Zootaxa 5165 (1): 107–114
https://www.mapress.com/zt/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

https://doi.org/10.11646/zootaxa.5165.1.5
http://zoobank.org/urn:lsid:zoobank.org:pub:7362A5F2-5B64-4FFF-A94D-A773B404719D

A review of the genus *Monseremus* Ingrisch, 2018 (Orthoptera, Stenopelmatoidea, Gryllacrididae) from Borneo

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Abstract

We review the taxonomy of the gryllacridids from a small genus *Monseremus* Ingrisch, 2018. *Monseremus bellus* (Tan & Wahab, 2018) **comb. nov.**, previously described from Brunei Darussalam before the description of *Monseremus*, is now added as a second known species in this genus. From a recent field trip, we also added new locality record for the type species *Monseremus appendiculatus* Ingrisch, 2018. First described from Mount Kinabalu in western Sabah, this species has now been reported also in Mount Silam in eastern Sabah. Males of the type species were also collected for the first time and are described here. Lastly, we provide a dichotomous key to separate these two species.

Key words: apterous, East Malaysia, key, new combination, Sabah, taxonomy

Introduction

Recently, a new species of apterous Gryllacrididae, *Melaneremus? bellus* Tan & Wahab, 2018 was described from Brunei Darussalam (Tan & Wahab, 2018a). This species has a unique modification in the female subgenital plate which is not found in apterous genera of Gryllacrididae. However, prior to the taxonomic revision of Gryllacrididae, Tan & Wahab (2018a) refrained from proposing a new genus and the new species was placed tentatively within *Melaneremus* Karny, 1937. A few months after Tan & Wahab (2018a) was published, Ingrisch (2018) presented a comprehensive revision of 50 genera of Gryllacrididae from Southeast Asia and New Guinea. In addition to a key to genera, six genera and 70 species new to science were described. The revision allowed us to re-examine the species described from Brunei Darussalam. We found that this species can now be more rightly placed under the genus of apterous Gryllacrididae, i.e., *Monseremus* Ingrisch, 2018: *Monseremus bellus* (Tan & Wahab, 2018) **comb. nov.**

Monseremus Ingrisch, 2018 was described based on a single species from Mount Kinabalu: *Monseremus appendiculatus* Ingrisch, 2018 (Fig. 1). This genus was defined by the unique shape of female subgenital plate—a pair of conspicuous projections at the anterior margin—that was also present in *Monseremus bellus* **comb. nov.** Nevertheless, in his monograph, Ingrisch did not examine any specimens that resemble *Monseremus bellus* **comb. nov.** Despite the overall similarities, the females of *Monseremus bellus* **comb. nov.** and *Monseremus appendiculatus* show distinct differences in the projections of the female subgenital plate. Since only the males of *Monseremus bellus* **comb. nov.** were known (and not for *Monseremus appendiculatus*), comparison of the males were not possible.

In this study, we report the discovery of a new population of the type species, *Monseremus appendiculatus* based on a recent survey in Mount Silam in the eastern part of Sabah, where we also collected the males of this species. We describe the males here and compare with those of *Monseremus bellus* **comb. nov.**

Accepted by D. Rentz: 23 Jun. 2022; published: 13 Jul. 2022

Materials and methods

Material. New materials were collected from Mount Silam during a field trip in eastern Sabah between 11 and 19 May 2022. The specimens were preserved in absolute analytic-grade ethanol and later pinned and dry-preserved. A single posterior leg was preserved in absolute analytic-grade ethanol for future molecular work. The specimens were eventually deposited in:

FRC Forest Research Centre (Sepilok), Sabah Forestry Department, East Malaysia
MNHN Muséum national d'Histoire naturelle, Paris, France
ZRC Zoological Reference Collection, Lee Kong Chian Natural History Museum, Singapore

Old material of *Monseremus bellus* **comb. nov.** from Brunei Darussalam were also examined (Tan & Wahab, 2018a, 2018b).

