

# The lanternfly genus *Pyrops* Spinola (Hemiptera: Fulgoridae) from China with description of a new species

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**Abstract:** Species in the genus *Pyrops* Spinola (Hemiptera: Fulgoridae) in Chinese fauna are studied, one new species, *P. jianfenglingensis* sp. nov. is described from Hainan (southern China). Morphological characters and male genitalia of most *Pyrops* species in China are illustrated. A key for identifying the species of *Pyrops* from China is also provided.

**Key words:** Auchenorrhyncha; Fulgoroidea; plant hopper; taxonomy; key

中国东方蜡蝉属分类并记一新种（半翅目：蜡蝉科）

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**摘要：**研究了中国东方蜡蝉属 *Pyrops* Spinola，并记述采自我国海南的 1 新种：尖峰岭东方蜡蝉 *Pyrops jianfenglingensis* sp. nov.。文中还提供了中国该属多数种类的外部形态及雄性外生殖器特征图，以及中国种类的检索表。

**关键词：**头喙亚目；蜡蝉总科；蜡蝉；分类；检索表

## Introduction

The lanternfly genus *Pyrops* is one of the largest groups within the family Fulgoridae (Hemiptera: Fulgoroidea). It was described by Spinola (1839) with the type species, *Pyrops candalaria* (L., 1758) subsequently designated by Duponchel (1840). A member in this genus can be easily recognized by its colourful, spectacular appearance and typical cephalic process. They are widely distributed in the Indomalayan region, from Sri Lanka to the Himalayas (north India, south China), eastward to Taiwan and Vietnam, and southward to Sulawesi and neighbouring islands through Indonesia and the Philippines (Constant 2015). Although its host-plants are poorly known (a few species are known damage Sapindales (Bourgoin 2018)), some species in this genus are serious pests of trees. One example, the Chinese lantern fly, *P. candalaria* (L.), has a broad host range including longan, litchi, olive, orange and mulberry. It usually causes serious economic losses by sucking the juice from the trunk and cortex of fruit trees, and also by the dark mildew that is caused by its feces (Chou *et al.* 1985; Wang *et al.* 2000).

Prior to this study, 68 species had been reported in the world (Bourgoin 2018), of which

only six are known in Chinese fauna (Chou, Wang & Huang 1985; Chou *et al.* 1985; Lallemand 1963; Metcalf 1947; Nagai & Porion 1996; Liang 1998): *P. candelaria* (L.), *P. clavatus* (Westwood), *P. lathburii* (Kirby), *P. philippina* (Stål), *P. spinolae* (Westwood) and *P. watanabei* (Matsumura). This paper adds a new species *P. jianfenglingensis* sp. nov. from Hainan (South China). This new species should be assigned to the *candelaria* species group based on the works of Lallemand (1963), Constant (2015), Constant & Pham (2017) and Yap *et al.* (2017).

## Material and methods

Dry pinned and mounted specimens were used for the descriptions and illustrations. External morphology was observed under a stereoscopic microscope and characters were measured with an ocular micrometer. Genital segments of the examined specimens were macerated in 10% NaOH and drawn from preparations in glycerin using a light microscope, subsequently rinsed several times with pure water and transferred into glycerin. Photographs of the specimens were made using a Leica M205A microscope with Leica DFC Camera. Images were captured and processed using Leica Application Suite (LAS) V3.7 and edited using Adobe Photoshop CS 8.0 (Adobe Systems).

Specimens examined in this study are deposited in the Entomological Museum, Northwest A&F University, Yangling, Shaanxi, China (NWFU) and Guangxi University (GXU). Body measurements are from apex of vertex to tip of abdomen (female body length not including the extension for mating and spawning). All measurements are in millimeters (mm). The morphological terminology used in this study follows O'Brien (1988) for external morphology, Bourgoin *et al.* (2014) for venation of the forewings and Yang & Chang (2000) for male genitalia.

## Taxonomy

Genus *Pyrops* Spinola, 1839.

*Pyrops* Spinola, 1839: 231. Type species: *Pyrops candelaria* (L., 1758).

*Hotinus* Amyot & Serville, 1843: 490.

For generic diagnosis see Constant (2015).

Distribution. Indomalayan Region, China (Guangxi, Hainan, Yunnan, Guangdong, Fujian, Hongkong, Macao and Taiwan).

