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Research article

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New insights into Chinese fungus gnats: description and molecular identification of *Falakia* gen. nov. (Diptera: Sciaridae) with six new species

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Abstract. *Falakia* gen. nov. (type species: *Falakia galactica* gen. et sp. nov.) is described. The genus is close to *Hirtipennia* Mohrig & Menzel, 1997 and *Sciara* Meigen, 1803, and includes six new species: *F. bicolor* gen. et sp. nov., *F. craniata* gen. et sp. nov., *F. galactica* gen. et sp. nov., *F. obscura* gen. et sp. nov., *F. varia* gen. et sp. nov., and *F. xizangensis* gen. et sp. nov. The Palearctic *Sciara flavomarginata* (Mohrig & Mamaev, 1982) and *Sciara modesta* (Winnertz, 1867) are transferred to *Falakia*, whereas *Trichosia longisetosa* Yang, Zhang & Yang, 1998 syn. nov. is now considered a synonym of *Falakia modesta* (Winnertz, 1867) gen. et comb. nov. The identification of these species is supported by both morphological characters and sequence data obtained from cytochrome oxidase subunit one (COI) in the DNA barcode analysis. Furthermore, a worldwide checklist and a key to the currently known eight species of *Falakia* is provided.

Keywords. Checklist, DNA barcoding, key, new species, taxonomy.

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Introduction

The genus *Trichosia* was introduced by Winnertz (1867) for three new species with macrotrichia on the wing membrane: *T. splendens* Winnertz, 1867, *T. absurda* Winnertz, 1867 and *T. modesta* Winnertz, 1867. The latter one, which is important to this study, was transferred to the genus *Sciara* Meigen, 1803 by Tuomikoski (1960) renaming it *Sciara mendax* (Tuomikoski, 1960) due to a secondary homonymy with *Sciara modesta* Staeger, 1840. Later, Mohrig & Menzel (1997) described *Hirtipennia* Mohrig & Menzel, 1997 as a subgenus of *Leptosciarella* Tuomikoski, 1960 to combine four species whose wing membrane is mostly covered with macrotrichia and whose antennal flagellar segments have a bottleneck-shaped

neck as in *Sciara*. The authors suspected a possibly closer relationship with *Sciara* as more species became known. Vilkamaa (2003) was the first to treat *Hirtipennia* as a distinct genus and Rudzinski (2005) agreed with that. Arthofer *et al.* (2021) who used two mitochondrial DNA markers (CO1, 16S) pointed out the close genetic vicinity between *Leptosciarella hirtipennis* (Zetterstedt, 1838) and *Sciara hebes* (Loew, 1869) [= *Sciara mendax*] and combined the latter in the genus *Hirtipennia*. The species epithet, "*modesta*" had priority over the younger synonym "*hebes*", because the secondary homonymy with *Sciara modesta* Staeger, 1840 [= *Hemineurina modesta* (Staeger, 1840)] was set aside as soon as the species was transferred from genus *Sciara*. We discovered six species from China, and two species from other Palaearctic regions, which are genetically and morphologically very close to *Sciara hebes* but differ notably from the type species of *Sciara* (*Sciara hemerobioides* Scopoli, 1763). These species differ also from the species included in *Hirtipennia*, for example in lacking the apical tooth of gonostylus, and are included in the newly described genus *Falakia* gen. nov. In addition, we are hereby applying the name *Trichosiopsis* Tuomikoski, 1960 instead of *Leptosciarella*, because it takes priority being published in the same work, but at a higher rank (Heller & Rulik in prep.).

Material and methods

Taxon sampling and processing

The fresh specimens were collected by sweep-net and/or Malaise traps, and preserved in small tubes containing 85% ethanol with tight-fitting caps to reduce evaporation. Every tube was labelled with either a temporary or a permanent label. The head, wings, legs, and genitalia were dissected and mounted on microscope slides in Euparal, while the thorax and abdomen were used for DNA extraction. Each slide was labelled with a sample identification number (sample ID).

Morphological observations, photography, and illustrations

Dissections and slides preparation were performed under a SDPTOP SZMN-7045 stereo microscope. The specimens were observed, measured, and photographed using a camera fitted KEYENCE VHX-6000 digital microscope (Keyence Corporation, Japan). All figures and photographs were edited using Adobe Photoshop 2025. The morphological terminology principally follows that from Hippa *et al.* (2010). This study focused solely on males, as because all species concepts in *Falakia* gen. nov. are primarily based on male morphology, whereas females are generally not identified at the species level. The specimens of *Falakia galactica* gen. et sp. nov. are deposited at Zoologisches Forschungsmuseum Koenig (ZFMK), Bonn, Germany. All other Chinese specimens of this study are deposited at the Institute of Forest Protection, Zhejiang A&F University (ZAFU), Hangzhou, Zhejiang Province, China, whereas their DNA extracts are deposited at the Canadian Centre for DNA Barcoding, Biodiversity Institute of Ontario (CCDB).

Institutional abbreviations

ZAFU = Institute of Forest Protection, Zhejiang A&F University, Hangzhou, China
ZFMK = Zoologisches Forschungsmuseum Koenig, Bonn, Germany

Morphological abbreviations

bM = base of medial vein
C = costal vein
c = distance between apex of R_{4+5} and end of costal vein
CuA_1 = first branch of anterior cubital vein
CuA_2 = second branch of anterior cubital vein
CuB = posterior cubital vein.
M_1 = first branch of media

M_2 = second branch of media
M-fork = branches of medial vein
R = radius or radial vein
R_1 = anterior branch of radius
R_{4+5} = third branch of radius
r-m = radial medial crossvein
Rs = radial sector
Sc = subcostal vein
stM = fused first and second branch of media
w = distance between apex of R_{4+5} and apex of M_1

Other abbreviations

BIN = Barcode Index Number
BOLD = Barcode of Life Data System
CCDB = Canadian Centre for DNA Barcoding, Biodiversity Institute of Ontario.
COI = Cytochrome c oxidase subunit I
NE = Nearctic region
OR = Oriental region
PA = Palearctic region

DNA extraction, PCR amplification, and DNA barcoding

Genomic DNA extraction and PCR amplification were performed on a single individual of each available species by the Canadian Centre for DNA Barcoding, Biodiversity Institute of Ontario (CCDB), following the standard protocols (deWaard *et al*. 2008). The COI gene sequences generated in this study were uploaded to the Barcode of Life Data System (BOLD; https://v4.boldsystems.org/) (Ratnasingham & Hebert 2007, 2013). All sequences used in the present study are included in the dataset DS-HIRTIPCN, that can be accessed at: https://bench.boldsystems.org/index.php/MAS_Management_DataConsole?codes=DS-HIRTIPCN. The sample IDs of new COI gene sequences, as well as the sequences obtained from BOLD systems used in this study, are provided in Table 1.

Sequence alignment and phylogenetic analysis

A total of 66 mitochondrial COI gene sequences, including 57 of the currently available eight species of *Falakia* gen. nov. and one not-studied BIN as ingroup, and eight mitochondrial COI gene sequences of the five different genera with six species as outgroup, downloaded from BOLD, were used in this study. All sequences were aligned with multiple sequence alignment in BOLD. For species delimitation, the intraspecific and interspecific genetic distances were calculated using the Kimura-2-Parameter (K2P) model (Kimura 1980) in MEGA11 (Tamura *et al.* 2021). For generating the neighbour-joining (NJ) tree (Saitou & Nei 1987) MEGA11 under the Kimura-2-Parameter (K2P) model was used. Other parameters were kept at default settings. The finalized tree was visualized and edited using FigTree ver. 1.4.3 (Rambaut 2016), Adobe Acrobat Pro DC (ver. 2021.007.20095), and Adobe Photoshop 2023, respectively.

Table 1 (continued on next page). List of specimens used in the present phylogenetic analyses (Fig. 1) based on the DNA barcodes (COI). All the sequences could be obtained from the Barcode of Life Data System (BOLD), the ones not generated in this study are highlighted in blue.

Species	Locality	BIN BOLD	Sample ID
Falakia bicolor gen. et sp. nov.	China: Xizang	AEG6821	ZAFUXZ1081
Falakia craniata gen. et sp. nov.	China: Sichuan	AEG3603	ZAFUSC195
Falakia craniata gen. et sp. nov.	China: Sichuan	AEG3603	ZAFUSC292
Falakia craniata gen. et sp. nov.	China: Sichuan	AEG3603	ZAFUSC312
Falakia galactica gen. et sp. nov.	China: Zhejiang	ADJ8571	ZFMK-TIS-2599026
Falakia galactica gen. et sp. nov.	China: Zhejiang	ADJ8571	ZFMK-TIS-2602324
Falakia modesta stat. nov.	Canada	AAM9253	BIOUG55445-F03
Falakia modesta stat. nov.	Norway	AGN9699	bf-sci-00539
Falakia modesta stat. nov.	United States	AGN9701	BIOUG50454-E07
Falakia modesta stat. nov.	China: Zhejiang	AGN9700	LW-XG332
Falakia modesta stat. nov.	China: Zhejiang	AGN9700	LW-XG379
Falakia modesta stat. nov.	China: Shaanxi	AGN9700	SXMH-583
Falakia modesta stat. nov.	China: Shaanxi	AGN9700	BIOUG14138-G03
Falakia modesta stat. nov.	China: Zhejiang	AGN9700	LW-XG696
Falakia modesta stat. nov.	China: Shaanxi	AGN9700	SXMH-560
Falakia modesta stat. nov.	China: Shaanxi	AGN9700	BIOUG14462-G03
Falakia modesta stat. nov.	China: Zhejiang	AGN9700	LW-QMT327
Falakia modesta stat. nov.	China: Zhejiang	AGN9700	TMM-903
Falakia modesta stat. nov.	China: Shaanxi	AGN9700	SXMH-212
Falakia modesta stat. nov.	China: Zhejiang	AGN9700	LW-QMT161
Falakia modesta stat. nov.	China: Zhejiang	AGN9700	LW-XG149
Falakia modesta stat. nov.	China: Zhejiang	AGN9700	LW-XG695
Falakia modesta stat. nov.	China: Zhejiang	AGN9700	LW-XG710
Falakia modesta stat. nov.	China: Zhejiang	AGN9700	LW-XG759
Falakia modesta stat. nov.	China: Zhejiang	AGN9700	LW-QMT183
Falakia modesta stat. nov.	China: Zhejiang	AGN9700	LW-XG500
Falakia modesta stat. nov.	China: Shaanxi	AGN9700	BIOUG14065-G10
Falakia modesta stat. nov.	China: Shaanxi	AGN9700	BIOUG14117-A02
Falakia modesta stat. nov.	China: Zhejiang	AGN9700	LW-XG568
Falakia modesta stat. nov.	China: Shaanxi	AGN9700	BIOUG14117-C09
Falakia modesta stat. nov.	China: Zhejiang	AGN9700	LW-XG925
Falakia modesta stat. nov.	China: Shaanxi	AGN9700	BIOUG14118-B06
Falakia modesta stat. nov.	China: Zhejiang	AGN9700	SXMH-958
Falakia modesta stat. nov.	China: Shaanxi	AGN9700	BIOUG14118-H03
Falakia modesta stat. nov.	China: Shaanxi	AGN9700	BIOUG14239-H01
Falakia modesta stat. nov.	China: Zhejiang	AGN9700	LW-XG575
Falakia modesta stat. nov.	China: Zhejiang	AGN9700	LW-XG402
Falakia modesta stat. nov.	China: Zhejiang	AGN9700	LW-XG406
Falakia modesta stat. nov.	China: Shaanxi	AGN9700	BIOUG14117-B12

Table 1 (continued).

