



## Two new species of the genus *Discophorellus* Tsaur & Hsu (Hemiptera: Fulgoromorpha: Cixiidae: Cixiini) from Guizhou Province, China

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### Abstract

Two new species of the Oriental cixiid planthopper genus *Discophorellus* Tsaur & Hsu, 1991 (Hemiptera: Fulgoromorpha: Cixiidae: Cixiini), *D. cehengensis* Zhang & Chen **sp. nov.** and *D. transspinus* Zhang & Chen **sp. nov.**, from Guizhou Province, southwestern China, are described and illustrated. The generic characteristics are redefined. A key to the three known species of this genus in the world is provided.

**Key words:** Cixiid, Fulgoroidea, Oriental region, planthopper, taxonomy

### Introduction

The cixiid planthopper genus *Discophorellus* was established by Tsaur and Hsu (1991) for *Discophorellus major* Tsaur & Hsu, 1991, and belongs to the tribe Cixiini in the family Cixiidae. To date, *D. major* is the only species recorded in the genus which occurs in the Oriental region (China: Taiwan) (Tsaur and Hsu, 1991).

During the course of studying species biodiversity of the suborder Auchenorrhyncha in southwestern China, two specimens belonging to undescribed species of the genus *Discophorellus* were found. The purpose of this paper is to describe these two new species and to provide an identification key to the known species of the genus.

### Material and methods

Morphological terminology follows Löcker *et al.* (2006). Dry specimens were used for the description and illustration. External morphology was observed under a stereoscopic microscope and characters were measured with an ocular micrometer. The genital segments of the examined specimens were macerated in 10% KOH and drawn from preparations in glycerin jelly with the aid of a Leica MZ 12.5 stereomicroscope. Illustrations were scanned with Canon CanoScan LiDE 200 and imported into Adobe Photoshop 8.0 for labeling and plate composition. Specimens examined are deposited in the Institute of Entomology, Guizhou University, Guiyang, Guizhou Province, China (IEGU).

### Taxonomy

#### *Discophorellus* Tsaur & Hsu, 1991

*Discophorellus* Tsaur & Hsu, 1991:21.

Type species: *Discophorellus major* Tsaur & Hsu, 1991, by original designation.

**Description.** The distinctive characters used by Tsaur *et al.* (1991) are modified as follows.

*Body size.* Moderately large cixiid species (5.4–8.5 mm).

*Head and thorax.* Head including eyes distinctly narrower than pronotum. Vertex much wider (more than 2.5 times) at basal emargination than at apex, with median carina and elevated lateral carinae, disc concave, bearing a reversed Y-shaped ridge touching transverse carina of frons at middle point, fusing with lateral carinae of vertex at apical parts, thus forming two oblique, trapezoid foveae. Frons narrowest at base, about 0.5 times width between endpoints of its lateral carinae, widest at level of antennae, disc not compressed, with elevated median and lateral carinae. Median ocellus present. Frontoclypeal suture strongly produced dorsad to middle. Clypeus tricarinate. Pronotum short, with median and intermediate carinae, carinate laterally. Mesonotum tricarinate. Forewings slender, smoothly widening towards apex, with 12 apical cells and 7 subapical cells; Sc+RP forked basad of fork CuA1+CuA2, r-m crossvein basad of fork MA+MP, two indistinct and incomplete subapical rows of cross veins, RP trifold (rarely quadrifold), M quinquefid; fork PCu+A1 distad of centre of clavus; fork MA1+MA2 basad of fork MP1+MP. Post tibia with about 2–3 lateral and 6–9 apical spines. Second tarsal segment with 9–11 apical spines, usually with platellae, except on lateral pair.

*Male genitalia.* Pygofer symmetrical, W-shaped, lateral lobes symmetrical in ventral view; lateral lobes angular convex caudad. Medioventral process symmetrical in ventral view, generally wider at base than long in midline. Anal segment tubular and symmetrical in caudal view. Genital styles symmetrical in ventral view. Aedeagus short and stout in lateral view, with four spines; flagellum slender and long.

