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**PONTONIINAE (DECAPODA, CARIDEA)
ASSOCIATED WITH *HELIOFUNGIA ACTINIFORMIS*
(SCLERACTINIA) FROM HANSA BAY, PAPUA NEW GUINEA)⁽¹⁾**

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Abstract. A small collection of Pontoniinae (Crustacea, Decapoda, Caridea) from Hansa Bay, northern Papua New Guinea associated with the diurnally active coral species, *Heliofungia actiniformis* is discussed. Four species are recorded as new to the Papua New Guinea fauna. Morphological details of *Periclimenes venustus* and *P. watumuae* are discussed and compared with previous records.

Key words: Pontoniinae, Caridea, Papua New Guinea.

INTRODUCTION

Although some of the earliest records of caridean shrimps came from the Papua New Guinea region (BORRADAILE, 1898; NOBILI, 1899), the shrimp fauna remains little studied. In a comparison of the Pontoniinae, one of the most speciose groups of Caridea, from Australia and neighbouring regions by BRUCE (1990a) many genera and species, although widespread in the Indo-West Pacific, were not recorded from Papua New Guinea. In recent decades, only very limited collecting has been carried out along the northern coastline of Papua New Guinea. MORGAN (1988) recorded only four species from Madang, which compares quite unfavourably with BRUCE (1981) who recorded 100 species from Heron Island in the southern part of the Great Barrier Reef. In view of the widespread nature of coral reefs along the northern coastline of Papua New Guinea (CLAEREBOUTD *et al.*, 1989) and the species richness of coral-biotope-associated Pontoniinae (BRUCE, 1976a), it is expected that many more species, especially the smaller or cryptic ones, await discovery.

This report deals with a small collection of Pontoniinae, found associated with the diurnally active coral, *Heliofungia actiniformis* (Quoy & Gaimard, 1833). *H. actiniformis* is one of only a few corals which have their polyps extended during the day. Five species of Pontoniinae are known to associate with *H. actiniformis*, only one of which, *Periclimenes holthuisi* Bruce, 1969 has been recorded previously from the northern coast of Papua New Guinea (BRUCE, 1977a).

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MATERIAL AND METHODS

Samples of *H. actiniformis* and its associated fauna were collected from Hansa Bay, about 10 km NW of Bogia (Madang Province) on the northern coast of Papua New Guinea during 1992 and 1993. For a map of the general area in which all sampling localities are listed see CLAERBOUDT *et al.* (1989). Samples were obtained by placing the complete coral in a sealed plastic bag in situ. In the laboratory, extraction of the commensal shrimp fauna was achieved by dousing the coral with a weak formalin solution.

Post-orbital carapace lengths (cl.) are given in mm. All specimens have been deposited in the collections of the «Koninklijk Belgisch Instituut voor Natuurwetenschappen», registration numbers IG 27951 and IG 28056.

SYSTEMATICS

Family Palaemonidae Rafinesque

Subfamily Pontoniinae Kingsley

Genus *Hamopontonia* Bruce, 1970*Hamopontonia corallicola* Bruce, 1970

Restricted synonymy

Hamopontonia corallicola BRUCE, 1970:37-48; Figs 1-4. – BRUCE, 1977b: 172-173; Fig. 4. – BRUCE, 1983a:896; Fig. 10g. – SUZUKI & HAYASHI, 1977: 195-196; Figs 1b, 2b; Plate 1.

Material examined

(i) 1 ovigerous (ov.) female cl. 4.1, 3 males cl. 1.8-1.9; Laing Island lagoon, NW side, 10m depth, from *H. actiniformis*; 15.09.1992; S. De Grave coll., field no. S92/58; KBIN IG 27951/NAT1. (ii) 1 female cl. 3.9, 1 male cl. 2.5; Davit wreck, Hansa Bay, 6mm depth, from *H. actiniformis*; 06.10.1992; S. De Grave coll., field no. S92/132; KBIN IG 27951/NAT2. (iii) 1 ov. female cl. 5.1; Laing Island lagoon, NW side, 6m depth, from *H. actiniformis*; 14.09.1994; H. Wilkins coll., field no. S92/54; KBIN IG 27951/NAT3.

