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## New taxa of crickets (Orthoptera: Grylloidea: Gryllinae, Phaloriinae and Pteroplistinae) from northern Borneo (Belait and Sandakan)

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### Abstract

Three species new to science of the Gryllid subfamilies Gryllinae and Pteroplistinae are described from Brunei: (1) *Mimicogryllus splendens* Tan, Gorochov & Wahab, **sp. nov.**, (2) *Pteroplistes bruneiensis* Tan, Gorochov & Wahab, **sp. nov.**, and (3) *Tembelingiola belaitensis* Tan, Gorochov & Wahab, **sp. nov.** A new species of cricket of the subfamily Phaloriinae is also described from Sandakan, eastern Sabah: *Vescelia sepilokensis* Tan, Gorochov, Japir & Chung, **sp. nov.**

**Key words:** Brunei Darussalam, new species, Sabah, taxonomy

### Introduction

Recent orthopteran surveys in Kuala Belalong, Brunei Darussalam (see Tan & Wahab, 2018a) led to the discoveries of eleven new species, including species from Meconematinae, Phaneropterinae and Landrevinae (Tan & Wahab, 2017a, 2017b, 2018b, 2018c, 2018d; Tan et al., 2017a, 2017b). These surveys are now extended to other parts of the country, particularly in the less explored western part (e.g., Belait District). New crickets of the Gryllidae from subfamilies Gryllinae and Pteroplistinae were discovered. Here, we describe three species new to science from Brunei: (1) *Mimicogryllus splendens* Tan, Gorochov & Wahab, **sp. nov.**, (2) *Pteroplistes bruneiensis* Tan, Gorochov & Wahab, **sp. nov.**, and (3) *Tembelingiola belaitensis* Tan, Gorochov & Wahab, **sp. nov.** Additionally, we also describe a new species of cricket of the subfamily Phaloriinae from Sandakan, eastern Sabah: *Vescelia sepilokensis* Tan, Gorochov, Japir & Chung, **sp. nov.**

### Materials and methods

**Sampling.** Field collections and observations were made in Belait, Brunei Darussalam: Andulau Forest Reserve, Wasai Wong Kadir Recreational Park and Jalan Labi at Teraja between 23 February and 3 March 2019 (Fig. 1). Surveys were also conducted at the Rainforest Discovery Centre (Sandakan, Sabah) between 8 and 12 January 2019. Specimens were collected by sight during, night and day. Whenever possible, in-situ images were taken using a Canon EOS 500D digital SLR camera with a compact-macro lens EF 100 mm f/2.8 Macro USM and Canon Macro Twin Lite MT-24EX was used for lighting and flash. Specimens collected by Tan & Wahab (2018a) in Kuala Belalong Field Studies Centre (Temburong, Brunei Darussalam) were also examined.

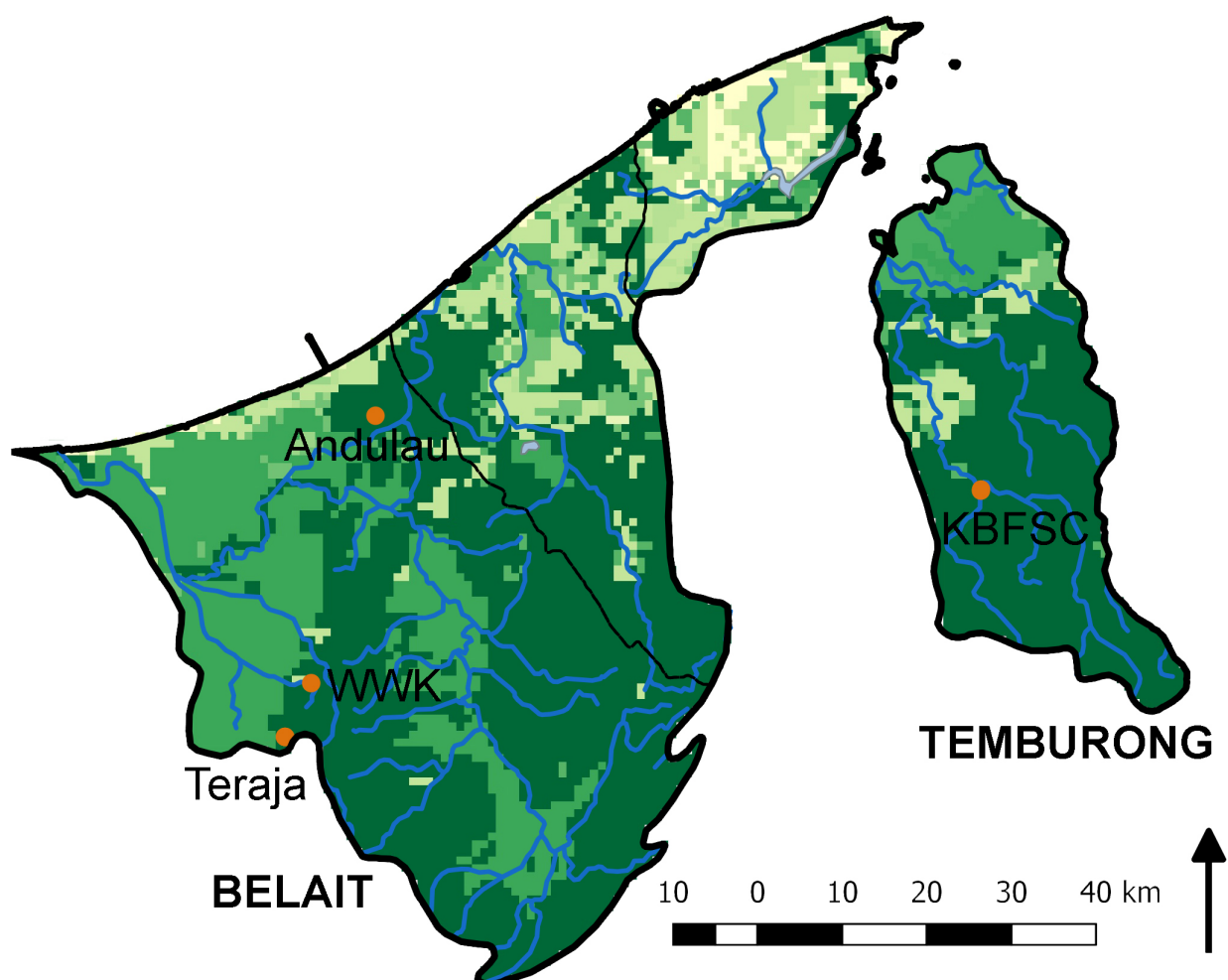
**Curation and examination of materials.** The specimens were preserved in absolute analytical-grade ethanol and later pinned and dry-preserved. A single hind leg from each specimen was also preserved in absolute analytical-grade ethanol for future molecular work.

Male genitalia were dissected from softened specimens and removed by squeezing the cerci against one another laterally. The male genitalia were then cleaned using aqueous KOH and subsequently preserved in glycerin. Terminology used to describe the male genitalia follows Gorochov (2015).

Habitus images were made with a Canon EOS 500D digital SLR camera with a compact-macro lens EF 100mm f/2.8 Macro USM. Close-up images of morphological features (including male genitalia) were done using a Canon EOS 500D digital SLR camera with a macro photo lens MP-E 65mm f/2.8 USM (1–5×). Canon Macro Twin Lite MT-24EX and Canon Macro Ring Lite MR-14EX were used for lighting and flash. Image editing was accomplished using Adobe Photoshop CC 2014.

Measurements of dried-pinned specimen were made using ImageJ. In the measurements, the following abbreviations are used: BL = body length; HL = head length; PL = pronotum length; PW = pronotum width; TL = tegmen length; TW = tegmen width; HWL = hindwing length; HFL = hind femur length; HTL = hind tibia length; OL = ovipositor length.

**Depositories.** Holotypes from Belait were deposited in the Universiti Brunei Darussalam Museum (UBDM); holotype from Sandakan was deposited in the collections of the Forest Research Centre, Sandakan (FRC); paratypes were deposited in the Zoological Reference Collection, Lee Kong Chian Natural History Museum, Singapore (ZRC).



**FIGURE 1.** Map of Brunei Darussalam indicating various sampling sites. WWK = Wasai Wong Kadir Recreational Park; KBFSC = Kuala Belalong Field Studies Centre. District names are in bold and upper-case.

