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## PRELIMINARY DESCRIPTIONS OF TEN NEW SPECIES OF THE GENUS *PERICLIMENAEUS* BORRADAILE, 1915 (CRUSTACEA, DECAPODA NATANTIA, PONTONIINAE)

by

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The study of the pontoniid fauna of the Indo-West-Pacific region has resulted in the discovery of a number of undescribed species of the genus *Periclimenaeus* Borradaile, 1915. A revision of this genus, the second largest in the subfamily, at present in progress, cannot be completed for some time and it is considered advisable to provide preliminary descriptions of the species concerned, as has been done in the case of the genus *Periclimenes* Costa (Bruce, 1969). The brief descriptions and remarks given here will enable the species to be identified and may further contribute to their recognition in other parts of their ranges, pending their full description and illustration.

All the specimens described are commensals of marine invertebrates. Most were obtained from sponges and some from tunicates. The hosts of most of the specimens were preserved and are in the process of identification.

### ***Periclimenaeus holthuisi* sp. nov.**

*Periclimenaeus rhodope*, Holthuis, 1952: 125, fig. 54, 55, 55bis (not *Coralliocaris* (*Onycocaris*) *rhodope* Nobili, 1904).

Remarks. — The species has been fully described by Holthuis, who noted a number of discrepancies between his specimens and Nobili's description. The examination of fresh material has provided specimens that correspond exactly with Nobili's description and indicate that Holthuis' material must

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be referred to a separate species, which is, of course, closely related to *P. rhodope* Nobili.

*Periclimenaeus holthuisi* may be distinguished from *P. rhodope* by the following features: (1) posteriormost rostral tooth well behind orbital margin; (2) supraorbital spines less strongly developed; (3) basal segment of antennular peduncle broad proximally; (4) distolateral spine of scaphocerite small, not exceeding lamella; (5) less heavily granulate dorsal surfaces of second pereopods; (6) posterior border of dactyls of ambulatory pereopods, including accessory spine crenulate, and not spinulate.

Distribution. — The only specimens known are from the Malay Archipelago: Banda, Moluccas, Indonesia (9 fathoms, 10 June 1922, leg. Th. Mortensen, 1 ♂ holotype, 1 ♀ paratype), and anchorage off Rumahlesi, north-point of Tioor Island, Watubela Islands, eastern Moluccas, Indonesia (4 and 5 November 1899, Siboga Exped., Sta. 248, 1 ovigerous ♀ paratype).

Types. — The holotype and the paratype from Banda are preserved in the Universitetets Zoologiske Museum, Copenhagen, the paratype from Tioor is in the Zoological Museum, Amsterdam.

#### ***Periclimenaeus orbitospinatus* sp. nov.**

Description. — A small, slenderly built species. Body generally smooth.

Rostrum well developed, with deep lamina, extending to distal end of antennular peduncle. Midrib broad, expanded posteriorly and continuous with lateral orbital margin. Dorsal and ventral rostral teeth absent, dorsal and ventral margins slightly convex. Very large triangular supraocular spines arise from lateral orbital margin and extend anteriorly to base of intermediate segment of antennular peduncle; tips blunt. Orbit deep; inferior orbital angle well developed, blunt. Antennal spine stout, marginal, situated laterally to inferior orbital angle. Hepatic spine absent. Sixth abdominal segment about as wide as long. Pleura of first four abdominal segments rounded, the fifth bluntly subrectangular and the sixth acutely pointed. Telson narrow, about 1.6 times length of sixth abdominal segment, dorsally hirsute. Two pairs of dorsal spines present; anterior pair at 0.2 and posterior pair at 0.6 of telson length. Three pairs of subequal posterior spines present on posterior margin of telson, slightly smaller than dorsal spines.

Basal segment of antennule moderately broad, with a broad triangular tooth distolaterally; stylocerite short and broad. Intermediate and distal segments subequal, equal to two thirds of basal segment. Flagella well developed. Upper flagellum with rami fused for three segments. Basicerite unarmed. Carpocerite short, not exceeding level of basal segment of anten-

nular peduncle. Antennal flagellum robust, short. Scaphocerite well developed, distinctly exceeding antennular peduncle. Lamella distally rounded, slightly exceeded by a short broad distolateral tooth. Eye with small transverse hemispherical cornea on short, stout stalk, most of which is concealed by the supraocular spines.

First pereopod moderately slender. Fingers slender, tapering, slightly greater than length of palm. Chela subequal to merus. Merus slightly longer than carpus. Second pereopods well developed, large, unequal, dissimilar. Major second pereopod with palm swollen, tapering distally, smooth. Fingers equal to about half the length of palm, stout, with numerous long setae. Dactylus without molar process but with large fossa in cutting edge proximally; tip not hooked. Fixed finger with hooked tip and distinct molar process. Carpus short and stout, unarmed, widely expanded distally, about one third of length of palm and with distal surface excavated to accommodate proximal end of chela. Merus robust, unarmed, widely expanded distally subequal to length of carpus, with distal surface excavated to accommodate proximal end of carpus. Minor chela generally similar but much smaller. Fingers almost equal to length of palm; without molar processes, cutting edges entire and tips strongly hooked. Ambulatory pereopods slender. Dactylus short, about one sixth of length of propodus, distinctly biunguiculate, with posterior margin spinulate proximally to the accessory spine. Propodus with finely spinulate posterior border, most marked on third pereopod and decreasing on the posterior appendages. Carpus and merus unarmed. Uropods normal with a small distolateral tooth with a mobile spinule medially; lateral border of exopod unarmed, entire.

