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New species and bioacoustics of *Varitrella* (*Cantotrella*) (Oecanthidae: Podoscirtinae) from Sulu Archipelago and Borneo's Sabah

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Abstract

Two new species of *Varitrella* (*Cantotrella*) (Oecanthidae: Podoscirtinae) are described from Sulu Archipelago: *Varitrella* (*Cantotrella*) *sulu* Haibil, Nuñeza & Tan, **sp. nov.** and *Varitrella* (*Cantotrella*) *alternata* Haibil, Nuñeza & Tan, **sp. nov.** The calling songs of *Varitrella* (*Cantotrella*) *sulu* Haibil, Nuñeza & Tan, **sp. nov.** and *Varitrella* (*Cantotrella*) *trusmadi* Gorochov, 2014 are also described.

Key words: Calling songs, East Malaysia, Philippines, Podoscirtini, Southeast Asia

Introduction

In recent years, studies of orthopterans in Mindanao Island and surrounding islands in the Philippines have led to the discovery of species new to science (Daguplo *et al.*, 2025; Grumo *et al.*, 2025; Rivera *et al.*, 2025; Tan *et al.*, 2026). This is partly owing to the lack of sampling in this biodiverse island. The genus *Varitrella* Gorochov, 2003 including its subgenus *Cantotrella* is one such example. Eight species of *Varitrella* (*Cantotrella*) species were found in Philippines: *Varitrella* (*Cantotrella*) *bakeri* (Chopard, 1925), *Varitrella* (*Cantotrella*) *conspersa* (Stål, 1877), *Varitrella* (*Cantotrella*) *depressa* Gorochov, 2003, *Varitrella* (*Cantotrella*) *fuscoirrorata* (Chopard, 1925), *Varitrella* (*Cantotrella*) *mindoroensis* Gorochov, 2006, *Varitrella* (*Cantotrella*) *palawanensis* Gorochov, 2006, *Varitrella* (*Cantotrella*) *saussurei* (Stål, 1877) and *Varitrella* (*Cantotrella*) *variabilis* Gorochov, 2006, including *V.* (*C.*) *bakeri* and *V.* (*C.*) *fuscoirrorata* from Mindanao (Tan *et al.*, 2025; Cigliano *et al.*, 2026). Nevertheless, a recent study has led to the discovery of five more new species and one new subspecies from the Philippines, including *Varitrella* (*Cantotrella*) *exculta* Gorochov, 2025 and *Varitrella* (*Cantotrella*) *mindanao* Gorochov, 2025 from Mindanao (Gorochov, 2025).

The Sulu Archipelago is situated between Mindanao and Borneo and remains an understudied location for orthopterans. A recent sampling in Sulu Island has led to the discovery of two new species of *Varitrella* (*Cantotrella*): *Varitrella* (*Cantotrella*) *sulu* Haibil, Nuñeza & Tan, **sp. nov.** and *Varitrella* (*Cantotrella*) *alternata* Haibil, Nuñeza & Tan, **sp. nov.** The calling songs of *Varitrella* (*Cantotrella*) *sulu* Haibil, Nuñeza & Tan, **sp. nov.** and *Varitrella* (*Cantotrella*) *trusmadi* Gorochov, 2014 are also described.

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Material and methods

Specimens were collected from Sulu Island of the Sulu Archipelago in the Philippines and Mount Trus Madi in Sabah State (East Malaysia) in Borneo. Whenever possible, sound recording of calling males was done using a sampling frequency of 40 or 96 kHz samples/s Zoom H1n with Stereo X/Y 90° microphones handles up to 120 dB SPL was used. A INKBIRD IBS-TH2 plus temperature and humidity sensor, was used to record the ambient temperature and humidity.

The specimens were preserved in absolute or 70% ethanol, and later pinned and dry-preserved. Male genitalia were dissected from the specimens, cleaned using diluted KOH and later preserved in glycerol. Pinned specimens were imaged using a Canon EOS 6D digital SLR camera attached to a Visionary Digital Passport system. Images of morphological features, a macro photo lens MP-E 65 mm f/2.8 USM (1–5×) was used. Image stacking was done using Zerene Stacker version 1.04. Male genitalia were imaged using a Leica M205C Encoded stereomicroscope. Image stacking was done using Leica Focus Stacking Imaging System operated within Leica Application Suite X. Image editing was accomplished using Adobe Photoshop 2025 (Adobe Systems Incorporated, San Jose, CA, USA). Measurements of dry, pinned specimen were made from images using ImageJ 1.54g (Wayne Rasband, Research Services Branch, National Institute of Mental Health, Bethesda, MD, USA).

The following abbreviations are used in the measurements: BL = body length [from the apex of the fastigium to the apex of the subgenital plate]; PronL = pronotum length; PronW = pronotum width (maximum); FWL = forewing length; FWW = forewing width; FIIIL = hind femur length; TIIIL = hind tibia length.

Abbreviations for general morphology:
I, II, III = front, median, hind respectively (femora, legs, tibiae)
F = femur
FW = forewing (tegmen)
T = tibia
Ta = tarsus

Terminology used to describe the male genitalia follows Desutter-Grandcolas (2003) and also Gorochov (2015) [in square brackets] (similar to Tan *et al.* [2023]):
Pseudepiphallus [epiphallus]
Pseudepiphallic paramere [ectoparamere]
Ectophallic fold [rachis (= guiding rod)]
Endophallic sclerite [formula (= mold of spermatophore attachment plate)]
Rami

Specimens collected were deposited in:
PNM = Philippine National Museum, Manila, Philippines
ZRC = Zoological Reference Collection, Lee Kong Chian Natural History Museum, Singapore

Acoustics analysis and song terminology generally follow Tan *et al.* (2022, 2023). Parameters of the temporal domain (e.g., durations and intervals) were measured manually using Raven Lite 2.0.0. The dominant frequency was obtained using the 'spectro_analysis' function from the R package warbleR version 1.1.27 (Araya-Salas & Smith-Vidaurre, 2017) in the R software version 4.4.1. Sound files were eventually deposited in xeno-canto database (www.xeno-canto.org).

Taxonomy part

Family Oecanthidae Blanchard, 1845

Subfamily Podoscirtinae Saussure, 1878

Tribe Podoscirtini Saussure, 1878

Genus *Varitrella* Gorochov, 2003

Subgenus *Cantotrella* Gorochov, 2006

Type species. *Varitrella* (*Cantotrella*) *palawanensis* Gorochov, 2006 by original designation.
Varitrella (*Cantotrella*) Gorochov, 2006: 33—Gorochov & Tan, 2014: 536; Tan *et al.*, 2020: 264; Tan *et al.*, 2022: 221.

Remarks. This subgenus consists of 27 species (and one subspecies) from Borneo (10 species), Indochina (one species), Malay Peninsula (one species), the Philippines (14 species), Sulawesi (one species) and Sumatra (one species). The species are most easily distinguishable from the male genitalia (Table 1), although some differences can also be observed in the colour patterns and FW venations in some taxa. Here, we describe two new species from Sulu Archipelago: *Varitrella* (*Cantotrella*) *sulu* Haibil, Nuñeza & Tan, **sp. nov.** and *Varitrella* (*Cantotrella*) *alternata* Haibil, Nuñeza & Tan, **sp. nov.**

The male calling songs are so far known for *Varitrella* (*Cantotrella*) *suikei* Tan, Japir & Chung, 2020 and *Varitrella* (*Cantotrella*) *tabin* Tan, Japir, Chung & Robillard, 2022 from Borneo and *V.* (*C.*) *bakeri* and *V.* (*C.*) *fuscoirrorata* from the Philippines (Tan *et al.*, 2020, 2022, 2023). Here, we describe the calling songs of *Varitrella* (*Cantotrella*) *sulu* Haibil, Nuñeza & Tan, **sp. nov.** from Sulu and *Varitrella* (*Cantotrella*) *trusmadi* Gorochov, 2014 from Sabah (Borneo).

