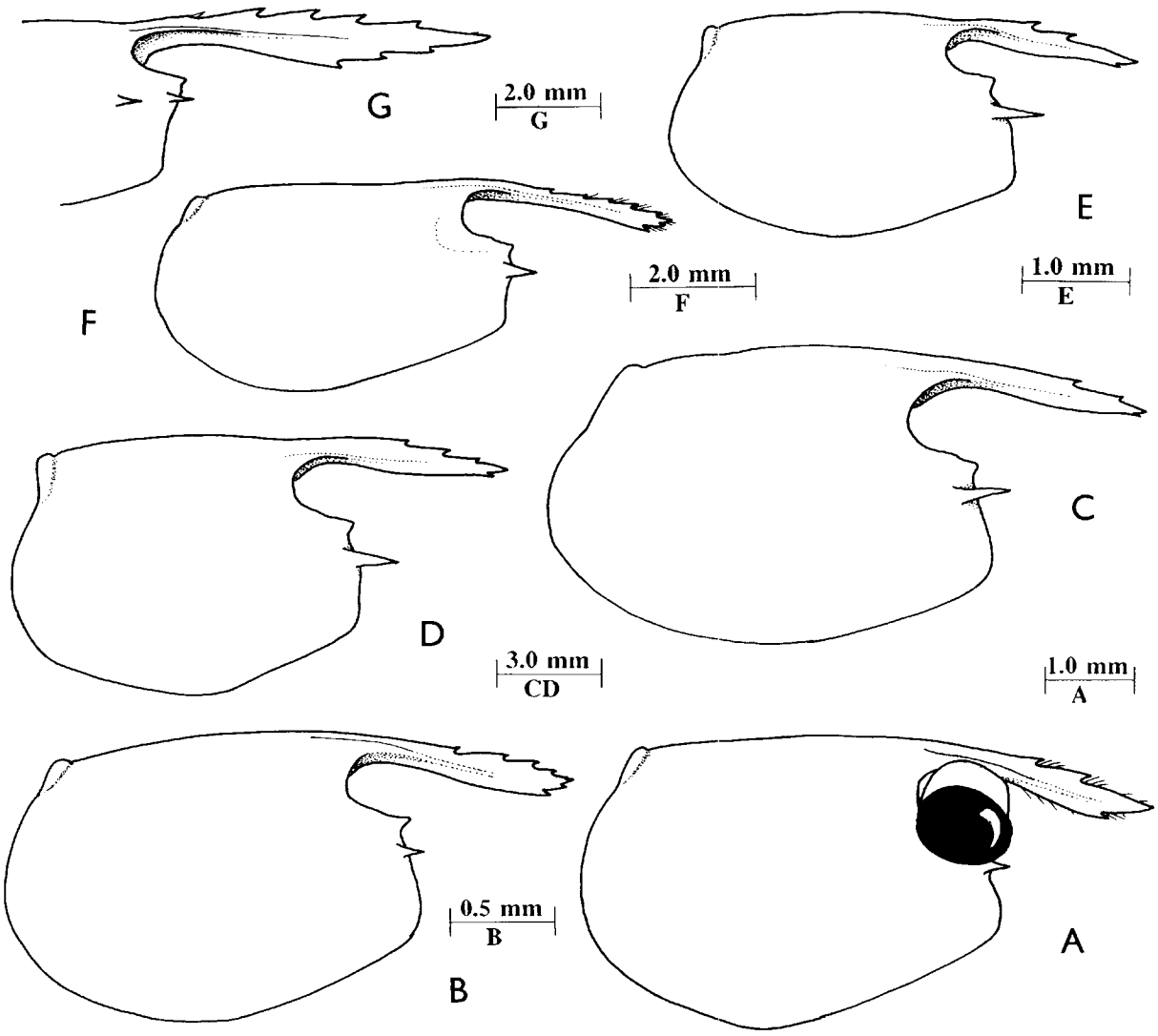

Fig. 2. *Coralliocaris superba* (Dana). A, carapace and rostrum, male. B, same, female. *Coralliocaris venusta* Kemp. C, carapace and rostrum, ovigerous female. D, E, same, juvenile females. *Coralliocaris viridis* Bruce. F, carapace and rostrum, ovigerous female. *Harpiliopsis beaupresii* (Audouin). G, anterior carapace and rostrum, male.

Remarks. The specimens agree with the data provided by Kemp (1922) and Holthuis (1952). All specimens show the lateral posterior telson spines (Fig. 3A) in a subdorsal position as illustrated by Holthuis (1952, fig. 45). Kemp does not precisely describe the condition in his material, from the Mergui Archipelago, Pulo Con Dua and Jakarta. The posterior telson spines are identical in specimens from *Tridacna maxima* and *T. squamosa*.

Host. Specimens were collected from *Tridacna maxima* Lamarck. (v) (ix) (x) (xvii); *T. squamosa*, Lamarck (ii) (iii) (iv) (vi) (vii) (viii) (xi) (xii) (xiv) (xv) (xvi) (xviii); and *Tridacna* sp, (i). [Mollusca: Tridacnidae].

Distribution. Type locality: Elphinstone Island, Mergui Archipelago, Burma. First recorded from Vietnam, at Pulo Con Dau, by Kemp (1922). Also known from Kenya, Zanzibar, Tanganyika,

