

ORIGINAL ARTICLE

# Contribution to the knowledge of the crane fly genus *Helius* (Diptera: Limoniidae) from Sichuan, China

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**Abstract** Specimens of the crane fly genus *Helius* Lepeletier & Serville, 1828 from Sichuan, China are examined and studied. Three *Helius* species all belonging to the nominotypical subgenus are recognized, of which *H. (H.) pallidissimoides* Xu, Ma & Zhang, **sp. nov.** is described and illustrated as new to science, and *H. (H.) pallidissimus* Alexander, 1930 and *H. (H.) franckianus* Alexander, 1940 are redescribed and illustrated. For the first time, descriptions and illustrations are provided for the male of *H. (H.) pallidissimus* and the female of *H. (H.) franckianus*.

**Key words** Chinese fauna, distribution, Elephantomyiini, new species, taxonomy.

## 1 Introduction

*Helius* Lepeletier & Serville, 1828 (in Latreille *et al.*, 1828) is a species-rich genus in the family Limoniidae (Diptera) with 232 known species and subspecies, of which 90 are from the Oriental Region, 22 from the Palearctic Region, and 50, 44, 29, 2 from the Neotropical, the Australasian, the Afrotropical and the Nearctic Regions, respectively (Oosterbroek, 2024). The genus can be easily distinguished from most limoniid crane flies by the elongate rostrum, except its sister-genus *Elephantomyia* Osten Sacken, 1860 (*e.g.* Petersen *et al.*, 2010; Kang *et al.*, 2023), which can be easily distinguished by the length of rostrum: in *Helius*, the rostrum is not longer than the combined head (excluding rostrum) and thorax, while in *Elephantomyia*, the rostrum length is approximately equal to the body length (excluding rostrum).

A total of 27 species and subspecies of the genus *Helius* have been recorded from China (Oosterbroek, 2024), in which 20 were described by Alexander (1913, 1924, 1928, 1929a, b, 1930a, b, c, 1932a, b, c, 1937, 1938, 1940a, b, 1945), two by Edwards (1916, 1921), and one by Brunetti (1912). Most of them can be identified by the rostrum length, the shape of antenna, the venation and pattern of wing, and the body color, besides the details of male genitalia, such as outer gonostylus, interbase and aedeagus. Xu *et al.* (2023) reported a new species and a newly recorded subspecies of *Helius* from China. After that, we had the opportunity to examine the specimens collected from Sichuan, China, which were deposited in the Entomological Museum of China Agricultural University, Beijing, China (CAU), resulting in the discovery of some specimens of *Helius* crane flies.

Sichuan Province has diverse terrain, excellent ecological environment and high species diversity, with four *Helius* species known to occur in the province (Oosterbroek, 2024). In this study, a new species, *H. (Helius) pallidissimoides* Xu,

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Ma & Zhang, **sp. nov.** is described and illustrated, and two species, *H. (H.) pallidissimus* Alexander, 1930 and *H. (H.) franckianus* Alexander, 1940, previously recorded in Sichuan, are redescribed and illustrated, with the male of *H. (H.) pallidissimus* and the female of *H. (H.) franckianus* are provided for the first time.

## 2 Material and methods

The specimens for this study were collected at different locations in Sichuan, China and deposited in the CAU. Genitalic preparation of males were made by macerating the apical portion of the abdomen in cold 10% sodium hydroxide (NaOH) for 12–15 hours. Observations and illustrations were made using a ZEISS Stemi 2000-C stereomicroscope. Photographs were taken with a Canon EOS 5D Mark IV digital camera through a macro lens.

The morphological terminology mainly follows Cumming & Wood (2017) and de Jong (2017). The following abbreviations in figures are used:

aed—edeagus;  
ant—antenna;  
cerc—cercus;  
ea—ejaculatory apodeme;  
flg—flagellum;  
goncx—gonocoxite;  
hyp vlv—hypogynial valve;  
i gonst—inner gonostylus;  
interb—interbase;  
mtg—mediotergite;  
o gonst—outer gonostylus;  
ped—pedicel;  
plp—palpus;  
pm—paramere;  
presct—prescutum;  
prn—pronotum;  
rst—rostrum;  
scp—scape;  
sct—scutum;  
sctl—scutellum;  
st—sternite;  
tg—tergite;  
vrtl—verticil.

## 3 Taxonomy

### Key to *Helius* species from Sichuan.

1. Rostrum nearly as long as combined head (excluding rostrum) and thorax (Alexander, 1932a).....*Helius (Helius) pluto* (Alexander, 1932)  
Rostrum no longer than 1.5 times remainder of head (Figs 1B, 4B, 6B).....2
2. Body generally with dark coloration (Fig. 1A), wing with stigma obvious, brown to dark brown (Fig. 1E).....3  
Body generally with pale coloration (Figs 4A, 6A), wing with stigma indistinct or missing (Figs 4E, 6E).....4
3. Legs with femora and tibiae dark brown and tarsi paling to brownish yellow, distance between tips of R<sub>4</sub> and R<sub>5</sub> about three times as long as distance between tips of R<sub>1</sub> and R<sub>4</sub>, halter dark brown, tip of outer gonostylus very indistinctly toothed (Alexander, 1932c)..  
.....*Helius (Helius) infirmus* Alexander, 1932  
Legs with femora and tibiae yellow and tarsi darkened (Fig. 1A), distance between tips of R<sub>4</sub> and R<sub>5</sub> slightly longer than distance between tips of R<sub>1</sub> and R<sub>4</sub> (Fig. 1E), halter pale yellow (Fig. 1A), tip of outer gonostylus bispinuous (Figs 2A–B, E) .....  
.....*Helius (Helius) franckianus* Alexander, 1940

4. Antenna with basal flagellomeres oval (Fig. 4C), legs with femora, tibiae and tarsi uniformly pale brownish yellow (Fig. 4A), tip of interbase significantly expanded laterally with an apically acute outgrowth (Figs 5C–D, F–G)..... *Helius (Helius) pallidissimoides* Xu, Ma & Zhang, sp. nov.
- Antenna with basal flagellomeres short and crowded (Fig. 6C), legs with femora, tibiae and tarsi gradually changing from yellow to brownish yellow (Fig. 6A), tip of interbase slightly expanded with an apically blunt outgrowth (Figs 7C–D, F–G) ..... *Helius (Helius) pallidissimus* Alexander, 1930

***Helius (Helius) franckianus* Alexander, 1940 (Figs 1–3)**

*Helius (Helius) franckianus* Alexander, 1940a: 183. Type locality: China, Sichuan, Mt. Emei.

