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PRELIMINARY DESCRIPTIONS OF SIXTEEN NEW SPECIES OF THE GENUS PERICLIMENES COSTA, 1844 (CRUSTACEA, DECAPODA NANTANTIA, PONTONIINAE)

by

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The study of the pontoniid fauna of the Indo-West-Pacific region has resulted in the discovery of numerous undescribed species of the genus *Periclimenes* Costa, 1844. A revision of this genus, the 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. The brief descriptions and remarks given here will enable the species to be identified and may contribute to their recognition in other parts of their ranges, pending their full description and illustration.

Most of the species described are commensally associated with other marine invertebrates. One species is thought to be free-living, eight were found in association with coelenterates and four with echinoderms. The three remaining species are probably also commensal but their hosts are as yet unknown.

The hosts of most specimens have been preserved and are in the course of identification.

The holotype specimens will be deposited in the collections of the Rijksmuseum van Natuurlijke Historie, Leiden, and paratypes in the British Museum (Natural History), London, except where the specimens are already in a museum collection.

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Periclimenes carinidactylus sp.nov.

Description. — A small robustly built species generally resembling *Periclimenes affinis* (Zehntner). Carapace smooth. Rostrum well developed, slender, slightly depressed, slightly exceeding antennular peduncle. Midrib distinct. Dorsal margin slightly convex, with ten acute teeth, decreasing in size anteriorly; the most posterior tooth situated behind the orbital margin. Ventral margin straight for proximal two thirds and convex distally, with three small teeth close together on distal third ventrally. Epigastric and supraorbital spines absent. Orbital depression present, margins feebly marked. Inferior orbital angle produced, blunt. Antennal spine robust, arising from anterior margin of carapace, directed slightly dorsally. Hepatic spine robust, slightly larger than antennal spine, situated at a lower and more posterior level, directed anteriorly. Fourth thoracic sternite with a low transverse ridge with a small median notch. Third abdominal segment not produced postero-dorsally. Sixth abdominal segment about one and a half times longer than deep. Pleura of fourth and fifth segments rounded. Telson narrow, with two pairs of well developed dorsal spines, anterior pair at about half telson length and posterior pair halfway between anterior pair and telson tip. Terminal spines well developed, intermediate spine slightly shorter than a quarter of the telson length.

Antennular peduncle with broad basal segment, tapering slightly distally. Anterior margin with small slender anterolateral spine and a small median lobe. Lateral margin slightly convex. Stylocerite well developed, acute, not extending to middle of segment. Intermediate and distal segments subequal, slender, equal to about two thirds of the length of the basal segment. Lower antennular flagellum filiform. Upper flagellum biramous, stout proximally, with rami fused for four segments. Shorter free ramus consisting of two segments. Longer free ramus filiform. Basicerite with small, acute, lateral tooth. Antennal flagella well developed. Scaphocerite broad, lateral margin feebly convex with distinct distolateral spine; lamella exceeding distolateral spine, with convex anterior margin meeting medial margin at a blunt angle. Eyes well developed with robust stalk and globular, oblique cornea.

First pereiopods slender, exceeding scaphocerite by length of chela. Chela slender, with tapering fingers with entire cutting edges. Carpus slightly longer than merus (15 : 13) and one and a half times longer than the chela.

Second pereiopod robust, chela slightly longer than postorbital carapace length (7:6). Palm cylindrical, smooth, two and a half times longer than fingers. Fingers curved medially, with strongly hooked tips; cutting edges situated medially, distal two thirds entire. Fixed finger with two small acute teeth on proximal third. Dactylus with a single large acute tooth on proximal third. Lateral border of dactylus with a broad laminar flange, dorsal aspect concave, ventral aspect convex. Carpus short and stout, about one seventh of length of chela, unarmed. Merus unarmed, less than half length of chela (5:2) and slightly longer than ischium. Coxa with medial lobe feebly developed. Ambulatory pereiopods slender. Dactylus slender, curved, without accessory spine, about one sixth of the length of propodus. Propodus about ten times longer than wide, non-spinose, with long setae distally. Uropods normal; exopod with small acute tooth and mobile spinule at posterior end of straight lateral border, exopod and endopod distinctly exceeding telson spines.

Colour. — Unknown.

Host. — Crinoid.

Type. — Holotype (an ovigerous female) in Australian Museum, Sydney, from Bottle and Glass Rocks, Port Jackson, New S. Wales, Australia, depth 20 feet, 23 April 1966, coll. L. Wilson.

Remarks. — *Periclimenes carinidactylus* is most closely related to *Periclimenes affinis* (Zehntner) and *P. brocketti* Borradaile, both of which are also known to live in association with crinoids. In *P. brocketti* the fingers of the second pereiopods are subequal to the length of the palm. In *P. affinis* the rostrum bears fewer teeth, seven dorsal and a single ventral tooth only being present. The chela is similar to that of *P. carinidactylus* but the fingers are more slender, without the conspicuous flange on the lateral aspect of the dactylus, with two broad teeth on the proximal half of the cutting edge of the dactylus and with two similar teeth distally and several smaller denticles proximally on the fixed finger. The carpus is also distinctly longer in relation to the palm.

Periclimenes exederens sp.nov.

Description. — A small slenderly built species closely resembling *Periclimenes leptopus* Kemp. Rostrum horizontal, slightly up-curved, slender, short, extending to base of terminal segment of antennular peduncle. Dorsal margin with seven small teeth, all anterior to posterior orbital margin, and three small ventral teeth situated on the distal third. Epigastric spine present at one quarter of the carapace length. Supraorbital spine absent. Orbit feebly

developed, posterior orbital ridge present. Inferior orbital angle feebly produced, rounded. Antennal spine arising from anterior margin of carapace close below inferior orbital angle. Hepatic spine small, acute, situated close to anterior edge of carapace at level of ventral surface of basicerite. Third abdominal segment not produced dorsoposteriorly. Sixth abdominal segment slightly more than twice as long as deep. Pleura of fourth and fifth segments rounded. Telson narrow, two pairs of dorsolateral spines situated at about thirds of the telson length. Terminal spines well developed, intermediate spines about one quarter of the telson length.

Antennule with narrow basal segment, tapering distally. Anterolateral margin not produced, with a small slender distolateral spine. Stylocerite short and blunt, not extending to middle of basal segment. Intermediate and distal segments subequal, slender, equal to about half the length of basal segment. Lower antennular flagellum filiform, short, subequal to peduncle. Upper flagellum biramous, stout proximally, rami fused for eight segments. Shorter free ramus consisting of two free segments; longer ramus far exceeding lower flagellum, longer ramus feebly developed, filiform. Basicerite with small acute ventrolateral tooth. Antennal flagella unknown. Scaphocerite tapering, exceeding antennular peduncle; lateral margin feebly concave with slender distolateral spine, lamella rounded distally, narrow, not exceeding base of distal spine. Eye with globular cornea, transverse; stalk short and stout.

First pereiopod very slender, exceeding scaphocerite by length of chela. Chela slender, with tapering fingers equal to one and a half times the length of palm. Carpus subequal to palm; merus slightly longer (9 : 10). Second pereiopods unknown. Ambulatory pereiopods very slender, third and fifth pereiopod exceeding scaphocerite by propodus and dactylus. Dactylus slender and curved, without accessory spine, equal to about one third of the length of the propodus. Propodus about fifteen times longer than wide, non-spinose. Uropods slender, endopod not exceeding telson; exopod longer with mobile distolateral spine and setose lateral border.