**Distribution.** Oriental region.

**Remarks.** This genus may be easily distinguished from other genera of Cixiini by the presence of 7 subapical cells and 12 apical cells on the forewing, by the vertex much wider (more than 2.5 times) at basal emargination than at apex, by the pygofer W-shaped in ventral view, by the aedeagus with four spines and round disc-like male anal segment in caudal view. The two new species, *D. cehengensis* **sp. nov.** (China: Guizhou) and *D. transspinus* **sp. nov.** (China: Guizhou), fit into the genus by the presence of the features above.

## World checklist of species of *Discophorellus* Tsaur & Hsu

*D. cehengensis* Zhang & Chen **sp. nov.**; southwestern China (Guizhou).

*D. major* Tsaur & Hsu; China (Taiwan).

*D. transspinus* Zhang & Chen **sp. nov.**; southwestern China (Guizhou).

## Key to species of the genus *Discophorellus* Tsaur & Hsu of the world

- 1 Left side of aedeagal flagellum with a long and sub-oval process (Figs 26, 32, 34) . . . . . *D. transspinus* **sp. nov.**
- Aedeagal flagellum without such process. . . . . 2
- 2 Forewings with r+m crossvein and apical cells yellowish brown (Fig. 36); medioventral process of pygofer papillary in ventral view, with bristles at apex (Fig. 5) . . . . . *D. cehengensis* **sp. nov.**
- Forewings with r+m crossvein and apical cells black; medioventral process of pygofer sub-triangular in ventral view, rounded and smooth at apex (Fig. 17). . . . . *D. major*

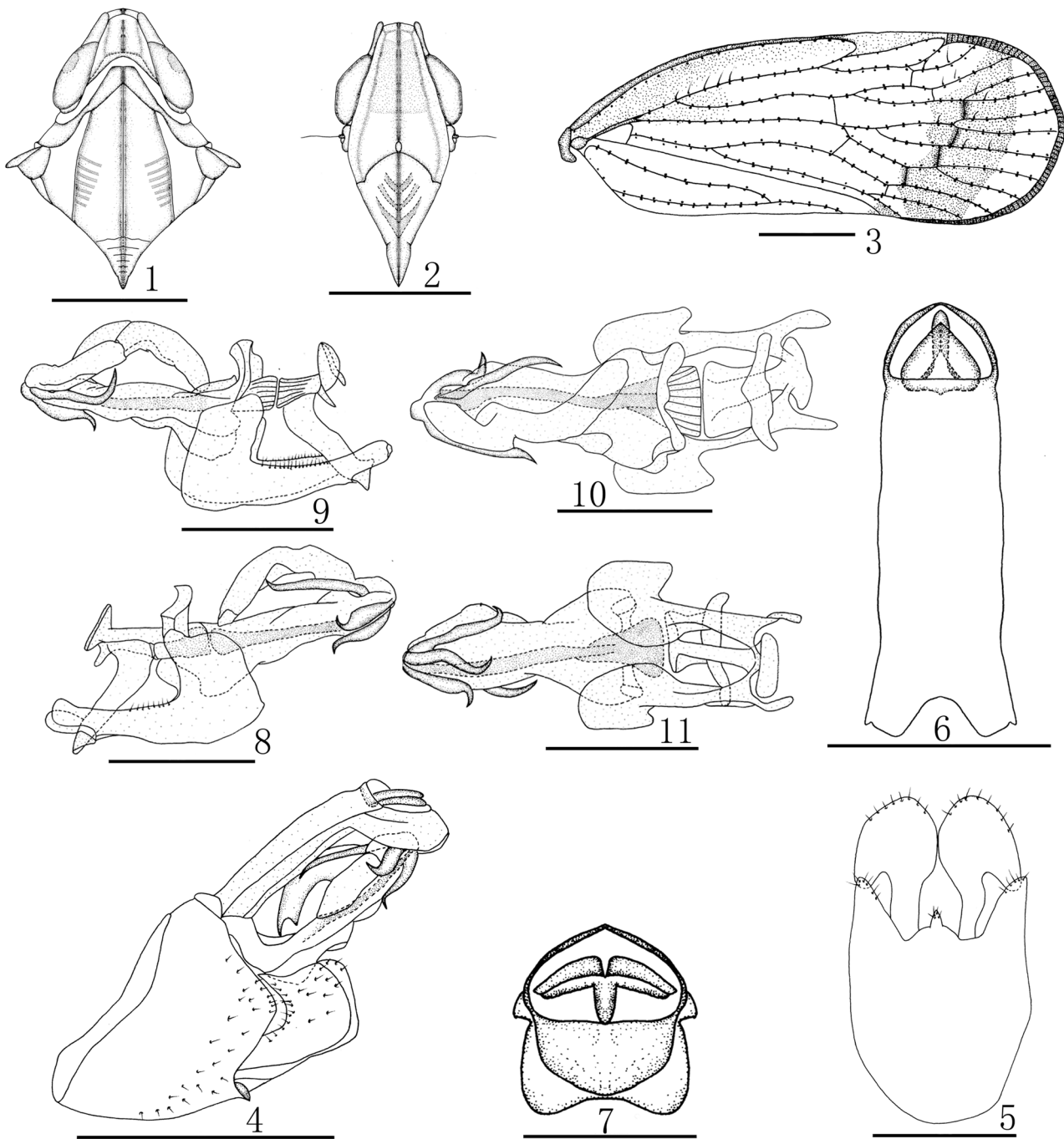
### *Discophorellus cehengensis* **sp. nov.**

