Deep-water Arcturidae (Crustacea, Isopoda, Valvifera) from French collections in the south-western Pacific Ocean

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Isopoda,
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Arcturidae,
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Dolichiscus,
south-western Pacific Ocean,
systematics,
new species.

ABSTRACT
The arcturid genera *Chaetarcturus* Brandt, 1990 and *Dolichiscus* Richardson, 1913 are rediagnosed and six deep-water species recorded or described: *C. abyssicola* (Beddard, 1886) from north-eastern Australia; *C. crosnieri* n.sp. from the Coral Sea and New Caledonia, *C. taniae* n.sp. from New Caledonia, *D. cornutus* (Beddard, 1886) from Philippines, Indonesia and New Caledonia; and *D. kai* n.sp. and *D. tanimbar* n.sp. from Indonesia.

MOTS CLÉS
Crustacea,
Isopoda,
Valvifera,
Arcturidae,
Chaetarcturus,
Dolichiscus,
océan Pacifique SW,
systématique,
nouvelles espèces.

RÉSUMÉ
Arcturidae (Crustacea, Isopoda, Valvifera) de profondeur provenant des expéditions françaises dans le sud-ouest de l'océan Pacifique. Les genres d'Arcturidae *Chaetarcturus* Brandt, 1990 et *Dolichiscus* Richardson, 1913 sont redéfinis et six espèces de profondeur sont signalées ou décrites : *C. abyssicola* (Beddard, 1886) du nord-est d'Australie ; *C. crosnieri* n.sp. de la mer de Corail et de Nouvelle-Calédonie, *C. taniae* n.sp. de Nouvelle-Calédonie, *D. cornutus* (Beddard, 1886) des Philippines, d'Indonésie et de Nouvelle-Calédonie, et *D. kai* n.sp. et *D. tanimbar* n.sp. d'Indonésie.

INTRODUCTION

Deep-water marine collections made by French expeditions in the Philippines, Indonesia and New Caledonia between 1985 and 1994 include several species of valviferan isopod crustaceans of the family Arcturidae, most new to science. In this contribution six species belonging to two genera are reported or described. The genera, *Chaetarcturus* Brandt, 1990 and *Dolichiscus* Richardson, 1913 are rediagnosed. Both are diverse in Antarctic and deep-sea environments, so it is no surprise that they are the best represented of the genera in these collections. The French collections, largely placed in the Muséum national d'Histoire naturelle, Paris (MNHN), are supplemented by material collected by Australian expeditions in northern Australia, now deposited in the Museum Victoria (NMV).

Measurements of these strongly flexed animals are total lengths from the front of the head to the tip of the pleotelson along a line in the middle of the lateral surface. Illustrations of whole animals were made with a camera lucida and stereomicroscope. Scale bars on the figures are 10 mm and refer to habitus drawings only. The pereopods were drawn at the same scale after removal from the body and flattened to more accurately show relative lengths. The orientation of the legs is not therefore as they would appear in a whole animal. Mouthparts are not illustrated because there appears no difference in many characters across a wide range of arcturid taxa (see for example, Brandt 1990).

Family ARCTURIDAE Bate *et* Westwood, 1868

Genus *Chaetarcturus* Brandt, 1990

Chaetarcturus Brandt, 1990: 74-76; 1991: 151-153. – Wägele 1991: 117.

TYPE SPECIES. — *Chaetarcturus longispinosus* Brandt, 1990 (by original designation).

DIAGNOSIS

Body geniculate. Female pereonite 4 about as long as pereonites 2, 3. Pleonite 1 short, its suture with pleotelson vertical in lateral view. Pleotelson cylindrical. Paired pleotelsonic posterior spines present; with medial pleotelsonic posterior spine present. Mouthparts and pereopod 1 exposed in lateral view. Antenna 2 peduncle with few setae; flagellum of three to four articles. Pereopod 1 dactylus tapering, with unguis. Pereopods 2-4 dissimilar to pereopods 5-7, with rows of paired long setae. Pereopods 2-4 dactylus as long as propodus, with posterior row of setae. Pereopod 4 about as long as pereopod 3, of similar form. Pereopods 5-7 stout. Penes fused. Male pleopod 1 exopod thickened, laterally convex at midpoint, obliquely grooved, groove ending distolaterally on a subterminal angle. Oostegite 4 supported by ventral coxal process. Oostegite 5 absent in ovigerous female; incipient coxal processes not meeting in middle.

REMARKS

Chaetarcturus was diagnosed by Brandt (1990) principally on the basis of rows of long setae extending from the carpus and propodus on to the elongate dactylus of pereopods 2-4. The genus is unique among the *Antarcturus*-like genera in this feature. All others have long setae on the carpus to propodus and a reduced dactylus with few setae. The condition is an autapomorphy for the genus and, unlike some other character states, is not seen in other arcturids. Brandt (1991) used this character to differentiate *Chaetarcturus* from ten other genera in her cladogram of Arcturidae. A further autapomorphy is the configuration of the male pleopod 1. The pleopod 1 of the male is a critical diagnostic character in Arcturidae but has been rarely illustrated well. In *Chaetarcturus* the exopod is thickened, laterally convex at its midpoint, obliquely grooved, and with the groove ending distolaterally on a subterminal angle. The only other species of *Chaetarcturus* for which the male pleopod 1 has been illustrated is *C. aculeatus* (Kussakin, 1967) and it conforms with those of the two new species described here. Oostegites and their coxal support were introduced as significant characters for genera of Austrarcturellidae by Poore & Bardsley (1992). They are important for Arcturidae too and differentiate, for example, the *Antarcturus*-like genera (with four separate pairs of oostegites) from the *Astacilla*-group with

fewer oostegites. These groups were recognized on the basis of different character sets by Wägele (1989) and Brandt (1991).

Brandt (1990) and Wägele (1991) together listed seven Antarctic and seven Pacific species. Another one from the literature and *C. taniae* n.sp. are typical of the genus as conceived by Brandt. That is, in addition to the setose dactylus on pereopods 4-7, the species are generally spinose and possess a pair of posterior pleotelsonic spines. These sixteen species, with subspecies, are listed in table 1.

The last four species in table 1 differ from *C. longispinosus* Brandt, 1990, type species of *Chaetarcturus*. They lack strong dorsal spines and supraocular horns. All possess no or weak posterolateral diverging spines on the pleotelson. They possess a strong posteromedian spine on the pleotelson. The anterior margin of pereopod 5 is convex and tuberculate. All possess a setiform unguis on pereopods 2-4 (usually short in *Chaetarcturus*). Some of the species of *Chaetarcturus* listed by the two earlier authors share one or more of these characters. But because there is no character which uniquely separates the group from other members of *Chaetarcturus* it is difficult to justify a new genus for them. Nevertheless, all are from a very confined area of deep water of the south-eastern Pacific and may represent a monophyletic clade. None was included in *Chaetarcturus* by Brandt (1990).

Chaetarcturus abyssicola (Beddard, 1886)

Arcturus abyssicola Beddard, 1886a: 111; 1886b: 98-99, pl. 21 figs 5-8.

TABLE 1. — Species of the genus *Chaetarcturus* Brandt, 1990.

Species	Region	References
C. abyssalis (Birstein, 1963)	North-western Pacific Ocean	Kussakin 1982; Brandt 1990.
C. aculeatus (Kussakin, 1967)	Argentina; Marion-Prince Edward region	Kensley 1980; Brandt 1990; Wägele 1991.
C. acutispinis (Kussakin, 1982)	North-western Pacific Ocean	Brandt 1990.
C. adareanus (Hodgson, 1902)	Antarctica	Hodgson 1910; Hale 1937; Hale 1946; Brandt 1990; Wägele 1991.
C. bathybialis (Birstein, 1963)	North-western Pacific Ocean	Kussakin 1982; Brandt 1990.
C. beddardi (Gurjanova, 1935)	Sea of Okhotsk; north-western Pacific Ocean	Birstein 1963; Kussakin 1971, 1982; Brandt 1990.
C. bovinus (Brandt & Wägele, 1988)	Antarctica	Brandt 1990; Wägele 1991.
C. brunneus (Beddard, 1886a)	Kerguelen Islands	Beddard 1886b; Brandt 1990; Wägele 1991.
C. brunneus spinulosus (Nordenstam, 1933)	Shag Rock; South Georgia	Brandt 1990.
C. echinatus (Kussakin, 1982)	North-western Pacific Ocean.	
C. franklini (Hodgson, 1902)	Victoria Land; Adelie Land; Antarctic Peninsula; Falkland Islands; Graham Land	Hodgson 1910; Richardson 1913; Nordenstam 1933; Hale 1946; Kussakin 1967; Amar & Roman 1974; Kussakin & Vasina 1982; Brandt 1990; Wägele 1991.
C. globicaudis (Kussakin, 1982)	North-western Pacific Ocean.	
C. longispinosus Brandt, 1990	Antarctica, Shetland Islands	Wägele 1991; Pires & Sumida 1997.
C. oligospinis (Kussakin, 1971)	North-western Pacific Ocean	Kussakin 1982; Brandt 1990.
C. praecipius (Menzies *et* George, 1972)	Peru-Chile Trench	Brandt 1990.
C. taniae n.sp.	Coral Sea	
C. ultraabyssalis (Birstein, 1963)	North-western Pacific Ocean	Kussakin 1982; Brandt 1990.
C. abyssicola (Beddard, 1886)	Queensland, Australia	Beddard 1886a, b.
C. myops (Beddard, 1886)	North-eastern New Zealand	Beddard 1886a, b.
C. spinifrons (Beddard, 1886)	Fiji	Beddard 1886a, b.
C. crosnieri n.sp.	Coral Sea	

MATERIAL EXAMINED. — *Challenger* stn 184, 1400 fm (= 2550 m): 12 mm ♂ and 14 mm juvenile ♀ (BMNH 89.4.27.89 – labelled "holotype" incorrectly).

REMARKS

The holotype of this species, from *Challenger* station 281 (4300 m depth off southern Queensland, Australia), was said by Beddard (1886b) to be lacking an abdomen and is not at the Natural History Museum, London. But a male and female from station 184 (2500 m depth off Cape York, Australia; BMNH 1889.4.27.89) subsequently illustrated by Beddard (1886b) were examined. Both specimens are characteristic of the genus (narrow pleotelson with posterodorsal spine; setose dactyli on pereopods 2-4; elongate antennae 2 without row of long setae) and share with *C. crosnieri* similar body proportions, ornamentation and tuberculation on the basis of pereopod 5.

Chaetarcturus crosnieri n.sp.