Colour. — Unknown.

Host. — Unknown.

Type. — Holotype from South China Sea, 20°36.0'N 113°54.2'E to 20°38.8'N 113°57.8'E, depth 47-48 fathoms, 21 February 1965, coll. D. Eggleston.

Remarks. — *Periclimenes exederens* appears most closely related to *Periclimenes leptopus* Kemp and may be distinguished from that species by the position of the hepatic spine, the less rounded, shorter anterior end of the lamella of the scaphocerite, and the longer ambulatory pereiopods and relatively shorter dactyli.

Periclimenes gorgonicola sp.nov.

Description. — Medium sized, slenderly built, generally similar to *Periclimenes laccadivensis* (Alcock & Anderson). Carapace smooth. Rostrum long and slender, slightly up-curved distally, exceeding antennular peduncle and scaphocerite; dorsal margin with ten and ventral margin with four teeth. Three posterior teeth situated on carapace, with first just in front of the middle of the carapace length and separated from second tooth by a larger space than between the rest of the series. Orbit feebly developed, inferior orbital angle acutely produced. Supraorbital and antennal spines absent. Hepatic spine robust, situated well below inferior orbital angle. Broad triangular lamina with a small median notch on fourth thoracic sternite. Third abdominal segment slightly produced posterodorsally. Sixth segment one and a half times longer than deep. Fourth and fifth abdominal pleura bluntly angled. Telson narrow with two pairs of spines situated dorsolaterally on the posterior half. Terminal spines well developed.

Antennular peduncle with narrow basal segment with the anterior margin produced medially and bearing a slender spine laterally: stylocerite reaching to middle of basal segment. Intermediate segment with a small lateral lobe, subequal to distal segment, which is about twice as long as wide. Lower antennular flagellum long and slender. Upper flagellum biramous, with the two rami fused for four segments. Shorter free ramus consisting of about eight segments, longer ramus filiform, subequal to lower flagellum. Basicerite with slender lateral spine. Antennal flagellum well developed. Scaphocerite narrow, tapering distally and exceeding antennular peduncle. Lateral margin with strong anterolateral spine. Lamella bluntly angled distally, exceeding anterolateral spine. Eye well developed with globular transverse cornea.

First pereiopod exceeds scaphocerite by length of fingers. Fingers of chela slender with entire cutting edges, about two thirds of the length of palm. Carpus subequal to chela, slightly shorter than merus (8: 10). Coxa with distinct medial setose process. Second pereiopods well developed, unequal, similar. Fingers of major pereiopod about three sevenths of the length of palm, with two large acute teeth on the proximal half of each cutting edge, tips strongly hooked. Carpus about two sevenths of length of palm, unarmed. Merus and ischium subequal, equal to about two thirds of length of palm, unarmed. Minor second pereiopod with chela seven tenths of length of major chela, more slender, with slightly longer, toothless fingers. Ambulatory pereiopods slender. Dactylus stout, with robust accessory spine. Propodus with spinulate posterior border, slightly longer than unarmed merus. Uropods rather narrow, only slightly exceeding the telson, with large mobile spinule on outer border of exopod.

Colour. — Not noted, probably transparent.

Host. — Gorgonians.

Type. — Holotype (an ovigerous female) and numerous paratypes, from South China Sea, 21°47.7'N 116°28.5'E to 21°43.3'N 116°28.0'E, depth 60-72 fathoms, 10 January 1964, coll. A. J. Bruce.

Remarks. — *Periclimenes gorgonicola* is closely related to *P. laccadivensis* (Alcock & Anderson) but can be immediately separated from that species by the absence of an antennal spine. This unusual feature has only been reported in the American Atlantic species *Periclimenes longicaudatus* (Stimpson), and an undescribed species from New Zealand (Richardson & Yaldwyn, 1958). The former has a short deep rostrum, that does not exceed the antennular peduncle and a knob-like, bluntly rounded inferior orbital angle. The latter species has a deep rostral lamina and the hepatic spine is situated close to and projecting beyond the anterior margin of the carapace (Yaldwyn, in litt.).

Periclimenes holthuisi sp.nov.

Urocaris longicaudata Pearson, 1905: 78, pl. 1 fig. 5.
Periclimenes (Periclimenes) aesopius Holthuis, 1952: 34, figs. 5, 6.
Periclimenes aesopius Bruce, 1966: 21, fig. 3b, 4e, f.

Description. — A full description with illustrations has been given by Holthuis

Colour. — Transparent with purple spots on carapace, red streaks on white abdominal hump, caudal fan red at base, white distally with large purple ocellus on exopod. First and second pereiopods mainly white, heavily ringed with purple at joints and on fingers.

Host. — Sea-anemones.

Type. — Male, holotype and paratype, from Lung Ha Wan, N.T., Hong Kong, 22°18.5'N 114°18.2'E, depth 2 fathoms, 25 August 1965, coll. J. D. Bromhall.

Distribution. — Maldives, Ceylon, Moluccas, Hong Kong, South China Sea, Japan, New Caledonia, Queensland.

Remarks. — *Periclimenes holthuisi* may be separated from *P. aesopius* (Bate), which is known only from South Australia, by the following features. (1) The presence of not more than two post-rostral teeth on the anterior quarter of the carapace. In *P. aesopius* three or four teeth are present, the most posterior being situated behind the middle of the carapace length. (2) The rostrum proper is distinctly arched with one or two small subapical ventral teeth and up to ten small dorsal teeth. In *P. aesopius* the rostrum

is straight but inclined slightly upwards with two or three large teeth on the distal quarter ventrally and with five to eight teeth on the dorsal margin. (3) The inferior orbital angle is longer and more acute. (4) The third abdominal segment does not form an overhanging posterior projection. (5) Carpus of second pereiopod about as long as palm.

It may also be noted that the fourth thoracic sternite is unarmed and that the coxa of the first pereiopod lacks a median setose process.

This species is named in honour of Dr. L. B. Holthuis, who first described specimens from the material collected by the Siboga Expedition.

Periclimenes hongkongensis sp.nov.

Description. — A small slender species resembling *Periclimenes incertus* Borradaile. Carapace smooth. Rostral lamina deep, horizontal or slightly depressed, and just exceeding antennular peduncle. Upper and lower margins convex. Dorsal margin with 13 to 16 long slender evenly distributed teeth, the posterior 8 to 10 mobile. Epigastric tooth present. Ventral margin with 2 to 4 small acute teeth situated on anterior third. Orbit feebly developed; inferior orbital angle acutely produced. Supraorbital spine absent. Antennal spine slender, arising from anterior margin of carapace well below inferior orbital angle. Hepatic spine robust, larger than antennal spine and situated at a much lower level, close to anterior margin of carapace. Fourth thoracic sternite with low transverse lamina. Third abdominal segment not produced posterodorsally. Sixth abdominal segment twice as long as wide. Pleura of fourth and fifth segments bluntly angled. Telson very narrow with two pairs of dorsolateral spines, the anterior pair at the middle of the telson length and the posterior pair half way between anterior pair and tip. Terminal spines well developed, intermediate spines equal to one fourth of telson length.

