

THE HERMIT CRAB GENUS *CATAPAGUROIDES* A. MILNE-EDWARDS & BOUVIER, 1892 (CRUSTACEA: DECAPODA: ANOMURA: PAGURIDAE) FROM THE BOHOL SEA, PHILIPPINES, WITH DESCRIPTIONS OF EIGHT NEW SPECIES

Tomoyuki Komai

Natural History Museum and Institute, Chiba, 955-2 Aoba-cho, Chuo-ku, Chiba, 260-8682 Japan

Email: komai@chiba-muse.or.jp

Dwi Listyo Rahayu

Marine Bio-Industry Technical Implementation Unit, Mataram, Research Center for Oceanography

Indonesian Institute of Sciences (LIPI), Teluk Kodek, Pemenang, Lombok Barat, NTB, Indonesia

Email: dwilistyo@yahoo.com

ABSTRACT. — Ten species of the pagurid genus *Catapaguroides* A. Milne-Edwards & Bouvier, 1892, including eight new to science, are reported from the Bohol Sea, the Philippines, collected by the PANGLAO 2004 Marine Biodiversity Project: *C. brevidactylus*, new species; *C. conicus*, new species; *C. crassimanus*, new species; *C. cristimanus* de Saint Laurent, 1968; *C. hirsutus*, new species; *C. karubar* McLaughlin, 1997; *C. levigatus*, new species; *C. pusillus*, new species; *C. tenuiclavus*, new species; and *C. tuber*, new species. The sample is rather small, but specimens came from diverse habitats, including coral reefs, underwater caves, and lower sublittoral soft bottoms. This study is the first report of the genus from the Philippines. Affinities of the eight new species are discussed. Supplemental descriptions and illustrations are also given for *C. cristimanus* and *C. karubar*. A list and identification key of all known species of the genus are provided.

KEY WORDS. — Paguridae, *Catapaguroides*, new species, new records, Philippines

INTRODUCTION

The pagurid genus *Catapaguroides* A. Milne-Edwards & Bouvier, 1892, is represented by 20 hitherto described species (Table 1). The taxonomic history of the genus was summarised by McLaughlin (2002). *Catapaguroides* is one of a few genera of the Paguridae characterised by the lack of a pleurobranch above the fourth pereopod (seventh thoracic sternite). As pointed out by previous authors (de Saint Laurent, 1968; McLaughlin, 1997, 2002; Komai, 2009; Komai et al., 2010), species of the genus are generally small, thus it is difficult to collect samples for study. In fact, most species are known from only one or a few specimens. From the Philippines, no species of the genus has been reported, although eight species are known from the adjacent waters in Indonesia (de Saint Laurent, 1968; McLaughlin, 1997; see Table 1).

The present study deals with a small collection of specimens of *Catapaguroides* made during the PANGLAO 2004 Marine Biodiversity Project, which was carried out in the Bohol Sea, the Philippines. This expedition resulted in extensive collection of marine decapod crustaceans (Bouchet et al., 2009), and several reports on hermit crabs are now

available (cf. McLaughlin & Rahayu, 2007; McLaughlin, 2008; McLaughlin & Lemaitre, 2009; Rahayu & Forest, 2009; Asakura, 2010; Komai & Rahayu, in press; Rahayu & Komai, in press). In spite of the small sample size, 10 species, including eight new to science, are recognised: *C. brevidactylus* new species, *C. conicus* new species, *C. crassimanus* new species, *C. cristimanus* de Saint Laurent, 1968, *C. hirsutus* new species, *C. karubar* McLaughlin, 1997, *C. levigatus* new species, *C. pusillus* new species, *C. tenuiclavus* new species, and *C. tuber* new species. The eight new species are fully described and illustrated, and their affinities are discussed. Supplemental descriptions and illustrations are provided for *C. cristimanus* and *C. karubar*. It has been found that the development of arthrobranches on the third maxilliped and of the left sexual tube in male varies interspecifically, and thus the generic diagnosis is slightly emended. An identification key to the species of the genus is also proposed.

The holotypes of the eight new species are deposited in the National Museum of the Philippines, Manila (NMCR) and other specimens examined in this study are deposited in the Zoological Reference Collection (ZRC), the Raffles Museum of Biodiversity Research, National University of

Table 1. Species of *Catapaguroides* A. Milne-Edwards & Bouvier, 1892 and their distribution.

Species	Distribution	References
<i>Catapaguroides brevidactylus</i> new species	Bohol Sea, the Philippines; 3–14 m	this study
<i>Catapaguroides conicus</i> new species	Bohol Sea, the Philippines; 8–23 m	this study
<i>Catapaguroides crassimanus</i> new species	Bohol Sea, the Philippines; 101–110 m	this study
<i>Catapaguroides cristimanus</i> de Saint Laurent, 1968	Banda Sea, Indonesia; Bohol Sea, the Philippines; Ryukyu Islands, Japan; 90–200 m	de Saint Laurent (1968); Asakura (2005); this study
<i>Catapaguroides declivis</i> McLaughlin, 1997	Banda Sea, Indonesia; 184–206 m	McLaughlin (1997)
<i>Catapaguroides foresti</i> McLaughlin, 2002	Guam; southern Japan; subtidal to 30 m	McLaughlin (2002); Osawa & Takeda (2004); as <i>Catapaguroides kasei</i> ; Komai et al. (2010)
<i>Catapaguroides fragilis</i> (Melin, 1939)	Southern Japan; Mururoa; 22–75 m	Melin (1939); de Saint Laurent (1968); Okuno & Arima (2006)
<i>Catapaguroides hirsutus</i> new species	Bohol Sea, the Philippines; 100–138 m	this study
<i>Catapaguroides hooveri</i> McLaughlin & Pittman, 2002	Maui, Hawaii; 11–18 m	McLaughlin & Pittman (2002)
<i>Catapaguroides iejimensis</i> Osawa & Takeda, 2004	Ryukyu Islands, Japan; 18–30 m	Osawa & Takeda (2004); Osawa & Okuno (2007)
<i>Catapaguroides inermis</i> de Saint Laurent, 1968	Indonesia; 570–794 m	de Saint Laurent (1968)
<i>Catapaguroides iris</i> (Bouvier, 1922)	Azores; Morocco; 650–914 m	Bouvier (1922); Ingle (1993); Garcia Raso (1996)
<i>Catapaguroides japonicus</i> de Saint Laurent, 1968	Japan; 23–366 m	de Saint Laurent (1968); Komai et al. (2002); Komai & Takeda (2006)
<i>Catapaguroides karubar</i> McLaughlin, 1997	Banda Sea, Indonesia; Bohol Sea, the Philippines; 80–212 m	McLaughlin (1997); this study
<i>Catapaguroides levigatus</i> new species	Bohol Sea, the Philippines; 2–32 m	this study
<i>Catapaguroides longior</i> Komai, Yamada & Shirakawa, 2010	Rykyu Islands, Japan; 30 m	Komai et al. (2010)
<i>Catapaguroides megalops</i> A. Milne-Edwards & Bouvier, 1892	Morocco; Azores; Cape Verde Islands; 200–636 m	A. Milne-Edwards & Bouvier (1892); de Saint Laurent (1968)
<i>Catapaguroides melini</i> de Saint Laurent, 1968	Indonesia; 16–91 m	de Saint Laurent (1968)
<i>Catapaguroides microps</i> A. Milne-Edwards & Bouvier, 1892	Cosmopolitan; 718–1900 m	de Saint Laurent (1968); Ingle (1993); McLaughlin et al. (2007); Lins & Cardoso (2010)
<i>Catapaguroides mortenseni</i> de Saint Laurent, 1968	Indonesia; 472–550 m	de Saint Laurent (1968)
<i>Catapaguroides olfaciens</i> (Alcock, 1905)	Maldives	Alcock (1905)
<i>Catapaguroides pectinipes</i> (Lewinsohn, 1969)	Red Sea; 108 m	Lewinshon (1969)
<i>Catapaguroides pusillus</i> new species	Bohol Sea, the Philippines; 83–102 m	this study
<i>Catapaguroides setosus</i> (Edmondson, 1951)	O'ahu, Hawaii; 18 m	Edmondson (1951); McLaughlin & Pittman (2002)
<i>Catapaguroides spinulimanus</i> de Saint Laurent, 1968	New Guinea; Banda Sea, Indonesia; 84–90 m	de Saint Laurent (1968)
<i>Catapaguroides tenuiclavus</i> new species	Bohol Sea, the Philippines; 35–45 m	this study
<i>Catapaguroides tuber</i> new species	Bohol Sea, the Philippines; 23 m	this study
<i>Catapaguroides umbra</i> Komai, 2009	Ryukyu Islands, Japan; 8–14 m	Komai (2009)

Singapore; Museum national d'Histoire naturelle (MNHN), Paris; and the Natural History Museum and Institute, Chiba (CBM). The shield length (sl) is measured from the tip of the rostrum to the midpoint of the posterior margin of the shield. Terminology used in the description generally follows McLaughlin et al. (2007). Measurements of the chelipeds and ambulatory legs follow the protocol proposed by Komai (2010).

TAXONOMIC ACCOUNT

Catapaguroides A. Milne-Edwards & Bouvier, 1892

Catapaguroides A. Milne-Edwards & Bouvier, 1892: 211 (in part);
Bouvier, 1922: 26 (in part); de Saint Laurent, 1968a: 927;
McLaughlin, 1997: 454; 2003: 120

Emended diagnosis. — Gills biserial, no pleurobranch on seventh thoracomere (above arthrobranches of fourth pereopod); arthrobranches of third maxilliped occasionally reduced to single or two rudimentary buds or absent, thus gill numbers varying from 8 to 10 pairs. Rostrum as rounded lobe or broadly triangular. Ocular acicles simple. Crista dentata of third maxilliped more or less reduced, no accessory tooth on ischium. Chelipeds unequal, right appreciably stronger. Sixth thoracic sternite with roundly rectangular, subsemicircular, or subtriangular, occasionally armed with spines or tubercles. Fourth pereopod semichelate; propodal rasp with 1 row of corneous scales; no preungual process on dactylus. Fifth pereopod semichelate. Male with short to long sexual tube on coxa of right fifth pereopod, directed from right to left under thorax and recurved anteriorly; coxa of left usually with very short to short tube concealed between 2 thick tufts of setae on eighth thoracic sternite or left sexual tube absent; third to fifth pleopods present. Female with single gonopore on coxa of left third pereopod; pleon with unpaired second to fifth pleopods. Telson without lateral indentations; terminal margins straight or oblique.

Remarks. — Although the tendency toward reduction and/or disappearance in the paired arthrobranches of the third maxilliped, without complete pleurobranch loss, has been reported in Paguridae, i.e., *Enneobranchus* García-Gómez, 1988, *Enneophyllus* McLaughlin, 1997, *Enneopagurus* McLaughlin, 1997, and *Pagurus* Fabricius, 1775 (García-Gómez, 1988; McLaughlin, 1997; Komai & Osawa, 2001; Siddiqui & Komai, 2008) the loss of those gills with complete loss of pleurobranches is rarely seen in the family. Indeed, loss of the arthrobranches of the third maxilliped is the fundamental character to diagnose *Enneopagurus*, *Enneophyllus*, and *Enneopagurus*. *Decaphyllus barunajaya* McLaughlin, 1997, represented the unique example of the latter case. During this study, reduction or loss of the arthrobranches on the third maxilliped is seen in four new species. In *Catapaguroides conicus*, new species, and *C. pusillus*, new species, there is only a minute, bud-like arthrobranch above the base of the third maxilliped; no arthrobranches are found in *C. tenuiclavus*, new species, and *C. tuber*, new species. In spite of the reduction of those

gills, these four new species fit the generic diagnosis of *Catapaguroides*. It is reasonable to consider that the loss of the arthrobranches on the third maxilliped could not be diagnostic alone at genus level.

It has been also found that the left sexual tube is absent in *C. tenuiclavus*, new species, and *C. tuber*, new species, though the left coxa has a very short to short sexual tube in other species in general (McLaughlin, 2003; this study). Male characters still need to be confirmed for *C. crassimanus*, new species, and *C. pusillus*, new species.

Catapaguroides brevidactylus, new species

(Figs. 1, 2)

Material examined. — Holotype: male (sl 1.1 mm), PANGLAO 2004, stn B10, Momo Beach, Panglao Island, 09°36.5'N, 123°45.6'E, 3–14 m, reef wall with small caves, 10 Jun.2004, NMCR 39061.

Description. — Ten pairs of biserial phyllobranchiate gills; 2 arthrobranches on third maxilliped each reduced to minute bud; other arthrobranches distinctly lamellate; no pleurobranches on wall of seventh thoracic somite.

Shield (Fig. 1A) approximately as long as wide; anterior margins between rostral lobe and lateral projections concave; anterolateral margins terraced, posterior margin truncate; dorsal surface almost glabrous, with few tufts of short setae laterally. Rostral lobe rounded, without setae. Lateral projections triangular, produced to level of rostral lobe.

Ocular peduncle (Fig. 1A) about 0.7 length of shield, slightly widened basally, with row of tufts of short to long setae on dorsal surface and 1 tuft of short setae on lateral face slightly proximal to corneal base; cornea normally developed, rounded, not dilated, slightly wider than long, corneal width about 0.3 of peduncular length. Ocular acicles narrowly triangular, terminating in acute marginal spine, separated basally by basal width of 1 acicle. Interocular lobe visible in dorsal view.

Antennular peduncle (Fig. 1A), when fully extended, overreaching distal corneal margin by full length of ultimate segment. Basal segment with spinule proximolaterally. Ultimate segment slightly broadened distally in lateral view, with 2 long plumose setae on dorsolateral distal portion. Dorsal flagellum with distal portion distinctly longer than proximal aesthetasc-bearing portion.

Antennal peduncle (Fig. 1A) overreaching distal corneal margin by 0.2 length of fifth segment. Fifth and fourth segments with few short setae. Third segment with 1 prominent spine at ventromesial distal angle. Second segment with dorsolateral distal angle produced in sharp spine nearly reaching midlength of fourth segment; dorsomesial distal angle with spinule. First segment unarmed. Antennal acicle slender, arcuate, nearly reaching

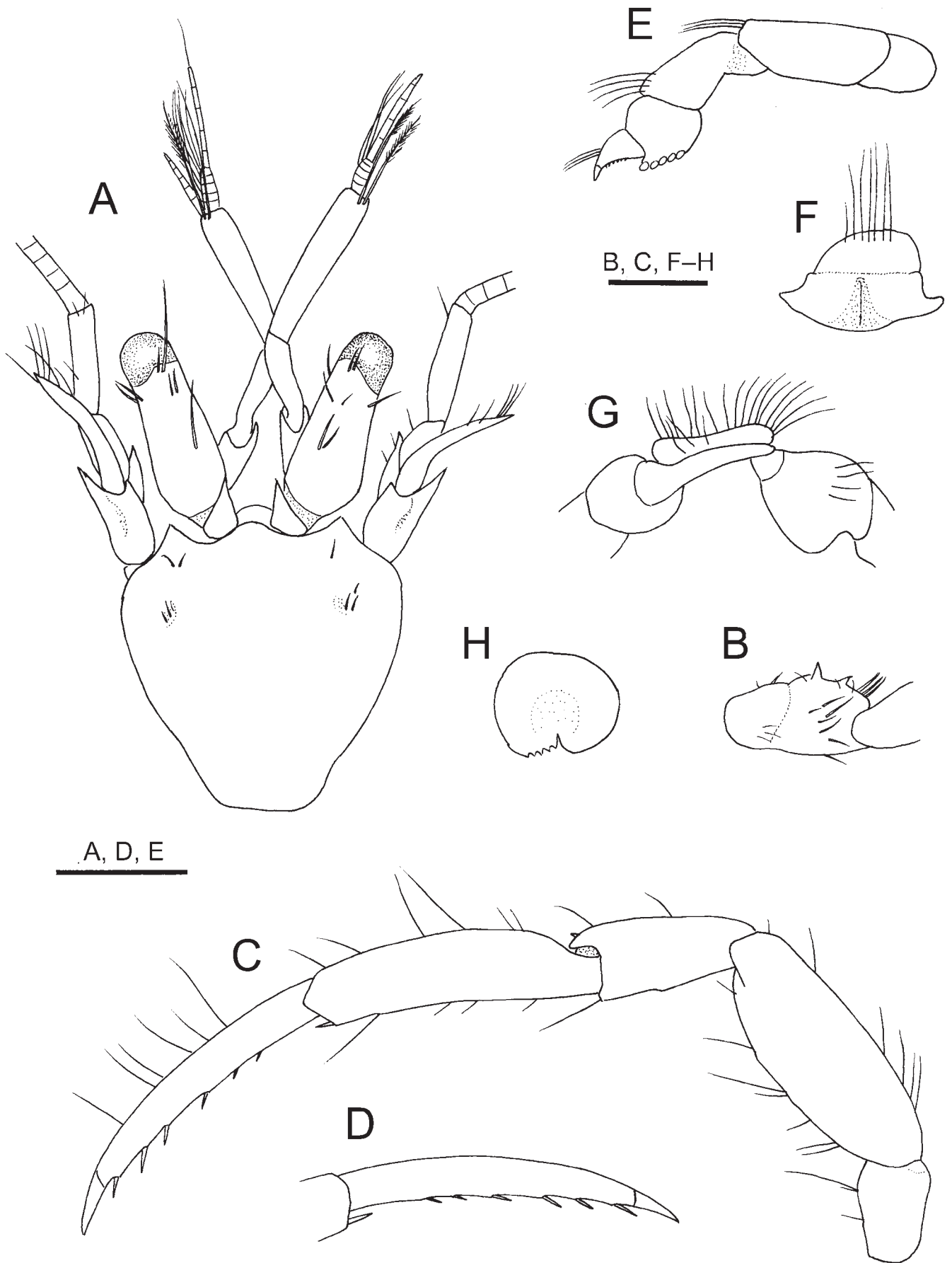


Fig. 1. *Catapaguroides brevidactylus*, new species, holotype, male (sl 1.1 mm), PANGLAO 2004, stn 10, NMCR 39061. A, shield and cephalic appendages, dorsal view; B, ischium-basis of left third maxilliped, ventral view; C, left second pereopod, lateral view; D, same, dactylus, mesial view (dorsal setae omitted); E, left fourth pereopod, lateral view; F, sixth thoracic sternite, ventral view; G, coxae of fifth pereopods and eighth thoracic sternite, ventral view; H, telson, dorsal view. Scale bars = 0.5 mm (A, C–E); 0.25 mm (B, F–H).

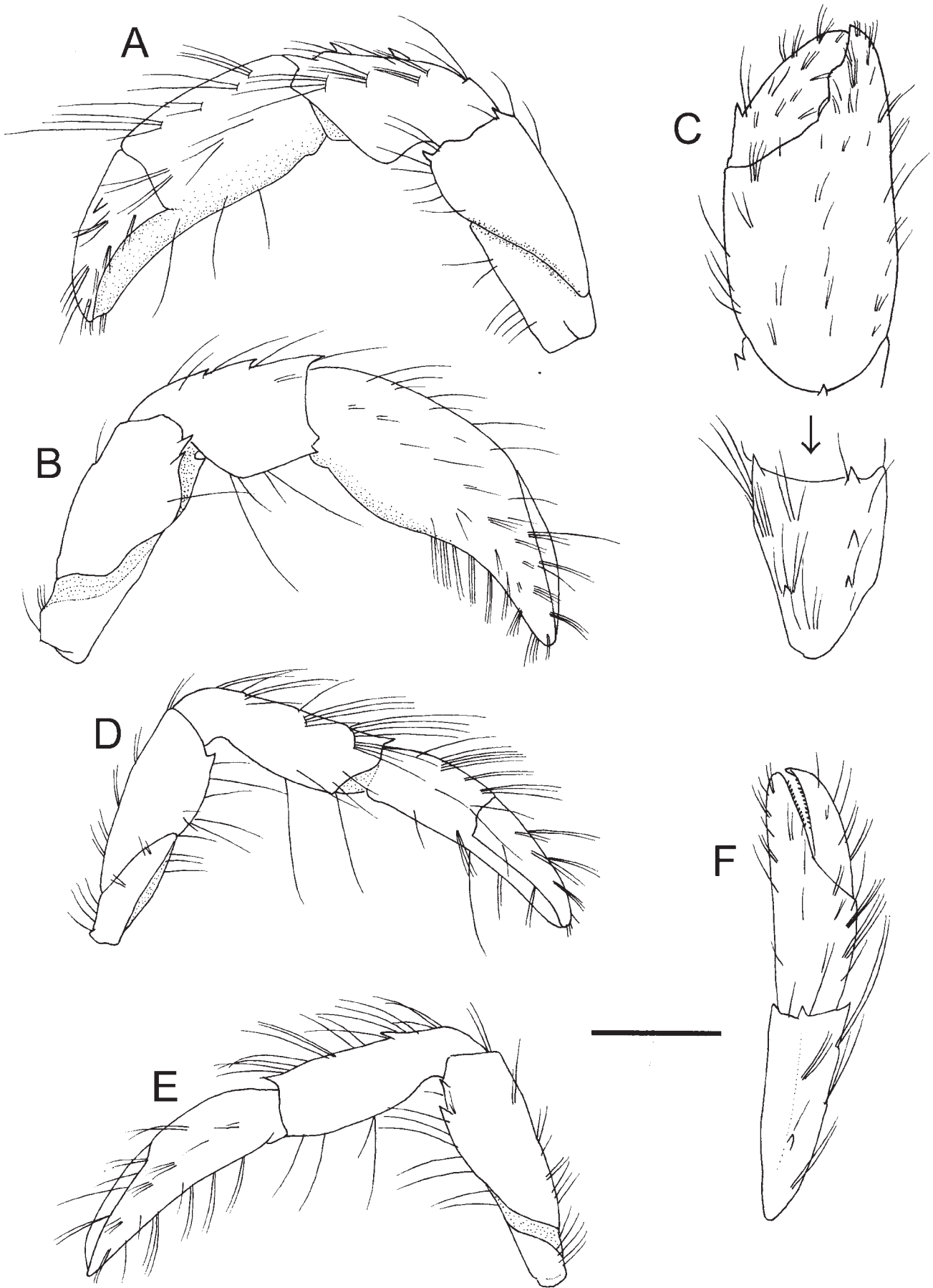


Fig. 2. *Catapaguroides brevidactylus*, new species, holotype, male (sl 1.1 mm), PANGLAO 2004, stn B10, NMCR 39061. A, right cheliped, mesial view; B, same, lateral view; C, same, chela and carpus, dorsal view; D, left cheliped, mesial view; E, same, lateral view; F, same, chela and carpus, dorsal view. Scale bar = 0.5 mm.

to distal corneal margin, terminating in slender spine and with row of relatively short setae distally. Antennal flagellum long, about 4.0 times longer than shield; articles each with some short to long setae.

Third maxilliped moderately stout; crista dentata on ischium consisting of 2 teeth (Fig. 1B). Carpus without dorsodistal spine.

Chelipeds (Fig. 2) subequal in length but distinctly dissimilar. Right cheliped (Fig. 2A–C) moderately large, not particularly elongate; right chela subovate, about 2.1 times longer than broad; palm-carpal articulation rotated clockwise about 20° from perpendicular. Dactylus 0.9 times as long as palm, slightly curved ventrally; dorsal surface rounded, dorsomesial margin not delimited; mesial surface armed with 1 small spine located at proximal 0.2; cutting edge with 2 obtuse calcareous teeth, terminating in small corneous claw; tufts of short to moderately long setae arranged in irregular longitudinal rows on surfaces. Palm 1.2 times longer than carpus; dorsal surface convex, unarmed, but with 3 irregularly longitudinal rows of tufts of short to long setae; dorsolateral and dorsomesial margins not delimited; lateral and mesial faces also with tufts of short to long setae; ventral surface slightly convex, with tufts of short to long setae extending onto fixed finger. Fixed finger with 1 obtuse calcareous tooth on cutting edge, terminating in minute corneous claw. Carpus subequal in length to merus, widened distally, 1.3 times longer than distal width; dorsal surface with tufts of moderately long setae, and 1 small mesial spine proximal to midlength and 3 spines on dorsolateral margin, dorsomesial distal angle with 1 larger spine; dorsomesial margin not delimited; lateral surface with few short setae dorsally, with 1 small spine at ventrodistal angle; mesial face with tufts of long stiff setae dorsally; ventral surface convex, with some long setae. Merus with few moderately long setae on dorsal surface distally; dorsodistal margin with 1 spine mesially; lateral surface glabrous, ventrolateral margin slightly concave in distal half, with 2 small spines; mesial surface also glabrous, ventromesial margin with 1 small spine at distal angle; ventral surface with few setae. Ischium unarmed.

Left cheliped (Fig. 2D–F) slender. Chela 3.0 times longer than wide, not arched; palm-carpal articulation rotated counterclockwise about 30° from perpendicular. Dactylus and fixed finger only slightly curved ventrally, without hiatus; dactylus 1.3 times longer than palm, unarmed but with scattered tufts of short to long setae; dorsomesial margin not delimited; cutting edge with row of minute corneous teeth, terminating in small corneous claw. Palm about half length of carpus; dorsal surface slightly convex, unarmed; surfaces with tufts of short to long setae arranged in irregular longitudinal rows. Carpus slightly widened distally, 2.8 times longer than distal width; dorsal surface laterally with 1 small spine proximal to midlength and tufts of long setae medially and on dorsomesial margin; dorsodistal margin with 2 small spines at lateral and mesial angles; lateral and mesial surfaces almost glabrous, ventral surface with few long setae. Merus with some tufts of

short setae on dorsal margin; ventrolateral margin with 2 small spines distally; ventromesial margin with 1 spine distally; ventral surface with scattered long setae. Ischium unarmed.

Only left second pereopod preserved. Left second pereopod (Fig. 1C) long and slender, overreaching right cheliped by about 0.7 length of dactylus. Dactylus 1.2 times longer than propodus, 8.3 times longer than wide, straight in dorsal view, slightly curved ventrally in lateral view, terminating in long, slender corneous claw; dorsal margin with sparse long setae; mesial surface without spines or bristle-like thick setae (Fig. 1D); ventral margin with 6 slender corneous spines. Propodus with pair of small corneous spines on ventrodistal margin; dorsal and ventral margins with sparse, short to long setae. Carpus with dorsodistal spinule and few short setae on dorsal surface. Merus unarmed, with sparse short to long setae on dorsal and ventral margins. Ischium with few moderately short setae on ventral margin. Distinct notch on ventral margin at articulation between merus and ischium.

Fourth pereopod (Fig. 1E) semichelate; dactylus with several minute corneous denticles on ventral margin; propodal rasp consisting of 5 corneous scales. Fifth pereopods semichelate.

Anterior lobe of sixth thoracic sternite (Fig. 1F) subsemicircular, skewed to left, with moderately short setae on anterior margin.

Male with short sexual tube emanating from coxa of right fifth pereopod (Fig. 1G), directed from right to left, tapering distally, reaching mesial margin of coxa of left fifth pereopod. Coxa of left with short, papilla-like sexual tube directed anteromesially, not obscured by tufts of setae on eighth thoracic sternite. Eighth thoracic sternite (Fig. 1G) with single broad lobe bearing row of numerous setae on anterior margin.