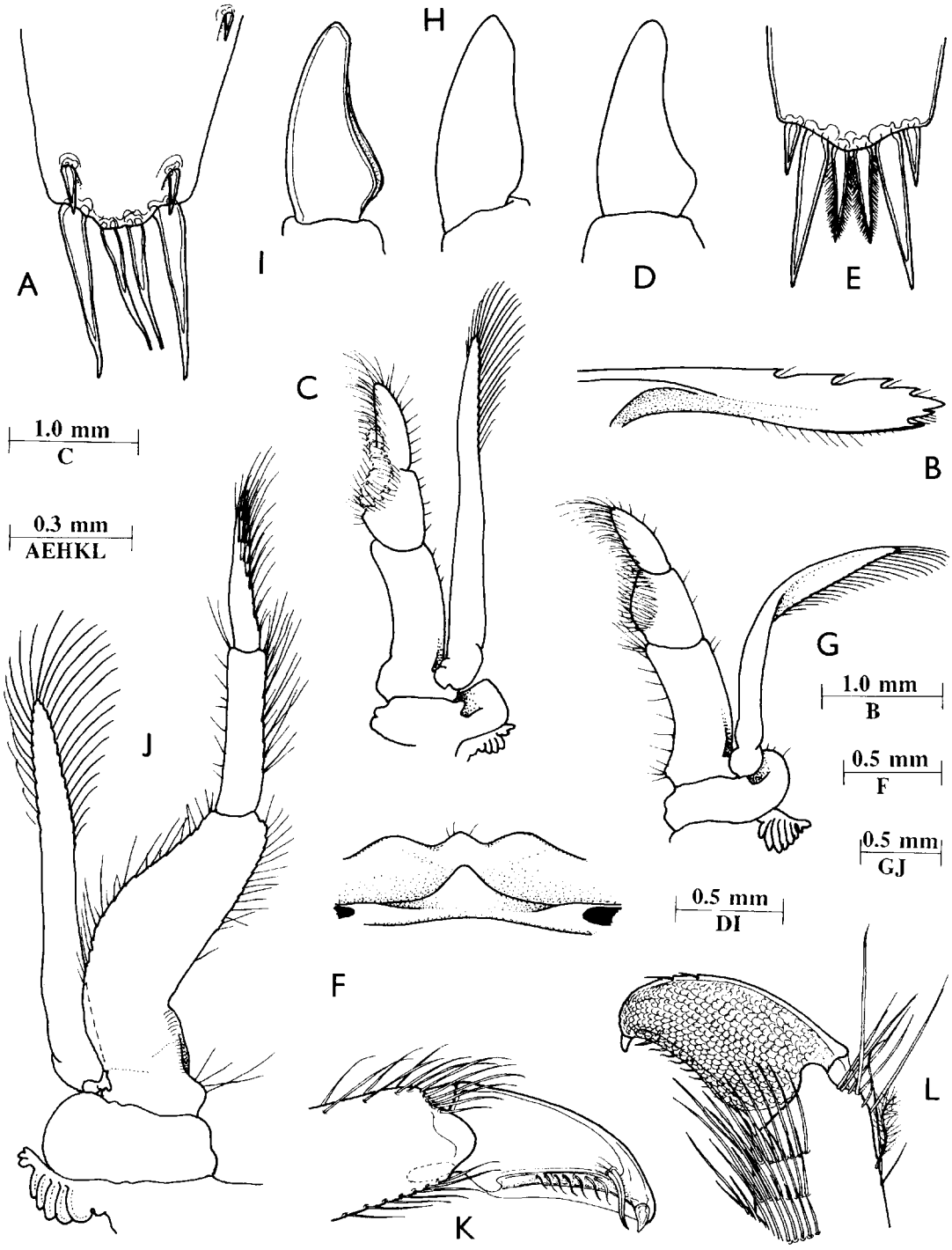

Fig. 3. *Anchistus miersi* (De Man). A, posterior telson spines, ovigerous female. *Coralliocaris superba* (Dana). B, rostrum, female. C, third maxilliped, male, dorsal. D, same, distal segment of endopod. E, posterior telson spines, female. F, fourth thoracic sternite, female. *Coralliocaris venusta* Kemp. G, third maxilliped, ovigerous female, dorsal. H, same, distal segment of endopod. *Coralliocaris viridis* Bruce. I, same. *Harpiliopsis beaupresii* (Audouin). J, third maxilliped, male, ventral. K, third pereiopod, distal propod and dactyl, lateral. L, same, medial.

Madagascar, Comoro, Seychelle, Chagos, Maldive and Andaman Islands, Malaya, Singapore, South China Sea, Philippines, Indonesia, Australia, Papua New Guinea, New Caledonia, Ryukyu, Caroline and Marshall Islands, and Tuvalu. Records of specimens from non-tridacnid bivalve hosts, such as *Pteria* or *Pinna* spp. require confirmation.

Conchodytes kempi Bruce (Fig. 4)

Conchodytes biunguiculatus - Kemp, 1922: 280–282, fig. 103.
Conchodytes kempi Bruce, 1989: 183–184, fig. 3 b–e.

Material examined. (i) male, 1 ovig. female, Tre Island, stn. 13, 26 March 1990. NTM Cr.008416.
Remarks. The single pair of specimens are distinctly larger than the following species, (CL male 9.4, ovig. female 11.2 mms), and agree with previous descriptions of specimens reported in the literature from the same host. The ambulatory dactyls have a well developed distal accessory tooth and a compressed basal protuberance with a distinctly acute tooth (Fig. 4B). The lateral posterior telson spines (Fig. 4C and D) are not markedly subdorsal and preterminal as in *C. biunguiculatus* (Paulson), but could be described as very feebly subdorsal and preterminal. The exopod of the uropod bears a small mobile

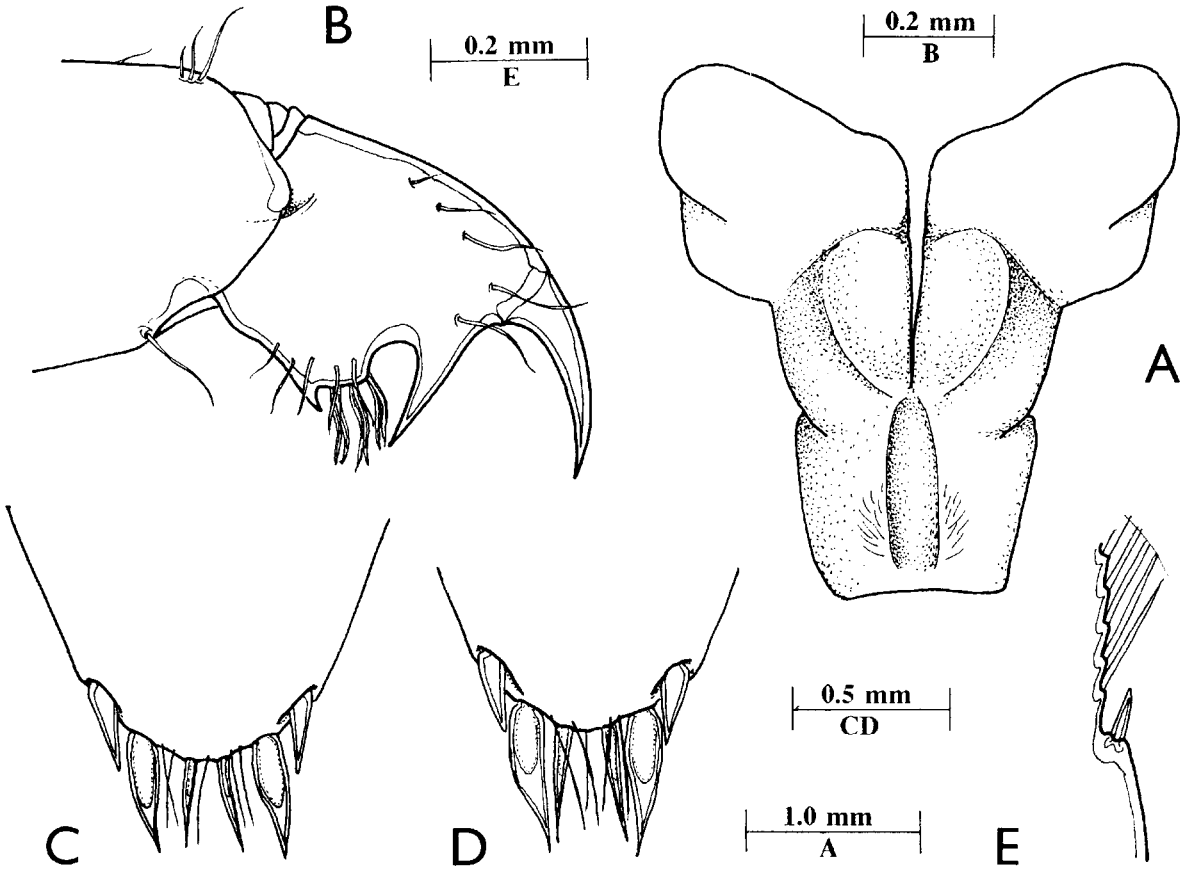

Fig. 4. *Conchodytes kempi* Bruce, ovigerous female. A, paragnaths. B, distal propod and dactyl of ambulatory pereiopod. C, posterior telson spines, female. D, same, male. F, exopod of uropod, posterolateral angle.

spinule, but is without a distinct fixed tooth (Fig. 4E).

The specimens differ in a number of minor features from the specimens provisionally referred to this species, found in association with *Isognomon* in the Philippines (Bruce 1989), particularly in their much larger size, but also in the better development of the basal protuberance of the ambulatory dactyls and in the posterior telson spines. In the present specimens, the submedian spines are separated by a small interval, not arising contiguously, from a rounded posterior margin, not from a small projection of the posterior margin, with the spines shorter than, not exceeding, the intermediate spines. The lateral spines are very robust, about half the length of the intermediate dorsal spines, and, as mentioned above, feebly preterminal and subdorsal in position, rather than marginal. These differences suggest than the specimens from *Isognomon* may represent a distinct taxon, but the examination of further material from this host is necessary before this can be confirmed.

The mouthparts of this species have been described by Holthuis (1952) and Hipeau-Jacquotte (1973), (as *C. biunguiculatus)*, but these authors did not describe the paragnaths. These are well developed, with large, feebly bilobed non-spinulate alae (Fig. 4A). The corpus is elongate with a pair of oval submedian eminences anteriorly, with feebly carinate lateral margins, and the median posterior part broadly cannulate, with setose lateral borders. The morphology of the paragnaths in *C. kempi* shows some remblance to the condition shown in *Pontonia pinnophylax* (Otto), in which the median part of the corpus is deeply channelled with sharp, setose lateral margins (Bruce 1991), and further emphasizes the close relationship between *Conchodytes* and *Pontonia*.

Host. Pinna bicolor Cheminitz [Mollusca: Pinnidae].

Distribution. Type locality: Andaman Islands. Also known from the Red Sea, Kenya, Zanzibar, Madagascar, Seychelle Islands, Indonesia, Taiwan, Marshall Islands, and possibly the Philippines.

