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SIX NEW SPECIES OF THE HERMIT CRAB GENUS *DECAPHYLLUS* DE SAINT LAURENT, 1968 (CRUSTACEA: DECAPODA: ANOMURA: PAGURIDAE) FROM THE BOHOLO SEA, THE PHILIPPINES, AND THE RYUKYU ISLANDS, JAPAN

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ABSTRACT. — The pagurid genus *Decaphyllus* de Saint Laurent, 1968 was represented by five species prior to this study. In this work, six new species of the genus are described and illustrated on the basis of material mainly collected by the PANGLAO 2004 Marine Biodiversity Project, carried out in Bohol, the Philippines, supplemented by a small collection from Japan: *D. brevis*, *D. deliquus*, *D. litoralis*, *D. proprius*, *D. spinulodigitus*, and *D. tenuis*. Affinities of these new species are discussed. Interspecific variation in the development of the arthrobranch gills on the third maxilliped is seen. The genus *Decaphyllus* is recorded from the Philippines for the first time. The present work increases the number of species of *Decaphyllus* to 11.

KEY WORDS. — Crustacea, Decapoda, Anomura, Paguridae, *Decaphyllus*, new species, Philippines, Japan

INTRODUCTION

In her revision of the pagurid hermit crab genera *Catapaguroides* A. Milne-Edwards & Bouvier, 1892 and *Cestopagurus* Bouvier, 1897, de Saint Laurent (1968a) erected a new genus *Decaphyllus* de Saint Laurent, 1968 for a previously unknown species *D. spinicornis* de Saint Laurent, 1968a from Japan. In this first publication of serial papers, she presented only a brief generic diagnosis and species diagnosis of the type species of the genus, *D. spinicornis*. A general description of the genus and full descriptions of *D. spinicornis* and two new species, *D. similis* de Saint Laurent, 1968b from Indonesia, and *D. junquai* de Saint Laurent, 1968b from New Guinea and Indonesia, were presented in a subsequent paper (de Saint Laurent, 1968b). Two additional new species have been described recently by McLaughlin (1997) from Indonesia, *D. barunajaya* McLaughlin, 1997 and *D. maci* McLaughlin, 1997. Komai & Takeda (2006) reported *D. spinicornis* from Sagami Bay, Japan, providing a description supplementing the original description. *Decaphyllus* is one of the five genera of the Paguridae characterised by the lack of a pleurobranch above the fourth pereopod (seventh thoracomere). *Catapaguroides* appears closest to *Decaphyllus* (de Saint Laurent, 1968a, 1968b). Diagnostic characters of *Decaphyllus* include: third maxilliped with crista dentata reduced, consisting only of a few to some sharp teeth, and lacking accessory tooth; fourth pereopod non-chelate, with strongly reduced propodal rasp consisting of 1 or 2 minute corneous scales; male with very long right sexual tube directed from right to left under thorax, and recurved dorsally and anteriorly; coxa of left fifth pereopod with short sexual tube directed from left to right; female with unpaired left gonopore; male with four unpaired left pleopods; and lateral indentations of telson absent (McLaughlin, 2003; Komai & Takeda, 2006).

The present study reports on species of *Decaphyllus* collected 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 have been published (McLaughlin & Rahayu, 2007; McLaughlin, 2008; McLaughlin & Lemaitre, 2009; Rahayu & Forest, 2009; Asakura, 2010; Komai & Rahayu, 2013a, 2013b; Komai, 2013; Rahayu & Komai, in press). In addition to this PANGLAO 2004 material, supplemental specimens from other sources were also examined during this study. Six species, all new to science, are recognized, i.e., *D. brevis*, *D. deliquus*, *D. litoralis*, *D. proprius*, *D. spinulodigitus*, and *D. tenuis*. Affinities of these new species

are discussed in detail. An identification key to the all known species of the genus is also provided.

The specimens examined are deposited in the following institutions: National Museum of the Philippines, Manila (NMCR); Zoological Reference Collection (ZRC), the Raffles Museum of Biodiversity Research, National University of Singapore; and 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).

For comparison, the following specimens were examined. *Decaphylus spinicornis* de Saint Laurent, 1968: 1 female (sl 2.1 mm), Tateyama Bay, S of Boso Peninsula, 34°59.38′N, 139°37.38'E, 62–73 m, oyster bed, 28 May 2004, dredge, coll. T. Komai, CBM-ZC 8432; 1 male (sl 2.8 mm), 1 female (sl 2.5 mm), same locality, 34°59.37'N, 139°47.40'E, 65–77 m, oyster bed, 28 May 2004, dredge, coll. T. Komai, CBM-ZC 8435; 1 female (sl 2.0 mm), same data, CBM-ZC 11607.

TAXONOMIC ACCOUNT

Decaphyllus de Saint Laurent, 1968

Decaphyllus de Saint Laurent, 1968a: 925; 1968b: 1100; McLaughlin, 1997: 447; 2003: 121.

Remarks. — As discussed by de Saint Laurent (1968a, 1968b), *Decaphyllus* appears closest to *Catapaguroides*. Differentiating characters between the two genera are well presented by de Saint Laurent (1968a, 1968b), though McLaughlin (1997) proposed an emended generic diagnosis to accommodate the new species described by her. The six new species described in this study fall within the generic diagnosis of McLaughlin (1997, 2003). Practically, *Decaphyllus* can be distinguished from *Catapaguroides* by the setose ambulatory dactyli lacking any armature, the non-chelate fourth pereopods with the dactylus bearing thick setae covering terminal claw, and the characteristic shape of the telson. In addition to these characters mentioned by previous authors, we noticed that the following characters are supplemental in differentiating species of *Decaphyllus* from those of *Catapaguroides*: ocular peduncle having dorsal or dorsomesial row of tufts of long setae (such tufts of setae absent in *Catapaguroides*); ultimate segment of antennular peduncle without one or two long feathered setae on dorsolateral distal angle (these long setae present in *Catapaguroides*); meri of both chelipeds bearing a proximoventral protuberance or spine on mesial surface (no such protuberance or spine in *Catapaguroides*); ischia of both chelipeds bearing two widely spaced small spine or spinules on ventromesial margin (such spines absent in *Catapaguroides*).

During this study, we have found reduction or loss of the arthrobranchs on the third maxilliped is rather widely seen in species of *Decaphyllus* (see Table 1), like in species of *Catapaguroides* (cf. Komai & Rahayu, 2013). The complete loss of those gills is seen in *D. deliquus*, new species, in addition to *D. barunajaya*. In *D. litoralis*, new species, there is only a single arthrobranch strongly reduced to a minute, simple bud. In the other species examined in this study, the arthrobranchs are very small in size, often reduced to non-lamellate, bud-like structure. Therefore, it is reasonable to consider that the loss of the arthrobranchs on the third maxilliped could not be diagnostic alone at genus level.

Decaphyllus brevis, new species
(Figs. 1–3)

Material examined. — Holotype: ovigerous female (sl 1.3 mm), PANGLAO 2004, stn T4, Bolod, Panglao Islands, 09°33.0'N, 123°48.5'E, 82 m, many sponges, 1 Jun.2004, trawl, NMCR 39086. Paratype: 1 ovigerous female (sl 1.6 mm), PANGLAO 2004, stn P1, Maribohoc Bay, Panglao Islands, 09°36.1'N, 123°45.0'E, 90–200 m, 30 May 2004, tangle nets from local fishermen, ZRC 2013.0678.

Description. — Ten pairs of biserial phyllobranchiae (no pleurobranchs). Arthrobranchs above base of third maxilliped very small, each gill bilobed.

Shield (Fig. 1A) approximately as long as wide; anterior margin between rostral region and lateral projection very slightly concave; anterolateral margins sloping; posterior margin roundly truncate; dorsal surface with poorly calcified area along midline, with few short setae laterally. Rostrum obsolete. Lateral projections moderately developed, each with terminal spinule.

Ocular peduncle (Fig. 1A) about 0.8 length of shield, faintly constricted at midlength; dorsal surface with mesial row of tufts of moderately short to long setae directed mesially, few median and lateral setae, and prominent tuft of long setae at base of cornea; cornea not dilated, its width about 0.3 of length of ocular peduncle; basal width subequal to corneal width. Ocular acicle tapering distally into acute spine, mesial margin with few long setae; separated basally by width of 1 acicle. Interocular lobe visible in dorsal view, anteriorly flat.

Antennular peduncle (Fig. 1A) overreaching distal corneal margin by about half length of ultimate segment. Basal segment with prominent spine on lateral margin of statocyst lobe, without ventromesial subdistal spine. Penultimate and ultimate segments unarmed, almost glabrous except for 2 thin short setae at dorsomesial distal angle of ultimate segment.

Antennal peduncle (Fig. 1A) reaching to base of cornea of ocular peduncle. Fifth and fourth segments with few setae. Third segment with prominent spine on ventromesial distal margin. Second segment with dorsolateral distal angle strongly produced, terminating in bifid spine (lateral spine distinctly subterminal), dorsomesial distal angle with tiny spine. First segment with 1 small spine on ventrodistal margin; lateral surface unarmed. Antennal acicle slightly falling short

Table 1. Comparison of development of arthrobranchs on third maxilliped in species of *Decaphyllus* de Saint Laurent, 1968.

Species	Condition	Source
D. barunajaya	completely absent	McLaughlin (1997)
D. brevis, new species	two arthrobranchs present, each very small, consisting of two lamellae	this study
D. deliquus, new species	completely absent	this study
D. janquai	two arthrobranchs present	de Saint Laurent (1968); McLaughlin (1997)
D. litoralis, new species	only one arthrobranch present, very small, non-lamellate, bud-like	this study
D. maci	two arthrobranch present, both lamellate	McLaughlin (1997)
D. proprius, new species	two arthrobranchs present, each very small, but with few lamellae	this study
D. similis	two arthrobranchs present, each very small, anterior gill simple, bud-like, posterior gill bilobed	this study
D. spinicornis	two arthrobranchs present, both very small, non-lamellate, bud-like	Komai & Takeda (2006)
D. tenuis, new species	two arthrobranchs present, each very small, anterior gill simple, bud-like, posterior gill bilobed	this study

or reaching distal margin of fifth peduncular segment or of corneal base or reaching to corneal base, terminating in small spine; mesial surface almost glabrous; lateral margin unarmed. Antennal flagellum with 2–4 short setae on distal margin of each article.

Third maxilliped (Fig. 1B) with merus armed with strong dorsodistal spine; crista dentata on ischium consisting of 2 widely separated triangular teeth; basis unarmed on mesial face. Exopod long, reaching to distal margin of carpus.

Chelipeds (Fig. 2) subequal in length; right only slightly longer, but appreciably stronger. Right cheliped (Fig. 2A–D) with chela elongate subovate in dorsal view, about 2.2 times longer than wide. Dactylus (Fig. 2C) set at slightly oblique angle to palm, slightly shorter than palm; dorsal surface with 3 or 4 tiny spines or tubercles proximally; all surfaces with scattered moderately short to long setae, particularly numerous on mesial surface; cutting edge with row of small, blunt calcareous teeth, terminating in tiny corneous claw. Palm (Fig. 2A–C) subequal in length to carpus; dorsomesial margin with row of small spines, dorsal midline with row of small spines or tubercles decreasing in size distally, dorsolateral margin not delimited and without spines, dorsal surface lateral to midline with some small spines or tubercles near base of fixed finger; lateral surface with scattered short to moderately short setae; mesial surface also with scattered moderately short setae; ventral surface convex, smooth, with sparse setae. Fixed finger with row of blunt calcareous teeth on cutting edge, terminating in tiny calcareous claw. Carpus (Fig. 2A–C) subequal in length to merus, moderately widened distally, about 1.7 times longer than wide; dorsomesial margin with row of 4 small to moderately large spines, dorsolateral surface with row of 3 moderately large spines; all surfaces with scattered short to long setae, subdistal transverse row of setae particularly prominent; ventrolateral distal angle and ventromesial angle each with 1 tiny spine. Merus (Fig. 2A, B, D) with 1 small spine on dorsodistal margin mesially; dorsal surface with sparse setae; ventrolateral margin with 1 moderately small spine subdistally; mesial surface with 1 small spiniform tubercle proximoventrally, ventromesial margin with 2 small spines, proximal spine directed mesially; ventral surface with 1 spine medially. Ischium (Fig. 2D) with 1 small spine on ventromesial margin distal to midlength; lateral surface with 1 spinule subdistally.

Left cheliped (Fig. 2E–H) without hiatus between dactylus and fixed finger. Dactylus (Fig. 2E, G) about 1.1 times longer than palm, with 1 minute tubercle on dorsal surface mesially and proximal to midlength, and with short to long setae, particularly numerous on mesial surface; cutting edge with row of small, blunt calcareous teeth, terminating in small corneous claw. Palm (Fig. 2E, G) about 0.8 length of carpus; dorsomesial margin with row of 5 minute spines, dorsal midline with 2 small proximal spines and row of 4 minute tubercles, dorsolateral margin with irregular row of minute tubercles or denticles extending onto fixed finger; all surfaces with scattered short to long setae. Fixed finger with row of tiny calcareous teeth on cutting edge, terminating in small corneous claw. Carpus (Fig. 2E–G) about 2.6 times

longer than wide, moderately widened distally; dorsolateral margin with 3 small spines in distal half, dorsomesial margin with 4 spines (distal second spine largest); ventrolateral distal angle with 1 minute spine, ventromesial distal angle unarmed; all surfaces with scattered setae. Merus (Fig. 2E, F, H) with sparse setae on dorsal surface; dorsodistal margin with 1 small spine; ventrolateral margin with 1 small subdistal spine; mesial surface with 1 prominent, anteriorly curved spine proximoventrally, ventromesial margin with 3 spines, second spine directed posteriorly, others directed anteriorly; ventral surface unarmed, with scattered setae. Ischium (Fig. 2H) with 2 tiny, mesially directed spines on ventromesial margin; lateral surface unarmed.

Ambulatory legs (Fig. 3) overreaching tip of right cheliped. Dactyli (Fig. 3A, B, D) 1.6–1.8 times longer than propodi, 11–12 times longer than broad, slightly curved ventrally; all surfaces unarmed, but with numerous setae, particularly longer on dorsal margins. Propodi unarmed, but with row of sparse short setae on dorsal and ventral margins and scattered very short setae on lateral and mesial faces (second, Fig. 3A) or almost glabrous (third, Fig. 3D). Carpi each with dorsodistal spine, and 2 additional small spines (second, Fig. 3C) or 2 minute denticles (third, Fig. 3E) located on proximal one-third of dorsal margin; dorsal and ventral surfaces with sparse setae. Meri (Fig. 3A, C–E) each with 2 small dorsal spines (distal spine located at distal 0.2 in second, distal 0.4 in third; proximal spine at proximal 0.2 in both second and third): dorsal and ventral margins with sparse long, distinctly plumose setae, latter with spinule distal to midlength (second) or unarmed (third). Ischium (Fig. 3C, E) with 1 small subdistal spine on ventral margin (second) or unarmed (third).

Fourth pereopods (Fig. 1C) with claw of dactylus entirely masked by tufts of short, dense setae; propodus with sparse setae on dorsal and ventral margins; no corneous scales apparently present. Fifth pereopods semichelate.

Female with unpaired left gonopore.

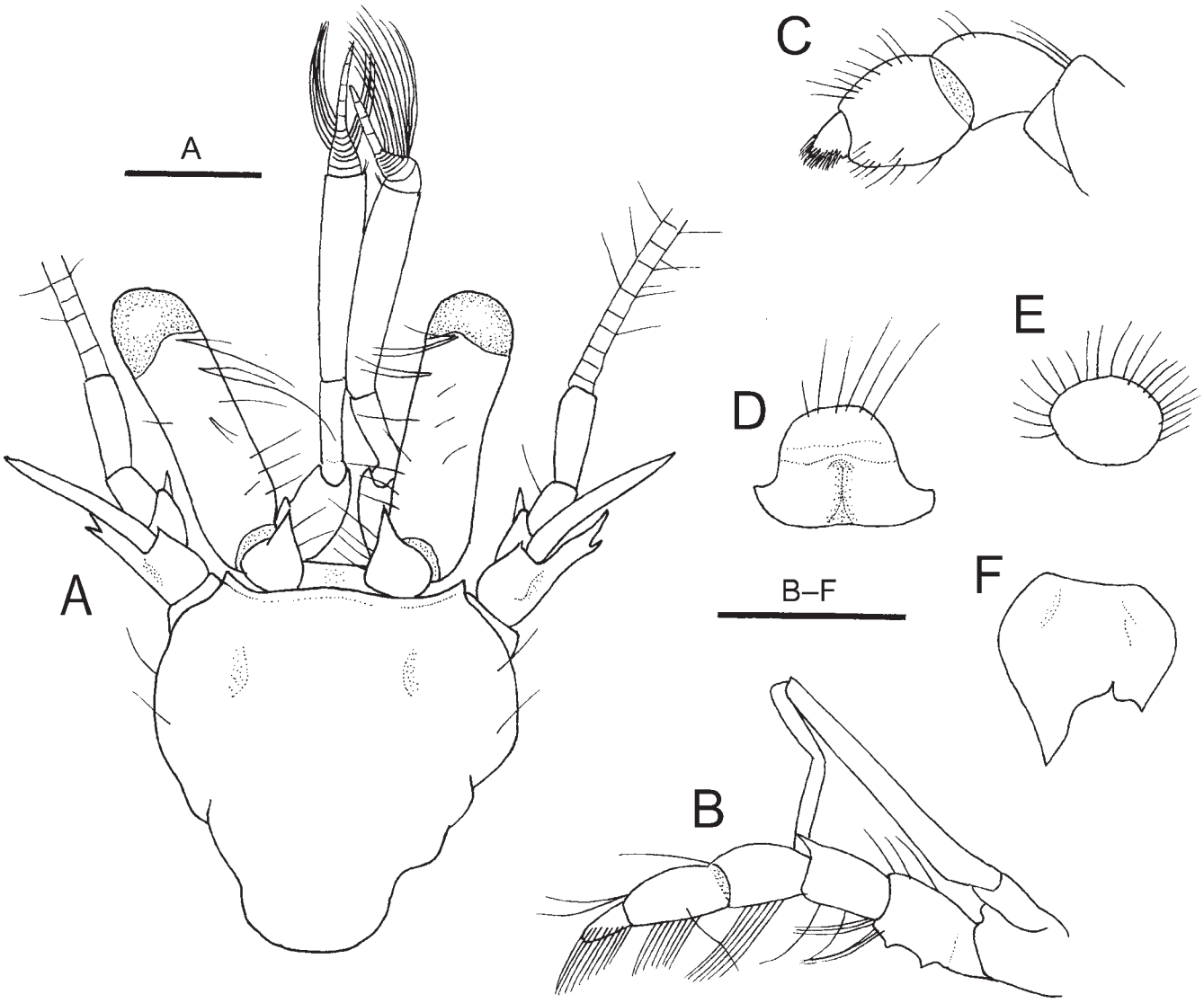

Fig. 1. *Decaphyllus brevis*, new species, holotype, female (sl 1.3 mm), PANGLAO 2004, stn T4, NMCR 39086. A, shield and cephalic appendages, dorsal view; B, left third maxilliped, lateral view (crista dentata on ischium partially visible); C, distal three segments of left fourth pereopod; D, sixth thoracic sternite, ventral view; E, eighth thoracic sternite, ventral view; F, telson, dorsal view. Scale bars = 0.5 mm.