Telson (Fig. 1H) semicircular, wider than long; no lateral indentations; posterior lobes slightly asymmetrical, separated by narrow median cleft; terminal margins slightly oblique, left with 4 minute spines, right apparently unarmed, outer angles not spinose.

Female unknown.

Colouration. — Not known.

Distribution. — Known only from Panglao Island, 3–14 m.

Remarks. — *Catapaguroides brevidactylus*, new species, is most similar to *C. mortenseni* de Saint Laurent, 1968. Shared characters are: cornea normally developed, rounded; antennular peduncle overreaching distal corneal margin by full length of ultimate segment; antennal peduncle distinctly overreaching distal corneal margin; chela of right cheliped subovate in dorsal view, with lateral margin of palm and

mesial margin of dactylus rounded, not crested; palm of right cheliped unarmed; and carpus of right cheliped bearing spines (de Saint Laurent, 1968). It is readily distinguished from the latter species by the shape of the ocular peduncle. In *C. brevidactylus*, the ocular peduncle is slightly widened proximally with a non-dilated cornea, whereas in *C. mortenseni*, it is widened distally with a dilated cornea. Furthermore, the dactylus of the right cheliped is armed with a proximal spine in *C. brevidactylus*, rather than unarmed in *C. mortenseni*; the palm of the right cheliped lacks a dorsomesial distal spine in *C. brevidactylus* unlike in *C. mortenseni*; the carpus of the right cheliped bears two spines on the dorsodistal margin in *C. brevidactylus*, whereas the margin lacks spines in *C. mortenseni*. In addition, it is suggested that the bathymetric range is different between the two species: *C. brevidactylus* inhabits shallow coral reefs at depths of 3–14 m, whereas *C. mortenseni* was recorded from upper bathyal zone at depths of 472–550 m (de Saint Laurent, 1968).

Etymology. — From the combination of the Latin “*brevis*” [= short] and “*dactylus*” [= claw], in reference to the relatively short dactylus of the ambulatory leg for the genus. Used as a noun in apposition.

Catapaguroides conicus, new species

(Figs. 3–5)

Material examined. — Holotype: male (sl 1.0 mm), PANGLAO 2004, stn B9, Napaling, Panglao Island, 09°33.1'N, 123°44'E, 8–10 m, caves in the reef wall, 8 Jun.2004, NMCR 39062.

Paratypes: 1 ovigerous female (sl 1.0 mm), same data as holotype, MNHN; 2 females (sl 0.76, 0.92 mm), stn B36, N of Doljo, Panglao Island, 09°35.9'N, 123°44.5'E, 23 m, reef wall, 1 Jul.2004, ZRC 2012.1092.

Description. — Nine pairs of biserial phyllobranchiate gills; third maxilliped with only 1 arthrobranch reduced to minute bud; two arthrobranches on chelipeds very small, poorly lamellate; no pleurobranch on wall of seventh thoracic somite.

Shield (Fig. 3A) slightly wider than long or approximately as long as wide; anterior margins between rostral lobe and lateral projections concave; anterolateral margins sloping or slightly terraced; posterior margin truncate; dorsal surface almost glabrous, with few tufts of very short setae posterior to each lateral projection. Rostrum roundly triangular. Lateral projections triangular, produced to level of rostrum, each with marginal or submarginal spinule.

Ocular peduncle (Fig. 3A) about 0.9 length of shield, stout basally, tapering to somewhat cone-shaped cornea; dorsal surface mesially with 3 tufts of short to long setae aligned longitudinally in distal half; 1 additional tuft of setae on lateral face near base of cornea. Ocular acicle narrowly triangular, armed with tiny, subterminal spinule, separated to each other basally by basal width of 1 acicle. Interocular lobe with convex anterior surface.

Antennular peduncle (Fig. 3A), when fully extended, overreaching distal corneal margin by full length of ultimate segment. Basal segment with spinule proximolaterally. Ultimate segment 0.7 length of shield, slightly broadened distally in lateral view, with 2 long plumose setae on dorsolateral distal portion. Dorsal flagellum with distal portion distinctly longer than proximal aesthetasc-bearing portion.

Antennal peduncle (Fig. 3A) slightly falling short of or just reaching distal corneal margin. Fifth and fourth segments with few short setae. Third segment with 1 prominent spine at ventromesial distal margin. Second segment with dorsolateral distal angle produced in simple or bifid spine nearly reaching midlength of fourth segment; dorsomesial distal angle with small spine. First segment unarmed. Antennal acicle slender, arcuate, slightly falling short of or reaching to distal corneal margin, terminating in slender spinule and with tufts of long setae distally. Antennal flagellum about 4.0 times longer than shield; articles each with several short to very long setae, making flagellum considerably setose.

Third maxilliped moderately stout, with crista dentata on ischium consisting of 2 or 3 teeth. Carpus without dorsodistal spine.

Chelipeds (Figs. 4A–D, 5A–C) appreciably unequal and dissimilar. Right cheliped of male (Fig. 4A–C) large, but not particularly elongate; propodal-carpal articulation rotated clockwise about 30° from perpendicular. Chela about 1.6 times longer than wide, widest at base of dactylus. Dactylus articulating obliquely with palm, about 0.8 length of palm, somewhat curved ventrally; dorsal surface slightly convex, dorsomesial margin not delimited, armed proximally with 1 prominent protuberance terminating in small spine; cutting edge with 3 prominent, triangular calcareous teeth, terminating in tiny corneous claw; tufts of short to moderately long setae arranged in irregular longitudinal rows on surfaces. Palm 1.3 longer than carpus; dorsal surface slightly convex, with some irregular longitudinal rows of tufts of short to long setae, no spines; dorsolateral and dorsomesial margins not delimited; lateral and mesial faces also with tufts of short to long setae; ventral surface slightly convex, with tufts of long setae extending onto fixed finger. Fixed finger with 1 prominent calcareous tooth on cutting edge (tip eroded). Carpus subequal in length to merus, broadened distally, about 1.1 times longer than distal width; dorsal surface mesially with short transverse rows of short to long setae and laterally with 2 small spines around midlength, dorsodistal margin with 1 spine at mesial angle and 2 spines at lateral angle; dorsomesial margin not delimited; mesial surface dorsally with transverse tufts of long setae; lateral surface with few short setae dorsally, with 1 minute spine at ventrodistal angle; ventral surface convex, with few long setae. Merus with row of sparse short setae on dorsal surface; dorsodistal margin with 1 small spine mesially; lateral surface glabrous, ventrolateral margin nearly straight, with 2 small spines subdistally; mesial surface also glabrous, ventromesial margin with 2

small spines at distal angle; ventral surface with some long setae. Ischium unarmed, with short setae on dorsal and ventral margins.

Right cheliped of female (Fig. 4D) proportionally slenderer than that of male, chela elongate subovate in dorsal view; setation generally similar to that of male cheliped. Chela 2.0 times longer than wide. Dactylus with small spine on mesial surface proximally. Calcareous teeth on cutting edges of fingers weaker than those of male. Carpus also more slender than in male; spines stronger, dorsodistal medial angle with 1 strong spine.

Left cheliped (Fig. 5A–C) relatively slender. Chela 3.3–3.4 times longer than wide, slightly arched ventrally. Dactylus

subequal in length to palm, unarmed, with scattered tufts of short to long setae; dorsomesial margin not delimited; cutting edge with row of minute corneous teeth, terminating in tiny corneous claw. Palm about 0.6 length of carpus; dorsal surface slightly convex, unarmed; surfaces with tufts of short to long setae arranged in irregular longitudinal rows. Carpus slightly widened distally, 2.7 times longer than distal width; dorsal surface unarmed, laterally with tufts of or individual long setae and mesially with 4 or 5 short transverse rows of long setae; dorsodistal margin armed with small spine each at lateral and mesial angles; lateral and mesial faces almost glabrous, ventral surface with some long setae. Merus with some tufts of moderately short setae on dorsal margin; ventrolateral margin with 1 strong spine subdistally; ventromesial margin with 1 small distal

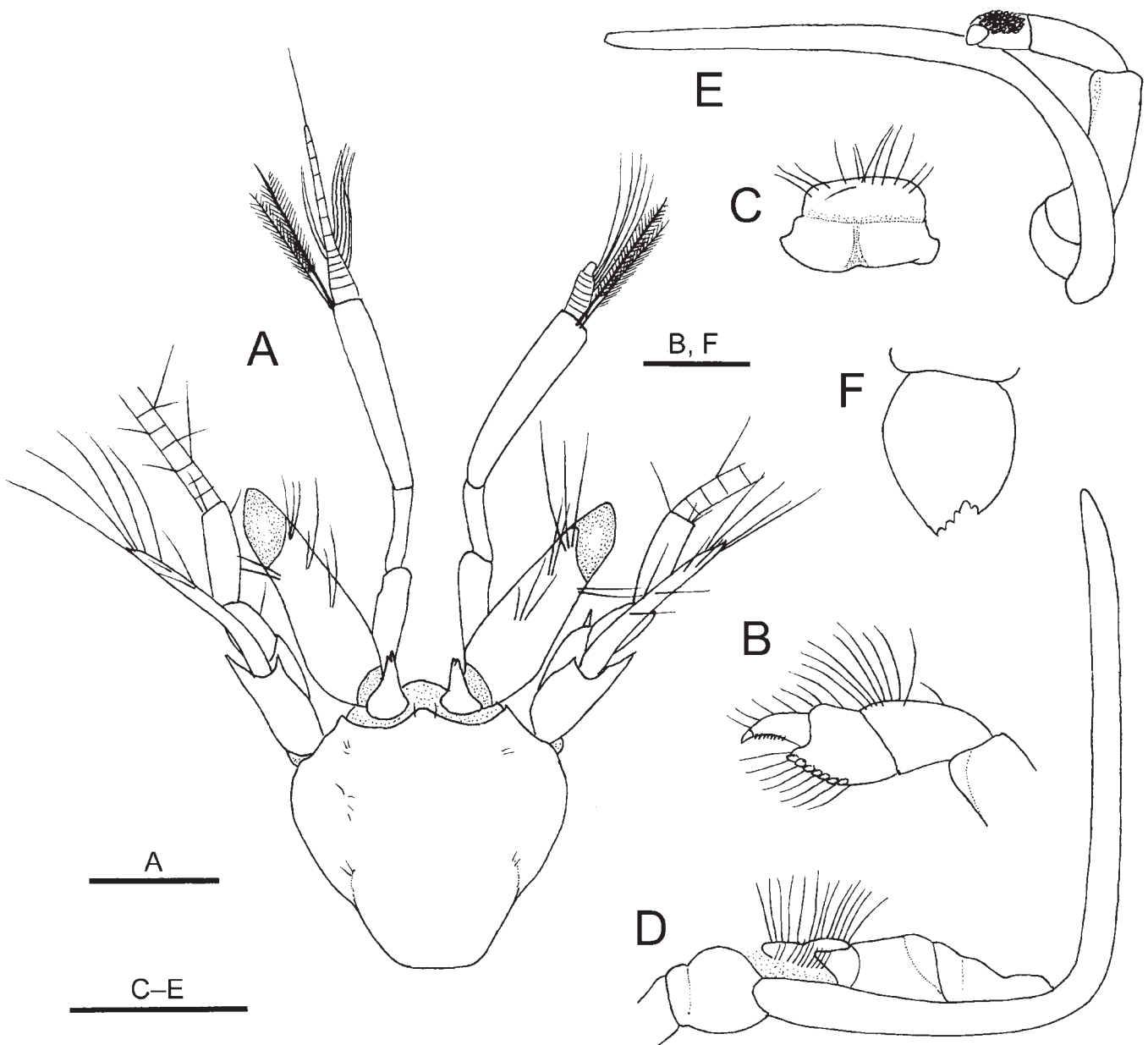


Fig. 3. *Catapaguroides conicus*, new species, holotype, male (sl 1.0 mm), PANGLAO 2004, stn B9, NMCR 39062. A, shield and cephalic appendages, dorsal view; B, left fourth pereopod, distal three segments, lateral view; C, sixth thoracic sternite, ventral view; D, coxae of fifth pereopods and eighth thoracic sternite, ventral view; left fifth pereopod and right sexual tube, lateral view. Scale bars = 0.5 mm (A, C–E); 0.25 mm (B, F).

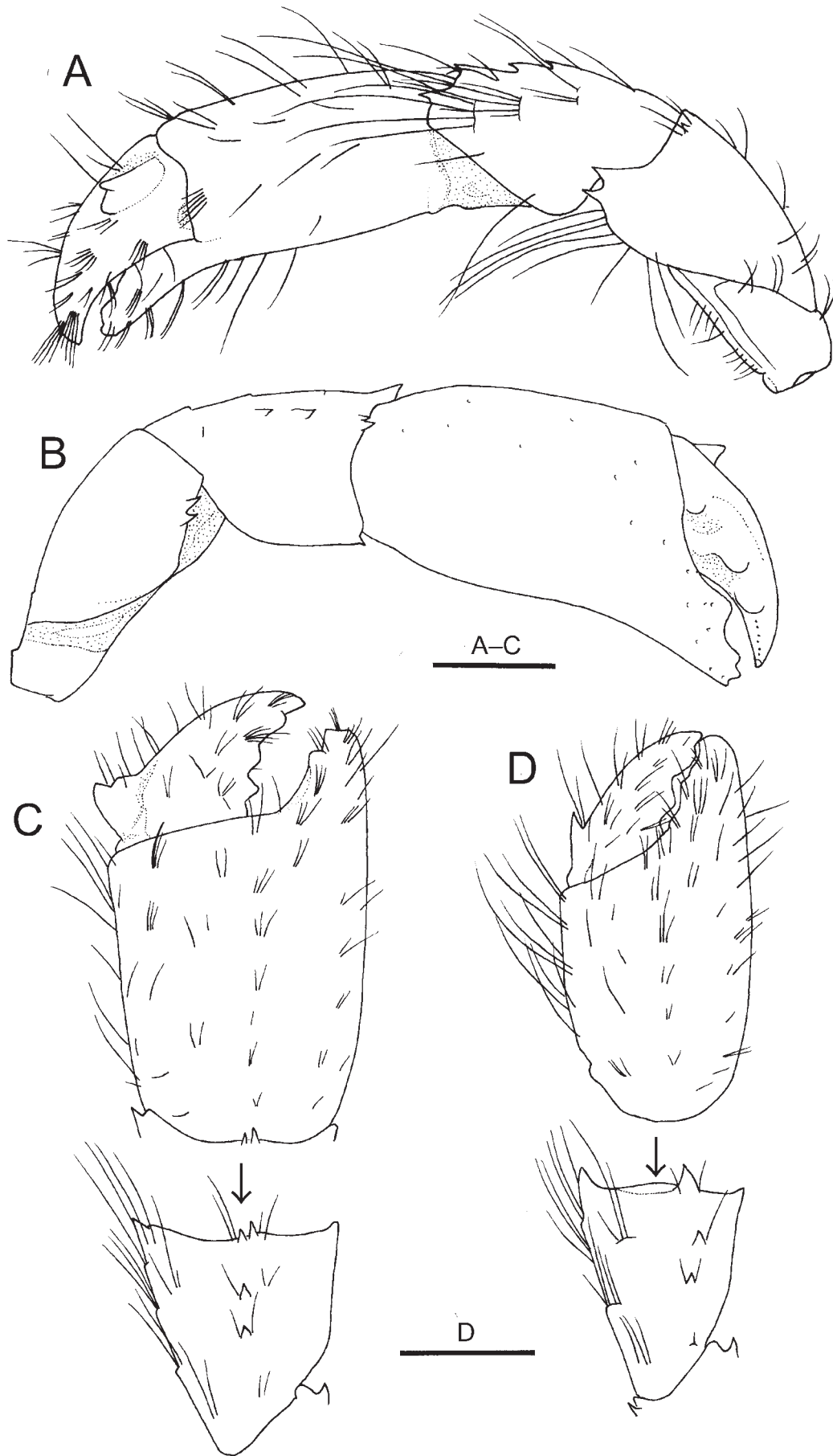


Fig. 4. *Catapaguroides conicus*, new species. A–C, holotype, male (sl 1.0 mm), PANGLAO 2004, stn B9, NMCR 39062; D, paratype, female (sl 1.0 mm), same station, ZRC 2012.1092. A, right cheliped, mesial view; B, same, lateral view (setae omitted); C, D, same, chela and carpus, dorsal view. Scale bars = 0.5 mm.

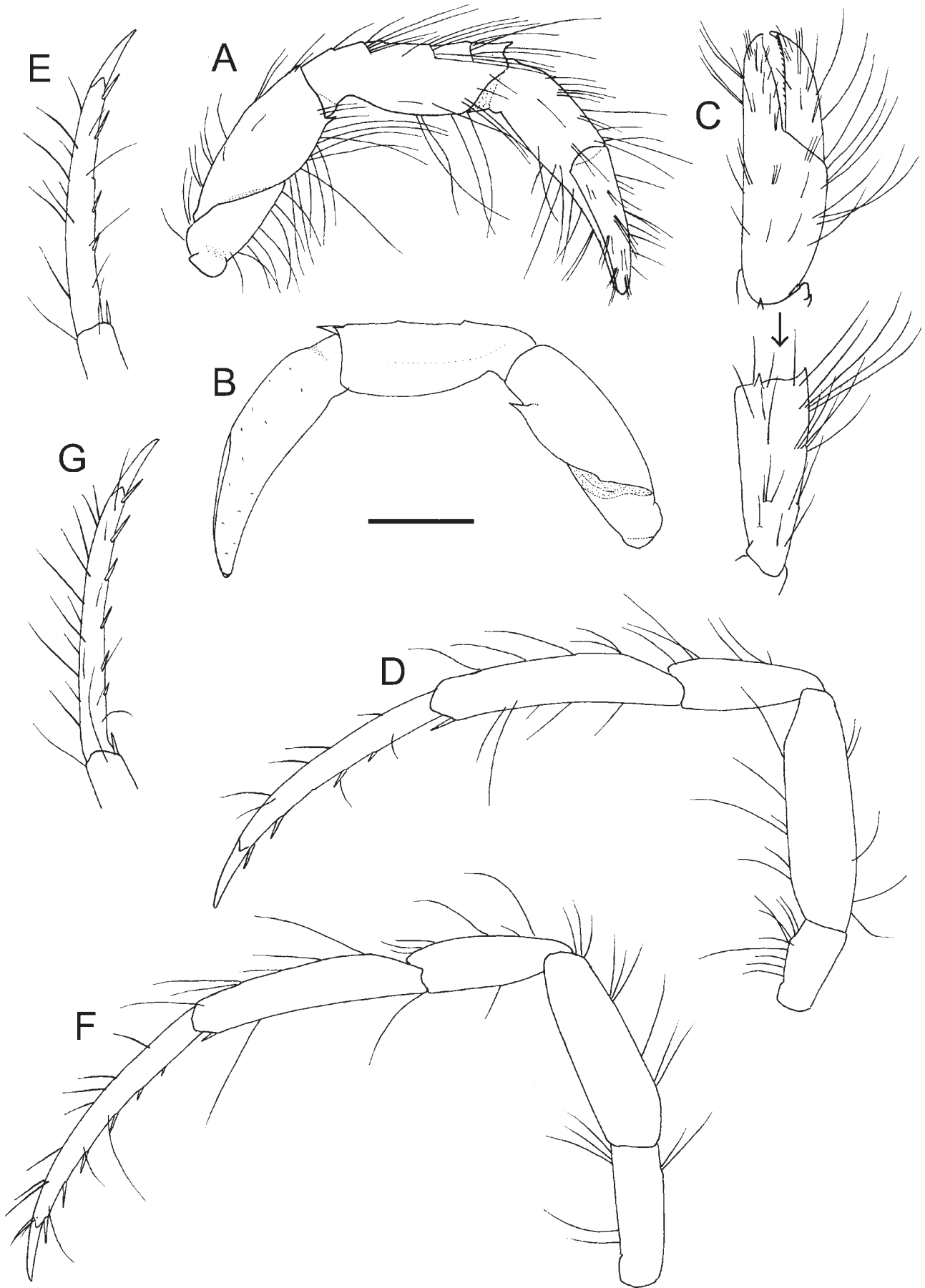


Fig. 5. *Catapaguroides conicus*, new species, holotype, male (sl 1.0 mm), PANGLAO 2004, stn B9, NMCR 39062. A, left cheliped, mesial view; B, same, lateral view (setae omitted); C, same, chela and carpus, dorsal view; D, left second pereopod, lateral view; E, same, dactylus, mesial view; F, left third pereopod, lateral view; G, same, dactylus, mesial view. Scale bar = 0.5 mm.

spine; ventral surface with numerous scattered long setae. Ischium spineless.

Ambulatory legs (Fig. 5D, F) long and slender, right second pereopod overreaching right cheliped by about half-length of dactylus. Dactyli (Fig. 5E, G) 1.3–1.4 times longer than propodi, 10.5–13.2 times longer than wide, straight in dorsal view, slightly curved ventrally in lateral view, terminating in long, slender corneous claws; dorsal margins each with sparse short to long setae; ventral margins each with 4–6 moderately spaced, slender corneous spines. Propodi each with pair of slender corneous spines on ventrodiscal margin; dorsal and ventral margins with sparse short to long setae. Carpus with or without minute spinules at dorsodistal angle, dorsal surface with few short to long setae. Merus unarmed, with sparse short to long setae on dorsal and/or ventral margins. Ischium with few long setae on ventral margin. Second pereopods each with distinct notch on ventral margin at articulation between merus and ischium. Female with unpaired left gonopore.

Fourth pereopod (Fig. 3B) semichelate; dactylus with several minute corneous denticles on ventral margin; propodal rasp consisting of 7 corneous scales. Fifth pereopods semichelate.

Anterior lobe of sixth thoracic sternite (Fig. 3C) wide, subsemicircular, slightly skewed to left, with short setae on anterior margin.

Male with long sexual tube extending from coxa of right fifth pereopod (Fig. 3D, E), directed from right to left across ventral body surface and then strongly curved dorsally and anteriorly, reaching to base of left cheliped. Left coxa with short sexual tube directed anteromesially, obscured by tufts of dense setae on eighth thoracic sternite. Sternal lobe of eighth thoracic somite slightly bilobed, obscured by numerous long setae (Fig. 3D).

Telson (Fig. 3F) slightly longer than wide; no lateral indentations; posterior lobes asymmetrical, separated by shallow median cleft; terminal margins oblique, left with 2 or 3 spinules, right with 1 or 2 spinules, outer angles acutely pointed.

Eggs about 0.4×0.6 mm.

Variation. — As is apparent from the above description, a notable variation is seen in the armature of the dactylus of the right cheliped. In the male holotype, the armature consists of a prominent proximal protuberance bearing a blunt spine, while there is only a small sharp spine located on the proximal 0.2 of the dactylus in the three female paratypes. It is possible that this variation might be due to sexual dimorphism.

Colouration. — Not known.

Distribution. — Known only from Panglao Island, the Philippines, 8–23 m.

Remarks. — *Catapaguroides conicus*, new species, appears most similar to *C. foresti* McLaughlin, 2002 in having the distally narrowed, cone-shaped cornea and the dorsally unarmed palm of the right cheliped. However, the new species can be readily distinguished from *C. foresti* by the short antennal peduncle and antennal acicle and the greatly elongate right sexual tube in male. The antennal peduncle and antennal acicle do not overreach the distal corneal margin in *C. conicus*, unlike distinctly overreaching it in *C. foresti*. The right sexual tube reaches the base of the left cheliped in *C. conicus*, rather than only reaching to the left coxa of the fifth pereopod in *C. foresti*. In addition, in *C. foresti*, four to eight dorsodistal marginal setae on the dactyli of the ambulatory legs become thick and bristle-like in *C. foresti*, but such a thickening of setae is not seen in *C. conicus*.

Catapaguroides hooveri McLaughlin & Pittman, 2002, known only from the Hawaiian Islands, also resembles *C. conicus* in having a distally narrowed cornea and relatively short antennal peduncle and antennal acicle, but this species is immediately distinguished from the new species by the possession of a dorsomesial row of spines on the palm of each cheliped. *Catapaguroides conicus* has no spines on the palms of both chelipeds.

Etymology. — From the Latin “*conicus*” [= conical], in reference to the cone-shaped cornea.

Catapaguroides crassimanus, new species

(Figs. 6–8)

Material examined. — Holotype: female (sl 1.1 mm), PANGLAO 2004, stn T14, Maribohoc Bay, Bohol Island, 09°41.5'N, 123°49.3'E, 101–110 m, mud with shells, 17 Jul.2004, NMCR 39063.

Comparative material. — *Catapaguroides fragilis* (Melin, 1939): 1 female (sl 1.1 mm), TRV *Toyoshio-maru*, 1996-6 cruise, stn 7, SE of Tanegashima Island, Ohsumi Islands, Japan, 30°15.00'N, 130°45.00'E, 75 m, 2 Jun.1996, dredge, coll. T. Komai, CBM-ZC 9018.

Description. — Ten pairs of biserial phyllobranchiate gills; 2 arthrobranchs on third maxilliped each reduced to minute bud; other arthrobranchs distinctly lamellate; no pleurobranchs on wall of seventh thoracic somite.

Shield (Fig. 6A) as long as wide; anterior margins between rostral lobe and lateral projections concave; anterolateral margins sloping, posterior margin rounded; dorsal surface almost glabrous, with tufts of short setae laterally. Rostrum rounded. Lateral projections triangular, produced to level of rostrum, each with submarginal spinule.

Ocular peduncle (Fig. 6A) about 0.9 length of shield, slender, not markedly widened basally; dorsal surface with tuft of moderately long setae at base of cornea, followed by tufts of or individual setae; cornea normally developed, rounded, not dilated, longer than wide, corneal width approximately

0.3 of peduncular length. Ocular acicle small, triangular, without submarginal or subterminal spinule, separated to each other basally by basal width of more than 1 acicle. Interocular lobe with convex anterior surface.

Antennular peduncle (Fig. 6A), when fully extended, overreaching distal corneal margin by full length of ultimate segment. Basal segment with spinule proximolaterally. Ultimate segment 0.7 length of shield, slightly broadened distally in lateral view, with 2 long plumose setae at dorsolateral distal portion. Dorsal flagellum with distal portion distinctly longer than proximal aesthetasc-bearing portion.

Antennal peduncle (Fig. 6A) slightly falling short of distal corneal margin. Fifth and fourth segments with few short setae. Third segment with 1 prominent spine at ventromesial distal margin. Second segment with dorsolateral distal angle produced in simple spine nearly reaching midlength of fourth segment; dorsomesial distal angle with minute spine. First segment unarmed. Antennal acicle slender, slightly sinuous, slightly falling short of distal corneal margin, terminating in slender spine and with row of short to long setae over entire length. Antennal flagellum long, exceeding

4.0 times of shield length; articles each with 1 short or long seta at each lateral and mesial angle.

Third maxilliped relatively stout; crista dentata on ischium consisting of 2 teeth (Fig. 6B). Carpus without dorsodistal spine.

