

A new species and notes of some pygmy grasshoppers (Orthoptera: Tetrigidae) from Sabah

MING KAI TAN^{1,*}, AMIRA AQILAH MUHAMMAD², DAYANG FAZRINAH BINTI AWG DAMIT³, RAZY JAPIR³, ARTHUR Y.C. CHUNG³ & TONY ROBILLARD⁴

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>

²Institute of Biological Sciences, Faculty of Science, Universiti Malaya, Kuala Lumpur 50603, Malaysia

 miamedulla@gmail.com;  <https://orcid.org/0000-0001-5772-1149>

³Forest 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>

⁴Institut 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

A recent orthopteran collection was conducted in Meligan and Maliau Basin, Sabah State (East Malaysia) in Borneo. We describe a new species of *Bolotettix* from Meligan: *Bolotettix adik* Tan & Muhammad, **sp. nov.** We also record *Mazarredia* (*Prosoaltus*) *cephalica* (Haan, 1843) and *Falconius pseudoclavitsaris* Günther, 1938 in Sabah and *Tripetalocera ferruginea* Westwood, 1834 in Maliau Basin for the first time. We also present colour variations of *Bolivaritettix apterus* (Rehn, 1904).

Key words: *Bolotettix*, Borneo, new locality record, taxonomy, variations

Introduction

Sampling on pygmy grasshoppers (Orthoptera: Caelifera: Tetrigidae) in Malaysia is gaining attention, but the effort is uneven with Peninsular Malaysia, more heavily studied as compared to its Borneo (Sabah and Sarawak states) counterpart (see Muhammad *et al.*, 2018, 2023; Rahim *et al.*, 2024; Tan *et al.*, 2017). Borneo, being a major “evolutionary biodiversity hotspot” (De Bruyn *et al.*, 2014), harbours a unique assemblage of species which are different from those in Peninsular Malaysia due to its geography and history (Williams *et al.*, 2017; Wong, 2011). Pygmy grasshoppers in Sabah are relatively understudied, owing to Borneo’s vast landmass and pristine forests, with past research being dispersed across various localities in Sabah (see Gen *et al.*, 2005; Muhammad, 2024; Skejo *et al.*, 2022).

Recently, an orthopteran survey was conducted in Meligan and Maliau Basin in Sabah State. A new species of *Bolotettix* Hancock, 1907 was discovered from Meligan and described here: *Bolotettix adik* Tan & Muhammad, **sp. nov.** New locality records of *Mazarredia* (*Prosoaltus*) *cephalica* (Haan, 1843) and *Falconius pseudoclavitsaris* Günther, 1938 in Sabah and *Tripetalocera ferruginea* Westwood, 1834 in Maliau Basin, as well as colour variations observed in *Bolivaritettix apterus* (Rehn, 1904) are also presented here.

Material and methods

Between 10 and 25 November 2024, opportunistic collection at day and night, and light-trapping were conducted in 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.1 and JKM/MBS.1000-2/3 JLD.5 (106)). The permissions for research in the Maliau Basin Conservation Area were also supported by the Maliau Basin Management Committee under Yayasan Sabah (YS/MBMC(RA)/2024/3). The fieldwork was also 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.

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.

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). The measurements following terminology by Tumbrinck (2014) and Tan & Artchawakom (2015) were made: BL = body length (length from vertex of head to apical margin of subgenital plate); VW = vertex width; EW = eye width; SW = scutellum (or frontal ridge) width (between the antennal scrobes); 1stAW = first antennal segment width (in the middle of the segment) = scapus width; PL = pronotum length; PW = pronotum width; PH = pronotum height; IAH = infrascapular area height; PAW = prozona width at anterior margin; TL = tegmen length; TW = tegmen width (in the middle, after radius vein to posterior (= ventral margin); HWL = hindwing length; HFL = hind femur length; HFW = hind femur width; HTL = hind tibia length (from knee to base of apical spine); 1st TaL = first tarsal segment (basal) length; 3rd TaL = third tarsal segment (apical) length (without claws).

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 additional repositories:

RMNH Naturalis Biodiversity Centre (formerly Rijksmuseum van Natuurlijke Historie), Leiden, The Netherlands

SMTD Museum für Tierkunde, Dresden, Germany

Taxonomy Parts

Family Tetrigidae Rambur, 1838

Genus *Bolotettix* Hancock, 1907

Type species. *Bolotettix validispinus* Hancock, 1907 by original designation of *Bolotettix* Hancock, 1907

Remarks. The genus consists of nine species from India Subcontinent [*Bolotettix anomalus* (Hancock, 1910), *Bolotettix inermis* Hancock, 1915], Sumatra [*Bolotettix affinis* Günther, 1938, *Bolotettix mentaweiensis* Günther, 1938], Borneo [*Bolotettix parvispinus* Hancock, 1913, *Bolotettix perminutus* (Bolívar, 1887), *Bolotettix planus* Hancock, 1907, *Bolotettix validispinus* Hancock, 1907] and the Philippines [*Bolotettix luzonicus* Bey-Bienko, 1935, *Bolotettix perminutus* (Bolívar, 1887)] (Cigliano *et al.*, 2025).

***Bolotettix adik* Tan & Muhammad, sp. nov.**

(Figs 1–3, 4A)

Material examined. Holotype: EAST MALAYSIA • ♂; Sabah State; Sinipung Hill, near Long Pasia; N4.44622 E115.71439, 1563.0±13.0 m.a.s.l.; 21 November 2024, 19h32; on foliage of herb near mossy rotten log; coll. M.K. Tan; SBH.24.194 (FRC).

Paratypes: EAST MALAYSIA, Sabah State; Sinipung Hill, near Long Pasia • 1♂; same details as holotype; SBH.24.195 (MNHN) • 2♂; N4.44669 E115.71443, 1598.0±11.5 m.a.s.l.; 21 November 2024, 20h25; on branch near dead log; coll. M.K. Tan; SBH.24.199, 200 (ZRC).

Generic status. We tentatively place the new species under *Bolotettix* Hancock, 1907 despite the similarities with species from the genus *Zhengitettix* Liang, 1994. *Bolotettix* is a little-known genus, and the species are in need for taxonomic revision. However, the new species shows similarities with the type species *Bolotettix validispinus* Hancock, 1907 (see diagnosis). On the other hand, *Zhengitettix* has not been recorded in Borneo, even though its distribution ranges from Philippines to Indochina.

Diagnosis. The new species is characterised by its small size (BL = 6.59±0.15 mm; PL = 7.86±0.23 mm) and marmorated colour patterns, its facial carinae (COS) wide, its pronotal disc with the prozonal carina (CA) and interhumeral carina (CD) thick and strongly raised; the spine of its lateral lobe acute triangular but slightly curved posteriorly and not elongated; EW/VW = 1.4±0.04; PL/PW = 2.36±0.05; HFL/HTL = 1.20±0.04.

From type species *Bolotettix validispinus* Hancock, 1907 (Fig. 4B) from Borneo, the new species differs by its face less slender, its facial carinae (COS) thicker and more widely spaced apart (SW/VW = 0.65 vs. 0.53); EW/VW = 1.46 (vs. 2.00); the prozonal carina (CA) and interhumeral carina (CD) thick and strongly raised, not different from the median carina (as compared to thinner, less distinctly raised compared to its median carina); the spine of its lateral lobe less slender and acute and curved slightly posteriorly; its pronotum slightly shorter (PL/PW = 2.36 vs. 2.44); its colour patterns generally more marmorated (including pronotum and legs).

From *Bolotettix parvispinus* Hancock, 1913 (Fig. 4C) from Borneo, the new species differs by the eyes in lateral view more globular; its face less slender, its facial carinae (COS) thicker and more widely spaced apart (SW/VW = 0.65 vs. 0.34); the prozonal carina (CA) and interhumeral carina (CD) thick and strongly raised, not different from the median carina (as compared to thinner, less distinctly raised compared to its median carina); the spine of its lateral lobe less slender and acute; its lateral lobe with the ventral sinus acute and distinctly narrower in angle than the tegminal sinus (obtuse) (instead of being nearly identical); its colour patterns (including pronotum and legs) generally more marmorated.

