Periclimenes mclaughlinae n. sp., a shrimp (Crustacea, Decapoda, Palaemonidae) associated with an echinoid from the Philippines

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ABSTRACT
A new species of pontoniine shrimp, *Periclimenes mclaughlinae* n. sp., is described and illustrated on the basis of seven specimens collected from shallow water in the Cebu Strait, Philippines. *Periclimenes mclaughlinae* n. sp. is associated with the cidarid sea urchin *Phyllacanthus imperialis*. It differs from all other *Periclimenes* Costa, 1844 species in having a distolateral, broad, rounded, downward curved lobe on the exopod of the uropod.

KEY WORDS
Crustacea,
Decapoda,
Palaemonidae,
Pontoniinae,
Echinoidea,
Philippines,
new species.

RÉSUMÉ
Periclimenes mclaughlinae *n. sp., une crevette (Crustacea, Decapoda, Palaemonidae) associée à un échinoïde des Philippines.*
Une nouvelle espèce de crevette pontoniine, *Periclimenes mclaughlinae* n. sp., est décrite et figurée d'après sept spécimens récoltés en eau peu profonde, dans le détroit de Cebu, aux Philippines. *Periclimenes mclaughlinae* n. sp. est associé à l'oursin cidaride *Phyllacanthus imperialis*. Il diffère de toutes les autres espèces de *Periclimenes* Costa, 1844 par la présence, sur l'exopode de l'uropode, d'un lobe distolatéral, large, arrondi et recourbé vers le bas.

MOTS CLÉS
Crustacea,
Decapoda,
Palaemonidae,
Pontoniinae,
Echinoidea,
Philippines,
espèce nouvelle.

INTRODUCTION

During fieldwork in 1999 in the Cebu Strait, Philippines, a shrimp of the subfamily Pontoniinae Kingsley, 1878 was collected on the cidarid echinoid *Phyllacanthus imperialis* Lamarck, 1816. Species of six pontoniine genera have so far been reported as living in association with echinoid echinoderms (Bruce 1982, 1994; Holthuis 1993; Fransen 1997): *Allopontonia iaini* Bruce, 1972, from temnopleurids, *Diapontonia maranulus* Bruce, 1986, from asterostomatids, and *Pontoniopsides paulae* (Gore, 1981), from a brissid echinoid. The species of *Stegopontonia* Nobili, 1906 and *Tulеariocaris* Hipeau-Jacquotte, 1965 are adapted to holding onto the long spines of diadematid urchins. Several species of *Periclimenes* have been reported from various echinoid families. *Periclimenes cristimanus* Bruce, 1965, *P. hirsutus* Bruce, 1971, and *P. zanzibaricus* Bruce, 1967 have been reported in associations with diadematids, living on or close to the body of the host. *Periclimenes rectirostris* Bruce, 1981 is probably also associated to a diadematid host, although its probable association with *Eremopyga denudata* (de Meijere, 1902) has not yet been confirmed. *Periclimenes hertwigi* Balss, 1913 and *P. colemani* Bruce, 1975 have been reported associated with echinothurid urchins, and *P. insolitus* Bruce, 1974 with Toxopneustidae Troschel, 1872. The host urchins for *P. brockii* (De Man, 1888) and *P. maldivensis* Bruce, 1969 remain unknown. The new *Periclimenes* species is the first recorded from a cidarid sea urchin.

The rostral formula is defined as the number of dorsal postorbital + rostral teeth/number of ventral rostral teeth, e.g., R = 2 + 4/1.

Specimens are stored in the collection of the Nationaal Natuurhistorisch Museum – Naturalis, Leiden, The Netherlands (previously Rijksmuseum van Natuurlijke Historie, RMNH). Postorbital carapace length is abbreviated as cl.

SYSTEMATICS

Family PALAEMONIDAE Rafinesque, 1815
Subfamily PONTONIINAE Kingsley, 1878

Genus *Periclimenes* Costa, 1844

Periclimenes mclaughlinae n. sp.
(Figs 1-6)

TYPE MATERIAL. — **Philippines**. Stn CEB.04, Cebu Strait, W of Bohol, NW side of Cabilao Island, La Estrella Dive Resort, 9°53.20'N, 123°45.53'E, 5 m, reef edge, scuba at night, 10.XI.1999, on *Phyllacanthus imperialis*, leg. C. H. J. M. Fransen, photo 7/27-37, ovig. ♀ holotype cl 2.50 mm (R = 2 + 5/0), ovig. ♀ paratype cl 2.94 mm (R = 2 + 5/1), ♂ allotype cl 2.22 mm (R = 1 + 6/0), ♂ paratype cl 1.88 mm (R = 1 + 6/0) (RMNH D 48485). — Same locality, 8 m, reef edge, scuba at night, 7.XI.1999, on *P. imperialis*, leg. C. H. J. M. Fransen, ovig. ♀ paratype cl 2.41 mm (R = 2 + 6/0), ♂ paratype with abdominal bopyrid cl 2.31 mm (R = 2 + 5/0) (RMNH D 48486). — Same locality, 15 m, reef edge, scuba at night, 8.XI.1999, on *P. imperialis*, leg. B. W. Hoeksema, ovig. ♀ paratype cl 2.81 mm (R = 1 + 6/1) (RMNH D 48487).
Indonesia. Manado Bay, North Sulawesi, night dive, on *P. imperialis*, photo Massimo Boyer, iconographic paratype.

