

First record of the genus *Dictyopharina* Melichar, 1903 (Hemiptera: Fulgoroidea: Dictyopharidae) from China, with descriptions of two new species

ZHI-SHUN SONG^{1,2} & AI-PING LIANG^{1*}

¹Institute of Zoology, Chinese Academy of Sciences, Beijing 100080, China

²Graduate School, Chinese Academy of Sciences, Beijing 100039, China

*Corresponding author, email: liangap@ioz.ac.cn

Abstract

The genus *Dictyopharina* Melichar, 1903, and its type species, *D. viridissima* Melichar, 1903 from Sri Lanka and India, are redescribed and illustrated. Two new species, *D. octaprotrusa* sp. nov. and *D. sichuanensis* sp. nov., are added to the genus from southern China, and they represent the first record of the genus from China. A key to the species of *Dictyopharina* is provided.

Key words: *Dictyopharina*, Dictyopharidae, first record, new species, China.

Introduction

The planthopper family Dictyopharidae is one of the larger families of the 20 Fulgoroidea families currently recognized, including more than 600 described species in about 400 genera (Metcalf, 1946; Liang & Wilson, 2002). This group was first recognized by Spinola in 1839 as a subfamily of the family Fulgoridae and not confirmed as subfamily or family until the 1930s. Except for the extreme Arctic and Antarctic regions, the species of the family are widely distributed in all parts of the world, especially in the tropical regions such as the South America, the Oriental Region, and the East Indies (Metcalf, 1946).

The dictyopharid fauna of China is poorly known. Approximately 39 species in 16 genera were described or recorded from the northeast and the southeast of China, including Taiwan Island. Most of these species were described rather briefly and were not illustrated, so standard revisionary work on this group in China is highly needed.

The genus *Dictyopharina* was established by Melichar in 1903 for *D. viridissima* Melichar, 1903, from Sri Lanka. Distant (1906) redescribed and illustrated this genus and

the type species from India. In addition, he also added the second species of the genus, *D. consanguinea* Distant, 1906, from Burma. Melichar (1912) in his dictyopharid monograph described the genus and its two species.

While sorting and identifying Dictyopharidae from material in the Insect Collection of the Institute of Zoology, Chinese Academy of Sciences, Beijing (IZCAS) and elsewhere, the authors found two new species of *Dictyopharina* from southern China. These new species represent the first record of the genus from China.

In this paper *Dictyopharina* Melichar, 1903 (Hemiptera: Fulgoroidea: Dictyopharidae) and its type species, *D. viridissima* Melichar, 1903, from Sri Lanka and India, are redescribed and illustrated. Two new species, *D. octaprotrusa* sp. nov. and *D. sichuanensis* sp. nov., are added to the genus from southern China, and a key to the species of *Dictyopharina* is provided.

Material and methods

The specimens studied in the course of this work are deposited in the following institutions, whose names are abbreviated in the text as follows: Bernice P. Bishop Museum, Honolulu, Hawaii, USA (BPBM); Department of Biology Insect Collection, Nankai University, Tianjin, China (NU); Department of Entomology Insect Collection, North Carolina State University, Raleigh, NC, USA (NCSU); Institute of Zoology, Chinese Academy of Sciences, Beijing, China (IZCAS); National Museum of Natural History, Smithsonian Institution, Washington, DC, USA (USNM).

The morphological terminology largely follows that of Distant (1906), Melichar (1912), and Fennah (1944, 1978).

Taxonomy

Genus *Dictyopharina* Melichar, 1903

Dictyopharina Melichar, 1903: 25; Distant, 1906: 252; Melichar, 1912: 156.

Type species: *Dictyopharina viridissima* Melichar, 1903

Redescription

General color viridescens in most specimens, or ochraceous in discoloured ones.

Head (Figs. 7, 10, 13) short and broad, not distinctly produced in a cephalic process. Vertex (Figs. 7, 10, 13) transversely broad and nearly trapeziform, anterior margin somewhat convex, lateral carinate margins converging anteriorly, posterior margin slightly concave; median longitudinal carina distinct and complete, lateral oblique depressions indistinct. Frons (Figs. 8, 11, 14) broad and elongate; anterior margin arched, lateral carinate margins nearly parallel, posterior margin slightly concave; median longitudinal

carina distinct, lateral longitudinal carinae converging posteriorly and approaching frontoclypeal suture. Postclypeus (Figs. 8, 11, 14) and anteclypeus convex medially, with distinct median carina. Rostrum long, reaching between hind coxa. Eyes (Figs. 9, 12, 15) oval, brown. Ocelli (Figs. 9, 12, 15) relatively large, reddish. Antennae (Figs. 8–9, 11–12, 14–15) with scape very small; pedicel large and subglobose, with more than 50 distinct sensory plaque organs distributed over entire surface; flagellum long, setuliform.

Pronotum (Figs. 7, 9–10, 12–13, 15) distinctly shorter than mesonotum in midline, narrow anteriorly and broad posteriorly; disc broad, slightly arched at middle front, lateral marginal areas straight and sloping, posterior margin angulately concave at more than 100°; median longitudinal carina distinct, lateral discal carinae obscure and only elevated anteriorly, lateral depressions large and distinct. Mesonotum (Figs. 7, 10, 13) tricarinate on disc; lateral carinae curving anteriorly towards median carina and forked obscurely towards front or not. Forewings (Figs. 16, 19, 22) hyaline, ratio of length to width about 3:1; Sc slightly sinuated distad of Sc+R fork, stigma long with 4–7 cells; apical cells about 16. Legs elongate, fore femur with a short and blunt spine near apex; hind tibia with 5–7 lateral spines, spinal formula 8-(11-12)-(11-12).