From *Bolotettix planus* Hancock, 1907 (Fig. 4D) from Borneo (Sarawak), the new species differs by its face less slender, facial carinae (COS) thicker and more widely spaced apart (SW/VW = 0.65 vs. 0.53); its prozonal carina (CA) and interhumeral carina (CD) thick and strongly raised, not different from the median carina (as compared to thinner, less distinctly raised compared to its median carina); the spine of its lateral lobe less slender and acute and curved slightly posteriorly; its humero-apical carina (CH) more strongly raised; its colour patterns (including pronotum and legs) generally more marmorated.

Etymology. The species name refers to the small size of the species; adik = little sibling in Bahasa Melayu; noun in apposition.

Description. Male. Body small sized for Tetrigidae in general (Fig. 1). Body dark grey with a tint of green.

Head. *In frontal view* (Fig. 2A): Face dark coloured with few faint pale spots and small white nodules. Vertex with transverse and lateral carinae faintly elevated, not elevated above dorsal margin of compound eyes. Frontal costa long, bifurcates at mid of compound eyes height, just between the paired lateral ocelli. Scutellum in its widest part wider than antennal groove. Scutellum forms shallow concavity, becoming wider ventrally. Antennal grooves with upper margins visible above lower margins of compound eyes. Antennae filiform, 13-segmented; antennal bases at level of lower margin of eyes; 1stAW/SW = 0.53. Antennal segment dark coloured. Median ocellus ventrad of antennal grooves. Compound eyes oblongly ovoid. Generally dark grey with some pale-yellow patterns. Mouthparts mostly dark coloured; maxillary palps with segments grey with margins pale. *In dorsal view* (Fig. 2B): Fastigium of vertex with deep concavities behind lateral carinae, not produced in front of eyes, EW/VW = 1.46. Fastigium with anterior margin truncated, median carina not produced in front of anterior margin of fastigium; lateral carinae elevated; subocular lobes distinct. Compound eyes oval. *In lateral view* (Figs 2C, 2D): Compound eyes hemispheric, exerted above vertex. Frontal ridge (or scutellum) distinctively produced to form two broadly rounded lobes; the two lobes are of about equal height. Genae dark coloured, with pale-yellow transverse band ventrad of compound of eye.

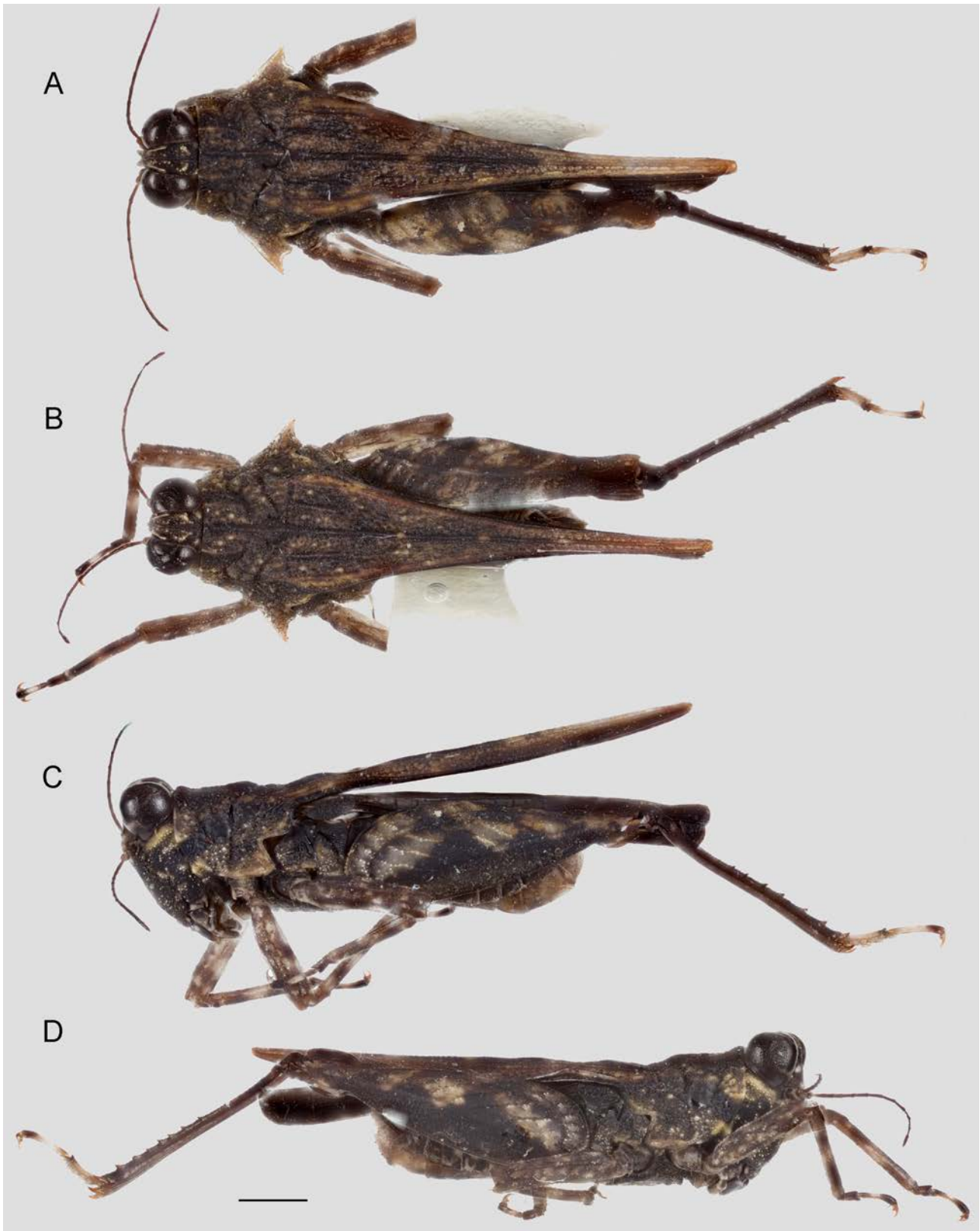


FIGURE 1. *Bolotettix adik* Tan & Muhammad, **sp. nov.** male paratypes habitus in dorsal (A, B) and lateral (C, D) views. Scale bar: 1 mm.