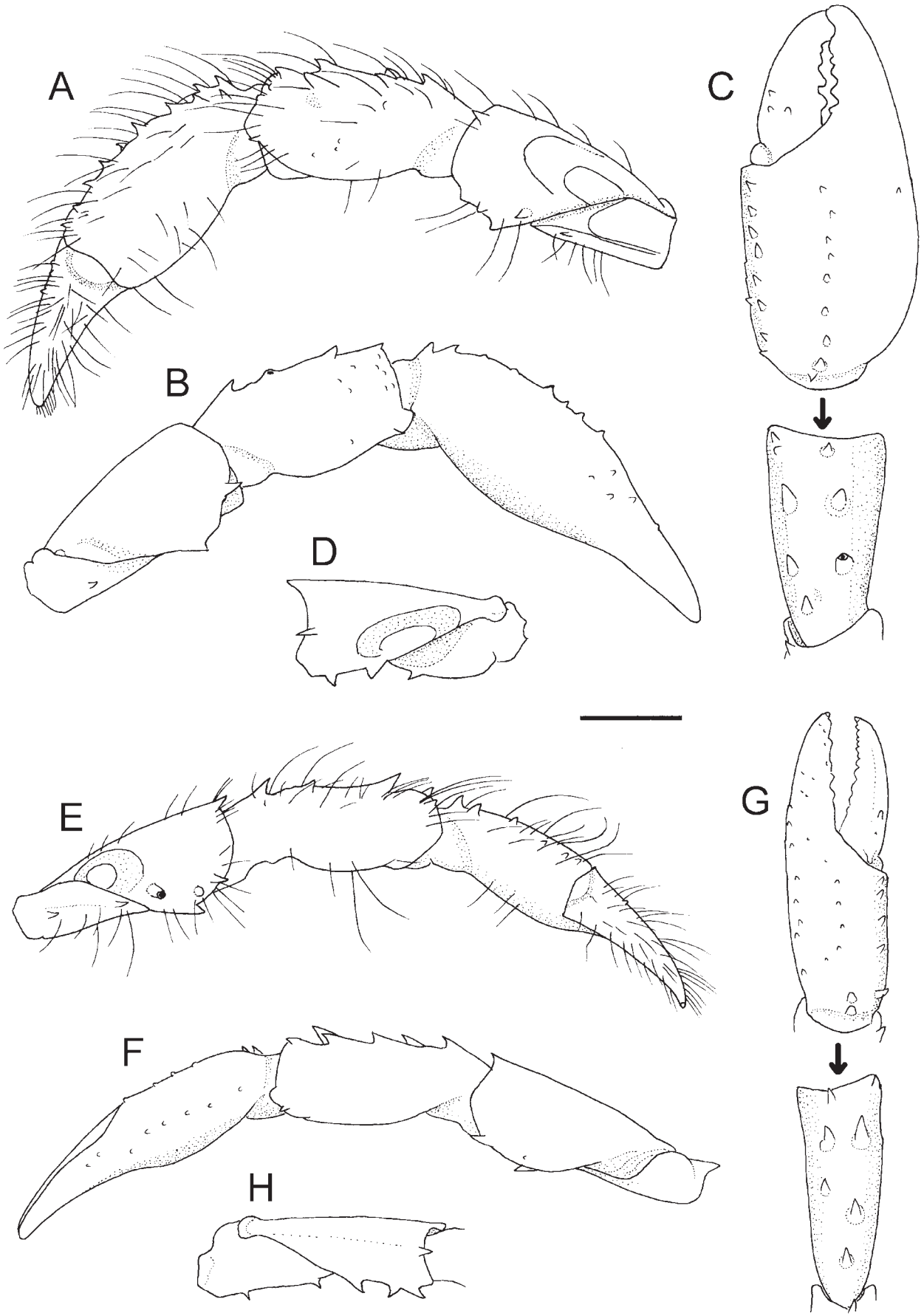

Fig. 2. *Decaphyllus brevis*, new species, holotype, female (sl 1.3 mm), PANGLAO 2004, stn T4, NMCR 39086. A, right cheliped, mesial view; B, same, lateral view (setae omitted); C, same, chela and carpus, dorsal view (setae omitted); D, same, merus, dorsal view (setae omitted); E, left cheliped, mesial view; F, same, lateral view (setae omitted); G, same, chela and carpus, dorsal view (setae omitted); H, same, merus, dorsal view (setae omitted). Scale bar = 0.5 mm.

Anterior lobe of thoracic sternite 6 (third pereopods, Fig. 1D) subtrapezoidal, slightly skewed to left, bearing some moderately long setae anteriorly. Sternite of thoracic sternite 8 (fifth pereopods) in female (Fig. 1E) subcircular, with row of moderately short setae anteriorly.

Telson (Fig. 1F) with median cleft small, V-shaped; terminal margin with prominently produced, spinose left exterior angle separated from weakly developed, also spinose right exterior angle, otherwise unarmed; lateral margins not forming chitinous plate.

Male unknown.

Colouration. — In preservative. No distinct markings seen on body and appendages. Shield, chelipeds and ambulatory legs with iridescence.

Distribution. — Known only from off Panglao Island, 82 m.

Remarks. — Although only two ovigerous females are available, this new species is safely assigned to the genus *Decaphyllus* by unarmed but setose dactyli of the ambulatory legs, the non-chelate fourth pereopod, and the entire thoracic sternite 8.

Decaphyllus brevis, new species, resembles *D. litoralis*, new species, described below. Shared characters include: ocular

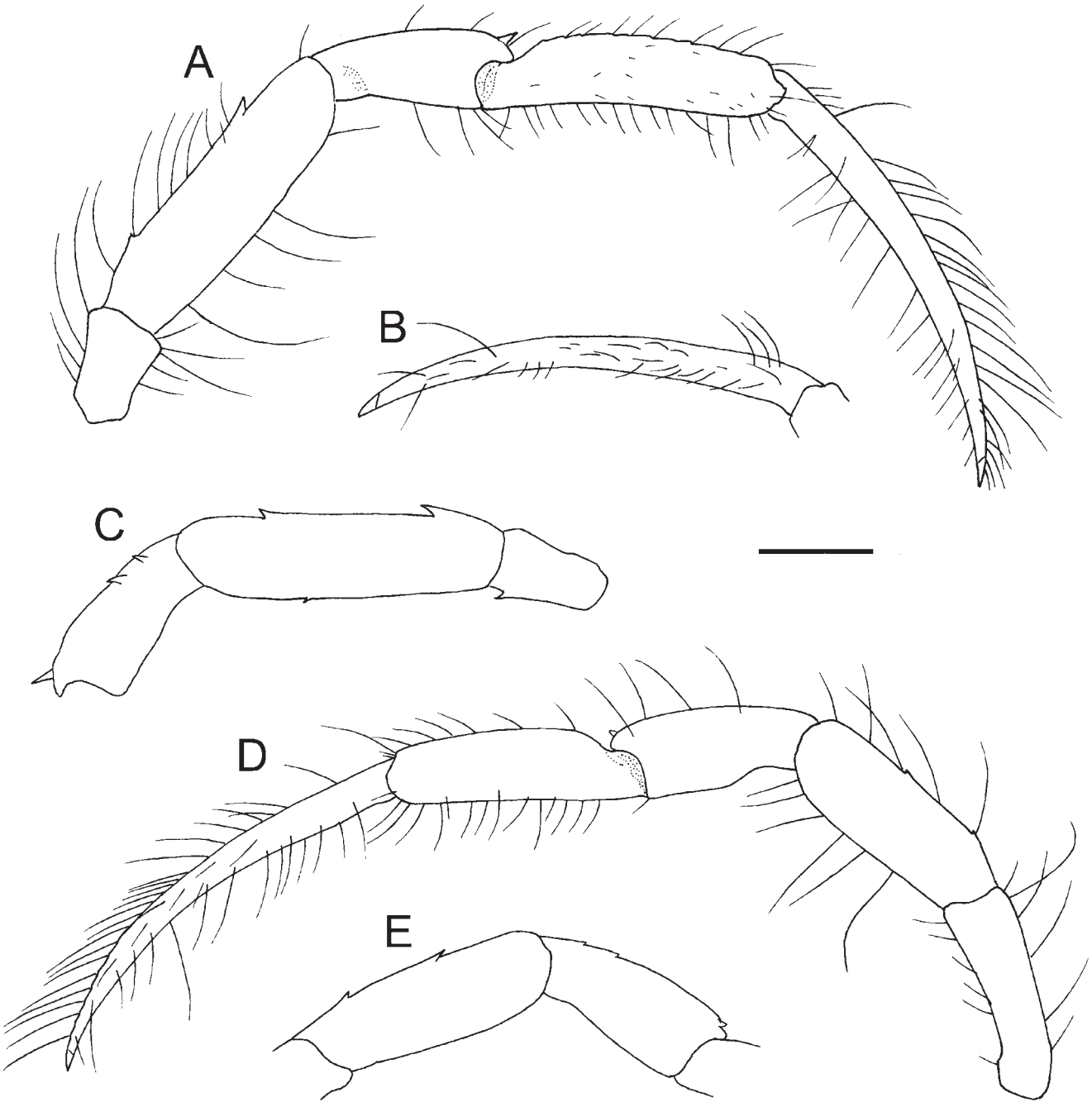

Fig. 3. *Decaphyllus brevis*, new species, holotype, female (sl 1.3 mm), PANGLAO 2004, stn T4, NMCR 39086. A, right second pereopod, lateral view; B, same, dactylus, mesial view (only mesial setae shown); C, same, carpus to ischium, mesial view (setae omitted); D, left third pereopod, lateral view; E, same, carpus and merus, mesial view (setae omitted). Scale bar = 0.5 mm.

peduncle relatively short, 0.8–0.9 times as long as shield, with cornea showing no dilation; antennal acicle not overreaching distal margin of fifth peduncular segment; dactylus of right cheliped with at least a few tiny spines or tubercles on dorsal surface; dorsal surface of palm of right cheliped lateral to midline without scattered spines or tubercles; and merus of right cheliped bearing mid-ventral spine. The present new species can be differentiated from *D. litoralis* by the following characters. On the third maxilliped, there are two arthrobranch gills, each bilobed in *D. brevis*, whereas there is only a single, simple, bud-like arthrobranch gill in *D. litoralis*. The antennal acicle falls short of the distal margin of the fifth segment of the antennal peduncle in *D. brevis*, rather than slightly overreaching it in *D. litoralis*. The distal-sided dorsal spine on the merus of the second pereopod is located more distally in *D. brevis* than in *D. litoralis* (about distal 0.3 versus about midlength). The merus of the second pereopod is also armed with a median spinule on the ventral margin in *D. brevis*, while unarmed in *D. litoralis*. The terminal margin of the telson is devoid of spinules between the exterior angles in *D. brevis*, rather than armed with spinules in *D. litoralis*. Finally, in *D. brevis*, iridescent sheen is seen on the shield, chelipeds and ambulatory legs, while it is absent in *D. litoralis*.

The present new species is also somewhat similar to *D. spinicornis* and *D. tenuis*, new species. *Decaphyllus spinicornis* is immediately distinguished from *D. brevis* by the presence of a prominent spine on the mesial surface of the basal segment of the antennular peduncle and the relatively longer antennal acicle (Komai & Takeda, 2006). In *D. brevis*, the mesial surface of the ultimate segment of the antennular peduncle is unarmed; the antennal acicle slightly falls short of the distal margin of the fifth peduncular segment, rather than overreaching in *D. spinicornis*. *Decaphyllus tenuis* is also readily distinguished from *D. brevis* by the more pronounced rostral lobe and the more slender right chela (about 3.0 times as long as wide versus 2.2 times), which bears scattered small spines or tubercles on the dorsal surface lateral to the midline.

Etymology. — From the Latin "*brevis*" (= short), in reference to the relatively short antennal acicle of this new species.

Decaphyllus deliquus, new species
(Figs. 4–7)

Material examined. — Holotype: ovigerous female (sl 1.6 mm), PANGLAO 2004, stn P1, Maribohoc Bay, Panglao Islands, 09°36.1'N, 123°45.0'E, 90–200 m, 30 May 2004, tangle nets from local fishermen, NMCR 39087.

Description. — Eight pairs of biserial phyllobranchiae (no pleurobranchs). Arthrobranch gills above base of third maxilliped absent.

Shield (Fig. 4A) approximately as long as wide; anterior margin between rostral region and lateral projection slightly concave; anterolateral margins sloping; posterior margin roundly truncate; dorsal surface with anteromedian and posteromedian parts poorly calcified, with few short setae laterally. Rostrum very broadly rounded. Lateral projections weakly developed, producing as far as rostrum, each with terminal spinule.

Ocular peduncle (Fig. 4A) subequal in length to shield; dorsal surface with mesial row of tufts of moderately short to long setae directed mesially, few lateral setae, and prominent tuft of long setae at base of cornea; cornea not dilated, its width slightly more than 0.2 of length of ocular peduncle; basal part slightly inflated, basal width slightly greater than corneal width. Ocular acicle drawn out distally into acute spine, mesial margin with several long setae; separated basally slightly less than width of 1 acicle. Interocular lobe visible in dorsal view, anteriorly slightly concave.

Antennular peduncle (Fig. 4A) overreaching distal corneal margin by about 0.3 length of ultimate segment. Basal segment with prominent spine on lateral margin of statocyst lobe, but without ventromesial subdistal spine. Penultimate and ultimate segments unarmed, almost glabrous except for 1 short thin seta at dorsomesial distal angle of ultimate segment.

Antennal peduncle (Fig. 4A) only reaching distal 0.4 of ocular peduncle. Fifth and fourth segments with few setae. Third segment with small spine on ventromesial distal margin. Second segment with dorsolateral distal angle strongly produced, terminating in bifid spine; dorsomesial distal angle with small spine. First segment with 1 strong spine on ventrodistal margin; lateral surface unarmed. Antennal acicle slightly overreaching distal margin of fifth peduncular segment, and reaching to corneal base, terminating in small spine; mesial surface with several long setae; lateral margin unarmed. Antennal flagellum with 2–4 short setae on distal margin of each article.

Third maxilliped (Fig. 4B) with merus armed with strong dorsodistal spine (right) or unarmed (left); crista dentata on ischium consisting of row of 4 triangular teeth; basis with 1 acute distal denticle on mesial face. Exopod long, reaching to distal margin of carpus.

Chelipeds (Figs. 5, 6) subequal in length; right only slightly longer, but appreciably stronger. Right cheliped (Fig. 5) with chela about 2.5 times longer than wide. Dactylus (Fig. 5C) set at slightly oblique angle to palm, slightly shorter than palm; dorsal surface with 1 small acute proximal spine mesially; all surfaces with scattered moderately short to long setae, particularly numerous on mesial surface; cutting edge with row of small, blunt calcareous teeth, terminating in tiny corneous claw. Palm (Fig. 5A, C) subequal in length to carpus; dorsomesial margin with row of moderately small spines, dorsal midline with row of moderately small spines or tubercles not extending onto fixed finger, dorsolateral margin with irregular row of small spines or tubercles, dorsal surface lateral to midline with only few small tubercles; lateral and mesial surfaces with scattered moderately short setae; ventral surface convex, smooth, with scattered setae. Fixed finger with row of blunt calcareous teeth on cutting edge, terminating in tiny calcareous claw. Carpus (Fig.

5A–C) slightly widened distally, subequal in length to merus, about 2.1 times longer than wide; dorsomesial margin with row of 5 spines of various sizes (distal second spine largest), dorsolateral margin with row of 5 smaller spines (proximalmost spine minute, tubercle-like); all surfaces with scattered short to long setae, subdistal transverse row of setae particularly prominent; ventrolateral distal angle with 1 minute spine; distomesial angle unarmed. Merus (Fig. 5A, B, D) with 1 small spine on dorsodistal margin mesially; dorsal surface with sparse setae; ventrolateral margin with 1 moderately large spine subdistally; mesial surface with 1 small protuberance proximoventrally, ventromesial margin with 2 widely spaced small spines; ventral surface with small spine medially. Ischium (Fig. 5D) with only proximal spinule on ventromesial margin, directed mesially; lateral surface with 1 spinule ventrally.

Left cheliped (Fig. 6) with narrow hiatus between dactylus and fixed finger. Dactylus (Fig. 6A, C) about 1.3 times longer than palm, unarmed, but with short to long setae particularly numerous mesially; cutting edge with row of minute corneous teeth in distal half. Palm (Fig. 6A, C) about 0.7 length of carpus; dorsomesial margin with row of 4 small spines, dorsal midline with 2 small spines proximally and 2 tiny spinulose tubercles distally, dorsolateral margin with irregular row of tiny spines or spinulose tubercles extending onto fixed finger; all surfaces with scattered short to long setae. Fixed finger with faintly denticulate cutting edge, terminating in tiny corneous claw. Carpus (Fig. 6A–C) slightly widened distally, about 3.2 times longer than wide; dorsolateral margin with 4 small tubercles or spines, dorsomesial margin with 3 moderately small spines; ventrolateral distal angle with 1 minute spine; all surfaces with scattered setae. Merus (Fig.

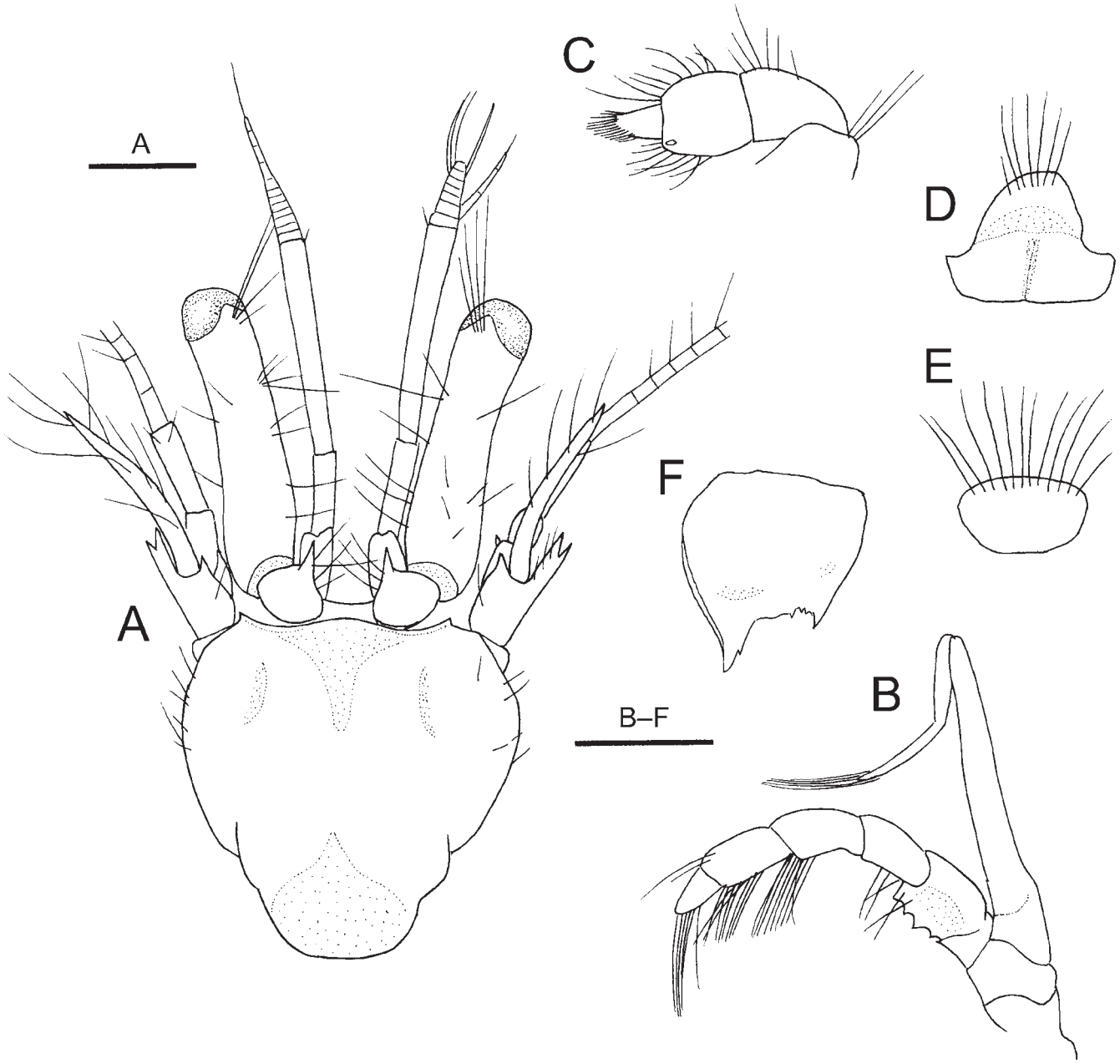

Fig. 4. *Decaphyllus deliquus*, new species, holotype, ovigerous female (sl 1.6 mm), PANGLAO 2004, stn P1, NMCR 39087. A, shield and cephalic appendages, dorsal view; B, left third maxilliped, lateral view (crista dentata on ischium partially visible); C, distal three segments of left fourth pereopod; D, sixth thoracic sternite, ventral view; E, eighth thoracic sternite, ventral view; F, telson, dorsal view. Scale bars = 0.5 mm.

6A, B, D) with sparse setae on dorsal surface; dorsodistal margin with 1 small spine; ventrolateral margin with 2 small, widely spaced spines; mesial surface with 1 prominent, proximally curved spine proximoventrally, ventromesial margin with 2 small spines; ventral surface unarmed, with scattered long setae. Ischium (Fig. 6D) with 1 anteriorly directed and 1 posteriorly directed spines on ventromesial margin; lateral surface with 1 minute spine.