## Taxonomy Part

### Superfamily Grylloidea

## Family Gryllidae

### Subfamily Gryllinae

#### Genus *Mimicogryllus* Gorochov, 1994

Type species: *Mimicogryllus hymenopteroides* Gorochov, by original designation

**Remarks.** Prior to the discovery of the new species, this genus comprises of two species from Indochina. This genus is unique in their relatively short antennae (also observed in *Sclerogryllus* Gorochov, 1985) and velvety black body (also observed in *Acanthoplistus* Saussure, 1877, *Agryllus* Gorochov, 1994, *Squamigryllus* Gorochov, 2001 and *Sclerogryllus*); but it differs by the combination of the following characters: small body size, large eyes, presence of tympana, developed stridulatory apparatus, but mainly by the original structure of male genitalia.

#### *Mimicogryllus splendens* Tan, Gorochov & Wahab, new species

(Figs. 2, 3)

*Mimicogryllus* sp., Tan & Wahab, 2018a: 127 and Fig. 9F–I

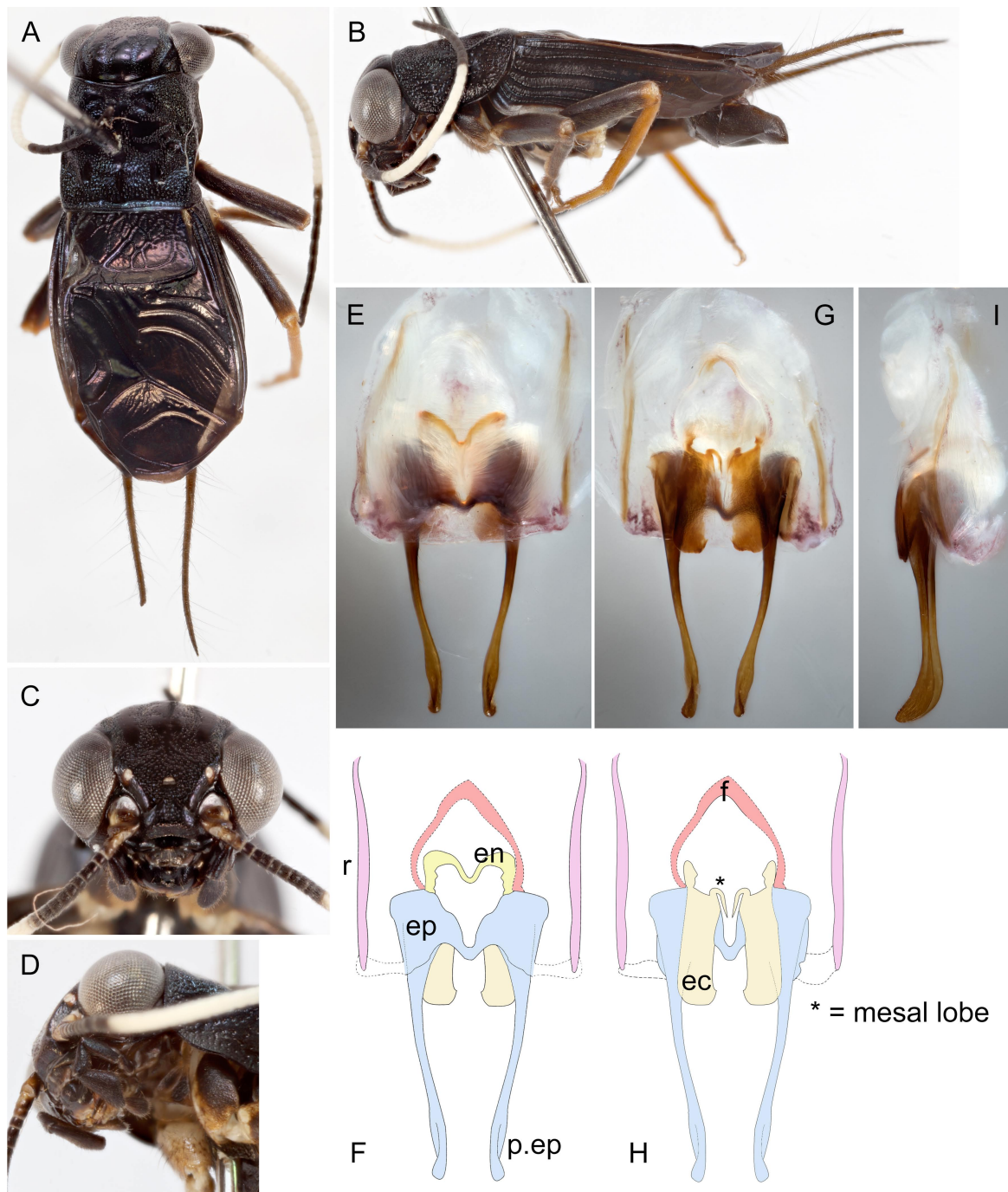
**Material examined.** Holotype (male, KB.17.73), **Brunei Darussalam**, Temburong District, Kuala Belalong Field Studies Centre, along Ashton Trail, ridge dipterocarp forest, N4.54590, E115.15696, 121.1±7.1 m, 26 July 2017, 1827 hours, on leaf litter, coll. M.K. Tan (UBDM).

Paratype: 1 female (BRU.19.46), **Brunei Darussalam**, Belait District, Wasai Wong Kadir Recreational Park, N4.34177, E114.44603, 46.3±8.9 m, 1 March 2019, 1834 hours, on leaf litter, coll. M.K. Tan & H. Yeo [collected as a juvenile and raised to adulthood] (ZRC).

**Diagnosis.** The new species differs from all known species of *Mimicogryllus* by the distinctly longer (about as long as the rest of the genitalia) posteroventral epiphallic lobes.

**Description.** Male. Body small, dorsoventrally compressed, with head and pronotum densely punctuated and having very fine and short hairs (Figs. 2A, 2B). Head in dorsal view transverse (2.9 times wider than long), with four non-punctuated smooth stripes stretching from the posterior part of the head to the rostrum and slightly raised above the punctuated parts; head rostrum 1.3 times as wide as scapus, with apex truncated (in dorsal view) (Fig. 2A); scapus rounded, distinctly wider than pedicel; antennae relatively short, with about 37 long segments (not including scapus and pedicel) (Fig. 2A); eyes distinctly oblong, clearly projected laterally; head in anterior view with clypeal suture distinct and straight, wider than high (Fig. 2C); median and lateral ocelli positioned behind antennal scapus; median ocellus wider than long and located slightly before lateral ocelli; lateral ocellus more rounded, located between scapus and anterior margin of eye; maxillary palpi fairly stout, with apical (fifth) segment elongated, obliquely triangular (but its apex truncated) and slightly longer than third and subapical (fourth) segments; fourth segment also obliquely (but less elongate) triangular; third segment of subequal length and more cylindrical (Fig. 2D). Pronotal disc 1.1 times as long as wide, generally punctuated but with some lateral swellings which are smooth; disc with longitudinal groove which is slightly swollen at the posterior part; a pair of smooth swellings located laterally from this posterior part; anterior margin of disc slightly concave; posterior one clearly straight; lateral carina obvious (Fig. 2A). Pronotal lateral lobe 2.1 times as long as high, with dorsal half punctuated (although less densely than pronotal disc), and ventral margin irregularly sinuous (Fig. 2B). Fore tibia without inner tympanum but with a large elongated outer tympanum; fore and middle legs generally very pubescent, with a few stout setae located usually along ventral margin; their tarsus with a row of stout setae on ventral surface; inner and outer margins of hind tibia with four stout articulated spurs (also known as movable spines) on each dorsal side, with 3–5 inner and 6–8 outer much smaller basal spines, with two long dorsal and one short ventral inner apical spurs, and with one short dorsal and two long ventral outer apical spurs; hind basitarsus with about two inner and five outer denticles. Tegmen shiny, extending to abdominal apex; dorsal field longer than lateral field; mirror large, wider than long, with anterior margin angular, with posterior margin curved and separated by a curved dividing vein, and with anal area small and having apex obtusely truncated (Fig. 2A); lateral field with six longitudinal veins (Fig. 2B). Anal plate tongue-shaped, smooth, with apex subtruncate; subgenital plate elongated, triangular, smooth but with

sparse short and fine hairs, with subacute apex. Male genitalia as shown in Fig. 2E–2I: epiphallus (ep) divided into a pair of large lateral sclerites which connected with each other by a narrow bridge; each of these sclerites strongly and transversally folded forming posterodorsal and posteroventral lobes; posterodorsal epiphallic lobes moderately elongate and having thin lateral arms articulated with rami; posteroventral ones (p.ep) very long and slender, directed backwards but with distal parts somewhat widened in profile and slightly curved upwards, weakly tapering in the basal half, slightly curved inwards after the middle, and with rounded apices; ectoparameres (ec) lamellar, in ventral view elongate, rectangular and with roundly truncated apex, in lateral view with ventral surface slightly convexly curved, and with small (narrow) mesal lobule fused with main body of ectoparamere at the inner anterior corner of the latter as well as curved backwards and having an acute apex (this lobule not reaching connecting bridge of epiphallus); endoparameres (en) fused with each other anteriorly characteristics of the subfamily; formula (f) (= mould of spermatophore attachment plate) flattened, semi-sclerotized and heart-shaped; rami (r) in dorsal view very straight, not fused together by the anterior ends.



