

Two new species of the tribe Meconematini (Orthoptera: Tettigoniidae: Meconematinae) from China and male song characters of *Pseudocosmetura yaoluopingensis* sp. nov.

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Academic editor: Ming Kai Tan | Received 3 January 2020 | Accepted 29 March 2020 | Published 14 September 2020

<http://zoobank.org/2F722CE3-E12E-4B32-B3E2-AA813289FEC7>

Citation: Wang T, Shi F (2020) Two new species of the tribe Meconematini (Orthoptera: Tettigoniidae: Meconematinae) from China and male song characters of *Pseudocosmetura yaoluopingensis* sp. nov. Journal of Orthoptera Research 29(2): 115–120. <https://doi.org/10.3897/jor.29.49821>

Abstract

This paper describes two new species of the tribe Meconematini from China, *Acosmetura longielata* sp. nov. and *Pseudocosmetura yaoluopingensis* sp. nov. Data on the male song characters of *Pseudocosmetura yaoluopingensis* sp. nov. are also provided. The type specimens of all new species are preserved in the Museum of Hebei University.

Keywords

Acosmetura, calling song, morphology, taxonomic images, type specimens

Introduction

Up to now, 19 brachypterou genera of Meconematini have been recorded from China, 13 of which are endemic to China (Cigliano et al. 2020). While examining the specimens collected from Anhui and Hunan provinces of China, we discovered two new species and analyzed the male calling songs of *Pseudocosmetura yaoluopingensis* sp. nov.

Liu (2000) established *Acosmetura* Liu, 2000 with *Acosmetura brevicerca* Liu, 2000 as the type species. Wang et al. (2018) summarized the taxonomic history of the genus and described one new species *Acosmetura longitubera* Wang, Shi & Wang, 2018. At the same time, they provided a supplementary description and morphological photographs of *Acosmetura emeica* Liu & Zhou, 2007. To date, the genus contains 11 species, all endemic to China (Liu 2000, Liu and Zhou 2007, Liu et al. 2008, Bian et al. 2014, Bian and Shi 2015, Wang et al. 2016, 2018).

The genus *Pseudocosmetura* was proposed by Liu et al. (2010) with type species *Pseudocosmetura fengyangshanensis* Liu, Zhou & Bi, 2010. The authors transferred *Tettigoniopsis anjiensis* Shi & Zheng, 1998 and *Acosmetura multicolora* Shi & Du, 2006 into this genus. Subsequently, Shi and Bian (2012) revised this genus, made a key to the known species, and described two new species: *Pseudocosmetura nanlingensis* Shi & Bian, 2012 and *Pseudocosmetura curva* Shi & Bian, 2012. Then Shi and Zhao (2018) reported a new species of this genus from Sichuan: *Pseudocosmetura wanglangensis* Shi & Zhao, 2018. They also thought *Thaumaspsis henanensis* Liu & Wang,

1998 may belong to this genus. At this point, this genus includes six species, all of which are endemic to China (Liu et al. 2010, Shi and Bian 2012, Shi and Zhao 2018).

As for acoustic studies of Meconematini from China, only Wang et al. (2020a, b) have analyzed the male calling of the genus *Sinocyrtaspis* Liu, 2000, which are all relatively similar. The Meconematini species richness of China is very high, but acoustics studies are rare and need to be strengthened.

This paper reports two new species—*Acosmetura longielata* sp. nov. and *Pseudocosmetura yaoluopingensis* sp. nov.—and their morphological characters are illustrated. All type specimens examined are preserved in the Museum of Hebei University (MHU).

Methods

Specimens were examined with a Nikon-SMZ-1500 stereomicroscope. Morphological images were acquired using a Leica M205A digital imaging system. The following conventions were adopted for the specimen measurements: body length: distance from apex of fastigium verticis to posterior margin of tenth abdominal tergite; pronotum length: distance from anterior to posterior margins of pronotum; hind femur length: distance from base of hind femur to apex of genicular lobes; ovipositor length: distance from base of subgenital plate to apex of ovipositor.