Male genitalia: pygofer (Figs. 17–18, 20–21, 23–24, 25, 28, 31) narrow and high in lateral view, posterior margin with a process near apex or not. Anal tube (Figs. 17–18, 20–21, 23–24) oval and large in dorsal view. Paramere (Figs. 17, 20, 23, 25, 28, 31) relatively large and broad in lateral view, apex expanded and relatively broad with 1 or 2 toothed processes; middle with a stout, large ventrally directed process; in ventral view parameres symmetrical, with numerous spiniform setae on inner surface. Aedeagus (Figs. 26–27, 29–30, 32–36) short and small, or stout and large; phallobase cylindrical, sclerotized, pigmented with membranous sac-like processes in pairs; phalli forked at base, with a pair parallel slender processes produced posteriorly, pigmented and sclerotized at apex.

Biology

In common with most planthopper groups, no biological data are currently available for species of *Dictyopharina*.

Remarks

Species of *Dictyopharina* can be easily distinguished from other dictyopharid planthoppers by the combination of the following diagnostic characters: (1) general color (Figs. 1–6) viridescant in fresh specimens; (2) head (Figs. 7, 10, 13) short and broad, not distinctly produced in a cephalic process; (3) vertex (Figs. 7, 10, 13) with median longitudinal carina distinct and complete; (4) frons with lateral longitudinal carinae (Figs. 8, 11, 14) converging posteriorly and approaching frontoclypeal suture; (5) pronotum (Figs. 7, 9–10, 12–13, 15) with median longitudinal carina distinct, lateral discal carinae obscure and only elevated anteriorly; (6) mesonotum (Figs. 7, 10, 13) tricarinate on disc, lateral carinae curving anteriorly towards median carina and forked or not to front; (7)

forewings (Figs. 16, 19, 22) with ratio of length to width about 3:1, stigma long with 4–7 cells; (8) fore femora with a short and blunt spine near apex.

Distant (1906) and Melichar (1912) indicated that the lateral carinae on the mesonotum of *D. viridissima* (Fig. 1) fork towards the front, and they regarded this to be a generic diagnostic character. However, in the examined specimens of *D. viridissima* from India and Sri Lanka, the forked carinae (Fig. 2) of some specimens are too obscure to observe. The same is also found in the samples of *D. octaprotrusa* sp. nov. from southern China. Furthermore, *D. sichuanensis* sp. nov. from Sichuan in China does not possess forked carinae on the mesonotum. Therefore, we suggest that this character should be regarded as a feature which should be combined with other diagnostic characters.

Distribution

Burma; India; Sri Lanka; southern China (Fujian, Guangdong, Guangxi, Hainan, Hunan, Jiangxi, Sichuan).

Key to the Species of genus *Dictyopharina*

- 1 Vertex less than 1.2 times longer than width between eyes *D. viridissima* Melichar
- Vertex more than 1.2 times longer than width between eyes 2
- 2 Vertex with lateral margins more sinuate; hind tibia only with an obsolete spine on basal area *D. consanguinea* Distant
- Vertex with lateral margins relatively straight; hind tibia with a distinct spine on basal area 3
- 3 Anal tube with ratio of length to width at middle about 2.5: 1 in dorsal view (Fig. 21); paramere with a short, acute toothed process at apex in lateral view (Fig. 20) *D. octaprotrusa* sp. nov.
- Anal tube with ratio of length to width at middle about 1.8: 1 in dorsal view (Fig. 24); paramere with a long, obtuse toothed process at apex in lateral view (Fig. 23) *D. sichuanensis* sp. nov.

***Dictyopharina viridissima* Melichar, 1903**

(Figs. 1–2, 7–9, 16–18, 25–27, 34)

Dictyopharina viridissima Melichar, 1903: 26; Distant, 1906: 253, fig. 111; Melichar, 1912: 156.

Redescription

♂: length (from apex of cephalic process to tip of forewings) 10.7–12.8mm; length of head 1.1–1.2mm, width (including eyes) 1.6–1.8mm; length of forewings 9.3–10.9mm.

Vertex (Fig. 7) nearly trapeziform, with ratio of length to width between eyes 1.14:1. Frons (Fig. 8) broad and elongate, with ratio of length to width 2.15:1.

Pronotum (Fig. 7) with posterior margin angulately concave at about 140°. Mesonotum (Fig. 7) tricarinate on disc; lateral carinae somewhat curving anteriorly towards median carina and forked obscurely at 2/5 to front, outer forks obscure and straight, inner ones longer and stronger. Stigma long, with 5–7 cells. Hind tibia with 6–7 (mostly 6) lateral spines, spinal formula 8-(11–12)-(11–12).

