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Research article

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Five new species of the genus *Phlugiolopsis* Zeuner, 1940 (Tettigoniidae: Meconematinae) from China

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Abstract. This paper reports five new species of *Phlugiolopsis* Zeuner, 1940 from Sichuan, Yunnan and Guangxi in China, i.e., *Phlugiolopsis luojishanensis* sp. nov., *Phlugiolopsis lata* sp. nov., *Phlugiolopsis rongshuiensis* sp. nov., *Phlugiolopsis acuta* sp. nov. and *Phlugiolopsis dawuishanensis* sp. nov. We present a redescription of the male of *Phlugiolopsis punctata* Wang, Li & Liu, 2012, describe the female of *Phlugiolopsis punctata* Wang, Li & Liu, 2012 and the male of *Phlugiolopsis pentagonis* Bian, Shi & Chang, 2013 for the first time. In addition, images illustrating the morphology of these species and seven previously described species are provided. The distribution map of the genus *Phlugiolopsis* from China is also provided.

Keywords. Tettigoniidae, Meconematinae, *Phlugiolopsis*, new species, China.

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Introduction

Meconematini Burmeister, 1838 is the most species-rich tribe within the subfamily Meconematinae Burmeister, 1838 and the discovery of new species is still on a rise because the Oriental Region has the main distribution (Storozhenko *et al.* 2015; Wang *et al.* 2015; Hemp *et al.* 2017; Jin *et al.* 2020; Guo *et al.* 2021; Su *et al.* 2023; Zheng *et al.* 2023a). There are some species with wings completely concealed beneath the pronotum, some cover the abdomen or even reach the middle area of the stretched hind tibiae. The genus *Phlugiolopsis* Zeuner, 1940 was established by Zeuner (1940). It is brachypterous, widely distributed in the Oriental Region and the Palaearctic Region also has a few distributions. Presently, *Phlugiolopsis* includes 57 species in the world, 50 of which are recorded in China (Cigliano *et al.* 2024).

China is located in eastern Asia and spans the Oriental and Palaearctic Regions with a complex and various topography. The terrain ranges from high in the west to low in the east on the whole. Its southern and southwestern areas have diverse climates and a high proportion of mountains which harbor a variety of vegetation forms and habitats, that may lead to island-like isolation of populations on the high peaks and ridges, including indigenous species of different genera of Meconematinae Burmeister, 1838 (Chang *et al.* 2021; Li *et al.* 2021; Duan *et al.* 2023).

Bian & Shi (2018) divided the genus *Phlugiolopsis* into three subgenera based only on the morphological differences of male cercus, i.e., *Longiloba* Bian, Shi & Chang, 2018, *Tribranchis* Bian & Shi, 2018 and *Uncinata* Bian & Shi, 2018, but Gorochov (2020) thought that the differences between these subgenera are insufficiently understood. Do these characteristics offer a suitable basis for the division of subgenera? Whether a subdivision into subgenera is reasonable needs further verification. So we will not use these subgenera names nor that introduced by Gorochov (2020). In recent years, our research group has accumulated some specimens from the genus *Phlugiolopsis* through field acquisition; we carefully examined these specimens recently and discovered several previously not described species and redescribe some others.

Material and methods

Specimens are preserved in 95% ethanol, some are dried, and were measured under a Nikon-SMZ-800 stereo microscope. Morphological structures were examined using a Leica M205A stereo microscope and a Leica DFC450 digital imaging system to acquire morphological images. Image editing was accomplished using Adobe Photoshop CC 2019. We describe the coloration of the preserved material in this paper. All specimens are preserved in the Museum of Hebei University (HBU).

The following conventions were adopted for the specimen measurements: body length from apex of fastigium verticis to posterior margin of tenth abdominal tergite in midline; pronotum length from anterior to posterior margins of pronotum in midline; tegmen length from base to apex of tegmen in lateral view in exposed area; hind femur length from base of hind femur to apex of genicular lobe; ovipositor length from base of subgenital plate to apex of ovipositor.

Results

Taxonomy

Class Insecta Linnaeus, 1758
Order Orthoptera Latreille, 1810
Suborder Ensifera Chopard, 1921
Family Tettigoniidae Krauss, 1902
Subfamily Meconematinae Burmeister, 1838
Tribe Meconematini Burmeister, 1838
Genus *Phlugiolopsis* Zeuner, 1940

Phlugiolopsis luojishanensis sp. nov.

urn:lsid:zoobank.org:act:BDDBC11E-7B22-472D-9A02-38B172C4E756

Figs 1, 15

Diagnosis

The species is similar to *Phlugiolopsis complanispinis* Bian, Shi & Chang, 2013 (Fig. 8), but differs in male cercus expanded inwards on both dorsal and ventral surfaces of basal third, apices roundly triangular; female subgenital plate with small spine near basal area on lateral margins separately, its apex acute.

Etymology

The specific epithet of the new species is derived from the type locality Luojishan (Sichuan).

Material examined

Holotype

CHINA • ♂; Sichuan, Xichang, Luojishan; 13 Sep. 2023; Jie Su leg.; HBU.

Paratypes

CHINA • 2 ♂♂, 2 ♀♀; same collection data as for holotype; HBU.

Other material

CHINA • 14 ♂♂, 15 ♀♀; same collection data as for holotype; HBU • 7 ♂♂, 4 ♀♀; Sichuan, Xichang, Luojishan; 14 Sep. 2023; Jie Su and Yifan Liu leg.; HBU.

Description

BODY. Small.

HEAD. Fastigium verticis conical, apex rounded, furrowed on dorsal surface. Eyes oval, feebly protruding outward and forward (Fig. 1A). Apical segment of maxillary palpus nearly equal to subapical one in length, apex slightly swollen.

THORAX. Pronotum slightly elongate backwards, anterior margin feebly prominent, posterior margin rounded; lateral lobe longer than high, without humeral sinus (Fig. 1B).

TEGMEN. Tegmina short, terminals faintly surpassing posterior margin of pronotum, reaching middle area of second abdominal tergite, apices rounded (Fig. 1B). Hind wings absent.

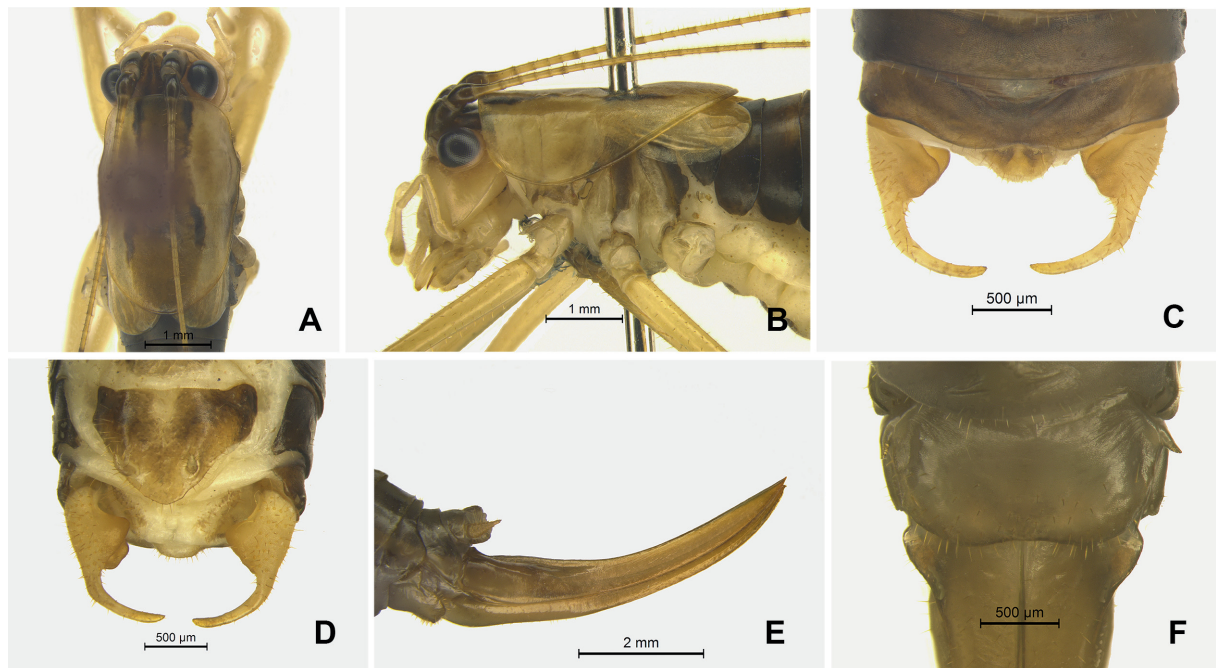


Fig. 1. *Phlugiolopsis luojishanensis* sp. nov. A–D. Holotype, ♂ (HBU). A–B. Head and pronotum. A. Dorsal view. B. Lateral view. C–D. Apex of abdomen. C. Dorsal view. D. Ventral view. E–F. Paratype, ♀ (HBU). E. Ovipositor in lateral view. F. Subgenital plate in ventral view.

LEGS. All femora unarmed on ventral surfaces. Fore coxa with 1 spine; fore and middle tibiae each with 5 external and 4 internal spines on ventral surfaces separately; fore tibial tympana open on both sides, oval. Genicular lobes of hind femur with apices rounded; hind tibia with 24–27 spines on both sides of dorsal surface separately, bearing 1 pair of dorsal apical spurs and 2 pairs of ventral apical spurs.

MALE ABDOMEN. Middle area of posterior margin of tenth abdominal tergite arc-shaped concave (Fig. 1C). Cercus expanded inwards on both dorsal and ventral surfaces of basal third, apices obtusely triangular; apical third of cercus cylindrical, apex rounded, obviously incurved (Fig. 1C–D). Subgenital plate with base broad, apical area narrowing; basal margin almost straight, lateral carinae distinct on basal half, middle area bulging ventrad, apical area arc-shaped protruding; styli short and conical, tips rounded, inserted on subapex of subgenital plate on ventral surface (Fig. 1D).

FEMALE ABDOMEN. Tenth abdominal tergite short, split in midline on posterior margin. Cercus conical, apex acute. Ovipositor short, gently curved upwards; both dorsal and ventral margins smooth, dorsal valvula slightly longer than ventral one, dorsal valvula with apex acute, ventral valvula with apex hook-shaped (Fig. 1E). Subgenital plate longer than broad, near basal area with small spine on lateral margins separately, its apex acute; basal margin faintly concave, posterior margin arc-shaped concave (Fig. 1F).

COLORATION. Body yellowish brown. Eyes black. Dorsal area of head with 4 longitudinal dark brown stripes. Scape and pedicel of antenna dark brown, flagellum with sparse annulate brown stripes, lamellar uplift on inner margin of antennal scrobe dark brown. Disc of pronotum with broad longitudinal brown stripe, posterior half slightly widened, lateral margins of two thirds anterior area of longitudinal stripe black. Genicular lobes black; tarsi dark brown.

MEASUREMENTS (mm). Body length: ♂: 6.2–7.1, ♀: 6.4–8.2; length of pronotum: ♂: 3.2–3.6, ♀: 3.2–3.6; length of tegmen: ♂: 1.1–1.3, ♀: 1.2–1.4; length of hind femur: ♂: 6.6–7.5, ♀: 7.5–8.0; length of ovipositor: 6.1–6.9.

Distribution

China (Sichuan).

***Phlugiolopsis lata* sp. nov.**

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Figs 2, 15

Diagnosis

The new species is characterized by male cercus with expansion on basal half of dorsal surface, its posterior area lobate, apex rounded; subgenital plate with longitudinal concave in midline, protruding on subapical area, apical area curved ventrally, in middle of posterior margin with two triangular processes, terminals rounded.