**FIGURE 2.** *Mimicogryllus splendens* Tan, Gorochov & Wahab, **sp. nov.** male holotype: dorsal (A) and lateral (B) habitus; face in anterior view (C); head in latero-ventral view (D); genitalia in dorsal (E, F), ventral (G, H) and lateral (I) views.

Female (Fig. 3). Body structure similar to that of male but with following differences: tegmen strongly shortened, glossy, slightly surpassing posterior margin of third abdominal apex; its dorsal field flat, with six to seven longitudinal veins joined by net of cross veins; its lateral field with four longitudinal veins; anal plate triangular with obtuse apex. Subgenital plate small, parallelogram in shape, with apex truncated. Ovipositor relatively short, barely surpassing apex of cercus, straight, with apex obtuse; dorsal and ventral valves dorsoventrally flattened in the apical part; external margin of this part in each dorsal valve with one distinct lateral denticle.

Colouration. Generally black (Figs. 2A, 2B, 3). Head and pronotum metallic black (Fig. 2A, 2B, 3); scapus and pedicel brown; flagellum with 10 basal segments black, 11<sup>th</sup>–26<sup>th</sup> segments white, and more distal ones black; gena, maxillary palpi and clypeus iridescent black (Fig. 2D). Tegmen completely black (Figs. 2A, 2B, 3). Foreleg with coxa black dorsally and brown to pale ventrally, with femur mostly black but having knee area slightly whitish, with tibia also black; middle leg with coxa white, colouration of femur similar to that of foreleg, and tibia brown; hind femur mostly black, but with red brown mark near knee; hind tibia red brown at the base, black thereafter and brown apically; hind tarsus yellow brown (Figs. 2A, 2B, 3). Thoracic segments black; abdominal tergites and sternites, including anal and subgenital plates, black but not metallic; cerci dark brown.

Measurements (in mm). Male holotype BL = 7.5; HL = 1.4; PL = 2.4; PW = 2.5; TL = 4.7; TW = 3.4; HFL = 5.1; HTL = 4.1. Female paratype BL = 7.7; HL = 1.4; PL = 2.1; PW = 2.1; TL = 2.1; TW = 1.3; HFL = 5.0; HTL = 3.1; OL = 3.9.

**Etymology.** The species name refers to the shining appearance of the cricket (from Latin, *splendens* = bright, shining, splendid).

**Natural history.** This species is probably an opportunistic detritivore, being a leaf-litter dweller. In captivity, the female survived on a variety of waste/ rotten fruits.



**FIGURE 3.** *Mimicogryllus splendens* Tan, Gorochov & Wahab, sp. nov. female paratype: lateral (A) and dorsal (B) habitus.

## Subfamily Phaloriinae

### Genus *Vescelia* Stål, 1877

Type species: *Vescelia infumata* Stål, by original monotypy

**Remarks.** Prior to the discovery of the new species, this genus comprises of six species from Asia: two species from Borneo, two species from the Philippines and two species from Indochina and East Asia. Species are very similar superficially to *Trellius* Gorochov, 1988; but differ by the male genitalia. Species are also similar to *Sumatloria* Gorochov, 2003; but differ in the absence of additional long epiphallic processes positioned dorsomedially from general (usual) posterolateral processes.

### *Vescelia sepilokensis* Tan, Gorochov, Japir & Chung, new species

(Figs. 4, 5)

**Material examined.** Holotype (male, SDK.19.24), East Malaysia, Sandakan District, Sepilok, Rainforest Discovery Centre, dipterocarp forest, N5.87524, E117.94215, 36.3±6.0 m, 9 January 2019, 1940 hours, near stream, coll. M.K. Tan, R. Japir, M. Binti & J.L. Yukang (FRC).

**Diagnosis.** The new species differs from all known species of *Vescelia* with known males by the presence of additional movable elongate rachial ectoparameres (ec) or ventral sclerite in the male genitalia which are located on membranous lateral folds under lateral parts of rachis, and by the distal parts of rachis having lateral lobules directed aside.

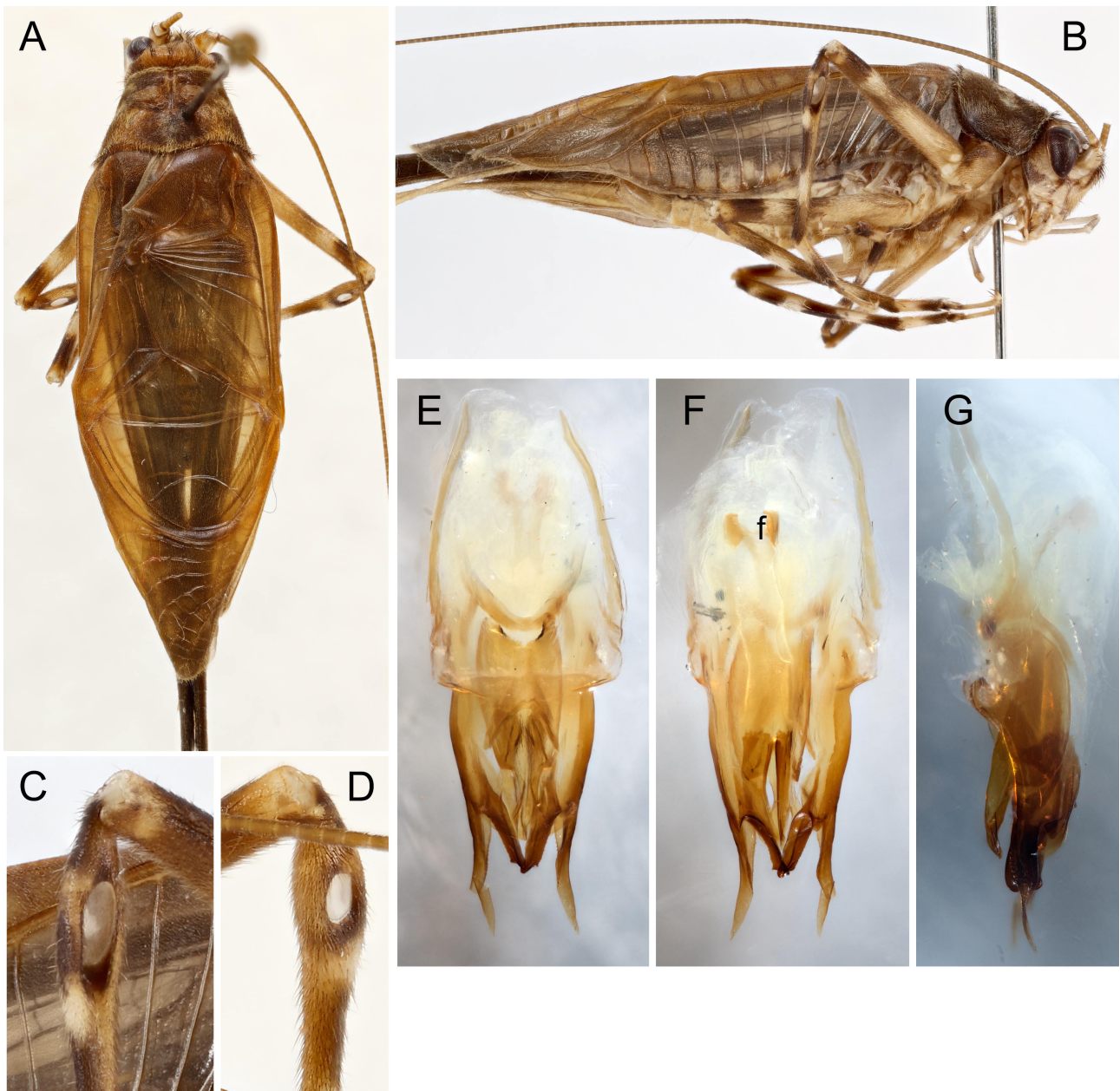
**Comparison with congeners.** The new species is somewhat similar to *Vescelia pieli* (Chopard, 1939) (China, Japan, Vietnam), *V. mulu* Gorochov, 2014 from Sarawak and *V. variegata* (Chopard, 1937) from Palawan in the rachis having a pair of distal lobes. However, the new species is additionally distinguished from the first and second species by the ectoparameres which are much not reaching apices of distal epiphallic processes, and from the second and third one, by the rachis with less deep posteromedian notch. From *V. picta* (Chopard, 1932) from Kalimantan, the new species differs in the same characters as in Diagnosis as well as in the male genitalia longer, epiphallic distal processes not curved in profile, ectoparameres thinner and longer, and rachis distinctly bifurcated. *Vescelia infumata* Stål, 1877 from the Philippines is impossible for comparison, as it is known only from female.