(Figs 1–11, 36, 37)

**Description.** Body length (from apex of vertex to tip of forewings): male 6.2–7.1 mm (n = 11), female 7.0–7.8 mm (n = 7); forewing length: male 5.5–6.2 mm (n = 11), female 6.1–7.0mm (n = 7).

*Coloration.* General color yellowish brown. Body covered with white powdery wax. Median part of eyes black, surrounding part yellowish brown. Median ocellus pale yellow, semihyaline. Median part of vertex blackish brown, lateral parts yellowish-white, carinae yellow to brown. Median area of pronotum yellowish brown, lateral areas dark brown; Mesonotum dark brown. Face brown to dark brown, carinae brown. Rostrum generally yellowish brown with apical part dark brown. Tegmina yellowish brown, semihyaline, each with a blackish brown stripe

originating from apical part of clavus; veins yellow to brown; tubercles yellow to brown; stigma yellowish brown. Hind tibiae yellow, lateral and apical spines yellow at base, black apically; platellae of tarsi yellow. Abdomen yellow to yellowish brown ventrally.



**FIGURES 1–11.** *Discophorellus cehengensis* sp. nov. (1) Head and thorax, dorsal view; (2) Frons; (3) Forewing; (4) Male genitalia, lateral view; (5) Pygofer and genital styles, ventral view; (6) Anal segment, dorsal view; (7) Anal segment, caudal view; (8) Aedeagus, left side; (9) Aedeagus, right side; (10) Aedeagus, dorsal view; (11) Aedeagus, ventral view. Scale bars = 0.5 mm (Figs 5–11), 1 mm (Figs 1–4).

*Head and Thorax.* Eyes ellipsoid-like; median ocellus situated on intersection of frontoclypeal suture and median carina of frons. Vertex with lateral sides tapering as shown in Figs 1, 36 and 37, width and length almost equal; anterior margin slightly prominent into obtuse angle, posterior margin arched concave, the bottom truncated; median carina almost reaching subapical carina; lateral carina slightly S-like; subapical carina joining lateral carinae at apical eighth. Frons as shown in Figs 2, 1.3 times longer than wide; lateral carinae slightly S-like; anterior

