

A review of the *Caryanda tamdaoensis* species-group (Orthoptera: Acrididae), with description of a new species from Yunnan, China



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
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Abstract

The species composition of the *Caryanda tamdaoensis* species-group (Acrididae: Caryandinae: *Caryanda* Stål, 1878) is discussed. A new species, *Caryanda hongheensis* Mao, Yin & Song, **sp. nov.**, is described and illustrated from China. A new synonymy is proposed: *Caryanda tamdaoensis* Storozhenko, 1992 = *Caryanda aurata* Mao, Ren & Ou, 2007, **syn. nov.** The name of the *Caryanda aurata* species-group is accordingly replaced by the *Caryanda tamdaoensis* species-group. *Caryanda azurea* Gorochov & Storozhenko, 1994 is divided into two subspecies: *Caryanda azurea azurea* **stat. nov.** from Vietnam and *Caryanda azurea colourfula* Mao, Ren & Ou, 2011, **stat. nov.** from China. A key to the species and two subspecies of this species group is given. All species are illustrated.

Key words: grasshoppers, Caryandinae; *Caryanda*, taxonomy; synonymy; new species, key, China, Vietnam

Introduction

The species of the genus *Caryanda* Stål, 1878 are a kind of small-sized flightless grasshoppers that are common in south-central Yunnan. It mainly feeds on Poaceae plants and is an important part of mountain biodiversity (Mao *et al.*, 2011). So far, 90 species of the genus are known (Cigliano *et al.*, 2024), mainly in China (73 species, including 31 species in Yunnan), Indo-China Peninsula (5 species, including 3 species in Vietnam, 2 species in Thailand) and the Indian subcontinent (8 species, including 6 species in India, 1 species in Nepal and 1 species in Bhutan), with a small number of species in the Malay Archipelago (1 species), Central Africa (1 species) and West Africa (2 species). Nineteen species of *Caryanda* distributed in Yunnan were divided into five species groups: namely *amplexicerca* species-group, *aurata* species-group, *dentata* species-group, *nigrospina* species-group, and *viridis* species-group (Mao & Li, 2015; Mao *et al.*, 2015a, 2015b, 2016, 2017). *Caryanda aurata* species-group was proposed by Mao *et al.* (2017) to accommodate primordially four species, namely *C. aurata* Mao, Ren & Ou, 2007, *C. colourfula* Mao, Ren & Ou, 2011, *C. nigrotibia* Mao, Xu & Li, 2017, and *C. zhenyuanensis* Mao, Xu & Li, 2017.

After examination of types and additional materials, *Caryanda aurata* is regarded be conspecific with *C. tamdaoensis* Storozhenko, 1992, and *C. colourfula* is considered as subspecies of *C. azurea* Gorochov & Storozhenko, 1994. Accordingly, the name *Caryanda aurata* species-group is replaced by *Caryanda tamdaoensis* species-group. A new species *Caryanda hongheensis* Mao, Yin & Song, **sp. nov.** from Yunnan province of China is described and illustrated below.

Material and methods

The specimens examined stored in collections of the Biological Science Museum, Dali University, China [BMDU] and the Zoological Institute of the Russian Academy of Sciences, Russia [ZIN]. The morphological terminology and measurements followed those of Uvarov (1966), Dirsh (1975) and Ingrisch *et al.* (2004). The terminology of male genitalia followed those of Dirsh (1956). The color figures 1, 3, 5, 7, 8 were prepared using a digital microscope (Keyence VHX-S550E), figure 6 and 9 was photographed by a smartphone (Honor 50), and figure 2 was taken with an Olympus SZX16 stereomicroscope and an Olympus DP74 digital camera, and then stacked using Helicon Focus software. The final illustrations were prepared into plates with Adobe Photoshop® CS2 software.

Taxonomy

Genus *Caryanda* Stål, 1878

Species group *Caryanda tamdaoensis*

Differential diagnosis. *Caryanda tamdaoensis* species-group shares the following diagnostic characters: male supra-anal plate nearly pentagonal; male cerci conical; apical penis valves of phallic complex lathy, upcurved and with a beak-shaped apex in lateral view; in females ventral basivalvular sclerite with inner margins always contiguous with each other.

Composition. This species group consists of five species. A key to species and subspecies is given below.

Key to the species and subspecies of *Caryanda tamdaoensis* species-group

1. Hind tibiae entirely black in male or blue in female; posterior margin of female subgenital plate concave in middle with two obtuse dentes *C. nigrotibia* Mao, Xu & Li, 2017
- Hind tibiae blue except base black in both sexes; posterior margin of female subgenital plate not as above 2
2. Hind femora partially red and partially yellow; outer lophi of epiphallus parallelogram in posterior view 3
- Hind femora mainly green; outer lophi of epiphallus triangular in posterior view, distally tapering 5
3. Hind femora with yellowish green basal half and reddish apical half in both sexes; posterior margin of female subgenital plate roundly projected at the middle; apical valves of penis and cingular valves long, curved upward, S-shaped
..... *C. tamdaoensis* Storozhenko, 1992
- Hind femora either yellowish brown (rare grayish green) or almost red in both sexes; female subgenital plate with posterior margin undulated, medially concaved with two blunt teeth; apical valves of penis and cingular valves relatively short, curved upward, but not S-shaped 4
4. Body size larger, body length 21–23 mm in male or 27–30 mm in female; hind femora yellowish brown (rare grayish green) without any red or pink parts in both sexes *C. azurea azurea* Gorochov & Storozhenko, 1994, **stat. nov.**
- Body size smaller, body length 17.7–17.9 mm in male or 20.7 mm in female; hind femora almost red but base yellowish green in both sexes *C. azurea colourfula* Mao, Ren & Ou, 2011, **stat. nov.**
5. Abdominal tergites darkish green with 2 black longitudinal stripes in male; hind femora with 3/5 basal parts yellowish green and the apical 2/5 orange; female subgenital plate with posterior margin roundly projected at the middle
..... *C. zhenyuanensis* Mao, Xu & Li, 2017
- Abdominal tergites black with 3 yellow longitudinal stripes in male; hind femora green with or without a yellow preapical ring in male, or green with or without a red preapical ring in female; female subgenital plate broad, near rectangular, median area concaved, posterior margin nearly straight but weakly excised near both sides
..... *C. hongheensis* Mao, Yin & Song, **sp. nov.**

Caryanda nigrotibia Mao, Xu & Li, 2017

Chinese common name: 黑胫卵翅蝗

(Fig. 1)

Caryanda nigrotibia Mao, Xu & Li, 2017: 39(2): 87–90, figs. 3–4, 14–21 (holotype—male, China: Jiangcheng County, in BMDU; examined).