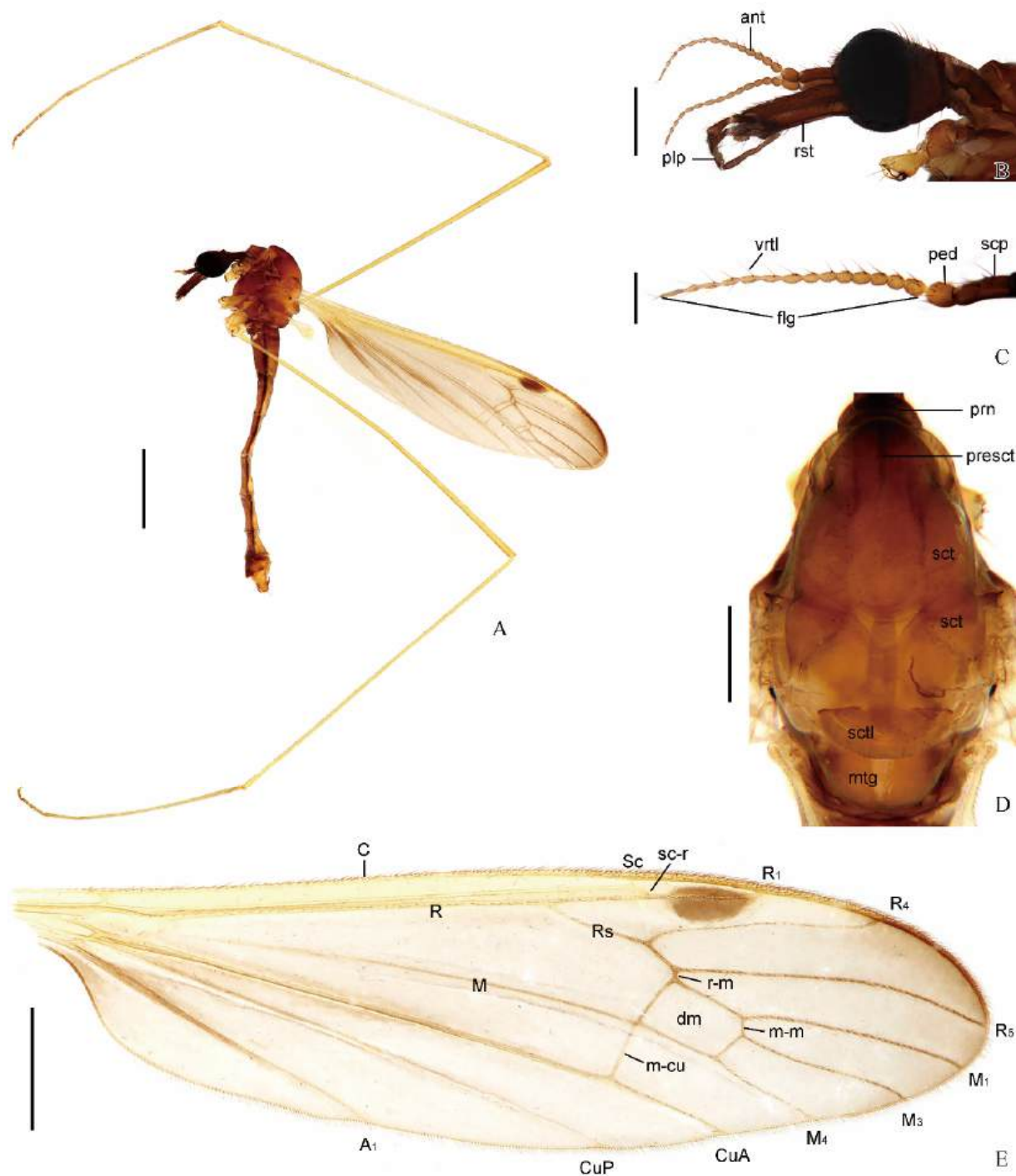


Figure 1. *Helius (Helius) franckianus* Alexander, 1940. A. Habitus of male, lateral view; B. Head, lateral view; C. Antenna; D. Thorax, dorsal view; E. Wing. Scale bars: A=2.0 mm; B, D=0.5 mm; C=0.2 mm; E=1.0 mm.