Species	Locality	BIN BOLD	Sample ID
Falakia obscura gen. et sp. nov.	China: Sichuan	AEJ9230	ZAFUSC867
Falakia varia gen. et sp. nov.	China: Sichuan	AEB8462	ZAFUSC777
Falakia varia gen. et sp. nov.	China: Sichuan	AEB8462	ZAFUSC778
Falakia varia gen. et sp. nov.	China: Zhejiang	AEB8462	LW-XG520-2
Falakia varia gen. et sp. nov.	China: Zhejiang	AEB8462	LW-QMT339
Falakia varia gen. et sp. nov.	China: Zhejiang	AEB8462	LW-QMT359
Falakia varia gen. et sp. nov.	China: Zhejiang	AEB8462	LW-QMT366
Falakia varia gen. et sp. nov.	China: Zhejiang	AEB8462	TMM-275
Falakia varia gen. et sp. nov.	China: Zhejiang	AEB8462	TMM-162
Falakia varia gen. et sp. nov.	China: Zhejiang	AEB8462	LW-XG480
Falakia varia gen. et sp. nov.	China: Zhejiang	AEB8462	LW-XG519
Falakia varia gen. et sp. nov.	China: Zhejiang	AEB8462	LW-XG773
Falakia varia gen. et sp. nov.	China: Zhejiang	AEB8462	LW-XG794
Falakia varia gen. et sp. nov.	China: Zhejiang	AEB8462	LW-XG799
Falakia varia gen. et sp. nov.	China: Zhejiang	AEB8462	LW-XG442
Falakia varia gen. et sp. nov.	China: Zhejiang	AEB8462	LW-XG446
Falakia xizangensis gen. et sp. nov.	China: Xizang	AEG1937	ZAFUXZ978
Not studied	China	ACD6711	JQ345006
Outgroup			
Hirtipennia hirtipennis (Zetterstedt, 1838)	Sweden	ACM3117	SL79_B12
Hirtipennia hirtipennis (Zetterstedt, 1838)	Norway	ACM3117	TSZD-JKJ-103912
Hirtipennia holotricha (Mohrig & Menzel, 1997)	Germany	ADR3348	BIOUG42784-D01
Hirtipennia holotricha (Mohrig & Menzel, 1997)	Norway	ADR3348	bf-sci-01677
Trichosiopsis scutellata (Staeger, 1840)	Canada	ACD1218	BIOUG37031-A02
Leptospina dentata (Mohrig & Krivoshina, 1979)	South Korea	ACD5220	JQ613843
Sciara hemerobioides (Scopoli, 1763)	Sweden	ACQ8933	TSZD-JKJ-108632
Trichosiopsis tuberculigera Tuomikoski, 1960	Norway	ACU4750	bf-sci-01521

Results

Taxonomy

Class Insecta Linnaeus, 1758
Order Diptera Linnaeus, 1758
Superfamily Sciaroidea Billberg, 1820
Family Sciaridae Billberg, 1820

Genus ***Falakia*** gen. nov.
urn:lsid:zoobank.org:act:DFD87DA3-CAED-4A62-859D-2675838342B8

Type species

Falakia galactica gen. et sp. nov., here designated.

Diagnosis

Medium-sized, mostly colourful species. Antennal flagellomeres bottle-neck-like as in *Sciara* and *Hirtipennia*. Wing membrane mostly covered with macrotrichia. Gonostylus without apical tooth, and with a group of 3–7 spines arranged in various patterns on a distinct dorsal lobe.

Etymology

This genus is named in honour of the late Mr Falak Shah (Manki, Swabi, Khyber Pakhtunkhwa, Pakistan), father of the first author, in tribute to his unwavering sacrifices in supporting the first author's education, despite financial hardships.

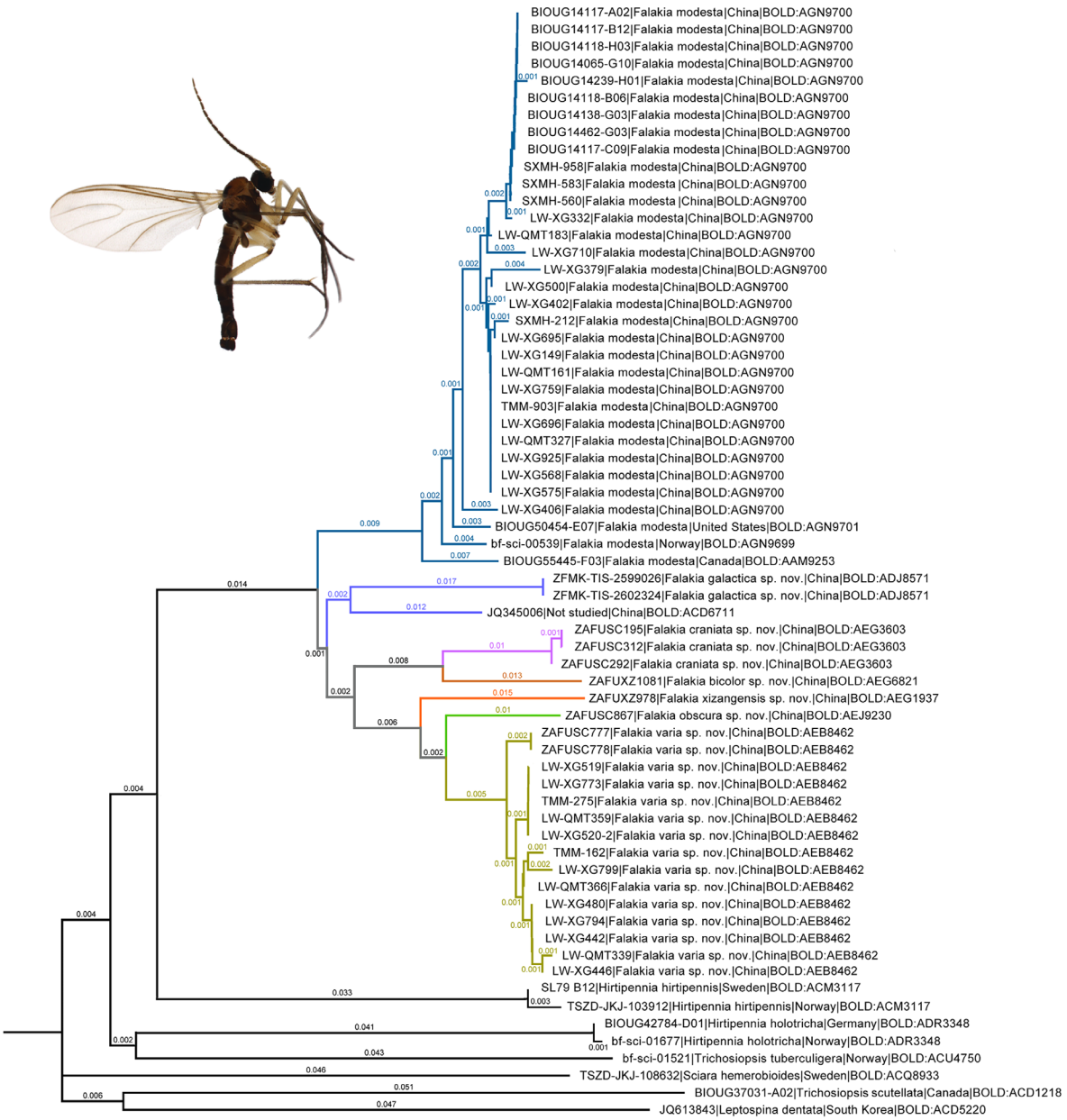

Fig. 1. Neighbour-joining (NJ) tree of *Falakia* gen. nov. and related genera based on partial COI gene sequences (DNA barcode fragment). Numbers on branches represent branch lengths corresponding to K2P genetic distances (substitutions per site).

Description

Mostly bright species, only few with dark colour. Head generally brown or dark brown. Antenna typically yellowish brown with basal three flagellomeres yellow. Eye bridge 3–4 facets wide. Face and clypeus with few setae. Maxillary palpus long, 3-segmented; basal segment with several bristles. Fourth antennal flagellomere 2.85–3.66 times as long as wide; neck short, bottleneck-like; longest setae shorter than width of flagellomere. Postpronotum setose. Wing mostly large with width/length = 0.36–0.41; membrane almost completely covered with macrotrichia, Sc fainted, reaching the level of Rs; R_1 joining the C at or beyond the base of the M-fork; stM weakly visible; R, R_1, and R_{4+5} setose; M_1, M_2, CuA_1, and CuA_2 with macrotrichia. Haltere pale to yellowish brown, with long stem. Legs mostly yellowish; coxae darkened; femora and tibiae yellow to yellowish brown; fore tibia without noticeable spines; fore tibial spur usually longer than tibial width. Abdomen mostly setose. Hypopygium mostly brown; gonocoxite generally as long as or longer than gonostylus; inner side of gonocoxite mostly non-setose or rarely found short hairs. Gonostylus stout, without apical tooth; apex with short hairs, with a group of 3–7 spines (megasetae) arranged in various patterns on a dorsal lobe. Tegmen membranous, longer than wide. Aedeagal rod mostly long, with a fork, Y-shaped.

Distribution

Palearctic, Oriental, and Nearctic regions.

Remarks

The genus is closely related to *Hirtipennia* in having the wing membrane covered with macrotrichia and bottle-neck shaped antennal flagellomeres, but can be differentiated by lacking apical tooth at the gonostylus and having an extended dorsal lobe with a group of spines (megasetae). Both genera are sharing characters with *Sciara* by having the same kind of antennal flagellomeres, the wing with Sc extended to or beyond Rs, and no conspicuous spines on the tibia. Some species of *Sciara* also have macrotrichia on the wing membrane to a lesser extent, only a few have a more complete coverage. But species of *Sciara* are generally larger and often darker. In an unpublished phylogenetic analysis using whole mitogenomes on Sciaridae from China, *Falakia* gen. nov. came out in between different clades of *Sciara*. In order to keep the morphologically well-defined *Falakia* and *Hirtipennia* as distinct genera, the paraphyletic and species-rich genus *Sciara* will be split into new, defined species groups (Shah *et al*. in prep.), later to be treated as distinct genera.