Varitrella (*Cantotrella*) *sulu* Haibil, Nuñeza & Tan, sp. nov.

(Figs 1A, 1B, 2–5)

Material examined. Holotype: PHILIPPINES • 1♂; Sulu Archipelago, Sulu Island, Barangay Kaunayan; 6°04’39.4”N 121°04’23.7”E, 50 m.a.s.l.; 6 November 2025, 20h04; on foliage of shrub; coll. H.H. Haibil *et al.*; 21 #085 (PNM).

Paratypes: • 1♂; Sulu Archipelago, Sulu Island, Barangay Kaunayan; 6°04’39.4”N 121°04’23.7”E, 50 m.a.s.l.; 6 November 2025, 20h06; on foliage of shrub; coll. H.H. Haibil *et al.*; 21 #086 (ZRC); calling song recorded ZOOM259, ZOOM317 (29.6°C/ RH 86.5%) • 1♂; Sulu Archipelago, Sulu Island, Barangay Bunut; 5°58’42.1”N 120°59’14.5”E, 142 m.a.s.l.; 20 November 2025, 20h35; on branch of small tree; coll. H.H. Haibil *et al.*; 35 #190 (ZRC) • 1♂; Sulu Archipelago, Sulu Island, Barangay Bunut Bunut; 5°58’46.3”N 120°59’10.1”E, 147 m.a.s.l.; 21 November 2025, 19h19; on leaf of small tree; coll. H.H. Haibil *et al.*; 35 #191 (ZRC); calling song recorded ZOOM290 (28.2°C/ RH 83.4%), ZOOM296 (28.2°C/ RH 83.4%).

Diagnosis. The new species is characterised by its dorso-anterior pseudepiphallic spines in profile slender and long, in dorsal view closely spaced together and close to the posterior apex of its pseudepiphallus; the latero-apical lobular parts of pseudepiphallus in profile each produced into a dorso-apical process; the pseudepiphallic paramere in profile forming a acute process, elongated and broadly curved; the ectophallic fold at the posterior end produced into wide and truncated apex and without distinctly produced lateral lobules; and the shape of the endophallic sclerite.

It is most similar to *Varitrella* (*Cantotrella*) *variabilis* Gorochov, 2006 from Palawan Island by the shape of the male genitalia; but differs by the pairs of dorso-anterior pseudepiphallic spines in dorsal view more closely spaced together compared to the pairs of latero-apical lobular parts of pseudepiphallus; the dorso-anterior pseudepiphallic spine closer to the latero-apical lobular parts; the latero-apical lobular parts of pseudepiphallus in profile slenderer with its dorso-apical process extended more dorsally; the pseudepiphallic paramere in profile more elongated and broadly curved, and in ventral view slenderer; the ectophallic fold at posterior end produced into wider lobules; the endophallic sclerite stouter with lateral arms stout and robust.

It is also similar to *Varitrella* (*Cantotrella*) *fuscoirrorata* (Chopard, 1925) and *Varitrella* (*Cantotrella*) *mindanao* Gorochov, 2025 from Mindanao by the shape of the male genitalia, particularly in the relative size and positions of the pairs of dorso-anterior pseudepiphallic spines and pairs of latero-apical lobular parts of pseudepiphallus; but differs by the latero-apical lobular parts of pseudepiphallus in profile slenderer and each forming more prominent dorso-apical process with acute apex; the pseudepiphallic paramere in profile more elongated; the shape of its ectophallic fold at posterior end; the spermatophore more elongated (instead of rounded); and the shape of the endophallic sclerite.

TABLE 1. Tabular key to species of *Varitrella* (*Cantotrella*) based on male genitalia.

Taxon	Distribution	Dorso-anterior pseudepiphallic spine	Latero-apical lobular parts of pseudepiphallus (in lateral view)
V. (*C.*) *amoena* Gorochov, 2014	Borneo	Absent	Large, triangular process produced dorso-anteriorly
V. (*C.*) *bakeri* (Chopard, 1925)	Philippines	Absent	Slender, acute process slightly pointed anteriorly
V. (*C.*) *conspersa* (Stål, 1877)	Philippines	Absent	Large, robust, acute process, curved anteriorly
V. (*C.*) *contraria* Gorochov, 2025	Philippines	Absent	Medium-sized, apex acute process, pointing dorsad
V. (*C.*) *depressa* Gorochov, 2003	Philippines	Absent	Large, acute process, curved anteriorly
V. (*C.*) *exculta* Gorochov, 2025	Philippines	Medium-sized but stout, triangular	Barely produced, appears as small spinule
V. (*C.*) *fuscoirrorata* (Chopard, 1925)	Philippines	Small and slender	Barely produced, appears as small spinule
V. (*C.*) *glabra* (Ingrisch, 1997)	Indochina (Thailand)	Large and long	Barely produced, appears as small spinule
V. (*C.*) *manukan* Gorochov, 2014	Borneo (Sabah)	Absent	Slender, acute process pointing dorsad
V. (*C.*) *mindanao* Gorochov, 2025	Philippines	Small and slender	Absent
V. (*C.*) *mindoroensis* Gorochov, 2006	Philippines	Absent	Fairly slender, acute process pointing dorsad
V. (*C.*) *mjobergi* (Chopard, 1930)	Borneo (Sarawak)	?	?
V. (*C.*) *orion* Tan & Gorochov, 2014	Malay Peninsula	Large and long	Barely produced, appears as small spinule
V. (*C.*) *palawanensis* Gorochov, 2006	Philippines	Small and slender	Absent
V. (*C.*) *paraiso* Gorochov, 2025	Philippines	Absent	Medium-sized, acute process, pointing dorsad
V. (*C.*) *quadrata* (Haan, 1844)	Borneo	Absent	Large, robust, acute process, pointing dorsad
V. (*C.*) *robusta luzoni* Gorochov, 2025	Philippines	Medium-sized obliquely acute	Barely produced, appears as small spinule
V. (*C.*) *robusta robusta* Gorochov, 2014	Sulawesi	Medium-sized obliquely acute	Barely produced, appears as small spinule
V. (*C.*) *saussurei* (Stål, 1877)	Philippines	Absent	Medium-sized, acute process pointing dorsad
V. (*C.*) *striata* Gorochov, 2014	Borneo (Sarawak)	Large and long	Barely produced, appears as small spinule
V. (*C.*) *suikei* Tan, Japir & Chung, 2020	Borneo (Sabah)	Robust, triangular	Barely produced, appears as small spinule
V. (*C.*) *sukau* Gorochov, 2014	Borneo (Sabah)	Large and long	Barely produced, appears as small spinule
V. (*C.*) *sumatra* Gorochov, 2025	Sumatra	Small and slender	Barely produced, appears as small spinule
V. (*C.*) *sympatrica* Gorochov, 2025	Philippines	Absent	Very large, blade-like process, apex acute
V. (*C.*) *tabin* Tan, Japir, Chung & Robillard, 2022	Borneo (Sabah)	Very and long, horn-like	Barely produced, appears as small spinule
V. (*C.*) *tawau* Gorochov, 2014	Borneo (Sabah)	Medium-sized, robust, triangular	Small, stout process, pointing dorsad
V. (*C.*) *trusmadi* Gorochov, 2014	Borneo (Sabah)	Large and long	Barely produced as a spine
V. (*C.*) *variabilis* Gorochov, 2006	Philippines	Small and slender	Small, stout process, pointing dorsad