(Figs 1, 2)

MATERIAL EXAMINED. — **Australia.** Queensland, Coral Sea, off Cairns, 17°12'S - 147°11'E, 13.V.1986, beam trawl, 1564 m, M. Pichon *et al.*: holotype, ♂, 28 mm (NMV J16513).

New Caledonia. BIOCAL stn CP23, 22°46'S - 166°20'E, 2040 m, 28.VIII.1985: paratype, ovigerous ♀, 18 mm (MNHN Is5070). — Stn CP26, 22°39.66'S - 166°26.37'E, 1618-1740 m, 28.VIII.1985: paratype, juvenile, 9.5 mm (MNHN Is5071). — Stn CP27, 26°06'S - 166°26'E, 1850-1900 m, 28.VIII.1985: paratype, juvenile ♀ with oostegites, 21 mm (MNHN Is5072). — Stn CP57, 23°44'S - 166°58'E, 1490-1620 m, 1.IX.1985: paratypes, ovigerous ♀, 16 mm; 2 juveniles, 9.3 and 12 mm (NMV J44029). — Stn CP58, 23°56.52'S - 166°40.55'E, 2660 m, 1.IX.1985: paratype, incomplete juvenile (MNHN Is5073). — Stn DS59, 23°56'S - 166°41'E, 2650 m, 2.IX.1985: paratype, ovigerous ♀, 26 mm (MNHN Is5074).

BIOGEOCAL stn CP272, 20°00.04'S - 166°56.94'S, 1615-1710 m, 19.IV.1987: paratype, damaged ♂, 15 mm (MNHN Is5075). — Stn CP317, 20°48.12'S - 166°53.16'E, 1630-1620 m, 2.V.1987: paratype, juvenile, 8.0 mm (MNHN Is5076).

Chesterfield Islands. MUSORSTOM 5 stn 323, 21°18.52'S - 157°57'E, 970 m, 14.X.1986: paratype, ovigerous ♀, 12 mm (MNHN Is5077).

DISTRIBUTION. — New Caledonia and north-eastern coast of Australia; 970-2660 m depth.

ETYMOLOGY. — For Alain Crosnier with thanks for making this material available, facilitating my study, and in recognition of his promotion of taxonomic research into marine crustaceans of the Pacific.

DESCRIPTION

Holotype

Head with scattered dorsal and dorsolateral tubercles and three more prominent lateral tubercles on marginal flange.

Pereonite 1 with three low transverse ridges, the most posterior with minute tubercles. Pereonites 2 and 3 each with two transverse ridges, minutely tuberculate; lateral margin swollen and minutely tuberculate. Pereonite 4 similar to pereonite 3, lateral swelling less pronounced. Pereonites 5-7 with transverse ridge minutely tuberculate.

Pleonite 1 minutely tuberculate, with ventrally directed lateral spine. Pleonites 2-5 and telson fused, areas of pleonites 2 and 3 distinguishable from remainder by ventrolateral notches. Pleonite 2 slightly articulating with pleonite 1, minutely tuberculate. Pleonite 3 minutely tuberculate, with pair of lateral triangular projections. Remaining pleotelson minutely tuberculate, with obtuse lateral triangular projections near apex; with strong mid-dorsal posterior spine.

Antenna 2: articles 2 and 3 minutely tuberculate in longitudinal rows; articles 1-3 together as long as head and pereonites 2 and 3; article 4 1.4 times as long as this; article 5 0.85 times as long as article 4; articles 4 and 5 weakly setose; flagellum broken.

Coxa 1 with weak row of marginal short spines. Coxae 2-4 each with two to three spinules on posterolateral corners, largest on coxa 4. Coxae 3, 4 with spinules on anterior and posterior margins. Coxae 5-7 swollen, each with mid-ventral short spine on posterior margin engaging pair of small tubercles on anterior margin of following pereonite. Bases of pereopods 1-7 minutely and irregularly tuberculate; following articles unarmed. Dactylus of pereopods 2-4 1.2, 1.5 and 1.8 times length of propodus respectively, with rows of long setae along posterior margin, with long apical setiform unguis.

Pereopod 1 basis with small tooth; all articles setose along posterior margin; carpus postero-

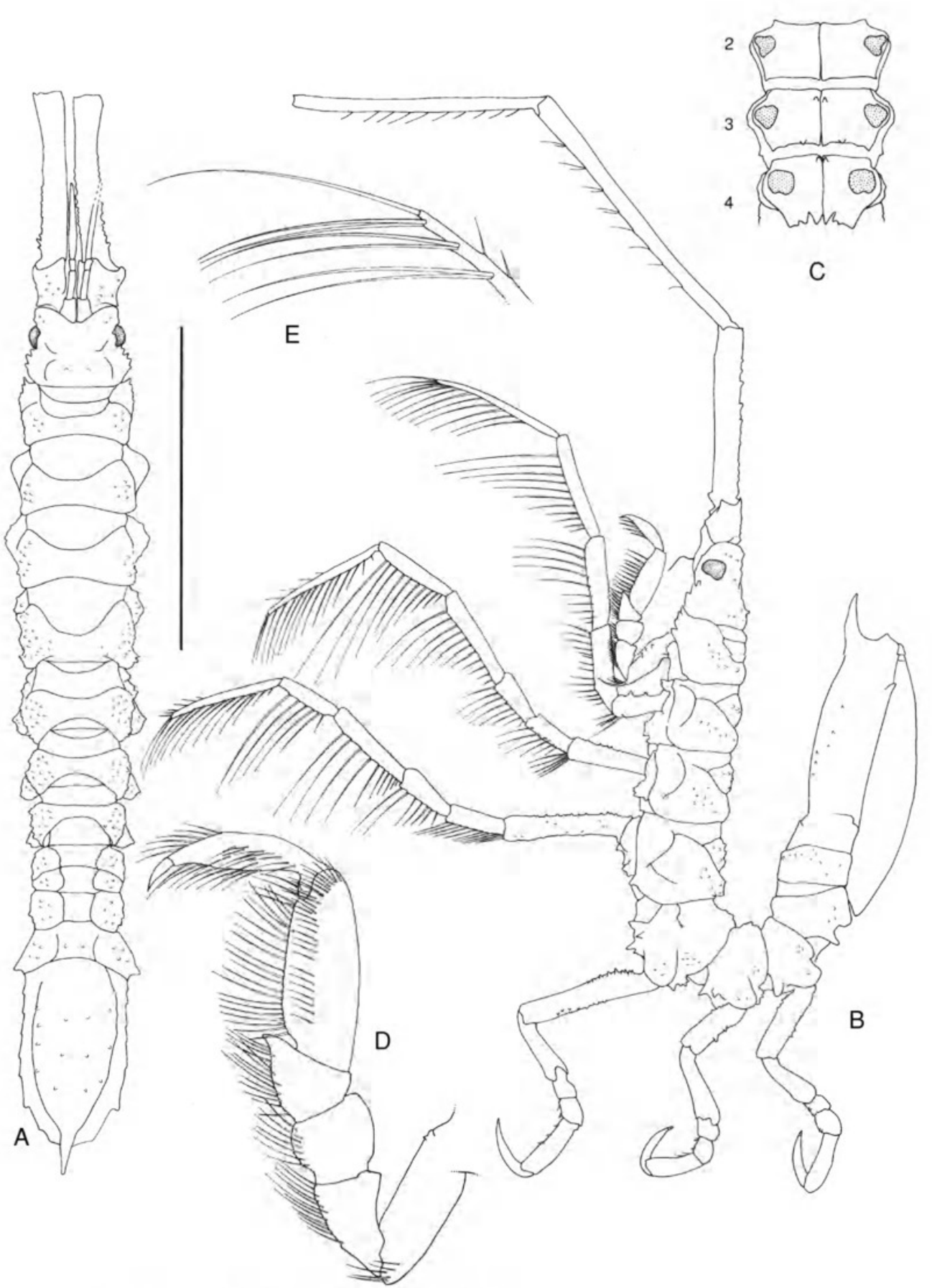

FIG. 1. — *Chaetarcturus crosnieri* n.sp., holotype ♂ (NMV J16513); **A**, **B**, habitus; **C**, pereonites 2-4, ventral view; **D**, pereopod 1, mesial view; **E**, pereopod 2, tip of dactylus. Scale bar for habitus: 10 mm.

distally produced as a sharp tooth; propodus and dactylus setose on mesial face; dactylus swollen in proximal two thirds; unguis 20% of dactyl.
Pereopods 5-7 bases with four, three and two spines or denticles respectively; merus-propodus with short robust setae along posterior margins.
Uropod with two rami; endopod 80% length of exopod, with acute apex with one small distal seta.
Brown on head and mouthparts.

Ovigerous female, 25.5 mm
Pleonite 1 and pleotelson with well-developed posterolateral spines. Coxae 2-4 with ventral plates, well-developed on coxa 4, apically rounded and not meeting medially. Coxa 5 with tuberculate ventral lobe, oostegite absent.

Juvenile female, 20.5 mm
Oostegite 5 visible only as semicircular bud.

REMARKS
The species is very similar to *Chaetarcturus abyssicola* (Beddard, 1886). The latter differs only in a less produced mid-dorsal posterior spine on the pleotelson, being smoother, and most significantly in lacking any indication of the posterolateral spines on the pleotelson. The male holotype of *C. crosnieri* has only small posterolateral lobes on the pleotelson and in this way resembles the smallest juveniles. All the adult females and larger juveniles have well-developed posterolateral pleotelsonic spines. Although the holotype comes from an area remote from New Caledonia where all others were collected, it is difficult to conclude that more than one species is involved because the general spination pattern is consistent in all material (except in the relatively smoother juveniles). The only male from New Caledonia has a damaged pleotelson but no spine is visible.

Chaetarcturus taniae n.sp.
(Figs 3, 4)

MATERIAL EXAMINED. — **New Caledonia.** BIOCAL stn CP26, 22°39.66'S - 166°26.37'E, 1618-1740 m, 28.VIII.1985: holotype, ♂, 13.8 mm (MNHN Is5078).

DISTRIBUTION. — New Caledonia; 1618-1740 m (type locality only).

ETYMOLOGY. — For Tania Bardsley, Melbourne, who helped with the recognition and illustration of some of these species.