World checklist of the species of *Falakia* gen. nov.

Falakia bicolor gen. et sp. nov. [OR, PA]
Falakia craniata gen. et sp. nov. [OR, PA]
Falakia flavomarginata (Mohrig & Mamaev, 1982) gen. et comb. nov. [PA]
Falakia galactica gen. et sp. nov. [OR, PA]
Falakia modesta (Winnertz, 1867) gen. et comb. nov., stat. nov. [NE, OR, PA]
Falakia obscura gen. et sp. nov. [OR, PA]
Falakia varia gen. et sp. nov. [OR, PA]
Falakia xizangensis gen. et sp. nov. [OR, PA]

Key to the known species of *Falakia* gen. nov.

1. Dark brown to black body coloration (Fig. 5A–B) 2
– Body partly yellowish or reddish (Fig. 2A) 3

2. Gonostylus with dorsal spines in 3 groups, completely covered behind the lobe, not visible in ventral view (Fig. 6F–G); wing membrane completely covered with macrotrichia (Fig. 6E) .... ***F. obscura*** gen. et sp. nov.

– Gonostylus with dorsal spines in 2 groups, partly covered behind the lobe, partially visible in ventral view (Fig. 5D–E); wing membrane with apical half covered by macrotrichia (Fig. 5H) ....***F. modesta*** (Winnertz, 1867) gen. et comb. nov., stat. nov.

3. Gonostylus very slender, finger-like (Fig. 4E–F) ..... ***F. galactica*** gen. et sp. nov.
– Not as above 4

4. Gonostylus with 3 subapical, short, nearly straight, spines on third dorsal lobe (Figs 2E–F, 3B–C) 5
– Gonostylus with 5–7 distinct, robust spines on dorsal lobe (Figs 7E–F, 8A–B) 6

5. Wing membrane with macrotrichia at apical two thirds; bM nearly as long as r-m (Fig. 2D). Gonostylus with three nearly straight subapical spines on an additional dorsal lobe (Fig. 2E–F). Tegmen with convex lateral margins and broadly round apex (Fig. 2E) ....***F. bicolor*** gen. et sp. nov.
– Wing membrane with macrotrichia at apical three quarters; bM longer than r-m (Fig. 3F). Gonostylus with three, nearly straight, subapical spines on the third dorsal lobe (Fig. 3B–C). Tegmen quadrangular, with flat apex (Fig. 3A) .....***F. craniata*** gen. et sp. nov.

6. Gonostylus with 3 longer and 4 shorter dorsal spines in a single row (see Mohrig *et al*. 1982: 173, Fig. 2A–B) ..... ***F. flavomarginata*** (Mohrig & Mamaev, 1982) gen. et comb. nov.
– Gonostylus with dorsal spines not in a single row but in 3 groups 7

7. Gonostylus somewhat oblong, dorsal lobe with slightly shorter spines; with central group unified bearing 3–5 spines (Fig. 7E–F). Tegmen with coarse apex. (Fig. 7E) .....***F. varia*** gen. et sp. nov.
– Gonostylus somewhat oval, dorsal lobe with relatively longer spines; with central group more separated 3–5 spines (Fig. 8A–B). Tegmen with broadly round apex (Fig. 8A–B) .... ***F. xizangensis*** gen. et sp. nov.

Species description

Falakia bicolor gen. et sp. nov.
urn:lsid:zoobank.org:act:8096013B-139F-426B-A0E1-D7E12F6857D4
Fig. 2

Diagnosis

Wing membrane with macrotrichia at apical two thirds. Gonostylus with three subapical, nearly straight, spines on additional dorsal lobe.

Etymology

The species name is derived from the Latin words '*bi*' ('two') and '*color*' ('colour') referring to the beautiful appearance of the habitus with yellow and brown colour at first glance.

Type material

Holotype

CHINA – **Xizang Autonomous Region** • ♂; Motuo, Damuxiang; 29°29′48″ N, 95°15′47″ E; elev. 1530 m; 24 Jun. 2018; Liang Wang leg.; Malaise trap; BIN BOLD:AEG6821; ZAFU, ZAFUXZ1081.

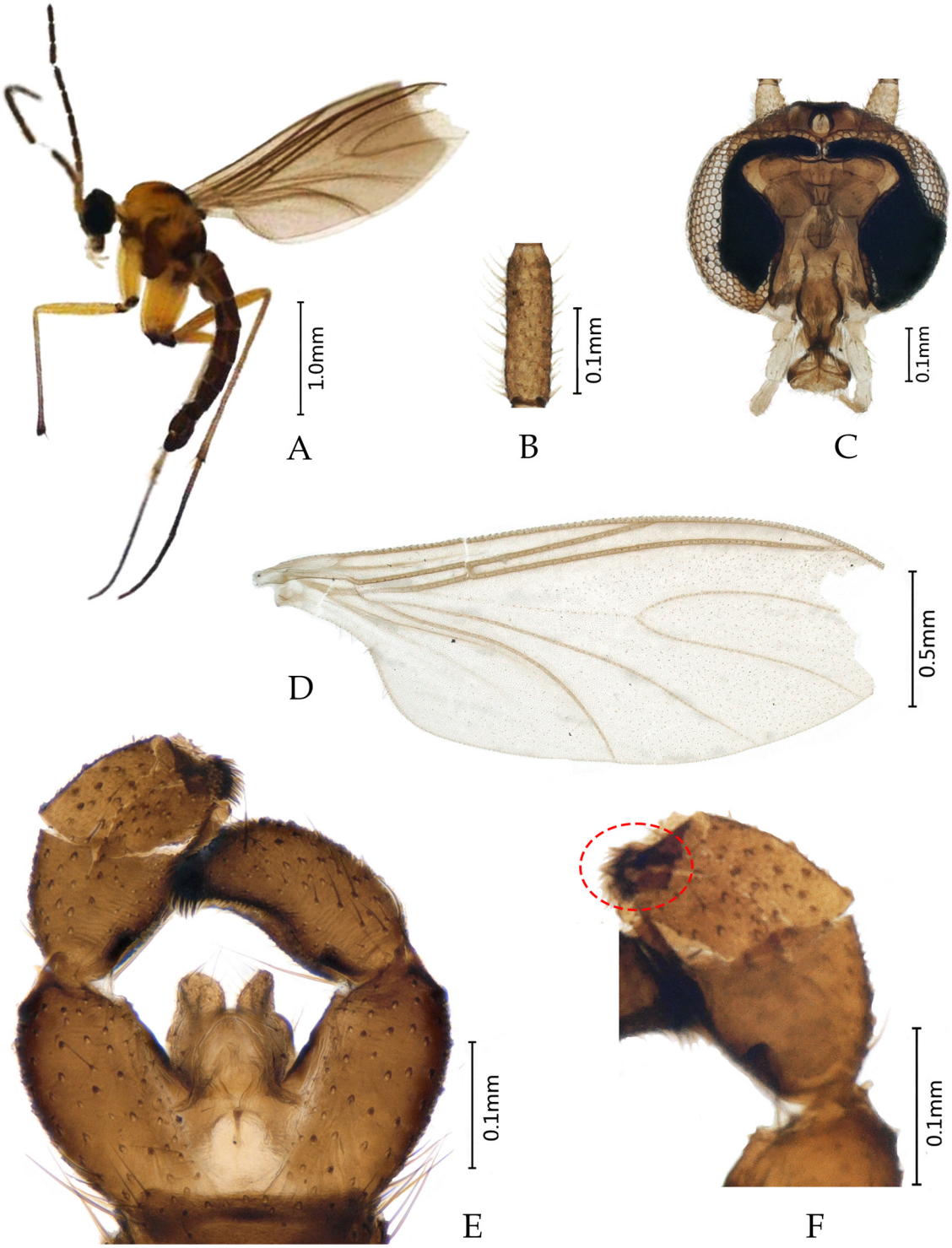

Fig. 2. *Falakia bicolor* gen. et sp. nov., holotype, ♂ (ZAFU, ZAFUXZ1081). **A**. Habitus, lateral view. **B**. Fourth antennal flagellomere. **C**. Head, frontal view. **D**. Wing, dorsal view. **E.** Hypopygium, ventral view. **F**. Gonostylus, dorsal view (red dotted circle indicates the dorsal subapical spines).

Description

Male

Head (Fig. 2C) brown. Antenna brown with basal three flagellomeres yellow (Fig. 2A). Maxillary palpus stramineous. Eye bridge 3–4 facets wide (Fig. 2C). Face with 6–8 setae. Clypeus with 8–10 setae. Maxillary palpus 3-segmented; 1st segment with 8 setae; 2nd segment with 12 setae; 3rd segment long, with 14 setae. Fourth antennal flagellomere 3.53 times as long as wide (Fig. 2B); neck shorter than broad; longest setae shorter than width of flagellomere. Thorax (Fig. 2A) mostly yellow with few brown patches. Wing (Fig. 2D) length = 2.46 mm; width/length = 0.37; R_1/R = 1.63; bM nearly as long as r-m; Sc reaching the level of Rs; R_1 long, joining C beyond the base of the M-fork; stM slightly shorter than M-fork; membrane with macrotrichia at apical two thirds; anterior and posterior veins dark brown; stM faded; bM with 2 setae; r-m with 6 setae; R, R_1, and R_{4+5} setose; M_1, M_2, CuA_1, and CuA_2 with macrotrichia; anal vein faded. Legs yellow (Fig. 2A); fore tibial organ with a dark patch of irregularly arranged setae; fore tibial spur slightly longer than tibial width; length of spur/width of foretibia = 1.25. Hypopygium (Fig. 2E) brown; gonocoxite nearly as long as gonostylus; outer margin with sparse setosity; ventral mesial margin bare; apex of the gonocoxite with a long, differentiated seta. Gonostylus somewhat slender (Fig. 2E–F); slightly wider at base; with mesial side impressed at the apical two third; outer margin with very few setae; mesial margin with a throughout row of minute fine hairs; apex slightly curving inward, with short dark bristles, and with three subapical, nearly straight, spines on dorsal lobe. Tegmen (Fig. 2D) membranous, nearly as high as wide, with slightly convex lateral margins and broadly round apex. Aedeagus dark brown, with a Y-shaped fork.

Distribution

China (Xizang) [Oriental, Palearctic].