Chelipeds (Figs. 7, 8A–D) distinctly unequal in length and dissimilar. Right cheliped (Fig. 7) large, but not particularly elongate; propodal-carpal articulation rotated clockwise about 30° from perpendicular. Chela about 1.7 times longer than wide, widest at base of dactylus. Dactylus articulating obliquely with palm, about 0.7 length of palm, somewhat curved ventrally; dorsal surface convex, dorsomesial margin not delimited, unarmed; cutting edge with 3 prominent, triangular calcareous teeth, terminating in tiny corneous claw; tufts of short to moderately long setae arranged in irregular longitudinal rows on surfaces. Palm 1.1 times longer than carpus; dorsal surface convex, bearing several tiny tubercles chiefly on mesial half and 1 prominent proximomedian tubercle; and scattered short setae; dorsolateral and dorsomesial margins not delimited; lateral and mesial faces with few tufts of short to moderately

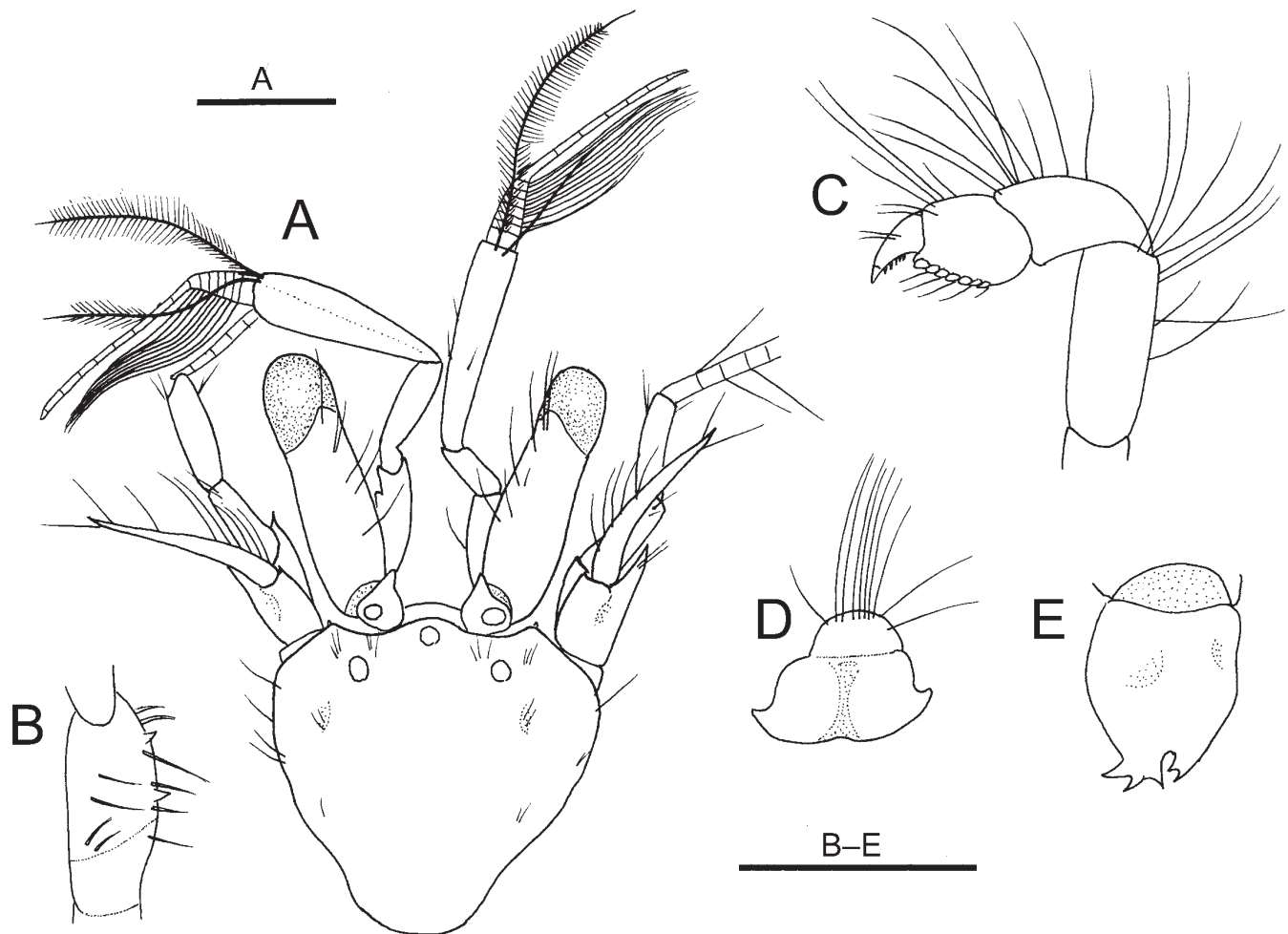


Fig. 6. *Catapaguroides crassimanus*, new species, holotype, female (sl 1.1 mm), PANGLAO 2004, stn T14, NMCR 39063. A, shield and cephalic appendages, dorsal view; B, ischium-basis of right third maxilliped, ventral view; C, left fourth pereopod, lateral view; D, sixth thoracic sternite, ventral view; E, telson, dorsal view. Scale bars = 0.5 mm.

long setae; ventral surface slightly convex, almost glabrous. Fixed finger with 2 prominent calcareous teeth on cutting edge, terminating in minute corneous claw. Carpus about 1.4 length of merus, slightly broadened distally, about 1.6 times longer than distal width; dorsal surface devoid of conspicuous spines, but mesially with few tiny tubercles and laterally with longitudinal row of 3 tiny tubercles, dorsodistal margin also with tiny tubercle laterally; dorsomesial margin not delimited; mesial surface with short to long stiff setae dorsally, ventromesial margin with tiny

distal spine; lateral surface with few short setae dorsally, ventrodistal angle slightly produced, but unarmed; ventral surface convex, with few short setae. Merus with row of sparse short to long setae on dorsal surface; dorsodistal margin with 1 small spine mesially; lateral surface glabrous, ventrolateral margin slightly concave, with 3 moderately small spines in distal half; mesial surface also glabrous, ventromesial margin with 4 spines in distal half; ventral surface strongly convex, with few moderately short setae. Ischium unarmed, with short setae on dorsal margin.

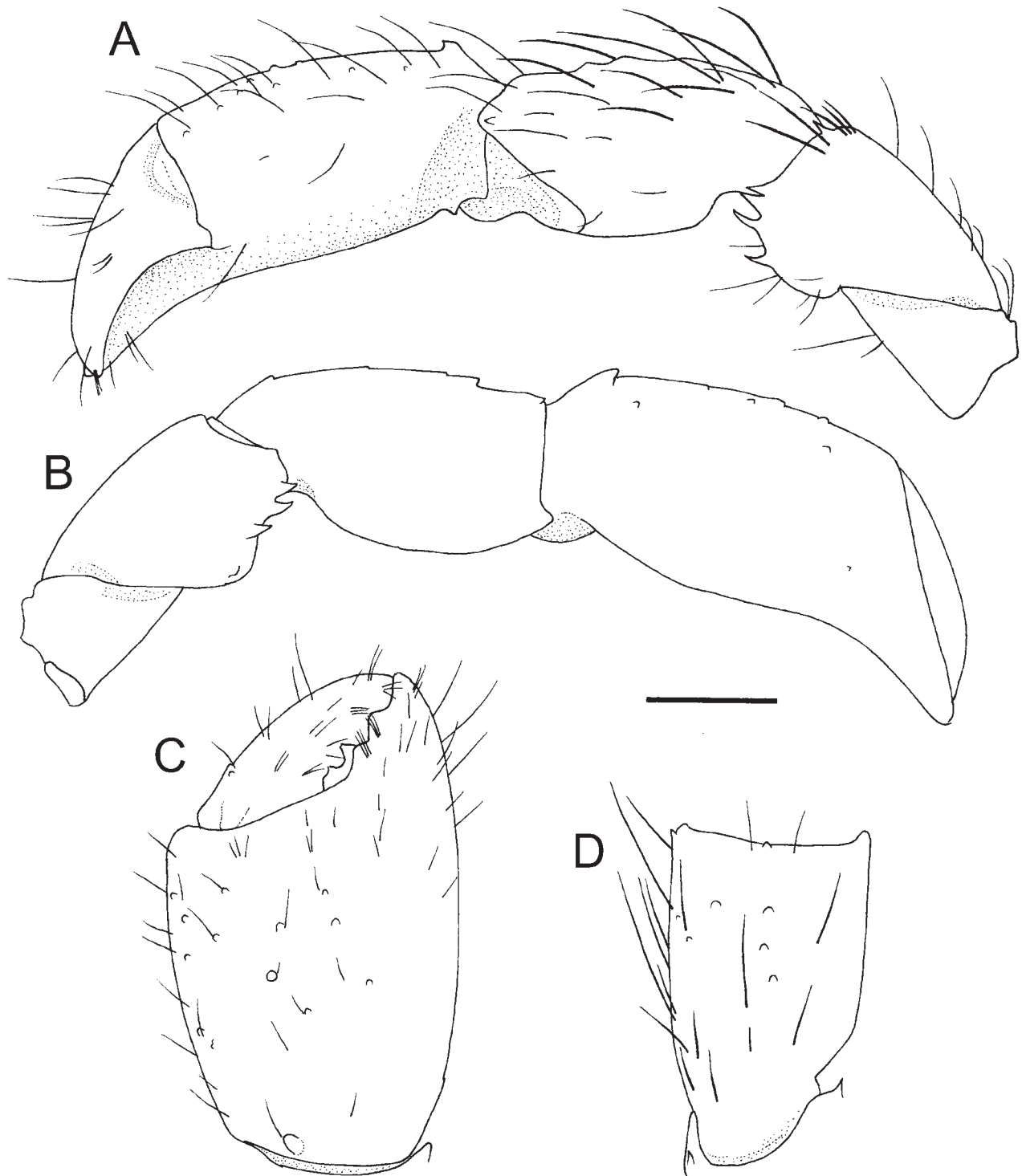


Fig. 7. *Catapaguroides crassimanus*, new species, holotype, female (sl 1.1 mm), PANGLAO 2004, stn T14, NMCR 39063. A, right cheliped, mesial view; B, same, lateral view (setae omitted); C, same, chela, dorsal view; D, same, carpus, dorsal view. Scale bar = 0.5 mm.

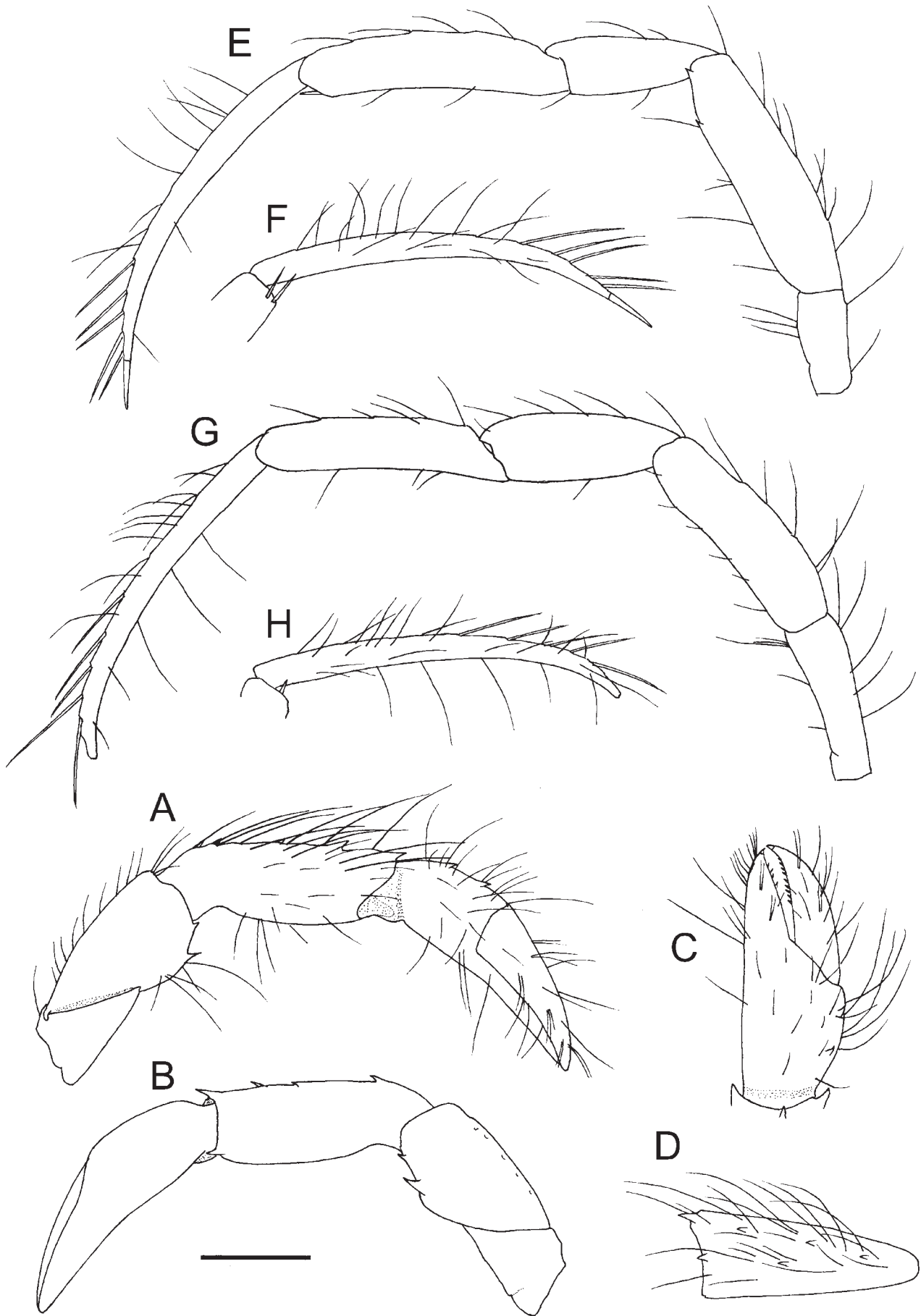


Fig. 8. *Catapaguroides crassimanus*, new species, holotype, female (sl 1.1 mm), PANGLAO 2004, stn T14, NMCR 39063. A, left cheliped, mesial view; B, same, lateral view (setae omitted); C, same, chela, dorsal view; D, same, carpus, dorsal view; E, left second pereopod, lateral view; F, same, dactylus, mesial view; G, left third pereopod, lateral view; H, same, dactylus, mesial view. Scale bar = 0.5 mm.

Left cheliped (Fig. 8A–D) relatively slender, reaching base of dactylus of right cheliped; propodal-carpal articulation rotated counterclockwise 20° from perpendicular. Chela 2.5 times longer than wide, not arched. Dactylus and fixed finger slightly curved ventrally, without hiatus; dactylus about 1.5 length of palm, unarmed, with scattered tufts of short to long setae; dorsomesial margin not delimited; cutting edge with row of minute corneous teeth, terminating in small corneous claw. Palm about half length of carpus; dorsal surface slightly convex, with 2 spines mesially; surfaces with tufts of or individual short to long setae arranged in irregular longitudinal rows. Fixed finger with row of minute corneous teeth on distal half of cutting edge, terminating in small corneous claw. Carpus longer than merus; slightly widened distally, about 2.7 times longer than distal width; dorsal surface laterally with 1 small spine (located slightly distal to midlength) and mesially with 3 spines, and with tufts of long setae laterally and mesially; dorsodistal margin armed with 1 spine at each lateral and mesial angle; lateral and mesial faces with scattered short setae; ventrolateral distal angle with 1 small spine; ventral surface slightly convex, with some short to long setae. Merus with row of short setae on dorsal margin; dorsodistal margin unarmed; ventrolateral margin slightly concave in distal half, with 2 spines subdistally (distal spine minute, proximal spine strong); ventromesial margin also with 2 small spine in distal half, similarly unequal as those on ventrolateral margin; ventral surface strongly convex, with several scattered long setae. Ischium spineless.

Ambulatory legs (Fig. 8E, G) long and slender (right second pereopod missing). Dactyli (Fig. 8F, H) 1.5–1.6 times longer than propodi, 13.4 times longer than wide, straight in dorsal view, slightly curved ventrally in lateral view, terminating in long, slender corneous claws; dorsal margins each with row of stiff setae increasing in length distally, distal 5 or 6 setae thickened, bristle-like; mesial faces each with row of stiff setae on midline; ventral margin unarmed. Propodi each with pair of (second) or single mesial (third) corneous spinules on ventrodistal margin (spinules on second longer than those of third); dorsal and ventral margins with sparse short to long stiff setae. Carpi each unarmed at dorsodistal angle, few short to long setae on dorsal margin. Meri each armed with 1 distal and 1 subdistal spines on ventrolateral margin (second) or unarmed (third); dorsal and ventral margins each with row of short to long setae. Ischium with few long setae on dorsal and ventral margins. Second pereopods with shallow notch on ventral margin at articulation between merus and ischium. Female with unpaired left gonopore.

Fourth pereopod (Fig. 6C) semichelate; dactylus with several minute corneous teeth on ventral margin; propodal rasp consisting of 7 corneous scales arranged in single row. Fifth pereopods semichelate.

Anterior lobe of sixth thoracic sternite (Fig. 6D) subsemicircular, slightly skewed to left, with long setae on anterior margin.

Telson (Fig. 6E) longer than wide, narrowed posteriorly in posterior half; no lateral indentations; posterior lobes strongly asymmetrical, separated by deep median cleft; left terminal margin with 2 strong spines and laterally directed, spinose outer angle, right terminal margin strongly oblique, with 1 small spine and spinose outer angle.

Male unknown.

Colouration. — Not known.

Distribution. — Known only from the type locality, 101–110 m.

Remarks. — *Catapaguroides crassimanus*, new species, appears close to *C. fragilis* (Melin, 1939) and *C. setosus* (Edmondson, 1951) in the following characters: cornea normally developed; antennal peduncle not overreaching distal corneal margin; right chela with subrectangular palm in dorsal view; and palm and carpus of left cheliped armed with spines on dorsal surface. The structure and armature of the right cheliped is considerably different among the three species. In *C. crassimanus*, the dorsomesial margin of the dactylus is not delimited; the palm is slightly widened distally, 1.1 times longer than wide, and bears scattered tiny tubercles on the mesial half of the dorsal surface and one relatively prominent tubercle proximally on the dorsal midline; the dorsolateral margin of the palm is not delimited; and the carpus bears tiny tubercles on the dorsal surface, but without mesial spines arranged in a longitudinal row. In *C. fragilis*, the dorsomesial margin of the dactylus is not delimited; the palm is not particularly widened distally, 1.4 times longer than wide, and bears a mesial row of small spines and one prominent proximal spine on the dorsal surface; the dorsolateral margin of the palm is not delimited; and the carpus bears a row of spines on the dorsolateral margin (de Saint Laurent, 1968; this study). In *C. setosus*, the dorsomesial margin of the dactylus is provided with a prominent, thin ridge; the palm is distinctly widened distally and armed with a dorsomesial row of four small spines; the dorsolateral margin of the palm is delimited by a slightly elevated ridge; the carpus is devoid of conspicuous spines (McLaughlin & Pittman, 2002). Furthermore, the antennular peduncle overreaches the distal corneal margin by the full length of the ultimate segment in the new species, but it overreaches the latter only by 0.3–0.5 length of the ultimate segment in *C. fragilis* and *C. setosus* (McLaughlin & Pittman, 2002; this study). The armature of the telson is also different among the three species. The terminal margins of the posterior lobes bear prominent spines (those on the left lobe are particularly strong) in *C. crassimanus*, but they are unarmed in *C. setosus*. de Saint Laurent (1968) described the armature of the terminal margins of the telson of *C. fragilis* as “trois epines fines et courtes sur le bord interne”. In the specimen of *C. fragilis* examined in this study, the left terminal margin is unarmed, while the right terminal margin bears one tiny spine.

Etymology. — From the combination of the Latin, “*crassus*” [= thick] and “*manus*” [= hand], in reference to the relatively

thick female right cheliped in this new species. Used as a noun in apposition.

***Catapaguroides cristimanus* de Saint Laurent, 1968**

(Figs. 9–11)

Catapaguroides cristimanus de Saint Laurent, 1968: 949, fig. 30; Asakura, 2004: 456, fig. 1; 2005: 133, figs. 1, 2A, B; McLaughlin et al., 2010: 28 (list)

Material examined. — Two females (sl 1.3, 1.3 mm), PANGLAO 2004, stn T1, Bolod, Panglao Island, 09°32.4'N, 123°47.3'E, 83–102 m, mud with many sponges, 30 May 2004, ZRC 2012.1093.

Additional material. — One male (sl 2.5 mm), TRV *Toyoshio-maru*, 1996-6 cruise, stn 7, SE of Tanegashima Island, Ohsumi Islands, 30°15.00'N, 130°45.00'E, 75 m, sand, 2 Jun.1996, dredge, coll. T. Komai, CBM-ZC 9019.

Description. — Ten pairs of biserial phyllobranchiate gills; 2 arthrobranchs on third maxilliped each reduced to minute bud; other arthrobranchs distinctly lamellate; no pleurobranchs on wall of seventh thoracic somite.

Shield (Fig. 9A) approximately as long as wide; anterior margins between rostrum and lateral projections concave; anterolateral margins sloping, posterior margin truncate; dorsal surface with tufts of short setae laterally. Rostrum rounded. Lateral projections triangular, produced to level of rostrum, with marginal spine.

Ocular peduncle (Fig. 9A) subequal in length to shield, slender, slightly widened basally; dorsal surface mesially with 2 or 3 tufts of moderately long setae in distal 0.7; corneas normally developed, rounded, slightly dilated, slightly longer than wide, corneal width 0.3 of peduncular length. Ocular acicle small, triangular, with submarginal distal spinule, separated to each other basally by more than basal width of 1 acicle. Interocular lobe with slightly convex anterior surface.

Antennular peduncle (Fig. 9A), when fully extended, overreaching distal corneal margin by approximately entire length of ultimate segment. Basal segment elongate, with small spine proximolaterally. Ultimate segment 0.8 length of shield, slightly widened distally in lateral view, with 2 long plumose setae at dorsolateral distal portion. Dorsal flagellum longer than ultimate peduncular segment, distal portion exceeding twice length of proximal aesthetasc-bearing portion.

Antennal peduncle (Fig. 9A) slightly falling short of distal corneal margin. Fifth and fourth segments with few short setae. Third segment with 1 prominent spine at ventromesial distal angle. Second segment with dorsolateral distal angle strongly produced in simple or bifid spine not reaching midlength of fourth segment; dorsomesial distal angle with small spine. First segment unarmed. Antennal acicle slender, gently arcuate, slightly overreaching base of cornea, terminating in slender spine, with row of short to long stiff

setae along entire length. Antennal flagellum exceeding 4.0 times of shield length; articles each with several short to long setae on distal margin (long setae present every 4 or 5 articles).

Third maxilliped moderately stout; crista dentata on ischium consisting of 2–4 sharp teeth. Carpus without dorsodistal spine.

Chelipeds (Figs. 10, 9B–E) appreciably unequal and dissimilar. Female right cheliped (Fig. 10A–E) large, not elongate; propodal-carpal articulation rotated clockwise about 40° from perpendicular. Chela subcircular, operculiform, about 1.4 times longer than wide, widest at base of dactylus. Dactylus broad, articulating obliquely with palm, strongly curved ventrally; dorsal surface slightly elevated in midline and slightly upturned along mesial margin, unarmed, bearing tufts of short setae along midline; mesial margin lamellar; ventral surface channeled laterally and elevated mesially, with tufts of short setae along cutting edge; cutting edge with 3 triangular calcareous teeth, terminating in small corneous claw. Palm about 1.1 length of carpus, widened distally; dorsal surface slightly convex, with dorsomesial row of 3 or 4 small spines and with longitudinal rows of tufts of short setae, median row of setae extending onto fixed finger; lateral part strongly compressed dorsoventrally, upturned along lateral margin, lateral margin lamellar; dorsomesial margin not distinctly delimited; ventral surface slightly convex in general, almost glabrous. Fixed finger very broad, with tufts of short setae along lateral margin; cutting edge with 2 triangular calcareous teeth, terminating in small calcareous claw. Carpus subequal in length to merus, widened distally, 1.1–1.2 times longer than distal width; dorsal surface with row of 5 or 6 small spines on slightly elevated midline, including distal marginal spine; dorsomesial distal angle with 1 minute spine; lateral surface almost glabrous, ventrolateral distal angle unarmed; mesial face with some tufts of long setae dorsally; ventral surface convex. Merus with few tufts of stiff setae on dorsal surface; dorsodistal margin with 1 small spine mesially; lateral surface glabrous, ventrolateral margin with 2 small spines distally; mesial surface almost glabrous, ventromesial margin strongly raised, with 4 small spines distally; ventral surface convex laterally, with few setae. Ischium unarmed.

Male right cheliped (Fig. 10F) generally similar to female right cheliped, but proportionally longer. Chela subrectangular, 1.8 times longer than wide. Carpus 1.5 times longer than distal width.

