

## TWO NEW SPECIES OF *GONODACTYLELLUS* FROM THE WESTERN PACIFIC (GONODACTYLIDAE: STOMATOPODA)

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**ABSTRACT.** – Two new Indo-West Pacific species of stomatopod crustacean, *Gonodactylellus kandi*, and *Gonodactylellus barberi* are described. Both new species belong to the group of species in *Gonodactylellus* united by the presence of upright conical spines at the base of the submedian (and usually also the intermediate) teeth of the telson, multiple posterior spines on the mid-dorsal telson carinae, and the absence of setae on the inner margins of the uropodal endopod and exopod (in most species of the group). This group of ‘spiny-telson’ species is named the ‘*molyneux* group’. *Gonodactylellus barberi* most closely resembles *G. snidvongsi* and *G. molyneux* but is distinguished from the former by the 3- instead of 2-segmented mandibular palp, and from the latter by the distinct rather than fused submedian denticles of the telson. *Gonodactylellus kandi* is the smallest known species of the genus, maturing at 10–12 mm TL and differs from other members of the *molyneux* group by the fully setose inner margins of the uropodal endopod and exopod and the unarmed ventrodistal margin of the proximal segment of the uropodal exopod.

**KEY WORDS.** – Crustacea, Stomatopoda, Gonodactylidae, *Gonodactylellus*, *molyneux* group, new species, coral reef, Indonesia.

### INTRODUCTION

Manning (1978) and Ahyong (2001) recognised that among species now referred to *Gonodactylellus* Manning, 1995, several species form a discrete group, united by the presence of upright conical spines at the base of the submedian (and usually also the intermediate) teeth of the telson, multiple posterior spines on the mid-dorsal telson carinae, and the absence or reduction of setae on the inner margins of the uropodal endopod and exopod. Recent sampling on coral reefs in Indonesia by the second author revealed the presence of two undescribed species of *Gonodactylellus*, morphologically allied to the ‘spiny-telson’ group of species. Both species are described below from Indonesian specimens, supplemented by additional material from Papua New Guinea and the Philippines.

### MATERIALS AND METHODS

Abbreviations and terminology follows Ahyong (2001). Abbreviations include: total length (TL), carapace length

(CL), antennule (A1), antenna (A2), abdominal somite (AS), thoracic somite (TS), and pleopod (PLP). The abdominal width-carapace length index (AWCLI) is given as 1,000 times width of AS5 divided by carapace length. Specimens are deposited in the collections of the Australian Museum, Sydney (AM), Bogor Museum, Bogor (MZB), National Institute of Water and Atmospheric Research, Wellington, New Zealand (NIWA), National Museum of Natural History, Smithsonian Institution, Washington D.C. (USNM), and Raffles Museum of Biodiversity Research, National University of Singapore (ZRC).

### SYSTEMATICS

#### GONODACTYLIDAE Giesbrecht, 1910

##### *Gonodactylellus kandi* new species

(Fig. 1)

**Material examined.** – Holotype: MZB CRU1502, male (TL 12 mm), Tanjung Kandi, N Sulawesi, 1°19.0'N 121°27.5'E, 1.5 m, cavities in coral bench, coll. M. Erdmann, 29 Apr.2000.

Paratypes: MZB CRU1503, 1 female (TL 10 mm), type locality; NIWA 25533, 3 males (TL 9–10 mm), 4 females (TL 8–11 mm), type locality; AMP74256, 2 males (TL 9–11 mm), type locality; ZRC 2006.0139, 1 male (TL 9 mm), 1 female (TL 10 mm), type locality; USNM 306022, 1 male (TL 12 mm), NE Banta, Komodo, 8°25'00"S 119°19'40"E, 1.5 m, in cavity on surface of partially buried dead coral boulder, surf zone on windward side of island, coll. M. Erdmann.

Non-type material: USNM 307135, 1 male (TL 13 mm), 1 female (TL 13 mm), Philippines, 9°04.5'S 123°16.4'E, 0–2.4 m, LK 79–20, coll. L. Kornicker, 18 May.1979; USNM 306015, 1 female (TL 10 mm), backside of Yazi Reef, Madang, Papua New Guinea, 1 m, rubble among breakers, coll. J. Thomas & J. Clark, 15 Jan.1989.

