

NOTES ON INDO-PACIFIC PONTONIINAE, X. *PERICLIMENES CRISTIMANUS* SP. NOV. A NEW PONTONIINID SHRIMP FROM SINGAPORE.*

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THE commensal habits of pontoniinid shrimps are now well known and species have been found in association with most sessile invertebrate groups. The genus *Periclimenes* Costa contains species that have been found in association with sponges, madrepora corals, anemones, alcyonarians, echinoderms and molluscs. Several species have been reported from echinoid and crinoid hosts but few have been reported on echinoids. The only species so far reported from echinoids are *Periclimenes zanzibarica* Bruce, which occurs in the western Indian Ocean, and *Periclimenes hertwigi* Balss from Japan and Indonesia. The discovery of a further species of *Periclimenes* on echinoids is therefore of interest.

The single specimen is unfortunately badly damaged, being broken across the third abdominal segment, and several appendages are missing. It is also slightly macerated. In spite of its condition, all the important systematic features can be ascertained and an almost complete description has been compiled. On account of the fragile state of the specimen, the mouthparts have not been removed for examination.

Periclimenes cristimanus sp. nov. (figs. 1 and 2).

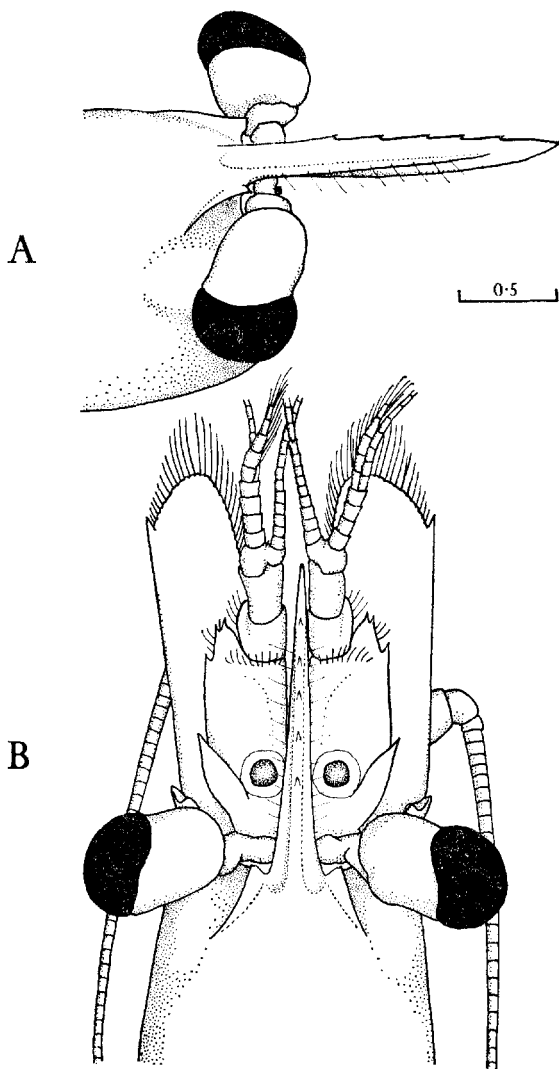
Material Examined. 1 specimen, coll. R. U. Gooding, 1° 12.7' N., 103° 43.65' E., Pulau Sudong, near Pulau Salu, Singapore. 8 July 1965.

Description. The carapace is depressed and smooth. The rostrum is straight and shallow and reaches to the level of the anterior end of the terminal segment of the antennular peduncle (fig. 1, A and B). The dorsal margin is feebly convex, with five small teeth present on the anterior two-thirds. The ventral margin is more strongly convex and without teeth. The midrib is well developed and lies along the middle of the lamina. It is continuous posteriorly with the supra-orbital margin and it decreases regularly in width anteriorly, reaching the level of the most anterior dorsal tooth. The lateral edges of the midrib bear numerous strong setae. The superior orbital margin bears a raised crest, which projects dorso-laterally from the surface of the carapace. Anteriorly the crest forms a large acute supra-ocular tooth, which is separated from the posterior end of the midrib of the rostrum by a deep notch. The anterior margin of the supra-ocular tooth bears a minute accessory tooth immediately medial to the main tooth and separated from it by a small notch. The lateral margins of the supra-ocular carina are feebly concave. The inferior orbital angle is acute and slightly produced. The antennal spine is slender and acute, and is situated on the anterior margin of the carapace slightly below the inferior orbital angle. The hepatic spine is more robust than the antennal spine and is placed at a lower level.

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The abdominal segments are badly damaged but the pleura of the fifth segment are rounded. The fifth segment is twice as long as wide. The telson is distinctly longer than the fifth segment (26 : 22), and is narrow, the length being eight times the width at the base, with straight sides.