Remarks

Genetically, DNA barcodes from specimens of *Falakia bicolor* gen. et sp. nov. are minimum 4.01% divergent from specimens of the nearest neighbour *F. craniata* gen. et sp. nov. Morphologically, both species look similar with few minute differences: the subapical spines on the dorsal lobe in *F. bicolor* are not parallel as in *F. craniata*. Also, the wing bM is nearly as long as r-m in *F. bicolor* whereas bM is slightly longer than r-m in *F. craniata*. Moreover, the shape of tegmen also separates this species from *F. craniata*. Both species belong to a complex of colourful Oriental species. There are two more BINs from Thailand in the same range of 3.5–4% K2P-divergence. One of them, BOLD:AEY0464, is as well reported from Pakistan. The second, BOLD:ADI8695, also occurs in China, but the record is private, so the species is not considered in this study.

Falakia craniata gen. et sp. nov.
urn:lsid:zoobank.org:act:45D714EE-B4B1-4674-A7D1-0A9D1F6A67F0
Fig. 3

Diagnosis

Thorax mostly yellow with three dorsal brown markings resembling a human skull. Wing membrane with macrotrichia at apical three quarters. Gonostylus with three nearly straight subapical spines on the dorsal most lobe. Tegmen quadrangular, with flat apex.

Etymology

The species epithet '*craniata*' is derived from the Latin word '*cranis*' meaning 'skull', referring to the thorax marked with dark patches resembling a skull shape.

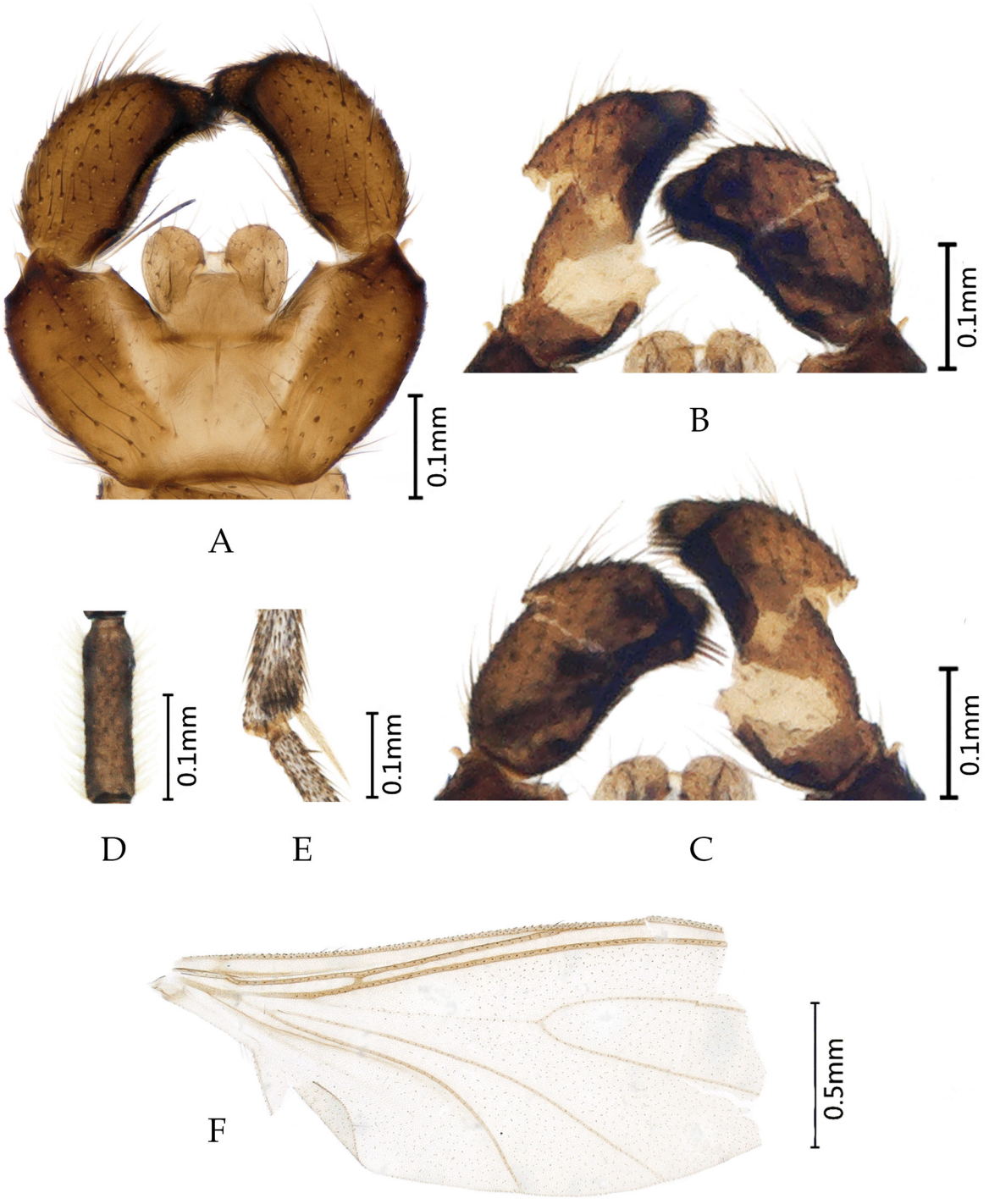

Fig. 3. *Falakia craniata* gen. et sp. nov. **A**. Hypopygium, ventral view (paratype, ♂, ZAFU, ZAFUSC292). **B–F**. Holotype, ♂ (ZAFU, ZAFUSC195). **B**. Gonostyli, ventral view. **C**. Gonostyli, dorsal view. **D**. Fourth antennal flagellomere. **E**. Apex of foretibia. **F**. Wing, dorsal view.

Type material

Holotype

CHINA – **Sichuan Province** • ♂; Hongya county, Mt Wawu; 29°40′0″ N, 102°58′0″ E; elev. 1650 m; 27 Jun. 2019; Tao Li leg.; Malaise trap; BIN BOLD:AEG3603; ZAFU, ZAFUSC195.

Paratypes

CHINA – **Sichuan Province** • 2 ♂♂; same data as for holotype; ZAFU, ZAFUSC292, ZAFUSC312 [currently not found].

Description

Male

Head brown. Antenna brown with basal three flagellomeres yellow. Maxillary palpus pale or yellow. Fourth antennal flagellomere 3.66 times as long as wide (Fig. 3D); neck shorter than broad; longest setae shorter than width of flagellomere. Thorax mostly yellow with three dorsal brown markings resembling a skull. Wing (Fig. 3F) length ~2.46 mm; R_1/R = 1.67; bM 1.26 times as long as r-m; Sc reaching the level of Rs; R_1 long, joining C beyond the base of the M-fork; stM slightly shorter than M-fork; with macrotrichia at apical three quarters; anterior and posterior veins dark brown; stM weakly visible; bM with 2 setae; r-m with 6 setae; R, R_1, and R_{4+5} setose; M_1, M_2, CuA_1, and CuA_2 with macrotrichia; anal vein faded. Legs yellow; fore tibial organ with a horseshoe-shaped patch of dark hairs (Fig. 3E); fore tibial spur much longer than tibial width; length of spur/width of foretibia = 1.57. Hypopygium (Fig. 3A–C) brown to yellowish brown; gonocoxite nearly as long as gonostylus; outer margin with sparse setosity; ventral mesial margin completely bare; apex of the gonocoxite with a long, differentiated seta. Gonostylus somewhat slender (Fig. 3A–C); slightly wider at base; with mesial side impressed at the apical two third; outer margin with very few setae; mesial margin with a throughout row of minute fine hairs; trilobed apex slightly curving inward, with short dark bristles, with three nearly straight subapical spines on the dorsal most lobe. Tegmen (Fig. 3A) membranous; slightly wider than high; quadrangular, with straight apex. Aedeagus long, with a Y-shaped fork.

Distribution

China (Sichuan) [Oriental, Palearctic].

Remarks

See remarks section under *Falakia bicolor* gen. et sp. nov.

Falakia flavomarginata (Mohrig & Mamaev, 1982) gen. et comb. nov.

Sciara flavomarginata Mohrig & Mamaev in Mohrig *et al*. 1982: 172, fig. 2a–e.

Sciara flavomarginata – Menzel *et al*. 1990: 311. — Menzel & Mohrig 2000: 523.

Diagnosis

Gonostylus elongate, with seven spines on dorsal subapical lobe.

Description

For detailed description see Mohrig *et al*. (1982): 172.

Distribution

Far East Russia [Palaearctic].

Remarks

This species was erroneously synonymized with *Sciara nursei* Freeman, 1983 (Menzel *et al*. 1990) and corrected by Menzel *et al.* (2006) reinstating *Sciara nursei* with *Sciara ulrichi* Menzel & Mohrig, 2006 as synonym. We did not study the type material of this Eastern Palearctic species, but from the original description and figures it clearly belongs to *Falakia* gen. nov., sharing all important characters. Also, it is a colourful species like most other members of the genus.

Falakia galactica gen. et sp. nov.

urn:lsid:zoobank.org:act:0D18A08E-B692-451A-B753-BE70D37766C3

Fig. 4

Diagnosis

Gonostylus slender/digitate, with three straight subapical spines separately arranged on the dorsal lobe.

Etymology

The eponymic name for the genus 'Falak' is of Arabic origin and means 'sky', 'heaven', or 'cosmos'. It is commonly symbolizing vastness and divinity. Therefore, the species epithet '*galactica*' of the type species of the genus is a counterpart, referring to the whole galaxy.

Type material

Holotype

CHINA – **Zhejiang Province** • ♂; Huzhou city, Chang Xing; 31°1′21″ N, 119°55′4″ E; 18 May 2016; Shi Kai leg.; Malaise trap; BIN BOLD:ADJ8571; ZFMK, ZFMK-TIS-2599026.

Paratype

CHINA – **Zhejiang Province** • 1 ♀; Huzhou city, Yang Wan Cun; 30°57′10″ N, 119°42′13″ E; 10 Jul. 2016; Shi Kai leg.; Malaise trap; ZAFU, ZFMK-TIS-2602324.