The calling songs of *Pseudocosmetura yaoluopingensis* sp. nov. were recorded in the field using a Pettersson D1000X with a sampling rate at 192 kHz. The materials are as follows: *P. yaoluopingensis* sp. nov., three males, 18–19 September 2019, collected by Tao Wang and Yanqing Li. In total, 90 recordings were recorded and analyzed. Sound measurements and power spectra were obtained using Audacity. Spectral analysis was taken from each syllable using the mean of 512 points in a Fast Fourier Transformation weighted with a Hanning window. Oscillogram of the song was acquired using Matlab R2018a. The recordings of *P. yaoluopingensis* sp. nov. were recorded at 21 °C. The insects were placed in a nylon cage with a microphone at distances between 10 to 15 cm.

Song terminology.—Echeme: a first-order assemblage of syllables; echeme duration: time period measured from the first syllable to

the last; echeme interval: time period measured from two neighboring echemes; syllable: sound produced during one cycle of tegmina movements; syllable period: time period measured from the start of one syllable to the next (reciprocal value: syllable repetition rate); impulse: a simple, undivided, transient train of sound waves.

Results

Genus *Acosmetura* Liu, 2000

Type species.—*Acosmetura brevicerca* Liu, 2000

Diagnosis.—The genus is characterized by the male tenth abdominal tergite with a shallow concavity on posterior margin; subgenital plate longer than wide; genitalia sclerotized, exposed, not surpassing the posterior margin of subgenital plate. Margins of ovipositor smooth or with small teeth.

Acosmetura longielata sp. nov.

<http://zoobank.org/F0BA88EA-71FD-494A-B61B-B3E4B93D2980>

Fig. 1

Type specimens.—**Holotype**: CHINA • ♂, Guangdong, Ruyuan, Nanling, 15.VI.2019, leg. Tao Wang, MHU. **Paratypes**: CHINA • 2♂2♀, Guangdong, Ruyuan, Nanling, 15.VI.2019, leg. Tao Wang, MHU.

Description.—**Male**. Body small. Fastigium verticis conical, narrower than antennal scape, blunt apically and grooved dorsally. Eyes faintly globular, obviously protruding forward and outward. Apical segment of maxillary palpus longer than subapical one; apex slightly swollen, truncate.

Pronotum long, distinctly prolonged posteriorly, reaching middle part of seventh abdominal tergite; anterior margin straight while posterior margin obtusely rounded (Fig. 1A), metazona rather strikingly elevated (Fig. 1B); lateral lobe longer than deep, metazona conspicuously extended ventrally, posterior margin without humeral sinus (Fig. 1B).

Tegmina short, completely covered by pronotum, overlapping, invisible in lateral view; hind wings absent.

All femora unarmed ventrally, genicular lobes with apices obtuse. Fore coxae with 1 short spine; tibiae with 5 spines respectively on both sides of ventral surface, tibial tympana open on both sides, ovoid. Middle tibiae with 5 inner and 6 outer spines on ventral surface. Hind tibiae with 2–3 spines on both sides of ventral surface as well as 22–26 spines on both sides of dorsal surface, bearing two pairs of ventral apical spurs and one pair of dorsal apical spurs.

Lateral margins of ninth abdominal tergite slightly prolonged posteriorly (Fig. 1C) and posterior margin of tenth abdominal tergite with a U-shaped concavity in the middle (Fig. 1G); epiproct triangular, apical area blunt, fused with tenth abdominal tergite. Cerci cylindrical, basal areas somewhat robust, tapering apically; subapical areas significantly bent dorsad, apical areas with a small spine (Fig. 1G–J). Genitalia sclerotized, not surpassing posterior margin of subgenital plate, apical area flat, tongue-shaped (Fig. 1I). Subgenital plate faintly trapezoidal, basal half slightly broad, with a triangular concavity at base, apical area with a V-shaped concavity; styli stout and short, inserted on apical areas of lateral lobes of subgenital plate (Fig. 1H).

Female. Pronotum slightly shorter than male, posterior margin reaching middle part of second abdominal tergite; anterior margin somewhat straight while posterior margin obtusely rounded (Fig. 1D); lateral lobe longer than deep, metazona gradually narrowing

(Fig. 1E). Lateral margins and posterior margin of eighth abdominal tergite feebly expanded posteriorly (Fig. 1L). Tenth abdominal tergite a bit short, with a triangular concavity in the middle on posterior margin (Fig. 1K); epiproct peltate, blunt apically. Cerci conical, apical areas subacute. Subgenital plate nearly trapezoidal, basal area broad, lateral margins and apical area somewhat expanded dorsad while posterior margin straight; approximate lateral margins with a V-shaped carina (Fig. 1F). Ovipositor robust, apical half bent dorsad; dorsal and ventral margins smooth (Fig. 1L).