ETYMOLOGY. — The species is named for Patsy A. McLaughlin, renowned carcinologist and valued colleague.

DISTRIBUTION. — The species is hitherto only known from the Philippines and North Sulawesi, Indonesia. The host has a wide distribution in the Indo-Pacific, from the Red Sea to Indonesia, Japan, and the Great Barrier Reef eastwards to the Central Pacific Islands.

DESCRIPTION

A medium sized pontoniine shrimp, with subcylindrical body form (Fig. 1A). Carapace smooth. Rostrum (Figs 1C; 2A, B) well developed, about as long as antennular peduncle; with lateral carina slightly developed in proximal part; dorsal margin straight somewhat directed downward, with six to eight acute evenly spaced teeth of which one or two postorbital; scar of an epigastral tooth present. Ventral margin straight, without setae, unarmed or with one small subdistal tooth. Inferior orbital angle protruding, bluntly acute. Antennal spine, acute, marginal, slightly overreaching inferior orbital angle. No supra-, para- or infra-orbital spines present. Hepatic spine well developed, acute, just below level of antennal spine. Anterolateral margin straight, anteroventral angle rounded.

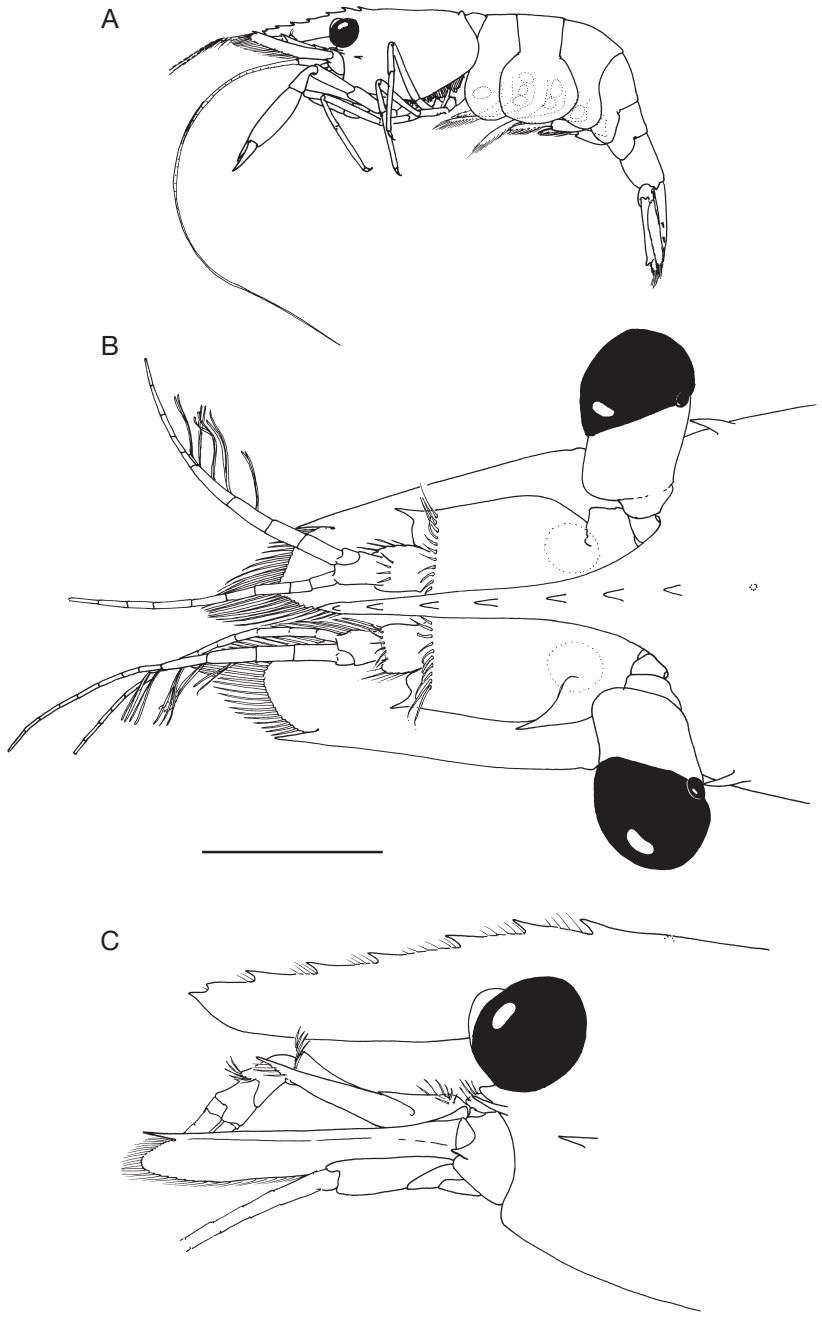

FIG. 1. — *Periclimenes mclaughlinae* n. sp., ovigerous ♀ holotype cl 2.50 mm, Philippines (RMNH D 48485): **A**, habitus, lateral view; **B**, anterior appendages, dorsal view; **C**, same, lateral view. Scale bar: A, 4 mm; B, C, 1 mm.

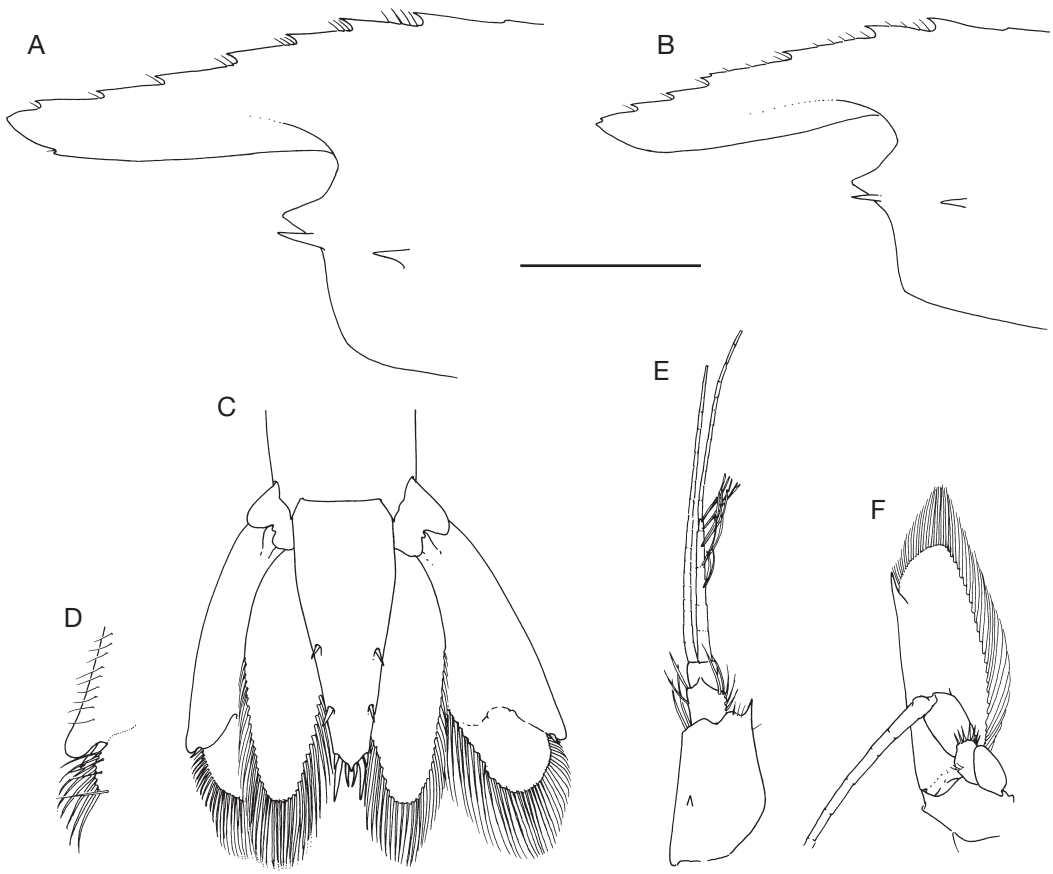

FIG. 2. — *Periclimenes mclaughlinae* n. sp.: **A**, ovigerous ♀ paratype cl 2.94 mm, Philippines (RMNH D 48485); **B**, ♂ allotype cl 2.22 mm, Philippines (RMNH D 48485); **C**-**F**, ovigerous ♀ holotype, cl. 2.50 mm; **A**, **B**, rostrum and anterior part of carapace, lateral view; **C**, telson and uropods, dorsal view; **D**, detail of distolateral part of uropod; **E**, left antennula (stylocerite missing), ventral view; **F**, right antenna, ventral aspect. Scale bar: A, B, D-F, 0.6 mm; C, 1 mm.

Abdomen smooth (Fig. 1A); sixth segment about 1.7 times longer than fifth, posteroventral angle blunt, posterolateral angle acute, produced; pleura of first five segments broadly rounded.

