

# Two new species of the leafhopper genus *Bhatia* and a new combination of the genus *Fistulatus* (Hemiptera: Cicadellidae: Drabescini) from China

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**Abstract:** Two new species of the genus *Bhatia* from China are described: *Bhatia parasagittata* Lu & Zhang **sp. nov.** at Mt. Fanjing (Guizhou) and *Bhatia loba* Lu & Zhang **sp. nov.** at Tongmo (Tibet). *Fistulatus longiradiatus* **comb. nov.** is provided based on the characters of pygofer lobe with a process on caudal margin and fore femur having several stout setae on anterior ventral margin. A checklist and key to all species of *Bhatia* and *Fistulatus* respectively are provided.

**Key words:** Auchenorrhyncha; Selenocephalinae; Paraboloponina; taxonomy; Tibet

中国沟顶叶蝉属二新种及管茎叶蝉属一新组合（半翅目：叶蝉科：胫槽叶蝉族）

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**摘要：**描记沟顶叶蝉属 2 新种：*Bhatia parasagittata* Lu & Zhang **sp. nov.** 和 *Bhatia loba* Lu & Zhang **sp. nov.**。基于尾节侧瓣具 1 尾节突和前腿节腹面有几个粗短刚毛等特征，提出了管茎叶蝉属的 1 个新组合 *Fistulatus longiradiatus* **comb. nov.**，并提供了沟顶叶蝉属和管茎叶蝉属的名录和检索表。

**关键词：**头喙亚目；缘脊叶蝉亚科；脊翅叶蝉亚族；分类；西藏

## Introduction

The genus *Bhatia* Distant belongs to the leafhopper subtribe Paraboloponina (Hemiptera: Cicadellidae: Deltocephalinae) mostly distributed in the Asian and Pacific regions. Previous studies of this genus focused on regional revision and species descriptions (Zhang & Webb 1996; Viraktamath 1998; Shang *et al.* 2006; Viraktamath & Murthy 2009; Lu & Zhang 2014, 2015; Yu *et al.* 2019). Until now, 19 species are recognized, of which 12 are recorded from China, including the two new species described below: *Bhatia parasagittata* **sp. nov.** from Guizhou and *Bhatia loba* **sp. nov.** from Tibet. A species originally described in *Bhatia* is here transferred to *Fistulatus* Zhang, creating a new combination: *Fistulatus longiradiatus* (Yu, Qu, Dai & Yang, 2019) **comb. nov.** Checklists and keys to all species of *Bhatia* and *Fistulatus* are also provided.

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## Material and methods

Specimens were collected from Guizhou and Tibet, China. Morphological methods and terminology follow Zhang & Webb (1996) and Dietrich (2005). The collection method of *B. parasagittata* is by fogging but *B. loba* by sweeping. Specimens were observed by an advanced stereo microscope (Discovery V20 and AxioCam ICc5, Zeiss) at the Insect Systematics and Biodiversity Platform, College of Plant Protection (NWAUFU). The holotype of *B. parasagittata* is deposited in the Institute of Zoology, Chinese Academy of Science, Beijing (IZCAS). The holotype of *B. loba* is deposited in the Entomological Museum of Northwest A&F University, Yangling, Shaanxi, China (NWAUFU).

## Taxonomy

### *Bhatia* Distant, 1908

*Bhatia* Distant, 1908: 357. Type species: *Eutettix? olivacea* Melichar, by monotypy, see Webb, 1994.

*Melichariella* Matsumura, 1914: 236.

*Koreanopsis* Kwon & Lee, 1979: 50.

**Diagnosis.** Ochraceous to brown. Head with vertex marked with dark brown including variable transverse bands, pedicel of antenna dark brown; pronotum with dark brown irroration. Forewing smoky hyaline; with brown spots on apices of claval veins and clavus. Head wider than pronotum, fore margin either transversely striated or wrinkled. Vertex either longer medially than next to eyes or shorter; usually not elevated posteriorly. Ocelli situated 1.5 to twice own diameter distant from adjacent eye. Antennae more than half body length, arising usually above mid height of eye; antennal pit encroaching onto clypeus. Pronotum with disc transversely striate, lateral margin short, carinate. Forewing with 3 subapical cells, inner subapical open; cross vein present between inner claval vein and claval suture. Fore femur with anteroventral 1 (AV1) seta single and long, intercalary (IC) row with about 11–16 setae; anteromedial 1 (AM1) seta large, near apex. Fore tibia with variable setal formula. Hind femur with apical setal formula 2+2+1. Male pygofer lobe truncate or conically rounded, sometimes with internal ledge. Subgenital plate without macrosetae, usually distally digitate. Connective Y-shaped. Aedeagus with one or two pairs of long ventral processes arising from base of shaft or one pair from preatrium, the latter pair sometimes loosely associated with preatrium near apex of connective; gonopore apical. Additional sclerite or process sometimes present between aedeagus and connective.