Description

Male

Head (Fig. 4A) light brown. Antenna yellowish brown with basal three flagellomeres yellow. Maxillary palpus stramineous. Eye bridge 3–4 facets wide. Face and clypeus with few setae. Maxillary palpus three segmented, with numerous setae on each segment; 3rd segment long. Fourth antennal flagellomere 2.85 times as long as wide (Fig. 4B); neck much shorter than broad; longest setae shorter than width of flagellomere. Thorax mostly yellow with few brown patches. Postpronotum with 3 bristles. Wing (Fig. 4C) length = 2.90 mm; width/length = 0.41; R_1/R = 1.79; c/w = 0.82; bM 1.3 times as long as r-m; Sc reaching the level of Rs; R_1 long, joining C beyond the base of the M-fork; stM 1.25 times as short as M-fork; membrane mostly covered with macrotrichia; anterior and posterior veins dark brown; stM weakly visible; bM with 2 setae; r-m with 6 setae; R, R_1, and R_{4+5} setose; M_1, M_2, CuA_1, and CuA_2 with sparse macrotrichia; anal vein faded. Legs yellow; fore tibial organ with a patch of dark hairs (Fig. 4D); fore tibial spur longer than tibial width; length of spur/width of foretibia = 1.41. Hypopygium (Fig. 4E) brown; gonocoxite much broader, longer than gonostylus; outer margin with normal setosity; ventral mesial margin mostly bare; apex of the gonocoxite with a long, differentiated seta. Gonostylus slender / digitate (Fig. 4E–F), with slightly concave mesial margin at the apical half; outer margin with very few setae; mesial margin with a throughout row of minute fine hairs; apex slightly curving inward with short fine bristles; three straight subapical spines separately arranged on the dorsal lobe. Tegmen (Fig. 4E) membranous, wider than high. Aedeagus dark brown, with a long, Y-shaped fork.

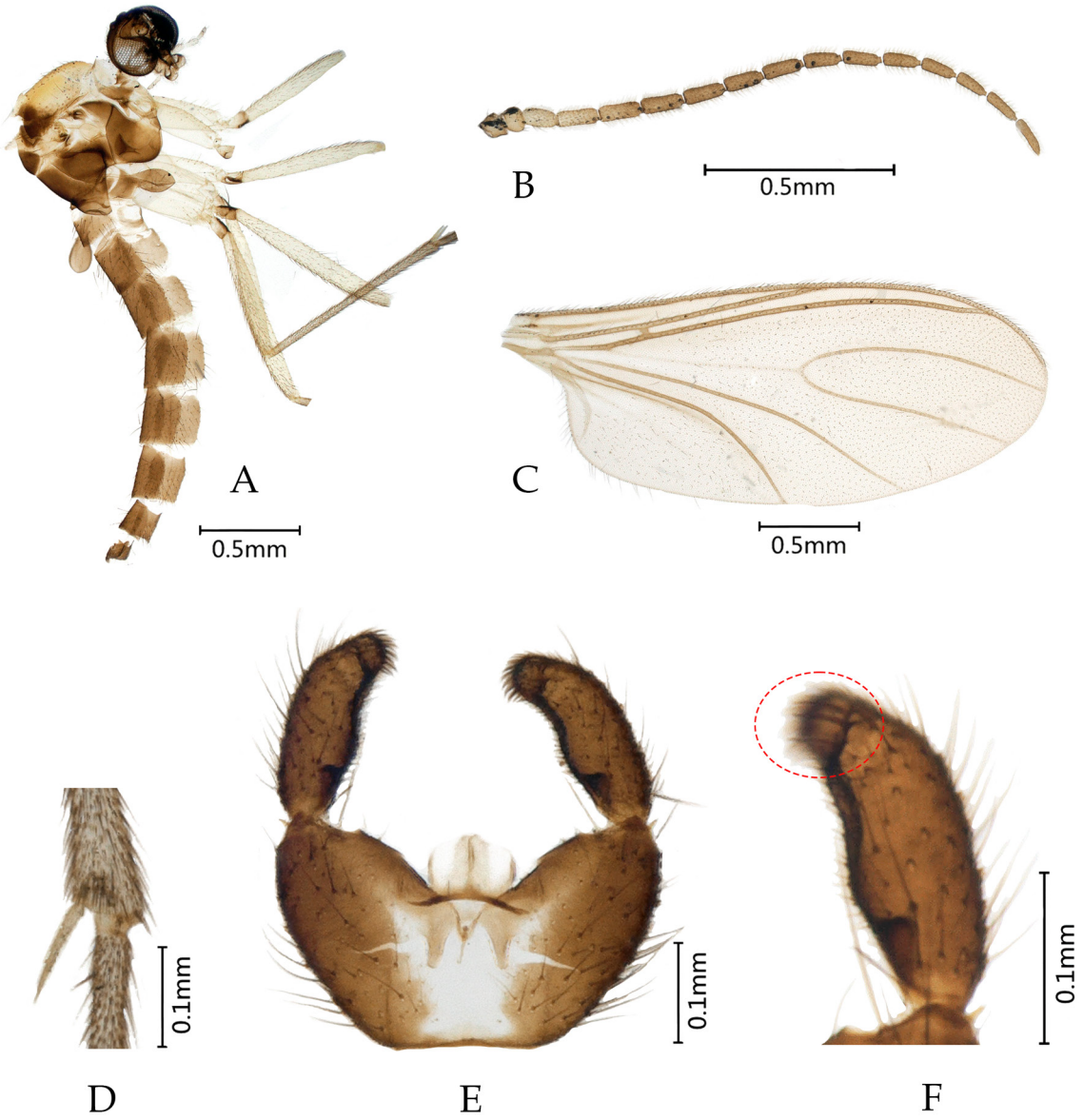

Fig. 4. A–B, D–F. *Falakia galactica* gen. et sp. nov., holotype, ♂ (ZFMK, ZFMK-TIS-2599026). **C**. Paratype, ♀ (ZAFU, ZFMK-TIS-2602324). **A**. Habitus, lateral view. **B**. Antenna. **C**. Wing, dorsal view. **D**. Apex of foretibia. **E**. Hypopygium, ventral view. **F**. Gonostylus, dorsal view (red dotted circle indicates the dorsal subapical spines).

Distribution

China (Zhejiang) [Oriental, Palearctic].

Remarks

Morphologically, this species resembles *Falakia bicolor* gen. et sp. nov. and related species by the colourful habitus and the general structure of the gonostylus with three dorsal subapical spines. It can be distinguished from them in the more slender and straighter shape of the gonostylus, arrangement of the spines on a dorsal lobe, and the shape of the tegmen. Genetically, DNA barcodes from specimens of this species are minimum 5.15% divergent from specimens of the not studied Chinese BIN, BOLD:ACD6711.

Falakia modesta (Winnertz, 1867) gen. et comb. nov., stat. nov.
Fig. 5

Trichosia modesta Winnertz, 1867: 30–31.
Trichosia hebes Loew, 1869: 161 syn. nov.
Sciara mendax Tuomikoski, 1960: 13–14, fig. 3a [replacement name for *Sciara modesta* (Winnertz, 1867) nec *Sciara modesta* Staeger (1840)].
Sciara nursei Freeman, 1983: 161–162, fig. 1.
Sciara marginata Mohrig & Krivosheina, 1983 in Mohrig *et al.* 1983: 2–3, fig. 1a–b.
Trichosia longisetosa Yang, Zhang & Yang, 1998: 298, 305–306; fig. 13 syn. nov.
Sciara ulrichi Menzel & Mohrig, 1998: 373 [replacement name for *Sciara marginata* Mohrig & Krivosheina nec *Sciara marginata* Rübsaamen, 1898].

Sciara modesta – Menzel & Mohrig 2000: 525.

Diagnosis

Wing membrane with macrotrichia at the apical half. Gonostylus with curved outer and depressed mesial margins, with 5–6 large spines on dorsal lobe of the gonostylus. BIN BOLD:AGN9700.

Material examined

CHINA – **Shaanxi Province** • 1 ♂; Yan'an, Ziwuling; 35°53′17″ N, 108°39′35″ E; elev. 1275 m; 10 Aug. 2019; Tao Li leg.; ZAFU, SXMH-560 • 1 ♂; same data as for preceding; 9 Oct. 2019; ZAFU, SXMH-583 • 2 ♂♂; same data as for preceding; 10 Oct. 2019; ZAFU, SXMH-212, SXMH-958 • 6 ♂♂; Haopingsi Nature Reserve Station; 34°5′17″ N, 107°42′40″ E; 8 Jun. 2012; Zhaofu Yang leg.; ZAFU, BIOUG14065-G10, BIOUG14117-A02, BIOUG14117-B12, BIOUG14117-C09, BIOUG14118-B06, BIOUG14118-H03 • 1 ♂; same data as for preceding; 22 Jun. 2012; ZAFU, BIOUG14138-G03 • 1 ♂; same data as for preceding; 13 Jul. 2012; ZAFU, BIOUG14462-G03 • 1 ♂; same data as for preceding; 3 Aug. 2012; ZAFU, BIOUG14239-H01. – **Zhejiang Province** • 1 ♂; Anji, Longwangshan Nature Reserve; 30°13′55″ N, 119°14′38″ E; 16 Jul. 2018; Caixia Liu leg.; Malaise trap; ZAFU, LW-XG406 • 1 ♂; same data as for preceding; 15 Jul. 2018; ZAFU, LW-XG149 • 2 ♂♂; same data as for preceding; 16. Jul. 2018; ZAFU, LW-XG332, LW-XG402 • 3 ♂♂; same data as for preceding; 17 Jul. 2018; ZAFU, LW-XG379, LW-QMT161, LW-QMT183 • 2 ♂♂; same data as for preceding; 15 Aug. 2018; ZAFU, LW-XG695, LW-XG696 • 3 ♂♂; same data as for preceding; 16 Aug. 2018; ZAFU, LW-XG710, LW-XG795, LW-XG925 • 2 ♂♂; same data as for preceding; 15 Sep. 2018; ZAFU, LW-XG568, LW-XG575 • 1 ♂; same data as for preceding; 17 Oct. 2018; ZAFU, LW-QMT327 • 1 ♂; same data as for preceding; 18 Nov. 2018; ZAFU, LW-XG500 • 1 ♂; Lin'an, Mt Tianmu; 30°12′6″ N, 119°15′19″ E; elev. 952 m; 29 Aug. 2018; Zuluan Chen leg.; ZAFU, TMM-903.