Ambulatory legs (Fig. 7) overreaching tip of right cheliped. Dactyli (Fig. 7A, B, D) 1.5–1.8 times longer than propodi, 12.5–12.8 times longer than broad, slightly curved ventrally; all surfaces unarmed, but with numerous setae, particularly longer and stronger on dorsal margins. Propodi (Fig. 7A, D) unarmed, but with scattered short to long setae on surfaces and margins. Carpi each with dorsodistal spine (second) or minute tubercle (third, Fig. 7E), and 1 additional small spine located on proximal one-third of dorsal margin (second and third, Fig. 7C, E). Meri (Fig. 7A, C–E) each with 1 small spine slightly distal to midlength of dorsal margin, also with 1 additional spine at about proximal 0.2 on second pereopods; dorsal and ventral margins with numerous long setae, latter spineless. Ischium (Fig. 7C, E) unarmed.

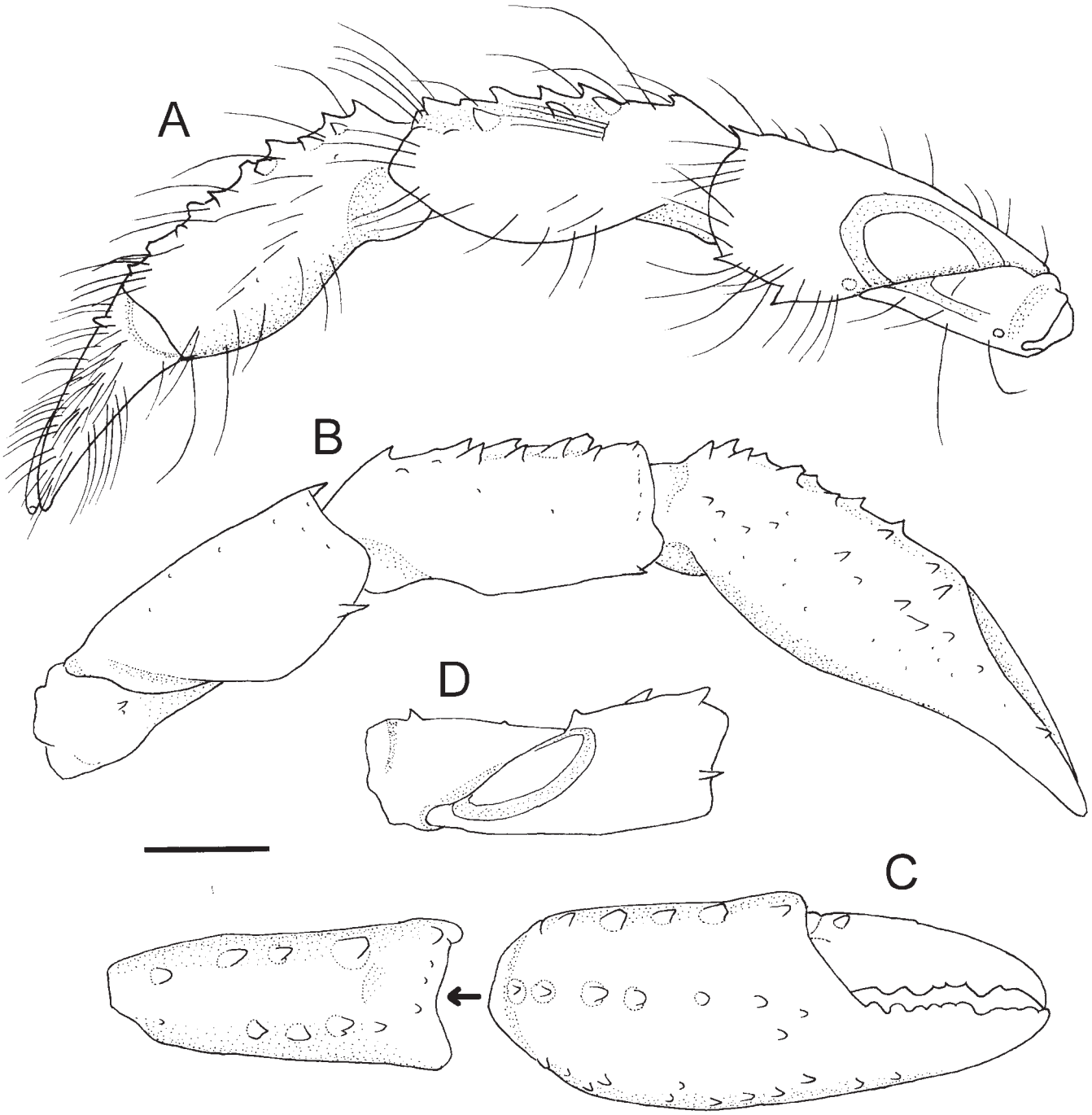

Fig. 5. *Decaphyllus deliquus*, new species, holotype, ovigerous female (sl 1.6 mm), PANGLAO 2004, stn P1, NMCR 39087. A, right cheliped, mesial view; B, same, lateral view (setae omitted); C, same, chela and carpus, dorsal view (setae omitted); D, same, merus, dorsal view (setae omitted). Scale bar = 0.5 mm.

Fourth pereopods (Fig. 4C) with claw of dactylus entirely masked by tufts of short, dense setae; propodus with 1 minute scale subterminally (Fig. 4C). Fifth pereopods semichelate.

Female with unpaired left gonopore.

Anterior lobe of sixth thoracic sternite (third pereopods, Fig. 4D) subsemicircular, slightly skewed to left, bearing moderately long submarginal setae. Sternite of eighth thoracic sternite (fifth pereopods) in female (Fig. 4E) subovate, with row of moderately long setae anteriorly.

Telson (Fig. 4F) with median cleft not apparent; left terminal margin with 1 minute denticle, left exterior angle prominently produced; right terminal margin narrow, with 4 minute denticles, right exterior angle spinose, weakly developed; left lateral margin with narrow chitinous plate.

Males unknown.

Colouration. — In preservative. Shield with slight iridescence posteriorly. Cornea light yellowish brown. Chelipeds and ambulatory legs with slight iridescence; merus of right cheliped with reddish brown patch on dorsal surface subdistally.

Distribution. — Known only from the type locality, Maribohoc Bay, Panglao Island. The real bathymetrical range is unknown, because the unique holotype came from steep slope at depths of 90–200 m.

Remarks. — Although only a single ovigerous female is available, this new species is safely assigned to *Decaphyllus* by unarmed but setose dactyli of the ambulatory legs, the non-chelate fourth pereopod, and the entire eighth thoracic sternite.

The complete loss of the arthrobranch gills on the third maxilliped links *Decaphyllus deliquus*, new species, to *D.*

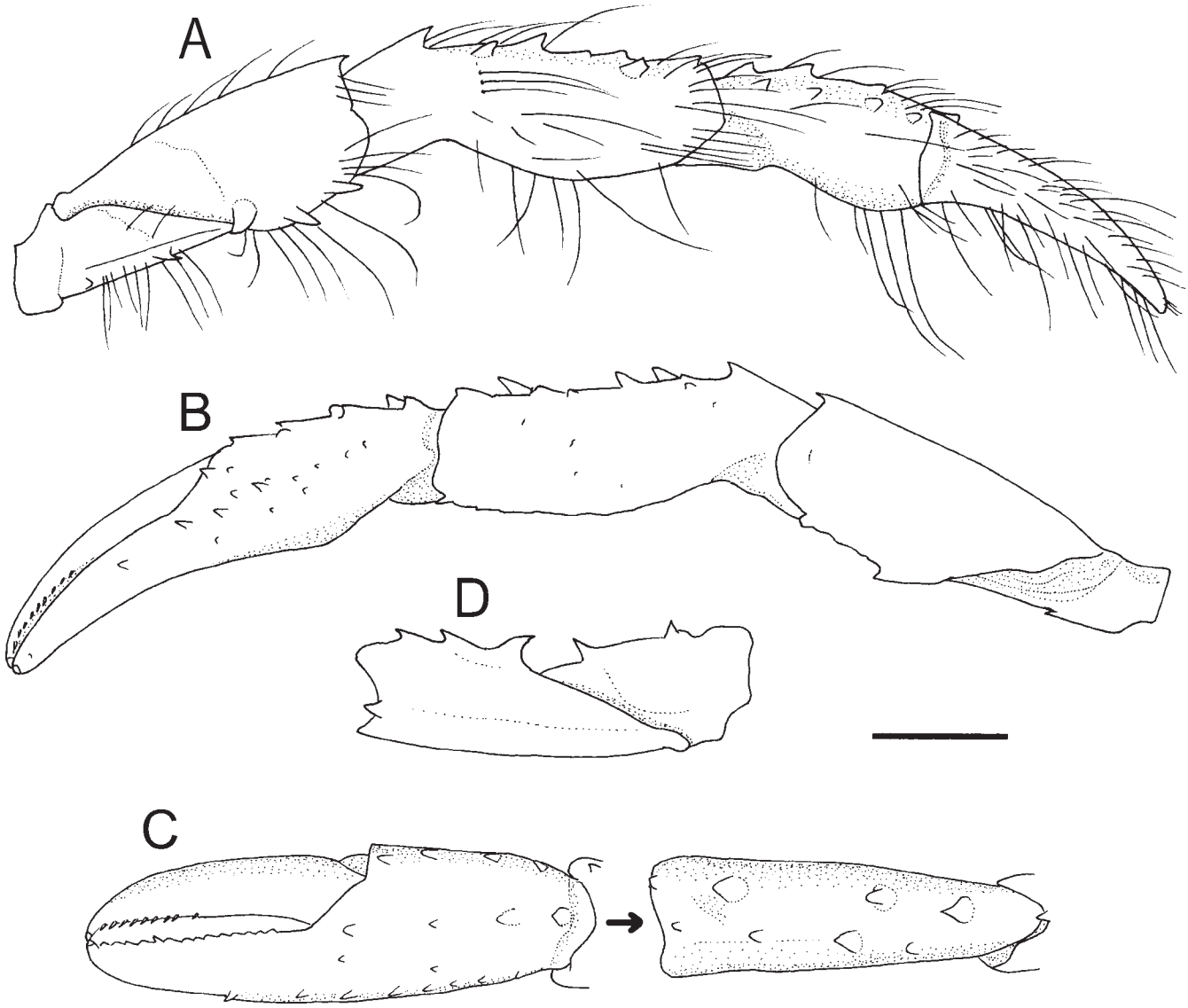

Fig. 6. *Decaphyllus deliquus*, new species, holotype, ovigerous female (sl 1.6 mm), PANGLAO 2004, stn P1, NMCR 39087. A, left cheliped, mesial view; B, same, lateral view (setae omitted); C, same, chela and carpus, dorsal view (setae omitted); D, same, merus, dorsal view (setae omitted). Scale bar = 0.5 mm.

barunajaya. The general proportion of the ocular peduncles and antennular peduncles and the shape and general armature of the chelipeds are also similar between the two species. Additionally, as in *D. barunajaya*, the first segment of the antennal peduncle is armed with a strong ventrodistal spine in this new species. Nevertheless, the new species can be distinguished morphologically from *D. barunajaya* by the following characters (cf. McLaughlin, 1997). The lateral projections of the shield are less produced in *D. deliquus* than in *D. barunajaya*; in the new species, they exceed as far as the rostral lobe, whereas distinctly overreaching it in *D. barunajaya*. The antennal peduncle is relatively shorter in *D. deliquus* than in *D. barunajaya*; in the new species, it only reaches to the distal 0.4 of the ocular peduncle, but

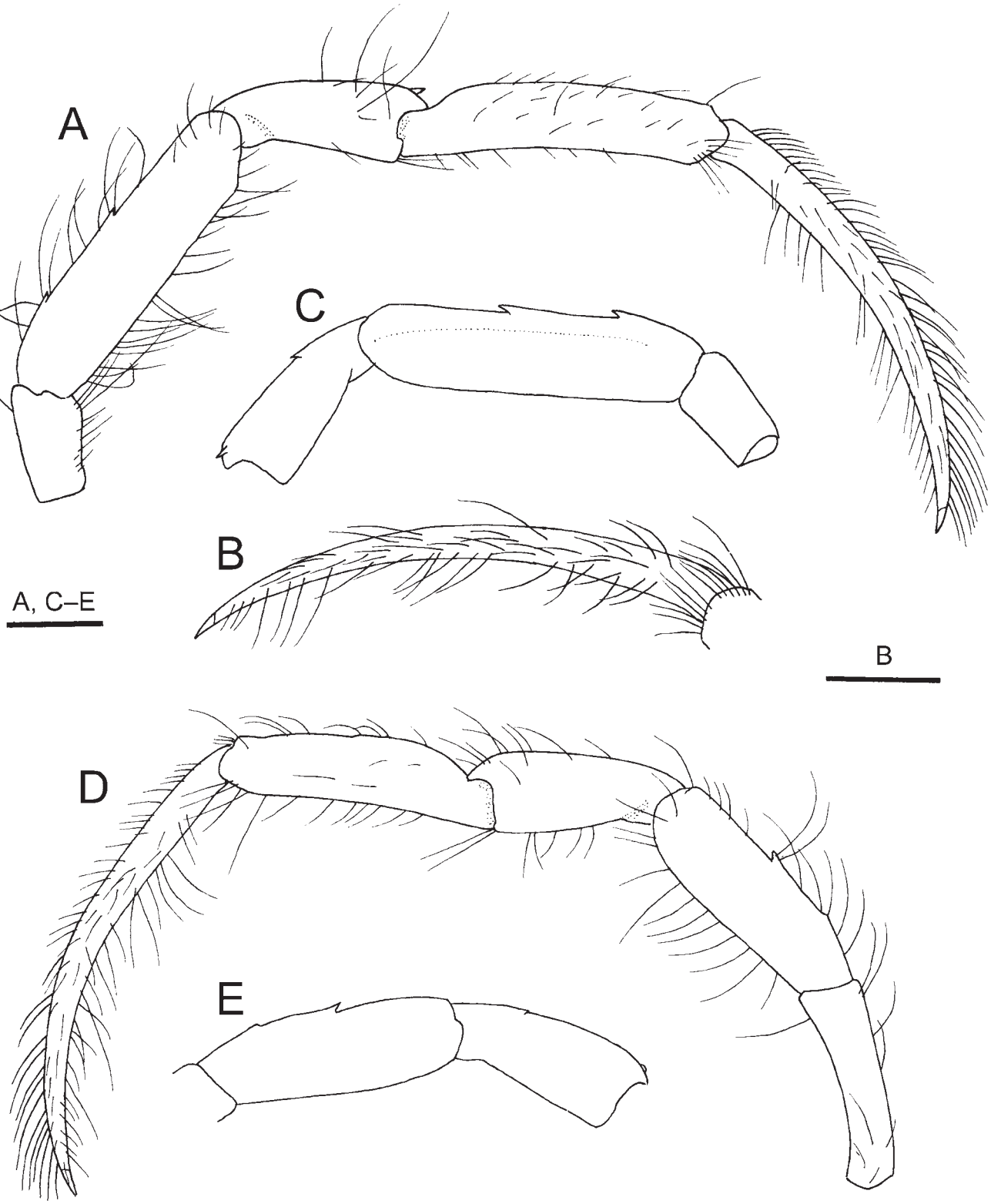

Fig. 7. *Decaphyllus deliquus*, new species, holotype, ovigerous female (sl 1.6 mm), PANGLAO 2004, stn P1, NMCR 39087. A, right second pereopod, lateral view; B, same, dactylus, mesial view (only mesial setae shown); C, same, carpus to ischium, mesial view (setae omitted); D, left third pereopod, lateral view; E, same, carpus and merus, mesial view (setae omitted). Scale bars = 0.5 mm.

it reaches nearly to the corneal base in *D. barunajaya*. The dactylus of the right cheliped is armed with one small but distinct proximal spine on the dorsal surface in *D. deliquus*, but it is unarmed in *D. barunajaya*. The right palm bears numerous additional spines lateral to the midline in *D. barunajaya*, but such numerous spines are not seen in *D. deliquus*. The cutting edge of the fixed finger of the left chela is entire and armed only with a distal row of minute corneous teeth in *D. deliquus*, rather than having a row of small calcareous teeth in *D. barunajaya*.

Decaphyllus deliquus also resembles *D. brevis*, new species, and *D. litoralis*, new species. As noted above, there are no arthrobranchs on the third maxilliped in *D. deliquus*, but in the latter two species, a single bud (*D. litoralis*) or paired tiny lamellae (*D. brevis*) are present. Other characters differentiating *D. deliquus* and the latter two taxa are: the ocular peduncle is proportionally longer in *D. deliquus* than in the latter two species (subequal in the length to the shield versus 0.8–0.9 times as long); and spines on the right chela are stronger and more conspicuous in *D. deliquus* than in the latter two species. Furthermore, the lateral projections of the shield are less produced in *D. deliquus* than in *D. litoralis* (cf. Fig. 4A versus Fig. 8A). The antennal acicle slightly overreaches the distal margin of the fifth peduncular segment in *D. deliquus*, rather than slightly falling short of or just reaching to it in *D. brevis*.

Etymology. — From the Latin "*deliquus*", meaning missing, in referent to the complete loss of arthrobranchs on the third maxilliped.

Decaphyllus litoralis, new species
(Figs. 8–12)

Material examined. — Holotype: male (sl 1.8 mm), Manza, Okinawa, Ryukyu Islands, Japan, 18 m, 3 Jul.2011, SCUBA diving, coll. S. Komai, CBM-ZC 11707.
Paratype: ovigerous female (sl 1.7 mm), PANGLAO 2004, stn B5, Biking, Panglao Island, 09°35.2'N, 123°50.4'E, 4 m, reef slope with overhangs, 2 Jun.2004, NMCR 39088.
Non-type: 1 juvenile (sl 1.2 mm), Horseshoe, Onna Village, Okinawa, 19 m, 13 Sep.2012, SCUBA diving, coll. Y. Yamada, CBM-ZC 11708.

Description. — Nine pairs of biserial phyllobranchiae (no pleurobranchs). Single arthrobranch above base of third maxilliped reduced to minute bud.

Shield (Fig. 8A) approximately as long as wide; anterior margin between rostral region and lateral projection slightly concave; anterolateral margins sloping; posterior margin truncate; dorsal surface with anteromedian part poorly calcified, with several short setae laterally. Rostrum obsolete. Lateral projections moderately developed, exceeding beyond rostral lobe, each with terminal spinule.

Ocular peduncle (Fig. 8A) about 0.8–0.9 times as long as shield, faintly constricted at midlength; dorsal surface with mesial row of tufts of moderately short to long setae directed mesially, scattered short setae on dorsal surface, and prominent tuft of long setae at base of cornea; cornea not dilated, its width slightly less than 0.3 of length of ocular peduncle; basal part slightly inflated, its width greater than corneal width. Ocular acicle tapering distally to acute spine, mesial margin glabrous; separated basally by width of 1 acicle. Interocular lobe visible in dorsal view, anteriorly slightly convex.

Antennular peduncle (Fig. 8A) overreaching distal corneal margin by about 0.4 length of ultimate segment. Basal segment with prominent spine on lateral margin of statocyst lobe, without ventromesial subdistal spine. Penultimate and ultimate segments unarmed, almost glabrous except for 1 short thin seta on dorsomesial distal angle of ultimate segment.

Antennal peduncle (Fig. 8A) reaching or slightly falling short of base of cornea of ocular peduncle. Fifth and fourth segments with few setae. Third segment with prominent spine on ventromesial distal margin. Second segment with dorsolateral distal angle strongly produced, terminating in bifid spine (lateral spine distinctly subterminal), dorsomesial distal angle with small spine. First segment unarmed on ventrodistal margin; lateral surface unarmed. Antennal acicle slightly overreaching distal margin of fifth peduncular segment, reaching or slightly falling short of corneal base, terminating in small spine; mesial surface with sparse row of setae; lateral margin unarmed. Antennal flagellum with 2–4 short to moderately long setae on distal margin of each article.

Third maxilliped with merus armed with strong dorsodistal spine; crista dentata on ischium consisting of 2–4 triangular teeth; basis unarmed or with minute denticle on mesial face. Exopod long, reaching nearly to distal margin of carpus.

