



Contribution to the taxonomy of *Uvarovia* (Orthoptera: Chorotypidae: Mnesicleinae) from Borneo and Malay Peninsula

MING KAI TAN¹, RAZY JAPIR² & ARTHUR Y. C. CHUNG²

¹ Institut de Systématique, Evolution Biodiversité (ISYEB), Muséum national d'Histoire naturelle, CNRS, SU, EPHE, UA, 57 rue Cuvier, CP 50, 75231 Paris Cedex 05, France.

MKT: [✉ orthoptera.mingkai@gmail.com](mailto:orthoptera.mingkai@gmail.com); [ORCID: https://orcid.org/0000-0002-4324-6305](https://orcid.org/0000-0002-4324-6305)

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

RJ: [✉ Razy.Japir@sabah.gov.my](mailto:Razy.Japir@sabah.gov.my)

AYCC: [✉ Arthur.Chung@sabah.gov.my](mailto:Arthur.Chung@sabah.gov.my); [ORCID: https://orcid.org/0000-0002-9529-4114](https://orcid.org/0000-0002-9529-4114)

Abstract

Mnesicleinae is a little-known subfamily of Chorotypidae and consists of 19 genera distributed throughout the Malay Archipelago, including *Uvarovia* Bolívar, 1930. For many species from this subfamily, nearly nothing is known after their original descriptions. Based on new materials from recent surveys, we were able to examine specimens from two species: *Uvarovia longipennis* Bolívar, 1930 from Malay Peninsula (also type species for genus) and *Uvarovia gracilipes* Bolívar, 1931 from Borneo. Only female specimens were known for the two species. Here, we describe for the first time males specimens of *Uvarovia longipennis* and *Uvarovia gracilipes*. We also present an updated key to species of *Uvarovia* and a key to genera of Mnesicleinae from Borneo and Malay Peninsula.

Key words: key, Malaysia, monkey grasshopper, redescription, Singapore, Southeast Asia

Introduction

The subfamily Mnesicleinae Descamps, 1973 belongs to the family of grasshopper Chorotypidae Stål, 1873. There are currently 19 genera from this subfamily, all of which occur in the Malay Archipelago (Cigliano *et al.*, 2021). Major contributions to the taxonomy of Mnesicleinae include Bolívar (1930, 1931) and Descamps (1973, 1974a, 1974b). These works provided revisions at the subfamily and genus levels, described new species and genera, as well as presented diagnoses and keys to genera and species. Since then, species of Mnesicleinae have received little attention. For many species, nearly nothing is known beyond their original descriptions. Owing to the elusiveness of these grasshoppers, many species are also only known for one of the sexes.

New specimens collected by the authors from Singapore and Sabah allow the revisitation of the Mnesicleinae from these places. In particular, specimens from the genus *Uvarovia* Bolívar, 1930 were collected. Both males and females specimens of *Uvarovia longipennis* Bolívar, 1930 were collected from Singapore and likewise of *Uvarovia gracilipes* Bolívar, 1931 from Sandakan. However, the males have not been described for both species, and only the males of *Uvarovia shelfordi* Bolívar, 1931 were known for species from *Uvarovia*. Here, we describe the males of *Uvarovia longipennis* and *Uvarovia gracilipes*. We also present an updated key to species of *Uvarovia* for both males and females, as well as another key to genera of Mnesicleinae from Borneo and Malay Peninsula.

Materials and Methods

New specimens were collected from Sandakan (East Malaysia: Sabah). Opportunistic collection was conducted during daytime. Whenever possible, in-situ images were taken using a Canon EOS 500D digital SLR camera with a compact-macro lens EF 100 mm f/2.8 Macro USM and Canon Macro Twin Lite MT-24EX was used for lighting

and flash. The specimens were preserved in absolute analytical-grade ethanol and later pinned and dry-preserved. A single hind leg from each specimen was also preserved in absolute analytic-grade ethanol for future molecular work. The specimens will be deposited in Forest Research Centre (FRC) (Sepilok), Sabah Forestry Department, East Malaysia.

Additionally, specimens deposited in the following museums were also studied:

- NHMUK Natural History Museum, London, UK
- RMNH Naturalis Biodiversity Center (formerly Rijksmuseum van Natuurlijke Historie), Leiden, The Netherlands
- ZRC Zoological Reference Collection, Lee Kong Chian's Natural History Museum, Singapore

Close-up images of habitus and morphological features were done using a Canon EOS 6D digital SLR camera with a macro photo lens MP-E 65 mm f/2.8 USM (1–5×). Image editing was accomplished using Adobe Photoshop CC2014. Measurements of specimen were made using ImageJ 1.51j8 (Wayne Rasband, Research Services Branch, National Institute of Mental Health, Bethesda, MD, USA).

Terminology used to describe the abdominal apex follows Bolívar (1931) (Fig. 1) and the following abbreviations are used: 9c = central portion of 9th abdominal tergite, 9l = lateral portion of 9th abdominal tergite, 10+12th = fused 10th and 12th abdominal tergite, c = cercus, sgp = subgenital plate. In the measurements, the following abbreviations are used: BL = body length, PL = pronotum length, FWL = forewing (tegmina) length, HWL = hindwing length, HFL = hind femur length, HFW = hind femur width, HTL = hind tibia length, HTaL = hind tarsus length.

Taxonomy part

Family Chorotypidae Stål, 1873

Subfamily Mnesicleinae Descamps, 1973

Remarks. Currently, 19 genera are recognised, all of which occurs across the Malay Archipelago (Cigliano *et al.*, 2021). In Borneo and Malay Peninsula, only five genera have been recorded:

1. *Borneacridium* Kevan, 1963 (monotypic genus from Borneo)
2. *Mnesicles* Stål, 1878
3. *Odontomastax* Bolívar, 1944 (monotypic genus from Borneo)
4. *Tuberomastax* Bolívar, 1944 (monotypic genus from Borneo)
5. *Uvarovia* Bolívar, 1930

Key to genera of Mnesicleinae from Borneo and Malay Peninsula (modified after Descamps, 1974a)