Morphology. In-situ and habitus images were made with a Canon EOS 500D digital SLR camera with a compact-macro lens EF 100 mm 1:2.8 USM. Close-up images of morphological features (including male genitalia) were done using a macro photo lens MP-E 65 mm 1:2.8 USM (1–5×). Canon Macro Twin Lite MT24EX was used for lighting and flash. Image editing was accomplished using Adobe Photoshop CC 2014. Measurements were done using a Vernier calipers.

Abbreviations. The abbreviations were used for the measurements: BL = body length, HL = head length, PL = pronotum length, PW = pronotum width, HFL = hind femur length, HTL = hind tibia length, n(SF) = number of teeth on stridulatory file.

Taxonomy part

Family Gryllacrididae Blanchard, 1845

Subfamily Gryllacridinae Blanchard, 1845

Tribe Gryllacridini Blanchard, 1845

Genus *Monseremus* Ingrisch, 2018

Monseremus Ingrisch, 2018: 222
Monseremus—Cadena-Castañeda 2019: 79

Type species. *Monseremus appendiculatus* Ingrisch, by monotypy and original designation

Included species.
Monseremus appendiculatus Ingrisch, 2018
Monseremus bellus (Tan & Wahab, 2018) **comb. nov.**

Distribution. Borneo (East Malaysia: Sabah; Brunei Darussalam: Temburong)

Remarks. The two species are very similar in general morphology, size and colouration in both males and females. Only the female subgenital plate and male tenth abdominal tergite show clear-cut species differences (Fig. 2). The female tenth abdominal tergite and epiproct did not exhibit species differences (Fig. 3).

The number of pegs on the two stridulatory files on each of the second and third tergites can be variable within species (second tergite ♂♀4–6, ♂♀12–14; third tergite ♂12–14 and ♀15–17, ♂♀16–19 in *Monseremus bellus* **comb. nov.** [n = 4♂, 4♀]) and do not appear show clear species differences (*vs.* ♂♀4–5, ♂♀11–13; ♂♀15–17, ♂♀16–18 in *Monseremus appendiculatus* [n = 2♂, 2♀]) (Fig. 3). Likewise, the shape of the stridulatory files are also not different between the two species (Fig. 3). Hence, these characters are unlikely to be important for species diagnosis.

Key to known species

1. Female: projections at the anterior margin of the subgenital plate larger, more bulbous (in lateral view), and longer in length than subgenital plate (Figs 2A, 2B). Ovipositor longer, length >17.0 mm. Male: medial processes of the tenth abdominal tergite with inner margins and apices clearly separated (Fig. 2C). Subgenital plate faintly more squarish, ca. 1.7 times wider than long (Fig. 2C). Distribution: highland forests in Sabah, East Malaysia. . . . . *Monseremus appendiculatus*

-. Female: projections at the anterior margin of the subgenital plate smaller, more flattened (in lateral view), and shorter in length than subgenital plate (Figs 2D, E). Ovipositor shorter, length <16.5 mm. Male: medial processes of the tenth abdominal tergite with inner margins and apices touching each other (Fig. 2F). Subgenital plate more transverse, ca. 2.5 times wider than long (Fig. 2F). Distribution: lowland forests in Brunei Darussalam. . . . . *Monseremus bellus*

Monseremus appendiculatus Ingrisch, 2018

(Figs 1, 2A–C, 3A, 3B, 4)

Monseremus appendiculatus Ingrisch, 2018: 222
Monseremus appendiculatus—Cadena-Castañeda 2019: 79

