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Research article

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Two new species of the treehopper genus *Machaerotypus* Uhler, 1896 from China (Hemiptera: Membracidae: Centrotinae)

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[4] urn:lsid:zoobank.org:author:4113463D-E962-4028-9041-C51899F003E5
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Abstract. Two new species of the treehopper genus *Machaerotypus* Uhler, 1896, *M. stigmosus* Li & Chen sp. nov. and *M. nodulus* Li & Chen sp. nov., are described and illustrated from Guizhou Province, China. A checklist and key to species of *Machaerotypus* are provided with a map of geographic distribution.

Keywords. Treehopper, Membracidae, taxonomy, distribution.

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Introduction

The treehopper family Membracidae Rafinesque, 1815 (Hemiptera: Auchenorrhyncha), comprising approximately 3200 described species, is a widespread group of phytophagous insects that includes some pests of horticultural crops and forestry (McKamey 1988). These include Chinese scholar tree (*Sophora japonica* L.), banyan (*Ficus benjamina* L.), *Camellia yunnanensis* Cohen-Stuart, and *Malus pumila* Mill. (Yuan & Chou 2002). Treehoppers are renowned for their exaggerated pronotal 'helmet', which may include horns, processes, or spines that contribute to defense or crypsis (Wood 1993). Species of Old World Membracidae belong exclusively to the subfamily Centrotinae Amyot & Serville, 1843 (Yuan & Chou 2002), except for the widely introduced *Stictocephala bisonia* Kopp & Yonke, 1977

(subfamily Smiliinae Stål, 1866), which has been recorded in China (Yuan *et al.* 2020) but is native to North America. In China, Centrotinae includes 42 genera and 282 species (Yuan & Chou 2002; Cai & Xu 2004; Zeng 2005; Li *et al.* 2019). The centrotine genus *Machaerotypus* was established by Uhler (Uhler 1896), with type species *Machaerotypus sellatus* Uhler, 1896. The identity of *Machaerotypus* was confused for a long time, especially with the related genus *Maurya* Distant, 1916. The latter was regarded as a synonym of *Machaerotypus* by Goding (1931) and Kato (1940). These two genera were considered valid in later studies (Funkhouser 1950). Chou & Yuan (1981) clarified the differences separating these genera and described three new species of *Machaerotypus*. The monophyly of the genus is supported by the triangular or arc-shaped suprahumeral horns not exceeding the humeral angle. Since then, two new species were described (Yuan *et al.* 1992; Yuan & Chou 2002). Detailed descriptions and illustrations of *Machaerotypus* were given except *M. ishiharai* Kato, 1940, and *M. sibiricus* (Lethierry, 1876) in a monograph of Chinese treehoppers by Yuan & Chou (2002). *Machaerotypus* currently comprises 11 species distributed in the Oriental and Palearctic bioregions (Uhler 1896; Lindberg 1927; Kato 1928, 1940; Yuan *et al.* 1992; Yuan & Chou 2002).

Herein, two new species, *M. stigmosus* Li & Chen sp. nov. and *M. nodulus* Li & Chen sp. nov. captured by yellow pan traps in Dafang County, Guizhou, are described and illustrated. A key to the species is given as well as a map of their geographic distribution. As a result, *Machaerotypus* now contains 13 species.

Material and methods

Samples were collected using yellow pan traps (Medler 1966) containing water with drop or two of dishwashing liquid. Traps were placed directly within vegetation and checked twice a week. General morphological terminology follows Deitz (1975) and Dietrich *et al*. (2001) except for the morphology of the female genitalia, which follows Mejdalani (1998). Biogeographical terminology follows Holt *et al.* (2013). Habitus photographs were taken using a Canon EOS5D with a MP-E 65mm f/2.8 1-5X lens. Photos taken at multiple focal planes were stacked using Helicon Focus 6. Photos of the forewing and hind wing were taken using a NIKON SMZ 25 digital camera with focus stacks combined as described above. The genital segments of the specimens examined were cleared in 10% NaOH and drawn from preparations in glycerin jelly using a Leica MZ 12.5 stereo microscope. The photographs and the illustrations were imported into Adobe Photoshop CS5 for plate composition and labeling. All the specimens examined are deposited in the Institute of Entomology, Guizhou University, Guiyang, China (IEGU).