1. Abdomen with several anterior tergites specialised 2
- 1'. Abdomen without specialised tergites (excluding apical tergites) 3
2. Male 1st tergite extended backwards by a large truncated lobe; 8th tergite with strong dorsal projection; last tergite not divided into three parts *Borneacridium*
- 2'. Male 1st and 2nd tergites protruding dorsal crest; 4th and 5th tergites with latero-posterior point; 8th tergite without dorsal protrusion; last tergite divided into three parts *Tuberomastax*
3. Dorso-median and -external carinae of hind femora armed with strong odontiform spines. Cerci right angled inward elbows *Odontomastax*
- 3'. Dorso-median and -external carinae of hind femora armed with smaller and finer spines. Cerci sharply angled inward elbows 4
4. Tegmina transparent; anterior margin bends towards the end. Hind wings elongated: maximum length / width ratio = 1.7–2.5 *Uvarovia*
- 4'. Tegmina coloured or opaque, at least at the basal part; anterior margin straight towards the end, slightly enlarged at the apex. Hind wings subcycloid: maximum length / width ratio = 1.3–1.5 *Mnesicles*

Genus *Uvarovia* Bolívar, 1930

Uvarovia Bolívar, 1930: 200

Uvarovia—Bolívar, 1931: 383; Rehn, 1948: 120; Descamps, 1974a: 1656

Type species. *Uvarovia longipennis* Bolívar, C., by monotypy and original designation

Distribution. Borneo (Kuching), Malay Peninsula (Perak, Singapore), Sumatra (Sipora Islands)

Diagnosis (after Bolívar, 1931). The fastigium of the vertex flat, horizontally directed and slightly protruding the eyes (in lateral view). The frons short, broad, with lateral keels almost parallel or somewhat divergent towards the epistoma. The eyes elliptical in shape with vertical dark stripes patterns. The antennae short. The tegmina narrow, transparent; slightly hunched back at the apical half; slightly or not widened towards the apex, the apex usually sharply-rounded. The hind wings hyalinous with dark veins. Legs short and strong.

Male: The 8th tergite normal, with the posterior margin broadly concave. The 9th tergite represented by an independent central portion (9c) and a large lobe on each side (9l), completely fused to the set of tergites 10th and 12th tergites (10+12th). The 10th and 12th tergites are clearly delimited in the dorsal portion; the 12th tergite forms a supra-anal plate with lanceolate apex. The cerci U-bent with apex chitinised and acute.

Female: The supra-anal plate lanceolate, acute at the apex. The subgenital plate narrow and elongated, smooth. The ovipositor valves short and strongly toothed. The pileolus is very narrow and elongated.

Species composition.

1. *Uvarovia gracilipes* Bolívar, 1931 from Borneo (Sarawak: Kuching)
2. *Uvarovia longipennis* Bolívar, 1930 from Malay Peninsula
3. *Uvarovia shelfordi* Bolívar, 1931 from Borneo (Sarawak: Kuching, Mount Matang)
- a. *Uvarovia shelfordi siebersi* Bolívar, 1944
4. *Uvarovia strigata* (Bolívar, 1898) from Sumatra (Sipora Islands)

Key to species for females (after Bolívar, 1931)

1. Tegmina with two brown oblique bands, narrowly and imperfectly marked, in its apical third. Distribution: Sumatra and Malay Peninsula. 2
- 1'. Tegmina completely transparent, without any trace of dark bands in its apical third. Distribution: Borneo. 3
2. Hind wings more elongated, almost 2.5 times as long as wide. Distribution: Malay Peninsula *U. longipennis*
- 2'. Hind wings less elongated, only 2.0 times as long as wide. Distribution: Sumatra. *U. strigata*
3. Tegmina and hind wings exceeding apex of the hind femora by 2–3 mm. Hind wings more than 2.0 times as long as wide. Hind femora stouter (maximum width <0.33 times the length hind femur). Subgenital plate with three equally sized triangular lobules at apex. *U. shelfordi*
- 3'. Tegmina and hind wings not reaching the apex of the hind femora. Hind wings less than 2.0 times as long as wide. Hind femora with portion long and thin filiform (maximum width >0.4 times the length hind femur). Subgenital plate with a medial triangular lobule and two more broad and rounded lateral lobules at apex. *U. gracilipes*

Key to species for males

Note: The male of *U. strigata* remains unknown.

1. 9c distinctly elongated and strongly bilobed at the apex 2
- 1'. 9c stouter and faintly bilobed at the apex. *U. shelfordi*
2. 9c apex bilobed with apices of lobes broadly round, black. 9l extend and narrowing posteriorly into a triangular lobe with obtuse apex. Cercus bent 90° at apical third, apical part lanceolate. Distribution: Borneo. *U. gracilipes*
- 2'. 9c apex bilobed with apices of lobes narrow, round and pointing externally, not black. 9l forming three lobes. Cercus U-bent at apical third, apical part tapering into an acute apex. Distribution: Malay Peninsula. *U. longipennis*