### Key to the species for Chinese *Pyrops* Spinola

1. Cephalic process inflated apically (Figs. 11, 18, 19, 47)..... 2
- . Cephalic process gradually narrowed apically (Figs. 1, 30, 41)..... 4
2. Cephalic process strongly inflated, forming a large ball apically (Figs. 11, 47)..... 3
- . Cephalic process slightly inflated, forming a small ball apically (Figs. 18, 19)..... *P. lathburii* (Kirby)
3. Tegmina yellow-white on disc, cephalic process yellow (Figs. 47–51)..... *P. watanabei* (Matsumura)
- . Tegmina black on disc, cephalic process red-brown to black (Figs. 11–14, 16)..... *P. clavatus* (Westwood)
4. Tegmina with 3 transverse bands (Figs. 1, 2, 30, 31, 41–43)..... 5
- . Tegmina without transverse bands..... *P. philippina* (Stål)

- 5. Tegmina and veins green (Figs. 1, 2, 30, 31)..... 6
- Tegmina black green, veins orange (Figs. 41–43)..... *P. spinolae* (Westwood)
- 6. Phallobasal conjunctival processes incisive at apex (Figs. 9, 10).....*P. candelaria* (L.)
- Phallobasal conjunctival processes slightly inflated and clubbed at apex (Figs. 39, 40).....
- ..... *P. jianfenglingensis* **sp. nov.**

1. *Pyrops candelaria* (L., 1758) (Figs. 1–10)

*Cicada candelaria* L., 1758: 434.

*Laternaria candelaria* L., 1764: 153.

*Fulgora candelaria* L., 1767: 703.

*Pyrops candelaria*, Spinola, 1839: 233.

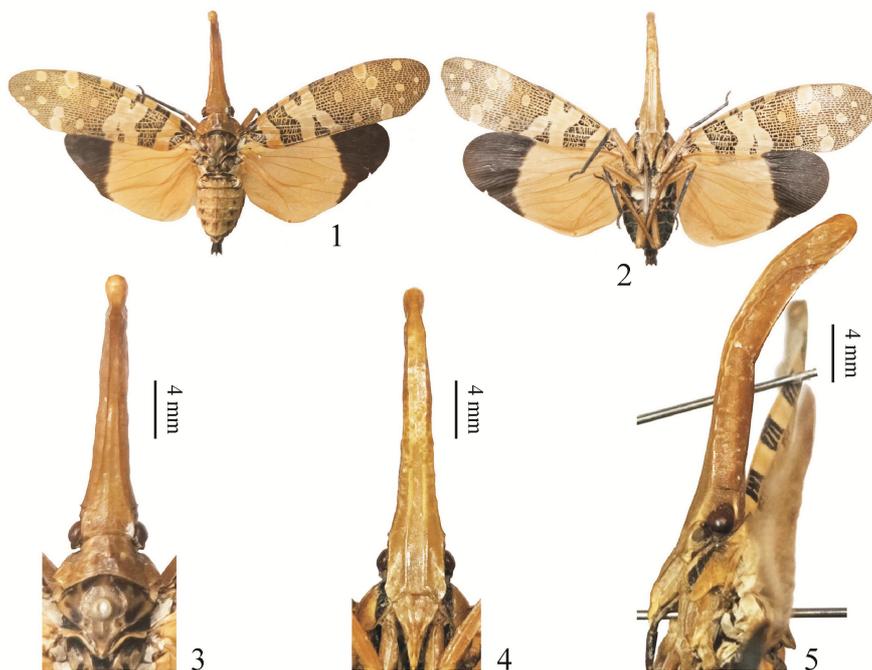
*Hotinus candelaria*, Amyot & Serville, 1843: 491.

*Laternaria candelaria*, Metcalf, 1947: 187.

*Fulgora candelaria*, Lallemand, 1963: 73.

*Pyrops candelaria*, Liang, 1998: 42.

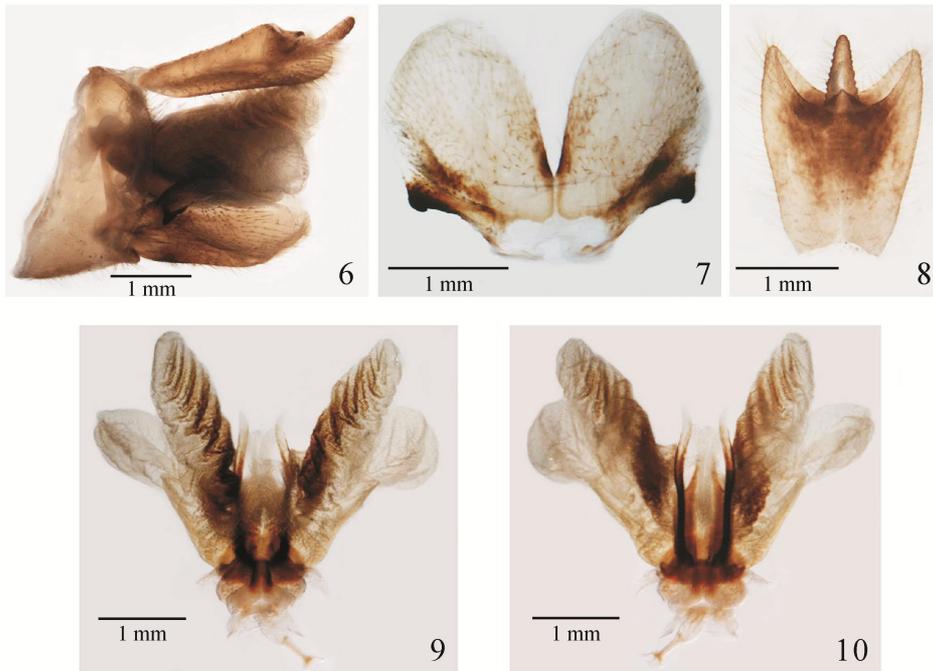
Body length. ♀ 36.5–41.5 mm; ♂ 34.5–39.5 mm. Wingspan. ♀ 66.5–76.5 mm; ♂ 53.5–65.5 mm. Cephalic process length. ♀ 17.5–20.5 mm; ♂ 16.5–18.0 mm.



