

## On a new species of *Sundathelphusa* Bott, 1969 (Crustacea: Brachyura: Gecarcinucidae) from southeastern Borneo

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**Abstract.** A new species of gecarcinucid freshwater crab of the genus *Sundathelphusa* Bott, 1969, is described from southern Kalimantan in Indonesian Borneo. Although the genus is species-rich, most of the taxa are from the Philippines, Moluccas and Sulawesi, and only two species, *S. tenebrosa* Holthuis, 1979, and *S. aspera* Ng & Stuebing, 1989, are known from Borneo. *Sundathelphusa brachyphallus*, new species, differs from these two species mainly by the distinctive structure of the male first gonopod. It also differs from *S. tenebrosa* by the form of the carapace, notably in the structure of the frontal median triangle.

**Key words.** Taxonomy, freshwater crab, *Sundathelphusa*, new species, Borneo, Gecarcinucidae

### INTRODUCTION

The genus *Sundathelphusa* Bott, 1969 (type species *Potamon (Geothelphusa) cassiope* De Man, 1902) currently contains 33 species (Ng et al., 2008; Schubart & Ng, 2008; Mendoza & Naruse, 2010; Husana et al., 2009, 2014, 2015; Ng, 2010). Most species occur in the Philippines, Sulawesi and Lesser Sunda Islands, with only two species known from the island of Borneo: *S. tenebrosa* Holthuis, 1979 (from northern Sarawak and Brunei) and *S. aspera* Ng & Stuebing, 1989 (from northwestern Sabah). In this paper, a third species from southeastern Borneo is described.

Specimens examined are deposited in the Muzium Zoologicum Bogoreense (MZB) in Cibinong, Java, Indonesia; The Natural History Museum (NHM), London, United Kingdom; The Naturalis Biodiversity Centre (previously the Rijksmuseum van Natuurlijke Historie, RMNH), Leiden, The Netherlands; and the Zoological Reference Collection (ZRC) of the Lee Kong Chian Natural History Museum (previously Raffles Museum of Biodiversity Research), National University of Singapore. Measurements provided, in millimetres, are of the carapace width and length, respectively. The terminology follows that used in Ng (1988); with the G1 and G2 used for the male first and second gonopods, respectively.

### TAXONOMY

#### Family Gecarcinucidae Rathbun, 1904

#### *Sundathelphusa* Bott, 1969

#### *Sundathelphusa brachyphallus*, new species (Figs. 1, 2, 7A–E)

**Material examined.** Holotype: male (27.1 × 22.0 mm) (MZB Cru 4396), Liang Hintan, Hulu Sungai Barito, Kalimantan Tengah, Borneo, Indonesia, coll. C. Rahmadi, 16 June 2004. Paratype: 1 male (29.3 × 23.4 mm, chelipeds missing) (ZRC 2015.0460), same data as holotype.

**Comparative material.** *Sundathelphusa tenebrosa* Holthuis, 1979: holotype male (23.5 × 19.1 mm) (NHM 1979.135), Camp 2, in 2 × 2 m pool, 10 cm deep, clear cold mountain stream with pebble and gravel bottom, hill dipterocarp forest, 4°03'N 114°53'E, 500 m asl, Gunung Mulu National Park, Sarawak, Malaysia, Borneo, coll. J. Dring, 18 March 1978; paratype male (21.9 × 17.8 mm) (NHM 1979.136), same data as holotype; 1 paratype female (RMNH D31972), Deer Cave, Gunung Mulu National stream near southwest entrance, under rock, Sarawak, Malaysia, Borneo, coll. P. Chapman, 10 March 1978; 1 paratype female (RMNH D31979), Deer Water Cave, Gunung Mulu National Park in stream about 100 m from entrance, Sarawak, Malaysia, Borneo, coll. P. Chapman, 25 April 1978; 2 paratype females (RMNH D31972), Clearwater Cave, Gunung Mulu National Park in main stream passage near river junction, coll. P. Chapman, 13 April 1978; 1 female (30.8 × 24.6 mm) (ZRC 1989.3420), Sungai Melinau, Merimau Gorge, Gunung Mulu National Park, Sarawak, Malaysia, Borneo, coll. R.P. Lim & G. Liew, 16 April 1978; 1 juvenile (ZRC 1989.3682), Sungai Melinau, Merimau Gorge, Gunung Mulu National Park, Sarawak, Malaysia, Borneo, coll. R.P. Lim, 17 April 1978; 1 male (16.1 × 13.0 mm) (ZRC 2013.1293), Mulu Summit trail at