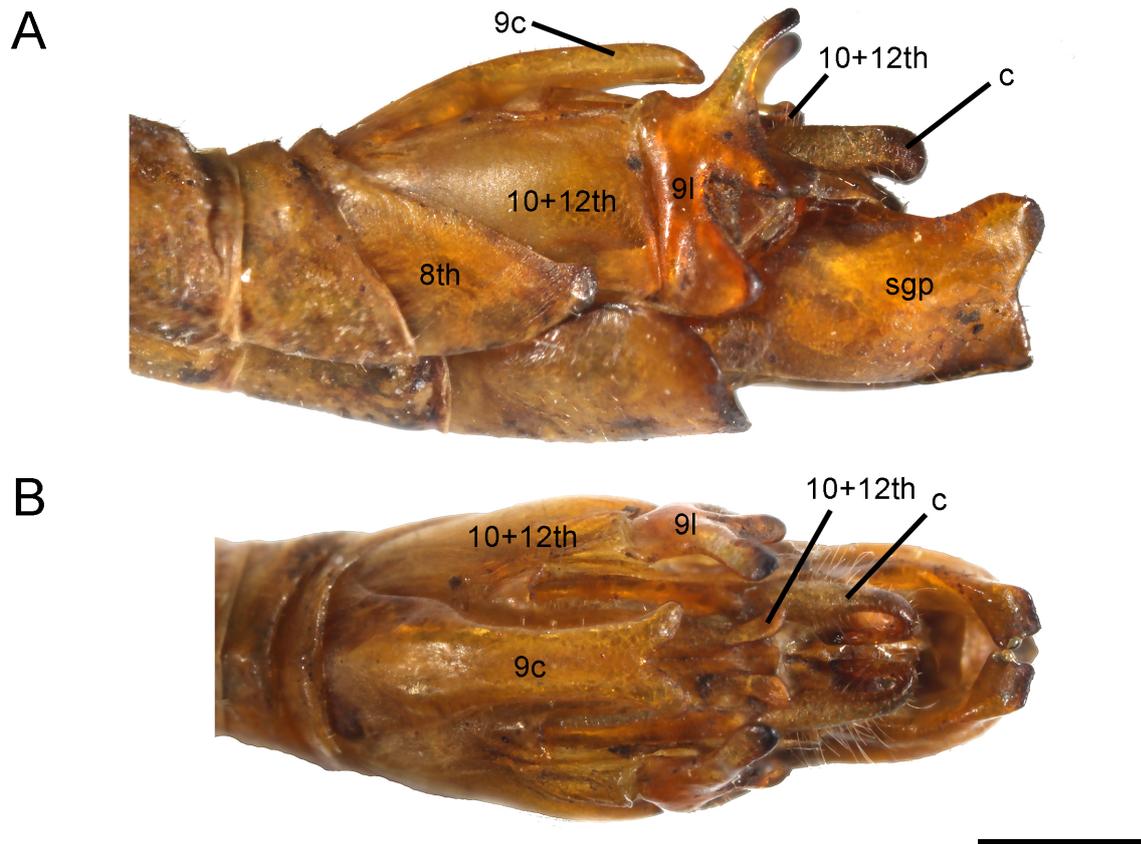


FIGURE 1. Abdominal apex of the male *Uvarovia longipennis* Bolívar, 1930 in lateral (A) and dorsal (B) views. Scale bar: 1 mm.

***Uvarovia longipennis* Bolívar, 1930**
(Figs. 1–4)

Uvarovia longipennis Bolívar, 1930: 202
Mnesicles sp. (misidentification)—Tan, 2012: 12; Tan *et al.*, 2015: 47

Material examined (image). Holotype (female), PENINSULAR MALAYSIA, Isla Dinding [= Manjung District (Perak)], H. N. Ridley leg., det. C. Bolívar, 1922 (NHMUK012499122).

Material examined. 3 males and 3 females, SINGAPORE: 1 male, Mandai Avenue, felled forest, M. K. Tan & R. W. J. Ngiam leg., 17 March 2011 (ZRC.ORT.248); 1 male, Nee Soon pipeline, edge of freshwater swamp forest, M. K. Tan, R. W. J. Ngiam & W. L. Lim leg., 31 May 2011 (ZRC.ORT.293); 1 female, Belukar Track near Bukit Timah Nature Reserve, forest edge, M. K. Tan & M. R. B. Ismail leg., 30 June 2011 (ZRC.ORT.313); 1 female; Mandai, secondary forest, M. K. Tan leg.; 1 male, Bukit Timah Hindhede Drive, near primary forest, H. K. Lua leg., 27 August 1989 (ZRC.ORT.563); 1 female, Admiralty Park (Nature Park), secondary forest, M. K. Tan leg., 30 September 2021 (ZRC).

Type locality. PENINSULAR MALAYSIA: Perak: Manjung District

Distribution. Malay Peninsula (i.e., Peninsular Malaysia and Singapore)

Male description. Habitus as shown in Figs. 2, 3A. Vertex with faint middle keel (Fig. 3B). Dorsally, fastigium narrow, 1.3 times as long as wide, slightly enlarged at the apex; separated from vertex by a transverse furrow (Fig. 3B). Frons narrow between antennal scapes with lateral keels sinuously converging dorsally, diverging ventrally (most far apart) between scapes before converging ventrally (Fig. 3C). Frontal costa with faint lateral keels (Fig.

3C). Scapus elongated, antenna with 11 segments; segment flattened, tend to widen apically (Fig. 3D). Pronotal dorsal disc with anterior margin broadly concave and posterior margin obtuse, rounded; with transverse furrow continuing to lateral lobe. Pronotal lateral lobe with anterior margin convex; ventral margin straight in anterior half and oblique in posterior half; ventro-posterior angle 90°; posterior margin straight. Tegmina and hind wings well surpassing beyond apex of hind femora and abdominal apex (Fig. 3D). Tegmina with fine veining and delimiting fairly large areoles; slightly curved back at apical part, at the apex subacutely-rounded (Fig. 3E). Hind wings 2.0 times as long as wide (Fig. 3E). Hind tibia armed with 20–22 external and 14–15 internal spines.

Abdomen enlarged apically (Fig. 1). 8th tergite normal, with lateral portion extending posteriorly into a narrow lobe with truncated apex (Fig. 1A). Central portion of 9th tergite elongated, narrow slightly after basal third and forming a shaft-like process, apex bilobed with apices of lobes narrow, round and pointing externally (Fig. 1B). Lateral portion of 9th tergite fused to 10+12th tergites with distinct suture; lateral portion forming three lobes: ventral lobe triangular and pointing posteriorly with subacute apex, middle lobe more narrow and elongated, separated from ventral lobe by deep and wide excision, dorsal projection longest and narrowest, pointing dorsad (slightly curved posteriorly in the middle) with lamellate and truncated apex (Fig. 1A). 10th and 12th tergites, although united, clearly delimited (Fig. 1B). 10th tergite in dorsal view producing two lateral posterior process with subacute apex, slightly diverging from one another at apex (Fig. 1B). 12th tergite forming tongue-shaped supra-anal plate. Cercus very long and U-bent; basal part slightly less than twice as long as apical part, slightly narrowed towards apex (in dorsal view) (Fig. 1B), although in lateral view, it has parallel margins (Fig. 1A); the apical part pointing anteriorly (parallel to basal part), narrower than basal part, chitinised, somewhat compressed and very sharp towards the apex (Fig. 1B). Subgenital plate with deeply V-excised basal margin; in the middle with narrow furrow along midline; posterior end bilobed, V-excised (not as deep as basal margin) between the lobes. Apical lobe of subgenital plate rectangular in vento-posterior view, slightly longer than on the posterior margin and converging apically, apex truncated.



FIGURE 2. *Uvarovia longipennis* Bolívar, 1930 male in its natural habitat in Singapore.