New material examined. EAST MALAYSIA: • 1♂; Sabah, Mount Silam, near Lahad Datu; N4.96816, E118.17191, 735.7±9.4 m.a.s.l.; on foliage of bamboo; 12 May 2022, 21h30; coll. M. K. Tan, T. Robillard & R. Japir (SBH.22.34, FRC) • 1♀; Sabah, Mount Silam, near Lahad Datu; N4.96878, E11.17189, 736.1±5.4 m.a.s.l.; on foliage near ground; 12 May 2022, 21h56; coll. M. K. Tan, T. Robillard & R. Japir (SBH.22.39, FRC) • 1♂; Sabah, Mount Silam, near Lahad Datu; N4.96800, E118.17189, 720.8±8.0 m.a.s.l.; on foliage; 12 May 2022, 23h00; coll. M. K. Tan, T. Robillard & R. Japir (SBH.22.45, ZRC) • 1♀; Sabah, Mount Silam, near Lahad Datu; N4.96858, E118.17159, 727 m.a.s.l.; on foliage; 12 May 2022, 22h00; coll. M. K. Tan, T. Robillard & R. Japir (TR22-7, MNHN).

Revised diagnosis. The male differs from that of *Monseremus bellus* **comb. nov.** by the medial processes of the tenth abdominal tergite: the inner margins and apices clearly separated (instead of touching each other). The female differs from that of *Monseremus bellus* **comb. nov.** by the lateral projections at the anterior margin of the subgenital plate larger, more bulbous (in lateral view), and longer in length than subgenital plate. Other minor differences include the male subgenital plate more squarish, ca. 1.7 times wider than long; ovipositor >17.0 mm in length, longer than in *Monseremus bellus* **comb. nov.**

Description of the males. Habitus and colouration similar to female described in Ingrisch (2018) (Fig. 4A). Four stridulatory files on first and second abdominal tergites, two on each tergite (Fig. 4B): Anterior file on first tergite short with 5 peg-like teeth (n = 2♂). Second file, also on first tergite, longer, more than twice the length of anterior file, slightly curved, with 12–13 peg-like teeth (n = 2♂). Third file on second tergite angularly curved, with 15–17 peg-like teeth (n = 2♂); teeth more densely packed than second file; posterior file on second tergite nearly straight, with 16–17 peg-like teeth (n = 2♂). Second and posterior files of subequal length. Eighth abdominal tergite enlarged, longer than other tergites (Figs 4C, 4D). Ninth abdominal tergite forming a hood (Fig. 4D). Tenth abdominal tergite with two processes in the middle; each process broadest at the base, triangular, pointing ventrally and produce into a sclerotized and obtuse apex (Fig. 2C); the process not touching each other at the apex (Fig. 2C). Epiproct concealed beneath tenth abdominal tergite (Fig. 2C). Cercus long and slender, cylindrical and setose, curved internally at the posterior end, with acute apex (Fig. 2C). Subgenital plate circa 1.7 times wider than long; anterior margin broadly concave; lateral margin straight, with some setae; posterior margin slightly emarginated in the middle, laterally forming a lobe where stylus is inserted (Fig. 2C). Stylus short and stout, setose, with obtuse apex (Fig. 2C).

Measurements (in mm, n = 2♂). BL = 18.6–21.3, HL = 2.8, PL = 5.0–5.3, PW = 5.9–6.6, HFL = 13.1–15.0, HTL = 12.5–14.1.

Distribution. EAST MALAYSIA: Sabah (Mount Kinabalu; Mount Silam[new locality record])

Ecology. This species seems to restricted to highlands of 500–900 m.a.s.l. This species was not found in lowland forests of eastern Sabah that the authors have sampled in (i.e., Kawag Forest Reserve, Kabili Sepilok Forest Reserve and Tabin Wildlife Reserve).