**Description.** Male. General appearance typical of this genus (Figs 4A, 4B). Head with frontal rostrum between antennal cavities approximately as wide as scapus, pubescent with strong long setae; eyes large, globular in dorsal view but elongated in lateral view; maxillary palpus long and slender, with apical segment longest, and with sub-apical segment shorter than third segment (apical segment only slightly widened apically); ocelli rounded; median ocellus surrounded by strong long setae. Pronotal disc pubescent, moderately transverse (1.3 times as wide as long), widening posteriorly; anterior margin of disc straight, with a row of strong setae developed also along anterior edge of pronotal lateral lobe; posterior margin of disc angularly convex, without strong setae (Fig. 4A). Pronotal lobe also pubescent, slightly longer than wide, with anteroventral corner almost 90°, and with ventral margin straight (Fig. 4B). Legs densely pubescent, especially the ventral margins; fore tibia with a large, oblong inner tympanum, distinctly immersed; outer tympanum of this tibia oval and smaller, not immersed (Figs. 4C, 4D); hind tibiae with 4 pairs of long movable dorsal spines (long and slender, with apex slightly hooked), not very numerous small immovable spinules between them, and 6 long spurs (=apical spines); hind tarsus with two rows of small dorsal spines. Tegmen reaching middle of cercus, very finely pubescent, with 6 harp veins in dorsal field, with mirror about as long as wide and having 2 dividing veins (anterior vein straight; posterior one shorter and curved; Fig. 4A); lateral tegminal field wide, with 17 branches of Sc and 13 cross-veins between R and M (Fig. 4B); R and M diverging gently in basal half and strongly converging towards the apex; area between these veins widest at its distal third; hind wings distinctly exposed behind tegmina, reaching apex of cercus. Subgenital plate rectangular (longer than wide), with apical part truncate, with median ventral groove, and with shallow ventral depression on distal half. Genitalia (Figs. 4E–G, 5): epiphallus with posterolateral epiphallic lobes (p.ep) long and slender, surpassing apices of ectoparameres; with a pair of medial ventral epiphallic lobes (m.ep); rachis (ra) large, elongate, plate-like, strongly narrowing near bifurcated apical part (with narrow and not very deep posteromedian notch), and with rather

large lateral lobules on this part directed aside, at the base with a forked sclerite underneath the epiphallus; rachial ectoparameres (ec) or ventral sclerite located on membranous lateral folds under lateral parts of rachis and movable, elongated, converging towards each other posteriorly, with lateral margins parallel, and with apical part truncated but having apical lobule on inner margin (this lobule stout and with obtuse apex); endoparameres (en) in shape of arcuate ribbons located near (along) anterior edge of rachis, fused with each other in median part, having elongate and rather narrow posterior arms as well as moderately long anterior apodemes; formula (f) elongated and weakly sclerotized, with a pair of bean-shaped lateral lamellae in anterior part, with elongate and not very narrow posterior part, and without apodeme; rami (r) in dorsal view straight, not fused together by the anterior ends.

Female. Unknown.

Colouration. Body brown with following marks: head with dark patterns on vertex, with median and lateral ocelli white, and with mouthparts light brown; fore and middle femora light brown with 2 brown bands (one band fainter and located near middle; second one located near knee); fore and middle tibiae with 2 whitish bands (one just below tympanum, and one near apex); hind femur pale with four brown bands, knee pale brown, hind tibiae with five dark brown bands (some of them situated between spurs); tegminal lateral field with membranes between R and M light yellowish brown, and with membranes between Sc branches transparent; abdomen with cerci light brown.

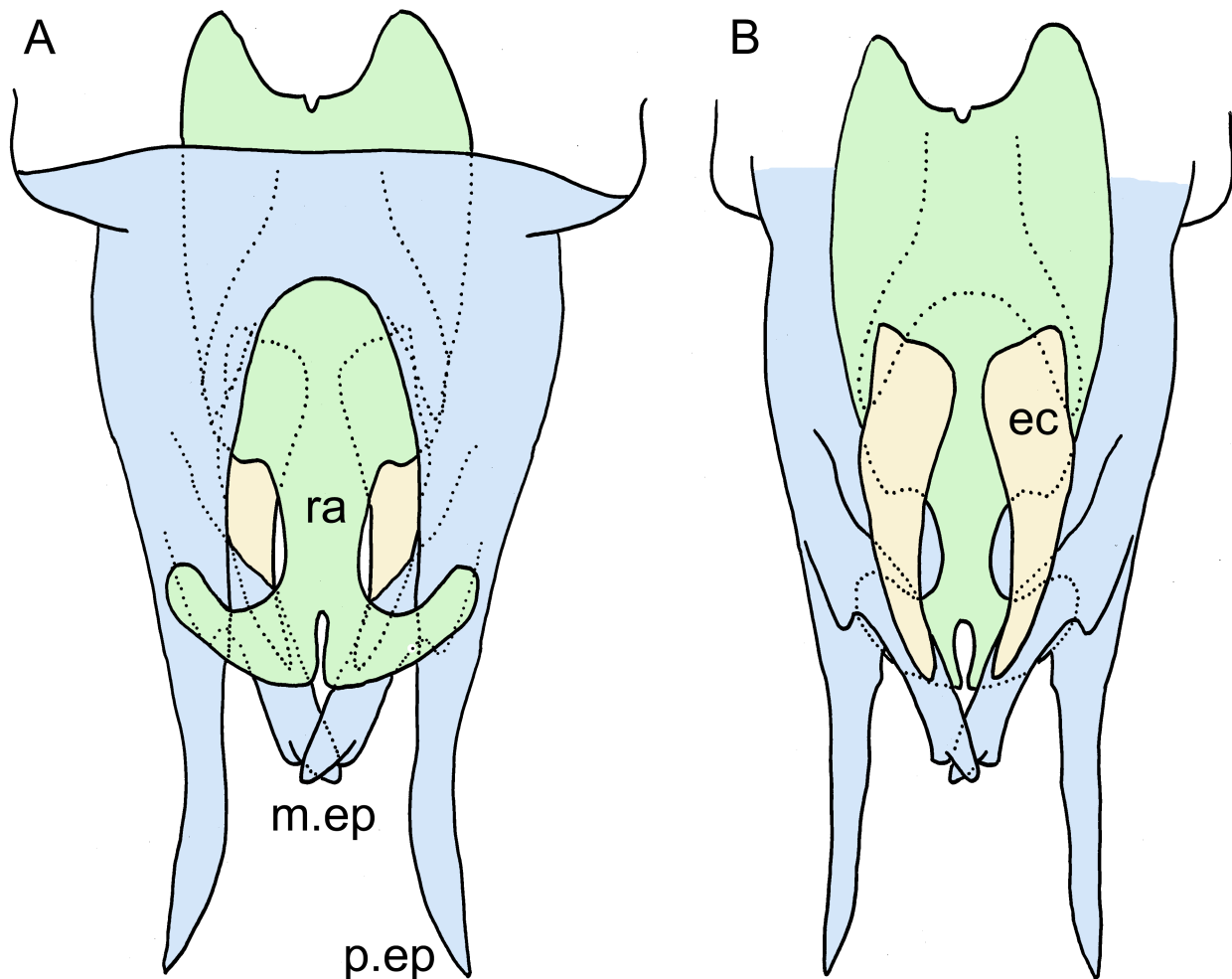


**FIGURE 4.** *Vescelia sepilokensis* Tan, Gorochov, Japir & Chung, **sp. nov.** male holotype: dorsal (A) and lateral (B) habitus; outer (C) and inner (D) tympana; genitalia in dorsal (E), ventral (F) and lateral (G) views.