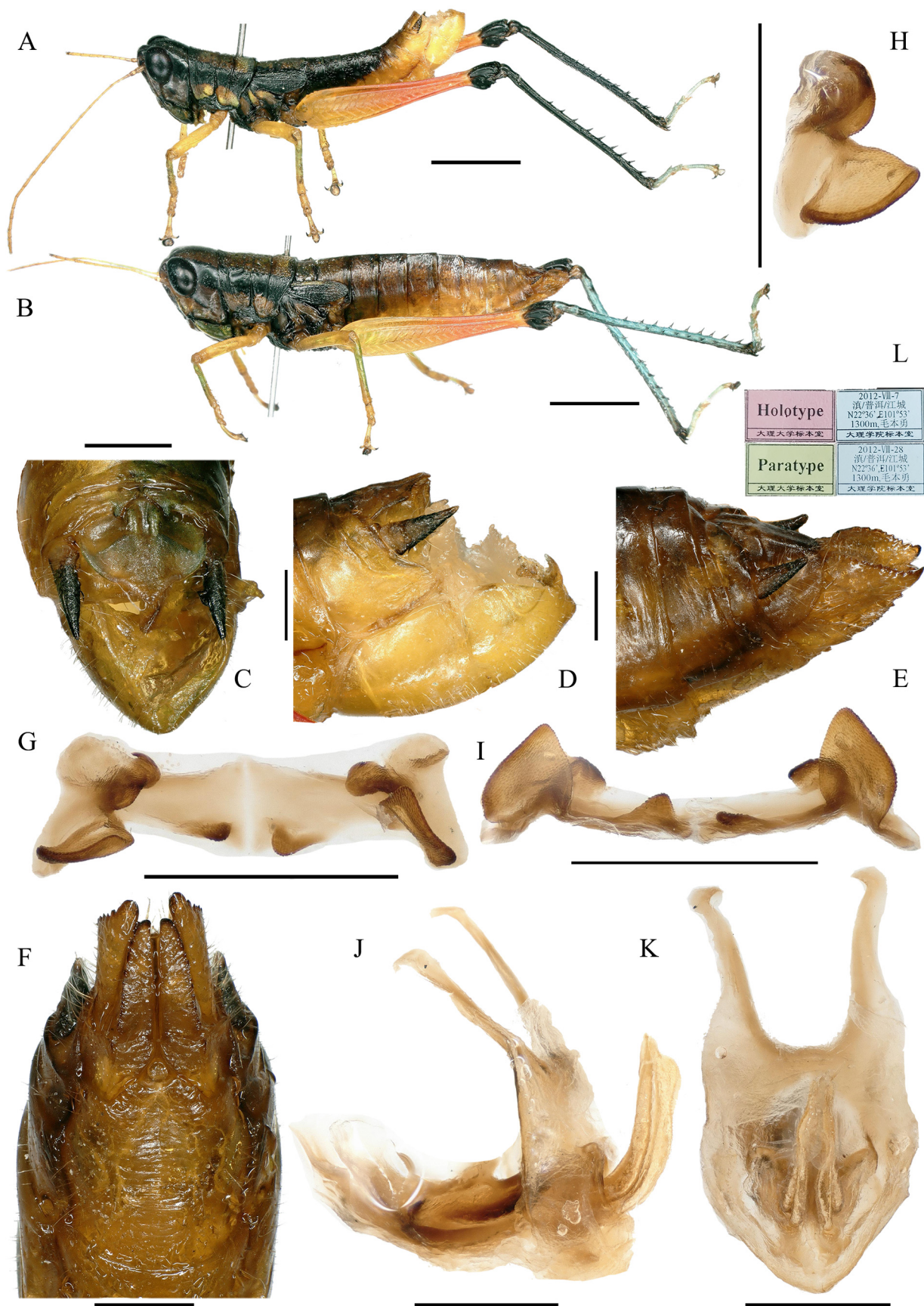


FIGURE 1. *Caryanda nigrotibia* Mao, Xu & Li, 2017. **A–B.** Male and female habitus, lateral view; **C–D.** Male terminalia, dorsal and lateral views; **E–F.** Female subgenital plate and ovipositor, lateral and ventral views; **G–I.** Epiphallus, dorsal, lateral and posterior views; **J–K.** Phallic complex, lateral and apical views; **L.** Labels. Scale bars: 5 mm for A–B and 1 mm for C–K.