Antennule with basal segment half as wide as long, anterolateral margin produced to form a small medial lobe with a slender lateral spine, not exceeding the lobe. Stylocerite slender, acute, reaching to well beyond middle of basal segment. Lower antennular flagellum filiform. Upper flagellum biramous with rami fused proximally for four segments. Shorter free ramus consisting of four segments; longer ramus filiform, exceeding lower flagellum. Basicerite with small, slender anterolateral spine. Antennal flagellum well developed. Scaphocerite broad, tapering slightly distally, lateral border almost straight with strong distolateral tooth. Lamella far exceeding distolateral tooth, bluntly angled medially, with convex anterior border. Eye well developed with short robust stalk. Cornea globular, slightly oblique, diameter slightly less than greatest diameter of eyestalk.

First pereiopod slender, chela with slender tapering fingers, subequal to palm; carpus slightly longer than chela and distinctly shorter than merus (9: 11). Coxa with a prominent medial setose lobe. Second pereiopods well developed, slender, unequal and dissimilar. Major chela with subcylindrical, distally tapering palm, about two and a half times longer than the fingers. Fingers robust, curved, with hooked tips, cutting edges situated laterally, with a single small tooth proximally on each margin. Carpus stout, subequal to fingers, unarmed. Merus slender, unarmed, equal to seven ninths of length of palm. Ischium slender, sixth sevenths of length of merus. Minor chela three fifths of length of major chela with slender fingers subequal to palm, unarmed. Ambulatory pereiopods slender. Dactylus slender with well developed accessory spine distally. Propodus slender, distal half of posterior border strongly spinose. Uropod distinctly exceeding telson; exopod longer than endopod, with mobile distolateral spinule and setose lateral border.

Colour. — Mainly transparent, with reddish mottlings.

Host. — Holothurian.

Type. — Female holotype and paratype, from Rocky Harbour, Hong Kong, 22°20.0'N 114°21'E, depth 14 fathoms, 16 January 1965, coll. D. Eggleston.

Remarks. — *Periclimenes hongkongensis* is closely related to *P. incertus* Borradaile. It may be readily separated from that species by the much greater number of rostral teeth ($\frac{13—16}{2—4}$ compared to $\frac{7—9}{1—2}$), the more anterior position of the hepatic spine, the shorter fingers of the major second pereiopod and the longer fingers of the minor second pereiopod, and the more slender dactyl of the ambulatory pereiopods with slender accessory spines. *P. hongkongensis* is also closely related to *P. sinensis* sp.nov. and may be distinguished from that species by the differences in rostrum and chelae.

Periclimenes kempi sp.nov.

Description. — A small shrimp, generally resembling *Periclimenes diversipes* Kemp. Carapace smooth. Rostrum deep with convex dorsal and ventral borders extending horizontally from the level of the middle of the terminal antennular segment to just beyond the peduncle. The dorsal rostral margin is armed with six acute teeth in males and seven or eight in females. The ventral margin bears one or two small teeth in the male and one or none in the female. The ventral teeth are situated on the distal third of the lamina and the most posterior dorsal tooth is situated on the carapace behind the orbital margin. Orbit is feebly developed. Inferior orbital angle acutely

produced. Supraorbital spine absent. Antennal spine slender, arising from anterior margin of carapace immediately below and slightly exceeding inferior orbital angle. Hepatic spine slender, slightly more robust than antennal and situated at a posterior and slightly lower level. Fourth thoracic sternite bearing a broad transverse lamina with a small median notch. Third abdominal segment is very feebly produced in the dorsal midline. Length of the sixth segment slightly less than twice the depth. Fourth and fifth pleura bluntly angled. Telson narrow with two pairs of small dorsal spines, anterior pair at middle of telson length and posterior pair half way between anterior pair and tip. Terminal spines well developed.

Antennule with narrow basal segment, anterior margin slightly produced with slender distolateral spine. Stylocerite long, slender and finely acute, exceeding middle of segment. Intermediate and distal segments short, subequal, equal to about half the length of basal segment. Lower antennular flagellum filiform, exceeding carapace length. Upper flagellum biramous with rami fused for about five segments, the short free ramus consisting of two free segments and the longer ramus filiform, subequal to lower flagellum. Basicerite with small lateral spine. Antennal flagellum well developed. Scaphocerite broad, exceeding antennular peduncle, with long slender distolateral spine. Lamella bluntly angled distally, far outreaching distolateral spine. Eye with globular, slightly oblique cornea.

First pereiopods exceeding scaphocerite by fingers of chela. Fingers of chela distinctly longer than palm, markedly subspatulate with entire cutting edges. Carpus and merus subequal, about one and a half times length of palm. Coxa with prominent slender medial process. Second pereiopods feeble, especially in males, similar, unequal. Major chela with subcylindrical palm, increasing in size distally with short broad subspatulate fingers with hooked tips and entire cutting edge. Fingers equal to about three tenths of the palm. Carpus short and stout, about one third of length of palm, unarmed. Merus and ischium subequal, slender, equal to two thirds of length of palm, unarmed. Minor chela much smaller, with fingers equal to two thirds of the length of the palm. Carpus more slender but other segments similar to those of major chela. Ambulatory pereiopods slender. Dactylus robust, simple and curved with slender tip. Propodus unarmed. Uropods rather narrow, distinctly exceeding telson, with a large mobile spinule on outer border of exopod.

Colour. — Transparent with white eyes.

Host. — Alcyonarians.

Type. — Holotype (an ovigerous female) and 3 paratypes, from Hurg-

hada, Red Sea, Egypt, 27°14'N 38°50'E, Stn. 36, depth 0.5 fathoms, 17 July 1966, coll. A. J. Bruce.

Remarks. — *Periclimenes kempi* is very closely related to *Periclimenes diversipes* Kemp. This species has been described as existing in two main forms, each with characteristic chelae on the second pereiopods, designated by Kemp as *a, b, c, and d. P. kempi* has chelae closely resembling the form c and quite distinct from *a* and *d. P. kempi* may be distinguished from the related form of *P. diversipes* by having a deeper rostrum, the hepatic spine situated at a lower level than the antennal spine, the first pereiopod having a chela with fingers longer than palm, markedly subspatulate and with entire cutting edges. The fingers of the major second pereiopod are shorter, broader and distinctly subspatulate, not as in *P. diversipes,* form *b,* which Kemp states to be normal in form.

The species is named in honour of the late Dr. Stanley Kemp, who described many of the Indo-West-Pacific species of the genus *Periclimenes.*

Periclimenes madreporae sp.nov.

Periclimenes (Harpilius) inornatus Patton, 1966: 274, 288, fig. 2.

Description. — The major features have been given by Patton (1966). The examination of Patton's specimens and fresh material from the Great Barrier Reef, and comparison with specimens of *P. inornatus* Kemp from the western Indian Ocean, has confirmed these differences.

Colour. — Translucent with reddish tinge (Patton, 1966).

Host. — Madrepore corals.

Type. — Male holotype and paratype, from Erskine Is., Capricorn Group, Great Barrier Reef, Queensland, Australia, depth 3-6 fathoms, February 1966, coll. I. R. Kirkegaard.

Distribution. — Queensland.