Colour. — Unknown.

Host. — Sublittoral sponge.

Distribution. — Gulf of Carpentaria, northern Australia (10-15 fms, 13 June 1967, leg. G. O. Moore, 1 specimen, holotype).

Type. — Holotype in Rijksmuseum van Natuurlijke Historie, no. Crust. D. 25616.

Remarks. — This unusual species of *Periclimenaeus* may be immediately recognized by the huge supraocular spines and the edentate rostrum. The only other species of the genus with supraocular spines is *P. truncatus* (Rathbun), from which *P. orbitospinus* may be easily separated by the features noted above and the absence of a series of mobile spines along the lateral border of the exopod of the uropod, a distinctive feature of *P. truncatus*. In its other morphological details *P. orbitospinus* shows a close resemblance to *P. truncatus*.

**Periclimentaenus pachydentatus** sp. nov.

Description. — A very large species. Body generally smooth.

Rostrum slender, depressed, with slightly upturned tip, extending to middle of distal segment of antennular peduncle. Dorsal border distinctly concave with five teeth. Posterior tooth, situated immediately posteriorly to orbital margin, short, stout and transversely broadened and flattened. The four anterior teeth, situated on the posterior third of the lamina, are long, blunt and digitiform, increasing in length anteriorly. Ventral rostral margin convex, unarmed. Epigastric spine absent. Supraorbital spine small, blunt. Orbit feebly developed. Inferior orbital angle obsolescent. Antennal spine large and robust, blunt, dorsoventrally flattened, extending beyond basicerite and stylocerite, slightly up-turned. Hepatic spine absent. Anterolateral angle of carapace bluntly obtuse. Sixth abdominal segment about 0.75 times longer than deep. Pleura of first three segments rounded; fourth and fifth acutely produced, blunt; sixth produced, acute. Telson narrow, slightly more than twice as long as wide. Dorsal spines long, subequal; anterior pair at 0.2 and posterior pair at 0.5 of the telson length from anterior margin. Posterior margin of telson rounded with three pairs of spines. Intermediate spines largest, slightly smaller than dorsal spines, stout; lateral spines large and stout, slightly smaller than intermediate spines; submedian spines shorter than lateral spines, slender.

Basal segment of antennule broad proximally and tapering anteriorly; anterolateral margin produced with small acute lateral spine; lateral border rounded posteriorly and feebly concave anteriorly; a very long slender spine is present ventrally at the middle of the medial border; stylocerite broad, leaf-like, reaching to middle of segment. Intermediate and distal segments subequal, equal to about two thirds of the length of the basal segment. Lower flagellum filiform. Upper flagellum stout with rami fused for twelve segments; short free ramus with two segments. Basicerite unarmed. Carapocerite subcylindrical, long, exceeding scaphocerite and antennular peduncle. Scaphocerite well developed, lamella extending to middle of terminal segment of antennular peduncle, broad, twice as long as broad, widest centrally, with rounded anterior margin; distolateral spine large, situated at about two thirds of the length of the lamella, and very greatly exceeded by distal fourth of lamella. Eyes small, extending to about two-thirds of the length of the basal segment of the antennular peduncle; cornea globular, slightly oblique and orientated ventrally, wider than stalk distally; stalk short and stout, tapering distally, length subequal to greatest diameter of cornea.

First pereopod very slender, exceeding antennular peduncle by distal

third of merus, carpus and chela. Chela with slender subcylindrical palm. Fingers slender, spatulate with entire cutting edges, distinctly shorter than length of palm. Carpus slender, more than twice length of chela, subequal to merus. Second pereopods very unequal, dissimilar. Major second pereopod massive, nearly twice carapace length. Chela with palm subcylindrical, slightly flattened, pitted over dorsal and distal aspects. Fingers stout, about half the length of palm. Dactylus with large molar process, tip hooked, acute. Fixed finger with large fossa proximally on cutting edge with short blunt hooked tip distally. A large broad, blunt process present at base of cutting edge in front of hinge, with a similar but smaller process in the same position dorsally. Carpus short and stout, about one third of length of palm. Merus one and a half times longer than carpus with very feeble granulation ventrally. Minor second pereopod comparatively slender. Palm subcylindrical a little more than twice length of fingers. Fingers slender; dactylus without molar process, cutting edge concave, dentate anteriorly, distinctly exceeding fixed finger; fixed finger with a small acute tooth dorsally and ventrally in front of hinge. Ambulatory pereopods robust, short. Dactylus short and stout, strongly curved with conspicuous recurved accessory spine. Propodus spinulate posteriorly on third and fourth pereopods, densely setose distally on fifth. Carpus and merus unarmed. Uropods normal; basipod blunt distolaterally; lateral border of exopod entire, unarmed, with acute distal tooth and large mobile spine medially.