**Remarks.** Several species of the genus are similar to *Bhatiahamus* Lu & Zhang in external characters of shape and coloration, but differ from latter by the male Xth segment without a pair of stout apical anal processes. *Bhatia* species with the longer medially than next to the eyes also resemble *Fistulatus* Zhang but can be distinguished by the pygofer lobe without extended processes on the posterior margin and the forefemur without stout anteroventral (AV) setae. Comparisons to other similar genera, *Athysanopsis* Matsumura and *Jamitettix* Matsumura, and other comparative notes were provided by Zhang & Webb (1996).

**Distribution.** Oriental Region and Pacific areas.

### Checklist of *Bhatia*

1. *B. biconjugara* Zhang & Zhang, 1998: 178, fig. 1 — China (Sichuan, Guangxi)

2. *B. digitata* Shang & Shen, in Shang, Shen, Zhang & Li, 2006a: 568, figs 24–31 — China (Henan, Guangxi)
3. *B. distanti* Zhang & Webb, 1996: 13, figs 112–116 — Sri Lanka
4. *B. guamenis* (Metcalf, 1946: 119–120, figs 10) — Guam; Northern Mariana Islands; Virgin Islands (U.S.A.)
5. *B. hastata* Shang & Shen, in Shang, Shen, Zhang & Li, 2006a: 567, figs 18–23 — China (Guangxi)
6. *B. javana* (Melichar, 1914: 132); Zhang & Webb, 1996: 12, figs 134–138 — Java
7. *B. koreana* (Kwon & Lee, 1979: 50, figs 1–5) — China (Shaanxi); South Korea
8. *B. lituriceps* (Walker, 1869: 323, fig. 487) — Sula Islands
9. *B. loba* Lu & Zhang **sp. nov.** — China (Tibet)
10. *B. metcalfi* (Linnavuori, 1960: 326, fig. 46) — Caroline islands; Palau; Micronesia (Yap)
11. *B. multispinosa* Lu & Zhang, 2014b: 148, fig. 1 — China (Sichuan)
12. *B. olivacea* (Melichar, 1903: 191–192, fig. 1) — China (Hainan); Thailand; Sri Lanka; Indonesia; Java
13. *B. parasagittata* Lu & Zhang **sp. nov.** — China (Guizhou)
14. *B. quadrispinosa* Shang & Zhang, in Shang, Shen, Zhang & Li, 2006a: 571, figs 39–45 — China (Sichuan)
15. *B. radhamaniae* Viraktamath & Murthy, 2009: 48, figs 1–13 — India
16. *B. sagittata* Cai & Shen, 1999: 38, fig. 3 — China (Henan)
17. *B. satsumensis* (Matsumura, 1914: 237–238, fig. 12) — China (Guangdong); Japan
18. *B. serrata* Viraktamath & Murthy, 2009: 50, figs 14–27 — India
19. *B. unicornis* Shang & Li, in Shang, Shen, Zhang & Li, 2006a: 573, figs 46–50 — China (Guangdong)

### Species removed from the genus

*B. longiradiata* Yu, Qu, Dai & Yang, 2019 (see *Fistulatus*).

### Key to species of *Bhatia* (excluding *B. lituriceps*) (♂)

Note: the species *B. lituriceps* known only from female is omitted from the key.