Remarks. — The differences between *Periclimenes madreporae* and *Periclimenes inornatus* Kemp have already been listed by Patton. Of these features, the most easily recognized is the position of the anterior pair of dorsal telson spines, which are situated on the lateral margins at the level of the anterior third of the telson length in *P. inornatus.* In *P. madreporae* they are situated in a dorsolateral position at the middle of the telson length. Other differences noted include a more slender rostrum in *P. madreporae* with the ventral tooth nearer to the tip than in *P. inornatus*; fingers of first pereiopod slender, tapering, subequal to palm; more slender ambulatory pereiopods with longer dactyls. It may also be noted that *P. madreporae,* a coral commensal, is a small species, reaching a maximum size of 12 mm

(Patton, 1966) whereas *P. inornatus,* a commensal of giant anemones, is distinctly larger, commonly reaching a total length of 16 mm. *Periclimenes madreporae* appears to be most closely related to *P. diversipes* or *P. kempi,* from which it can be distinguished by the form of the chelae of the second pereiopods. The fourth thoracic sternite is unarmed.

Periclimenes mahei sp.nov.

Description. — A small, slender shrimp, closely resembling *Periclimenes diversipes* Kemp. Carapace smooth. Rostrum well developed, slightly shorter than antennular peduncle, horizontal or slightly depressed, with six dorsal teeth and one ventral tooth. The five anterior dorsal teeth are large and evenly spaced; the most anterior is not subapical; the posterior tooth is smaller than the anterior five and situated at the level of the posterior orbital margin. No teeth are present on the carapace. Dorsal margin of the rostrum feebly convex. Ventral margin,posterior to the single tooth, which is situated at three quarters of the rostral length, straight; tip slightly upturned. Orbit feebly developed; inferior orbital angle slightly produced, acute. Supraorbital spine absent. Antennal spine, arising from anterior margin of carapace slightly below inferior orbital angle, acute and slender. Hepatic spine much smaller than antennal, situated at a much lower and posterior level. Fourth thoracic sternite with broad truncated triangular lamina. Third abdominal segment not posterodorsally produced. Sixth segment one and a half times longer than deep. Pleura of fourth and fifth segments bluntly rounded. Telson narrow, lateral margins slightly concave, with two pairs of small dorsal spines situated laterally on the posterior half of the telson at approximately the third and fourth fifths of the length. Terminal spines well developed.

Antennular peduncle with narrow basal segment, slightly produced anterolaterally and with a long slender distolateral tooth, reaching to middle of intermediate peduncular segment. Stylocerite acute, reaching to middle of basal segment. Intermediate and distal segments subequal, slender, equal to half length of basal segment. Lower antennal flagellum filiform. Upper flagellum biramous, with rami fused for three to five segments proximally. Short free ramus with two free segments; longer ramus filiform, subequal to lower flagellum. Basicerite with acute lateral spine. Antennular flagellum well developed. Scaphocerite broad, tapering slightly distally; lateral margin feebly concave with large distolateral tooth. Anterior end of lamella produced, bluntly angled and far exceeding distolateral spine. Eye well developed, cornea globular, of slightly smaller diameter than eyestalk.

First pereiopod exceeding tip of scaphocerite by length of fingers. Fingers

of chela short, slender, non-spatulate, slightly gaping, about half the length of palm. Carpus and merus subequal, slightly longer than chela. Coxa with prominent setose medial lobe. Second pereiopods well developed, robust, similar and subequal. Chela with subcylindrical palm; fingers equal to two sevenths of length of chela, curved, with a large acute tooth at one third of length of cutting edge on each finger and a smaller additional tooth proximally on the fixed finger. Distally cutting edges concave, entire and widely gaping. Tips of fingers feebly hooked. Carpus short and stout, two sevenths of length of palm, unarmed. Merus unarmed, three fifths of length of palm. Ambulatory pereiopods slender. Dactylus slender, curved distally, simple, about a quarter of length of propodus. Propodus non-spinulate, with long stout setae distally. Uropods narrow, both rami distinctly exceeding telson. Exopod with large mobile spinule on outer border.

Colour. — Transparent, with fine longitudinal red striae.

Host. — Madrepore corals.

Type. — Holotype (an ovigerous female) and nine paratypes, from North West Bay, Mahé, Seychelles Islands, 4°36′15″S 55°26′01″E, Stn. 27-82, depth 1-2 fathoms, 23 May 1966, coll. A. J. Bruce.

Remarks. — *Periclimenes mahei* is closely related to *P. diversipes* Kemp but can be readily separated from that species by the differences in the first pereiopods which have much shorter, non-pectinate, fingers. The second pereiopods are also markedly different, as in *P. mahei* the cutting edges bear a strong tooth proximally and are distally concave and widely gaping. *P. mahei* is also closely related to *P. madreporae* sp.nov. and may also be separated from that species by the distinctive form of the chela of the second pereiopod.

Periclimenes maldivensis sp.nov.

Periclimenes (Cristiger) brocki Borradaile, 1917: 363.

Description. — A small slender shrimp, closely resembling *Periclimenes brockii* De Man. Carapace smooth. Rostrum depressed, slender, slightly exceeding antennular peduncle. Nine or ten regularly spaced teeth dorsally and one or none ventrally. All dorsal teeth anterior to posterior orbital margin and the ventral tooth situated at beginning of distal fourth of rostrum. Orbit feebly developed. Inferior orbital angle acute, feebly produced. Supraorbital spine absent. Antennal spine robust, acute, arising from carapace slightly behind anterior margin and slightly below level of inferior orbital angle. Hepatic spine very small, posterior to antennal spine. Antennule with narrow basal segment; anterolateral margin produced with slender distolateral spine; stylocerite short, acute. Basicerite with small acute lateral process. Scapho-

cerite narrow, lateral border very slightly convex, armed with short distolateral spine which does not exceed broadly rounded anterior margin of lamella. Eye short with globular cornea.

First pereiopods robust, fingers simple, subequal to palm. Carpus slightly longer than chela, slightly shorter than merus. Coxa with small medial lobe. Second pereiopods stout, similar, markedly unequal. Major chela with subcylindrical palm; fingers less than three quarters of length of palm, circular in section with entire cutting edges and densely provided with curly setae. Carpus short, stout, about as long as fingers, unarmed. Merus robust, slightly shorter than palm with conspicuous distoventral tooth. Ischium shorter than merus, unarmed. Minor second pereiopod similar but chela subequal to palm of major chela. Fingers slightly shorter than palm, feebly setose. Merus subequal to palm with distoventral spine. Ambulatory pereiopods normal. Dactylus with well developed unguis, without accessory spine, short and stout with slender hair-like setae subterminally on third pereiopod, longer and more slender with short curly setae subterminally on fifth. Propodus with posterior and distoventral spines, sparsely setose. Merus unarmed.

Colour. — Not recorded.

Host. — Sea urchin.

Type. — Five syntypes in Zoological Museum Cambridge, from Suvadiva Atoll, Maldive Archipelago, ?1900.

Remarks. — The description is based upon the specimens examined by Borradaile. As noticed by Kemp (1922) and also noted by Holthuis (1952) the merus of the second pereiopods is provided with a well developed distoventral tooth, a feature that at once separates the Maldive specimens from *P. brockii* De Man, under which name it was originally recorded (Borradaile, 1917). Other differences from *P. brockii* include shallower rostrum, with ventral teeth more anteriorly placed; antennal spine closer to inferior orbital angle with hepatic spine at similar level; major second pereiopod with longer fingers with dense curly setae; ambulatory pereiopods with ventral margins of dactylus non-setose, posterior margin of propodus spinulate and sparsely setose.