DESCRIPTION
Holotype
Head with pair of strong dorsolateral spines anterior to eyes, second pair of dorsolateral spines posterior to eyes, lateral margin with denticles.
Pereonite 1 well-differentiated from head laterally, with pair of dorsal submedian and pair of shorter dorsolateral spines posteriorly. Pereonites 2-4 each with pair of dorsal submedian spines posteriorly, pair of dorsolateral spines and pair of lateral spines; pereonite 4 with pair of dorsal submedian denticles anteriorly.
Pereonites 5-7 each with pair of dorsal submedian spines posteriorly, pair of dorsolateral spines becoming more lateral on pereonites 6 and 7; pereonite 5 with pair of lateral denticles.
All pleonites and telson immoveably fused. Pleonites 1-3 each with pair of dorsal submedian spines, pair of dorsolateral spines and pair of lateral spines (all posteriorly curved), dorsolateral spines longest and most posteriorly directed on pleonite 3. Remaining pleotelson domed, distinguished from more anterior region by deep transverse groove, with mid-dorsal row of three spines, two pairs of dorsolateral spines, three pairs of smaller spines near lateral margins, the last overreaching the broadly angled apex.
Antenna 2: article 2 with one upper spine; article 3 with three upper spines, last the longest, and one distolateral spine; articles 1-3 together as long as head and pereonites 1-2; article 4 1.5 times as long as this; article 5 1.3 times as long as article 4; flagellum of 6 articles, first very long, plus minute claw.
Coxa 1 with irregular anterolateral and lateral teeth. Coxae 2 and 3 each with minute denticles laterally. Coxa 4 with lateral denticles, ventral plate with two denticles on posterior margin. Coxae 5-7 (indistinguishable from pereonite) each with one lateral spine. Basis of pereopod 1 unarmed; bases of pereopods 2-4 with irregular denticles along anterior margins; merus and carpus of pereopod 2 with one distal spine; basis

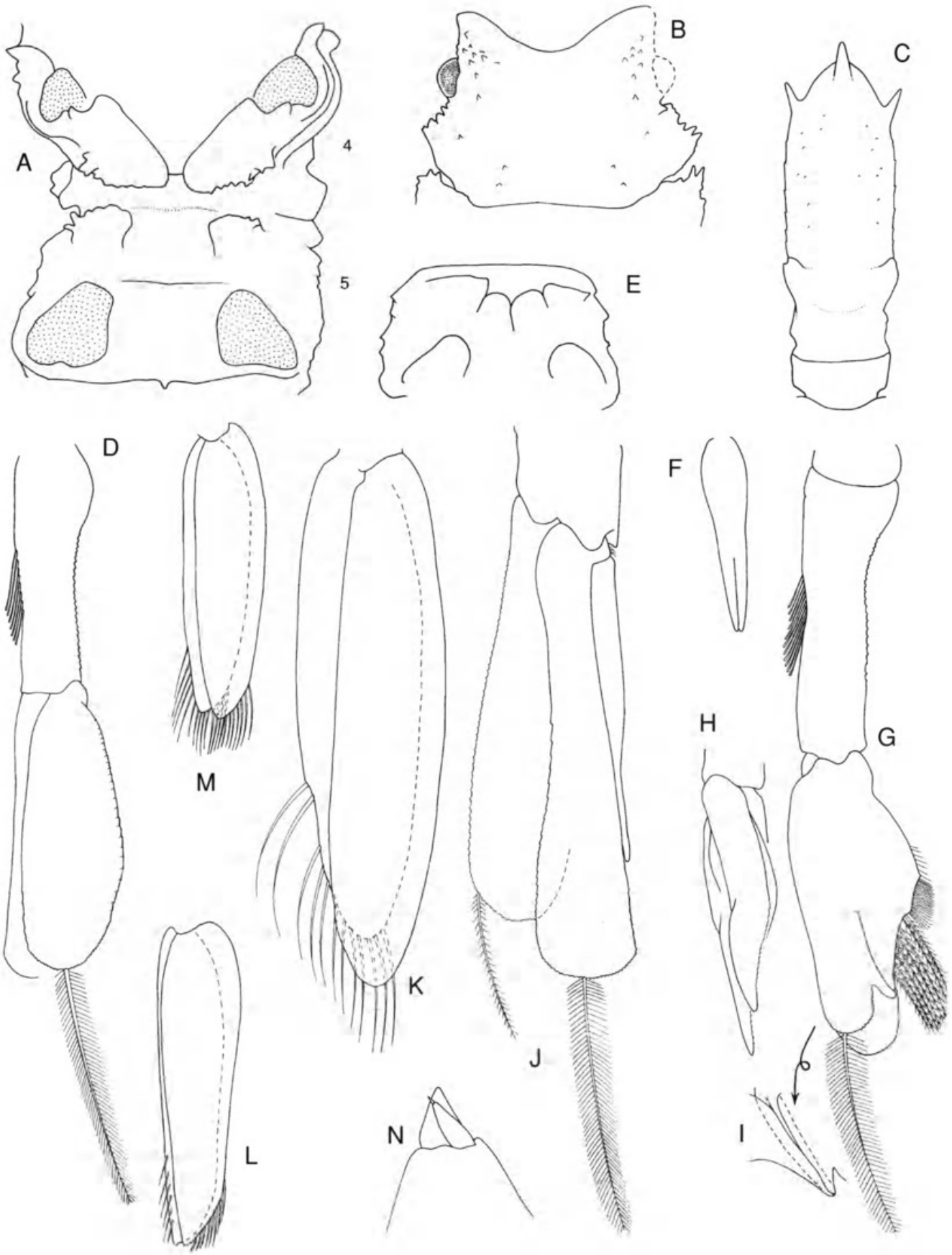

FIG. 2. — *Chaetarcturus crosnieri* n.sp.; **A-D**, paratype, ovigerous ♀ (MNHN Is5074); **A**, pereonites 4-5, ventral view; **B**, head; **C**, pleonite 1 and pleotelson; **D**, pleopod 1; **E**, paratype, juvenile ♀ (MNHN Is5072), pleonite 5; **F-M**, holotype ♂ (NMV J16513); **F**, penial plate; **G**, **H**, pleopod 1, anterior and lateral views; **I**, pleopod 1, detail of posterolateral lobe of exopod; **J-M**, pleopods 2-5 (4 and 5 half scale of others); **N**, uropodal rami.

and ischium of pereopod 4 with one distal spine; propodus unarmed. Dactylus of pereopods 2 and 4 1 and 1.4 times length of propodus respectively, with rows of long setae along posterior margin, with long apical setiform unguis. (Pereopod 3 unknown.)
Pereopods 5 and 6 bases with short irregular denticles posteriorly; merus-propodus with short robust setae along posterior margins.
Uropod with irregular row of six denticles.

REMARKS
Chaetarcturus taniae is a typical *Chaetarcturus*, spinose and with paired posterodorsal pleotelso-

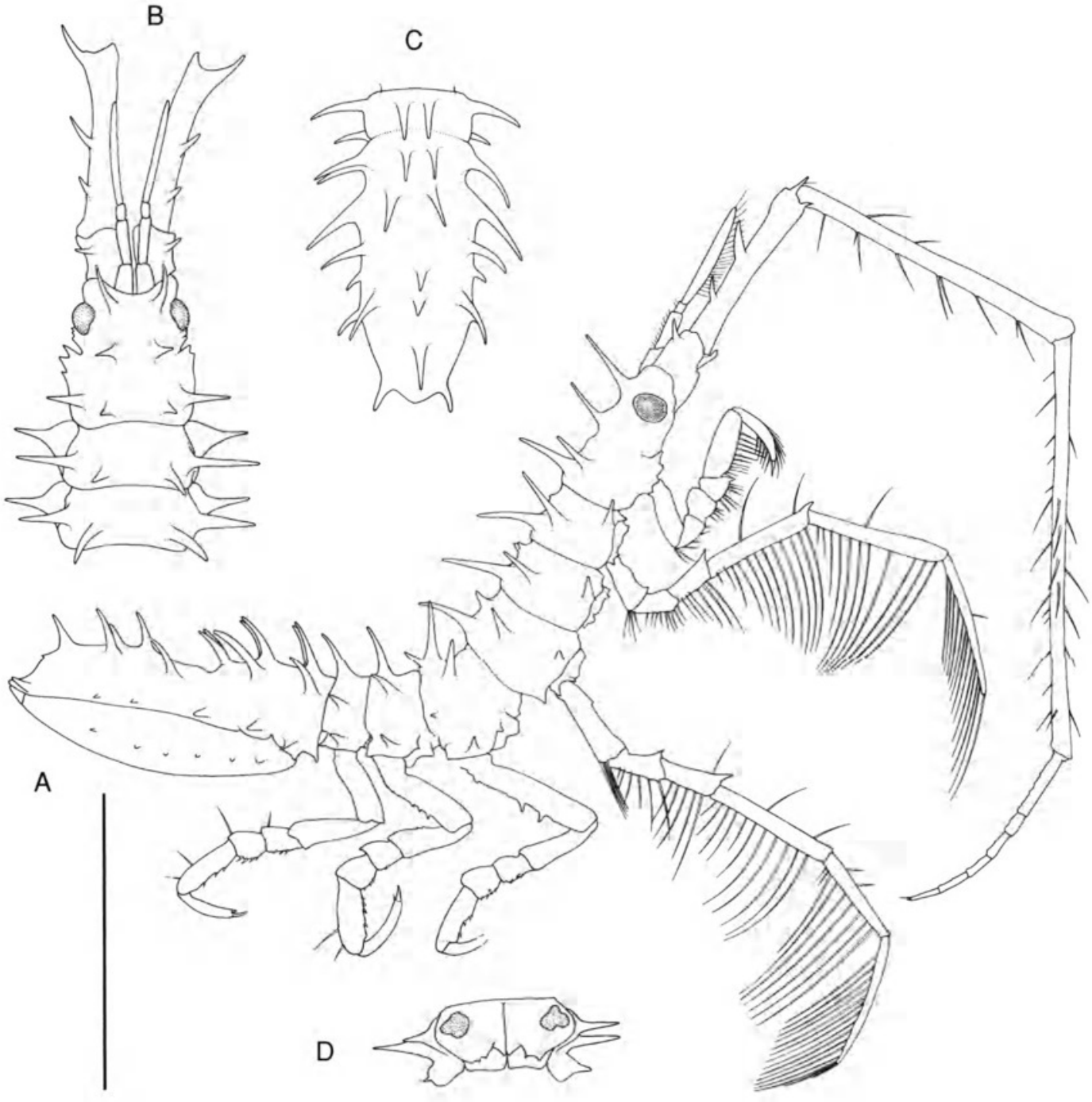

FIG. 3. — *Chaetarcturus taniae* n.sp.; holotype ♂ (MNHN Is5078); **A**, habitus, lateral view; **B**, head and pereonites 1-3; **C**, pleonite 1 and pleotelson; **D**, pereonite 4, ventral view. Scale bar for habitus: 10 mm.

nic spines. It has fewer dorsal spines than *C. longispinosus* and *C. bovinus* and differs from all species in the possession of three median spines on the posterior half of the pleotelson.