Conchodytes meleagrinae Peters

Conchodytes meleagrinae Peters, 1852:25.

Material examined. (i) 1 male, 1 ovig. female, Tre Island, stn. ?, 2–4 m, 13 February 1987, NTM Cr.008417. (ii) 1 male, 1 ovig. female, Tre Island, stn. 2, 1.5–4m 13, February 1987, NTM Cr.008418. (iii) 1 male, 1 ovig. female, Tam Island, stn. 4, 10 February 1989, NTM. Cr.008419. (iv) 1 male, 1 ovig. female, Nam Island, Cam Ranh Bay, 2 m, 13 March 1990, NTM Cr.008420. (v) 1 male, 1 ovig. female, Tre Island, stn. 10, 8 m, 27 March 1990, NTM Cr.008421. (vi) 1 male, 1 female, Tre Island, stn. 10, 6 m, 27 March 1990, NTM Cr.008422.

Remarks. The specimens present no special features. In the first pereiopods, the carpus is shorter than the merus. Typical carapace lengths for these specimens are: male, 4.0; female, 5.0 mms.

Hosts. (i), (ii), (iii), *Pinctada* sp.; (iv), *Pinctada margaritifera* (L.); (v), and (vi), *Pinctada nigra* Chemnitz [Mollusca: Pteriidae].

Distribution. Type locality: Ibo, Mozambique. Otherwise recorded extensively from the Red Sea to Mozambique, Japan to the Great Barrier Reef, east to Hawaii.

Corallicocaris superba (Dana)
(Figs. 2AB, 3B–F)

Oedipus superbus Dana, 1852:25; 1852a: 575; 1855: pl. 37, figs. 2a–f.
Coralliocaris superba - Stimpson, 1860: 38. - Kemp, 1922: 272–274, figs. 98–99.

Material examined. (i) 1 male, Tam Island, stn. 3, 1.5–2 m, November 1985, NTM Cr.008423. (ii) 1 male, 1 female, *idem*, NTM Cr.008424.

Remarks. All specimens lack both second pereiopods. The males have a rostral dentition of 4/2, 2/1 (Fig. 2A) and the female, 4/2 (Figs. 2B and 3B), with a distinct ventral carina, and are provisionally attributed to *C. superba* on account of the stronger rostral dentitions than in *C.*

venusta, and the third maxillipeds not having the distal segment of the endopod longer than the penultimate (Fig. 3C), as in *C. graminea*. The third maxillipeds (Fig. 3C) also show the distinct setal basket on the distodorsal surface of the penultimate segment of the endopod, full of finely granular material, similar to that reported in *C. graminea* (Bruce 1976). The endopod is robust, with the ischiomeral and basal segments completely fused, the two distal segments slightly exceeding the length of the combined proximal segment, the penultimate segment about 1.3 times longer than broad, the distal segment (Fig. 3D) of similar length, about 2.5 times longer than wide, with the medial margin distinctly concave and the distal end broadly rounded. The posterior margin of the telson (Fig. 3E) is feebly angulate, without a median process, with the lateral pair of posterior marginal spines subequal to the dorsal spine length, intermediate spines robust, 5.5 times longer than basal width, subequal to posterior margin width, submedian spines 5.0 times longer than wide, densely setulose, and about 0.6 of the submedian spine length. The fourth thoracic sternite (Fig. 3F) shows a low transverse ridge, with a slight median eminence and the fifth sternite shows a larger stout, broadly triangular median process.

Host. Both lots of specimens were found in associations with *Acropora* spp. [Scleractinia: Acroporidae].

Distribution. Type locality: Tongatabu. Otherwise widely reported from the Red Sea to Madagascar, Ryukyu Islands to the Great Barrier Reef, east to Tahiti.

Coralliocaris venusta Kemp
(Figs. 2C–E, 3GH)

Coralliocaris venusta Kemp; 1922: 274–276, figs. 100–101.

Material examined. (i) 2 juv., Tam Island, stn. 3, 1.5–2 m, November 1985, NTM Cr.008425. (ii) 1 ovig. female, *idem*, NTM Cr.008426.

Remarks. The specimen (ii) is without second pereiopods. Although the general agreement with Kemp's description is good, particularly in regard to the second pereiopods, the spacing of the dorsal rostral teeth is variable (Fig. 2C and D). The inferior orbital angle in the type material appears much less distinctly produced than in the present specimens. One juvenile female also has three small dorsal rostral teeth rather than the more usual two (Fig. 2D). The third maxilliped bears a setal basket (Fig. 3G), but less well marked than in *C. superba*. The distal segment of the endopod is feebly sinuous medially, distally angulate (Fig. 3H).

Host. Acropora sp. [Scleractinia: Acroporidae].

Distributions. Type locality: off Tholyram Paar, Gulf of Manaar. Also known from the Red Sea to Mozambique, Seychelle, Comoro and Maldive Islands, La Réunion, Indonesia, Japan, Marshall and Solomon Islands.

Coralliocaris viridis Bruce (Figs. 2F, 3I)

Coralliocaris viridis Bruce, 1974c: 222–224, fig. 1.

Material examined. (i) 1 male, 2 juv., Tre Island, stn. 18, 2 m, 6 March 1990, NTM Cr.008427. (ii) 1 ovig. female, *idem*, NTM Cr.008428.

Remarks. The ovigerous female specimen has a slender, shallow rostrum, (Fig. 2F) with a low dorsal carina and a dentition of 5/2, with small acute teeth, the male, 5/1, and the juveniles 4–5/1. The third maxilliped is also generally similar to that of *C. superba*. The ischiomerus: basis articulation is obsolete dorsally, distinct ventrally, and the distal segment of the endopod (Fig. 3I) appears feebly grooved proximally along its concave medial margin, a feature that was not discerned in the previous species. The colour pattern of the Vietnamese specimens is unknown.

Host. (i) *Acropora* sp. [Scleractinia: Acroporidae].

Distribution. Type locality; Mombasa, Kenya. Also known from Mozambique, Sri Lanka, Maldive Islands, Ryukyu Islands, Indonesia and the Great Barrier Reef.

Harpiliopsis beaupresii (Audouin)
(Figs. 2G, 3J–I)

Palaemon beaupresii Audouin, 1825: 91.
Harpilius beaupresii - Heller, 1861: 27.
Harpiliopsis beaupresi - Borradaile, 1917: 324, 379, pl. 55, fig. 21.

Material examined. (i) 1 male, 1 ovig. female, Mung Island, stn. 22, 5–7 m, 23 March 1990, NTM Cr.008429.

Remarks. The rostral dentition is: male, 6/3 (Fig. 2G); female, 6/2. In both, the first dorsal tooth is small and appears articulated. The rostrum is more slender in the male and the distal dorsal tooth is minute. The specimens differ slightly from the condition illustrated in Kemp (1922, p. 229, fig. 67), in which the first dorsal rostral tooth is far in advance of the level of the inferior orbital angle, whereas in the present specimens it is only slightly more anteriorly situated. The coxae of the third maxillipeds are widely separated by a broad, unarmed sternite. The endopod has the two distal segments slender, as in *H. depressa*, as illustrated by Holthuis (1951, pl. 22f) but the ischiomeral segment is markedly broader, distinctly angulated medially at about 0.25 of its length, where there is a small notch, proximal to which a row of some 15 short medially directed ventral submarginal setae are present. This setal row was not present in the *Coralliocaris* species examined, and the dorsal setal basket found on the penultimate segment in that genus was not present in the present specimen. Also noted by Holthuis (1951), the dactylus of the ambulatory pereiopod (Fig. 3K) is twisted, giving it a most characteristic appearance, diagnostic for the genus, and the ventral propod is devoid of spines, with numerous finely plumose setae. The dactylus is robust, with a dorso-medial carina and a short stout subconical unguis, with the dorsolateral surface strongly convex. The medial aspect of the corpus (Fig. 3L) is quite flat, densely covered by a pavement of small rounded squames, the ventral margin is lamellate with several short submarginal setae laterally, with a pair of more robust sensory setae distolaterally, which may clump together and produce a biunguicate appearance.

Host. Pocillopora verrucosa (Ellis and Solander) [Scleractinia: Thamnasteriidae].