Telson (Fig. 2C) 1.3 times longer than sixth abdominal segment, 2.7 times longer than proximal width; lateral margins almost straight; posterior border with median process; two pairs of dorsal spines situated at 0.56 and 0.76 of telson length, both submarginal, length about 0.07 of that of telson; posterior margin with three pairs of spines, lateral spines short, distal and marginal; intermediate pair longest, about three times length of lateral spines; submedian spines slender, plumose, twice as long as lateral pair.

Eyestalk (Fig. 1B, C) slightly longer than wide, cylindrical, swollen proximally; cornea globular, hemispherical; with accessory pigment spot.

Antennula well developed (Fig. 2E). Basal segment of antennular peduncle slightly more than twice as long as proximal width, with acute, strongly produced distolateral tooth almost reaching distal margin of intermediate segment, anterior margin produced, convex; medioventral tooth of moderate size, acute, submarginal, situated at 0.45 of basal segment; stylocerite short, almost half length of

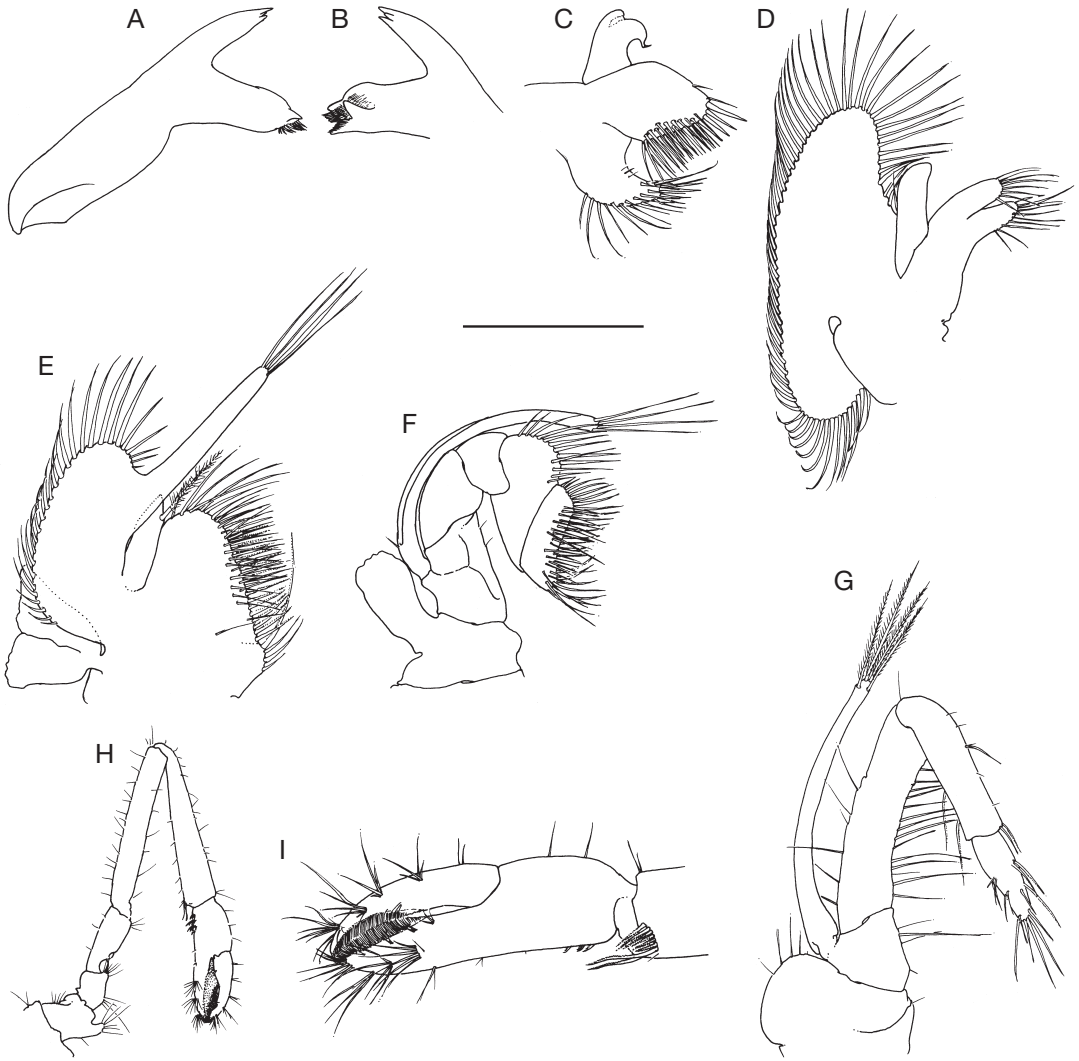

FIG. 3. — *Periclimenes mclaughlinae* n. sp., ovigerous ♀ holotype cl 2.50 mm, Philippines (RMNH D 48485): **A**, right mandible, ventral view; **B**, same, dorsal view; **C**, right maxillula, ventral view; **D**, maxilla, ventral view; **E**, right first maxilliped, ventral view; **F**, right second maxilliped, ventral view; **G**, right third maxilliped, ventral view; **H**, right first pereiopod, ventral view; **I**, same, chela, dorsal view. Scale bar: A-G, I, 0.6 mm; H, 1.5 mm.