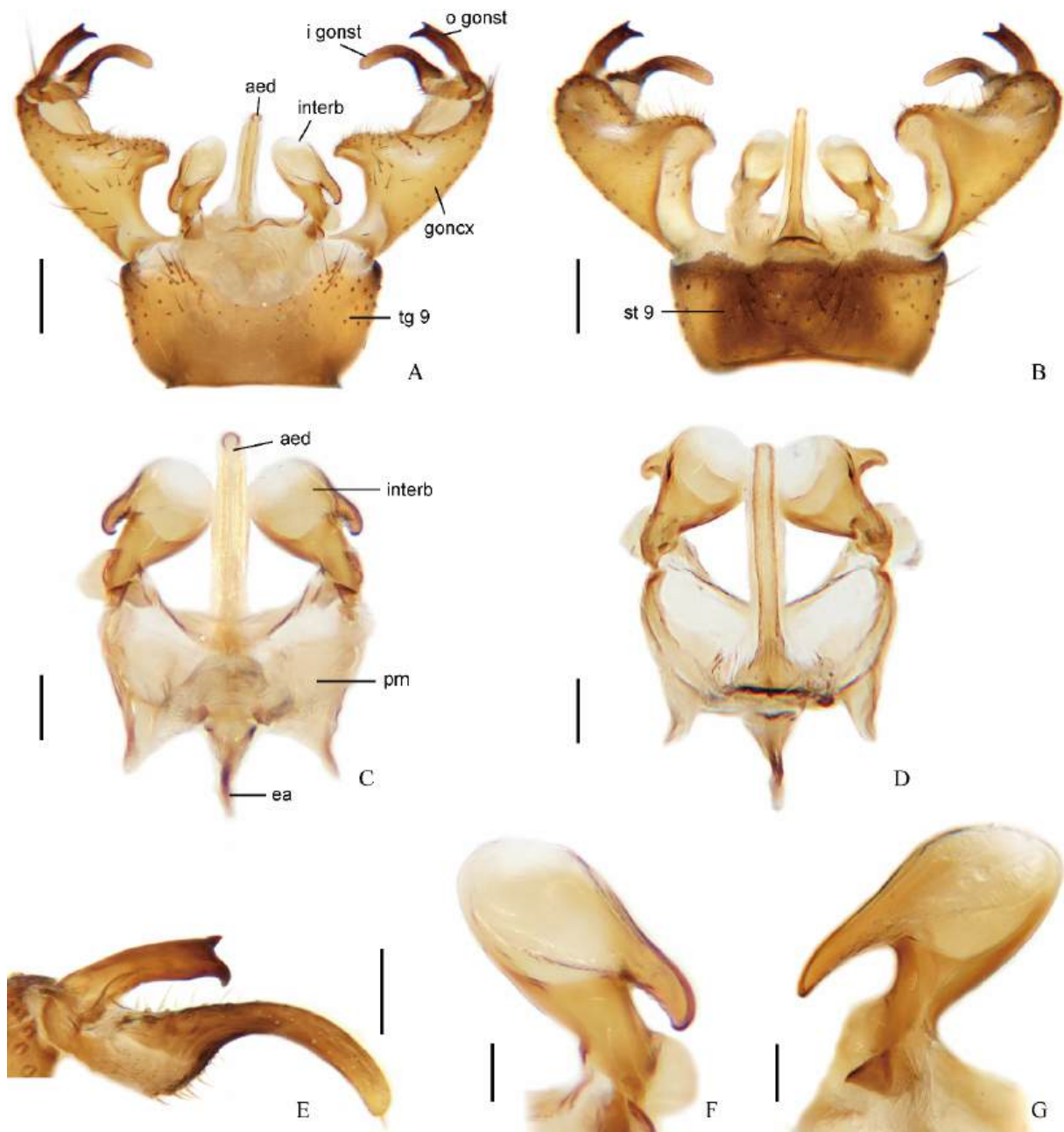


Figure 2. *Helius (Helius) franckianus* Alexander, 1940. A. Male hypopygium, dorsal view; B. Male hypopygium, ventral view; C. Aedeagal complex, dorsal view; D. Aedeagal complex, ventral view; E. Gonostyli, dorsal view; F. Interbase, dorsal view; G. Interbase, lateral view. Scale bars: A–B=0.2 mm; C–E=0.1 mm; F–G=0.05 mm.

**Diagnosis.** Antenna with flagellomeres oval, apically tapering and elongated. Rostrum about 1.2 times as long as remainder of head. Prescutum and presutural scutum dark brown with anterior area darker. Pleuron dark brown to brownish black. Wing with stigma oval, dark brown. Distance between tips of  $R_4$  and  $R_5$  slightly longer than distance between tips of  $R_1$  and  $R_4$ . Tip of outer gonostylus bispinuous, outer spine small, inner spine large and bent ventrally. Interbase oval; laterally producing into a narrow, apically acute outgrowth, beak-shaped in lateral aspect.

**Description.** Male. Body length 9.3–9.5 mm (excluding rostrum), wing length 8.0–8.2 mm, rostrum length 0.7–0.8 mm, antenna length 1.4–1.5 mm.

**Head** (Fig. 1B). Dark brown with brownish black setae. Antenna (Fig. 1C) brown with scape and pedicel darker. Scape long cylindrical, three times as long as wide. Pedicel oval. Flagellomeres oval, apically tapering and elongated, with dark brown verticils that subequal in length to or slightly longer than corresponding flagellomere; verticils on basal flagellomeres unilaterally arranged. Rostrum about 1.2 times as long as remainder of head, dark brown with brownish black setae. Palpus

dark brown with dark brown setae.

Thorax (Fig. 1D). Pronotum black with two sides dark brown. Prescutum and presutural scutum dark brown with anterior area darker. Postsutural scutum dark brown with middle area paler. Scutellum dark brown. Mediotergite brown with two sides dark brown. Pleuron (Fig. 1A) dark brown to brownish black. Setae on thorax brownish black. Coxae and trochanters dark yellow; femora and tibiae yellow; tarsi yellow with terminal segments darkened. Setae on legs brown. Wing (Fig. 1E) tinged with brownish yellow, base and costal field conspicuously light yellow. Stigma oval, dark brown; a scarcely apparent brown seam on anterior cord; wing tip narrowly darkened; darkened area over basal portions of CuA, CuP and A<sub>1</sub>. Veins pale brown, yellow in yellow areas and darker in clouded areas. Venation: Sc ending near fork of Rs, sc-r at its tip; distance between tips of R<sub>4</sub> and R<sub>5</sub> slightly longer than distance between tips of R<sub>1</sub> and R<sub>4</sub>; cell dm about 1.5 times as long as wide; m-cu close to or just beyond fork of M. Halter pale yellow.

Abdomen (Fig. 1A). Dark brown with tergites slightly paler. Setae on abdomen brown.

Hypopygium (Fig. 2). Brownish yellow. Posterior margin of tergite 9 with a broad U-shaped emargination (Fig. 2A). Gonocoxite conical with brown setae, setae on inner side slender and denser (Figs 2A–B). Outer gonostylus slightly curved with subtip slightly expanded; tip blackened and bispinous, outer spine small, inner spine large and bent ventrally (Figs 2A–