Male genitalia: pygofer (Figs. 17–18, 25) narrow and high in lateral view (Fig. 17), posterior margin with an obtuse, posteriorly directed process near apex, length ratio of upper margin to lower margin about 1:6; in dorsal view (Fig. 18) dorsal margin deeply excavated to accommodate anal tube, dorsolateral margins angularly produced posteriorly; in ventral view (Fig. 25) dorsal margin slightly concave, lateral ones nearly parallel. Anal tube (Figs. 17–18) oval and large in dorsal view (Fig. 18), ratio of length to width at middle about 1.1: 1; in lateral view (Fig. 17) anal tube triangle, broad and large. Anal style (Figs. 17–18) short and broad. Paramere (Figs. 17, 25) relatively large and broad in lateral view (Fig. 17), apex expanded and relatively broad with 2 stout, forward toothed processes; middle with a stout, ventrad directed process. Aedeagus (Figs. 26–27, 34) short and small; phallobase cylindrical, sclerotized, pigmented with 2 pairs of membranous sac-like processes; dorsal pair narrow and long, produced dorsad in lateral view (Fig. 34); ventral pair stout and short, produced laterad in dorsal and ventral views (Figs. 27–28); phalli forked at base, with a pair of parallel slender processes produced posteriorly, pigmented and sclerotized at apex.

Material examined

INDIA: 1♂, Central India, Madhya Pradesh State, Jabalpur, 488m, IX-1957 (P. S. Nathan) (NCSU); 1♂, S. Malabar, 450m, 28-VIII-1938 (P. S. Nathan) (NCSU); 1♂, S. Malabar, 9-IX-1938 (P. S. Nathan) (NCSU); 1♂, INDIA: S. Malabar, Walayar Forests, 300m, VIII-1952 (P. S. Nathan) (NCSU); 1♂, Santiniketan, Birbhum, Bengal, 10-X-1937 (T. C. Maa) (BPBM). SRI LANKA: 1♂, Anu. Dist. Wildlife Soc. Bungalow Hunuwilagama, Wilpattu, 60m, (10–19)-III-1970 (Davis & Rowe) (USNM); 1♂, Kan. Dist. Kasalaka, 500m, (22–25)-XI-1970 (O. S. Flint, Jr) (USNM).

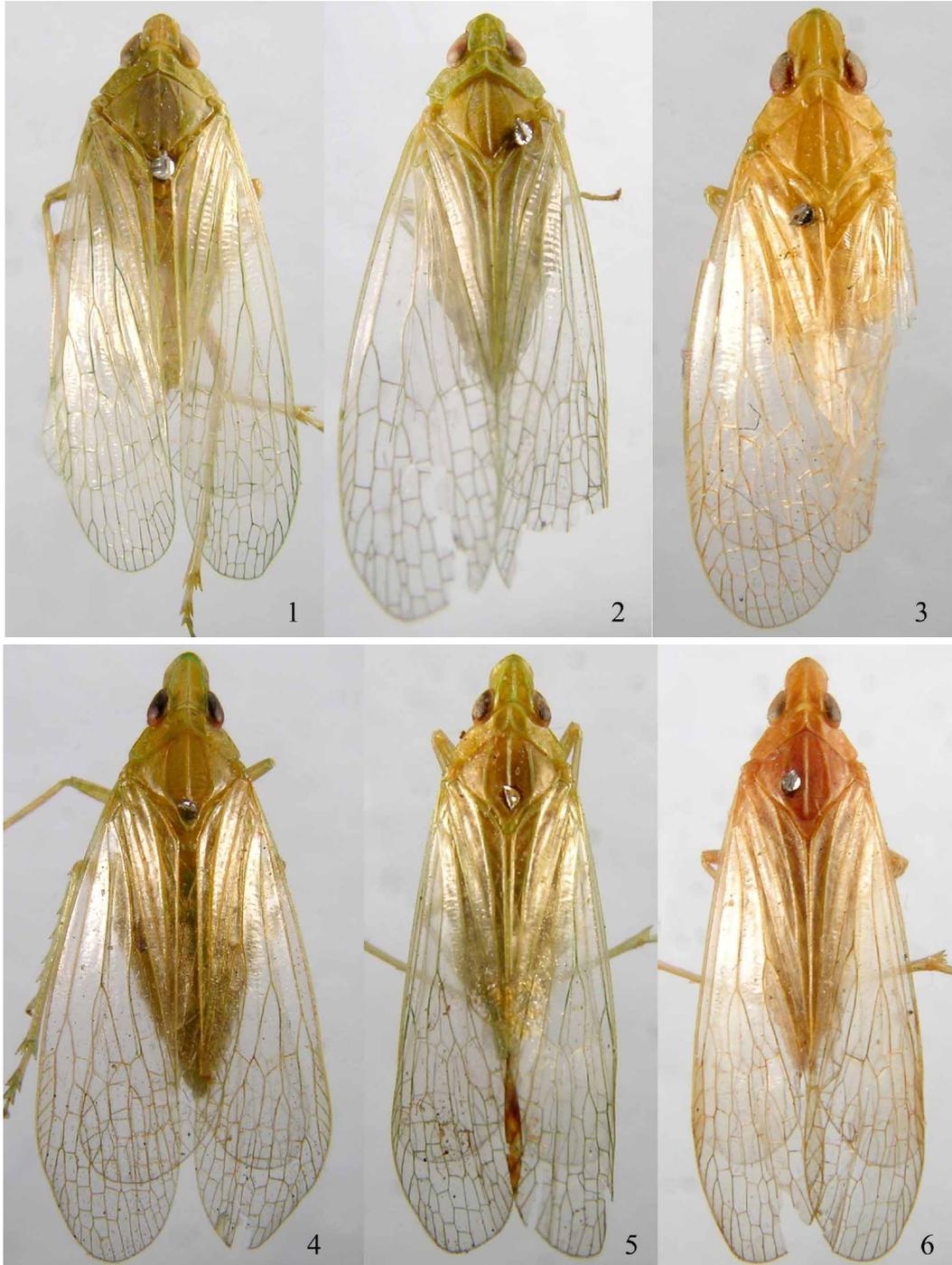
Remarks

The species can be recognized from other species in *Dictyopharina* by one obtuse, posteriorly directed process on the pygofer, and two stout, forward toothed processes on the paramere.

