

New records and calling songs of Landrevinae (Orthoptera, Grylloidea, Gryllidae) from Sabah

MING KAI TAN^{1*}, DAYANG FAZRINAH BINTI AWG DAMIT², RAZY JAPIR², ARTHUR Y.C. CHUNG² & TONY ROBILLARD³

¹Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore, 2 Conservatory Drive, Singapore 117377, Republic of Singapore.

 orthoptera.mingkai@gmail.com;  <https://orcid.org/0000-0002-4324-6305>

²Forest Research Centre (Sepilok), Sabah Forestry Department, PO Box 1407, 90715 Sandakan, Sabah, Malaysia.

 DgFazrinah.AgDamit@sabah.gov.my;  <https://orcid.org/0009-0008-2925-7623>

 razy.japir@sabah.gov.my;  <https://orcid.org/0009-0004-1879-6550>

 arthur.chung@sabah.gov.my;  <https://orcid.org/0000-0002-9529-4114>

³Institut de Systématique, Evolution, Biodiversité (ISYEB), Muséum national d'Histoire naturelle, CNRS, SU, EPHE-PSL, UA, 57 rue Cuvier, CP 50, 75231 Paris Cedex 05, France.

 tony.robillard@mnhn.fr;  <https://orcid.org/0000-0002-2177-9549>

*Corresponding author

Abstract

We studied new material of six species of Landrevinae (Orthoptera, Grylloidea, Gryllidae) collected from recent field trips in Sabah. New locality records are reported for five species. *Duolandrevus* (*Eulandrevus*) *borneo* Gorochoy, 2016 in Maliau Basin, *Duolandrevus* (*Duolandrevus*) *spinicauda* Gorochoy, 2016 in Maliau Basin, *Endodreelanva peculiaris* Gorochoy, 2016 in Sinipung Hill, *Repapa denticulata* Gorochoy, 2016 in Maliau Basin and *Repapa trusmadi* Gorochoy, 2016 in Bukit Hampuan and Tenompok Forest Reserve. Previously-unknown calling songs of three species are also described: *Duolandrevus* (*Duolandrevus*) *spinicauda*, *Repapa denticulata* and *Repapa trusmadi*. The calling song of *Repapa* is known for the first time.

Key words: Borneo, bioacoustics, East Malaysia, new locality record, taxonomy

Introduction

Crickets of the subfamily Landrevinae Saussure, 1878, commonly known as the Bark Crickets, are highly speciose in Borneo, with at least 30 species currently known (Cigliano *et al.*, 2024). Advancement in the taxonomy of Landrevinae from Borneo and Southeast Asia was made by monographic work by Otte (1988) and Gorochoy (2000, 2016, 2017). In the forests of Southeast Asia, Landrevine crickets are readily heard calling at night. However, it can be challenging to locate or collect them, as many of them call while hiding in the crevices of dead logs, under tree trunks or hanging leaf litter among understory plants. Nothing is probably known about arboreal species. Upon disturbance, they will stop calling. They are often also very agile crickets, making them difficult to collect. Consequently, many species remain at large. Even as recent as the past three years, new species are still being discovered from Borneo such as: *Odontogryllodes magnus* Tan *et al.*, 2024 from Tenompok Forest Reserve (Tan *et al.*, 2024a), *Odontogryllodes spinifer* Tan *et al.*, 2022 from Sabah and *Duolandrevus* (*Duolandrevus*) *nobilis* Tan *et al.*, 2022 from Mount Silam (Tan *et al.*, 2022). Many species are also known from only a few specimens, and very little is known beyond their original descriptions.

Likewise, we know the calling songs of only a few Landrevinae. Recently, efforts by the first author to document the calling songs of Landrevinae has led to the descriptions of the calling songs of six species from five genera or subgenera: *Ajorama balatukanis* Otte, 1988 and *Ajorama siargaoensis* Tan *et al.*, 2019 (Tan *et al.*, 2019, 2023), *Duolandrevus* (*Bejorama*) *firmus tiomani* Gorochoy, 2016 (Tan *et al.*, 2024b), *Duolandrevus* (*Bejorama*)

lambir Gorochoy, 2017, *Duolandrevus* (*Duolandrevus*) *nobilis* Tan *et al.*, 2022 (Tan *et al.*, 2022) and *Duolandrevus* (*Eulandrevus*) *kawataredoki* Tan & Wahab, 2017 (Tan & Wahab, 2017). Since the calling songs are used for species recognition, the structure and parameters of both the time and frequency domains of the calling songs were found to be useful to delimit similar-looking congeners (see e.g., Tan *et al.*, 2023). This highlights the importance of collecting the calling songs as an additional data to understand species boundaries in landrevine and crickets in general.

Based on new material collected in different parts of Sabah during recent fieldwork, we found *Duolandrevus* (*Eulandrevus*) *borneo* Gorochoy, 2016 in Maliau Basin, *Duolandrevus* (*Duolandrevus*) *spinicauda* Gorochoy, 2016 in Maliau Basin, *Endodreelanva peculiaris* Gorochoy, 2016 in Sinipung Hill, *Repapa denticulata* Gorochoy, 2016 in Maliau Basin and *Repapa trusmadi* Gorochoy, 2016 in Bukit Hampuan and Tenompok Forest Reserve for the first time. Here, we also describe previously-unknown calling songs of three species: *Duolandrevus* (*Duolandrevus*) *spinicauda*, *Repapa denticulata* and *Repapa trusmadi*. The calling song of *Repapa* is documented for the first time (Cigliano *et al.*, 2024).

Material and methods

In October–November 2023 and November 2024, opportunistic collections of crickets day and night were conducted in Mount Trus Madi, Bukit Hampuan, Tenompok Forest Reserve, as well as Maliau Basin Conservation Area and around Meligan (including near Long Pasia and Sinipung Hill) in Sabah State (East Malaysia), Borneo. The permissions for collecting and exporting material were granted by the Sabah Biodiversity Centre (JKM/MBS.1000-2/2 JLD.16 (106) and JKM/MBS.1000-2/3 JLD.5 (40) for Mount Trus Madi; and JKM/MBS.1000-2/2 JLD.1 and JKM/MBS.1000-2/3 JLD.5 (106) for Maliau Basin and Meligan). The permission for research in Maliau Basin Conservation Area was also supported by the Maliau Basin Management Committee under the Yayasan Sabah (YS/MBMC(RA)/2024/3). This work was supported by the National Geographic Grant NGS-73188R-20. Whenever possible, live specimens were photographed 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.

Sound recording was done either in the field or in captivity. In the field, a sampling frequency of 96 kHz-samples/s Zoom H1n with Stereo X/Y 90° microphones handles up to 120 dB SPL was used. In captivity, the cricket was kept isolated in a small insect cage with nylon cover. Dead wood or dried leaves were provided to create a more naturalised environment to simulate calling. A Wildlife Acoustics Song Meter (SM) Mini acoustic recorder programmed to record continuously with a sampling frequency of 96 kilo-samples per second and channel gain of 18 dB (16 bit) was placed at most 30 cm away beside the cage with the microphone pointing horizontally towards the cage. A temperature logger, HOBO 8K Pendant® Temperature logger (model: UA-001-08, Onset, Bourne, MA), was used to record the ambient temperature.