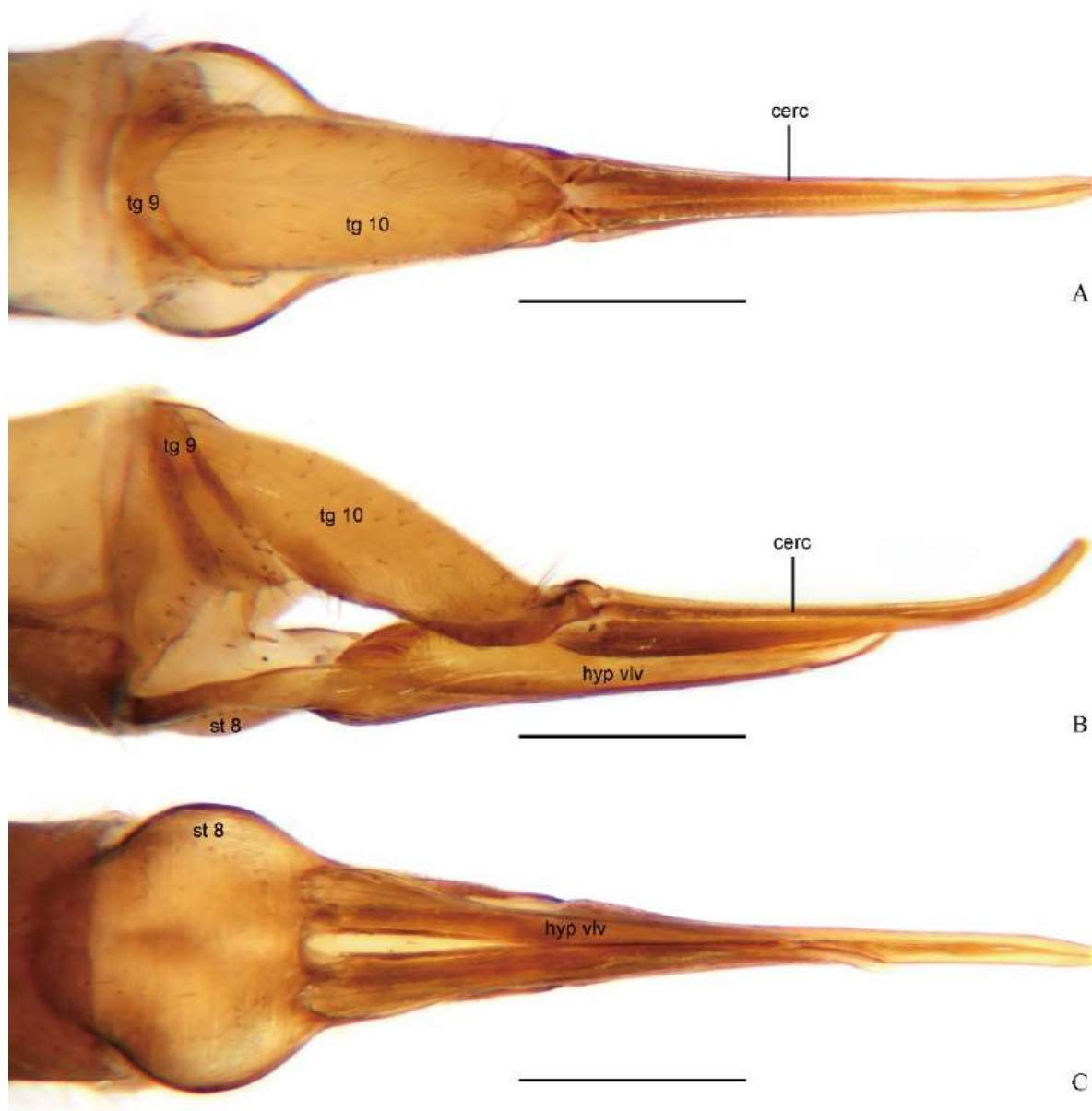


Figure 3. *Helius* (*Helius*) *franckianus* Alexander, 1940. A. Female ovipositor, dorsal view; B. Female ovipositor, lateral view; C. Female ovipositor, ventral view. Scale bars = 0.5 mm.



B, E). Inner gonostylus curved with basal 1/3 expanded and tip pale (Figs 2A–B, E). Aedeagal complex with semen pump spherical (Figs 2C–D), ejaculatory apodeme elongated with base widened (Figs 2C–D); aedeagus rod-shaped with tip bent dorsally (Figs 2A–D). Parameres fused forming flattened transverse plate with short basal and apical parts, tip of apical part bent dorsally (Figs 2C–D). Interbase oval; laterally producing into a narrow, apically acute outgrowth, beak-shaped in lateral aspect (Figs 2C–D, F–G).

Female. Body length 11.1–12.2 mm (excluding rostrum), wing length 8.0–8.8 mm, rostrum length 0.7–0.8 mm, antenna length 1.3–1.4 mm. Generally similar to male by body coloration. Ovipositor (Fig. 3): tergite 9 brown with two sides darker, tergite 10 dark brownish yellow with caudal edge darker; sternite 8 dark brownish yellow two lateral edges brownish black; cercus dark brown gradually to brownish yellow, distal part curved dorsally; hypogynial valve dark brown, tip reaching approximately 3/5 of cercus.

Material examined. 2♂2♀ (LHEL002A01–LHEL002A04), China: Sichuan Province, Emeishan City, Mt. Emei, Jingshui (29°35'56"N, 103°20'47"E, 710 m), 2015.VIII.20, Xiao Zhang, light trap.

Distribution. Sichuan (Emeishan).

Remarks. Alexander (1940a) firstly described this species based on a male from Sichuan, China and provided figures of the wing and male hypopygium for this species. In this study, the description and illustration for female are provided for the first time. In addition, more detailed description and illustration for male hypopygium are also provided.