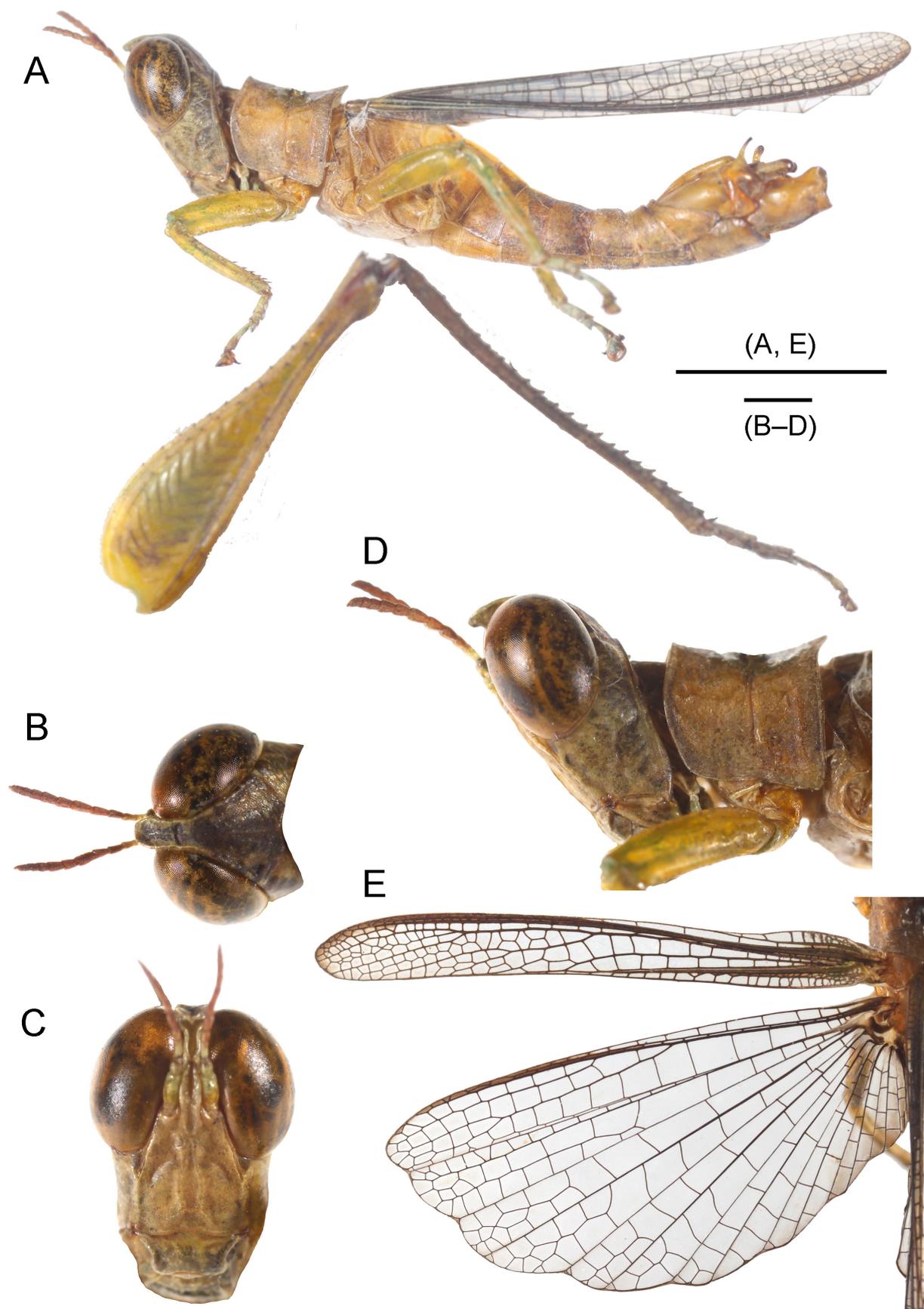


FIGURE 3. *Uvarovia longipennis* Bolívar, 1930 male: habitus in lateral view (A), head in dorsal view (B), face in anterior view (C), head and pronotum in lateral view (D), wings in dorsal view (E). Scale bars: 5 mm (A, E), 1 mm (B–D).