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TABLE 1. (Continued)

Taxon	Latero-apical lobular parts of pseudepiphallus (in dorsal view)	Emargination at posterior end of pseudepiphallus	Dorsal margin of pseudepiphallus (in lateral view)
V. (*C.*) *amoena* Gorochov, 2014	Parallel	Triangular, fairly shallow; base rounded	Angular indented at middle?
V. (*C.*) *bakeri* (Chopard, 1925)	Parallel	Broad and shallow	Straight
V. (*C.*) *conspersa* (Stål, 1877)	Parallel	Narrow and deep	Sinuous to slightly convex
V. (*C.*) *contraria* Gorochov, 2025	Faintly diverging	Broad and shallow	Mostly straight, humped at middle, apical half slightly concave
V. (*C.*) *depressa* Gorochov, 2003	Parallel	Relatively narrower	Humped near middle
V. (*C.*) *exculta* Gorochov, 2025	Parallel	Broad and deep; base rounded	Sinuous
V. (*C.*) *fuscoirrorata* (Chopard, 1925)	Parallel	Triangular, deep; base acute	Basal half distinctly raised
V. (*C.*) *glabra* (Ingrisch, 1997)	Parallel	Deep; broad apical half, basal half narrow	Straight
V. (*C.*) *manukan* Gorochov, 2014	Faintly diverging	Broad, deep, triangular	Faintly sinuous
V. (*C.*) *mindanao* Gorochov, 2025	Parallel	Fairly narrow and deep	Strongly convex at basal half, straight at apical half
V. (*C.*) *mindoroensis* Gorochov, 2006	Parallel	Shallow; base angularly rounded	Mostly straight, faintly sinuous
V. (*C.*) *mjobergi* (Chopard, 1930)	?	?	?
V. (*C.*) *orion* Tan & Gorochov, 2014	Diverging	Broad, deep, triangular	Strongly sinuous
V. (*C.*) *palawanensis* Gorochov, 2006	Parallel	Broad, deep, triangular	Broadly convex
V. (*C.*) *paraiso* Gorochov, 2025	Parallel	Deep; fairly narrow especially basal half	Slightly sinuous
V. (*C.*) *quadrata* (Haan, 1844)	Parallel	Deep; basal half narrow	Sinuous
V. (*C.*) *robusta luzoni* Gorochov, 2025	Parallel	Deep; apical half broad, basal half narrow	Sinuous, variable
V. (*C.*) *robusta robusta* Gorochov, 2014	Parallel	Deep; apical half broad, basal half narrow	Sinuous, variable
V. (*C.*) *saussurei* (Stål, 1877)	Parallel	Shallow; base angular	Straight
V. (*C.*) *striata* Gorochov, 2014	Slightly diverging	Broad and deep; base narrow	Straight
V. (*C.*) *suikei* Tan, Japir & Chung, 2020	Diverging	Broad and deep; base acute	Straight
V. (*C.*) *sukau* Gorochov, 2014	Diverging	Deep; base rounded	Slightly sinuous, apical half raised with irregular small denticles
V. (*C.*) *sumatra* Gorochov, 2025	Parallel	Deep and very narrow	humped basal half, straight apical half
V. (*C.*) *sympatrica* Gorochov, 2025	Parallel	Shallow and rectangular	Strongly convex at basal half, straight at apical half
V. (*C.*) *tabin* Tan, Japir, Chung & Robillard, 2022	Diverging	Broad and deep; base rounded	Convex, apical half with a few denticles
V. (*C.*) *tawau* Gorochov, 2014	Parallel	Deep; base slightly narrow, rounded	Mostly straight
V. (*C.*) *trusmadi* Gorochov, 2014	Slightly diverging	Broad and deep; base narrow	Straight
V. (*C.*) *variabilis* Gorochov, 2006	Parallel	Deep and triangular; base acute	Faintly sinuous

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TABLE 1. (Continued)

Taxon	Pseudepiphallic parameres (mostly in lateral view)	Apical end of ectophallic fold	Spermatophore
V. (*C.*) *amoena* Gorochov, 2014	Hook-like, bent near base	Expanded, apical end truncated	Rounded
V. (*C.*) *bakeri* (Chopard, 1925)	Acute process	Lateral apical lobules long and slender, curved dorsad	Rounded?
V. (*C.*) *conspersa* (Stål, 1877)	Finger-like	Simple, apex tongue-shaped, without lateral lobules	?
V. (*C.*) *contraria* Gorochov, 2025	Acute process, long, gently curved	Lateral apical lobules long, curved dorsad, hook-like	?
V. (*C.*) *depressa* Gorochov, 2003	Finger-like		?
V. (*C.*) *exculta* Gorochov, 2025	Stout, hook-like to finger-like	Expanded, lamellate, apical end broadly rounded	?
V. (*C.*) *fuscoirrorata* (Chopard, 1925)	Hook-like, short, strongly curved	Lateral apical lobules finger-like, straight, slender with apex obtuse	Rounded
V. (*C.*) *glabra* (Ingrisch, 1997)	Hook-like, curved at distal end	Enlarged at apex, folded	?
V. (*C.*) *manukan* Gorochov, 2014	Acute process	Lateral apical lobules long and slender, curved dorsad	?
V. (*C.*) *mindanao* Gorochov, 2025	Hook-like, roundly curved	Lateral apical lobules small and squarish	Oval
V. (*C.*) *mindoroensis* Gorochov, 2006	Hook-like, curved	Expanded, two lateral lobules folded dorsad	Rounded
V. (*C.*) *mjobergi* (Chopard, 1930)	?	?	?
V. (*C.*) *orion* Tan & Gorochov, 2014	Hook-like, bent slightly after middle	Apical lateral lobules broadly tongue-shaped	Rounded
V. (*C.*) *palawanensis* Gorochov, 2006	Acute process, long, gently curved	Enlarged, three apical lobules, enlarged	?
V. (*C.*) *paraiso* Gorochov, 2025	Finger-like	Lateral apical lobules close together, with apex very slender, curved inwardly and dorsad	Rounded
V. (*C.*) *quadrata* (Haan, 1844)	Acute process, long and slightly sinuous	Lateral apical lobules tongue-shaped	?
V. (*C.*) *robusta luzoni* Gorochov, 2025	Hook-like, robust, curved at distal end	Expanded, apical end truncated	?
V. (*C.*) *robusta robusta* Gorochov, 2014	Hook-like, robust, curved at distal end	Expanded, apical end truncated	?
V. (*C.*) *saussurei* (Stål, 1877)	Acute process, faintly curved or bent	Lateral apical lobules long and slender	?
V. (*C.*) *striata* Gorochov, 2014	Hook-like, long, mostly straight, curved at distal end	Lateral apical lobules tongue-shaped	Elongated
V. (*C.*) *suikei* Tan, Japir & Chung, 2020	Hook-like, short, strongly curved distally	Lateral apical lobules tongue-shaped	?
V. (*C.*) *sukau* Gorochov, 2014	Finger-like	Expanded, apical end truncated	Rounded
V. (*C.*) *sumatra* Gorochov, 2025	Hook-like, strongly curved	Expanded, apical end rounded	Rounded
V. (*C.*) *sympatrica* Gorochov, 2025	Acute process, mostly straight	Apical lateral lobules spaced apart, with apex very slender, curved inwardly and dorsad	?
V. (*C.*) *tabin* Tan, Japir, Chung & Robillard, 2022	Hook-like, curved at distal end	Apical lateral lobules broadly tongue-shaped	Rounded
V. (*C.*) *tawau* Gorochov, 2014	Membraneous	Expanded, apical end truncated	Pyriform
V. (*C.*) *trusmadi* Gorochov, 2014	Hook-like, long, mostly straight, curved at distal end	Lateral apical lobules truncated	Rounded
V. (*C.*) *variabilis* Gorochov, 2006	Hook-like, short, curved at distal end	Enlarged at apex, folded	Oval