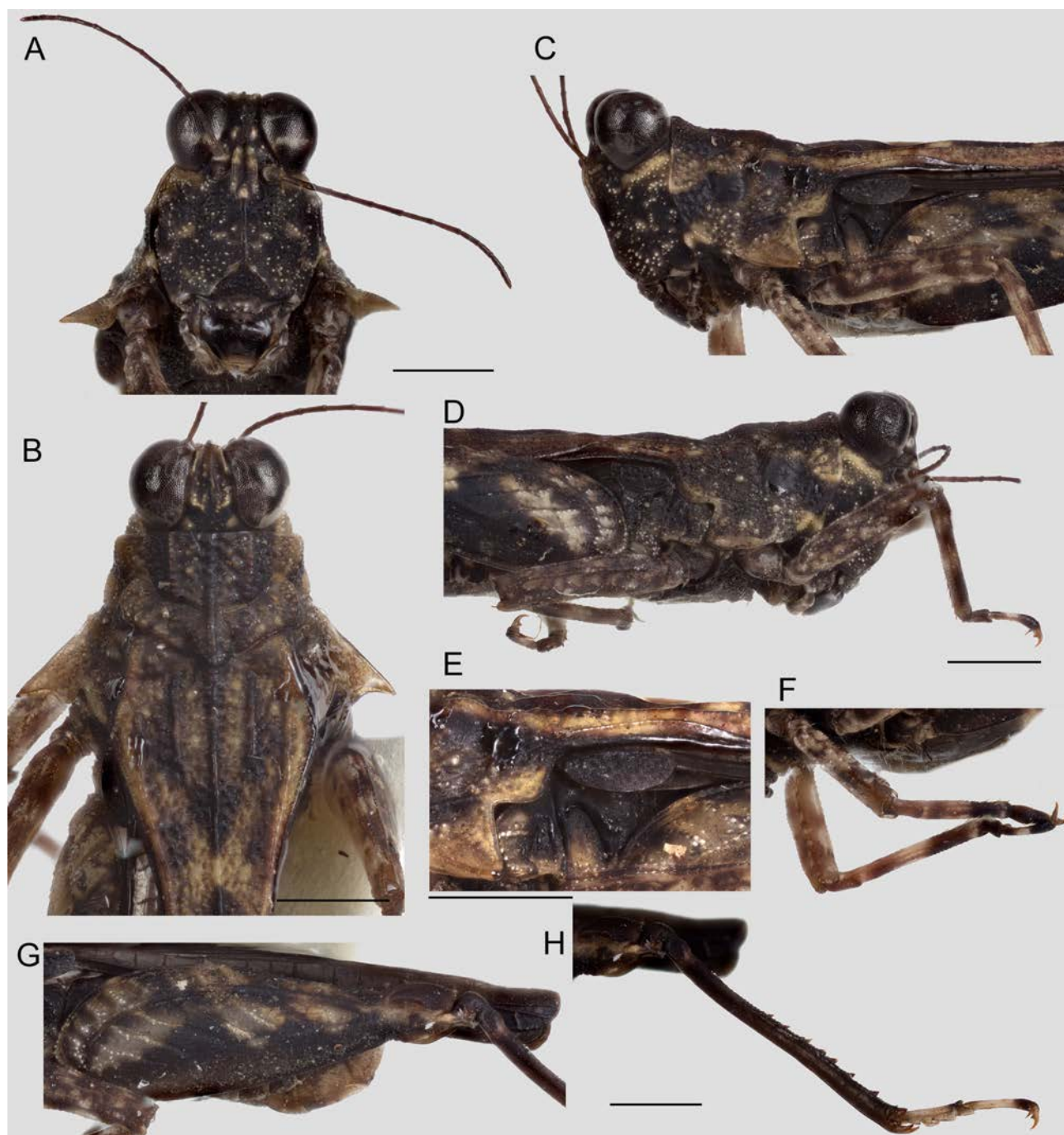


FIGURE 2. *Bolotettix adik* Tan & Muhammad, **sp. nov.**: head in frontal view (A); head and prozona in dorsal (B) and lateral (C, D) views; tegmen in lateral view (E); fore and middle leg (F); hind femur (G) and tibia and tarsus (H) in lateral view. Scale bars: 1 mm.

Pronotum. Finely nodulose, long (macropronotal state), surpassing abdominal apex, hind femur, but reaching only base of hind tibiae (Fig. 1). *In dorsal view* (Fig. 2B): Anterior margin straight; posterior process with truncated apex. Dorsal plate of pronotum dark grey with tint of brown and pale yellow; lateral margins after prozona distinctly red or orange with tint of yellow. Nodules typically pale yellow. Prozonal carinae diverge posteriorly. Pronotal disc with carinae prozonal carina (CA) and interhumeral carina (CD) well defined, thick and strongly raised. Lateral lobes of pronotum mostly dark grey with anterior margin with pale patch that continues with pale-yellow transverse band ventrad of compound of eye, and with smaller pale patch at ventral margin; lower part more pale coloured, directed laterally, produced into triangular spine. Spine of lateral lobe triangular and acute and curved slightly

posteriorly, apex pale coloured. *In lateral view (Figs 2C, 2D)*: Median carina of pronotum substraight. Prozonal carinae well defined. Hind margin of lateral lobe of pronotum bisinuate, tegminal (dorsal) sinus less deep than ventral sinus, distinctly more obtuse in angle than ventral sinus. Anterior margin straight, then curved broadly into ventral margin.

Wings. Tegmen elongated, oval with apical margin obtuse or subacute; TL/TW = 2.55 (Fig. 2E). Hind wings long, not surpassing apex of pronotum (Fig. 1).

Legs. Fore and mid femora compressed laterally; upper carinae finely serrated. Upper and lower carinae of middle femur slightly sinuated and finely serrated (Figs 2C, 2D, 2F). Fore and mid legs dark grey, with sparse pale-coloured marmoration (Figs 2C, 2D, 2F). First segment of fore and mid tarsi dark grey, third segment with dark grey with incomplete white ring (Fig. 2F). Hind femur with ventral third unicolourous black or dark grey, otherwise dark grey with white or pale patches; 3.16 times as long as wide. Hind tibia mostly black. Upper side of hind tibia with 5–7 spines on the inner and outer margins, each; spines can be indistinct with minute denticles between spines. Ventral surface of first tarsal segment with 3 pads. Length of first tarsal segment of hind legs 0.75 times the length of third segment (without claws). First segment of hind tarsus mostly white, except apex; second segment mostly dark coloured, third segment white except at apex.

Abdominal apex. Tergite generally dark grey; sternites, including subgenital plate generally pale coloured. Subgenital plate in ventral view triangular, with apex of plate slightly excised; in lateral view slender and elongated. Cerci stout basally with pointed apex.

Variations. Some individual having a darker colouration, but patterns remain consistent.

Measurements. See Table 1.

TABLE 1. Measurements of *Bolotettix adik* Tan & Muhammad, **sp. nov.** (in mm). SD = standard deviation, MIN = minimum, MAX = maximum.

	BL	VW	EW	SW	1 st AW	PL	PW	PH	IAH	PAW	TL	TW	HWL
SBH.24.194	6.54	0.37	0.54	0.24	0.13	8.01	3.40	1.46	0.15	1.68	0.79	0.29	6.10
SBH.24.195	6.59	0.38	0.54	0.25	0.13	8.01	3.31	1.67	0.14	1.64	0.74	0.28	6.14
SBH.24.199	6.44	0.38	0.55	0.22	0.12	7.52	3.26	1.48	0.15	1.60	0.67	0.30	5.39
SBH.24.200	6.80	0.35	0.53	0.26	0.14	7.89	3.34	1.44	0.16	1.68	0.72	0.27	6.11
Mean	6.59	0.37	0.54	0.24	0.13	7.86	3.33	1.51	0.15	1.65	0.73	0.29	5.94
SD	0.15	0.01	0.00	0.01	0.01	0.23	0.06	0.10	0.01	0.04	0.05	0.01	0.36
MIN	6.44	0.35	0.53	0.22	0.12	7.52	3.26	1.44	0.14	1.60	0.67	0.27	5.39
MAX	6.80	0.38	0.55	0.26	0.14	8.01	3.40	1.67	0.16	1.68	0.79	0.30	6.14
	HFL	HFW	HTL	1 st TaL	3 rd TaL	EW/ VW	1 st AW/d SW	PL/ PW	TL/ TW	HWL/ TL	HFL/ HFW	HFL/ HTL	SW/ VW
194	4.25	1.39	3.72	0.62	0.84	1.46	0.57	2.36	2.73	7.70	3.05	1.14	0.63
195	4.65	1.48	3.80	0.61	NA	1.43	0.51	2.42	2.61	8.27	3.13	1.22	0.66
199	4.43	1.30	3.63	0.57	0.82	1.43	0.51	2.31	2.23	8.09	3.40	1.22	0.59
200	4.41	1.43	3.62	0.65	0.82	1.51	0.55	2.36	2.64	8.50	3.07	1.22	0.72
Mean	4.43	1.40	3.69	0.61	0.82	1.46	0.53	2.36	2.55	8.14	3.16	1.20	0.65
SD	0.16	0.08	0.09	0.03	0.01	0.04	0.03	0.05	0.22	0.34	0.16	0.04	0.06
MIN	4.25	1.30	3.62	0.57	0.82	1.43	0.51	2.31	2.23	7.70	3.05	1.14	0.59
MAX	4.65	1.48	3.80	0.65	0.84	1.51	0.57	2.42	2.73	8.50	3.40	1.22	0.72