Fig. 1.



Perichimenes cristimanus sp. nov. Holotype.

A, oblique right dorso-lateral view of anterior part of carapace and rostrum; B, dorsal view of anterior end of carapace, eyes and antennal peduncles. Scale in mm.

The dorsal surface of the telson bears two pairs of small spines, close to the lateral borders. Both pairs lie on the posterior half of the telson, the anterior pair at about $\frac{3}{5}$ and the posterior pair at about $\frac{4}{5}$ of the telson length from the anterior border. The telson bears three pairs of terminal spines. A pair of small spines, similar to the dorsal spines, is situated laterally. Strong intermediate spines, of about one-fifth of the length of the telson, and smaller slender plumose submedian spines, of about half the length of the intermediate spines, are also present. The median posterior border of the telson is not produced into a point.

The eyes are large. The cornea is globular and set obliquely on a short, stout, dorso-ventrally flattened stalk. No ocellus could be discerned (fig. 1, A and B).

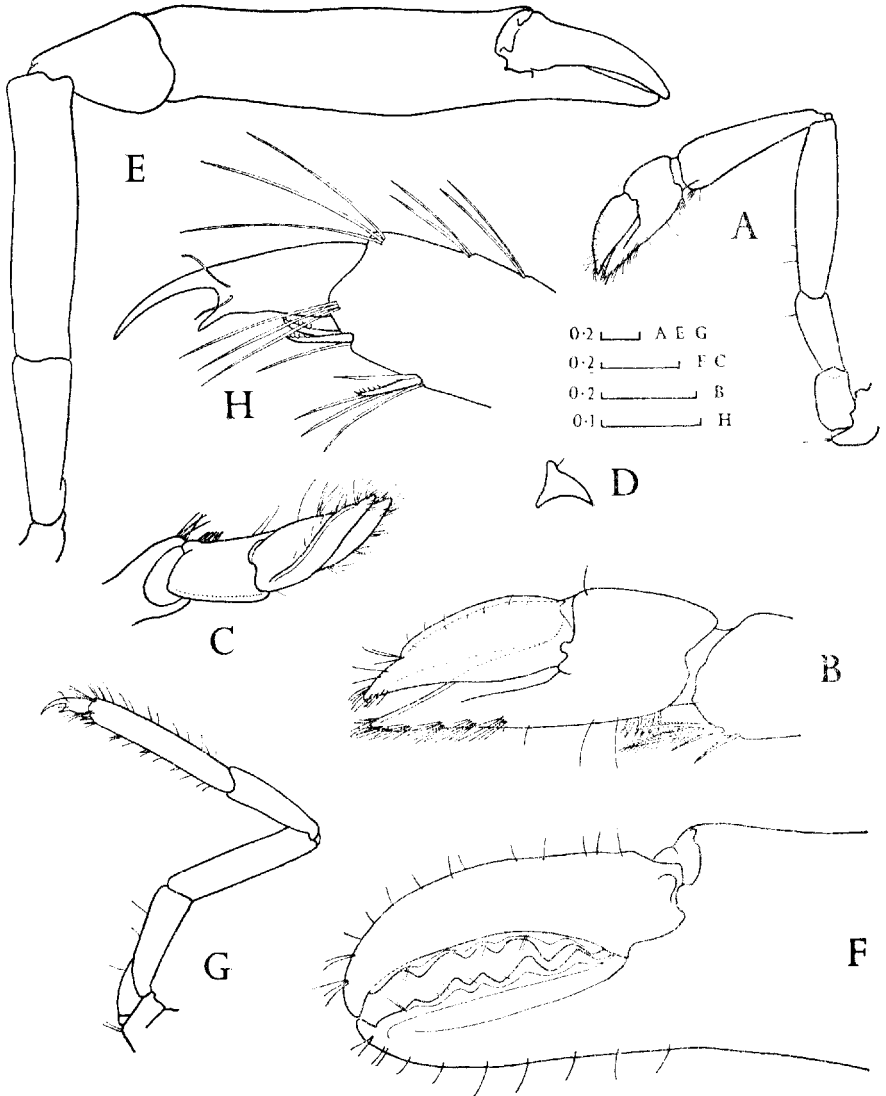
The antennular peduncle extends anteriorly to the level of the tip of the rostrum (fig. 1, B). The basal segment is two and a half times longer than wide and has a conspicuous statocyst with a smoothly circular statolith. The stylocerite terminates opposite the middle of the medial border of the segment. The lateral border is straight and bears a well-developed tooth at the level of the proximal end of the intermediate segment. The antero-lateral margin of the basal segment is strongly produced anteriorly and reaches the level of the proximal end of the distal segment of the peduncle. The process is rather triangular and bears two small acute teeth distally, the lateral tooth being situated at a slightly posterior level to the medial tooth. The lateral border of the process is almost straight and bears plumose setæ, and the medial border is slightly convex. A small ventral spine is present on the ventral surface of the basal segment, close to the median border, at about the middle of its length. The intermediate and distal segments together are equal to about half the length of the basal segment. The intermediate segment is two-thirds the length of the distal segment and is produced antero-laterally into a lobe bearing plumose setæ. The upper flagellum has the two rami fused for the four proximal segments and the short ramus, which consists of five segments, is subequal to the fused part. The longer ramus is filiform, subequal to the post-orbital carapace length, and consists of twenty segments. The lower flagellum on each side is partly broken off.