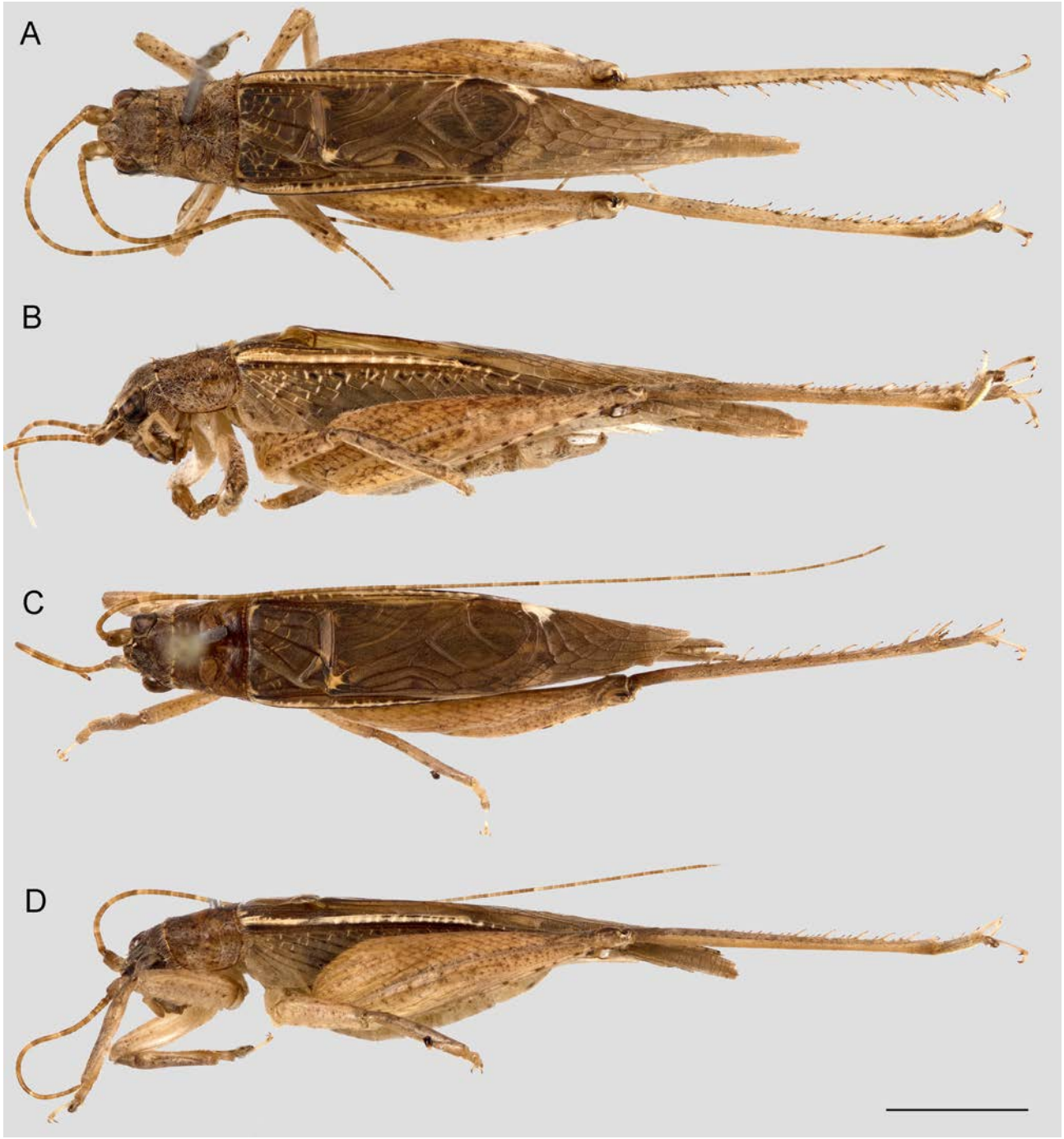

FIGURE 1. *Varitrella* (*Cantotrella*) *sulu* Haibil, Nuñeza & Tan, **sp. nov.** (A, B) and *Varitrella* (*Cantotrella*) *alternata* Haibil, Nuñeza & Tan, **sp. nov.** (C, D) male holotype habitus in dorsal (A, C) and lateral (B, D) views. Scale bar: 5 mm.

It is also similar to *Varitrella* (*Cantotrella*) *robusta* Gorochov, 2014 from Sulawesi and Luzon by the shape of the male genitalia; but differs by the dorso-anterior pseudepiphallic spine in profile slenderer; the latero-apical lobular parts of pseudepiphallus in profile slenderer and each forming a more prominent dorso-apical process; the pseudepiphallic paramere in profile more elongated, slenderer and more broadly curved (instead of bent at distal end).

Etymology. The species is named after its type locality, Sulu Island; noun in apposition.

FIGURE 2. *Varitrella* (*Cantotrella*) *sulu* Haibil, Nuñeza & Tan, **sp. nov.** male: head and pronotum in dorsal (A) and lateral (B) views; face in anterior view (C); FW in dorsal (D) and lateral (E) views; metanotal gland in dorsal view (F); anal plate in dorsal view (G). Scale bars: 2 mm (A, B), 1 mm (C, F, G), 5 mm (D, E).

Description. Habitus medium sized, generally brown to dark brown (Figs 1A, 1B). Head in dorsal view slightly broader than long; finely pubescent and textured brown (Fig. 2A). Fastigium in dorsal view with apex truncated, about as wide as scapes (Fig. 2A); in profile flattened (Fig. 2B). Compound eyes in dorsal and lateral views rounded to slightly triangular and slightly protruding anteriorly (Figs 2A, 2B). Median ocellus small and oval (Figs 2A, 2C); lateral ocelli oval and similarly sized as median ocellus, in anterior view located posterior of scapes (Fig. 2A). Antennae brown with rings of different shades of darker and lighter (Figs 2A–C). Maxillary palpi pubescent, with

apical segment longest, somewhat pyriform with truncated apex; subapical segment cylindrical, apically expanded; third segment slender, cylindrical, slightly longer than subapical segment (Fig. 2B). Gena light brown, posterior of eye in profile view brown with tint of dark patterns (Fig. 2B). Face in anterior view cream coloured between antennal sockets, with dark spots internally and ventrad of antennal sockets; frons pale brown; mouthparts mostly yellow or pale brown (Fig. 2C). Pronotal disk brown densely pubescent, 1.4 times as wide as long, subrectangular to slightly trapezoidal with lateral margins faintly widening posteriorly, with diffuse dark-brown mottling (Fig. 2A). Pronotal disk with anterior margin faintly concave and with darker maculation; posterior margin faintly angularly convex with fewer contrasting-coloured spots; anterior and posterior margins with longer and stronger setae (Fig. 2A). Pronotal lateral lobe 1.7 times longer than tall, also densely pubescent; ventral margin straight, without dense pubescence (Fig. 2B). Legs generally brown coloured with scattered small dark-brown spots; genicular region distinctly darkened; TIII pale brown with numerous small dark-brown spots; spurs generally pale coloured with dark tips (Figs 1A, 1B). Thoracic and abdominal tergites and sternites generally cream coloured with faintly-dark spots (Figs 1A, 1B).