Genus *Dolichiscus* Richardson, 1913

Dolichiscus Richardson, 1913: 13-14. – Hale 1946: 197. – Schultz 1981: 71-73. – Wägele 1989: 139-140; 1991: 98. – Brandt 1990: 140-142; 1991: 151-152.

Paradolichiscus Schultz, 1981: 80-81 (type species *Antarcturus gaussianus* Vanhöffen, 1914 by original designation). – Wägele 1989: 139-140; 1991: 112. – Brandt 1991: 151-152.

TYPE SPECIES. — *Dolichiscus pfefferi* Richardson, 1913 (by original designation).

DIAGNOSIS

Body geniculate. Female pereonite 4 about as long as pereonites 2, 3. Pleonite 1 elongate, its

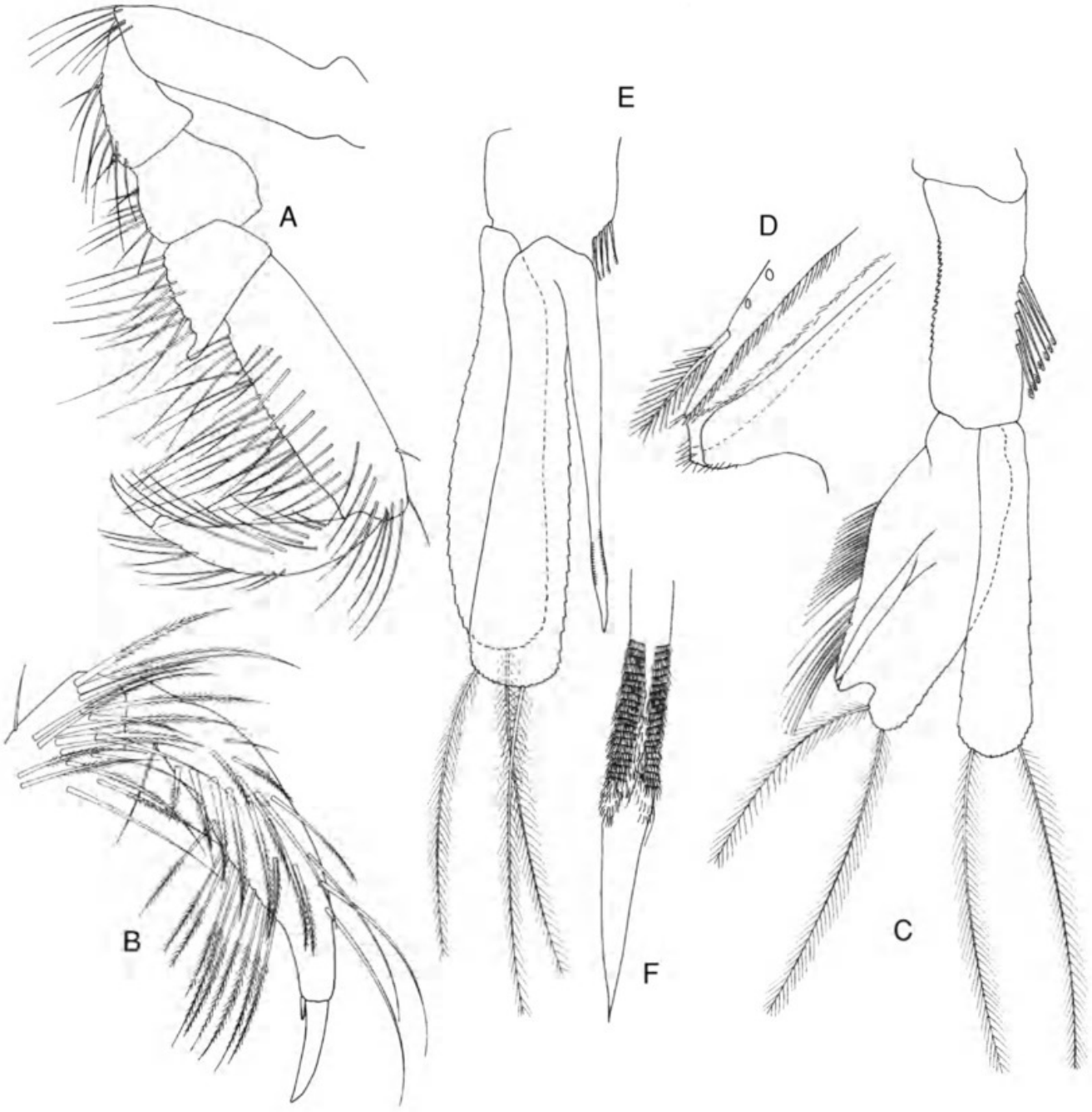

FIG. 4. — *Chaetarcturus taniae* n.sp.; holotype ♂ (MNHN Is5078); **A**, pereopod 1; **B**, pereopod 1, dactylus; **C**, pleopod 1; **D**, pleopod 1, detail of end of groove and distolateral lobe; **E**, pleopod 2; **F**, pleopod 2, tip of appendix masculina.

suture with pleotelson strongly oblique in lateral view, sometimes weakly articulating. Pleotelson with mid-dorsal ridge. Paired pleotelsonic posterior spines absent; medial pleotelsonic posterior spine present. Mouthparts and pereopod 1 exposed in lateral view. Antenna 2 peduncle with few setae; flagellum of more than 8 articles. Pereopod 1 dactylus lobed anteriorly, with unguis. Pereopods 2-4 dissimilar to pereopods 5-7, with rows of paired long setae. Pereopods 2-4 dactylus shorter than propodus, without posterior row of setae; unguis setiform. Pereopod 4 about as long as pereopod 3, of similar form. Pereopods 5-7 elongate. Penes fused. Male pleopod 1 exopod thickened, parallel-sided for most of length, obliquely grooved, groove ending distolaterally on a triangular lobe. Oostegite 4 supported by ventral coxal process. Oostegite 5 absent in ovigerous female.

REMARKS

Schultz (1981) separated *Paradolichiscus* from *Dolichiscus* only on the basis of possession of "short or long dorsal and coxal spines". All species of *Dolichiscus* are more or less spinose, the degree of spination being a useful specific character. The species assigned to his new genus by Schultz are not much more spinose than those placed in *Dolichiscus* and there is no clear division between the two. The two genera are therefore synonimized. Wägele (1989) recognised the similarity of the two genera, proposing that an elongate antennal 2 flagellum was a synapomorphy linking them. He was unable to find automorphies for either but retained them as separate genera in 1991. Similarly, Brandt (1991) placed the two genera together without synapomorphies or autapomorphies in her cladogram.

Brandt (1990) contradicted Richardson's (1913) and Schultz's (1981) opinion that pleonite 1 is free by stating that although indicated by a deep groove it is not movable. There certainly is a clear well-marked oblique "suture" between pleonite 1 and the pleotelson and, in fixed material, slight movement between them. This is quite different from the situation in *Antarcturus* for example where there is no indication, except on the edges of the epimera, of pleonite 1 which is truly fused into the pleotelson.

The seventeen known species of *Dolichiscus* are distinguished on the basis of body and limb ornamentation. Mouthparts are not informative for species recognition (see Brandt 1990 and Pires & Sumida 1997 for good examples) and are not figured here. Three species of *Dolichiscus* were found in these collections.

Dolichiscus cornutus (Beddard, 1886) (Figs 5, 6)

Arcturus cornutus Beddard, 1886a: 108. – 1886b: 93-94, pl. 19 figs 6-12.

Dolichiscus cornutus – Brandt 1990: 142.

MATERIAL EXAMINED. — **Philippines.** Samboangan, HMS *Challenger* stn 214, 04°33'N - 127°06'E, 10.II.1875, 920 m: holotype ovigerous ♀, 36 mm (BMNH 1889.4.27.84).

Indonesia. Tanimbar Islands, KARUBAR stn CP53, 08°18'S - 131°41'E, 1026-1053 m, 30.X.1991: figured ♂, 35.6 mm (MNHN Is5079). — Stn CP52, 08°03'S - 131°48'E, 1244-1266 m, 30.X.1991: ♂, 31.7 mm (MNHN Is5080). — Stn CP87, 08°47'S - 130°49'E, 1017-1024 m, 5.XI.1991: 1 ♂, 34.1 mm; 1 ovigerous ♀, 38.3 mm (NMV J44024).

New Caledonia. BATHUS 1 stn CP651, 21°41.80'S - 166°40.10'E, 1080-1118 m, 11.III.1993: ovigerous ♀, 44.0 mm (MNHN Is5081). — Stn CP660, 21°10.48'S - 165°53.19'E, 786-800 m, 13.III.1993: ♂, 25.7 mm (NMV J44025). — Stn CP662, 21°01.03'S - 165°48.70'E, 960 m, 13.III.1993: ♂, 38.1 mm; juvenile, 28.0 mm (MNHN Is5082).

BATHUS 4 stn CP951, 21°31.44'S - 164°54.97'E, 960 m, 10.VIII.1994: ovigerous ♀, 38.0 mm (MNHN Is5083).

BIOCAL stn CP61, 24°11'S - 167°32'E, 1070 m, 2.IX.1985: juvenile ♀, 42.1 mm; ovigerous ♀, 45.2 mm (MNHN Is5084). — Stn CP62, 24°19'S - 167°49'E, 1395-1410 m, 2.IX.1985: ♀ bearing juveniles, 42 mm; ovigerous ♀, 37.2 mm (NMV J44026).

BIOGEOCAL stn CP232, 21°33.53'S - 166°23.1'E, 530 m, 12.IV.1987: ♂, 30.2 mm (MNHN Is5085). — Stn CP297, 20°38.64'S - 167°10.77'E, 1230-1240 m, 28.IV.1987: 2 ovigerous ♀♀, 38 and 46 mm (MNHN Is5086).

Chesterfield Islands. MUSORSTOM 5 stn CP323, 21°18.52'S - 157°57.62'E, 970 m, 14.X.1986: ♂, 31.5 mm; juvenile 33.6 mm (MNHN Is5087). — Stn CP324, 21°15.01'S - 157°51.33'E, 970 m, 14.X.1986: juvenile 26.8 mm (MNHN Is5088).

DISTRIBUTION. — Philippines, Indonesia, New Caledonia; 530-1410 m depth.