**Diagnosis.** – Mandibular palp 2-segmented. Telson with spiniform submedian denticles; intermediate teeth distinct, apices extending posteriorly well beyond apices of intermediate denticles. AS6 with unarmed submedian, intermediate and lateral bosses. Telson mid-dorsal carinae posteriorly armed, otherwise smooth; submedian and intermediate teeth with dorsal spinules. Uropodal exopod proximal segment with setose inner margin; distal margin without ventral spine. Uropodal endopod and distal segment of exopod with entire margin setose.

**Description.** – Eyes elongate; cornea subconical. Ocular scales low, separate, bases transverse. A1 peduncle length 0.66–0.76CL. A2 scale length 0.36–0.43CL.

Rostral plate longer than broad; basal portion with transverse or slightly concave anterior margins; anterolateral angles blunt; lateral margins divergent anteriorly; median spine longer than base, laterally flattened, with obtusely angular ventral keel.

Raptorial claw dactylus with proximal notch; propodus with proximal movable spine, opposable margin sparsely pectinate proximally.

Mandibular palp 2-segmented.

TS6–7 lateral processes subequal to or slightly broader than that of TS6; lower margins truncate. TS8 anterolateral margin rounded; sternal keel obsolete.

PLP1 endopod with lateral lobe on posterior endite.

AS1–5 posterolateral angles unarmed. AWCLI 781–833. AS6 with unarmed submedian and intermediate bosses; lateral boss posterolateral angle a short blunt, triangular projection.

Telson broader than long; with 9–11 spiniform submedian denticles; intermediate teeth distinct, apices extending posteriorly well beyond apices of intermediate denticles; lateral teeth indicated by a shallow, narrow notch, apex blunt, not projecting well off margin of telson. Telson median carina tumid in both sexes, obscuring accessory median carinae, together with a group of up to 5 small posterior spines, apices often broken leaving pit; anterior submedian carina usually with 1 spine; submedian tooth armed dorsally with 2–4 spines;

intermediate tooth with 0–3 dorsal spines; knob absent. Telson ventral surface lacking carina on submedian or intermediate teeth.

Uropodal protopod terminal spines with length subequal; upper proximal surface with blunt, ill-defined dorsal carina, without obtuse swelling posteriorly. Uropodal exopod proximal segment outer margin with 8–10 (usually 9) movable spines, distalmost not exceeding apex of distal segment; inner margin setose; distal margin without ventral spine, at most with small blunt tubercle; exopod distal segment with entire margin setose. Uropodal endopod narrow, length 2.43–3.20 breadth; entire inner margin and distal half of outer margin setose.

**Colour in life.** – Overall mottled light green and white. Small brown spots scattered across carapace and outer surface of merus, and across dorsal surface of TS5 and TS8, and AS1–5. Meral spot flesh-toned.

**Measurements.** – Male (n = 9) TL 9–13 mm, female (n = 8) TL 9–13 mm. Other measurements of holotype: CL 2.20 mm, A1 peduncle length 1.50 mm, A2 scale length 0.92 mm, AS5 width 1.80 mm.

**Etymology.** – Named *kandi*, based on the type locality Tanjung Kandi; used as a noun in apposition.

**Remarks.** – At a maximum of 13 mm TL, *Gonodactylellus kandi* new species, is the smallest known species of the genus. It is unusual in *Gonodactylellus* in the absence of a fixed distoventral spine on the proximal segment of the uropodal exopod, a condition otherwise shared only with *G. choprai* (Manning, 1967) from the western Indian Ocean. *Gonodactylellus choprai*, however, is readily distinguished from *G. kandi* by the complete absence of spines or spinules on the primary telson teeth or posterior surfaces of the median carina. Conversely, the posterior spinules on the median carina of the telson and dorsal spines on the submedian and intermediate telson teeth align *G. kandi* with members of the 'spiny-telson' group. In particular, *G. kandi* is most similar to *G. barberi* new species, and *G. molyneux* Ahyong, 2001, based on telson shape and spination. Apart from its much smaller maximum size (13 mm versus 25+ mm), however, *G. kandi* is readily distinguished from *G. barberi* and *G. molyneux* by the unarmed posterolateral angle of AS6, unarmed distoventral margin of the proximal segment of the uropodal exopod, and setose instead of smooth inner margins of the uropodal exopod and endopod.