Etymology

The specific epithet of the new species refers to the male cercus broad on the basal area, the Latin ‘*lata*’ meaning ‘wide’.

Material examined

Holotype

CHINA • ♂; Yunnan, Ruili, Nongdao; 18 Aug. 2019; Yanqing Li leg.; HBU.

Paratypes

CHINA • 1 ♀; Yunnan, Ruili, Nongdao; 18 Aug. 2019; Limin Lu leg.; HBU • 1 ♀; Yunnan, Ruili, Nongdao; 24 Oct. 2019; Peng Cui leg.; HBU • 2 ♂♂; Yunnan, Ruili, Zhiwuyuan; 20 Aug. 2019; Yanqing Li and Limin Lu leg.; HBU.

Other material

CHINA • 1 ♀; Yunnan, Ruili, Nongdao; 18 Aug. 2019; Limin Lu leg.; HBU • 1 ♂, 2 ♀♀; Yunnan, Ruili, Zhiwuyuan; 20 Aug. 2019; Yanqing Li and Limin Lu leg.; HBU • 1 ♂, 1 ♀; Yunnan, Ruili, Moli; 17 Aug. 2019; Yanqing Li and Limin Lu leg.; HBU.

Description

BODY. Small.

HEAD. Fastigium verticis conical, apex rounded, furrowed dorsally. Eyes subglobular, prominent forward and outward (Fig. 2A). Apical segment of maxillary palpus nearly equal to subapical one in length, faintly swollen apically.

THORAX. Pronotum slightly elongate backwards, anterior margin feebly prominent, posterior margin rounded; lateral lobe longer than deep, without humeral sinus (Fig. 2B).

TEGMEN. Tegmina short, terminals slightly surpassing posterior margin of pronotum, reaching posterior margin of second abdominal tergite, apices rounded (Fig. 2B). Hind wings absent.

LEGS. All femora unarmed on ventral surfaces. Fore coxa with 1 spine; fore and middle tibiae each with 6 outer and 5 inner spines on ventral surfaces, respectively, fore tibial tympana open and ovel on both sides. Genicular lobes of hind femur with apices rounded; hind tibia with 2–3 internal spines

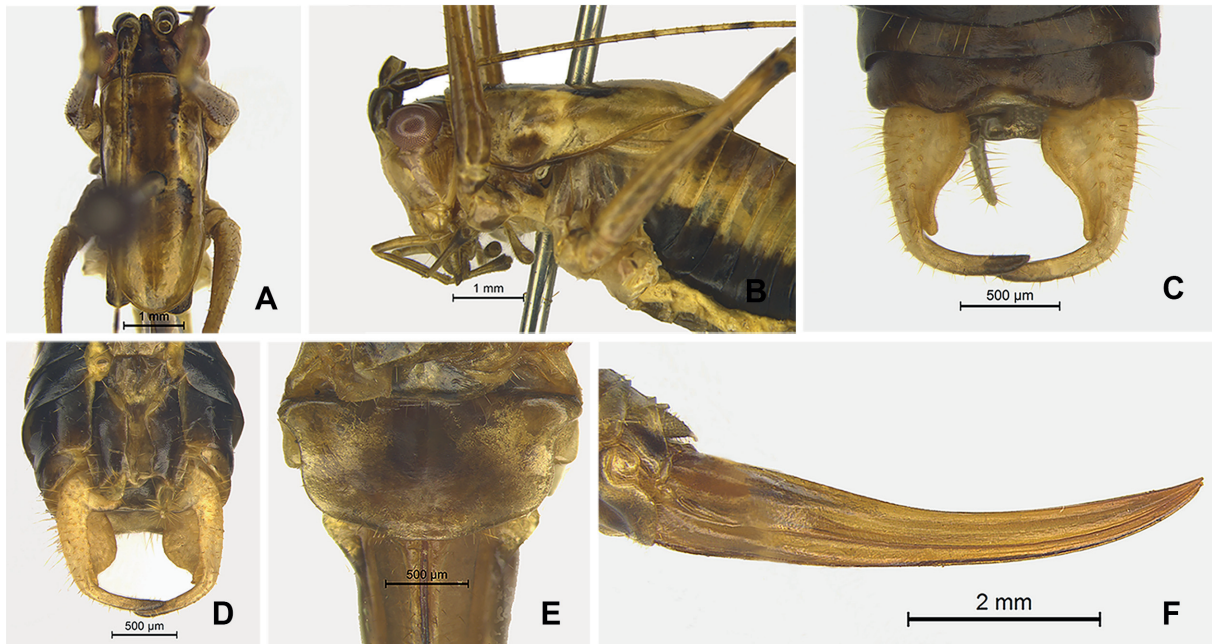


Fig. 2. *Phlugiolopsis lata* sp. nov. A–D. Holotype, ♂ (HBU). A–B. Head and pronotum. A. Dorsal view. B. Lateral view. C–D. Apex of abdomen. C. Dorsal view. D. Ventral view. E–F. Paratype, ♀ (HBU). E. Subgenital plate in ventral view. F. Ovipositor in lateral view.

and 6 external spines on ventral surface, and dorsal surface with 29–32 spines on inner margin and 33–35 spines on outer margin, bearing 1 pair of dorsal apical spurs and 2 pairs of ventral apical spurs.

MALE ABDOMEN. Tenth abdominal tergite arc-shaped concave on posterior margin. Cercus semicircular expanded inwards on basal half, its posterior area with small lobe, apex rounded; interno-ventral surface with digital projection near basal area, incurved near middle area, apex rounded; apical half of cercus spinous, rectangularly incurved, tip subacute (Fig. 2C–D). Subgenital plate with V-shaped notch on basal margin, in midline with longitudinal concave, lateral margins subparallel, subapical area protruding, apical area curved ventrally, posterior margin with two triangular projections, terminals rounded; comparatively long and conical styli inserted at ventral surface not far from apex (Fig. 2D).

FEMALE ABDOMEN. Posterior margin of tenth abdominal tergite feebly concave. Epiproct tongue-shaped with longitudinal sulcus on dorsal surface. Cercus conical, apex acute. Ovipositor comparatively long, faintly upcurved, dorsal valvula slightly longer than ventral one, dorsal valvula with apex acute, apex of ventral valvula hook-shaped (Fig. 2F). Subgenital plate roughly trapezoid; basal margin relatively straight, lateral margins faintly concave, posterior margin subobtuse (Fig. 2E–F).

COLORATION. Body yellowish brown. Eyes reddish brown. Dorsum of head with 4 longitudinal black stripes. Flagellum of antenna with sparse annulate black stripes, lamellar uplift on inner margin of antennal scrobe dark brown. Disc of pronotum with broad longitudinal brown stripe, its lateral margins black on anterior two thirds, posterior half pale and slightly widened. Genicular lobes black; tibial spines dark brown; trasi dark brown.

MEASUREMENTS (mm). Body length: ♂: 6.9–7.2, ♀: 6.4–9.6; length of pronotum: ♂: 3.8–4.0, ♀: 3.7–3.8; length of tegmen: ♂: 1.6–1.8, ♀: 1.2–1.7; length of hind femur: ♂: 9.5–10.0, ♀: 9.9–10.1; length of ovipositor: 6.2–7.3.

Distribution

China (Yunnan).

***Phlugiolopsis rongshuiensis* sp. nov.**

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Figs 3, 15

Diagnosis

This new species resembles *Phlugiolopsis damingshanis* Bian, Shi & Chang, 2012 (Fig. 9), but differs in male cercus with rectangular process on interno-ventral surface near middle area, apex truncate; female subgenital plate with apex roundly triangular.

Etymology

The specific epithet of the new species refers to the type locality Rongshui (Guangxi).

Material examined

Holotype

CHINA • ♂; Guangxi, Rongshui, Yangmeiao; 8 Aug. 2019; Lixuan Chen leg.; HBU.

Paratypes

CHINA • 2 ♀♀; same collection data as for holotype; Lixuan Chen and Lidan Zhang leg.; HBU • 1 ♂; same collection data as for preceding; 11 Aug. 2019; Lidan Zhang leg.; HBU • 1 ♂; same collection data as for preceding; 8 Aug. 2018; Qidi Zhu leg.; HBU.

Other material

CHINA • 2 ♂♂, 3 ♀♀; same collection data as for holotype; Lixuan Chen and Lidan Zhang leg.; HBU • 3 ♂♂; same collection data as for preceding; 9 Aug. 2019; HBU • 4 ♂♂, 5 ♀♀; same collection data as for preceding; 11 Aug. 2019; HBU • 2 ♂♂, 3 ♀♀; same collection data as for preceding; 7 Aug. 2018; Qidi Zhu and Lixuan Chen leg.; HBU • 9 ♂♂, 3 ♀♀; same collection data as for preceding; 8 Aug. 2018; HBU.

Description

BODY. Small.

HEAD. Fastigium verticis conical, apex rounded with longitudinal sulcus on dorsum. Eyes roughly globular, projecting forwards (Fig. 3A). Apical segment of maxillary palpus subequal to subapical one in length, apical area inflated.

THORAX. Pronotum feebly elongate backwards, anterior margin roughly straight, posterior margin rounded; lateral lobe longer than deep, humeral sinus absent (Fig. 3B).

TEGMEN. Tegmina short, terminals slightly surpassing posterior margin of pronotum, reaching middle area of third abdominal tergite, apices rounded (Fig. 3B). Hind wings absent.

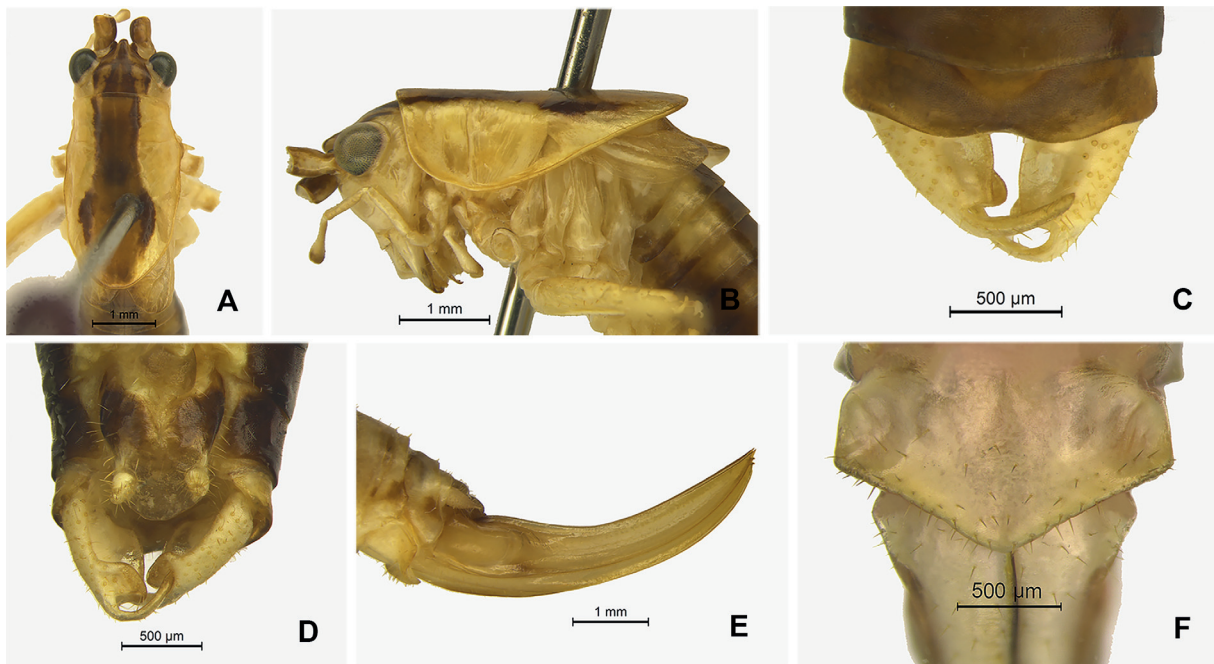


Fig. 3. *Phlugiolopsis rongshuiensis* sp. nov. A–D. Holotype, ♂ (HBU). A–B. Head and pronotum. A. Dorsal view. B. Lateral view. C–D. Apex of abdomen. C. Dorsal view. D. Ventral view. E–F. Paratype, ♀ (HBU). E. Ovipositor in lateral view. F. Subgenital plate in ventral view.