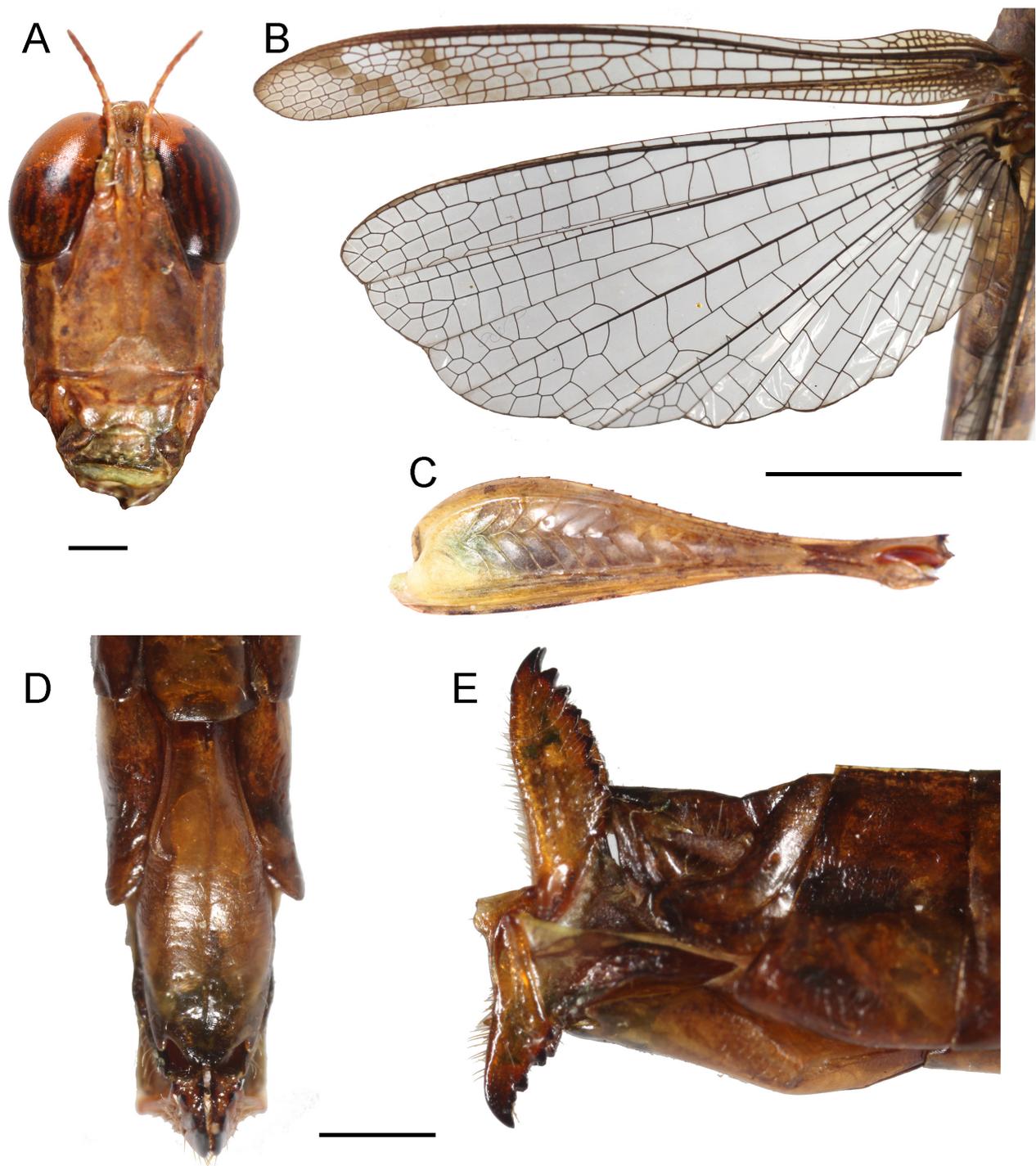


FIGURE 4. *Uvarovia longipennis* Bolívar, 1930 female: face in anterior view (A), wings in dorsal view (B), hind femur in lateral view (C), abdominal apex in ventral (D) and lateral (E) views. Scale bars: 5 mm (B, C), 1 mm (A, D, E).

Colouration. Generally yellow with tint of green when alive (Fig. 2), green colouration lost when dry-preserved (Fig. 3A). Head with vertex mottled dark and lateral keel yellow; fastigium sometimes lighter in colouration at apex. Eyes white when alive (Fig. 2), brown when dry-preserved, with numerous vertical dark stripes (Fig. 3D). Scapus yellow green, antennal segments brown to dark brown (Figs. 3B, 3D). Labrum green in dorsal half and mottled dark in ventral half. Maxillary palps grey green with brown rings. Pronotal dorsal disc generally grey (dark when dry-preserved) with anterior margin brown; lateral lobe yellow green with tint of blue grey (Figs. 2, 3D). Tegmina with dark brown veins; cells completely hyaline, apex with trace of brown (Fig. 3E). Anterior and middle legs generally

yellow green to green with brown spines. Hind femora generally yellow green, basal parts more green, apical part more yellow with brown knees (Figs. 2, 3A). Hind tibia and tarsus grey. Thoracic tergites grey yellow, abdominal tergites yellow with tints of green (Fig. 2). Lateral parts of 9th tergite with apices of processes dark. Cercus apical half brown with black apex (Fig. 1).

Measurements (in mm). BL = 15.6, PL = 2.1, FWL = 12.2, HWL = 11.5, HFL = 9.1, HFW = 2.3, HTL = 8.7, HTaL = 3.9.

Female (Fig. 4). Newly acquired specimens match the original female description: FW with two brown oblique bands, narrowly and imperfectly marked, in its apical third (Fig. 4B). Wings being 2.4 times as long as wide (Fig. 4B). Abdominal apex with a dorsal tongue-shaped plate with lateral margins emarginated in the middle. Subgenital plate elongated shaft, narrow at the base, widening until basal third, lateral margins parallel; narrowed angularly near the apex into a narrow and truncated apex (Fig. 4D). Ovipositor as shown in Fig. 4E.

***Uvarovia gracilipes* Bolívar, 1931**

(Figs. 5–7)

Uvarovia gracilipes Bolívar, 1931: 391

New material examined. 1 male and 1 female, EAST MALAYSIA, Sabah, Sandakan: 1 female (SDK.19.4), Sepilok, Rainforest Discovery Centre, N5.87387, E117.94453, 35.5±5.2 m.a.s.l., M. K. Tan & S. T. Toh leg., 8 January 2019 2027 h (FRC); 1 male (SDK.19.57), Kebun Cina, N5.84891, E118.06110, 58.0±7.1 m.a.s.l., M. K. Tan & A. Y. C. Chung, R. Japir, J. L. Yukang leg., 11 January 2019 2045 h (FRC).

Type locality. EAST MALAYSIA: Sarawak: Kuching

Distribution. Borneo (states of Sarawak, Sabah)

Male description. Habitus as shown in Fig. 5A. Vertex with faint middle keel (Fig. 6A). Dorsally, fastigium narrow and more elongated, 2.1 times as long as wide, faintly enlarged at the apex; separated from vertex by a very faint transverse keel, apex rounded (Fig. 6A). Frons narrow between antennal scapes with lateral keels straight (Fig. 6B). Frontal costa with lateral keels barely visible (Fig. 6B). Scapus elongated, antenna with 11 segments; segment flattened, tend to widen apically (Fig. 6C). Pronotal dorsal disc with anterior margin strongly concave and posterior margin obtuse, rounded; with transverse furrow continuing to lateral lobe. Pronotal lateral lobe with anterior margin convex; ventral margin straight to faintly sinuous throughout; ventro-posterior angle 90°; posterior margin straight. Tegmina and hind wings surpassing beyond abdominal apex but not apex of hind femora. Tegmina with fine veining and delimiting fairly large areoles; faintly curved back at apical part, at the apex rounded. Hind tibia armed with 22–23 external and 17–18 internal spines.

Abdomen enlarged apically (Figs. 7A, 7B). 8th tergite normal, with lateral portion extending slightly posteriorly (Fig. 7A). Central portion of 9th tergite elongated, narrow posteriorly until apical third; apical third widens, apex bilobed with apices of lobes broadly round (Fig. 7B). Lateral portion of 9th tergite large, extend and narrowing posteriorly into a triangular lobe with obtuse apex (Fig. 7A). 10th tergite in dorsal view tongue-shaped, longitudinally furrowed in the middle (Fig. 7B). 12th tergite forming lanceolate supra-anal plate with acute apex (Fig. 7B). Cercus bent 90° at apical third; basal part typical of genus; the apical part pointing inwards, lamellate and chitinised, lanceolate with acute apex (Fig. 7B). Subgenital plate with posterior end bilobed, U-excised between the lobes: middle of excision with a small stout lobule, apical lobe of subgenital plate triangular with rounded apex.