The specimens were preserved in absolute analytical-grade ethanol and later pinned and dry-preserved. Typically, a single leg (not standardised) from each specimen was kept 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 glycerine or hand sanitiser. Terminology used to describe the male genitalia follows Desutter-Grandcolas (2003) and also Gorochoy (2015) [in square brackets]:

Pseudepiphallus (ps) [epiphallus]

Pseudepiphallic lophi (ps l) [posterolateral epiphallic lobe]

Pseudepiphallic posteromedial lophi (ps m) [posteromedial epiphallic lobe]

Pseudepiphallic paramere (ps p) [ectoparamere]

Ectophallic fold (ec f) [rachis (= guiding rod)]

Ectophallic apodeme (ec ap) [endoparameral apodeme]

Endophallic sclerite (en s) [formula (= mold of spermatophore attachment plate)]

Rami (ra)

The pinned specimens were imaged using a Canon EOS 6D digital SLR camera attached to a Visionary Digital Passport system. For habitus, a compact-macro lens EF 50 mm at f/2.5 was used; for close-up images of morphological features, a macro photo lens MP-E 65 mm f/2.8 USM (1–5×) (sometimes with Tamron SP AF Tele-Converter 140F-CA 1.4×) was used. Image stacking was done using Zerene Stacker version 1.04. Image editing was accomplished using Adobe Photoshop 2025 (Adobe Systems Incorporated, San Jose, CA, USA). Measurements of dry, pinned specimens were made from images using ImageJ 1.54g (Wayne Rasband, Research Services Branch, National Institute of Mental Health, Bethesda, MD, USA).

Acoustics analysis and song terminology generally follow Tan *et al.* (2022, 2023, 2024b). 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.

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

Abbreviations for general morphology:

I, II, III = front, median, hind respectively (femora, legs, tibiae)

F = femur

FW = forewing (tegmen)

T = tibia

Ta = tarsus

Abbreviations for measurements:

BL = body length

PronL = pronotum length

PronW = pronotum width

FWL = forewing length

FWW = forewing width

FIIL = length of hind femur

TIIL = length of hind tibia

Taxonomic parts

Superfamily Grylloidea Laicharting, 1781

Family Gryllidae Laicharting, 1781

Subfamily Landrevinae Saussure, 1878

Duolandrevus (Bejorama) lambir Gorochov, 2017

(Fig. 1)

Duolandrevus (Bejorama) lambir Gorochov, 2017: 230—Tan & Wahab, 2018: 128; Tan *et al.*, 2022: 203

Duolandrevus (Bejorama) nr. *luzonensis*—Tan & Wahab, 2017: 442 [tentative identification prior to species described by Gorochov (2017)]

New material examined. EAST MALAYSIA; Sabah State • 1♂; Sandakan District, Sepilok, Rainforest Discovery Centre, Giant Sepilok (24SA2); N5.87247, E117.94002, 55 m; 9 November 2024, night; on ground; coll. T. Robillard; TR24-07 (MNHN).

Distribution. EAST MALAYSIA: Sarawak State: Lambir Hills (type locality); Sabah State: Sandakan; BRUNEI DARUSSALAM



FIGURE 1. *Duolandrevus (Bejorama) lambir* Gorochov, 2017 in its natural environment in Sepilok.

***Duolandrevus (Duolandrevus) spinicauda* Gorochov, 2016**

(Figs 2A, 3, 4)

Duolandrevus (Duolandrevus) spinicauda Gorochov, 2016: 46.

Duolandrevus (Duolandrevus) spinicauda gading Gorochov, 2017: 229

New material examined. EAST MALAYSIA; Sabah State • 1♂; Maliau Basin Conservation Area, Agathis Nature Trail; N4.70158 E116.90745, 541.9±8.1 m.a.s.l.; 16 November 2024, 19h52; calling under bark of rotten log; coll. M.K. Tan; SBH.24.116 (ZRC) • 1♂; Maliau Basin Conservation Area, at Maliau Basin Studies Centre along Wildlife Trail; N4.73815 E116.97520, 232.9±8.4 m.a.s.l.; 10 November 2024, 20h48; on tree trunk; coll. M.K. Tan; SBH.24.9 (ZRC) • 1♂; Maliau Basin Conservation Area, at Maliau Basin Studies Centre along Knowledge Trail (start) (24SA4); N4.74189 E116.97062, 227 m; 10–18 November 2024, night; on tree trunk; coll. T. Robillard; TR24-33 (MNHN).

Remarks. Our male specimens are very similar to *Duolandrevus (Duolandrevus) spinicauda* Gorochov, 2016 from Sarawak and *Duolandrevus (Duolandrevus) balikpapan* Gorochov, 2016 from Kalimantan (both species from Borneo) in the general morphology. Our specimens show more similarities in the male FWs with *D. spinicauda* by the venation around the mirror area and its stridulatory file vein more sinuous; as well as more similar in the male genitalia with *D. spinicauda* by the pseudepiphallic lophi in profile almost not S-shaped (instead of clearly S-shaped in *D. balikpapan*) (these lobes in our specimens are also shorter like in *D. balikpapan*) and the pseudepiphallic paramere in profile view more rounded (distinct from both *D. balikpapan* and *D. spinicauda*).

Our specimens are also more similar to the nominal subspecies in that the pseudepiphallic lophi curved dorsad only at the apex (instead of subapical part) and the pseudepiphallic parameres in profile more triangular (instead of

flattened). Our specimens are, however, more similar to *D. (D.) spinicauda gading* Gorochoy, 2017 in the metanotal gland having its lateral parts of posterior keel-like fold extended more posteriorly and laterally than the nominal subspecies. These suggest that the subspecies status require revision, and more material and additional data type will be necessary.