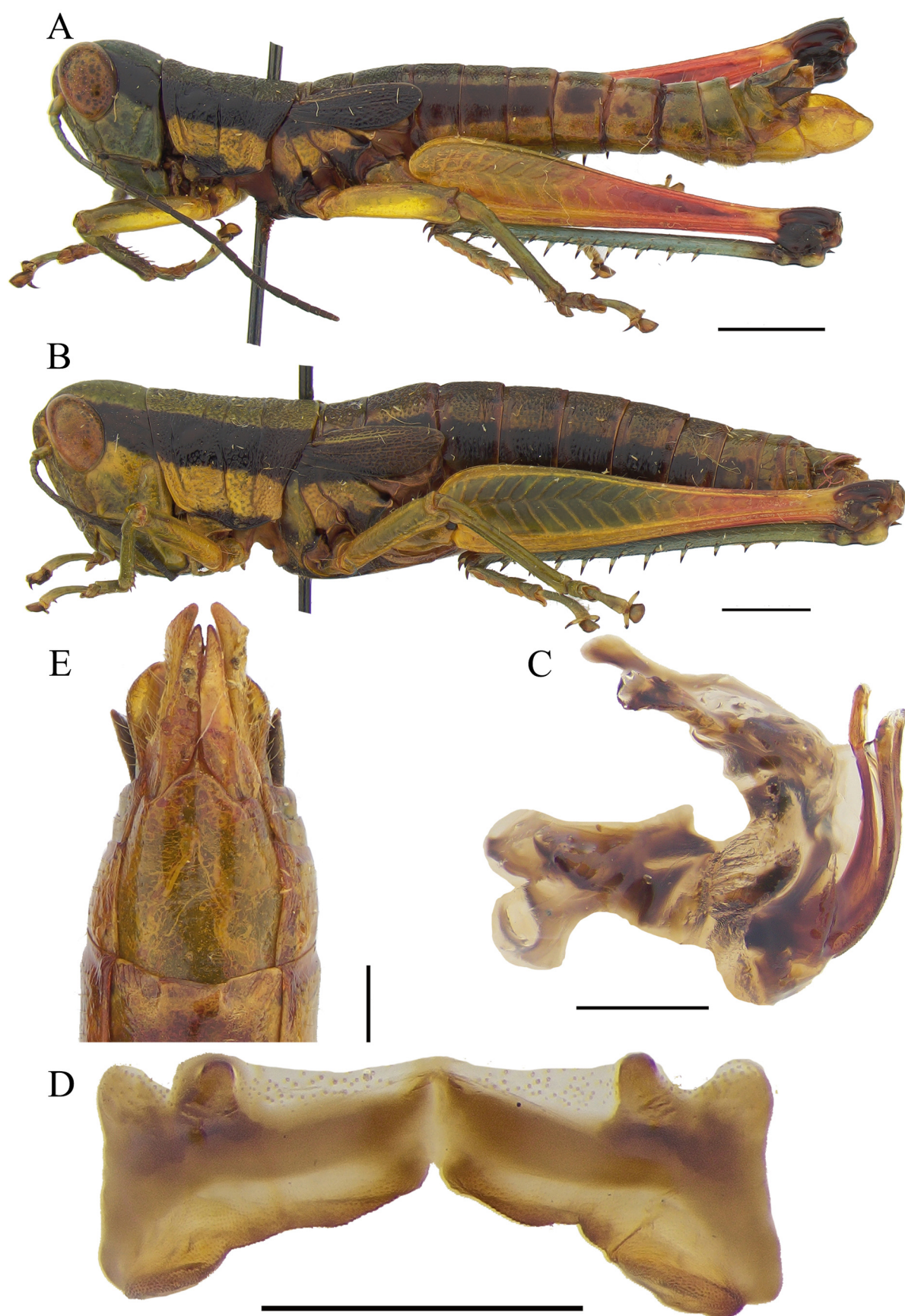


FIGURE 2. *Caryanda tamdaoensis* Storozhenko, 1992. A–B. Male and female habitus, lateral view; C. Phallic complex, lateral view; D. Epiphallus, dorsal view; E. Female subgenital plate and ovipositor, ventral view. Scale bars: 3 mm for A–B and 1 mm for C–E.

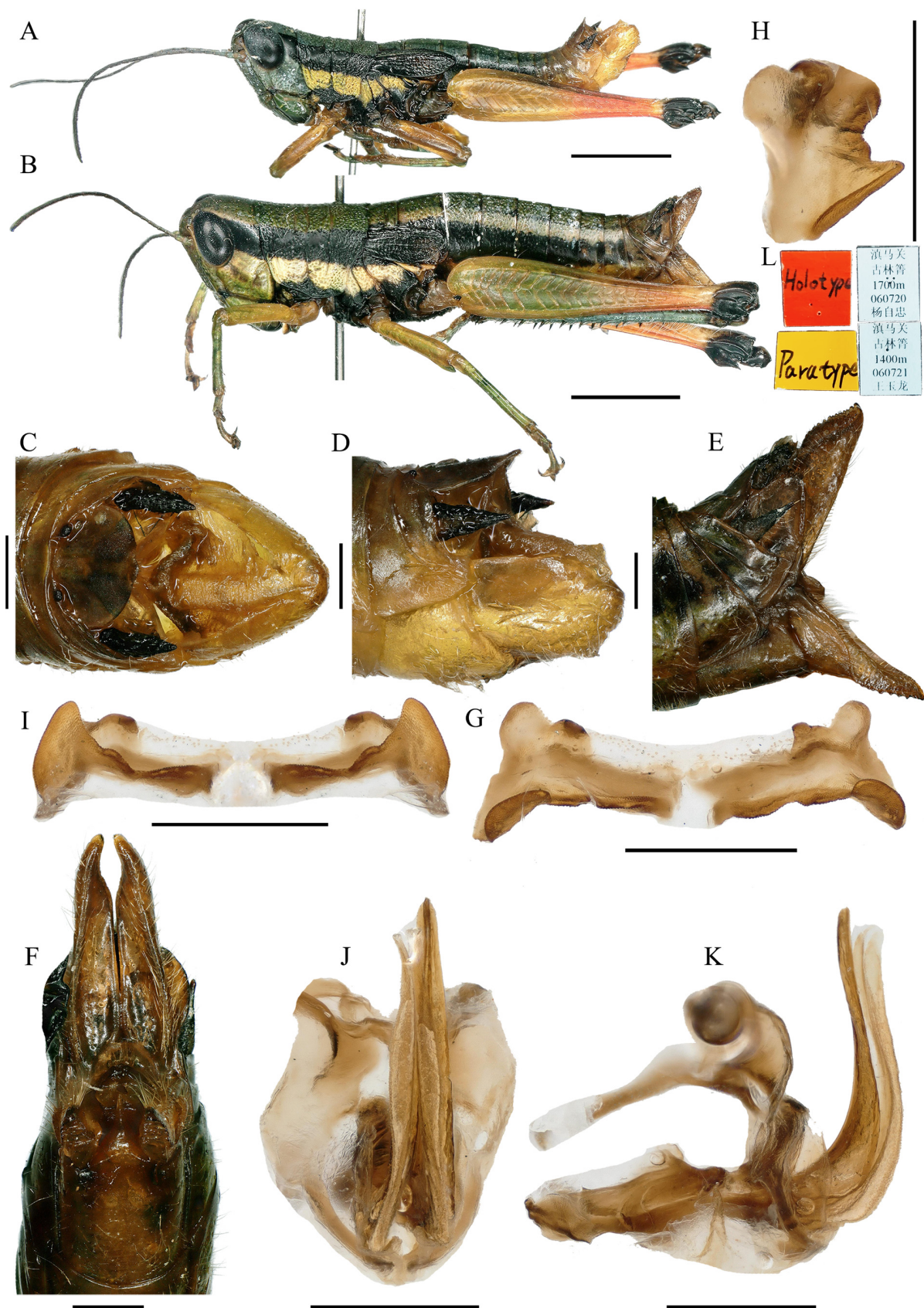


FIGURE 3. The nominal species *Caryanda aurata* Mao, Ren & Ou, 2007. **A–B.** Male and female habitus, lateral view; **C–D.** Male terminalia, dorsal and lateral views; **E–F.** Female subgenital plate and ovipositor, lateral and ventral views; **G–I.** Epiphallus, dorsal, lateral and posterior views; **J–K.** Phallic complex, apical and lateral views; **L.** Labels. Scale bars: 5 mm for A–B and 1 mm for C–K.

Type material examined. Holotype: male, CHINA: Jiangcheng County, Yunnan Province, 22°36'N, 101°52'E, alt. 1300 m, 7 August 2012, leg. Benyong Mao. Deposited in BMDU. Paratypes: 6 males, 4 females, same data as holotype; 1 male, same data as holotype but 12 July 2009, leg. Jishan Xu & Miao Li.