1. Antenna base slightly lower than mid height of eye ..... *B. metcalfi*
- Antenna base above mid height of eye ..... 2
2. Aedeagus without pair of basal processes ..... *B. unicornis*
- Aedeagus with one or two pairs of basal processes ..... 3
3. Male pygofer with an internal posterior ledge ..... 4
- Male pygofer without an internal posterior ledge ..... 6
4. Sclerite (paraphysis) between connective and aedeagus absent; aedeagal shaft with ventral angular projection and a pair of small processes subapically ..... *B. olivacea*
- Sclerite (paraphysis) between connective and aedeagus present; aedeagus not as above ..... 5
5. Aedeagal shaft with two pairs of apical and subapical processes, basal processes without spiral internal structure; apophysis of style bilobed ..... *B. satsumensis*
- Aedeagal shaft with a pair of small apical processes, basal processes with spiral internal structure; apophysis of style not bilobed ..... *B. distanti*
6. Dorsoatrium of aedeagus with a pair of lateral processes ..... *B. radhamaniae*
- Dorsoatrium of aedeagus without processes ..... 7

7. Aedeagus with two pairs of basal processes ..... 8  
 -. Aedeagus with one pair of basal processes ..... 10
8. Sclerite present between connective and aedeagus ..... *B. multispinosa*  
 -. Sclerite absent between the connective and aedeagus ..... 9
9. Style apophysis bilobed with apical extension to laterally directed apical process ..... *B. biconjugara*  
 -. Style apophysis beaklike without apical extension ..... *B. quadrispinosa*
10. Sclerite present between connective and aedeagus ..... 11  
 -. Sclerite absent between connective and aedeagus ..... 13
11. Sclerite between connective and aedeagus foliaceous ..... *B. loba* **sp. nov.**  
 -. Sclerite between connective and aedeagus oblong ..... 12
12. Style apophysis beaklike; aedeagus with shaft relatively long ..... *B. guamensis*  
 -. Style apophysis bilobed; aedeagus with shaft short and sagittate, apex arcuate in ventral view .....  
 ..... *B. parasagittata* **sp. nov.**
13. Style apophysis strongly extended forward ..... *B. hastata*  
 -. Style apophysis not as above ..... 14
14. Style apophysis expanded ..... *B. javana*  
 -. Style apophysis bilobed or beaklike ..... 15
15. Style apophysis bilobed ..... 16  
 -. Style apophysis beaklike ..... 17
16. Aedeagal shaft with apex sagittate in ventral view and expanded subapically in lateral view .....  
 ..... *B. sagittata*  
 -. Aedeagal shaft serrated subapically in ventral view ..... *B. serrata*
17. Aedeagal shaft robust ..... *B. digitata*  
 -. Aedeagal shaft relatively slender with denticulate lateral flanges ..... *B. koreana*

### 1. *Bhatia parasagittata* Lu & Zhang **sp. nov.** (Fig. 1)

Description. Length (including tegmen). Male 7.0–7.5 mm; female 8.5 mm.

Yellowish to ochraceous. Crown with pair of dark brown spots near posterior margin, pedicel of antennae dark brown, variable transverse bands on frontoclypeus; pronotum with symmetrical dark brown irroration along fore margin. Forewing without brown spots on claval apex.

Crown shorter medially than next to eyes or subparallel, with several transverse wrinkles on anterior margin and median transverse impression and oblique striation. Crown with coronal suture visible, slightly elevated posteriorly. Ocelli large, approximately twice own diameter from adjacent eyes. Clypeal suture present and arc-shaped slightly; anteclypeus with lateral margins concave, apex expanded; lora subequal to basal width of anteclypeus; gena emarginate below eyes; antennal pit slightly encroaching onto clypeus. Scutellum shagreen in basal half, the length equal to pronotum; scutoscutellar suture slightly arcuate. Forewing with appendix broad.

Fore femur with anteromedial 1 (AM1) stout and long, anteroventral 1 (AV1) fine and long, intercalary (IC) with about 11 fine setae (male) and 12 fine setae (female) in anterior view, anteroventral (AV) setae absent. Fore tibia with dorsal setal arrangement on row anterodorsal (AD) and posterodorsal (PD) 1+4.

Male genitalia. Pygofer lobe sclerotized, posteriorly rounded with several macrosetae subapically, dorsal margin straight and caudal margin rounded without an internal ledge (Fig.

1H). Style with apical process bilobed with dense scalelike sculpture (Fig. 1N). Connective Y-shaped, stem equal to branch with a rectangular sclerite between the base of aedeagus and apex of connective (Figs 1Q, 1T). Aedeagus with shaft short and smooth, tapered to apex subapically in lateral view and apex semi-arc in ventral view (Fig. 1S), strongly curved dorsad; with a pair of elongate divergent basal processes extended from preatrium beyond apex of shaft with some sculptures, with dorsoatrium developed and preatrium extended (Figs 1P, 1S); gonopore large on ventral surface, subapical (Figs 1P, 1T).