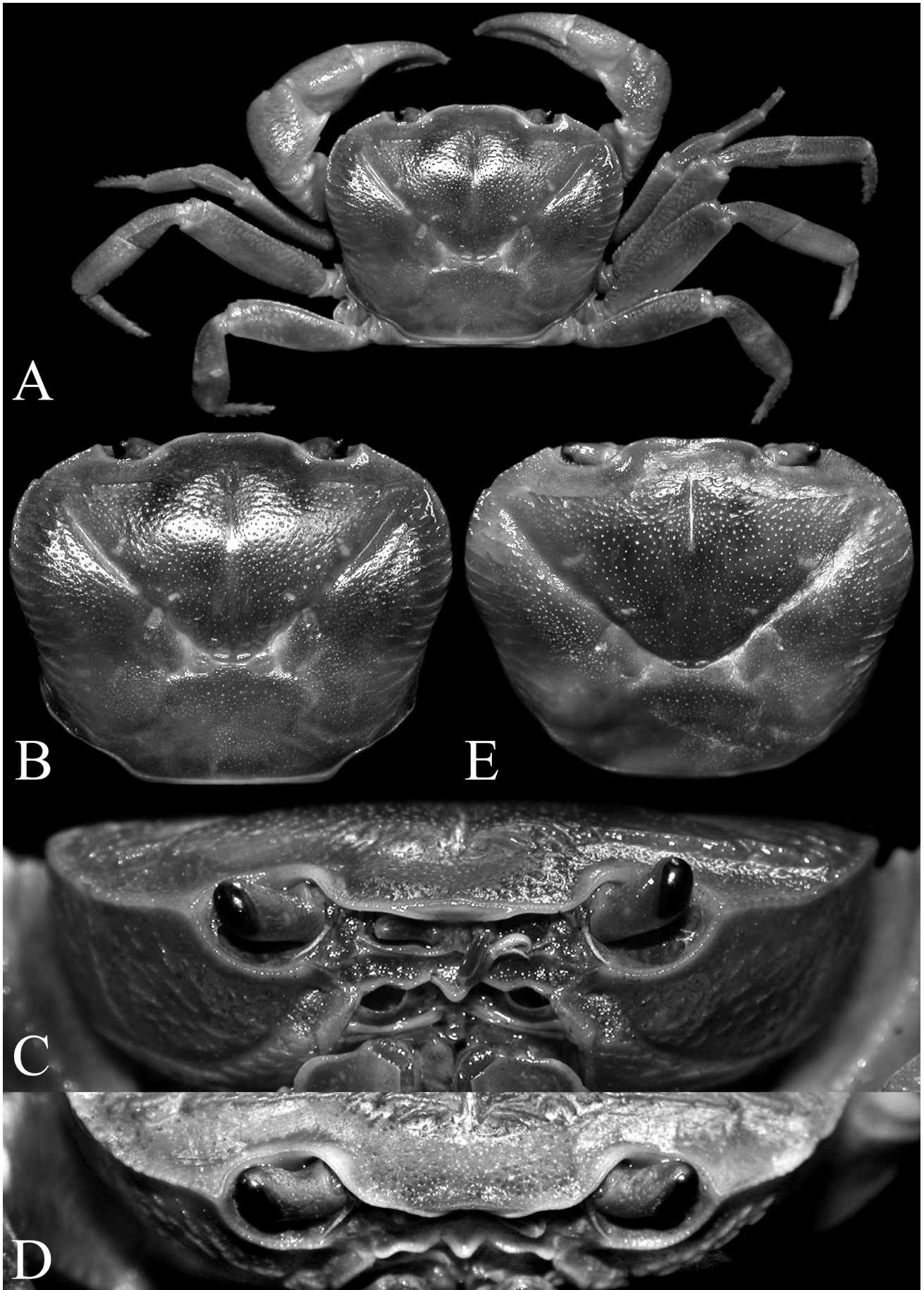


Fig. 1. *Sundathelphusa brachyphallus*, new species. A–D, holotype male (27.1 × 22.0 mm) (MZB Cru 4396); E, paratype male (29.3 × 23.4 mm) (ZRC 2015.0460). Kalimantan Tengah, Indonesia. A, overall habitus; B, E, dorsal view of carapace; C, frontal view of cephalothorax; D, subfrontal view of cephalothorax.