Measurements (in mm). BL = 12.8; HL = 1.6; PL = 3.2; PW = 4.3; TL = 15.4; TW = 6.0; HWL = 21.1; HFL = 12.6; HTL = 12.6.

**Etymology.** The species is named after the type locality, Sepilok in Sandakan.



**FIGURE 5.** *Vescelia sepilokensis* Tan, Gorochoy, Japir & Chung, **sp. nov.** male genitalia (posterior end): Schematic diagram in dorsal (A) and ventral (B) views.

### Subfamily Pteroplistinae

### Genus *Pteroplistes* Brunner von Wattenwyl, 1873

Type species: *Pteroplistus acinaceus* Saussure, by subsequent designation

**Remarks.** This genus currently consists of nine extant species (Cigliano *et al.*, 2019). They are described from India (three species), Malay Peninsula (two species), Borneo (two species), Sumatra (one species), and Java (one species, but its belonging to this genus and synonymy with another Javanese species are problematic).

### *Pteroplistes bruneiensis* Tan, Gorochoy & Wahab, new species (Figs. 6–9)

**Material examined.** Holotype (male, BRU.19.55), **Brunei Darussalam**, Belait District, along Jalan Labi at Teraja,

abandoned fruit plantation, N4.28479, E114.41841, 46.7±5.2 m, 1 March 2019, 2033 hours, on tree trunk, coll. M.K. Tan & H. Yeo (UBDM).

Paratypes: 2 males, 1 female: 2 males (BRU.19.59, 60), same locality as holotype, N4.28487, E114.41817, 28.7±4.9, 2 March 2019, 1906 hours, on tree trunk, coll. M.K. Tan & H. Yeo; 1 female (KB.17.79), **Brunei Darussalam**, Temburong District, Kuala Belalong Field Studies Centre, along Ashton Trail, ridge dipterocarp forest, N4.54714, E115.15715, 90.1±7.3 m, 26 July 2017, 2102 hours, on foliage, coll. M.K. Tan (all ZRC).

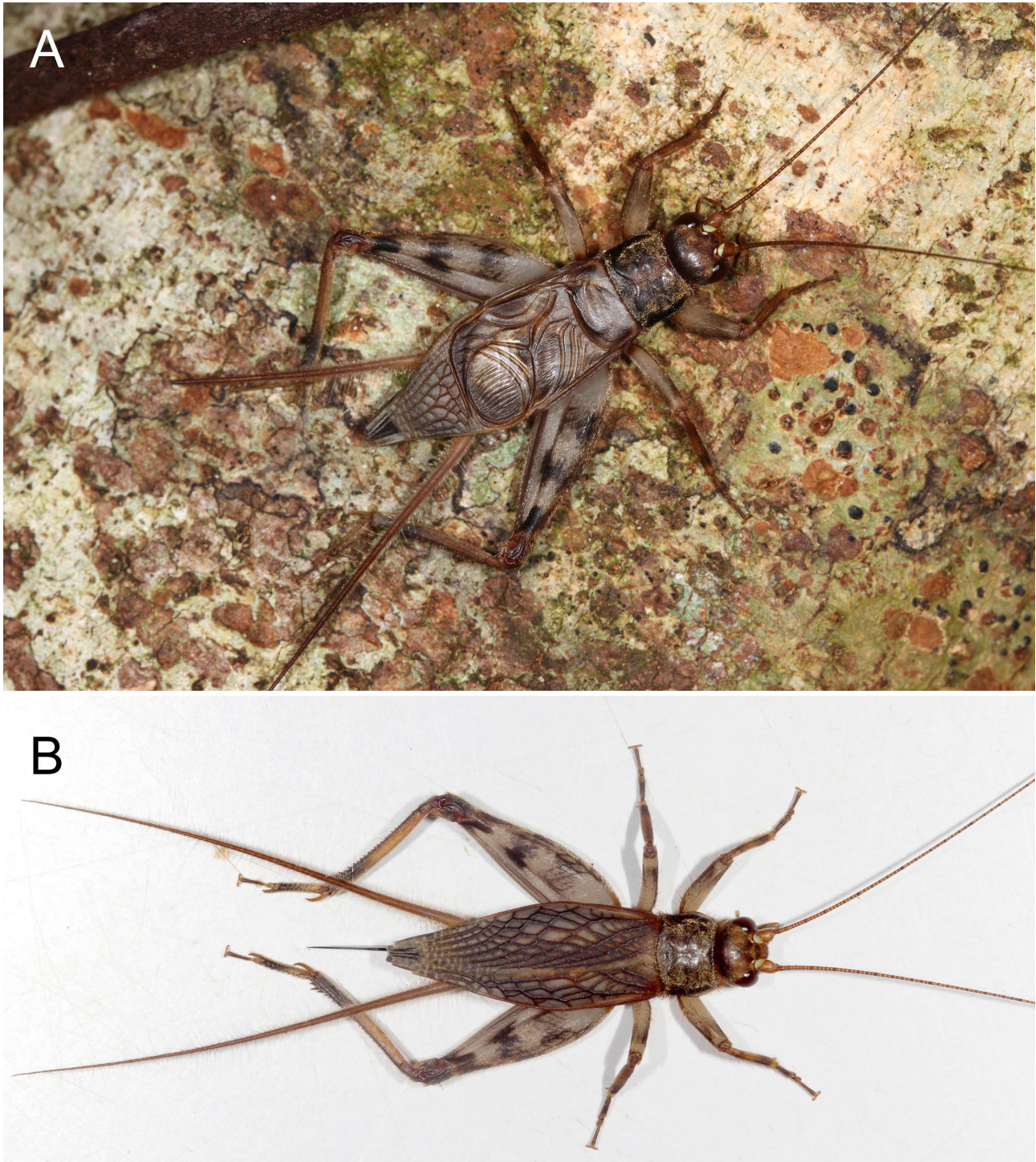
**Diagnosis.** The new species differs from all known species of *Pteroplistes* by the following characters: rachis (=guiding rod) in male genitalia almost straight, rather short and broad, located nearly perpendicular to the longitudinal axis of genitalia, and with posterior (dorsal in other congeners) process strongly bifurcated.

**Comparison with congeners.** In bifurcated posterior (dorsal) process of rachis, the species is similar to *Pteroplistes acinaceus* Saussure, 1877 from Malay Peninsula, *Pteroplistes borneoensis* Gorochoy, 2004 from Sandakan (Sabah) and Sarawak and *Pteroplistes malaccanus* Gorochoy, 2018 from Malay Peninsula, but this bifurcated part is with wider distance between its apices in *P. acinaceus*, and rachis is more straight and shorter than in *P. borneoensis* and *P. malaccanus*. The new species also differs from *P. borneoensis* in the lobules on male anal plate longer and with thinner proximal part, rachis almost straight and directed downwards, and upper process of rachis fairly broad (in lateral view).