Results

Class Insecta Linnaeus, 1758
Order Hemiptera Linnaeus, 1758
Family Membracidae Rafinesque, 1815
Subfamily Centrotinae Amyot & Serville, 1843
Tribe Gargarini Distant, 1908

Genus ***Machaerotypus*** Uhler, 1896
Figs 1–6, 8

Machaerotypus Uhler, 1896: 30.

Machaerotypus – Goding 1931: 303. — Kato 1940: 147. — Funkhouser 1950: 207. — Metcalf & Wade 1965: 416. — Chou & Yuan 1981: 103. — McKamey 1998: 70. — Yuan & Chou 1988: 72; 2002: 254.

Type species

Machaerotypus sellatus Uhler, 1896 = *M. sibirica* (Lethierry, 1896).

Diagnosis

Body usually with bright red markings. Head with vertex slightly to strongly arcuate dorsally, ventral margins oblique. Ocelli ovoid, closer to inner margin of eyes than to each other. Suprahumeral horns rounded, each with crescent-shaped ridge, not extended laterad of humeral angles. Posterior pronotal process mostly concealing scutellum, depressed at base, flat or with slight bulge in center. Humeral angle triangular and stout. Callosity smooth or slightly bristly. Scutellum exposed on both sides and at apex. Forewing multi-striped or hyaline, base with opaque sclerotization. Metathoracic tibia with three longitudinal rows of cucullate setae, trochanter without teeth.

Remarks

Compared with Yuan & Chou's (2002) record, pronotum characteristics of four species, *M. subinermis*, *M. ishiharai*, *M. stigmosus* Li & Chen sp.nov., and *M. nodulus* Li & Chen sp.nov., were supplemented, and the key to species of *Machaerotypus* was updated based on Yuan & Chou (2002).

Host plant

Unknown.

Distribution

China, Japan, Russia, Korea (Fig. 7).

Checklist of species of *Machaerotypus* Uhler, 1896

M. arisanus (Kato, 1928); Japan, China (Taiwan).
M. camelliae Chou & Yuan, 1981; China (Yunnan).
M. ishiharai Kato, 1940; Japan (Honshu).
M. mali Chou & Yuan, 1981; China (Shaanxi).
M. nodulus Li & Chen sp. nov.; China (Guizhou).
M. rubromarginatus Kato, 1940; China (Shaanxi, Liaoning).
M. rubronigris Funkhouser, 1938; China (Zhejiang, Gansu).
M. semirubronigris Yuan & Chou, 1992; China (Sichuan).
M. sibiricus (Lethierry, 1876); Russia; Korea; Japan; China (Heilongjiang, Beijing, Shanxi, Shaanxi, Sichuan).
M. stigmosus Li & Chen sp. nov.; China (Guizhou).
M. subinermis Lindberg, 1927; Russia; Korea; China (Gansu, Heilongjiang).
M. taibaiensis Yuan, 2002; China (Shaanxi).
M. yananensis Chou & Yuan, 1981; China (Shaanxi).

Key to species of *Machaerotypus* Uhler, 1896 (based on Chou & Yuan 2002)

1. Body or pronotum with obviously reddish markings 2
– Body dark or brown 8

2. Reddish markings on pronotum trident shaped (Fig. 8A, a) ..... ***M. camelliae*** Chou & Yuan, 1981
– Reddish markings on pronotum non-trident shaped 3

3. Half of suprahumeral horn reddish (Fig. 8D, d) ..... ***M. semirubronigris*** Yuan & Chou, 1992
– Suprahumeral horn entirely reddish 4