Figures 1–5. *Pyrops candelaria* (L., 1758). 1. Adult, dorsal view; 2. Adult, ventral view; 3. Head and thorax, dorsal view; 4. Face; 5. Head and thorax, left lateral view.

Male genitalia. Pygofer higher than long, with ventral margin straight, laterocaudal margin slightly convex (Fig. 6). Anal tube slightly elongate, ventral margin straight, apical margin slightly rounded in lateral view, epiproct acutely angled apically, paraproct long subulate in dorsal view and apical margin strongly concave in dorsal view (Figs. 6, 8). Genital

styles oval, apical margin rounded in lateral view, in ventral view plates connected in basal 1/3 (Figs. 6, 7). Phallobase membranous, phallobasal conjunctival processes mostly sclerotized, about 3.0 times as long as sheath, apical 1/4 exposed, apex cuspidal. Connective rod-like (Figs. 6, 9, 10).



Figures 6–10. *Pyrops candelaria* (L., 1758). 6. Male genitalia, left lateral view; 7. Genital styles, ventral view; 8. Anal tube, dorsal view; 9. Phallic complex, dorsal view; 10. Phallic complex, ventral view.

**Specimens examined.** **China**, 1♂, Guangxi, Nanning, Yiling Rock Cave, 10-V-1984, coll. Zhangliang Wu & Xiaolin Lu (NWFU); 1♂, Guangxi, Beihai, Beihai Zhongshan Park, 01-V-1984, coll. Zhangliang Wu & Xiaolin Lu (NWFU); 2♀, Guangxi, Longtan Mountain Forest Park, 24-IX-2017, coll. Ye Xu (NWFU); 10♂10♀, Hainan, Ledong, Mt. Jianfengling, 26–27-VIII-2002, coll. Qingzong Wang, Yanli Che & Peiming Wang (NWFU); 3♂, Guangdong, Yingtai, Shimentai Nature Reserve, 06-VI-2017, coll. Yixin Huang & Wenhui Zhao (NWFU).

**Distribution.** China (Guangxi, Hainan, Yunnan, Guangdong, Fujian, Hongkong); India; Malaysia; Thailand; Vietnam; Cambodia; Indonesia; Sikkim.

**Diagnosis.** This species can be separated from other members in the *candelaria* group in *Pyrops* by: (1) cephalic process brown ochre or red ochre dorsally, greenish brown or tawny ventrally and gradually narrowed apically (Figs. 1–5); (2) mesonotum tricarinate in disc, median carina straight, lateral carinae curved with 4 subulate dark patches along anterior margin, 2 large long dark patches near posterolateral angle (Figs. 1, 3); (3) tegmina green with 3 transverse bands formed with some irregular orange spots with white margin on corium, one near base and other two intersecting near middle of tegmina; 8–10 round orange spots (larger spots with white margin) on membrane; hindwings orange with apical 1/3 black brown,

slightly broader than tegmina (Figs. 1, 2); and (4) abdomen tergites orange sometimes tinged, sternites black (Figs. 1, 2).

2. *Pyrops clavatus* (Westwood, 1839) (Figs. 11–17)

*Fulgora clavata* Westwood, 1839: 139.

*Hotinus ponderosus* Stål, 1854: 244, synonymized by Distant (1906).

*Fulgora clavata*, Butler, 1874: 98.

*Fulgora woodii* Ollenbach, 1929: 279, synonymized by Lallemand (1963).

*Laternaria clavata*, Metcalf, 1947: 193.

*Fulgora nigripennis* Chou, Wang & Huang, 1985: 33, synonymized by Constant & Pham (2017).

*Fulgora clavata mizumumai* Satô & Nagai, 1994: 312, synonymized by Constant & Pham (2017).

*Pyrops clavatus*, Liang, 1998: 42.

Body length. ♀ 41.3 mm; ♂ 34.2 mm. Wingspan. ♀ 86.5 mm; ♂ 78.5 mm. Cephalic process length. ♀ 14.5 mm; ♂ 12.5 mm.



Figures 11–17. *Pyrops clavatus* (Westwood, 1839) (Holotype of *Pyrops nigripennis* Chou, Wang & Huang, 1985). 11. Adult, dorsal view; 12. Adult, left lateral view; 13. Adult, ventral view; 14. Head and thorax, dorsal

view; 15. Face; 16. Head and thorax, left lateral view; 17. Labels.