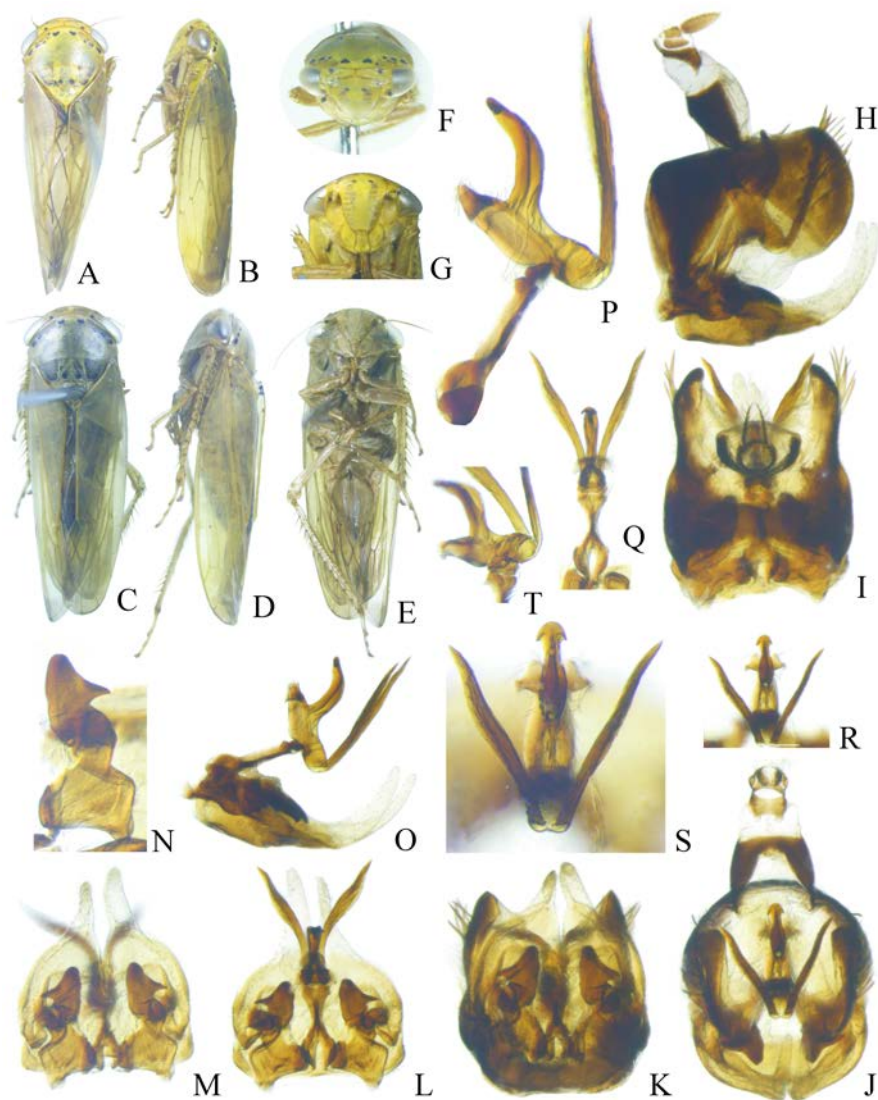


Figure 1. *Bhatia parasagittata* Lu & Zhang A, B. Male, dorsal and lateral views; C–E. Female, dorsal, lateral and ventral views; F. Head, anterodorsal view; G. Face; H–K. Male genitalia, lateral, dorsal, caudal and ventral views; L, M. Valve, subgenital plates, styli, connective and aedeagus, dorsal and ventral views; N. Style; O, P. Connective and aedeagus and amplification, lateral view; Q–S. Aedeagus and basal processes and amplification, dorsal and ventral views; T. The base of aedeagus and appendage, caudolateral view.

Female genitalia. Sternite VII with posterior margin strongly concave inverted V-shaped with marginal median brown markings (Fig. 1E).