margin slightly concave into obtuse angle. Clypeus with median carina distinct and elevated throughout; lateral sides of median carina with oblique striations. Rostrum reaching hind trochanter, apical and subapical segments equally long. Pronotum as shown in Figs 1, 36 and 37; posterior margin and apical half of lateral carinae strongly elevated, the areas between those deeply depressed; posterior margin concave, forming obtuse angle; as long as vertex. Mesonotum 1.5 times longer than pronotum and vertex combined, inner sides of lateral carinae with oblique striations, median carina indistinct on posteromedian area, which bears transverse striations. Forewings 3 times longer than wide, with sparse setae on tubercles which situated along two side of veins, CuP vein without tubercles, C with 45 tubercles; RP apically trifold, MA apically trifold, MP apically bifid; PCu+A1 relatively long; Sc+R and M fused at superior angle of basal cell. Hind-tibia with 3 lateral spines, 6 apical spines (1 large, 2 medium, 3 small, divided into 3 groups); chaetotaxy of hind tarsus 9/11, 2<sup>nd</sup> hind tarsus with 8 platellae.

**Male Genitalia.** Pygofer symmetrical, slightly extended; in lateral view, dorsal margin tilted dorsad, upper part of inner margin slightly arc-shaped concave; lateral lobes symmetrical, medium part caudally convex, sub-triangular; in ventral view, dorsal margin W-shaped, widening from base to middle, almost equal in width from middle to apex. Medioventral process mastoid in ventral view, 2 times wider than long, reaching to half length of lateral lobes; sub-triangular in lateral view. Anal segment long and wide as shown in Figs 4 and 6; 2.1 times longer than wide in dorsal view; symmetrical in caudad view, dorsal margin slightly convex, ventral margin slightly arched concave; incompletely connected with pygofer, freely movable; anal style stout, not protruding anal segment. Genital styles as shown in Figs 4–5 and 8–11; in ventral view, symmetrical, widening towards apex, apical part extended, apical margin rounded, internal processes broad, touching each other; in lateral view, “L-shaped”, base covered by lateral lobes of pygofer, compactly connected with connective, unmovable; apical margin with bristles in ventral view. Aedeagus short and stout, with four spines, as shown in Figs 8–11; two on left side, one with basal two-thirds stout, apical third arc-shaped curved and directed dorsad, other one slender, straight and apical part curving dorsocephalad; one on right side, slender, basal part straight, apical third strongly curving dorsad; the last one on ventral side, with basal two-thirds stout, apical third arc-shaped curved and directed ventrad. Connective stout, as shown in Figs 8–11; aedeagal shaft as wide as width of connective plus ventral arm. Flagellum strongly sclerotized, freely movable, structure simple, generally curving left and finger-like in ventral view.

**Type material.** Holotype: ♂, Ceheng County (900m), Guizhou Province, China, 29 June–1 July 2006, Q.-Z. Song; paratypes: 8 ♂♂, 2 ♀♀, same data as holotype; 1 ♂, 1 ♀, Ceheng County (900m), Guizhou Province, China, 29 June–1 July 2006, P. Zhang; 2 ♂♂, Taipingshan (520–859m), Liping County, Guizhou Province, China, 15–23 July 2006, Z.-G. Zhang; 4 ♀♀, Dahemiaozhai (930m), Getuhe, Ziyun County, Guizhou Province, China, 24–27 June 2006, P. Zhang.

**Distribution.** Southwest China (Guizhou Province).

**Remarks.** This new species is similar in appearance to *D. major* Tsaur & Hsu. Without access to specimens of *D. major*, we have sent the illustrations and habitus figure of *D. cehengensis* to Prof. Dr. S.-C. Tsaur for comparison with the holotype of *D. major*. According to his advice, we regard this species as new, the reasons as follows: (1) hind tibiae of *D. cehengensis* with 6 apical spines, hind tibiae of *D. major* with 8–9 spines; (2) aedeagus of the new species with one spine on ventral side, the latter with all spines situated on lateral sides; (3) the new species also differs from the latter in the coloration of crossveins and apical cells of tegmina, shape of the medioventral process and the anal segment.