Remarks. Constant & Pham (2017) treated *Fulgora nigripennis* Chou, Huang & Wang, 1985 as a synonym of *Pyrops clavatus*. After checking the type specimen deposited in NWAUFU, we support this view and the type specimen of *F. nigripennis* is reillustrated here.

**Specimens examined.** **China**, 1♂ (holotype of *F. nigripennis* Chou, Wang & Huang), Guangdong, Ruyuan, V-1975, coll. Lizhong Hua (NWAUFU); 1♀, **China**, Guangxi, Baise, VI-2009, coll. Ailin Tan (GXU).

Distribution. South China (Guangdong, Guangxi); North India; Myanmar; North Thailand; North Vietnam.

### 3. *Pyrops lathburii* (Kirby, 1818) (Figs. 18–29)

*Fulgora lathburii* Kirby, 1818: 450.

*Flata lathburii*, Germar, 1830: 46.

*Laternaria lathburii*, Metcalf, 1947: 197.

*Fulgora lathburii*, Lallemand, 1963: 86.

*Pyrops lathburii*, Liang, 1998: 43.

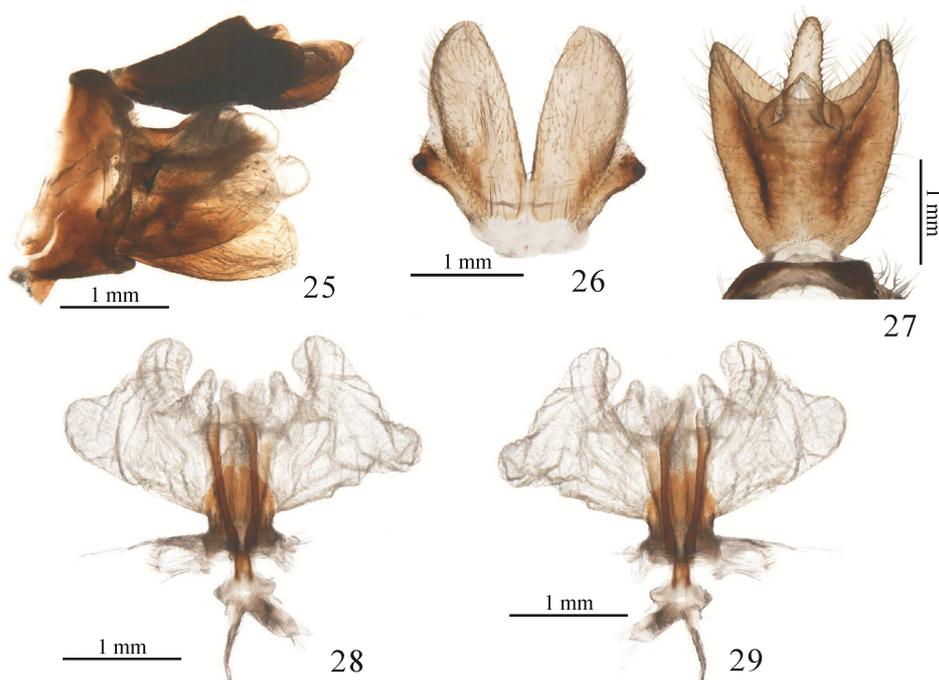
Body length. ♀ 32.5–41.5 mm; ♂ 24.5–37.5 mm. Wingspan. ♀ 61.2–84.5 mm; ♂ 59.5–71.6 mm. Cephalic process length. ♀ 11.3–17.5 mm; ♂ 9.5–14.4 mm.



Figures 18–24. *Pyrops lathburii* (Kirby, 1818). 18, 19. Adult, dorsal views; 20. Adult, ventral view; 21. Adult, left lateral view; 22. Head and thorax, dorsal view; 23. Face; 24. Head and thorax, left lateral view.

Male genitalia. Pygofer higher than long, with ventral margin bisinuate, laterocaudal

margin slightly convex (Fig. 25). Anal tube slightly elongate, ventral margin concave, apical margin oblique in lateral view, epiproct acutely angled apically, paraproct long subulate in dorsal view and apical margin strongly concave in dorsal view (Figs. 25, 27). Genital styles oval, apical margin rounded in lateral view, in ventral view plates connected in basal 1/3 (Figs. 25, 26). Phallobase membranous, phallobasal conjunctival processes mostly sclerotized, about 4.0 times as long as sheath, apical 1/4 exposed, apex cuspidal. Connective rod-like. Support bridge large in lateral view, trapezoidal (Figs. 25, 28, 29).



Figures 25–29. *Pyrops lathburii* (Kirby, 1818). 25. Male genitalia, left lateral view; 26. Genital styles, ventral view; 27. Anal tube, dorsal view; 28. Phallic complex, dorsal view; 29. Phallic complex, ventral view.