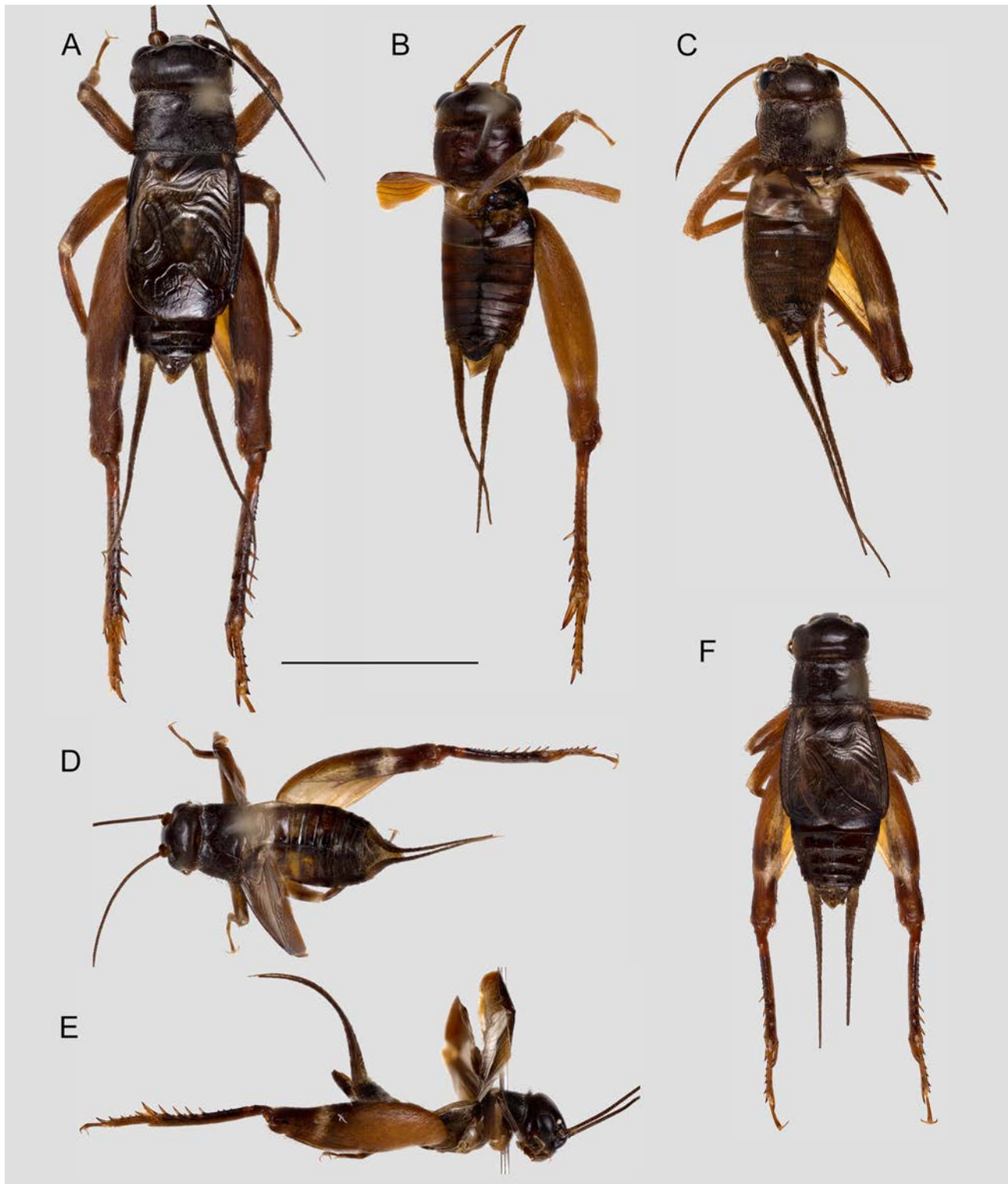


FIGURE 2. Male habitus of *Duolandrevus (Duolandrevus) spinicauda* Gorochoy, 2016 (A), *Duolandrevus (Eulandrevus) borneo* Gorochoy, 2016 (B), *Endodreelanva peculiaris* Gorochoy, 2016 (C), *Repapa denticulata* Gorochoy, 2016 (D, E), *Repapa trusmadi* Gorochoy, 2016 (F) in dorsal (all except E) and lateral (E) views. Scale bar: 10 mm.

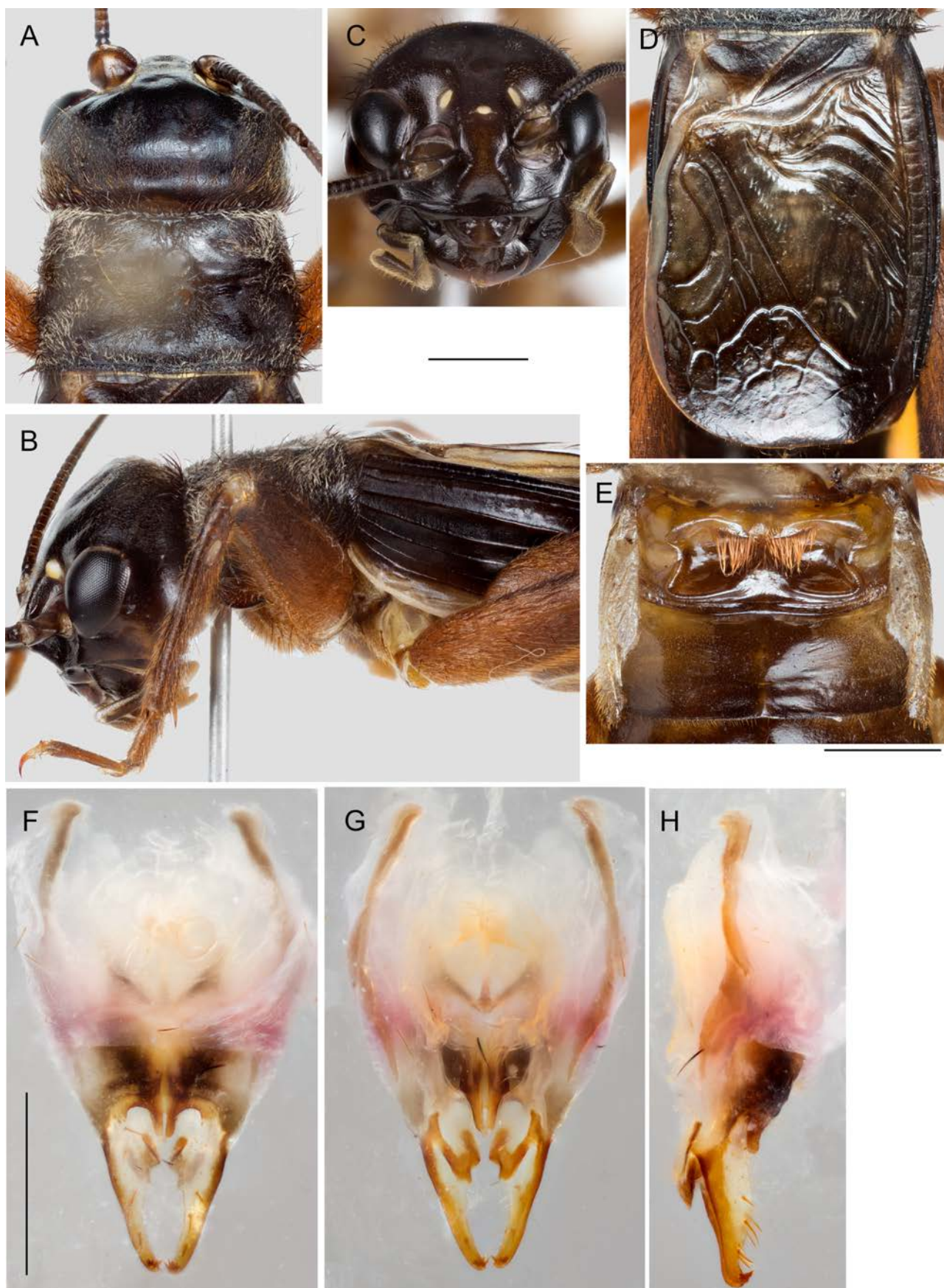


FIGURE 3. *Duolandrevus (Duolandrevus) spinicauda* Gorochoy, 2016 male: head and pronotum in dorsal (A) and lateral (B) views; face in anterior view (C); right FW in dorsal view (D); metanotal gland in dorsal view (E); genitalia in dorsal (F), ventral (G) and lateral (H) views. Scale bars: 2 mm (A–E); 1 mm (F–H).