Colour. — Unknown.

Host. — Compound ascidians.

Distribution. — Great Barrier Reef, northern Australia, 14°12' N 142°48' E (19 fathoms, 9 March 1929, 1 ovigerous ♀ holotype, 1 ♂ paratype).

Types. — Holo- and paratypes in collection British Museum (Nat. Hist.).

Remarks. — *Periclimenaeus pachydentatus* is most closely related to *P. tridentatus* (Miers) and may be distinguished from that species by the following features: (1) much larger size; (2) broad posterior rostral spine over orbital margin; (3) long finger-like antennal spine, exceeding basicerite; (4) anterior pair of telson spines close to anterior margin of telson; (5) anterolateral angle of basal segment of antennule more produced and posterior part of lateral margin evenly convex; (6) rounded anterior margin of lamella of scaphocerite, with lateral spine more posteriorly situated; (7) small eyes; (8) first pereopod with fingers shorter than palm, spatulate, carpus more than twice length of chela; (9) dactylus of ambulatory pereopods with strong recurved accessory spines; (10) ventral margins of propods of ambulatory pereopods spinulate or hirsute.

**Periclimenaeus spinicauda** sp. nov.

Description. — A small, stoutly built species. Body generally smooth.

Rostrum well developed, acute, extending anteriorly to distal end of antennular peduncle. Midrib broadly expanded forming a roof to orbit posteriorly, and extending along whole length of rostrum. Dorsal margin with four small, acute teeth situated on anterior two thirds. Ventral margin convex and without teeth. Supraocular and supraorbital spines absent. Orbit very deep and well defined laterally. Inferior orbital angle feeble and blunt. Antennal spine robust and marginal, over inferior orbital angle at lower anterior edge of orbital rim. Hepatic spine absent. Sixth abdominal segment broader than long. Pleura of first four segments rounded; pleuron of fifth segment bluntly subrectangular and of sixth acute. Telson narrow, twice as long as sixth abdominal segment, and three times longer than wide anteriorly. Four pairs of long, slender semi-erect, dorsal spines present, situated at approximately 0.2, 0.6, 0.8 and 0.9 of the telson length from the anterior margin, and decreasing in length posteriorly. The posterior margin of telson bears three pairs of long, subequal spines equal in length to the anterior pair of dorsal telson spines.

Basal segment of antennular peduncle broad proximally and tapering distally, with a small antero-lateral lobe bearing an acute distolateral tooth. Stylocerite short and broad. Intermediate and distal segments subequal, equal to about two-thirds of length of basal segment. Flagella normal. Lower flagellum filiform. Upper flagellum stout, rami fused for three segments, short ramus with four free segments. Longer ramus of 10-11 segments. Basicerite unarmed. Carpocerite short, about equal to basal segment of antennular peduncle. Scaphocerite well developed, broad posteriorly, rounded distally, distinctly exceeding antennular peduncle, with stout triangular distolateral spine extending to anterior margin of lamella. Eye small, cornea globular, slightly less than diameter of stalk, which is short and stout.

First pereopod normally developed. Chela compressed, fingers simple, subequal to palm. Carpus cylindrical, about 1.5 times longer than chela and about 1.2 times longer than merus. Second pereopods well developed, unequal and dissimilar. Major second pereopod with swollen palm, tapering anteriorly, smooth, hirsute. Dactylus moderately slender with a fossa proximally on cutting edge. Fixed finger short and stout with a low molar process proximally and a feebly hooked tip. Carpus short and stout, expanded and excavated distally, unarmed. Merus broad and compressed, unarmed, dis-ventral angle acute. Ischium slightly shorter than merus, unarmed. Minor second pereopod generally similar but smaller, with elongated fingers subequal to palm, cutting edge of dactylus entire, opposing into groove along

fixed finger. Tips of fingers gently hooked. Ambulatory pereopod slender, hirsute. Dactylus short, stout, strongly curved, distinctly biunguiculate with small spinules along ventral border proximally to the accessory spine. Propodus with posterior border densely spinulate, but decreasing posteriorly. Carpus and merus unarmed. Uropods with posterolateral border of basipod acutely pointed. Lateral border of exopod armed with a series of about a dozen mobile spines along distal two thirds, increasing in length distally and with a transverse row of four longer spines at the diaeresis. The endopod is unarmed and both rami are hirsute.

Colour. — Unknown.

Host. — Sublittoral sponges.

Distribution. — South China Sea, 20°57.5' N 115°55.0' E — 20°57.5' N 115°58.6' E (35-36 fathoms, 2 August 1963, leg. A. J. Bruce, 1 holotype).

Type. — Holotype in Rijksmuseum van Natuurlijke Historie, no. Crust. D. 25611.