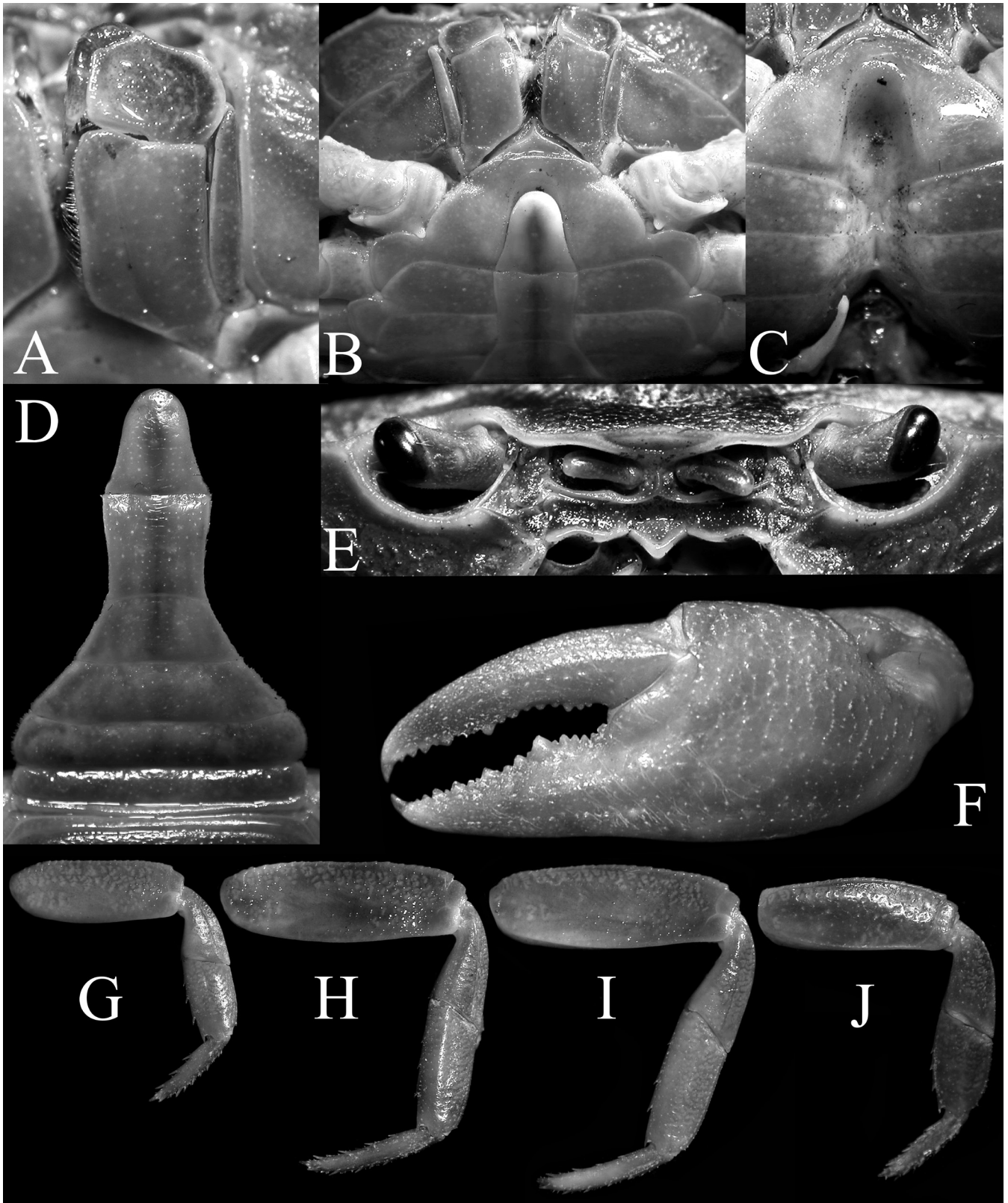


Fig. 2. *Sundathelphusa brachyphallus*, new species, holotype male (27.1 × 22.0 mm) (MZB Cru 4396); Kalimantan Tengah, Indonesia. A, left third maxilliped; B, anterior thoracic sternum and abdomen; C, sternoabdominal cavity and abdominal locking tubercles on sternite 5; D, male abdomen; E, frontal view showing frontal median triangle, orbits, antennules, antennae and epistome; F, outer view of left chela; G–J, outer views of right first to fourth ambulatory legs, respectively.

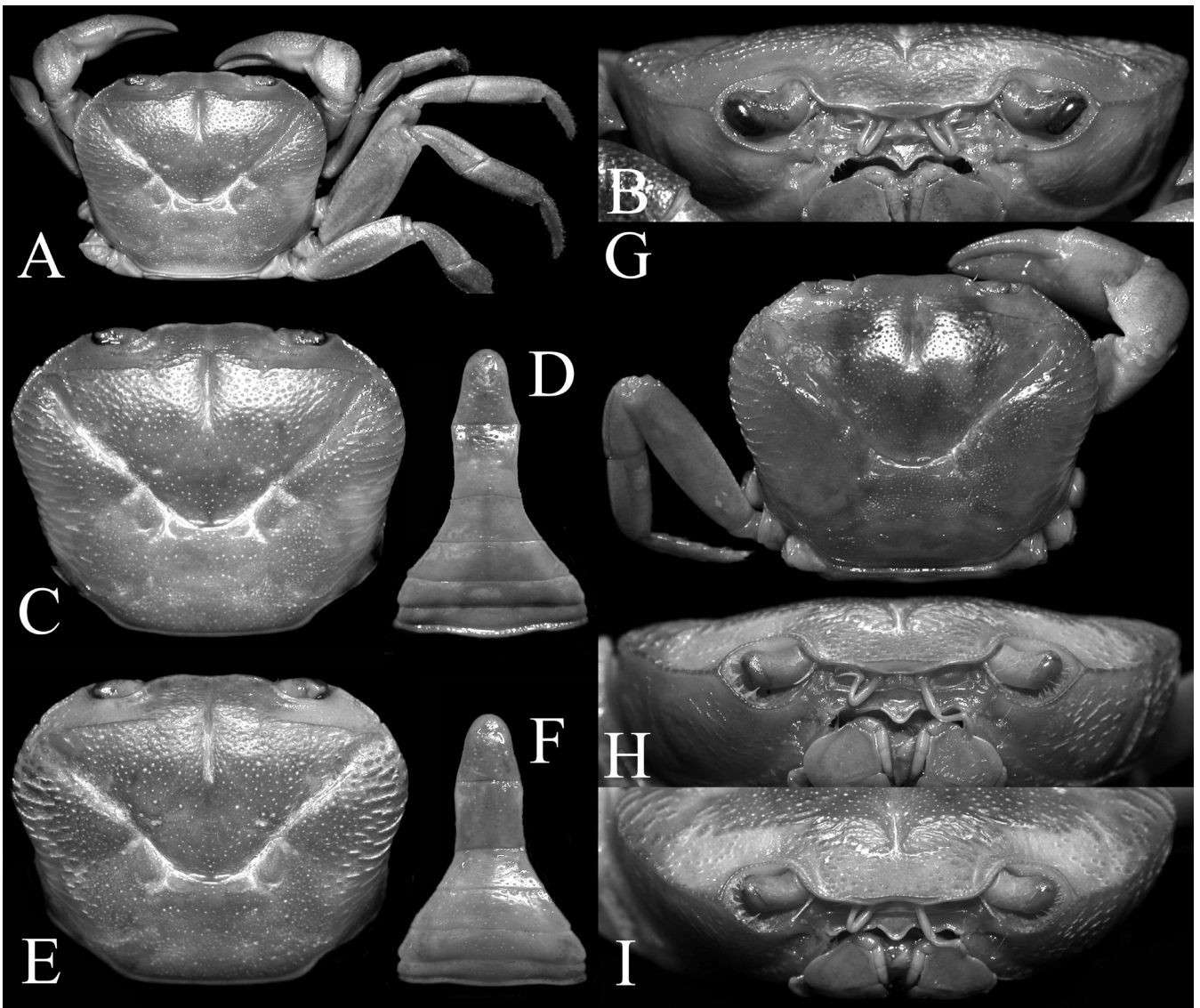


Fig. 3. *Sundathelphusa tenebrosa* Holthuis, 1979. A–D, holotype male (23.5 × 19.1 mm) (NHM 1979.135), Gunung Mulu National Park, Sarawak; E, F, paratype male (21.9 × 17.8 mm) (NHM 1979.136), Gunung Mulu National Park, Sarawak; G–I, female (30.8 × 24.6 mm) (ZRC 1989.3420), Gunung Mulu National Park, Sarawak. A, G, overall habitus; B, H, frontal view of cephalothorax; C, E, dorsal view of carapace; D, F, male abdomen; I, subfrontal view of cephalothorax.

