

**PERICLIMENES MILLERI NEW SPECIES, A BATHYAL  
ECHINOID-ASSOCIATED PONTONIINE SHRIMP  
FROM THE BAHAMAS**

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ABSTRACT

*Periclimenes milleri*, a new species of pontoniine shrimp (Decapoda: Palaemonidae) from the Bahamas, is described and illustrated. The specimens were collected by submersible from a depth of 527 m and were found in association with sea urchins of the genus *Heterobrissus* (Asterostomatidae).

The genus *Periclimenes* Costa, 1844, contains numerous species, particularly from shallow tropical waters, that are associated with a wide range of invertebrate hosts. A number have been found in association with echinoids and these have been recently reviewed (Bruce, 1982). Relatively few are known from deeper water. This is probably due to their small size and the type of sampling gear used. Most specimens have been obtained from dredge or trawl catches and, in these, the associations with their host animals are frequently obscured or lost.

The present specimens were first observed from the JOHNSON-SEA-LINK submersible, videotaped in situ on their host, and both were subsequently collected. Few carideans have been collected by this method. These include *Alvinocaris fusca*, and *Diapontonia maranus* (Williams and Chace, 1982; Bruce, 1986). The submersible appears to be an ideal engine for augmenting present knowledge of deep sea commensal carideans and their associations.

Drawings were prepared by camera lucida. CL refers to the post-orbital carapace length. Measurements in millimeters.

*Periclimenes milleri* new species

Figures 1-5

*Material*.—20 spms (7♂, CL 1.7-2.9; 5 ovig. ♀, CL 2.8-3.65; 8♀, CL 1.5-2.7) Stn JSL-1500, 24°02.75'N, 74°32.53'W, 527 m, 22 October 1983, coll. Askew, Kier, Hall and Miller. Bottom temp 17.9°C.

*Description*.—Ovigerous female: body generally sub-cylindrical, moderately slender, smooth and glabrous.

Rostrum slender, straight, reaching to or beyond end of antennular peduncle, lateral of carinae obsolete, dorsal carinae with 8-9 acute teeth, with 2-3 situated on anterior carapace; ventral margin with two smaller acute teeth; supra-orbital spines absent; orbit obsolete, inferior orbital angle slightly produced, rounded; antennal and hepatic spines well developed, hepatic spine smaller than antennal, situated at lower and more posterior position, antennal spine marginal: antero-lateral angle obtusely rounded.

Abdomen with third somite not postero-dorsally produced; fifth segment about 0.6 of length of sixth; sixth about 1.5 times longer than deep, posterior lateral angle short and acute, postero-ventral angle blunter. Pleura of first three segments broadly rounded, fourth and fifth slightly produced, rounded. Telson about 1.8 times length of sixth segment, 2.8 times longer than wide anteriorly, sides straight, convergent, posterior border rounded, about 0.4 of anterior width; two pairs of well developed marginal dorsal spines at 0.6 and 0.8 of telson length; lateral