**Habitat.** – Found in high-energy, wave-washed subtidal environments, generally between 1 and 2 m depth (rarely to 5 m) living in miniscule cavities in the coralline algal crust that often forms over dead coral platform or large volcanic boulders. May reach densities of up to 20 individuals per m<sup>2</sup>. Often sympatric with *Hoplosquilla said* Erdmann & Manning, 1998.

**Distribution.** – Known from Indonesia, the Philippines and Madang, Papua New Guinea.

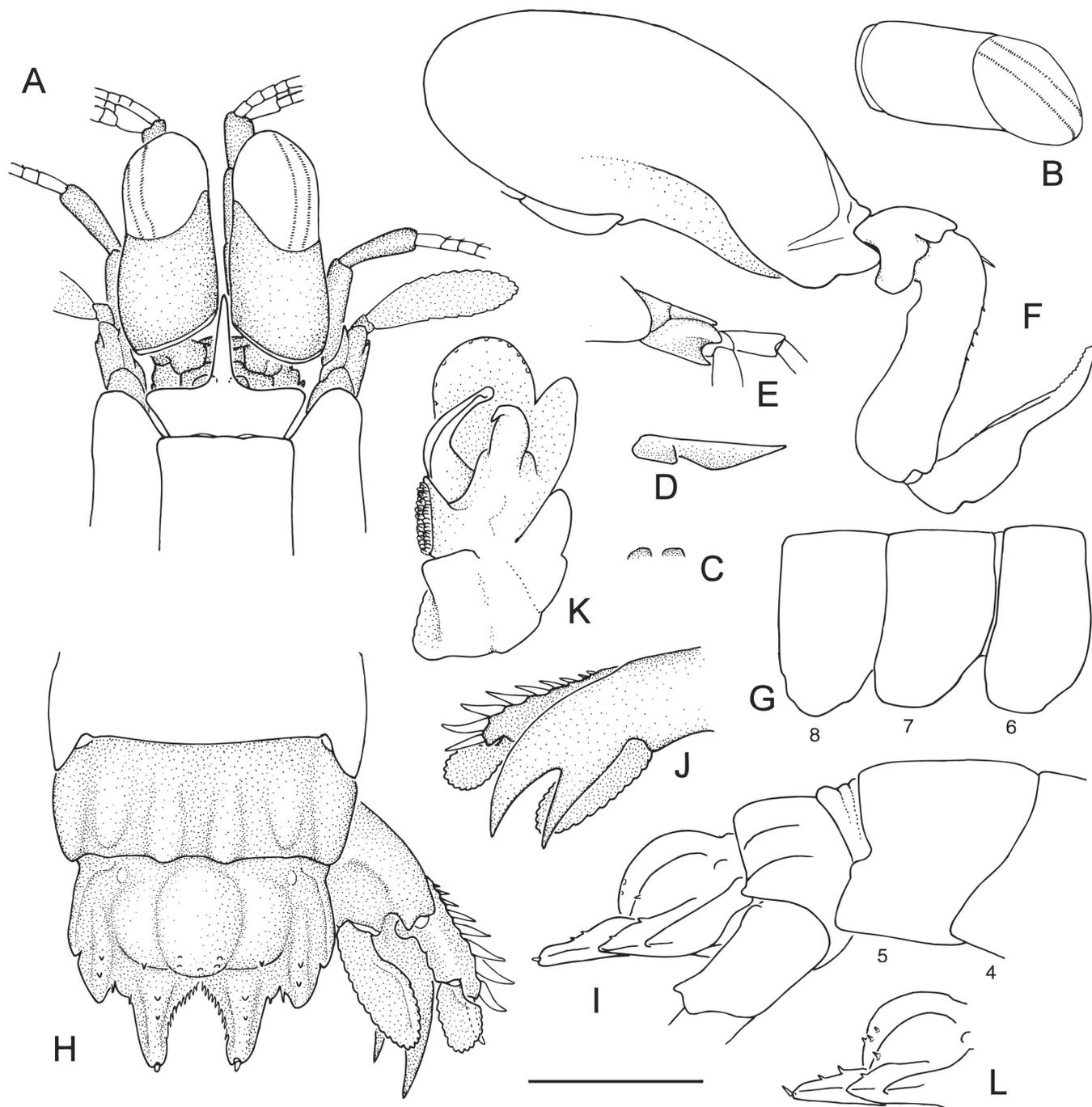


Fig. 1. *Gonodactylellus kandi* new species, Tanjung Kandi, Indonesia: A–K, holotype male (TL 12 mm), MZB CRU1502; L, paratype female (TL 10 mm), MZB CRU1503. A, anterior; B, right eye, lateral view; C, ocular scales; D, rostral plate, right lateral view; E, right A2 protopod; F, right raptorial claw, lateral view; G, TS6–8, right lateral view; H, AS5–6, telson and Uropod; I, AS4–6, telson and uropod, right lateral view; J, right uropod, ventral view; K, right PLP1 endopod, anterior view; L, telson, right lateral view. Scale bar: A–J, L = 1.0 mm; K = 0.5 mm.

***Gonodactylellus barberi* new species**

(Figs. 2, 3)

*Gonodactylellus hendersoni* – Barber & Erdmann, 2000: 22 [not *G. hendersoni* (Manning, 1967) = *G. demanii* (Henderson, 1893)].

**Material examined.** – Holotype: USNM 304372a, male (TL 24 mm), Spermonde Archipelago, Sulawesi, Indonesia, 5°10'S 119°50'E, dead coral rubble, 0–2 m, coll. M. Erdmann, 1996.

Paratypes: USNM 304372b, 2 males (19–20 mm), 8 females (13–27 mm), 2 juvenile females (11–12 mm), type locality.