Colouration. Generally green and yellow when alive (Fig. 5), green colouration lost when dry-preserved. Head more yellow than green, with vertex mottled dark and lateral keel yellow; fastigium yellow (when alive) (Fig. 5). Eyes yellow; with numerous vertical dark stripes (Figs. 5A, 6A–C). Scapus yellow green, antennal segments red brown (Figs. 5A, 6B, 6C). Labrum green in dorsal half and mottled dark in ventral half. Maxillary palps grey green with brown rings. Pronotal dorsal disc generally green with tint of blue grey (dark when dry-preserved) with anterior margin yellow green (Figs. 5A, 6C). Tegmina with dark brown veins; cells completely hyaline, apex with very faint trace of brown. Anterior and middle legs generally green, femora with tint of brown. Hind femora generally yellow green, basal parts more green, apical part more grey, knees with black stripes (Figs. 5A). Hind tibia and tarsus grey. Thoracic tergites green with tint of blue, abdominal tergites pale green dorsally, pale yellow laterally (Fig. 5A). Central and lateral portions of 9th tergite and 12th tergite with apices of lobes black. Cercus apical half pale yellow green with black apex (Figs. 5A, 7B).



FIGURE 5. *Uvarovia gracilipes* Bolívar, 1931 male (A) and female (B) in their natural habitat in Sabah.

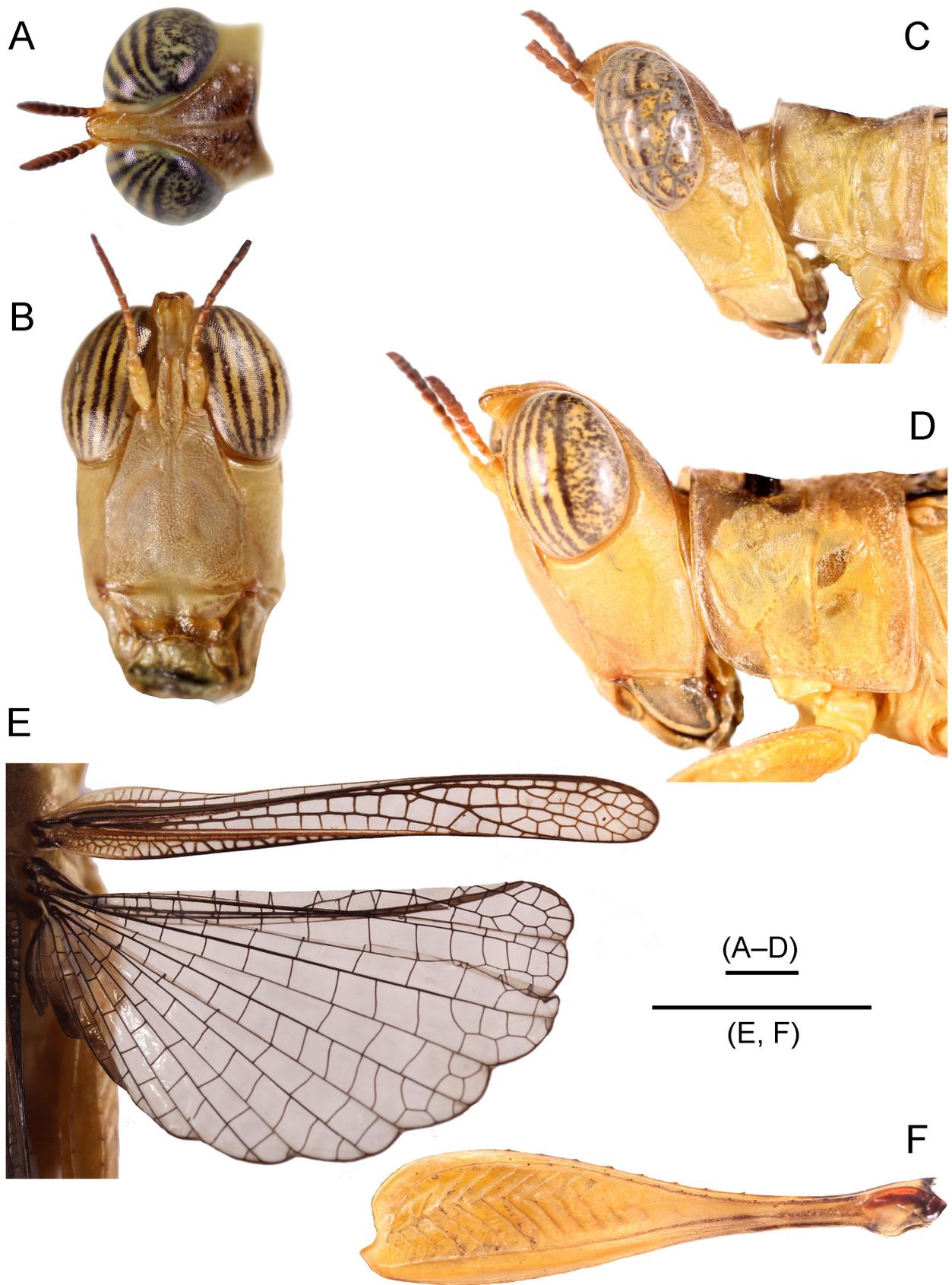


FIGURE 6. *Uvarovia gracilipes* Bolívar, 1931: head in dorsal view (A), face in anterior view (B), head and pronotum of male (C) and female (D) in lateral views, wings in dorsal view (E), hind femur in lateral view (F). Scale bars: 5 mm (E, F), 1 mm (A–D).