**Holotype.** ♂, **China**, Guizhou, Jiangkou County, Fanjing Mountains, Heihewan, 27°82'54"N; 108°76'73"E, 509 m, 31-VII-2014, fogging, coll. Xianjin PENG (IZCAS).

**Paratypes.** 3♂1♀, same data as holotype (IZCAS).

**Etymology.** The specific epithet “*parasagittata*” refers to this species having a sagittate apex of the aedeagal shaft similar to that of *B. sagittata*.

**Remarks.** This species is similar to *B. sagittata* Cai & Shen in having a pair of basal processes on the aedeagus and a sagittate apex of the shaft, but can be distinguished from the latter by the pair divergent (rather than subparallel) basal processes, shaft tapered subapically (rather than expanded) and the apex arcuate in ventral view (rather than acute), and by the presence of a rectangular sclerite between the aedeagus and connective (absent in *B. sagittata*).

## 2. *Bhatia loba* Lu & Zhang sp. nov. (Fig. 2)

**Description.** Length (including tegmen). Male: 8.2 mm.

Brownish. Crown with red stripes on fore margin with dark brown bands between ocelli and brownish bands between eyes. Pronotum with dark brown irregular spots on disc and posterior. Face pale brownish, with dorsal margin with narrow black band; anteclypeus dark brown. Scutellum with five variable longitudinal dark bands and 8-shaped in middle. Forewing with brown spots on claval apex.

Crown subparallel, slightly longer than next to eyes, with several transverse striations on fore margin and a few oblique stripes subapically; crown slightly broader than pronotum coronal suture present, depressed between ocelli except for the middle, and posterior margin not elevated. Ocelli situated on fore margin twice own diameter from adjacent eyes. Clypeal suture straight; anteclypeus with longitudinal carina in middle, narrowed medially and expanded apically. Scutellum equal length to pronotum with scutoscutellar suture arcuate.

Fore femur with AM1 stout and long, AV1 fine and long, IC with about 13 fine setae in anterior view; AV one fine seta. Fore tibia with dorsal setal arrangement on row AD and PD 12+6.

**Male genitalia.** Pygofer lobe sclerotized, posteriorly rounded with several macrosetae, dorsal and caudal margin conically rounded without an internal ledge (Fig. 2H). Subgenital plates long with inner margin straight and constricted subapically (Fig. 2N). Style with apophysis bilobed and strongly extended posteriorly (Fig. 2N). Connective Y-shaped (Fig. 2M), stem equal to branch with a foliaceous sclerite between basal processes of aedeagus and connective (Fig. 2Q), articulated each other (Fig. 2O). Aedeagus with shaft short, curved dorsad with a small apical process on dorsal margin in lateral view and constricted laterally (Fig. 2O); with a pair of elongate divergent smooth processes extended from base of preatrium beyond apex of shaft, with dorsoatrium developed; gonopore apical (Figs 2P, 2Q).

**Holotype.** ♂ (NWAUFU), **China**, Tibet, Tongmo County, 22–24-VII-2016, coll. Ziqiang SUN.

**Etymology.** The specific epithet “*loba*” refers to this species having a foliaceous sclerite between the aedeagus and connective.

**Remarks.** This species is similar to *B. multispinosa* in external shape but can be distinguished from the latter by the crown with red stripes on the fore margin, and the

aedeagus with one pair of basal processes rather than two. It resembles *B. koreana* and *B. hastata* externally but differs in having a leaf-shaped sclerite articulated between the connective and aedeagus and a smooth aedeagal shaft. Within *Bhatia*, the paraphysis between the aedeagus and connective is usually present but differs in shape between small and suboblong (*distanti*, *guamensis*, *parasagittata*, *satsumensis*), small and triangular (*metcalfi*), leaf-shaped (*loba*), and elongate (*multispinosa*, *unicornis*). This structure is absent in a few species (*digitata*, *hastata*, *javana*, *koreana*, *quadrspinosa*). The new species differs from the others based on the characters of the style with strongly elongated apical apophysis (excluding *hastata*) and the leaf-shaped sclerite between the connective and aedeagus.