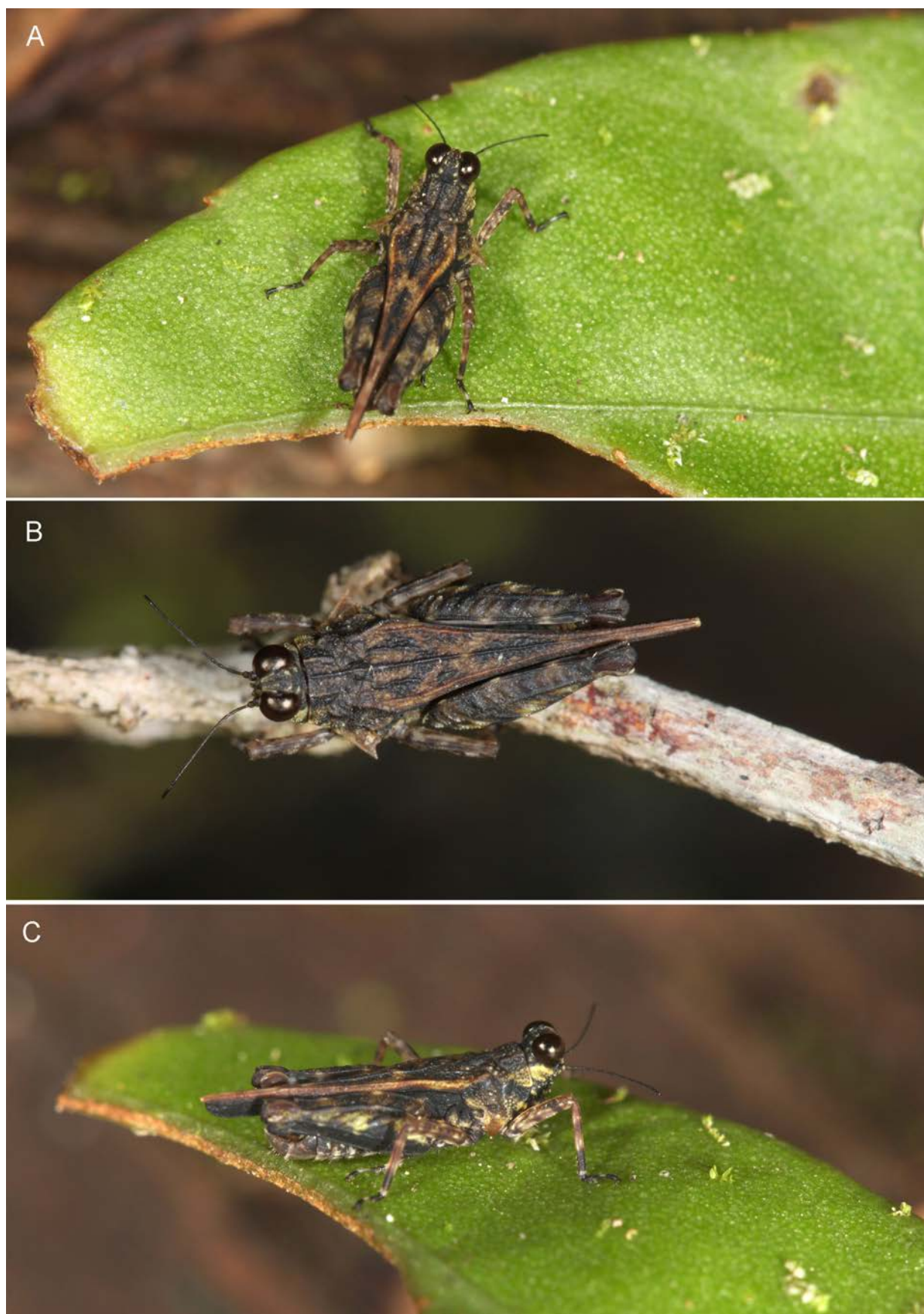


FIGURE 3. *Bolotettix adik* Tan & Muhammad, **sp. nov.** males in their natural environment in Sinipung Hill.



FIGURE 4. *Bolotettix* species from Borneo when alive: *B. adik* Tan & Muhammad, **sp. nov.** (A); *B. validispinus* Hancock, 1907 (B); *B. parvispinus* Hancock, 1913 (C); *B. planus* Hancock, 1907 (D). Images of other Bornean species obtained from iNaturalist, with permission by Chien Lee (B, D) and Amila Sumanapala (C).

Subfamily Metrodorinae Bolívar, 1887

Mazarredia (Prosoaltus) cephalica (Haan, 1843)

(Figs 5, 6)

Acridium (Tetrix) cephalicum Haan, 1843: 169.

Systolederus cephalicus (Haan, 1843)—Hancock, 1907a: 34; Kirby, 1910: 20; Bruner, 1915: 245; Willemse, 1928: 20; Willemse, 1930a: 26.

Prosoaltus oculatus Hancock, 1913: 47—Günther, 1939: 49, 5; Steinmann, 1970: 227; Otte, 1979: 41

Mazarredia (Prosoaltus) cephalica (Haan, 1843)—Günther, 1939: 49, 6.

Mazarredia cephalica (Haan, 1843)—Steinmann, 1970: 227; Blackith, 1992: 113; Zheng & Jiang, 1994: 87.

Type material examined (only images). • ♀ holotype; INDONESIA, West Sumatra, “Padang” [Batang Singgalang]; coll. De Haan (RMNH).

New material examined. EAST MALAYSIA; Sabah State; Sinipung Hill, near Long Pasia • 1♀; N4.42966 E115.72585, 1201.0±7.0 m.a.s.l.; 20 November 2024, 13h46; on tree trunk; coll. M.K. Tan; SBH.24.155 (ZRC) • 1♂; N4.43219 E115.72458, 1257.0±7.6 m.a.s.l.; 20 November 2024, 20h24; on tree trunk; coll. M.K. Tan; SBH.24.185 (ZRC) • 1♂; N4.44624 E115.71442, 1563.0±13.8 m.a.s.l.; 21 November 2024, 19h39; on foliage of liana near bottom of trunk; coll. M.K. Tan; SBH.24.196 (ZRC) • 1 juvenile; N4.44622, E115.7143, 1563 m; 21 November 2024, day; leaf litter; coll. T. Robillard; TR24-160 (MNH).

Remarks. Our specimens probably represent the first record in Sabah of this widely distributed species. It may not be a surprise since it has been recorded in other parts of Borneo and in the Philippines. We however now also know that this species tends to be found on tree trunk and foliage.

Distribution. Sumatra [type locality], Borneo (Kalimantan, Sarawak), Philippines.