LEGS. All femora without spines on ventral surfaces. Fore coxa with 1 spine; fore and middle tibiae each with 4 inner spines and 5 outer spines on ventral surfaces, respectively; fore tibial tympana open and ovoid on both inner and outer sides. Genicular lobes of hind femur with apices rounded; hind tibia with 1–2 spines on inner side and 3–4 spines on outer side of ventral surface as well as 28–29 inner spines and 31–33 outer spines on dorsal surface, bearing 2 pairs of ventral apical spurs and 1 pair of dorsal apical spurs.

MALE ABDOMEN. Tenth abdominal tergite with posterior margin faintly concave. Cercus stout on basal area, expanding inwards on dorsal surface, its apical area obtusely triangular; near middle area with rectangular projection on interno-ventral surface, apex truncate; apical half of cercus spinous, obviously incurved and upcurved, apex slightly acute (Fig. 3C–D). Subgenital plate with base broad, apical area narrowing; basal margin V-shaped concave, posterior margin rounded; styli short, conical, tips rounded, inserted at subapico-lateral angles of subgenital plate on ventral surface (Fig. 3D).

FEMALE ABDOMEN. Posterior margin of tenth abdominal tergite faintly concave. Cercus conic, tip acute. Ovipositor short, feebly upcurved; dorsal valvula slightly longer than ventral valvula, dorsal valvula with apex acute, ventral valvula with a terminal hook (Fig. 3E). Subgenital plate almost straight on basal margin; basal half rectangular, wide and short, lateral margins parallel; apical half triangular, apex rounded (Fig. 3F).

COLORATION. Body yellowish brown. Eyes black. Dorsum of head with 4 longitudinal dark brown stripes. Flagellum of antenna with sparse annulate black stripes, lamellar uplift on inner margin of antennal scrobe dark brown. Disc of pronotum with broad longitudinal brown stripe, posterior half slightly widened, lateral margins of two thirds anterior area of longitudinal stripe black. Genicular lobes dark brown; tarsi dark brown.

MEASUREMENTS (mm). Body length: ♂: 7.0–7.8, ♀: 6.4–7.5; length of pronotum: ♂: 3.2–3.5, ♀: 3.3–3.5; length of tegmen: ♂: 1.3–1.5, ♀: 0.9–1.4; length of hind femur: ♂: 7.6–8.0, ♀: 7.4–9.0; length of ovipositor: 5.7–6.0.

Distribution

China (Guangxi).

***Phlugiolopsis acuta* sp. nov.**

urn:lsid:zoobank.org:act:2FAFEE0B-AD6A-4EFD-9F22-93FB7C44D8A1

Figs 4, 15

Diagnosis

The new species is similar to *Phlugiolopsis trullis* Bian, Shi & Chang, 2012 (Fig. 10), but can be distinguished from it in male cercus with expansion on base to middle area of ventral surface; basal margin of female subgenital plate V-shaped concave, posterior margin arc-shaped protruding.

Etymology

The name of the new species refers to the male cercus being acute, from the Latin ‘*acuta*’ (adjective, feminine) meaning ‘acute’.

Material examined

Holotype

CHINA • ♂; Yunnan, Yingjiang, Tongbiguan; 30 Oct. 2019; Peng Cui leg.; HBU.

Paratypes

CHINA • 1 ♂; same collection data as for holotype; 28 Oct. 2019; Peng Cui leg.; HBU • 1 ♂; same collection data as for preceding; 12 Aug. 2019; Yanqing Li leg.; HBU • 1 ♀; same collection data as for preceding; 26 Oct. 2019; Peng Cui leg.; HBU • 1 ♀; same collection data as for preceding; 16 Aug. 2019; Yanqing Li leg.; HBU.

Other material

CHINA • 2 ♂♂, 4 ♀♀; same collection data as for holotype; 14 Sep. 2023; Hao Xu and Yueting Duan leg.; HBU • 1 ♂, 5 ♀♀; same collection data as for preceding; 15 Sep. 2023; HBU • 1 ♂, 1 ♀; same collection data as for preceding; 5 Aug. 2019; Yanqing Li and Limin Lu leg.; HBU • 5 ♀♀; same collection data as for preceding; 28 Oct. 2019; Peng Cui leg.; HBU • 1 ♂; same collection data as for preceding; 30 Oct. 2019; Peng Cui leg.; HBU • 1 ♀; same collection data as for preceding; 26 Oct. 2019; Yanqing Li leg.; HBU • 1 ♀; same collection data as for preceding; 10 Aug. 2018; Peng Cui leg.; HBU • 1 ♂; Yunnan, Yingjiang, Xima; 5 Aug. 2019; Limin Lu leg.; HBU.

Description

BODY. Small.

HEAD. Fastigium verticis conical, apex rounded, with median sulcus on dorsal area. Eyes nearly globular, convex forwards (Fig. 4A). Apical and subapical segments of maxillary palpus almost equal in length, apical area inflated.

THORAX. Pronotum elongate, anterior margin faintly prominent, posterior margin rounded; lateral lobe longer than high, without humeral sinus (Fig. 4B).

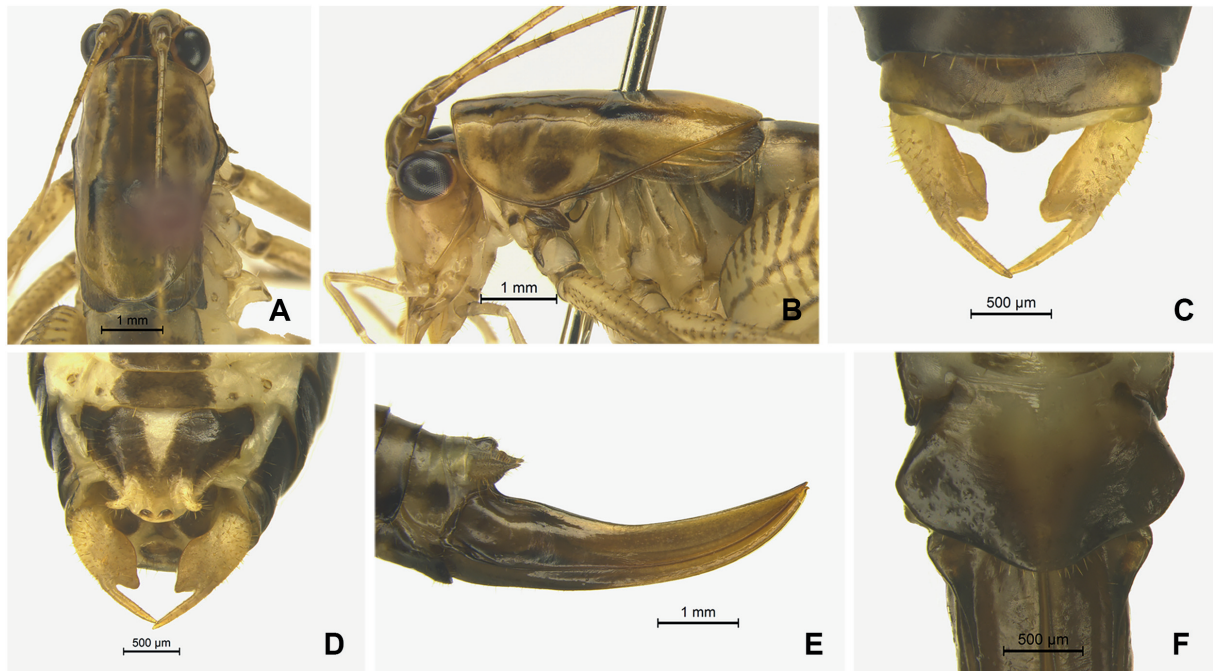


Fig. 4. *Phlugiolopsis acuta* sp. nov. A–D. Holotype, ♂ (HBU). A–B. Head and pronotum. A. Dorsal view. B. Lateral view. C–D. Apex of abdomen. C. Dorsal view. D. Ventral view. E–F. Paratype, ♀ (HBU). E. Ovipositor in lateral view. F. Subgenital plate in ventral view.

TEGMEN. Tegmina short, terminals feebly surpassing posterior margin of pronotum, reaching posterior margin of second abdominal tergite, apices rounded (Fig. 4B). Hind wings absent.

LEGS. All femora without spines on ventral surfaces. Fore coxa with 1 spine; fore tibia with 5 spines on inner side and 5–6 spines on outer side of ventral surface, tibial tympana open and oval on both sides. Middle tibia with 6 outer and 5 inner spines on ventral surface. Hind femur with apices of genicular lobes rounded; hind tibia with 25–28 spines on both inner and outer margins of dorsal surface, bearing 2 pairs of ventral apical spurs and 1 pair of dorsal apical spurs.

MALE ABDOMEN. Tenth abdominal tergite slightly concave on posterior margin. Basal half of cercus with long and narrow lamellar expansion on interno-dorsal surface, its posterior area truncate; cercus expanded inwards between near basal to middle area on ventral surface; apical half of cercus cylindrical, tip acute (Fig. 4C–D). Subgenital plate subtrapezoidal; basal margin with V-shaped membranous area, apical area with two triangular processes, apices rounded, curved ventrally; styli conical with apices subacute, inserted on ventral surface of subapex of subgenital plate (Fig. 4D).

FEMALE ABDOMEN. Posterior margin of tenth abdominal tergite almost straight. Cercus conic, tip acute. Ovipositor short, faintly upcurved; dorsal valvula and ventral valvula subequal in length, dorsal valvula with apex acute, ventral valvula with apex hook-shaped (Fig. 4E). Subgenital plate with basal margin almost straight; middle broad, apical area narrow, posterior margin roundly triangular protruding (Fig. 4F).

COLORATION. Body yellowish brown. Eyes black. Dorsal area of head with 4 longitudinal dark brown stripes. Flagellum of antenna with sparse annulate brown stripes, lamellar uplift on inner margin of antennal scrobe dark brown. Disc of pronotum with broad longitudinal brown stripe, which widened and pale on posterior area, lateral margins black on anterior two thirds. Genicular lobes black; tarsi dark brown.

MEASUREMENTS (mm). Body length: ♂: 6.6–8.6, ♀: 7.9–8.4; length of pronotum: ♂: 3.3–4.1, ♀: 3.4–3.5; length of tegmen: ♂: 1.1–1.7, ♀: 1.1–1.6; length of hind femur: ♂: 8.2–9.5, ♀: 8.1–8.9; length of ovipositor: 5.0–5.2.

Distribution

China (Yunnan).

***Phlugiolopsis daweishanensis* sp. nov.**

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Figs 5, 15

Diagnosis

In comparison with known species of the genus, the new species can be distinguished by male cercus expanded inwards on dorsal surface of basal half, long and narrow, its apex obtusely triangular; near middle area of female subgenital plate faintly concave on lateral margins, posterior margin roundly triangular.

Etymology

The specific epithet of the new species derives from its type locality Daweishan (Yunnan).