The basicerite of the antenna is provided with a robust antero-lateral spine. The carpocerite reaches to a level of two-thirds of the length of the medial border of the basal segment of the antennular peduncle. The scaphocerite is well developed (fig. 1, B). The lamina exceeds the length of the rostrum and reaches the level of the separation of the rami of the upper antennular flagellum. The lateral border of the scaphocerite is straight and is armed distally, distinctly beyond the level of the tip of the rostrum, with a strong tooth. The distal end of the lamina reaches far beyond the disto-lateral spine and the anterior border forms a blunt angle medially with the inner margin. The flagellum is well developed but slender and is approximately three times the post-orbital carapace length.

The mouth parts, including the third maxillipeds, are partly missing. The second maxilliped is provided with an exopod and a simple epipod.

Only one of the first pair of pereiopods has been preserved, and this has become detached from the specimen (fig. 2, A-D). The palm of the chela is strongly compressed and is about 0.46 of the length of the chela.

Fig. 2.



Periclimenes cristimanus sp. nov. Holotype.

A, first pereiopod; B, chela of first pereiopod; C, dorso-lateral view of chela of first pereiopod; D, approximate cross-section of dactyl of first pereiopod; E, lateral view of right second pereiopod; F, fingers of right second pereiopod; G, third pereiopod; H, dactyl of third pereiopod. Scale in mm.

The dactylar margin of the palm is carinate. The fixed finger of the chela is typical and is grooved along its inner edge. It bears numerous tufts of setæ along its outer margin. The dactyl is strongly compressed and bears a sinuous carina along the posterior three-quarters of its dorsal border. Small isolated setæ are present along the sides of the carina and some tufts of setæ are present distally. Some short serrated cleaning setæ are present proximally on the ventral surface of the palm. The carpus is about 1.2 times the length of the chela and is twice as wide at its distal end as at its proximal end. It bears a small group of slender, serrated cleaning setæ at the anterior end of its ventral border. The merus is more robust than the carpus and 1.2 times its length and 1.4 times the length of the chela. The ischium is about half the length of the merus.

Both second pereopods, which are subequal and similar, are present. They exceed the antennular peduncle by the length of carpus and chela. The palm is subcylindrical, slightly swollen in its middle portion, and about two and a half times the length of the fingers (fig. 2, E). The fingers are robust with strongly hooked tips which fit into notches in the cutting edges of the opposing fingers. The cutting edges bear large teeth except for the distal fifth. There are four teeth on the free finger and five on the fixed finger (fig. 2, F). The proximal teeth are larger and more acute than the distal teeth. The carpus is short and stout, twice as wide distally as proximally, about two-fifths of the length of the palm, and unarmed. The merus is also unarmed and about 0.8 times the length of the palm. The ischium is four-sixths of the length of the merus and two-fifths of the length of the palm, but slightly shorter than the carpus.

The third to fifth pereopods are all detached on the right side of the specimen and only one is preserved. The pereopods are all present on the left side but the third has been detached during examination. The dactyli are biunguiculate with slender terminal and accessory spines, the latter being about half the length of the former. Each dactylus is equal to about a third of the length of the propodus—which is short and stout, about six times longer than wide, and armed with short spines and setæ along its posterior border (fig. 2, G, H). The anterior border bears scattered setæ. The third pereopod extends anteriorly to the level of the distal end of the antennular peduncle.

The pleopods are mainly destroyed and the sex of the specimen is uncertain. The uropods are typical of the genus and the exopod, which has a feebly convex lateral border, bears an acute disto-lateral tooth and a moveable spinule at the level of the posterior margin of the telson. The diaeresis of the exopod is conspicuous and the lamella distinctly exceeds the tips of the telson spines posteriorly. The endopod is shorter than the exopod and reaches only to the level of the tips of the telson spines.

Measurements. The post-orbital carapace length is 1.80 mm. and the length of carapace and rostrum is 3.60 mm.

Type. The holotype and only specimen, has been deposited in the British Museum (Natural History); B. M. No. 1965:12:29:2.