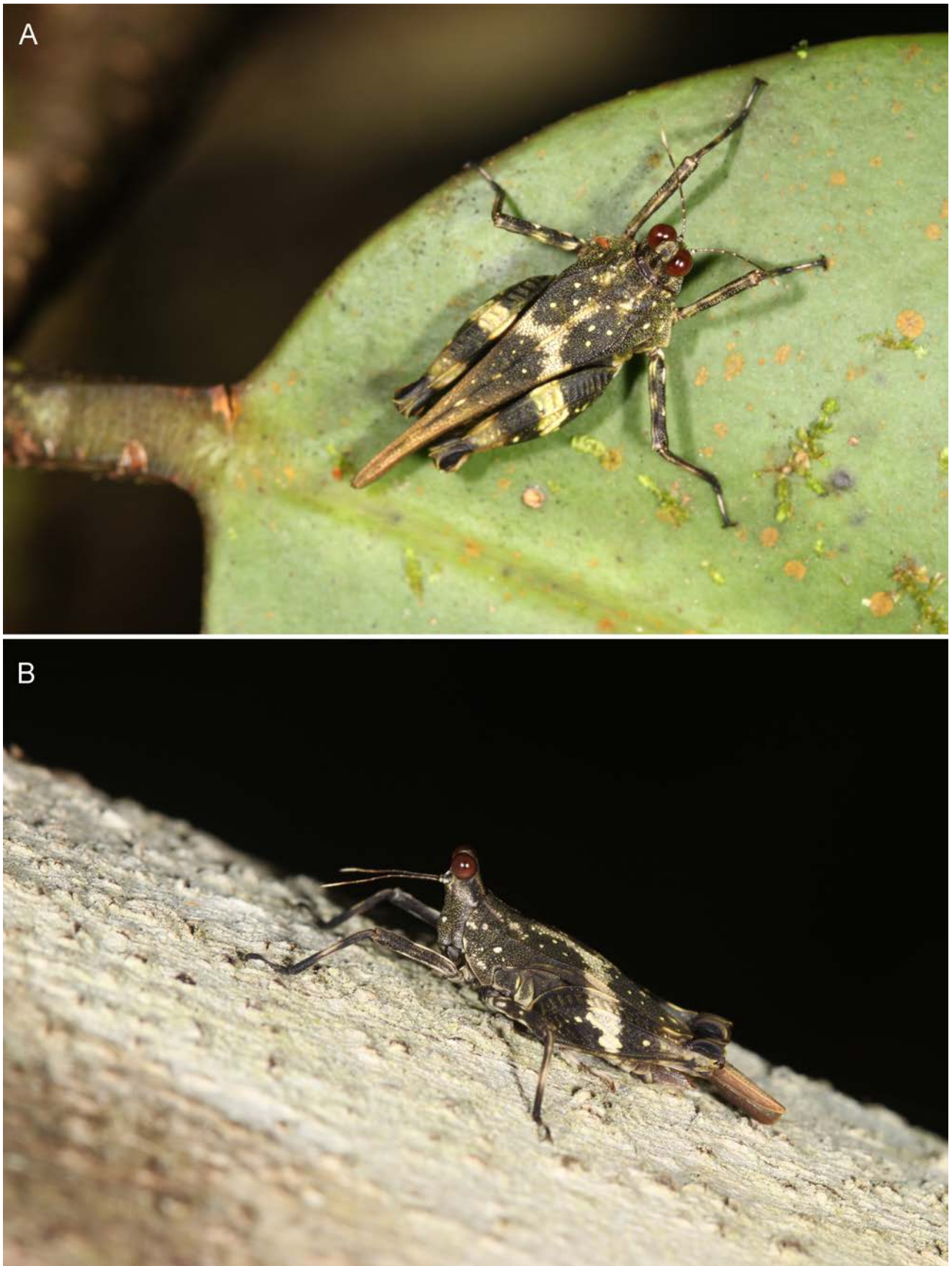


FIGURE 5. *Mazarredia (Prosoaltus) cephalica* (Haan, 1843) in its natural environment in Sinipung Hill.



FIGURE 6. *Mazarredia (Prosoaltus) cephalica* (Haan, 1843) male habitus in lateral (A) and dorsal (B) views. Scale bar: 10 mm.

***Bolivaritettix apterus* (Rehn, 1904)**

(Figs 7, 8)

Mazarredia aptera Rehn, 1904: 663—Hancock, 1907a: 43; Kirby, 1910: 25.

Hyboella siebersi Günther, 1935: 260—Günther, 1939: 79; Blackith, 1992: 7.

Bolivaritettix apterus (Rehn, 1904)—Günther, 1939: 79; Günther, 1942: 343; Blackith, 1992: 7; Deng *et al.*, 2010: 46.

Type material examined (only images). • ♀ syntype (of *Hyboella siebersi*); INDONESIA, Kalimantan; “West Borneo, Midden”; 19 October 1925; coll. H.C. Siebers; 1935 4; 177; DORSA D005XF01 (SMTD) • ♂ syntype (of *Hyboella siebersi*); INDONESIA, Kalimantan; “West Borneo, Midden”, [near border of Koetai and Beraoe]; 17 October 1925; coll. H.C. Siebers; 171 (RMNH).

New material examined. EAST MALAYSIA; Sabah State • 1♀; Bukit Hampuan; N5.99651 E116.67594, 936.8±7.0 m.a.s.l.; 3 November 2023, 20h07; on tree trunk; coll. M.K. Tan *et al.*; SBH.23.134 (FRC) • 1♂; Bukit Hampuan; N5.99258 E116.67004, 986.6±9.8 m.a.s.l.; 4 November 2023, 18h44; on grass near ground; coll. M.K. Tan *et al.*; SBH.23.147 (FRC) • 1♀; Maliau Basin, trail from Agathis–Nepenthes Camps at 2-km mark; N4.70797 E116.89475, 985.6±9.5 m.a.s.l.; 12 November 2024, 19h29; on trunk of small tree; coll. M.K. Tan; SBH.24.47 (ZRC) • 1♂; Maliau Basin, trail from Agathis–Nepenthes Camps at 2-km mark; N4.70840 E116.89452, 954.2±9.5 m.a.s.l.; 12 November 2024, 19h58; on tree trunk; coll. M.K. Tan; SBH.24.49 (ZRC) • 1♀; Maliau Basin, trail from Agathis–Nepenthes Camps at 2-km mark; N4.70851 E116.89444, 956.2±9.9 m.a.s.l.; 12 November 2024, 20h08; on tree trunk; coll. M.K. Tan; SBH.24.50 (ZRC) • 1♀; Maliau Basin, trail from Agathis–Nepenthes Camps at 2-km mark; N4.70734 E116.89536, 955.9±7.9 m.a.s.l.; 12 November 2024, 18h26; on tree trunk; coll. M.K. Tan; SBH.24.40



FIGURE 7. *Bolivaritettix apterus* (Rehn, 1904) black (A) and light (B) forms in their natural environment in Meligan.



FIGURE 8. *Bolivaritettix apterus* (Rehn, 1904) colour variants in dorsal (A, C, E, G) and lateral (B, D, F, H) views. Scale bar: 10 mm.

(ZRC) • 1♀; Sinipung Hill, near Long Pasia; N4.43620 E115.72344, 1311.0±7.3 m.a.s.l.; 20 November 2024, 16h46; on trunk of huge tree; coll. M.K. Tan; SBH.24.167 (ZRC) • 1♂; Sinipung Hill, near Long Pasia; N4.43459 E115.72325, 1284.0±9.2 m.a.s.l.; 20 November 2024, 15h45; among leaf litter; coll. M.K. Tan; SBH.24.162 (ZRC) • 7♂, 2♀; Meligan (P28 a.k.a. pt 2); N4.57485 E115.73430, 1359.0±6.2 m.a.s.l.; 23 November 2024, 20h42; on tree trunk; coll. M.K. Tan; SBH.24.239–247 (ZRC) • 1♂; Sinipung Hill, near Long Pasia; N4.44622, E115.7143, 1563 m; 21 November 2024, day; leaf litter; coll. T. Robillard; TR24-160 (MNHN) • 1♂; Maliau Basin, trail from Agathis–Nepenthes Camps at 2-km mark; N4.70723 E116.89538, 954 m; 12 November 2024, day; leaf litter; coll. C. Jouault; TR24-55 (MNHN) • 1♂; Maliau Basin, trail from Agathis–Nepenthes Camps at 2-km mark; N4.70723, E116.89538, 954 m; 16 November 2024, day; leaf litter; coll. T. Robillard; TR24-98 (MNHN) • 2♀, 2♂; Maliau Basin, trail from Agathis–Nepenthes Camps at 2-km mark; N4.70723 E116.89538, 954 m; 16 November 2024, day; leaf litter; coll. T. Robillard; TR24-43 (MNHN) • 3♀; forest near Meligan village; N4.67986 E115.68787, 863 m (GPS24SA16); 24 November 2024, day; leaf litter; coll. T. Robillard; TR24-201 (MNHN).

Remarks. We observed two colour forms of this species: the darker and lighter form. While the darker form is generally dark grey, including head, pronotum and legs, the lighter form differs by the head and pronotal disc orange brown (its pronotum disc at the apex mottled with some black parts) and the legs generally with more pale rings. The syntypes appear to be of a darker form. However, the lighter form appears to be more commonly seen. In Meligan (SBH.24.239–2247), both dark and light forms were found co-occurring on the same tree trunk (Fig.7).

Subfamily Scelimeninae Bolívar, 1887

Discotettix (*Discotettix*) *belzebuth* (Serville, 1838)

(Fig. 9)

Tetrix belzebuth Serville, 1838: 759.

Discotettix belzebuth (Serville, 1838)—Hancock, 1907a: 6; Hancock, 1907b: 213; Kirby, 1910: 2; Hancock, 1915; Willemse, 1930a: 8; Günther, 1938: 301; Günther, 1942: 340; Vanschuytbroeck, 1980: 24; Blackith, 1992: 46; Kočárek *et al.*, 2015: 289; Muhammad *et al.*, 2018: 20; Tan & Wahab, 2018: 123; Skejo *et al.*, 2022: 15, 59; Muhammad & Tan, 2025: 99.

Discotettix armatus Costa, 1864: 59—Blackith, 1992: 46; Kočárek *et al.*, 2015: 289 (synonym); Skejo *et al.*, 2022: 15, 59 (synonym).