Remarks. — This unusual species may be immediately recognized by the broad expansion of the rostral midrib, forming a deep orbital fossa. This feature has not been reported in any other previously described species of *Periclimenaeus*. Also remarkable is the armament of the caudal fan. The additional spines on the telson may possibly be an abnormality but in view of the increased spinulation on the uropods it is probably a normal feature.

The only other species of *Periclimenaeus* previously reported to have mobile spines along the outer border of the exopod of the uropod is *P. truncatus* (Rathbun), from which *P. spinicauda* is immediately separated by the absence of supraocular spines.

***Periclimenaeus spinimanus* sp. nov.**

Description. — A rather slenderly built, moderately sized species. Body generally smooth.

Rostrum slender, slightly depressed, extending to just beyond the base of terminal segment of the antennular peduncle. Dorsal margin with nine small teeth, all situated anteriorly to the orbital margin and with the anterior teeth slightly larger than the posterior teeth. Ventral margin feebly concave with a single small subterminal tooth. Epigastric and hepatic spines absent. Supraorbital spines absent and orbits feebly developed. Inferior orbital angle feebly developed. Antennal spine well developed, arising over inferior orbital angle. Sixth abdominal segment about one and a half times longer than deep. Pleura of fourth and fifth segments rounded. Telson narrow, about twice as long as sixth abdominal segment. Two pairs of large dorsal spines, the posterior pair at one half of the telson length and the anterior

slightly closer to the anterior border of the telson than to the posterior pair of spines. Only two pairs of terminal telson spines discernable, subequal in length, similar to dorsal spines with outer pair stouter than inner pair. Lateral telson spines absent.

Basal segment of antennule narrow, tapering distally with a long, acute tooth distolaterally; stylocerite short. Intermediate and distal segments subequal, about two thirds of length of basal segment. Lower flagellum filiform. Upper flagellum stout, rami fused for about eight segments; short free ramus with two segments, longer ramus with eight segments. Basicerite unarmed. Carpocerite exceeding basal antennular segment. Antennal flagellum about equal to carapace length. Scaphocerite not exceeding antennular peduncle, lateral border straight with well developed distolateral tooth not exceeding anterior margin of lamella. Eye well developed, stout; cornea hemispherical, slightly oblique, stalk about as wide as long.

First pereopod slender, exceeding antennular peduncle by the length of carpus and chela. Chela with subcylindrical palm about three times as long as dactylus which is short, stout, ventromedially curved and distinctly exceeds the fixed finger. The carpus is about one fifth longer than the chela and about one fifth shorter than the merus. Second pereopods markedly unequal. Major second pereopod with swollen but slightly flattened, palm and incurved fingers. The dorsal surface is covered with long, slender, upright spines which are best developed along the lateral borders and least developed over the dorsal aspects of the fingers. The fixed finger bears a small acute tooth dorsally in front of the hinge and has a distinctly hooked tip. The cutting edge is broad and flattened. The dactylus also has a hooked tip but lacks a distinct molar process but has a broad flattened cutting edge. The carpus is short, stout and unarmed. The ventral borders of merus and ischium are strongly spinose. The minor second pereopod is generally similar but distinctly smaller, more heavily spinose and with spines also on the dorsum of the carpus. The ambulatory pereopods are stout. The dactylus is stout and distinctly biunguiculate. The ventral border of the propodus bears numerous stout spines. Merus robust, unarmed. The uropods show no special features, the lateral border of exopod is entire and bears a robust, mobile distolateral spine.

Colour. — Translucent with golden corneae.

Host. — Unknown.

Distribution. — North-western Indian Ocean, off Ras Asir,  $11^{\circ}37' N$   $51^{\circ}27' E$  —  $11^{\circ}38' N$   $51^{\circ}27' E$  (37-40 fathoms, 18 December 1968, leg. A. J. Bruce, 1 holotype).



Type. — Holotype in U.S. National Museum, Washington, D.C.

Remarks. — *Periclimenaeus spinimanus* is distinguished from all other species of the genus by the heavily spinose dorsal surfaces of the chelae of the second pereopods. A number of species have the dorsal surface covered with tubercles but in none of these do the tubercles develop into spines. The form of the chela of the first pereopod also appears to be unique. It is not certain whether or not the absence of the lateral pair of terminal telson spines can be considered normal. In its other features, *P. spinimanus* seems to be most closely related to *P. rhodope* (Nobili).

***Periclimenaeus stylirostris* sp. nov.**

Description. — A medium-sized, robust species. Body generally smooth.

Rostrum very slender, especially in female, straight, depressed, extending to end of antennular peduncle. Dorsal margin straight with six slender acute teeth, all curving, anterior to the orbital margin. Ventral border concave, slightly convex distally, in female; straight in male, without teeth. Midrib feebly developed. Epigastric, hepatic and supraorbital spines absent. Inferior orbital angle obsolescent. Orbit feebly developed. Antennal spine large robust, supported by feeble longitudinal carina, situated over inferior orbital angle and exceeding basicerite. Anterolateral angle of carapace strongly produced, rounded. Sixth abdominal segment about one and a half times longer than deep. Pleura of first five abdominal segments broadly rounded, sixth produced and acute. Telson normal, about twice as long as anterior width, with two pairs of small dorsal spines situated at 0.1 and 0.5 of the telson length from the anterior margin. Three pairs of terminal spines present; lateral spines small, intermediate spines robust, longer than dorsal spines; submedian spines slightly shorter and more slender than intermediate spines.