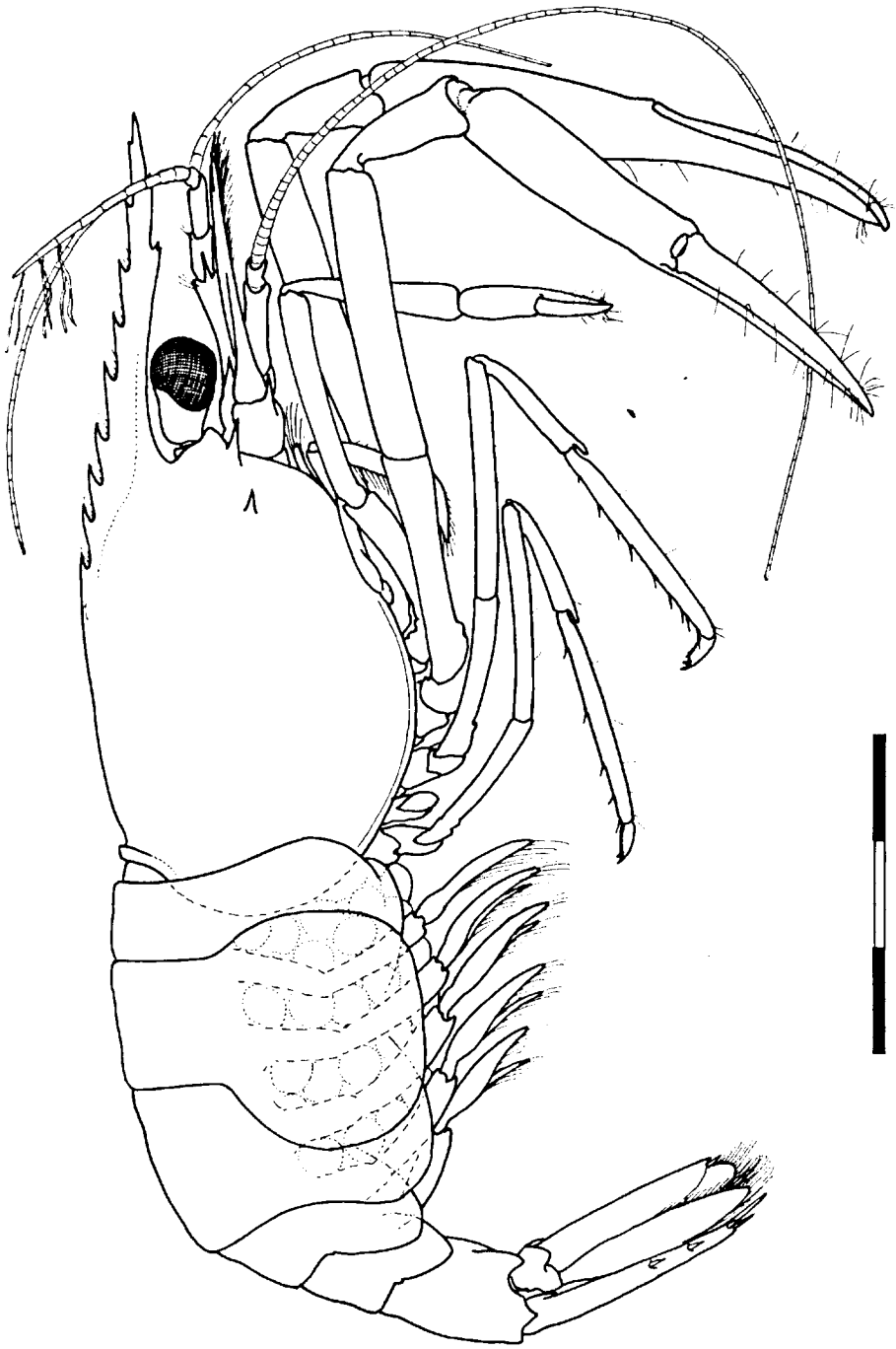


Figure 1. *Periclimenes milleri* new species, holotype female, Grand Bahama. Scale in millimeters.