Periclimenes maldivensis appears to be most closely related to *P. lanipes* Kemp, from which it may be distinguished by the absence of strong teeth on the fingers of the second pereiopod, the absence of distoventral teeth on the meri of the ambulatory pereiopods and the absence of a distinct accessory spine on the dactylus of these appendages.

The specimens are in the collections of the Zoological Museum, Cambridge.

Periclimenes ornatus sp.nov.

Description. — Moderately sized, robustly built and generally similar to *P. brevicarpalis* (Schenkel) and *P. inornatus* Kemp. Carapace smooth. Rostrum deep, extending horizontally to distal border of antennular peduncle, with seven dorsal and one ventral tooth. The first dorsal tooth is situated on the carapace and the ventral tooth at two thirds of the rostrum's length. Supraorbital spine absent. Inferior orbital angle feebly produced. Antennal spine slender, arising from anterior margin of carapace slightly below inferior orbital angle. Hepatic spine robust, situated at a distinctly lower and posterior level than the antennal spine. Broad triangular lamina with small median notch on fourth thoracic sternite. Third abdominal segment slightly produced dorsoposteriorly. Sixth segment one and a quarter times longer than deep. Abdominal pleura rounded. Telson narrow with two pairs of large, laterally placed dorsal spines, arising at one third and two thirds of the telson length. Three pairs of terminal telson spines present.

Antennular peduncle with broad basal segment with acute distolateral spine and stylocerite reaching to the middle of the segment. Intermediate and distal segments short, narrow and subequal, without a lateral lamina on the intermediate segment. Lower antennular flagellum long and slender. Upper flagellum with two rami fused for four segments. Shorter free ramus consists of four segments; longer ramus filiform, subequal to lower flagellum. Basicerite with a small lateral spine. Antennal flagellum long and slender. Scaphocerite broad, longer than antennular peduncle, with strong anterolateral spine which is exceeded by the broadly rounded anterior part of the lamella. Eye normal with transverse hemispherical cornea.

First pereiopod exceeding scaphocerite by length of chela. Fingers of chela subequal to palm, strongly subspatulate with entire cutting edges. Carpus longer than chela (15 : 11) and subequal to merus. Coxa with conspicuous setose medial process. Second pereiopod robust, fingers greater than half length of palm, with strongly hooked tips, with tree acute teeth on the posterior half of the dactylus and seven similar smaller teeth on the fixed finger; palm subcylindrical. Carpus short, about one quarter of length of palm, unarmed. Merus shorter than palm (8:11), unarmed. Ischium about two thirds of length of merus, unarmed. Ambulatory pereiopods robust. Dactylus short and simple, stout basally with slender tip. Propodus and other segments unarmed. Uropods broad, exceeding tip of telson, with large mobile spinule on outer border of exopod.

Colour. — Transparent with fine red spots over body and purple spots over appendages.

Host. — Actiniarian.

Type. — Holotype (an ovigerous female) from Lung Ha Wan, N.T., Hong Kong, 22°18.5'N 114°18.2'E, depth 2 fathoms, 28 May 1965, coll. J. D. Bromhall.

Remarks. — *Periclimenes ornatus* is most closely related to *P. inornatus* Kemp but may be readily distinguished by the following morphological features. (1) Fingers of first pereiopod strongly subspatulate and subequal to palm. (2) Fingers of second pereiopod greater than half the length of the palm, with well developed teeth. (3) Feebly produced inferior orbital angle with slender antennal spine and robust hepatic spine. A further characteristic is provided by the red and purple spotted colouration of the live shrimp.

Periclimenes paraparvus sp.nov.

Description. — A small slender shrimp, closely resembling *Periclimenes parvus* Borradaile. Carapace smooth. Rostrum short and deep, very slightly exceeding antennular peduncle, with feebly developed midrib. Dorsal margin elevated, convex, with five acute similar teeth. Ventral margin convex, with a single small acute tooth at about three quarters of the length of the rostrum. No dorsal teeth posterior to orbital margin. Orbit feebly developed; inferior orbital angle slightly produced, acute. Supraorbital spine absent. Antennal spine slender, marginal, situated well below inferior orbital angle. Hepatic spine similar to antennal spine but situated at a much lower and more posterior level. Anterolateral margin of carapace bluntly subrectangular. Fourth thoracic sternite unarmed. Third abdominal segment not produced posterodorsally. Sixth abdominal segment twice as long as deep. Fourth and fifth pleura bluntly angled. Telson narrow with two pairs of small dorsal spines; the anterior spines lie beyond the middle of the telson length and the posterior spines are distinctly closer to the telson tip than to the anterior pair. Terminal spines normally developed.

Antennular peduncle with narrow basal segment, anterior margin produced medially with a long slender spine laterally; stylocerite reaching to middle of lateral border. Intermediate and distal segments short, subequal, equal to half length of basal segment. Lower flagellum short and slender. Upper flagellum biramous, with two rami fused for five segments. Shorter free ramus with two segments; longer free ramus with five segments. Basicerite with acute distolateral spine. Carpocerite short. Antennal flagellum well developed. Scaphocerite broad, with straight lateral border terminating in a small acute tooth and distinctly exceeded by the anterior part of the lamella which is broadly rounded, far exceeding antennular peduncle and rostrum. Eye well developed with large globular cornea, situated obliquely on a short peduncle, with distinct dorsal accessory pigment spot.

First pereiopod exceeding scaphocerite by length of chela. Chela robust with stout fingers, subequal to palm, with entire, laterally situated cutting edges. Carpus slightly shorter than chela and markedly shorter than merus. Coxa with distinct medial setose process. Second pereiopods robust, subequal, similar, extending beyond antennular peduncle by whole of chela. Chela with smooth, subcylindrical palm; fingers straight, strongly compressed, slightly greater than half the length of the palm. The posterior third of the cutting edge of the fixed finger bears a small anterior and a large posterior triangular tooth separated by a deep notch. The posterior third of the cutting edge of the dactylus bears a single larger acute tooth. The fingers bear numerous long setae and the tips are strongly hooked. The palm is devoid of setae. The carpus is short, stout and unarmed, about one quarter of the length of the palm. The merus is three quarters of the length of the palm and bears an acute distoventral tooth. The ischium is only slightly shorter than the merus. The ambulatory pereiopods are slender and the fifth pereiopod exceeds the scaphocerite by half the length of the dactylus. Dactylus biunguiculate with robust accessory spine, one fifth of length of propodus, feebly curved. Propodus slender with spinulate posterior border. Uropods broad; exopod with convex lateral border terminating in an acute tooth and a small mobile spinule.

Colour. — Dorsally transparent body with reddish ventrolateral regions.

Host. — Unknown.

Type. — Holotype from South China Sea, 20°28.2'N 112°46.5'E to 20°23.3'N 112°52.2'E, depth 46-48 fathoms, 13 February 1965, coll. D. Eggleston.

Remarks. — *Periclimenes paraparvus* resembles *Periclimenes parvus* Borradaile very closely but may be conveniently separated from that species by the presence of an acute distoventral tooth on the merus and the absence of short transverse rows of tubercles from the palms of the chelae of the second pereiopod.