Remarks

The specimens agree closely with previous descriptions (BRUCE, 1970, 1977b), although some differences were noted. As in the Indonesian material of BRUCE (1983a) the telson has three pairs of spines and the rostrum has seven dorsal spines in all specimens except the ovigerous female (i). A further difference was found in the structure of the second pereopods. All females and one male (ii) had the second pereopods of nearly equal size, in contrast to the type specimens (BRUCE, 1970). In nearly all specimens the ratio between the palm and fingers of the second pereopod approached 2:1 rather than 3:1.

Colour in life. Females with figure eight shaped white patch on gastric region, posterodorsal aspect of abdominal segments with transverse white bands. Colouration of males not noted.

Distribution

Papua New Guinea (this report), Hong Kong (BRUCE, 1970), Japan (SUZUKI & HAYASHI, 1977), Indonesia (BRUCE, 1983a), Australia (BRUCE, 1977b).

Hosts

Scleractinia: *H. actiniformis*, *Euphyllia glabrescens* (Chamisso & Eysenhardt, 1821), *Goniopora stokesi* Edwards & Haime, 1851; Actiniaria: *Entacmaea quadricolor* (Rüppel & Leuckart, 1828).

Genus *Periclimenes* Costa, 1844

Periclimenes kororensis Bruce, 1977

Restricted synonymy

Periclimenes kororensis BRUCE, 1977c: 33-43; Figs 1-4. – BRUCE, 1983b: 209. – BRUCE & SVOBODA, 1984: 94-96; Figs 5-6.

Material examined

1 ov. female cl. 4.5, 1 male cl. 2.9; Laing Island Reef, outer slope, 10m depth, from *H. actiniformis*; 14.10.1993; S. De Grave coll., field no. S93/116; KBIN IG 28056/NAT4.

Remarks

The specimens agree with previous descriptions (BRUCE, 1977c; BRUCE & SVOBODA, 1984) with some minor differences noted. The rostral dentition of the female was 7/4 and the male 6/3 with a distinct postrostral tubercle, the latter being completely absent in the female. The second pereopods are similar but unequal, with the minor one being 0.65 times as long as the major second pereopod.

Colour in life. Orbital region, rostrum and antennal peduncles white; remainder of carapace orange, although transparent; pleon segments and appendages transparent; joints of all pereopods blue; eye stalks with blue longitudinal stripes.

Distribution

Papua New Guinea (this report), Palau Islands (BRUCE, 1977c), Philippines (BRUCE & SVOBODA, 1984), Australia (BRUCE, 1983b).

Hosts

Scleractinia: *H. actiniformis*.

Periclimenes venustus Bruce, 1990**Restricted synonymy**

Periclimenes venustus BRUCE, 1990b: 229-243; Figs. 1-6. – FRANSEN, 1989: 139-143 (partim, as *P. holthuisi*). – BRUCE, 1990a: 12. – BRUCE, 1989: 178.

Material examined

(i) 2 ov. females cl. 4.1-5.1, 2 males cl. 1.6-3.1; Laing Island Lagoon, NW reef slope, 6m depth, from *H. actiniformis*; 14.09.1992; coll. S. De Grave, field no. S92/54; KBIN IG 27951/NAT5. (ii) 1 ov. female cl. 4.1, 2 males cl. 2.1-2.2, 4 juveniles cl. 1.3-2.0; Laing Island Lagoon, NW reef slope, 10m depth, from *H. actiniformis*; 16.09.1992; coll. S. De Grave, field no. S92/58; KBIN IG 27951/NAT6. (iii) 2 females cl. 2.1-2.8, 2 males cl. 1.2-1.3, 3 juveniles cl. 1.0-1.1; Laing Island Lagoon, 6m depth, from *H. actiniformis*; 18.09.1993; coll. S. De Grave, field no. S93/132; KBIN IG 28056/NAT7.

Remarks

The specimens agree closely with the type description (BRUCE, 1990b). As already pointed out by BRUCE (1990b) the close similarity of *P. venustus* to *P. holthuisi* suggests that some of the records of the latter species probably belong to *P. venustus*. Indeed, some of the chelae of *P. holthuisi* illustrated by FRANSEN (1989) show a close similarity with *P. venustus*, and in all likelihood belong to the latter species. Although in fully grown individuals the characteristic dentition of the chelae (Fig. 1a, b) is the single most useful morphological difference with *P. holthuisi*; in juveniles (Fig. 1c, d) this dentition is largely absent. The only reliable morphological difference in small specimens between both species appears to be the spines on the propodus of the third pereopod, which in *P. venustus* only bears a few short ventrodistal spines (Fig. 1e, f, g) while in *P. holthuisi* more and longer spines are present.