4. Posterior pronotal process with one reddish band (Fig. 8B, b) .... ***M. rubronigris*** Funkhouser, 1938
– Reddish markings on posterior pronotal process more extensive, Y-shaped 5

5. Anterior parts of reddish Y-shaped pronotal marking enlarged (Fig. 8G, g) .....
.....***M. mali*** Chou & Yuan, 1981
– Anterior parts of reddish Y-shaped marking narrow 6

6. Posterior pronotal process almost entirely reddish (Fig. 8C, c) .....***M. rubromarginatus*** Kato, 1940
– Center of posterior pronotal process in dorsal view brown or black 7

7. Forewing with a hyaline transverse band near center .....***M. taibaiensis*** Yuan, 2002
– Forewing brown and slightly shallow edge .....***M. yananensis*** Chou & Yuan, 1981

8. Forewing veins with small nodules 9
– Forewing veins without nodules 10

9. Posterior pronotal process flat (Fig. 8J) .....***M. subinermis*** Lindberg, 1927
– Posterior pronotal process with dorsal margin arched (Fig. 8M) .....***M. nodulus*** Li & Chen sp. nov.

10. The apex of posterior pronotal process curved (Fig. 8L) .....***M. arisanus*** (Kato, 1928)
– The apex of posterior pronotal process flat 11

11. Posterior pronotal process with two depressions (Fig. 8I) .....***M. ishiharai*** Kato, 1940
– Posterior pronotal process with one depression 12

12. Posterior pronotal process flat or slightly expanded (Fig. 8K) .....***M. sibiricus*** (Lethierry, 1876)
– Posterior pronotal process obviously expanded in lateral view (Fig. 8H) .....
.....***M. stigmosus*** Li & Chen sp. nov.

Machaerotypus stigmosus Li & Chen sp. nov.
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Figs 1–4, 7, 8H

Diagnosis

Forewing dark brown with indistinct transverse white stripes (Figs 1E–F, 2A–B), half of anterior surface and margin densely clothed with coarse denticulation; aedeagal shaft with tiny dorsal hump at base (Fig. 3E), dorsal margin dentate in distal half; second valvulae with broad dorsal hump on basal half (Fig. 4E).

Etymology

The word '*stigmosus*' is a Latinized adjective derived from the Greek word 'stigma' (spot), referring to the forewing with many spots.

Material examined

Holotype

CHINA • ♂; Guizhou Province, Dafang County; 27°19′ N, 105°61′ E; 8 Mar. 2019; Xiu-Dong Huang leg.; collected with yellow pan traps; IEGU.

Paratypes

CHINA • 23 ♂♂, 5 ♀♀; same collection data as for holotype; IEGU.

Fig. 1. *Machaerotypus stigmosus* Li & Chen sp. nov. **A, C, E**. Paratype, ♀ (IEGU), habitus in dorsal, frontal and lateral view. **B, D, F**. Paratype, ♂ (IEGU), habitus in dorsal, frontal and lateral view. Scale bars = 1 mm.