Chelipeds (Figs. 9, 10) slightly unequal in length; right slightly longer but appreciably stronger. Right cheliped (Fig. 9) with chela elongate subovate in dorsal view, 2.3–2.5 times longer than wide. Dactylus (Fig. 9C) set at slightly oblique angle to palm, slightly shorter than palm; dorsal surface with 2–4 tiny spines or tubercles proximally; all surfaces with scattered moderately short to long setae, particularly numerous on mesial surface; cutting edge with row of small, blunt calcareous teeth in proximal 0.8 and microscopic corneous teeth in distal 0.2, terminating in tiny corneous claw. Palm (Fig. 9A, C) subequal in length to carpus; dorsomesial margin with row of 8 tiny spines, dorsal midline with 1 small proximal spine and row of minute tubercles or spinules not extending onto fixed finger, dorsolateral margin not delimited and with irregular row of minute tubercles or spinules, dorsal surface lateral to midline without conspicuous spines; lateral and mesial surfaces with scattered short to moderately short setae; ventral surface gently convex, smooth, with sparse setae. Fixed finger with row of blunt calcareous teeth on cutting edge, terminating in small calcareous claw. Carpus (Fig. 9A–C) moderately widened distally, subequal in length to merus, 1.9–2.2 times longer than wide; dorsomesial margin with row of 4 or 5 small to moderately strong spines, dorsolateral surface with

row of 3 or 4 moderately small spines; all surfaces with scattered short to long setae, subdistal transverse row of setae particularly prominent; ventrolateral distal angle with spinule, distomesial angle unarmed. Merus (Fig. 9A, B, D) with 1 small spine on dorsodistal margin mesially; dorsal surface with sparse setae; ventrolateral margin with 1 or 2 small spines on distal half; mesial surface with small spine or protuberance proximoventrally, ventromesial margin with 2 small spines, distal spine directed proximally; ventral surface with small spine medially. Ischium (Fig. 9D) with 2 widely spaced spinules on ventromesial margin; lateral surface unarmed or with spinule subdistally.

Left cheliped (Fig. 10) without hiatus between dactylus and fixed finger. Dactylus (Fig. 10A, C) about 1.3 times longer than palm, with few minute proximal tubercles or spinules on dorsal surface mesially, and with short to long setae particularly numerous on mesial surface; cutting edge with row of calcareous denticles, terminating in small corneous claw. Palm (Fig. 10A, C) about 0.6–0.7 length of carpus; dorsomesial margin with row of 4 or 5 spinules, dorsal midline with 1 small proximal spine and row of minute tubercles, dorsolateral margin not delimited and with some minute tubercles or spinules and also with scattered short to long setae. Fixed finger with cutting edge faintly denticulate, with row of minute corneous teeth in distal 0.4, terminating in small corneous claw. Carpus (Fig. 10A–C) moderately widened distally, about 3.0–3.4 times longer than wide; dorsolateral margin with 3 small spines in distal half, dorsomesial margin with 4 or 5 small to moderately strong spines (distal second spine largest); ventrolateral distal angle with spinule, distomesial angle unarmed; all surfaces with scattered setae. Merus (Fig. 10A, B, D) with sparse setae on dorsal surface; dorsodistal margin with 1 small spine; ventrolateral margin with 2 small spines; mesial surface with 1 small, anteriorly curved spine proximoventrally, ventromesial margin with 1 or 2 spines; ventral surface with 1 small spine medially and with scattered setae. Ischium (Fig. 10D) with 2 widely spaced, anteriorly directed spinules on ventromesial margin; lateral surface with subdistal spinule ventrally.

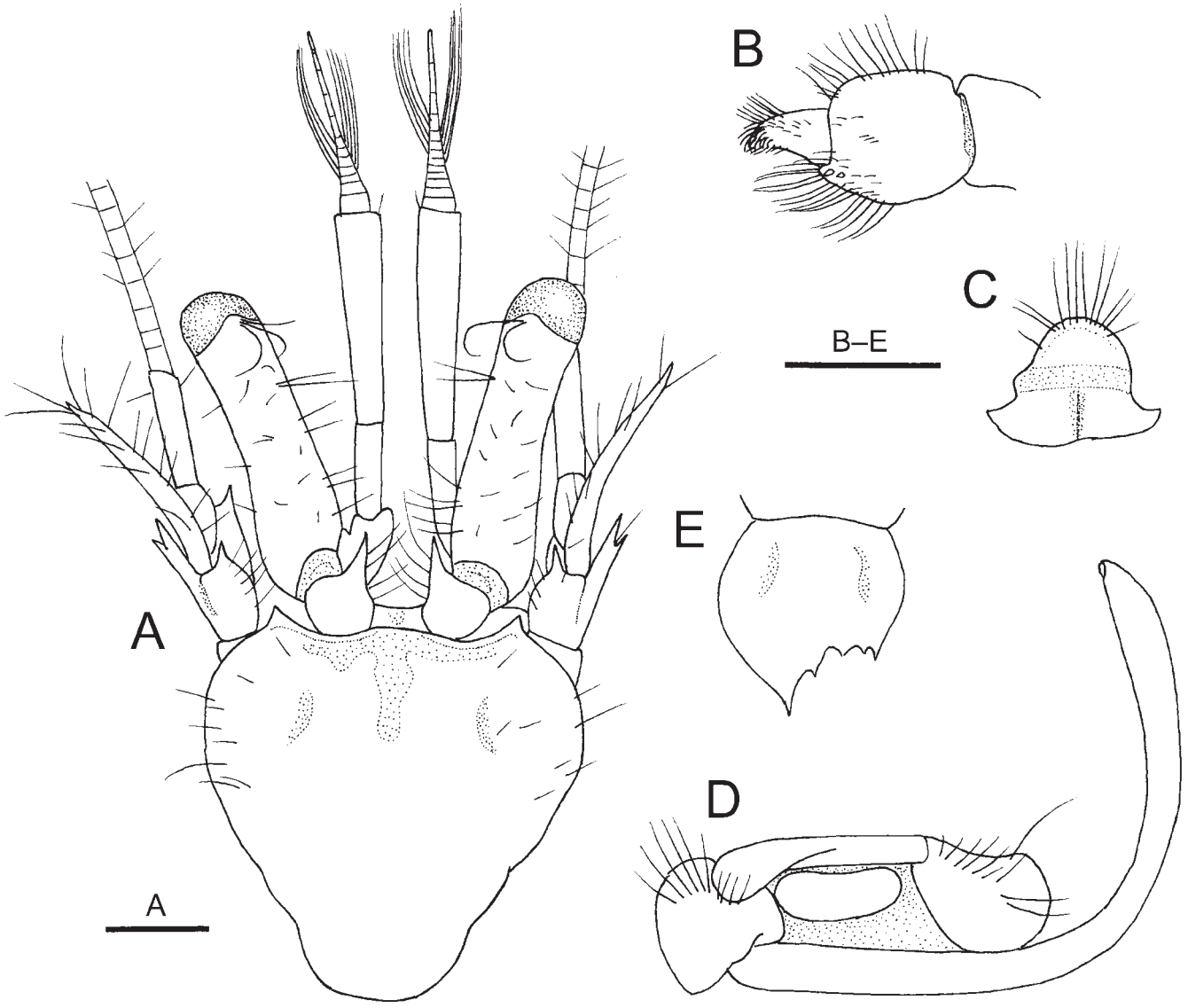

Fig. 8. *Decaphyllus litoralis*, new species, holotype, male (sl 1.8 mm), Manza, Okinawa, CBM-ZC 11707. A, shield and cephalic appendages, dorsal view; B, distal three segments of left fourth pereopod; C, sixth thoracic sternite, ventral view; D, coxae of fifth pereopods, sexual tubes, and eighth thoracic sternite, ventral view; E, telson, dorsal view. Scale bars = 0.5 mm.

Ambulatory legs (Fig. 11) overreaching tip of right cheliped. Dactyli (Fig. 11A, B, D) 1.6–1.9 times longer than propodi, 9.8–12.0 times longer than broad, gently curved ventrally; all surfaces unarmed, but with numerous setae, particularly longer and stronger on dorsal margins. Propodi (Fig. 11A, D) unarmed, but with row of sparse setae on dorsal and ventral margins and scattered short setae on lateral and mesial faces. Carpi each with dorsodistal spine (spine distinctly stronger in second than in third), and 1 additional small spine slightly proximal to midlength (second, Fig. 11C) or no additional spine (third, Fig. 11D). Meri (Fig. 11A, C, D) each with 2 small spines (located at slightly distal to midlength and proximal 0.2) on dorsal margin: dorsal and ventral margins with sparse long setae, latter unarmed. Ischium with 1 subdistal spinule on ventral margin mesially (second; Fig. 11C) or unarmed (third).

Fourth pereopods (Fig. 8B) non-chelate, with claw of dactylus entirely masked by tufts of short, dense setae; propodus with sparse setae on dorsal margin and distal half of ventral margin, 1 or 2 minute corneous scales present distally. Fifth pereopods semichelate.

Male with right sexual tube (Fig. 8D) long, directed from right to left across ventral body surface and curved anteriorly, reaching to level of coxa of left third pereopod; distal part

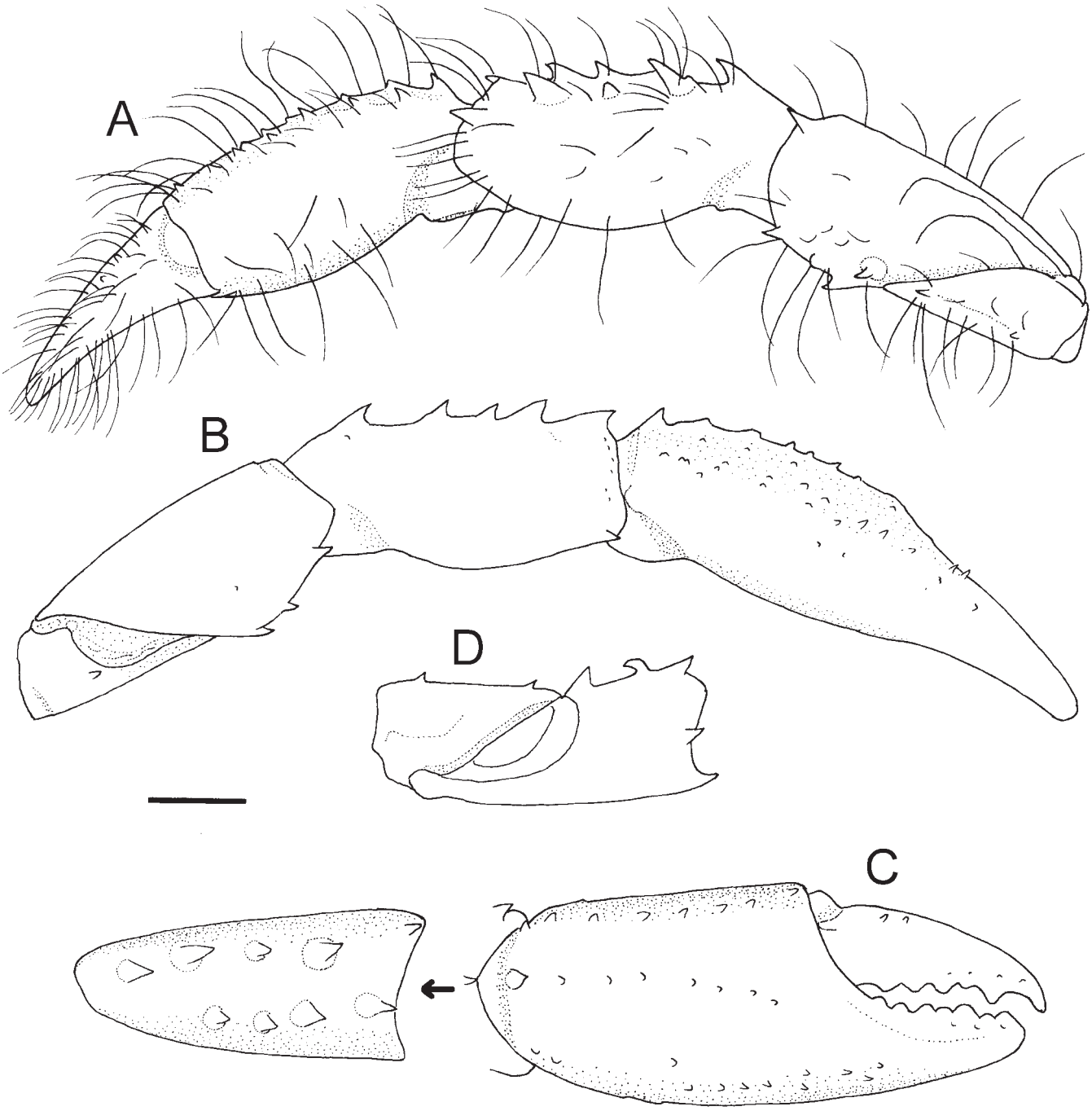

Fig. 9. *Decaphyllus litoralis*, new species, holotype, male (sl 1.8 mm), Manza, Okinawa, CBM-ZC 11707. A, right cheliped, mesial view; B, same, lateral view (setae omitted); C, same, chela and carpus, dorsal view (setae omitted); D, same, merus, dorsal view (setae omitted). Scale bar = 0.5 mm.

somewhat flattened, slightly widened. Left sexual tube (Fig. 8D) directed from left to right, reaching to anteromesial part of coxa of right fifth pereopod, twisted, markedly broadened distally. Female with unpaired left gonopore.

Anterior lobe of thoracic sternite 6 (third pereopods, Fig. 8C) subsemicircular, slightly skewed to left, bearing some moderately long setae anteriorly. Sternite of thoracic sternite 8 (fifth pereopods) in male (Fig. 8D) transversely subovate, almost glabrous; that in female subcircular, with row of moderately short setae anteriorly.

Pleon dextrally twisted. Male with 4 unpaired pleopods; second, fourth and fifth pleopods uniramous, third unequally biramous. Female with 4 unpaired, unequally biramous pleopods.

Telson (Fig. 8E) with shallow median cleft; terminal margin with prominently produced, spinose left exterior angle separated from faintly produced, minutely spinose right exterior angle, and with 1 or 2 minute spinules on either side of median cleft; left lateral margin forming very narrow chitinous plate, but right lateral margin simple.

Colouration. — In life (Fig. 12). Ocular peduncle generally light gray-brown. Antennular peduncle also generally light gray-brown, ultimate segment with narrow white ring distally. Antennal flagellum generally white with reddish brown distal

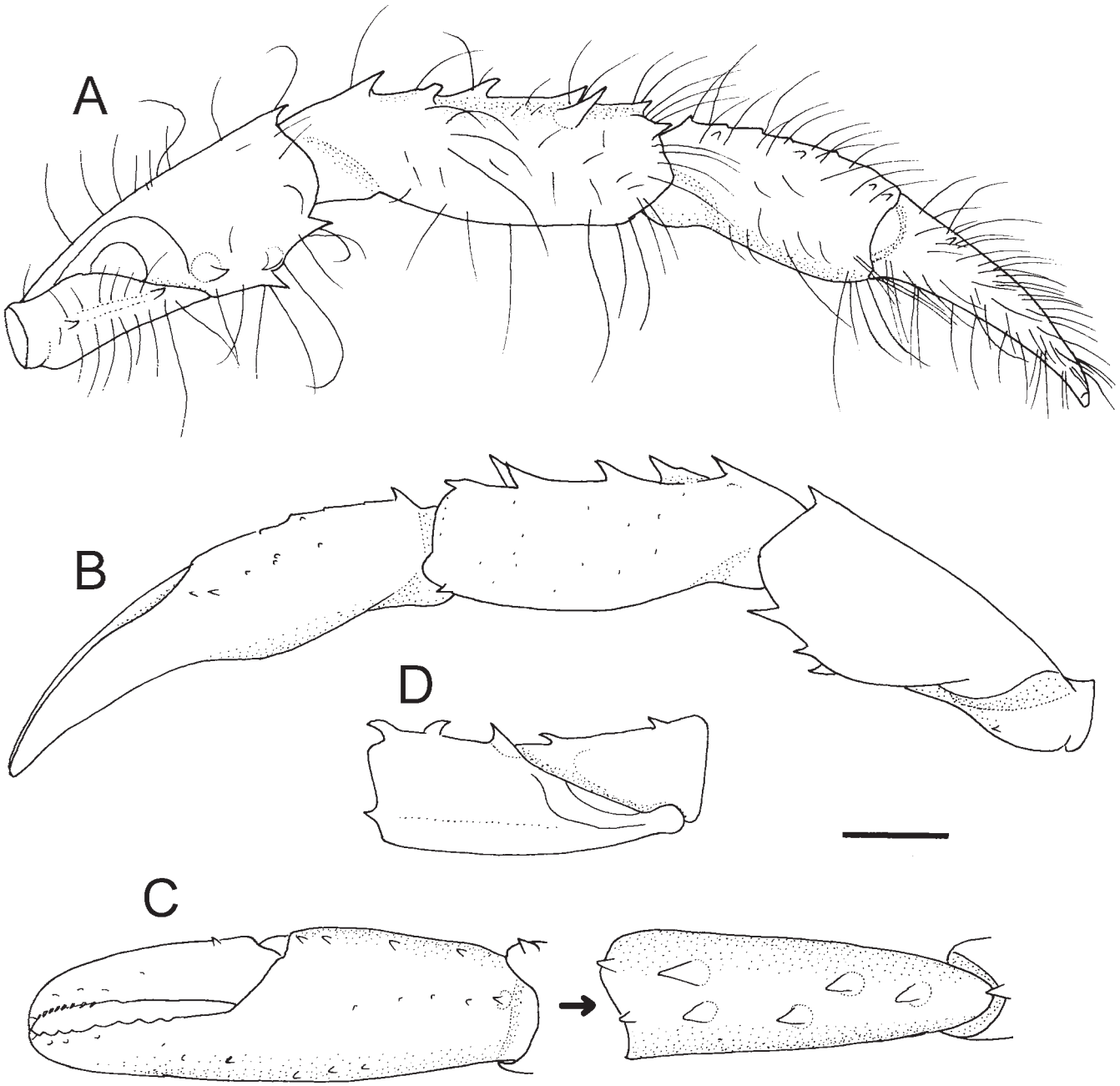

Fig. 10. *Decaphyllus litoralis*, new species, holotype, male (sl 1.8 mm), Manza, Okinawa, CBM-ZC 11707. A, left cheliped, mesial view; B, same, lateral view (setae omitted); C, same, chela and carpus, dorsal view (setae omitted); D, same, merus, dorsal view (setae omitted). Scale bar = 0.5 mm.

part. Chelipeds generally light gray-brown, with brown transverse markings at least on palms and carpi. Ambulatory legs generally light gray-brown; propodi whitish distally and brownish proximally.

In preservative. No iridescent sheen on shield and appendages.

Distribution. — Ryukyu Islands, Japan, and the Bohol Sea, Philippines; 4–18 m.

Remarks. — As discussed above, *Decaphyllus litoralis*, new species, is similar to *D. brevis*, new species, and *D. deliquus*, new species. Differentiating characters are discussed under "***Remarks***" of respective species.

Decaphyllus litoralis is the sole representative of the genus occurring in the shallow coral reefs at depths of 4–18 m. Other known species in the genus occur at sublittoral depths greater than 50 m.

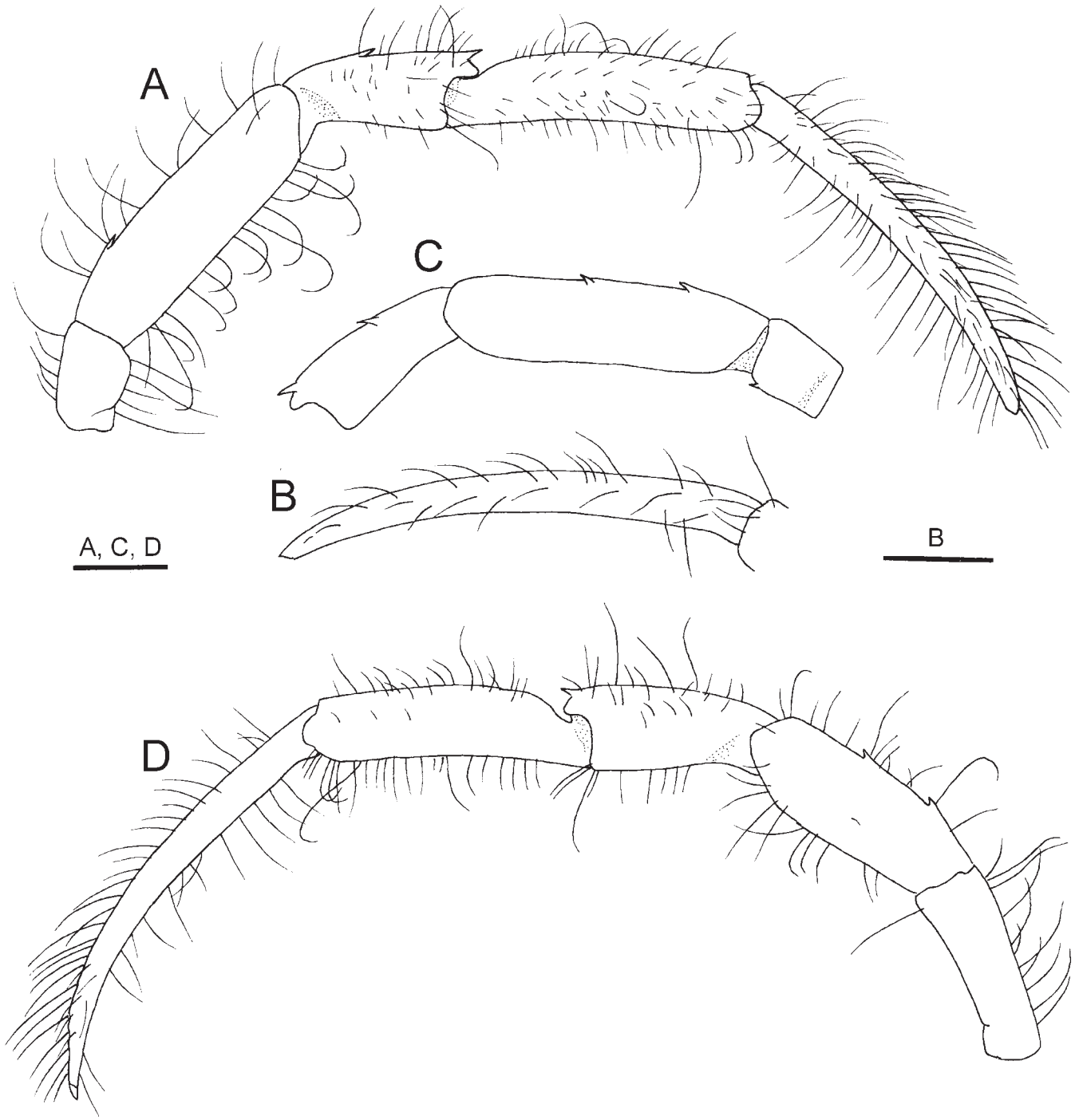

Fig. 11. *Decaphyllus litoralis*, new species, holotype, male (sl 1.8 mm), Manza, Okinawa, CBM-ZC 11707. A, right second pereopod, lateral view; B, same, dactylus, mesial view (only mesial setae shown); C, same, carpus to ischium, mesial view (setae omitted); D, left third pereopod, lateral view. Scale bars = 0.5 mm.