***Helius (Helius) pallidissimoides* Xu, Ma & Zhang, sp. nov.** (Figs 4–5)

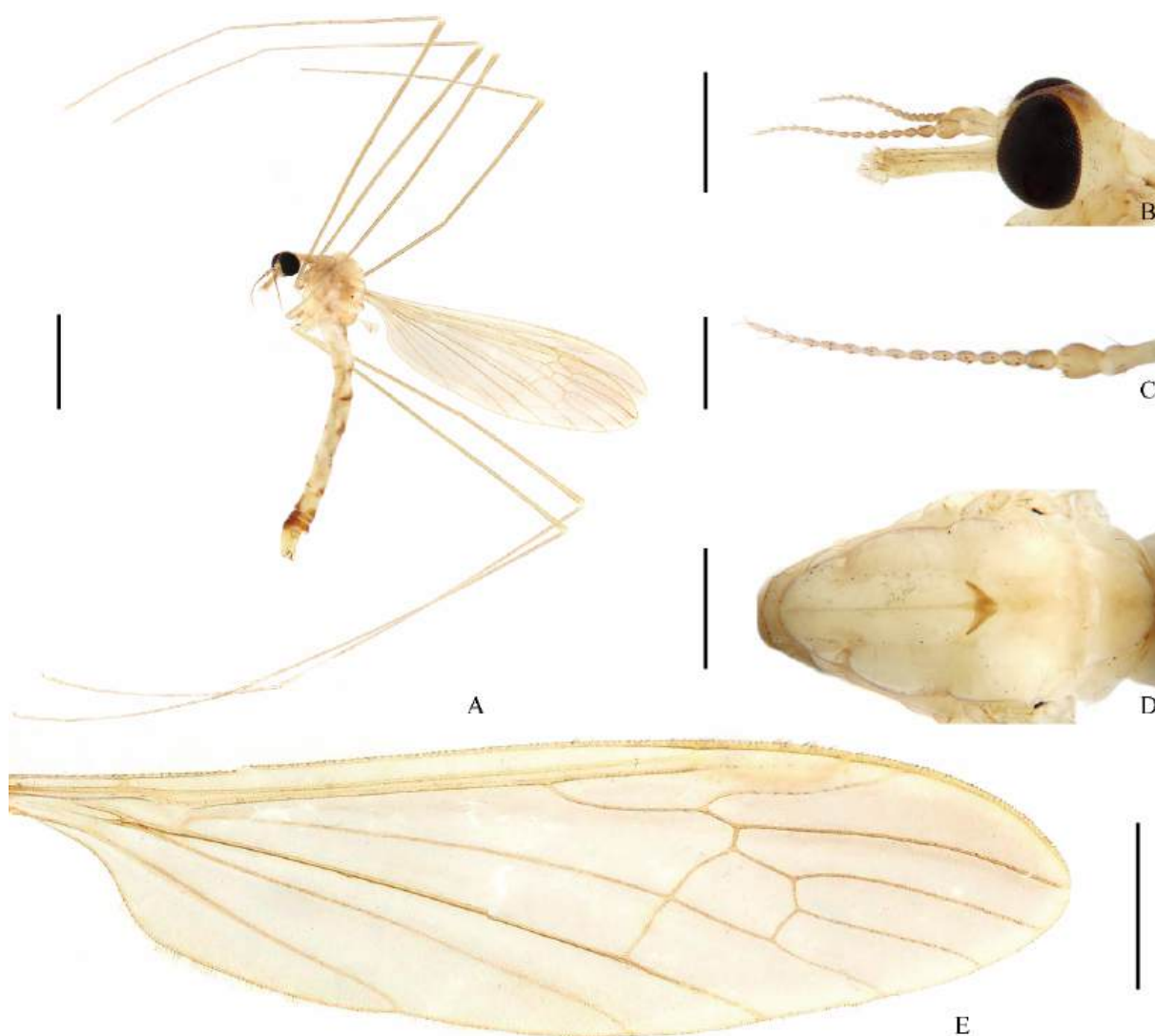


Figure 4. *Helius (Helius) pallidissimoides* Xu, Ma & Zhang, sp. nov. A. Habitus of male, lateral view; B. Head, lateral view; C. Antenna; D. Thorax, dorsal view; E. Wing. Scale bars: A = 2.0 mm; B, D = 0.5 mm; C = 0.2 mm; E = 1.0 mm.

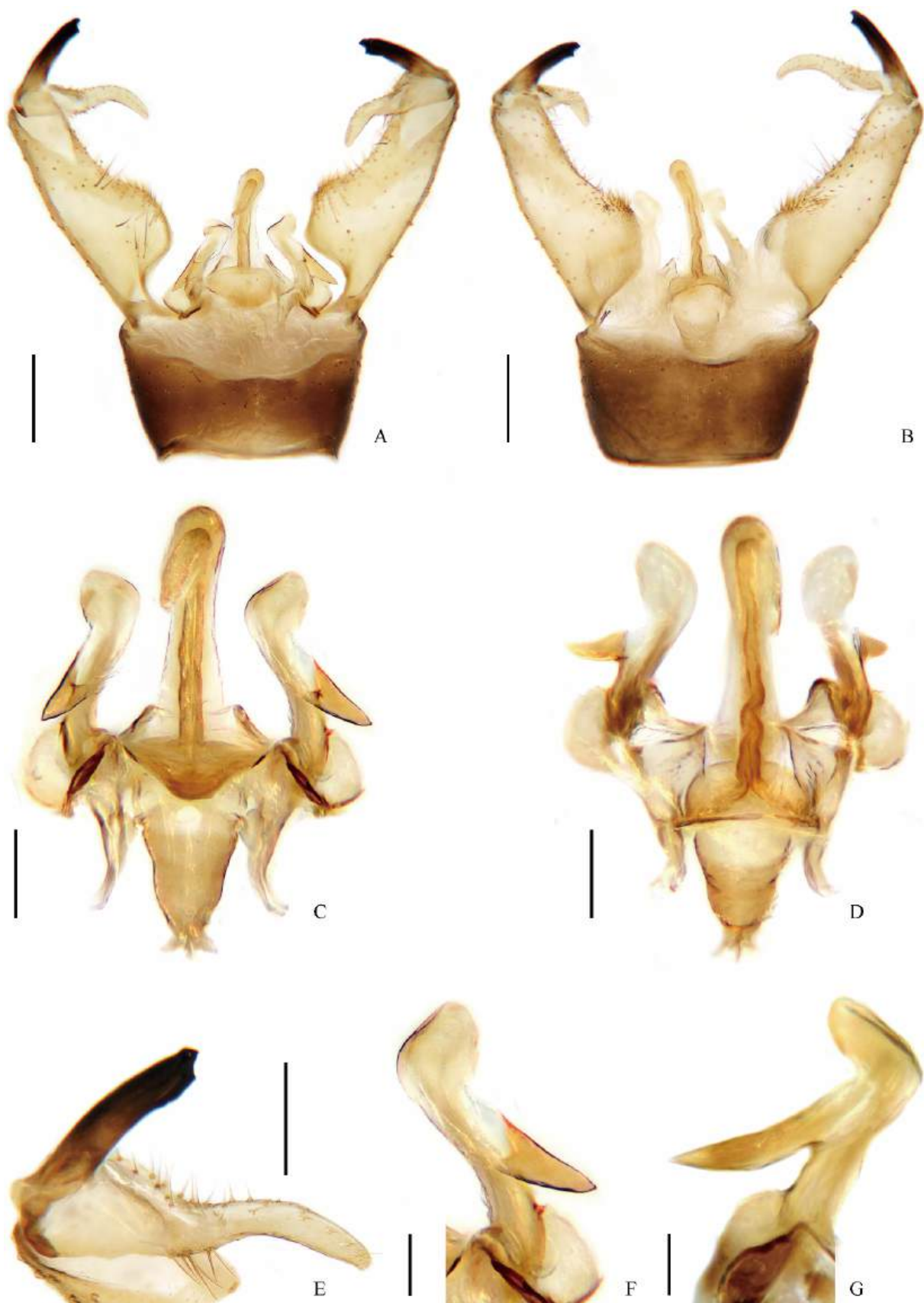


Figure 5. *Helius (Helius) pallidissimoides* Xu, Ma & Zhang, **sp. nov.** A. Male hypopygium, dorsal view; B. Male hypopygium, ventral view; C. Aedeagal complex, dorsal view; D. Aedeagal complex, ventral view; E. Gonostyli, dorsal view; F. Interbase, dorsal view; G. Interbase, lateral view. Scale bars: A–B=0.2 mm; C–E=0.1 mm; F–G=0.05 mm.