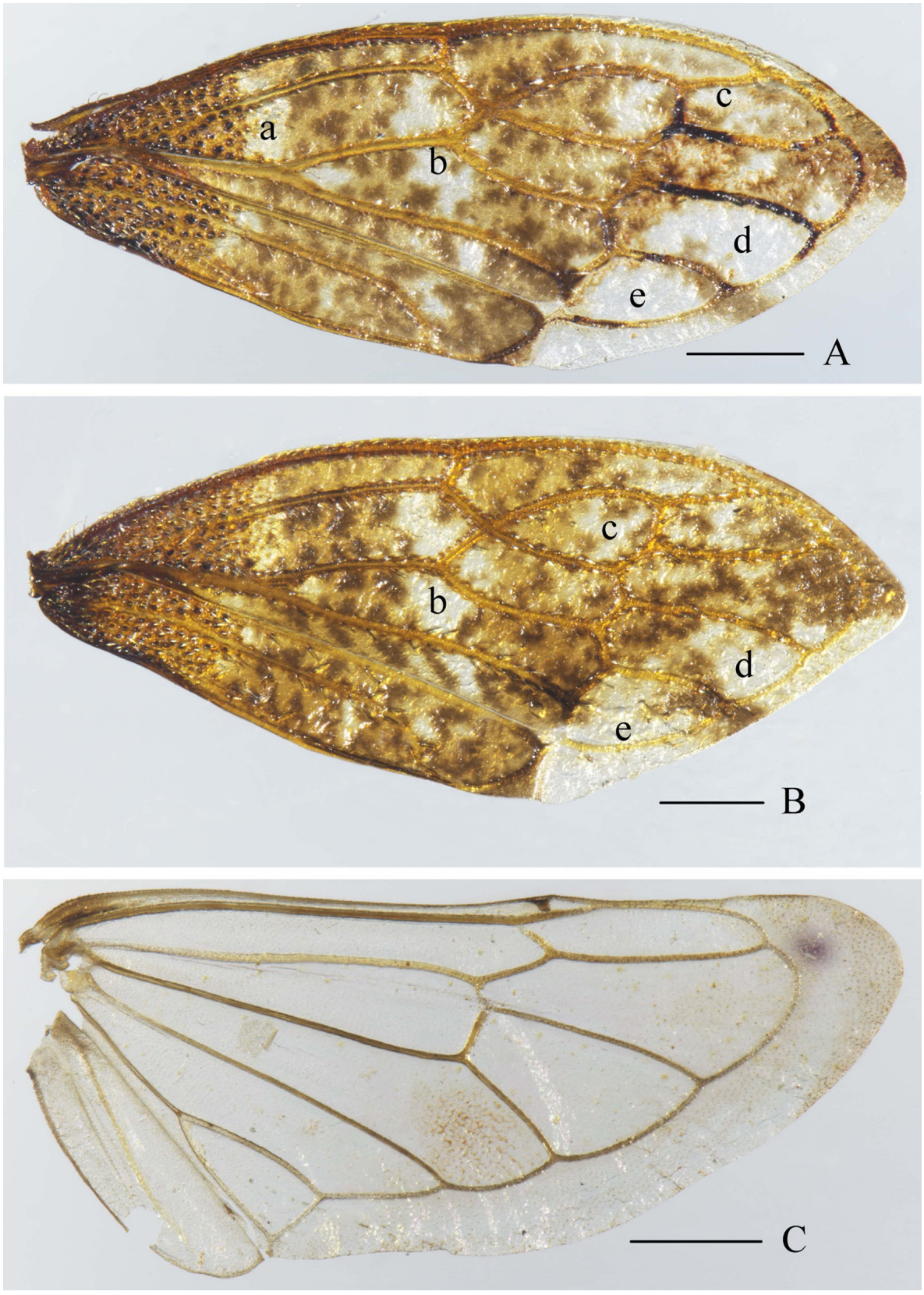

Fig. 2. *Machaerotypus stigmosus* Li & Chen sp. nov. **A**. Paratype, ♂ (IEGU), forewing. **B**. Paratype, ♀ (IEGU), forewing. **C**. Paratype, ♀ (IEGU), hind wing. Scale bars: A–C = 0.5 mm. a–e = white parts.