Coloration.—Body yellowish green, green when alive. Eyes brown. Disc of pronotum with 1 broad longitudinal light brown stripe, of which lateral margins black-brown, outer margins of stripe with 1 longitudinal yellowish white stripe, not reaching posterior margin of pronotum (Fig. 1A, D). Dorsal surface of abdomen with 1 longitudinal black brown stripe in the midline. Posterior margin of male genitalia black-brown (Fig. 1I). Ovipositor light brown. Apices of all third segment of tarsi and claws blackish-brown and spines of hind tibiae black.

Measurements (mm).—Body: ♂ 10.2–11.6, ♀ 11.4–12.9; pronotum: ♂ 7.5–8.6, ♀ 5.8–6.3; hind femora: ♂ 10.1–11.3, ♀ 11.8–13.0; ovipositor: 7.7–8.2.

Specimens examined.—CHINA • 1♀, Guangdong, Ruyuan, Nanling, 11.VI.2019, leg. Tao Wang, MHU • 1♀, Guangdong, Ruyuan, Nanling, 13.VI.2019, leg. Tao Wang, MHU • 1♂, Guangdong, Ruyuan, Nanling, 15.VI.2019, leg. Tao Wang, MHU • 1♀, Hunan, Yizhang, Mangshan, 31.VII.2019, leg. Yarui Xin, MHU.

Distribution.—China (Guangdong, Hunan).

Discussion.—According to the caudal morphological characters of the male, this new species belongs to the genus *Acosmetura*. The differences between this new species and the known species of the genus *Acosmetura* are as follows: pronotum long, distinctly prolonged posteriorly, metazona rather strikingly elevated; female subgenital plate nearly trapezoidal, lateral margins and posterior margin somewhat expanded dorsad while posterior margin straight, approaching lateral margins with a V-shaped carina.

Etymology.—The name of this new species is derived from the male pronotum that is long and the metazona that is strongly elevated. In Latin, “long-” means long and “elat-” means elevated.

Genus *Pseudocosmetura* Liu, Zhou & Bi, 2010

Type species.—*Pseudocosmetura fengyangshanensis* Liu, Zhou & Bi, 2010

Diagnosis.—The genus is characterized by the male tenth abdominal tergite normal, epiproct distinct or absent; cerci long; genitalia sclerotized, somewhat short. Ovipositor stout, moderately bent dorsad.

Pseudocosmetura yaoluopingensis sp. nov.

<http://zoobank.org/91D8B281-F536-4DEA-937C-17135734BB47>

Figs 2–4

Type specimens.—**Holotype**: CHINA • ♂, Anhui, Yuexi, Yaoluoping, 19.IX.2019, leg. Tao Wang, MHU. **Paratypes**: CHINA • 1♂, Anhui, Yuexi, Yaoluoping, 19.IX.2019, leg. Tao Wang, MHU • 1♀, Anhui, Yuexi, Yaoluoping, 18.IX.2019, leg. Yanqing Li, MHU.

