On a New Commensal Shrimp *Periclimenes hirsutus* sp. nov. (Crustacea, Decapoda Natantia, Pontoniinae) from Fiji[1]

A. J. BRUCE[2]

ABSTRACT: *Periclimenes hirsutus*, a new species of pontoniid shrimp collected in Fiji, is described. The shrimp was obtained from a littoral echinoid. The distinctive features of the shrimp and its relationship to other species are discussed.

THE GENUS *Periclimenes* Costa, 1844, is now known to contain many species of shrimp that are commensally associated with a wide range of marine invertebrates. The first species found to be associated with an echinoid was *Periclimenes hertwigi* Balss (Kubo, 1940, as *P. gracilrostris*) and three more species, *P. cristimanus, P. maldivensis* and *P. zanzibaricus,* have since been reported as similarly associated (Bruce, 1965, 1967, 1969). The discovery of a further species of *Periclimenes* that is also associated with echinoids is therefore of interest. The new species is quite distinct from those species already described and presents a number of unusual morphological characteristics that are not found in any other species of *Periclimenes* and are without parallel in the Pontoniinae.

Periclimenes hirsutus sp. nov.

Fig. 1

DIAGNOSIS: A medium-sized pontoniid shrimp of typical body form. Carapace smooth, densely hirsute. Rostrum slender with eight dorsal teeth. Ventral teeth absent. Midrib feebly developed. Supraorbital spine absent. Antennal spine present, robust. Hepatic spine present, small. Abdomen smooth, hirsute. Third segment feebly produced posteriorly in dorsal midline. Pleura of first to fifth segments rounded, densely hirsute. Sixth segment very densely hirsute. Telson slender, dorsal spines small, laterally placed; three pairs of terminal spines. Antennae normal. Epistome unarmed. Mouthparts normal. Mandible without palp; molar process with teeth and setae: incisor process with three teeth. Maxillula with bifid palp, upper lacinia spinose and the lower lacinia setose. Maxilla with well developed scaphognathite, palp normal, endite bifid. First maxilliped with well developed exopod, setose palp, distinct coxal and basal endites and bilobed epipod. Second maxilliped normal, exopod well developed, epipod simple without podobranch. Third maxilliped robust with basis distinct, and with stout exopod, large epipod, and a small arthrobranch. First pereiopods slender, fingers of chelae subspatulate; coxa with a medial process. Second pereiopods robust, subequal, similar, finely setose; carpus short; merus with distal ventro-lateral tooth. Ambulatory pereiopods stout, hirsute; propod flattened ventrally, bearing numerous transverse rows of long plumose setae; dactylus with small accessory spine. Sternite of fourth thoracic segment without a slender median process. Pleopods and telson normal, densely hirsute.

MATERIAL EXAMINED: 1 female, Nukulau Island, Laucala Bay, Suva, Viti Levu, Fiji. July 14, 1968. Collectors, F. Schuiter and P. J. Beveridge.

DESCRIPTION: A medium-sized, robustly built pontoniid shrimp with the postorbital carapace length equal to about 3.5 times the length of the second abdominal segment in the dorsal midline.

Carapace: The carapace is smooth and densely hirsute except in the periorbital region. The rostrum is elongated, slender, and acutely pointed, extending well beyond the extremity of the scaphocerite. The dorsal border is almost straight and bears eight acute teeth. The most posterior margin of the orbit and the remaining teeth are distributed along the length of the dorsal edge of the rostrum at increasing intervals anteriorly. A few short plumose setae are

[1] Manuscript received June 15, 1970.

[2] East African Marine Fisheries Research Organization, P.O. Box 668, Zanzibar, Tanzania.