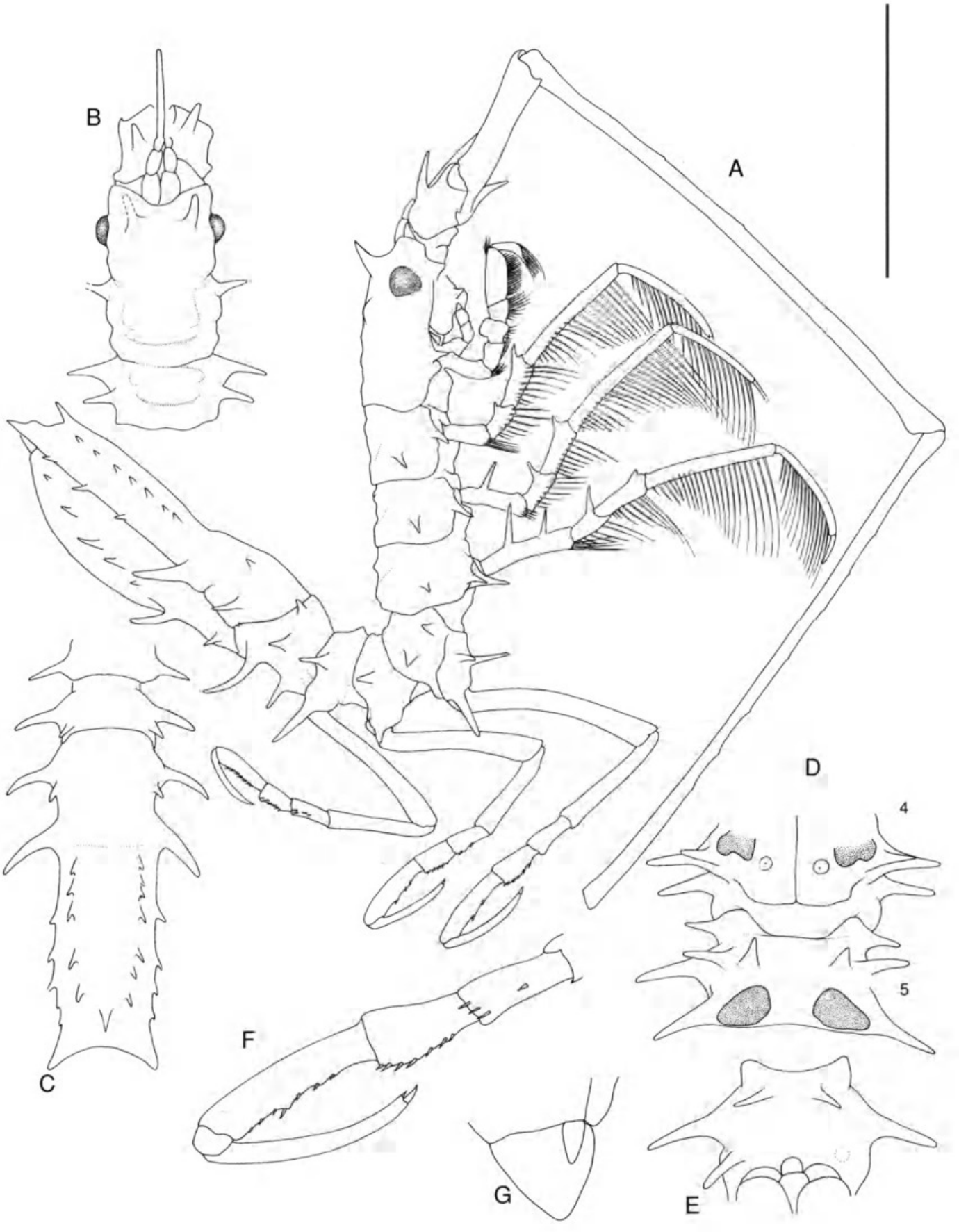

FIG. 5. — *Dolichiscus cornutus* (Beddard, 1886) ♂ (MNHN Is5079); **A**, habitus; **B**, head, pereonites 1-2; **C**, pleonite 1 and pleotelson; **D**, pereonites 4 and 5, ventral view; **E**, pleonite 1, ventral view; **F**, pereopod 5; **G**, uropodal rami. Scale bar for habitus: 10 mm.

DESCRIPTION

Figured 35.6 mm male

Head with pair of dorsolateral spines.

Pereonite 1 with pair of obscure dorsolateral bosses, pair of lateral spines, and two dorsal transverse low ridges. Pereonites 2-4 each with two pairs of lateral spines (lower pair marginal) and two dorsal transvere low ridges, one near anterior margin and other near posterior margin. Pereonite 5 with two pairs of lateral spines (horizontally arranged), and one dorsal transverse low ridge. Pereonites 6 and 7 each with one pair of lateral spines and one dorsal transverse low ridge.

Pleonite 1 with pair of dorsolateral spines, pair of lateral spines, two pairs of ventrolateral spines (posterior pair longer), minute spine on lower posterlateral margin, and two pairs of ventral spines (posterior pair longer). Pleonites 2-5 and telson fused, only area of pleonite 2 distinguishable from remainder by lateral indentation and ventrolateral notch. Pleonite 2 articulating freely from pleonite 1, with pair of dorsolateral and pair of lateral spines. Pleonite 3 with pair of lateral spines. Remaining pleotelson with dorsolateral rows each of seven spines, lateral margins convex each with row of three spines (plus obscure denticles), median dorsal posterior spine, and concave posterior margin separating pair of diverging flat posterolateral spines.

Antenna 2: article 2 with one upper spine; article 3 with lower spine; articles 1-3 together as long as head-pereonite 2; article 4, 2.5 times as long as this; article 5, 1.05 times as long as article 4; flagellum (broken) of more than six articles.

Coxae 1-3 unarmed. Coxa 4 with lateral spine and spine on ventral coxal plate. Coxa 5 with one lateral spine and three spines anterior, antero- and posterolateral to basis socket. Coxae 6 and 7 (indistinguishable from pereonite) each with lateral spine. Basis of pereopod 1 with minute proximal anterior denticle; bases of pereopods 2-4 with zero, one, two anterior spines respectivcly; ischium and merus of pereopods 2-4 each with one distal spine; remaining articles unarmed. Dactylus of pereopods 2-4 about 0.3 length of propodus, with one long apical seta.

Pereopods 5-7 bases unarmed; merus-propodus with short robust setae along posterior margins.

Penial plate split in distal third.

Pleopod 1 peduncle thickened, with nine coupling hooks, irregularly denticulate along lateral margin; endopod as long as exopod, both 1.1 times as long as peduncle. Endopod thickened through most of length; with marginal plumose setae distally, setae up to two thirds length of endopod; medial and lateral setae shorter; diagonal groove along posterior face enclosed as a channel by overlying flaps in distal two thirds of endopod and opening near the apex of a triangular projection, extending as far as half endopod width and with a soft convex distal margin.

Pleopod 2 peduncle about quarter length of that of pleopod 1, with six coupling hooks; rami membranous; endopod broader and 1.15 times as long as exopod, both rami with marginal plumose setae up to two thirds length of rami; appendix masculina just shorter than endopod, tapering and distally curved anteriorly. Pleopod 3 as long as pleopod 2, with short peduncle, without coupling hooks; rami membranous; endopod just shorter than exopod, with sparse marginal short plumose setae; exopod enclosing endopod proximally. Pleopods 4 and 5 longer than others; peduncle short and narrower than rami; rami membranous; endopods subacute, with short distolateral plumose setae; exopod enclosing endopod proximally.

Uropod with anterior spine, longer second spine and row of five shorter spines (third longest); endopod half length of exopod, tapering.

Ovigerous 38 mm female

Differs from male in presence of oostegites on pereonites 1-4 and broader and deeper pereon. Head with additional pair of smaller dorsolateral spines. Pereonites 1-4 each with additional pair of short posterolateral spines. Pereonite 5 with strongly concave anterior margin of sternite. Pleotelson with dorsolateral rows each of eight spines. Coxae 2-4 each with additional medially-directed strong spine supporting marsupium. Coxa 4 ventral plate with additional pair of posterolaterally directed spines. Pereopod 3 basis with two spines. Coxa 7 with additional anterior spine. Pereopods 2-4 with basis relatively longer than in male and curved. Uropod with row of seven spines of uneven lengths.

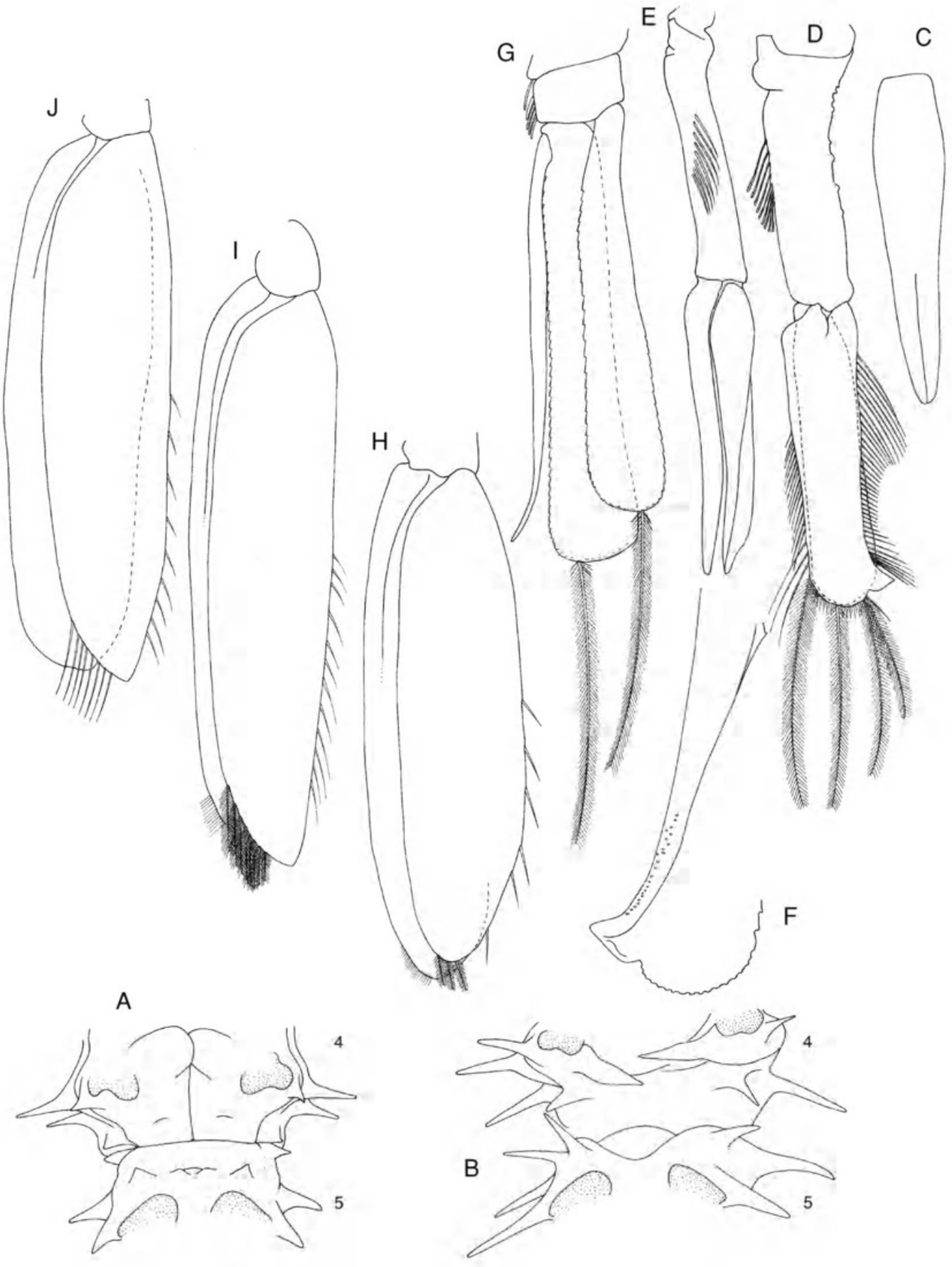

FIG. 6. — *Dolichiscus cornutus* (Beddard, 1886); **A**, juvenile ♀ (MNHN Is5084), pleonites 4 and 5, ventral view; **B**, ovigerous ♀ (NMV J44024), pereonites 4 and 5, ventral view; **C-J**, ♂ (MNHN Is5079); **C**, penial plate; **D**, **E**, pleopod 1, anterior and medial views; **F**, pleopod 1, detail of end of groove and lobe; **G-J**, pleopods 2-5.