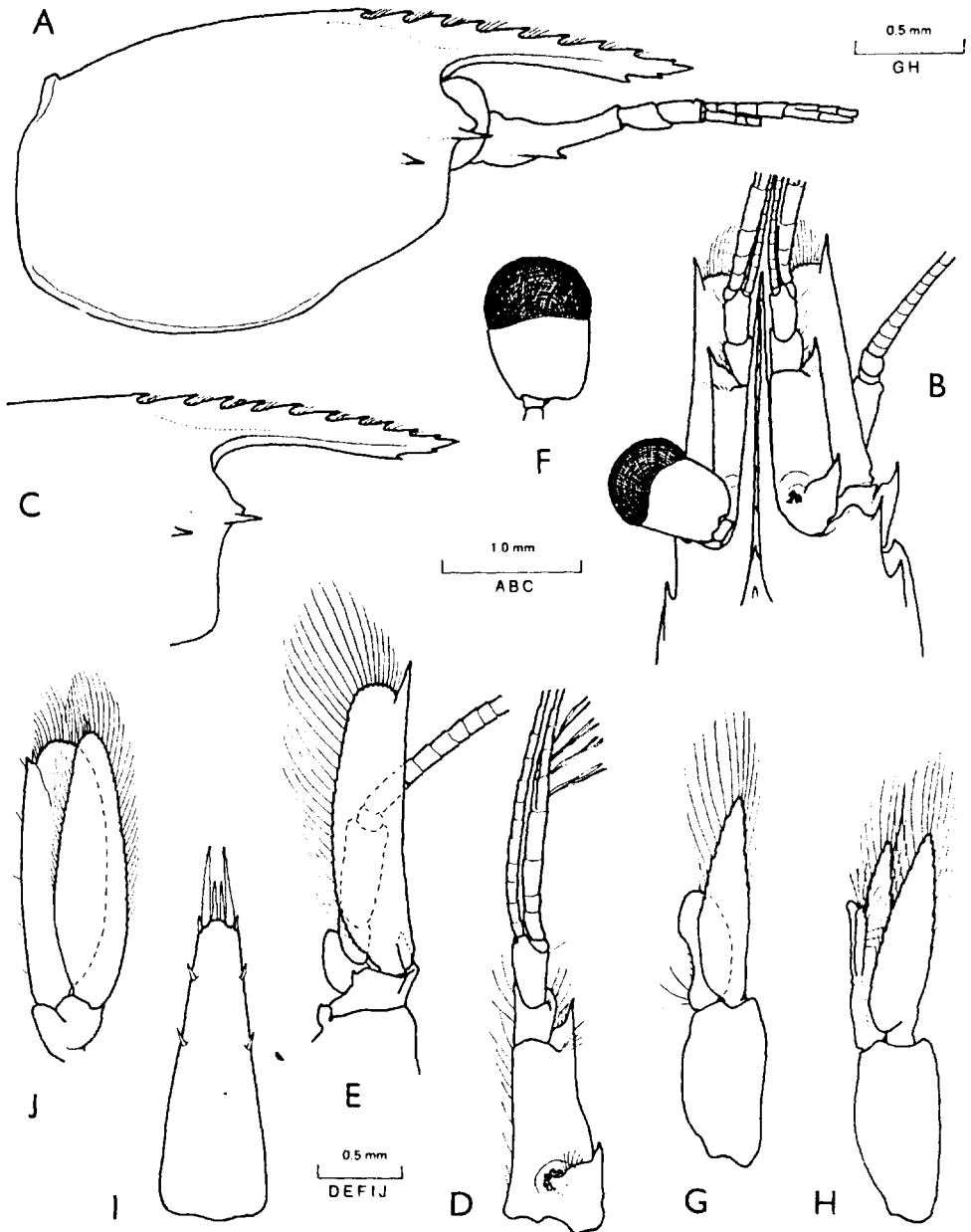


Figure 2. *Periclimenes milleri* new species, paratype ovigerous female. A, carapace and rostrum, lateral. B, anterior carapace, rostrum and antennal peduncles, dorsal. D, antennule. E, antenna. F, eye, dorsal. I, telson. J, uropod. Male allotype. C, anterior carapace and rostrum. G, first pleopod. H, second pleopod.

posterior spines slightly smaller than dorsal spines; intermediate spines large, 0.28 of telson length; submedian spines smaller and more slender, setulose, 0.45 of intermediate spine length.