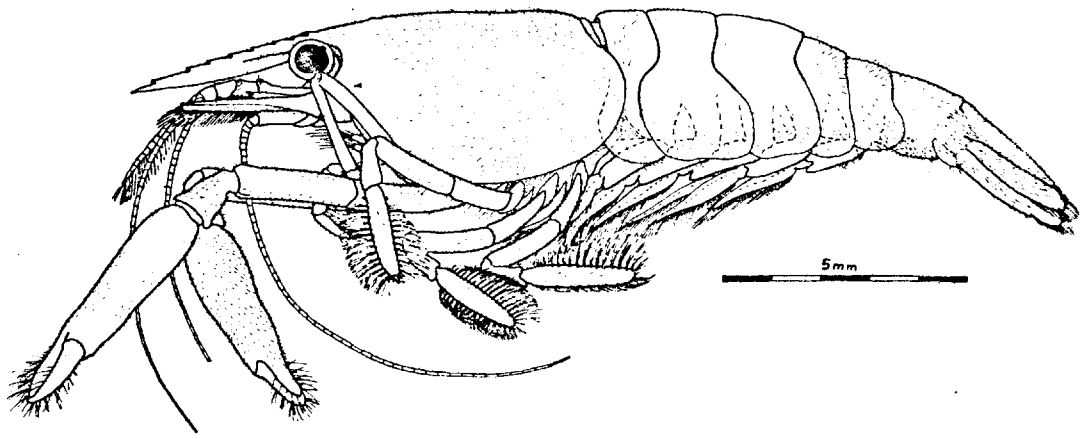

FIG. 1. *Periclimenes hirsutus* sp. nov., holotype, male, Fiji. Scale in millimeters.

situated immediately in front of each tooth. The ventral rostral margin is feebly convex, unarmed, and nonsetose. The midrib is feebly developed and bears a few setae laterally. There is no epigastric spine but a small tubercle is present in this position. Supraorbital spines are absent. The orbit is feebly developed. The inferior orbital angle is feebly produced and bluntly rounded. The antennal spine is well developed, acute, submarginal, arising slightly below the inferior orbital angle, and inclined slightly ventrally. The hepatic spine is small, situated on a level with the antennal spine, and directed horizontally. The anterolateral angle of the carapace is bluntly obtuse and the posterior angle of the branchiostegite broadly rounded (Fig. 2).

Abdomen: Abdomen is generally hirsute, except over the second and third terga, which are finely pitted and where the setae appear to have been lost through abrasion. The setae are short over the dorsal aspects but become longer over the lateral aspects and pleura, the edges of which bear a fringe of long setae. The posterior and ventral aspects of the sixth segment are densely covered with long silky setae. The third abdominal segment is produced slightly posteriorly in the dorsal midline. The fifth segment is about four-sevenths of the length of the sixth segment, which is as long as deep. The pleura of all segments are broadly rounded. The posterior angle of the sixth segment is subrectangular and the posteroventral angle is blunt.

Telson: Length of telson is about 1.6 times the length of the sixth abdominal segment; hirsute dorsally. The telson length is about twice its greatest width and the lateral borders are

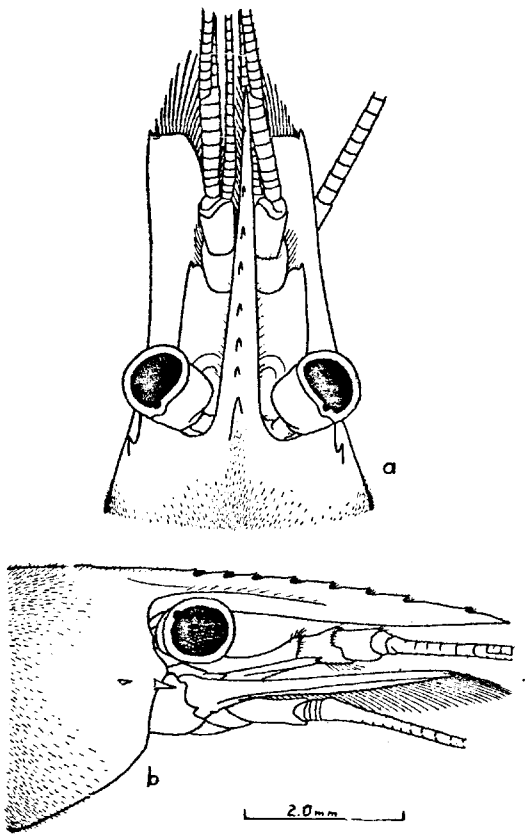

FIG. 2. *Periclimenes hirsutus* sp. nov. Anterior carapace and appendages. *a,* Dorsal view; *b,* lateral view.

straight, converging posteriorly to a small bluntly rounded posterior border. Two pairs of small dorsal spines are present upon the lateral margins. The anterior pair is situated at about three-quarters of the telson length from the anterior margin. The posterior pair is situated half way between the anterior pair and the posterior margin. Three pairs of terminal spines are present on the posterior border. The lateral spines are minute and situated close to the bases of the intermediate spines which are large and swollen and bear a small mobile (?) setule at the tip. The intermediate spines are inclined medially and are separated by a pair of shorter slender plumose setae.