Discotettix adenanii Mahmood, Idris & Salmah, 2007: 1276—Kočárek *et al.*, 2015: 289 (synonym); Skejo *et al.*, 2022: 15, 59 (synonym).

New material examined. EAST MALAYSIA; Sabah State • 1♂; Maliau Basin, along Wildlife Trail; N4.74173 E116.97523, 244.7±6.8; 11 November 2024, 10h17; on rotten log; coll. M.K. Tan; SBH.24.19 (ZRC) (Fig. 9) • 1♂; Maliau Basin, along Balien Nature Trail; N 4.73809 E116.97415, 247.7±8.0; 13 November, 23h50; on tree trunk; coll. M.K. Tan; SBH.24.69 (ZRC) • 1♂, 1♀; Maliau Basin, along Knowledge Trail; N 4.74261 E116.97153, 250.6±7.9; 15 November 2024, 19h36; among wood litter/ trunk; coll. M.K. Tan; SBH.24.105, 106 (ZRC) • 1♂; Maliau Basin, along EE Trail; N4.73588 E116.97340, 253.6±7.9; 17 November 2024, 18h38; on huge tree trunk; coll. M.K. Tan; SBH.24.124 (ZRC) • 5♀, 2♂; Maliau Basin, along Knowledge Trail; N4.74189 E116.970, 227 m (GPS24SA4); 10–11 November 2024, day, leaf litter; coll. T. Robillard; TR24-22 (2♀, 2♂), TR24-52 (2♀), TR24-103 (1♀), TR24-79 (1♂) (MNHN) • 1♀; Maliau Basin, along Wildlife Trail; N4.73977 E116.97669, 260 m (GPS24SA3); 11 November 2024, day; leaf litter; coll. C. Jouault; TR24-42 (MNHN) • 1♀; Maliau Basin, trail from Agathis–Nepenthes Camps, 1.5 km mark; N4.70213 E116.97256, 616 m (GPS24SA9); 16 November 2024, day; leaf litter; coll. T. Robillard; TR24-98 (MNHN) • 1♀; forest near Meligan village; N4.67986 E115.68787, 863 m (GPS24SA16); 24 November 2024, day; leaf litter; coll. T. Robillard; TR24-201 (MNHN).



FIGURE 9. *Discotettix belzebuth* (Serville, 1838) in its natural environment in Maliau Basin.

Remarks. In Sabah, it has been recorded in Crocker Range Keningau, Kinabalu National Park, Mount Trus Madi, Pajau [= Padas?] River, Ranau and Tambunan (Skejo *et al.*, 2022). Here, we present a new locality record in Maliau Basin. This is the nearest to the known distribution of *Discotettix* (*Discotettix*) *kirscheyi* Skejo, Pushkar, Tumbrinck et Tan, 2022 from the eastern part of Sabah (Sepilok, Kawag, Kinabatangan and Tabin).

Distribution. Borneo (Brunei Darussalam, Sabah, Sarawak)

***Falconius pseudoclavitsaris* Günther, 1938**

(Fig. 10)

Falconius pseudoclavitsaris Günther, 1938: 398, 400. Günther, 1942: 341; Blackith, 1992: 76; Muhammad *et al.*, 2018: 29

New material examined. EAST MALAYSIA; Sabah State • 1♀; Maliau Basin, along Knowledge Trail; N4.74189 E116.970, 227 m; 15 November 2024, day, leaf litter; coll. T. Robillard; TR24-79 (MNHN) • 1♀; Tabin Wildlife Reserve; N5.19534 E118.50365, 120 m (SAB22_9); 15 May 2022, night, on plant; TR22-17 (MNHN).

Remarks. The species was first described from Kalimantan. The material from Maliau Basin and Tabin Wildlife Reserve represents the first record of this species in Sabah. Our specimens resemble the syntypes in the general habitus, but differ slightly in the relative size of the anterior and posterior lateral processes of the pronotal lateral lobe and the carinae on the anterior femora.

Distribution. Borneo (Kalimantan [type locality], Sabah [new locality record]), Malay Peninsula (Selangor), India [needs clarification].



FIGURE 10. *Falconius pseudoclavitsaris* Günther, 1938 in dorsal (A) and lateral (B) views. Scale bar: 2 mm.

Subfamily Tripetalocerinae Bolívar, 1887

Tripetalocera ferruginea Westwood, 1834

(Fig. 11)

Tripetalocera ferruginea Westwood, 1834: 444—Bolívar, 1887: 310; Hancock, 1907a: 4; Hancock, 1907b: 213; Kirby, 1914: 12; Hancock, 1915: 133; Bolívar, 1917: 281; Willemse, 1930a: 32; Willemse, 1930b: 20; Günther, 1938: 300; Günther, 1942: 339; Steinmann, 1970: 215; Blackith, 1992: 195; Mahmood *et al.*, 2007: 1283; Shishodia *et al.*, 2010: 182; Storozhenko, 2013b: 160.

Acrydium (Tetrix) ferrugineum (Westwood, 1834)—Haan, 1843: 166.

New material examined. EAST MALAYSIA; Sabah State • 1♀; Maliau Basin, Knowledge Trail; N4.74271 E116.97168, 252.1±10.7 m.a.s.l.; 15 November 2024, 20h00; on leaf litter; coll. M. K. Tan; SBH.24.107 (ZRC).

Remarks. In Sabah, it has been recorded in Poring and Mount Trus Madi. Here, we present a new locality record in Maliau Basin.

Distribution. India [type locality], Borneo (Sabah), Sumatra.



FIGURE 11. *Tripetalocera ferruginea* Westwood, 1834 male habitus in lateral (A) and dorsal (B) views. Scale bar: 10 mm.

Discussion

The genus *Bolotettix* has nine extant species described from South and Southeast Asia: *B. affinis* Günther, 1938 (Sumatra); *B. anomalus* Hancock, 1910 (Southern India and Sri Lanka); *B. inermis* Hancock, 1915 (Nepal); *B. luzonicus* Bey-Bienko, 1935 (Philippines); *B. mentaweiensis* Günther, 1938 (Sumatra); *B. parvispinus* Hancock, 1913 (Borneo); *B. perminutus* Bolívar, 1887 (Borneo and Philippines); *B. planus* Hancock, 1907 (Borneo—Sarawak); and *B. validispinus* Hancock, 1907 (Borneo—Sarawak). The type specimen (*B. validispinus*) was first described in the early 20th century, followed by the descriptions of succeeding species until 1938—except for *B. perminutus* which was formerly a *Criotettix* Bolívar, 1887 before being placed under *Bolotettix* in 1907 (Günther, 1938b; Hancock, 1907b). Despite the similarities with species from the genus *Zhengitettix*, which was first described at the end of the 20th century, it is distributed in the northern region of Southeast Asia, excluding Borneo with no records as of now. Hence, we tentatively place the new species under *Bolotettix*, supported by the similar characteristics shared with type species of this genus.

Currently, *Bolotettix* does not belong to any subfamily nor tribe, unlike most genera under Tetrigidae (Adzic *et*

al., 2020). On the other hand, *Zhengitettix*, which is currently placed under Scelimeninae but not under any tribe. Variation in morphology between species of *Bolotettix* and *Zhengitettix* is distinct, with members of *Zhengitettix* having textured ventral surface of the subgenital plate, especially in their females (Dawwrueng & Doodduem, 2014; Storozhenko, 2013a). Nevertheless, *Zhengitettix* appears more similar to *Bolotettix* rather than Scelimeninae, owing to its small body size (body length <10 mm), unlike other species under this subfamily which are normally larger in size (Chen & Deng, 2022; Muhammad *et al.*, 2018; Skejo *et al.*, 2022). In light of this, we call for a revision of both *Bolotettix* and *Zhengitettix*, especially since *Bolotettix* is relatively unknown as compared to the latter genus.