Antennule with proximal segment of peduncle narrow, central width about 0.35

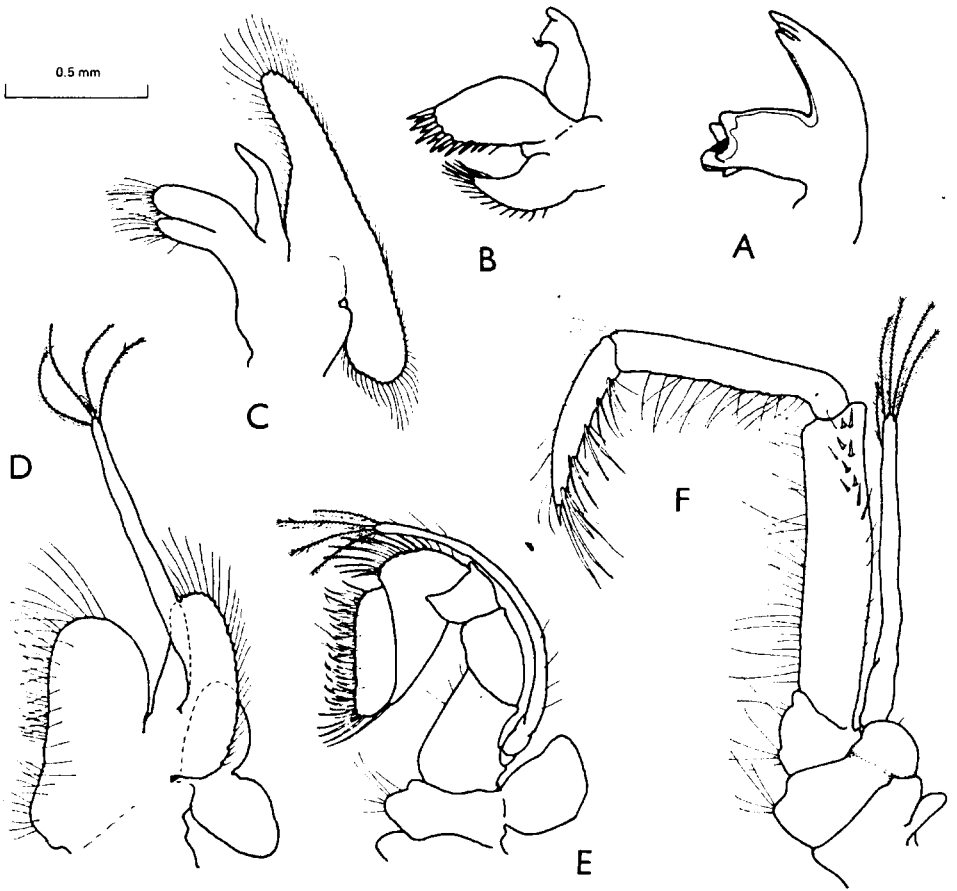


Figure 3. *Periclimenes milleri* new species, ovigerous female paratype. A, mandible. B, maxillula. C, maxilla. D, first maxilliped. E, second maxilliped. F, third maxilliped.

of length; stylocerite short, distally acute, not reaching half segment length; statocyst normal with granular statolith; disto-lateral angle strongly produced with well developed disto-lateral spine that reaches proximal margin of distal peduncular segment; inferior medial margin with strong acute tooth; intermediate segment subequal to distal segment length, together equal to about 0.55 of proximal segment length; intermediate segment with lateral lobe. Upper flagellum biramous, rami slender, fused for four proximal segments; shorter ramus with two free segments with 3-4 groups of aesthetascs; longer ramus filiform with about 14 segments. Lower ramus also filiform, about 22 segments.

Antenna normally developed, basicerite with strong lateral tooth; carpuccerite about 2.5 times longer than broad, compressed, extending to middle of scaphocerite; flagellum well developed, about 3 times carapace length; scaphocerite extending beyond antennular peduncle, lamella narrow, about 4.0 times longer than broad, rather uniform, anterior border rounded, lateral margin feebly concave with strong distal tooth extending well beyond anterior laminar margin.

Epistome unarmed. Mouthparts typical of *Periclimenes* spp. Mandible moderately robust, without palp; molar process stout with 5 blunt teeth and small