The male genitalia of *D. viridissima* have never been described or illustrated in detail, and we have done so here.

Distribution

India; Sri Lanka.



FIGURES 1–6. Dorsal habitus of *Dictyopharina* species. 1. *D. viridissima* Melichar (σ , India, NCSU). 2. Ditto. (σ , Sri Lanka, USNM). 3–4. *D. octaprotrusa* sp. nov. (σ , holotype, China: Hunan; ♀ , paratype, China: Hunan, IZCAS). 5–6. *D. sichuanensis* sp. nov. (σ , paratype; ♀ , paratype, China: Sichuan, IZCAS).

***Dictyopharina octaprotrusa* sp. nov.**
(Figs. 3–4, 10–12, 19–21, 28–30, 35)

Description

♂, length (from apex of cephalic process to tip of forewings) 11.9–15.6mm; length of head 1.6–1.9mm, width (including eyes) 1.5–2.0mm; length of forewings 9.5–12.7mm; ♀, length (from apex of cephalic process to tip of forewings) 13.9–16.7mm; length of head 1.7–2.1mm, width (including eyes) 1.6–2.1mm; length of forewings 10.9–13.4mm.

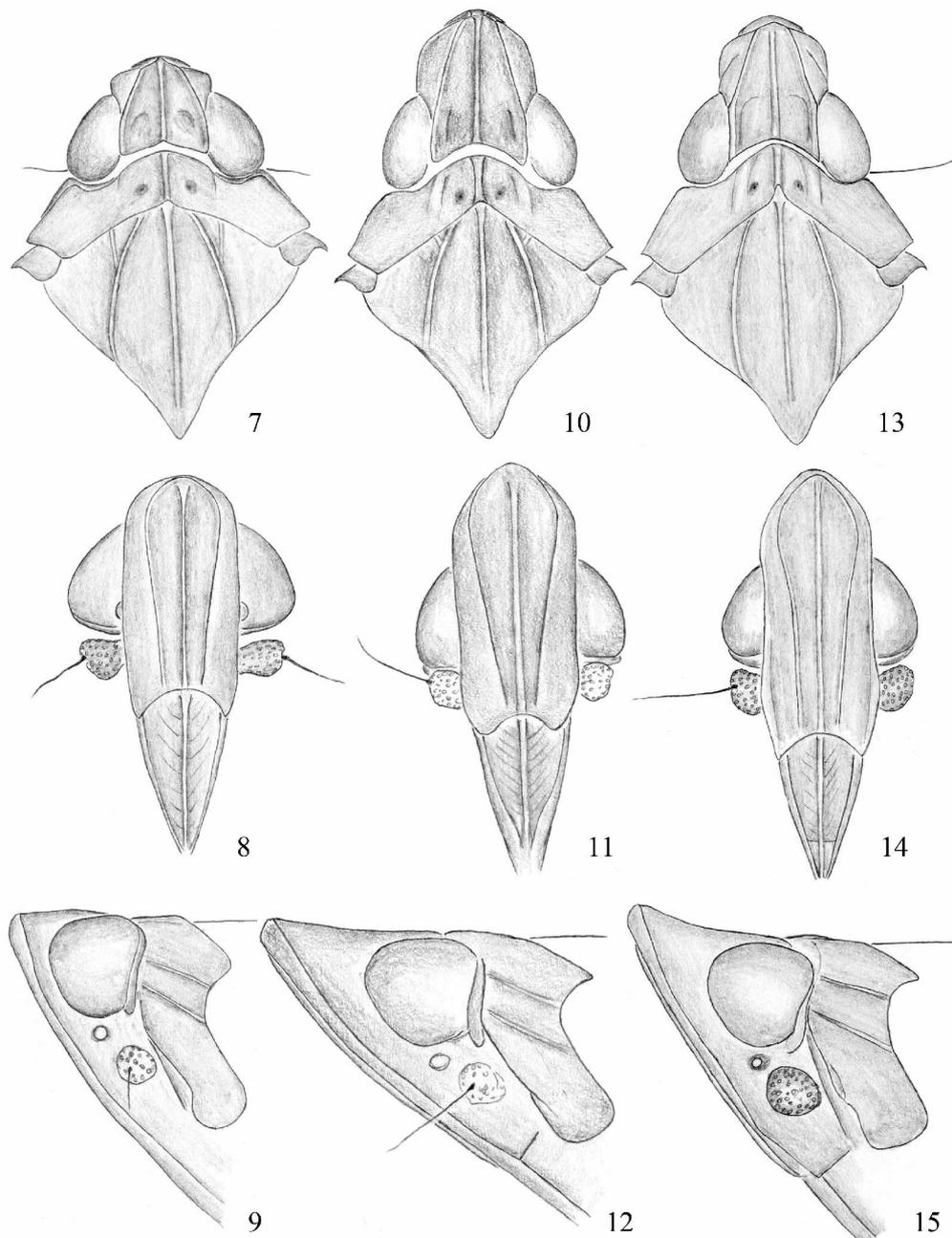
Vertex (Fig. 10) nearly trapeziform, with ratio of length to width between eyes 1.54:1. Frons (Fig. 11) broad and elongate, with ratio of length to width 2.40:1.