Juvenile 42 mm female
With overlapping oostegite buds on pereonites 1-4. Pereonite 5 with pair of short lobes covering oopores on anterior margin of sternite.

Other variation
Other ovigerous females have an extra spine on the basis of pereopods 2-4. The smaller juveniles from Chesterfield Islands have reduced spination on the pleotelson.

REMARKS
The ovigerous female holotype from the Philippines was examined and found to fall within the variability of the large collection from Indonesia and New Caledonia. It differed most noticeably from the specimen illustrated here in having ten spines on the uropods in two rows, whereas only a single row of about six spines is more typical.
The species is distinguished from others in this collection by the presence of a spinose or serrate dorsolateral ridge on the pleotelson and an irregular row of six to seven spines on the uropod. The first and second uropodal spines are much larger than those in the ridge. There is considerable variability in the degree of spination on the body and legs. The basis of at least pereopods 2-4 has a spine but in some individuals there is also a spine on the basis of pereopods 1 and 6, or more spines than usual on the other legs. Larger specimens tend to be more spinose than smaller ones.
The two small specimens from the Chesterfield Islands differ from the others but are not differentiated as a separate species because of the wide range of variability within specimens from nearby New Caledonia. These two only have obscurely dentate dorsolateral ridges on the pleotelson ending in a strong spine.

Dolichiscus kai n.sp.
(Figs 7-9)

MATERIAL EXAMINED. — **Indonesia.** Tanimbar Islands, KARUBAR stn CP38, 07°40'S - 132°27'E, 620-666 m, 28.X.1991: holotype, ♂, 27 mm (MNHN Is5089). — Kai Islands, KARUBAR stn CP20, 05°15'S - 132°59'E, 769-809 m, 25.X.1991: paratypes, 8 ovigerous ♀♀, 22-30 mm; 6 ♂♂, 20-29 mm (MNHN Is5090); 2 ♂♂, 2 ♀♀ (NMV J44027). — Stn CP19, 05°15'S - 132°01'E, 605-576 m, 25.X.1991: paratypes, 4 ovigerous ♀♀, 26-29 mm (MNHN Is5091); 1 ♂, 24 mm (MNHN Is5092). — Stn CC21, 05°14'S - 133°00'E, 688-694 m, 25.X.1991: paratypes, 2 ovigerous ♀♀, 22, 30 mm (MNHN Is5093).

ETYMOLOGY. — For the Kai Islands, Indonesia; noun in apposition.

DISTRIBUTION. — Eastern Indonesia; 576-809 m depth.

DESCRIPTION
Holotype
Head with pair of dorsolateral spines.
Pereonite 1 with pair of dorsolateral spines, two pairs of lateral spines (anterior pair longer), and two dorsal transverse obscure ridges. Pereonites 2-4 each with pair of dorsolateral spines, two pairs of lateral spines (anterior pair longer) and transverse obscure ridge near posterior margin. Pereonite 4 with minute ventrolateral spine. Pereonite 5 with two pairs of lateral spines (horizontally arranged), two dorsal transverse low ridges. Pereonites 6 and 7 each with one pair of lateral spines and one dorsal transverse low ridge.
Pleonite 1 with pair of dorsolateral spines and two pairs of ventrolateral spines (posterior pair longer). Pleonites 2-5 and telson fused, only area of pleonite 2 distinguishable from remainder by lateral indentation and ventrolateral notch. Pleonite 2 articulating freely from pleonite 1, with pair of dorsolateral and pair of lateral spines. Pleonite 3 with pair of lateral spines. Remaining pleotelson with dorsolateral rows each of up to six irregular tubercles, lateral margins parallel, with weak denticles, median dorsal posterior spine, and straight posterior margin separating pair of parallel flat posterolateral triangular projections.
Antenna 2 article 2 with one upper spine; article 3 with weak lower spine; articles 1-3 together as long as head-pereonite 2; article 4 2.1 times as long as this; article 5 and flagellum unknown.
Coxae 1-3 unarmed. Coxa 4 with lateral spine. Coxa 5 with one lateral spine and one spine anterior to basis socket. Coxae 6 and 7 (distinguishable from pereonite) each with lateral spine. Basis of pereopod 1 with minute proximal anterior denticle; bases of pereopods 2-4 with two,

two, three anterior spines respectively; ischium and merus of pereopods 2-4 each with one distal spine; remaining articles unarmed. Dactylus of pereopods 2-4 about 0.2 length of propodus, with one long apical seta.

Pereopod 5 basis unarmed; pereopods 6 and 7 bases each with one spine; merus-propodus with short robust setae along posterior margins.

Penial plate split in distal third.

Pleopod 1 peduncle thickened, with six coupling hooks, irregularly denticulate along lateral margin; endopod as long as exopod, both 1.4 times as long as peduncle. Endopod thickened through most of length; with marginal plumose setae distally, setae up to two thirds length of endopod; medial and lateral setae shorter; diagonal groove

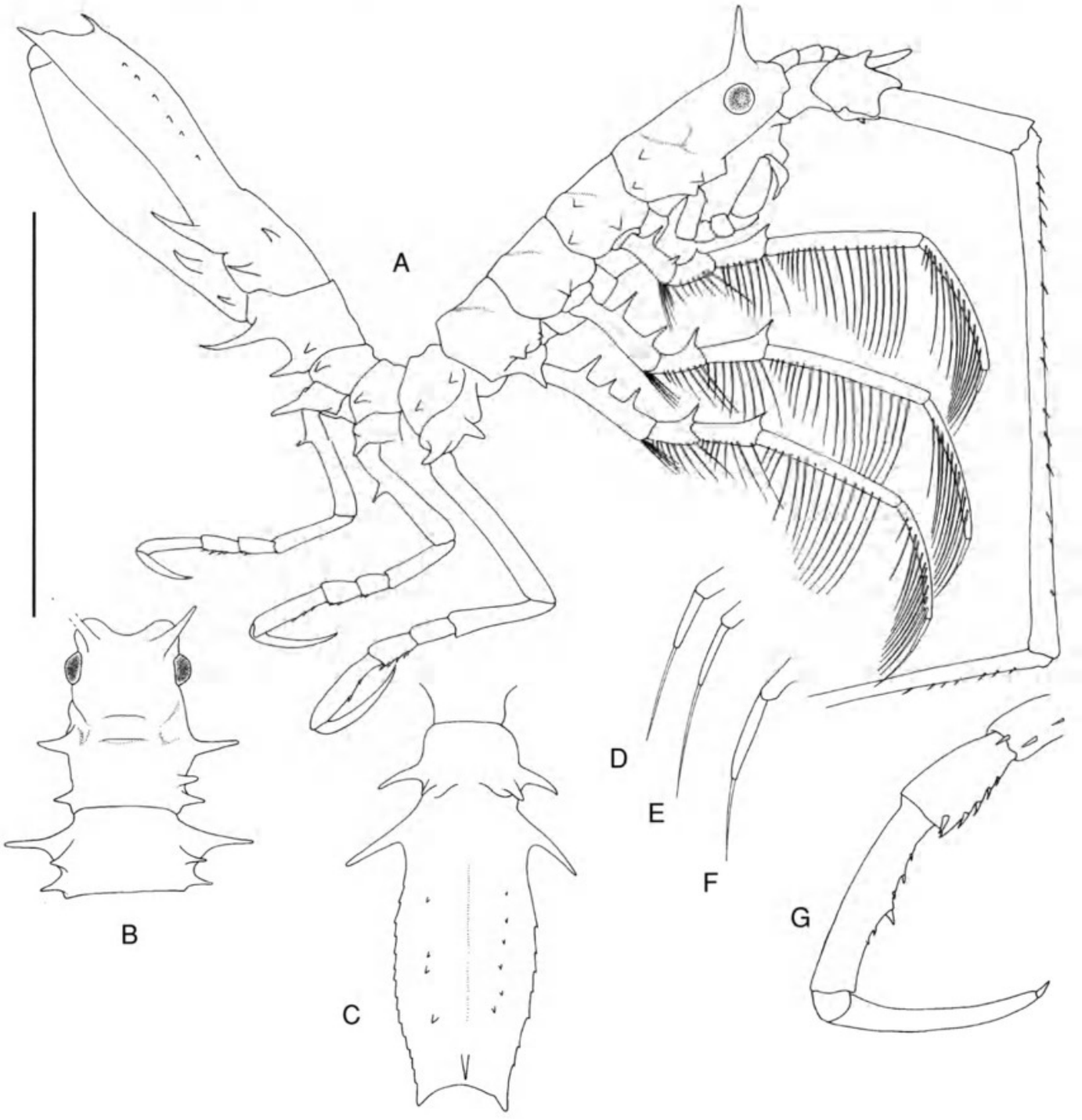

FIG. 7. — *Dolichiscus kai* n.sp., holotype ♂ (MNHN Is5089); **A**, habitus; **B**, head and pereonites 1-2; **C**, pleonite 1 and pleotelson; **D-F**, pereopods 2-4, dactyli; **G**, pereopod 5. Scale bar for habitus: 10 mm.

along posterior face enclosed as a channel by overlying flaps in distal two thirds of endopod and opening near the apex of a broad-based triangular projection, extending as far as 0.3 endopod width and with a soft convex distal margin. Pleopod 2 peduncle about quarter length of that of pleopod 1, with six coupling hooks; rami membranous; endopod broader and 1.15 times as long as exopod, both rami with marginal plumose setae up to two thirds length of rami; appendix masculina just shorter than endopod, tapering and distally curved anteriorly. Pleopods 3-5 as in *D. cornutus*.
Uropod with anterior spine and longer second spine about quarter way along; endopod half length of exopod, with truncate margin.