basal segment, with acute tip, lateral margin slightly convex with few short plumose setae. Intermediate segment about as long as broad. Distal segment as long as intermediate segment, slightly longer than broad. Upper flagellum biramous, with four or five proximal segments fused; short free ramus one-segmented; longer, slender free ramus of about eight segments; lower flagellum about as long as upper flagellum.

Antenna (Fig. 2F) with basicerite short, laterally armed with acute tooth, with antennal gland tubercle medially; ischiocerite and merocerite normal; carpocerite extending to half of scaphocerite, twice as long as distal width; flagellum about four times longer than postorbital carapace length; scaphocerite with lamina about three times longer than median width, anterior margin truncate, lateral margin straight; distolateral tooth robust,

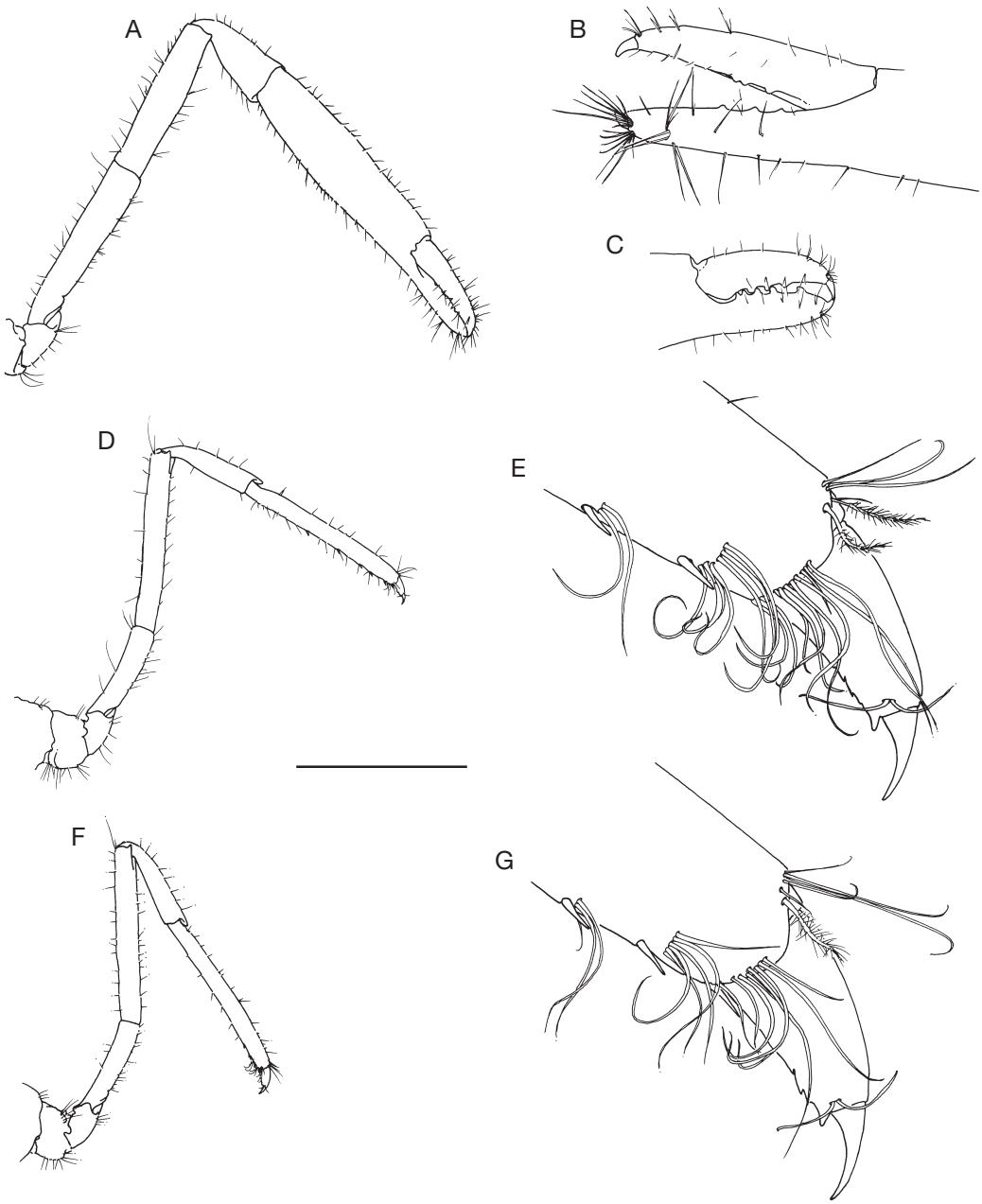

FIG. 4. — *Periclimenes mclaughlinae* n. sp.: **A**, **B**, **D**-**G**, ovigerous ♀ holotype cl 2.50 mm, Philippines (RMNH D 48485); **C**, male allotype, cl. 2.22 mm, Philippines (RMNH D 48485); **A**, right second pereiopod; **B**, **C**, same, chela; **D**, right third pereiopod; **E**, same, dactylus; **F**, right fourth pereiopod; **G**, same, dactylus. Scale bar: A, D, F, 1.5 mm; B, 0.6 mm; C, 1 mm; E, G, 0.15 mm.

0.13 of length of lamina, not overreaching distal lamina.

Epistome with blunt anterior median carina; labrum broad.

Paragnath with alae small, rectangular, distal lobes slightly larger than submedian ventral lobes; corpus small, short, without submedian carinae.

Second and third thoracic sternites moderately broad, unarmed; fourth with low lateral carinae posteromedian of first pereiopods with several long setae.

Mandible (Fig. 3A, B) without palp; with three small distal teeth on slender incisor process, without denticles along ventromedial margin; molar process slender, with three blunt distal teeth and areas of short setae.