The first record of this species is by BRUCE (1989), who lists the actual species description as in press. This was followed in 1990 (BRUCE, 1990b) by a more formal description, inclusive of the designation of type material and locality selection. Clearly the latter publication was intended to be the type description, its publication in all possibility being delayed. As volume 6 of Indo-Malayan Zoology was the 1989 volume, but only appeared in June 1990, it seems logical to maintain the authorship of *P. venustus* as BRUCE (1990).

Colour in life. Body and appendages transparent, white patch on third abdominal segment with two to four smaller pink or blue patches superimposed. The colouration of live *P. venustus* distinguishes this species immediately from *P. holthuisi*.

Distribution

Papua New Guinea (this report), Australia (BRUCE, 1990), Philippines (BRUCE, 1989), Indonesia (FRANSEN, 1989), Ryukyu Islands (CHACE & BRUCE, 1993).

Hosts

Actiniaria: unidentified sp.; Scleractinia: *H. actiniformis*.

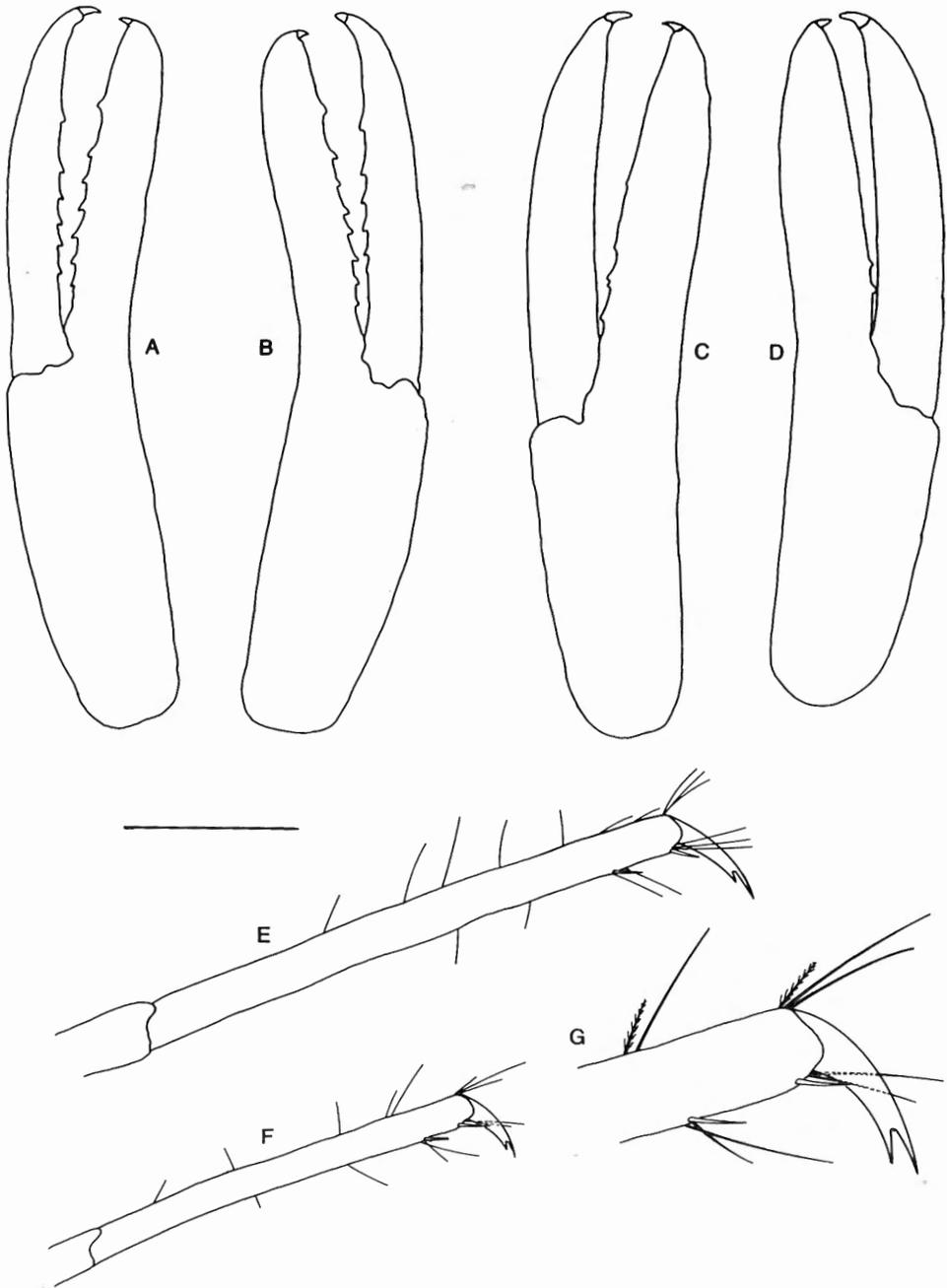


Fig. 1. — *Periclimenes venustus* Bruce, Laing Isl. Lagoon, Hansa Bay, ovigerous female (cl. 4.1mm): chelae of left (A) and right (B) second pereopod, third pereopod (E); juvenile male (cl. 2.1mm), chelae of left (C) and right (D) second pereopod, third pereopod (F), distal part of third pereopod (G). Scale bar indicates 0.1 mm (A, B, E) or 0.4 mm (C, D, F, G).

Periclimenes watamuae Bruce, 1976**Restricted synonymy**

Periclimenes watamuae BRUCE, 1976b: 16-20, Figs. 5-6 – FRANSEN, 1994: 130.

Material examined

1 ov. female cl. 1.2, 2 males cl. 1.0-1.1; Purar-I Reef, Hansa Bay, 10m depth, from *H. actiniformis*; 11/10/1993; S. De Grave coll., field no. S93/95; KBIN IG 28056/NAT8.

Remarks

Rostrum slender, with rostral formula 5/1 in female, 5/0 and 4/1 in males. Third maxilliped with well developed exopod with 4 plumose, segmented terminal setae. Epipod well developed.