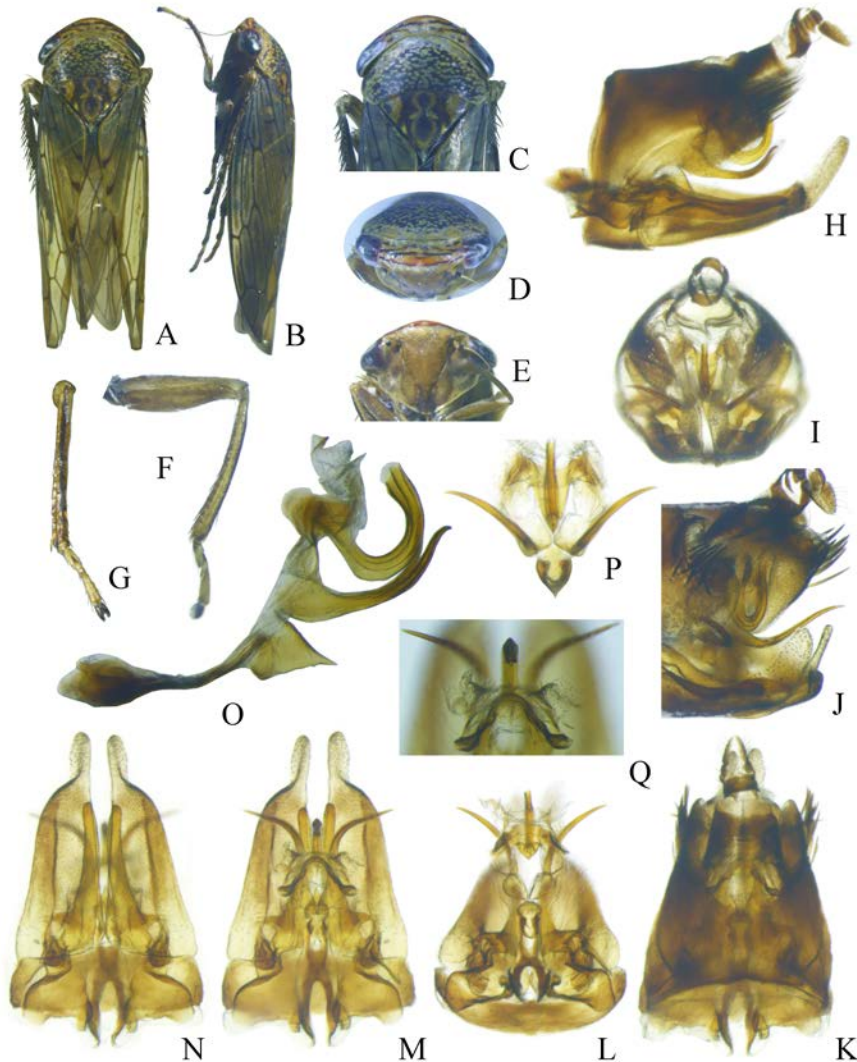


Figure 2. *Bhatia loba* Lu & Zhang A, B. Male, dorsal and lateral views; C, D. Head, dorsal and anterodorsal views; E. Face; F. Fore femur, anterior view; G. Fore tibia, dorsal view; H–L. Male genitalia, lateral, caudal, caudolateral, dorsal and anterior views; M, N. Valve, subgenital plates, styli, connective, sclerite and aedeagus, dorsal and ventral views; O. Connective, sclerite and aedeagus, lateral view; P. Aedeagus, sclerite and basal processes, caudal view; Q. Aedeagus and apex, dorsal view.

***Fistulatus* Zhang, 1997**

*Fistulatus* Zhang, 1997: 237. Type species: *Fistulatus sinensis* Zhang, Zhang & Chen, 1997 by original designation.

Diagnosis. Body pale greenish to stramineous. Crown slightly broader than or equal to pronotum and longer medially than next to eyes and transversely depressed subapically between ocelli, with a few transverse striations on anterior margin and oblique longitudinal stripes; usually elevated posteriorly. Ocelli approximately 1.5 times to twice own diameter distant from eyes. Forewing without cross-vein between claval veins. Fore femur with AM1 stout and long, AV1 fine and long; anterior ventral margin bearing 4 stout setae. Fore tibia with dorsal setal arrangement on row AD and PD 1+4. Hind femur with distal macrosetae 2+2+1.

Male genitalia. Pygofer lobe with a few macrosetae, with pair of processes. Valve nearly rectangular. Subgenital plates triangular without macrosetae, distally prolonged. Connective short and Y-shaped. Aedeagus with atrium well developed, shaft fairly simple with paired processes; gonopore apical.