Eyes: The eyes are well developed with a large hemispherical cornea with a distinct accessory pigment spot. The eyestalk is short and broad, about twice as wide as long, and slightly compressed. The cornea is slightly wider than the stalk and transversely oriented.

Antennular peduncle: The antennular peduncle is markedly exceeded by both rostrum and scaphocerite. The basal segment is slightly less than twice as long as it is wide, parallel sided, with a short, stout, acute stylocerite which does not exceed one-third of the length of the segment. The statocyst contains a subcircular statolith. A stout anteriorly directed tooth is present near the middle of the ventral medial border. The anterolateral margin is produced to the level of the middle of the intermediate segment and bears a single small acute tooth laterally. The intermediate segment is slightly shorter than the distal segment and is expanded laterally to form a small setose lamina. The distal segment is about 1.5 times longer than wide and the intermediate and distal segments together are equal to about four-fifths of the length of the basal segment. The lower flagellum is filiform, subequal to the length of the carapace, and has 31 segments. The upper flagellum is biramous with the seven proximal segments fused. The shorter free ramus consists of seven segments and the longer ramus of 35 segments. The longer ramus is 1.3 times the length of the carapace. The short ramus and distal part of the fused rami bear 20 groups of aesthaetascs.

Antennae: Antennae are well developed; the scaphocerite distinctly exceeds the antennular peduncle. The basicerite bears a small lateral tooth. The carpocerite is subcylindrical and extends slightly beyond the basal segment of the antennular peduncle. The flagellum is normally developed and reaches posteriorly to the level of the posterior of the third abdominal segment. The scaphocerite is 3.5 times longer than wide. The lateral border is very feebly concave. The medial border is convex and widest centrally, meeting the anterior margin subrectangularly. The distolateral tooth is small but slightly exceeds the anterior margin of the lamella (Fig. 3).

Epistome: The epistome is unarmed and the labrum of normal type. The sternite of the fourth thoracic segment bears a low transverse lamina with a small median notch and lacks a median process. The fifth thoracic sternite bears a low triangular plate behind the coxa of the second pereiopod.

Mouthparts: These have been removed on the right hand side of the specimen and are typical of the genus *Periclimenes* Costa (Fig. 4).

Mandible: The mandible lacks palp. The molar process is robust and provided with several stout processes and fringes of short setae distally. The incisor process is well developed and bears only three acute terminal teeth. The lateral tooth is distinctly larger than the median tooth and the intermediate tooth is the smallest.

Maxillula: This shows no special features. The upper lacinia is broad and bears numerous stout simple spines distally as well as a few setae along its borders. The lower lacinia is slender and bears numerous slender simple setae. The palp is distinctly bifid and the inner lobe bears a small hooked setule.

Maxilla: This bears a large broad scaphognathite. The palp is tapering and nonsetiferous. The coxal portion bears a large bifid endite, the distal lobe being distinctly broader than the proximal lobe, both bearing numerous slender simple setae. The basal portion bears a small lobe.

First maxilliped: This bears a well-developed exopod with a large caridean lobe. The palp is slender and bears a single subterminal plumose seta. The coxal and basal lobes are separated by a distinct notch, and bear a dense fringe of simple setae. A bilobed epipod is present.

Second maxilliped: The second maxilliped is normal; bears a dense fringe of fine setae along