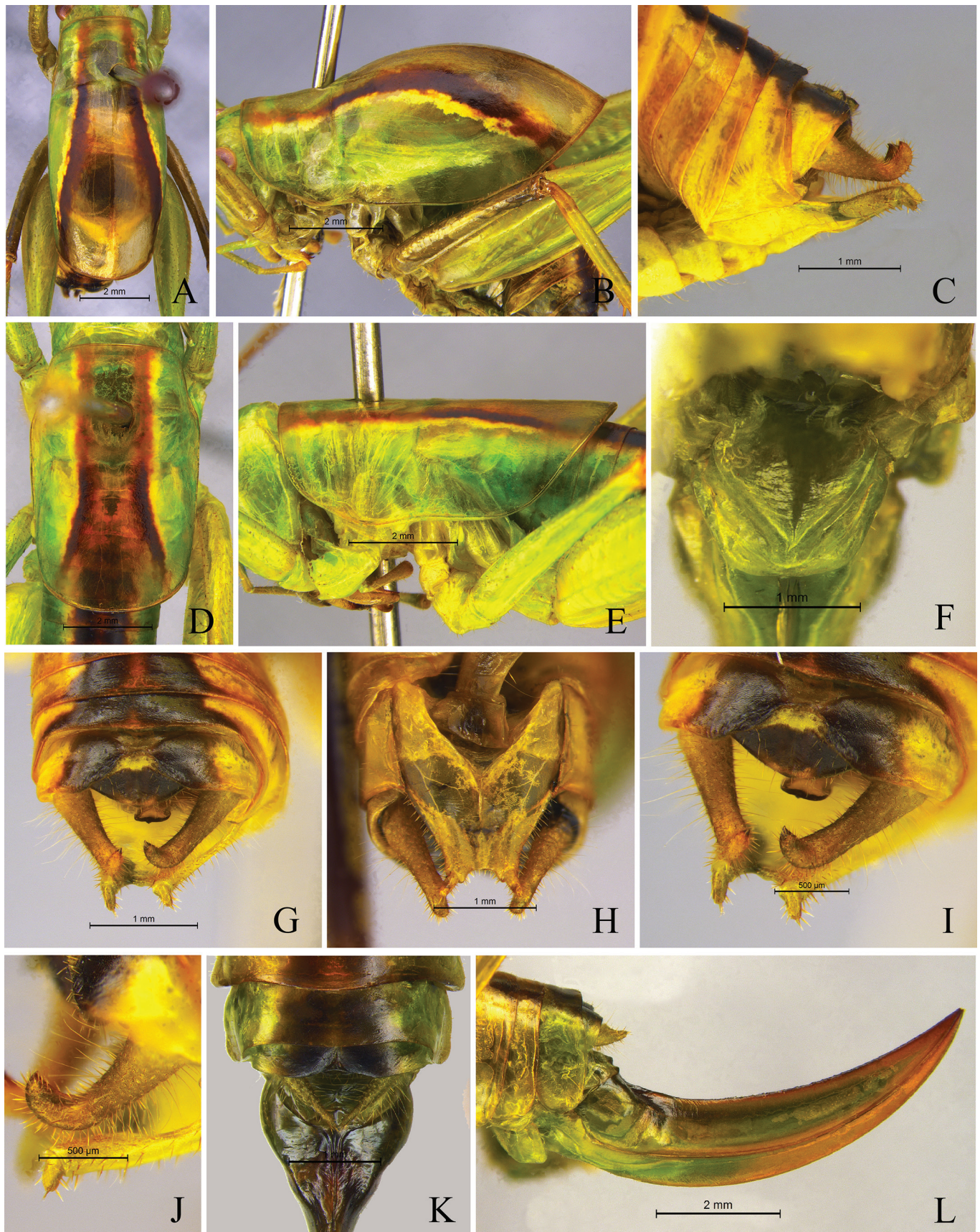


Fig. 1. *Acosmetura longielata* sp. nov.: A–B, D–E. Pronotum: A, D. Dorsal view; B, E. Lateral view; C, G, I, K–L. Apex of abdomen: C, L. Lateral view; G, K. Dorsal view; I. Latero-dorsal view; F, H. Subgenital plate in ventral view; J. Right cercus in lateral view. A–C, G–J. Male; D–F, K–L. Female. Scale bars: 2 mm (A–B, D–E, L); 1 mm (C, F–H, K); 500 µm (I–J).