Pronotum (Fig. 10) with posterior margin angulately concave at about 110°. Mesonotum (Fig. 10) tricarinate on disc; lateral carinae curving anteriorly towards median carina and forked obscurely at 1/5 to front, outer forks obscure and straight, inner ones longer and stronger. Stigma long, with 5–7 cells. Hind tibia with 6–7 (mostly 6) lateral spines, spinal formula 8-(11-12)-(11-12).

Male genitalia: pygofer (Figs. 20–21, 28) narrow and high in lateral view (Fig. 20), posterior margin straight and curved anteriorly near 1/3 apex to accommodate anal tube, length ratio of upper margin to lower margin about 1:3; in dorsal view dorsal (Fig. 21) margin slightly excavated, dorsal lateral margin not angular; in ventral view (Fig. 28) dorsal margin slightly concave, lateral ones nearly parallel. Anal tube (Figs. 20–21) large and long in dorsal view (Fig. 21), ratio of length to width at middle about 2.5: 1; in lateral view (Fig. 20) anal tube triangle, narrow and long. Anal style (Figs. 20–21) narrow and long. Paramere (Figs. 20, 28) large and broad in lateral view (Fig. 20), apex expanded and broad with a stout, inward toothed process; middle with a stout, ventrad directed process. Aedeagus (Figs. 29–30, 35) stout and large; phallobase cylindrical, sclerotized, pigmented with 4 pairs of membranous sac-like processes; first pair narrow and long, produced posteriorly in lateral view (Fig. 35); second pair relatively stout and short, produced dorsad in lateral view (Fig. 35); third pair relatively stout and long, produced ventrad in lateral view (Fig. 35), apex with numerous short setae; fourth pair stout and long, produced laterad in dorsal and ventral views (Figs. 29–30); phalli forked at base, with a pair of parallel slender processes produced posteriorly, pigmented and sclerotized at apex.

Material examined

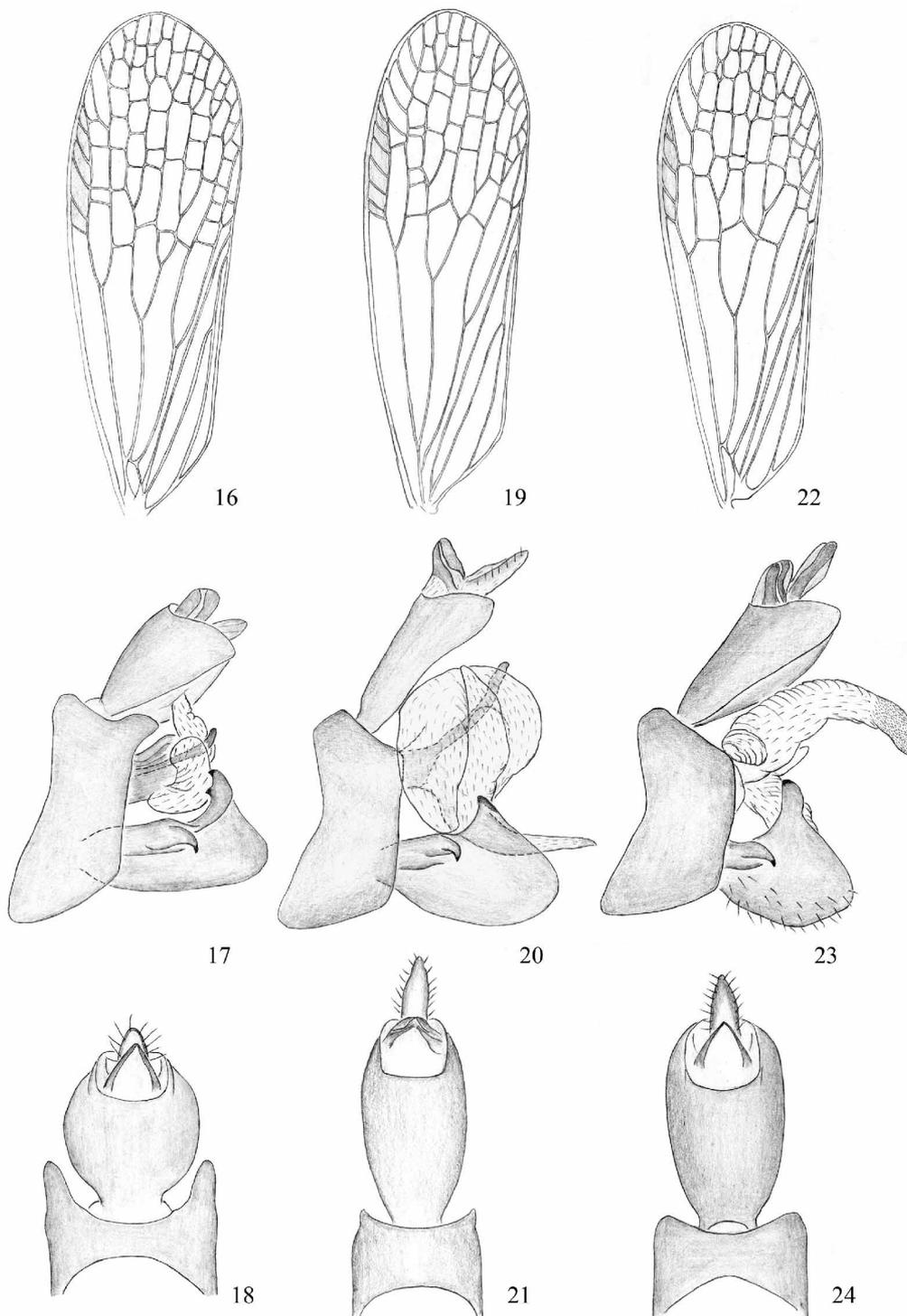
Holotype ♂, CHINA: Hunan, Rucheng, 7-IX-1957 (IZCAS). Paratypes, CHINA: 1 ♂, Fujian, Jianyang, Huangkeng, Tangtou, 310–350m, 24-VIII-1960 (Y. Zuo) (IZCAS); 1 ♂, CHINA: Guangdong, Le Chang, 25-IX-1947 (J. L. Gressitt) (BPBM); 2 ♂, CHINA: Hainan, Ta Han, 14-21-VI-1935 (L. Gressitt) (NCSU); 1 ♂, CHINA: Jiangxi, Wuning, 3-IX-1936 (S. K. Teng) (IZCAS); 1 ♀, CHINA: Guangdong, Gaoyao, Mt. Dinghu, 2-X-1962 (L. Y. Zheng & H. H. Cheng) (NU); 1 ♀, CHINA: Guangxi, Napo, Defu, 16-VIII-1998 (L. H. He) (IZCAS); 1 ♀, CHINA: Hainan, Yinggen, 200m, 5-VII-1960 (Z. F. Li) (IZCAS); 1 ♀, CHINA: Hunan, Rucheng, 7-IX-1957 (IZCAS).