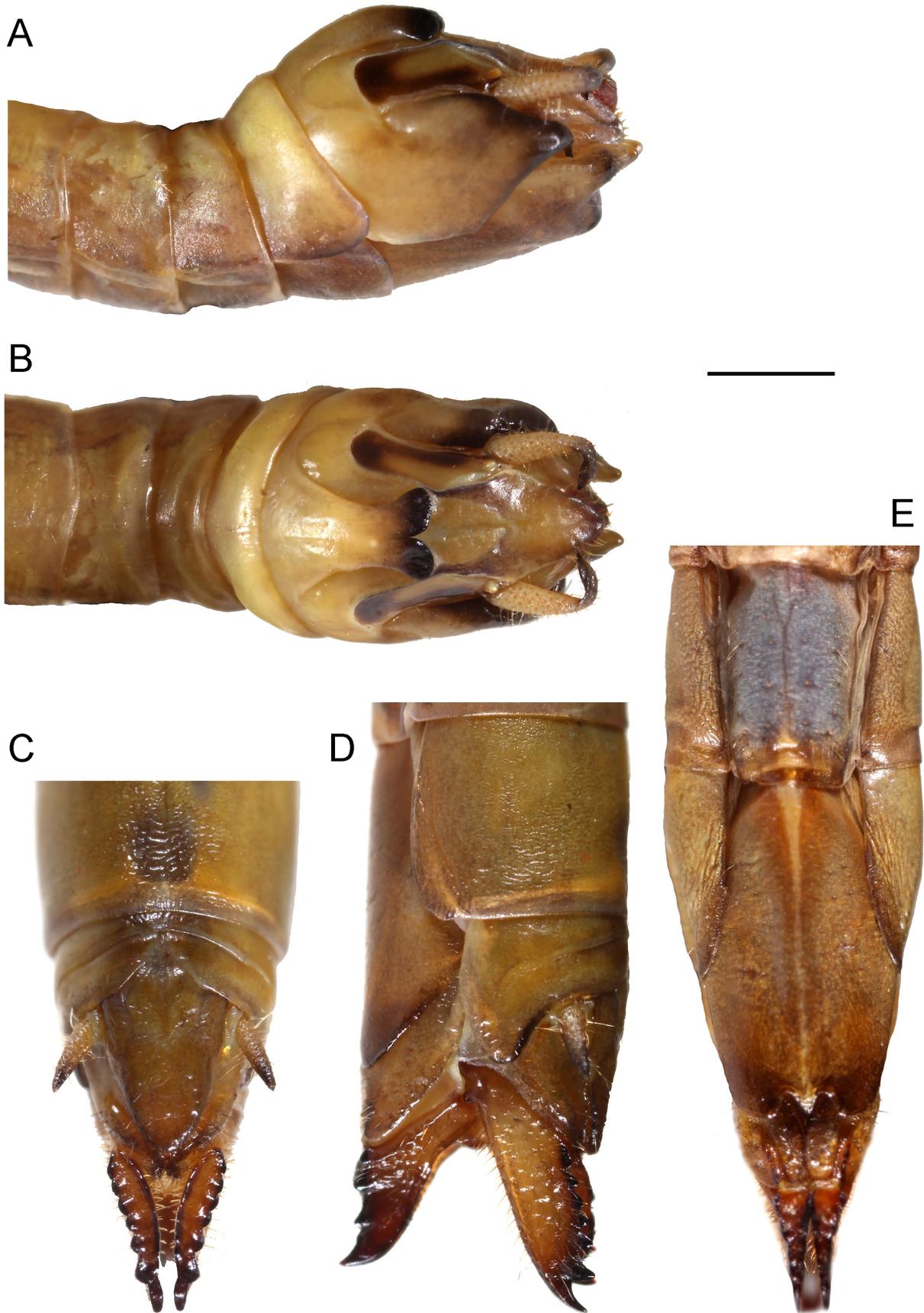


FIGURE 7. *Uvarovia gracilipes* Bolívar, 1931 abdominal apices of male (A, B) and female (C–E) in lateral (A, D), dorsal (B, C) and ventral (E). Scale bar: 1 mm.

Measurements (in mm). BL = 13.2, PL = 2.1, FWL = 10.3, HFL = 10.0, HFW = 2.3, HTL = 9.4, HTaL = 3.9.

Female (Figs. 5B, 6E, 6F, 7C–E). Newly acquired specimens agree with the original description: Tegmina not surpassing apex of hind femur and rounded at apex (Fig. 6E). Wings being 1.9–2.0 times as long as wide (Fig. 6E). Hind femur as shown in Fig. 6F. Subgenital plate smooth, apex with two notches, medial sharp triangle lobule and on each side a rounded lobe, equally prominent but much wider. (Fig. 7E). Ovipositor as shown in Fig. 7D).



FIGURE 8. *Mnesicles crenatus* (Haan, 1842) male holotype: specimen and labels. Image credit: Luc Willemse (RMNH).

Mnesicles crenatus (Haan, 1842)

(Figs. 8, 9)

Acridium (Mastax) crenatum Haan, 1842: 163

Mastax? crenata—Walker, 1870: 792

Mnesicles crenatus—Kirby, 1910: 74; Willemse, 1928: 16; Bolívar, 1930: 198

Material examined. Holotype (male), Borneo, Doesoan [= north Borneo or Sabah?] (RMNH INS. 1277500)

Remarks. The male holotype was reported to be very damaged, with missing abdomen and hind legs (Willemse, 1928). Bolívar (1930, 1931) was not confident about the generic status of *Uvarovia gracilipes*, but placed this species as an *Mnesicles* based on the slightly arching tegmina and more elongated hind wings. From the description by Bolívar (1930), we know it differs from Bornean *Uvarovia* by the presence of dorsal tubercles on the 6th and 7th tergites, abdominal apex dilated, with arched or spiny margins (absence in *Uvarovia*).

Acknowledgements

The authors are thankful to Siew Tin Toh, Momin Binti, John Lee Yukang and Saudi Bintang for field assistance in Sandakan. The permissions for collecting and exporting material were granted by the Sabah Biodiversity Centre (JKM/MBS.1000-2/3 JLD.3 (99)). MKT is thankful to Luc Willemse (RMNH) for providing photographs of the

holotype of *Mnesicles crenatus*, to Wendy Wang for permitting the examination of specimens in the ZRC and to Ricardo Mariño-Pérez for providing Bolívar, 1944 paper. The work of MKT was supported by the Orthoptera Species File Grant 2019 under the taxonomic research project titled “Contribution to the species diversity and acoustic data on Orthoptera from Sandakan (Borneo, East Malaysia, Sabah)”.