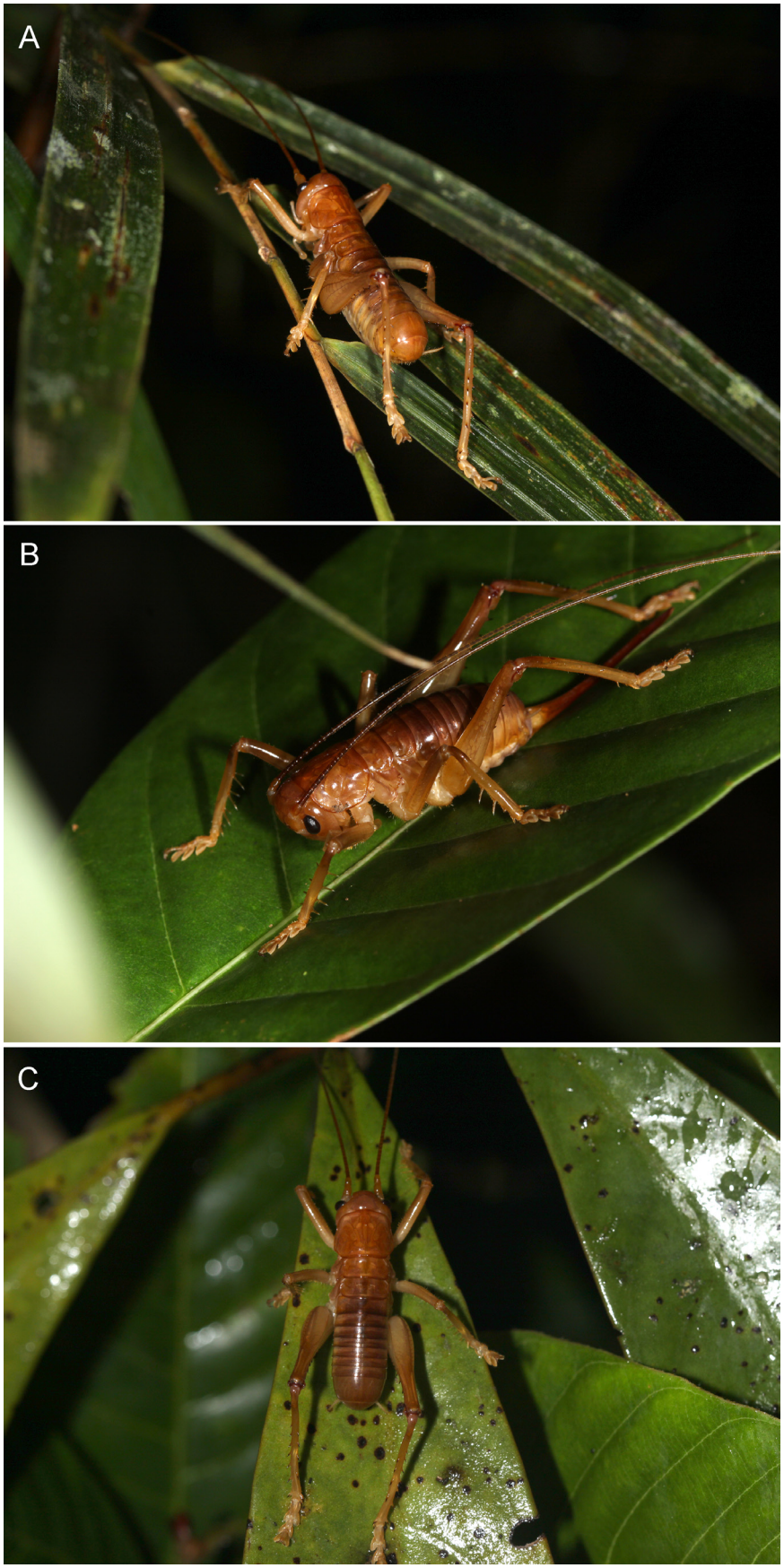

FIGURE 1. *Monseremus appendiculatus* in its natural environment in Mount Silam, Sabah.