**Specimens examined.** China, 4♀3♂, Yunnan, Zhenyuan, 13-VI-2011, coll. Silong Xu (NWAUFU); 1♀, Yunnan, Menghai, 01-V-1980, collector unknown (NWAUFU); 1♀, Yunnan, Gengma, 22-V-1980, collector unknown (NWAUFU); 1♂, Guangxi, Nanning, 17-VII-1981, collector unknown (GXU); 1♀, Guangxi, Nanning, Guangxi University, 20-VIII-2002, coll. Meilin Lang (GXU); 8♀1♂, Guangxi, Nanning, Guangxi University, IX-1989, collector unknown (GXU); 1♀, Guangxi, Nanning, VII-1982, collector unknown (GXU); 1♀, Guangxi, Nanning, Guangxi University, 03-VI-1999, coll. Linyuan Xie (GXU); 1♀, Guangxi, Nanning, Guangxi University, 05-VI-1999, coll. Huang Shi (GXU); 1♂, Guangxi, Nanning, VI-2006, collector unknown (GXU); 1♀, Guangxi, Nanning, Guangxi University, VI-1999, coll. Jiangu Wei (GXU); 1♀, Guangxi, Nanning, Guangxi University, VIII-1986, coll. Yuanhua Xie (GXU).

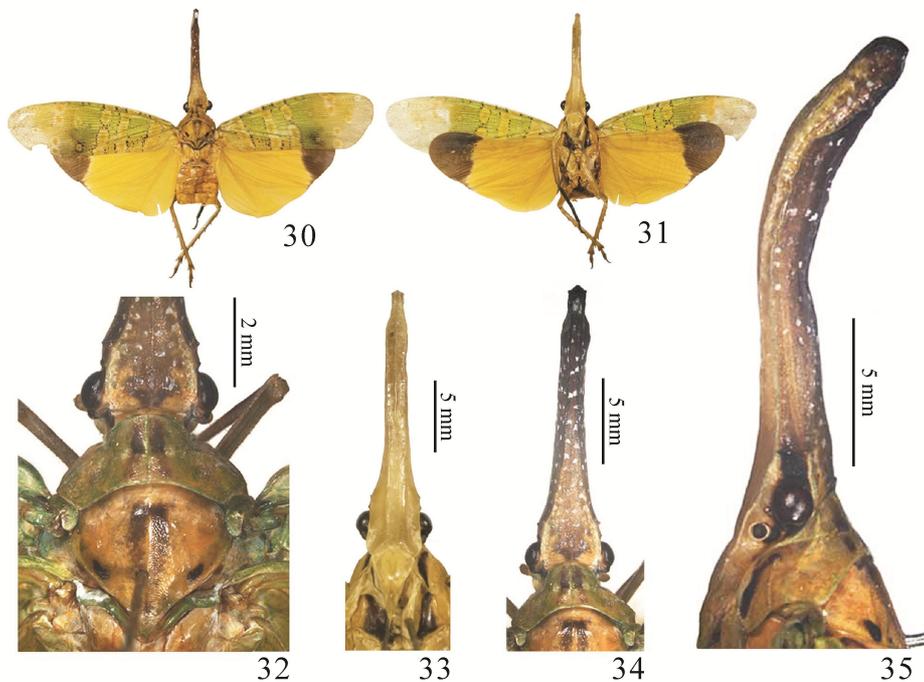
**Distribution.** China (Guangxi, Hainan, Yunnan, Guangdong, Fujian, Hongkong, Macao); India; Thailand; Vietnam; Bangladesh.

**Diagnosis.** This species was assigned to the *pyrorhynchus* group in *Pyrops* (Baker 1925;

Lallemand 1963; Nagai & Porion 1996; Constant & Pham 2017) but can be separated from other members in this species group by: (1) cephalic process black dorsally, greenish brown ventrally ochre yellow and slightly inflated forming a small ball apically (Figs. 18–24); (2) pronotum with one longitudinal dark band along median carina; mesonotum black and tricarinate in disc, median carina straight, lateral carinae curved with 2 large long dark patches near posterolateral angle, 6 dark patches along anterior margin (Figs. 18, 19, 22); (3) tegmina black green, veins orange with many round orange spots with white margin in different size; near the base, spots transverse and coalescent; hindwings orange or white with apical 1/3 black brown, slightly broader than tegmina (Figs. 18–20); and (4) abdomen tergites orange; sternites black or anterior segments orange with posterior segments black (Figs. 18–20).

4. *Pyrops jianfenglingensis* sp. nov. (Figs. 30–40)

Body length. ♀ 39.3–41.8 mm; ♂ 38.5 mm. Wingspan. ♀ 73.6–75.1 mm; ♂ 63.5 mm. Cephalic process length. ♀ 17.3–17.5 mm; ♂ 16.8 mm.



Figures 30–35. *Pyrops jianfenglingensis* sp. nov. 30. Adult, dorsal view; 31. Adult, ventral view; 32. Head (part) and thorax, dorsal view; 33. Face; 34. Head and thorax, dorsal view; 35. Head and thorax, left lateral view.