Colour. The specimen showed no colour except for distinct traces of purple on the fingers and along the carina of the chela of the first pereopod, the fingers of the second pereopod, the tips of the supra-ocular spines and the posterior edges of the uropods. Cornea black.

Host. The single specimen was obtained from washings of the echinoid *Diadema setosum* (Leske).

DISCUSSION.

The new species, *Periclimenes cristimanus*, is closely related to *P. zanzibarica* which has also been obtained from echinoids (Bruce 1966). Both species are littoral forms and are placed in the sub-genus *Periclimenes* Costa, as they are provided with distinct accessory spines on the posterior borders of the dactyli of the third to fifth pereopods. A wide rostral midrib with a broad superior orbital margin and a large triangular supra-ocular tooth is found in both species. Other species in which supra-ocular teeth are present are *P. ceratophthalmus* Borradaile 1915 and *P. cornutus* Borradaile 1915, both of which have the cornea conically produced. The only other *Periclimenes* known to be associated with echinoids, *P. hertwigi* Balss, is a deep-water form occurring in 120–305 m. It lacks supra-ocular spines and has the dactyli of the third to fifth pereopods provided with small crenulations posteriorly instead of an accessory spine.

Periclimenes cristimanus may be readily distinguished from *P. zanzibarica* by the bilaterally compressed chela of the first pereopod, with its carinate dorsal margins of dactyl and palm, and smooth cutting edges. The second pereopod is markedly longer and more slender, and the opposing edges of the fingers of the chela are provided with large triangular teeth along almost the whole edge, while the short cutting edges are smooth. Other differences lie in the form of the rostral midrib which tapers uniformly distally in *P. cristimanus* but is generally wider and constricted proximally in *P. zanzibarica*. In the latter species the superior orbital margins are less expanded and projecting when compared with *P. cristimanus*, and also the anterior lobe of the basal segment of the antennular peduncle is less strongly produced and more feebly armed.

The single specimen of *Periclimenes cristimanus* was obtained from the echinoid *Diadema setosum* (Leske). *Periclimenes zanzibarica* has also been obtained from *Diadema savignyi* (Audouin) in addition to *Echinothrix calamaris* (Pallas) and *Astropyge radiata* (Leske).

Lists of the various invertebrates with which the Pontoniinae are known to be associated have already been given by Kemp (1922) and Holthuis (1952). Recent data have also been given by Jacotte (1965). The echinoderm associations of the Indo-West-Pacific species of *Periclimenes* may be summarized as follows. Those marked with an asterisk (*) are personal observations.

I. CRINOIDEA.

<i>P. affinis</i> Zehntner	<i>Actinometra</i> sp.
<i>P. brockettii</i> Borradaile	Not determined
<i>P. ceratophthalmus</i> Borradaile	„ „

<i>P. commensalis</i> Borradaile	<i>Comanthus timorensis</i> (J. Müller)
<i>P. cornutus</i> Borradaile	* <i>Tropiometra afra</i> (Hartlaub)
	Not determined

II. OPHIUROIDEA.

<i>P. lanipes</i> Kemp	* <i>Astroboa nigra</i> Döderlein
	* <i>Astroglymna sculptum</i> (Döderlein)
	* <i>Euryale purpura</i> Mortensen

III. ASTEROIDEA.

<i>P. noverca</i> Kemp	* <i>Protoreaster lincki</i> (Blainv.)
<i>P. parasiticus</i> Borradaile	<i>Linckia</i> sp.
<i>P. soror</i> Nobili	* <i>Acanthaster planki</i> (L.)
	* <i>Culcita novae-guineae</i> Müller and Troschel
	<i>Culcita schmideliana</i> (Retzius)
	<i>Protoreaster lincki</i> (Blainv.)

IV. ECHINOIDEA.

<i>P. cristimanus</i> sp. nov.	<i>Diadema setosum</i> (Loske)
<i>P. hertwigi</i> Balss	<i>Phormosoma</i> sp.
<i>P. zanzibarica</i> Bruce	<i>Astropyge radiata</i> (Leske)
	<i>Diadema savignyi</i> (Michelin)
	<i>Echinothrix calamaris</i> (Pallas)

V. HOLOTHUROIDEA.

<i>P. soror</i> Nobili	* <i>Holothuria</i> sp.
<i>P. rex</i> Kemp	<i>Synapta oceanica</i> (Less.)

It seems probable that the record of *P. rex* in association with *Acanthaster planki* (L.) (MacNae and Kalk, 1958) also refers to *P. soror* Nobili. Specimens from Madagascar which had been previously determined as *P. rex* by the late Dr. K. H. Barnard, who also identified MacNae and Kalk's material, have been re-examined and found to belong to *P. soror* Nobili.

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