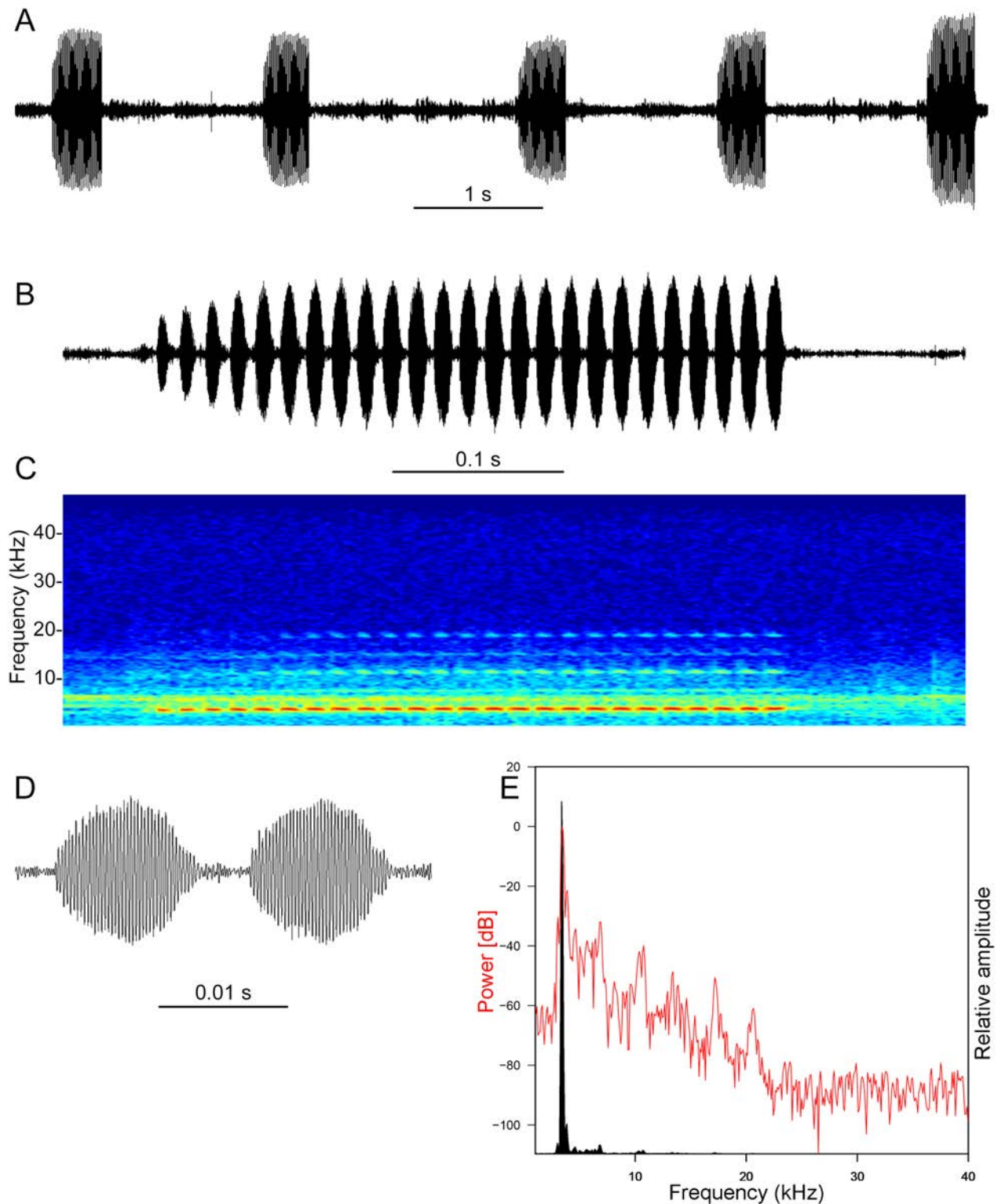


FIGURE 4. *Duolandrevus (Duolandrevus) spinicauda* Gorochov, 2016 male calling song: oscillograms of five echemes (A), one echeme made up of 25 syllables (B); spectrogram of the echeme (C); oscillogram of two syllables (D); power spectrum of a syllable (E) where the red line represents the power [dB] (axis name in red) and the black solid peak represents the relative amplitude (axis name in black).

Distribution. EAST MALAYSIA: Sarawak State: Kubah (Matang Mountains) (type locality for nominal subspecies), Gunung Gading (type locality for subspecies *gading*); Sabah State: Maliau Basin [new locality record]

Calling song (2♂, in the field, 25.2°C) (Fig. 4). The calling song consists of an echeme made up of an average of 24 ± 1 syllables (21–27 syllables). The average echeme duration is 0.34 ± 0.03 s (0.29–0.40 s). The first few syllables are of lower amplitudes but eventually the amplitude increases to a maximum and remains relatively consistent. The average syllable duration is of 11.1 ± 0.6 ms (9.8–11.8 ms), the interval between consecutive syllables is 3.2 ± 0.4 ms (2.5–3.9 ms) and the average period is 14.3 ± 0.6 ms (13.3–15.0 ms). The frequency spectrum is pure-tonal and forms a harmonic series, with the energy peaking at a dominant and fundamental frequency of 3.66 ± 0.19 kHz (3.47–3.84 kHz).



FIGURE 5. *Duolandrevus (Eulandrevus) borneo* Gorochoy, 2016 in its natural environment in Maliau Basin.

***Duolandrevus (Eulandrevus) borneo* Gorochoy, 2016**

(Figs 2B, 5, 6)

Duolandrevus (Eulandrevus) borneo Gorochoy, 2016: 50.

New material examined. EAST MALAYSIA; Sabah State • 1♂; Maliau Basin Conservation Area, at Maliau Basin Studies Centre along Balien Nature Trail; N4.73843 E116.97134, 255.9±7.4 m.a.s.l.; 13 November 2024, 23h15; walking among forest floor; coll. M.K. Tan; SBH.24.68 (ZRC) • 1♂; Maliau Basin Conservation Area along Agathis–Nepenthes Trail, 1.5 km mark (24SA9); N4.70213 E116.97256, 616 m; 12–16 November 2024, night; on dead branch on ground; TR24-100 (MNHN).

Remarks. Pseudepiphallidic lophi in profile are distinctly more elongated and our specimens show slight differences in the male FWs (but not clear differences in the venation) and metanotal glands (but still similar in being somewhat reduced). We do not think that the minor differences can be considered species differences.

Distribution. EAST MALAYSIA: Sabah State: Tawau Hills (type locality), Crocker Range, Maliau Basin [new locality record].