Periclimenes perlucidus sp.nov.

Description. — A small, slenderly built shrimp, closely related to *Periclimenes latipollex* Kemp. Carapace smooth. Rostrum incomplete, missing beyond the level of the proximal two thirds of the basal segment of the antennular penduncle; slender, horizontal, with straight setose, toothless ventral margin; dorsal margin with three acute, robust teeth with a more slender tooth situated above the posterior orbital margin and a still more slender and smaller epigastric tooth situated at one third of the carapace length.

Midrib inconspicuous. Orbit feebly developed, inferior orbital angle bluntly produced. Supraorbital spine absent. Antennal spine well developed, arising from anterior margin of carapace well below and not exceeding inferior orbital angle. Hepatic spine at lower level than antennal spine and less robust. Anterolateral angle of carapace bluntly obtuse. Fourth thoracic sternite unarmed. Third abdominal segment slightly produced posterodorsally. Sixth segment 2.2 times longer than deep. Fourth and fifth abdominal pleura bluntly angled. Telson narrow with straight sides; two pairs of small dorsal spines present, all situated posterior to the middle of the telson length, with the posterior pair slightly closer to the telson tip than to the anterior pair. Terminal telson spines well developed.

Antennular peduncle with narrow basal segment with the anterior margin produced medially and bearing a slender spine laterally; stylocerite slender, not reaching to middle of basal segment: intermediate and distal segments equal to two thirds of basal segment; intermediate segment with feeble lateral lobe, subequal to slender distal segment. Lower flagellum very long and filiform, equal to three times the carapace length. The upper flagellum is biramous, with the rami fused for the five proximal segments; shorter free ramus consists of three segments; longer free ramus filiform, equal to twice carapace length. Basicerite with small acute lateral tooth. Carpocerite robust. Antennal flagellum well developed, extending far beyond telson tip. Scaphocerite narrow, parallel sided, and exceeding antennular peduncle; lateral border feebly concave with strong distolateral tooth; lamella exceeding distolateral tooth, with anterior margin convex, bluntly angled medially. Eye well developed with globular, slightly oblique cornea, with distinct dorsal accessory pigment spot. Eyestalk cylindrical, of smaller diameter than cornea.

First pereiopod slender, exceeding scaphocerite by length of fingers. Chela with simple tapering fingers with entire cutting edges, subequal to two thirds of subcylindrical palm. Carpus slender, 1.6 times longer than chela, and very slightly shorter than merus. Coxa with distinct medial setose process. Second pereiopods markedly unequal, generally similar, the larger exceeding the scaphocerite by half the length of the carpus. Major chela well developed, slender, with subcylindrical palm and slightly deflexed fingers Fingers robust, equal to one quarter of the length of the palm, with hooked tips. Cutting edge of fixed finger with a blunt triangular tooth at midpoint and a smaller acute tooth proximally. Dactylus with a larger triangular tooth at one third of the length of the cutting edge, which fits into a depression of the fixed finger. The dorsal aspect of the dactylus bears a prominent raised flange. The carpus is relatively slender, unarmed, and slightly greater than one third of the length of the chela. The merus is robust, unarmed and

0.6 times the length of the chela. The ischium is more slender and slightly shorter than the merus. The minor second pereiopod has a more slender chela, slightly more than two thirds of the length of the major chela, with unarmed fingers and a poorly developed dorsal flange on the dactylus. Ambulatory pereiopods slender, the fifth exceeding the scaphocerite by the dactylus and one fifth of the propodus. Dactylus slender, feebly curved, biunguiculate with robust accessory spine. Propodus slender with spinulate posterior margin, about 16 times longer than wide, slightly longer than unarmed meri. Uropods normal, extending well beyond telson, with large mobile spinule at distal end of lateral margin of exopod.

Colour. — Transparent.

Host. — Gorgonian.

Type. — Holotype, an ovigerous female, from South China Sea, 16°06.5'N 114°41.5'E to 16°05.8'N 114°38.2'E, depth 43-44 fathoms, 13 June 1964, coll. A. J. Bruce.

Remarks. — *Periclimenes perlucidus* is closely related to *Periclimenes latipollex* Kemp but may be distinguished from that species by numerous small differences, including the following: rostrum not styliform, with only a single slender epigastric tooth situated on carapace; inferior orbital angle more produced and hepatic spine more ventral than antennal; the dorsal telson spines are situated on the posterior half of the telson; the stylocerite is shorter; the lamella of the scaphocerite exceeds the distolateral spine; the proportions of the segments of first and second pereiopods are markedly different and the ambulatory pereiopods are distinctly more slender.

P. perlucidus also closely resembles *P. laccadivensis* (Alcock & Anderson), especially in the form of the carapace. It may be readily separated by the presence of the flange on the dactyli of the second pereiopods, by the fewer teeth on the fingers and a relatively longer carpus.

Periclimenes sinensis sp.nov.

Description. — A small shrimp generally similar to *Periclimenes incertus* Borradaile. Carapace smooth. Rostrum deep, horizontal, slightly exceeding antennular peduncle. Dorsal margin almost straight with nine or ten dorsal teeth. The five posterior teeth are more slender than the anterior teeth and are articulated with the carapace. The most posterior tooth is situated on the carapace close behind the posterior orbital margin. When ten dorsal teeth are present the most anterior is small and subapical. The ventral margin is distally convex and bears two small teeth on the distal fourth. The orbit is feebly developed; the inferior orbital angle feebly pro-

duced, bluntly angled. Supraorbital spine absent. Antennal spine long and slender, arising from anterior margin of carapace immediately below inferior orbital angle. Hepatic spine similar to antennal spine in length but more robust, situated at lower and more posterior level. Fourth thoracic sternite with transverse lamina bearing a small lateral triangular process. Third abdominal segment not produced posterodorsally. Sixth abdominal segment 1.6 times longer than deep. The fourth and fifth pleura are bluntly angled. Telson narrow with two pairs of well developed dorsal spines, the anterior pair at the middle of the telson length and the posterior pair half way between the anterior pair and the tip. Terminal spines well developed.

Antennule with narrow basal segment, anterolateral margin produced to form a small medial lobe, with a slender spine laterally extending to level of proximal end of distal segment of peduncle. Stylocerite slender, acute, reaching beyond middle of basal segment. Intermediate and distal segments short, equal to about half the length of basal segment. Lower antennular flagellum short and slender. Upper flagellum biramous with rami fused for three segments. Shorter free ramus consisting of four segments; the longer ramus filiform. Basicerite with short acute lateral spine. Antennal flagellum well developed. Scaphocerite broad, tapering slightly distally, lateral border straight with robust distolateral spine which exceeds antennular peduncle; lamella far exceeding distolateral spine, bluntly angulated. Eye well developed with slightly oblique globular cornea.

First pereiopod slender; chela with fingers slender tapering, subequal to palm. Carpus subequal to chela, shorter than merus (19:22). Coxa with distinct medial process. Second pereiopods slender, unequal, similar. Major chela with fingers slender, setose, subequal to cylindrical palm, cutting edges entire, unarmed, tips slightly hooked. Carpus moderately stout, three quarters of length of palm, unarmed. Merus seven tenths of length of chela, unarmed. Ischium slightly greater than length of palm, unarmed. Minor chela three quarters of length of major chela, fingers subequal to palm. Carpus, merus and ischium as in major chela. Ambulatory pereiopods slender. Dactylus long and slender with slender accessory spine at two thirds of the length. Propodus slender, setose and with spinose posterior border. Uropods slightly longer than telson, rami subequal, with mobile spinule distolaterally on exopod, which has a straight, heavily setose lateral border.