**Diagnosis.** – Mandibular palp 3-segmented. Telson with spiniform submedian denticles; lateral teeth indicated by a shallow, narrow notch, apex blunt, not projecting well off margin of telson. Telson mid-dorsal carinae posteriorly armed, otherwise smooth; mid-dorsal carinae armed posteriorly; submedian tooth armed dorsally with 1 or 2 spines in longitudinal row; intermediate tooth with 0–2 dorsal spines. Telson ventral surface with carina on submedian and intermediate teeth. Uropodal exopod proximal segment inner margin smooth, non-setose, with distal ventral spine; exopod distal segment inner margin smooth, non-setose. Uropodal endopod narrow, length 2.60–2.85 breadth; inner margin smooth, non-setose.

**Description.** – Eyes elongate; cornea subconical. Ocular scales low, separate, bases transverse. A1 peduncle length 0.52–0.64 CL. A2 scale length 0.38–0.43 CL.

Rostral plate as long as broad; basal portion with transverse or slightly concave anterior margins; anterolateral margins angular; lateral margins divergent anteriorly; median spine longer than base, laterally flattened, with obtusely angular ventral keel.

Raptorial claw dactylus with shallow notch; propodus with proximal movable spine, opposable margin sparsely pectinate proximally.

Mandibular palp 3-segmented.

TS6–7 lateral processes subequal to or slightly broader than that of TS6; lower margins subtruncate. TS8 anterolateral margin rounded; sternal keel obsolete.

PLP1 endopod with lateral lobe on posterior endite.

AS1–5 posterolateral angles unarmed. AWCLI 700–851. AS6 with submedian and intermediate bosses armed in females and juvenile males, apices blunt or obsolete in adult males; lateral bosses armed at all sizes.