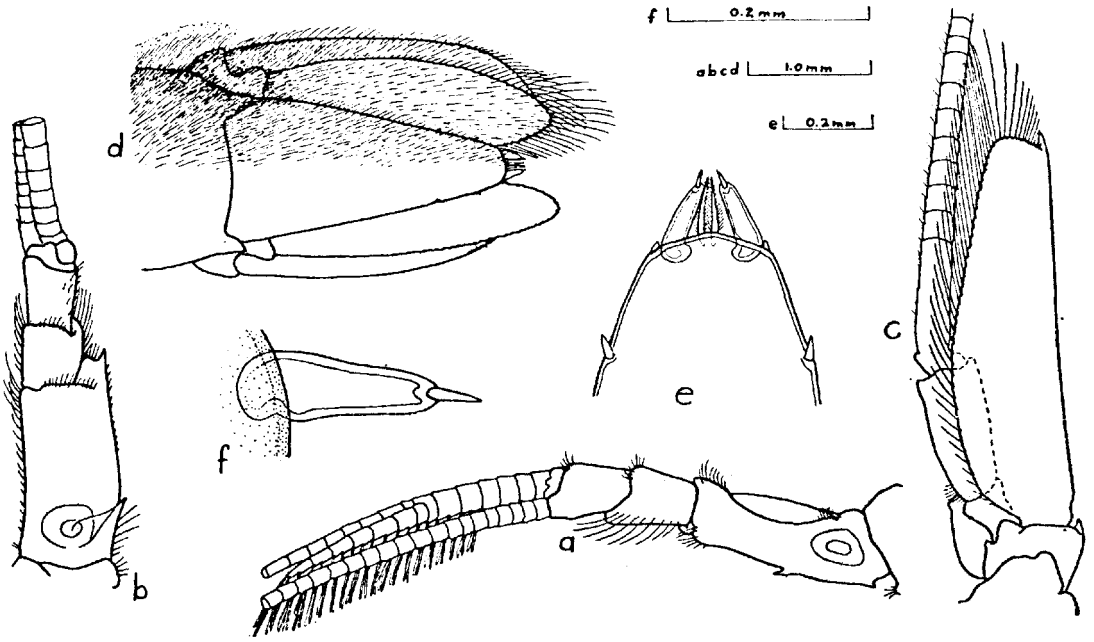

FIG. 3. *Periclimenes hirsutus* sp. nov. *a,* Antennule, lateral view; *b,* antennular peduncle, dorsal view; *c,* antenna; *d,* telson and uropods; *e,* tip of telson; *f,* intermediate terminal telson spine.

the medial aspect of the dactylus. The coxa bears a small setiferous medial projection. The exopod is well developed and there is a simple epipod without a podobranch.

Third maxilliped: The third maxilliped is robust. The endopod extends to the tip of the carpocerite. The antepenultimate segment is four times longer than wide and slightly bowed. The proximal half of the inner margin is provided with a dense fringe of short setae in addition to numerous longer setae which tend to become arranged in transverse rows along the distal part of the medial border. The lateral aspect of the antepenultimate segment bears numerous long silky setae. The penultimate segment is slender, about six times the length of the terminal segment. It bears a fringe of long simple setae medially and is sparsely setose laterally. The terminal segment is armed with transverse rows of spines which increase in length distally. The basis is markedly setose medially and is not fused to the ischiomerus. The coxa bears a small median setose process. The exopod is well developed, broad, and as long as the antepenultimate segment of the endopod. The epipod is large and rounded with a few marginal setae. A small multilamellar arthrobranch is present.

First pereiopod: The first pereiopod is slender; exceeds the carpocerite by the length of the carpus and chela, and the scaphocerite by the length of the chela. The palm is subcylindrical and 0.8 times the length of the fingers, which are moderately subspatulate, with entire cutting edges and provided with numerous tufts of setae. The carpus is about 1.5 times the length of the chela, slightly expanded distally, and six times longer than the distal width. The merus is slender and uniform in width, slightly longer than the carpus. The ischium is about 0.6 times the length of the merus, with a fringe of setae along its ventral border. The basis bears a subterminal setiferous lobe on its ventral surface and the coxa bears a large median setose process (Fig. 5).

Second pereiopods: These are generally finely hirsute except over the lateral aspects. The chelae are robust, similar, and subequal, exceeding the antennular peduncle by the length of the carpus and chela. The palm is subcylindrical, tapering slightly distally, and about twice the length of the fingers. The fingers are robust,