Distribution. China: Yunnan.

Caryanda tamdaoensis Storozhenko, 1992

Chinese common name: 金黄卵翅蝗

(Figs 2, 3)

Caryanda tamdaoensis Storozhenko, 1992: 40, figs. 11–25 (holotype—male, Vietnam: Tamdao, in ZIN; examined).

Caryanda aurata Mao, Ren & Ou, 2007: 57 (holotype—male, China: Maguan, in BMDU; examined). **Syn. nov.**

Type material examined. *Caryanda tamdaoensis*: Holotype: male, VIETNAM: Tamdao [=Tam Đảo District, Vĩnh Phúc province, northern Vietnam], alt. 900–1000 m, 9–18 November 1990, leg. A.V. Gorochov. Deposited in Zoological Institute of the Russian Academy of Sciences. Paratypes: 3 males, 4 females, same data as holotype.

Caryanda aurata: Holotype: male, CHINA: Yunnan: Maguan, 22°49'N, 103°58'E, alt. 1700 m, 20 July 2006, leg. Zizhong Yang, Benyong Mao, Jishan Xu, Yulong Wang, Haoyu Liu, Yuxia Yang and Qiqi Wu. Deposited in BMDU. Paratypes: 21 males, 5 females, same data as holotype.

Other material examined. 5 males, 5 females, CHINA: Yunnan: Hekou, 22°52'N, 103°37'E, alt. 1108 m, 30 August 2022, leg. Zhilong Yin; 30 males, 19 females, Maguan, 23°3'N, 104°14'E, alt. 1537 m, 3 September 2022, leg. Zhilong Yin; 1 male, 2 females, CHINA: Yunnan: Pinbian, 23°00'N, 104°3'E, alt. 1594 m, 1 April 2022, leg. Zhilong Yin.

Mesurements of length (in mm). For types of *C. tamdaoensis*. Body: male 20–22.3, female 26.5–28; pronotum: male 4–4.1, female 5.4–6; tegmen: male 3.6–3.8, female 4.1–4.7; hind femur: male 12.1–12.6, female 15.7–16.2. For the nominal species of *C. aurata*. Body: male 20.3–23.3, female 25.6–27.9; pronotum: male 3.8–4.1, female 4.8–5.0; tegmen: male 3.8–4.1, female 4.1–4.8; hind femur: male 12.0–12.4, female 13.5–15.2.

Distribution. Vietnam: Tamdao; China: Yunnan.

Remarks. By comparing the type specimens of *Caryanda aurata* with *C. tamdaoensis* from Vietnam, based on the substantial similarities in the external morphology and male genitalia structures, both species are proven to be conspecific. They share the following diagnostic characteristics: head and pronotum blue (male) or green (female) in dorsal view; hind femora with basal half yellowish and apical half reddish in both sexes; epiphallus with lophi nearly parallelogrammic in posterior view and distal-inner corner nearly rectangular; phallic complex with cingular valves and apical penis valves lathy, upcurved, distally tapering, and with a beak-shaped apex in lateral view; posterior margin of female subgenital plate roundly projected at the middle. Therefore, a new synonymy is proposed here according to Article 23 of the Code of Zoological Nomenclature (ICZN, 1999).

Caryanda azurea Gorochov & Storozhenko, 1994

Remarks. Two species, *C. azurea* and *C. colourfula*, were described from North Vietnam and South China, respectively (Gorochov & Storozhenko, 1994; Mao *et al.*, 2011). The shape of male genitalia of both species are identical but the specimens from Yunnan are smaller and the color of hind femora mostly red while Vietnamese specimens are larger and hind femora yellowish brown (rare grayish green) without red color. In Vietnam, this species occupied highlands at altitude below 1000 m, while in China it is found in mountains at altitudes 1300–1800 m.

Caryanda azurea azurea Gorochov & Storozhenko, 1994, stat. nov.

(Fig. 4)

Caryanda azurea Gorochov & Storozhenko, 1994: 55, figs. 5–8 (holotype—male, Vietnam: Tamdao, in ZIN; examined).

Type material examined. *Caryanda azurea*: Holotype: male, VIETNAM: Tamdao [=Tam Đảo District, Vĩnh Phúc province, northern Vietnam], alt. 900–1000 m, 9–18 November 1990, leg. A.V. Gorochov. Deposited in Zoological Institute of the Russian Academy of Sciences. Paratypes: 2 males, 2 females, same data as holotype.