Redescription

Male

Head (Fig. 5C) brown. Antenna mostly brown with apical 3–4 flagellomeres yellowish brown. Maxillary palpus pale. Eye bridge 3–5 facets wide (Fig. 5C). Face and clypeus with few setae. Maxillary palpus 3 segmented; basal segment with 5–6 setae; 2nd segment with 8–10 setae; 3rd segment long with 10–14 setae. Fourth antennal flagellomere 3.15 times as long as wide (Fig. 5F); neck shorter than broad with bottleneck-like; longest setae shorter than width of flagellomere. Thorax mostly dark, with few yellow spots. Wing (Fig. 5H) length = 2.62 mm; width/length = 0.38; R_1/R = 1.66; c/w = 0.80; bM 1.2 times as long as r-m; Sc reaching the level of Rs; R_1 joining C just before the base of the M-fork; stM slightly shorter than M-fork; membrane with macrotrichia at the apical half; anterior veins dark brown; posterior veins light brown; stM weakly visible; bM and r-m non-setose; R, R_1, and R_{4+5} setose; M_1, M_2, CuA_1,

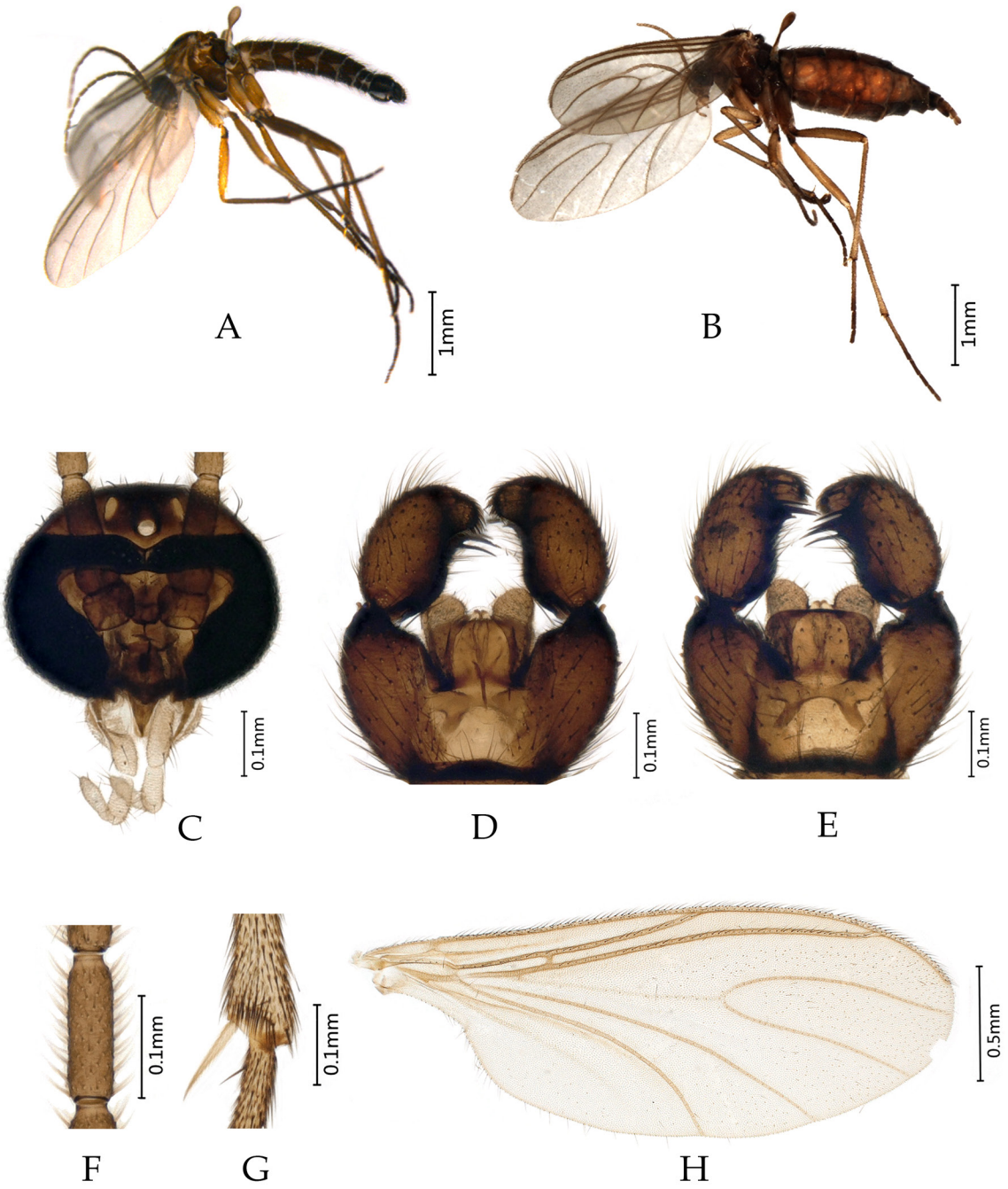

Fig. 5. *Falakia modesta* (Winnertz, 1867) gen. et comb. nov. **A**. Habitus (♂: JWDCH537-10, BOLD, License: CreativeCommons-Attribution 2011, License Holder: CBG Photography Group, Centre for Biodiversity Genomics), lateral view. **B**. Habitus (♀: TTMDI1269-10, BOLD, License: CreativeCommons-Attribution, License Holder: CBG Photography Group, Centre for Biodiversity Genomics), lateral view. **C–H**. ♂ (ZAFU, ZAFUXG406). **C**. Head, frontal view. **D**. Hypopygium, ventral view. **E**. Hypopygium, dorsal view. **F**. Fourth antennal flagellomere. **G**. Apex of foretibia. **H**. Wing, dorsal view.

and CuA_2 with macrotrichia; anal vein faded; anal lobe with few sparse macrosetae. Legs pale or yellow; fore tibial organ (Fig. 5G) with 2–3 rows of dark hairs; fore tibial spur longer than tibial width; length of spur/width of foretibia = 1.36. Hypopygium (Fig. 5D–E) brown to dark brown and hairy; gonocoxite somewhat U-shaped, nearly as long as gonostylus; outer margin with normal setosity; ventral mesial margin with a row of short hairs at apical region; apex of the gonocoxite with a long, differentiated seta. Gonostylus (Fig. 5D–E) stout; broad at base, slightly attenuated at apex; with the mesial side impressed at the apical two third; outer and mesial margins with continuous long setae; apex round, slightly curving inward, with short bristles; with 1 anterior, 4–5 mesial, nearly straight, spines on dorsal lobe (Fig. 5E). Tegmen (Fig. 5D) bell-shaped; slightly higher than wide; with somewhat convex lateral margins and rounded apex. Aedeagus dark brown, with a Y-shaped fork.

Distribution

China [Oriental, Palaearctic], Europe and Far East Russia [Palaearctic], Canada and United States [Nearctic].

Remarks

The oldest available species epithet "*modesta*" is hereby reinstated, because it is no longer combined with *Sciara* and thus the secondary homonymy is suspended. This species was erroneously synonymized with *Sciara lackschewitzi* (Lengersdorf, 1934) by Menzel & Mohrig (2000) under the name *Sciara mendax* Tuomikoski on page 524 and listed again under the unavailable combination *Sciara modesta* (Winnertz, 1867) on the next page. The authors placed it in the *Sciara hemerobioides* group. *Falakia modesta* gen. et comb. nov. is easily distinguished by the unique structure of the gonostylus with curved outer and depressed mesial margins, with 5–6 large spines on dorsal lobe of the gonostylus. Most species of the genus have a colourful thorax except for *F. modesta* and also *F. obscura* gen. et sp. nov. *Falakia modesta* is genetically divergent with four different BINs from the Palearctic, Oriental and Nearctic Regions (BOLD:AGN9699, AGN9700, AGN9701 and AAM9253). We are synonymizing the Chinese *Trichosia longisetosa* Yang, Zhang & Yang, 1998 with this species, even though the holotype is lost, because the original description including the figure matches well with *F. modesta*. The type locality is also the same as for our material form Zhejiang.

Falakia obscura gen. et sp. nov.
urn:lsid:zoobank.org:act:6E5A6E39-B836-4025-827C-7DCC92DA57F0
Fig. 6

Diagnosis

Gonostylus somewhat oval, dorsal lobe with short, scattered spines (1 anterior, 3–5 mesial, 1 posterior).

Etymology

The Latin adjective '*obscurus*' means 'dark' and refers to the dark coloration of the body.

Type material

Holotype

CHINA – **Sichuan Province** • ♂; Ludingxian, Deweizhen, Kaishucun; 29°41′34″ N, 102°12′47″ E; 15 Jul. 2020; Lihua Jiang leg.; BIN BOLD:AEJ9230; ZAFU, ZAFUSC867.

Description

Male

Head (Fig. 6B) dark brown. Antenna dark brown with basal three flagellomeres paler brown. Maxillary palpus pale. Eye bridge 3–4 facets wide. Face and clypeus with few setae. Maxillary palpus three

segmented; basal segment with very few setae; 2nd segment with 12 setae; 3rd segment long with 14 setae. Fourth antennal flagellomere 3.10 times as long as wide (Fig. 6C); neck shorter than broad; longest setae shorter than width of flagellomere. Thorax (Fig. 6A) mostly dark brown. Wing (Fig. 6E) length = 2.43 mm; width/length = 0.36; R_1/R = 1.49; c/w = 0.73; Sc reaching the level of Rs; bM 1.78 times as