**Etymology.** The species is named after the type locality, Ceheng, Guizhou Province in China.

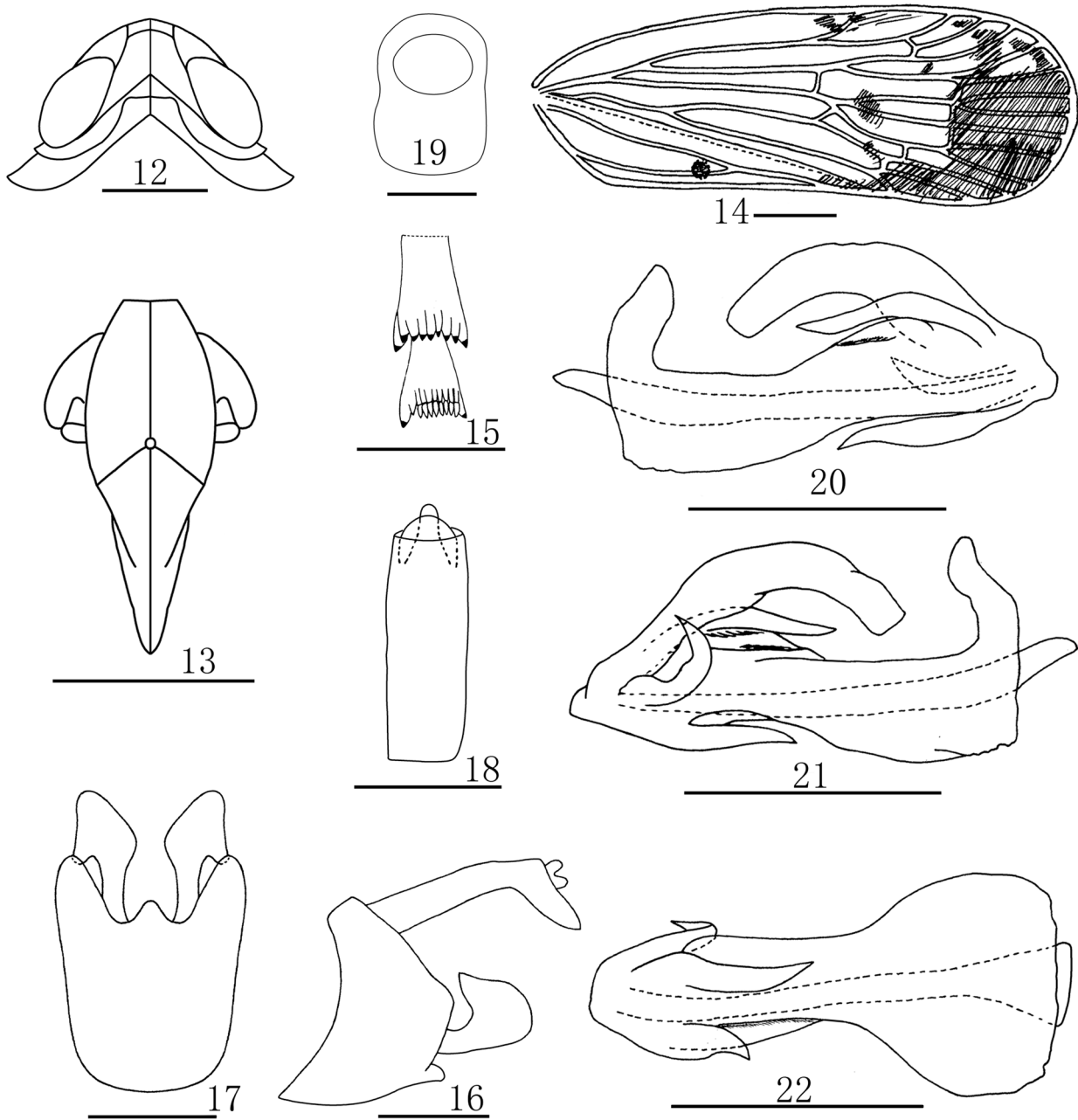
### ***Discophorellus major* Tsaur & Hsu, 1991**

(Figs 12–22)

*Discophorellus major* Tsaur & Hsu, 1991: 21.