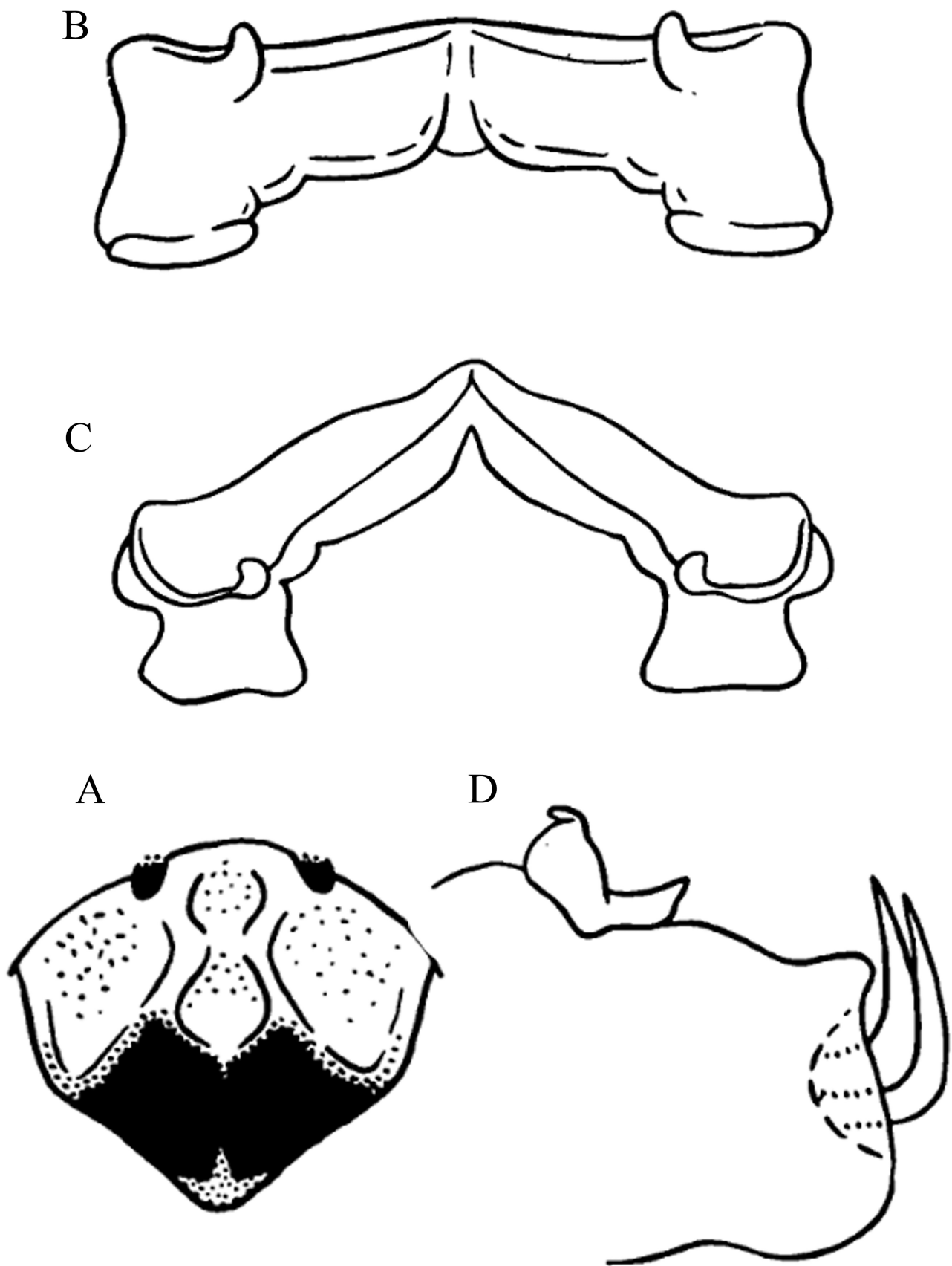


FIGURE 4. *Caryanda azurea azurea* Gorochov & Storozhenko, 1994, **stat. nov.** **A.** Supra-anal plate; **B–C.** epiphallus, dorsal and anterior views; **D.** Phallic complex, lateral view. The picture is from Gorochov & Storozhenko, 1994.

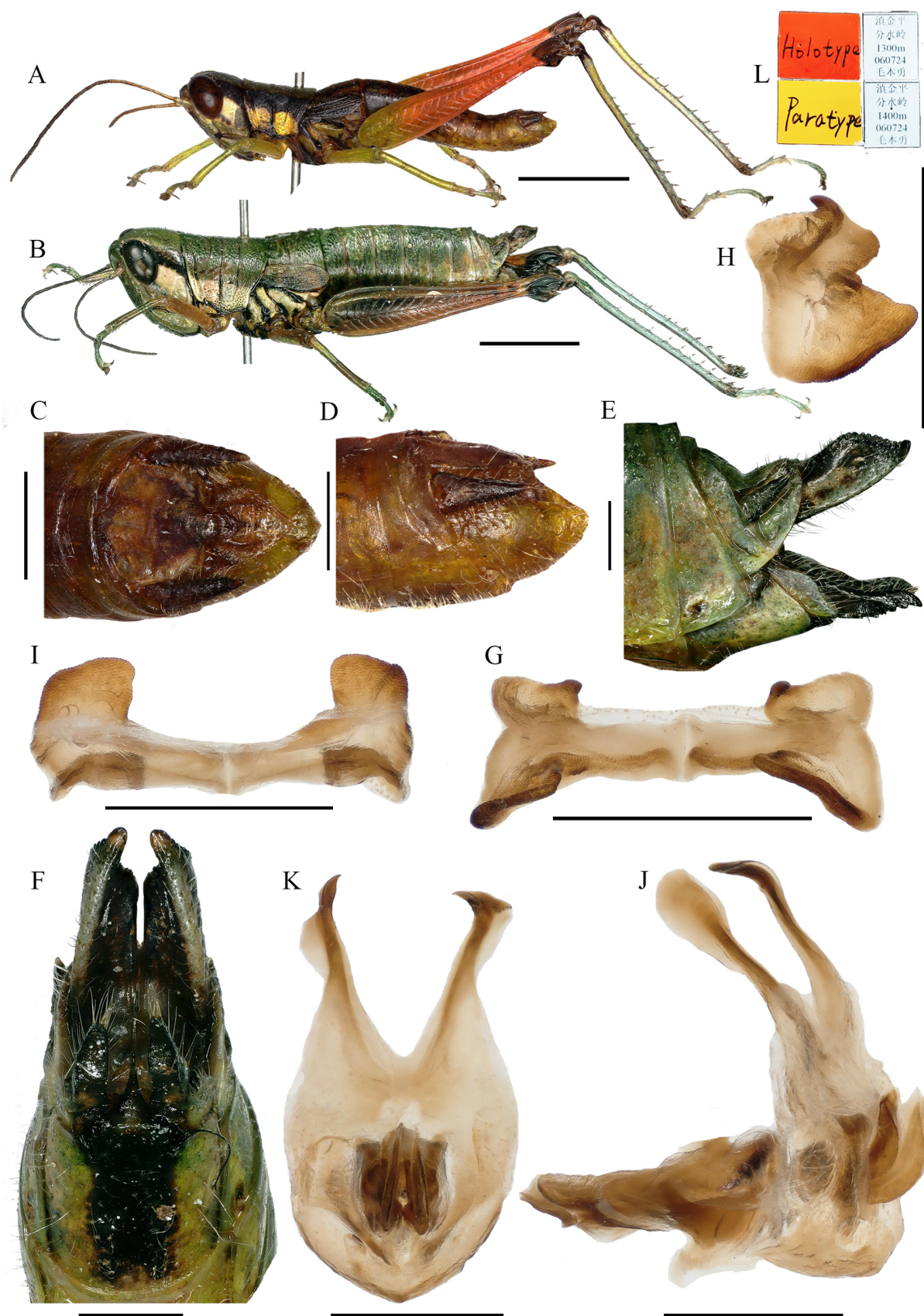


FIGURE 5. *Caryanda azurea colourfula* Mao, Ren & Ou, 2011, **stat. nov.** A–B. Male and female habitus, lateral view; C–D. Male terminalia, dorsal and lateral views; E–F. Female subgenital plate and ovipositor, lateral and ventral views; G–I. Epiphallus, dorsal, lateral and posterior views; J–K. Phallic complex, lateral and apical views; L. Labels. Scale bars: 5 mm for A–B and 1 mm for C–K.