Telson broader than long; with 9–12 spiniform submedian denticles; intermediate teeth distinct, longer and sharper in females, apices extending posteriorly well beyond apices of intermediate denticles; lateral teeth indicated by a shallow, narrow notch, apex blunt, not projecting well off margin of telson. Telson median carina tumid in males, so inflated as to obscure accessory median carinae, together with a group

of up to 3–8 posterior spines (1 or 2 spines on median, 1–3 spines on each accessory median); anterior submedian carina usually with 0–3 (usually 2) spines in longitudinal row; submedian tooth armed dorsally with 1 or 2 spines in longitudinal row (1 female with spinule mesial to anterior spine); intermediate tooth with 0–2 dorsal spines; knob absent; submedian and intermediate teeth with ventral carina.

Uropodal protopod terminal spines with length subequal; upper proximal surface with obtuse swelling behind dorsal carina. Uropodal exopod proximal segment outer margin with 9 or 10 (usually 10) movable spines, distalmost reaching or slightly exceeding apex of distal segment; inner margin smooth, non-setose; distal margin with ventral spine; exopod distal segment with outer margin setose, inner margin smooth, non-setose. Uropodal endopod narrow, length 2.60–2.85 breadth; distal half of outer margin setose, remainder smooth, non-setose.

**Colour in life.** – Overall light green to light brown; with two thin, white transverse bands, one across carapace (arising two-thirds posteriorly) and continuing across merus, and a second across posterior third of AS6 and anterior quarter of telson, continuing across uropods. General subtle brown mottling over body, with three iridescent blue spots medially on carapace behind white transverse band. Large blue iridescent spot medially on TS6–7 and AS1, with 5 smaller blue iridescent spots spaced evenly across dorsal surface all exposed thoracic and abdominal somites. Meral spot flesh-toned with small black spot distally.

**Measurements.** – Male ( $n = 3$ ) TL 19–24 mm, female ( $n = 9$ ) TL 13–29 mm. Other measurements of holotype: CL 5.85 mm, A1 peduncle length 3.25 mm, A2 scale length 2.25 mm, AS5 width 4.10 mm.

**Etymology.** – Named *barberi*, after our colleague Paul Barber, for his studies into the genetics and population structure of gonodactyloid stomatopods.

**Habitat.** – Prefers areas of sand and dense coral rubble on calm, shallow (0–2 m depth) coastal reef flats. Found only on reefs close to mainland rivers (never more than 10 km from river outlets, and generally much closer); seemingly very tolerant of high sediment loads and lowered salinities.

**Remarks.** – *Gonodactylellus barberi* closely resembles *G. molyneux* Ahyong, 2001 (from Australia) and *G. snidvongsi* (Naiyanetr, 1987) (presently believed to range from Thailand to Japan and Hawaii) in completely lacking setae on the inner margin of the uropodal endopod, the width of which is less than one-third of the telson width. The new species is readily distinguished from *G. snidvongsi* in having a 3- instead of 2-segmented mandibular palp, in the distinctness of the lateral primary teeth of the telson, in which the apices are blunt instead of sharp, not markedly standing out beyond the outline of the telson. Additionally, adult *G. barberi* differ from *G. snidvongsi* in having fewer dorsal spines on the telson carinae. The dorsal carina of the submedian teeth in *G. barberi* bears a conical spine at the base of the submedian tooth, but a second