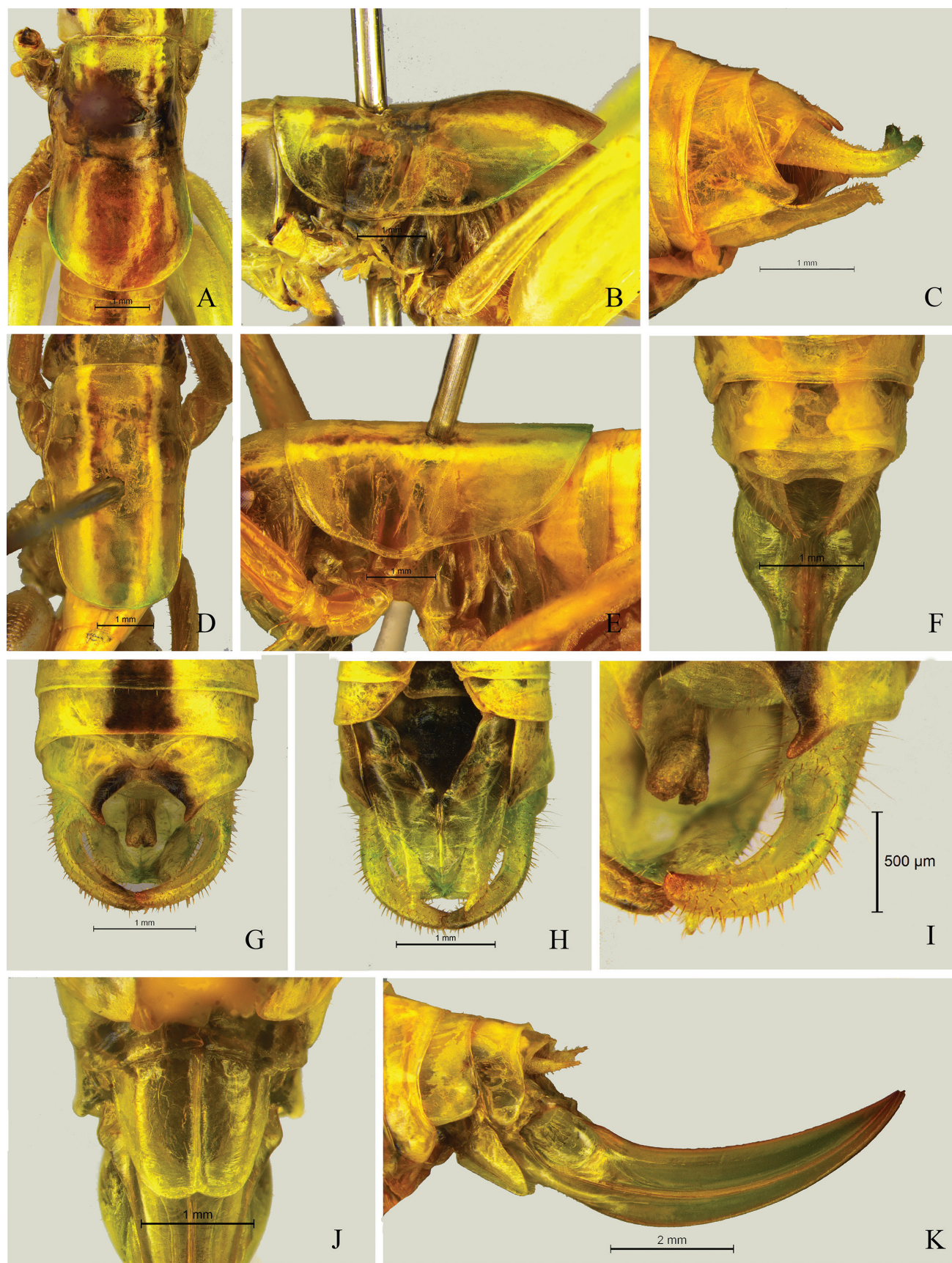


Fig. 2. *Pseudocosmetura yaoluopingensis* sp. nov.: A–B, D–E. Pronotum: A, D. Dorsal view; B, E. Lateral view; C, F, G, K. Apex of abdomen: C, K. Lateral view; F–G. Dorsal view; H, J. Subgenital plate in ventral view; I. Right cercus in latero-dorsal view; A–C, G–I. Male; D–F, J–K. Female. Scale bars: 2 mm (K); 1 mm (A–H, J); 500 µm (I).