In addition to a new species discovery, we have also expanded our understanding on the intra-specific variation and distribution of other Tetrigidae. Specifically, two colour forms of *Bolivaritettix apterus* were encountered in Sabah, even though intra-specific colour variation is not uncommon among Tetrigidae from Southeast Asia (Neo *et al.*, 2023). There are also slight variations in the spinal processes on the pronotum of *Discotettix belzebuth* from Maliau Basin not far from overlapping its distribution with that of *Discotettix kirscheyi*. Typically, such variants do not differ drastically in morphometry and genetic distance and exist likely owing to environmental influences (Zhao *et al.*, 2016; Neo *et al.*, submitted). However, here, we do not have supplementary genetic data to understand the variations observed in *Bolivaritettix apterus* and *Discotettix*. Lastly, we report new locality records of *Mazarredia (Prosoaltus) cephalica* (Haan, 1843) and *Falconius pseudoclavitoris* Günther, 1938 in Sabah and *Tripetalocera ferruginea* Westwood, 1834 in Maliau Basin. Reports, both in the scientific literature and citizen science platforms (e.g., inaturalist.org), on these species are rare (Cigliano *et al.*, 2025).

Acknowledgements

MKT is thankful to Shartner Liew and Hasamuddin bin Abu Bakar, Mohamad Azizan Bin Asidi, John Lee Yukang for field assistance. We also appreciate the assistance provided by the Trusmadi Entomology Camp: Clara Chong and Jimmy Chew. The permissions for collecting and exporting material were granted by the Sabah Biodiversity Centre (JKM/MBS.1000-2/3 JLD.3 (99) and JKM/MBS.1000-2/2 JLD.10 (179) for Tabin Wildlife Reserve; JKM/MBS.1000-2/2 JLD.16 (106) and JKM/MBS.1000-2/3 JLD.5 (40) for Mount Trus Madi and Bukit Hampuan; 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/PSH100-14/18/2/JLD.17(04)); Alexander Geivasius (the Assistant DFO of Ranau); Osman Bangkong [the DFO of Lahad Datu]; Geungnong Ah Jing (the assistant DFO of Lahad Datu); and Jackly Ambrose (the DFO of Ulu Segama-Malua); 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. The authors also thank Chien C. Lee and Amila Prasanna Sumanapala for permitting the use of their photographs (Figs 4B–D).

References

- Adžić, K., Deranja, M., Franjević, D. & Skejo, J. (2020) Are Scelimeninae (Orthoptera: Tetrigidae) monophyletic and why it remains a question?. *Entomological News*, 129 (2), 128–146.
<https://doi.org/10.3157/021.129.0202>
- Blackith, R.E. (1992) *The Tetrigidae (Insecta; Orthoptera) of South-East Asia; an Annotated Catalogue with Partial Translated Keys and Bibliography*. Japaga Press, Dublin, LIV + 249 pp.
- Bolívar, I. (1887) Essai sur les Acridiens de la tribu des Tettigidae. *Annales de la Société Entomologique de Belgique*, 31, 175–313.
- Bolívar, I. (1917 [1918]) Contribución al conocimiento de la fauna índica. Orthoptera (Locustidae vel Acridiidae). *Revista de la Real Academia de Ciencias Exactas, Físicas y Naturales*, 16, 278–289 + 374–412.
- Bruner, L. (1915) Preliminary catalogue of the Orthopteroid insects of the Philippines Island. *The University Studies of the University of Nebraska*, 15 (2), 195–281.
- Chen, Y.Z. & Deng, W.A. (2022) Two new species of the genus *Zhengitettix* (Orthoptera: Tetrigidae: Scelimeninae) from China. *Zootaxa*, 5154 (1), 71–80.
<https://doi.org/10.11646/zootaxa.5154.1.4>
- Cigliano, M.M., Braun, H., Eades, D.C. & Otte, D. (2025) Orthoptera Species File Online. Version 5 (5.0). Available from:

<http://orthoptera.speciesfile.org/HomePage/Orthoptera/HomePage.aspx> (accessed 14 July 2025)

- Costa, A. (1864) Acquisti fatti durante l'anno 1862. *Annuario dell'istituto e museo di zoologia della universita di Napoli*, 4, 8–94.
- Dawwrueng, P. & Doodduem, C. (2014) A new species of the genus *Zhengitettix* (Orthoptera: Tetrigidae, Scelimeninae) from Thailand. *Far Eastern Entomologist*, 282, 1–6.
- De Bruyn, M., Stelbrink, B., Morley, R.J., Hall, R., Carvalho, G.R., Cannon, C.H., van den Bergh, G., Meijaard, E., Metcalfe, I., Boitani, L., Maiorano, L., Shoup, R. & Von Rintelen, T. (2014) Borneo and Indochina are major evolutionary hotspots for Southeast Asian biodiversity. *Systematic Biology*, 63 (6), 879–901.
<https://doi.org/10.1093/sysbio/syu047>
- Deng, W.-A., Zheng, Z.-M. & Wei, S.-Z. (2010) A taxonomic study of the genus *Bolivaritettix* Günther (Orthoptera: Tetrigidae: Metrodorinae). *Zootaxa*, 2423 (1), 44–54.
<https://doi.org/10.11646/zootaxa.2423.1.3>
- Gen, I., Alliamat, A. & Mohamed, M. (2005) Tetrigid pygmy grasshopper and their associations with altitude and habitats in Mt. Trus Madi, Sabah, Borneo (Insecta: Orthoptera). *Journal of Tropical Biology & Conservation (JTBC)*, 1, 21–25.
- Günther, K. (1935) Acrydiinen (Orth. Acrididae) aus dem mittleren Ostrorneo gesammelt von H. C. Siebers 1925. *Arbeiten über morphologische und taxonomische Entomologie aus Berlin-Dahlem*, 2 (4), 257–263, 7 figs.
- Günther, K. (1938) Revision der Acrydiinae, I. Sectiones Tripetalocerae, Discotettigiae, Lophotettigiae, Cleostratae, Bufonidae, Cladonotae, Scelimenae verae. *Mitteilungen aus dem Zoologischen Museum in Berlin*, 23, 299–437.
- Günther, K. (1939) Revision der Acrydiinae (Orthoptera), III. Sectio Amorphopi (Metrodora Bol. 1887, aut.). *Abhandlungen und Berichte aus den Staatlichen Museen für Tierkunde und Völkerkunde in Dresden, Series A (Zoology), Neue Folge*, 20 (Bd. 1), 16–335.
- Günther, K. (1942) Die Acrydiinae der Oxford University Expedition nach Sarawak vom Jahre 1932. *Eos, Revista española de Entomología*, 18, 339–346, 6 figs.
- Haan, W. (1843) Bijdragen tot de kennis der Orthoptera. In: Temminck, C.J. (Ed.), *Verhandelingen over de Natuurlijke Geschiedenis der Nederlansche Overzeesche Bezittingen*, 19/20, pp. 165–228.
- Hancock, J.L. (1907a) Orthoptera Fam. Acridiidae. Subfam. Tetriginae. *Genera Insectorum*, 48, 1–79, 4 pls.
- Hancock, J.L. (1907b) Studies of the Tetriginae (Orthoptera) in the Oxford University Museum. *Transactions of the Entomological Society of London*, 1907, 213–244, pl. 21.
<https://doi.org/10.1111/j.1365-2311.1907.tb01760.x>
- Hancock, J.L. (1915) V. Indian Tetriginae (Acrydiinae). *Records of the Indian Museum*, 11, 55–137.
<https://doi.org/10.26515/rzsi/v11/i1/1915/163610>
- Kirby, W.F. (1910) *A Synonymic Catalogue of Orthoptera (Orthoptera Saltatoria, Locustidae vel Acridiidae)*. The Trustees of the British Museum, London, 674 pp.
- Kirby, W.F. (1914) Orthoptera (Acridiidae). In: Shipley, A.E. (Ed.), *The Fauna of British India, Including Ceylon and Burma*. Friedländer & Sohn, Berlin, pp. 1–176.
<https://doi.org/10.5962/bhl.title.109305>
- Kočárek, P., Kuravová, K., Musiolek, D., Wahab, R.A. & Kahar, S.R.A. (2015) Synonymy of *Discotettix adenanii* Mahmood, Idris & Salmah, 2007 with *D. belzebuth* (Serville, 1838) (Orthoptera: Tetrigidae). *Zootaxa*, 4057 (2), 288–294.
<https://doi.org/10.11646/zootaxa.4057.2.10>
- Kuravová, K., Wahab, R.A. & Kočárek, P. (2017) External morphology of the antennae and sense organs of the groundhopper *Discotettix belzebuth* (Orthoptera, Tetrigidae). *Zoologischer Anzeiger*, 266, 120–128.
<https://doi.org/10.1016/j.jcz.2016.11.003>
- Mahmood, K., Idris, A.B. & Salmah, Y. (2007) Tetrigidae (Orthoptera: Tetrigoidea) from Malaysia with the description of six new species. *Acta Entomologica Sinica*, 50 (12), 1272–1284.
- Muhammad, A.A. (2024) Diversity of Orthoptera From Marai Parai and Nunuk, Kinabalu Park, Sabah, Malaysia. *Sabah Parks Nature Journal*, 13, 75–83.
- Muhammad, A.A., Deranja, M., Adžić, K. & Abdullah, N.A. (2023) Towards a better understanding of the genus *Scelimena* (Orthoptera, Tetrigidae, Scelimeninae): New insights and notes on the taxonomy, ecology, and physiology of the genus in Peninsular Malaysia. *Journal of Orthoptera Research*, 32 (1), 55–62.
<https://doi.org/10.3897/jor.32.91153>
- Muhammad, A.A. & Tan, M.K. (2025) The diversity of Orthoptera in the northwestern parts of Mount Kinabalu, Sabah, Malaysia. *Journal of Orthoptera Research*, 34 (1), 95–118.
<https://doi.org/10.3897/jor.34.128225>
- Muhammad, A.A., Tan, M.K., Abdullah, N.A., Azirun, M.S., Bhaskar, D. & Skejo, J. (2018) An annotated catalogue of the pygmy grasshoppers of the tribe Scelimenini Bolívar, 1887 (Orthoptera: Tetrigidae) with two new *Scelimena* species from the Malay Peninsula and Sumatra. *Zootaxa*, 4485 (1), 1–70.
<https://doi.org/10.11646/zootaxa.4485.1.1>
- Neo, I., Tan, M.K., Cho, T.J.Y. & Yeo, D.C.J. (2023) A faunistic study and taxonomic account of species of pygmy grasshoppers (Orthoptera: Tetrigidae) from Singapore's last freshwater swamp forest. *Journal of Asia-Pacific Biodiversity*, 17 (1), 87–116.
<https://doi.org/10.1016/j.japb.2023.09.006>