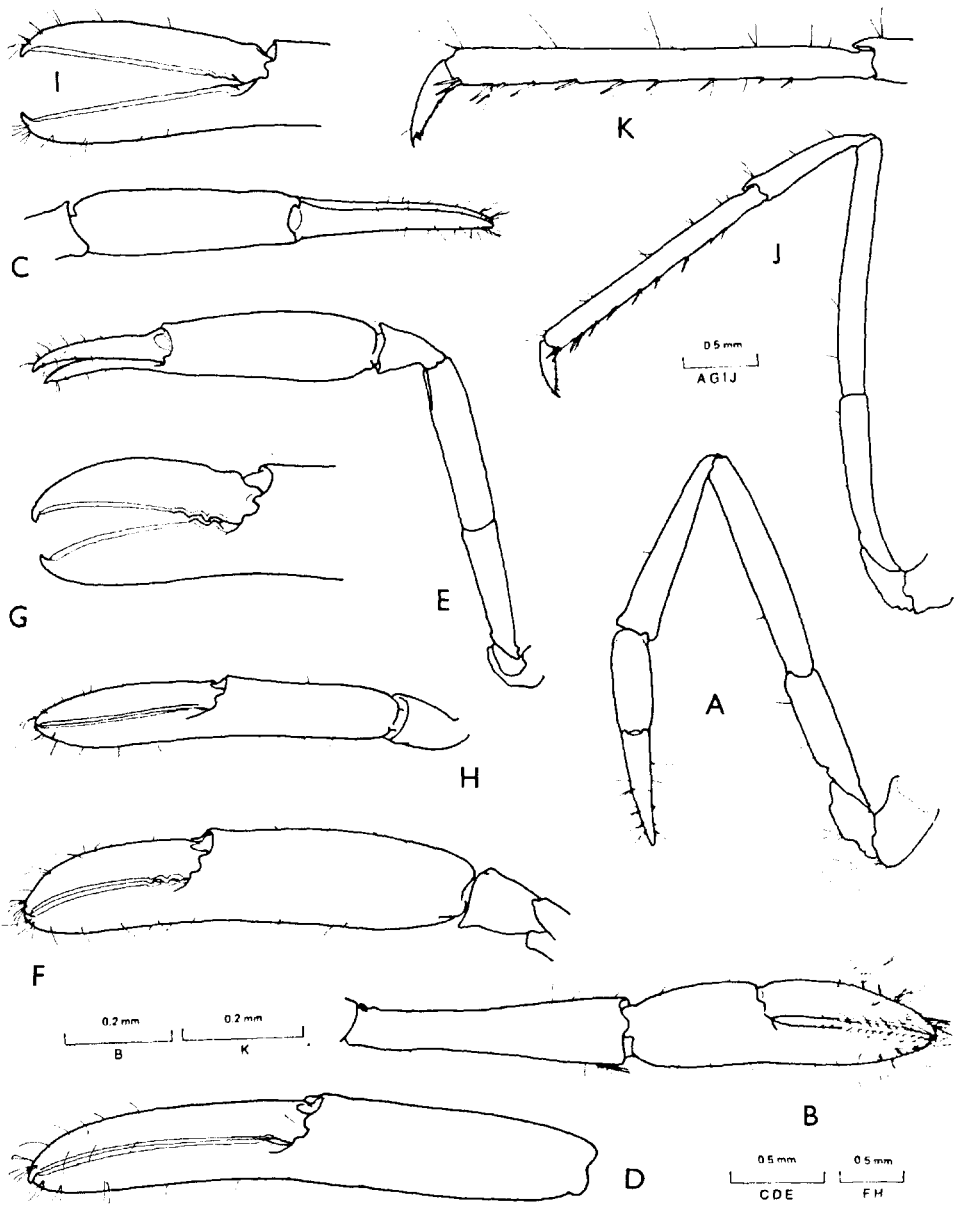


Figure 4. *Periclimenes milleri* new species. A, first pereiopod. B, same, chela and carpus. C, chela of second pereiopod, minor. D, same, major. E, second pereiopod. F, same, major chela. G, same, fingers. H, chela of minor second pereiopod. I, same, fingers. J, third pereiopod. K, same, dactyl and propod. ABJK, female paratype. CD, holotype, ovigerous female. EFGHI, male allotype.

marginal groups of short setae; incisor process robust, distal margin oblique, with 4 teeth, central pair shorter than outer teeth. Maxillula with bilobed palp, upper lobe small, lower lobe with small acute uncinata seta; upper lacinia normal with about 10 stout spines and some setae distally; lower lacinia tapering with numerous setae. Maxilla with slender, tapering, non-setose palp; basal endite well developed,