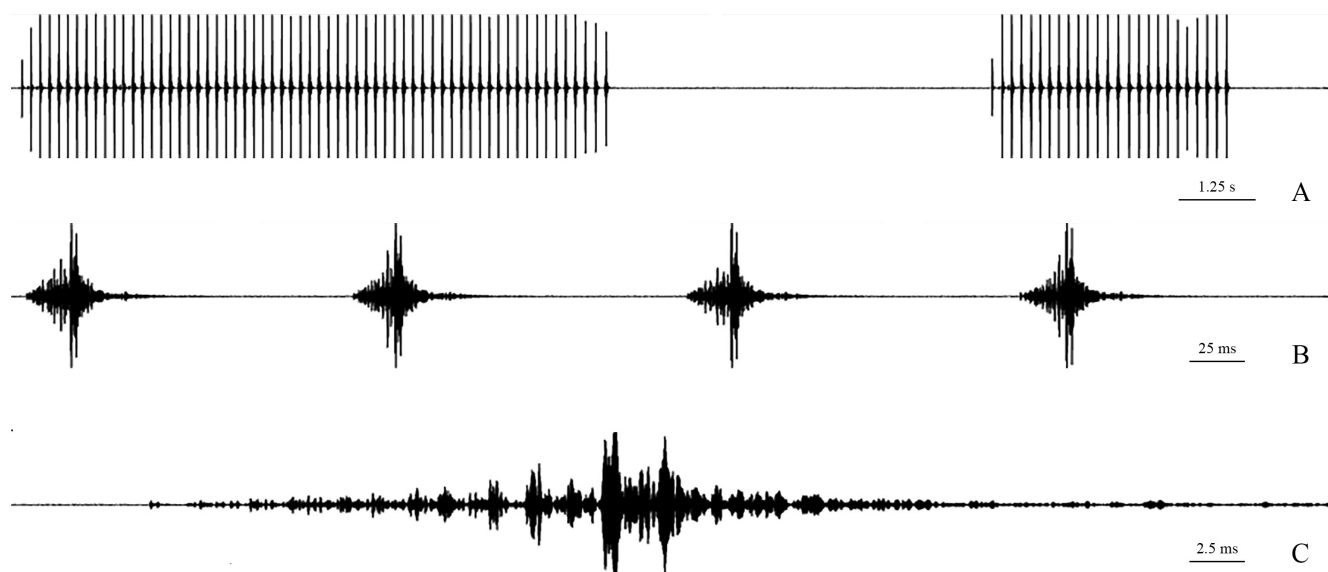


Fig. 3. Oscillograms at different scales of the male calling song of *P. yaoluopingensis* sp. nov. A. Two echemes; B. Four syllables; C. Syllable. Scale bars: 1.25 s (A); 25 ms (B); 2.5 ms (C).

Description.—**Male.** Body small, somewhat robust. Fastigium verticis conical, apex obtusely rounded with a longitudinal sulcus on dorsal surface. Eyes approximatively globular and distinctly protruding forward and outward. Apical segment of maxillary palpus longer than subapical one, slightly swollen apically, truncate.

Pronotum feebly long, reaching middle part of second abdominal tergite; anterior margin straight while posterior margin arch-shaped (Fig. 2A), metazona slightly raised (Fig. 2B); lateral lobe longer than deep, posterior margin slightly expanded ventrally, without humeral sinus (Fig. 2B).

Tegmina short, covered by pronotum, visible in lateral view; hind wings absent.

All femora unarmed ventrally, genicular lobes with apices obtuse. Fore coxae with 1 small spine; fore tibiae with 5 spines respectively on inner and outer sides of ventral surface, tympanal organs open on both sides, ovoid. Middle tibiae with 4 inner and 5 outer spines on ventral surface. Hind tibiae with 21–24 spines separately on both sides of dorsal surface, bearing one pair of ventral apical spurs and one pair of dorsal apical spurs.

Lateral margins of ninth abdominal tergite strongly prolonged posteriorly (Fig. 2C), terminals obtusely rounded and bent inward. Tenth abdominal tergite expanded posteriorly, with a U-shaped concavity in the middle, lateral lobes conical, bent inward and backward, terminals somewhat blunt (Fig. 2G, I). Epiproct fused with tenth abdominal tergite, peltate. Cerci markedly bent inward, inner margins of 2/3 apical area concave, grooved (Fig. 2I); apical areas with a small odontoid. Genitalia sclerotized, exposed, surpassing posterior margin of tenth abdominal tergite, basal area robust, apical area slim, split in the middle (Fig. 2G, I). Subgenital plate nearly trapezoidal, broad at base, with a triangular concavity in the middle; midline with longitudinal carinae, posterior margin truncate; styli stout and short, inserted on apico-lateral margins of subgenital plate (Fig. 2H).