Male. FW covering abdomen and barely surpassing apex of FIII (Figs 1A, 1B). Dorsal field mostly parallel in anterior half, posterior third tapering toward narrowly subacute apex (Fig. 2D). Colouration: generally brown with white spots and veins and some faint dark spots. Dorsal field at basal area with cross-veins cream coloured; chords with proximal part faintly darker; chord area with pale dark spot; plectral area with white spot; and between disto-lateral edge of mirror and stock of M and Cu with white oblong spot; M and region (including cross veins) with Cu and R cream coloured (Fig. 2D). Lateral field pale brown with region between R and Sc dark; with Sc branches (including cross veins) at base cream coloured, between branches with black spots of different sizes and shapes (Fig. 2E). Venation: 1A straight, bent at 90°; diagonal faintly bent, with 6 oblique veins in harp area, longest ones faintly sinuous, shorter ones rounded; mirror 1.5 times as long as wide, dividing vein typical of subgenus, apical area 1.8 times as long as mirror length (Fig. 2D). Lateral field with around 16 branches on Sc, mostly parallel (Fig. 2E). Hind wings clearly surpassing FWs (Figs. 1A).

Metanotal gland underdeveloped (Fig. 2F). Anal plate typical of subgenus; basal half with two oval pale faint depression at middle, apical half narrowed and dark (Fig. 2G). Subgenital plate with lateral margin tapering into subacute apex.

Male genitalia as shown in Fig. 3: Pseudepiphallus fairly slender, in profile view long and not broad with dorsal margin mostly straight at basal half and slightly concave in distal half. Pseudepiphallus with dorso-anterior pseudepiphallic spine slender, acute; in profile view pointing dorsad; in dorsal view close together. Pseudepiphallus with posterior end produced into two latero-apical lobular parts, pointing posteriorly and barely diverging; between lobules shallowly and widely emarginated, in profile with posterior part curved dorsad into dorso-apical process. Apical process large and distinct, apex acute pointing dorsad. Pseudepiphallic paramere elongated, acute, mostly straight to broadly curved. Ectophallic fold shaft-like, slender, with lateral margins somewhat parallel throughout length; at posterior end expanded, produced into two faintly produced lobules; in dorsal view with apical emargination very shallow wider between lateral lobes and truncated. Endophallic sclerite elongated, typical of genus; with lateral arms stout and narrowly spaced apart. Rami medium, slightly shorter than length of pseudepiphallus. Spermatophore elongated oval.

Measurements. See Table 2.

TABLE 2. Measurements of the males of *Varitrella* (*Cantotrella*) *sulu* Haibil, Nuñeza & Tan, **sp. nov.** and *Varitrella* (*Cantotrella*) *alternata* Haibil, Nuñeza & Tan, **sp. nov.** (in mm).

	BL	PronL	PronW	FWL	FWW	HWT	FIIIL	TIIIL
Varitrella (*Cantotrella*) *sulu* Haibil, Nuñeza & Tan, **sp. nov.**								
Holotype #85	16.4	3.0	4.1	16.7	3.7	3.1	11.1	11.5
Paratype #86	17.9	2.9	4.0	17.2	3.8	2.7	12.1	11.7
Paratype #190	17.9	2.9	3.6				11.7	10.9
Paratype #191	18.0	2.8	4.0	18.1	3.9	2.8	12.0	11.5
Varitrella (*Cantotrella*) *alternata* Haibil, Nuñeza & Tan, **sp. nov.**								
Holotype #173	16.4	2.8	3.6	15.7	3.9	1.7	11.4	11.0

FIGURE 3. *Varitrella* (*Cantotrella*) *sulu* Haibil, Nuñeza & Tan, **sp. nov.** male genitalia before cleaning (A–C), with spermatophore (D, E) and after cleaning (F–H); in dorsal (A, F), ventral (B, D, G) and lateral (C, E, H) views. Scale bar: 1 mm.

Type locality. PHILIPPINES, Sulu Archipelago, Sulu Island.
Distribution. Known only from the type locality.

FIGURE 4. *Varitrella* (*Cantotrella*) *sulu* Haibil, Nuñeza & Tan, **sp. nov.** male in their natural environment in Sulu Island.

Calling song. The calling song consists of a well-defined echeme-sequence made up of 3 to 7 echemes. The echeme-sequence has an average duration of 0.93±0.20 s (0.63–1.33 s). Each echeme consists of two closely-spaced syllables and has an average duration of 0.07±0.0 s (0.07–0.08 s). The silent interval between consecutive echemes is 0.14±0.03 s (0.11–0.21 s). Each syllable has an average duration of 22.5±1.9 ms (18.5–26.0 ms) and the interval between consecutive syllables is 30.6±2.6 ms (25.5–35.3 ms). The frequency spectrum is pure-tonal and forms a harmonic series, with the dominant frequency being the fundamental frequency of 6.95±0.06 kHz (6.82–7.01 kHz).