Material examined

Holotype

CHINA • ♂; Yunnan, Pingbian, Daweishan; 14 Aug. 2019; Peng Cui leg.; HBU.

Paratypes

CHINA • 1 ♂, 2 ♀♀; same collection data as for holotype; HBU.

Other material

CHINA • 1 ♂, 5 ♀♀; same collection data as for holotype; HBU • 1 ♀; same collection data as for preceding; 12 Aug. 2019; HBU.

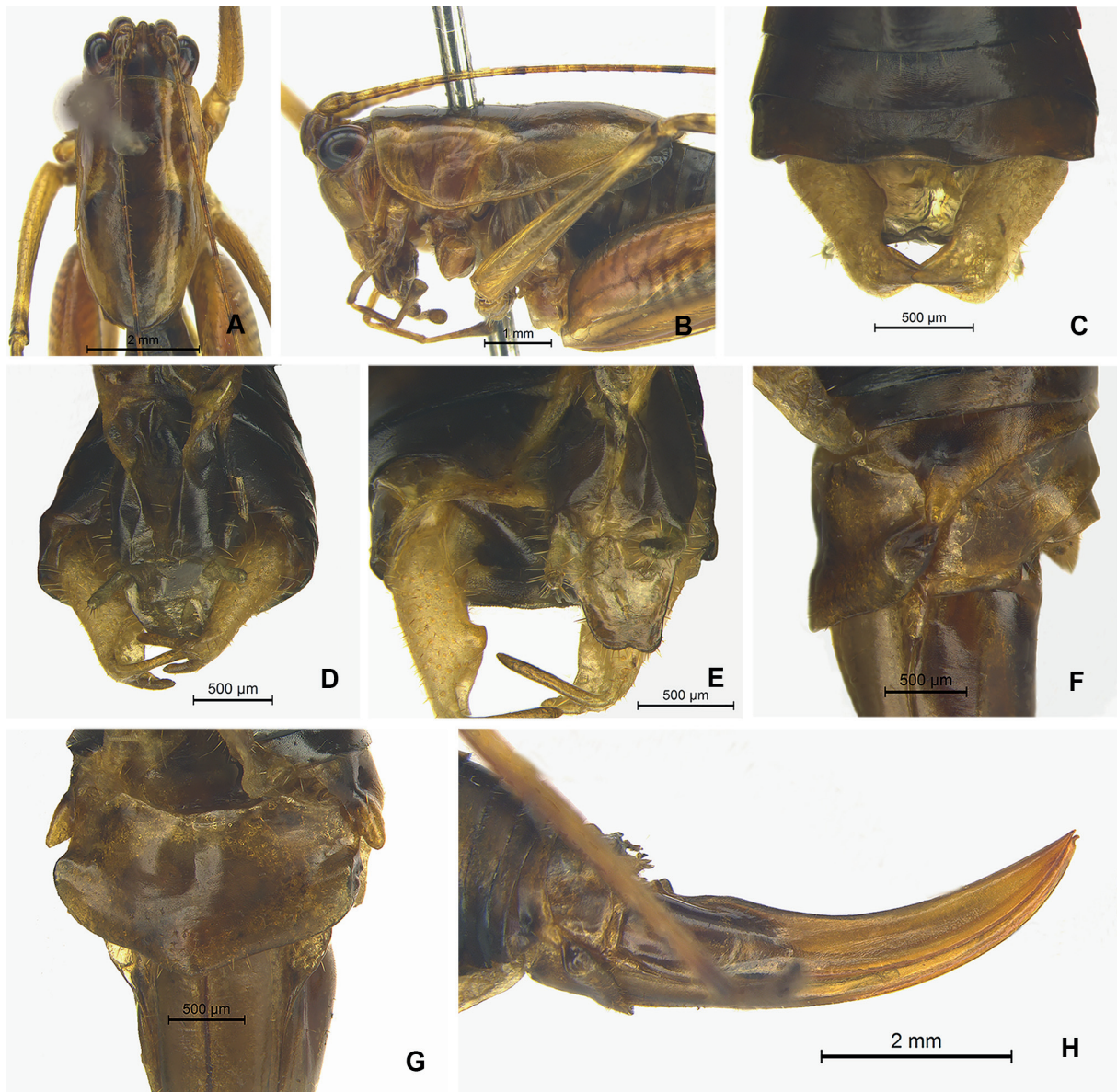


Fig. 5. *Phlugiolopsis daweishanensis* sp. nov. **A–D.** Holotype, ♂ (HBU). **E.** Type, sex (coll. code). **F–H.** Paratype, ♀ (HBU). **A–B.** Head and pronotum. **A.** Dorsal view. **B.** Lateral view. **C–E.** Apex of abdomen. **C.** Dorsal view. **D–E.** Ventral view. **F.** Apex of abdomen in lateral view. **G.** Subgenital plate in ventral view. **H.** Ovipositor in lateral view.

Description

BODY. Small.

HEAD. Fastigium verticis conical, apex rounded, furrowed dorsally. Eyes oval, protruding forwards (Fig. 5A). Apical segment of maxillary palpus and subapical one almost equal in length, apical area inflated.

THORAX. Pronotum slightly elongate, anterior margin roughly straight, posterior margin rounded; lateral lobe longer than high, with tapering posterior area, humeral sinus absent (Fig. 5B).

TEGMEN. Tegmina short, terminals not surpassing posterior margin of pronotum, apices rounded (Fig. 5B). Hind wings absent.

LEGS. All femora unarmed on ventral surfaces. Fore coxa with 1 spine; fore and middle tibiae each with 5 internal spines and 6 external spines on ventral surfaces separately; fore tibial tympana open and oval on both sides. Hind knees with apices obtuse; hind tibia with 2–3 internal spines and 5 external spines on ventral surface, and dorsal surface with 27–28 spines on inner margin and 30–33 spines on outer margin, bearing 2 pairs of ventral apical spurs and 1 pair of dorsal apical spurs.

MALE ABDOMEN. Tenth abdominal tergite with posterior margin concave. Cercus obviously incurved on basal two thirds; basal half of cercus with long and narrow lamellar expansion on interno-dorsal surface, its apex obtusely triangular; basal half of cercus with inward expansion on ventral surface, its posterior area with trapezoid process, apex truncate; apical third of cercus cylindrical, apex subacute, curved inward and dorsad (Fig. 5C–E). Subgenital plate longer than wide, basal margin concave, posterior margin slightly concave; styli comparatively long, inserted on ventral surface near lateral margins on apical third of subgenital plate (Fig. 5D).

FEMALE ABDOMEN. Lateral surfaces of eighth abdominal tergite on posterior margin with conic projection separately, apex rounded. Lateral surfaces of ninth abdominal tergite expanded backwards (Fig. 5F). Tenth abdominal tergite nearly straight on posterior margin. Cercus conical, apex acute. Ovipositor short, gently upcurved; dorsal and ventral valvulae almost equal in length, dorsal valvula with apex acute, apex of ventral valvula hook-shaped (Fig. 5H). Subgenital plate broad and short, middle wide, posterior area narrowing; basal margin feebly concave, lateral margins near middle area with notch, posterior margin obtusely triangular (Fig. 5G).

COLORATION. Body yellowish brown. Eyes blackish brown. Dorsal area of head with 4 longitudinal dark brown stripes. Flagellum of antenna with sparse annulate black stripes, lamellar uplift on internal margin of antennal scrobe dark brown. Pronotal disc with a broad longitudinal brown stripe, posterior half slightly widened, outer margins dark brown. Genicular lobes black; spines on tibia black; tarsi dark brown.

MEASUREMENTS (mm). Body length: ♂: 7.4–9.7, ♀: 7.9–8.2; length of pronotum: ♂: 4.3–4.6, ♀: 4.2–4.3; length of tegmen: ♂: 1.7–1.9, ♀: 1.6–1.9; length of hind femur: ♂: 9.5–9.8, ♀: 9.6–9.7; length of ovipositor: 6.4–6.6.

Distribution

China (Yunnan).

Phlugiopsis punctata Wang, Li & Liu, 2012

Figs 6, 15

Phlugiopsis punctata Wang, Li & Liu, 2012: 36.

Phlugiopsis (Tribranchis) punctata – Bian & Shi 2018: 350.

Material examined

CHINA • 1 ♂, 2 ♀♀; Yunnan, Menghai, Banggang; 16 Aug. 2023; Jie Su and Sheng Gao leg.; HBU • 1 ♂, 3 ♀♀; same collection data as for preceding; 15 Aug. 2023; HBU • 1 ♂, 1 ♀; Yunnan, Menghai, Guomenshan; 13 Aug. 2023; Jie Su leg.; HBU • 1 ♂; same collection data as for preceding; 12 Aug. 2023; HBU • 1 ♂, 5 ♀♀; Yunnan, Menghai, Mengsong; 18 Aug. 2019; Qidi Zhu and Yun Li leg.; HBU • 1 ♂; same collection data as for preceding; 17 Aug. 2019; Qidi Zhu leg.; HBU • 1 ♀; same collection data as for preceding; 15 Aug. 2019; Yun Li leg.; HBU • 1 ♀; same collection data as for preceding; 16 Aug. 2018; Qidi Zhu leg.; HBU • 1 ♂, 7 ♀♀; Yunnan, Jingdong, Wuliangshan; 9 Aug. 2022; Yanhao Duan and Jie Su leg.; HBU • 2 ♂♂; same collection data as for preceding; 18 Aug. 2022; HBU • 1 ♀; same collection data as for preceding; 19 Aug. 2022; Yanhao Duan leg.; HBU • 2 ♂♂, 1 ♀; Yunnan, Jingdong, Jingfu; 14 Aug. 2020; Peng Cui leg.; HBU.

Redescription

MALE ABDOMEN. Tenth abdominal tergite with posterior margin feebly concave. Cercus expanded inwards on dorsal surface, lobate, which curved inward and ventrad on apical area, apex rounded; near basal area with a broad lamellar process on interno-ventral surface, which curved forward near middle area, apex