Measurements of length (in mm). Body: male 21–23, female 27–30; pronotum: male 4.3–4.7, female 5.7–6.4; tegmen: male 3.8–4.1, female 4.6–5; hind femur: male 13–14, female 16–17.5.

Distribution. Vietnam: Tamdao.

***Caryanda azurea colourfula* Mao, Ren & Ou, 2011, stat. nov.**

Chinese common name: 彩色卵翅蝗

(Figs 5, 6)

Caryanda colourfula Mao, Ren & Ou, 2011: 62 (holotype—male, China: Jinping, in BMDU; examined).

Type material examined. Holotype: CHINA: Yunnan: Jinping, 22°55'N, 103°13'E, alt. 1300–1400 m, 23 July 2006, leg. Benyong Mao. Deposited in BMDU. Paratypes: 5 males, 1 female, same data as holotype; 38 males, 31 females, CHINA: Yunnan, Yuanjiang, 23°06'N, 102°45'E, alt. 1829 m, 29 September 2009, leg. Benyong Mao; 1 male, CHINA: Yunnan, Yuanyang, 23°23'N, 102°07'E, alt. 1731 m, 1 October 2009, leg. Benyong Mao.



FIGURE 6. *Caryanda azurea colourfula* Mao, Ren & Ou, 2011, **stat. nov.** **A–B.** Living male from Lancang; **C.** Living female from Lancang; **D.** Habitat in Lancang.

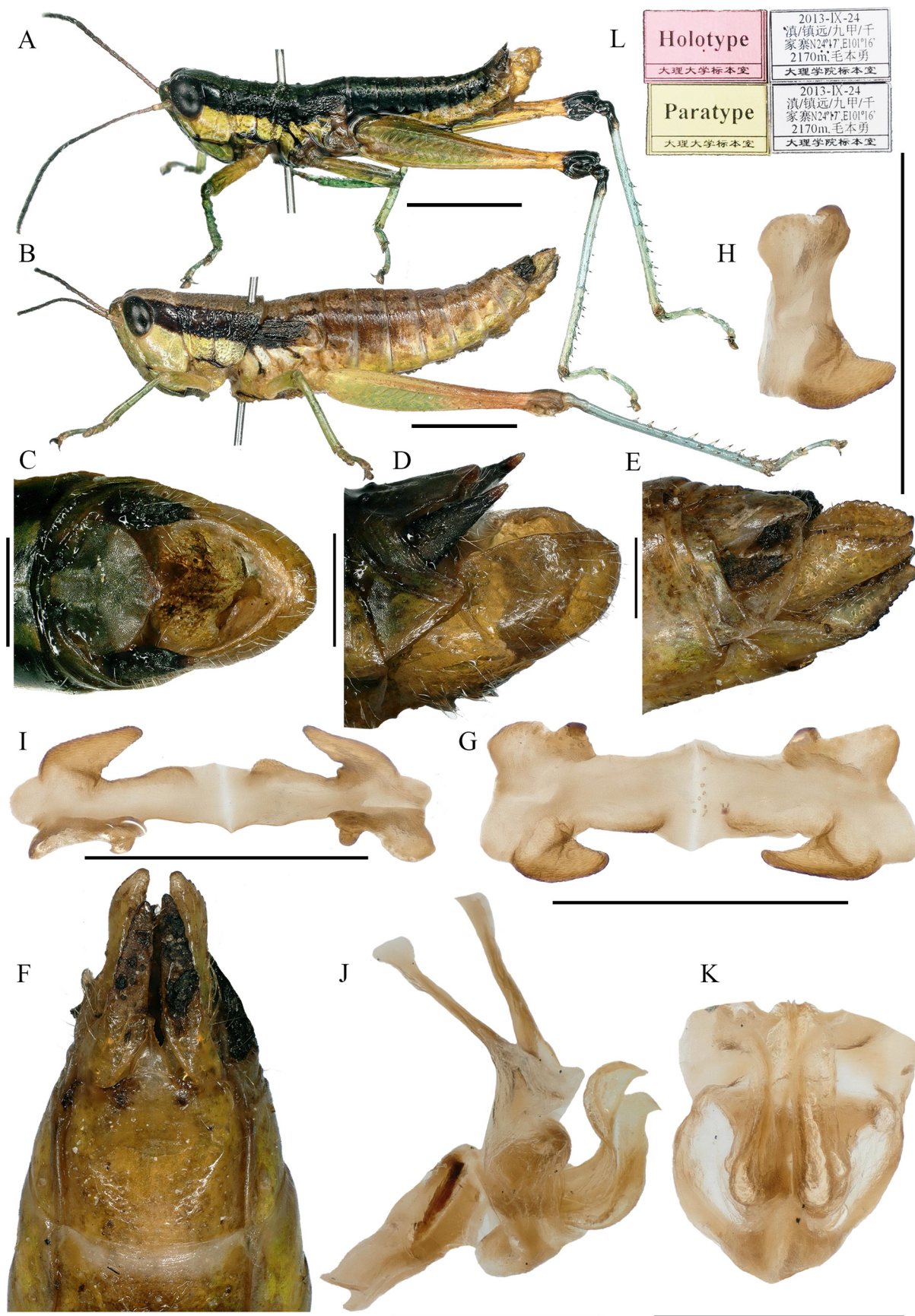


FIGURE 7. *Caryanda zhenyuanensis* Mao, Xu & Li, 2017. **A–B.** Male and female habitus, lateral view; **C–D.** Male terminalia, dorsal and lateral views; **E–F.** Female subgenital plate and ovipositor, lateral and ventral views; **G–I.** Epiphallus, dorsal, lateral and posterior views; **J–K.** Phallic complex, lateral and apical views; **L.** Labels. Scale bars: 5 mm for A–B and 1 mm for C–K.

Other material examined. 1 male, CHINA: Yunnan, Lvchun, 22°57'N, 102°16'E, alt. 1477 m, 22 July 2022, leg. Benyong Mao. 1 male, 1 female, CHINA: Yunnan, Lvchun, 22°49'N, 102°28'E, alt. 1317 m, 23 July 2022, leg. Zhilong Yin. 2 males, 2 females, CHINA: Yunnan, Yuanyang, 23°9'N, 102°45'E, alt. 1481 m, 25 July 2022, leg. Zhilong Yin. 2 males, 3 females, Puer, 22°51'N, 101°3'E, alt. 1600 m, 21 July, 2023, leg. Zhilong Yin. 5 males, 1 female, Menghai, 21°56'N, 100°36'E, alt. 1657 m, 21 July 2023, leg. Zhilong Yin, Hong Song. 2 males, 8 females, Lancang, 22°31'N, 99°57'E, alt. 1067 m, 21 July 2023, leg. Zhilong Yin, Hong Song.