Camp 2, Gunung Mulu National Park, Sarawak, Malaysia, Borneo, coll. A.D. Tranh, 4 November 2006. *Sundathelphusa aspera* Ng & Stuebing, 1989: holotype male (42.6 × 32.8 mm) (ZRC 1989.2143), clear, swift forest stream, Sungei Rabergan, tributary of Sungei Muaya, near Mendalong, 4°57'N 115°43'E, 750 m above sea level, Sipitang District, Sabah, Malaysia, Borneo; 1 male (32.3 × 25.4 mm), 1 female (44.1 × 33.1 mm) (ZRC 2014.845), Temburong, Amo, Batu Apoi Forest Reserve, Ulu Temburong National Park, Brunei, Borneo, coll. Jangorun anak Eri, 7 August 2014; 1 female (44.5 × 33.7 mm) (ZRC 2013.746), Temburong District, Brunei, Borneo, coll. S. Salam, 6 July 2012; 2 females (29.3 × 23.0 mm, 19.7 × 15.6 mm) (ZRC 2012.1225), in primary forest stream, in area near Sarawak border, Brunei, coll. H. Mohammad, October, 2012.

**Diagnosis.** Carapace with dorsal surfaces rugose, cervical grooves deep, broad (Fig. 1A–C). Frontal median triangle distinct, dorsal margin cristate, contiguous with lateral

margins (Figs. 1C, D, 2E). External orbital angle broadly triangular, margin granulated, anterolateral margin separated by small but distinct notch, epibranchial tooth small but visible (Fig. 1A, B, E). Male abdominal somite 6 subrectangular, slightly longer than broad (Fig. 2B, D). G1 relatively short, stout; terminal segment 0.25 times total length, subcylindrical, proximal part swollen, outer margin sinuous, surfaces covered with numerous setae, tip with wide opening (Fig. 7A–D).

**Description.** Carapace transversely subovate, wider than long; regions distinct, separated by distinct grooves; dorsal surface gently convex, glabrous, pitted or rugose, especially along margins and cristae; frontal region with low granules, orbital regions finely pitted; cervical groove deep, broad, extending from lateral edge of postorbital cristae to deep H-shaped gastric groove; branchial regions gently inflated; postorbital cristae relatively sharp, distinct, gradually becoming lower, less distinct towards cervical groove, with