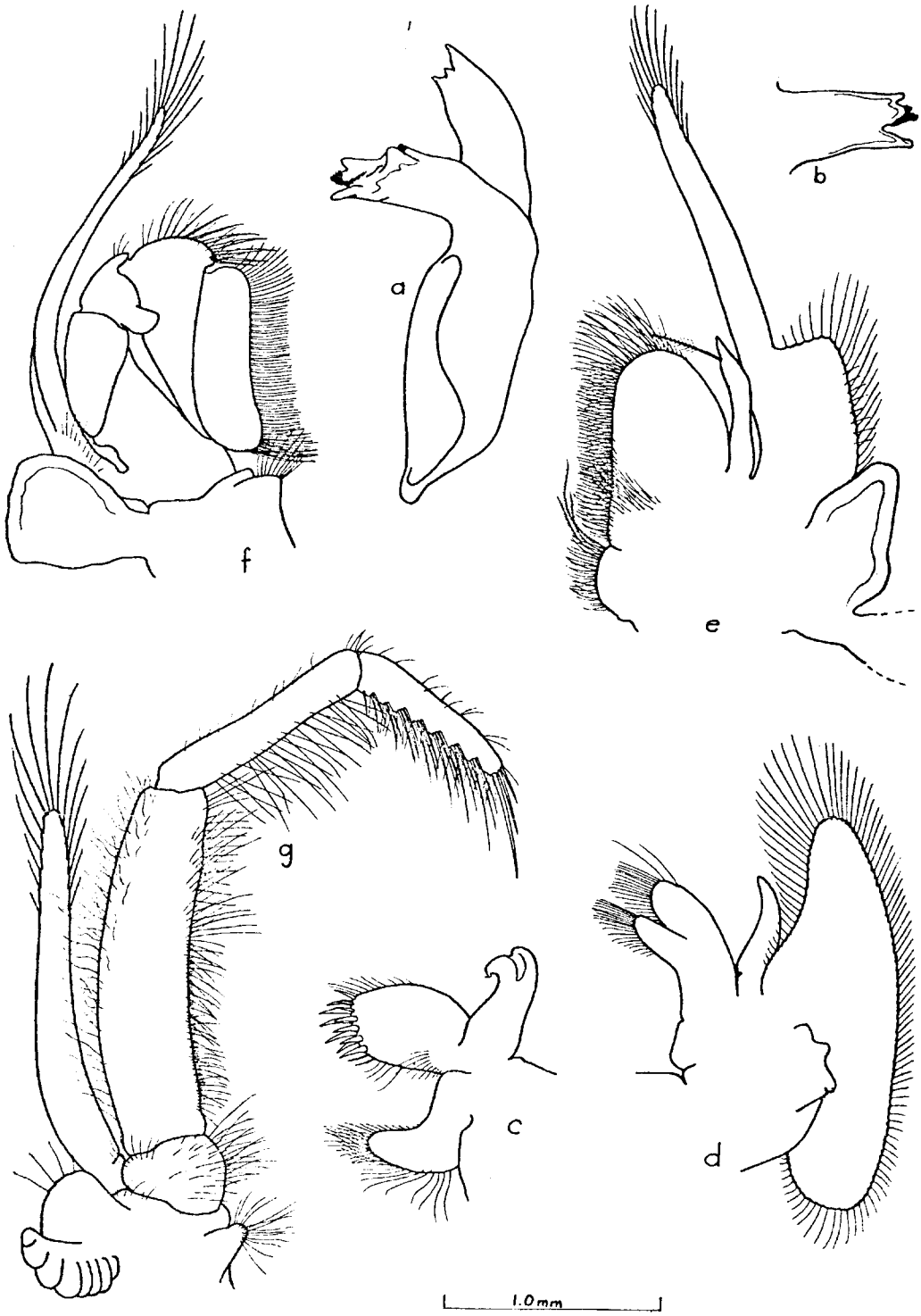

FIG. 4. *Periclimenes hirsutus* sp. nov. *a*, Mandible; *b*, molar process; *c*, maxillula; *d*, maxilla; *e*, first maxilliped; *f*, second maxilliped; *g*, third maxilliped.