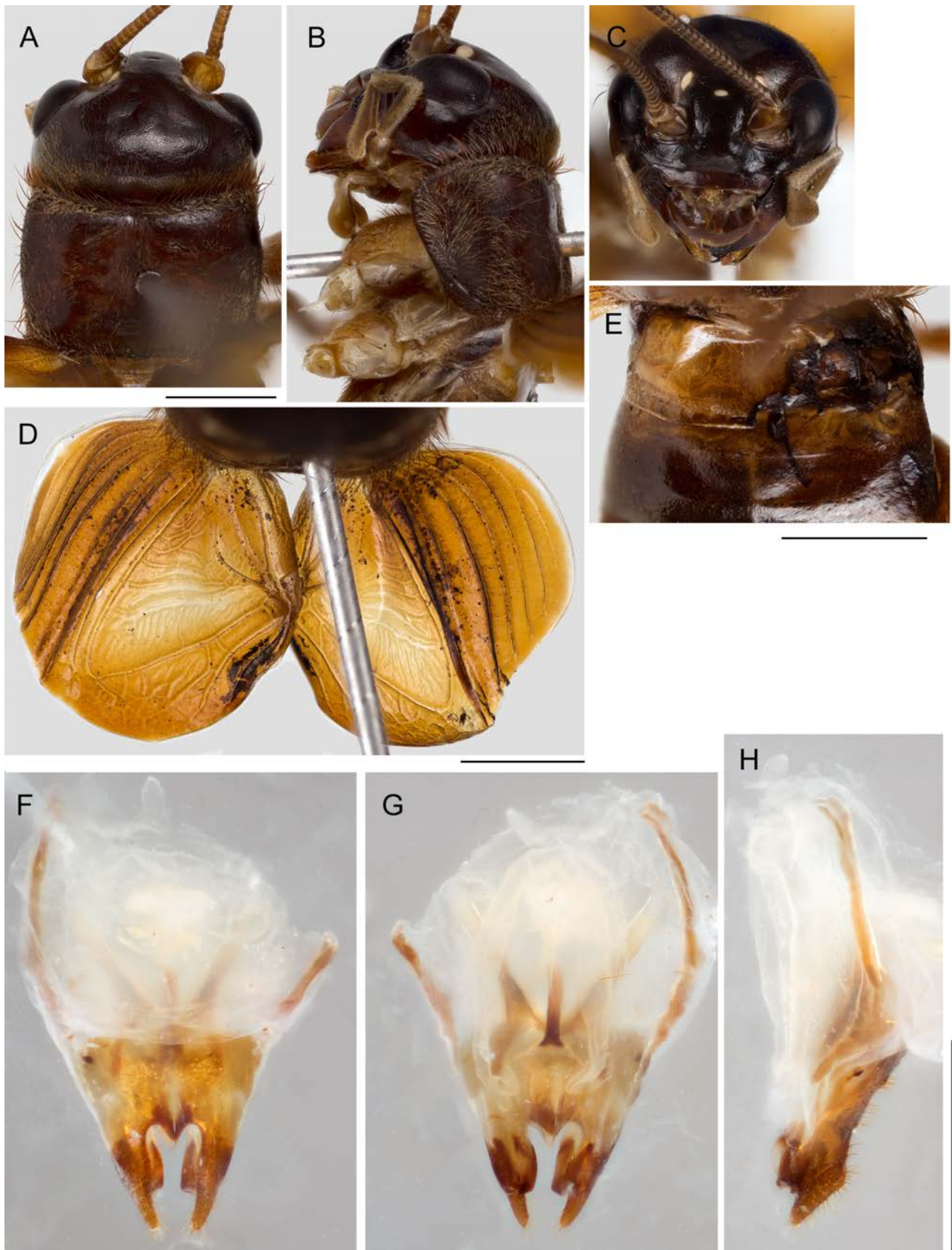


FIGURE 6. *Duolandrevus (Eulandrevus) borneo* Gorochoy, 2016 male: head and pronotum in dorsal (A) and lateral (B) views; face in anterior view (C); FWs in dorsal view (D); metanotal gland in dorsal view (E); genitalia in dorsal (F), ventral (G) and lateral (H) views. Scale bars: 2 mm (A–E); 1 mm (F–H).

***Endodreelanva peculiaris* Gorochov, 2016**

(Figs 2C, 7, 8)

Endodreelanva peculiaris Gorochov, 2016: 85—Tan & Kamaruddin, 2016: 561; Tan *et al.*, 2019: 290, 292.

New material examined. EAST MALAYSIA; Sabah State • 1♂; Sinipung Hill, near Long Pasia; N4.43510 E115.72318, 1295.0±8.3 m.a.s.l.; 20 November 2024, 19h30; on Liana; coll. M.K. Tan; SBH.24.180 (ZRC).

Distribution. EAST MALAYSIA: Sabah State: Mount Trus Madi (type locality), Sinipung Hill [new locality record].



FIGURE 7. *Endodreelanva peculiaris* Gorochov, 2016 in its natural environment in Sinipung Hill.

***Repapa denticulata* Gorochov, 2016**

(Figs 2D, 2E, 9, 10)

Repapa denticulata Gorochov, 2016: 74.

New material examined. EAST MALAYSIA; Sabah State • 1♂; Maliau Basin Conservation Area, at Agathis Camp along Agathis Nature Trail; N4.70048 E116.90703, 552.1±11.2 m.a.s.l.; 16 November 2024, 20h24; calling under bark of trunk; coll. M.K. Tan; SBH.24.117 (ZRC) • 2♂; Maliau Basin Conservation Area, at Maliau Basin Studies Centre along Knowledge Trail (start) (24SA4); N4.74189 E116.97062, 227 m; 10–18 November 2024, night; on tree trunk (TR24-33) or on dead trunk (TR24-81); coll. T. Robillard; TR24-33, TR24-81 (MNHN).

Remarks. Our specimens from Maliau Basin differ slightly from the type by the pseudepiphallidic lophi in dorsal view at apex more widely expanded and not pointing externally, and in lateral view slightly less slender as in *R. denticulata*.

Distribution. EAST MALAYSIA: Sabah State: Tawau Hills National Park (type locality), Maliau Basin [new locality record].

Calling song (1♂, in captivity, 28.7°C) (Fig. 10). The calling song consists of an echeme with a highly variable number of isolated syllables, ranging from 10 to 68. Consequently, the echeme duration can be variable, ranging from 0.51–3.53 s. On average, the echeme duration is 1.25 ± 0.76 s and the average number of syllables is 24 ± 14 . The first few syllables sometimes are of slightly lower amplitudes or of shorter durations, but these parameters eventually remain relatively consistent. Each syllable has an average duration of 16.1 ± 4.6 ms (9.8–22.0 ms), the interval between consecutive syllables is 38.9 ± 5.9 ms (29.8–46.6 ms) and the average period is 55.0 ± 2.8 ms (51.0–61.8 ms). The frequency spectrum is pure-tonal and forms a harmonic series, with the energy peaking at a dominant and fundamental frequency of 5.47 ± 0.11 kHz (5.34–5.72 kHz)