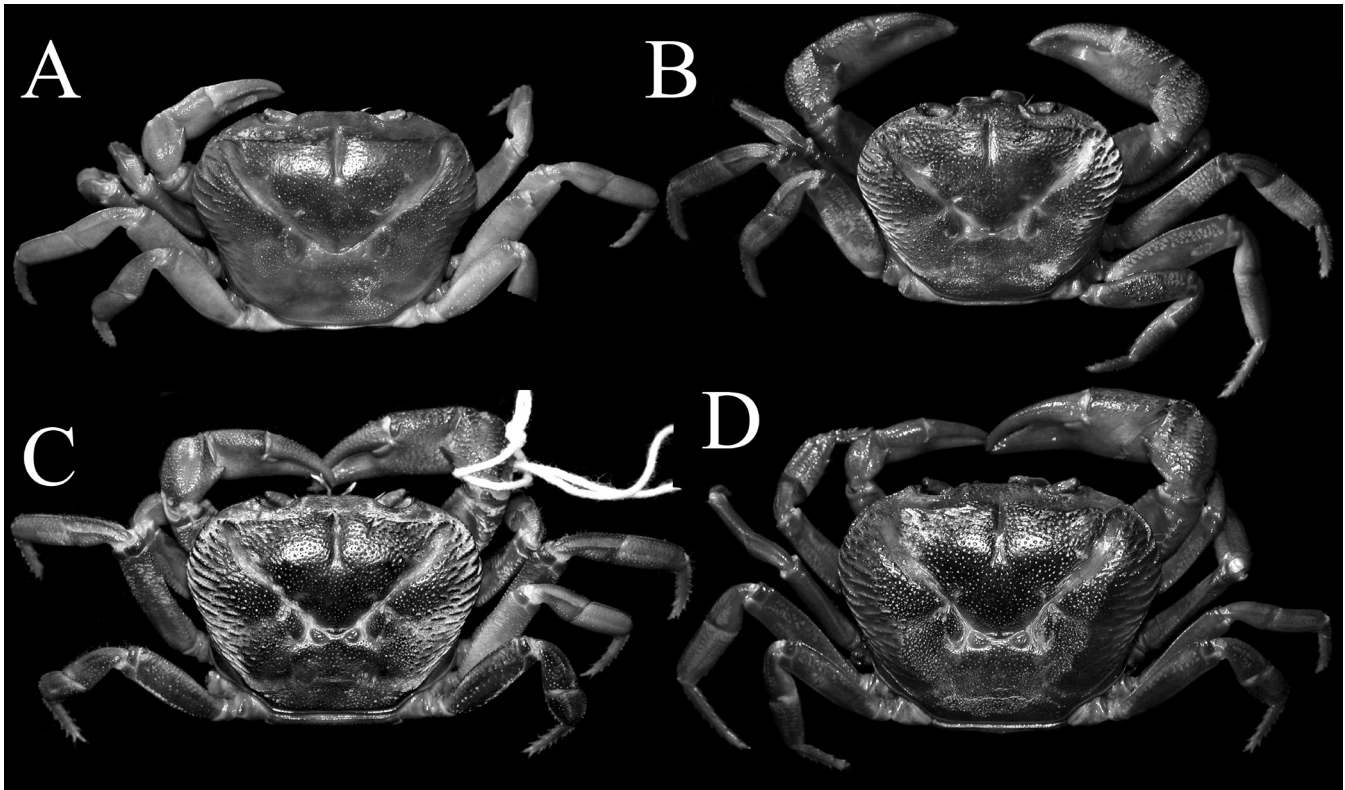


Fig. 4. *Sundathelphusa aspera* Ng & Stuebing, 1989, overall habitus. A, holotype male (42.6 × 32.8 mm) (ZRC 1989.2143), Sabah; B, male (32.3 × 25.4 mm) (ZRC 2014.845), Temburong, Brunei; C, female (44.1 × 33.1 mm) (ZRC 2014.845), Temburong, Brunei; D, female (44.5 × 33.7 mm) (ZRC 2013.746), Temburong, Brunei.

separate short, low crista just before anterolateral margin; postorbital crista separated from epigastric crista by shallow depression; epigastric cristae distinct, not sharp, prominently rugose, margins sloping anteriorly, separated medially by deep longitudinal groove which extends to just before mesogastric area (Fig. 1A, B, E). Frontal margin slightly sinuous to almost straight, slightly deflexed, frontal median triangle broad, distinct, dorsal crista distinct, completely merging with lateral parts; inner edge of supraorbital margin, next to outer edge of frontal margin, with low crista adjacent, parallel to it (Figs. 1, 2E). External orbital angle low, broadly triangular, outer margin length ca. 4 times longer than inner margin, outer margin almost straight, lined with small granules, curving to meet anterolateral margin, forming small triangular notch; epibranchial tooth low but just visible even when eroded; anterolateral margin gently convex, lined with small granules, adjacent surfaces covered with numerous rows of strong oblique striae; not clearly demarcated from posterolateral margin; posterolateral margin gently concave, adjacent surfaces lined with oblique striae, converging to almost straight or gently posterior carapace margin (Fig. 1A, B, E). Pterygostomial, suborbital, sub-hepatic and sub-branchial regions distinctly rugose or lined with oblique granules (Figs. 1C, D, 2E). Posterior margin of epistome with triangular median lobe, tip rounded; lateral margin with broadly triangular lobe, separated by deep fissures (Figs. 1C, D, 2E). Third maxilliped quadrate; ischium subrectangular, distinctly longer than broad, sulcus deep, oblique, closer to inner margin; merus squarish, lateral and distal margins cristate, medially depressed; exopod slender, reaching to half length of merus, with distinct triangular projection on



Fig. 5. *Sundathelphusa aspera* Ng & Stuebing, 1989, frontal and subfrontal views showing frontal median triangle. A, holotype male (42.6 × 32.8 mm) (ZRC 1989.2143), Sabah; B, C, male (32.3 × 25.4 mm) (ZRC 2014.845), Temburong, Brunei; D, E, female (29.3 × 23.0 mm) (ZRC 2012.1225), Brunei.

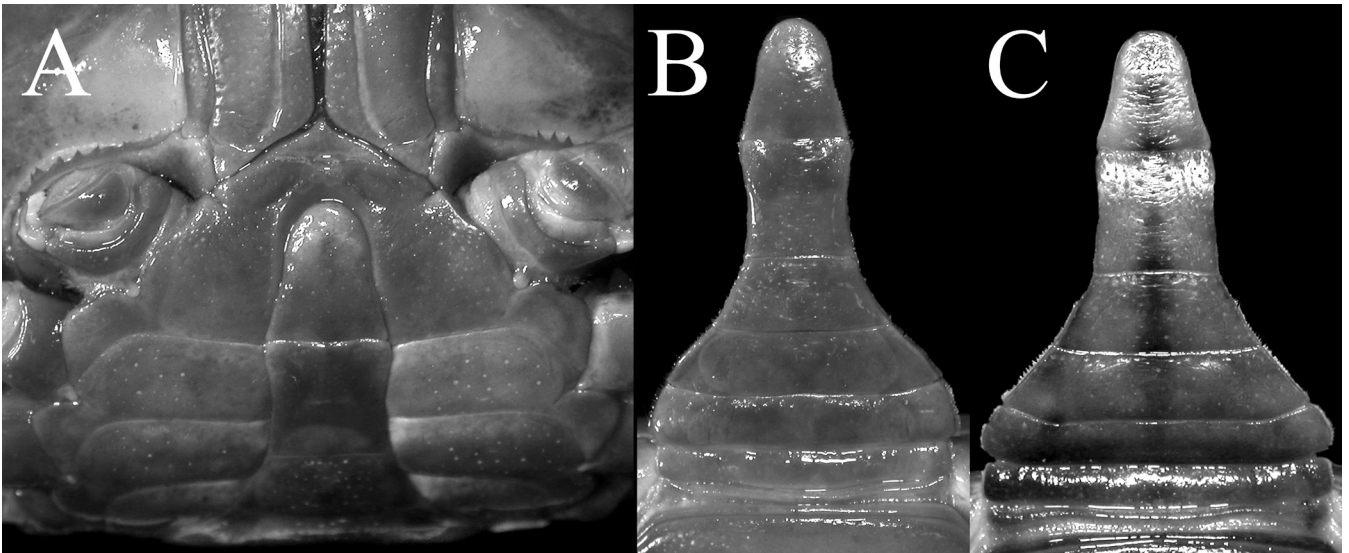


Fig. 6. *Sundathelphusa aspera* Ng & Stuebing, 1989. A, B, holotype male (42.6 × 32.8 mm) (ZRC 1989.2143), Sabah; C, male (32.3 × 25.4 mm) (ZRC 2014.845), Temburong, Brunei. A, anterior thoracic sternum and male abdomen; B, C, male abdomen.

inner margin of distal part, flagellum long, extending across width of merus (Fig. 2A). Terminal segment of mandibular palp bilobed, inner lobe twice length of outer lobe, flap-like.