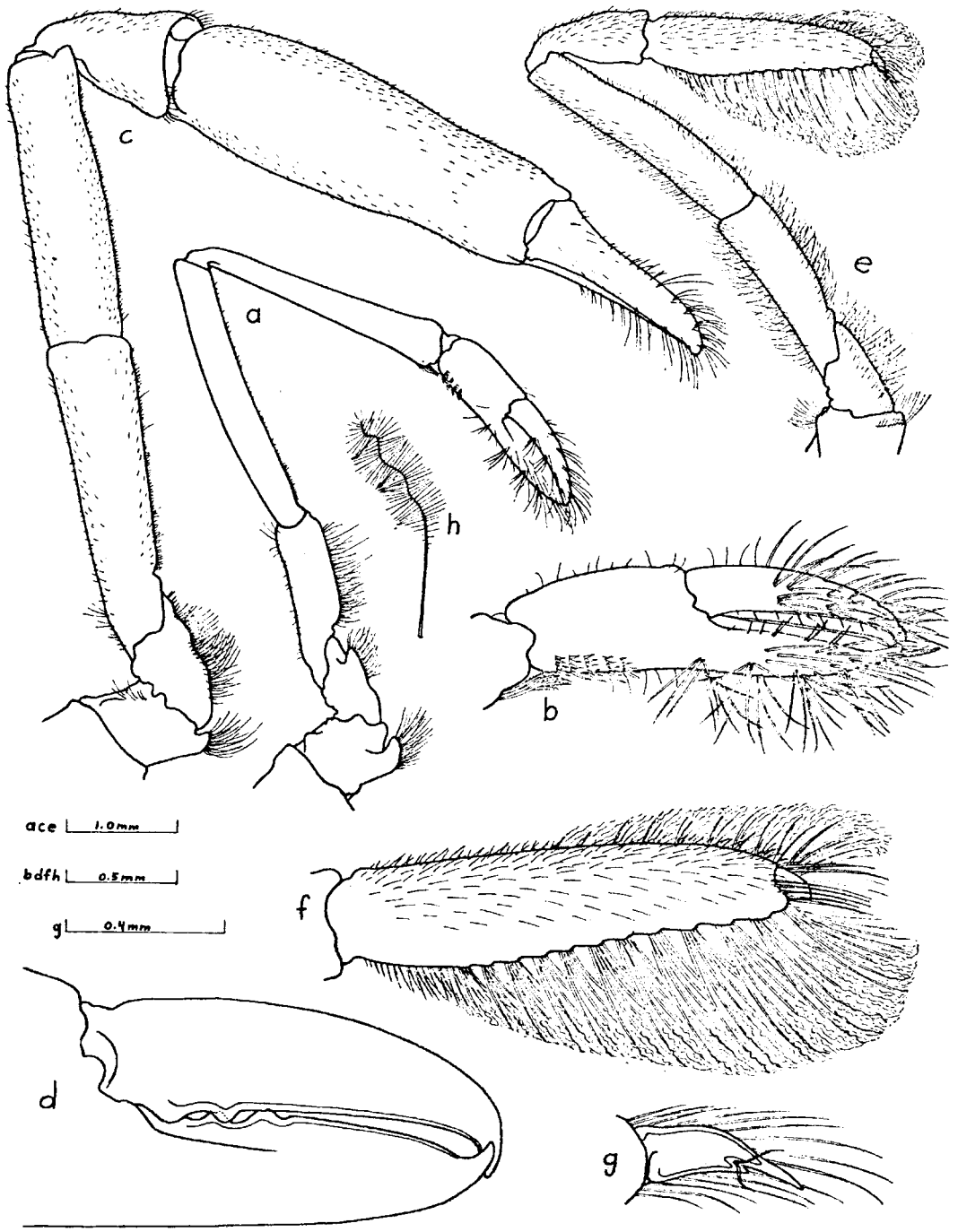

FIG. 5. *Periclimenes hirsutus* sp. nov. *a*, First pereiopod; *b*, chela of first pereiopod; *c*, second pereiopod; *d*, fingers of second pereiopod; *e*, third pereiopod; *f*, propodus of third pereiopod; *g*, dactylus of third pereiopod; *h*, seta from ventral brushes of propod of third pereiopod.

narrow, with strongly hooked tips. The cutting edges are situated laterally. The cutting edge of the dactylus bears two blunt teeth on its proximal fourth, with the rest of the edge entire. The proximal third of the cutting edge of the fixed finger bears two similar teeth, situated in advance of those on the dactylus, the tips of which are notched. The rest of the cutting edge is entire. The fingers bear numerous tufts of long setae. The carpus is robust, triquetral, about 0.4 times the length of the palm of the chela, considerably expanded distally and unarmed. The merus is 0.7 times the length of the palm of the chela, subcylindrical, and has a distinct distoventral tooth. The ischium is about 1.2 times the length of the merus and is bilaterally compressed. The basis bears a fringe of long setae along its ventral margin, and the distoventral border of the coxa bears a small setose process.