Distribution. Type locality: Egypt. Common throughout the Indo-West Pacific region from the Red Sea to Mozambique, Ryukyu Islands to Great Barrier Reef, east to Marshall Islands and also Easter Island in the Eastern Pacific region.

Jocaste japonica (Ortmann, 1890)

Coralliocaris superba var. *japonica* Ortmann, 1890: 509.
Jocaste japonica - Holthuis, 1952: 190–195. fig. 94 (partim). - Patton, 1966:279–280, fig. 3b. - Bruce, 1974a: 198–199, fig. 7.

Material examined. (i) 2 males, 1 ovig. female, Tre Island, stn. 4, 9 March 1990, NTM Cr.008430. (ii) 1 male, 2 ovig. female, *idem*, NTM Cr.008431. (iii) 1 male, Mung Island, stn. ?, 21 March 1990, NTM Cr.008432. (iv) 2 juv., Tre Island, stn. 13, 26 March 1990, NTM Cr.008433. (v) 1 male, 2 ovig. female, Tre Island, stn. 20, 5–7 m, 28 March 1990, NTM Cr.008434. (vi) 1 male, 2 ovig. female, Tre Island, stn. 21, 5 m, 29 March 1990, NTM Cr.008435. (vii) 1 ovig. female, Tre Island, stn. 9, 4–5 m, 31 March 1990, NTM Cr.008436.

Remarks. The specimens show no significant differences from previous descriptions.

Host. All specimens were reported from *Acropora* spp., except (v), which was found on *Pocillopora verrucosa* (Ellis and Solander), together with *Philarius gerlachei*. This species is not normally found in association with *Pocillopora* corals, and the presence of *P. gerlachei*, another *Acropora* asssociate, suggests that a labelling error may have occurred.

Distribution. Type locality: Kagoshima, Japan. Also known from East Africa to the Philippines and the Cook Islands, apparently absent from the Red Sea.

Jocaste lucina (Nobili)

Coralliocaris lucina Nobili, 1901: 5; 1906: 57–58.

Jocaste lucina - Holthuis, 1952: 190–195, fig. 94 (*partim*). - Patton, 1966: 278–279, fig. 3a. - Bruce, 1974a: 199, fig. 8.

Material examined. (i) 1 spm, unspecified locality, NTM Cr.008437. (ii) 1 male, 3 ovig. female, Tam Island stn. 3, 1.5–2 m, November 1985, NTM Cr.008438. (iii) 4 spms., *idem*, NTM Cr.008439. (iv) 3 spms., *idem*, NTM Cr.008440. (v) 4 spms., *idem*, NTM Cr.008441. (vi) 1 male, 1 ovig. female, Cape Hoi, Cam Ranh Bay, 1.5 m, 12 March 1990, NTM Cr.008442. (vii) 1 male, 2 ovig. female. Tre Island, stn. 9, 18 March 1990, NTM Cr.008443. (viii) 1 ovig. female, 1 juv., stn. 20, Tre Island, 28 March 1990, NTM Cr.008444.

Remarks. The specimens show no differences from previous descriptions.

Hosts. All specimens were collected from *Acropora* spp., except for (vi), which was reported as associated with *Pocillopora* sp. [Scleractinia: Thamnasteriidae].

Parasites. The ovigerous female from stn. 20 was parasitized by a male-female pair of *Hemiphryxus malindiae* (Bruce 1974) (Isopoda: Bopyridae), det. J.C. Markham.

Distribution. Type locality: Eritrea. Also known extensively throughout the Indian Ocean, and Red Sea, and western and central Pacific Oceans as far east as the Cook Islands and Johnson Atoll.

Periclimenaeus arabicus (Calman) (Fig. 6A–D)

Periclimenes (Periclimenaeus) arabicus Calman, 1939: 210, fig. 4.
Periclimenaeus arabicus - Holthuis, 1952: 13, 130. - Bruce, 1974b: 1563–1568, 1581, figs. 3 g–f, 4–6, 7 c–h.

Material examined. (i) 2 ovig. female, Tre Island, stn. 12, 19 March 1990, NTM Cr.008445.

Remarks. The specimens correspond well with the original and subsequent descriptions, with a rostral dentition of 6/0 and 7/1, with acute supraorbital spines. The posteroventral angle of the sixth abdominal segment (Fig. 6B) is acute. The telson (Fig. 6B) is about 2.0 times longer than wide, lateral margins convergent, straight, with the posterior margin (Fig. 6C) about 0.4 of the anterior width, convex with a small acute median point; anterior dorsal spines about 0.22 of telson length, posterior dorsal spines about 0.1, half the anterior spine length; lateral posterior spines small, subdorsal, 0.25 of intermediate spine length, intermediate spines robust, about 0.2 of telson length, submedian spines well developed, slightly smaller and more slender than intermediate spines, strongly setose medially and laterally. The posterolateral angle of the exopod (Fig. 6D) of the uropod is expanded, with a small acute tooth, the immediately adjacent spine is large, robust and strongly curved medially. The dactyl of the third ambulatory pereiopod has the unguis (Fig. 6A) much as shown in Bruce (1974b, fig. 7d), but the denticles are fewer, more acute and distally inclined.

Host. Sponge, unidentified.

Distribution. Type locality: Oman, 19° 22.6'N, 57° 53.0'E, 13.5m. Also known from Djibuti, Kenya, Zanzibar, Tanganyika, Maldive Islands, Japan, Hong Kong, Great Barrier Reef, New Caledonia and Fiji.

Periclimenes amymone De Man (Figs. 5A, 6E)

Periclimenes amymone De Man, 1902: 829–833, pl. 25, fig. 53.

Material examined. (i) 9 spms, Tam Island, stn. 3, 1.5–2 m, November 1985, NTM Cr.008446. (ii) 1 male, 1 ovig female. Tre Island, stn. 13, 2 March 1990, NTM Cr.008447. (iii), 1 ovig. female, Tre Island, stn. 19, 7 m, 7 March 1990, NTM Cr.008448. (iv), 1 male, 1 ovig. female, 1 juv., Tre Island, stn. 18, 2–3 m, 7 March 1990, NTM Cr.008449. (v), 2 juv., Tre Island, stn. 4, 9 March 1990, NTM Cr.008450. (vi), 4 juv., Tre Island, stn. 12, 19 March 1990, NTM Cr.008451. (vii), 3 males, 1 ovig. female, Mung Island, stn. 22, 5–7 m, 23 March, 1990, NTM Cr.008452.