Basal segment of antennular peduncle broad proximally, tapering distally with anterolateral border acutely produced, lateral border concave, posteriorly angulated; stylocerite short, broad and leaf-like. Intermediate and distal segments, subequal, short, equal to half length of basal segment. Antennular flagella short, normal. Upper flagellum stout with rami fused for seven segments, one or two free segments. Basicerite unarmed. Carpocerite subequal to length of basal segment of antennular peduncle. Scaphocerite broadest anteriorly; lamella rounded, reaching to level of base of distal segment of antennular peduncle; lateral border straight with small distolateral spine, slightly exceeded by lamella. Eye stout, cornea hemispherical, slightly oblique, stalk short, greatest length equal to diameter of cornea.

First pereopod robust, merus not exceeding antennular peduncle. Chela stout, palm subcylindrical, slightly shorter than fingers. Fingers simple, densely hirsute, cutting edges simple, tip of dactylus hooked. Carpus about one and a half times length of chela, subequal to merus and slightly widened distally. Second pereopods dissimilar, markedly unequal. Major second pereopod massive, palm subcylindrical, tapering slightly distally and slightly flattened, smooth or feebly pitted distally. Fingers short, stout, equal to about half length of palm, incurved. Dactylus stout and deep with large, low, molar process proximally, feebly separated from the rest of cutting edge which is blunt and strongly thickened; tip slightly hooked. Fixed finger slender with large fossa on cutting edge proximally and strongly hooked tip; slender conical process dorsally immediately in front of hinge. Carpus short, stout, distally expanded, about one third of length of palm. Merus and ischium equal to greatest length of carpus, subequal, unarmed. Minor second pereopod about half length of palm of major second pereopod. Palm subcylindrical tapering distally, smooth. Dactylus, a thin plate, subcircular, with a strong tooth at distal extremity. Fixed finger slender, curved, with concave cutting edge terminating distally in a pair of very acute teeth, separated by a deep notch. Ambulatory pereopods slender, not swollen. Dactylus short, stout, with distinct accessory spine. Propodus of third pereopod feebly spinose ventrally, fifth unarmed. Carpus and merus unarmed. Uropods normal, distolateral angle of basipod blunt; lateral border of exopod convex with acute distolateral tooth with mobile spine medially, entire and unarmed.

Colour. — Unknown.

Host. — Sponges.

Distribution. — South China Sea,  $20^{\circ}34.0' N$   $113^{\circ}30.5' E$  —  $20^{\circ}30.3' N$   $113^{\circ}29.0' E$  (49-50 fathoms, 17 December 1963, leg. A. J. Bruce, 1 ♂ paratype, 1 ovigerous ♀ holotype).

Type. — The holotype is in Rijksmuseum van Natuurlijke Historie (no. Crust. D. 25612), the paratype is in the British Museum (Nat. Hist.).

Remarks. — *Periclimenaeus stylirostris* most closely resembles *P. leptodactylus* Fujino & Miyake. It may be readily distinguished from this species by the following features: (1) larger size; (2) styliform rostrum, without ventral teeth; (3) stronger antennal spine, supported by a longitudinal carina; (4) produced anterolateral angle of carapace; (5) shorter scaphocerite; (6) first pereopod with stouter chela, with longer hirsute fingers; (7) major second pereopod with molar process of dactylus indistinctly separated from anterior cutting edge; (8) minor second pereopod with dactylus virtually circular in outline, fixed finger with two acute teeth at tip.

**Periclimenaeus trispinosus** sp. nov.

Description. — A slender, small sized species. Body generally smooth.

Rostrum slender, slightly depressed, straight extending well beyond the antennular peduncle in the male and slightly shorter than the peduncle in the female. The ventral border is straight and unarmed. The dorsal margin bears 7-8 teeth with the most posterior tooth situated over the posterior orbital margin. In the male the slender teeth show a distinct increase in length anterior. In the female this is less marked. Epigastric, hepatic and supraorbital spines absent. Orbit feebly developed posteriorly. Inferior orbital angle feebly developed. Antennal spine long and slender, situated over inferior orbital angle. Anterior lateral rim of orbit bearing a pair of long spines, similar to the antennal spine, one behind and above the other and rather longer in the male than in the female. Sixth abdominal segment about as long as wide posteriorly. Pleura of the first four abdominal segments broadly rounded. Pleuron of the fifth elongated and acutely pointed in the male and small and rounded in the female. Pleuron of the sixth segment also short, broad and acute. Telson narrow with two pairs of long, curved, upstanding dorsal spines. Posterior pair situated at middle of telson length and anterior pair at one third of the telson length from the anterior margin. Submedian and intermediate telson spines long; lateral spines small and situated at a slightly more anterior level.