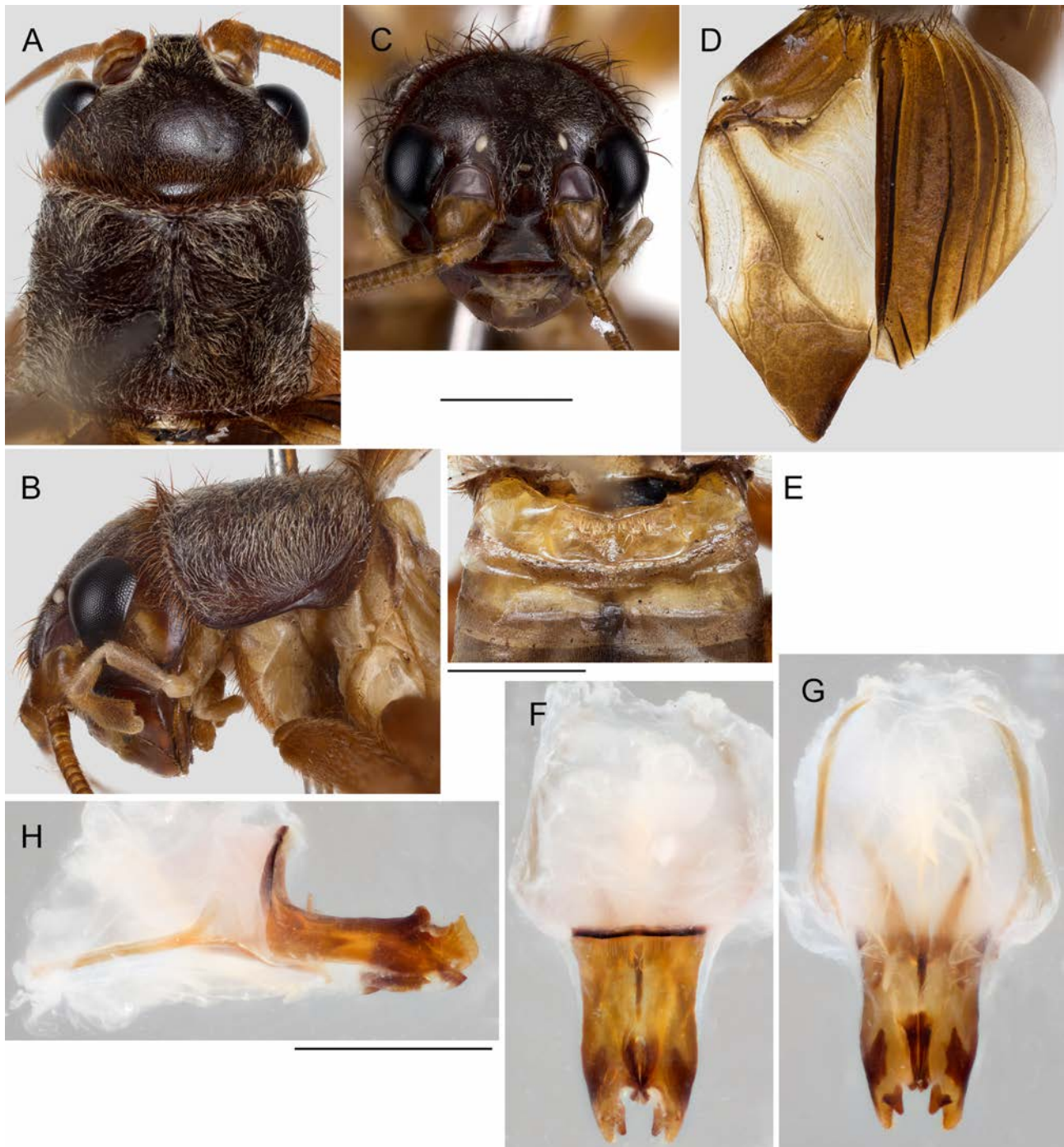


FIGURE 8. *Endodreelanva peculiaris* Gorochov, 2016 male: head and pronotum in dorsal (A) and lateral (B) views; face in anterior view (C); right FW in dorsal view (D); metanotal gland in dorsal view (E); genitalia in dorsal (F), ventral (G) and lateral (H) views. Scale bars: 2 mm (A–E); 1 mm (F–H).

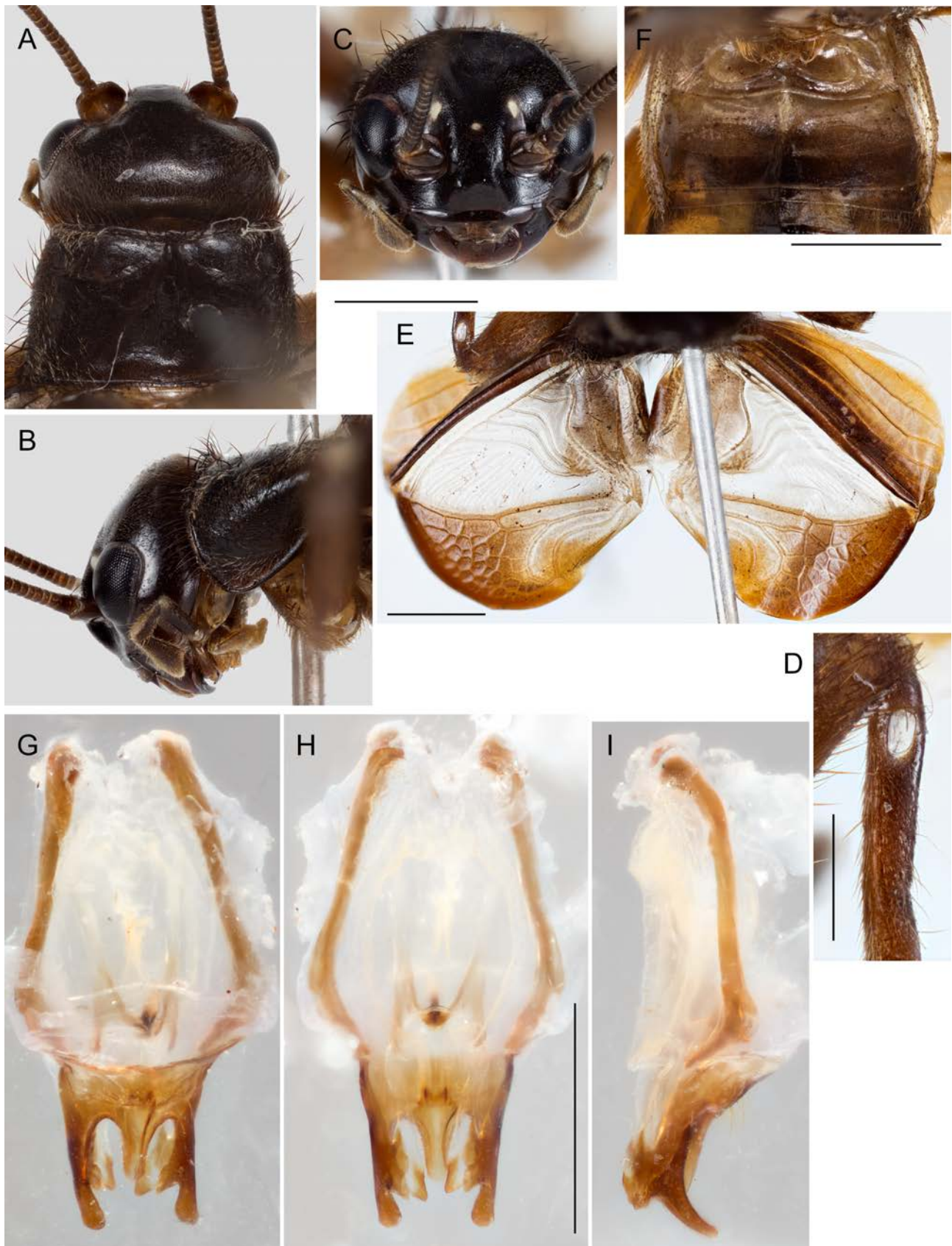


FIGURE 9. *Repapa denticulata* Gorochov, 2016 male: head and pronotum in dorsal (A) and lateral (B) views; face in anterior view (C); inner tympanum of TI (D); FWs in dorsal view (E); metanotal gland in dorsal view (F); genitalia in dorsal (G), ventral (H) and lateral (I) views. Scale bars: 2 mm (A–C, E, F); 1 mm (D, G–I).