Remarks. The specimens agree well with previous

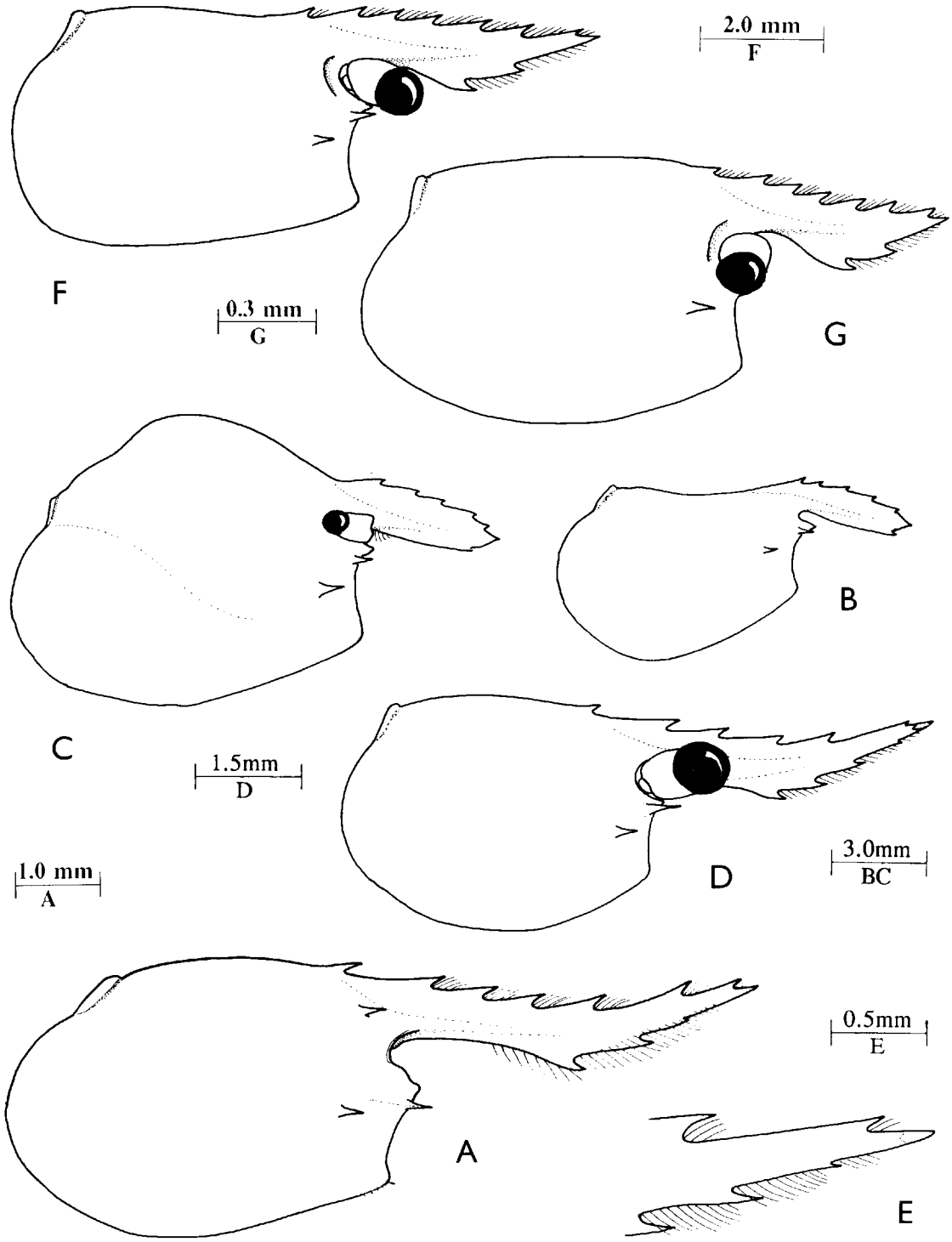

Fig. 5. *Periclimenes amymone* De Man. A, carapace and rostrum. *Periclimenes brevicarpalis* (Schenkel). B, carapace and rostrum, male. C, same, ovigerous female. *Periclimenes consobrinus* (De Man). D, carapace and rostrum, ovigerous female. E, same, tip of rostrum. *Periclimenes lutescens* (Dana). F, carapace rostrum, male. G, same, ovigerous female.

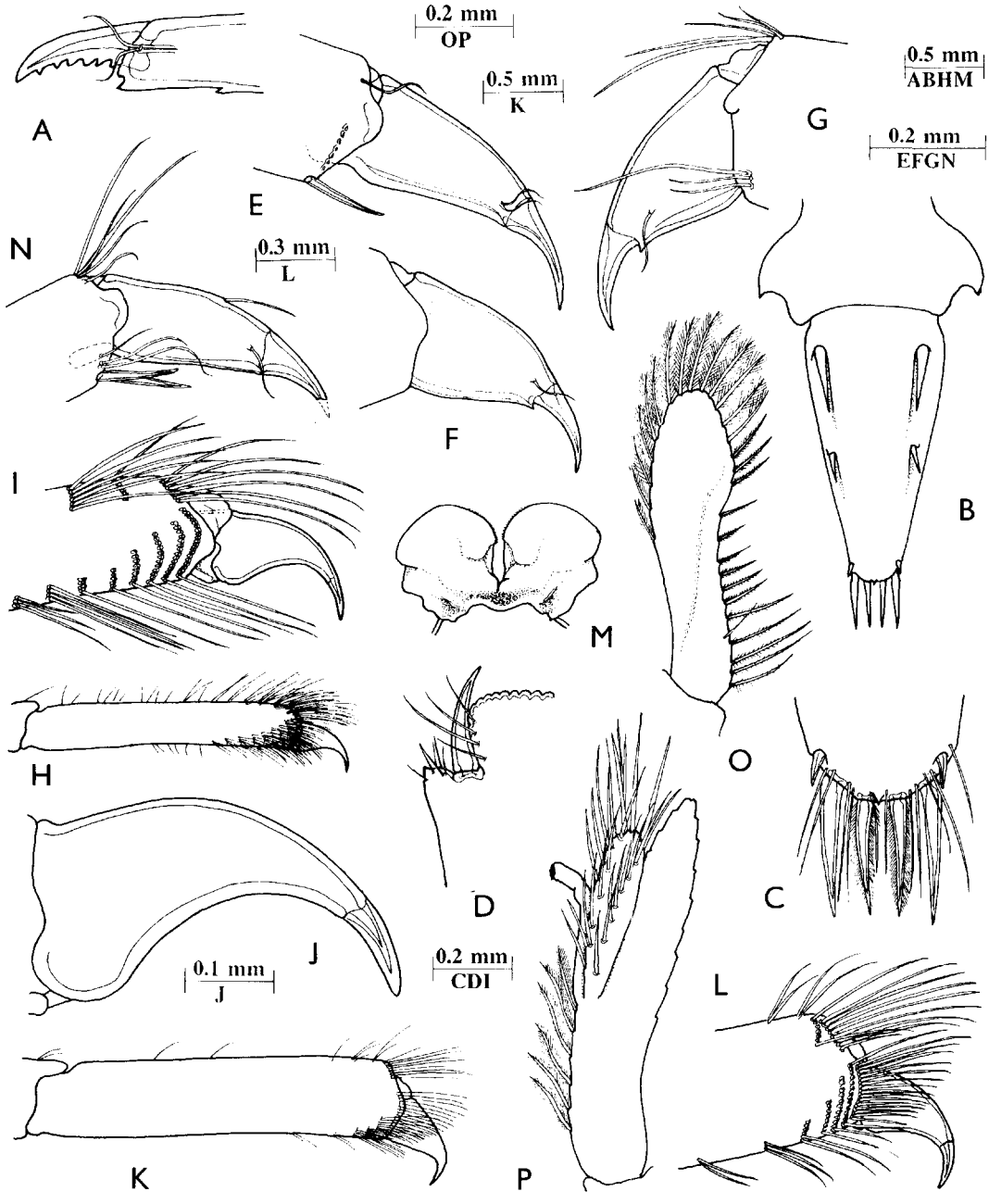

Fig. 6. *Periclimenaeus arabicus* (Calman), ovigerous female. A, third pereiopod, dactyl, unguis and distal corpus. B, sixth abdominal segment and telson. C, posterior telson spines. D, exopod of uropod, posterolateral angle. *Periclimenes amymone* (De Man), ovigerous female. E, third pereiopod, distal propod and dactyl. *Periclimenenes brevicarpalis* (Schenkel). F, third pereiopod, dactyl and distal propod, male. G, same, ovigerous female. *Periclimenes consobrinus* (De Man), ovigerous female. H, third pereiopod, propod and dactyl. I, same, distal propod and dactyl, (setae not shown). J, same dactyl. *Perclimenes lutescens* (Dana), ovigerous female. K, third pereiopod, propod and dactyl. L, same, distal propod and dactyl. *Periclimenes spiniferus* De Man, ovigerous female. M, paragnaths. N, third pereiopod, distal propod and dactyl. Male. O, first pleopod, endopod. P, second pleopod, endopod.

descriptions. They were found in association with *Periclimenes spiniferus* and *Thor* sp. [Hippolytidae]. The presence of a single distoventral spine in the third ambulatory pereiopod (Fig. 6E) in this species has been reported in Bruce (1980), in contradiction to the statement in Kemp (1922) that the ambulatory propods lack spines. The numerous long flexible setae on the distal propod are also flattened and with finely biserrate margins. The rostrum (Fig. 5A) in the present material is provided with numerous short densely plumose setate, in front of each dorsal tooth, and medially along the proximal ventral margin but submarginally and bilaterally along the distal portion, a condition apparently unusual in *Periclimenes* species.