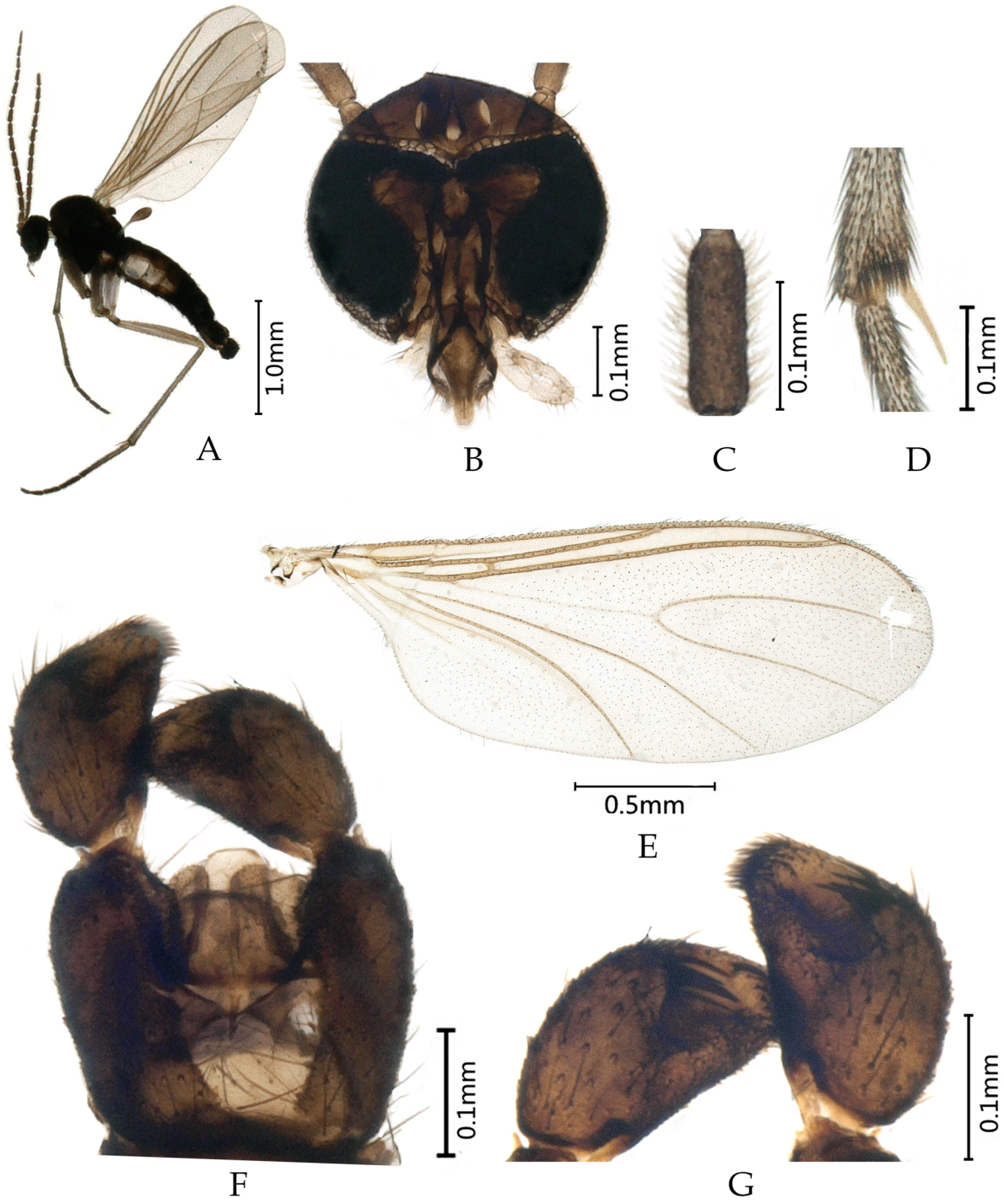

Fig. 6. *Falakia obscura* gen. et sp. nov., holotype, ♂ (ZAFU, ZAFUSC867). **A**. Habitus, lateral view. **B**. Head, frontal view. **C**. Fourth antennal flagellomere. **D**. Apex of foretibia. **E**. Wing, dorsal view. **F**. Hypopygium, ventral view. **G**. Gonostyli, dorsal view.

long as r-m; R_1 long, joining C just after the base of the M-fork; stM 0.76 times as short as M-fork; membrane mostly covered with macrotrichia; anterior and posterior veins dark brown. stM weakly visible; bM with 4 setae; r-m with 6–7 setae; R, R_1, and R_{4+5} setose; M_1, M_2, CuA_1, and CuA_2 with macrotrichia; anal vein faded. Legs yellowish brown (Fig. 6A); fore tibial organ with a patch of dark hairs; fore tibial spur (Fig. 6D) slightly longer than tibial width; length of spur/width of foretibia = 1.40. Hypopygium (Fig. 6D) dark brown; gonocoxite somewhat quadrangular, longer than gonostylus; outer margin with sparse setosity; ventral mesial margin with a row of minute hairs near the apical region, few long setae at the basal region; apex of the gonocoxite with a long, differentiated seta. Gonostylus somewhat oval (Fig. 6F–G); slightly wider at base; apex attenuated, broadly round with numerous short setae; outer margin with very few setae; mesial margin with minute fine hairs; dorsal lobe with short, scattered spines (1 anterior, 3–5 mesial, 1 posterior) (Fig. 6G). Tegmen (Fig. 6F) membranous; much higher than wide; with slightly concave lateral margins and broadly round apex. Aedeagus sclerotised, with a fork.

Distribution

China (Sichuan) [Oriental, Palearctic].

Remarks

Morphologically, this species is similar to *Falakia xizangensis* gen. et sp. nov. in the general structure of gonostylus and in the shape of tegmen. However, the dorsal subapical spines are comparatively shorter and more scattered. Also, the body colour is distinctly darker. Genetically, DNA barcodes from specimens of this species are minimum 2.85% divergent from specimens of the nearest neighbour *F. varia* gen. et sp. nov. All three species constitute a subgroup of the genus by the arrangement of the gonostylar spines in three groups, one anterior, one posterior and three to five mesial, and also by the presence of long setae at the basal region of the ventromesial margin of the gonocoxite.

Falakia varia gen. et sp. nov.
urn:lsid:zoobank.org:act:2C5D8BED-C6BA-4A5A-BE35-D0E2243C6668
Fig. 7

Diagnosis

Gonostylus is somewhat oblong, dorsal lobe with short, unified 3–5 spines. Tegmen slightly higher than wide, with coarse apex.

Etymology

The subspecies epithet '*varia*' is a Latin word meaning 'different' or 'colourful', alluding to the colourful appearance of the habitus.

Type material

Holotype

CHINA – **Zhejiang Province** • ♂; Anji, Longwangshan Nature Reserve; 30°13′55″ N, 119°14′38″ E; elev. 989 m; 18 Nov. 2018; Caixia Liu leg.; Malaise trap; BIN BOLD:AEB8462; ZAFU, LW-XG446.

Paratypes

CHINA – **Sichuan Province** • 2 ♂♂; Emeishan, Lingjuesi; 29°33′0″ N, 103°19′0″ E; elev. 2390 m; 25 Jul. 2019; Tao Li leg.; ZAFU, ZAFUSC777, ZAFUSC778. – **Zhejiang Province** • 2 ♂♂; same collection data as for preceding; 16 Oct. 2018; ZAFU, LW-XG519, LW-XG520 • 1 ♂; same collection data as for preceding; 17 Oct. 2018; ZAFU, LW-QMT399 • 4 ♂♂; same collection data as for preceding; 18 Nov. 2018; ZAFU, LW-XG442, LW-XG480, LW-XG794, LW-XG799 • 2 ♂♂; same collection data

as for preceding; 19 Nov. 2018; ZAFU, LW-QMT359, LW-QMT366 • 1 ♂; same collection data as for preceding; 23 Nov. 2018; ZAFU, LW-XG733 • 1 ♂; Lin'an, Mt Tianmu; 30°13′52″ N, 119°15′50″ E; elev. 748 m; 29 Jul. 2018; Zuluan Chen leg.; ZAFU, TMM-162 • 1 ♂; same data as for preceding; 29 Aug. 2018; ZAFU, TMM-275.

Description

Male

Head (Fig. 7A) and antenna yellowish brown. Maxillary palpus pale. Eye bridge 3–4 facets wide. Face and clypeus with few setae. Maxillary palpus three segmented, 1st segment with 8–9 setae; 2nd segment with 12–14 setae; 3rd segment long with 14–15 setae. Fourth antennal flagellomere 3.43 times as long

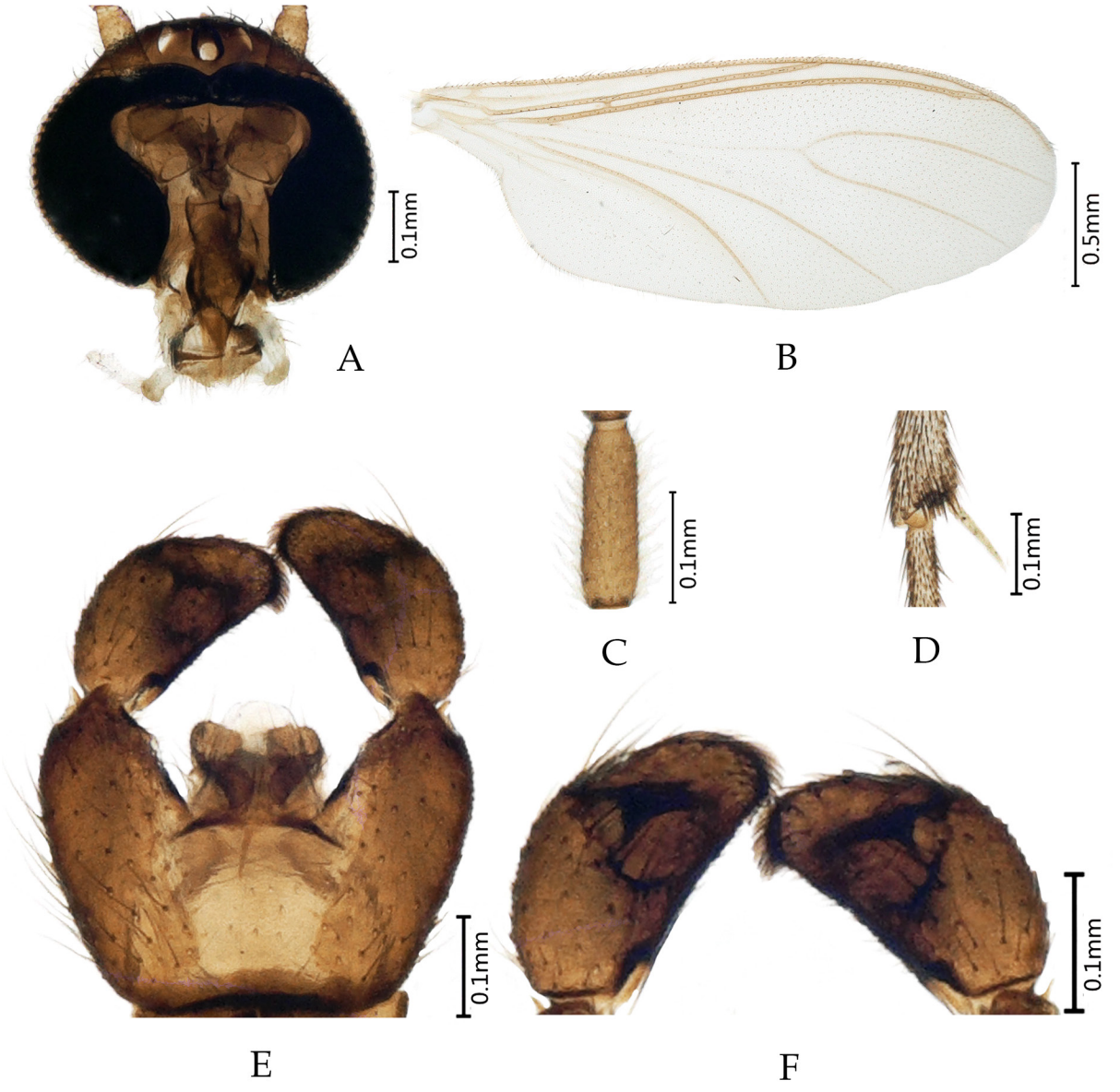

Fig. 7. *Falakia varia* gen. et sp. nov., holotype, ♂ (ZAFU, ZAFUXG446). **A**. Head, frontal view. **B**. Wing, dorsal view. **C**. Fourth antennal flagellomere. **D**. Apex of foretibia. **E**. Hypopygium, ventral view. **F**. Gonostyli, dorsal view.

as wide (Fig. 7C); neck shorter than broad; longest setae shorter than width of flagellomere. Wing (Fig. 7B) length = 2.68 mm; width/length = 0.38; R_1/R = 1.82; c/w = 0.75; Sc fainted, reaching the level of Rs; r-m 1.15 times as long as bM; R_1 long, joining C beyond the base of M-fork; stM 1.04 times as long as M-fork; membrane mostly covered with macrotrichia; anterior and posterior veins prominent; stM weakly visible; bM with 0–1 seta; r-m with 8–9 setae; R, R_1, and R_{4+5} setose; M_1, M_2, CuA_1, and CuA_2 with macrotrichia; anal veins faded. Legs yellowish brown; fore tibial organ (Fig. 7D) with a patch of dark hairs; fore tibial spur longer than tibial width; length of spur/width of foretibia = 1.33. Hypopygium (Fig. 7E) somewhat yellowish brown; gonocoxite much longer than gonostylus; outer margin with normal setosity; ventral mesial margin with sparse setae; apex of the gonocoxite with a long, differentiated seta. Gonostylus somewhat oblong (Fig. 7E–F); slightly wider at base; apex attenuated, broadly round with numerous short hairs; outer margin with very few long setae; mesial margin with minute fine hairs; dorsal lobe with short, unified 3–5 spines (Fig. 7F). Tegmen (Fig. 7E) membranous; slightly higher than wide, with coarse apex. Aedeagal rod long.