**Material examined.** No specimen has been obtained by the authors.

**Distribution.** South China (Taiwan Province).



**FIGURES 12–22.** *Discophorellus major* Tsaour & Hsu. (12) Head and pronotum, dorsal view; (13) Frons; (14) Forewing; (15) Hind tarsus; (16) Male genitalia, lateral view; (17) Pygofer and genital styles, ventral view; (18) Anal segment, dorsal view; (19) Anal segment, caudal view; (20) Aedeagus, left side; (21) Aedeagus, right side; (22) Aedeagus, ventral view. Scale bars = 0.5 mm (Figs 12, 15–22), 1 mm (Figs 13–14). (After Tsaour and Hsu, 1991).

***Discophorellus transspinus* sp. nov.**

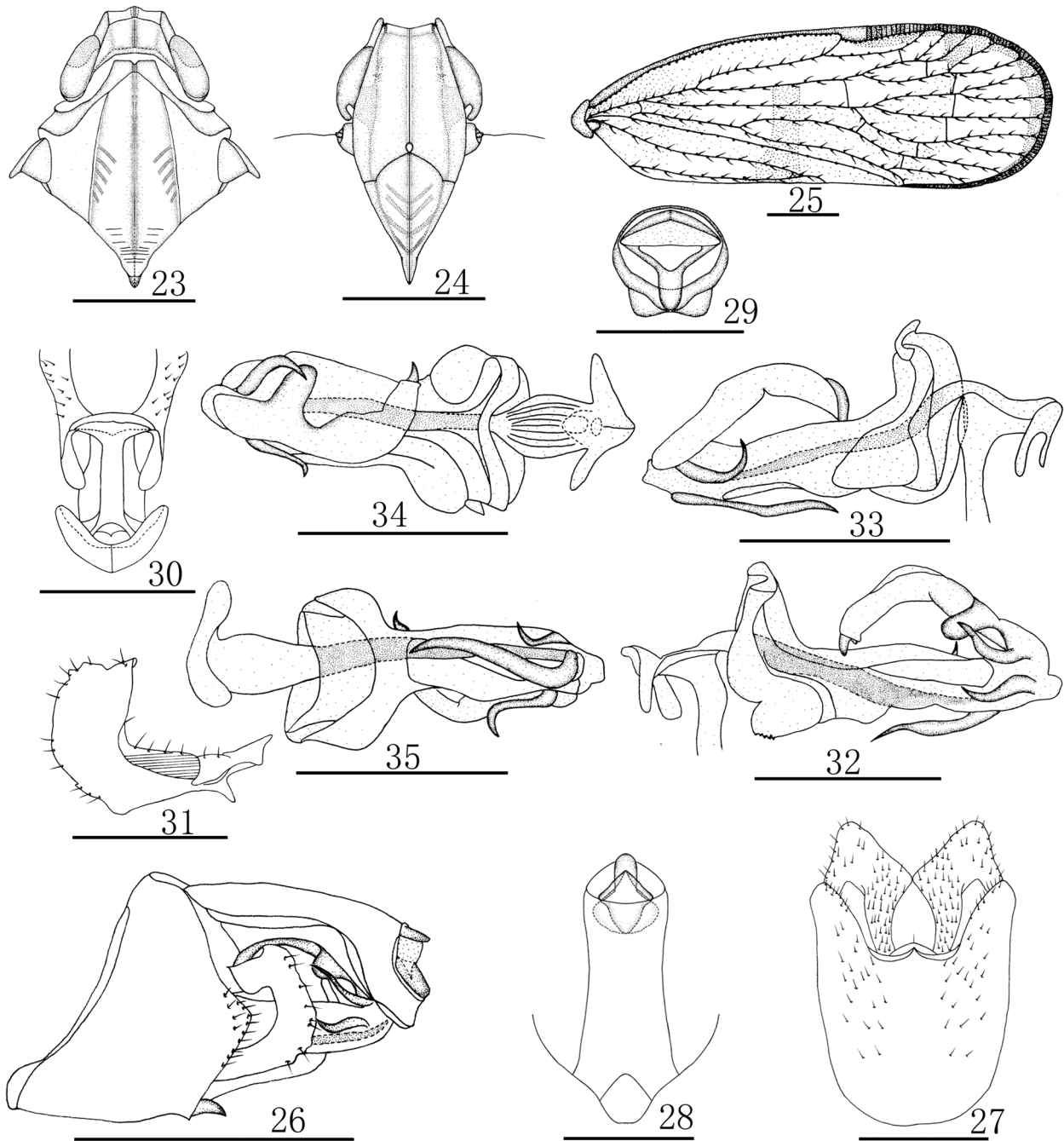
(Figs 23–35, 38, 39)