Etymology. — From the Latin *litoralis* (= coastal), in reference to the habitat of this new species in the shallow coral reefs, which is unique for the genus.

Decaphyllus proprius, new species
(Figs. 13–16, 23A)

Material examined. — Holotype: male (sl 1.4 mm), PANGLAO 2004, stn T39, Cervera shoal, West Pamilacan Island, 09°30.1'N, 123°50.4'E, 100–138 m, muddy sand, 6 Jul.2004, NMCR 39089.

Description. — Ten pairs of biserial phyllobranchiae (no pleurobranchs). Two very small arthrobranchs above base of third maxilliped, each bearing few lamellae (Fig. 13C).

Shield (Fig. 13A) approximately as long as wide; anterior margin between rostral region and lateral projection slightly concave; anterolateral margins sloping; posterior margin roundly truncate; dorsal surface with median part poorly calcified, with several minute setae anteriorly and laterally. Rostrum broadly rounded. Lateral projections weakly developed, exceeding as far as rostral lobe, each with terminal spinule.

Ocular peduncle (Fig. 13A) approximately as long as shield, faintly constricted at midlength; dorsal surface with mesial row of tufts of moderately short to long setae directed mesially and few individual setae laterally, and prominent tuft of long setae at base of cornea; cornea not dilated, its width slightly more than 0.2 of length of ocular peduncle; basal part slightly inflated, its width greater than corneal width. Ocular acicle drawn out into long acute spine, mesial margin with some moderately short setae; separated basally by width of less than 1 acicle. Interocular lobe visible in dorsal view, anteriorly slightly convex.

Antennular peduncle (Fig. 13A) overreaching distal corneal margin by about 0.4 length of ultimate segment. Basal segment with prominent spine on lateral margin of statocyst lobe, without ventromesial subdistal spine. Penultimate and ultimate segments unarmed, almost glabrous except for 1 short, thin seta on dorsomesial distal angle.

Fig. 12. *Decaphyllus litoralis*, new species, holotype, male (sl 1.8 mm), Manza, Okinawa, CBM-ZC 11707, in situ. (Photograph by: Satoko Komai).

Antennal peduncle (Fig. 13A) reaching to distal 0.4 of ocular peduncle. Fifth and fourth segments with few setae. Third segment with prominent spine on ventromesial distal margin. Second segment with dorsolateral distal angle strongly produced, terminating in bifid spine (lateral spine distinctly subterminal), dorsomesial distal angle with strong spine. First segment with strong spine on ventrodistal margin; lateral surface unarmed. Antennal acicle slightly overreaching distal margin of fifth peduncular segment, far falling short of corneal base, terminating in small simple (left) or slightly falling short of distal margin of fifth peduncular segment, terminating in bifid spine (right) (possibly abnormal condition); mesial surface with sparse row of setae; lateral margin with small spine located at proximal 0.3. Antennal flagellum with 2–4 short to moderately setae on distal margin of each article.

Third maxilliped (Fig. 13B) with merus armed with strong dorsodistal spine; crista dentata on ischium consisting of 3 triangular teeth; basis with minute denticle on mesial face. Exopod long, reaching nearly to distal margin of carpus.

Chelipeds (Figs. 14, 15) slightly unequal in length; right slightly longer but appreciably stronger. Right cheliped (Fig. 14) with chela elongate subovate in dorsal view, 2.9 times longer than wide. Dactylus (Fig. 14C) set at slightly oblique angle to palm, subequal in length to palm; dorsal surface with 1 tiny spine proximally; all surfaces with scattered moderately short to moderately long setae, particularly numerous on mesial surface; cutting edge with row of small, blunt calcareous teeth, terminating in tiny corneous claw. Palm (Fig. 14A, C) slightly shorter than carpus; dorsomesial margin with row of spinules or minute tubercles, dorsal midline with row of prominent spines decreasing in size distally and not extending onto fixed finger, dorsolateral margin not delimited and with irregular row of slender small spines, dorsal surface lateral to midline unarmed; lateral and mesial surfaces with scattered short to long setae; ventral surface convex, smooth, with sparse setae. Fixed finger with row of small, blunt or subtriangular calcareous teeth on cutting edge, terminating in small calcareous claw. Carpus (Fig. 14A–C) subequal in length to merus, slightly widened distally, 2.4 times longer than wide; dorsomesial margin with row of 7 spines (distalmost 2 minute, others moderately strong), dorsolateral surface with row of 7 small and minute spines; all surfaces with scattered short to long setae, subdistal transverse row of setae particularly prominent; both ventrolateral distal and ventromesial distal angles unarmed. Merus (Fig. 14A, B, D) with 1 small spine on dorsodistal margin mesially; dorsal surface with short transverse rows of setae; lateral surface with 1 low, small tubercle at about midlength adjacent to ventral margin, ventrolateral margin with 1 small subdistal spine; mesial surface with small, low protuberance adjacent to ventral margin proximally, ventromesial margin with 2 small, widely spaced spines; ventral surface unarmed. Ischium (Fig. 14D) with 2 widely spaced small spines on ventromesial margin, distal spine directed distally, proximal

spine curved proximally and hook-like; lateral surface with 2 closely spaced spinules ventrodistally.

Left cheliped (Fig. 15) with distinct hiatus between dactylus and fixed finger. Dactylus (Fig. 15A, C) about 1.2 times longer than palm, dorsal midline with 3 spinules in proximal 0.4; all surfaces with numerous short to long setae particularly on mesial surface; cutting edge with row of minute corneous teeth in distal half, terminating in small corneous claw. Palm (Fig. 15A, C) about 0.6 length of carpus; dorsomesial margin not delimited, dorsal midline with row of 5 small spines not extending onto fixed finger, dorsolateral margin not delimited, unarmed; all surfaces with scattered short to long setae. Fixed finger with row of calcareous denticles increasing in size distally on cutting edge, terminating in small corneous claw. Carpus (Fig. 15A–C) slightly widened distally, about 3.2 times longer than wide; dorsolateral margin with 4 moderately large spines, dorsomesial margin with 5 moderately strong spines; ventrolateral distal and distomesial angles unarmed; all surfaces with scattered setae. Merus (Fig. 15A, B, D) with sparse setae on dorsal surface; dorsodistal margin unarmed; lateral surface with 1 minute denticle adjacent to ventral margin, ventrolateral margin with 2 small subdistal spines and 1 median spinule; mesial surface with 1 small protuberance proximoventrally, ventromesial margin with 2 widely spaced spines in distal half. Ischium (Fig. 15D) with 2 widely spaced small spines on ventromesial margin, distal spine directed distally, proximal spine curved proximally; lateral surface with spinule ventrally.

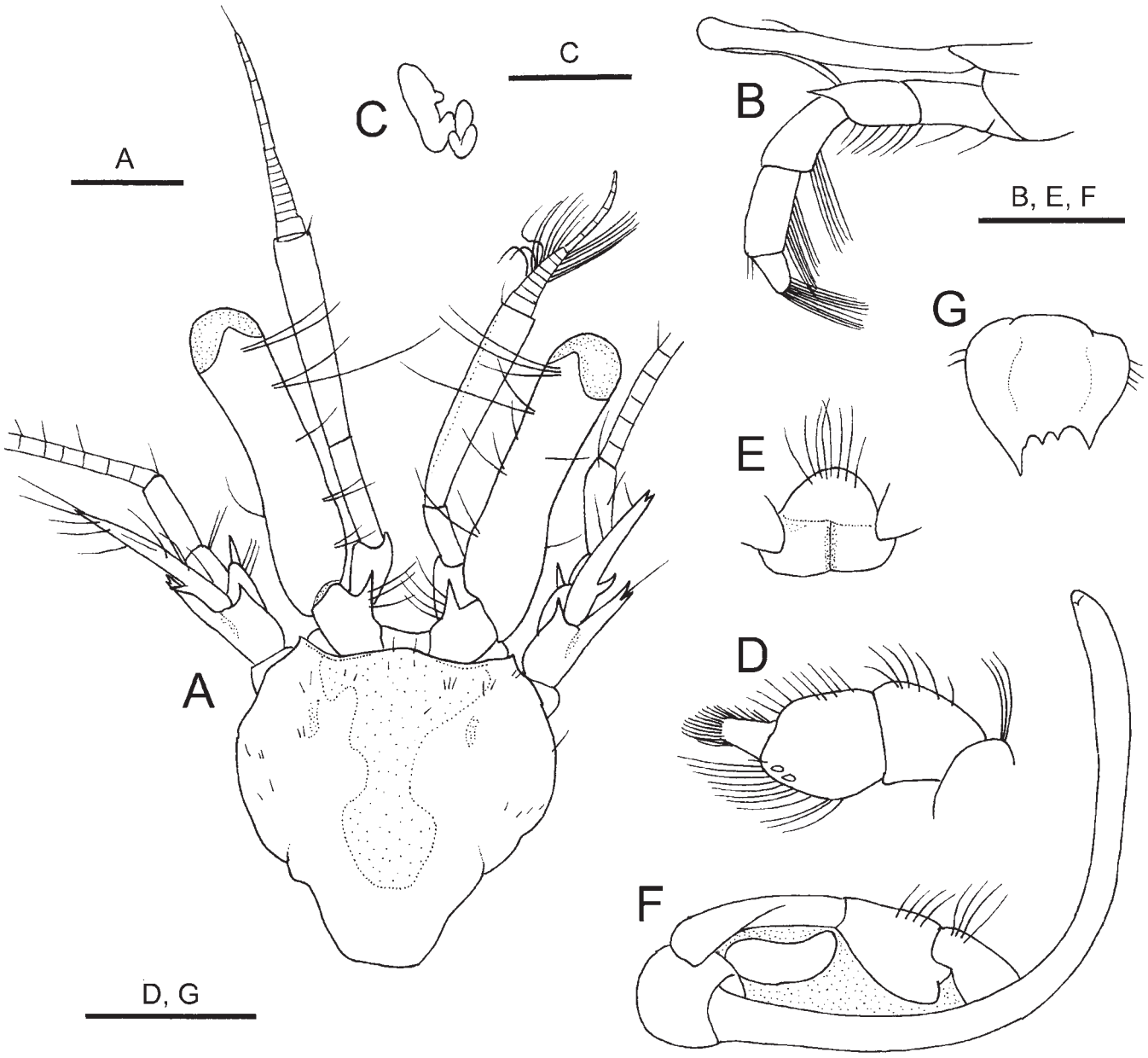

Fig. 13. *Decaphyllus proprius*, new species, holotype, male (sl 1.4 mm), PANGLAO 2004, stn T39, NMCR 39089. A, shield and cephalic appendages, dorsal view; B, left third maxilliped, lateral view; C, same, arthrobranchs; D, distal three segments of left fourth pereopod; E, sixth thoracic sternite, ventral view; F, coxae of fifth pereopods, sexual tubes, and eighth thoracic sternite, ventral view; G, telson, dorsal view. Scale bars = 0.5 mm (A, B, D–G), 0.25 mm (C).

Ambulatory legs (Fig. 16) overreaching tip of right cheliped. Dactyli (Fig. 16A, B, D) 1.4–1.5 times longer than propodi, 13.3–14.6 times longer than broad, gently curved ventrally; all surfaces unarmed, but with numerous setae, particularly longer and stronger on dorsal margins. Propodi (Fig. 16A, D) unarmed, but with row of sparse setae on dorsal and ventral margins and with scattered short setae on lateral and mesial faces. Carpi each with dorsodistal spine and 2 additional small dorsal spines in proximal 0.4 (second, Fig. 16C) or entirely unarmed (third, Fig. 16E). Meri each with 2 small spines (located at slightly distal to midlength and proximal 0.2) on dorsal margin; dorsal and ventral margins with sparse short to long setae, latter armed with spinule at distal 0.3 (second, Fig. 16C) or unarmed (third, Fig. 16E). Ischium with distal spinule on ventral margin mesially (second, Fig. 16C) or unarmed (third, Fig. 16E).

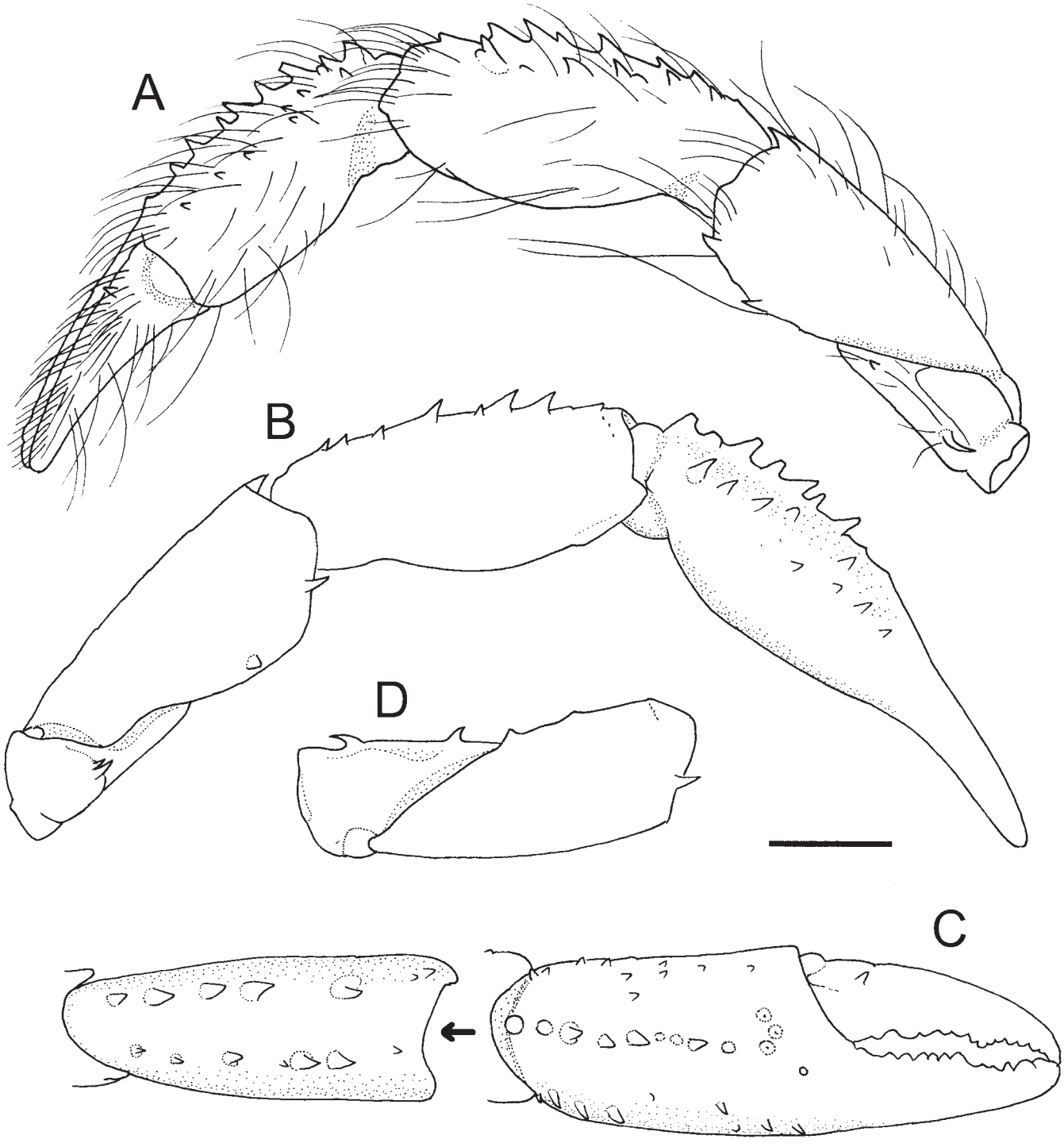

Fig. 14. *Decaphyllus proprius*, new species, holotype, male (sl 1.4 mm), PANGLAO 2004, stn T39, NMCR 39089. A, right cheliped, mesial view; B, same, lateral view (setae omitted); C, same, chela and carpus, dorsal view (setae omitted); D, same, merus, dorsal view (setae omitted). Scale bar = 0.5 mm.

Fourth pereopods (Fig.13D) non-chelate, with claw of dactylus entirely masked by tufts of short, dense setae; propodus with sparse setae on dorsal margin and distal half of ventral margin; 2 minute corneous scales present distally. Fifth pereopods semichelate.

Male with right sexual tube (Fig. 13F) long, directed from right to left across ventral body surface and curved anteriorly, reaching to level of coxa of left second pereopod; distal part somewhat flattened. Left sexual tube (Fig. 13F) directed from left to right, reaching to anteromesial part of coxa of right fifth pereopod, twisted, slightly broadened distally.

Anterior lobe of thoracic sternite 6 (third pereopods, Fig. 13E) subsemicircular, slightly skewed to left, bearing several moderately long setae anteriorly. Sternite of thoracic sternite 8 (fifth pereopods) in male (Fig. 13F) transversely subovate, almost glabrous; anterior surface slightly concave.

Pleon dextrally twisted, with 4 unpaired left pleopods, second, fourth and fifth uniramous, third unequally biramous.

Telson (Fig. 13G) with shallow median cleft; terminal margin with prominently produced, spinose left exterior angle separated from less produced, but also prominent, spinose right exterior angle, and with 1 minute spinules on either side of median cleft; left lateral margin not chitinous.

Female unknown.