Colour. — Unknown.

Host. — Alcyonarian.

Type. — Holotype, a female, and paratype, from Hong Kong, before 1962, collector unknown.

Remarks. — *Periclimenes sinensis* is most closely related to *Periclimenes*

incertus Borradaile. It may be distinguished from that species by the deeper rostrum with articulated posterior teeth, and convex lower border; lack of an epigastric spine; hepatic spine situated closer to antennal spine; longer fingers on chela of first pereiopod; longer setose fingers of chelae of second pereiopods; ambulatory pereiopods with slender dactylus with slender accessory spine. *P. sinensis* is also closely related to *P. obscurus* Kemp, from which it may be distinguished by the presence of a slightly depressed rostrum, an epigastric spine, the antennal spine arising posteriorly to the anterior margin of the carapace and by a longer carpus and shorter fingers in the chelae of the second pereiopods in the latter species. *P. sinensis* is also closely related to *P. hongkongensis* sp.nov. (vide supra, p. 259).

Periclimenes tenuis sp.nov.

Description. — A small, slenderly built species. Carapace smooth. Rostrum slender, without lamina below midrib, horizontal, extending slightly beyond basal segment of antennular peduncle. Five large dorsal teeth present, all anterior to posterior orbital margin, evenly spaced, decreasing in size anteriorly; ventral teeth absent. Orbit feebly developed, inferior orbital angle acutely produced. Supraorbital spine absent. Antennal spine long and slender, situated on anterior margin of carapace immediately below the inferior orbital angle. Hepatic spine robust, situated at a level well below and behind antennal spine. Third abdominal segment not produced posterodorsally. Sixth segment more than twice as long as deep. Pleura of fourth and fifth segments feebly developed, rounded. Telson narrow with two pairs of small dorsolateral spines on the posterior half of the telson. The terminal spines are well developed.

Antennular peduncle with very narrow basal segment, with anterior margin produced laterally and bearing a long slender distolateral spine; stylocerite acute, slender, extending to level of proximal third of the basal segment. Intermediate and distal segments slender, subequal, together equal to two thirds of the length of the basal segment, and exceeding the lamella of the scaphocerite. Lower antennular flagellum filiform, approximately equal to carapace length. Upper flagellum biramous with rami fused proximally for three segments. Shorter free ramus consisting of two segments; longer ramus filiform, subequal to lower flagellum. Basicerite with very small acute lateral tooth. Antennal flagellum well developed, about five times body length. Scaphocerite narrow, scarcely tapering, reaching to middle of distal segment of antennular peduncle. Lateral border straight or feebly concave with strong distolateral spine. Anterior margin of lamella bluntly rounded and exceeding tip of distolateral spine. Eyes well developed, stalk subcylindrical,

about three times longer than wide; cornea hemisperical, slightly oblique, diameter slightly greater than stalk.

First pereiopod slender, extending approximately to the tip of the carpocerite. The fingers of the chela are very slender with spatulate tips and curved medially, equal to about half the length of the palm. Carpus slightly longer than chela but distinctly shorter than merus. Second pereiopods feeble, short, slender and similar, exceeding scaphocerite by half length of fingers. Fingers scissor-like, about three times longer than palm, with entire cutting edges except at tips where numerous minute recurved teeth are present. Carpus about one a half times length of palm, slender, expanded distally and unarmed. Merus also slender and unarmed, about twice the length of carpus. Ambulatory pereiopods slender. Dactylus slender, simple, distinctly curved, with distinct unguis. Propodus with distal part of posterior border provided with numerous groups of long spinulate setae. Uropods slender, slightly exceeding tip of telson, with a slender mobile spinule on lateral border of exopod.

Colour. — Black.

Host. — Crinoid.

Type. — Female holotype, and paratype, from Chukwani, Zanzibar Island, E. Africa, 6°15.1'S 39°12.7'E, depth 1 foot, 8 March 1962, coll. A. J. Bruce.

Remarks. — *Periclimenes tenuis* does not appear to be particularly closely related to any species of *Periclimenes* as yet described, but may be readily distinguished from all other species by the form of the second pereiopod in which the fingers are about three times the length of the palm and are scissor-like with minutely toothed cutting edges distally. The two species showing the closest resemblance to *P. tenuis* are *P. platalea* Holthuis and *P. galene* Holthuis, both which have a first pereiopod similar to that of *P. tenuis*.

Periclimenes toloensis sp.nov.

Description. — A medium sized, slender shrimp generally resembling *Periclimenes obscurus* Kemp. Carapace smooth. Rostrum slender, horizontal, extending to end of antennular peduncle. Midrib feebly developed. Dorsal margin gently convex with eight evenly spaced teeth, the first situated behind the orbital margin. Epigastric tooth present at one quarter of the carapace length. The epigastric and two posterior rostral teeth are slender and appear mobile. Ventral margin with a single small acute tooth on anterior quarter, posteriorly straight and setose. Orbit feebly developed; inferior orbital angle acutely produced. Supraorbital spine absent. Antennal spine

robust, slender, situated on anterior margin of carapace, exceeding inferior orbital angle. Hepatic spine robust, slender, similar to antennal spine but situated at lower and more posterior level. Anterolateral angle of carapace bluntly subrectangular. Fourth thoracic sternite with a low transverse ridge with a small median notch. Third abdominal segment feebly produced posterodorsally. Sixth segment 1.7 times longer than deep. Pleura of fourth and fifth segments bluntly angled. Telson longer than sixth segment, slender, straight-sided; with two pairs of small dorsal spines, situated at three and four fifths of the telson length. Terminal spines well developed.

Antennular peduncle with narrow basal segment, with anterior margin feebly produced medially and a small slender spine laterally; lateral border convex; stylocerite robust, acute, reaching to middle of segment. Intermediate segment short, with small lateral lobe, subequal to distal segment. Lower antennular flagellum filiform, exceeding carapace length. Upper flagellum biramous with rami fused proximally for five segments. Shorter free ramus with five segments; longer free ramus filiform, twice as long as carapace. Basicerite with acute anterolateral tooth. Antennal flagellum well developed. Carpocerite robust, extending to end of basal antennular segment. Scaphocerite broad, lateral border straight with robust distolateral spine. Lamella tapering slightly, distinctly exceeding distolateral spine, bluntly angled distally, with anterior border convex. Eyes well developed with globular, slightly oblique cornea with large dorsal accessory pigment spot. Eyestalk stout, broadened proximally.