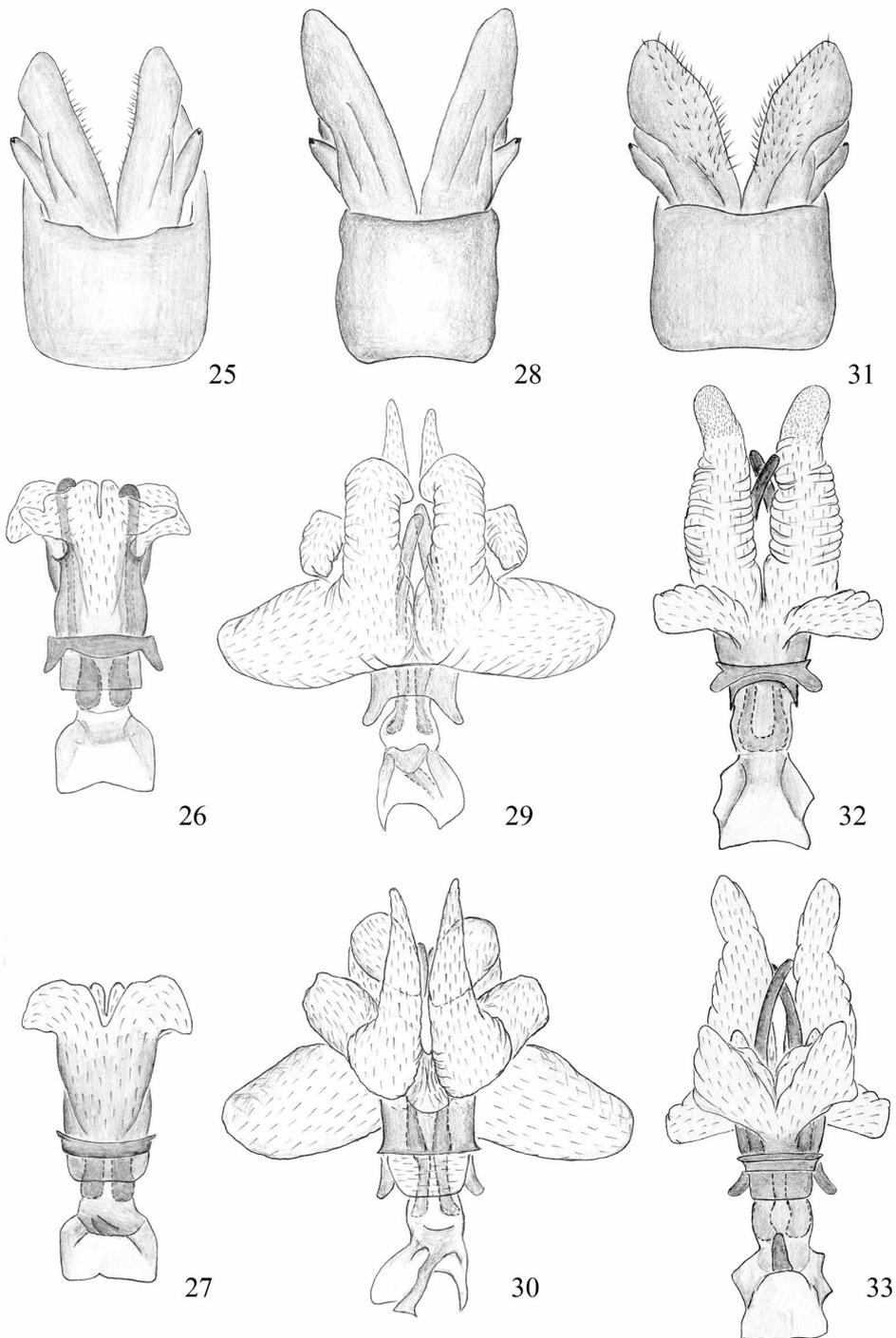
FIGURES 7–15. *Dictyopharina* species: head, pronotum and mesonotum (dorsal view); head (ventral view); head and pronotum (lateral view). 7–9. *D. viridissima* Melichar (σ). 10–12. *D. octaprotrusa* sp. nov. (σ , holotype). 13–15. *D. sichuanensis* sp. nov. (σ , holotype).