In the key to the species of the *Periclimenes grandis* species group provided in Bruce (1987), the substitution of the following for couplet 10 will facilitate the separation of the two species concerned:

10. Ambulatory perciopods with propods strongly spinulate ventrally; chelae of second pereiopods tuberculate in males; R.1+6–9/2–3 ..... *P. elegans* (Paulson)

Ambulatory pereiopods with at most single distoventral spine; chelae of second pereiopodsds non-tuberculate; R.1+6–9/2–3..... ..... *P. amymone* De Man

Host. Acropora spp; [Scleractinia: Acroporidae], except (vi), from *A. gemmifera* (Brooks), and (ii) (vii) from *Pocillopora verrucosa* (Ellis and Solander) [Thamnasteriidae].

Distribution. Type locality: Ternate, Indonesia. Also known from the Nicobar Islands, Singapore, Indonesia, Papua New Guinea, Great Barrier Reef, Solomon Islands and New Caledonia.

Periclimenes brevicarpalis (Schenkel)
(Figs. 5BC, 6FG)

Ancylocaris brevicarpalis Schenkel, 1902: 563, pl. 13, fig. 21.
Periclimenes (Ancylocaris) brevicarpalis - Kemp, 1922: 185–191, figs. 40–42, pl. 67.

Material examined. (i) 1 male, 1 ovig. female, stn. 3, Lo Bay, Nha Trang, 26 May 1983, NTM Cr.008453. (ii) 1 male, 1 ovig. female, Cape Hoi, Cam Ranh Bay, 2 m, 12 March 1990, NTM Cr.008454.

Remarks. In the larger ovigerous female, the carapace (Fig. 5C) shows a strongly humped appearance as noted by some previous authors, much more marked than in the male (Fig. 5B). The ambulatory dactyls are minutely biunguiculate in both sexes (Fig. 6 F and G) and the propods are sparsely setose and devoid of spines. *Periclimenes brevicarpalis* has been previously recorded from Pulo Con Dua by Kemp (1922).

Host. (i) from coral? (ii) sea anemone.

Distribution. Type locality: Ujung Pandang, Sulawesi, Indonesia. Otherwise common and widely distributed from the Red Sea to Mozambique, Japan to the South Great Barrier Reef, east to the Marshall Islands.

Periclimenes consobrinus (De Man)
(Figs. 5DE, 6H–J)

Harpilius consobrinus De Man, 1902: 836–840, pl. 26, fig. 54.
Periclimenes consobrinus - Bruce, 1972: 403, 409, 412 (key), fig. 1b. - Holthuis, 1981: 795–796, fig. 3 i–l.

Material examined. (i) 1 ovig. female, Tre Island, stn. 10, 27 March 1990, NTM Cr.008455.

Remarks. The single example unfortunately lacks both second pereiopods, but in all features, corresponds exactly with previous descriptions in regard to its main diagnostic characters, i.e., the rostrum, third maxillipeds and ambulatory propods and dactyls. The rostral lamina (Fig. 5D) is deep, with a dentition of 1 + 5/4, slightly up-curved, and only slightly exceeds the scaphocerite, but distinctly exceeds the carapace length and there is no trace of a postorbital ridge. The ventral margin of the rostrum bears a single median row of short plumose setae (Fig. 5E), as in *P. lutescens*, without bilateral submarginal rows distally, as in *P. amymone*. The ambulatory pereiopods also

resemble those of *P. lutescens*, with a compressed, strongly hooked simple dactylus (Fig. 5J). The propod (Fig. 5H) is about 7.0 times longer than wide, less robust than in *P. lutescens*, with about 8–9 transverse rows of setae (Fig. 5I) distoventrolaterally, which partly conceal the dactyl, distinctly more numerous than in *P. lutescens*, and without spines.

The colour pattern in life was not recorded, and the specimen was collected together with an ovigerous female of *Alpheus lottini* Güerin.

Host. Pocillopora verrucosa (Ellis and Solander) [Scleractinia: Thamnasteriidae].

Distribution. Type locality: Ternate, Moluccas, Indonesia. Otherwise known only from Kenya, Tanganyika, Comoro Islands, La Réunion, southern Great Barrier Reef, Thailand and the Philippines.

Periclimenes holthuisi Bruce

Periclimenes holthuisi Bruce, 1969: 258–259; 1982: 244–246, fig. 7.

Material examined. (i) 1 male, 1 ovig. female, Tre Island, stn. 19, 5 m, 7 March 1990, NTM Cr.008457. (ii) 1 male, 1 ovig. female, *idem*, NTM Cr.008458. (iii) 1 male, 1 ovig. female, *idem*, NTM Cr.008459.

Remarks. The three pairs of specimens, each collected separately, from giant anemones, all agree closely with previous descriptions, including Bruce (1989). The closely related and morphologically very similar *Periclimenes venustus* has been only recently distinguished from *P. holthuisi*. It is possible that some of the earlier records of *P. holthuisi* may, upon re-examination, prove to be specimens of *P. venustus*. The differences are discussed in Bruce (1990b).

Host. Stichodactyla mertensi gigantea Brandt, 1836 (= *Stoichactis gigantea* Forsskål, 1775) [Actiniaria: Stichodactylidae].

Distribution. Type locality: Lung Ha Wan, Hong Kong. Otherwise recorded from the Red Sea to Zanzibar, Japan to southern Queensland, Australia, east to New Caledonia and Caroline Islands, but many records are in need of confirmation, due to possible confusion with *P. venustus* Bruce.

Periclimenes imperator Bruce

Periclimenes imperator Bruce, 1967: 53–62, figs. 23–25.

Material examined. (i) 2 juv, Tre Island, stn. 13, 26 March 1990, NTM Cr.008460. (ii) 1 juv. female, Tre Island, stn. 20, 9–12 m, 28 March 1990, NTM Cr.008461. (iii) 1 male, 1 ovig. female, *idem*, NTM Cr.008462.

Remarks. All specimens conform closely to previous descriptions.

Host. All specimens were found in association with *Stichopus variegatus* Semper [Holothuroidea: Stichopidae].

Distribution. Type locality, Chumbe Island, Zanzibar. Also known from the Red Sea to Mozambique, Ryukyu Islands to Great Barrier Reef, east to the Hawaiian Islands.

Periclimenes lutescens (Dana)
(Figs. 5FG and 6KL)

Harpilius lutescens Dana, 1852:25: 1852a: 576; 1855: pl. 37, fig. 4.
?*Harpilius lutescens* - Kemp, 1922:235–237, figs. 72–73.
Periclimenes (Harpilius) lutescens - Holthuis, 1952: 88–91, fig. 35.

Material examined. (i) 1 male, 1 ovig. female, Tre Island, stn. 17, 2 m, 5 March 1990, NTM Cr.008463. (ii) 1 male, 1 ovig female, Tre Island, stn. 18, 2 m, 6 March 1990, NTM Cr.008464. (iii) 1 male, 1 ovig. female, *idem*, NTM Cr.008465. (iv) 1 male, 1 ovig. female, *idem*, NTM Cr.008466. (v) 1 male, Tre Island, stn. 19, 7 March 1990, NTM Cr.008467. (vi) 3 juv., Tre Island, stn. 4, 9 March 1990, NTM Cr.008468.

(vii) 1 male, Tre Island, stn. 12, 19 March 1990, NTM Cr.008469. (viii) 1 male, 1 ovig. female, 1 juv., *idem*, NTM Cr.008470.

Remarks. All specimens agree well with previous descriptions. The rostral dentition of the adult males and females (Fig. 5G) is 7/2, except one female with 7/3. The rostrum is distinctly shorter than the carapace length, horizontal, and deeper in females than males, with a simple median row of short plumose setae distoventrally. A distinct postorbital ridge is present, as noted by Kemp (1922), which is not apparent in the closely related *P. consobrinus*. The ambulatory pereipods are stout, the propod (Fig. 6K) about 5.0 times longer than wide, more robust than in *P. consobrinus*, with only some 4–5 transverse rows of setae (Fig. 6L) distoventrolaterally, distinctly less conspicuous than in *P. consobrinus*, and without spines. Specimens (v) were found in association with *Periclimenes amymone*.

Holthuis (1952) noted that the specimens referred to this species by Boone (1935), from Tahiti and Nuku Hiva, showed numerous distinct differences from *P. lutescens* s. str. Boone's illustration of the ambulatory dactyl alone is sufficiently different from that of *P.lutescens* to indicate that the specimens cannot belong to Dana's species, so that its occurrence further east than the Samoan Islands is yet to be demonstrated. The correct identity of Boone's material also remains to be established.