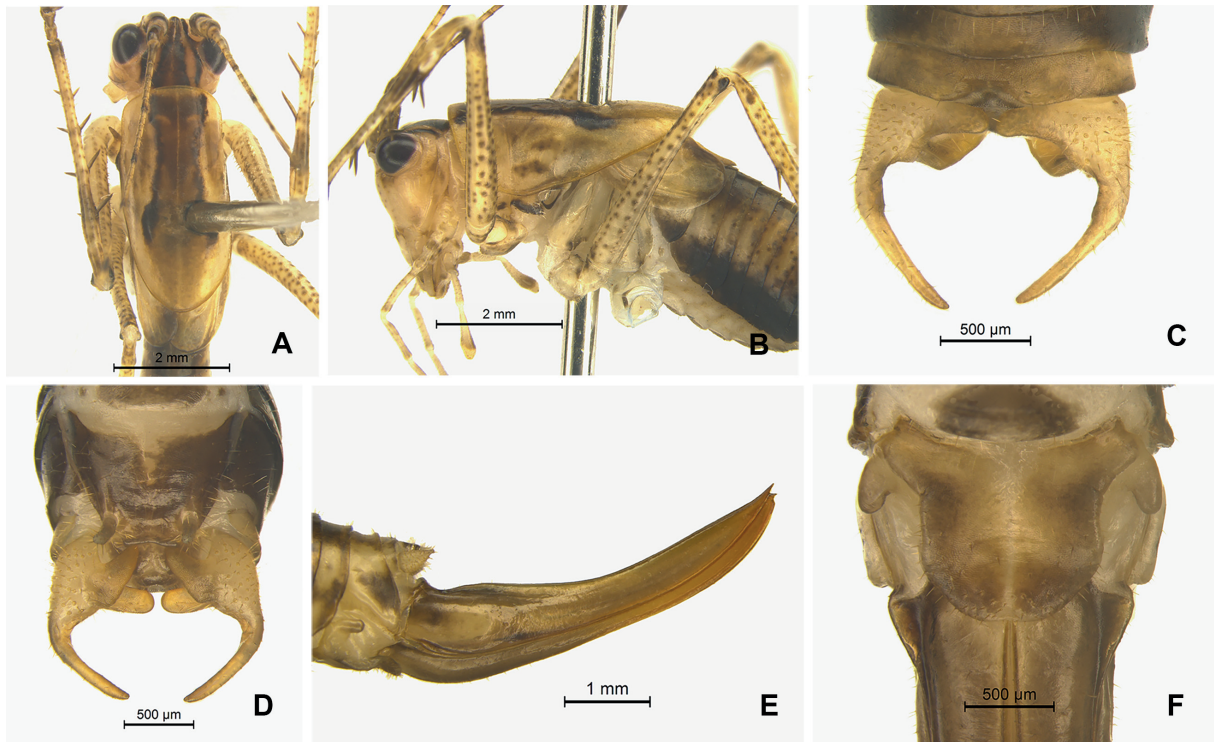


Fig. 6. *Phlugiopsis punctata* Wang, Li & Liu, 2012. **A–D.** ♂ (HBU). **A–B.** Head and pronotum. **A.** Dorsal view. **B.** Lateral view. **C–D.** Apex of abdomen. **C.** Dorsal view. **D.** Ventral view. **E–F.** ♀ (HBU). **E.** Ovipositor in lateral view. **F.** Subgenital plate in ventral view.

obtusely triangular; apical half of cercus spinous, obviously incurved, apex slightly acute (Fig. 6C–D). Subgenital plate longer than wide; basal margin with V-shaped membranous area, subapical area convex dorsally, posterior margin with two triangular processes in midline, tips rounded, curved ventrally. Styli conical, apices rounded, inserted on subapex of subgenital plate on ventral surface (Fig. 6D).

FEMALE ABDOMEN. Tenth abdominal tergite split in midline on posterior margin. Epiproct triangular, apex rounded. Cercus conic, apex acute. Ovipositor short, gently upcurved; dorsal valvula subequal to ventral one in length, dorsal valvula with apex acute, ventral valvula with apex hook-shaped (Fig. 6E). Subgenital plate tongue-shaped, basal area with conical process on lateral margins separately, apex rounded; basal margin feebly concave, near basal area concave on lateral margins, middle area slightly convex, posterior margin truncate (Fig. 6F).

MEASUREMENTS (mm). Body length: ♂: 6.6–7.3, ♀: 6.3–7.9; length of pronotum: ♂: 3.3–3.5, ♀: 3.4–3.6; length of tegmen: ♂: 1.2–1.7, ♀: 1.2–1.7; length of hind femur: ♂: 7.3–7.7, ♀: 8.4–9.2; length of ovipositor: 5.7–6.2.

Distribution

China (Yunnan).

Remark

After examining a few specimens collected from the type locality and adjacent areas, we discovered some deviations in the original description of *Phlugiolopsis punctata* Wang, Li & Liu, 2012; consequently, we redescribe the male of *Phlugiolopsis punctata* Wang, Li & Liu, 2012 and describe the female for the first time.

Phlugiolopsis pentagonis Bian, Shi & Chang, 2013
Figs 7, 15

Phlugiolopsis pentagonis Bian, Shi & Chang, 2013: 172.

Phlugiolopsis (Longiloba) pentagonis – Bian & Shi 2018: 348.

Material examined

Holotype

CHINA • ♀; Yunnan, Honghe, Jinping; 3 Sep. 2012; Xun Bian leg.; HBU.

Paratypes

CHINA • 2 ♀♀; same collection data as for holotype; HBU.

Other material

CHINA • 1 ♂, 2 ♀♀; Yunnan, Jinping, Maandi; 24 Aug. 2023; Mengjia Zheng leg.; HBU • 3 ♂♂, 3 ♀♀; Yunnan, Hekou, Daweishan; 23 Aug. 2022; Hao Xu and Qi Guo leg.; HBU • 2 ♀♀; Yunnan, Hekou, Yaoshan; 20 Aug. 2022; Hao Xu and Qi Guo leg.; HBU • 1 ♂; Yunnan, Pingbian, Daweishan; 8 Aug. 2021; Qi Guo leg.; HBU • 2 ♂♂, 1 ♀; Yunnan, Maguan, Gulinqing; 1 Nov. 2023; Xiangjin Liu leg.; HBU • 2 ♂♂, 7 ♀♀; same collection data as for preceding; 10 Nov. 2023; HBU • 1 ♂, 2 ♀♀; same collection data as for preceding; 17 Aug. 2019; Peng Cui leg.; HBU • 2 ♂♂, 1 ♀; same collection data as for preceding; 18 Aug. 2019; HBU • 7 ♂♂; same collection data as for preceding; 5 Aug. 2021; Qi Guo and Yanhao Duan leg.; HBU • 2 ♂♂; same collection data as for preceding; 4 Aug. 2021; Qi Guo leg.; HBU • 1 ♂; Yunnan, Wenshan, Bozhushan; 26 Jul. 2021; Yanhao Duan leg.; HBU.

Description

Descriptive notes of the male

Ninth abdominal tergite short; tenth abdominal tergite elongate backwards, feebly concave or with deeply notch on posterior margin in midline (Fig. 7D–F). Cercus obviously incurved, stout at base, narrowing towards tip; basal half expanded inwards on dorsal surface, its posterior area obtusely triangular; near base to middle area with rectangular expansion on ventral surface, apex truncate; apical half of cercus cylindrical, moderately incurved, tip acute (Fig. 7D–F). Subgenital plate broader than long, basal margin with V-shaped notch, posterior margin with two triangular projections, apices subacute; styli inserted ventrally just before apical area (Fig. 7C).

MEASUREMENTS (mm). Body length: ♂: 7.8–10.6, ♀: 9.3–10.2; length of pronotum: ♂: 4.7–4.9, ♀: 4.4–4.7; length of tegmen: ♂: 1.5–1.8, ♀: 1.6–1.9; length of hind femur: ♂: 9.5–10.4, ♀: 9.4–9.8; length of ovipositor: 5.3–5.6.

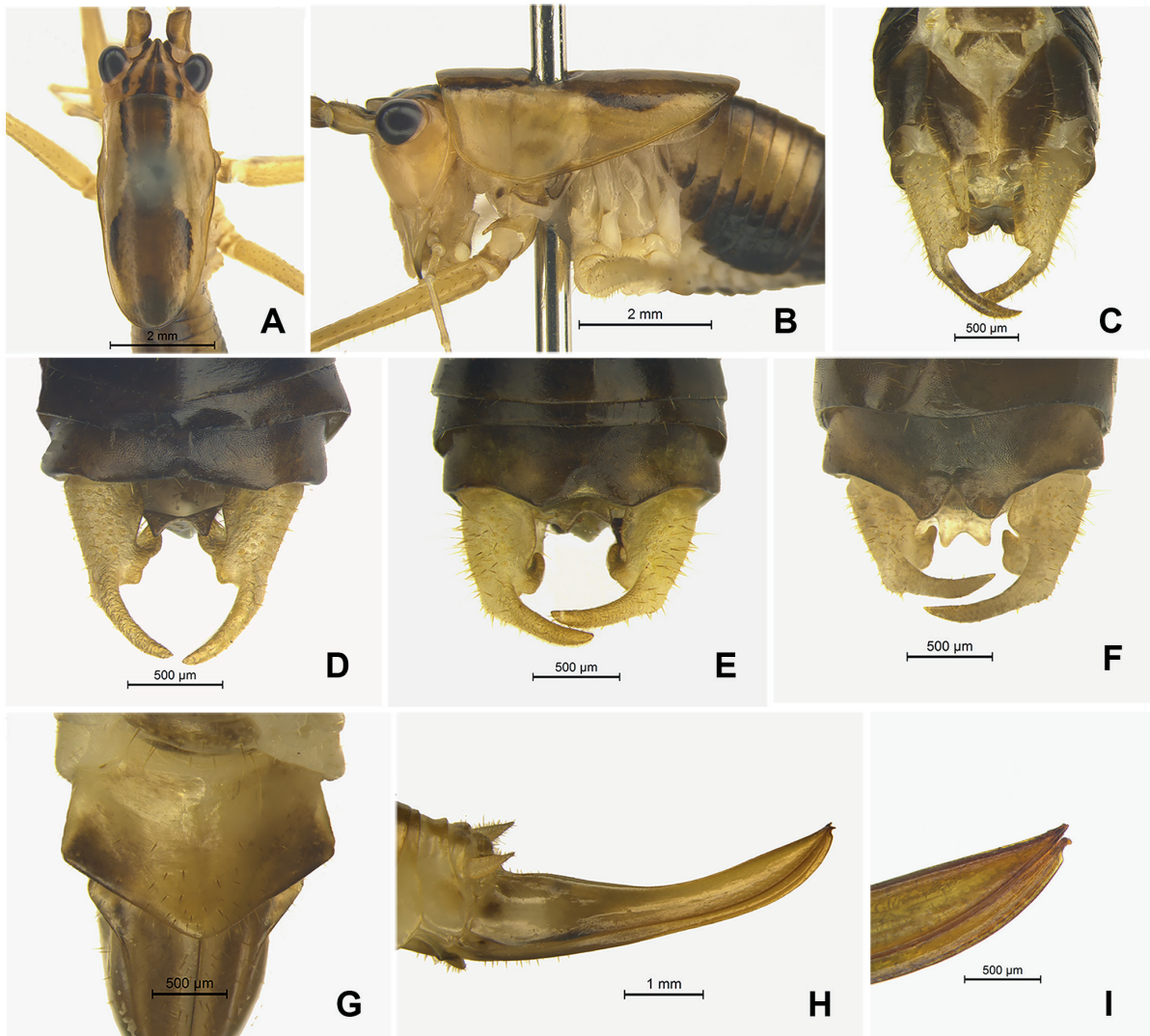


Fig. 7. *Phlugiolopsis pentagonis* Bian, Shi & Chang, 2013. A–F. ♂ (HBU). A–B. Head and pronotum. A. Dorsal view. B. Lateral view. C–F. Apex of abdomen. C. Ventral view. D–F. Dorsal view. G–I. ♀ (HBU). G. Subgenital plate in ventral view. H. Ovipositor in lateral view. I. Apex of ovipositor in lateral view.

Distribution

China (Yunnan).

Remark

By checking the type specimens and material collected from the type locality and adjacent localities, we found some differences in the morphology of the male tenth abdominal tergite among different geographic populations and describe the male of *Phlugiolopsis pentagonis* Bian, Shi & Chang, 2013 for the first time.

Phlugiolopsis complanispinis Bian, Shi & Chang, 2013

Figs 8, 15

Phlugiolopsis complanispinis Bian, Shi & Chang, 2013: 165.

Phlugiolopsis (Longiloba) complanispinis – Bian & Shi 2018: 346.

Material examined

CHINA • 13 ♂♂, 21 ♀♀; Yunnan, Yongshan, Xiaoyanfang; 19 Aug. 2020; Tao Wang and Qi Guo leg.; HBU • 1 ♀; same collection data as for preceding; 13 Aug. 2020; Tao Wang leg.; HBU.

Distribution

China (Yunnan).