Etymology

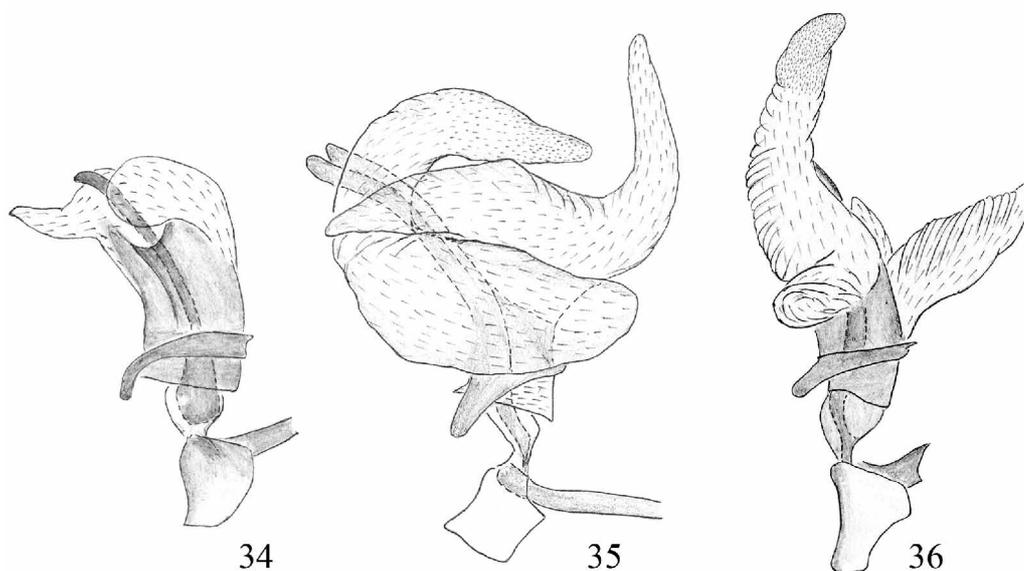
This species is named for its 4 pairs of membranous sac-like processes on the aedeagus.



FIGURES 16–24. *Dictyopharina* species: right forewing; genitalia (lateral view); pygofer and anal tube (dorsal view). 16–18. *D. viridissima* Melichar (σ). 19–21. *D. octaprotrusa* sp. nov. (σ , holotype). 22–24. *D. sichuanensis* sp. nov. (σ , holotype).



FIGURES 25–33. *Dictyopharina* species: pygofer and parameres (ventral view); aedeagus (dorsal view); ditto (ventral view). 25–27. *D. viridissima* Melichar (σ). 28–30. *D. octaprotrusa* sp. nov. (σ , holotype). 31–33. *D. sichuanensis* sp. nov. (σ , holotype).



FIGURES 34–36. *Dictyopharina* species: aedeagus (lateral view). 34. *D. viridissima* Melichar (σ). 35. *D. octaprotrusa* sp. nov. (σ , holotype). 36. *D. sichuanensis* sp. nov. (σ , holotype).

Remarks

This species is similar to *D. consanguinea* Distant, 1906, from Burma, but can be distinguished from the latter by the vertex whose lateral margins are relatively straight, and the hind tibia with distinct spine on its basal area. The species can be distinguished from *D. viridissima* Melichar, 1903, by its elongate head (Fig. 10), the pygofer without the process (Fig. 20), and the apex of paramere with one toothed process (Fig. 20).

The new species possesses the obscure forked carinae on the mesonotum. However, like *D. viridissima*, in some specimens the forked carinae are too obscure to observe.

Distribution

Southern China (Fujian, Guangdong, Guangxi, Hainan, Hunan, Jiangxi).

Dictyopharina sichuanensis sp. nov.

(Figs. 5–6, 13–15, 22–24, 31–33, 36)

Description

σ , length (from apex of cephalic process to tip of forewings) 12.1–12.3mm; length of head 1.4–1.5mm, width (including eyes) 1.6–1.7mm; length of forewings 9.8–10.2mm; φ , length (from apex of cephalic process to tip of forewings) 13.5–13.7mm; length of head 1.5–1.6mm, width (including eyes) 1.7–1.8mm; length of forewings 11.0–11.7mm.