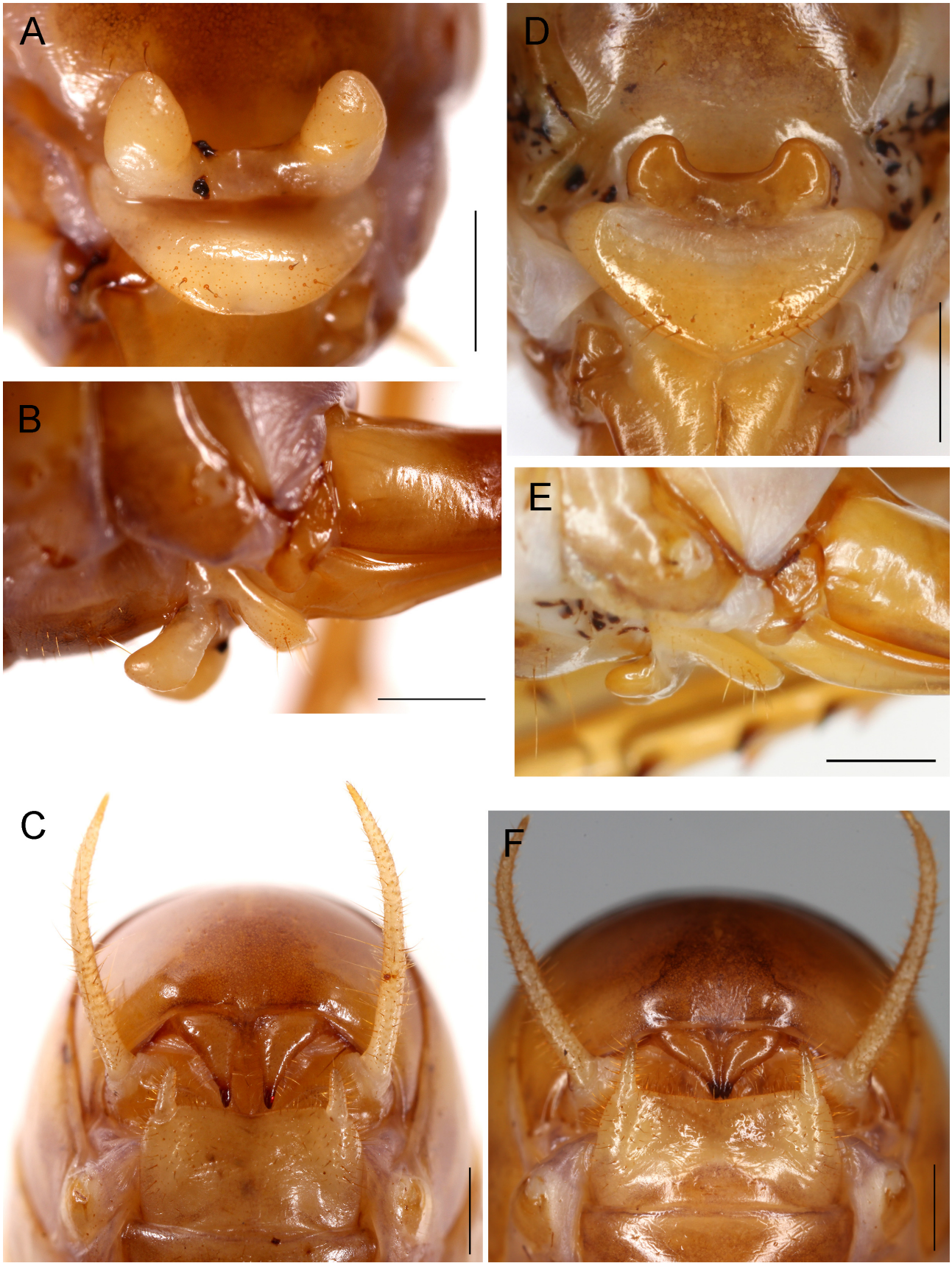

FIGURE 2. *Monseremus appendiculatus* (A–C) and *Monseremus bellus* (D–F): female subgenital plate in ventral (A, D) and lateral (B, E) views; male abdominal apex in ventral view (C, F). Scale bars: 1 mm.