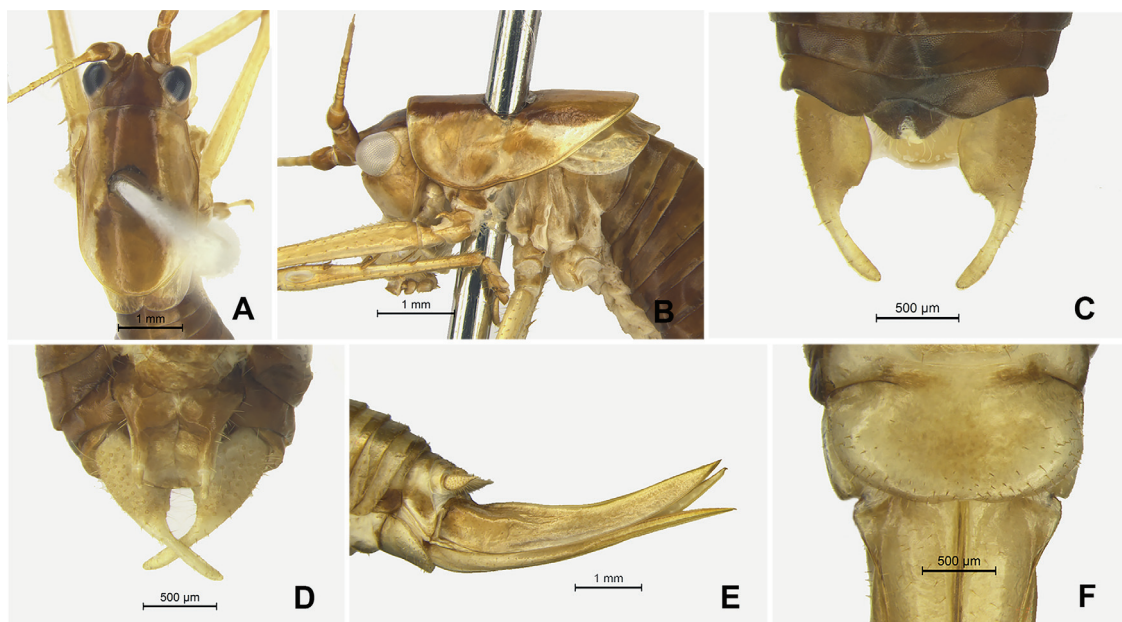


Fig. 8. *Phlugiolopsis complanispinis* Bian, Shi & Chang, 2013. **A–D.** ♂ (HBU). **A–B.** Head and pronotum. **A.** Dorsal view. **B.** Lateral view. **C–D.** Apex of abdomen. **C.** Dorsal view. **D.** Ventral view. **E–F.** ♀ (HBU). **E.** Ovipositor in lateral view. **F.** Subgenital plate in ventral view.

Phlugiolopsis damingshanis Bian, Shi & Chang, 2012

Figs 9, 15

Phlugiolopsis damingshanis Bian, Shi & Chang, 2012: 55.

Phlugiolopsis damingshanis – Shi, Bai, Zhang & Chang 2013: 596.

Phlugiolopsis (Omkoiana) damingshanis – Gorochov 2020: 347, 350.

Material examined

CHINA • 4 ♂♂, 3 ♀♀; Guangxi, Wuming, Damingshan; 21 Aug. 2023; Jianhua Huang leg.; HBU • 1 ♀; same collection data as for preceding; 19 Aug. 2019; Lidan Zhang leg.; HBU • 1 ♀; same collection data as for preceding; 20 Aug. 2019; Lixuan Chen leg.; HBU • 1 ♀; same collection data as for preceding; 21 Aug. 2019; Lidan Zhang leg.; HBU • 1 ♂, 1 ♀; Guangxi, Lingui, Anjiangping; 1 Aug. 2019; Lixuan Chen leg.; HBU.

Distribution

China (Guangxi).

Phlugiolopsis trullis Bian, Shi & Chang, 2012

Figs 10, 15

Phlugiolopsis trullis Bian, Shi & Chang, 2012: 15.

Phlugiolopsis (Omkoiana) trullis – Gorochov 2020: 347, 351.

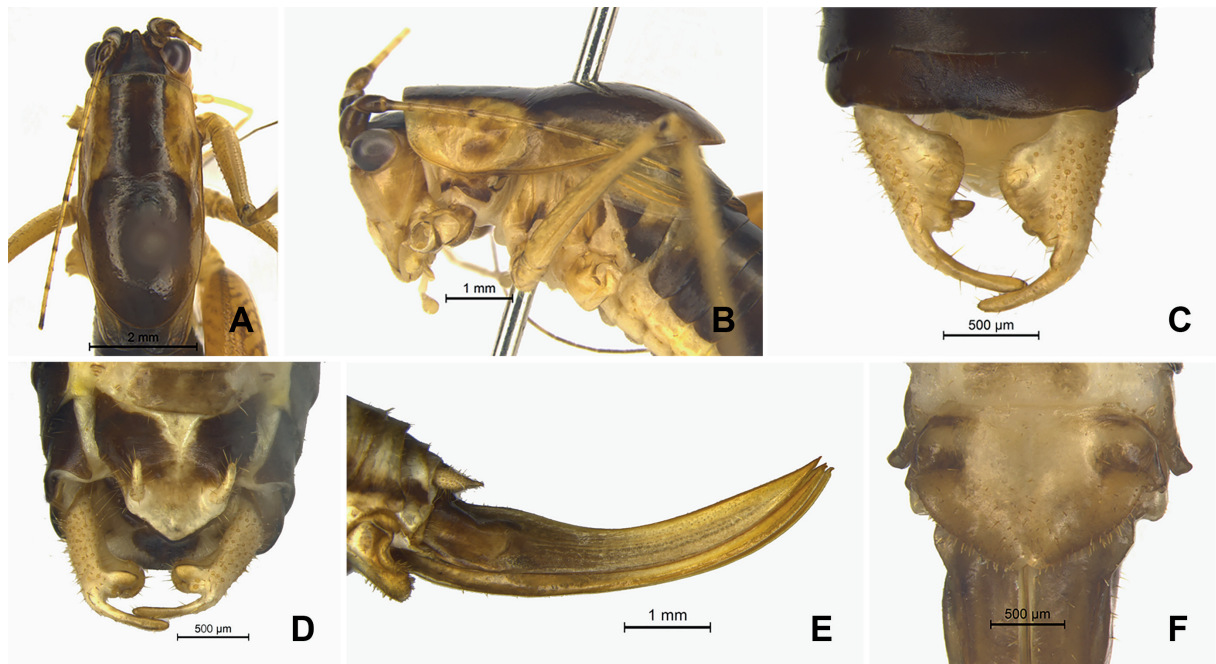


Fig. 9. *Phlugiolopsis damingshanis* Bian, Shi & Chang, 2012. **A–D.** ♂ (HBU). **A–B.** Head and pronotum. **A.** Dorsal view. **B.** Lateral view. **C–D.** Apex of abdomen. **C.** Dorsal view. **D.** Ventral view. **E–F.** ♀ (HBU). **E.** Ovipositor in lateral view. **F.** Subgenital plate in ventral view.

Material examined

CHINA • 1 ♂; Yunnan, Maguan, Xiaobazi; 6 Aug. 2022; Mengjia Zheng leg.; HBU • 1 ♂; same collection data as for preceding; 7 Aug. 2022; Hao Xu leg.; HBU • 6 ♂♂, 1 ♀; same collection data as for preceding; 20 Aug. 2019; Peng Cui leg.; HBU • 3 ♂♂, 1 ♀; same collection data as for preceding; 21 Aug. 2019; HBU.

Distribution

China (Yunnan).

Phlugiolopsis longiangulis Bian, Shi & Chang, 2013

Figs 11, 15

Phlugiolopsis longiangulis Bian, Shi & Chang, 2013: 170.

Phlugiolopsis (Omkoiana) longiangulis – Gorochov 2020: 347.

Material examined

CHINA • 5 ♂♂, 5 ♀♀; Yunnan, Jinping, Maandi; 22 Aug. 2023; Mengjia Zheng leg.; HBU • 7 ♂♂, 8 ♀♀; same collection data as for preceding; 23 Aug. 2023; Mengjia Zheng and Tianshuo Han leg.; HBU • 2 ♂♂, 1 ♀; same collection data as for preceding; 24 Aug. 2023; Mengjia Zheng leg.; HBU • 2 ♂♂, 8 ♀♀; same collection data as for preceding; 25 Aug. 2023; Tianshuo Han and Xiaolong Tong leg.; HBU • 3 ♂♂; same collection data as for preceding; 4 Aug. 2019; Peng Cui leg.; HBU • 1 ♂; same collection data as for preceding; 6 Aug. 2019; HBU.

Distribution

China (Yunnan).

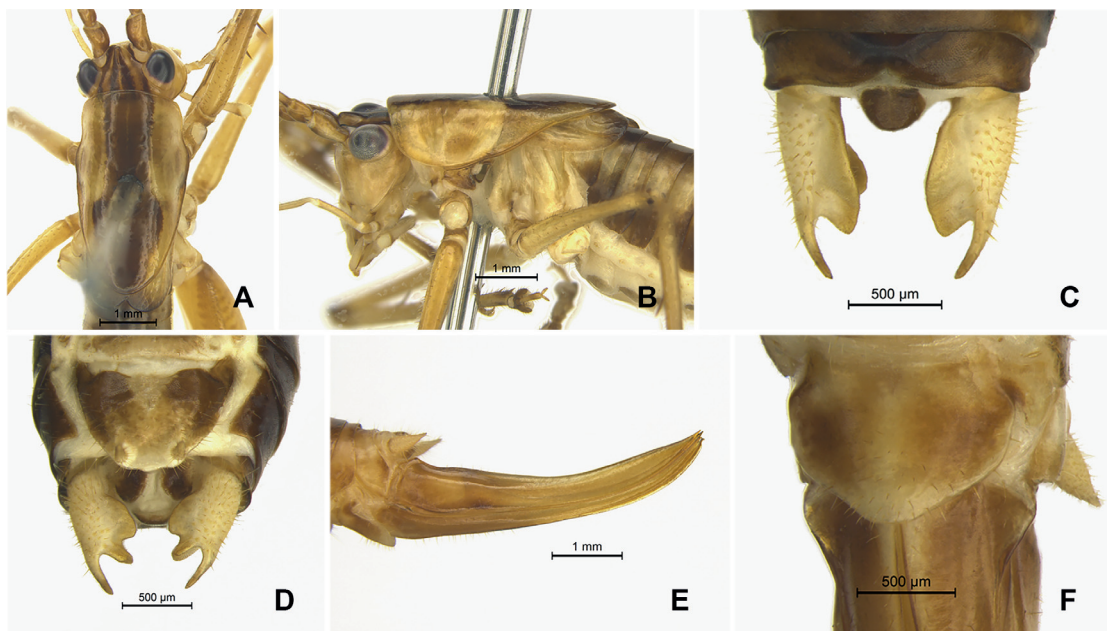


Fig. 10. *Phlugiolopsis trullis* Bian, Shi & Chang, 2012. A–D. ♂ (HBU). A–B. Head and pronotum. A. Dorsal view. B. Lateral view. C–D. Apex of abdomen. C. Dorsal view. D. Ventral view. E–F. ♀ (HBU). E. Ovipositor in lateral view. F. Subgenital plate in ventral view.

Phlugioloipsis brevis Xia & Liu, 1993

Figs 12, 15

Phlugioloipsis brevis Xia & Liu, 1993: 94, 110.

Phlugioloipsis brevis – Shi & Ou 2005: 359. — Bian, Shi & Chang 2012: 3. — Wang, Li & Liu 2012: 38. — Shi, Bai, Zhang & Chang 2013: 596. — Xiao, Mao, Wang & Huang 2016: 18.