- Otte, D. (1979) The primary types of Orthoptera (Saltatoria, Blattodea, Phasmatodea, and Mantodea) at the Academy of Natural Sciences of Philadelphia. *Proceedings of the Academy of Natural Sciences, Philadelphia*, 130, 26–87.
- Rahim, N.A.A., Muhammad, A.A. & Abdullah, N.A. (2024) An insight into the distribution of pygmy grasshoppers (Orthoptera: Tetrigidae) in the Klang Valley, Malaysia. *Serangga*, 29 (2), 96–109.
<https://doi.org/10.17576/serangga-2024-2902-08>
- Rehn, J.A.G. (1904) Studies in the orthopterous subfamilies Acrydiinae (Tettiginae), Eumastacinae and Proscopinae. *Proceedings of the Academy of Natural Sciences, Philadelphia*, 56, 658–683.
- Serville, J.G.A. (1838) *Histoire naturelle des insectes. Orthoptères*. Librairie Encyclopédique de Roret, Paris, xviii + 776 pp., pls. 1–14. [1839]
- Shishodia, M.S., Chandra, K. & Gupta, S.K. (2010) An annotated checklist of Orthoptera (Insecta) from India. *Records of the Zoological Survey of India, Miscellaneous Publication, Occasional Paper*, 314, 1–366.
- Skejo, J., Pushkar, T.I., Kasalo, N., Pavlović, M., Deranja, M., Adžić, K., Tan, M.K., Rebrina, F., Muhammad, A.A., Abdullah, N.A., Japir, R., Chung, A.Y.C. & Tumbrinck, J. (2022) Spiky pygmy devils: revision of the genus *Discotettix* (Orthoptera: Tetrigidae) and synonymy of *Discotettiginae* with *Scelimeninae*. *Zootaxa*, 5217 (1), 1–64.
<https://doi.org/10.11646/zootaxa.5217.1.1>
- Steinmann, H. (1970) Check-list of the Tetricidae (Orthoptera) of the Oriental faunal region. *Acta Zoologica Academiae Scientiarum Hungaricae*, 16, 215–240.
- Storozhenko, S.Y. (2013a) New and little-known species of the genus *Zhengitettix* (Orthoptera: Tetrigidae: Scelimeninae) from Southeast Asia. *Zoosystematica Rossica*, 22, 204–223.
<https://doi.org/10.31610/zsr/2013.22.2.204>
- Storozhenko, S.Y. (2013b) Review of the subfamily Tripetalocerinae Bolívar, 1887 (Orthoptera: Tetrigidae). *Zootaxa*, 3718 (2), 158–170.
<https://doi.org/10.11646/zootaxa.3718.2.4>
- Tan, M.K. & Artchawakom, T. (2015) A new species from the genus *Gorochovitettix* (Tetrigidae: Metrodorinae) from Thailand. *Zootaxa*, 3990 (3), 444–450.
<https://doi.org/10.11646/zootaxa.3990.3.9>
- Tan, M.K., Choi, J. & Shankar, N. (2017) Trends in new species discovery of Orthoptera (Insecta) from Southeast Asia. *Zootaxa*, 4238 (1), 127–134.
<https://doi.org/10.11646/zootaxa.4238.1.10>
- 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>
- Tumbrinck, J. (2014) Taxonomic revision of the Cladonotinae (Orthoptera: Tetrigidae) from the islands of South-East Asia and from Australia, with general remarks to the classification and morphology of the Tetrigidae and descriptions of new genera and species from New Guinea and New Caledonia. In: Telnov, D. (Ed.), *Biodiversity, Biogeography and Nature Conservation in Wallacea and New Guinea*, II, pp. 350–396.
- Vanschuytbroeck, P. (1980) Catalogue et liste du matériel typique des Tetrigidae conservés dans les collections entomologiques de l'Institut royal des Sciences naturelles de Belgique. *Bulletin de l'Institut Royal des Sciences Naturelles de Belgique*, 52 (22), 1–25.
- Westwood, J.O. (1834) Insectorum Arachnoidumque novorum Decades duo. *Zoological Journal*, 5, 440–453, pl. 22, Fig. 3.
- Willemse, C.J.M. (1928) Revision des Acridioidea, décrites par De Haan, avec descriptions de nouvelles espèces. *Zoologische Mededeelingen*, 11 (1), 1–27.
- Willemse, C.J.M. (1930a) Fauna Sumatrensis (Bijdrage Nr. 62): Preliminary revision of the Acrididae (Orthoptera). *Overgedrukt uithet Tijdschrift voor Entomologie*, 73, 1–210.
- Willemse, C.J.M. (1930b) List of the species of Acrididae occurring in Sumatra and adjacent islands. *Tijdschrift voor Entomologie*, 73, 207–210.
- Williams, E.W., Gardner, E.M., Harris III, R., Chaveerach, A., Pereira, J.T. & Zerega, N.J. (2017) Out of Borneo: biogeography, phylogeny and divergence date estimates of *Artocarpus* (Moraceae). *Annals of Botany*, 119 (4), 611–627.
<https://doi.org/10.1093/aob/mcw249>
- Wong, K.M. (2011) A biogeographic history of Southeast Asian rainforests. In: *Managing the Future of Southeast Asia's Valuable Tropical Rainforests: A Practitioner's Guide to Forest Genetics*. Springer, Dordrecht, pp. 21–55.
https://doi.org/10.1007/978-94-007-2175-3_2
- Zhao, L., Lin, L.-L. & Zheng, Z.-M. (2016) DNA barcoding reveals polymorphism in the pygmy grasshopper *Tetrix bolivari* (Orthoptera, Tetrigidae). *ZooKeys*, 582, 111–120.
<https://doi.org/10.3897/zookeys.582.6301>
- Zheng, Z.-M. & Jiang, G. (1994) A survey of Tetrigoidea from the Huanjiang region in the north of Guangxi (Orthoptera). *Journal of the Guangxi Academy of Sciences*, 10 (1), 86–92.