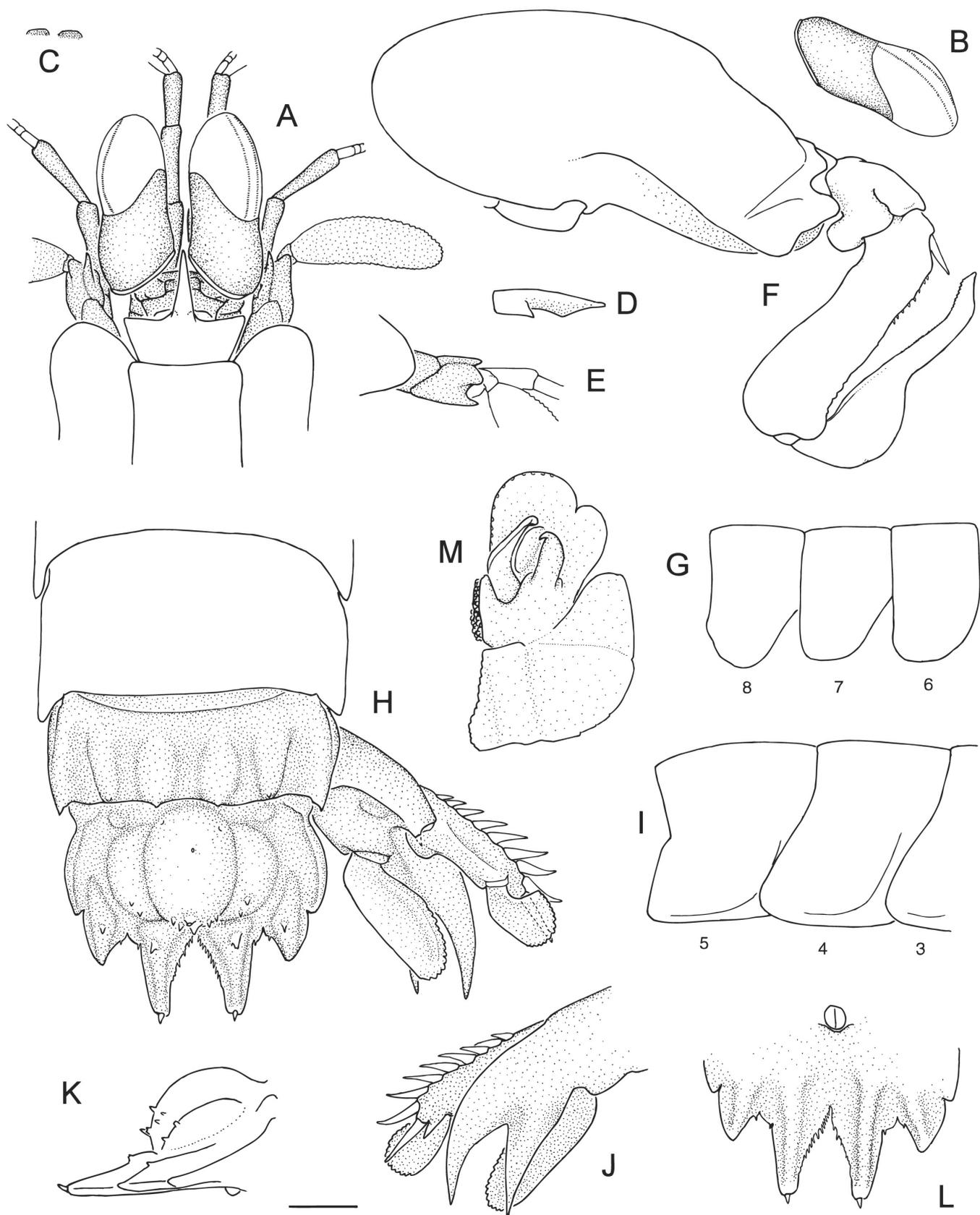


Fig. 2. *Gonodactylellus barberi* new species, holotype male (TL 24 mm), USNM 304372a, Spermonde Archipelago, Sulawesi, Indonesia: A, anterior; B, right eye, lateral view; C, ocular scales; D, rostral plate, right lateral view; E, right A2 protopod; F, right raptorial claw, lateral view; G, TS6-8, right lateral view; H, AS5-6, telson and Uropod; I, AS3-5, right lateral view; J, right uropod, ventral view; K, telson, right lateral view; L, telson, ventral view; M, right PLP1 endopod, anterior view. Scale bar: A-L = 1.0 mm, M = 0.5 mm.

may be present near the midlength in specimens of about 20 mm or larger. Occasionally, in specimens 24 mm TL or larger, an additional spine may be present mesial to the basal spine. In contrast, the spination of the carina of the submedian teeth develops at a much smaller size in *G. snidvongsi*. By 16 mm TL in *G. snidvongsi*, a cluster of two or more (usually three or more) spines is always present at the base of the submedian teeth. In the segmentation of the mandibular palp, form of the lateral primary telson teeth, and telson spination, *G. barberi* resembles *G. molyneux*. *Gonodactylellus barberi* differs from *G. molyneux*, however, in bearing a narrower uropodal endopod in which the width is about one-third instead of one-half the length, and in which the submedian denticles are spiniform and distinct, rather than fused into the margin.