Maxillula (Fig. 3C) with upper lacinia moderately broad, with several rows of robust setulose setae and setae along medial margin; lower lacinia short and slender, with setulose setae distoventrally; palp bilobed, larger lobe with medial tubercle with, short, recurved, simple seta.

Maxilla (Fig. 3D) with basal endite robust, well developed, bilobed; distal and proximal lobes rounded, with long setae along medial margin. Coxal endite with medial margin not produced, without setae. Scaphognathite rather broad. Palp simple, short, tapering to blunt point distally, not extending beyond distal lobe of basal endite, with plumose setae along proximal lateral margin.

First maxilliped (Fig. 3E) with coxal and basal endite almost completely fused, broad; basal endite fringed with many finely serrulate setae along entire median margin; coxal endite with one strong, long recurved setulose seta and few moderately long setae along median margin; exopod well developed, flagellum with four long plumose setae distally; caridean lobe well developed; epipod, bilobed; palp simple, short, as long as distal margin of basal endite, with one plumose seta ventrally.

Second maxilliped (Fig. 3F) with well developed endopod. Dactylar segment narrow, about three times longer than broad, densely fringed with coarsely serrulate spiniform, and long curled finely serrulate setae medially. Propodal segment with row of long spines and simple and finely serrulate setae along rounded distomedial margin; distomedial margin slightly produced; ventrolateral margin without setae. Carpal segment short, triangular, unarmed, with well developed rounded medial lobe. Merus normal.

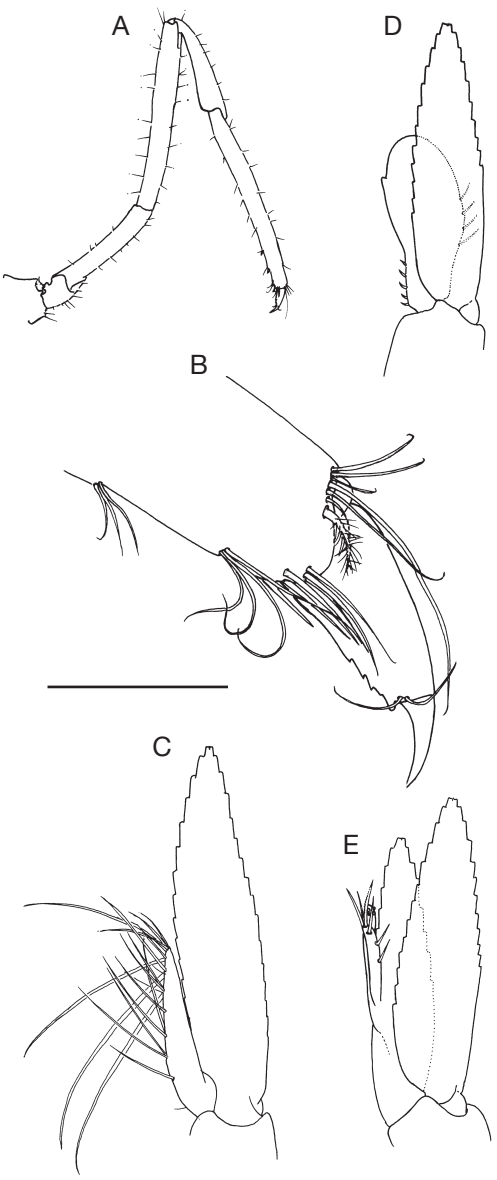

FIG. 5. — *Periclimenes mclaughlinae* n. sp.: **A**-**C**, ovigerous ♀ holotype cl 2.50 mm, Philippines (RMNH D 48485); **D**, **E**, ♂ allotype cl 2.22 mm, Philippines (RMNH D 48485); **A**, right fifth pereiopod; **B**, same, dactylus; **C**, female right first pleopod; **D**, male right first pleopod; **E**, male right second pleopod. Scale bar: A, 1.5 mm; B, 0.15 mm; C-E, 0.6 mm.