***Monseremus bellus* (Tan & Wahab, 2018) new combination**
(Figs 2D–F, 3C, 3D)

Melaneremus? bellus Tan & Wahab, 2018: 584

Melaneremus (?) sp.—Tan & Wahab, 2018b: 132
Melaneremus bellus—Cadena-Castañeda 2019: 79

Material examined. Holotype: BRUNEI DARUSSALAM:• ♀; Ulu Temburong National Park, Kuala Belalong Field Studies Centre, primary ridge dipterocarp forest; N4.54731, E115.15697, 103.9±8.7 m.a.s.l.; on foliage of tree; 26 July 2017, 20h31; coll. M. K. Tan (KB.17.76, ZRC).

Paratypes: BRUNEI DARUSSALAM: • 1♀; Ulu Temburong National Park, Kuala Belalong Field Studies Centre, primary ridge dipterocarp forest; N4.54629, E115.15680, 133.9±9.0 m.a.s.l.; on rattan leaf; 23 September 2016; 21h49; coll. M. K. Tan (KB.16.20, ZRC) • 1♂; Ulu Temburong National Park, Kuala Belalong Field Studies Centre, primary ridge dipterocarp forest; N4.54706, E115.15720, 112.1±16.0 m.a.s.l.; on foliage of tree; 23 September 2016, 22h14; coll. M. K. Tan (KB.16.22, ZRC) • 1♂; Ulu Temburong National Park, Kuala Belalong Field Studies Centre, primary ridge dipterocarp forest; N4.54584, E115.15685, 103.3±6.8 m.a.s.l., on foliage near ground; 25 July 2017, 21h30; coll. M. K. Tan (KB.16.63, ZRC) • 1♀; Ulu Temburong National Park, Kuala Belalong Field Studies Centre, primary ridge dipterocarp forest; N4.54730, E115.15703, 99.8±6.0 m.a.s.l.; on rattan leaf; 26 July 2017, 20h41; coll. M. K. Tan (KB.17.77, ZRC) • 1♂; Ulu Temburong National Park, Kuala Belalong Field Studies Centre, primary ridge dipterocarp forest; N4.54655, E115.15688, 101.9±7.5 m.a.s.l.; on rattan leaf; 27 July 2017, 20h38; coll. M. K. Tan (KB.17.90, ZRC).