**Description.** Body length (from apex of vertex to tip of forewings): male 6.9–8.0 mm (n = 11), female 6.0–8.5 mm (n = 22); forewing length: male 6.0–7.0 mm (n = 11), female 5.4–7.6 mm (n = 22).

**Coloration.** General color dark brown. Body covered with powdery wax. Eyes, anterior half blackish, posterior half brown. Median ocellus milk white, lateral ocellus pale yellow, semihyaline. Vertex dark brown, carinae black

brown. Pronotum brown; Mesonotum black, carinae dark brown. Median area of frons black, lateral margin dark brown. Clypeus dark brown. Rostrum brown. Tegmina yellowish brown to dark brown, semihyaline, outer margin with spaced dimmed stains; veins yellowish brown (except C blackish brown), with concolorous tubercles; stigma blackish brown. Hind tibiae brown, lateral spines yellowish brown, apical spines black; hind tarsi with apical spines black and platellae yellowish brown. Abdomen black ventrally.

*Head and Thorax.* Eyes reniform, ventral margin concave above antennae; median ocellus slightly above intersection of frontoclypeal suture and median carina of frons. Vertex widening from subapical carina to both endpoints of lateral carinae as shown in Figs 23, 38 and 39; 1.2 times wider than long; anterior margin with a middle



**FIGURES 23–35.** *Discophorellus transspinus* sp. nov. (23) Head and thorax, dorsal view; (24) Frons; (25) Forewing; (26) Male genitalia, lateral view; (27) Pygofer and genital styles, ventral view; (28) Anal segment, dorsal view; (29) Anal segment, caudal view; (30) Connective, ventrocephalad view; (31) Right genital style, ventral view; (32) Aedeagus, left side; (33) Aedeagus, right side; (34) Aedeagus, dorsal view; (35) Aedeagus, ventral view. Scale bars = 0.5 mm (Figs 27–35), 1 mm (Figs 23–25).



**FIGURES 36–39.** Body of adult of *Discophorellus*. *D. cehengensis* **sp. nov.**: 36. dorsal view, 37. lateral view; *D. transspinus* **sp. nov.**: 38. dorsal view, 39. lateral view.

cornuted process, posterior margin arc-shaped concave; area before subapical carina slightly hollowed, area behind subapical carina deeply hollowed, posterior margin forming a narrow footstep; both sides of median carina before subapical carina with arc-shaped scotches; subapical carina fusing with lateral carinae at apical seventh. Frons as shown in Figs 24, 1.4 times longer than wide; lateral carinae slightly S-like, elevated and lobate; anterior margin slightly concave into obtuse angle. Clypeus disc elevated, lateral side of median carina with oblique striations. Rostrum reaching hind coxae, apical segment 1.2 times longer than subapical segment. Pronotum as shown in Figs 23, 38 and 39, posterior margin deeply concave, forming obtuse angle; as long as vertex. Mesonotum 1.6 times longer than pronotum and vertex combined, inner sides of lateral carinae with oblique striations, median carina indistinct in posterior-median area, which bears transverse scotches. Forewings 2.7 times longer than wide, with setae on tubercles which situated along two sides of veins, CuP vein with tubercles but without setae; C with 45 tubercles; RP apically quadrifid, MA apically trifid, MP bifid; PCu+A1 relatively short; Sc+R and M fused out of superior angle of basal cell. Hind-tibiae with 2 lateral spines, 6 apical spines; chaetotaxy of hind tarsus 8–9/11, 2<sup>nd</sup> hind tarsus with 8 platellae.