Phlugioloipsis (Omkoiana) brevis – Gorochov 2020: 347, 350.

Material examined

CHINA – **Hunan Prov.** • 3 ♂♂, 2 ♀♀; Shuangpai, Yangmingshan; 2 Aug. 2023; Hao Xu and Chun Chen leg.; HBU. – **Hubei Prov.** • 2 ♂♂, 3 ♀♀; Baokang, Houping; 8 Aug. 2020; Guanglin Xie leg.; HBU. – **Sichuan Prov.** • 6 ♂♂, 6 ♀♀; Dayi, Xiling; 21 Sep. 2023; Jie Su and Yifan Liu leg.; HBU. – **Guizhou Prov.** • 2 ♂♂, 3 ♀♀; Leishan, Wudong; 4 Aug. 2023; Yueting Duan and Yang Wang leg.; HBU • 4 ♂♂, 2 ♀♀; Leishan, Leigongshan; 5 Aug. 2023; same collection data as for preceding; HBU • 1 ♂, 4 ♀♀; Leishan, Xiannvtang; 7 Aug. 2023; same collection data as for preceding; HBU • 1 ♂, 3 ♀♀; Leishan, Leigongshan; 8 Aug. 2023; same collection data as for preceding; HBU • 1 ♂, 1 ♀; Jiangkou, Yamugou; 17 Aug. 2023; Yueting Duan leg.; HBU • 2 ♂♂, 1 ♀; Daozhen, Dashahe; 17 Aug. 2023; Yanhao Duan leg.; HBU • 5 ♂♂, 13 ♀♀; Daozhen, Yangxi; 18 Aug. 2023; same collection data as for preceding; HBU • 25 ♂♂, 32 ♀♀; Daozhen, Yangxi; 19 Aug. 2023; same collection data as for preceding; HBU. – **Guangxi Zhuang Autonomous Region** • 2 ♂♂, 1 ♀; Wuming, Damingshan; 21 Aug. 2023; Jianhua Huang leg.; HBU • 2 ♂♂; Lingui, Anjiangping; 2 Aug. 2019; Lixuan Chen leg.; HBU • 2 ♂♂; Lingui, Anjiangping; 3 Aug. 2019; Lidan Zhang leg.; HBU • 5 ♂♂, 4 ♀♀; Rongshui, Yangmeiao; 8 Aug. 2019; Lixuan Chen and Lidan Zhang leg.; HBU • 1 ♂; same collection data as for preceding; 7 Aug. 2018; Qidi Zhu leg.; HBU • 1 ♂; same collection data as for preceding; 8 Aug. 2018; Lixuan Chen leg.; HBU • 1 ♂;

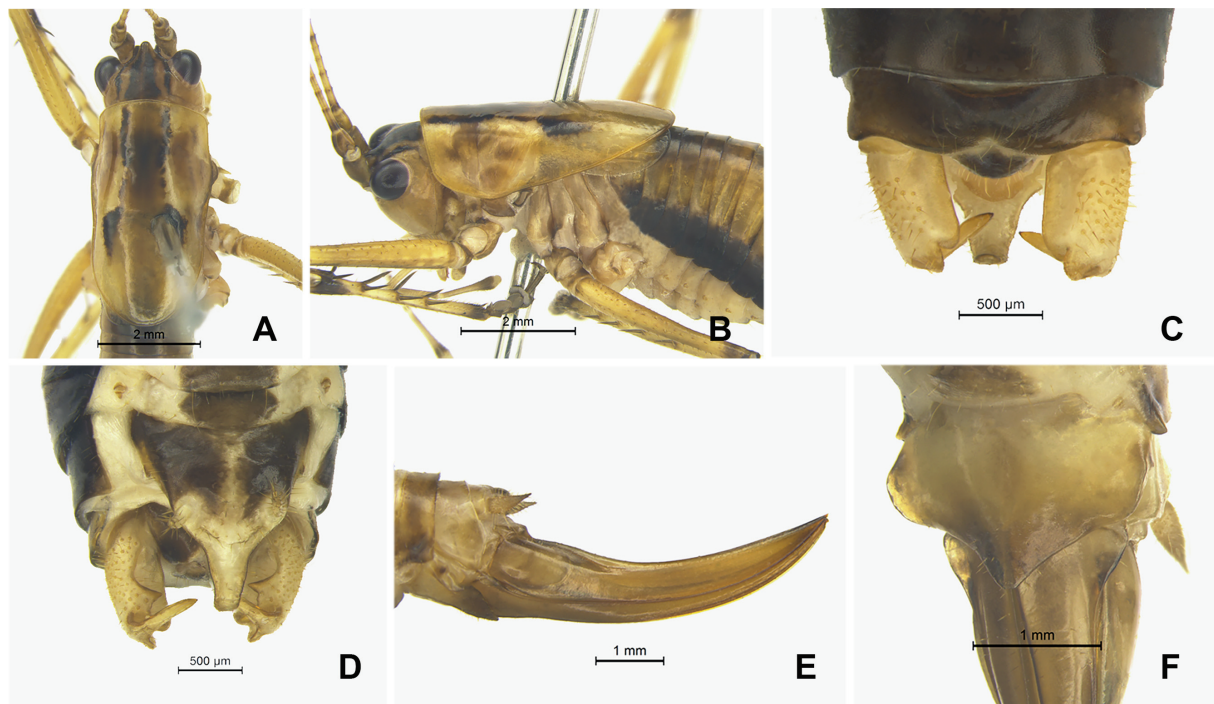


Fig. 11. *Phlugioloipsis longiangulis* Bian, Shi & Chang, 2013. **A–D.** ♂ (HBU). **A–B.** Head and pronotum. **A.** Dorsal view. **B.** Lateral view. **C–D.** Apex of abdomen. **C.** Dorsal view. **D.** Ventral view. **E–F.** ♀ (HBU). **E.** Ovipositor in lateral view. **F.** Subgenital plate in ventral view.

Rongshui, Yuanbaoshan; 20 Jul. 2023; Wenqing Lv leg.; HBU • 2 ♂♂, 1 ♀; same collection data as for preceding; 22 Jul. 2023; HBU • 1 ♂, 1 ♀; same collection data as for preceding; 23 Jul. 2023; HBU.

Distribution

China (Hubei, Hunan, Guangxi, Sichuan, Guizhou).

Remark

The *Phlugiolopsis brevis* Xia & Liu, 1993 has a relatively wide distribution in Southern China, and the morphology of the male subgenital plate has a slight intraspecific variation in different geographical populations, some may be feebly concave, others may be nearly truncate or even rounded.

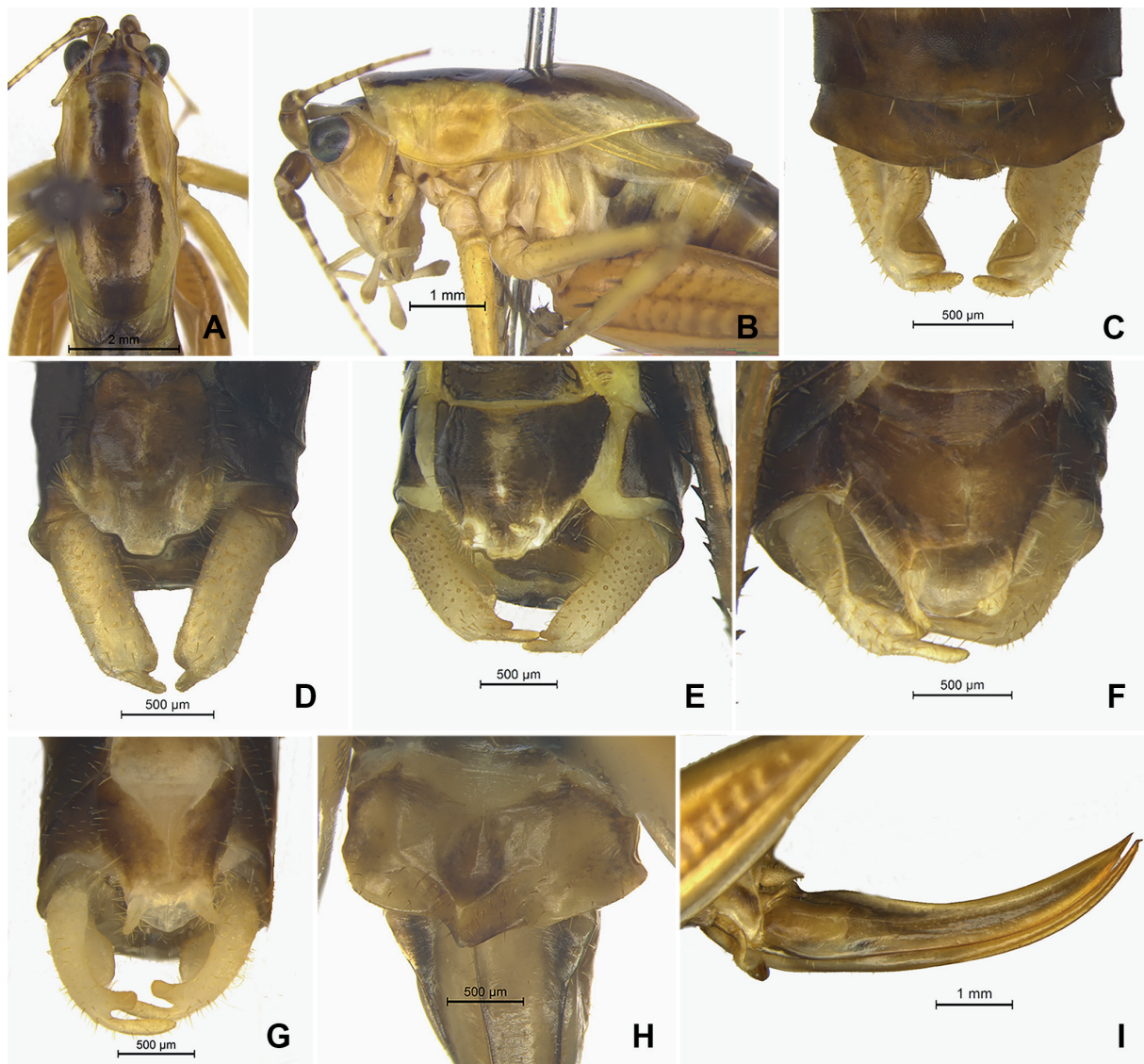


Fig. 12. *Phlugiolopsis brevis* Xia & Liu, 1993. A–G. ♂ (HBU). A–B. Head and pronotum. A. Dorsal view. B. Lateral view. C–G. Apex of abdomen. C. Dorsal view. D–G. Ventral view. H–I. ♀ (HBU). H. Subgenital plate in ventral view. I. Ovipositor in lateral view.

Phlugioloipsis montana Wang, Liu & Li, 2012

Figs 13, 15

Phlugioloipsis montana Wang, Li & Liu, 2012: 40.

Phlugioloipsis (Longiloba) montana – Bian & Shi 2018: 346.

Material examined

CHINA • 6 ♂♂, 10 ♀♀; Yunnan, Longyang, Mangkuan; 22 Sep. 2023; Yanhao Duan and Yonghui Li leg.; HBU • 7 ♂♂, 9 ♀♀; same collection data as for preceding; 23 Sep. 2023; HBU • 10 ♂♂, 12 ♀♀; same collection data as for preceding; 25 Sep. 2023; HBU • 15 ♂♂, 13 ♀♀; Yunnan, Baoshan, Baihualing; 14 Sep. 2019; Peng Cui leg.; HBU • 10 ♂♂, 8 ♀♀; same collection data as for preceding; 15 Sep. 2019; HBU • 2 ♂♂, 1 ♀; same collection data as for preceding; 16 Sep. 2019; HBU • 9 ♂♂, 8 ♀♀; same collection data as for preceding; 20 Sep. 2019; HBU.