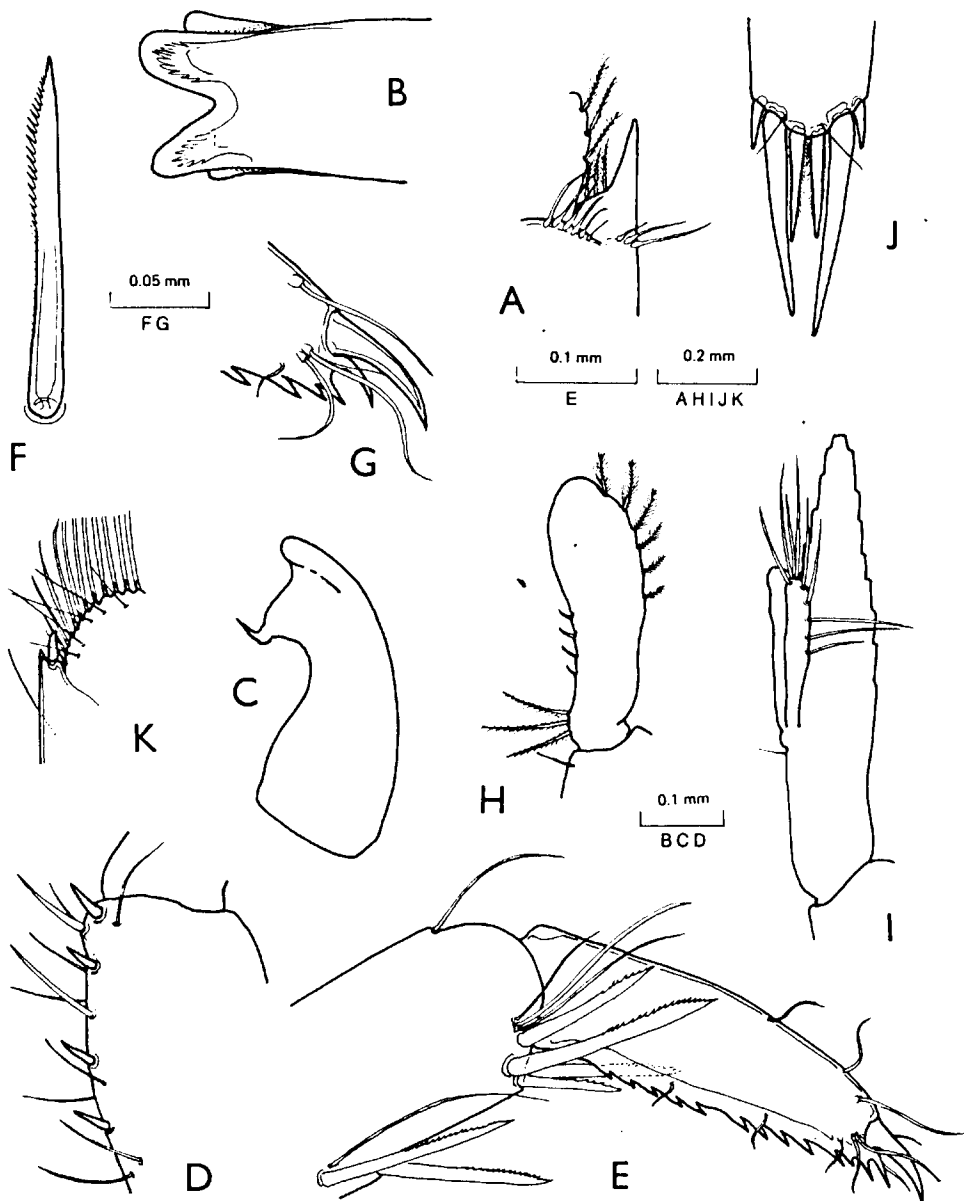


Figure 5. *Periclimenes milleri* new species. A, disto-lateral angle of proximal segment of antennular peduncle. B, molar process of mandible. C, palp of maxillula. D, disto-lateral, angle of antepenultimate segment of endopod of third maxilliped. E, dactyl of third pereiopod. F, disto-ventral spine of propod of third pereiopod. G, unguis and distal dactyl. H, endopod of first pleopod. I, endopod of second pleopod. A-G, female paratype. H, I, male allotype.