**Male Genitalia.** Pygofer symmetrical; in lateral view, inner margin arc-shaped concave, dorsal margin tilted dorsad, lateral lobes symmetrical with medium parts caudally convex, triangular, with bristles; in ventral view, dorsal margin W-shaped, widening from base to apex. Medioventral process symmetrical, rounded in ventral view, with a seta at apex, 3.2 times wider than long, reaching to two ninths of length of lateral lobes; thumb shaped in lateral view, base covered by lateral lobes. Anal segment as shown in Figs 26, 28 and 29; L-shaped in lateral view; symmetrical in caudad view, dorsal margin arched convex, ventral margin slightly concave into obtuse angle; 2.4 times longer than wide in dorsal view; closely connected with pygofer by two points; anal style short and stout, finger-like, not protruding anal segment. Genital styles as shown in Figs 26, 27 and 31; in ventral view, symmetrical, hammer-like, with dense setae, internal processes broad, sub-angular, touching each other; in lateral view, ventral margin of basal part straight, apical part bending dorsad, dorsal margin strongly bent cephalad; closely connected with connective, unmovable. Aedeagus short and stout, as shown in Figs 26, 32–35, in total with four spines arising at apex of aedeagal shaft; two on left side, short and stout, both curved dorsocephalad; the other two on right side, one short and curved dorsocaudad, other one longer and directed ventrocephalad; both sides of perianthrium with a hemispheric process. Connective slightly I-shaped as shown in Fig. 30, the width of aedeagal shaft 1.3 times as wide as the width of connective plus ventral arms. Flagellum semi-sclerotized, freely movable, arising slightly before apex of aedeagal shaft on the right side, generally curving left, basal third with a long and sub-oval process on left side, apex with a hornlike process.

**Type material.** Holotype: ♂, Lijiaba (700m), Mayanghe National Natural Reserve, Yanhe County, Guizhou Province, China, 5–12 June 2007, X.-S. Chen. Paratypes: 4 ♂♂, 11 ♀♀, same data as holotype; 2 ♀♀, Xiannvdong (640m), Dashahe Provincial Natural Reserve, Daozhen County, Guizhou Province, China, 26 August 2004, X.-S. Chen; 4 ♂♂, 5 ♀♀, Forest Park (1000m), Guiyang, Guizhou Province, China, 21 May 2006, P. Zhang; 2 ♀♀, Taipingshan (520–859m), Liping County, Guizhou Province, China, 15–23 July 2006, Q.-Z. Song; 1 ♀, Taipingshan (520–859m), Liping County, Guizhou Province, China, 15–23 July 2006, Z.-G. Zhang; 1 ♂, Lijiaba (700m), Mayanghe National Natural Reserve, Yanhe County, Guizhou Province, China, 5–12 June 2007, H.-S. Deng; 1 ♂, 1 ♀, Maojia (600–900m), Mayanghe National Natural Reserve, Yanhe County, Guizhou Province, China, 5–12 June 2007, Z.-G. Zhang.

**Distribution.** Southwest China (Guizhou Province).

**Remarks.** This new species is similar in appearance to *D. cehengensis* sp. nov, but differs from the latter in the shape of the medioventral process, the degree of sclerotisation of the flagellum, the shape of the flagellum, the shape of the internal processes of the genital styles and the shape and direction of the spines of the aedeagus.

**Etymology.** The name is derived from the Latin words *trans-* (transverse) and *spinus* (spine), which refers to the long and sub-oval process at the basal third part of flagellum.

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