Ovigerous 27 mm female
Differs from male in presence of oostegites on pereonites 1-4, broader and deeper pereon, all spines longer. Pereonites 2-4 each with additional pair of anterolateral spines and additional pair of short posterolateral spines. Pleotelson with dorsolateral rows of five or six spines. Coxa 1 with anterior spine. Coxae 2-4 each with additonal posterolateral spines and additional medially-directed strong spine supporting marsupium. Coxa 4 ventral plate with additional pair of posterolaterally directed spines. Pereopod 5 basis with one spine. Coxa 5 with additional lateral spine. Pereopods 2-4 with basis relatively longer than in male and curved.

29 mm male
Antenna 2 peduncle article 4 2.1 times as long as articles 1-3 together, article 5 as long as 4; flagellum (broken) of more than sixteen articles.

REMARKS
Males smaller than that figured have only one spine on the uropod, lack spines on bases of pereopods 2-4 and any ornamentation on the dorsolateral ridge of the pleotelson. *Dolichiscus kai* differs from *D. cornutus* in the absence of a spine row on the distal part of the uropod, weaker spination of the pleotelson, its parallel sides, and the parallel (rather than diverging) posterolateral spines on the pleotelson.

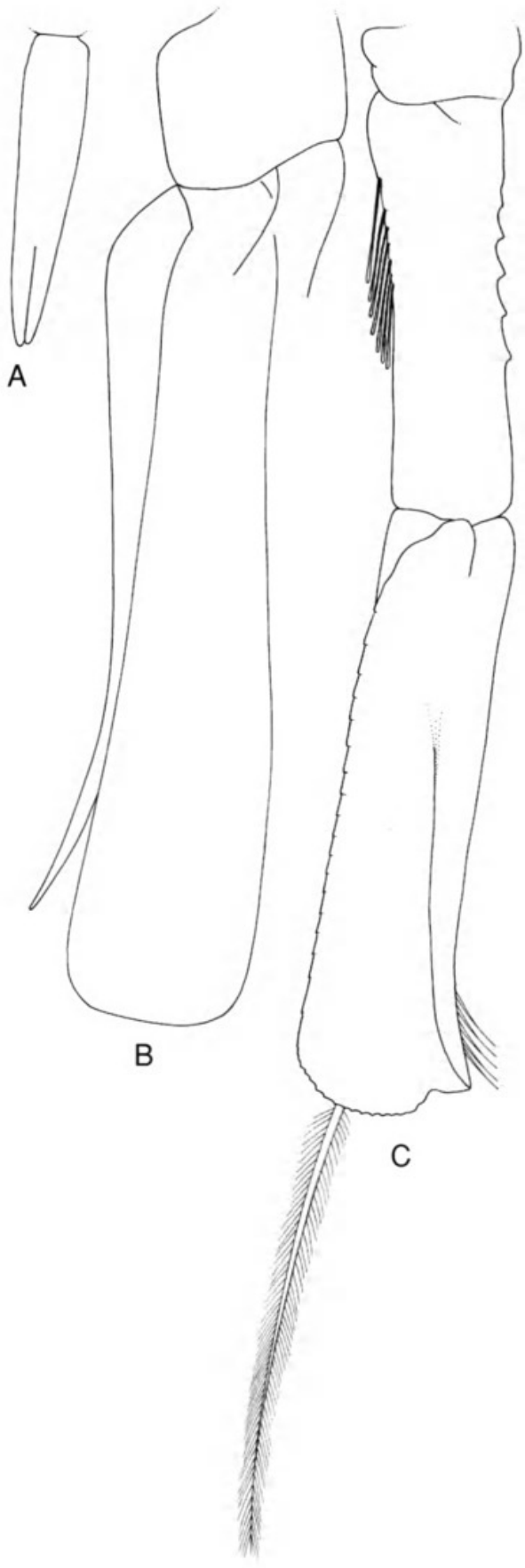

FIG. 8. — *Dolichiscus kai* n.sp., holotype ♂ (MNHN Is5089); **A**, penial plate; **B**, pleopod 2 (with endopod only); **C**, pleopod 1 (with exopod only).

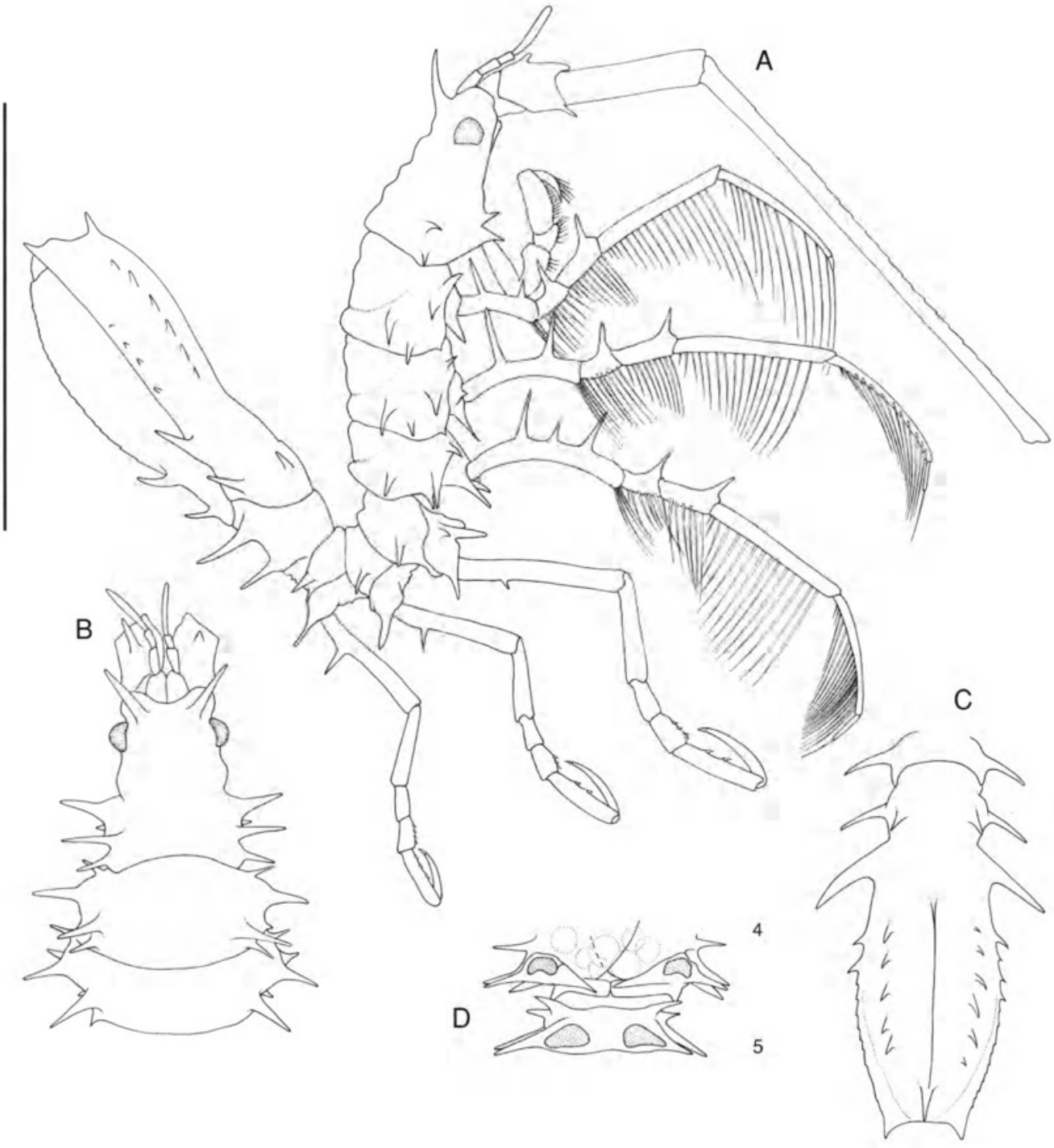

FIG. 9. — *Dolichiscus kai* n.sp., ovigerous ♀ (MNHN Is5091); **A**, habitus; **B**, head and pereonites 1-3; **C**, pereonite 1 and pleotelson; **D**, pereonites 4 and 5, ventral view. Scale bar for habitus: 10 mm.

Dolichiscus tanimbar n.sp.
(Figs 10, 11)

MATERIAL EXAMINED. — **Indonesia.** Tanimbar Islands, KARUBAR stn CP70, 08°41'S - 131°47'E, 413-410m, 2.XI.1991: holotype, ovigerous ♀, 23 mm (MNHN Is5094). — Stn CP69, 08°42'S - 131°53'E, 356-368 m, 2.XI.1991: paratype ♀ carrying juveniles, 24 mm (NMV J44028).

ETYMOLOGY. — For the Tanimbar Islands, Indonesia; noun in apposition.

DISTRIBUTION. — Eastern Indonesia; 356-410 m depth.