As in *G. snidvongsi* and *G. molyneux*, telson spination in *G. barberi* generally increases with size. Thus, specimens of *G. barberi* up to 20 mm TL usually have a single dorsal spine on the submedian and intermediate carinae of the telson and 1 or 2 posterior spines on the accessory median and anterior submedian carinae. The telson of specimens exceeding 20 mm TL may have 2 dorsal spines on the submedian carinae,

1 or 2 spines on the intermediate carinae, and 2 or 3 posterior spines on the accessory median and anterior submedian carinae. Additionally, sexual dimorphism is evident in the strongly inflated telson carinae of adult males in which the accessory median carinae are subsumed by the anterior submedian carinae, and the associated spines are blunt. The intermediate primary teeth of the telson are also longer and sharper in females than adult males.

In view of the similarity between *G. barberi* and *G. snidvongsi*, some published records of the latter (under the names *G. hendersoni* or *G. demanii*) could well be based on the former. Holthuis' (1941) records of *G. demanii* from Indonesia, judging from his figure 8, appear to be based on *G. snidvongsi*. Similarly, two forms of *G. hendersoni* reported by Barber & Erdmann (2000) from Java and southern Sulawesi, Indonesia (as *G. hendersoni* J and *G. hendersoni* S), are referable to *G. snidvongsi* and *G. barberi*, respectively.

**Distribution.** – Presently known only from Spermonde Archipelago, Sulawesi, Indonesia, from reef areas under significant terrigenous influence.