Chelipeds subequal; outer surfaces of articles rugose (Fig. 1A). Basis-ischium fused, with low tooth on anterior margin (Fig. 2B). Merus trigonal in cross-section, margins uneven, covered with striae and low granules; anterior margin with low subterminal tooth. Upper surfaces of carpus with broad, shallow longitudinal depression, inner angle with prominent sharp spine, base with sharp tubercle (Fig. 1A). Fingers of chela subequal to length of palm; cutting edges with numerous sharp teeth and denticles, tips of fingers strongly curved (Fig. 2F).

Ambulatory legs not elongated, third pair longest; outer surfaces gently rugose (Figs. 1A, 2G–J). Merus stout, anterior margin slightly crested, uneven appears weakly serrated, dorsal subterminal angle just visible but without spine or tooth; propodus with 2 rows of downward pointing spines on posterior margin; dactylus almost straight or gently curved, margins with numerous well developed spines pointing obliquely distally (Fig. 2G–J).

Surface of thoracic sternum smooth to punctate; sternites 1 and 2 completely fused, forming triangular plate; separated from sternite 3 by gently concave suture; sternites 3 and 4 completely fused except for lateral clefts; sternoabdominal cavity almost reaching imaginary line connecting anterior edges of coxae of chelipeds (Fig. 2B, C). Sternoabdominal cavity deep; abdominal locking mechanism on sternum composed of rounded tubercle on submedian part of sternite 5 (Fig. 2C).

Abdomen distinctly T-shaped; all somites and telson free; somite 1 longitudinally narrow, extending across width of posterior carapace margin, reaching bases of coxae of last ambulatory legs; somite 2 as wide as somite 1; somite 3 subrectangular, with convex lateral margins; somites 4 and

5 trapezoidal with gently concave to straight lateral margins; somite 6 subrectangular, slightly longer than broad, proximal margin slightly shorter than distal margin; telson triangular with concave lateral margins and rounded tip (Fig. 2B, D).

G1 relatively short, stout, directed obliquely outwards; subterminal segment tapering gradually from broad base, sinuous on proximal part of outer margin, rest of margin gently concave; terminal segment demarcated from subterminal segment but grooves shallow, 0.25 times length of G1, subcylindrical, proximal part swollen, outer margin sinuous, surfaces covered with numerous setae, tip with wide opening, groove for G2 marginal or slightly dorsal in position, dorsal and ventral folds slightly overlapping (Fig. 7A–D). G2 slightly longer than G1, flagellum well developed, about half length of basal segment (Fig. 7E).

**Etymology.** The name alludes to the diagnostic G1 of the species, which is relatively short and stout. The name is used as a noun in apposition.

**Remarks.** Ng & Stuebing (1989: 17) discussed the systematic status of the two *Sundathelphusa* species from Borneo, commenting that they are distinct among congeners in having carapaces which are not strongly inflated, with the dorsal surfaces prominently rugose, possession of prominent and rugose epigastric and postorbital cristae, a frontal median triangle which is more developed, with the dorsal crista distinct; and adult male chelipeds which are symmetrical (Figs. 1, 2E, 3A–C, E, G, H, I, 4, 5; Holthuis, 1979: pl. 7; Ng & Stuebing, 1989: fig. 1A). In almost all other non-Bornean *Sundathelphusa* species, the carapaces are generally higher and/or more inflated, with the surfaces generally smoother; the epigastric and postorbital cristae are less prominent; the frontal median triangle is incomplete, with the dorsal crista distinct, not very sharp and separated from the lateral margins; and the adult male chelipeds are often distinctly asymmetrical. Ng & Stuebing (1989) believed that *S. minahassae* (Schenkel, 1902) (from Sulawesi)