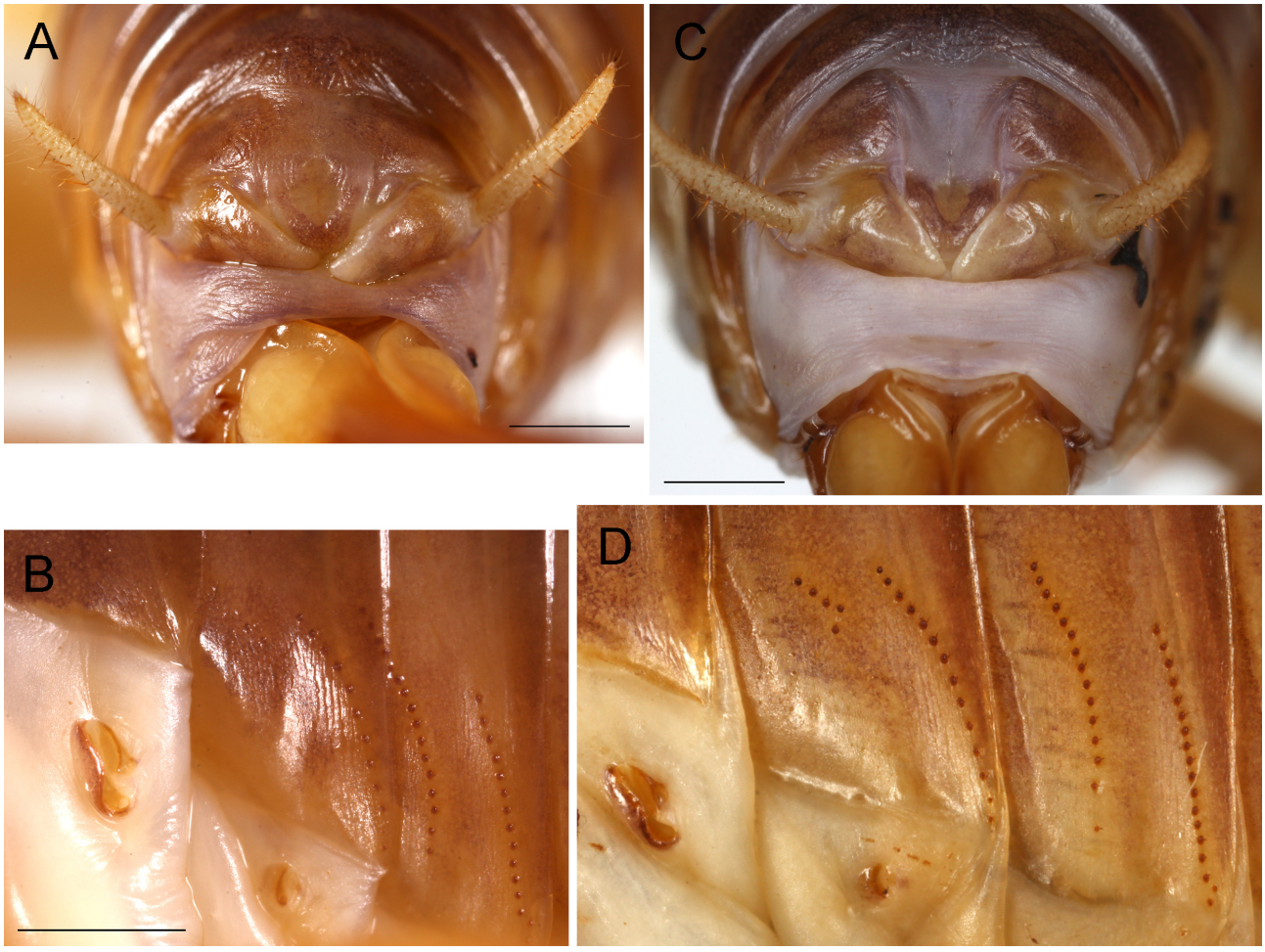

FIGURE 3. *Monseremus appendiculatus* (A, B) and *Monseremus bellus* (C, D): female abdominal apex in posterior view (A, C); female stridulatory files on second and third tergites (B, D). Scale bars: 1 mm.