Host. Specimen (vii) was found in *Acropora gemmifera* (Brook), all others reported from *Acropora* sp. [Scleractinia: Acroporidae].

Distribution. Type locality: Tongatabu, Cook Islands. Widely distributed from the Red Sea to Madagascar; Amami Islands, Japan, to southern Great Barrier Reef, east to Samoan Islands.

Periclimenes soror Nobili

Periclimenes soror Nobili, 1904: 232. - Bruce, 1978: 299–306, figs. 1–6.

Material examined. (i) 1 male, 1 ovig. female, Tre Island, stn. 12, 24 January 1989, NTM Cr.008471. (ii) 1 ovig. female, Rua Island, stn. 16, 16 February 1989, NTM Cr.008472.

Remarks. The specimens do not differ from previous descriptions.

Host. *Culcita novaeguineae* Müller and Tröschel [Asteroidea, Oreasteridae].

Distribution. Type locality: Djibuti. Common and widespread throughout the Indo-West Pacific region, from the Red Sea and East Africa to the Hawaiian Islands, and also recorded in the Eastern Pacific region from Panama (Bruce 1978).

Periclimenes spiniferus De Man (Fig. 6M–P)

Periclimenes petitthouarsi var. *spinifera* De Man, 1902: 284.
Periclimenes (Falciger) spiniferus - Borradaile, 1917: 324, 369, pl. 52 fig. 1.
Pericilimenes (Harpilius) spiniferus - Holthuis, 1952: 76–78, fig. 30.

Material examined. (i) 1 male, 3 ovig. female, without locality, NTM Cr.008473. (ii) 4 spms., Tam Island, stn. 3, 1.5–2 m, November 1985, NTM Cr.008474. (iii) 4 spms, Tre Island, stn. 7, 2 m, 29 November 1985, NTM. Cr.008475.

Remarks. Many of the specimens lack pereiopods but all second pereiopods preserved are consistent with those of *P. spiniferus*, as are all other morphological features.

Borradaile (1917) provided one of the first illustrations of the paragnaths of a pontoniine shrimp (pl. 52, 1q), referring to the large bilobed lower lip or metastoma. The paragnaths in an ovigerous female of the present specimens (Fig. 6M) closely resembles Borradaile's figure (pl. 52, 1q). The alae are well developed, with feeble development into lobes, the distal medial margin finely spinulate, the proximal medial margin non-spinulate. The proximal median part is short and broad, with feeble carinae laterally.

The ambulatory pereiopods are also as illustrated by Borradaile. The dactyl of the third pereiopod (Fig. 6N) is compressed, with a sharp ventral edge. The unguis is distinct, stout, about

2.0 times longer than the basal width, about 0.5 of the corpus length. The corpus has the dorsal margin convex, with a single seta at about 0.66 of its length, the ventral margin is almost straight, and a single sensory seta is present distolaterally, and two distomedially. The propod has a pair of long distoventral spines and several similar ventral spines.

The male first and second pleopods have been illustrated by both Borradaile (1917) and Holthuis (1952). In the present specimens, these appendages are similar to the earlier data. The endopod of the first pleopod (Fig. 6O) is about 3.75 times longer than the distal width, distal third moderately expanded, without distomedial lobule. The proximal three fourths of the medial border bears a series of spiniform setae of distally decreasing length and size, the first finely plumose, the rest spinulose, with short plumose setae around the rest of the medial and distal half of the lateral margin. The endopod of the second pleopod (Fig. 6P) distinctly exceeds the appendix masculina, which also slightly exceeds the appendix interna. The corpus of the appendix masculina is robust, about 4.0 times longer than wide, with about 25 simple spines distributed over the whole ventral surface, with longer spines distally. The proximal medial margin of the endopod bears plumose setae.

Distribution. Type locality: Ternate, Indonesia. Also known from most of the Indo-West Pacific region, east to Tahiti, but absent from Red Sea and north-western Indian Ocean.

Periclimenes sp.

Material examined. (i) 1 ♀, Tre Island, stn. 7, 2 m, 29 November 1985, NTM Cr.008476.

Remarks. The single example belongs to the *P. grandis* group s. str. (Kemp 1922), but can not be identified as it lacks both second pereiopods.

Philarius gerlachei (Nobili)

Harpilius gerlachei Nobili, 1905: 160; 1906: 45, pl. 4, fig. 10.
Philarius gerlachei. - Holthuis, 1952: 152–153, fig. 69.

Material examined. (i) 2 juv., Tre Island, stn. 12, 19 March 1990, NTM Cr.008477. (ii) 1 male, 1 ovig. female, Tre Island, stn. 20, 28 March 1990, NTM Cr.008478.

Remarks. The specimens all have a rostral dentition of 4/1, with no postorbital teeth. Specimens (ii) were in association with *Jocaste lucina*.

Host. Acropora sp. [Scleractinia: Acroporidae].

Distribution. Type locality: Arzana Island, Persian Gulf. Also known from the Red Sea to Geyser Reef, Mocambique Channel; Ryukyu Islands to southern Great Barrier Reef, east to Fijian, Samoan and Marshall Islands.

Table 1. Comparison of the pontoniine shrimp faunas of Hong Kong, Vietnam and Singapore.

	Species	Hong Kong	Vietnam	Singapore
1.	*Anapontonia denticauda*	–	–	+
2.	*Anchistus australis*	–	+	–
3.	*Anchistus custoides*	–	+	–
4.	*Anchistus custos*	+	+	+
5.	*Anchistus demani*	–	+	+
6.	*Anchistus miersi*	–	+	+
7.	*Chernocaris placunae*	–	–	+
8.	*Conchodytes kempi*	–	+	–
9.	*Conchodytes meleagrinae*	–	+	+
10.	*Conchodytes monodactylus*	+	–	–
11.	*Coralliocaris graminea*	+	+	–

Table 1 (continued)

	Species	Hong Kong	Vietnam	Singapore
12.	*Coralliocaris superba*	–	+	–
13.	*Coralliocaris venusta*	–	+	–
14.	*Coralliocaris viridis*	–	+	–
15.	*Hamodactylus boschmai*	+	–	–
16.	*Hamopontonia corallicola*	+	–	–
17.	*Harpiliopsis beaupresii*	–	+	+
18.	*Ischnopontonia lophos*	–	–	+
19.	*Jocaste japonica*	–	+	–
20.	*Jocaste lucina*	–	+	–
21.	*Onycocaris oligodentata*	+	–	–
22.	*Onycocaris quadratophthalma*	+	–	–
23.	*Palaemonella pottsi*	–	–	+
24.	*Palaemonella rotumana*	+	–	+
25.	*Periclimenaeus arabicus*	+	+	–
26.	*Periclimeneaeus rastrifer*	+	–	–
27.	*Periclimenaeus tridentatus*	–	–	+
28.	*Periclimenes akiensis*	–	–	+
29.	*Periclimenes amymone*	–	+	+
30.	*Periclimenes brevicarpalis*	+	+	+
31.	*Periclimenes commensalis*	+	–	–
32.	*Periclimenes consobrinus*	–	+	–
33.	*Periclimenes cristimanus*	+	–	+
34.	*Periclimenes demani*	+	–	–
35.	*Periclimenes digitalis*	+	–	+
36.	*Periclimenes diversipes*	–	–	+
37.	*Periclimenes elegans*	+	–	+
38.	*Periclimenes grandis*	–	–	+
39.	*Periclimenes holthuisi*	+	+	–
40.	*Periclimenes hongkongensis*	+	–	–
41.	*Periclimenes johnsoni*	–	–	+
42.	*Periclimenes imperator*	–	+	–
43.	*Periclimenes indicus*	–	–	+
44.	*Periclimenes kempi*	–	–	+
45.	*Periclimenes lutescens*	–	+	+
46.	*Periclimenes lanipes*	–	–	+
47.	*Periclimenes ornatus*	+	–	–
48.	*Periclimenes parvus*	–	–	+
49.	*Periclimenes perturbans*	+	–	–
50.	*Periclimenes seychellensis*	–	–	+
51.	*Periclimenes sinensis*	+	–	–
52.	*Periclimenes soror*	+	+	–
53.	*Periclimenes spiniferus*	–	+	+
54.	*Periclimenes toloensis*	+	–	–
55.	*Periclimenoides odontodactylus*	+	–	–
56.	*Philarius gerlachei*	–	+	–
57.	*Philarius imperialis*	–	+	+
58.	*Pontonides* sp.	+	–	–

Philarius imperialis (Kubo)

Harpilius imperialis Kubo, 1940: 1–4, figs. 1–3.
Philarius imperialis - Holthuis, 1952: 15.