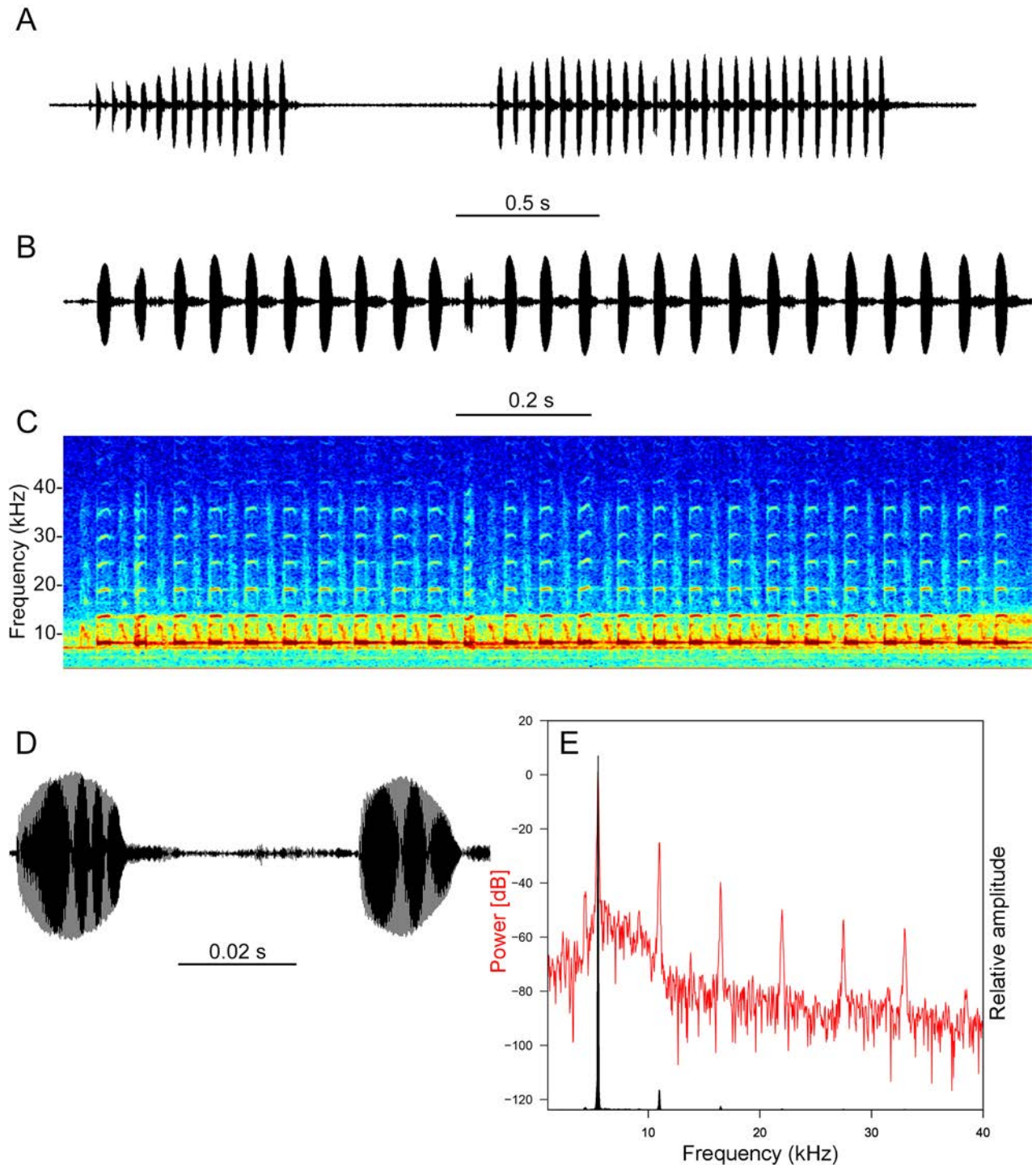


FIGURE 10. *Repapa denticulata* Gorochoy, 2016 male calling song: oscillograms of two echemes (A), one echeme made up of 25 syllables (B); spectrogram of the echeme (C); oscillogram of two syllables (D); power spectrum of a syllable (E) where the red line represents the power [dB] (axis name in red) and the black solid peak represents the relative amplitude (axis name in black).



FIGURE 11. *Repapa trusmadi* Gorochoy, 2016 male: head and pronotum in dorsal (A) and lateral (B) views; face in anterior view (C); right FW in dorsal view (D); metanotal gland in dorsal view (E); genitalia in dorsal (F), ventral (G) and lateral (H) views. Scale bars: 2 mm (A–E); 1 mm (F–H).

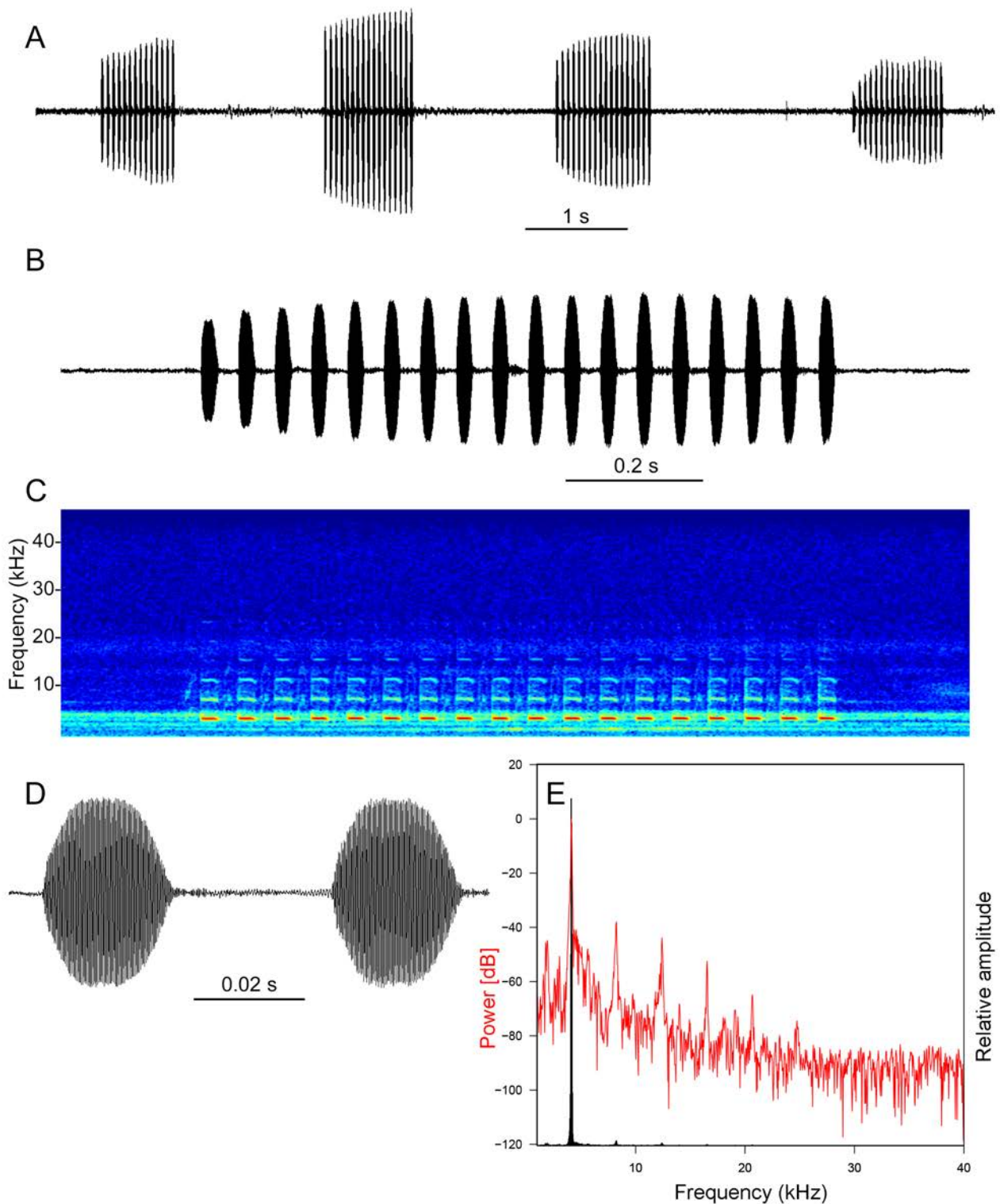


FIGURE 12. *Repapa trusmadi* Gorochoy, 2016 male calling song: oscillograms of four echemes (A), one echeme made up of 18 syllables (B); spectrogram of the echeme (C); oscillogram of two syllables (D); power spectrum of a syllable (E) where the red line represents the power [dB] (axis name in red) and the black solid peak represents the relative amplitude (axis name in black).

***Repapa trusmadi* Gorochoy, 2016**

(Figs 2F, 11, 12)

Repapa trusmadi Gorochoy, 2016: 73.

New material examined. EAST MALAYSIA; Sabah State • 1♂; Bukit Hampuan; N5.99629 E116.67598, 943.1±11.5 m.a.s.l.; 4 November 2023, 21h00; calling under bark of fallen log; coll. M.K. Tan *et al.*; SBH.23.152 (ZRC) • 1♂; Tenompok Forest Reserve; N6.01856 E116.50286, 1390.0±6.6 m.a.s.l.; 6 November 2023, 19h59; calling under rotten log; coll. M.K. Tan *et al.*; SBH.23.187 (ZRC).