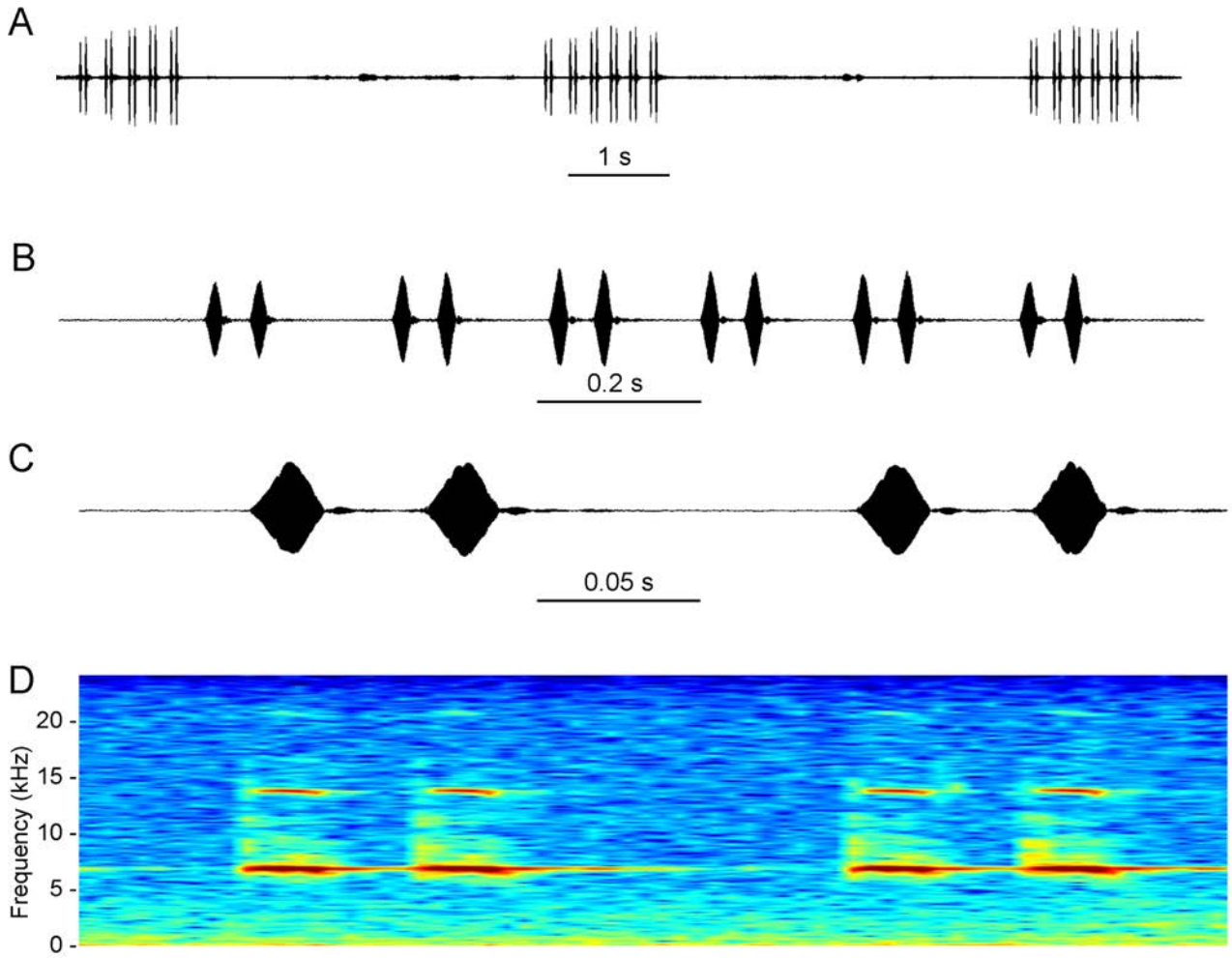

FIGURE 5. *Varitrella* (*Cantotrella*) *sulu* Haibil, Nuñeza & Tan, **sp. nov.** male calling song: oscillograms of three echeme-sequences (A), one echeme-sequence (B) and two echemes (C); spectrogram of the two echemes (D).

Varitrella (*Cantotrella*) *alternata* Haibil, Nuñeza & Tan, sp. nov.

(Figs 1C, 1D, 6, 7)

Material examined. Holotype: PHILIPPINES • 1♂; Sulu Archipelago, Sulu Island, Barangay Bunut; 5°58’37.1”N 120°59’17.8”E, 128 m.a.s.l.; 18 November 2025, 18h18; on leaf of shrubs; coll. H.H. Haibil *et al.*; 35 #173 (PNM).

Diagnosis. This new species is characterised by its dorso-anterior pseudepiphallic spine fairly robust and in dorsal view spaced apart and pointing slightly externally; the posterior end of its pseudepiphallus deeply emarginated between latero-apical lobular parts, with the base of this emargination rounded; in profile the posterior part curved dorsad into small dorso-apical spinule; its pseudepiphallic parameres elongated, acute, slightly bent at the apical end; the ectophallic fold at its posterior end produced into two elongated, tongue-like lobules; and its spermatophore almost pyriform.

This new species is most similar to *Varitrella* (*Cantotrella*) *robusta* Gorochov, 2014 from Sulawesi and Luzon and *Varitrella* (*Cantotrella*) *variabilis* Gorochov, 2006 from Palawan Island by the shape of the genitalia, including the shapes of dorso-anterior pseudepiphallic spines and latero-apical lobular parts of pseudepiphallus; but differs by the pseudepiphallic paramere in profile more elongated and slenderer, and the ectophallic fold at posterior end produced into two elongated tongue-shaped lateral apical lobules (instead of truncated).

It also shares with *Varitrella* (*Cantotrella*) *fuscoirrorata* (Chopard, 1925) from the Philippines and *Varitrella* (*Cantotrella*) *quadrata* (Haan, 1844) from Borneo by the ectophallic fold at posterior end produced into two elongated, tongue-like lobules; but differs from both species in the shape and presence of dorso-anterior pseudepiphallic spine, respectively.

This new species differs from sympatric species *Varitrella* (*Cantotrella*) *sulu* Haibil, Nuñeza & Tan, **sp. nov.** by its pseudepiphallus more robust, in profile broader, a larger dorso-anterior pseudepiphallic spines, its relative distance between each other and with the latero-apical lobular parts of its pseudepiphallus, posterior part curved dorsad into dorso-apical spinule (instead of a large process), shorter rami, as well as the shapes of ectophallic fold and endophallic sclerite.

Etymology. The species name refers to a surprisingly second species found in Sulu Island in sympatry with *V.* (*C.*) *sulu* **sp. nov.**; alternata derives from alter = the other, in Latin.

Description. General habitus very similar to *Varitrella* (*Cantotrella*) *sulu* **sp. nov.** (Figs 1C, 1D, 6A–C). Pronotal disk 1.3 times as wide as long; pronotal lateral lobe 1.8 times longer than tall.