Ambulatory pereiopods: These are robust. The third pereiopod extends to the end of the antennular peduncle and the fifth pereiopod slightly exceeds the basicerite. The dactylus of the third pereiopod is short, about one-sixth of the length of the propodus, and strongly compressed. A small accessory spine is present. The propod is four times longer than wide, and tapers distally. The ventral aspect is nonspinose, strongly flattened, and bears many transverse rows of long setae throughout its length. The setae are simple basally, with a finely plumose distal half. The dorsal and lateral aspects of the propod are also generally setose. The carpus is slightly greater than half the length of the propod and expanded distally. The merus is twice the length of the carpus and tapers slightly distally, with a feeble distoventral tooth. The ischium is three-quarters of the length of the merus and bears a dense fringe of long setae along its ventral margin with a sparser fringe of setae along the dorsal border. The coxa is 0.6 times the length of the ischium and is densely setose along the ventral margin. The coxa bears a transverse row of setae only. The fourth and fifth pereiopods are similar to the third. See Table 1 for branchial formula.

Pleopods: These are of normal type and are conspicuously setose on the dorsal surfaces of the margins of the endopods and the lateral aspects of the basipods. The endopod of the first pleopod is expanded distally and bears a triangular lobe on the median side. The proximal half of the median border bears about a dozen short spines and the intermediate third of the lateral border bears six long plumose setae. The endopod of the second pleopod bears appendix masculina and appendix interna. The appendix masculina bears a terminal group of five stout, finely spinulate spines, with a single simple subterminal spine. The appendix interna slightly exceeds the appendix masculina (Fig. 6).

TABLE 1

BRANCHIAL FORMULA FOR *Periclimenes hirsutus* SP. NOV.

	MAXILLIPED			PEREIOPOD				
	1	2	3	1	2	3	4	5
Pleurobranch	—	—	—	1	1	1	1	1
Arthrobranch	—	—	1	—	—	—	—	—
Podobranch	—	—	—	—	—	—	—	—
Epipod	1	1	1	—	—	—	—	—
Exopod	1	1	1	—	—	—	—	—

Uropods: The uropods show no special features other than general hirsuteness. The basipod is unarmed laterally. The endopod slightly exceeds the exopod and both distinctly exceed the tip of the telson. The lateral border of the exopod is slightly convex and the distal spinule is minute.

TYPE: The holotype, the only specimen, partly

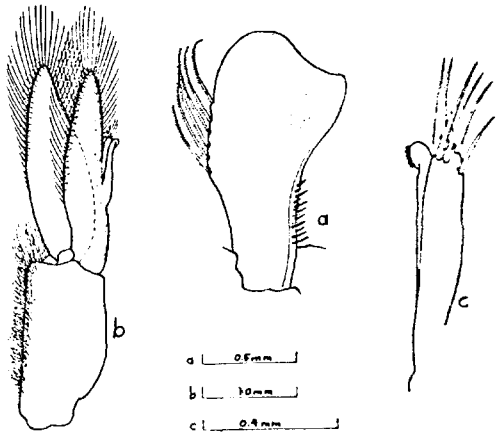

FIG. 6. *Periclimenes hirsutus* sp. nov. *a*, Endopod of first pleopod; *b*, second pleopod; *c*, appendix interna and appendix masculina of second pleopod.

dissected, is deposited in the collections of the British Museum (Natural History), registration number 1970:444.

MEASUREMENTS: Postorbital carapace length, 5.0 mm; length of carapace with rostrum, 9.5 mm; chela of left second pereiopod, 5.2 mm; chela of right second pereiopod, 5.2 mm.

COLORATION: No data.

HOST: Echinoid, probably *Diadematidae.*

REMARKS: The host sea urchin was unfortunately not identified and attempts to locate further specimens by the collectors were unsuccessful. The host was described as follows: "Capable of rapid movement; spines long, slender, brittle and 'hot'; dark purple-black, with bright pink ambulacral grooves; a large urchin, clustered in groups on sand." The host is therefore tentatively identified as *Astropyga radiata* (Leske), which has a wide distribution all over the Indo-West-Pacific region and the South Sea islands (Mortensen, 1940).

Specimens of the apogonid fish *Siphamia versicolor* (Smith and Radcliffe, 1911) were also associated with the urchins.