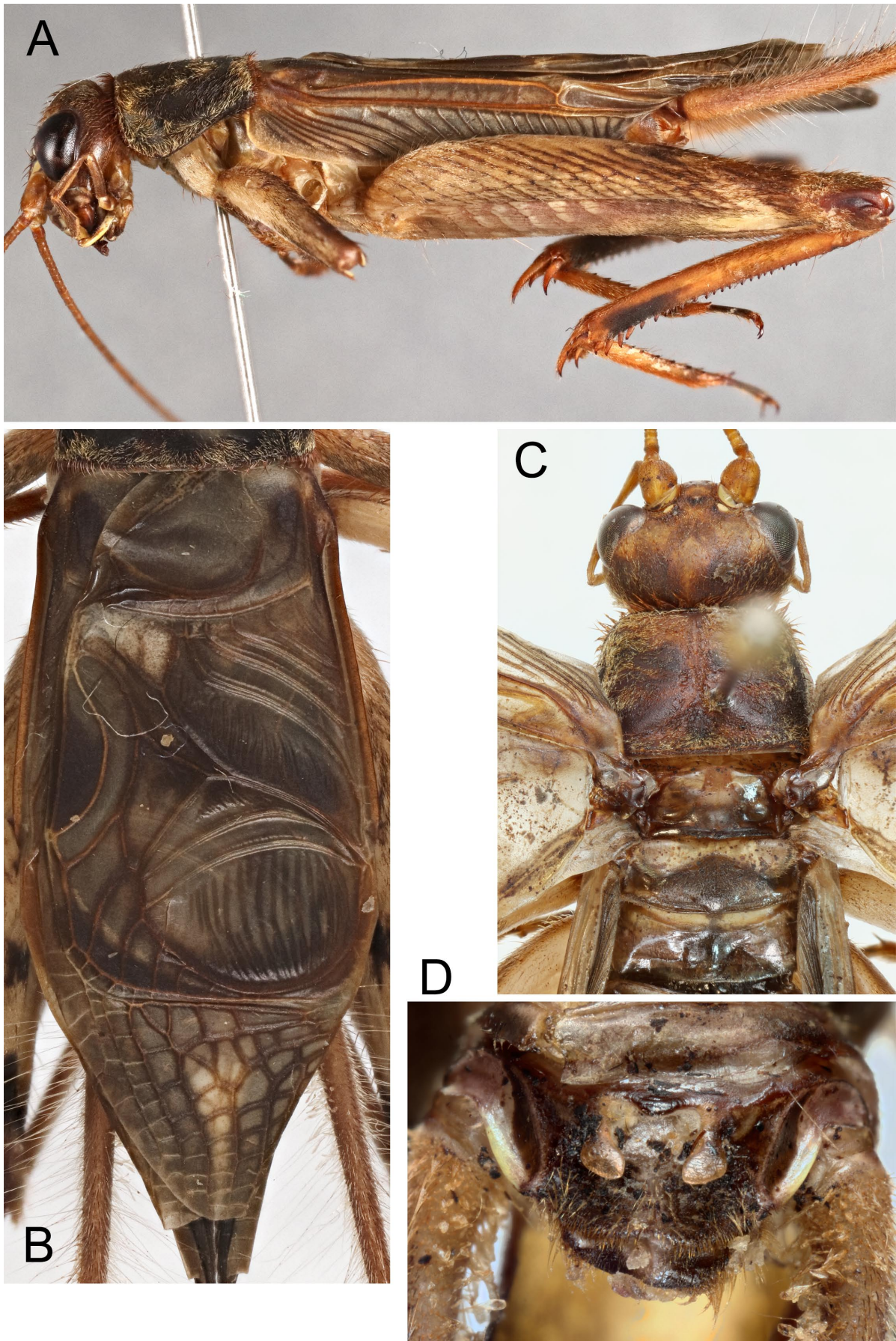
The new species is also similar to *Pteroplistes lagrecai* Gorochoy, 2004 from Mount Kinabalu (Sabah) in the rachis is almost straight and nearly perpendicular to the longitudinal axis of genitalia, and apex of posterolateral epiphallal lobes with an outward-pointing hook; but it differs from the latter in rachis fairly broad (in lateral view), upper process of rachis bifurcated, and apex of endoparamere less strongly curved backwards (i.e., this apex is located distinctly before the middle of genitalia; vs. at the middle of genitalia in *P. lagrecai*).

**Description.** Body distinctly dorsoventrally compressed, with head and pronotum clearly pubescent (Figs. 6A, 7A). Head rostrum about as wide as scapus, with apex truncated (in dorsal view) (Fig. 7C); scapus rectangular; maxillary palpi elongated, with subapical segment longest, and with apical segment subequal to third segment in length but slightly wider apically (its apex obliquely truncated); eyes globular in dorsal view, elongated in lateral view; median ocellus small; lateral ocelli large, located near eyes; lateral ocelli small, located ventrally of median ocellus. Pronotal disc 1.1 times as wide as long, pubescent with strong hairs along anterior and posterior margins; anterior margin of disc slightly concave; posterior margin of disc straight (Fig. 7C). Pronotal lateral lobe 1.5 times as long as high, with ventral margin rising posteriorly (Fig. 7A). Fore tibia with minute oval tympana on both sides; fore and middle legs generally pubescent (especially along ventral margin), with a few stout setae usually located along dorsal margin; their tarsus with a row of stout setae on ventral surface; hind femur pubescent and flattened, without ventral spines; hind tibia also pubescent, with about 18 small and stout spines on each dorsal side, with 2 long ventral apical spurs on inner margin and 4 shorter other apical spurs; hind basitarsus with about 7 inner and 7 outer denticles. Tegmen (Fig. 7B) not pubescent, extending beyond abdominal apex, with dorsal field longer than lateral field, and with five oblique veins in harp area; tegminal mirror large, about as wide as long, with anterior margin angular, with posterior margin widely rounded, and with two parallel dividing veins which gently-curved and located close to one another; anal area of tegmen longer than length of mirror; lateral field wide, with 20 branches of Sc and about 10 cross-veins (often indistinct) between R and M (Fig. 7A); R and M mostly parallel, strongly converging towards the apex; hind wings slightly surpassing tegmina (Fig. 6A). Metanotal gland with anterior half having dorsal convexity; this convexity large, transverse, non-pubescent, with two punctures in the middle near the anterior margin, with lateral parts bulbous, and with posterior margin concave forwards and distinctly carinated; posterior half of this gland pubescent, with small bulbous lobules laterally, and with posterior edge having obtuse-angled median tubercle (Fig. 7C). Anal plate tongue-shaped, with a small (short) triangular median lobule near the anterior margin and lamellate lateral lobules more or less similar to those of *P. lagrecai* (see Gorochoy, 2004: Fig. 27) (Fig. 7D). Subgenital plate trapezoidal, about as long as wide anterior margin wide, lateral margins tapers slightly posteriorly, posterior margin deeply emarginated. Male genitalia as shown in Fig. 8: epiphallus (ep) almost H-shaped, with strongly transverse median part, moderately long posterolateral lobes and very long anterolateral parts; posterolateral epiphallal lobes (p.ep) lamellate, but with strongly sclerotized inner margins as well as basal and distal parts only (lateral parts of these lobes, except for distal parts, membranous); distal parts of these lobes hook-like apically, with apices of these hooks directed aside; rachis (ra) very strongly sclerotized, almost straight and stout in lateral view, and directed almost perpendicularly downwards in relation to the longitudinal axis of genitalia; apical part of rachis tapering into an acute apex, laterally compressed when viewed ventrally; anterior

margin of rachis straight when viewed laterally; apical part of rachis pointed, looking slightly less sclerotized; posterior margin of rachis, when viewed laterally, substraight, slightly sinuated after posterior (dorsal) process; this process almost perpendicular to rachis but somewhat curved in lateral view, strongly bifurcated, with each branch slightly hooked and pointing posteriorly and slightly dorsad (i.e., backwards and slightly upwards); endoparameres (en) strongly sclerotized, slender, with anterior parts curved ventrad and posteriorly, and with posterior parts almost touching each other. Formula (f) complicate shape, with long lateral projections: one strongly sclerotized, curved ventro-posteriorly and forked at the apex (each apical branch with acute apex pointing posteriorly); another projection produced anteriorly, slightly less sclerotized, lamellate and with obtuse apex; rami (r) strongly S-shaped, widened and lamellate in the middle part.



**FIGURE 6.** *Pteroplastes bruneiensis* Tan, Gorochov & Wahab, **sp. nov.** male (A) and female (B) in dorsal view.



**FIGURE 7.** *Pteroplites bruneiensis* Tan, Gorochov & Wahab, **sp. nov.** male habitus in lateral view (A); tegmen in dorsal view (B); head, pronotum and metanotal gland in dorsal view (C); anal plate in dorsal view (D).