**Diagnosis.** Antenna with flagellomeres oval, apically tapering and elongated. Rostrum nearly as long as remainder of head. Prescutum and presutural scutum yellow with a very narrow darkened median line. Pleuron yellow to brownish yellow. Wing with stigma indistinct, pale yellow. Distance between tips of  $R_4$  and  $R_5$  about four times as long as distance between tips of  $R_1$  and  $R_4$ . Tip of outer gonostylus bispinuous, inner spine smaller. Interbase oval, tip significantly expanded laterally; laterally producing into a narrow, apically acute outgrowth.

**Description.** Male. Body length 7.5–7.6 mm (excluding rostrum), wing length 6.5–6.7 mm, rostrum length 0.4–0.5 mm, antenna length 0.9–1.0 mm.

**Head** (Fig. 4B). Pale brownish yellow with vertex dark brown. Setae on head dark brown. Antenna (Fig. 4C) brown with scape paler. Scape long cylindrical with tip slightly expanded, about 2.5 times as long as wide. Pedicel oval. Flagellomeres oval, apically tapering and elongated, with unilaterally arranged dark brown verticils; verticils on outer flagellomeres long, subequal in length to or slightly longer than corresponding flagellomere. Rostrum nearly as long as remainder of head, brownish yellow with dark brown setae. Palpus brownish yellow with brown setae.

**Thorax** (Fig. 4D). Pronotum pale brown. Prescutum and presutural scutum yellow with a very narrow darkened median line. Postsutural scutum pale yellow with middle area darker. Scutellum pale yellow with middle area darker. Mediotergite yellow with two sides of base paler. Pleuron (Fig. 4A) yellow to brownish yellow. Setae on thorax dark brown. Fore coxa pale brownish yellow, mid and hind coxae yellow; trochanters yellow; remainder of legs pale brownish yellow. Setae on legs brown. Wing (Fig. 4E) tinged with pale brownish yellow, costal field slightly light yellow. Stigma indistinct, pale yellow. Veins yellow to brownish yellow. Venation: Sc ending just before fork of  $R_s$ , sc-r at its tip; distance between tips of  $R_4$  and  $R_5$  about four times as long as distance between tips of  $R_1$  and  $R_4$ ; cell dm about 1.5 times as long as wide; m-cu close to or just beyond fork of M. Halter yellow with knob paler.

**Abdomen** (Fig. 4A). Tergite 1 dark brown; sternite 1 pale yellow. Segment 2–7 pale brownish yellow with caudal areas dark brown. Segment 8–9 dark brown. Setae on abdomen dark brown.

**Hypopygium** (Fig. 5). Pale brownish yellow. Posterior margin of tergite 9 with a broad and shallow U-shaped emargination (Fig. 5A). Gonocoxite cylindrical with base slightly expanded. Setae on gonocoxite dark brown; shorter, slender and denser on inner side (Figs 5A–B). Outer gonostylus slightly curved with subtip slightly expanded; tip blackened and bispinuous, inner spine smaller (Figs 5A–B, E). Inner gonostylus curved with basal half expanded (Figs 5A–B, E). Aedeagal complex with semen pump inverted pear-shaped (Figs 5C–D), ejaculatory apodeme very short and stout with tip trifurcated (Figs 5C–D); aedeagus rod-shaped with tip curled dorsally (Figs 5A–D). Parameres fused forming flattened transverse plate with long basal and apical parts, tip of apical part bent dorsally (Figs 5C–D). Interbase oval, tip significantly expanded laterally; laterally producing into a narrow, apically acute outgrowth (Figs 5C–D, F–G).

**Female.** Unknown.

**Type material.** Holotype ♂ (TYPE003B01), China: Sichuan Province, Emeishan City, Mt. Emei, Linggongli (29°34'58"N, 103°17'24"E), 2016.V.21, Zehui Kang. Paratypes. 1♂ (TYPE003B02), same data as holotype. 1♂ (TYPE003B03), China: Sichuan Province, Emeishan City, Mt. Emei, Qingyinge (29°34'27"N, 103°23'30"E), 2016.V.20, Zehui Kang.

**Distribution.** Sichuan (Emeishan).

**Etymology.** The name of the new species refers to *H. (H.) pallidissimus* Alexander, 1930, as the two species are very similar morphologically.

**Remarks.** This new species is similar to *H. (H.) pallidissimus* from China by having a similar pale body coloration, but can be separated by the basal flagellomeres being oval (Fig. 4C), the femora, tibiae and tarsi of the legs being uniformly pale brownish yellow (Fig. 4A), and the tip of the interbase being significantly expanded laterally with an apically acute outgrowth (Figs 5C–D, F–G). In *H. (H.) pallidissimus*, the basal flagellomeres are short and crowded (Fig. 6C), the femora, tibiae and tarsi of the legs gradually change from yellow to brownish yellow (Fig. 6A), and the tip of the interbase is slightly expanded with an apically blunt outgrowth (Figs 7C–D, F–G).

### ***Helius (Helius) pallidissimus* Alexander, 1930 (Figs 6–8)**

*Helius (Helius) pallidissimus* Alexander, 1930b: 515. Type locality: China, Sichuan, Mt. Emei.

**Diagnosis.** Antenna with basal flagellomeres short and crowded. Rostrum about 1.4 times as long as remainder of head. Prescutum and presutural scutum pale yellow with anterior area paler. Pleuron pale yellow to yellow. Wing with distance between tips of  $R_4$  and  $R_5$  about 2.5 times as long as distance between tips of  $R_1$  and  $R_4$ . Tip of outer gonostylus bispinuous, outer spine slightly smaller. Interbase oval, tip slightly expanded; laterally producing into a narrow, apically blunt outgrowth, hook-like in lateral aspect.

**Description.** Male. Body length 6.5–6.9 mm (excluding rostrum), wing length 6.1–6.5 mm, rostrum length 0.6–0.7 mm,



antenna length 1.4–1.5 mm.