DISCUSSION

The new species *Periclimenes hirsutus* shows little resemblance to two of the species of *Periclimenes* previously recorded in association with echinoids, *P. cristimanus* Bruce and *P. zanzibaricus* Bruce, which are themselves closely related and characterized by a broad lateral extension of the rostral midrib with the presence of large triangular marginal supraorbital spines. It is also quite distinct from *P. maldivensis,* which is closely related to *P. lanipes* Kemp, an associate of gorgonocephalid ophiuroids.

A much closer resemblance is shown in *P. hertwigi* Balss, 1913, 1914, an inhabitant of deep waters, associated with urchins of the family Echinothuridae. *Periclimenes hirsutus* can be readily separated from *P. hertwigi* by the following features: (1) general hirsuteness of body and appendages; (2) absence of ventral rostral teeth; (3) small hepatic spine; (4) anterior dorsal telson spines at three quarters of telson length from anterior margin; (5) characteristic intermediate terminal telson spines; (6) propods of ambulatory pereiopods ventrally flattened, with dense brushes of setae over almost whole length and without spines; (7) dactyli of ambulatory pereiopods with small, distinct accessory tooth.

In its general morphology *Periclimenes hirsutus* shows a close resemblance to *P. affinis* (Zehntner) and *P. brocketti* Borradaile. These two species appear to be very similar, being distinguishable only by the proportion of fingers and palm of the chelae of the second pereiopod, and both are associated with crinoid hosts. *Periclimenes hirsutus* may be distinguished from these two species by the presence of the following characteristics: (1) general hirsuteness of body and appendages; (2) absence of postorbital rostral teeth; (3) absence of ventral rostral teeth; (4) propods of ambulatory pereiopods ventrally flattened, with dense brushes of setae over almost the whole length of the segment; (5) dactyli of ambulatory pereiopods with a small but distinct accessory tooth.

The general hirsuteness of the body is a characteristic feature of the shrimp that is not found in any other species at present referred to the subfamily Pontoniinae, most species of which have a smooth, polished cuticle. The characteristic brushes of setae on the propods of the ambulatory pereiopods are also without parallel in the Pontoniinae. A tendency towards the development of a similar condition appears to be shown by the distantly related species *Periclimenes curvirostris* Kubo, a species whose host is as yet unknown. In this species the presence of tufts of long setae is limited to the distal half of the propod. The function of the specialized propods is unknown, but it is presumably concerned with the shrimp's adherence to its host. Whether the shrimp's normal position is on the test or the spines of the host also is still unknown.

ACKNOWLEDGMENTS

I am grateful to Professor J. S. Garth for forwarding the specimen of this species for my examination and to the collectors, Dr. F. Schuirer and P. F. Beveridge, for supplying additional information for inclusion in this report. Dr. J. Paxton kindly identified the associated fish.

LITERATURE CITED

BALSS, H. 1913. Diagnosen neuer ostasiatischer Macruren. Zoologischer Anzeiger, vol. 42, pp. 234–239.

——— 1914. Ostasiatische Decapoden. II. Die Natantia und Reptantia. In: F. Doflein, Die Beitrage zur Naturgeschichte Ostasiens. Abhandlungen der Bayerischen Akademie der Wissenschaften (Suppl.), vol. 2, no. 10, pp. 1–110, figs. 1–5, pl. 1.

BRUCE, A. J. 1965. Notes on some Indo-Pacific Pontoniinae. X. *Periclimenes cristimanus* sp. nov., a new pontoniinid shrimp from Singapore. Annals and Magazine of Natural History, series 13, vol. 8, pp. 487–493, figs. 1–2.

——— 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. Zoologische Verhandelingen, Leiden, no. 87, pp. 1–73, figs. 1–29.

——— 1969. Preliminary descriptions of sixteen new species of the genus *Periclimenes* Costa, 1844 (Crustacea, Decapoda Natantia, Pontoniinae). Zoologische Mededeelingen, Leiden, vol. 33, no. 20, pp. 253–278.

KUBO, I. 1940. Pontoniinae. Studies on Japanese palaemonid shrimps. II. Journal of the Imperial Fisheries Institute, Tokyo, vol. 34, pp. 31–75, figs. 1–36.

MORTENSEN, T. 1940. A monograph of the Echinoidea. Vol. 3, no. 1, Aulodonta. With additions to vol. 2. (Lepidocentroida and Stirondonta). Copenhagen, C. A. Reitsel. Pp. 1–197, pls. 1–77.