First pereopods slender (Fig. 2a, c, d). Chelae with subcylindrical palm, about twice as long as wide, with slender fingers, slightly gaping, not subspatulate, with entire blunt cutting edge and hooked tips, equal to approximately 0.7x length of palm. Distal part of both fixed finger and dactylus with numerous, finely-serrated long setae. Carpo-propodal region with numerous serrated stout setae. Carpus and merus slender, equal in length, approximately 1.5 times the length of the chela. Ischium and basis about 0.4x and 0.3x as long as merus, respectively. Coxa with small medial lobe, furnished with three long setae. Fourth thoracic sternite unarmed.

Second pereopods similar and equal (Fig. 2e, f), showing a resemblance to those of *P. diversipes* Kemp, 1922 form c. Chelae 5.2x as long as wide, palm gradually expanding distally. Fingers 2.4 times as long as palm, shallowly spatulate with entire cutting edges. Tip of dactylus blunt, curved. Tip of fixed finger with accessory blunt spine, so as to create bifid aspect in which dactylar tip fits. Carpus short, distally expanded, approximately 0.9 times as long as palm. Ischium and merus unarmed, slender, with ischium approximately 1.45 times as long as merus. Basis and coxa show no special features. The second pereopods of the males are similar to those of the female.

Ambulatory pereopods slender. Third pereopod dactylus slender (Fig. 2g, h), nearly five times longer than proximal width. Unguis well demarcated, equal to 0.75x length of corpus. No accessory spines, but one setae present on the lateral aspect of the corpus. Propodus approximately 8.7x longer than wide, with a single ventrodiscal blunt spine. Two plumose setae present on the upper border, situated in the distal half. Carpus, merus and ischium unarmed. Merus approximately 1.75x as long as carpus, ischium subequal in length to carpus. Fourth and fifth pereopods similar.

Male first pleopod with endopod approximately 0.5x exopod length (Fig. 3a, b), distal part broadly expanded, with small lobe on medio-distal margin and with four short simple spines on proximal half, distal margin with one plumose seta. Second pleopod with endopod approximately 0.8x exopod length, with appendices at 0.4 along medial margin (Fig. 3c, d). Appendix masculina feebly tapering distally, with two long, equal ter-