**Checklist of *Fistulatus***

1. *F. athena* Shang & Zhang, 2003: 21, 22, fig. 2 — Malaysia (Sabah)
2. *F. bidentatus* Cen & Cai, 2002: 117–119, figs 9–17 — China (Zhejiang)
3. *F. biconjugara* Yang, Dai & You, 2024: 143–150 — China (Guizhou)
4. *F. brevimarginalis* Yang, Dai & You, 2024: 143–150 — China (Yunnan)
5. *F. luteolus* Cen & Cai, 2002: 119, 120, figs 18–25 — China (Zhejiang, Henan, Hubei)
6. *F. monkoboensis* Shang & Zhang, 2003: 21, 22, fig. 1 — Malaysia (Sabah)
7. *F. motuoensis* Hassan & Xing, 2024: 365 — China (Tibet)
8. *F. quadrispinosus* Lu & Zhang, 2014a: 248, 249, fig. 1 — China (Zhejiang)
9. *F. rectilineus* Shang & Zhang, in Shang, Shen, Zhang & Li, 2006b: 152–154, figs 1–7 — China (Sichuan)
10. *F. sinensis* Zhang, Zhang & Chen, 1997: 237–238, fig. 2 — China (Shaanxi, Henan, Gansu)
11. *F. longiradiatus* (Yu, Qu, Dai & Yang), 2019: 143, figs. 1, 2 **comb. nov.** — China (Zhejiang)

**Key to species of *Fistulatus* (♂)**

1. Pygofer with two pairs of processes ..... 2
- . Pygofer with one pair of processes ..... 5
2. Aedeagal shaft with processes at the end ..... 3
- . Aedeagal shaft without processes at the end ..... *F. luteolus*
3. Aedeagus thick, with two processes of the shaft on zigzag dorsal surface ..... *F. brevimarginalis*
- . Aedeagus slender, with the process of the shaft not as above ..... 4
4. Aedeagal shaft with two pairs of slender sub-medial processes ..... *F. quadrispinosus*
- . Aedeagal shaft not as above ..... *F. biconjugara*
5. Aedeagus with a single basal process bifurcated in basal 1/3 ..... *F. longiradiatus* **comb. nov.**
- . Aedeagus without basal process ..... 6
6. Aedeagal shaft with two small pairs of processes ..... *F. bidentatus*
- . Aedeagal shaft with pair of apical processes or flanges ..... 7
7. Aedeagal shaft with fish-shape apical process and retrorse subapical lateral spines ..... *F. motuoensis*
- . Aedeagal shaft not as above ..... 8
8. Style bilobed with an apical extension ..... *F. sinensis*
- . Style rostriform without apical extension ..... 8
9. Aedeagus with shaft relatively straight in lateral view; pygofer with paired processes directed medially ...



- ..... *F. rectilineus*  
 -. Aedeagus with shaft curved dorsally in lateral view; pygofer with paired processes directed ventrally..... 9  
 10. Style with apical process long and digitate ..... *F. athena*  
 -. Style with apical process beaklike and strongly curved laterally ..... *F. monkoboensis*

***Fistulatus longiradiatus* (Yu, Qu, Dai & Yang, 2019) comb. nov. (Fig. 3)**

*Bhatia longiradiata* Yu, Qu, Dai & Yang, 2019: 143.