Remarks. Our specimens from Bukit Hampuan and Tenompok Forest Reserve resemble the ones described by Gorochoy (2016) in the male FW venations and metanotal gland. There are some slight variations in the apex of the pseudepiphallal lophi of the male genitalia, but the specimens still resemble *R. trusmadi* most, compared to other congeners and particularly *Repapa brevipes* (Chopard, 1937) from northern Palawan Islands. Owing to the close proximity of our specimens to Mount Trus Madi (type locality), we refrain from considering the variations in the male genitalia as specific differences and refrain from describing a new species until we have more material.

Distribution. EAST MALAYSIA: Sabah State: Mount Trus Madi (type locality), Crocker Range, Bukit Hampuan [new locality record], Tenompok Forest Reserve [new locality record].

Calling song (2♂, in the field, 21.1°C) (Fig. 12). The calling song consists of an echeme made up of an average of 17±1 syllables (15–18 syllables). The average echeme duration is 0.85±0.05 s (0.76–0.92 s). The average interval between consecutive echemes is 1.27±0.39 s (0.87–2.12 s). The very first few syllables are of slightly lower amplitudes but generally the amplitudes of syllables remain relatively consistent. The average syllable duration of 25.9±1.0 ms (24.1–27.7 ms), the interval between consecutive syllables is 26.1±0.9 ms (24.6–27.6 ms) and the average period is 52.0±0.5 ms (51.2–53.1 ms). The frequency spectrum is pure-tonal and forms a harmonic series, with the energy peaking at a dominant and fundamental frequency of 4.09±0.09 kHz (4.03–4.22 kHz).

Acknowledgements

The authors thank Shartner Liew and Hasamuddin bin Abu Bakar, Mohamad Azizan Bin Asidi, Momin Binti, John Lee Yukang for field assistance. We also appreciate the assistance provided by the Mount Trus Madi Entomology Camp: Clara Chong and Jimmy Chew. The permissions for collecting and exporting material were granted by the Sabah Biodiversity Centre (JKM/MBS.1000-2/2 JLD.16 (106) and JKM/MBS.1000-2/3 JLD.5 (40) for Mount Trus Madi; and JKM/MBS.1000-2/2 JLD.1 and JKM/MBS.1000-2/3 JLD.5 (106) for Maliau Basin and Meligan); Narbert Nasly [the District Forestry Officer (DFO) of Keningau] (JPHTN/PSH 100-14/18/2/JLD.17(04)); Alexander Geivasius (the Assistant DFO of Ranau); Mohd Zainur Rijal [the DFO of Tibow (for Maliau Basin)]; and Andrew Monis Noni [the DFO of Sipitang (Meligan Forest Reserve)]. The permission for research in Maliau Basin Conservation Area was also supported by the Maliau Basin Management Committee under the Yayasan Sabah (YS/MBMC(RA)/2024/3). The work of MKT and TR was supported by the National Geographic Grant NGS-73188R-20 and the Orthoptera Species File Grant 2019.

References

- Araya-Salas, M. & Smith-Vidaurre, G. (2017) warbleR: an R package to streamline analysis of animal acoustic signals. *Methods in Ecology and Evolution*, 8, 184–191.
<https://doi.org/10.1111/2041-210X.12624>
- Cigliano, M.M., Braun, H., Eades, D.C. & Otte, D. (2024) Orthoptera Species File Online. Version 5 (5.0). Available from: <http://orthoptera.speciesfile.org/HomePage/Orthoptera/HomePage.aspx> (accessed 15 December 2024)
- Desutter-Grandcolas, L. (2003) Phylogeny and the evolution of acoustic communication in extant Ensifera (Insecta, Orthoptera). *Zoologica Scripta*, 32, 525–561.
<https://doi.org/10.1046/j.1463-6409.2003.00142.x>
- Gorochoy, A.V. (2000) New and little known Landrevinae (Orthoptera: Gryllidae). *Zoosystematica Rossica*, 8 (2), 267–280.
- Gorochoy, A.V. (2015) Evolution and taxonomic significance of the copulatory apparatus in Ensifera (Orthoptera). Part 2: Male genitalia in Grylloidea (Orthoptera: Ensifera). *Zoosystematica Rossica*, 24 (1), 31–41.
<https://doi.org/10.31610/zsr/2015.24.1.31>

- Gorochoy, A.V. (2016) Taxonomic studies on the subfamily Landrevinae (Orthoptera: Gryllidae). *Zoosystematica Rossica*, 25 (1), 23–97.
<https://doi.org/10.31610/zsr/2016.25.1.23>
- Gorochoy, A.V. (2017) New data on Asiatic and Papuan crickets of the subfamily Landrevinae (Orthoptera: Gryllidae). *Zoosystematica Rossica*, 26 (2), 223–240.
<https://doi.org/10.31610/zsr/2017.26.2.223>
- Otte, D. (1988) Bark crickets of the western Pacific region (Gryllidae: Pteroplistinae). *Proceedings of the Academy of Natural Sciences, Philadelphia*, 140 (2), 281–335.
- Tan, M.K., Gorochoy, A.V., Baroga-Barbecho, J.B. & Yap, S.A. (2019) A new species of Landrevinae (Orthoptera) from the Philippines, with notes on *Endodreelanva* and *Endolandrevus* (Orthoptera: Gryllidae; Gryllinae; Landrevini). *Zootaxa*, 4544 (2), 285–295.
<https://doi.org/10.11646/zootaxa.4544.2.8>
- Tan, M.K., Japir, R., Chung, A.Y.C. & Robillard, T. (2022) New taxa and notes on bark and bush crickets (Orthoptera, Grylloidea, Gryllidae, Landrevinae and Podoscirtinae) from Sabah. *Zootaxa*, 5178 (3), 201–228.
<https://doi.org/10.11646/zootaxa.5178.3.1>
- Tan, M.K. & Kamaruddin, K.N. (2016) New taxa and notes on some Landrevinae (Orthoptera: Gryllidae) from Malay Peninsula. *Zootaxa*, 4162 (3), 559–570.
<https://doi.org/10.11646/zootaxa.4162.3.9>
- Tan, M.K., Muhammad, A.A., Abdullah, N.A., Japir, R. & Chung, A.Y.C. (2024a) A taxonomic review of *Odontogrylloides* Chopard, 1969 (Gryllidae: Landrevinae). *Zootaxa*, 5410 (2), 267–279.
<https://doi.org/10.11646/zootaxa.5410.2.7>
- Tan, M.K., Muhammad, A.A., Gorochoy, A.V. & Abdullah, N.A. (2024b) Taxonomy and bioacoustics of some crickets (Orthoptera: Grylloidea) from Panti Forest Reserve in Johor, Peninsular Malaysia. *Zootaxa*, 5501 (1), 1–38.
<https://doi.org/10.11646/zootaxa.5501.1.1>
- Tan, M.K., Salvador, J.A.G., Sabang, A.M.M., Bahoy, D.C.M., Nuñez, O.M. & Robillard, T. (2023) Taxonomy and bioacoustics of little-known Grylloidea crickets (Orthoptera, Ensifera) from Mindanao, Philippines. *Zootaxa*, 5323 (3), 301–348.
<https://doi.org/10.11646/zootaxa.5323.3.1>
- Tan, M.K. & Wahab, R.A. (2017) New taxa and notes on crickets of the subfamily Landrevinae (Orthoptera: Gryllidae) from Brunei Darussalam, Borneo. *Zootaxa*, 4365 (4), 440–454.
<https://doi.org/10.11646/zootaxa.4365.4.4>
- Tan, M.K. & Wahab, R.A. (2018) Preliminary study on the diversity of Orthoptera from Kuala Belalong Field Studies Centre, Brunei Darussalam, Borneo. *Journal of Orthoptera Research*, 27 (2), 119–142.
<https://doi.org/10.3897/jor.27.24152>