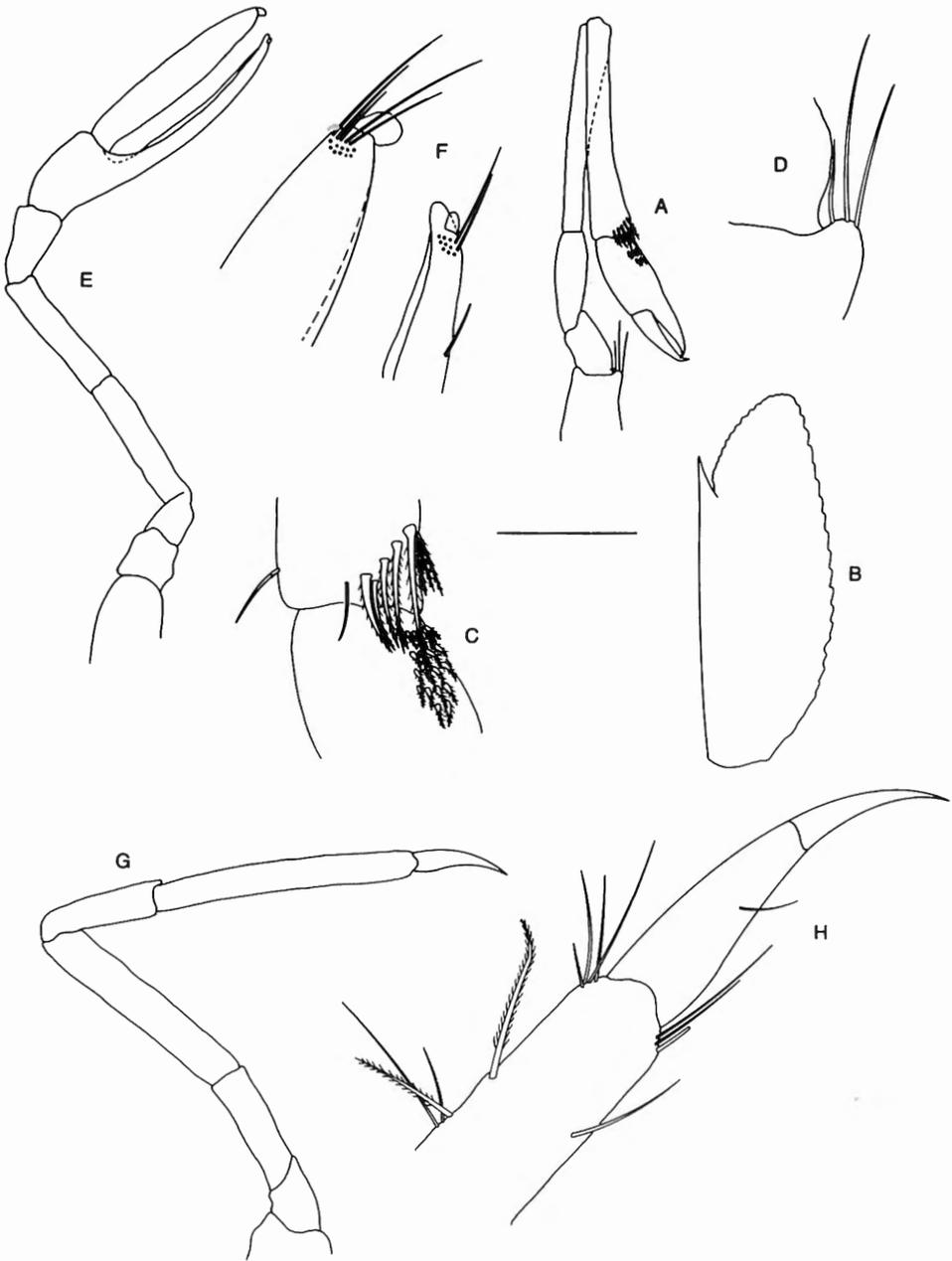


Fig. 2. — *Periclimenes watamuae* Bruce, Purar-I Reef, Hansa Bay, female: first pereopod (A), antennal scale (B), mesial aspect of carpo-propodal joint of first pereopod (C), coxal lobe of first pereopod (D); second pereopod (E), detail of chelae of second pereopod (F); third pereopod (G), dactylus of third pereopod (H). Scale bar indicates 0.1 mm (B, C, D, F, H) or 0.4 mm (A, E, G).

minimal spines and six spines of decreasing length along lateral margin. Appendix interna approximately 1.3x as long as appendix masculina, with four subterminal cincinnuli.