Head black brown; cephalic process black brown with 3 longitudinal carinae dorsally and the median carina lost apically, greenish brown with 3 longitudinal carinae ventrally and the median carina lost at base, gradually narrowed apically (Figs. 30, 31, 34, 35); frons quadrangular with 2 longitudinal carinae, about 1.3 times as long as broad; clypeus narrower and shorter than frons, greenish brown; labium elongate, black brown, not reaching apex of abdomen (Figs. 31, 33).

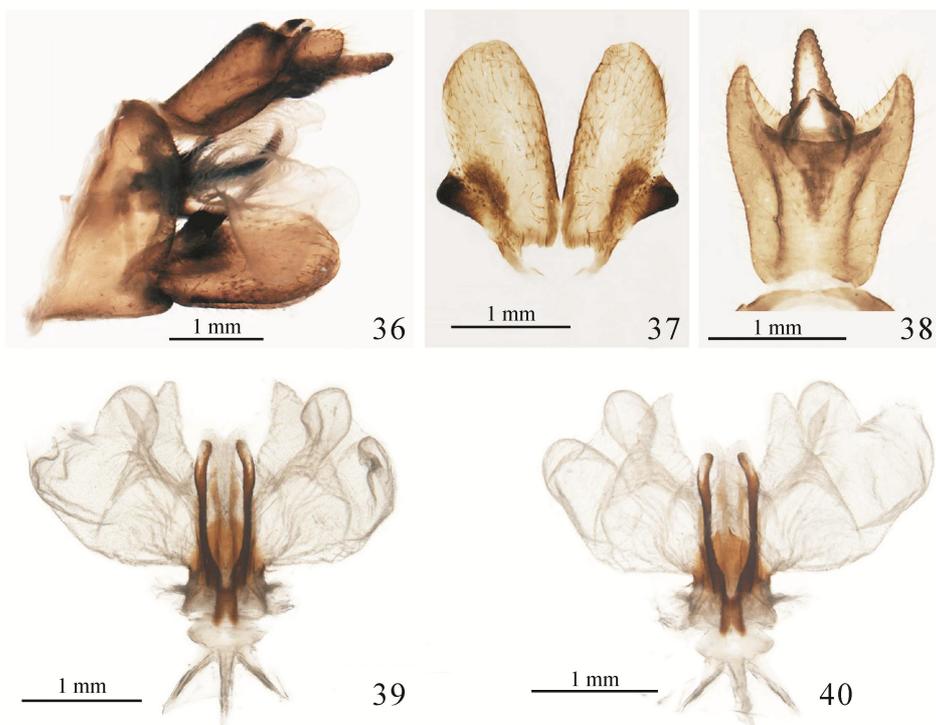
Thorax brown ochre; pronotum and mesonotum with 2 longitudinal dark bands on each sides of median carina; mesonotum tricarinate in disc, median carina straight, lateral carinae curved with 2 long dark patches near posterolateral angle (Figs. 30, 32, 34).

Tegmina green with 3 subparallel transverse bands formed with some irregular orange spots bordered with white on corium, one near the base, one interrupted transverse bands formed with 5–6 orange spots with white margin on membrane; Apical margin oblique with angles broadly rounded (Figs. 30, 31).

Hindwings orange with apical 1/3 black brown; slightly broader than tegmina (Figs. 30, 31).

Leg pro-, mesotibia and tarsomeres black brown, metatibiae with 6 lateral and 7 apical spines (Figs. 30, 31).

Abdomen. Tergites, sternites and genital segments orange (Figs. 30, 31).



Figures 36–40. *Pyrops jianfenglingensis* sp. nov. 36. Male genitalia, left lateral view; 37. Genital styles, ventral view; 38. Anal tube, dorsal view; 39. Phallic complex, ventral view. 40. Phallic complex, dorsal view.

Male genitalia. Pygofer higher than long, with ventral margin straight, laterocaudal margin slightly convex (Fig. 36). Anal tube slightly elongate, ventral margin slightly sinuate and apical margin concave in lateral view, epiproct acutely angled apically, paraproct long subulate in dorsal view and apical margin strongly concave in dorsal view (Figs. 36, 38). Genital styles oval, apical margin rounded in lateral view, in ventral view plates connected in basal 1/5 (Figs. 36, 37). Phallobase sclerotized at basal 1/3, remaining membranous,

phallobasal conjunctival processes mostly sclerotized, about 4.0 times as long as sheath, apical 1/3 exposed, apex clubbed. Connective rod-like (Figs. 36, 39, 40).

**Holotype.** ♂, **China**, Hainan, Ledong, Mt. Jianfengling, 26-VIII-2002, coll. Qingzong Wang, Yanli Che & Peiming Wang (NWAUFU). **Paratypes.** 2♀, same data as holotype.