Colouration. — In life (Fig. 23A). Carapace generally pinkish, shield slightly mottled; posterior carapace with scattered darker pink spots. Ocular peduncles mottled with pink. Antennular and antennal peduncles pale pink, without conspicuous markings; antennal flagellum generally translucent. Chelipeds generally whitish, carpi and meri with large darker reddish blotches. Ambulatory legs obscurely

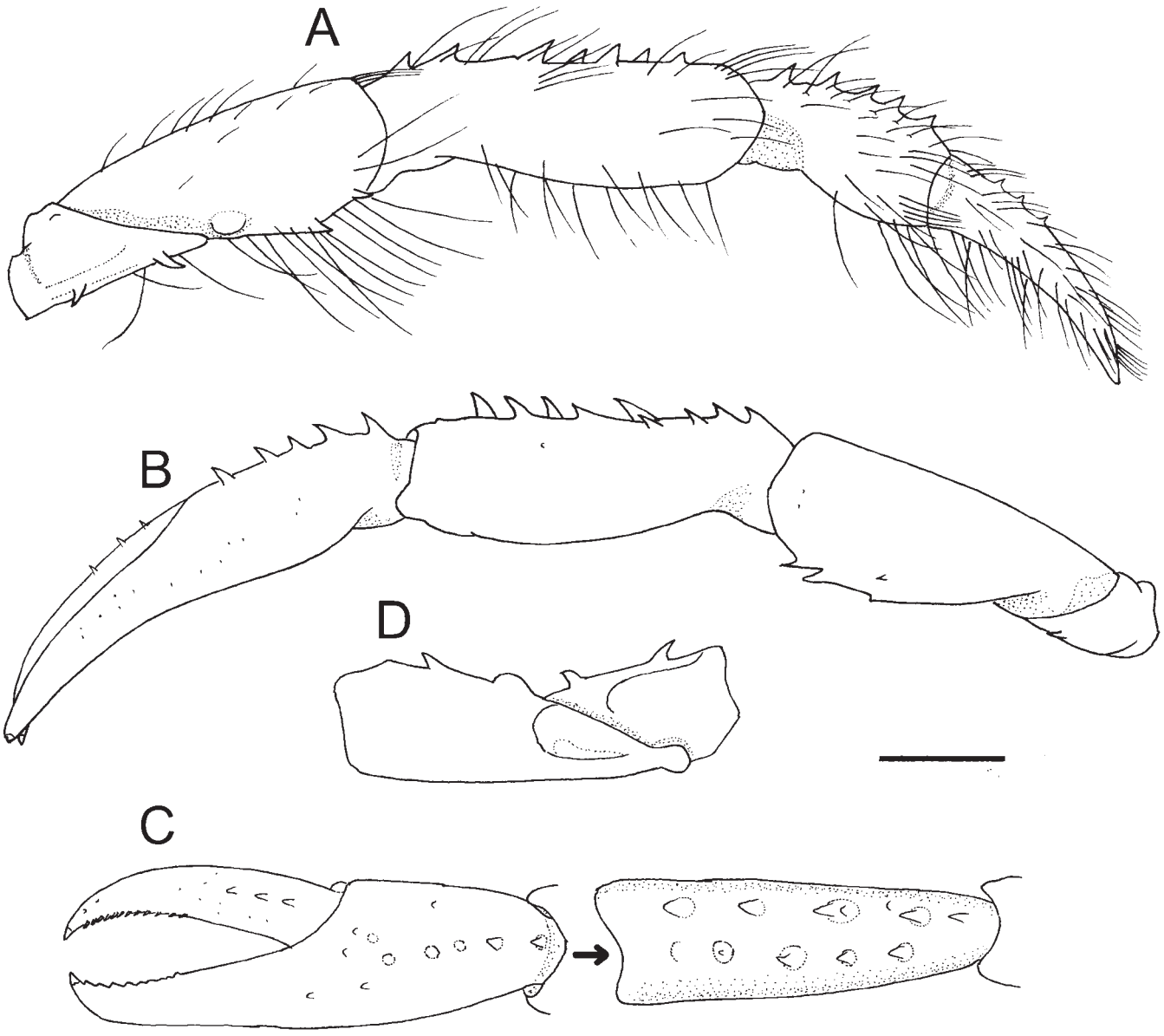

Fig. 15. *Decaphyllus proprius*, new species, holotype, male (sl 1.4 mm), PANGLAO 2004, stn T39, NMCR 39089. A, left cheliped, mesial view; B, same, lateral view (setae omitted); C, same, chela and carpus, dorsal view (setae omitted); D, same, merus, dorsal view (setae omitted). Scale bar = 0.5 mm.

banded by dull red and white; dactyli whitish; propodi with distal part white and proximal part white, remainder alternated with red (distal to midlength) and white (proximal to midlength); carpi reddish; meri each with obscure 2 reddish bands. Pleon pinkish.

In preservative. Slight iridescence seen on shield, chelipeds and ambulatory legs.

Distribution. — Known only from Panglao Islands, 100–138 m.

Remarks. — In proportions of the cephalic appendages and armature of the chelipeds, *Decaphyllus proprius*, new species, most closely resembles *D. maci*. However, the present new species is quite distinctive in the genus in having a small but prominent spine on the lateral margin of the antennal

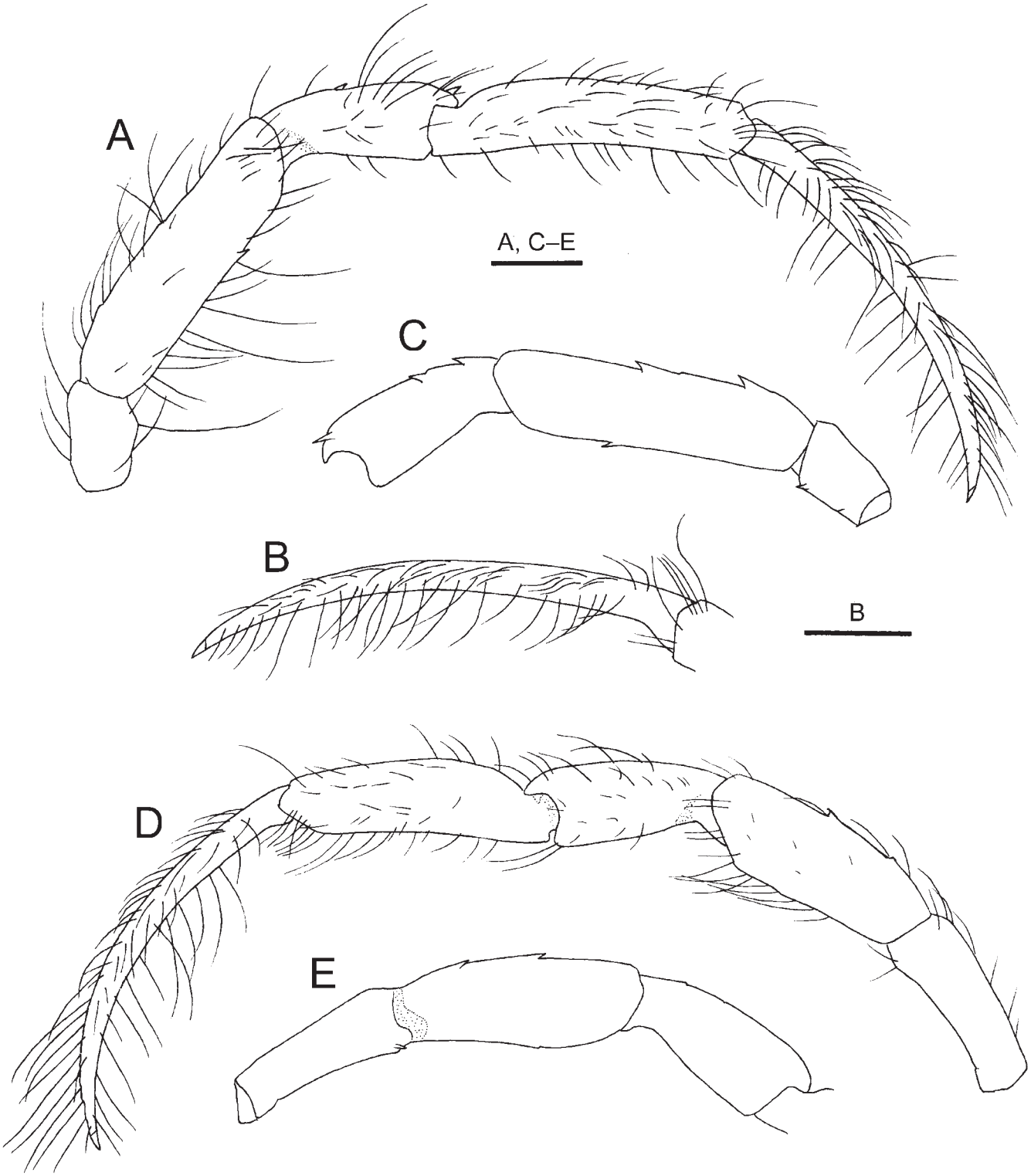

Fig. 16. *Decaphyllus proprius*, new species, holotype, male (sl 1.4 mm), PANGLAO 2004, stn T39, NMCR 39089. A, right second pereopod, lateral view; B, same, dactylus, mesial view (only mesial setae shown); C, same, carpus to ischium, mesial view (setae omitted); D, left third pereopod, lateral view; E, same, carpus to ischium, mesial view (setae omitted). Scale bars = 0.5 mm.

acicle, which is located proximal to the midlength. In other congeneric species, such a spine is absent. The lack of a dorsodistal spine on the merus of the left cheliped appears also unique for the genus. Furthermore, *D. proprius* differs from *D. maci* in the following characters: shield proportionally wider in *D. proprius* than in *D. maci* (approximately as long as wide versus about 1.2 times as long as wide); lateral projections of shield less produced in *D. proprius* than in *D. maci*; fingers of left chela, when closed, leaving a distinct hiatus in *D. proprius*, whereas no hiatus in *D. maci*; dactylus of left cheliped with short proximal row of small spines on dorsal midline in *D. proprius*, while unarmed in *D. maci*; dorsomesial margin of palm of left cheliped unarmed in *D. proprius*, whereas armed with 2 conspicuous spines in *D. maci*; and anterior lobe of thoracic sternite 6 subsemicircular in *D. proprius*, rather than roundly subtriangular in *D. maci*.

Etymology. — From the Latin *proprius* (= characteristic), in reference to the unique armature of the antennal acicle in this new species.

Decaphyllus spinulodigitus, new species
(Figs. 17–19)

Material examined. — Holotype: ovigerous female (sl 2.3 mm), PANGLAO 2004, stn T1, Bolod, Panglao Island, 9°32.4'N, 123°47.3'E, 83–102 m, mud and many sponges, 30 May 2004, trawl, NMCR 39090.

Description. — Ten pairs of biserial phyllobranchiae (no pleurobranchs). Two very small arthrobranch gills above base of third maxilliped, anterior gill simple, posterior gill bilobed (Fig. 17C).

Shield (Fig. 17A) approximately as long as wide; anterior margin between rostral region and lateral projection slightly concave; anterolateral margins sloping; posterior margin roundly truncate; dorsal surface with anteromedian part poorly calcified, with several minute to short setae laterally. Rostrum broadly rounded. Lateral projections weakly developed, exceeding as far as rostral lobe, each with terminal spinule.

Ocular peduncle (Fig. 17A) about 0.7 times as long as shield, faintly constricted at midlength; dorsal surface with mesial row of long setae directed mesially and few setae laterally, and prominent tuft of moderately long setae at base of cornea; cornea not dilated, its width slightly less than 0.3 of length of ocular peduncle; basal part slightly inflated, its width greater than corneal width. Ocular acicle drawn out distally into acute spine, mesial margin with tuft of moderately short setae medially; separated basally slightly less than width of 1 acicle. Interocular lobe visible in dorsal view, anteriorly slightly concave.

Antennular peduncle (Fig. 17A) overreaching distal corneal margin by about 0.8 length of ultimate segment. Basal segment with prominent spine on lateral margin of statocyst lobe, mesial face unarmed. Penultimate and ultimate segments unarmed, almost glabrous except for 1 thin minute seta at dorsomesial distal angle.

Antennal peduncle (Fig. 17A) slightly overreaching base of cornea of ocular peduncle. Fifth and fourth segments with few setae. Third segment with prominent spine on ventromesial distal margin. Second segment with dorsolateral distal angle strongly produced, terminating in bifid spine (lateral spine subterminal), dorsomesial distal angle with strong spine. First segment with small spine on ventrodistal margin; lateral surface unarmed. Antennal acicle slightly falling short of distal margin of fifth peduncular segment, reaching corneal base, terminating in small spine; mesial surface with row of sparse setae; lateral margin unarmed. Antennal flagellum with 2–4 short to moderately setae on distal margin of each article.

Third maxilliped with merus bearing strong dorsodistal spine; crista dentata on ischium consisting of 3 widely spaced, triangular teeth (Fig. 17B); basis with minute denticle distally on mesial surface. Exopod long, reaching nearly to distal margin of carpus.

Chelipeds (Fig. 18) slightly unequal in length, right slightly longer, appreciably stronger. Right cheliped (Fig. 18A–D) with chela elongate subovate in dorsal view, about 2.2 times longer than wide. Dactylus set at slightly oblique angle to palm (Fig. 18C), shorter than palm; dorsal surface mesially with several small spines or tubercles in proximal half; all surfaces with scattered moderately short to long setae, particularly numerous on mesial surface; cutting edge with row of moderately large, blunt calcareous teeth, terminating in tiny corneous claw. Palm subequal in length to carpus (Fig.18A, C); dorsomesial margin with row of 8 small spines, dorsal midline with row small spines decreasing in size and acuteness distally and not extending onto fixed finger, dorsolateral margin not delimited and with few minute tubercles, dorsal surface lateral to midline with scattered microscopic spinules; lateral and mesial surfaces with scattered short to long setae; ventral surface gently convex, smooth, with sparse setae. Fixed finger with row of blunt calcareous teeth on cutting edge, terminating in tiny corneous claw. Carpus (Fig. 18A–C) moderately widened distally, subequal in length to merus, 1.8 times longer than wide; dorsomesial margin with row of 4 moderately strong spines, dorsolateral surface with row of 4 moderately small spines and 1 proximal spinule; all surfaces with scattered short to long setae, subdistal transverse row of setae particularly prominent; ventrolateral distal angle with small spine, ventromesial distal angle unarmed. Merus (Fig. 18A, B, D) with 1 small spine on dorsodistal margin mesially; dorsal surface with sparse setae; lateral surface unarmed, ventrolateral margin with 1 small subdistal spine; mesial surface with small tubercle proximoventrally, ventromesial margin with 1 small subdistal spine; ventral surface unarmed. Ischium (Fig. 18D) with 2 widely spaced spinules on ventromesial margin; lateral surface with minute spine ventrodistally.

Left cheliped (Fig. 18E–H) with distinct hiatus between dactylus and fixed finger. Dactylus (Fig 18G) about 1.2 times longer than palm, gently curved; all surfaces unarmed, but

with numerous short to long setae particularly on mesial surface; cutting edge microscopically denticulate, terminating in small corneous claw. Palm (Fig. 18E–G) about 0.6 length of carpus; dorsomesial margin without conspicuous spines, though few minute tubercles adjacent to dorsomesial margin; dorsal midline with row of spinules not extending onto fixed finger, dorsolateral margin not delimited and only with some minute tubercles; all surfaces with scattered short to long setae. Fixed finger with row of minute calcareous denticles on cutting edge, terminating in small corneous claw. Carpus (Fig. 18E–G) moderately widened distally, about 3.0 times longer than wide; dorsolateral margin with 2 moderately small spines in distal half, dorsomesial margin with 5 small to moderately strong spines; ventrolateral distal angle with spinule, distomesial angle unarmed; all surfaces with scattered setae. Merus (Fig. 18E, F, H) with sparse setae on dorsal surface; dorsodistal margin with small spine; lateral surface unarmed, ventrolateral margin with 2 widely spaced, small spines; mesial surface with spine-like tubercle proximoventrally, ventromesial margin with 2 widely spaced, small spines; ventral surface with tiny spine medially and scattered long setae. Ischium (Fig. 18H) with 2 widely spaced spinules on ventromesial margin, both directed forward; lateral surface with spinule distoventrally.

Ambulatory legs (Fig. 19) overreaching tip of right cheliped. Dactyli (Fig. 19A, B, D) about 1.6 times longer than propodi, 11.7–14.6 times longer than broad, gently curved ventrally;

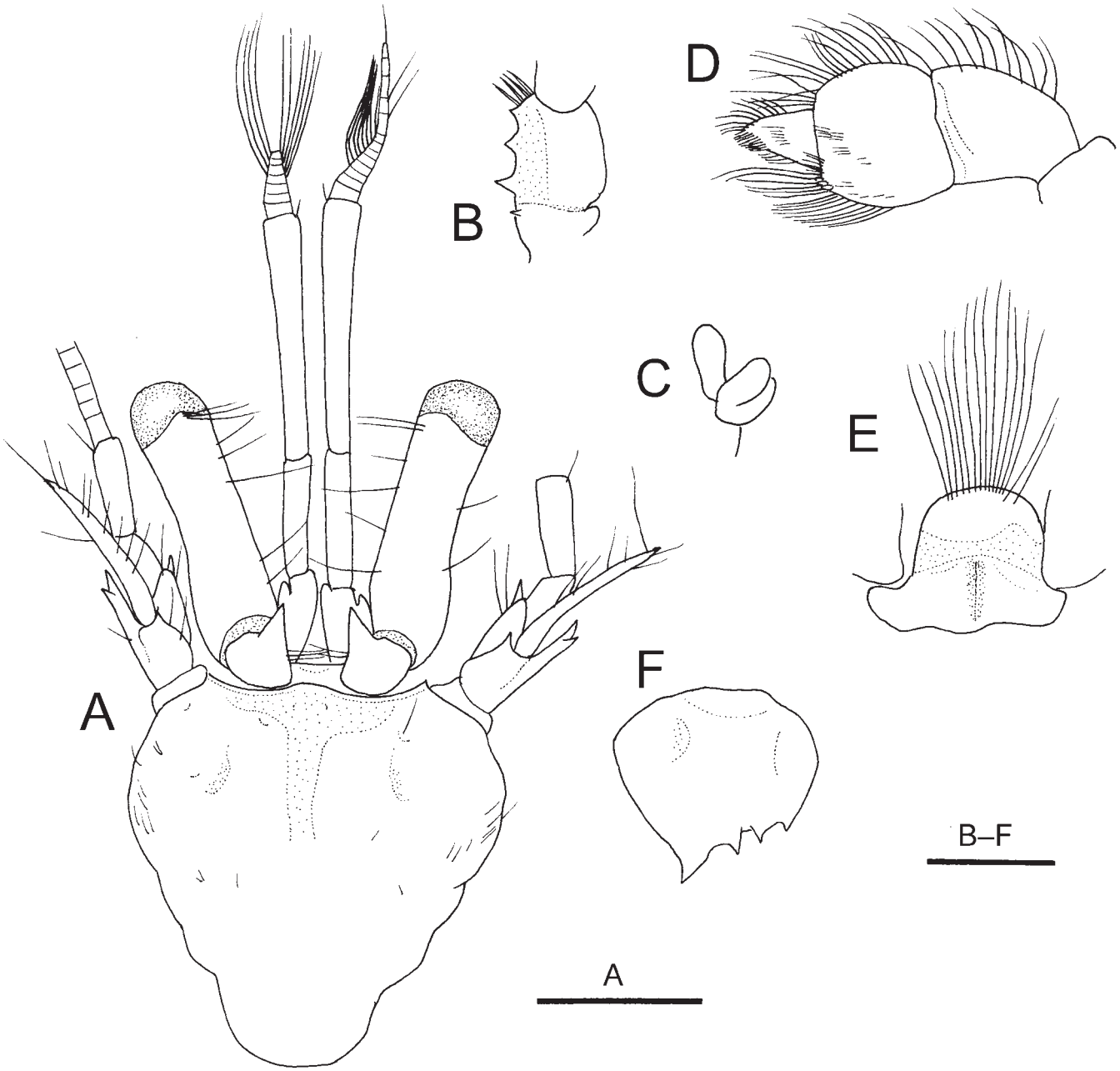

Fig. 17. *Decaphyllus spinulodigitus*, new species, holotype, ovigerous female (sl 2.3 mm), PANGLAO 2004, stn T1, NMCR 39090. A, shield and cephalic appendages, dorsal view; B, ischium of left third maxilliped, ventral view; C, arthrobranchs on left third maxilliped; D, distal three segments of left fourth pereopod; E, sixth thoracic sternite, ventral view; F, telson, dorsal view. Scale bars = 1 mm (A), 0.5 mm (B, D–F), 0.25 mm (C).