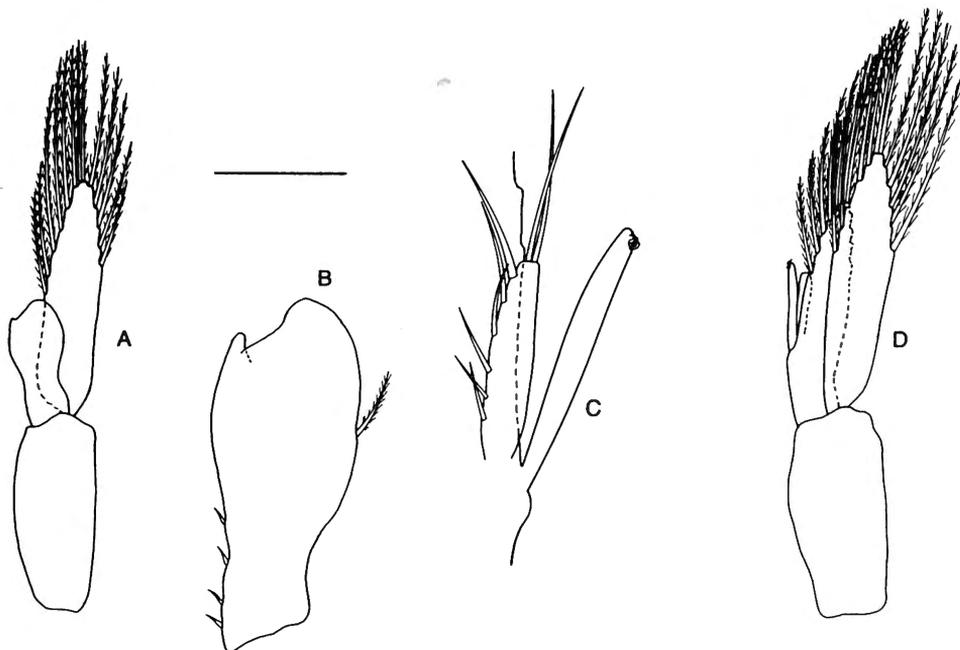


Fig. 3. – *Periclimeses watamuae* Bruce, Purar-I Reef, Hansa Bay, male: first pleopod (A), endopod of first pleopod (B), appendix masculina and appendix interna of second pleopod (C), second pleopod (D). Scale bar indicates 0.1 mm (B, C) or 0.3 mm (A, D).

Generally, the present specimens agree with the type description (BRUCE, 1976b) although some differences were noted, especially in the fingers of the second pereopod. The latter character is the single most useful interspecific character in the *P. diversipes* group, to which *P. watamuae* belongs. Although BRUCE (1976b) stated that the tip of the fingers are simple, Dr. C. H. J. M. Fransen on examination of the holotype and allotype found these to be bifid, as in the present specimens. Other minor differences, notably in the structure of the male secondary sexual appendages may be developmental in nature or simply structural variations in this poorly known species.

Colour in life. Body and appendages near totally transparent, with minute scattered red chromatophores over body

Distribution

Papua New Guinea (this report), Kenya (BRUCE, 1976), Seychelles (FRANSEN, 1994).

Hosts

Alcyonaria: unidentified sp., Gorgonacea: unidentified sp., Scleractinia: *H. actiniformis*, *Fungia* sp.

DISCUSSION

Five species of Pontoniinae were previously known to associate with *Heliofungia actiniformis*, and with *Periclimenes watamuae* this number is now raised to six. Of these, only *P. tenuipes* Borradaile, 1898, recorded by READ (1974) as occurring with *H. actiniformis*, has not yet been recorded from northern Papua New Guinea. As BRUCE (1983) regards *P. tenuipes* as a free-living species, its association may have been incidental.

It was noted in the field that the different shrimp species exhibited some form of habitat segregation on their host corals. Female *H. corallicola* were invariably perched on top of the mouth of *H. actiniformis* between the tentacles, while the smaller-sized males occurred between the tentacles. The cryptic colouration of this species, which resembles the tentacle tips of their hosts, renders them very inconspicuous. Individuals of *P. venustus* were much more mobile and roamed freely over the oral surface of the coral, darting around the tips of the tentacles.

The pair of *P. kororensis* were encountered between the tentacles, where their large size and bright colouration made them very conspicuous. In contrast to the other species, the specimens of *P. watamuae* were encountered on the aboral side of the coral, the side resting on the sand. *Metapontonia fungiacola* Bruce, 1967 occupies the latter habitat in parts of the Indian Ocean and the Ryukyu Islands, however this species has not been recorded in association with *H. actiniformis*, only with the coral genera *Fungia*, *Halomitra*, *Hydnophora* and *Goniastrea* (BRUCE, 1977b). On two occasions, individuals of *H. corallicola* and *P. venustus* were collected from the same host individual.