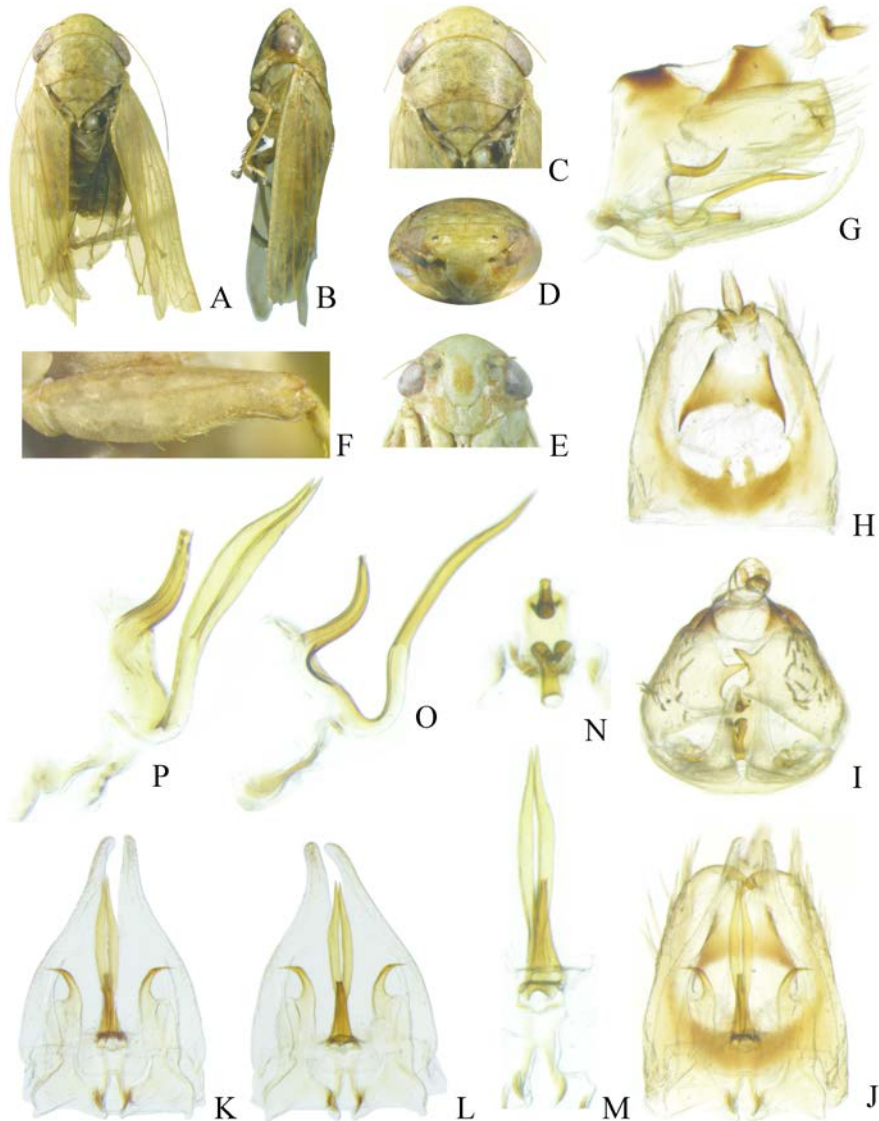


Figure 3. *Fistulatus longiradiatus*. A, B. Male, dorsal and lateral views; C, D. Head, dorsal and anterodorsal views; E. Face; F. Fore femur, anterior view; G–J. Male genitalia, lateral, dorsal, caudal and ventral views; K–L. Valve, subgenital plates, styli, connective, sclerite and aedeagus, ventral and dorsal views; M. Connective, sclerite and aedeagus, dorsal view; N. Aedeagus and apex, dorsal view; O, P. Aedeagus, sclerite and basal processes, lateral and caudolateral views.

Description. Length (including tegmen). Male. 7.5 mm. Body pale greenish to stramineous, with small dark spots on dorsal margin of ocelli symmetrically and some irrorations on crown, pronotum and mesonotum. Face with rusty markings. Antennal pedicel pale brownish. Scutellum with basal triangular brownish. Forewing hyaline without markings. IC with about 13 fine setae in anterior view, and AV with several stout setae.

Male genitalia. Pygofer with one pair of short processes caudally. Style apical process rostriform, with preapical lobe near rectangular. Connective short, Y-shaped, arms diverging distally. Aedeagus with anterior atrium developed, with shaft tubular, strongly curved dorsad, with a single process arising from the base of aedeagus but bifurcated at base 1/3 twisted parallel protruding beyond the length of aedeagal shaft, shaft tapered to apex in lateral view; gonopore small, apical.

**Specimens examined.** 1♂, **China**, Zhejiang, Quzhou City, Shuangzikou County, Laofoyan, 28-V-2017, coll. Shuanghu LIN (NWFU).

Remarks. This species originally described in *Bhatia* Distant by Yu, Qu, Dai & Yang, 2019 is here transferred to *Fistulatus* Zhang as a new combination *Fistulatus longiradiatus* (Yu, Qu, Dai & Yang, 2019) based on the pygofer lobe with a process on the caudal margin and the fore femur having several stout setae on the anterior ventral margin.

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