Left cheliped (Fig. 9B–E) moderately slender, reaching midlength of dactylus of right chela; propodal-carpal articulation rotated counter-clockwise 20° from perpendicular. Chela not arched; no hiatus between fingers. Dactylus about 1.4 length of palm, unarmed, with sparse tufts of short to long setae; dorsomesial margin not delimited; cutting edge with row of small corneous teeth in distal 0.7, terminating in small corneous claw. Palm about half length of carpus; dorsal surface slightly convex, unarmed; surfaces

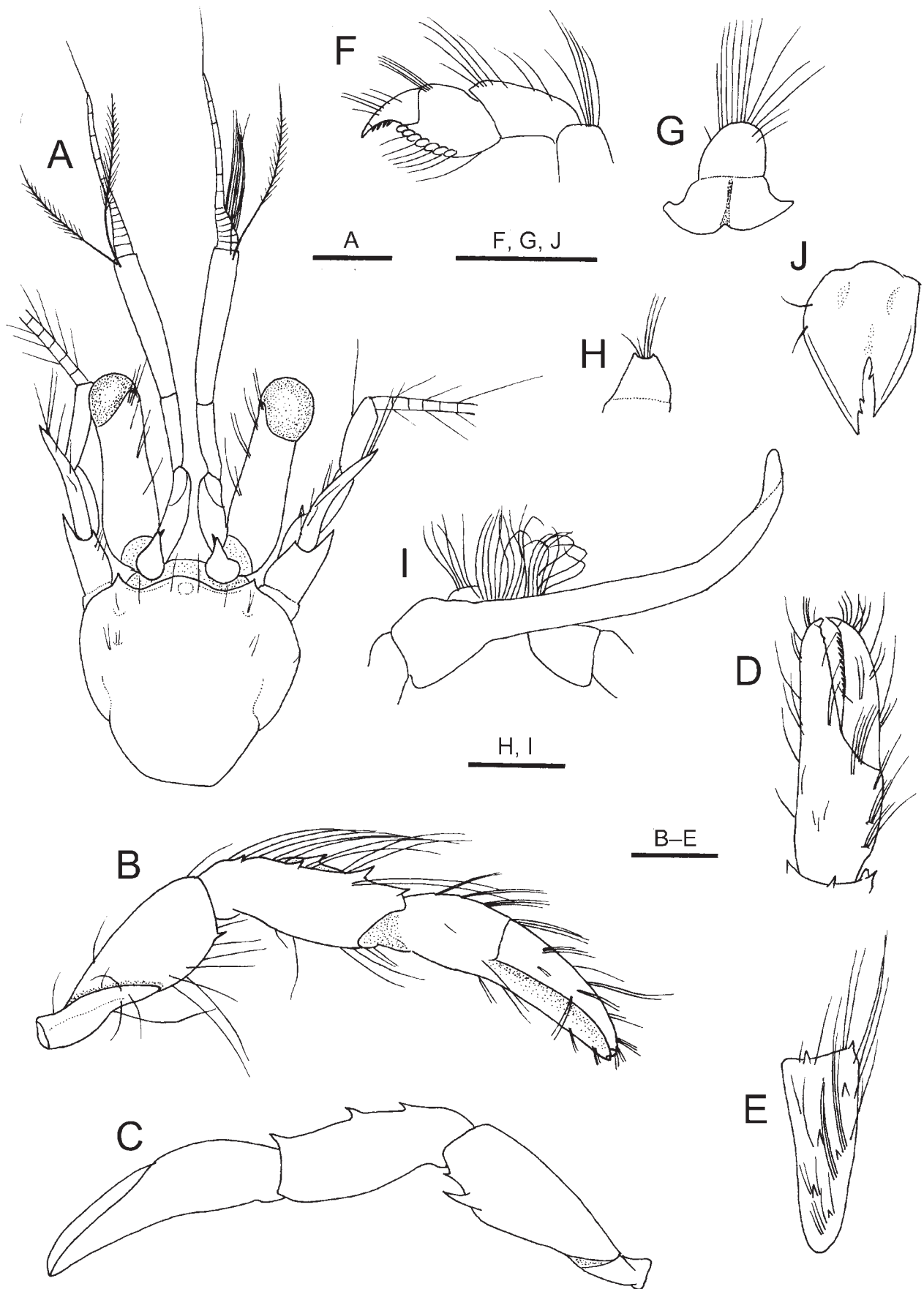


Fig. 9. *Catapaguroides cristimanus* de Saint Laurent, 1968. A–E, F, G, J, female (sl 1.3 mm), PANGLAO 2004, stn T1, ZRC 2012.1093; H, I, male (sl 2.5 mm), SE of Tanegashima Island, Ohsumi Islands, Japan, CBM-ZC 9019. A, shield and cephalic appendages, dorsal view; B, left cheliped, mesial view; C, same, lateral view (setae omitted); D, same, chela, dorsal view; E, same, carpus, dorsal view; F, distal three segments of left fourth pereopod, lateral view; G, sixth thoracic sternite, ventral view; H, anterior lobe of sixth thoracic sternite, ventral view; I, coxae of fifth pereopods and eighth thoracic sternite, ventral view; J, telson, dorsal view. Scale bars = 0.5 mm.

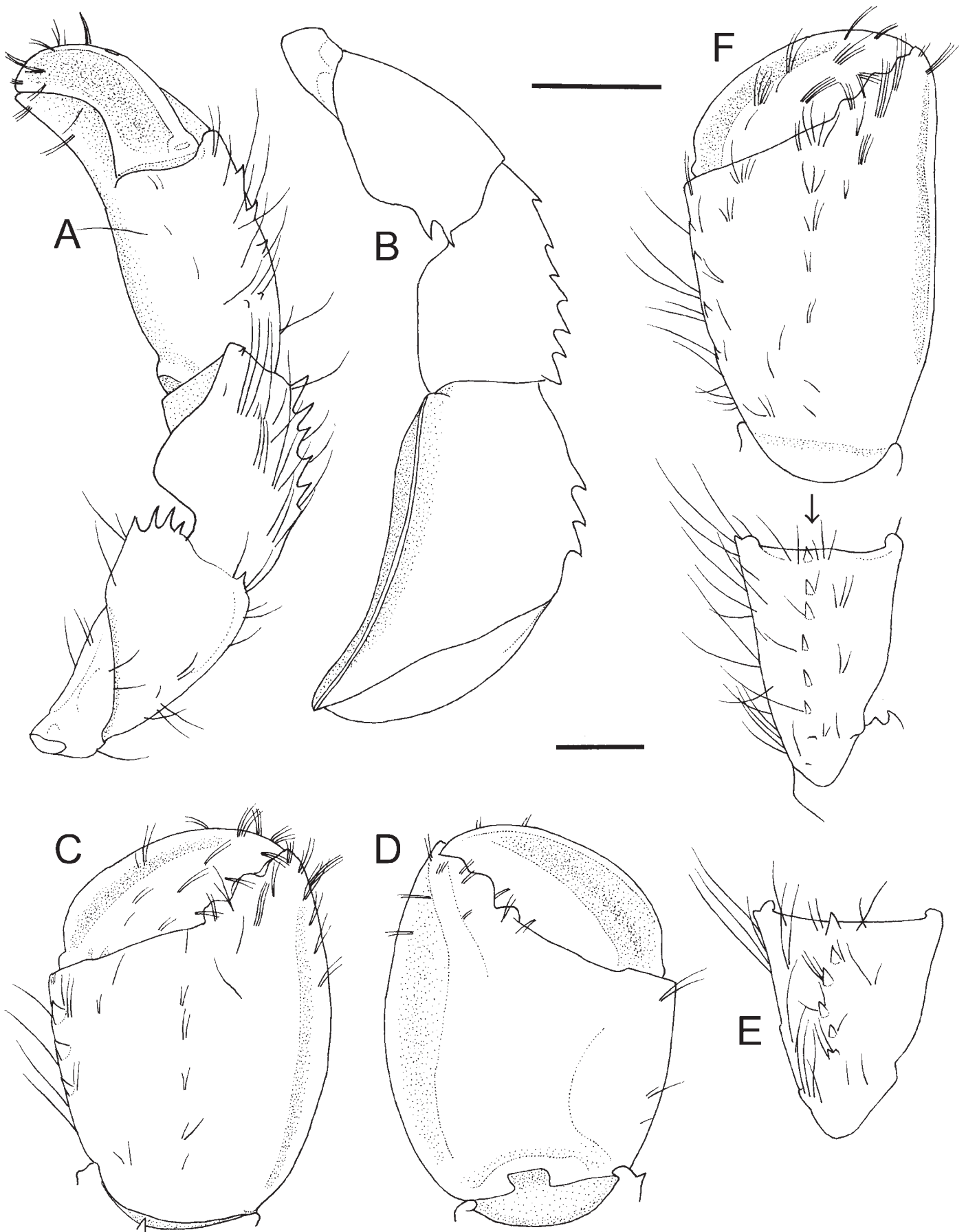


Fig. 10. *Catapaguroides cristimanus* de Saint Laurent, 1968. A–E, female (sl 1.3 mm), PANGLAO 2004, stn T1, ZRC 2012.1093; F, male (sl 1.6 mm), SE of Tanegashima Island, Ohsumi Islands, Japan, CBM-ZC 9019. A, right cheliped, mesial view; B, same, lateral view (setae omitted); C, same, chela, dorsal view; D, same, ventral view; F, chela and carpus of right cheliped, dorsal view. Scale bars = 1 mm (F); 0.5 mm (A–E).

with tufts of short to long setae. Fixed finger with cutting edge thin, faintly denticulate, terminating in small corneous claw. Carpus slightly widened distally; dorsal surface with dorsolateral row of 3 small spines and dorsomesial row of 4 small spines (including those on dorsodistal margin) and with dorsomesial row of tufts of long stiff setae obscuring armature; lateral and mesial surfaces glabrous, ventrolateral distal angle unarmed; ventral surface slightly convex, with few long setae. Merus with few tufts of moderately long setae on dorsal margin; dorsodistal margin unarmed; ventrolateral margin with 2 strongly unequal subdistal spines (proximal spine strong); ventromesial margin with 1 small distal spine; ventral surface slightly convex, with some long setae. Ischium unarmed.

Ambulatory legs (Fig. 11A, D) long and slender. Dactyli (Fig. 11B, E) 1.4–1.6 times longer than propodi, 15.0–16.0 times longer than wide, straight in dorsal view, slightly curved ventrally in lateral view, terminating in elongate, slender corneous claws; dorsal margins each with sparse short setae; mesial faces each with dorsal row of moderately long thick bristles and ventral row of 4 or 5 slender corneous spines, and with additional row of bristles adjacent to ventral corneous spines in second. Propodi of second pereopods (Fig. 11C) each with cluster of 7 or 8 corneous spines (male) or 2 small slender corneous spines (female) on ventrodistal margin, those of third with 1 or 2 small corneous spines ventrodistally. Carpi each with minute dorsodistal spine. Meri with 1 minute ventrolateral distal spine (second) or

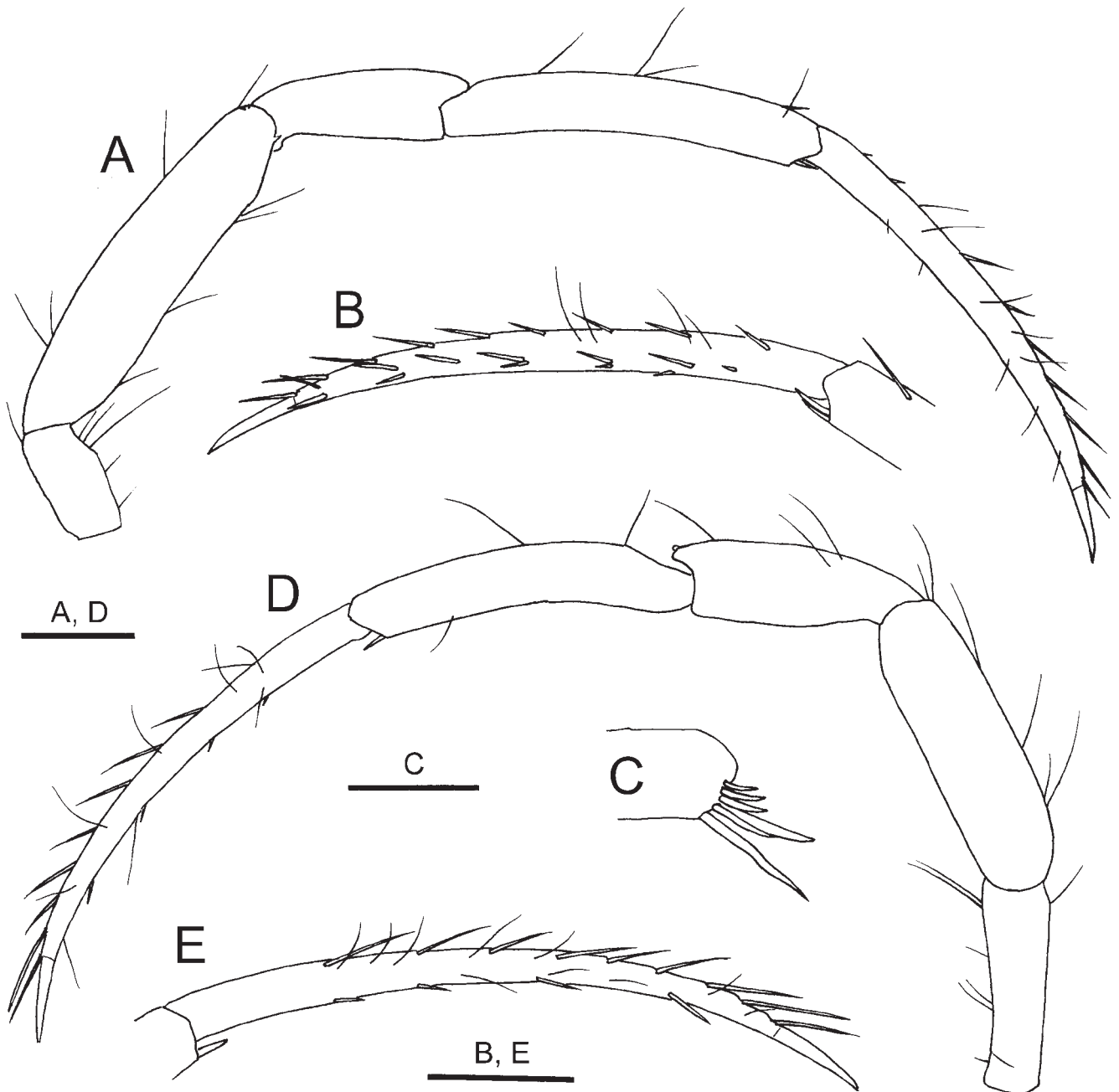


Fig. 11. *Catapagurooides cristimanus* de Saint Laurent, 1968, female (sl 1.3 mm), PANGLAO 2004, stn T1, ZRC 2012.1093; C, male (sl 1.6 mm), SE of Tanegashima Island, Ohsumi Islands, Japan, CBM-ZC 9019. A, right second pereopod, lateral view; B, same, dactylus, mesial view (dorsal setae partially omitted); C, distal part of propodus of right second pereopod, lateral view, showing armature on ventrodistal margin; D, left third pereopod, lateral view; E, same, dactylus, mesial view (dorsal setae partially omitted). Scale bars = 0.5 mm.

unarmed (third); dorsal margins each with few moderately long setae. Ischia unarmed. Second pereopods with deep notch on ventral margin at articulation between merus and ischium. Female with unpaired left gonopore.

Fourth pereopod (Fig. 9F) semichelate; dactylus with several minute corneous teeth on ventral margin; propodal rasp consisting of 6 or 7 corneous scales arranged in single row. Fifth pereopods semichelate.

Anterior lobe of sixth thoracic sternite (Fig. 9G, H) relatively narrow, subsemicircular to subtrapezoidal, slightly skewed to left; anterior margin unarmed or armed with pair of minute tubercles, and with short to long setae.

Male with long sexual tube extending from coxa of right fifth pereopod (Fig. 9I), directed anterolaterally from right to left across ventral body surface and overreaching lateral margin of left coxa by more than half length of tube. Left coxa with papilla-like short sexual tube directed anteromesially, concealed by right tube and thick setae arising from eighth thoracic sternite.

Telson (Fig. 9J) narrowed posteriorly in posterior half; no lateral indentations; posterior lobes slightly asymmetrical, separated by deep median cleft; terminal margins strongly oblique, each with 1 or 2 small spines and spinose outer angle; lateral margins each delimited by chitinous plate.

Colouration. — See Asakura (2005).

Distribution. — Previously known from Kai Islands, Indonesia, and Ryukyu Islands, Japan, at depths of 90–200 m. The present specimens represent the first record of this species from the Philippines.

Remarks. — In her original description of *C. cristimanus*, de Saint Laurent (1968) noted that the antennal peduncle overreaches the distal corneal margin by the half-length of the fifth segment. However, Asakura (2004), who examined the type series (including the holotype and two paratypes) and additional specimens from Japan, showed that the antennal peduncle does not overreach the distal corneal margin in *C. cristimanus*. In addition, de Saint Laurent (1968) mentioned the presence of two mesial tubercles on the left palm in the original description, but Asakura (2004) indicated that there were no such tubercles. The present specimens well support Asakura's (2004) observation.

As McLaughlin (1997) argued, *C. cristimanus* appears closest to *C. karubar* in having an operculiform right chela. Differentiating characters between the two species are discussed under the account of *C. karubar*.

***Catapaguroides hirsutus*, new species**

(Figs. 12–14)

Material examined. — Holotype: male (sl 1.3 mm), PANGLAO 2004, stn T39, W of Pamilacan Island, 09°30.1'N, 123°50.4'E, 100–138 m, muddy sand, 4 Jul.2004, NMCR 39064.

Description. — Ten pairs of biserial phyllobranchiate gills; third maxilliped with 2 small arthrobranchs, both weakly lamellate; cheliped with distinctly lamellate arthrobranchs; no pleurobranchs on wall of seventh thoracic somite.

Shield (Fig. 12A) as long as wide; anterior margins between rostral lobe and lateral projections concave; anterolateral margins slightly terraced, posterior margin roundly truncate; dorsal surface almost glabrous, with few tufts of short setae laterally. Rostrum roundly triangular. Lateral projections roundly triangular, produced to level of rostrum, without marginal or submarginal spinule.

Ocular peduncle (Fig. 12A) slender, subequal in length to shield, slightly constricted at midlength; dorsal surface mesially with row of 4 tufts of stiff setae increasing in length distally; cornea normally developed, rounded, not dilated, longer than wide, corneal width approximately 0.3 of peduncular length. Ocular acicle triangular, with minute submarginal spinule, separated to each other basally by basal width of 2 acicles. Interocular lobe with convex anterior surface.

Antennular peduncle (Fig. 12A), when fully extended, overreaching distal corneal margin by full length of ultimate segment. Basal segment with spinule proximolaterally. Ultimate segment 0.8 length of shield, slightly broadened distally in lateral view, with 2 long plumose setae at dorsolateral distal portion. Dorsal flagellum longer than ultimate peduncular segment, with distal portion more than twice length of proximal aesthetasc-bearing portion.

Antennal peduncle (Fig. 12A) nearly reaching distal corneal margin. Fifth and fourth segments with few short setae. Third segment with 1 prominent spine at ventromesial distal margin. Second segment with dorsolateral distal angle produced in bifid spine falling short of midlength of fourth segment; dorsomesial distal angle with minute spine. First segment unarmed. Antennal acicle slender, slightly arcuate, overreaching corneal base but not reaching distal corneal margin, terminating in slender spine, with row of short to long stiff setae over entire length. Antennal flagellum exceeding 5.0 times of shield length; articles each principally with few short setae on distal margin, about 10 articles in proximal part with few moderately long setae.

Third maxilliped moderately stout, with crista dentata on ischium consisting of 4 teeth (Fig. 12B). Carpus without dorsodistal spine.

Chelipeds greatly unequal in length and dissimilar (Figs. 12C–F, 13). Right cheliped (Fig. 13) elongate; propodal-carpal articulation rotated clockwise about 30° from

perpendicular. Chela about 2.7 times longer than wide, widest at proximal to base of dactylus. Dactylus articulating obliquely with palm, about 0.6 length of palm, somewhat curved ventrally; dorsal surface convex, dorsomesial margin not delimited, unarmed; cutting edge with 3 blunt, triangular calcareous teeth, terminating in tiny corneous claw; scattered tufts of short to moderately long setae on surfaces. Palm 0.8 times longer than carpus, very slightly widened distally; dorsal surface convex, unarmed, with numerous scattered, short to long setae; dorsolateral and dorsomesial margins not delimited; lateral, mesial and ventral surfaces also with tufts of short to long setae; ventral surface slightly convex. Fixed finger with 2 blunt triangular calcareous teeth on cutting edge, terminating in minute corneous claw. Carpus subcylindrical, about 1.3 length of merus, not broadened distally, about 3.1 times longer than distal width; dorsal surface devoid of conspicuous spines, but laterally and mesially with some minute tubercles in distal half; ventrolateral distal angle and ventromesial distal margin unarmed; surfaces with numerous scattered tufts of short to long setae; dorsomesial setae in proximal one-third thickened, bristle-like. Merus with transverse rows of thick, bristle-like setae on dorsal surface; dorsodistal margin without spine; lateral surface with few tufts of setae, ventrolateral margin generally convex, with 2 small spines distally; mesial surface mostly glabrous except for ventral part, ventromesial margin with 2 small spines at distal angle; ventral surface gently convex, with numerous tufts of long setae. Ischium unarmed, but bearing long thick, bristle-like setae on dorsal margin.

Left cheliped (Fig. 12 C–F) slender, reaching midlength of right chela; propodal-carpal articulation without rotation. Chela not arched, 3.4 times longer than wide. Dactylus and fixed finger slightly curved ventrally, without hiatus; dactylus subequal in length to palm, unarmed, with numerous tufts of short to long setae; dorsomesial margin not delimited; cutting edge with row of minute corneous teeth, terminating in small corneous claw. Palm approximately half length of carpus; dorsal surface moderately convex, spineless; surfaces with numerous tufts of or individual short to long setae. Fixed finger with row of minute corneous teeth on distal half of cutting edge, terminating in small corneous claw. Carpus elongate, slightly widened distally, about 3.8 times longer than distal width; dorsal surface with 1 tiny spine (located distal to midlength) laterally, 3 widely spaced tiny spines mesially, and with numerous tufts of long setae (proximal setae becoming thick, bristle-like); dorsodistal margin armed with 1 small spine at mesial angle; lateral, mesial and ventral surfaces also with numerous long setae, unarmed on ventrolateral distal angle; ventral surface slightly convex. Merus with short transverse rows of short to long stiff setae on dorsal surface; dorsodistal margin unarmed; ventrolateral margin generally convex, with 2 small spines subdistally (distal spine smaller than proximal spine); ventromesial margin also convex, unarmed; ventral surface strongly convex, with numerous long setae. Ischium spineless.

Ambulatory legs (Fig. 14A, C) long and slender. Dactyli (Fig. B, D) 1.3–1.6 times longer than propodi, 16.0 times

longer than wide, straight in dorsal view, gently curved ventrally in lateral view, terminating in long, slender corneous claws; dorsal margins each with row of stiff setae increasing in length distally, distal 6–9 setae thickened, bristle-like; mesial faces each with row of short stiff setae on midline; ventral margin with 0–1 slender submedian spine. Propodi each with pair of long, slender corneous spines flanked by 2 pairs of much shorter spines on ventrodorsal margin (second) or unarmed (third); dorsal and ventral margins with sparse, short stiff setae. Carpi each with minute dorsodistal spine; sparse, short to moderately long setae on dorsal margin. Meri each with 1 tiny distal spine on ventrolateral margin (second) or unarmed (third); dorsal margins each with row of short to moderately long setae; ventral margins with sparse long setae (second) or glabrous (third). Ischia with dorsal margins naked (second) or with row of short setae (third); ventral margins with short sparse setae. Second pereopods with conspicuous notch on ventral margin at articulation between merus and ischium.

Fourth pereopod (Fig. 12G) semichelate; dactylus with several minute corneous teeth on ventral margin; propodal rasp consisting of 6 corneous scales arranged in single row. Fifth pereopods semichelate.

Anterior lobe of sixth thoracic sternite (Fig. 12H) subtrapezoidal, with minute tubercle at each anterolateral angle, slightly skewed to left, bearing moderately short setae on anterior margin.

Male with short sexual tube emanating from coxa of right fifth pereopod (Fig. 12I), directed from right to left, slightly thickened in distal 0.4, reaching lateral margin of coxa of left fifth pereopod. Coxa of left with short, papilla-like sexual tube directed anteromesially, partially obscured by adjacent tufts of setae. Eighth thoracic sternite (Fig. 12I) with single broad lobe bearing dense short setae.

Telson (Fig. 12J) longer than wide, narrowed posteriorly in posterior half; no lateral indentations; posterior lobes strongly asymmetrical, separated by deep median cleft; left terminal margin with 3 strong spines and laterally directed, spinose outer angle; right terminal margin strongly oblique, with 2 small spines and spinose outer angle.

Female unknown.

Colouration. — Not known.

Distribution. — Known only from the type locality, 100–138 m.

Remarks. — *Catapaguroides hirsutus*, new species, somewhat resembles *C. iejimensis* Osawa & Takeda, 2004 and *C. umbra* Komai, 2009 in sharing the following features: cornea normally developed and rounded; antennal peduncle not overreaching distal corneal margin; palm of left cheliped unarmed; and carpus of left cheliped armed with small spines on dorsal surface. The greatly elongate right cheliped is one of the obvious characters that differentiate

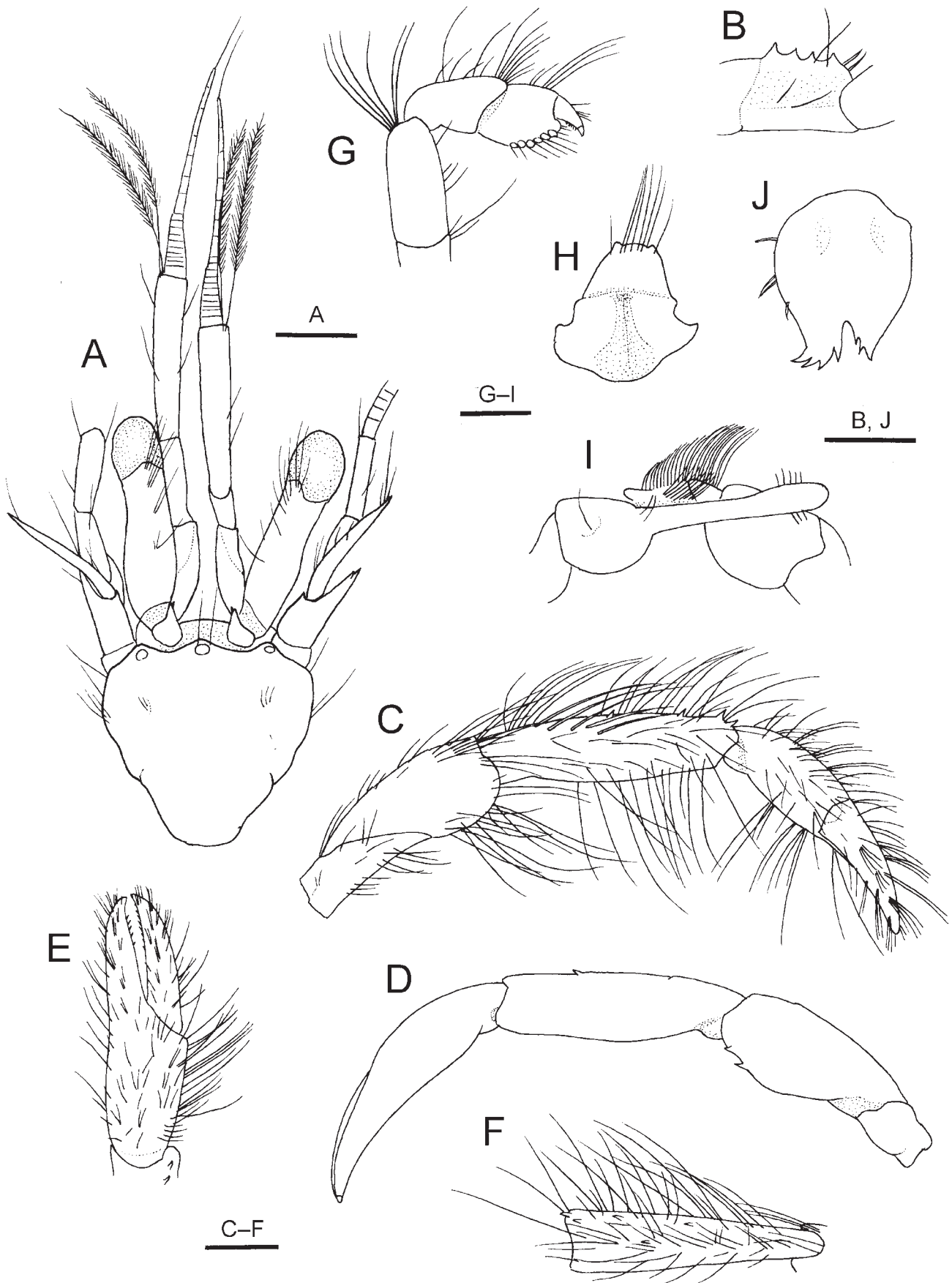


Fig. 12. *Catapaguroides hirsutus*, new species, holotype, male (sl 1.3 mm), PANGLAO 2004, stn T39, NMCR 39064. A, shield and cephalic appendages, dorsal view; B, ischium-basis of left third maxilliped, ventral view; C, left cheliped, mesial view; D, same, lateral view (setae omitted); E, same, chela, dorsal view; F, same, carpus, dorsal view; G, right fourth pereopod, lateral view; H, sixth thoracic sternite, ventral view; I, coxae of fifth pereopods and eighth thoracic sternite, ventral view; J, telson, dorsal view. Scale bars = 0.5 mm (A, C-F); 0.25 mm (B, G-J).