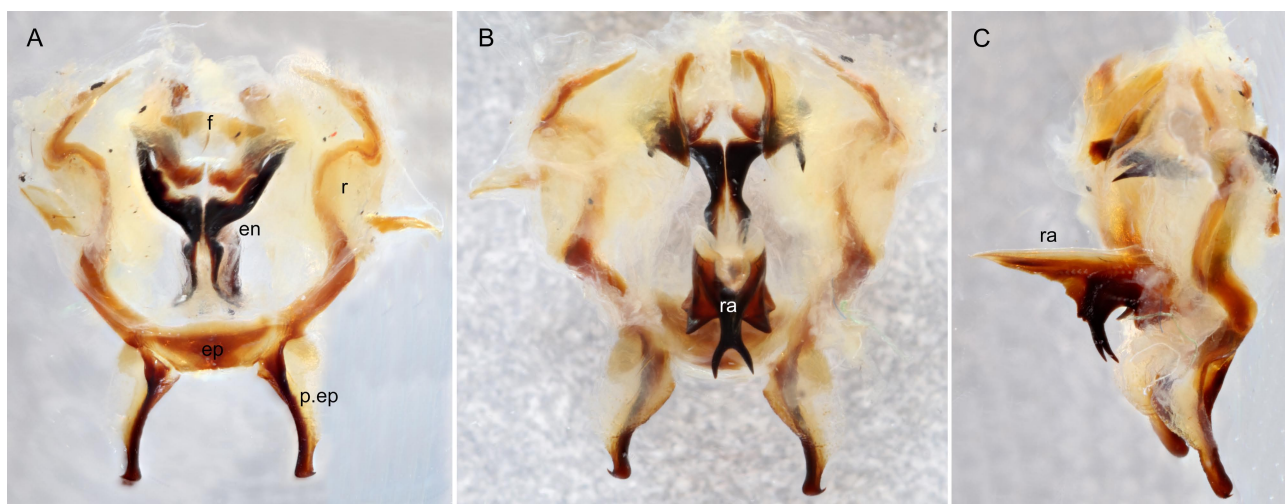
Female (Fig. 6B). Similar to males, but dorsal tegminal field with 9–10 longitudinal branches (some of these branches in middle part of tegmen more or less S-shaped) and rather numerous cross-veins (in proximal and middle parts of tegmen, these cross-veins obliquely situated, and cells between them largest in middle part of tegmen), lateral tegminal field with 11–13 branches of Sc and 12–13 cross-veins (often indistinct) between R and M (Fig. 9A), metanotal gland absent, and anal plate unspecialised. Subgenital plate large, transverse, broadly rounded, with apex having a minute posteromedian notch (Fig. 9B). Ovipositor typical of genus: elongated, reaching middle of hind tibia, and with margins smooth; ventral margin gently curved upwards in distal half; dorsal margin also very gently curved upwards but with small and almost obtusely angular convexity before distal part; distal part of ovipositor (after this convexity) straight and tapering into an acute apex (Fig. 9C).

Colouration. Body generally brown (Fig. 6). Head and pronotum dark brown (Fig. 7A); scapus and pedicel red brown; gena, maxillary palpi and clypeus brown to red brown (Fig. 7A). Tegminal dorsal field with black pattern near anterior area, chord area and behind mirror; lateral tegminal field pale brown with brown veins (Fig. 7B). Fore and middle legs with coxa brown, femur pale, tibia and tarsus brown; hind femur mostly pale with spot of black pattern on the dorsal edge before middle, at apical third and knee area of inner surface (knee of this femur dorsally dark brown, ventrally red brown); hind tibia and tarsus brown, with distal part darker, and with black spines (Fig. 6). Thoracic and abdominal segments yellow brown to brown.

Measurements (in mm). Male holotype BL = 17.7; HL = 2.7; PL = 3.2; PW = 3.4; TL = 15.5; TW = 6.6; HWL = 16.3; HFL = 12.2; HTL = 7.8. Female paratype BL = 14.5; HL = 2.8; PL = 3.5; PW = 4.0; TL = 13.9; TW = 4.0; HWL = 15.5, HFL = 21.3; HTL = 8.6; OL = 9.5.

**Etymology.** The species is named after the type locality, Brunei Darussalam.

**Natural history.** Numerous individuals, including nymphs, were found dwelling on the tree trunk.



**FIGURE 8.** *Pteroplistes bruneiensis* Tan, Gorochov & Wahab, **sp. nov.** male (holotype) genitalia in dorsal (A), ventral (B) and lateral (C) views.

### Genus *Tembelingiola* Gorochov, 2004

Type species: *Tembelingiola plana* Gorochov, by original monotypy

#### *Tembelingiola belaitensis* Tan, Gorochov & Wahab, new species

(Figs. 10–12)

**Material examined.** Holotype (male, BRU.19.44), **Brunei Darussalam**, Belait District, Andulau Forest Reserve, near peat swamp forest, N4.62535, E114.51429, 101.4±6.0 m, 28 February 2019, 2043 hours, calling on tree trunk, coll. M.K. Tan & H. Yeo (UBDM).

Paratype: 1 female (BRU.19.52), **Brunei Darussalam**, Belait District, along Jalan Labi at Teraja, abandoned fruit plantation, N4.28462, E114.41859, 36.8±6.1 m, 1 March 2019, 2010 hours, on branch of tree sapling, coll. M.K. Tan & H. Yeo (ZRC).



**FIGURE 9.** *Pteroplites bruneiensis* Tan, Gorochov & Wahab, **sp. nov.** female: body in dorsal view (A); subgenital plate in ventral view (B); ovipositor in lateral view (C).

**Diagnosis.** The new species strongly differs from the type and previously alone species of this genus in the male genitalia having ectoparameres much smaller (narrower and shorter, strongly not reaching apices of epiphallic posterolateral lobes), rachis with much longer distal (narrowed) part, endoparameral apodemes shorter, formula also shorter but with much wider lateral parts.

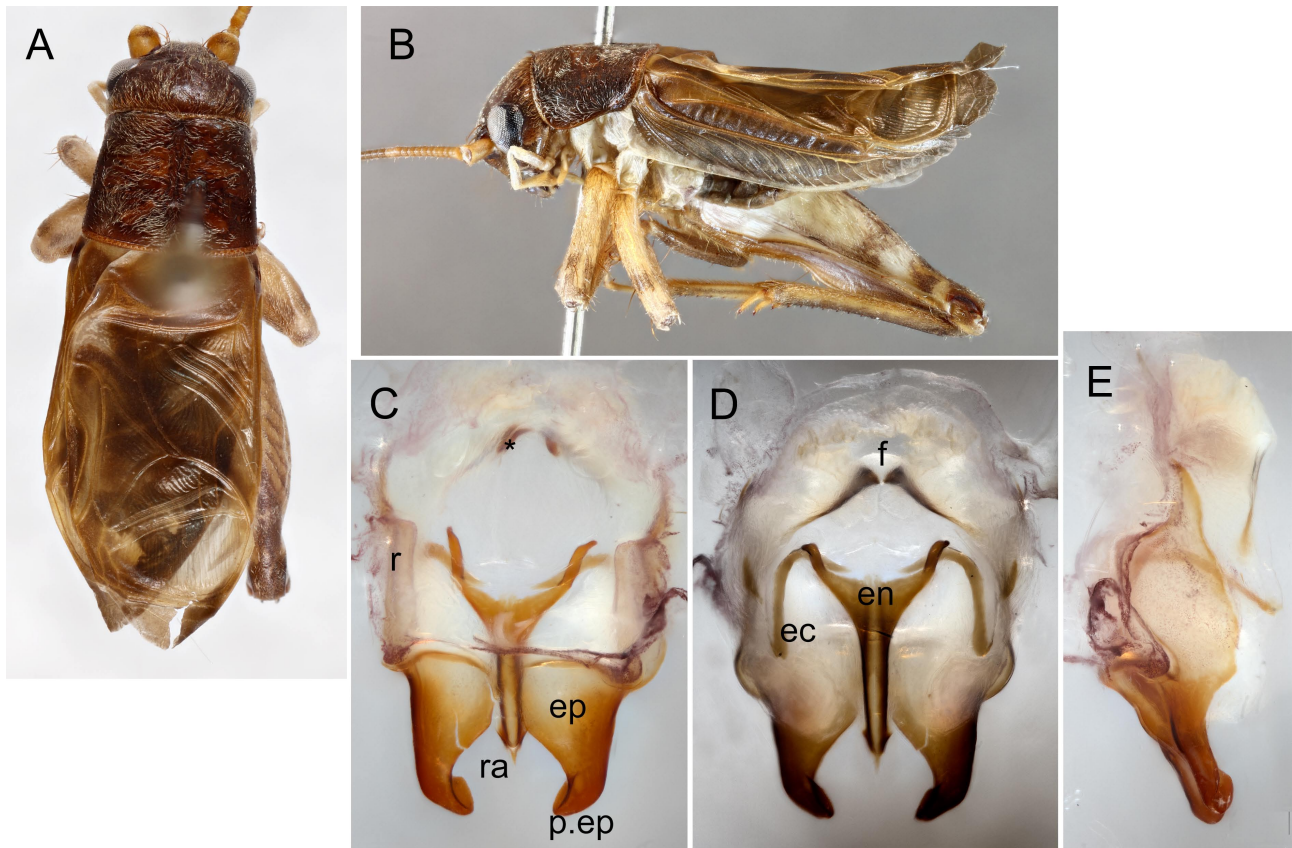
**Description.** Male (Fig. 10A). Body well pubescent (Figs 11A, 11B). Head with rostrum angularly-rounded in profile (Fig. 11B); this rostrum between antennal cavities slightly wider than scapus; ocelli present, rounded; lateral ocelli smaller than median ocellus. Pronotum weakly transverse, barely widening posteriorly; anterior and posterior margins of pronotal disc fairly straight (Fig. 11A). Inner tympanum large, oval (opened) and not immersed; outer tympanum undeveloped; hind tibiae with only numerous small dorsal denticles with 3 pairs of apical spurs; hind basitarsus with 2 rows of dorsal spines (each row with 5–6 spines); apical spurs of hind basitarsus long but not reaching middle of third tarsomere. Tegmina slightly surpassing abdominal apex; its dorsal field with rather long diagonal vein, moderately short apical area, 6 oblique veins (3 long ones and 3 shorter ones), and tegminal mirror approximately 1.1 times as wide as long (Fig. 11A); lateral tegminal field with about 11 branches of Sc and 12 crossveins between R and M; hind wings not exposed (Fig. 11B). Subgenital plate wider than long, with apex having an angular posteromedian projection (with obtuse apex) and very short posterolateral projections and with notches between posteromedian lobule and posterolateral lobules. Male genitalia as shown in Fig. 11C–E: epiphallus (ep) divided into two lateral parts; posterolateral epiphallic lobes (p.ep) broad and moderately long, with inner margins concave in dorsal view, and with external margins straight but curved inwards at the distal part (distal parts of these lobes slightly hook-like, with apices obtusely rounded); rachis (ra) strongly sclerotized, long and straight; apical part of rachis tapering into an acute apex; ectoparameres (ec) very small (narrow and shortened, strongly not reaching apices of epiphallic posterolateral lobes); endoparameres (en) completely fused with rachis, with apodemes short; formula (f) short, lamellate and weakly sclerotized, divided into two lateral half, each half with a short process (\*) at the interior end pointing dorsad; rami (r) weakly sclerotized, fused with epiphallus, in dorsal view somewhat arcuately curved in distal part and straight in rest part, and lamellate in lateral view.