Female. Pronotum slightly shorter than male, reaching posterior margin of first abdominal tergite, metazona not raised (Fig. 2D, E); metazona of lateral lobe gradually tapering (Fig. 2E). Lateral margins of eighth and ninth abdominal tergum feebly prolonged posteriorly (Fig. 2K). Tenth abdominal tergite short and broad, center of posterior margin concave, lateral angles somewhat blunt (Fig. 2F). Epiproct slightly small, triangular, blunt apically. Cerci

conical, apical areas subacute. Subgenital plate trapezoidal, longer than wide, median carinae distinct, posterior margin slightly concave in the middle (Fig. 2J). Ovipositor stout, robust at base, apical half bent dorsad, apical area subacute; dorsal and ventral margins smooth (Fig. 2K).

Coloration.—Body yellowish green, green when alive. Eyes brown. Disc of pronotum with 1 longitudinal light brown stripe, of which lateral margins black brown, outer margins of stripe with yellowish white longitudinal stripe severally (Fig. 2A, D). Dorsal surface of abdomen with 1 longitudinal black brown stripe in the midline. Apical areas of male cerci light brown. Apices of all third segment of tarsi and claws black brown.

Measurements (mm).—Body: ♂ 9.2–10.8, ♀ 10.3–12.5; pronotum: ♂ 4.3–4.7, ♀ 3.6–4.4; hind femora: ♂ 8.6–9.5, ♀ 9.5–10.7; ovipositor: 6.6–7.8.

Specimens examined.—CHINA • 1♂, Anhui, Yuexi, Yaoluoping, 18.IX.2019, leg. Yanqing Li, MHU • 2♀, Anhui, Yuexi, Yaoluoping, 18.IX.2019, leg. Tao Wang, MHU.

Acoustics.—The male calling song of this species is performed only at night and is inaudible to humans. Both echeme duration (3–35 s) and echeme interval (1.6–8.5 s) are irregular (Fig. 3). The echeme consists of more than ten syllables, the amplitude of syllables in the beginning part is small, then gradually increasing. The syllable period is 156 ± 7 ms ($n = 600$) and the syllable repetition rate is 6.41 Hz. A single syllable consists of more than ten impulses, the amplitude of which gradually increases and then decreases (Fig. 3). The calling song has a large proportion in the ultrasonic range (Fig. 4), and the peak frequency is 33.386 ± 1.71 kHz ($n = 600$).

Distribution.—China (Anhui).

Discussion.—This new species resembles *Pseudocosmetura anjiensis* (Shi & Zheng, 1998), but differs in the following: male tenth abdominal tergite expanded posteriorly, with a U-shaped concavity in the middle, lateral lobes conical, bent inward and backward,

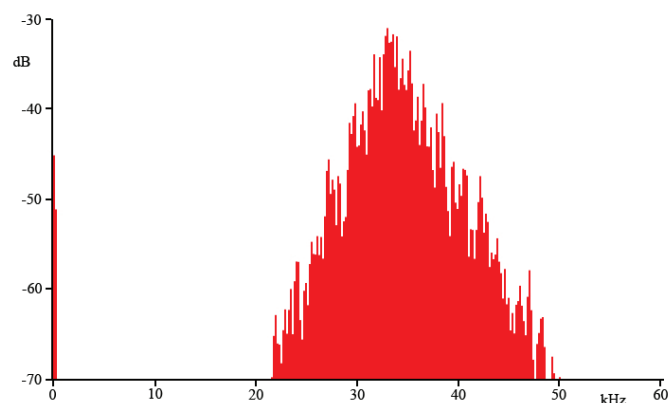


Fig. 4. Spectrum of male calling song of *P. yaoluopingensis* sp. nov. (Hanning window, 512 points).

terminals somewhat blunt; female tenth abdominal tergite short and broad, center of posterior margin concave, lateral angles somewhat blunt; subgenital plate trapezoidal, longer than wide.

Etymology.—The name of the new species is derived from the type locality, Yaoluoping.

Acknowledgements

We are grateful to the collectors for specimens. We thank the Yaoluoping National Nature Reserve for permitting research. This project is supported by the National Natural Science Foundation of China (No. 31372232, 31672259, 31872268), Post-graduate's Innovation Fund Project of Hebei University (hbu2019ss024), and the support of the Orthopterists' Society.

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