Mesurements of length (in mm). Body: male 17.7–17.9, female 20.7; pronotum: male 3.4–3.5, female 4.4; tegmen: male 3.2–3.4, female 3.2; hind femur: male 10.5–11, female 12.2.

Distribution. China: Yunnan.

Remarks. The careful comparison of holotypes of *Caryanda colourfula* from China and *C. azurea* from North Vietnam show the same shape of epiphallus, cingular valves and apical valves of penis, therefore we consider both form conspecific. However, the specimens from Yunnan are smaller and the color of hind femora mostly red while Vietnamese specimens are larger and hind femora yellowish brown (rare grayish green) without red color. Therefore, we treat *C. colourfula* as a subspecies of *C. azurea*.

***Caryanda zhenyuanensis* Mao, Xu & Li, 2017**

Chinese common name: 镇沅卵翅蝗

(Fig. 7)

Caryanda zhenyuanensis Mao, Xu & Li, 2017: 39(2): 91–92, figs. 7–8, 30–37 (holotype—male, China: Zhenyuan County, in BMDU; examined).

Distribution. China: Yunnan.

***Caryanda hongheensis* Mao, Yin & Song, sp. nov.**

Chinese common name: 红河卵翅蝗

(Figs 8, 9)

Type material examined. Holotype: male, CHINA: Honghe County, Yunnan Province, 23°14'N, 102°24'E, alt. 1909 m, 19 August 2022, leg. Zhilong Yin. Paratypes: 30 males, 30 females, same data as holotype; 18 males, 8 females, CHINA: Xiping County, Yunnan Province, 23°57'N, 101°55'E, alt. 2102 m, 16 August 2022, leg. Zhilong Yin. All type specimens are deposited in BMDU.

Diagnosis. This new species is placed in *Caryanda tamdaoensis* species-group as demonstrated by sharing appearance of nearly pentagonal epiproct, conical male cerci and lathy upcurved apical penis valves, and is very similar to *C. zhenyuanensis* Mao, Xu & Li, 2017, but differs from latter in: 1) body length larger, 19.0–20.0 mm in male, 21.5–24.0 mm in female (in *C. zhenyuanensis*, the length is 17.0–17.9 mm in male or 20.3–21.0 mm in female); 2) abdominal tergites black with 3 yellow longitudinal stripes in male (in *C. zhenyuanensis*, abdominal tergites darkish green in male); 3) female subgenital plate with posterior margin nearly straight but weakly excised near both sides (in *C. zhenyuanensis*, female subgenital plate with posterior margin roundly projected at the middle).

Etymology. The specific epithet refers to the type locality, Honghe River basin, Yunnan Province, China.

Description. Body size small to medium for genus, stouter in female.

Head. Head shorter than pronotum; fastigium broad, slightly flat in dorsal view, and the anterior margin broadly rounded, width in front of eyes about 2.0–2.4 (2.2, mean, n=5, male) (the same below) or 2.3–2.9 (2.7, female) times larger than length, interocular distance 1.1–1.5 (1.3, male) or 1.0–1.3 (1.2, female) times width of frontal ridge between antennae. Face sloping, strongly foveolate; frontal ridge laterally straight with shallow longitudinal sulcus, subobsolete near the base of labrum; lateral margins nearly parallel, except somewhat extended around median ocellus. Lateral facial keels thick and straight. Antennae filiform, retrad reaching the base of hind femora (male) or posterior margin of pronotum (female), median 7–9 segments about 2.4–3.1 (2.7, male) or 2.0–2.6 (2.3, female) times as long as wide. Eyes oval, longitudinal diameter about 1.5–1.6 (1.6, male) or 1.6–1.9 (1.7, female) times as long as horizontal diameter, and about 2.0–2.3 (2.1, male) or 1.7–1.8 (1.8, female) times as long as subocular furrow.