**Etymology.** The specific epithet refers to the ridge on origin of the type specimen.

**Remarks.** In this paper we place the new species in the *candelaria* group in *Pyrops* according to morphological characters (Baker 1925; Lallemand 1963; Nagai & Porion 1996; Constant & Pham 2017) and is similar to *P. spinolae*, *P. candelaria* and *P. viridirostris*, but differs from *P. spinolae* by the tegmina and veins green (tegmina black green, veins orange in *P. spinolae*), from *P. candelaria* and *P. viridirostris* by tegmina with 3 subparallel transverse bands (tegmina with 3 transverse bands and two of three intersecting near the middle of tegmina in *P. candelaria* and *P. viridirostris*). Furthermore, it differs from *P. candelaria* by the ventral margin anal tube slightly concave in lateral view, phallobasal conjunctival processes sclerotized and apex clubbed (ventral margin anal tube straight in lateral view, phallobasal conjunctival processes sclerotized and apex cuspidal in *P. candelaria*).

##### 5. *Pyrops philippina* (Stål, 1870)

*Fulgora philippina* Stål, 1870: 740.

*Laternaria philippina*, Metcalf, 1947: 202.

*Fulgora philippina*, Lallemand, 1963: 75.

*Pyrops philippina*, Nagai & Porion, 1996: 25.

Distribution. China (South China); Philippines.

##### 6. *Pyrops spinolae* (Westwood, 1842) (Figs. 41–46)

*Fulgora (Pyrops) spinolae* Westwood, 1842: 118.

*Pyrops spinolae*, Schaum, 1850: 64.

*Hotinus spinolae*, Walker, 1851: 266.

*Laternaria spinolae*, Metcalf, 1947: 205.

*Fulgora spinolae*, Lallemand, 1963: 76.

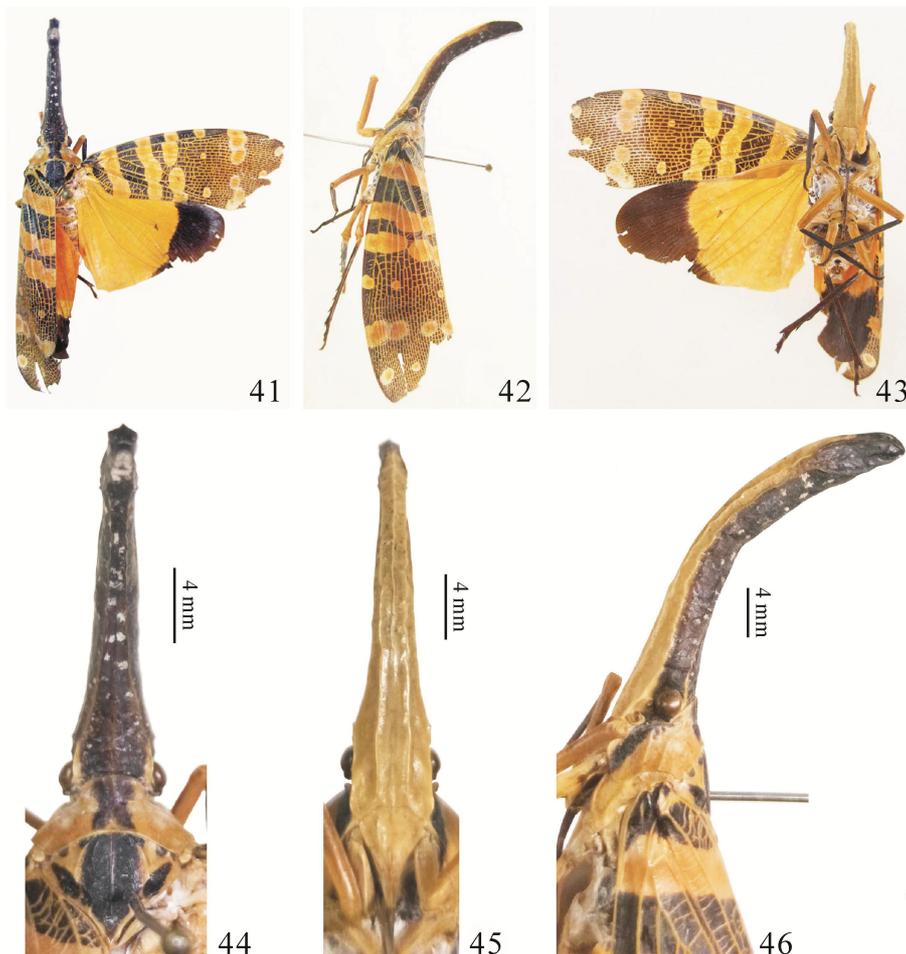
*Pyrops spinolae*, Liang, 1998: 44.

Body length. ♀ 41.5–42.5 mm. Wingspan. ♀ 86.5–88.6 mm. Cephalic process length. ♀ 19.0–20.5 mm.

This species was assigned to the *candelaria* group in *Pyrops* (Baker 1925; Lallemand 1963; Nagai & Porion 1996; Constant & Pham 2017) but can be separated from other members in this species group by: (1) cephalic process black dorsally, greenish brown ventrally and gradually narrowed apically (Figs. 41–46); (2) pronotum and mesonotum with one longitudinal dark band along median carina, mesonotum tricarinate in disc, median carina straight, lateral carinae curved with 2 large long dark patches near posterolateral angle, 6 dark patches along anterior margin (Figs. 41, 44); (3) tegmina black green, veins orange with 3 subparallel transverse bands formed with some irregular orange spots with white margin on corium, one near the base, one interrupted transverse band formed with 4–5 orange spots with white margin on membrane; hindwings orange with apical 1/3 black brown, slightly broader than tegmina (Figs. 41, 42, 43); and (4) abdomen tergites orange, sternites black or orange (Figs. 41, 43).