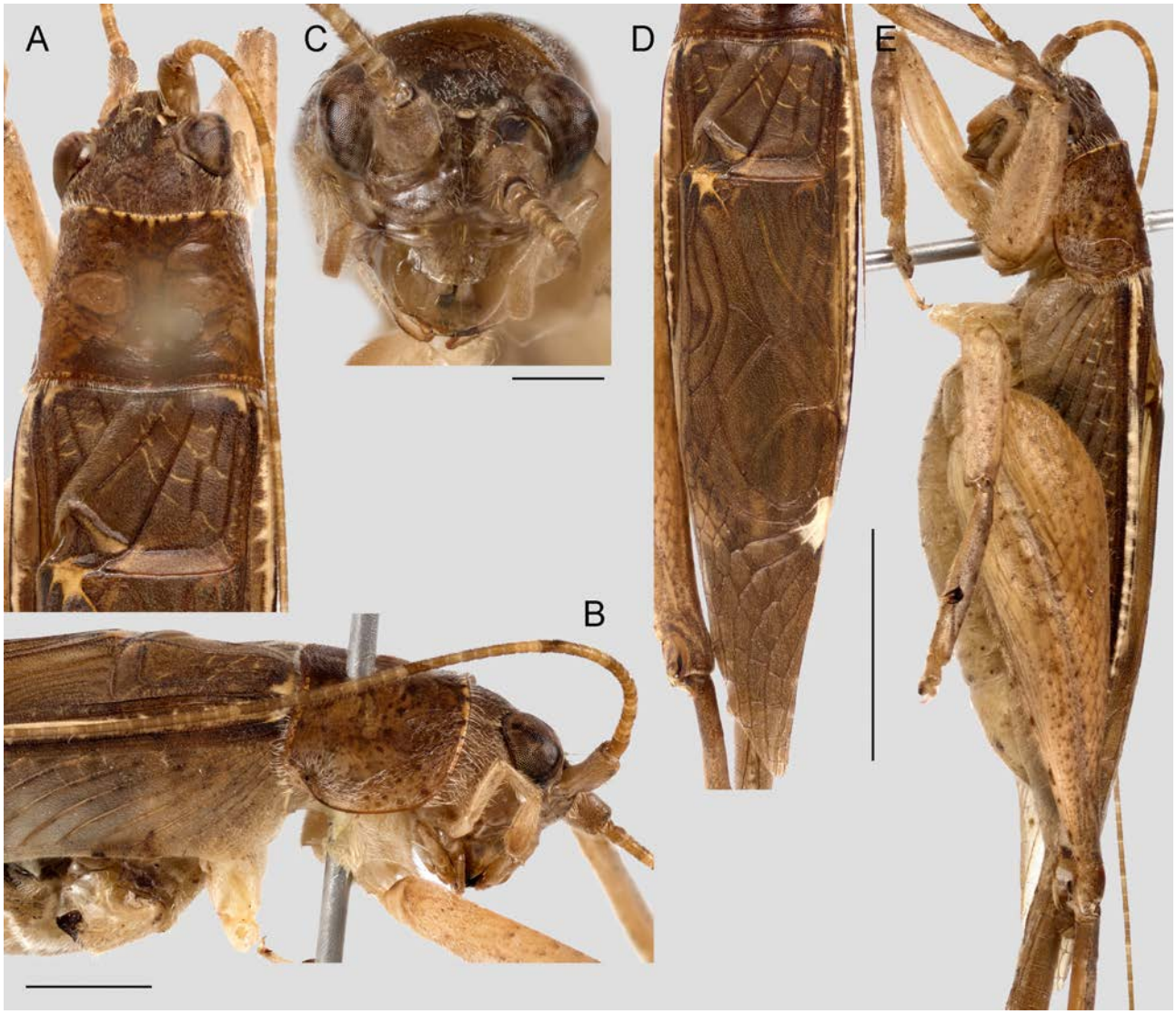

FIGURE 6. *Varitrella* (*Cantotrella*) *alternata* Haibil, Nuñeza & Tan, **sp. nov.** male: head and pronotum in dorsal (A) and lateral (B) views; face in anterior view (C); FW in dorsal (D) and lateral (E) views. Scale bars: 2 mm (A, B), 1 mm (C), 5 mm (D, E).

Male. FW. Colouration: more unicolourous with fewer white patterns and fewer faint dark spots. Dorsal field at basal area with cream colouration less prominent; proximal part of region of chords faintly darker but less extensive; chord area with smaller pale dark spot; plectral area with white spot but smaller; and between disto-lateral edge of mirror and stock of M and Cu with white spot; M and region (including cross veins) with Cu and R cream coloured (Fig. 6D). Lateral field pale brown with region between R and Sc dark; with Sc branches (including cross veins) at base cream coloured, between branches with fewer and less prominent black (Fig. 6D). Venation: 1A straight, bent at 90°; diagonal faintly bent, with 5 oblique veins in harp area, longest ones faintly sinuous, shorter ones rounded; mirror 1.5 times as long as wide, dividing vein typical of subgenus, apical area 1.6 times as long as mirror length (Fig. 6D). Lateral field with around 16 branches on Sc, mostly parallel (Fig. 6E).

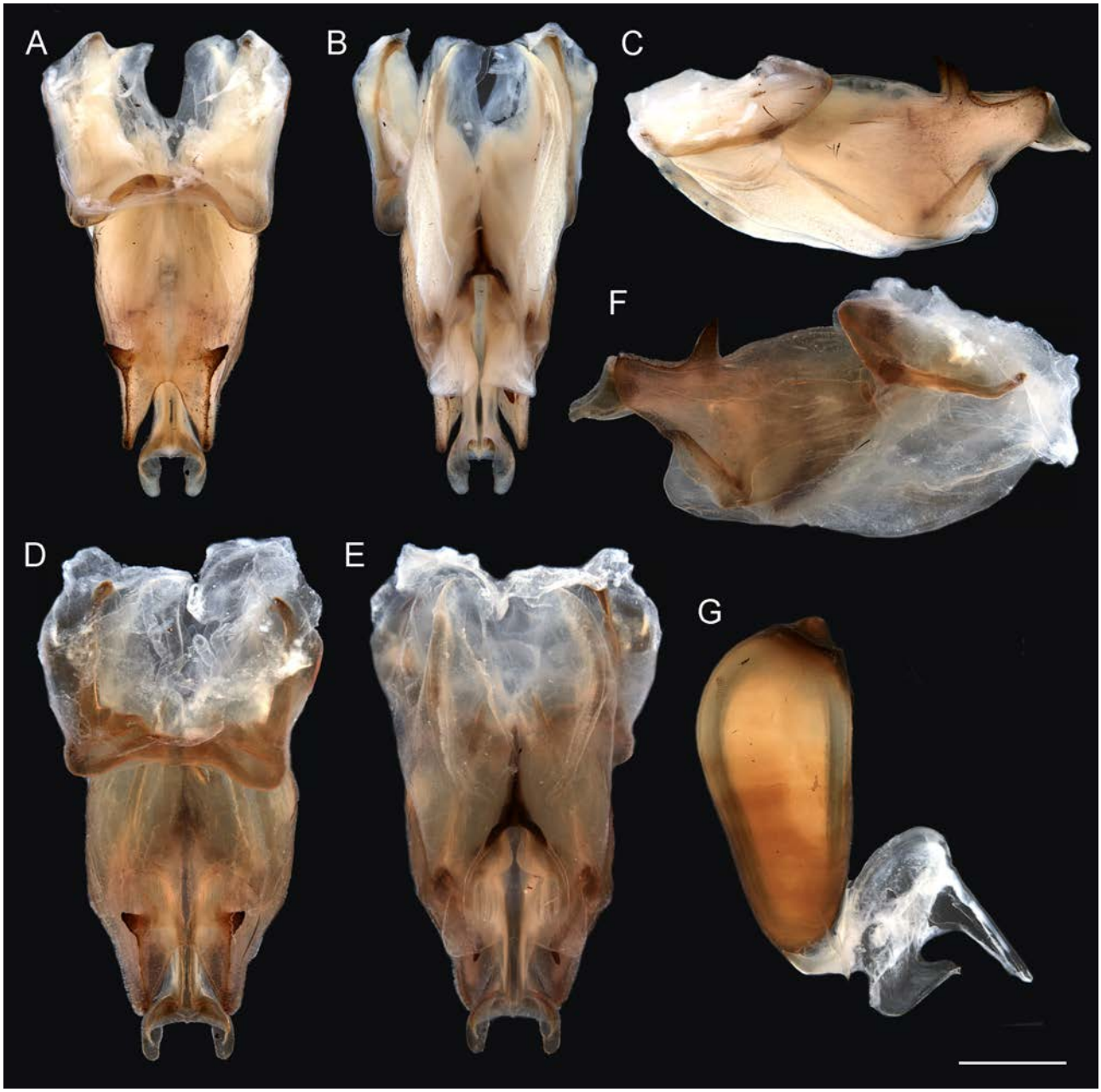

FIGURE 7. *Varitrella* (*Cantotrella*) *alternata* Haibil, Nuñeza & Tan, **sp. nov.** male genitalia before cleaning (A–C) and after cleaning (D–F) and spermatophore (G); in dorsal (A, D), ventral (B, E) and lateral (C, F, G) views. Scale bar: 1 mm.