Distribution

China (Sichuan, Zhejiang) [Oriental, Palearctic].

Remarks

This species is morphologically similar to *Falakia obscura* gen. et sp. nov. and *F. xizangensis* gen. et sp. nov., but can be differentiated from both by the closely aligned central group of spines on a dorsal lobe, the tegmen with not so smooth apex, the wing with bM almost as long as r-m and relatively longer fourth antennal flagellomere. DNA barcodes from specimens of this species have a minimum genetic distance of 2.85% to that from the specimen of *F. obscura*.

Falakia xizangensis gen. et sp. nov.
urn:lsid:zoobank.org:act:21A063FE-E910-481F-B224-D9855BBF1E3A
Fig. 8

Diagnosis

Gonostylus somewhat oval, dorsal lobe with 3–5, relatively long, spines. Tegmen membranous, much higher than wide, with broadly round apex.

Etymology

The species epithet '*xizangensis*' refers to the Xizang autonomous region in China, from where the type specimen is collected.

Type material

Holotype

CHINA – **Xizang Autonomous Region** • ♂; Motuo; 29°19′52″ N, 95°20′23″ E; elev. 980 m; 23 Jun. 2018; Liang Wang leg.; Malaise trap; BIN BOLD:AEG1937; ZAFU, ZAFUXZ978.

Description

Male

Head and antenna brown to yellowish brown. Maxillary palpus pale. Fourth antennal flagellomere relatively short, 3 times as long as wide (Fig. 8C); neck shorter than broad; longest setae shorter than width of flagellomere. Wing (Fig. 8D) length = 2.19 mm; width/length = 0.41; R_1/R = 1.77; c/w = 0.73; Sc fainted, reaching the level of Rs; bM 1.67 times as long as r-m; R_1 long, joining C just after the base of M-fork; stM 0.79 times as short as M-fork; membrane mostly covered with macrotrichia with apical half denser; anterior and posterior veins prominent; stM weakly visible; bM with 6 setae; r-m with 6 setae; R,

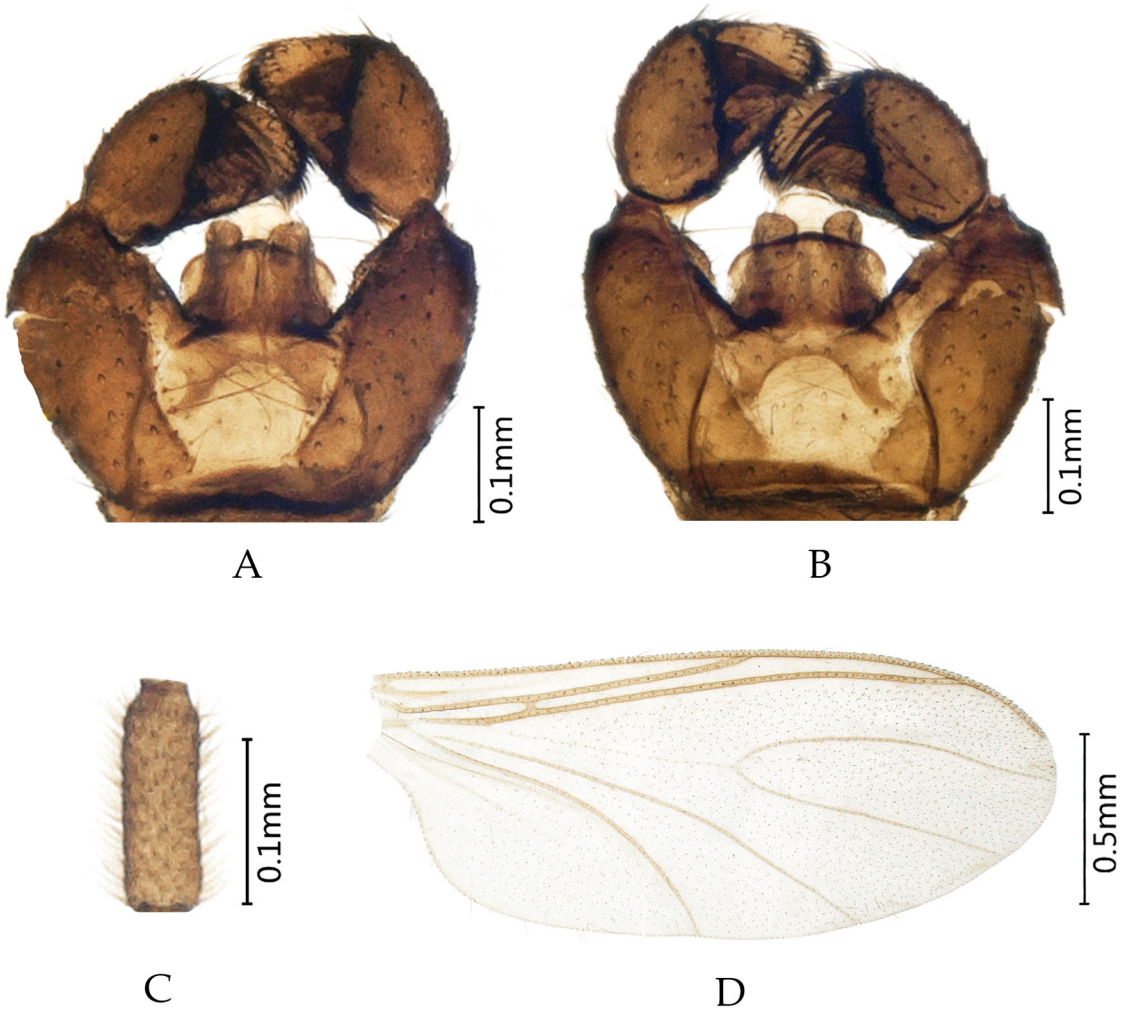

Fig. 8. *Falakia xizangensis* gen. et sp. nov., holotype, ♂ (ZAFU, ZAFUXZ978). **A**. Hypopygium, ventral view. **B**. Hypopygium, dorsal view. **C**. Fourth antennal flagellomere. **D**. Wing, dorsal view.

R_1, and R_{4+5} setose; M_1, M_2, CuA_1, and CuA_2 with macrotrichia; anal vein faded. Hypopygium (Fig. 8A–B) brown; gonocoxite slightly longer than gonostylus; outer margin with no setae; ventral mesial margin with few short marginal hairs near the apical and subapical region, few long setae near the base; apex of the gonocoxite with a long, differentiated seta. Gonostylus somewhat oval (Fig. 8A–B); slightly wider at base; attenuated apically with numerous short setae; outer margin with very long setae near the middle; mesial margin with minute fine hairs; dorsal lobe with 3–5, relatively long spines (Fig. 8B). Tegmen (Fig. 8A–B) membranous; much higher than wide, with broadly round apex. Aedeagus long, with a fork.

Distribution

China (Xizang) [Oriental, Palearctic].

Remarks

See under the remark's sections of *Falakia obscura* gen. et sp. nov. and *F. varia* gen. et sp. nov. for morphological differences. Genetically, DNA barcodes from specimens of *Falakia xizangensis* gen. et sp. nov. are minimum 4.07% divergent from specimens of both of these.

Discussion

The present study reveals an unexpected diversity of a new genus, from which previously only one isolated species was known. Like for *Sciara* (Shah *et al.* in prep.) the currently known seven species are certainly still only a small fraction of the real diversity in the Oriental Region. Six more BINs are already known and future sampling may probably produce a lot more. Initially, we planned to introduce *Falakia* gen. nov. only as a subgenus of *Hirtipennia*, but because of the morphological and genetically closely circumscribed homogeneity we considered it adequate to create a proper genus. Moreover, the monophyly of *Hirtipennia* is not certain, as *Hirtipennia holotricha* Menzel & Mohrig, 1997 does not clade together with the type species *Hirtipennia hirtipennis* Zetterstedt, 1838 and not with *Falakia*. In the future, more and better-defined genera need to be designated in order to avoid too broad and non-natural groupings of many species. Molecular studies including significant genes are necessary to reach that aim.

Another interesting aspect is the biogeographical information gained by the example of *Falakia modesta* gen. et comb. nov. There is high level of divergence in barcodes within this species, and it appears to have some geographical structure. Because all other species and also the not treated BINs are only known from Asia, it is quite justified to assume that also this species is originally from here. The Chinese BIN BOLD:AGN9700 may have spread in various steps to other parts of the world. The most former splitting seems to be that of BIN BOLD:AAM9253 to North America, followed by the Palearctic BIN BOLD:AGN9699. Finally, a second introgression to North America seems to have taken place by a yet not defined fourth BIN BOLD:AGN9701. Although the four BINs show low genetic divergence, their distinct geographic separation suggests that they can tentatively be regarded as different geographic subspecies, for which names are already available. The European BIN would be *Falakia modesta modesta* Winnertz, 1867, the first North American one *Falakia modesta hebes* Loew, 1869 and the Chinese could be *Falakia modesta longisetosa* Yang, Zhang & Yang, 1998. Only the second North American BIN remained yet unnamed. However, the concept of use of subspecies is still too controversial among the community of Sciaridae experts and is deemed to create chaos without substantial arguments. In our opinion, contrarily, subspecies may contribute to a better understanding of the evolutionary processes as being shown by this example. A more detailed morphological study and comparison of specimens of the different BINs may possibly support this concept.

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