DESCRIPTION

Holotype

Head with pair of dorsolateral spines anterior to

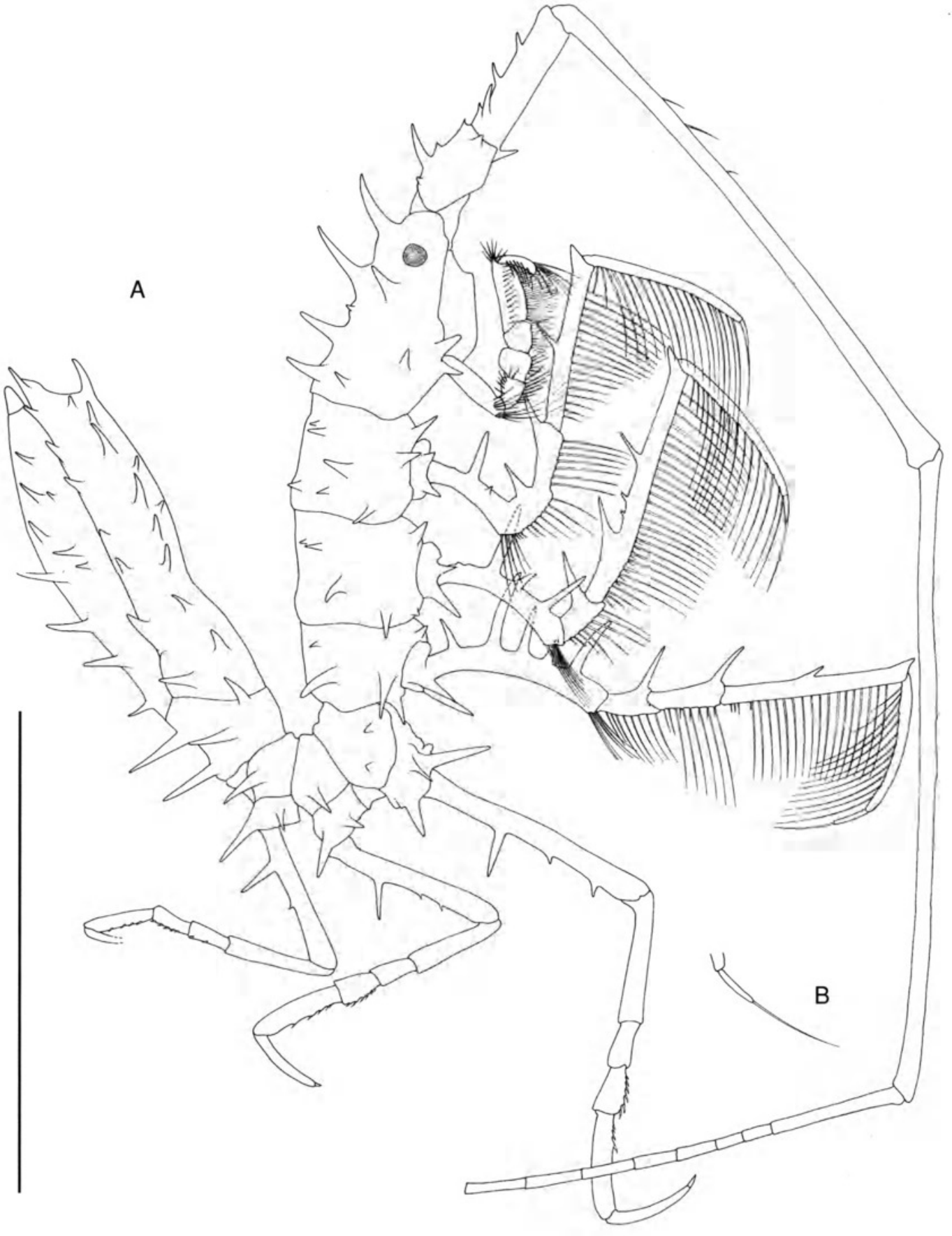

FIG. 10. — *Dolichiscus tanimbar* n.sp., holotype, ovigerous ♀ (MNHN Is5094); **A**, habitus; **B**, pereopod 2, dactylus. Scale bar for habitus: 10 mm.

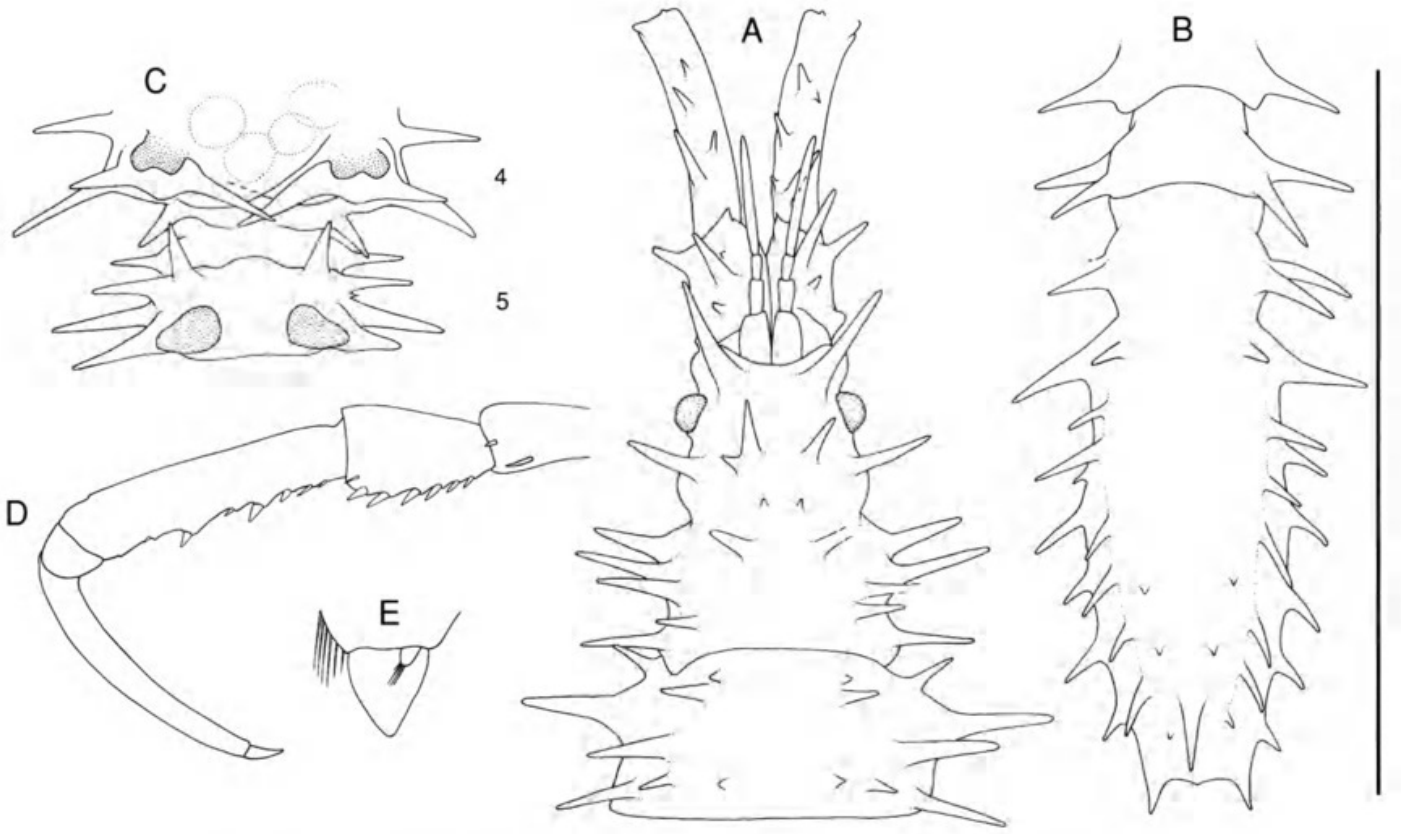

FIG. 11. — *Dolichiscus tanimbar* n.sp., holotype, ovigerous ♀ (MNHN Is5094); **A**, head and pereonites 1-2; **B**, pereonite 7, pleonite 1 and pleotelson; **C**, pereonites 4 and 5, ventral view; **D**, pereopod 5; **E**, uropodal rami. Scale bar for A-C: 10 mm.

eyes, pair of dorsolateral spines posterior to eyes (one with lateral spinule), pair of dorsolateral spines posterior to these, and pair of lateral spines. Pereonite 1 with two pairs of dorsolateral spines, and two pairs of lateral spines (more dorsal pair posterior to other pair). Pereonite 2 with two pairs of short dorsolateral spines anteriorly, one pair of dorsolateral spines posteriorly, four pairs of lateral spines (most ventral longest), and pair of anteroventral marginal spines. Pereonite 3 with two pairs of short dorsolateral spines anteriorly, two pairs of lateral spines (placed obliquely), one pair of anteroventral marginal spines, and one pair of posterolateral marginal denticles. Pereonite 4 with two pairs of short dorsolateral spines anteriorly, two pairs of lateral spines, one pair of anteroventral marginal spines, and one pair of posterolateral marginal spines.

Pereonite 5 with two pairs of lateral spines (horizontally arranged), one dorsal transverse low ridge. Pereonites 6 and 7 each with one pair of lateral spines and one dorsal transverse low ridge.

Pleonite 1 with pair of dorsolateral spines, pair of lateral spines, two pairs of ventrolateral spines (posterior pair longer), minute spine on lower posterolateral margin, and two pairs of ventral spines (posterior pair longer). Pleonites 2-5 and telson fused, only area of pleonite 2 distinguishable from remainder by ventrolateral notch. Pleonite 2 articulating freely from pleonite 1, with pair of dorsolateral and pair of lateral spines. Pleonite 3 with pair of lateral spines and pair of dorsolateral spines (longest of all pleotelson spines). Remaining pleotelson with dorsolateral rows each of six spines, two pairs of much smaller spines mediad to these rows in posterior half of dorsum, lateral margins convex each with row of five uneven spines, median dorsal posterior spine, pair of small spines on posterior face, and convex posterior margin separating pair of posteriorly-directed flat posterolateral teeth.

Antenna 2: article 2 with four upper spines, second the longest, and one lateral spine distally; article 3 with four irregularly spaced upper

spines, first the longest, and one lower spine; articles 1-3 together as long as head and half of pereonite 2; article 4, 2.3 times as long as this; article 5, 1.1 times as long as article 4; flagellum (broken) of more than eight articles.

Coxa 1 with one anterolateral and one lateral spines. Coxae 2 and 3 each with one lateral and one posterolateral spine. Coxa 4 with one lateral and one posterolateral spine, lateral spine and medially-directed strong spine supporting marsupium. Coxa 5 with two lateral spines (more posterior longer) and two spines anterior and posterolateral to basis socket. Coxae 6 and 7 (distinguishable from pereonite) each with two lateral spines (more posterior longer). Basis of pereopod 1 unarmed; bases of pereopods 2-4 with two, three, five anterior spines respectively; ischium and merus of pereopods 2-4 each with one distal spine; carpus of pereopods 2-4 each with one spine at midpoint and one spine distally (two smaller more proximal spines on pereonite 4); propodus unarmed. Dactylus of pereopods 2-4 about 0.25 length of propodus, with one long apical seta.

Pereopods 5-7 bases with four, three and two spines or denticles respectively; merus-propodus with short robust setae along posterior margins.

Uropod with irregular row of seven spines along middle, three more lateral; endopod 0.3 length of exopod, with rounded setose apex.

Remarks

This species is more spinose than others of *Dolichiscus* in these collections and resembles species included by Schultz (1981) in *Paradolichiscus*, a genus I have synonymized with *Dolichiscus*. It is similar to *D. opiliones* (Schultz, 1981) from New Zealand but its dorsal spines are more prominent. A notable similarity between the two species is the pleopod 1 of the male. Schultz's figure shows the pleopod 1 to be typical of the genus.

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