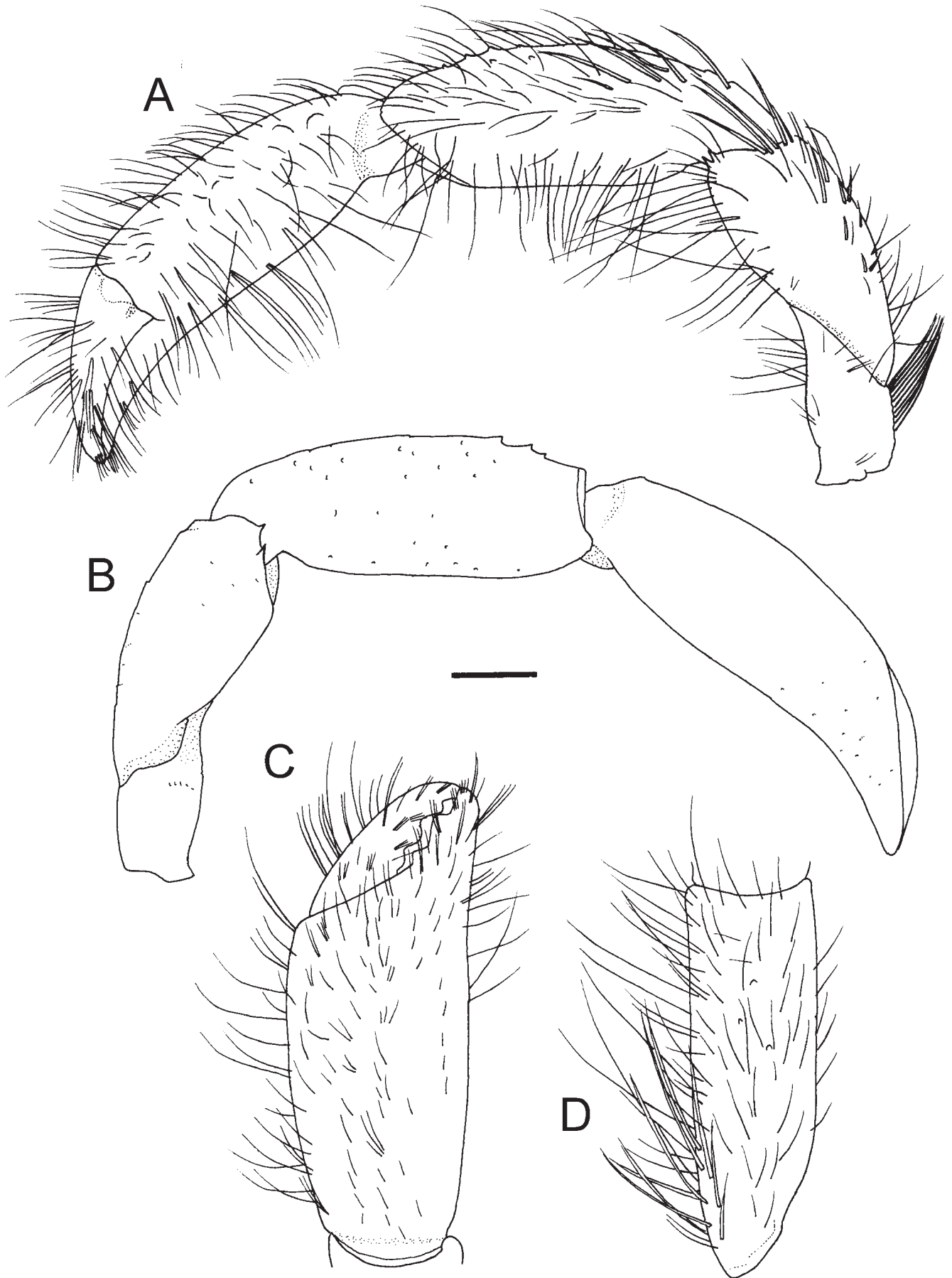


Fig. 13. *Catapaguroides hirsutus*, new species, holotype, male (sl 1.3 mm), PANGLAO 2004, stn T39, NMCR 39064. A, right cheliped, mesial view; B, same, lateral view (setae omitted); C, same, chela, dorsal view; D, same, carpus, dorsal view. Scale bar = 0.5 mm.

the new species from the latter two species, though the elongation might be a male sexual character. Furthermore, in *C. hirsutus*, the palm and carpus of the right cheliped lack conspicuous spines. In the latter two species, the right palm has a dorsomesial row of spines and one proximal spine on the dorsal midline; and the carpus bears a dorsolateral row of spines in *C. iejimensis*, or only one spine slightly distal to the midlength in *C. umbra*. The ambulatory dactyli are unarmed or armed with only one submedian ventral spine in *C. hirsutus*, whereas they are armed with four to seven ventral spines (*C. iejimensis*) or one to three spines (*C. umbra*). The setation on the chelipeds is much more pronounced in *C. hirsutus* than in *C. iejimensis* and *C.*

umbra. *Catapaguroides iejimensis* differs further from *C. hirsutus* in having shorter antennular peduncle (overreaching the distal corneal margin by the distal 0.7–0.8 length of the ultimate segment versus overreaching it by the full length of the ultimate segment) and the possession of a dorsodistal spine on the merus of the right cheliped. *Catapaguroides umbra* further differs from *C. hirsutus* in the non-constricted ocular peduncles and the terminal margins of the telson devoid of conspicuous spines.

This new species also resembles *C. levigatus*, new species. Differentiating characters between the two species are discussed under the account of the latter species.

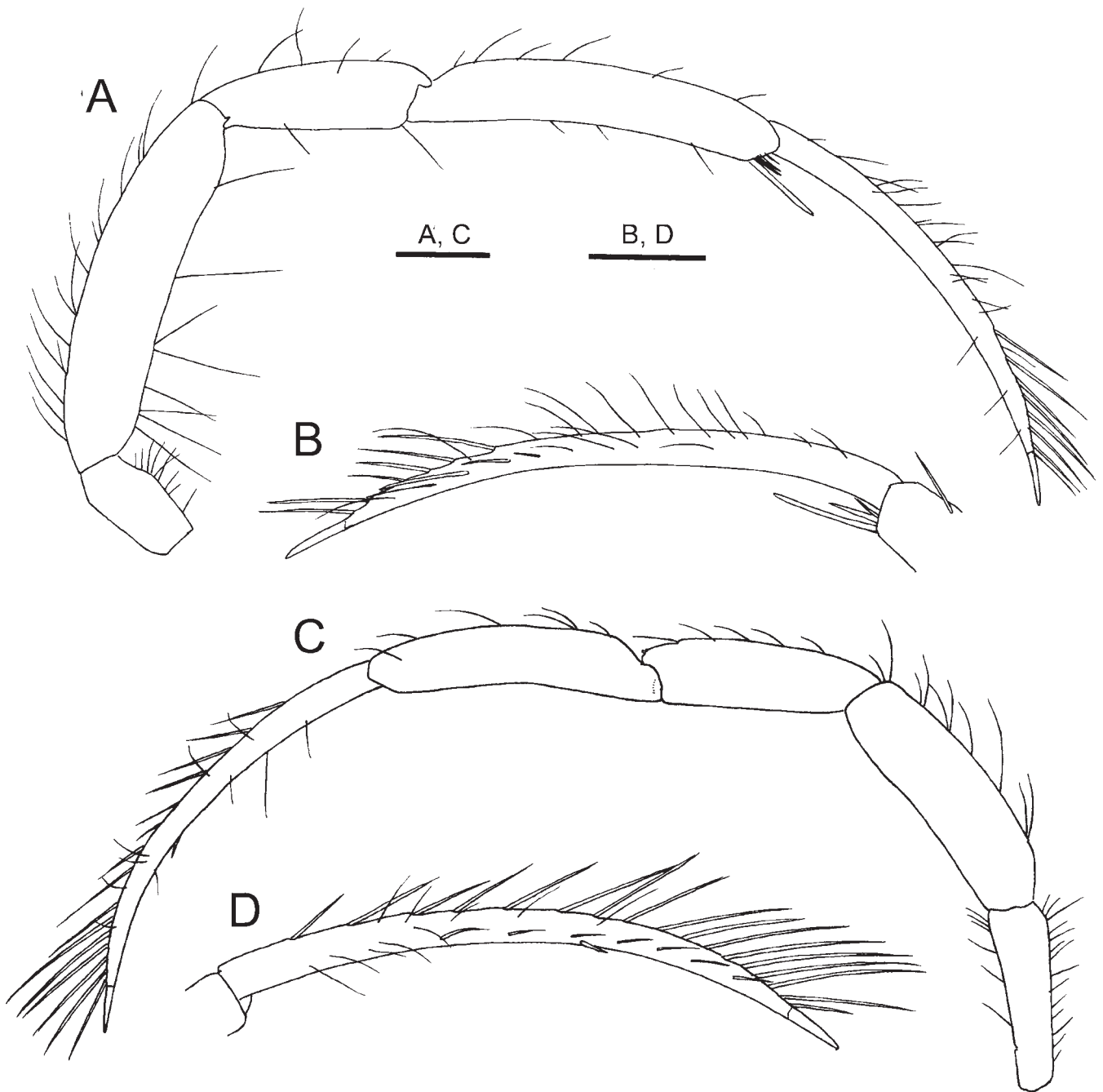


Fig. 14. *Catapaguroides hirsutus*, new species, holotype, male (sl 1.3 mm), PANGLAO 2004, stn T39, NMCR 39064. A, right second pereopod, lateral view; B, same, dactylus, mesial view; C, left third pereopod, lateral view; D, same, dactylus, mesial view. Scale bars = 0.5 mm.

Etymology. — From the Latin “*hirsutus*” [= hairy], in reference to the setose chelipeds in this new species.

***Catapaguroides karubar* McLaughlin, 1997**
(Figs. 15–17)

Catapaguroides karubar McLaughlin, 1997: 458, fig. 7a–h; McLaughlin et al., 2010: 28 (list)

Material examined. — One male (sl 1.0 mm), PANGLAO 2004, stn T39, W of Pamilacan Island, 09°30.1'N, 123°50.4'E, 100–138 m, muddy sand, 6 Jul.2004, ZRC 2012.1094.

Description of male. — Ten pairs of biserial phyllobranchiate gills; third maxilliped with 2 arthrobranchs each reduced to minute, simple bud; other arthrobranchs well developed, distinctly lamellate; no pleurobranchs on wall of seventh thoracic somite.

Shield (Fig. 15A) approximately as long as wide; anterior margins between rostral lobe and lateral projections concave; anterolateral margins sloping, posterior margin roundly truncate; dorsal surface with tufts of short setae laterally. Rostrum roundly triangular. Lateral projections triangular, produced to level of rostrum, each with submarginal spinule.

Ocular peduncle (Fig. 15A) subequal in length to shield, slender, not widened distally or proximally; dorsal surface mesially with 3 tufts of moderately long setae in distal 0.7; cornea normally developed, rounded, not dilated, slightly longer than wide, corneal width about 0.2 of peduncular length. Ocular acicles small, triangular, sharply pointed, each with minute submarginal spinule concealed by terminal point in dorsal view, separated to each other basally by basal width of 2 acicles. Interocular lobe with slightly convex anterior surface.

Antennular peduncle (Fig. 15A), when fully extended, overreaching distal corneal margin by nearly full length of ultimate segment. Basal segment elongate, with small spine proximolaterally. Ultimate segment 0.7 length of shield, slightly widened distally in lateral view, with 2 long plumose setae at dorsolateral distal portion. Dorsal flagellum (left broken distally) slightly longer than ultimate segment, distal portion about twice length of proximal aesthetasc-bearing portion.

Antennal peduncle (Fig. 15A) slightly falling short of distal corneal margin. Fifth and fourth segments with few short setae. Third segment with 1 prominent spine at ventromesial distal angle. Second segment with dorsolateral distal angle strongly produced in simple or bifid spine slightly overreaching midlength of fourth segment; dorsomesial distal angle with small spine. First segment unarmed. Antennal acicle slender, faintly sinuous, slightly falling short of distal corneal margin, terminating in slender spine, with row of short to long stiff setae along entire length. Antennal flagellum exceeding 4.0 times of shield length;

articles each with several short to long setae on distal margin (long setae present every 4 or 5 articles).

Third maxilliped moderately stout; crista dentata on ischium consisting of 2 sharp teeth (Fig. 15B). Carpus without dorsodistal spine.

Chelipeds (Fig. 16) appreciably unequal and dissimilar. Male right cheliped (Fig. 16A–D) large, not particularly elongate; propodal-carpal articulation rotated clockwise about 30° from perpendicular. Chela operculiform, about 1.7 times longer than wide, widest at base of dactylus. Dactylus broad, articulating obliquely with palm, about 0.8 length of palm, slightly curved ventrally; dorsal surface slightly elevated in midline, unarmed, with tufts of short setae along midline and mesial margin; mesial margin distinctly carinate, but not lamellar; ventral surface slightly concave mesially, with few short setae; cutting edge with 2 roundly triangular calcareous teeth, terminating in minute corneous claw. Palm about 1.2 length of carpus, widened distally; dorsal surface convex, with 2 widely spaced mesial spines on proximal two-thirds and 2 proximal submedian tubercles, scattered short setae present submarginally; dorsolateral margin distinctly carinate, slightly upturned, but not lamellar; dorsomesial margin not delimited; ventral surface slightly convex, almost glabrous. Fixed finger very broad, with 2 blunt calcareous teeth on cutting edge, terminating in small calcareous claw. Carpus 1.1 length of merus, widened distally, about 1.4 times longer than distal width; dorsal surface with 2 small spines on dorsal midline, including distal marginal spine; dorsomesial distal angle with 1 spine; lateral surface almost glabrous, ventrolateral distal angle unarmed; mesial face with sparse short to long setae; ventral surface convex. Merus with few stiff short setae on dorsal surface; dorsodistal margin with 1 strong spine mesially; lateral surface glabrous, ventrolateral margin with 2 tiny subdistal tubercles; mesial surface also almost glabrous, ventromesial margin raised, with 2 strong spines distally and numerous long setae; ventral surface convex, with few long setae. Ischium unarmed.

Left cheliped (Fig. 16E–G) relatively stout, reaching midlength of right chela; propodal-carpal articulation rotated counter-clockwise 20° from perpendicular. Chela not arched; no hiatus between fingers. Dactylus about 1.1 length of palm, unarmed, with sparse tufts of short setae; dorsomesial margin not delimited; cutting edge with row of minute corneous teeth in distal half. Palm about 0.6 length of carpus; dorsal surface slightly convex, unarmed; surfaces with scattered short setae. Fixed finger bordered with thin corneous cutting edge, terminating in small calcareous claw. Carpus slightly widened distally; dorsal surface mesially with 1 spine at midlength; dorsodistal margin armed with 2 spines including one at dorsomesial distal angle; ventral surface gently convex; surfaces with sparse short to long setae. Merus with few short setae on dorsal margin; dorsodistal margin unarmed; ventrolateral margin with 2 closely spaced, small spines subdistally; ventromesial margin with 1 small distal spine; ventral surface slightly convex, with several long setae. Ischium unarmed.

Ambulatory legs (Fig. 17A, C) long and slender. Dactyli (Fig. 17B, D) 1.5–1.7 times longer than propodi, 10.6–11.0 times longer than wide, straight in dorsal view, slightly curved ventrally in lateral view, terminating in elongate, slender corneous claws; dorsal margins each with row of thick, bristle-like setae increasing in length distally; mesial faces each with 4–6 slender corneous spines and few short setae adjacent to ventral margin. Propodi each with single long corneous spine flanked by 2 or 3 shorter spines (second) or with only small corneous spine (third) on ventrodistal margin; dorsal and ventral margins each with 1 or 2 short setae. Carpi each with small dorsodistal spine and few short dorsal setae. Meri each with 1 small ventrolateral distal spine (second) or unarmed (third); dorsal margins each with few short setae. Ischia unarmed. Second pereopods with deep notch on ventral margin at articulation between merus and ischium.

Fourth pereopod (Fig. 15C) semichelate; dactylus with several minute corneous teeth on ventral margin; propodal rasp consisting of 6 corneous scales arranged in single row. Fifth pereopods semichelate.

Anterior lobe of sixth thoracic sternite (Fig. 15D) subsemicircular, slightly skewed to left, with sparse short setae on anterior margin. Lobe of eighth thoracic sternite bearing numerous short setae (Fig. 15E).

Male with short and stout sexual tube extending from coxa of right fifth pereopod (Fig. 15E), directed slightly posterior from right to left across ventral body surface, not reaching lateral margin of left coxa. Left coxa with papilla-like sexual tube directed anteromesially.

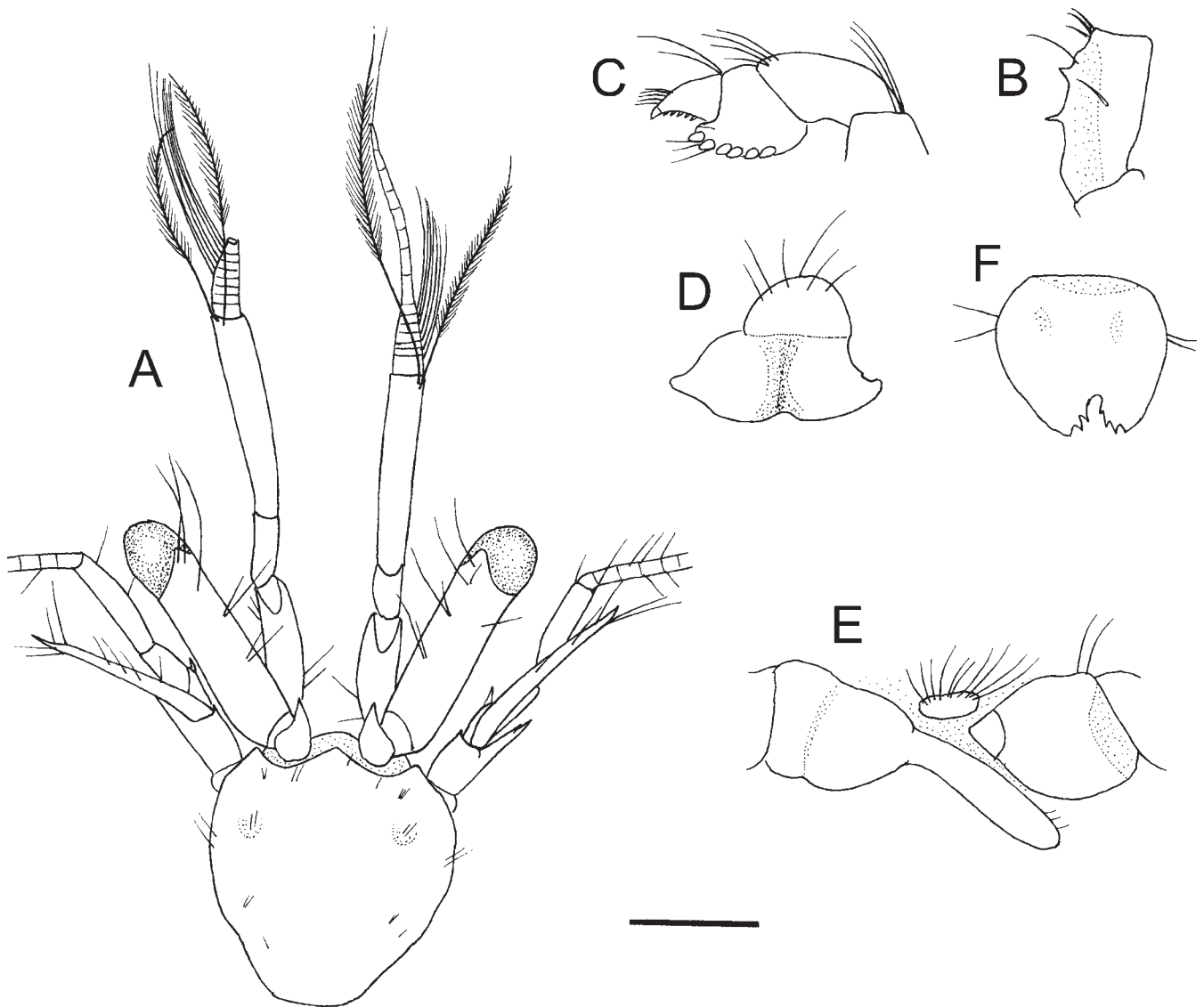


Fig. 15. *Catapaguroides karubar* McLaughlin, 1997, male (sl 1.0 mm), PANGLAO 2004, stn T39, ZRC 2012.1094. A, shield and cephalic appendages, dorsal view; B, ischium-basis of left third maxilliped, ventral view; C, distal three segments of left fourth pereopod, lateral view; D, sixth thoracic sternite, ventral view; E, coxae of fifth pereopods and eighth thoracic sternite, ventral view; F, telson, dorsal view. Scale bars = 0.5 mm (A); 0.25 mm (B–F).

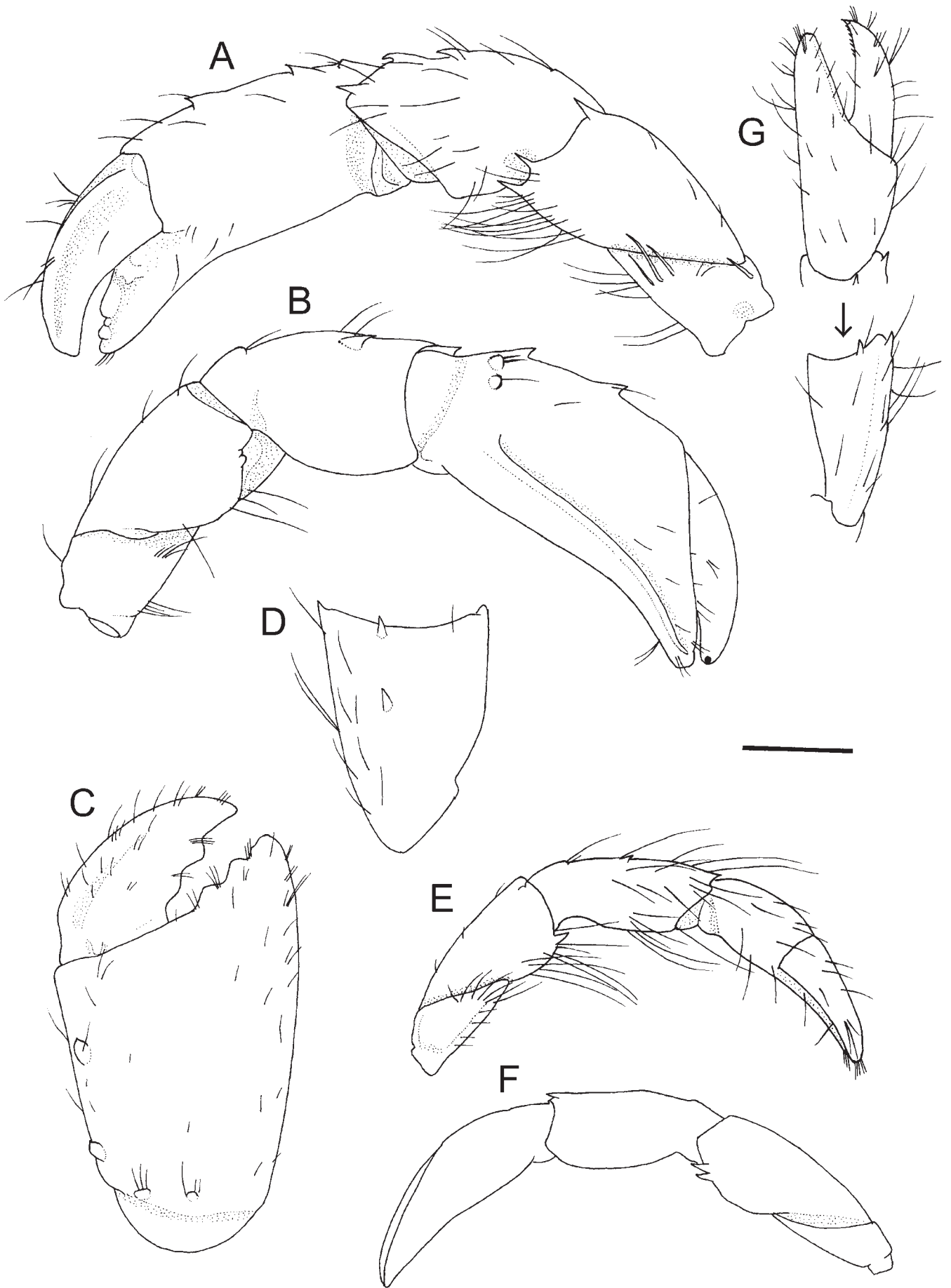


Fig. 16. *Catapaguroides karubar* McLaughlin, 1997, male (sl 1.0 mm), PANGLAO 2004, stn T39, ZRC 2012.1094. A, right cheliped, mesial view; B, same, lateral view; C, same, chela, dorsal view; D, same, carpus, dorsal view; E, left cheliped, mesial view; F, same, lateral view (setae omitted); G, same, chela and carpus, dorsal view. Scale bar = 0.5 mm.

Telson (Fig. 15F) narrowed posteriorly in posterior half; no lateral indentations; posterior lobes slightly asymmetrical, separated by shallow median cleft; terminal margins strongly oblique, left with 2 spinules, right with 3 spinules, outer angles acutely pointed.

Colouration. — In preservative: Colour substantially faded away, but iridescence on chelipeds and red blotches on chelipeds and ambulatory legs still preserved. Right cheliped with carpus bearing red blotches on dorsal and

mesial surfaces located medially; merus with 2 red blotches on mesial face. Left cheliped with similar colour pattern to right cheliped, though mesial face of merus with only 1 blotch. Ambulatory legs with propodi each bearing 1 large red spot on lateral surface located distal to midlength; carpi each with 1 red spot on lateral surface distal to midlength; meri each with 2 large red spots.