Male genitalia as shown in Fig. 7: Pseudepiphallus stout, in profile view robust, tall and broad; with dorsal margin faintly sinuous. Pseudepiphallus with dorso-anterior pseudepiphallic spine fairly robust, apex acute; in profile view pointing dorsad; in dorsal view spaced apart and pointing slightly externally. Pseudepiphallus with

posterior end produced into two latero-apical lobular parts, pointing posteriorly and not diverging; between lobules deeply emarginated, base of emargination rounded; in profile with posterior part curved dorsad into dorso-apical spinule. Apical spinule small, apex acute pointing dorsad. Pseudepiphallic paramere elongated, acute, slightly bent at apical end. Ectophallic fold shaft-like, slender, with lateral margins somewhat parallel throughout length; at posterior end expanded, produced into two elongated, tongue-like lobules; in dorsal view with apical emargination very shallow wider between lateral lobes and faintly concave. Endophallic sclerite elongated, typical of genus; with lateral arms stout and broadly diverging. Rami short, about half the length of pseudepiphallus. Spermatophore almost pyriform.

Measurements. See Table 2.

Type locality. PHILIPPINES, Sulu Archipelago, Sulu Island.

Distribution. Known only from the type locality.

Varitrella (*Cantotrella*) *trusmadi* Gorochov, 2014

(Figs 8, 9)

Varitrella (*Cantotrella*) *trusmadi* Gorochov, 2014 in Gorochov & Tan, 2014: 540.

FIGURE 8. *Varitrella* (*Cantotrella*) *trusmadi* Gorochov, 2014 in its natural environment in Tabin Wildlife Reserve, Sabah.

Material examined. EAST MALAYSIA • 1♂; Sabah State, Mount Trus Madi, Trusmadi Entomology Camp; N5.44373 E116.45203, 1191.0±7.5 m.a.s.l.; 1 November 2023, 20h25; attracted to light trap near camp; coll. M.K. Tan; SBH.23.88 (ZRC).

Remarks. A male was recently collected. The calling song was recorded and describe here.

Type locality. EAST MALAYSIA: Sabah State: Mount Trus Madi.

Distribution. Known only from the type locality in Borneo.

Calling song. The calling song consists of a well-defined echeme-sequence made up of 6 to 11 echemes. The echeme-sequence has an average duration of 2.51±0.42 s (1.87–3.26 s). Each echeme consists of two closely-spaced syllables and has an average duration of 0.13±0.0 s (0.12–0.14 s). The silent interval between consecutive echemes is 0.25±0.06 s (0.18–0.37 s). Each syllable has an average duration of 38.7±2.1 ms (35.7–42.2 ms) and the interval between consecutive syllables is 52.7±2.0 ms (49.1–55.2 ms). The frequency spectrum is pure-tonal and forms a harmonic series, with the dominant frequency being the fundamental frequency of 5.53 kHz.

The calling song is similar to *V.* (*C.*) *tabin* from eastern Sabah in the call structure but differs by the echeme-sequence made up of more variable numbers of echemes. The two species have similar echeme and syllable durations; but *V.* (*C.*) *tabin* has a longer interval between consecutive syllables.

The calling song is also similar to *V.* (*C.*) *sulu* **sp. nov.** in the call structure and duration parameters, but differs generally by distinctively more echemes, as well as longer durations and intervals of the echemes and syllables.

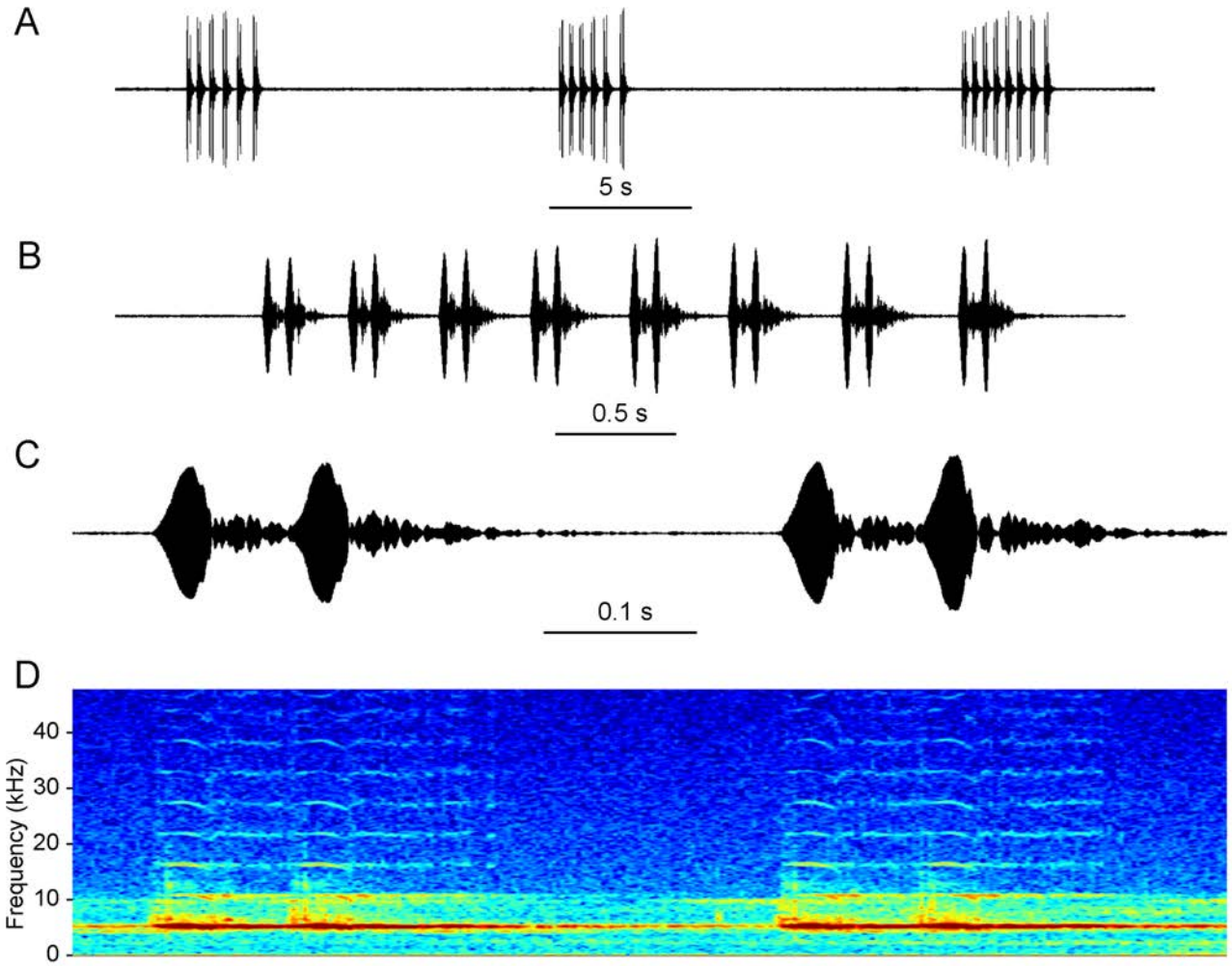

FIGURE 9. *Varitrella* (*Cantotrella*) *trusmadi* male calling song: oscillograms of three echeme-sequences (A), one echeme-sequence (B) and two echemes (C); spectrogram of the two echemes (D).

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