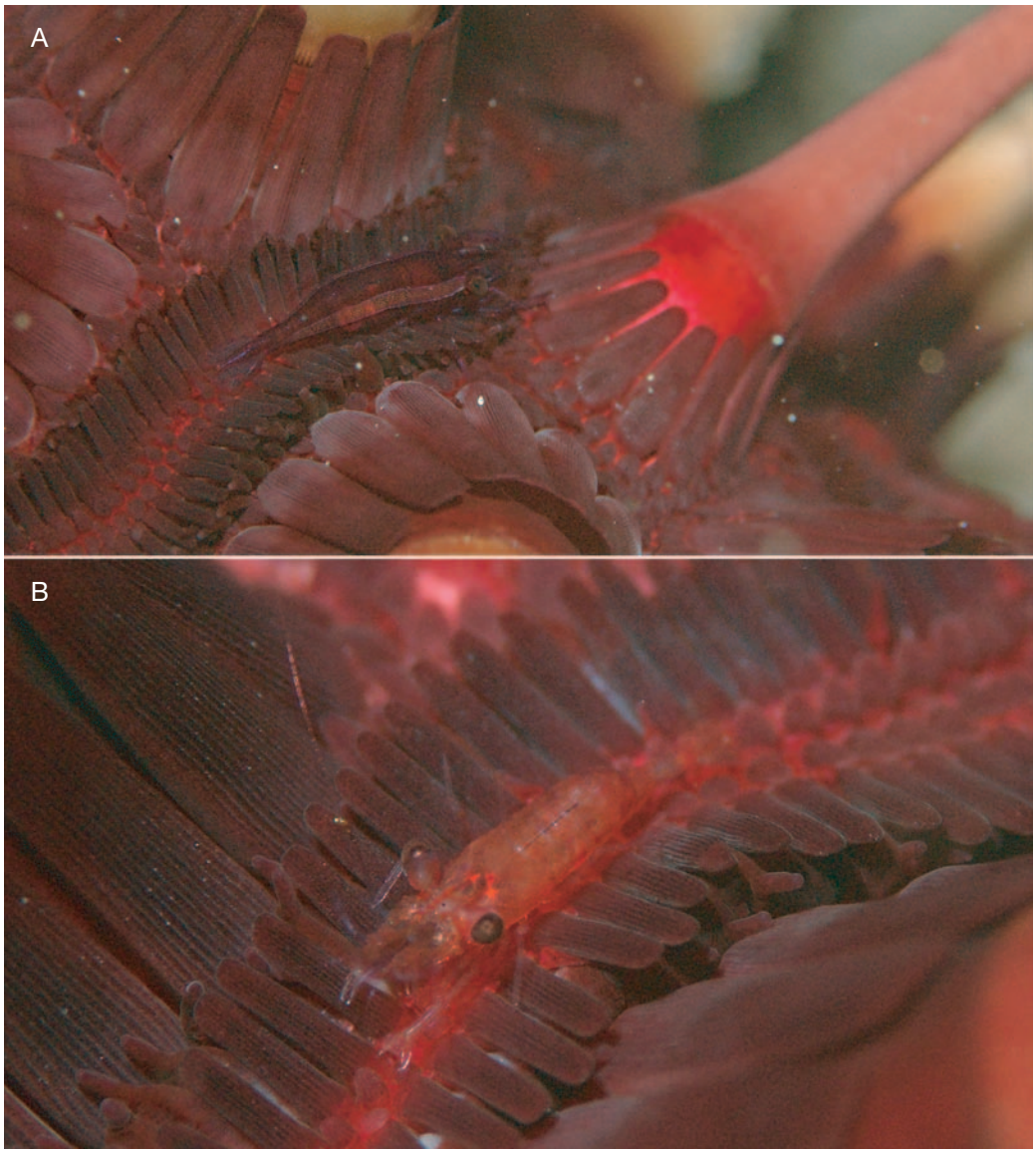

FIG. 6. — *Periclimenes mclaughlinae* n. sp., iconographic paratypes, Manado Bay, North Sulawesi, Indonesia: **A**, adult; **B** juvenile. Photo Massimo Boyer/edge-of-reef.com.

Basal and ischial segments fused, medially excavate; exopod normal, with long plumose setae on distal part. Coxa medially produced, rounded, without setae; epipod well developed, rectangular.