Material examined. (i) male, 1 ovig. female, Tre Island, stn. 4, 9 March 1990, NTM Cr.008479. (ii) 1 male, 1 ovig. female, Tre Island, stn. 20, 5–7 m, 28 March 1990, NTM Cr.008480.
Remarks. The specimens are as previously described by previous authors. The males have a rostral dentition of 7–8/1, with 1–2 postorbital teeth; the females 6–7/1, with 1–2 postorbital teeth. The specimens (i) were associated with *Periclimenes amymone* and *Jocaste lucina*, (ii) with *Jocaste japonica*.

Hosts. (i) *Acropora* sp. (ii) *Pocillopora verrucosa* (Ellis and Solander). [Scleractinia: Acroporidae, Thamnasteriidae]. *Philarius* species are not generally found in association with pocilloporid hosts and it is possible that the latter record may be a labelling error.

Distribution. Type locality: Bonin Island. Also known from the Red Sea to Tanganyika, La Réunion, Singapore, Indonesia, northern Australia to southern Great Barrier Reef, Coral Sea, Caroline and Marshall Islands.

Discussion

Data are presently available on 58 pontoniine shrimp species from Singapore, Vietnam and Hong Kong coastal waters.

Only two species, *Anchistus custos* and *Periclimenes brevicarpalis*, have so far been found to occur in all three regions. Eight species are found in both Vietnam and Singapore and only four in both Hong Kong and Vietnam. Four species are found in both Hong Kong and Singapore but have not yet been recorded from Vietnam. This leaves 41 species (70%) that are not shared between the three localities. The *Periclimenes* sp., from Tre Island, is omitted from the above, as it could probably be either *P. grandis* or *P. elegans*.

The comparisons above are to some extent artificial. The pontoniine coral shrimp fauna of Singapore has been sampled by Patton and reported in Johnson (1961, 1979) and provides eight species, of which six are associated with branching corals. The coral-associated pontoniine fauna of Hong Kong consists of only two species, with one, *Coralliocaris graminea* associated with branching corals, reported by Stimpson (1860), but not collected since in Hong Kong waters, although abundant on most Indo-West pacific reefs. The branching coral fauna of Hong Kong is now so restricted that it has not been sampled recently and its associated crustacean fauna is unknown. The present collection from Vietnam indicates the presence of 11 coral-associated pontoniine shrimps, all living in association with branching hosts (44%). Seven species are associated with bivalve mollusc hosts (28%), two with echinoderms (8%), two with coelenterates (8%), one with a sponge host (4%) and two free-living species (8%). The Hong Kong fauna also includes a number of trawl-caught species from shallow sublittoral waters, as does the Singapore material, which were not sampled in the Vietnamese collections, but could well occur in Vietnamese waters.

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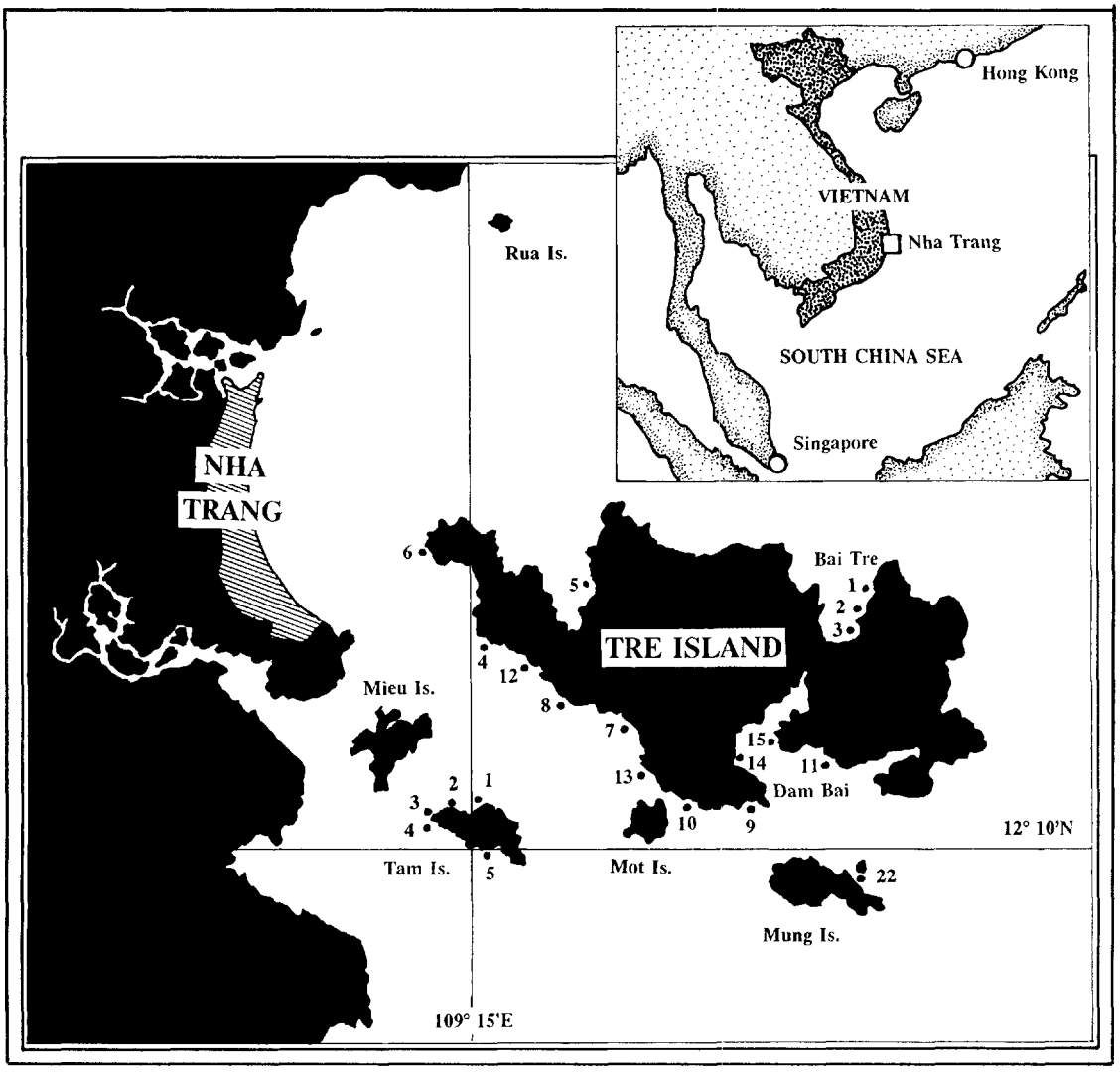

Fig. 1. Map of localities mentioned in text; inset, approximate position of localities in the South China Sea.

Remarks. The female has a rostral dentition of 4/1, the male has a dention that may be interpreted as 5/0 or 4/1.

Host. Tridacna squamosa Lamarck [Mollusca: Tridacnidae].

Distribution. Type locality: Capre Cay, Swain Reefs, Great Barrier Reef. Also known from Indonesia, northern Australia, New Caledonia, Fiji and the Marshall Islands.

Anchistus custoides Bruce

Anchistus custoides Bruce, 1977: 50–56 figs. 4–6.

Material examined. (i) 1 juv., Tre Island, stn 2, 7 m, 14 February 1987, NTM Cr.008375.

Remarks. The single example has a carapace length of 2.5 mm, and lacks both second pereiopods, with a single attached first pereiopod

Kükenthal in Indischen Archipel gesammelten Dekapoden und Stomatopoden. In Kükenthal, W., Ergebisse einer zoologischen Forschungsreise in den Molukken und Borneo. *Abandlingen hrsg. von des Senckenbergischen Naturforschenden Gesell-schaft* 24:467–929, pls. 19–27.

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