bilobed, distal lobe larger than proximal, each with about 12-14 slender setae; coxal endite obsolete, margin feebly rounded; scaphognathite narrow, about 4 times longer than broad, distal half of anterior lobe particularly narrow, posterior lobe relatively broad. First maxilliped with subcylindrical, non-setose palp, reaching to distal border of caridean lobe; basal endite distally produced, broadly

rounded, sparsely setose disto-medially and separated from feebly developed coxal endite by small notch only; exopod with normal flagellum with four plumose distal setae and narrow, elongated caridean lobe; well developed deeply bilobed epipod present. Second maxilliped with endopod of normal form, exopod slender with four plumose distal setae; coxa slightly produced and feebly setose medially, with subrectangular epipod laterally; without podobranch. Third maxilliped with endopod slender, reaching to distal end of carapocerate; ischio-merus feebly separated from basis, about 5 times longer than broad, uniform, with numerous small spines disto-laterally, sparsely setose medially; penultimate segment slender, about 6.5 times longer than broad and about 0.85 of ischio-meral length, feebly setose medially; terminal segment tapering, about 0.6 of ischio-meral length, with short terminal spine and two long preterminal spines, with several groups of shorter spines along medial border; basis medially rounded, feebly setose; exopod slender with 4 large plumose setae distally; coxa slightly produced medially, feebly setose, with small rounded lateral plate, without epipod; rudimentary arthrobranch present.

Thoracic sternites moderately broad, particularly third to fifth, fourth with minute median tooth, fifth with small lateral processes.

First pereopod moderately robust, extending beyond carapocerate by carpus and chela; chela with palm about 1.6 times longer than broad, slightly compressed, fingers about 1.3 times palm length, dactyl about 4.5 times longer than deep, with small hooked tip, fixed finger similar; cutting edges gaping proximally, laminar and entire over distal two thirds, with numerous groups of setae generally; carpus slightly shorter than chela, 4 times longer than distal width; slightly tapered proximally; merus about 1.17 times carpal length, 6.5 times longer than broad, uniform but slightly swollen centrally; ischium about 0.6 of merus length, about 4.0 times longer than broad, obliquely articulated with short basis; coxa robust; without ventro-median process.

Second pereopods well developed with robust, subequal or slightly unequal, feebly dissimilar chelae, major chela of holotype about 1.35 times carapace length and minor chela about 1.30 times; extending beyond antennular peduncle by length of carpus and chela. Major chela with palm smooth, subcylindrical, slightly compressed distally, about 3.2 times longer than deep, smooth; fingers subequal to palm, slender, dactyl about 8.0 times longer than deep, tips slightly hooked, cutting edges entire. Minor chela with palm about 3.3 times longer than deep; fingers equal to about 0.85 of palm length, slender, about 7.0 times longer than deep, with small hooked tips, cutting edges entire.

Ambulatory pereopods slender, with third extending beyond carapocerate by length of propod and dactyl. Third pereopod with dactyl equal to about 0.2 of propod length, corpus strongly compressed, about 3.3 times longer than deep, broadest centrally, ventrally sharp, with about 12–13 acute distally inclined teeth, of increasing size distally, with short setae sparsely along sides of cutting edge, on distal dorsal border and disto-laterally at base of unguis; unguis distinct, strongly curved, unarmed, equal to 0.25 of carpus length. Propod about 13.0 times longer than deep, uniform, ventral margin with about 9–10 strong spines, disto-ventral angle with four spines, with disto-dorsal margins strongly serrulate. Carpus equal to 0.5 of propod length, unarmed, about 5.0 times longer than distal width, slightly tapered proximally. Merus subequal to propod length, about 9.0 times longer than wide, uniform, unarmed. Ischium about 0.7 of merus length, about 6.4 times longer than distal width. Basis without special features. Coxa with small medial process. Fourth and fifth pereopods similar, propods slightly shorter.

Uropod with protopodite with small blunt postero-lateral lobe; exopod 3.0 times

longer than broad, lateral border feebly convex with small postero-lateral tooth with small spine medially; endopod exceeds exopod, about 3.8 times longer than width.