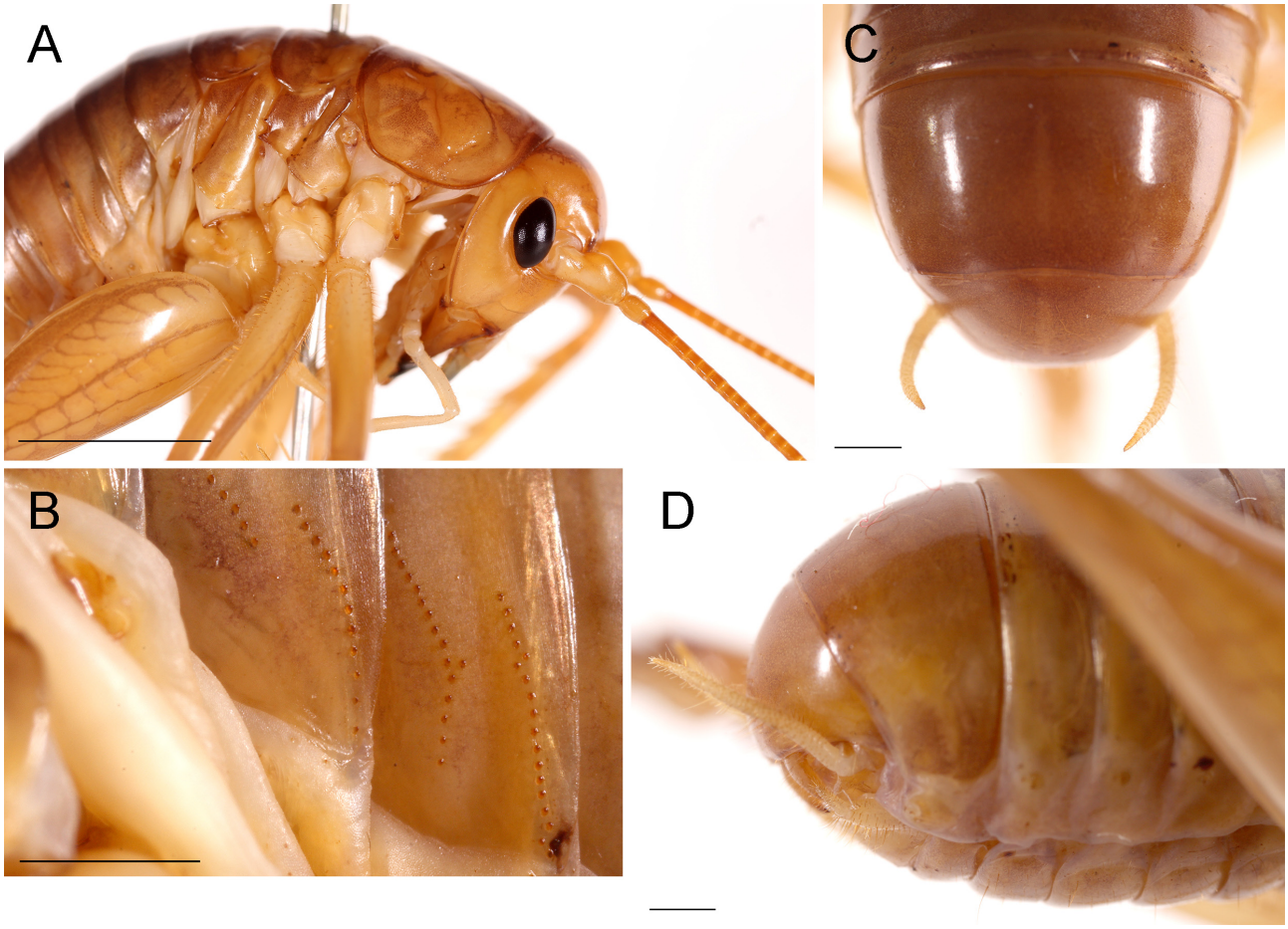

FIGURE 4. *Monseremus appendiculatus* male: body in lateral view (A); stridulatory files on second and third tergites (B); abdominal apex in dorsal (C) and lateral (D) views. Scale bars: 5 mm (A); 1 mm (all except A).

Revised diagnosis. The male differs from that of *M. appendiculatus* by the medial processes of the tenth abdominal tergite: the inner margins and apices touching each other. The female differs from that of *M. appendiculatus* by the projections at the anterior margin of subgenital plate smaller, more flattened (in lateral view), and shorter in length than subgenital plate. Other minor differences include the male subgenital plate more transverse, ca. 2.5 times wider than long; the ovipositor <16.5 mm in length, shorter than *M. appendiculatus*.

Distribution. BRUNEI DARUSSALAM: Temburong

Ecology. This species is currently known to inhabit the lowland ridge dipterocarp forest.

Acknowledgements

The authors are grateful to Mohamad Azizan Bin Asidi for field assistance. The permission for research in Sabah was granted by the Sabah Biodiversity Centre (JKM/MBS.1000-2/2 JLD.10 (179)). The work of MKT was supported by the Orthoptera Species File Grant 2019 under the taxonomic research project titled "Contribution to the species diversity and acoustic data on Orthoptera from Sandakan (Borneo, East Malaysia, Sabah)".

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