Distribution. — Previously known from Kai Islands, Indonesia, at depths of 205–212 m. The present specimen

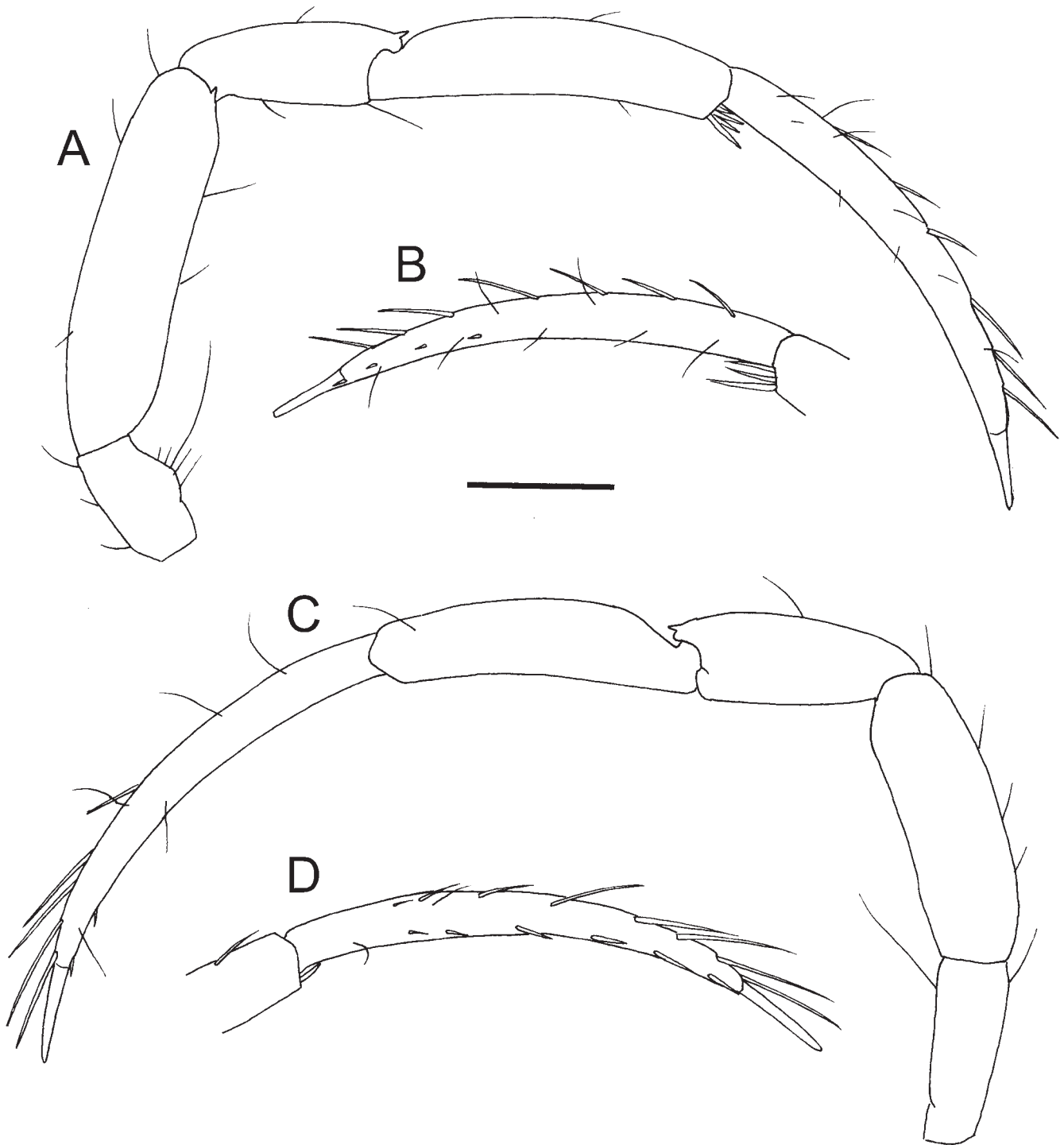


Fig. 17. *Catapaguroides karubar* McLaughlin, 1997, male (sl 1.0 mm), PANGLAO 2004, stn T39, ZRC 2012.1094. A, right second pereopod, lateral view; B, same, dactylus, mesial view; C, left third pereopod, lateral view; D, same, dactylus, mesial view (dorsal setae partially omitted). Scale bars = 0.5 mm.

represents the first record of this species from the Philippines, and slightly extends the bathymetric range to 83 m.

Remarks. — *Catapaguroides karubar* was originally described on the basis of a single female holotype from Kai Islands, Indonesia (McLaughlin, 1997). There have been no subsequent records of this species since the original description. The present male specimen agrees with *C. karubar* in the following diagnostic characters: ocular peduncle not widened distally or proximally with cornea normally developed, rounded; antennular peduncle overreaching distal corneal margin by slightly less than length of ultimate segment; antennal peduncle falling short of distal corneal margin; right chela operculiform, with distinct carinae on mesial margin of dactylus and lateral margin of palm; dorsal surface of right palm armed with a few mesial and proximal spines or tubercles; carpus of right cheliped with 2 spines on dorsal midline; and palm of left cheliped spineless. Nevertheless, it differs from the holotype female in the following points: the right palm is more lengthened in the present specimen than in the holotype, with the lateral margin not lamellar (lamellar in the holotype); the dorsal surface of the right palm is armed with two mesial spines and two proximal tubercles in the present specimen, rather than having one mesial spine at the midlength and two sharp proximal spines in the holotype; the crista dentata of the third maxilliped consists of only two sharp teeth in the present specimen, rather than five or six teeth in the holotype; and the posterior lobes of the telson are less produced and less acuminate in the present specimen than in the holotype. Most of these differences could be attributed to intraspecific variation. In particular, the difference in the shape of the right chela might be sex-related, as seen in the close relative *C. cristimanus*. The difference in the shape and armature of the telson is substantial, but it is difficult to assess this difference is of specific significance. Consequently, the present male specimen is provisionally referred to *C. karubar*.

As McLaughlin (1997) noted, *C. karubar* appears closest to *C. cristimanus* in the operculiform right chela with sharply carinate mesial margin of the dactylus and lateral margin of the palm. Differentiating characters of the two species are reassessed on the basis of the original descriptions and examination of the present specimens. *Catapaguroides karubar* can be distinguished from *C. cristimanus* primarily by the different armature of chelipeds: the right palm is armed with one or two dorsomesial and two proximal spines or tubercles in *C. karubar*, whereas it is armed only with three or more dorsomesial spines in *C. cristimanus*; the carpus of the right cheliped bears only two spines on the dorsal midline in *C. karubar*, rather than a distinct row of five or six spines in *C. cristimanus*; the carpus of the left cheliped is devoid of dorsolateral spines (except for a spine on the dorsodistal margin) in *C. karubar*, whereas there are two or more dorsolateral spines in *C. cristimanus*. Furthermore, the cornea of the ocular peduncle is not inflated in *C. karubar* unlike in *C. cristimanus*; the mesial faces of the dactyli of the second pereopods are each armed with an additional row of thick bristle-like setae adjacent

to the ventral corneous spines in *C. cristimanus*, but such bristle-like setae are absent in *C. karubar*. In addition, the lateral margin of the male right chela is lamellar in *C. cristimanus*, rather than non-lamellar (though still carinate) in *C. karubar*. Finally, in *C. cristimanus*, the right sexual tube is directed anterolaterally from the right to the left across the ventral body surface and overreaches the lateral margin of the left coxa by more than half length of the tube, whereas it is short, directed mesially, but not reaching the lateral margin of the left coxa in *C. karubar*.

Catapaguroides levigatus, new species

(Figs. 18–20)

Material examined. — Holotype: female (sl 1.4 mm), PANGLAO 2004, stn B15, Sunglolan, Panglao Island, 09°38.8'N, 123°49.2'E, 2–4 m, reef wall with dead coral, 16 Jun.2004, NMCR 39065.

Paratypes: 2 males (sl 1.2, 1.4 mm), 2 females (sl 1.0, 1.2 mm), 1 ovigerous female (sl 1.2 mm), PANGLAO 2004, stn S29, Pamilacan Island, 09°29.4'N, 123°56.0'E, 32 m, wall and floor of small cavern, 25 Jun.2004, ZRC 2012.1095; 1 male (sl 1.1 mm), 1 ovigerous female (sl 1.3 mm), same data, CBM-ZC 11356.

Description. — Ten pairs of biserial phyllobranchiate gills; 2 arthrobranchs on third maxilliped small, weakly lamellate; other arthrobranchs distinctly lamellate; no pleurobranchs on wall of seventh thoracic somite.

Shield (Fig. 18A) approximately as long as wide; anterior margins between rostral lobe and lateral projections concave; anterolateral margins terraced; posterior margin rounded, medially emarginate; dorsal surface almost glabrous, with few tufts of short setae laterally. Rostrum triangular, pointed distally. Lateral projections also triangular, slightly falling short of rostrum, with submarginal spinule.

Ocular peduncle (Fig. 18A) about 0.8 length of shield, slender, slightly widened basally; dorsal surface with 2 or 3 tufts of short setae in distal half; additional tuft of setae on each lateral and mesial surface near corneal base; cornea normally developed, rounded, not dilated, longer than wide, corneal width about 0.2 of peduncular length. Ocular acicle small, triangular, with submarginal terminal spinule, separated to each other basally by basal width of 2 acicles. Interocular lobe with straight or slightly convex anterior surface.

Antennular peduncle (Fig. 18A), when fully extended, overreaching distal corneal margin by half length of ultimate segment. Basal segment with spinule proximolaterally. Ultimate segment 0.6 length of shield, slightly broadened distally in lateral view, with 2 long plumose setae at dorsolateral distal portion. Dorsal flagellum with distal portion distinctly longer than proximal aesthetasc-bearing portion.

Antennal peduncle (Fig. 18A) slightly falling short of distal corneal margin. Fifth and fourth segments with few short setae. Third segment with 1 prominent spine at ventromesial

distal margin. Second segment with dorsolateral distal angle produced in simple or bifid spine nearly reaching midlength of fourth segment; dorsomesial distal angle with small spine. First segment unarmed. Antennal acicle slender, slightly sinuous, slightly falling short of distal corneal margin, terminating in slender spine, with row of short to long stiff setae in distal half. Antennal flagellum exceeding 4.0 times of shield length; articles each with several short to long setae on distal margin (long setae present every 2 or 3 articles).

Third maxilliped moderately stout, with crista dentata on ischium consisting of 3 or 4 strong teeth (Fig. 18B). Carpus without dorsodistal spine.

Chelipeds (Fig. 19) distinctly unequal and dissimilar. Right cheliped (Fig. 19A–E) large, not particularly elongate; propodal-carpal articulation rotated clockwise about 20° from perpendicular. Chela subovate in dorsal view, about 1.8

times (males) or 2.4 times (females) longer than wide, widest at base of dactylus. Dactylus articulating slightly obliquely with palm, about 0.7–0.9 length of palm, slightly curved ventrally; dorsal surface convex, dorsomesial margin not delimited, armed with 1 small spine proximally; cutting edge with 3 prominent, triangular calcareous teeth, terminating in tiny corneous claw; tufts of short to moderately long setae on surfaces. Palm about 0.8 length of carpus; dorsal surface convex, entirely unarmed, with tufts of short to moderately long setae arranged in some irregular longitudinal rows; lateral and mesial faces also with few short to moderately long setae; ventral surface slightly convex, with some long setae. Fixed finger with 2 or 3 prominent calcareous teeth on cutting edge, terminating in minute corneous claw. Carpus 1.2–1.3 length of merus, noticeably widened distally, about 1.1 times (male) or 1.6 times (female) longer than distal width; dorsal surface with 1–3 small spines on dorsolateral margin and with 1 spine on dorsomesial margin proximal to midlength; dorsodistal margin with 1 spine at each lateral and

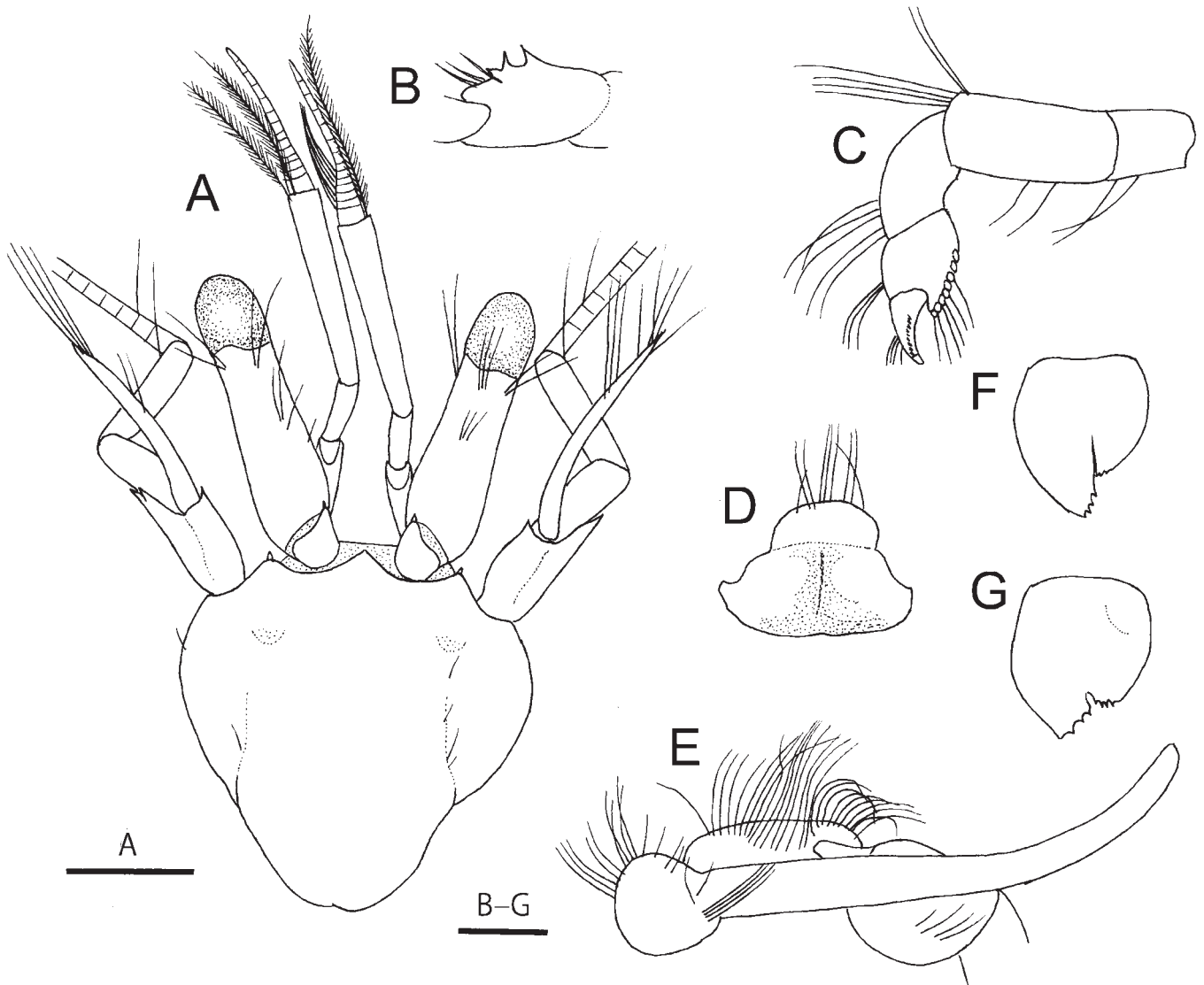


Fig. 18. *Catapaguroides levigatus*, new species. A–D, F, holotype, female (sl 1.4 mm), PANGLAO 2004, stn B15, NMCR 39065; E, G, paratype, male (sl 1.2 mm), PANGLAO 2004, stn S29, ZRC 2012.1095. A, shield and cephalic appendages, dorsal view; B, ischium-basis of left third maxilliped, ventral view; C, left fourth pereopod, lateral view; D, sixth thoracic sternite, ventral view; E, coxae of fifth pereopods and eighth thoracic sternite, ventral view; F, G, telson, dorsal view. Scale bars = 0.5 mm (A); 0.25 mm (B–G).

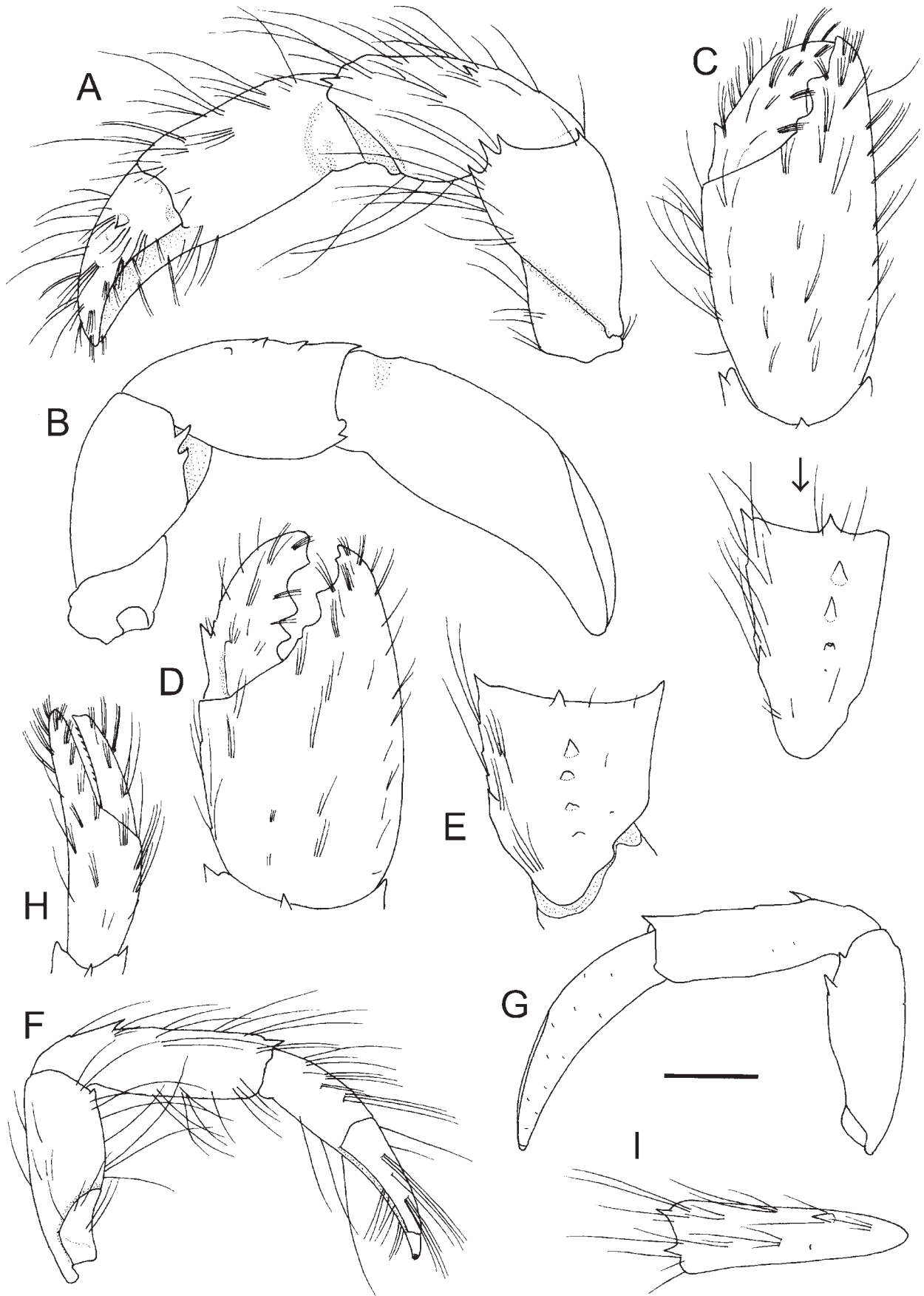


Fig. 19. *Catapaguroides levigatus*, new species. A–C, F–I, holotype, female (sl 1.4 mm), PANGLAO 2004, stn B15, NMCR 39065; D, E, paratype, male (sl 1.2 mm), PANGLAO 2004, stn S29, ZRC 2012.1095. A, right cheliped, mesial view; B, same, lateral view (setae omitted); C, same, chela and carpus, dorsal view; D, right chela, dorsal view; E, carpus of right cheliped, dorsal view; F, left cheliped, mesial view (tip of dactylus broken); G, same, lateral view (setae omitted); H, same, chela, dorsal view; I, same, carpus, dorsal view. Scale bar = 0.5 mm.

mesial angle; lateral surface almost glabrous, ventrolateral distal angle with 1 small spine; mesial face with some long setae dorsally; ventral surface gently convex. Merus with few tufts of setae on distal half of dorsal surface; dorsodistal margin with 1 small spine mesially; lateral surface glabrous, ventrolateral margin nearly straight, with 2 small subdistal spines; mesial surface also almost glabrous, ventromesial margin with 3 small spines distally; ventral surface slightly convex, with some long setae. Ischium unarmed, with short setae on mesial and ventral surfaces.

Left cheliped (Fig. 19F–I) slender, reaching beyond base of dactylus of right cheliped; propodal-carpal articulation without rotation. Chela slightly arched ventrally, 4.0–4.2 times longer than wide; no hiatus between fingers. Dactylus about 1.1 length of palm, unarmed, with tufts of short to long setae; dorsomesial margin not delimited; cutting edge with row of widely spaced minute corneous teeth, terminating in small corneous claw. Palm about 0.5 length of carpus; dorsal surface slightly convex, unarmed; surfaces with tufts of short to long setae arranged in irregular longitudinal

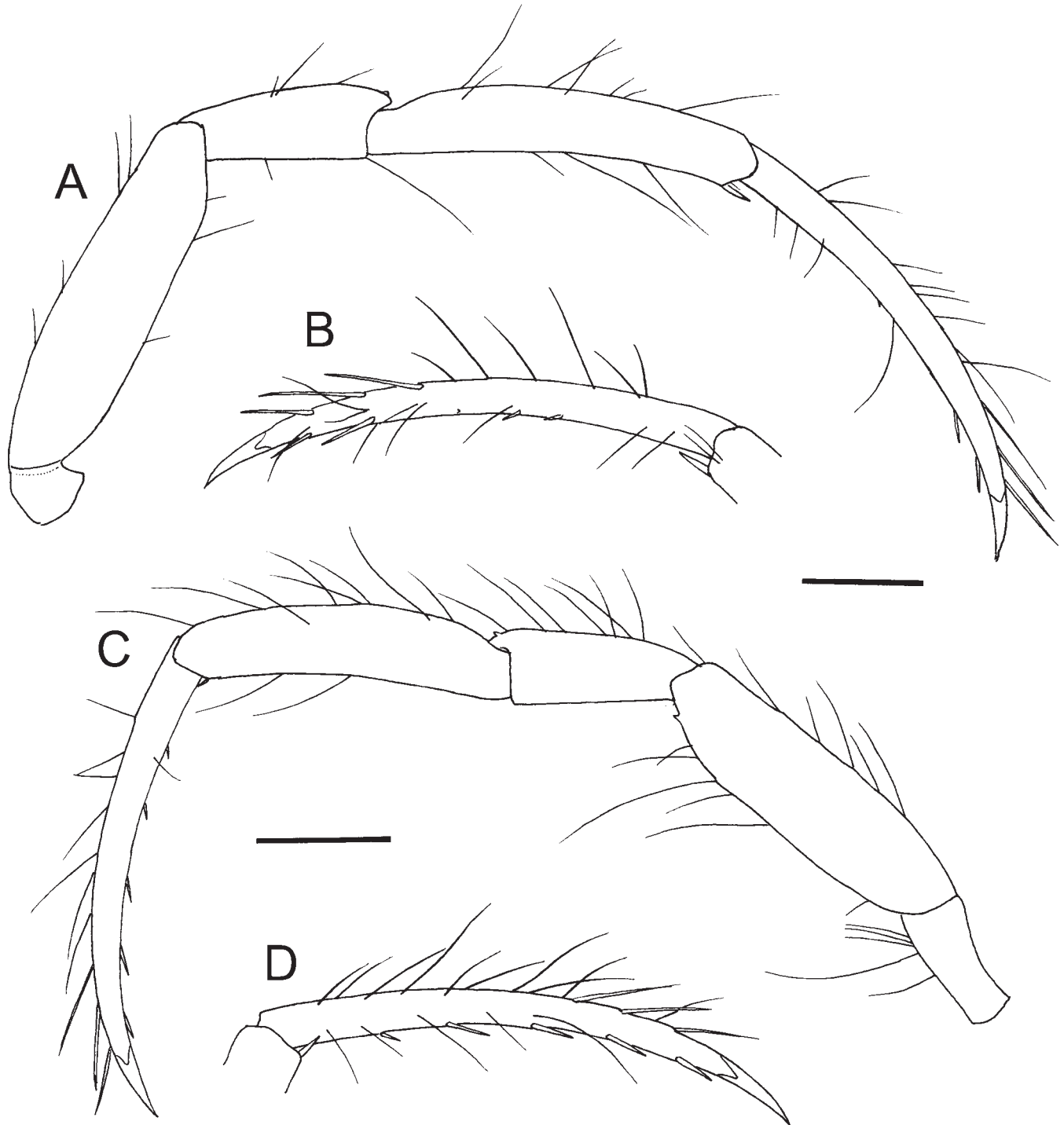


Fig. 20. *Catapaguroides levigatus*, new species, holotype, female (sl 1.4 mm), PANGLAO 2004, stn B15, NMCR 39065. A, right second pereopod, lateral view; B, same, dactylus, mesial view; C, left third pereopod, lateral view; D, same, dactylus, mesial view. Scale bars = 0.5 mm.

rows. Fixed finger with or without corneous teeth on cutting edge, terminating in small corneous claw. Carpus slightly widened distally, 3.2–3.3 times longer than distal width; dorsal surface laterally unarmed, mesially with 1 small spine proximal to midlength, and with tufts of long setae laterally and mesially; dorsodistal margin armed with 1 spine at each lateral and mesial angle; lateral and mesial faces with few long setae, ventrolateral distal angle unarmed; ventral surface slightly convex, with some short to long setae. Merus with few long setae on dorsal margin; dorsodistal margin unarmed; ventrolateral margin, with 2 small spines subdistally; ventromesial margin with 1 small distal spine; ventral surface slightly convex, with several long setae. Ischium unarmed.

Ambulatory legs (Fig. 20A, C) long and slender. Dactyli (Fig. 20B, D) 1.3–1.5 times longer than propodi, 12.9–14.0 times longer than wide, straight in dorsal view, slightly curved ventrally in lateral view, terminating in slender corneous claws; dorsal margins each with row of sparse stiff setae increasing in length distally, distal 3 or 4 setae thickened, bristle-like; mesial faces each with row of stiff setae on midline; ventral margins with 5–7 slender spines noticeably increasing in length distally. Propodi each with pair of corneous spines on ventrodistal margin in both male and female (second) or single mesial spine (third); dorsal and ventral margins with sparse, short and long stiff setae. Carpus with minute dorsodistal spine and with short and long setae (more numerous on second) on dorsal margins. Merus unarmed or armed with 1 minute subdistal spine on ventrolateral margin; dorsal and ventral margins each with sparse stiff setae. Ischium glabrous (second) or with long setae on ventral margins (third). Second pereopods with deep notch on ventral margin at articulation between merus and ischium. Female with unpaired left gonopore.