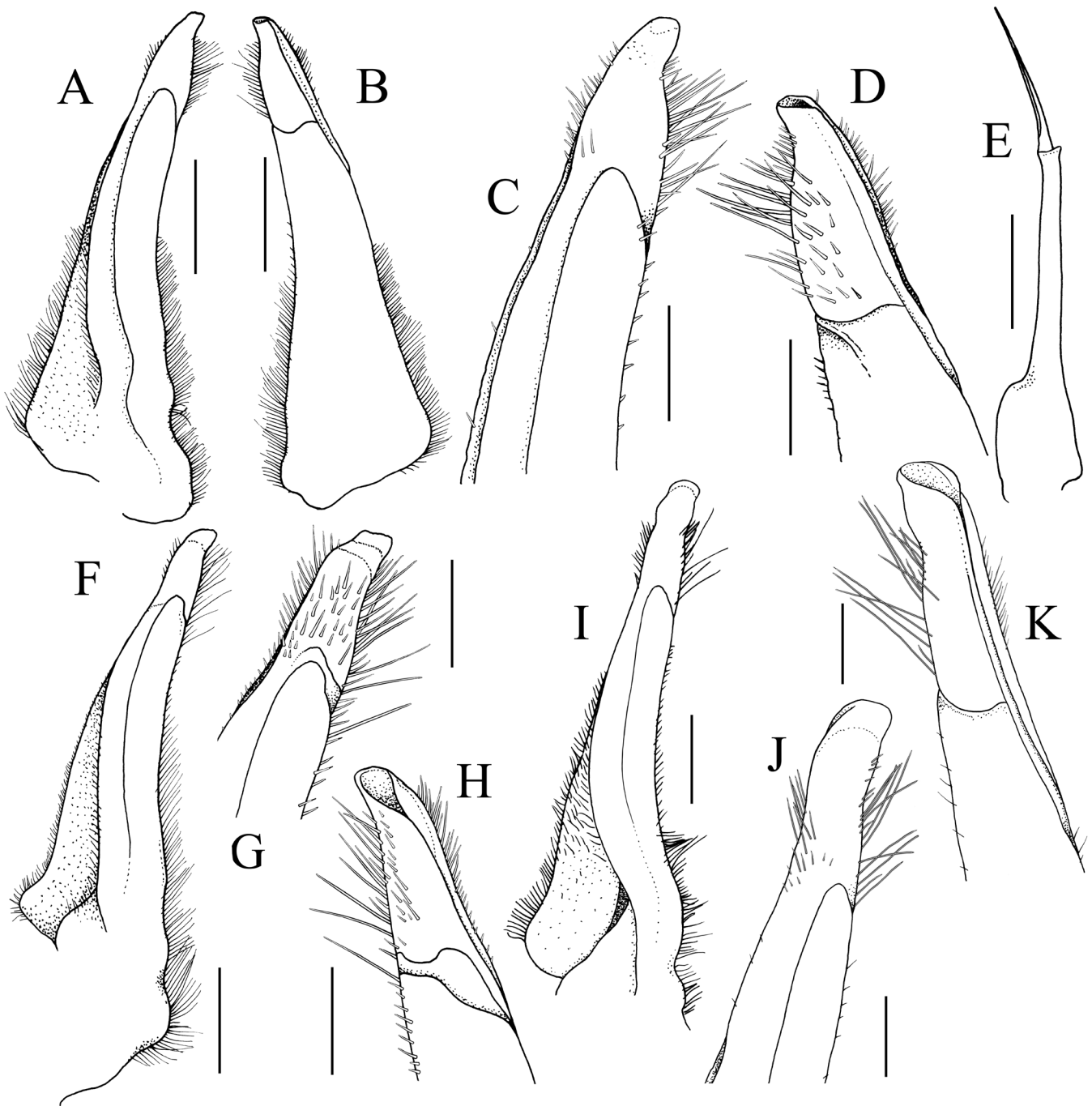


Fig. 7. A–E, *Sundathelphusa brachyphallus*, new species, holotype male (27.1 × 22.0 mm) (MZB Cru 4396); Kalimantan Tengah, Indonesia; F–H, *Sundathelphusa tenebrosa* Holthuis, 1979, holotype male (23.5 × 19.1 mm) (NHM 1979.135), Gunung Mulu National Park, Sarawak; I–K, *Sundathelphusa aspera* Ng & Stuebing, 1989, male (32.3 × 25.4 mm) (ZRC 2014.845), Temburong, Brunei. A–D, I–K, left G1; E, left G2; F–H, right G1 (laterally inverted to allow for better comparisons; left G1 missing). A, F, I, left G1 (ventral view); B, left G1 (dorsal view); C, G, J, distal part of left G1 (ventral view); D, H, K, distal part of left G1 (dorsal view); E, left G2. Scale bars: A, B, E = 1.0 mm; C, D = 0.5 mm.

and *S. halmaherensis* (De Man, 1902) (from Halmahera) also belonged to the group on the basis of the external features. However, external carapace features aside, their G1 structures are quite different. The two Bornean species are unique among *Sundathelphusa* species in having the G1 terminal segment relatively cylindrical, with the tip broad and the opening relatively wide; and the surfaces covered with numerous setae (Fig. 7F–K; Holthuis, 1979: fig. 8b, c; Ng & Stuebing, 1989: fig. 2B–E; Ng, 2004: fig. 11E). In all other *Sundathelphusa* species, including *S. minahassae*

and *S. halmaherensis*, the G1 terminal segment is conical and tapering to a sharp tip (e.g., see Chia & Ng, 2006: figs. 39–44). In *S. brachyphallus*, the G1 terminal segment is actually subcylindrical as the distal part does taper and the tip is proportionately less broad compared to its two Bornean congeners (Fig. 7A–D). However, the G1 terminal segment is still relatively stouter than other *Sundathelphusa* species, with the opening at the tip wider and the surfaces are covered with numerous long setae (Fig. 7A–D), as in the other two Bornean *Sundathelphusa* species (Fig. 7F–K).

In a molecular phylogenetic study of the family by Klaus et al. (2009), *Sundathelphusa* was shown to be polyphyletic, with its members in several clades. *Sundathelphusa minahassae* came out with a clade from Java and Peninsular Malaysia, and possibly including Sulawesi (Klaus et al., 2009: 520, 523) while *S. halmaherensis* was in a clade primarily comprising species from the Philippines and Moluccas (Klaus et al., 2009: 520, 522). Significantly, the only Bornean species tested, *S. tenebrosa*, came out in a monophyletic clade by itself, far from other congeners. The Bornean species will need to be removed to their own genus at a later date. Certainly, the distinctive form of their G1 structures easily distinguishes them from all other *Sundathelphusa* species.

The known distributions of *S. tenebrosa* and *S. aspera* are interesting. The type locality of *S. aspera* in Mendalong in Sipitang, Sabah, is some 150 km northeast of the type locality of *S. tenebrosa* in Gunung Mulu in northern Sarawak. These species are found in montane habitats, and as such are probably easily isolated. The specimens from Temburong in Brunei are in a location between Mendalong and Gunung Mulu, but in almost all features, including the form of the G1, they are clearly *S. aspera*.

Holthuis (1979: 39) reported that the two type males of *S. tenebrosa* were 25 × 21 mm and 22 × 19 mm in size, but the specimens on hand (NHM 1979.135 and 136) measure 23.5 × 19.1 mm and 21.9 × 17.8 mm, respectively. The difference is not substantial.