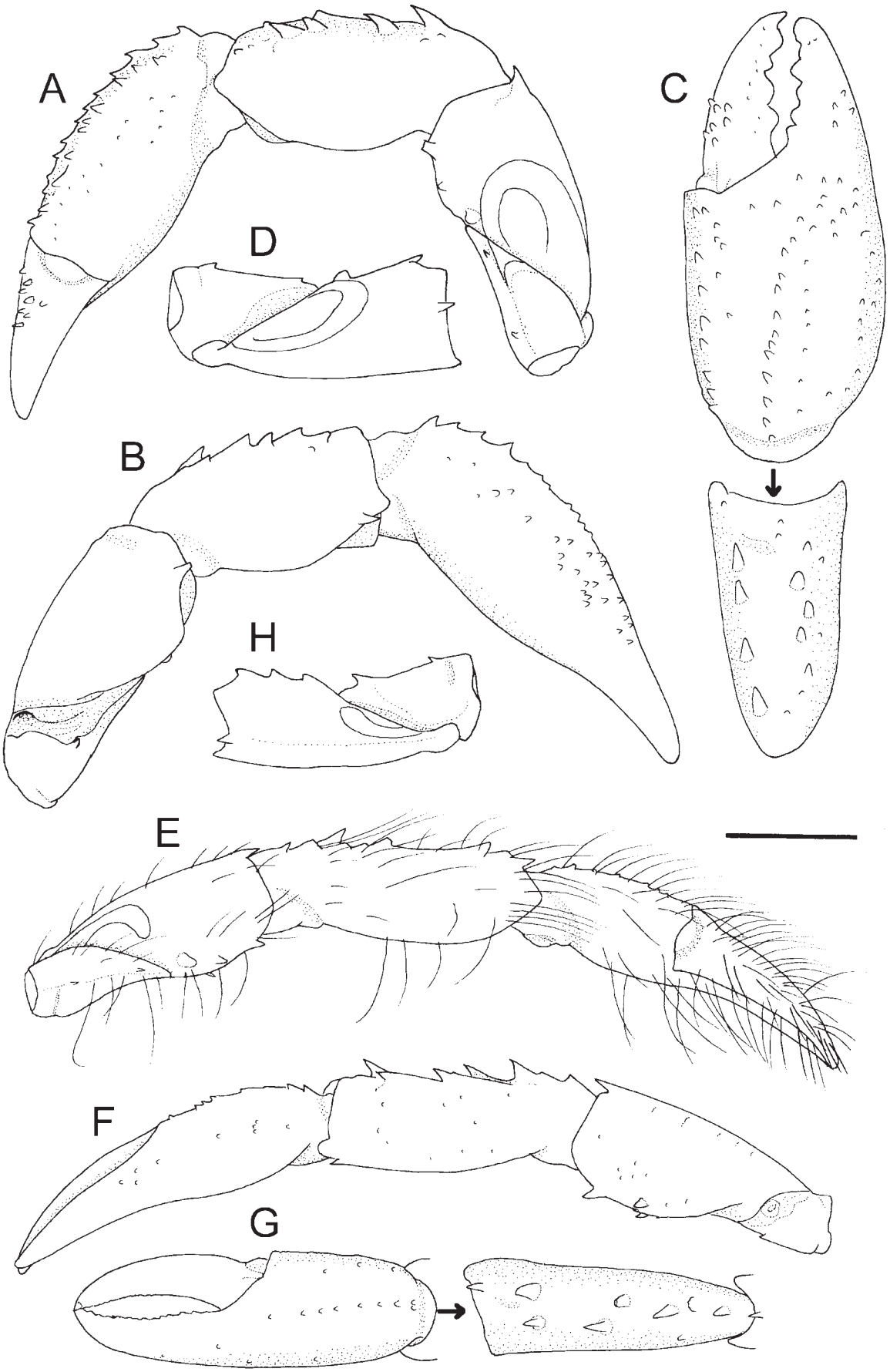

Fig. 18. *Decaphyllus spinulodigitus*, new species, holotype, ovigerous female (sl 2.3 mm), PANGLAO 2004, stn T1, NMCR 39090. A, right cheliped, mesial view; B, same, lateral view; C, same, chela and carpus, dorsal view; D, same, merus, dorsal view; E, left cheliped, mesial view; F, same, lateral view; G, same, chela and carpus, dorsal view; H, same, merus, dorsal view. Setae omitted except for E. Scale bar = 1.0 mm.

all surfaces unarmed, but with numerous setae, particularly longer and stronger on dorsal margins. Propodi (Fig. 19A, D) unarmed, but with row of sparse setae on dorsal and ventral margins. Carpi each with dorsodistal spine (second; Fig. 19A) or without dorsodistal spine (third; Fig. 19D), and with 1 additional small spine located at proximal 0.4 (second; Fig. 19C) or no additional spine (third; Fig. 19E). Meri each with 2 small dorsal spines (distal-sided spine located slightly

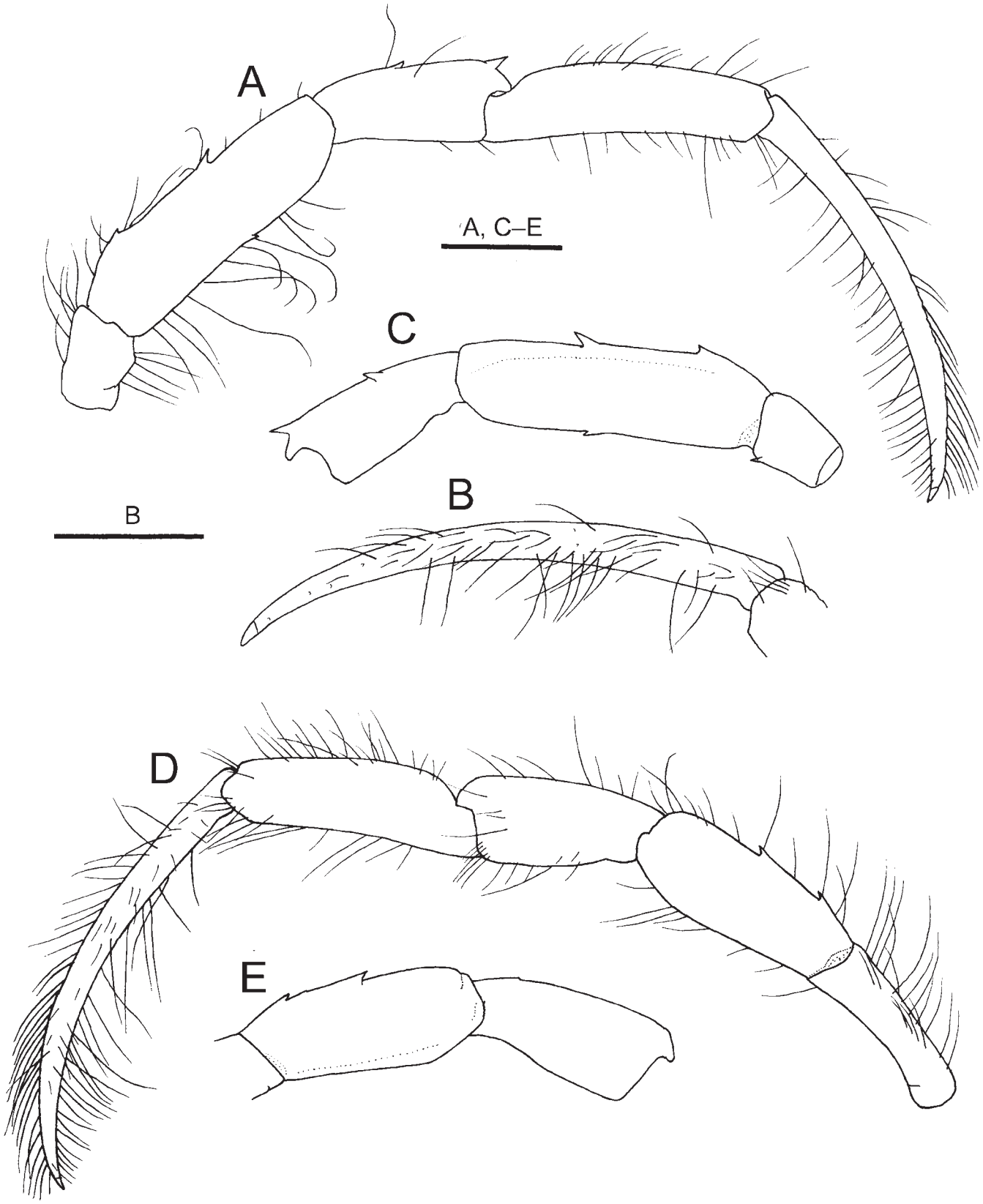

Fig. 19. *Decaphyllus spinulodigitus*, new species, holotype, ovigerous female (sl 2.3 mm), PANGLAO 2004, stn T1, NMCR 39090. A, right second pereopod, lateral view; B, same, dactylus, mesial view (only mesial setae shown); C, same, carpus to ischium, mesial view (setae omitted); D, left third pereopod, lateral view; E, same, carpus and merus, mesial view (setae omitted). Scale bars = 1.0 mm.

distal to midlength and another at proximal 0.2); dorsal and ventral margins with sparse long setae, latter armed with spinule at distal 0.4 (second, Fig. 19C) or unarmed (third, Fig. 19E). Ischium with distal spinule on ventral margin mesially (second, Fig. 19C) or unarmed (third, Fig. 19E)

Fourth pereopods (Fig. 17D) non-chelate, with claw of dactylus entirely masked by tufts of short, dense setae; propodus roundly subquadrate, slightly wider than long, with numerous setae on dorsal margin and distal half of ventral margin; 3 minute corneous scales located distally on ventral margin. Fifth pereopods semichelate.

Female with unpaired left gonopore.

Anterior lobe of thoracic sternite 6 (third pereopods, Fig. 17E) subsemicircular, slightly skewed to left, bearing numerous long setae anteriorly. Sternite of thoracic sternite 8 (fifth pereopods) in female transversely subovate, with setae along anterior margin.

Telson (Fig. 17F) with shallow median cleft; terminal margin with prominently produced, spinose left exterior angle separated from non-produced, minutely pointed right exterior angle, and with 1 spinule on either side of median cleft; lateral margins apparently not chitinous.

Male unknown.

Colouration. — In preservative. No distinct markings seen on body and appendages. Chelipeds and ambulatory legs with iridescence, particularly strong on chelipeds.

Distribution. — Known only from Panglao Island, the Philippines, 83–102 m.

Remarks. — Although only a single ovigerous female is available, this new species is safely assigned to *Decaphyllus* by the unarmed but setose dactyli of the ambulatory legs, the non-chelate fourth pereopod, the entire eighth thoracic sternite and the characteristic shape of the telson. The setation of the ocular peduncle also supports the generic assignment.

The presence of several small spines or tubercles on the dorsal surface of the dactylus of the right cheliped and the relatively long antennular peduncle of *Decaphyllus spinulodigitus*, new species, suggests a close relationship with *D. similis*; however, there are some morphological differences of diagnostic significance between the two taxa (de Saint Laurent, 1968b). The strongly produced dorsolateral distal angle of the second segment of the antennal peduncle terminates in a clearly bifid spine in *D. spinulodigitus*, rather than terminating into a simply acuminate spine in *D. similis*. The basal segment of the antennular peduncle is unarmed on the mesial face in *D. spinulodigitus*, but it is armed with a small spine on the mesial face in *D. similis*. The antennal acicle does not reach the distal margin of the fifth segment of the antennal peduncle in *D. spinulodigitus*, rather than slightly overreaching it in *D. similis*. The armature of the right cheliped is weaker in *D. spinulodigitus* than in *D. similis*. For example, the dorsomedian row on the palm consists of small spines or tubercles decreasing in the size and acuteness distally in *D. spinulodigitus*, whereas it is composed of numerous conspicuous spines not weakened distally in *D. similis*. The merus of the second pereopod bears a small spine on the ventral margin, located slightly distal to the midlength in *D. spinulodigitus*, but such a spine is absent in *D. similis*.

Etymology. — From the combination of the Latin *spinuloso* (spinulose) and *digitus* (finger), in reference to the dactyli of the right cheliped bearing several spinules on the dorsal surface. Used as a noun in apposition.

Decaphyllus tenuis, new species
(Figs. 20–22)

Material examined. — Holotype: male (sl 1.8 mm), PANGLAO 2004, stn T5, Bohol Island, W of Baclayon, 09°35.3'N, 123°52.2"E, 84–87 m, coarse sand and mud, 2 Jun.2004, NMCR 39091.
Paratypes: 2 females (sl 1.3, 1.3 mm), PANGLAO 2004, stn T18, Cortes, Bohol Island, 09°41.8'N, 123°49.9'E, 80–100 m, muddy bottom with sponges, 19 Jun.2004, ZRC 2013.0679; 1 male (sl 1.9 mm), same data, CBM-ZC 11709; stn T41, 2 males (sl 1.0, 1.1 mm), Cervera shoal, West Pamilacan Island, 09°29.7'N, 123°50.2'E, 110–112 m, 6 Jul.2004, ZRC 2013.0680.

Description. — Ten pairs of biserial phyllobranchiae (no pleurobranchs). Two very small arthrobranchs above base of third maxilliped, anterior gill simple, posterior gill bilobed (Fig. 20C).

Shield (Fig. 20A) approximately as long as wide; anterior margin between rostral region and lateral projection concave; anterolateral margins sloping; posterior margin roundly truncate; dorsal surface with anteromedian part poorly calcified, with some tufts of short setae laterally. Rostrum rounded. Lateral projections moderately well developed, exceeding as far as rostral lobe, each with terminal spinule.

Ocular peduncle (Fig. 20A) approximately as long as shield, faintly constricted distal to midlength; dorsal surface with mesial row of tufts of moderately short to long setae directed mesially and some individual setae laterally, and prominent tuft of moderately long setae at base of cornea; cornea slightly dilated, its width slightly more than 0.2 of length of ocular peduncle; basal part not inflated, its width narrower than corneal width. Ocular acicle drawn out distally into acute spine, mesial margin with some long setae; separated basally by width of less than 1 acicle. Interocular lobe visible in dorsal view, anteriorly slightly concave.

Antennular peduncle (Fig. 20A) overreaching distal corneal margin by 0.4–0.5 length of ultimate segment. Basal segment with prominent spine on lateral margin of statocyst lobe, mesial face unarmed. Penultimate and ultimate segments unarmed, almost glabrous except for thin short setae at dorsomesial distal angle of ultimate segment.

Antennal peduncle (Fig. 20A) slightly falling short of base of cornea of ocular peduncle. Fifth and fourth segments with few setae. Third segment with prominent spine on ventromesial distal margin. Second segment with dorsolateral distal angle strongly produced, terminating in bifid spine, dorsomesial distal angle with small spine. First segment with strong spine on ventrodistal margin; lateral surface unarmed. Antennal acicle reaching or overreaching distal margin of fifth peduncular segment, or not reaching to reaching corneal base, terminating in small spine; mesial surface with row of sparse setae; lateral margin unarmed. Antennal flagellum with 2–4 short to moderately long setae on distal margin of each article.

Third maxilliped with merus armed with strong dorsodistal spine; crista dentata on ischium consisting of 4 or 5 triangular teeth (Fig. 20B); basis with acute denticle on mesial face. Exopod long, reaching nearly to distal margin of carpus.

Chelipeds (Fig. 21) slightly unequal in length; right slightly longer but appreciably stronger. Right cheliped (Fig. 21A–D) slender, with chela elongate subovate in dorsal view, about 3.0 times longer than wide. Dactylus set at slightly oblique angle to palm (Fig. 21C), subequal in length to palm; dorsal surface with 1 or 2 tiny spines or tubercles proximally; all surfaces with scattered moderately short to long setae, particularly numerous on mesial surface; cutting edge with

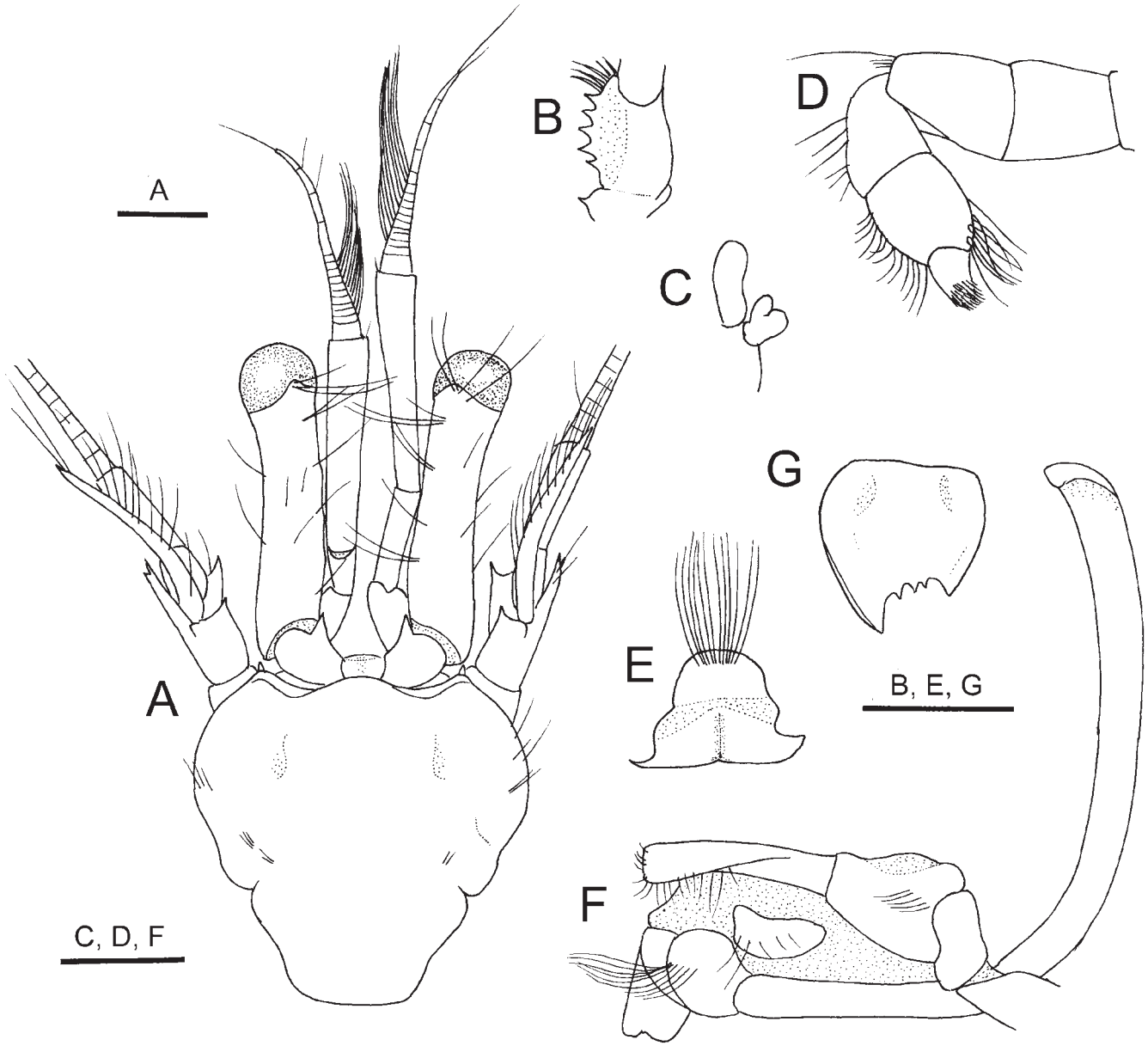

Fig. 20. *Decaphyllus tenuis*, new species. A–D, F, G, holotype, male (sl 1.8 mm), PANGLAO 2004, stn T5, NMCR 39091; E, paratype, female (sl 1.3 mm), PANGLAO 2004, stn T18, ZRC 2013.0679. A, shield and cephalic appendages, dorsal view; B, ischium of left third maxilliped, ventral view; C, arthrobranchs on left third maxilliped; D, left fourth pereopod, lateral view; E, sixth thoracic sternite, ventral view; F, coxae of fifth pereopods, sexual tubes, and eighth thoracic sternite, ventral view; G, telson, dorsal view. Scale bars = 0.5 mm (A, B, D–G), 0.25 mm (C).