Fourth pereopod (Fig. 18C) semichelate; dactylus with several minute corneous teeth on ventral margin; propodal rasp consisting of 7 or 8 corneous scales arranged in single row. Fifth pereopods semichelate.

Anterior lobe of sixth thoracic sternite (Fig. 18E) subsemicircular, slightly skewed to left, with short setae on anterior margin.

Male with long sexual tube extending from coxa of right fifth pereopod (Fig. 18D), directed from right to left across ventral body surface and far overreaching lateral margin of left coxa, then slightly curved anteriorly, tapering to rounded tip; left coxa with short sexual tube directed anteromesially, partially obscured by tufts of dense setae arising from eighth thoracic sternite.

Telson (Fig. 18F, G) slightly longer than wide, narrowed posteriorly in posterior half; no lateral indentations; posterior lobes strongly asymmetrical, separated by narrow median cleft; terminal margins oblique, left with 3 or 4 tiny spinules, right with 3 minute spinules, left angle spinose, right angle not spinose.

Eggs shrunk, about 0.4×0.5 mm.

Colouration. — Not known.

Distribution. — Known only from the type locality, 2–32 m.

Remarks. — *Catapaguroides levigatus*, new species, resembles *C. hirsutus*, new species, in sharing the following characters: cornea normally developed, rounded; antennal peduncle not reaching distal corneal margin; palm of right cheliped non-operculiform, without spines on dorsal surface; left cheliped with unarmed palm and carpus bearing one or more dorsal spines. However, *C. levigatus* is readily distinguished from *C. hirsutus* by the distinctly shorter antennular peduncle (overreaching the distal corneal margin by the half length of the ultimate segment versus by the full length of that segment), the non-elongate right cheliped and the dactyli of the ambulatory legs armed with five to seven slender corneous spinules on ventral margins. In *C. hirsutus*, the ambulatory dactyli are unarmed or armed only with one submedian corneous spine on ventral margins.

Etymology. — From the Latin “*levigatus*” [= smooth], alluding to the unarmed palm of the right cheliped.

Catapaguroides pusillus, new species

(Figs. 21, 22)

Material examined. — Holotype: ovigerous female (sl 0.9 mm), PANGLAO 2004, stn T1, Bolod, Panglao Island, 09°32.4'N, 123°47.3'E, 83–102 m, mud with many sponges, 30 May 2004, NMCR 39066.

Description. — Nine pairs of biserial phyllobranchiate gills; only single rudimentary bud of arthrobranch above base of third maxilliped; 2 arthrobranches on cheliped very small, weakly lamellate; other arthrobranches distinctly lamellate; no pleurobranches on wall of seventh thoracic somite.

Shield (Fig. 21A) about 1.2 times longer than wide; anterior margins between rostral lobe and lateral projections concave; anterolateral margins sloping; posterior margin rounded; dorsal surface almost glabrous, with few tufts of short setae laterally. Rostrum broadly triangular, blunt terminally. Lateral projections triangular, exceeding to level of rostrum, acutely pointed.

Ocular peduncle (Fig. 21A) about 0.7 length of shield, moderately slender, slightly widened basally; dorsal surface mesially with 2 or 3 tufts of short to long setae in distal half, additional tuft of setae on lateral surface near corneal base; cornea slightly narrowed distally, but not cone-shaped, rounded, as long as wide, corneal width about 0.3 of peduncular length. Ocular acicle somewhat elongate, narrowly triangular, without submarginal or subterminal spinule, separated to each other basally by basal width of 1 acicle. Interocular lobe with slightly convex anterior surface.

Antennular peduncle (Fig. 21A), when fully extended, overreaching distal corneal margin by 0.7 length of ultimate segment. Basal segment with spinule proximolaterally. Ultimate segment 0.6 length of shield, slightly broadened distally in lateral view, with 2 long plumose setae at dorsolateral distal portion. Dorsal flagellum with distal portion distinctly longer than proximal aesthetasc-bearing portion.

Antennal peduncle (Fig. 21A) reaching distal corneal margin. Fifth and fourth segments with few short setae. Third segment with 1 prominent spine at ventromesial distal margin. Second segment with dorsolateral distal angle produced in bifid spine reaching midlength of fourth segment; dorsomesial distal angle with small spine. First segment unarmed. Antennal acicle slender, slightly sinuous, slightly falling short of distal corneal margin, terminating in

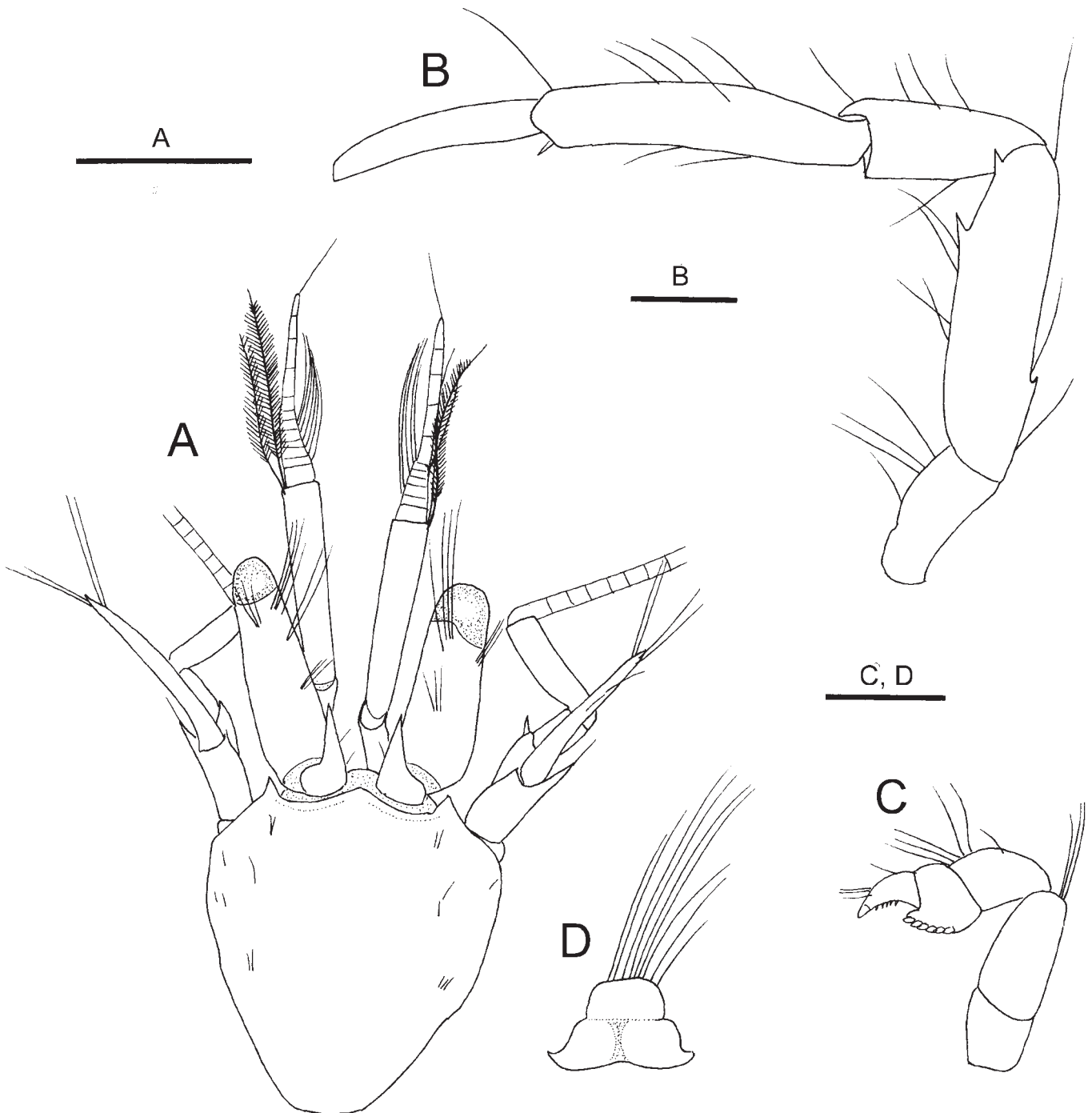


Fig. 21. *Catapaguroides pusillus*, new species, holotype, female (sl 0.9 mm), PANGLAO 2004, stn T1, NMCR 39066. A, shield and cephalic appendages, dorsal view; B, left second pereopod, lateral view (dactylus possibly in process of regeneration); C, left fourth pereopod, lateral view; D, sixth thoracic sternite, ventral view. Scale bars: 0.5 mm (A); 0.25 mm (B–D).

slender spine, with prominent tuft of long setae distally and few shorter setae in distal half. Antennal flagellum about 3.0 of shield length; articles each with some short to long setae on distal margin.

Third maxilliped moderately stout; crista dentata on ischium consisting of 2 small teeth. Carpus without dorsodistal spine.

Chelipeds (Fig. 22) distinctly unequal and dissimilar. Right cheliped (Fig. 22A–C) moderately large, not particularly elongate; propodal-carpal articulation rotated clockwise about 30° from perpendicular. Chela subovate in dorsal view, about 2.1 times longer than wide, widest at base of dactylus. Dactylus articulating obliquely with palm, about 0.9 length of palm, slightly curved ventrally; dorsal surface convex, dorsomesial margin not delimited; mesial surface

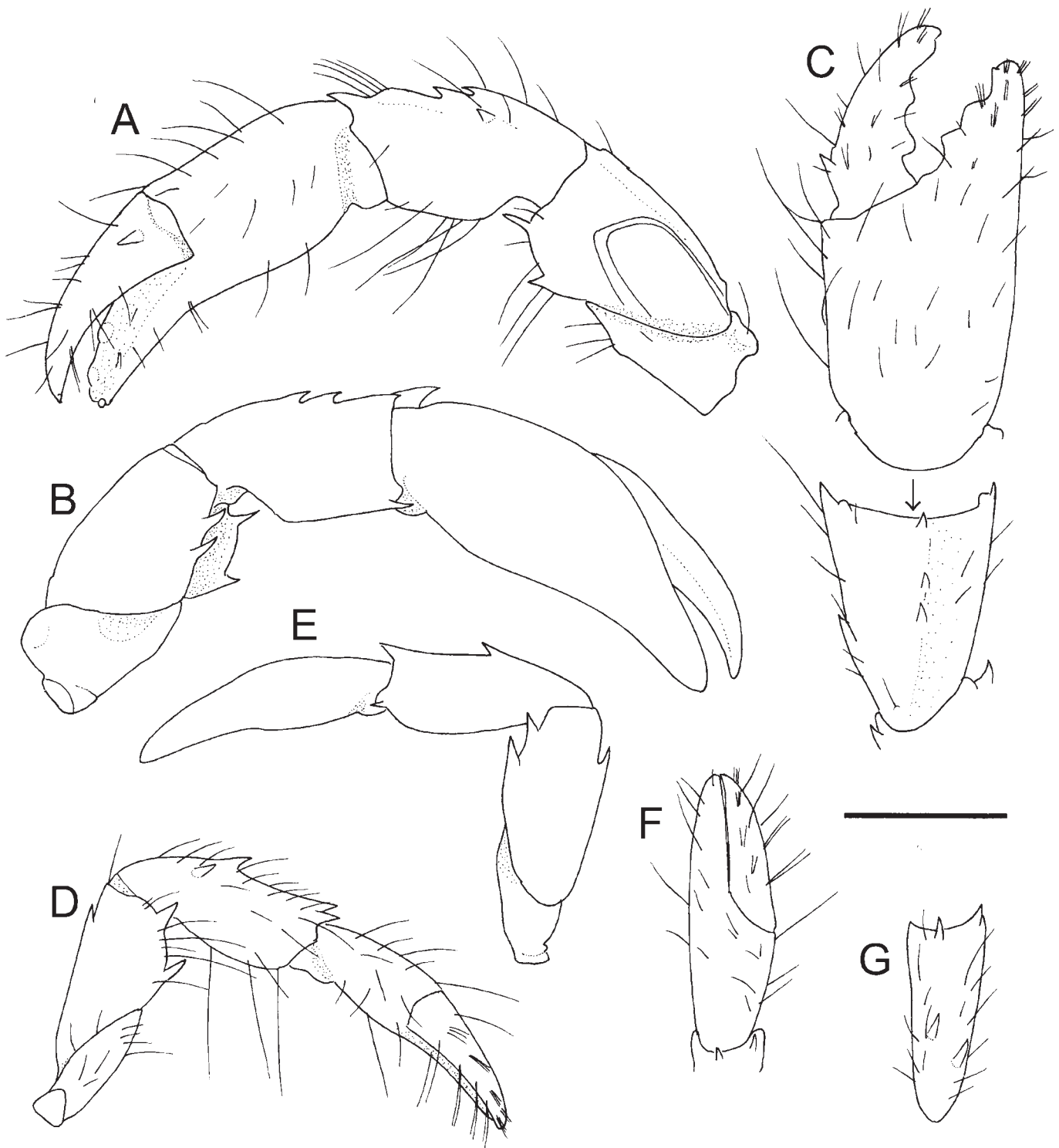


Fig. 22. *Catapaguroides pusillus*, new species, holotype, female (sl 0.9 mm), PANGLAO 2004, stn T1, NMCR 39066. A, right cheliped, mesial view; B, same, lateral view (setae omitted); C, same, chela and carpus, dorsal view; D, left cheliped, mesial view; E, same, lateral view (setae omitted); F, same, chela, dorsal view; G, same, carpus, dorsal view. Scale bar = 0.5 mm.

armed with 1 small spine proximally; cutting edge with 3 roundly triangular calcareous teeth, terminating in tiny corneous claw; tufts of short setae on surfaces arranged in irregular longitudinal rows. Palm about 0.8 length of carpus; dorsal surface convex, entirely unarmed, with scattered moderately long setae; lateral, mesial and ventral surfaces with few short to long setae, ventral surface slightly convex. Fixed finger with 3 large calcareous teeth on cutting edge, terminating in minute corneous claw. Carpus 1.1 length of merus, noticeably widened distally, about 1.3 times longer than distal width; dorsal surface with 2 small spines on dorsolateral margin and 1 moderately small spine on dorsomesial margin proximal to midlength; dorsodistal margin with 1 small spine at lateral angle and 1 moderately strong spine at mesial angle; lateral and mesial surfaces almost glabrous, ventrolateral distal angle with 1 small spine; ventral surface slightly convex. Merus with few short setae on dorsal surface; dorsodistal margin with 1 small spine mesially; lateral surface glabrous, ventrolateral margin with 2 moderately strong subdistal spines; mesial surface also glabrous, ventromesial margin strongly elevated, with 2 moderately small spines (proximal spine far separated from and smaller than distal spine); ventral surface concave, with few moderately long setae. Ischium unarmed, with few short setae on dorsal and ventral margins.

Left cheliped (Fig. 22D–G) moderately slender, reaching beyond base of dactylus of right cheliped; propodal-carpal articulation without rotation. Chela not arched, 3.2 times longer than wide; no hiatus between fingers. Dactylus about 1.3 length of palm, unarmed, with tufts of short to long setae arranged in irregular longitudinal rows; dorsomesial margin not delimited; cutting edge with row minute corneous teeth, terminating in minute corneous claw. Palm about 0.6 length of carpus; dorsal surface slightly convex, unarmed; surfaces with short to long setae. Fixed finger with sparse corneous teeth on cutting edge, terminating in minute corneous claw. Carpus slightly widened distally, 2.3 times longer than distal width; dorsal surface laterally with 1 small spine slightly proximal to midlength, mesially with 1 similar spine at proximal 0.3, and with short and long setae laterally and mesially; dorsodistal margin armed with 1 small spine at each lateral and medial angle; lateral and mesial faces with few long setae, ventrolateral distal angle with 1 small spine; ventral surface slightly convex, with some long setae. Merus almost glabrous, with 1 subdistal spine on dorsal surface; dorsodistal margin unarmed; ventrolateral margin with 2 strong spines subdistally; ventromesial margin also with 2 strong spines (proximal spine far separated from distal spine); ventral surface slightly convex, with several long setae. Ischium spineless, with few short setae on mesial surface.

Only left third pereopod preserved. Left third pereopod (Fig. 21B) long and slender. Dactylus unusually short and unarmed (also no marginal setae, no corneous claw), perhaps in process of regeneration. Propodus with sparse long setae on dorsal and ventral margins; ventrodistal margin with pair of small, slender corneous spines. Carpus

without dorsodistal spine; dorsal margin with sparse setae. Merus armed with 1 tiny spine at proximal 0.3 of dorsal margin; ventrolateral margin with 2 widely spaced spines on distal 0.3; few long setae on dorsal and ventral margins. Ischium also with few setae on ventral margin. Female with unpaired left gonopore.

Fourth pereopod (Fig. 21C) semichelate; dactylus with several minute corneous teeth on ventral margin; propodal rasp consisting of 6 corneous scales arranged in single row. Fifth pereopods semichelate.

Anterior lobe of sixth thoracic sternite (Fig. 21D) subsemicircular, slightly skewed to left, with long setae on anterior margin.

Telson missing.

Eggs about 0.3 x 0.4 mm.

Male unknown.

Colouration. — Not known.

Distribution. — Known only from the type locality, 83–102 m.

Remarks. — The holotype is an ovigerous female and incomplete with both the right and left second pereopods and the posterior part of the abdomen missing. Nevertheless, the present new species is assignable to *Catapaguroides* by the lack of pleurobranch, the poorly developed crista dentata of the third maxilliped, and the semichelate fourth pereopod. *Catapaguroides pusillus*, new species, is readily distinguished from other congeneric species by the following unique features: ocular acicles elongate; merus of left cheliped with dorsal subdistal spine; and merus of second pereopod with proximal spine on dorsal margin and subdistal spine on ventral margin.

Etymology. — From the Latin “*pusillus*” [= small], referring to the small size of this new species.

***Catapaguroides tenuiclavus*, new species**

(Figs. 23, 24)

Material examined. — Holotype: male (sl 0.89 mm), PANGLAO 2004, stn T23, Cortes, Bohol Island, 09°42.2'N, 123°50.6'N, 35–45 m, 12 Jun.2004, NMCR 39067.

Paratype: 1 male (sl 0.89 mm), same data as holotype, ZRC 2012.1096.

Description. — Eight pairs of biserial phyllobranchiate gills; no arthrobranchs on third maxilliped; 2 arthrobranchs on cheliped each reduced to minute, non-lamellate buds; other arthrobranchs well developed, distinctly lamellate; no pleurobranchs on wall of seventh thoracic somite.

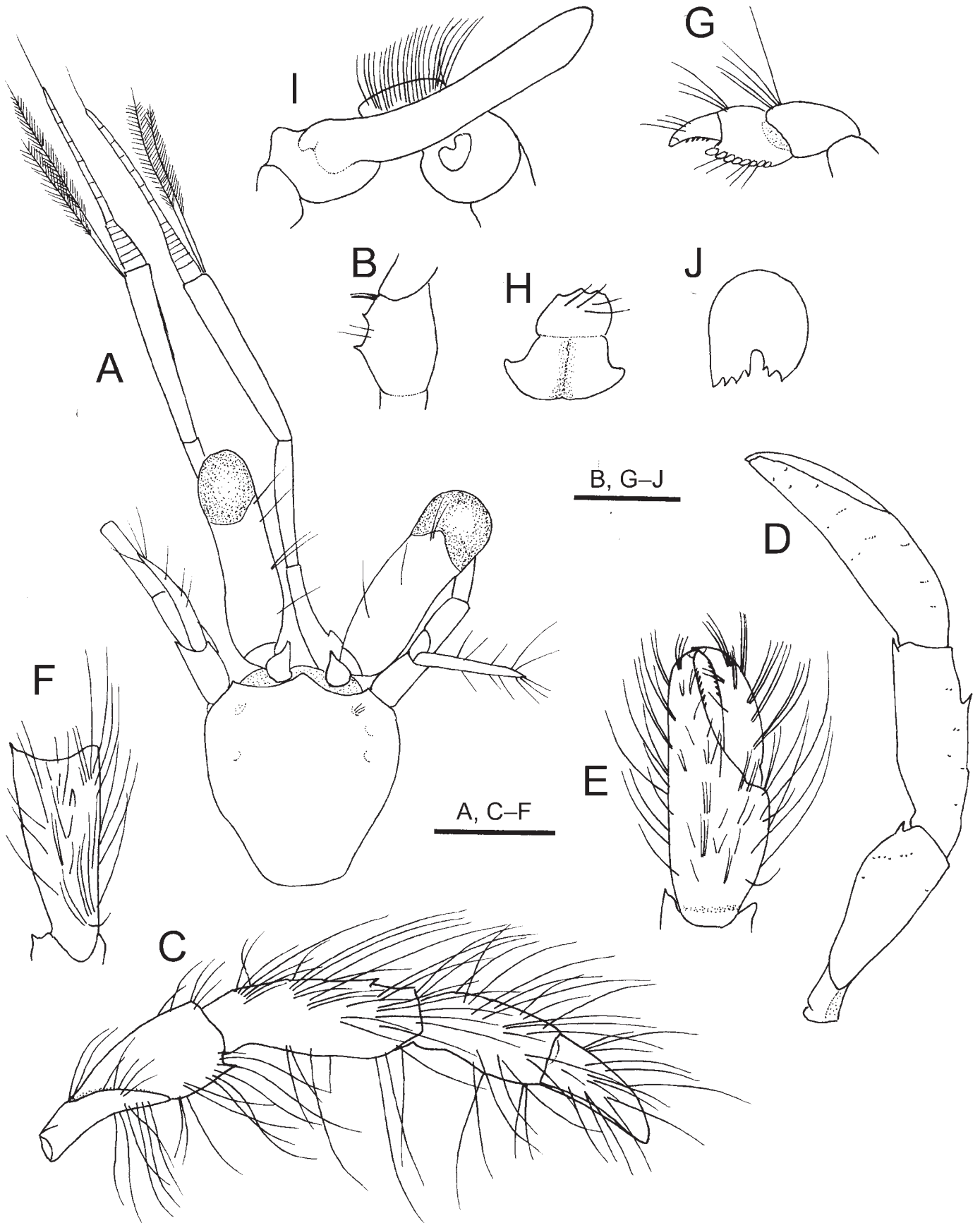


Fig. 23. *Catapaguroides tenuiclavus*, new species, holotype, male (sl 0.89 mm), PANGLAO 2004, stn T23, NMCR 39067. A, shield and cephalic appendages, dorsal view; B, ischium-basis of left third maxilliped, ventral view; C, left cheliped, mesial view; D, same, lateral view (setae omitted); E, same, chela, dorsal view; F, same, carpus, dorsal view; G, distal three segments of left fourth pereopod, lateral view; H, sixth thoracic sternite, ventral view; I, coxae of fifth pereopods and eighth thoracic sternite, ventral view; J, telson, dorsal view. Scale bars = 0.5 mm (A, C–F); 0.25 mm (B, G–J).

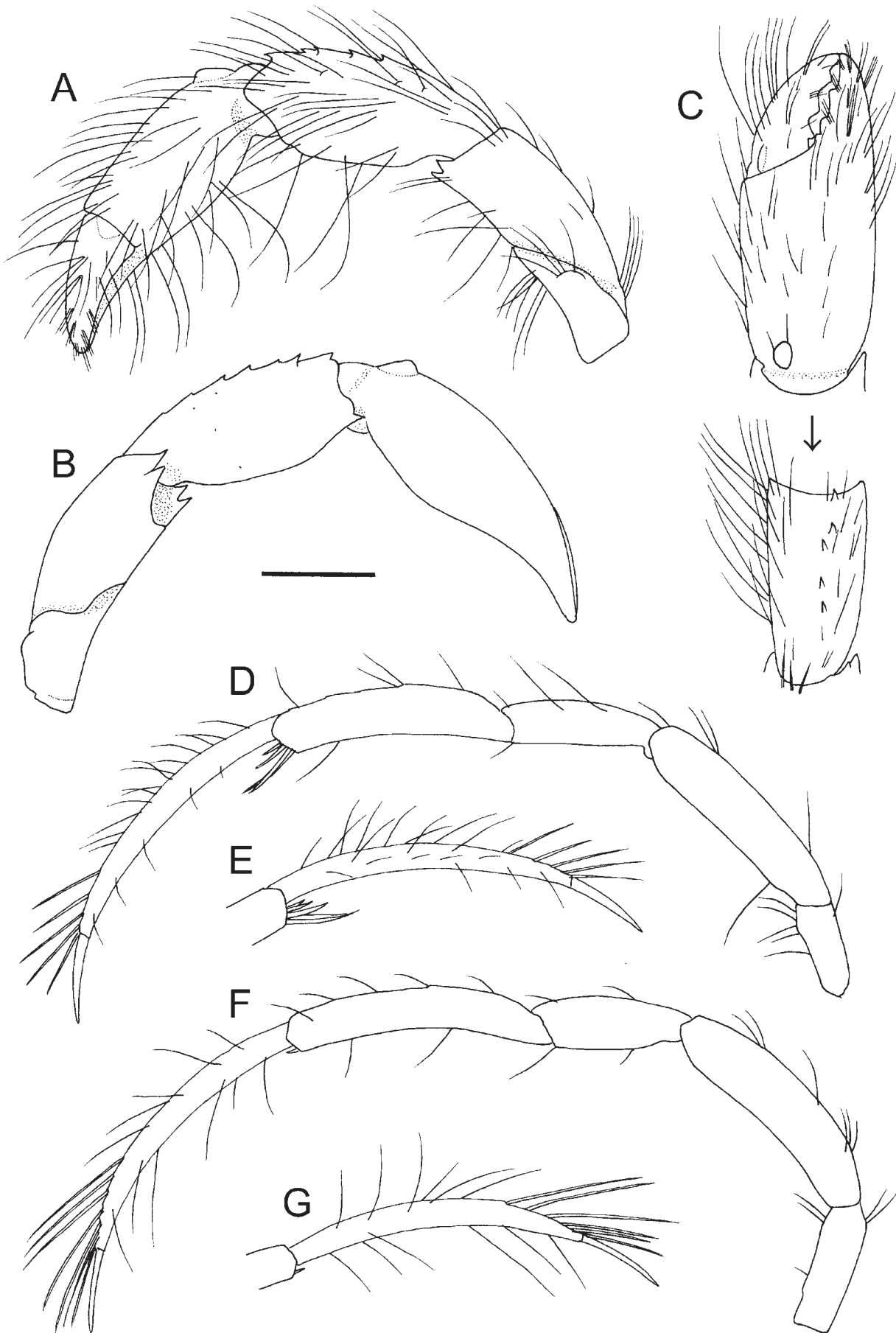


Fig. 24. *Catapaguroides tenuiclavus*, new species, holotype, male (sl 0.89 mm), PANGLAO 2004, stn T23, NMCR 39067. A, right cheliped, mesial view; B, same, lateral view (setae omitted); C, same, chela and carpus, dorsal view; D, left second pereopod, lateral view; E, same, dactylus, mesial view; F, left third pereopod, lateral view; G, same, dactylus, mesial view. Scale bar = 0.5 mm.