**Specimens examined.** **China**, 1♀, Guangxi, Nanning, Daming Peak, VII-2008, coll.

Ziling Li (GXU); 1♀, collection site unknown, 15-VIII-1980, coll. Gandi Ruan (NWFU).  
 Distribution. China (Guangxi, Yunnan, Taiwan ); India; Malaysia; Sikkim; Vietnam.



Figures 41–46. *Pyrops spinolae* (Westwood, 1842). 41. Adult, dorsal view; 42. Adult, left lateral view; 43. Adult, ventral view; 44. Head and thorax, dorsal view; 45. Face; 46. Head and thorax, left lateral view.

7. *Pyrops watanabei* (Matsumura, 1913) (Figs. 47–51)

*Fulgora* (*Hotinus*) *watanabei* Matsumura, 1913: 54.

*Fulgora chimara* Schumacher, 1915: 129, synonymized by Lallemand (1963).

*Fulgora watanabei* var. *apicalis* Kato, 1928: 221.

*Fulgora watanabei* var. *formosana* Metcalf, 1947: 208.

*Fulgora watanabei*, Kato, 1928: 221.

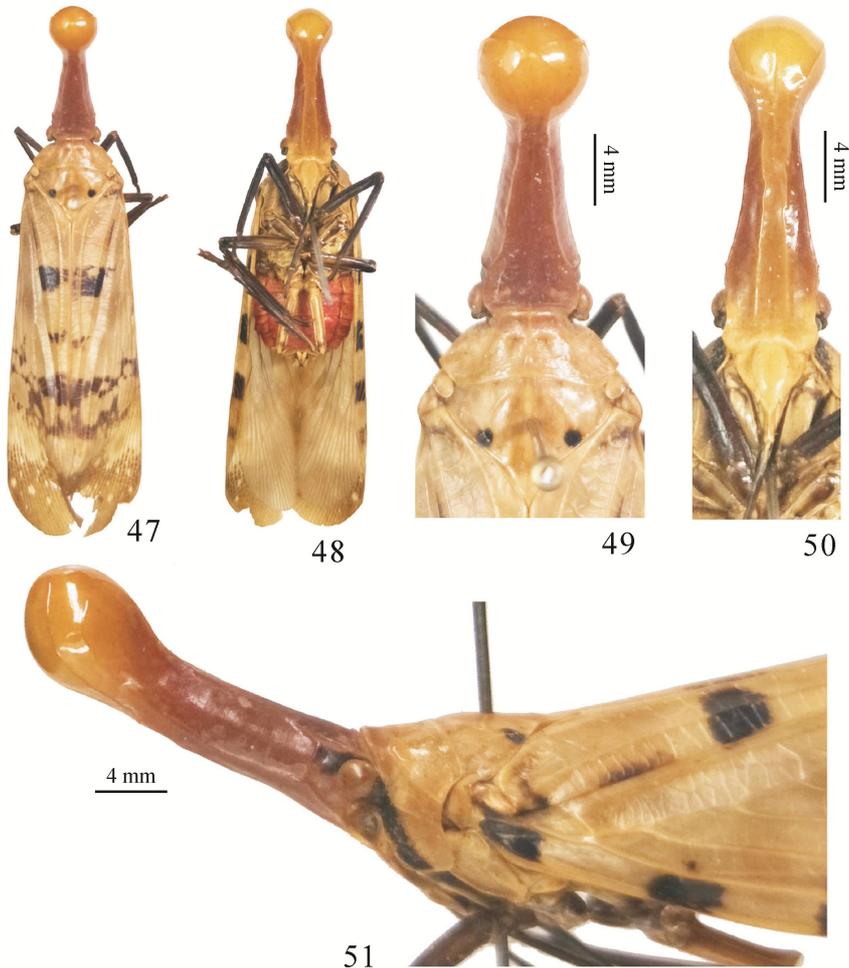
*Pyrops watanabei*, Nagai & Porion, 1996: 26.

Body length: ♀ 39.1 mm. Wingspan: ♀ 85.5 mm. Cephalic process length: ♀ 12.5 mm.

Remarks. Currently this species is known in China (Taiwan) (Constant & Pham 2017). Here is the first record from the Chinese mainland.

**Specimens examined.** China, 1♀, Guangxi, Baise, VI-2009, coll. Ailin Tan (GXU).

Distribution. China (Guangxi, Taiwan).



Figures 47–51. *Pyrops watanabei* (Matsumura, 1913). 47. Adult, dorsal view; 48. Adult, ventral view; 49. Head and thorax, dorsal view; 50. Face; 51. Head and thorax, left lateral view.

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