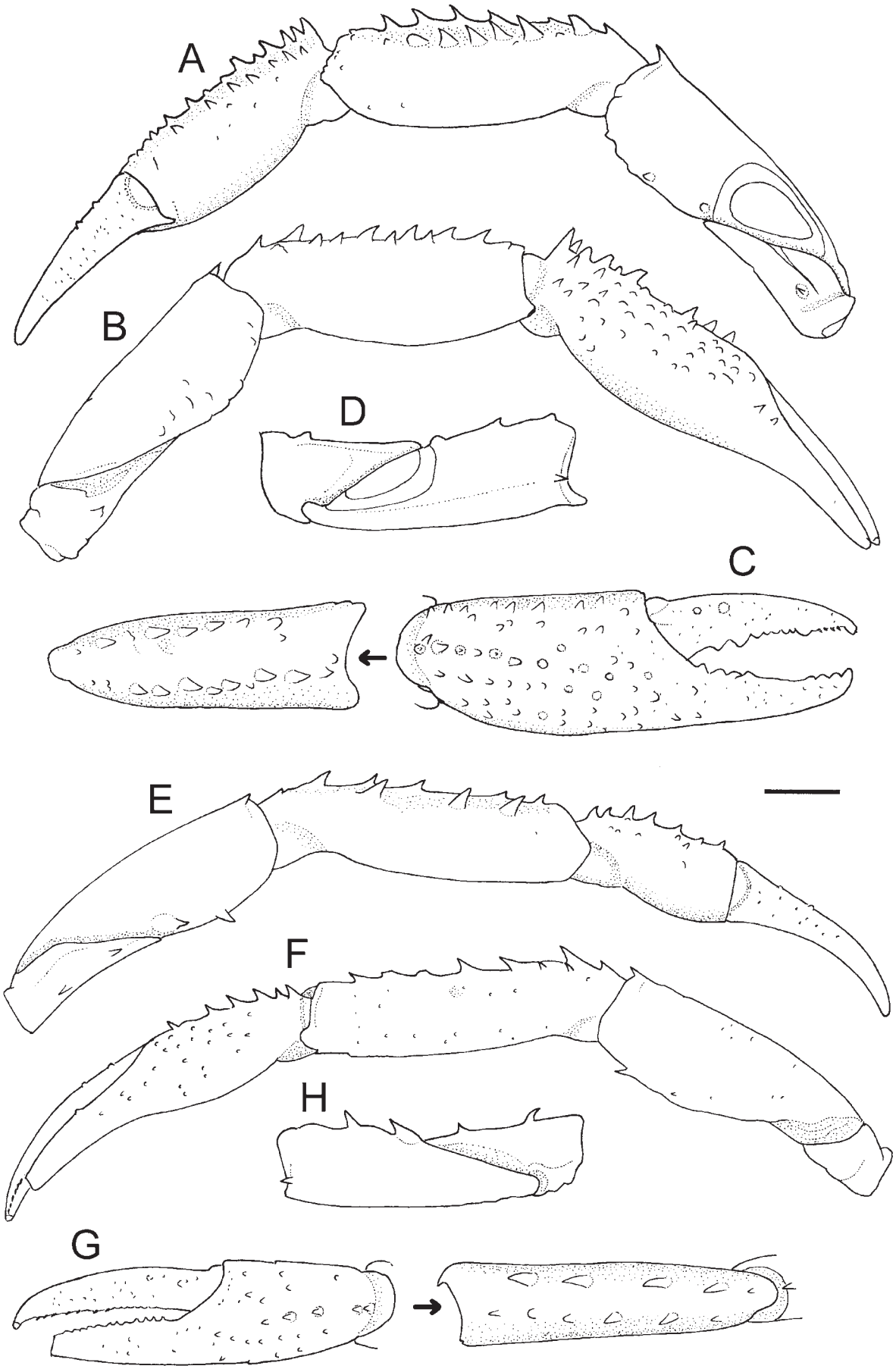

Fig. 21. *Decaphyllus tenuis*, new species, holotype, male (sl 1.8 mm), PANGLAO 2004, stn T5, NMCR 39091. A, right cheliped, mesial view; B, same, lateral view; C, same, chela and carpus, dorsal view; D, same, merus, dorsal view; E, left cheliped, mesial view; F, same, lateral view; G, same, chela and carpus, dorsal view; H, same, merus, dorsal view. Setae omitted. Scale bar = 1.0 mm.

row of numerous small, blunt or acute calcareous teeth in proximal 0.8 and row of spaced minute corneous teeth in distal 0.2, terminating in small calcareous claw. Palm (Fig. 21A, C) distinctly shorter than carpus; dorsomesial margin with row of small spines, dorsal midline with row of moderately small spines not extending onto fixed finger, dorsolateral margin not delimited, dorsal surface lateral to midline with scattered small slender spines or low tubercles; lateral and mesial surfaces with scattered short to long setae; ventral surface gently convex, smooth, with sparse setae.

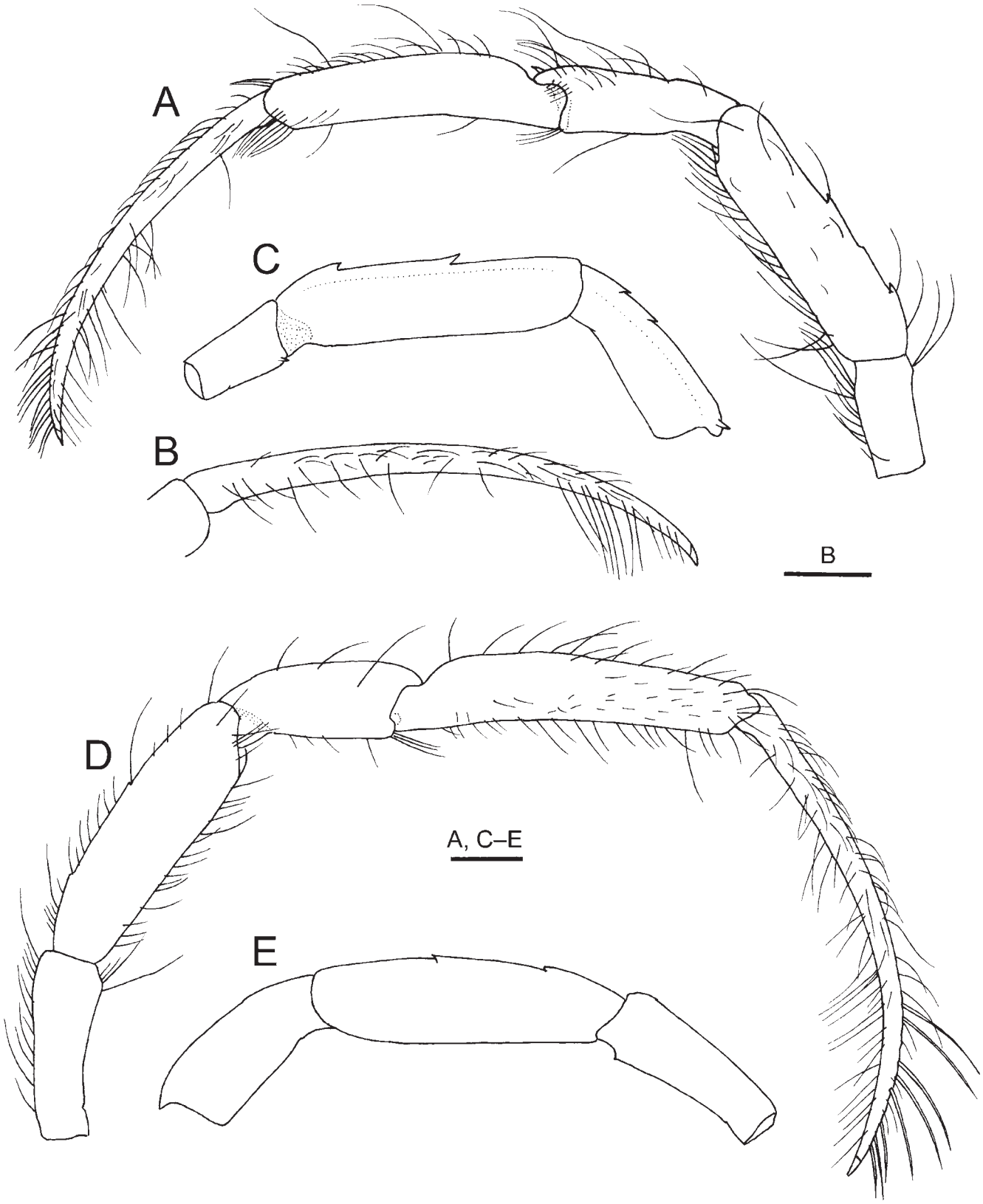

Fig. 22. *Decaphyllus tenuis*, new species, holotype, male (sl 1.8 mm), PANGLAO 2004, stn T5, NMCR 39091. A, right second pereopod, lateral view; B, same, dactylus, mesial view (only mesial setae shown); C, same, carpus to ischium, mesial view (setae omitted); D, right third pereopod, lateral view; E, same, carpus to ischium, mesial view (setae omitted). Scale bars = 1.0 mm.

Fixed finger (Fig. 21A, C) with cutting edge bearing row of numerous blunt to acute calcareous teeth, terminating in small calcareous claw. Carpus (Fig. 21A–C) subequal in length to merus, slightly widened distally, 2.3–2.9 times longer than wide; dorsomesial margin with row of 4–7 small spines, dorsolateral margin with row of 4–12 small spines (distalmost spine at dorsolateral distal angle minute); all surfaces with scattered short to long setae, subdistal transverse row of setae particularly prominent; both ventrolateral distal and distomesial angles unarmed. Merus (Fig. 21A, B, D) with 1 small spine on dorsodistal margin mesially; dorsal surface with sparse short setae; lateral surface without conspicuous spines or tubercles, ventrolateral margin unarmed or with 1 or 2 small, widely spaced spines or tubercles; mesial surface with 1 small proximoventral tubercle, ventromesial margin with 2 small, widely spaced spines or tubercles in distal half; ventral surface without conspicuous spine. Ischium (Fig. 21D) with 1 or 2 widely spaced small spines on ventromesial margin, distal spine, if present, directed distally, proximal spine also directed distally; lateral surface with spinule ventrally. Spines or spinules on merus and ischium sharper in small specimens than in large specimens.

Left cheliped (Fig. 21E–H) without hiatus between dactylus and fixed finger. Dactylus (Fig. 21E, G) about 1.3 times longer than palm, unarmed; all surfaces with numerous short to long setae, on mesial surface; cutting edge minutely denticulate, with row of minute corneous teeth in distal half. Palm (Fig. 21E–G) about half-length of carpus; dorsal surface with irregular longitudinal rows of small spines or tubercles, including stronger spines on midline; all surfaces with scattered short to long setae. Fixed finger with row of small calcareous teeth decreasing in size distally, several proximal teeth spine-like. Carpus (Fig. 21E–G) very slightly widened distally, about 3.8 times longer than wide; dorsolateral margin with 4–7 minute to moderately large spines, dorsomesial margin with 3–5 minute to moderately large spines; ventrolateral distal angle unarmed or with minute denticle, distomesial angle unarmed; all surfaces with scattered short to long setae. Merus (Fig. 21E, F, H) with sparse setae on dorsal surface; dorsodistal margin with 1 small spine; lateral surface with 1 spinule adjacent to ventral margin, ventrolateral margin with 1 subdistal spine; mesial surface with small distally curved spine proximoventrally, ventromesial margin with 1 small spine distal to midlength; ventral surface unarmed, with scattered long setae. Ischium (Fig. 21E, H) with 2 widely spaced small spines on ventromesial margin, distal spine directed mesially, proximal spine curved proximally; lateral surface unarmed.

Ambulatory legs (Fig. 22) overreaching tip of right cheliped. Dactyli (Fig. 22A, B, D) 1.4–1.5 times longer than propodi, 14.5–16.7 times longer than broad, gently curved ventrally; all surfaces unarmed, but with numerous setae, particularly longer and stronger on dorsal margins (several distal setae on dorsal margins bristle-like). Propodi (Fig. 22A, D) unarmed, but with row of sparse setae on dorsal and ventral margins and scattered short setae on lateral and mesial faces. Carpi each with dorsodistal spine (second; Fig. 22A) or without dorsodistal spine (third; Fig. 22D), and with 2 additional small spines in proximal 0.3 (second, Fig. 22C) or no additional spines (third, Fig. 22E). Meri (Fig. 22A, C–E) each with 2 small spines (one located slightly distal to midlength and another at proximal 0.2) on dorsal margin; dorsal and ventral margins with sparse long setae, latter unarmed. Ischium with distal spinule on ventral margin mesially (second, Fig. 22C) or unarmed (third, Fig. 22E).

Fourth pereopods (Fig. 20D) non-chelate, with claw of dactylus entirely masked by tufts of short, dense setae; propodus with sparse setae on dorsal margin and distal half of ventral margins; 2 minute corneous scales present ventrodistally. Fifth pereopods semichelate.

Male with right sexual tube (Fig. 20F) long, directed from right to left across ventral body surface and curved anteriorly, reaching to level of coxa of left second pereopod; distal part somewhat flattened. Left sexual tube (Fig. 20F) directed from left to right, reaching to anteromesial part of coxa of right fifth pereopod, slightly twisted, slightly broadened distally, with sparse setae terminally and posteriorly. Female with unpaired left gonopore.

Anterior lobe of thoracic sternite 6 (third pereopods, Fig. 20E) subsemicircular, slightly skewed to left, bearing numerous long setae anteriorly. Sternite of thoracic sternite 8 (fifth pereopods) in male (Fig. 20F) asymmetrical, anteriorly concave, with few setae ventrally; that in female transversely subovate.

Pleon dextrally twisted. Male with 4 unpaired pleopods, second, fourth and fifth uniramous, third unequally biramous; ramus of second pleopod bearing numerous marginal setae. Female with 4 unpaired, unequally biramous pleopods.

Telson (Fig. 20G) with shallow median cleft; terminal margin with prominently produced, spinose left exterior angle separated from less produced, but also prominent, spinose right exterior angle, and with 1 or 2 spinules on either side of median cleft; lateral margins forming chitinous plate.

Colouration. — In life (Fig. 23B). Carapace generally reddish, shield slightly mottled. Ocular peduncles pinkish, with scattered white spots. Antennal peduncles reddish, without conspicuous markings; antennal flagellum whitish in proximal half, blue in distal half. Chelae generally whitish, carpi generally reddish with whitish distal part; meri whitish, with reddish blotches. Ambulatory legs indistinctly banded by red and white; dactyli entirely whitish; propodi with distal part white and proximal part white, remainder alternated with red (distal to midlength) and white (proximal to midlength); carpi reddish; meri reddish with white distal parts. Pleon reddish.

In preservative. Chelipeds and ambulatory legs with iridescent sheen.

Variation. — Acuteness of dorsal spines on the right palm, scattered lateral to the midline, is substantially variable, although it seems to be size related. In small specimens (sl 1.0–1.3 mm), those spines are slender and acute, but in large

specimens (sl 1.8, 1.9 mm), they are reduced to blunt, rounded tubercles. The number of dorsolateral and dorsomesial spines on the carpi of chelipeds seems to increase with the increase of the body size.

Distribution. — Known only from Panglao Islands, 82–200 m.

Remarks. — *Decaphyllus tenuis*, new species, is very similar to *D. janquai* in the general proportion of the cephalic appendages and the armature of the right chela. In particular, the dorsomedian row of spines on the right palm is clearly recognisable only in the proximal portion in both species. *Decaphyllus tenuis* is distinguished from *D. janquai* by the relatively shorter antennular peduncle overreaching the distal corneal margin by about half length of the ultimate segment (versus about 0.8 length) and the relatively slender right chela (about 3.0 times as long as wide versus 2.0 times as long).

As discussed above, *D. brevis*, new species, and *D. spinicornis* also superficially resemble *D. tenuis*. Differentiating characters between the three species are discussed under ***Remarks*** of *D. brevis*.

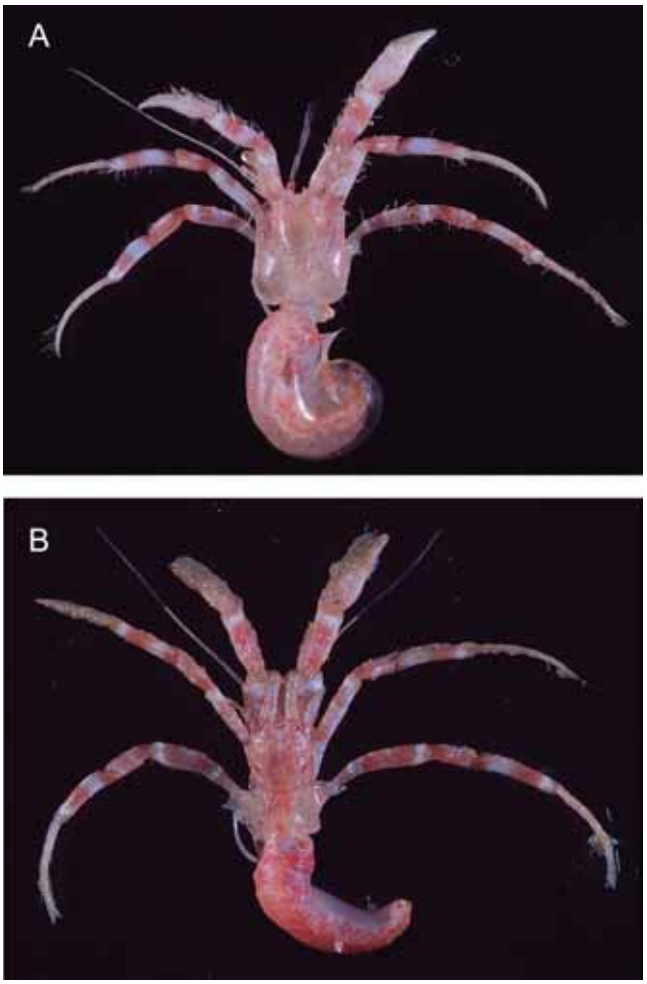

Fig. 23. A, *Decaphyllus proprius*, new species, holotype, male (sl 1.4 mm), PANGLAO 2004, stn T39, NMCR 39089, entire animal in dorsal view, showing living colouration; B, *Decaphyllus tenuis*, new species, holotype, male (sl 1.8 mm), PANGLAO 2004, stn T5, NMCR 39091, entire animal in dorsal view, showing living colouration.

Decaphyllus barunajaya (cf. McLaughlin, 1997) has a right chela being armed similarly to *D. tenuis*, but this species is readily distinguished from *D. tenuis* by the complete loss of arthrobranch gills on the third maxilliped, the stouter and less elongate right cheliped, the presence of a hiatus between fingers of the left cheliped, and the possession of a row of small calcareous teeth on the cutting edge of the dactylus of the left chela.

Etymology. — From the Latin *tenuis* [= narrow], in reference to the slender, elongate right cheliped of this new species.

KEY TO SPECIES OF *DECAPHYLLUS*

Species of *Decaphyllus* are represented only by respective name bearing type and/or a few paratypic or additional specimens subsequently reported, and therefore, assessment of diagnostic characters is not easy. The following key should be used with caution considering the current situation. Non-dichotomous characters being possibly useful in species recognition are cited in brackets.

1. Antennal acicle with spine on lateral margin proximally..... ..... *D. proprius*, new species
1. Antennal acicle without spine on lateral margin 2
2. No or only one bud-like arthrobranch gill on third maxilliped 3
2. Two arthrobranch gills on third maxilliped, though often non-lamellate, bud-like 5
3. Dactylus of right cheliped unarmed on dorsal surface, dorsal surface of right palm with numerous scattered small spines or tubercles lateral to midline; [lateral projections of shield distinctly overreaching rostral lobe; no arthrobranch gill on third maxilliped] ..... *D. barunajaya* McLaughlin, 1997
3. Dactylus of right cheliped with 1 to few spinules or tubercles dorsomesially, dorsal surface of right palm without conspicuous spines lateral to midline 4
4. No arthrobranch gill on third maxilliped; lateral projections of shield reaching as far as rostral lobe; palm of right cheliped with rows of prominent spines on dorsal midline and dorsomesial margin; shield, chelipeds and ambulatory legs with slight iridescent sheen ..... *D. deliquus*, new species
4. Single bud-like arthrobranch gill on third maxilliped; lateral projections of shield distinctly overreaching rostral lobe; palm of right cheliped with row of tiny spines or tubercles on dorsal midline and row of tiny spines on dorsomesial margin; no iridescent sheen on shield and ambulatory legs .... *D. litoralis*, new species
5. Dactylus of right cheliped with clustered several small spines or tubercles just proximal to midlength 6
5. Dactylus of right cheliped proximally with 1 small spine or 1–3 tiny tubercles 7
6. Dorsolateral distal angle of second segment of antennal peduncle terminating in simple spine; palm of right chela with conspicuous spines on dorsal midline, not decreasing in size and acuteness distally ..... *D. similis* de Saint Laurent, 1968
6. Dorsolateral distal angle of second segment of antennal peduncle terminating in bifid spine; palm of right chela with small spines and tubercles on dorsal midline, decreasing in size and acuteness distally ..... *D. spinulodigitus*, new species

7. Shield about 1.2 times as long as wide; anterior lobe of thoracic sternite 6 roundly subtriangular ....*D. maci* McLaughlin, 1997
7. Shield 1.0–1.1 times as long as wide; anterior lobe of thoracic sternite 6 subsemicircular or roundly subtrapezoidal 8
8. Antennular peduncle overreaching distal corneal margin by 0.8 or more length of ultimate segment; [right chela about twice as long as wide, with scattered tiny tubercles lateral to midline .. .. *D. janquai* de Saint Laurent, 1968
8. Antennular peduncle overreaching distal corneal margin by about half length of ultimate segment 9
9. Basal segment of antennular peduncle with prominent spine on mesial surface; [rostral lobe obsolescent, exceeded by lateral projections] .....*D. spinicornis* de Saint Laurent, 1968
9. Basal segment of antennular peduncle without spine on mesial surface.....10
10. Rostrum relatively narrowly rounded, exceeding as far as lateral projections; right chela about 3.0 times as long as wide, with scattered small spines or tubercles lateral to midline..... .....*D. tenuis*, new species
10. Rostrum obsolescent, exceeded by lateral projections; right chela about 2.2 times as long as wide, without scattered small spines or tubercles lateral to midline ... *D. brevis*, new species

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