Head (Fig. 6B). Light gray with dark brown setae. Antenna (Fig. 6C) with scape pale yellow, pedicel brown and flagellomeres brownish black. Scape long cylindrical, three times as long as wide. Pedicel oval, tip slightly expanded. Basal flagellomeres short and crowded with unilaterally arranged dark brown verticils; outer flagellomeres long, apically tapering and elongated, with long dark brown verticils that longer than corresponding flagellomere. Rostrum about 1.4 times as long as remainder of head, pale brownish yellow with pale brown setae. Basal segments of palpus pale brownish yellow with tips darker, terminal segment brown with tip darker. Setae on palpus dark brown.

Thorax (Fig. 6D). Pronotum pale yellow. Prescutum and presutural scutum pale yellow with anterior area paler. Postsutural scutum pale yellow with middle area darker. Scutellum pale yellow. Mediotergite dark brown with middle area slightly daker. Pleuron (Fig. 6A) pale yellow to yellow. Setae on thorax pale brown. Coxae and trochanters pale yellow; femora yellow; tibiae pale brownish yellow; tarsi brownish yellow with terminal segments darkened. Setae on legs brown. Wing (Fig. 6E) tinged with yellow. Veins pale yellow to yellow. Venation: Sc ending before fork of Rs, sc-r at its tip; distance between tips of R<sub>4</sub> and R<sub>5</sub> about 2.5 times as long as distance between tips of R<sub>1</sub> and R<sub>4</sub>; cell dm about twice as long as wide; m-cu from just before to just beyond fork of M. Halter pale yellow.

Abdomen (Fig. 6A). Yellow to brownish yellow with pale brown setae.

Hypopygium (Fig. 7). Pale brown. Posterior margin of tergite 9 with a broad V-shaped emargination (Fig. 7A). Gonocoxite cylindrical with base slightly expanded. Setae on gonocoxite brown; shorter, slender and denser on inner side

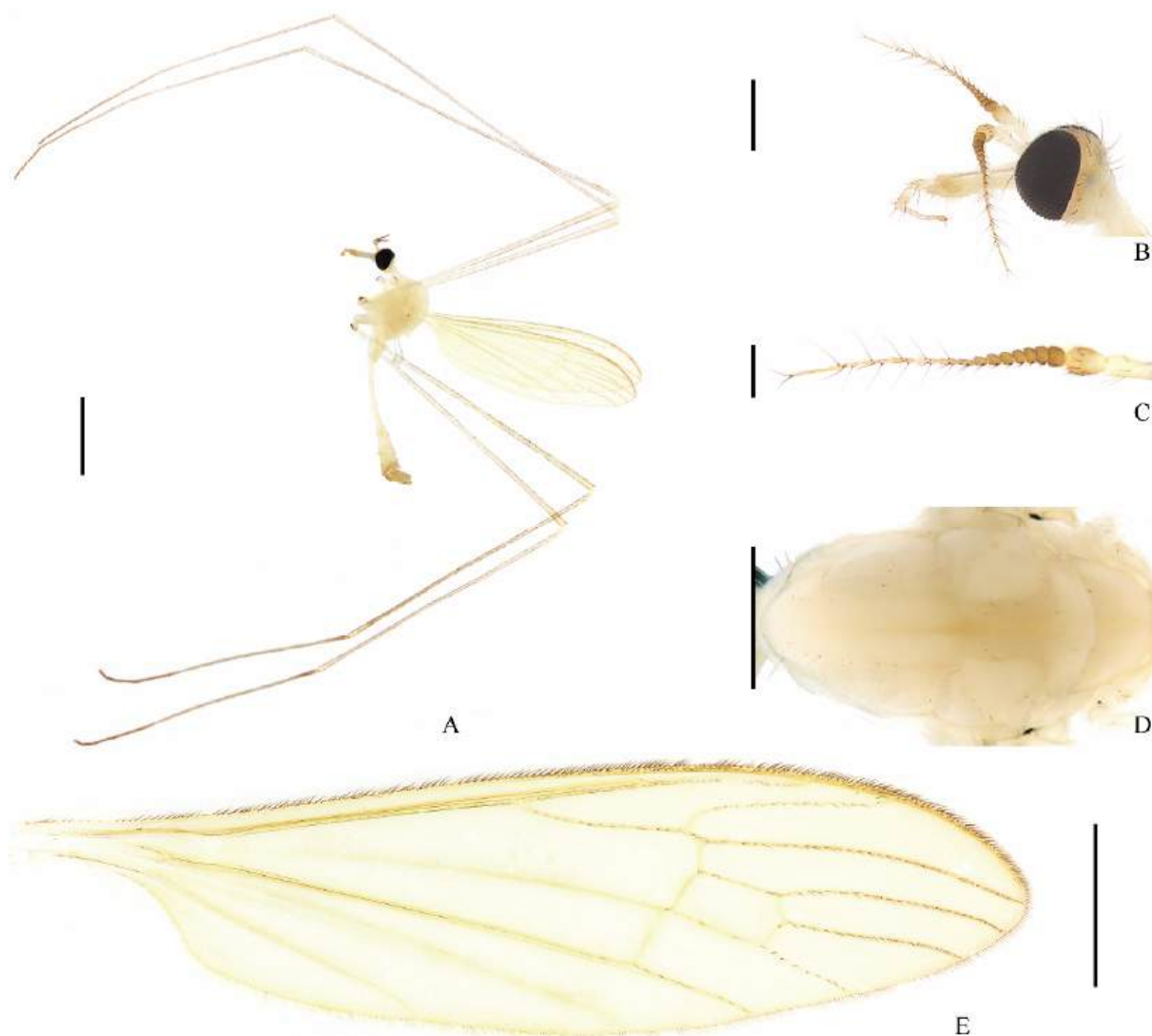


Figure 6. *Helius (Helius) pallidissimus* Alexander, 1930. A. Habitus of male, lateral view; B. Head, lateral view; C. Antenna; D. Thorax, dorsal view; E. Wing. Scale bars: A = 2.0 mm; B, D = 0.5 mm; C = 0.2 mm; E = 1.0 mm.