Ova numerous and small, about 30, length about 1.0 mm.

**MALE.** Generally as female, smaller and more slender, with shorter rostrum, second pereopods with larger, less similar chelae. Larger examples with rostral dentitions of 9–10/2 smaller with 7–8/2. Major chela with palm section oval, about 3.0 times longer than deep, uniform; fingers 0.7 of palm length, similar; dactyl about 5.0 times longer than deep, with hooked tip, cutting edge distally entire, with two small acute teeth proximally; fixed finger similar. Minor chela with palm similar to female, about 0.8 of length of major palm, 3.5 times longer than deep, fingers subequal to palm length, dactyl about 6.0 times longer than deep, with small hooked tips, and entire cutting edges.

Endopod of first pleopod about 3.1 times longer than distal width, distal half feebly expanded, without disto-medial lobe; medial border concave with 3 setulose setae proximally and 4 short curved spines centrally; distal half of lateral border with 6 short plumose setae. Endopod of second pleopod with well developed appendix masculina, equal to 0.3 of ramus length and slightly exceeded by appendix interna, with 4 simple terminal spines and 5 spines along distal ventro-lateral border.

*Measurements.*—Holotype female, CL 3.6 mm; carapace and rostrum 6.8; sixth abdominal segment 1.5, chela of right second pereopod 4.75, left 4.8. Allotype male, CL 2.55, carapace and rostrum, 4.5; sixth abdominal segment, 1.0; chela of right second pereopod, 3.3, left, 3.75.

*Types.*—The ovigerous female holotype and allotype male are deposited in the collections of the National Museum of Natural History, Washington, D.C., catalogue numbers USNM228037 and 228039. Female paratypes are also deposited in the collections of the Rijksmuseum van Natuurlijke Historie, Leiden, (D36342) and the Northern Territory Museum, Darwin (NTM. Cr.003016). A further paratype is deposited in the Indian River Coastal Zone Museum, Harbor Branch Foundation, Fort Pierce, Florida and the remainder of the paratypes (15) are held in the collection of the National Museum of Natural History, Washington, D.C. (USNM 228039).

*Host.*—*Heterobrissus hystrix* (Agassiz) (Echinoidea: Asterostomatidae).

*Remarks.*—*Periclimenes milleri* is readily distinguished from all species of *Periclimenes* by the characteristic form of the dactyl on the ambulatory pereopods, which is quite without parallel. However, it does show a remarkably close resemblance to the recently described species *Diapontonia maranulus* Bruce, also an echinoid associate, from which is primarily distinguishable by the presence of an hepatic spine, a feature of generic importance in the Pontoniinae. At species-level, the most significant difference is the longer rostrum with a greater number of dorsal teeth (in larger specimens) and the invariable presence of two ventral teeth. In *Diapontonia maranulus* the rostral formula in non-juveniles is 7–9/1. In *P. milleri* the unguis and distal accessory tooth of the corpus of the dactyl of the third pereopod are simple. In *D. maranulus* they are minutely crenulate. Although both shrimps were found in the Bahamas region, they were found in association with different host urchins, *D. maranulus* occurring in association with *Palaeopneustes tholoformis* (Chesher).



## DISCUSSION

The pontoniine shrimps associated with echinoid hosts have been reviewed by Bruce (1982) and further species, probably similarly associated, have since been described (Bruce, 1981; 1985). A key for the identification of the deeper water (>100 m) Indo-West Pacific species of *Periclimenes*, including those associated with echinoids, is given in Bruce (1985). There appear to be no previous reports of such associations in the deeper waters of the Atlantic Ocean, but *Tuleariocaris neglecta* Chace is found on *Diadema* urchins in shallow water.

In the Indo-West Pacific region only *Periclimenes hertwigi* Balse is known with certainty to associate with deepwater echinoids, and has been reported with *Arcaeosoma* and *Phormosoma* (Echinothuriidae). *P. rectirostris* Bruce is thought to be associated with *Eremopyga* (Bruce, 1981) and it appears probable on the basis of their general morphology that *P. curvirostris* Kubo and *P. dentidactylus* Bruce are similarly associated with deep water echinoids.

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