**FIGURE 10.** *Tembelingiola belaitensis* Tan, Gorochov & Wahab, **sp. nov.** male holotype (A) and female paratype (B) in natural environment.

Female (Figs. 10B, 12A, 12B). Colouration and structure of body similar to male. However, terminal dorsal field with 5 partly oblique longitudinal branches and with not numerous and slightly irregular crossveins (some of

these cross-veins rather long and very oblique, i.e. situated almost longitudinally) (Fig. 12A), lateral field with 3 branches of Sc and with cross-veins between R and M indistinct (Fig. 12B). Subgenital plate wide but gradually narrowing backwards, with almost widely truncate apex having shallow and rather wide posteromedian notch. Ovipositor dark rufous, weakly arcuate in profile, with middle part rather high (wide) and distal third gradually narrowing to acute apex (Fig. 12D).



**FIGURE 11.** *Tembelingiola belaitensis* Tan, Gorochov & Wahab, **sp. nov.** male holotype: habitus in dorsal (A) and lateral (B) views; genitalia in dorsal (C), ventral (D) and lateral (E) views.

**Colouration.** Brown with following marks: head, pronotum and abdomen with rufous tinge; thoracic sternites light brown; hind legs with distal femoral area, knee, and tibia dark rufous; tegmina light brown but with darker (brown) spots between longest oblique vein of dorsal field and mirror, between R and M, and in apical area.

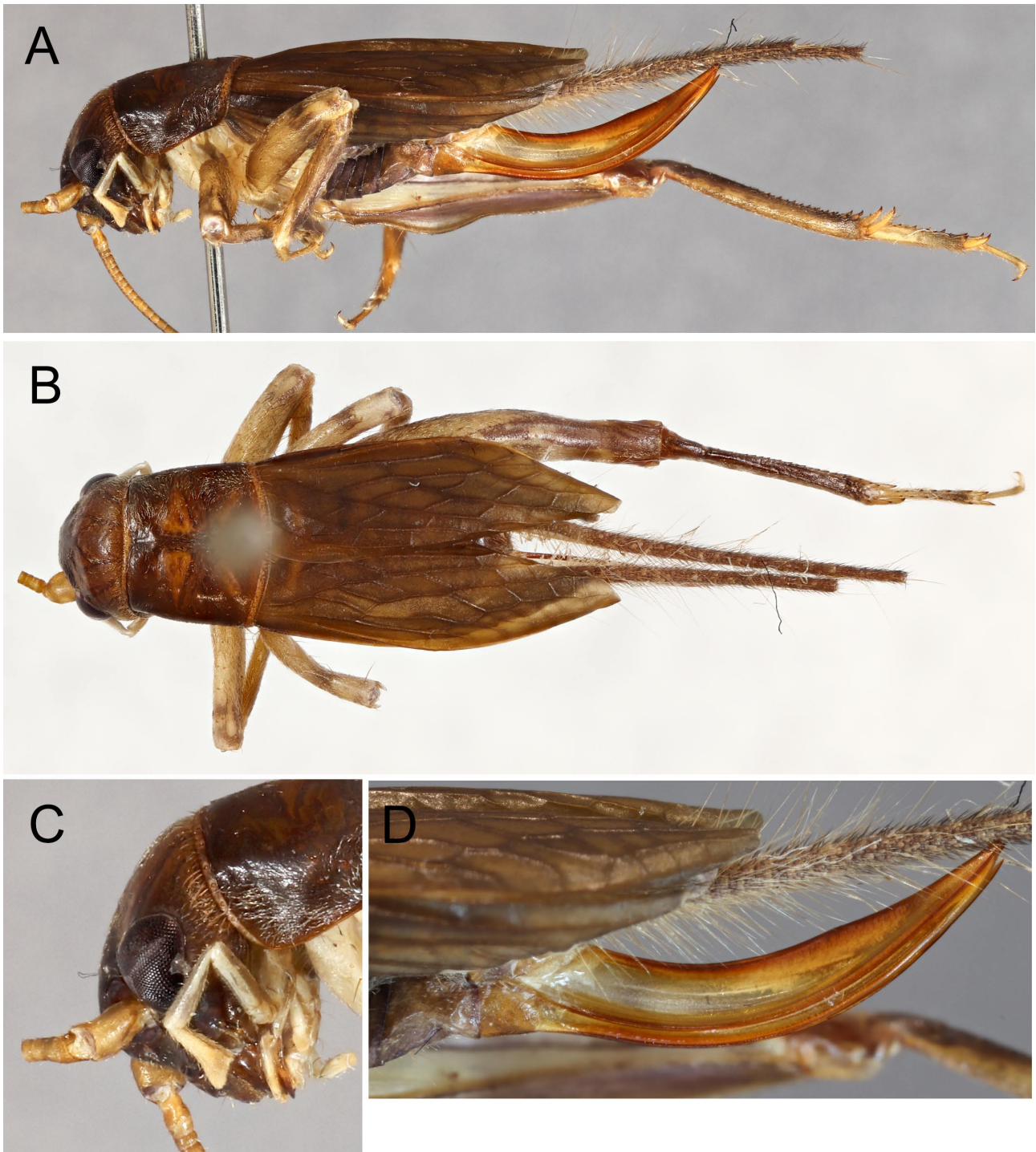
**Measurements (in mm).** Male holotype BL = 7.4; HL = 1.6; PL = 2.2; PW = 2.6; TL = 5.8; TW = 3.0; HFL = 5.9; HTL = 4.0. Female paratype BL = 7.2; HL = 1.7; PL = 2.4; PW = 2.7; TL = 5.8; HFL = 6.6; HTL = 3.9; OL = 4.6.

**Etymology.** The species is named after the type locality, Belait.

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**FIGURE 12.** *Tembelingiola belaitensis* Tan, Gorochov & Wahab, **sp. nov.** female paratype: habitus in lateral (A) and dorsal (B) views; head in lateral view (C); ovipositor in lateral view (D).

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