Vertex (Fig. 13) nearly trapeziform, with ratio of length to width between eyes 1.53:1. Frons (Fig. 14) broad and elongate, with ratio of length to width 2.35:1.

Pronotum (Fig. 13) with posterior margin angulately concave at about 100°. Mesonotum (Fig. 13) tricarinate on disc; lateral carinae somewhat curving anteriorly towards median carina and not forked. Stigma long, with 4–5 cells. Hind tibia with 5 lateral spines, spinal formula 8-(12-13)-(11-12).

Male genitalia: pygofer (Figs. 23–24, 31) broad and high in lateral view (Fig. 23), posterior margin straight and curved anteriorly near 1/3 apex to accommodate anal tube, length ratio of upper margin to lower margin about 1:3; in dorsal view dorsal (Fig. 24) margin slightly excavated, dorsal lateral margin not angular; in ventral view (Fig. 31) dorsal margin slightly concave, lateral ones nearly parallel. Anal tube (Figs. 23–24) large and long in dorsal view (Fig. 24), ratio of length to width at middle about 1.8: 1; in lateral view (Fig. 23) anal tube triangle, narrow and long. Anal style (Figs. 23–24) narrow and long. Paramere (Figs. 23, 31) large and broad in lateral view (Fig. 23), apex expanded and broad with a stout, long dorsally directed toothed process; middle with a stout, ventrad directed process; in ventral view (Fig. 31) parameres symmetrical, with numerous spiniform setae on outer and inner surfaces. Aedeagus (Figs. 32–33, 36) stout and large; phallobase cylindrical, sclerotized, pigmented with 4 pairs of membranous sac-like processes; first pair stout and large, produced ventrad in lateral view (Fig. 36); second pair relatively small and short, produced posteriorly in lateral view (Fig. 36); third pair stout and very long, produced posteriorly in lateral view (Fig. 36), apex with numerous short setae; fourth pair stout and short, produced laterad in dorsal and ventral views (Figs. 32–33); phalli forked at base, with a pair of parallel slender processes produced posteriorly, pigmented and sclerotized at apex.

Material examined

Holotype ♂, CHINA: Sichuan, Mt. Emei, 550–750m, 6-IX-1957 (F. X. Zhu) (IZCAS). Paratypes, 1♂, CHINA: Sichuan, Mt. Emei, 550–750m, 31-VIII-1957 (K. R. Huang) (IZCAS); 1♂, CHINA: Sichuan, Mt. Emei, 9-IX-1943 (IZCAS); 2♀, CHINA: Sichuan, Chengdu, Longchi, 2-IX-1943 (IZCAS).

Etymology

This species is named for its occurrence in Sichuan Province of China.

Remarks

The new species can be distinguished from other species in *Dictyopharina* by the mesonotum without forked carinae (Fig. 13), apex of paramere with a stout, long dorsally directed process (Fig. 23), and outer surface of paramere with numerous spiniform setae (Fig. 23, 31). It can be separated from *D. octaprotrusa* sp. nov. by the aedeagal structure (Figs. 32–33, 36), especially the size and tendency of membranous sac-like processes.

Distribution

southern China (Sichuan).

Acknowledgments

The authors wish to thank the following curators for the loan of specimens or access to the collections in their charge: Mr. Davis J. Preston and Dr. Scott E. Miller (BPBM), Mr. Robert L. Blinn and Dr. Lewis L. Deitz (NCSU), Drs. Richard C. Froeschner and Thomas J. Henry (USNM), Prof. Le-Yi Zheng (NU). This work was supported by the Hundred Talent Program and an Innovation Program, both from the Chinese Academy of Sciences and the National Science Fund for Fostering Talents in Basic Research (NSFC-J0030092), all awarded to APL.

References

- Distant, W.L. (1906) *The Fauna of British India, including Ceylon and Burma. Rhynchota 3 (Heteroptera-Homoptera)*. Taylor & Francis, London, pp. 236–254.
- Fennah, R.G. (1944) New Dictyopharidae from the New World (Homoptera: Fulgoroidea). *Proceedings of the Biological Society of Washington*, 57, 77–94.
- Fennah, R.G. (1956) Fulgoroidea from southern China. *Proceedings of the California Academy of Sciences*, 4(28), 441–527.
- Fennah, R.G. (1978) Fulgoroidea (Homoptera) from Vietnam. *Annales Zoologici*, 34(9), 207–279.
- Liang, A.P. & Wilson, M.R. (2002) Wax-secreting, cuticular structures in nymphs of *Scolops abnormis* Ball (Hemiptera: Fulgoromorpha: Dictyopharidae). *Journal of the Kansas Entomological Society*, 75, 132–137.
- Melichar, L. (1903) *Homopteren Fauna von Ceylon*. Verlag von Felix L. Dames, Berlin, 248pp.
- Melichar, L. (1912) Monographie der Dictyophorinen (Homoptera). *Abhandlungen der zoologisch botanischen Gesellschaft in Wien*, 7(1), 1–221.
- Metcalf, Z.P. (1946) *General catalogue of the Hemiptera, Fasc. IV. Fulgoroidea, Part 8 Dictyopharidae*. Smith College, Northampton, MASS., 246 pp.
- Spinola, M.M. (1839) Sur les Fulgorelles, sous-tribu de la tribu des Cicadaïres, ordre des Rhyn-gotes. *Annales de la Société Entomologique de France*, 8, 133–388.