Distribution

China (Yunnan).

Phlugioloipsis ventralis Wang, Li & Liu, 2012

Figs 14–15

Phlugioloipsis ventralis Wang, Li & Liu, 2012: 46.

Phlugioloipsis ventralis – Bian, Shi & Chang 2013: 176.

Phlugioloipsis (Omkoiana) ventralis – Gorochov 2020: 347.

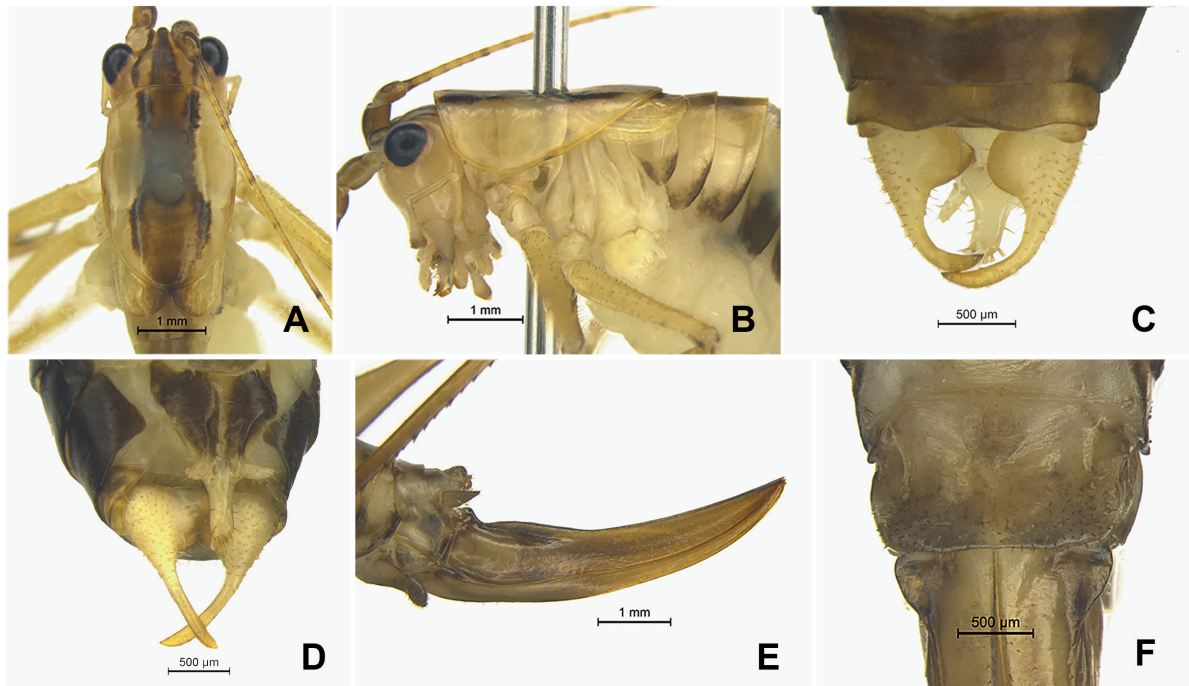


Fig. 13. *Phlugioloipsis montana* Wang, Liu & Li, 2012. A–D. ♂ (HBU). A–B. Head and pronotum. A. Dorsal view. B. Lateral view. C–D. Apex of abdomen. C. Dorsal view. D. Ventral view. E–F. ♀ (HBU). E. Ovipositor in lateral view. F. Subgenital plate in ventral view.

Material examined

CHINA • 17 ♂♂, 19 ♀♀; Yunnan, Kunming, Xishan; 8 Sep. 2020; Peng Cui leg.; HBU • 1 ♂; Yunnan, Kunming, Xishan; 23 Aug. 2016; Xun Bian leg.; HBU.

Distribution

China (Yunnan).

Discussion

The genus *Phlugiolopsis* is brachypterous, which, along other factors of limited dispersal ability, led to a distribution of restricted small ranges; they are mainly distributed in southern and southwestern of China (Tinkham 1943, 1944; Xia & Liu 1993; Bian *et al.* 2012a, 2012b; Bian & Shi 2018; Zheng *et al.* 2023b). Studying the formation of their distribution pattern and the relationship between them is very meaningful.

There are some questions that still affect the species taxonomy. First, on account of only type specimens available for several species, without morphological photographs and line drawings with large error, may lead to the difficulty of identifying specimens with similar characteristics. Second, a few species were reported merely on the basis of a single specimen or single sex specimen, making it challenging to determine intraspecific variation in *Phlugiolopsis*. Third, by reason of morphological differences between sympatrically distributed species, they are indistinctive and some species have intraspecific variation (Fig. 15), which will make it hard to distinguish them. Some slight intraspecific variation in *Phlugiolopsis* can be observed after the material examination from different geographic populations (Figs 7, 12), so the discovery of further material appears crucial.

As for the ideal material in studying biogeographical, *Phlugiolopsis* may play an important role in determining the current geographic distribution. Nonetheless, no biogeography research of *Phlugiolopsis*

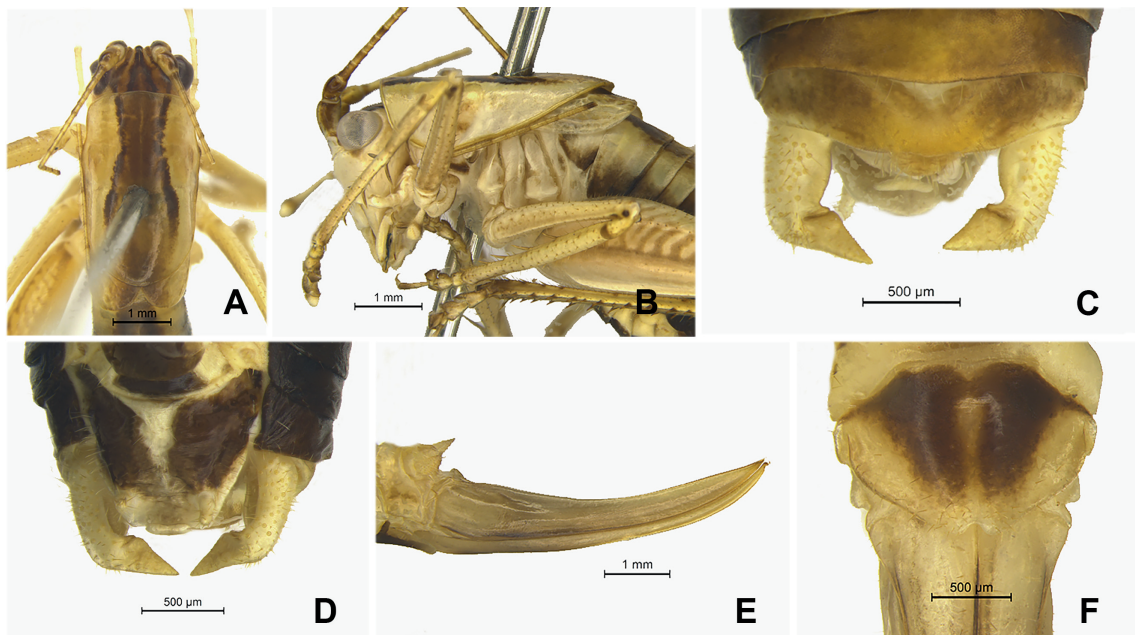


Fig. 14. *Phlugiolopsis ventralis* Wang, Li & Liu, 2012. A–D. ♂ (HBU). A–B. Head and pronotum. A. Dorsal view. B. Lateral view. C–D. Apex of abdomen. C. Dorsal view. D. Ventral view. E–F. ♀ (HBU). E. Ovipositor in lateral view. F. Subgenital plate in ventral view.

has yet been attempted in China. Looking forward to following up with a new study to address these questions in order to probe for the causes of the current distribution pattern of the species.

Acknowledgments

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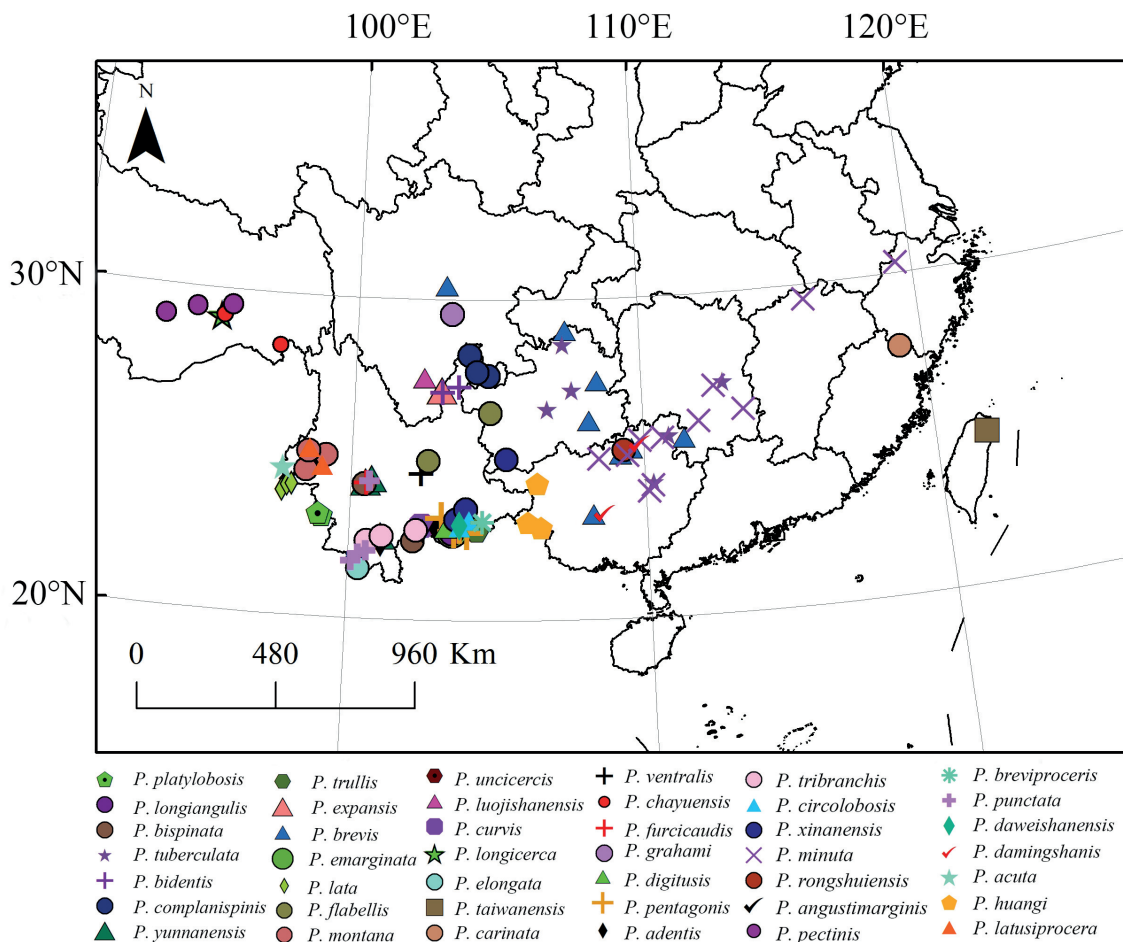


Fig. 15. Distribution of the genus *Phlugioloopsis* Zeuner, 1940 in China.

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