Third maxilliped (Fig. 3G) small, short. Ischiomerus not fused with basis, about 4.4 times longer than broad, with row of few simple setae along median margin, lateral margin with few simple setae. Basal segment medially straight, not convex, with few setae; exopod well developed, as long as ischiomeral segment, with four long plumose setae distally. Coxa without medial process, with

rounded lateral plate with few marginal setae, without arthrobranch. Penultimate segment about 3.8 times longer than broad, about 0.7 of ischiomeral length, with long, finely serrulate setae ventromedially. Ultimate segment 0.6 times as long as penultimate segment, tapering distally, with rows of coarsely serrulate setae.

First pereiopods (Fig. 3H) slender, exceeding antennular peduncle by length of chela. Chela (Fig. 3I) about 3.1 times longer than deep, subspatulate; fingers slightly longer than palm, cutting edges finely pectinate in distal half, with groups of serrulate setae, and acute tip, hooked. Carpus about 1.3 times longer than chela, four times longer than distal width, somewhat tapering proximally, unarmed, with few simple setae; cleaning organ well developed on carpal-propodal joint. Merus as long as carpus, seven times longer than central width, unarmed, with few simple setae. Ischium 0.4 times merus length, with few simple setae. Basis slightly shorter than ischium; coxa with distinct medial process having marginal setae.

Second pereiopods (Fig. 4A) equal, similar, extending beyond antennular peduncle by length of fingers and part of palm. Chela (Fig. 4B, C) slightly compressed; fingers slightly less than half palm length, tips hooked, acute, simple; cutting edge with three to five blunt teeth. Carpus short and stout, about 0.4 of palm length, expanding distally, twice as long as distal width, unarmed. Merus 1.7 times longer than carpus, 4.6 times longer than central width, with blunt distoventral tooth. Ischium 1.1 times merus length. Basis and coxa short, without special features.

Ambulatory pereiopods similar. Dactylus (Fig. 4E) of third pereiopod (Fig. 4D) compressed, twice as long as proximal width, with small accessory tooth and row of three or four acute small denticles on distal third of flexor margin, corpus with two distolateral setae only, unguis about 0.5 of corpus length, curved and acute, without ornamentation. Propodus 10 times longer than proximal width, with five short spines along flexor margin, with one pair of small ventrodistal spines, with rows of long setae distally. Carpus about 0.5 propodus length, 4.1 times longer than distal width, unarmed. Merus 1.9 times longer than carpus, 7.8 times longer than central width, with small, acute, distolateral tooth. Ischium 0.53 times as long as merus, as wide as merus, with few simple setae. Basis and coxa short, without special features. Fourth (Fig. 4F, G) and fifth (Fig. 5A, B) pereiopods similar, with only two or three spines on distal part of flexor margin of propodus.

Endopod of first pleopod slender, with several long curved simple setae distally, with row of long plumose setae laterally.

Number of eggs *c.* 50. Embryo at point of hatching about 0.4 mm long.

Uropods with short unarmed protopodite. Exopod broad, lateral margin straight, with distinct broad, rounded, downward curved distolateral produced lobe (Fig. 2D), and small distolateral mobile spine; distal lamina rounded. Endopod more slender than exopod, as long as telson.

Endopod of first pleopod of male allotype (Fig. 5D) slightly more than half as long as exopod, distally expanded, broadly rounded, with small rounded appendix interna. Endopod of male second pleopod (Fig. 5E) with appendix interna and appendix masculina arising from proximal third of mesial margin of endopod; appendix interna slender, slightly longer than appendix masculina, with few distal cincinnuli; appendix masculina slender, with six spiniform setae on distal half.

Endopod of first female pleopod (Fig. 5C) half as long as exopod.

Size

Postorbital carapace length 2.50 mm in ovigerous female holotype. Largest ovigerous female cl 2.94 mm; largest male cl 2.31 mm.

Coloration

Uniformly dark brown-red over entire body, same colour as the ambulacral regions of the sea urchin; dorsolateral longitudinal line consisting of small white chromatophores along carapace and abdomen (Fig. 6A). Juvenile specimens translucent (Fig. 6B).

Host

Sea urchin: *Phyllacanthus imperialis* Lamarck, 1816, Cidaridae, Echinoidea, Echinodermata. The shrimps were observed on the body of the sea urchin, never on the spines.

REMARKS

The rostrum armature varies from seven to eight dorsal teeth, of which one or two are postorbital. A subdistal ventral tooth was observed in two female specimens. The second chelipeds in females are slightly less robust than in males. The teeth on the cutting edges of the fingers are smaller and fewer in females than in males.

Among the *Periclimenes* species known to associate with echinoids, the present species shares the pectinate cutting edges of the first pereiopod with both *P. hirsutus* and *P. rectirostris*. It differs from these and all other *Periclimenes* species in having a distolateral, broad, rounded, downward curved lobe on the exopod of the uropod.

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