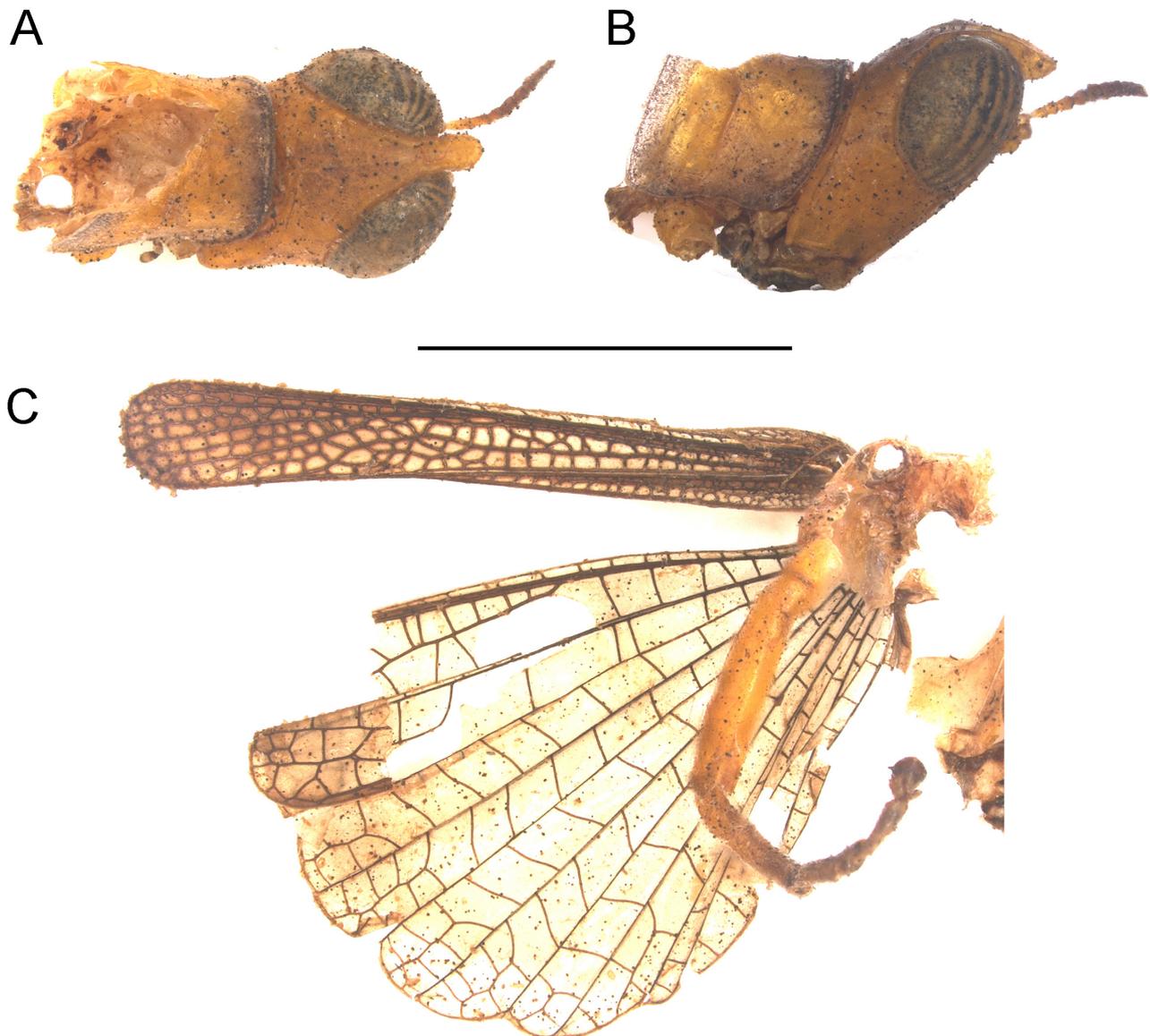


FIGURE 9. *Mnesicles crenatus* (Haan, 1842) male holotype: head and pronotum in dorsal (A) and lateral (B) views, wings in dorsal view (C). Scale bar: 5 mm. Image credit: Luc Willemse (RMNH).

References

- Bolívar, C. (1930) Monografía de los eumastácidos (Orth. Acrid.). Primera Parte. *Trabajos del Museo de Ciencias Naturales, Serie Zoológica*, 46, i–xxxii + 1–380.
- Bolívar, C. (1931) Estudios sobre Eumastácidos (Orthoptera; Acrid.). III. Revisión del género *Uvarovia* C. Bol. *Eos, Revista española de Entomología*, 7, 383–393.
- Cigliano, M.M., Braun, H., Eades, D.C. & Otte, D. (2021) Orthoptera Species File online. Version 5 (5.0). Available from: <http://orthoptera.speciesfile.org/HomePage/Orthoptera/HomePage.aspx> (accessed 15 August 2021)
- Descamps, M. (1973). Revision of Eumastacoidea (Orthoptera) at the levels of families and sub-families (genitalia, distribution, phylogeny). *Acrida*, 2, 161–298.
- Descamps, M. (1974a) Diagnoses and reports of Eumastacoidea (Orthoptera). II. Indo-Malaysia. *Bulletin of the National Museum of Natural History Paris, Series 3, 237 Zoology* (11), 1033–1053.
- Descamps, M. (1974b) Les Mnesicleinae des Philippines (Orthoptera Eumastacoidea). *Bulletin du Muséum national d'Histoire*

naturelle Paris, 3e Serie, Zoology, 184 (262), 1653–1696.

- Haan, W. (1842) Bijdragen tot de kennis der Orthoptera. In: Temminck, C.J. (Ed.), *Verhandelingen over de Natuurlijke Geschiedenis der Nederlandsche Overzeesche Bezittingen*, 16/18, pp. 45–124 + 125–164.
- Kirby, W. F. (1910) *A Synonymic Catalogue of Orthoptera (Orthoptera Saltatoria, Locustidae vel Acridiidae)*. 3 (2). Printed by order of the Trustees [by Taylor and Francis], London, 674 pp.
- Rehn, J.A.G. (1948) The Acridoid family Eumastacidae (Orthoptera). A review of our knowledge of its components, features and systematics, with a suggested new classification of its major groups. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 100, 77–139.
- Tan, M.K. (2012) Orthoptera in the Bukit Timah and Central Catchment Nature Reserves (Part 1): Suborder Caelifera. Raffles Museum of Biodiversity Research, National University Singapore, Singapore, 40 pp. [uploaded 4 May 2012]
- Tan, M.K., Yeo, H. & Lee, J.X.Q. (2015) Diversity of entomofauna (Orthoptera, Reduviidae and Aculeata) in the Mandai-Lake Road area, Singapore. *Nature in Singapore*, 8, 37–51.
- Walker, F. (1870) s.n. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum*, 4, 605–809.
- Willemse, C. (1928) Revision des Acridioidea, décrites par De Haan, avec descriptions de nouvelles espèces. *Zoologische Mededelingen, Leiden*, 11 (1), 1–27.