The most distinct differences between *S. tenebrosa* and *S. aspera* are in the structures of the frontal median triangle and G1. In *S. tenebrosa*, the dorsal crista of the frontal median triangle is distinct, but is not completely fused with the lateral margins. There is either a small but distinct gap between the cristae, or it joins by a series of uneven flattened granules (Fig. 3B, H, I) (see also Ng, 1988: fig. 38C). In *S. aspera*, the dorsal margin of the frontal median triangle is contiguous with the lateral margins, even if the two margins can still be discerned by a groove (Fig. 5A–E). This is obvious even in small specimens and females (Fig. 5C, D). The G1 terminal segment of *S. tenebrosa* is relatively shorter than that of *S. aspera* (0.21 versus 0.27 times the total G1 length), with the distal opening relatively smaller (Fig. 7F–H versus Fig. 7I–K). In addition, the distal half of the terminal segment is relatively more sinuous and elongated in *S. aspera* (Fig. 7I–K) compared to that of *S. tenebrosa* (Fig. 7F–H). These gonopodal differences are evident even in smaller specimens of each species examined.

There are other differences between the two species but these are size dependent or may vary. The cervical groove of *S. aspera* (Fig. 4) is distinctly broader than *S. tenebrosa* (Fig. 3A, C, E, G) when specimens of similar sizes are compared. The epibranchial tooth of *S. aspera* is usually visible, even if small, and there is usually a distinct small V-shaped notch separating it from the anterolateral margin (Fig. 4). In *S. tenebrosa*, the epibranchial tooth is very low and hardly demarcated from the anterolateral margin, with the two structures separated only by a small shallow

notch (Fig. 3A, C, E, G). The rugosity of the carapaces differs to some degree. The holotype of *S. aspera* has the dorso-lateral surfaces relatively less rugose (Fig. 4A) and is slightly weaker in smaller adult specimens of *S. tenebrosa* (Fig. 3A, C). Other specimens of *S. aspera* (from Brunei), however, have their dorsal surfaces distinctly more rugose (Fig. 4B–D) than any specimen of *S. tenebrosa*. The form of the male abdomen for specimens is useful, but only when they are of comparable sizes. Large specimens of many gecarcinucids often have the abdomen relatively more slender, often with somite 6 proportionately longer when compared to smaller ones. For *S. aspera*, the type is the largest known specimen (42.6 × 32.8 mm), and its male abdominal somite 6 is relatively elongate (Fig. 6A, B). In an adult, but smaller male specimen from Brunei (32.3 × 25.4 mm), somite 6 is relatively broader and less elongate (Fig. 6C). For *S. tenebrosa*, smaller males (e.g., 21.9 × 17.8 mm) still have a relatively elongated abdominal somite 6 (Fig. 3F), which in adults, is proportionately longer (Fig. 3D; Holthuis, 1979: fig. 8a).

*Sundathelphusa brachyphallus*, new species, can be separated from *S. aspera* in having the dorsal carapace surfaces, notably posterolateral regions relatively less rugose (Fig. 1A–C) (prominently rugose with strong striae in *S. aspera*; Fig. 4; Ng & Stuebing, 1989: fig. 1A); the external orbital tooth is very broad (Fig. 1A–C) (relatively narrower in *S. aspera*; Fig. 4; Ng & Stuebing, 1989: fig. 1A); the cervical groove is relatively less broad and distinct (Fig. 1A–C) (relatively broader in *S. aspera*; Fig. 4); the third maxilliped is relatively more slender (Fig. 2A) (versus more quadrate in *S. aspera*; Ng & Stuebing, 1989: fig. 2A); the male abdominal somite 6 is as wide as long (Fig. 2D) (versus longer than wide in *S. aspera*; Fig. 6; Ng & Stuebing, 1989: fig. 1B); and the G1 is relatively stouter, with the terminal segment shorter and more swollen (Fig. 7A–D) (versus G1 relatively slender, with the terminal segment more elongate in *S. aspera*, at 0.27 times the length of the G1; Fig. 7I–K; Ng & Stuebing, 1989: fig. 2B–E).

Compared to *S. tenebrosa*, *S. brachyphallus* has the dorsal margin of the frontal median triangle completely contiguous with the lateral margins (Fig. 1C, D) (versus with a small gap or joining as a series of low granules; Fig. 3B, H, I); it has a male abdominal somite 6 which is squarish, being as wide as long for specimens of similar or smaller sizes (Fig. 2D) (versus subrectangular, longer than wide with the lateral margins gently concave in *S. tenebrosa*; Fig. 3D, F; Holthuis, 1979: fig. 8a); and the G1 is distinctly stouter, with the terminal segment proportionately shorter and more swollen (Fig. 7A–D) (versus G1 relatively slender, with the terminal segment longer in *S. tenebrosa*, at 0.21 times the length of the G1; Fig. 7F–H; Holthuis, 1979: fig. 8b, c).

The proportions of the G1 terminal segment to overall length are deceptive, being 0.21 in *S. tenebrosa*, 0.27 in *S. aspera* and 0.25 times in *S. brachyphallus*, even though the G1 of *S. brachyphallus* actually appears shorter. This is because in *S. brachyphallus*, the overall G1 structure is already short and stout, as is the terminal segment (Fig. 7A, B). In *S. tenebrosa*



and *S. aspera*, the terminal segment proportions are more indicative of differences as their subterminal segments have the same structure (Fig. 7F, I).

The specimens of *S. brachyphallus* were collected from highlands in southeastern Kalimantan in the karst formations of the Barito River basin (see Rahmadi, 2006; Rahmadi & Suhardjono, 2004).

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