Basal segment of antennule narrow with short stylocerite: distal border slightly produced with a slender lateral spine. Intermediate and distal segments subequal, equal to about half the length of basal segment. Antennular flagella short. Basicerite short, unarmed. Carpocerite elongated, slender, exceeding basal segment of antennule. Scaphocerite very small not reaching to level of distal end of basal segment of antennular peduncle, lateral spine not discernable. Eyes normally developed, cornea hemispherical, oblique; stalk short and broad.

First pereopod short and stout, with merus reaching almost to middle of carpocerite. Chela short and robust, with palm broad and compressed; fingers stout slightly shorter than palm. Carpus short, slightly longer than chela, widening distally but distinctly narrower than width of palm. Merus robust, about 1.5 times longer than carpus, very broad, especially proximally, and stout, slightly shorter than palm. Carpus short, slightly longer than chela, relatively much larger in male. Major chela with subcylindrical, slightly compressed palm, feebly pitted. Fingers about one third of length of palm, tips strongly hooked. Dactylus with well developed molar process. Fixed finger with a pair of blunt triangular processes on dorsal edge in front of hinge,

and a single blunt tooth ventrally. Carpus short and stout, about one quarter of length of chela, spinulate ventrally. Merus subequal to carpus, ventrally spinulate. Ischium subequal to merus, non-spinulate. Minor second pereopod generally similar but not pitted. Dactylus without molar process, cutting edge straight, entire. Carpus and merus ventrally non-spinulate. Ambulatory pereopods robust, first two pairs with carpus distally and propodus proximally strongly swollen. Third pair normal. Dactylus short, stout, strongly curved and simple. Propodus non-spinulate. Merus robust, compressed, non-spinulate. Uropods normal, with small distolateral tooth with a medial mobile spinule; lateral border of exopod entire, unarmed.

Colour. — Unknown.

Host. — Sublittoral sponges.

Distribution. — Mkokotoni, N. end of Zanzibar Island, East Africa (14-15 fathoms, 24 January 1961, leg. A. J. Bruce, 1 ♂ paratype, 1 ovigerous ♀ holotype).

Type. — The holotype is in Rijksmuseum van Natuurlijke Historie (110. Crust. D. 25613), the paratype in British Museum (Nat. Hist.).

Remarks. — *Periclimenaeus trispinosus* may be immediately distinguished from all other members of the genus by the presence of the two post-antennal spines on each side of the carapace. The very small scaphocerite is also noteworthy.

#### ***Periclimenaeus tuamotae* sp. nov.**

Description. — A very small, lightly built species. Body generally smooth.

Rostrum slender, straight, horizontal, extending anteriorly to distal border of the basal segment of the antennular peduncle. Dorsal margin with six teeth, all anterior to the orbital margin and increasing gradually in size distally. Ventral margin straight, without teeth. Midrib feebly developed. Epigastric and hepatic spines absent. Small supraorbital tubercles present. Orbit feebly developed. Inferior orbital obsolescent. Antennal spine acute, situated over the inferior orbital angle. Sixth abdominal segment about as broad as long. Pleura of first four segments rounded, fifth bluntly subrectangular and the sixth feebly acute. Telson narrow, about twice length of sixth abdominal segment. Two pairs of long, slender dorsal spines situated at about 0.2 and 0.5 of the telson length, anterior pair submarginal and posterior pair marginal. Three pairs of posterior telson spines present; submedian and intermediate spines long and slender, subequal in length; lateral spines small.

Basal segment of antennule broad proximally with short broad stylocerite,

and narrowed distally, lateral border concave, distolateral angle produced, acute. Intermediate and distal segments subequal, equal to half length of basal segment. Antennular flagella short. Lower flagellum filiform. Upper flagellum with rami fused for five segments. Short ramus of three segments; longer free ramus of 7-8 segments. Basicerite unarmed. Carpocerite short, not exceeding basal segment of antennule. Scaphocerite well developed, lamella not exceeding intermediate segment of antennular peduncle, lateral border straight with a long slender distolateral spine that extends beyond the rounded anterior border of the lamella. Eye large, extending beyond the tip of the rostrum, to the level of the base of the intermediate segment of the intermediate peduncle segment. Cornea hemispherical, slightly oblique, of same diameter as stalk; maximum length of stalk about twice the width.