(Figs 7A–B). Outer gonostylus slightly curved with subtip slightly constricted; tip blackened and bispinous, outer spine slightly smaller (Figs 7A–B, E). Inner gonostylus curved with basal 2/3 expanded (Figs 7A–B, E). Aedeagal complex with semen pump oval (Figs 7C–D), ejaculatory apodeme short and stout (Figs 7C–D); aedeagus rod-shaped with tip curled dorsally (Figs 7A–D). Parameres fused forming flattened transverse plate with short basal and apical parts, tip of apical part bent dorsally (Figs 7C–D). Interbase oval, tip slightly expanded; laterally producing into a narrow, apically blunt outgrowth, hook-like in lateral aspect (Figs 7C–D, F–G).

Female. Body length 7.3–7.7 mm (excluding rostrum), wing length 6.7–7.0 mm, rostrum length 0.5–0.6 mm, antenna

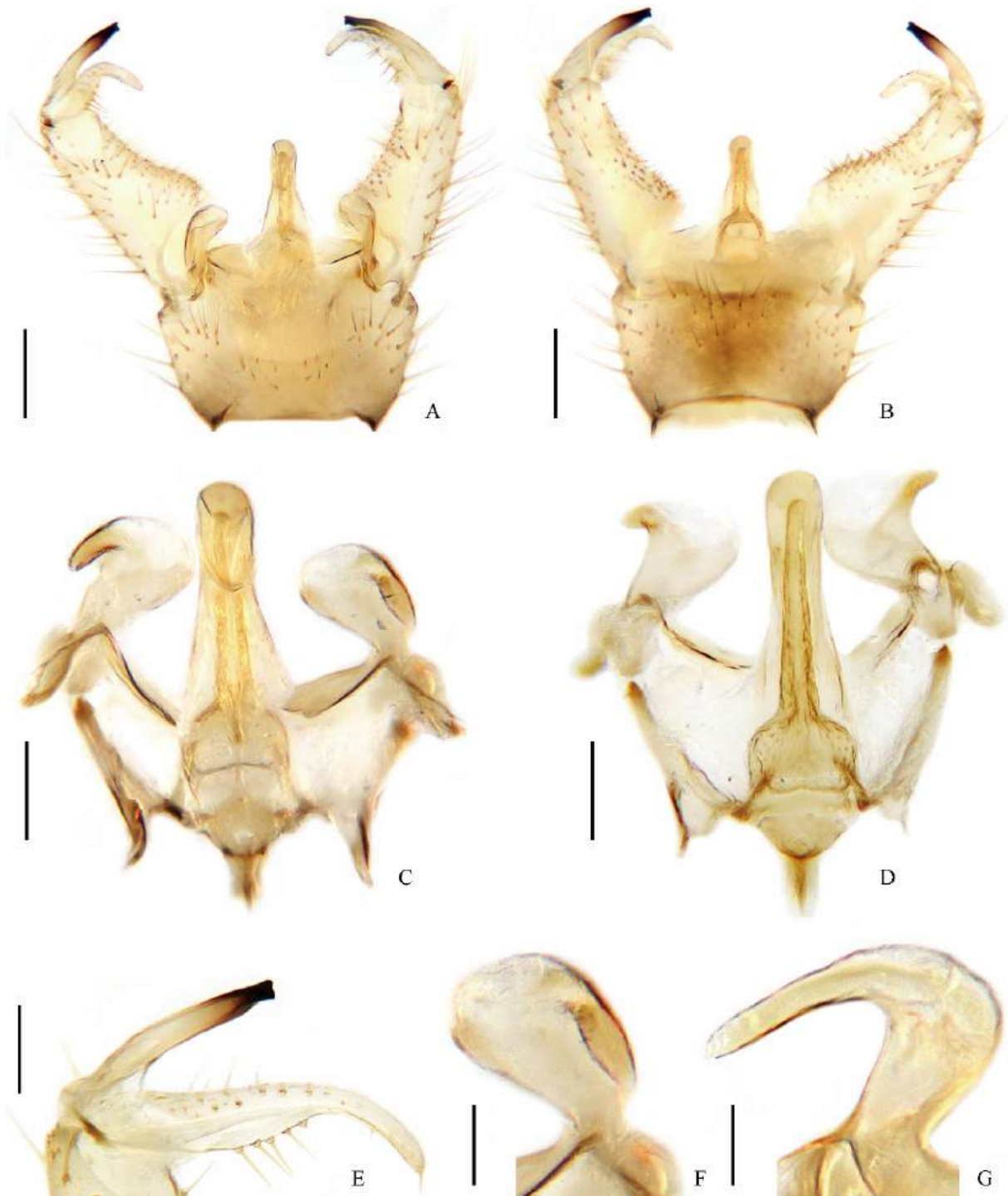


Figure 7. *Helius (Helius) pallidissimus* Alexander, 1930. A. Male hypopygium, dorsal view; B. Male hypopygium, ventral view; C. Aedeagal complex, dorsal view; D. Aedeagal complex, ventral view; E. Gonostyli, dorsal view; F. Interbase, dorsal view; G. Interbase, lateral view. Scale bars: A–B=0.2 mm; C–E=0.1 mm; F–G=0.05 mm.

length 1.0–1.1 mm. Generally similar to male by body coloration. Ovipositor (Fig. 8): tergite 9 yellow with middle area darker, tergite 10 yellow; sternite 8 yellow; cercus yellow to brownish yellow, distal part curved dorsally; hypogynial valve brownish yellow with middle of base paler, tip reaching approximately middle of cercus.

Material examined. 2♂2♀ (LHEL002B01–LHEL002B04), China: Sichuan Province, Chongzhou City, Anzihe Nature Reserve, Shaoyaogou Protection Station (30°48'08"N, 103°12'58"E, 1434 m), 2016.VII.30, Yuqiang Xi, light trap. 2♂ (LHEL002B05–LHEL002B06), China: Sichuan Province, Chongzhou City, Anzihe Nature Reserve, Shaoyaogou Protection Station (30°47'59"N, 103°13'05"E, 1450 m), 2016.VII.31, Yuqiang Xi, light trap.

Distribution. Sichuan (Emeishan, Chongzhou).

Remarks. Alexander (1930b) firstly described this species based on two females from Sichuan, China and provided figure of the wing for this species. In this study, the description and illustration for male are provided for the first time. In addition, more detailed description and illustration for female ovipositor are also provided.



Figure 8. *Helius (Helius) pallidissimus* Alexander, 1930. A. Female ovipositor, dorsal view; B. Female ovipositor, lateral view; C. Female ovipositor, ventral view. Scale bars=0.5 mm.

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