Shield (Fig. 23A) 1.1 times longer than wide; anterior margins between rostrum and lateral projections concave; anterolateral margins sloping; posterior margin roundly truncate; dorsal surface almost glabrous, with few tufts of short setae laterally. Rostrum broadly triangular, with blunt tip. Lateral projections triangular, not reaching level of rostrum, with submarginal spinule.

Ocular peduncle (Fig. 23A) long, subequal in length to shield, moderately stout, slightly constricted at midlength; dorsal surface mesially with 3 or 4 tufts of or individual setae arranged in longitudinal row; cornea normally developed, rounded, not dilated, approximately as long as wide, corneal width approximately 0.3 of peduncular length. Ocular acicle small, triangular, without submarginal or subterminal spinule, separated to each other basally by basal width of more than 1 acicle. Interocular lobe with nearly flat anterior surface.

Antennular peduncle (Fig. 23A) elongate, when fully extended, overreaching distal corneal margin by full length of ultimate segment and 0.1 length of penultimate segment. Basal segment with spinule proximolaterally. Ultimate segment 0.9 length of shield, slightly broadened distally in lateral view, with 2 long plumose setae at dorsolateral distal portion. Dorsal flagellum subequal in length to ultimate peduncular segment, with distal portion about twice length of proximal aesthetasc-bearing portion.

Antennal peduncle (Fig. 23A) falling short of distal corneal margin. Fifth and fourth segments with few short setae. Third segment with 1 prominent spine at ventromesial distal margin. Second segment with dorsolateral distal angle produced in simple spine far falling short of midlength of fourth segment; dorsomesial distal angle with minute spine. First segment unarmed. Antennal acicle slender, slightly arcuate, only reaching corneal base, terminating in slender spine, with row of short setae along entire length. Antennal flagellum exceeding 4.0 length of shield; articles each with some short to long setae on distal margin (long setae present every 2 or 3 articles).

Third maxilliped moderately stout, with crista dentata on ischium consisting of 2 teeth (Fig. 23B). Carpus without dorsodistal spine.

Chelipeds (Figs. 23C–F, 24A–C) distinctly unequal and dissimilar. Right cheliped (Fig. 24A–C) moderately long; propodal-carpal articulation rotated clockwise about 20° from perpendicular. Chela about 2.2 times longer than wide, elongate subovate, widest slightly proximal to base of dactylus. Dactylus articulating slightly obliquely with palm, about 0.7 length of palm, slightly curved ventrally; dorsal surface convex, dorsomesial margin not delimited; mesial surface unarmed; cutting edge with 3 prominent calcareous teeth (proximalmost teeth tubercle-like, distal 2 teeth triangular), terminating in tiny corneous claw; scattered tufts of short to long setae on surfaces. Palm 0.9 times as long as carpus, with parallel lateral and mesial margins; dorsal surface convex, spineless, but with prominent

proximal protuberance slightly mesial to midline, and with numerous long setae arranged in irregular longitudinal rows; dorsolateral and dorsomesial margins not delimited; lateral, mesial and ventral surfaces also with long setae; ventral surface slightly convex. Fixed finger with 2 blunt triangular calcareous teeth on cutting edge, terminating in minute corneous claw. Carpus subcylindrical, about 1.2 length of merus, not broadened distally, about 2.0 times longer than distal width; dorsal surface with dorsolateral row of 5 small spines (including 1 spine on dorsodistal lateral angle), no mesial spines; mesial surface with numerous scattered long setae; ventrolateral distal angle with 1 small spine; lateral and ventral surfaces with some long setae. Merus with few moderately short setae on dorsal margin; dorsodistal margin without spine; lateral surface almost glabrous, ventrolateral margin generally convex, with 2 strong spines distally; mesial surface mostly glabrous, ventromesial margin with 2 small spines at distal angle; ventral surface slightly concave, with several long setae. Ischium unarmed, with moderately long setae on surfaces.

Left cheliped (Fig. 23C–F) slender, reaching midlength of right chela; propodal-carpal articulation rotated counterclockwise about 20° from perpendicular. Chela not arched, 2.8 times longer than wide; fingers without hiatus. Dactylus subequal in length to palm, unarmed, with numerous tufts of long setae; dorsomesial margin not delimited; cutting edge with row of minute corneous teeth in distal half, terminating in small corneous claw. Palm about 0.6 length of carpus; dorsal surface moderately convex, spineless; surfaces with numerous tufts of long setae or individual short to long setae arranged in irregular longitudinal rows. Fixed finger with row of minute corneous teeth in distal half of cutting edge, terminating in small corneous claw. Carpus slightly widened distally, 2.3 times longer than distal width; dorsal surface with 1 small mesial spine distal to midlength and with several tufts of long setae; dorsodistal margin unarmed; lateral and mesial surfaces also with tufts of long setae dorsally and distally, ventrolateral distal angle with 1 small spine; ventral surface slightly convex, with some long setae. Merus with few short setae on dorsal margin distally; dorsodistal margin unarmed; lateral surface with tufts of long setae ventrally, ventrolateral margin with 1 small subdistal spine; mesial surface with several long setae adjacent to ventral margin, ventromesial margin raised, with 1 small distal spine; ventral surface concave transversely, with some long setae. Ischium unarmed.

Ambulatory legs (Fig. 24D, F) long and slender. Dactyli (Fig. 24E, G) 1.4–1.5 times longer than propodi, about 14.0 times longer than wide, straight in dorsal view, gently curved ventrally in lateral view, terminating in very long, slender corneous claws; dorsal margins each with row of stiff setae increasing in length distally, distal 5 or 6 setae thickened, bristle-like; mesial faces each with row of short stiff setae on midline (second) or almost glabrous (third); ventral margins unarmed, each bearing sparse, short or long setae. Propodi each with single elongate corneous spine flanked by 2 or 3 much shorter spines (second) or only with pair of small corneous spines (third) on ventrodistal

margin; dorsal and ventral margins with sparse short stiff setae. Carpi without dorsodistal spine; few setae on dorsal margins. Meri unarmed; dorsal margins each with few tufts of short setae; ventral margins glabrous. Ischia with few short setae on dorsal and ventral margins. Second pereopods with shallow notch on ventral margin at articulation between merus and ischium.

Fourth pereopod (Fig. 23G) semichelate; dactylus with several minute corneous teeth on ventral margin; propodal rasp consisting of 8 corneous scales arranged in single row. Fifth pereopods semichelate.

Anterior lobe of sixth thoracic sternite (Fig. 23H) subtrapezoidal, slightly skewed to left, bearing some submarginal short setae anteriorly; anterior margin faintly tuberculate.

Male with moderately long sexual tube emanating from coxa of right fifth pereopod (Fig. 23I), directed from right to left, distinctly overreaching lateral margin of coxa of left fifth pereopod. Coxa of left without trace of papilla-like sexual tube, but gonopore well marked. Eighth thoracic sternite (Fig. 23I) with single broad lobe bearing numerous setae.

Telson (Fig. 23J) almost as long as wide, not narrowed posteriorly; no lateral indentations; posterior lobes somewhat asymmetrical, separated by deep U-shaped median cleft; terminal margins oblique, left with 4 small spines, right with 3 small spines.

Female unknown.

Colouration. — Not known.

Distribution. — Known only from the type locality, 33–45 m.

Remarks. — *Catapaguroides tenuiclavus*, new species, somewhat resembles *C. iejimensis*, *C. levigatus*, new species, and *C. umbra* in sharing the following features: cornea normally developed, rounded; antennal peduncle not overreaching distal corneal margin; right chela subovate, non-operculiform; left cheliped with spineless palm and carpus bearing one or more dorsal spines. *Catapaguroides tenuiclavus* is, however, readily distinguished from the latter three species by the long antennular peduncle overreaching the distal corneal margin by the full length of the ultimate segment, the possession of a prominent hump-like proximal protuberance on the palm of the right cheliped, and the elongate claws of dactyli of the ambulatory legs. In the latter three species, the antennular peduncle overreaches the distal corneal margin by at most half length of the ultimate segment; the palm of the right cheliped has a sharp proximal spine in *C. iejimensis* and *C. umbra*, whereas such a spine or protuberance is absent in *C. levigatus*; claws of the ambulatory dactyli are not particularly elongate. Furthermore, in *C. tenuiclavus*, there are no arthrobranch gills above the base of the third maxilliped, whereas the

latter three species have two arthrobranches above the base of the third maxilliped.

Etymology. — From the combination of the Latin, “*tenuis*” [= narrow] and “*clavus*” [= nail], alluding to the elongate corneous claws on the dactyli of the ambulatory legs. Used as a noun in apposition.

***Catapaguroides tuber*, new species**

(Figs. 25, 26)

Material examined. — Holotype: male (sl 0.86 mm), PANGLAO 2004, stn B36, N of Doljo, Panglao Island, 09°35.9'N, 123°44.5'E, 23 m, reef wall, 1 Jul.2004, NMCR 39068.

Description. — Eight pairs of biserial phyllobranchiate gills; no arthrobranches above base of third maxilliped; 2 arthrobranches on cheliped very small, each bilobed; remaining gills distinctly lamellate; no pleurobranches on wall of seventh thoracic somite.

Shield (Fig. 25A) about 1.2 times longer than wide; anterior margins between rostrum and lateral projections slightly concave; anterolateral margins sloping; posterior margin rounded with shallow median notch; dorsal surface glabrous. Rostrum broadly triangular. Lateral projections triangular, not reaching level of rostrum, without marginal or submarginal spinule.

Ocular peduncle (Fig. 25A) about 0.9 length of shield, moderately slender, slightly widened proximally; dorsal surface with 2 tufts of long stiff setae in mesial distal 0.2 and 1 additional seta laterally adjacent to base of cornea; cornea artificially shrunk. Ocular acicle small, triangular, without submarginal or subterminal spinule, separated to each other basally by basal width of 1 acicle. Interocular lobe with nearly flat anterior surface.

Antennular peduncle (Fig. 25A) when fully extended, overreaching distal corneal margin by approximately full length of ultimate segment. Basal segment with spinule proximolaterally. Ultimate segment 0.6 length of shield, slightly broadened distally in lateral view, with 2 long plumose setae at dorsolateral distal portion. Dorsal flagellum slightly longer than ultimate peduncular segment, with distal portion about twice length of proximal aesthetasc-bearing portion.

Antennal peduncle (Fig. 25A) reaching corneal base. Fifth and fourth segments with few short setae. Third segment with 1 prominent spine at ventromesial distal margin. Second segment with dorsolateral distal angle produced in short simple spine far falling short of midlength of fourth segment; dorsomesial distal angle with minute spine. First segment unarmed. Antennal acicle slender, slightly arcuate, only reaching corneal base, terminating in slender spine, with terminal tuft of setae. Antennal flagellum exceeding 3.0 length of shield, articles each with some short to long setae on distal margin (long setae present every 2 or 3 articles).

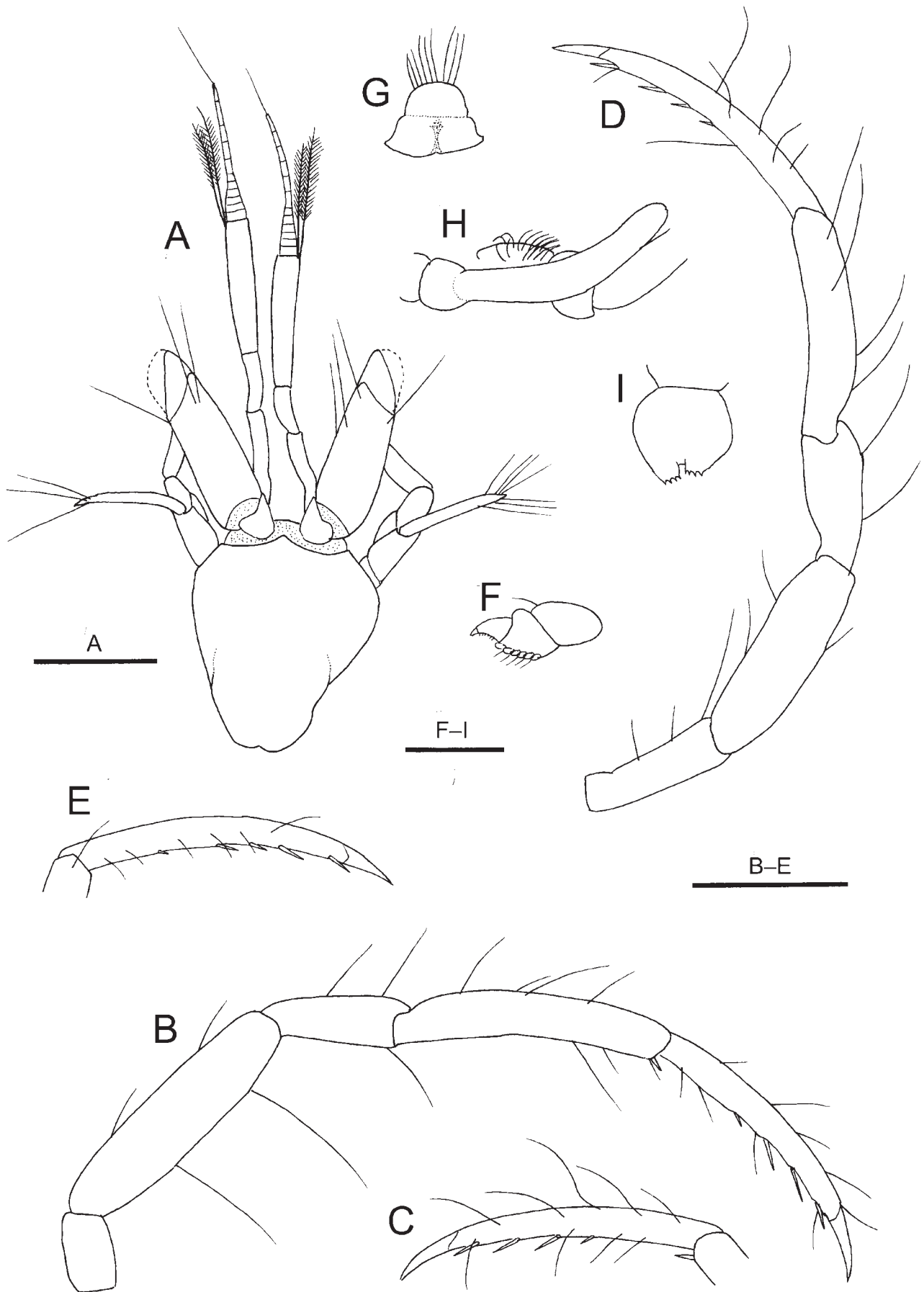


Fig. 25. *Catapaguroides tuber*, new species, holotype, male (sl 0.86 mm), PANGLAO 2004, stn T36, NMCR 39068. A, shield and cephalic appendages, dorsal view; B, right second pereopod, lateral view; C, same, dactylus, mesial view; D, left third pereopod, lateral view; E, same, dactylus, mesial view; F, distal three segments of left fourth pereopod, lateral view; G, sixth thoracic sternite, ventral view; H, coxae of fifth pereopods and eighth thoracic sternite, ventral view; I, telson, dorsal view. Scale bars = 0.5 mm (A, B-E); 0.25 mm (F-I).

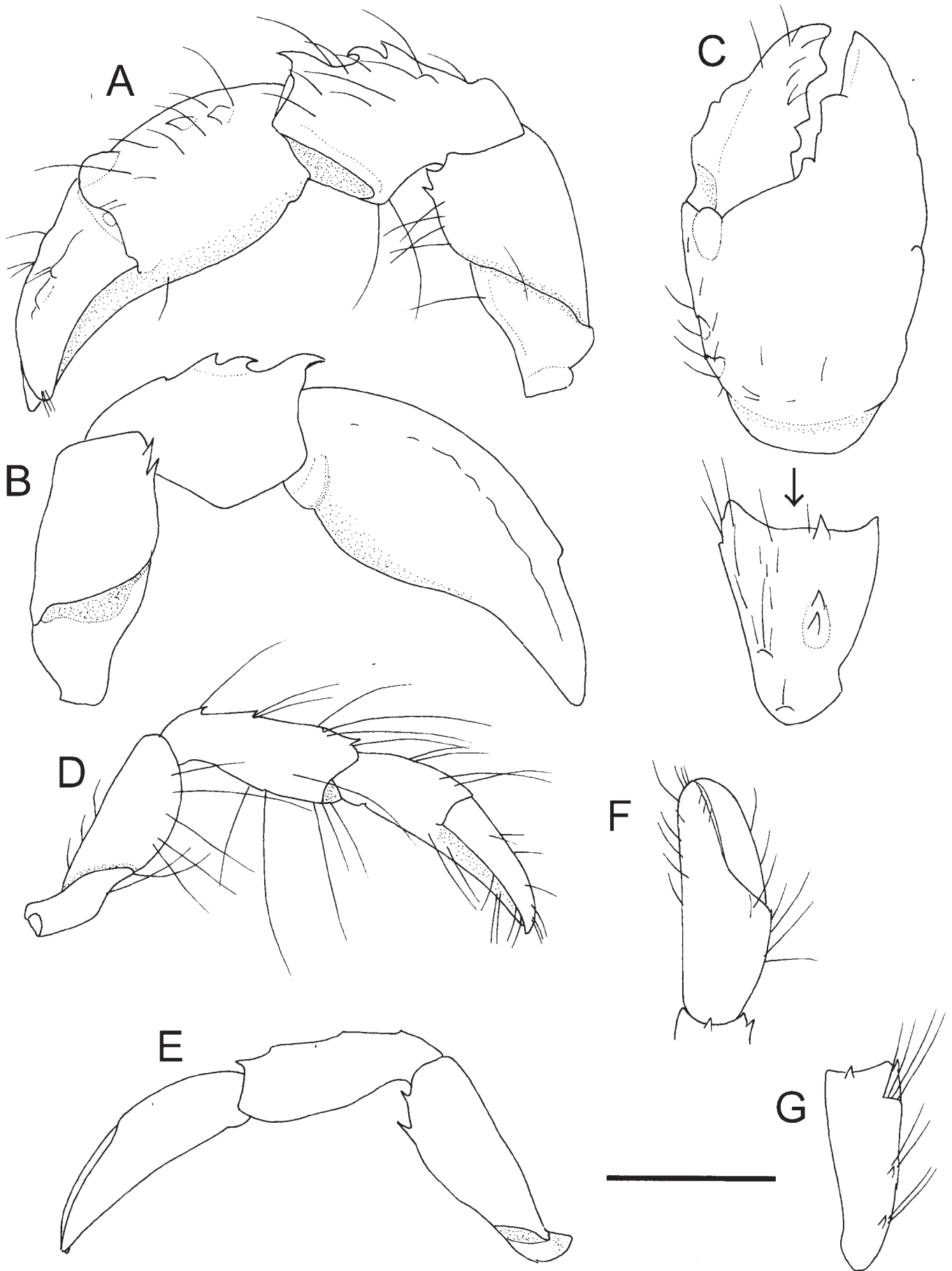


Fig. 26. *Catapaguroides tuber*, new species, holotype, male (sl 0.86 mm), PANGLAO 2004, stn T36, NMCR 39068. A, right cheliped, mesial view; B, same, lateral view (setae omitted); C, same, chela and carpus, dorsal view; D, left cheliped, mesial view; E, same, lateral view (setae omitted); F, same, chela, dorsal view; G, same, carpus, dorsal view. Scale bar = 0.5 mm.

Third maxilliped moderately stout, with crista dentata on ischium consisting of 2 teeth. Carpus without dorsodistal spine.

Chelipeds distinctly (Fig. 26) unequal and dissimilar. Right cheliped (Fig. 26A–C) stout; propodal-carpal articulation rotated clockwise about 20° from perpendicular. Chela about 1.7 times longer than wide, subovate, widest at base of dactylus. Dactylus articulating obliquely with palm, subequal in length to palm, slightly curved ventrally, without conspicuous spines; dorsal surface slightly convex, with few short setae; dorsomesial margin delimited by faintly tuberculate ridge in proximal 0.6; mesial and ventral surfaces glabrous; cutting edge with 3 prominent calcareous teeth (proximalmost teeth rounded, distal two teeth triangular), terminating in tiny corneous claw. Palm subequal in length to carpus; dorsal surface slightly convex, with 2 small mesial spines located in proximal half, and low but prominent rounded protuberance at articulation with dactylus, and with few short setae; dorsolateral margin delimited by faintly tuberculate ridge; dorsomesial margins not delimited; lateral, mesial and ventral surfaces with few setae; ventral surface convex. Fixed finger with 3 unequal calcareous teeth on proximal half of cutting edge, terminating in minute corneous claw. Carpus broadened distally, about 1.3 times longer than distal width; dorsal surface with 2 moderately small lateral spines at about midlength, no mesial spine; dorsodistal margin with strong spine at lateral angle; mesial surface with few long setae dorsally; ventrolateral distal angle unarmed; ventral surface convex, with few long setae. Merus glabrous on dorsal margin; dorsodistal margin with 1 small spine mesially; lateral surface almost glabrous, ventrolateral margin generally convex, with 2 small spines subdistally; mesial surface also almost glabrous, ventromesial margin with 2 small subdistal spines; ventral surface slightly convex, with some moderately short setae. Ischium unarmed.

Left cheliped (Fig. 26D–G) moderately slender, slightly overreaching base of dactylus of right chela; propodal-carpal articulation rotated counterclockwise about 20° from perpendicular. Chela 2.9 times longer than wide, not arched; fingers without hiatus. Dactylus 1.1 length of palm, unarmed, with some short setae; dorsomesial margin not delimited; cutting edge microscopically denticulate, terminating in minute corneous claw. Palm about 0.6 length of carpus; dorsal surface moderately convex, spineless; dorsal and ventral surfaces with sparse long setae. Fixed finger with row of minute corneous teeth on cutting edge, terminating in minute corneous claw. Carpus slightly widened distally, about 2.7 times longer than distal width; dorsal surface with 2 mesial spines on proximal half and few tufts of long setae mesially; dorsodistal margin with 1 spine at each lateral and mesial angle; lateral and mesial surfaces almost glabrous, ventrolateral distal angle unarmed; ventral surface slightly convex, with some long setae. Merus with few short setae on dorsal margin; dorsodistal margin unarmed; lateral surface almost glabrous, ventrodorsal margin with 2 small subdistal spines; mesial surface also almost glabrous, ventromesial

margin generally convex, unarmed; ventral surface convex, with some long setae. Ischium unarmed.

Ambulatory legs (Fig. 25B, D) long and slender. Dactyli (Fig. 25C, E) 1.1–1.4 times longer than propodi, about 10.0–11.3 times longer than wide, straight in dorsal view, gently curved ventrally in lateral view, terminating in moderately long corneous claws; dorsal margins each with sparse short to long setae; mesial faces each with row of short sparse setae ventrally; ventral margins each with 4 or 5 slender corneous spines in distal 0.5–0.7. Propodi each with pair of slender corneous spines (second) or unarmed (third) on ventrodorsal margin; dorsal and ventral margins with sparse short and long setae. Carpi without dorsodistal spine; few long setae on dorsal margin. Meri spineless; dorsal and ventral margins with few short and long setae. Ischia glabrous (second) or with few ventral setae (third). Second pereopods with shallow notch on ventral margin at articulation between merus and ischium.

Fourth pereopod (Fig. 25F) semichelate; dactylus with several minute corneous teeth on ventral margin; propodal rasp consisting of 6 corneous scales arranged in single row. Fifth pereopods semichelate.

Anterior lobe of sixth thoracic sternite (Fig. 25G) subsemicircular, bearing short setae on anterior margin.

Male with medium-sized sexual tube emanating from coxa of right fifth pereopod (Fig. 25H), directed from right to left, slightly curved anteriorly, distinctly overreaching lateral margin of coxa of left fifth pereopod. Coxa of left without trace of papilla-like sexual tube, but with normal opening of gonopore. Eighth thoracic sternite (Fig. 25H) with single broad lobe bearing numerous short setae.

Telson (Fig. 25I) slightly wider than long, narrowed in posterior half; no lateral indentations; posterior lobes somewhat asymmetrical, separated by small median cleft; terminal margins slightly oblique, each with 4 small spines (including spines at outer angle).

Female unknown.

Colouration. — Not known.

Distribution. — Known only from the type locality, 23 m.

Remarks. — The corneas of the holotype are artificially shrunk, and thus, it is not known if the corneas are cone-shaped or normally developed and rounded. Nevertheless, *Catapaguroides tuber*, new species, appears unique in the genus in having a prominent dorsal protuberance of the palm of the right cheliped just proximal to the base of the dactylus. The carinate mesial margin of the dactylus of the right cheliped may link this new species to *C. cristimanus* and *C. karubar*, but the slightly tuberculate margin of the mesial carina differentiates *C. tuber* from the latter two

species. In the latter two species, the margin of the mesial dactylar carina of the right cheliped is smooth; furthermore, the carina is lamellar in *C. cristimanus*.

Etymology. — From the Latin “*tuber*” [= protuberance], referring to the presence of a prominent protuberance on the right palm just proximal to the base of dactylus. Used as a noun in apposition.

KEY TO SPECIES OF CATAPAGUROIDES

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- Ocular peduncles with corneas not appreciably reduced, nor conical in shape, rounded6
- 3. Right cheliped entirely unarmed.....
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- Right cheliped armed with spines on chela and carpus.....4
- 4. Cornea pointed distally; left chela unarmed on dorsal surface5
- Cornea not distinctly pointed distally; left chela armed with few spines on dorsomesial margin*C. hooveri* McLaughlin & Pittman, 2002
- 5. Antennal peduncle and acicle distinctly overreaching distal corneal margin; right male sexual tube relatively short, directed to left across ventral body surface, at most slightly overreaching lateral margin of left coxa..... *C. foresti* McLaughlin, 2002
- Antennal peduncle and acicle not overreaching distal corneal margin; right male sexual tube very long, directed to left across ventral body surface and then strongly curved anteriorly, extending to base of left cheliped.....*C. conicus*, new species
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- Antennal peduncles not overreaching distal corneal margins.....17
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- Carpus of right cheliped as long as or distinctly longer than palm.....11
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- Carpus of left cheliped unarmed.....*C. megalops* A. Milne-Edwards & Bouvier, 1892
- 12. Dactylus of right cheliped with dorsomedian ridge or crest, at least in proximal half *C. declivis* McLaughlin, 1997
- Dactylus of right cheliped without dorsomedian ridge or crest.....*C. pectinipes* (Lewinsohn, 1969)

- 13. Palm of right cheliped with numerous small spines at least on distal half of dorsal surface.....*C. japonicus* de Saint Laurent, 1968
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- 16. Ocular peduncle widened proximally with non-dilated cornea; carpus of right cheliped with spines on lateral and mesial angles of dorsodistal margin.....*C. brevidactylus*, new species
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- Palm of right cheliped without dorsomesial spines23
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- Cornea not dilated; dactylus of right cheliped always unarmed; carpus of right cheliped unarmed on dorsodistal margin; dactyli of ambulatory legs each with 1–3 corneous spines on ventral margin..... *C. umbra* Komai, 2009
- 23. Merus of left cheliped with subdistal spine on dorsal margin; merus of left third pereopod with 1 spine on dorsal margin proximal to midlength and 2 spines on ventral margin in distal 0.3*C. pusillus*, new species
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