First pereopod slender, exceeding the antennular peduncle by two thirds of the length of the carpus. The chela is slender, and the fingers incurved, two thirds of the length of the palm. Carpus about 1.5 times the length of the chela, subequal to merus. Second pereopods, unequal, dissimilar. The major second pereopod with palm swollen, tapering, slightly compressed and finely tuberculate along ventral margin. Fingers short, about one third of length of palm. Dactylus broad, strongly compressed, with a slightly hooked tip and a well developed molar process. Fixed finger tapering, with large fossa on cutting edge. The dorsal margin of the upper cutting edge bears a large acute process which overlies the molar process on the dactylus. Carpus short and greatly expanded and excavated distally, about one quarter of length of palm, unarmed. Merus about 0.4 times the length of palm and spinulate along ventral border. Ischium about three quarters of the length of the merus, ventrally spinulate. Minor second pereopod similar but slightly smaller. Dactylus without molar process and with evenly convex, entire cutting edge. A small tooth is present on the cutting edge of the fixed finger proximally. Merus feebly spinulate. Ambulatory pereopods slender. Dactylus about one quarter of length of propodus, slender with a small accessory spine, and a series of minute spinules along ventral border proximally. Propodus with 6-7 large spines along the ventral border on third pereopod, 2-3 on the fourth and none on the fifth. Carpus and merus unarmed. Uropods normal, posterolateral angle of basipod blunt; lateral border of exopod entire, unarmed, with a small distolateral tooth and a large mobile spinule.

Colour. — Unknown.

Host. — Sponges.

Distribution. — Mururoa Is., Tuamotu Archipelago, Polynesia (1965, leg. B. Salvat, 4 specimens).

Type. — The ovigerous female holotype and three paratypes are in the Muséum National d'Histoire Naturelle, Paris.

Remarks. — *Periclimenaeus tuamotae* appears most closely related to *P. leptodactylus* Fujino & Miyake, another very small species. It may be distinguished by the following features: (1) rostrum horizontal without ventral tooth; (2) supraorbital tubercles present; (3) carpocerite much shorter than basal segment of antennular peduncle; (4) scaphocerite shorter, not exceeding intermediate segment of antennular peduncle; (5) distolateral spine of scaphocerite long and slender, exceeding lamella; (6) first pereopod with fingers more than half length of palm, subspatulate, cutting edges entire; (7) carpus of first pereopod distinctly longer than chela and subequal to merus; (8) presence of an acute process on dorsal aspect of fixed finger in front of hinge; (9) propodus of third and fourth pereopods with stout spines.

***Periclimenaeus usitatus* sp. nov.**

Description. — A moderately sized, slender species. Body generally smooth.

Rostrum slender, slightly depressed, straight with slightly upturned tip, extending to anterior margin of intermediate segment of antennular peduncle. Dorsal margin with five acute, subequal, teeth, all anterior to the posterior margin of orbit. Ventral margin straight or slightly concave, with single small ventral tooth situated just behind the anterior dorsal tooth. Midrib feebly developed. Epigastric, hepatic and supraorbital spines absent. Orbit feebly developed ventrolaterally, with feeble postorbital ridges, inferior orbital angle obsolescent. Antennal spine small, acute, situated over inferior orbital angle. Sixth abdominal segment about twice as long as deep. Pleura of first five segments bluntly rounded; sixth acutely produced. Telson narrow. Dorsal spines small, anterior pair at 0.2, posterior pair at 0.6 of telson length from anterior margin. Three pairs of terminal telson spines; lateral spines stout, half length of intermediate spines, submedian spines shorter and more slender than intermediate spines.

Basal segment of antennule broad posteriorly, narrowing anteriorly; anterior border acutely produced, lateral border concave, rounded posteriorly; stylocerite leaf-like, reaching to middle of segment. Intermediate and distal segments subequal, short, equal to half length of basal segment. Flagella normal. Basicerite unarmed. Carpocerite slender, exceeding intermediate segment of antennular peduncle. Scaphocerite broadest distally with rounded anterior margin, lamella exceeding intermediate segment of antennular peduncle, lateral border straight with small distal spine, slightly exceeded

by lamella. Eye normal, cornea hemispherical, slightly oblique, stalk short.

First pereopods slender, exceeding antennular peduncle by one third of merus, carpus and chela. Chela with subcylindrical slender palm and slender spatulate fingers, slightly shorter than palm. Carpus slender, about 1.5 times length of chela and slightly shorter than merus. Second pereopods dissimilar, subequal in female, very unequal in male. Major chela in male with palm subcylindrical, slightly compressed, smooth. Fingers equal to half length of palm. Dactylus slender with small molar process, fixed finger broad, with fossa in proximal cutting edge, cutting edges concave, sharp; fingers hooked. Carpus about half length of palm. Merus robust, subequal to carpus, unarmed. Minor second pereopod with fingers equal to about 0.6 of palm, cutting edges entire and tips hooked. Chelae in the female generally similar to minor chela of male, except that major chela bears a small molar process. Ambulatory pereopods robust, carpus swollen proximally and merus distally. Dactylus short and stout, with distinct accessory spine. Propodus with few stout spines distally. Carpus and merus unarmed. Uropods normal, basipod blunt distolaterally, lateral border of exopod entire, unarmed.

Colour. — Unknown.

Host. — Sublittoral sponges.

Distribution. — Indian Ocean, 7°46'48" S 39°42'36" E (11 fathoms, 20 October 1960, leg. A. J. Bruce, 1 ♂ paratype, 1 ♀ holotype).

Type. — The holotype is in Rijksmuseum van Natuurlijke Historie (no. Crust. D. 25614), the paratype in British Museum (Nat. Hist.).