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REFERENCES

- BORRADAILE, L.A. (1898) – A revision of the Pontoniidae. *Annals and Magazine of Natural History, series 7*, 2: 376-391.
- BRUCE, A.J. (1970) – Notes on some Indo-Pacific Pontoniinae. XV. *Hamopontonia corallicola* gen. nov., sp. nov., a new pontoniid shrimp from Hong Kong. *Crustaceana*, 18(1): 37-48.
- BRUCE, A.J. (1976a) – Shrimps and prawns of coral reefs, with special reference to commensalism. In: O. A. JONES & R. ENDEAN (eds.). *Biology and geology of coral reefs*, volume 3. Academic Press, New York: 37-94.

- BRUCE, A.J. (1976b) – A report on a small collection of shrimps from the Kenya National Marine Parks at Malindi, with notes on selected species. *Zoologische Verhandelingen*, Leiden, **145**: 1-72.
- BRUCE, A.J. (1977a) – The hosts of the coral-associated Indo-west-Pacific pontoniine shrimps. *Atoll Research Bulletin*, **205**: 1-19.
- BRUCE, A.J. (1977b) – A report on a small collection of pontoniine shrimps from Queensland, Australia. *Crustaceana*, **33**(2): 167-181.
- BRUCE, A.J. (1977c) – *Periclimenes kororensis* n. sp., an unusual shrimp associate of the fungiid coral, *Heliofungia actiniformis*. *Micronesica*, **13**(\ddagger): 33-43.
- BRUCE, A.J. (1981) – Pontoniine shrimps of Heron Island. *Atoll Research Bulletin*, **245**: 1-33.
- BRUCE, A.J. (1983a) – Expedition Rumphius II (1975). Crustaceans parasites, commensaux, etc. (Th. MONOD ed.), IX: Crustacés Décapodes (1^{re} partie: Natantia Pontoniinae. *Bulletin du Muséum National d'Histoire Naturelle*, Paris, series 4(5), section A, **3**: 871-902.
- BRUCE, A.J. (1983b) – The pontoniine shrimp fauna of Australia. *Memoirs of the Australian Museum*, **18**: 195-218.
- BRUCE, A.J. (1989) – A report on some coral reef shrimps from the Philippine Islands. *Asian Marine Biology*, **6**: 173-192.
- BRUCE, A.J. (1990a) – Recent additions to the pontoniine shrimp fauna of Australia. *The Beagle*, **7**(2): 9-20.
- BRUCE, A.J. (1990b) – A new cnidarian-associated shrimp from Port Essington, Cobourg Peninsula, Australia. *Indo-Malayan Zoology*, **6**: 229-243.
- BRUCE, A.J. & A. SVOBODA (1984) – A report on a small collection of coelenterate-associated pontoniine shrimps from Cebu, Philippines Islands. *Asian Marine Biology*, **1**: 87-99.
- CLAEREBOUT, M., C. MASSIN & J. BOUILLON (1989) – A general survey of Laing Island environment (Papua New Guinea). *Indo-Malayan Zoology*, **6**: 1-23.
- FRANSEN, C. H. J. M. (1989) – Notes on caridean shrimps collected during the Snellius-II expedition. I. Associates of Anthozoa. *Netherlands Journal of Sea Research*, **23**(2): 131-147.
- FRANSEN, C.H.J.M. (1994) – Marine palaemonoid shrimps of the Netherlands Seychelles Expedition 1992-1993. *Zoologische Verhandelingen*, Leiden, **297**: 85-152.
- MORGAN, G.J. (1988) – A checklist of decapod Crustacea from the Madang region, Papua New Guinea. *Science in New Guinea*, **14**(3): 124-139.
- NOBILI, G. (1899) – Contribuzioni alla conoscenza della fauna carcinologica della Papuasias, delle Molucche e dell'Australia. *Annali del Museum Civico di Storia Naturale di Genova*, **20**(40): 473-523.
- READ, K.R.H. (1974) – The rock islands of Palau. *Oceans*, **7**(6): 10-17.
- SUZUKI, K. & K.-I. HAYASHI (1977) – Five Caridean shrimps associated with sea anemones in Central Japan. *Publications from the Seto Marine Biological Laboratory*, **24**(1/3): 193-208.