First pereiopods slender, short, not reaching to end of antennular peduncle. Chela slender with fingers subequal to palm, compressed, with entire cutting edges. Carpus slightly shorter than chela. Merus subequal to chela. Coxa with slender medial setose process. Second pereiopods similar, markedly unequal. Major chela well developed, slender, exceeding distolateral spine of scaphocerite by the length of the chela. Chela with subcylindrical palm; fingers slender, compressed, slightly less than half length of palm, with hooked tips and a single small tooth at one third of the length of the cutting edge, larger on the fixed finger than on the dactylus. Carpus unarmed, one quarter of length of chela, less than half length of palm. Merus unarmed, 1.6 times length of carpus. Ischium subequal to merus. Minor second pereiopod smaller and more slender. Chela about two thirds of length of major chela, with unarmed fingers almost equal to length of palm (13: 16). Carpus longer than palm, two thirds of length of chela; merus subequal to carpus; ischium one fifth longer than merus. Ambulatory pereiopods slender, fifth pereiopod exceeding antennular peduncle by length of dactylus. Dactylus slender, about one third of the length of the propodus, biunguiculate, with

slender accessory spine. Propodus about ten times longer than wide, posterior margin bearing long slender spines. Uropods slender, slightly exceeding telson; lateral margin of exopod straight, setose, with small tooth and mobile spinule distally.

Colour. — Transparent.

Host. — Unknown.

Type. — Male holotype from Ap Chau, Tolo Channel, Hong Kong, depth 5-15 fathoms, 16 February 1965, coll. D. Eggleston.

Remarks. — *Periclimenes toloensis* is very similar to *Periclimenes obscurus* Kemp and *P. incertus* Borradaile. *P. toloensis* may be distinguished from the former by the presence of the very acute and produced inferior orbital angle with a marginal antennal spine. Kemp states that although the proportions of the segments in the second pereiopods are subject to much variation, in the males of *P. obscurus* the carpus is rarely shorter than the palm and generally longer. Other differences include the much longer rostrum and the longer spines on the propodus of the ambulatory pereiopods. *P. toloensis* may be distinguished from *P. incertus* by the feebler development of the distolateral spine of the scaphocerite, which is far exceeded by the lamella. The second pereiopods are generally similar but the first pereiopods lack the characteristic basal and coxal processes found in that species. The basal process is absent and the coxal process short and slender. The dactylus of the ambulatory pereiopods is slender with a slender accessory spine quite unlike the stout dactylus with a robust accessory spine found in *P. incertus*.

Periclimenes ungujaensis sp.nov.

Description. — A small slenderly built shrimp, resembling *Periclimenes seychellensis* Borradaile. Rostrum slender, slightly elevated and slightly exceeding antennular peduncle. Ventral lamina well developed distally, bearing three large teeth, and reduced proximally. Dorsal margin with five well developed teeth anterior to orbital margin and two teeth situated on anterior third of carapace. Orbit feebly developed, inferior orbital angle slightly produced, blunt. Supraorbital spine absent. Antennal spine robust, arising from anterior margin of carapace distinctly below inferior orbital angle. Hepatic spine robust, similar to antennal spine but at posterior and much lower level. Third abdominal segment produced posterodorsally. Sixth abdominal segment 1.4 times longer than deep. Pleura of fourth and fifth segments rounded. Telson narrow, with two pairs of dorsal spines situated at thirds of the telson length; terminal spines well developed, submedian spines equal to one third of telson length.

An ennal peduncle subequal to scaphocerite. Basal segment narrow, an-

terior margin feebly produced with slender distolateral spine. Stylocerite acute, reaching middle of basal segment. Terminal peduncular segment distinctly longer than intermediate segment. Lower antennular flagellum, long, filiform. Upper flagellum biramous, with rami fused proximally for seven segments. Shorter free ramus with five free segments; longer ramus filiform, subequal to lower flagellum. Basicerite with acute ventrolateral spine. Antennal flagellum well developed. Scaphocerite broad with small distolateral tooth and feebly concave lateral margin. Anterior margin of lamella bluntly angled, slightly exceeding distolateral spine. Eye well developed with large globular cornea, slightly oblique. Eyestalk stout, greater in diameter than cornea, without papilla.

First pereiopods slender, just exceeding tip of scaphocerite. Chela with slender fingers, slightly longer than palm. Carpus slightly shorter than palm; merus subequal to palm; coxa with small medial process. Second pereiopods, feeble, equal and similar. Chela with subcylindrical palm and slender unarmed fingers, subequal to palm. Carpus slender, about four fifths of length of chela; subequal to merus and ischium, all unarmed. Ambulatory pereiopods slender. Dactylus robust, curved, simple, equal to one quarter of length of propodus. Posterior border of propodus spinulate. Uropods narrow extending well beyond tip of telson, with small mobile distolateral spine.

Colour. — Unknown.

Host. — Free-living?

Type. — Holotype, a male from Unguja Ukuu, Zanzibar Island, E. Africa, 6°18.8'S 39°21.1'E, depth 0.5 feet, 24 October 1961, coll. A. J. Bruce.

Remarks. — *Periclimenes ungujaensis* is very closely related to *P. seychellensis* Borradaile, from which it may be distinguished by the stouter, non-papillate eyestalk; the carpus of the first pereiopod slightly shorter than the chela; the carpus of the second pereiopod longer than the palm, the fingers of the chela slender and unarmed, and the longer dactylus of the ambulatory pereiopods.

NOTE ON THE "INCERTUS" SPECIES GROUP

The new species described above, *P. hongkongensis, P. sinensis* and *P. toloensis* together with the previously described species *P. batei* (Borradaile), *P. incertus* Borradaile, and *P. obscurus* Kemp constitute a natural group of closely related species. The full extent of the range of intra-specific morphological variation is at present unknown but some variation in the dentition of the rostrum and in the proportions of the segments of the second pereiopods may be expected. In order to facilitate the separation of these species a key is provided.

The *"Periclimenes incertus* species group" may be defined as follows: Species of *Periclimenes* with a well developed, horizontal rostrum with a moderately deep lamina bearing numerous dorsal teeth and 0 to 2 ventral teeth; antennal spine well developed, supraorbital spine absent, epigastric spine present or absent; inferior orbital angle feebly produced; fourth thoracic sternite without slender median process; third abdominal segment not conspicuously produced posterodorsally; fingers of first pereiopod simple; second pereiopods slender, unspecialized, carpus more than one third of length of palm, merus unarmed, and the dactylus of ambulatory pereiopods biunguiculate.

A key to the Indo-West-Pacific Species of the *"Periclimenes incertus"* group

1. An isolated epigastric spine present on carapace 2
— No isolated epigastric spine present on carapace 5
2. Dactyls of ambulatory pereiopods stout, with accessory spine more robust than terminal spine . . . . . *P. incertus* Borradaile
— Dactyls of ambulatory pereiopods slender, with accessory spine more slender than terminal spine 3
3 Second pereiopods subequal, similar, carpus approximately equal to palm; antennal spine post-marginal, inferior orbital angle feebly produced, blunt *P. obscurus* Kemp
— Second pereiopods markedly unequal, carpus much shorter than palm . . . 4
4. Carpus of second pereiopod about two fifths of length of palm; rostral lamina relatively deep, R 13—17/2—4 + 1 . . . . . *P. hongkongensis* sp.nov.
— Carpus of second pereiopod about half length of palm; rostral lamina relatively shallow, R 8/1 + 1 . . . . . *P. toloensis* sp.nov.
5. Carpus of first pereiopod subequal to length of palm, much shorter than chela *P. batei* Borradaile[1])
— Carpus of first pereiopod much longer than palm, subequal to chela . . . . *P. sinensis* sp.nov.

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1) The absence of a median sternal spine on the fourth thoracic somite of this species is probable but has not yet been verified.

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