Remarks. — *Periclimenaeus usitatus* is characterized by the absence of supraorbital spines and the presence of a distinct ventral rostral tooth. The only other species of *Periclimenaeus* presenting these features are *P. novae-zealandiae* (Borradaile), *P. natalensis* (Stebbing) and *P. leptodactylus* Fujino & Miyake. *P. usitatus* may be readily separated from these species by the following characters: (1) absence of postrostral teeth; (2) presence of only a single ventral rostral tooth; (3) slender chela of first pereopod, with fingers almost equal to palm length; (4) cutting edge of dactylus of minor second pereopod concave; (5) posterior border of propods of ambulatory pereopod with few spines distally only.

*Periclimenaeus usitatus* also resembles *P. tuamotae* (see p. 170), which is closely related to *P. leptodactylus*, and may be distinguished from that species by: (1) larger size; (2) single ventral rostral tooth; (3) absence of supra-

orbital tubercles; (4) smaller eye; (5) second pereiopods non-tuberculate; (6) posterior border of propods of ambulatory pereiopods distally spinulate only.

***Periclimenaeus zanzibaricus* sp. nov.**

Description. — A small but robust species. Body generally smooth.

Rostrum straight, slender, horizontal or slightly depressed, extending to or a little beyond the end of the intermediate segment of the antennular peduncle. Ventral margin of rostrum straight, unarmed and the tip may be slightly upturned. The teeth are acute and triangular, slightly larger posteriorly than anteriorly. Epigastric and hepatic spines absent. Supraorbital spines well developed and acute. Orbit feebly demarcated and the inferior orbital angle bluntly rounded and indistinct. Antennal spine large and acute, situated over the inferior orbital angle. Anterolateral angle of the carapace bluntly and obtusely angled. Sixth abdominal segment as broad as long. Pleura of first five segments bluntly rounded, the sixth enlarged, produced and acute. Telson bearing two pairs of long dorsal spines. The posterior pair situated slightly behind the middle of the telson length and the anterior pair close to the anterior border of the telson. Three pairs of telson spines present. Submedian and intermediate spines slightly longer than dorsal spines and lateral spines small.

Basal segment of the antennular peduncle moderately narrow with a small anterolateral lobe bearing an acute lateral tooth; stylocerite short. Intermediate and distal segments subequal, about two thirds of the length of the basal segment. Lower flagellum filiform. Upper flagellum stout, with rami fused for about five segments; free short ramus consisting of two segments, long ramus filiform. Basicerite unarmed. Carpocerite extending to anterior border of basal segment of antennule. Scaphocerite broad, rounded anteriorly, with lamella not exceeding antennular peduncle. Lateral spine large, extending far beyond lamella. Eye well developed, cornea hemispherical, slightly oblique, diameter slightly greater than distal end of peduncle, which is about 1.5 times longer than wide.

First pereiopod slender, exceeding antennular peduncle by the length of carpus and chela. Chela slender, subcylindrical, curved medially; fingers normal, slightly greater than half length of palm. Carpus about 1.3 times longer than chela, slender, subequal to merus. Second pereiopods unequal, especially in males. Major second pereiopod with palm swollen proximally and covered with fine acute granules over dorsal aspect. Fingers equal to half length of palm. Dactylus with molar process feebly developed, indistinct anteriorly. Fixed finger with single blunt process dorsally in front of hinge.



Carpus about one third of length of palm, strongly expanded distally, unarmed. Merus about half length of palm and spinulate ventrally and with broad blunt lobe distoventrally. Ischium also spinulate ventrally, about 0.8 times length of merus. Minor second pereopod generally similar but fingers equal to two thirds of length of palm. Dactylus without molar process and with entire cutting edge, but with small acute tooth fitting into a longitudinal groove on fixed finger, which bears a small acute tooth on upper lip of groove in front of hinge. Tips of fingers hooked. Ventral margins of merus and ischium spinulate. Ambulatory pereopods slender. Dactyli slender, distinctly biunguiculate, with small spinules along posterior border in front of and beyond the accessory spine. Propodus spinulate, heavily on third pereopod to feebly on the fourth. Carpus about two thirds of propodus, unarmed. Merus non-spinulate, slightly longer than propodus. Uropods normal, with very strong distolateral tooth and a strong mobile spine: lateral border of exopod entire, unarmed.

Colour. — Unknown.

Host. — Littoral sponges.

Distribution. — Uroa, east coast of Zanzibar Island, East Africa (littoral, 21 March 1960, leg. A. J. Bruce, 1 ♂ paratype, 1 ovigerous ♀ holotype).

Types. — The holotype is in Rijksmuseum van Natuurlijke Historie (no. Crust. D. 25615), the paratype in British Museum (Nat. Hist.).

Remarks. — *Periclimenaeus zanzibaricus* is closely related to *P. rhodope* (Nobili) and may be separated most easily from that species by the shorter and stouter first pereopod in which the merus does not far exceed the scaphocerite and the chela is distinctly more than half the length of the carpus. *P. zanzibaricus* is also a small species, about 10 mm total length, whereas *P. rhodope* is about 15 mm long.

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