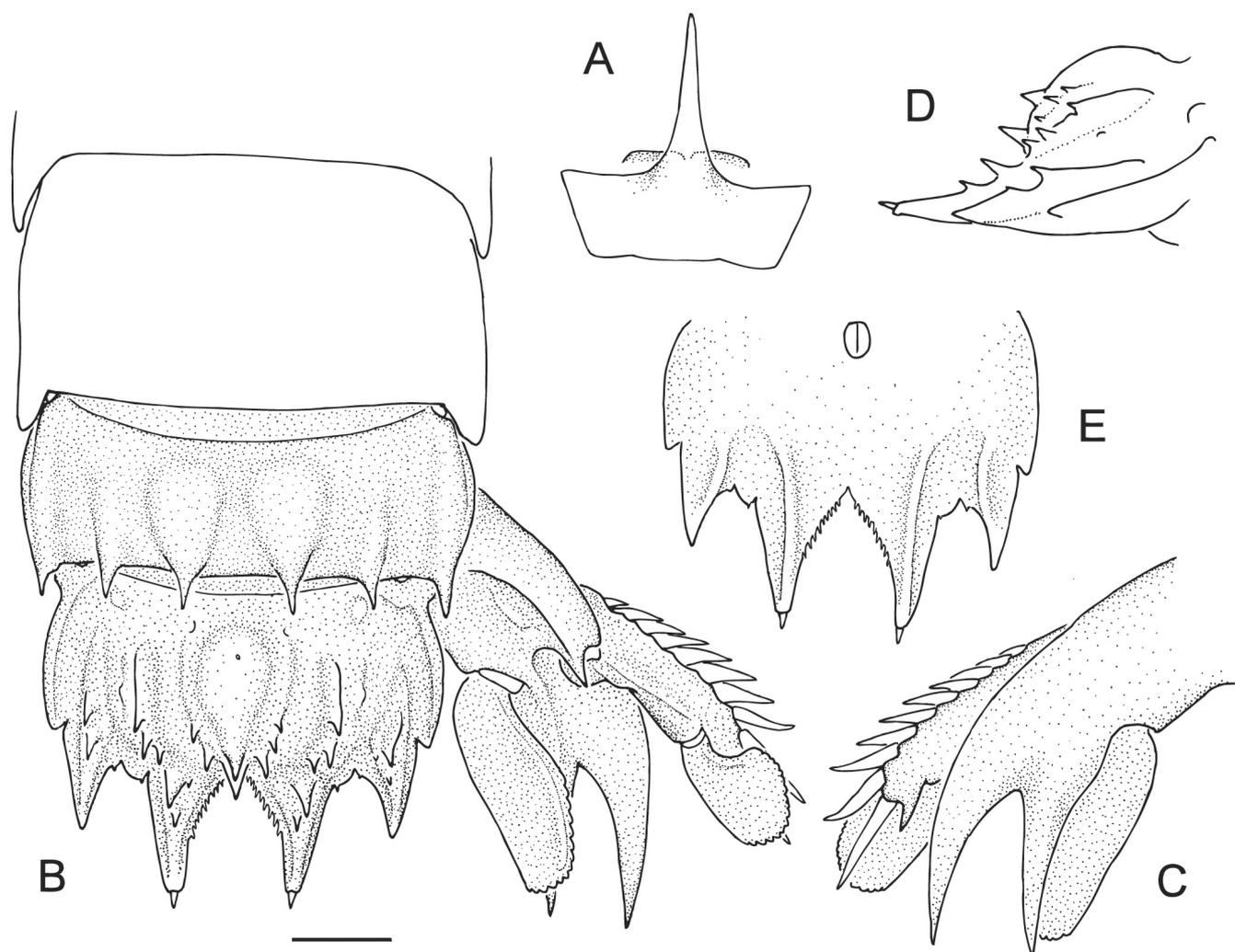


Fig. 3. *Gonodactylellus barberi* new species, paratype female (TL 26 mm), USNM 304372b, Spermonde Archipelago, Sulawesi, Indonesia: A, rostral plate and ocular scales; B, AS5–6, telson and Uropod; C, right uropod, ventral view; D, telson, right lateral view; E, telson, ventral view. Scale bar: A = 0.7 mm, B–E = 1.0 mm.

## DISCUSSION

Ahyong (2001) remarked that five species, namely *G. bicarinatus* (Manning, 1968), *G. crosnieri* (Manning, 1968), and *G. demanii* (Henderson, 1893) from the Indian Ocean, and two Pacific species, *G. snidvongsi* (Naiyanetr, 1987) and *G. molyneux* Ahyong, 2001, form a morphologically discrete group within the genus. They share the upright conical spines at the base of the submedian (and usually also the intermediate) telson teeth, and in most species a smooth inner margin of the uropodal exopod and inner margin of the uropodal endopod, features present even in juveniles. An additional character shared by members of the *molyneux* group is the presence of low, often obscure ocular scales in adults, each being about as wide as the base of the median spine of the rostral plate. In other species of *Gonodactyllus*, the ocular scales are distinct and about as high as wide. We herein refer to this 'spiny-telson' group of species as the '*molyneux* group'.

*Gonodactyllus barberi*, with its strong resemblance to *G. molyneux* and *G. snidvongsi*, is clearly referable to the *molyneux* group. *Gonodactyllus kandi*, although having fully setose inner margins of the uropodal endopod and exopod, exhibits the characteristic telson spination of *G. molyneux* and allies and is tentatively referred to the *molyneux* group. Also tentatively referred to the *molyneux* group is *G. lanchesteri* (Manning, 1967) and *G. spinosus* (Bigelow, 1893), which each have short spinules and tubercles covering the entire dorsal surface of the telson. As in *G. kandi*, both *G. lanchesteri* and *G. spinosus* have fully setose inner margins of the uropodal endopod and exopod.

Characters uniting the *molyneux* group are also shared by species of *Gonodactylopsis* Manning, 1969, and *Hoplosquilla* Holthuis, 1964, genera separated from *Gonodactyllus* by the trispinous rostral plate and condition of the mandibular palp (absent in *Hoplosquilla*). Species of the *molyneux* group appear more closely related to species of *Gonodactylopsis* and *Hoplosquilla* than to the more 'typical' species of *Gonodactyllus* such as *G. affinis* (de Man, 1902), *G. rubriguttatus* Erdmann & Manning, 1998, and *G. erdmanni* Ahyong, 2001 (Barber & Erdmann, 2000; Ahyong, 2001). Although *Gonodactyllus* is probably not monophyletic, we refrain from attributing separate generic status to the *molyneux* group until further phylogenetic studies can be completed.

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