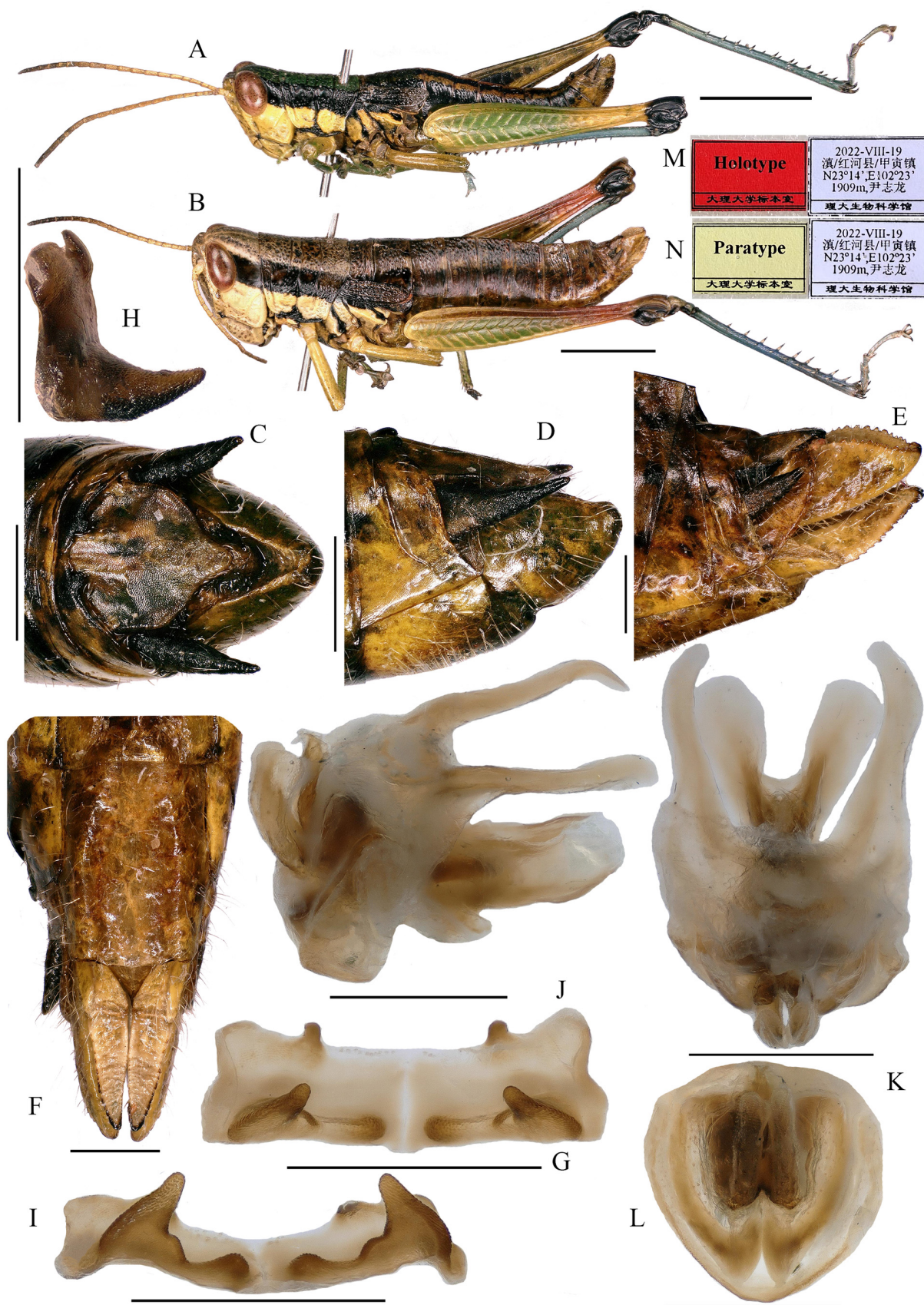


FIGURE 8. *Caryanda hongheensis* Mao, Yin & Song sp. nov. A–B. Male and female habitus, lateral view; C–D. Male terminalia, dorsal and lateral views; E–F. Female subgenital plate and ovipositor, lateral and ventral views; G–I. Epiphallus, dorsal, lateral and posterior views; J–L. Phallic complex, lateral, dorsal and apical views; M–N. Labels. Scale bars: 5 mm for A–B and 1 mm for C–L.



FIGURE 9. *Caryanda hongheensis* Mao, Yin & Song, **sp. nov.** A–B. Living female and male from Honghe; C–E. Living individuals from Xinping; F. Habitat in Honghe.

Thorax. Pronotum in both genders nearly cylindrical, surface foveolate, anterior margin nearly straight, posterior margin nearly straight and with a wide and shallow notch at the middle; median carina indistinct, lateral carinae absent; three transverse sulci distinct; prozona 2.2–2.7 (2.4, male) or 2.2–2.3 (2.3, female) times as long as metazona; lateral lobe with posterior margin distinctly concave, posteroventral corner nearly rectangular (male) or obtusely angular (female). Prosternal spine conical, straight, apex weakly acute (male, female). Mesosternal interspace about 1.4–1.8 (1.6, male) or 1.0–1.4 (1.2, female) times longer than minimum width; mesosternal lobes nearly square, 1.1–1.4 (1.2, male) or 1.1–1.3 (1.2, female) times wider than long; metasternal lobes almost contiguous (male) or separated (female). Tegmina lateral, squamiform, length 2.8–3.9 (3.3, male) or 2.6–3.4 (3.2, female) times larger than maximum width, apex surpassing (male) or reaching (female) posterior margin of 2nd abdominal tergite. Hind femora with upper carina smooth and terminating in an acute angle; apex of lower knee lobes with spine. Hind tibiae with apical half nearly cylindrical, with internal and external apical spines, 7–8 external and 8–9 internal spines on dorsal side. Abdomen tergites with median carina. Tympana opening distinct, oval.

Abdomen. Male genitalia (Fig. 8 C–D, G–L). Tenth abdominal tergite widely divided in middle, with small furculae. Epiproct nearly pentagonal, width at base larger than length; basal half with broad median longitudinal sulcus, lateral areas concaved; flat and longitudinally elevated in the middle; posterior margin triangular, apex acute. Cerci long conical, straight and apex acute, surpassing apex of epiproct. Subgenital plate long conical, apex rounded. Epiphallus with outer lophi near narrowly triangular, apically tapering in posterior view, inner lophi small and triangular; ancorae fingerlike, pointing dorsad, apically blunt; bridge divided in middle with anterior margin flat. Phallic complex: apical valves of penis and cingular valves obviously extended out of hind margin of cingular rami; apical valves of penis upcurved in lateral view, in posterior view apex strongly expanded nearly long oval with inner edge retrad rolled; cingular valves upcurved in lateral view, fused apically.

Female genitalia (Fig. 8 E–F). Epiproct nearly triangular, with a transverse crease in the middle and a middle longitudinal sulcus in the basal half. Cerci conical, apex blunt, not reaching apex of epiproct. Subgenital plate broad, near rectangular, median area concaved, posterior margin nearly straight but weakly excised near both sides. Valves of ovipositor with dentes along margins.

Coloration (Figs 8 A–B, 9 A–E). Head dorsally blue or greenish blue in male, green or greenish brown in female, frons and genae yellow, eyes brown. Antennae yellow except apical segments fuscous; postocular bands black, continued on pronotum, tegmen and abdomen. Pronotum with disc blue or greenish blue in male, yellowish green or brown in female; lateral lobes black with two yellow maculae close to each other, lower edge black. Prosternum and prosternal spine yellow-green. Meso- and meta- thoraxes with episterna and epimera yellow. Tegmina black. Fore and middle legs green. Hind femora green with or without a yellow preapical ring in male, or green with or without a red preapical ring in female; knee black; hind tibiae blue except base black; claws black. Abdominal tergites black with 3 yellow longitudinal stripes in male, green or brown in female; abdominal sternites yellow. Cerci black. Epiproct yellow.

Mesurements of length (in mm). Body length: male 19.0–20.0, female 21.5–24.0; pronotum length: male 6.5–7.1, female 8.8–9.1; tegmen length: male 5.0–7.0, female 5.9–7.2; hind femora length: male 10.2–11.4, female 12.6–13.4.

Distribution. China: Yunnan.

Remarks. After a careful examination of all materials, we found that all individuals from Xinping County share the same morphological feature with those from Honghe County, especially showing the same shape of epiphallus, cingular valves and apical valves of penis, but only small different in body color. Eighteen male individuals from Honghe show hind femora green having a yellow preapical ring and 8 female individuals with a red preapical ring while all individuals from Xinping without any color preapical ring in both sexes (Fig. 9). Therefore, it is reasonable that they are identified as the same species.

Acknowledgments

We are very grateful to Ms. Chengmei Fan (BMDU) and Mr. Zhuangzhuang Du (BMDU) for collecting specimens, and to Mr. Jinchen Yang for his helpful advice. We also thank anonymous reviewers for the valuable comments on the manuscript. The present study of Chinese authors was supported by the National Natural Science Foundation of China (31960110, 31760628). The research of Storozhenko was carried out within the state assignment of Ministry of Science and Higher Education of the Russian Federation (124012400285-7).

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