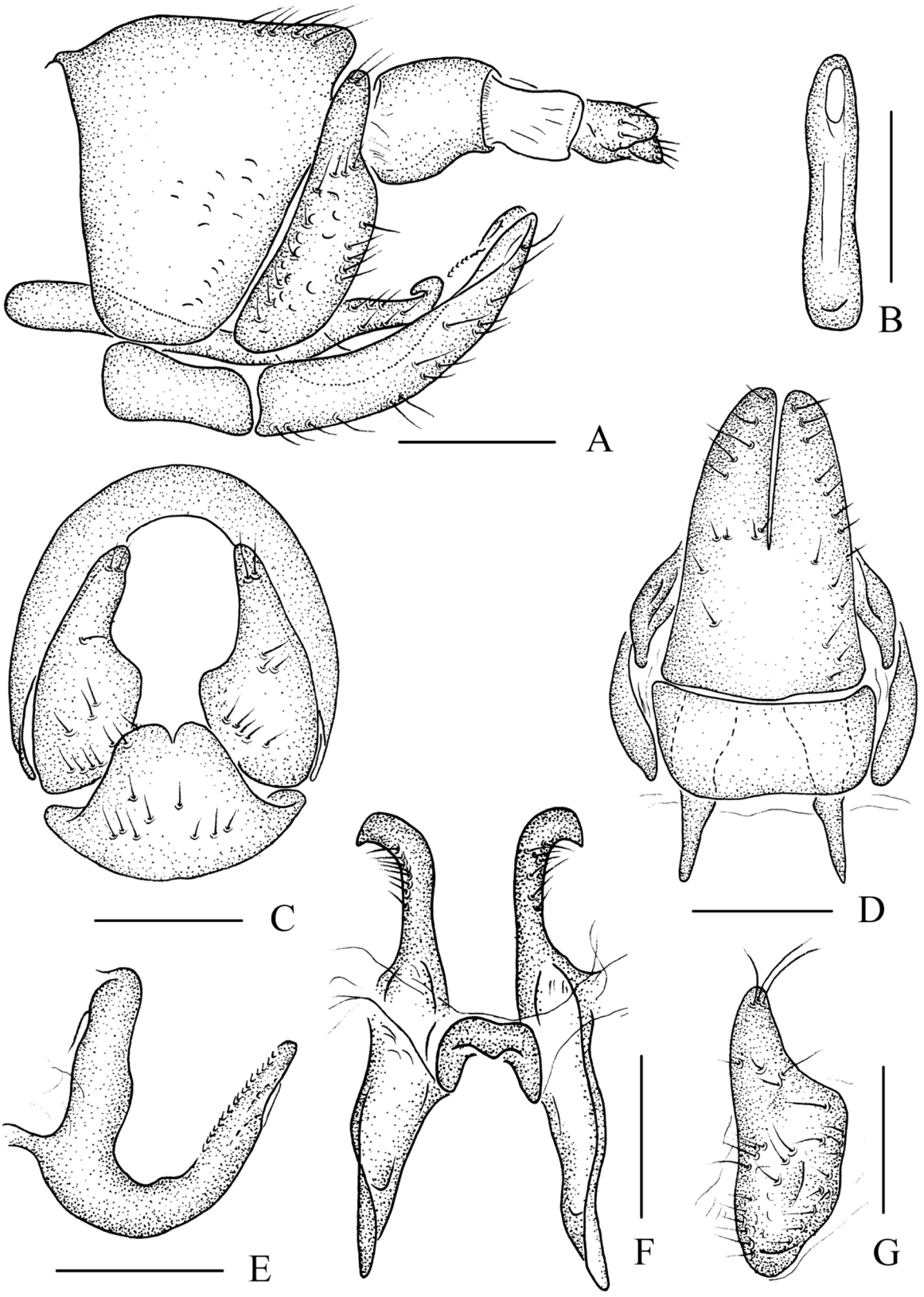

Fig. 3. *Machaerotypus stigmosus* Li & Chen sp. nov., paratype, ♂ (IEGU). **A, C, D**. Genitalia in lateral, posterior and ventral view. **B, E**. Aedeagus, posterior and lateral view. **F**. Style, dorsal view. **G**. Lateral plate. Scale bars = 0.2 mm.

Description

Measurements. Male (n = 24) body length: 4.7–5.1 mm, forewing length: 3.9–4.0 mm, width between humeral angle apices: 1.5–2.1 mm, width between suprahumeral horn apices: 1.5–1.9 mm. Female (n = 5) body length: 5.2–5.3 mm, forewing length: 4.2–4.6 mm, width between humeral angle apices: 2.2–2.3 mm, width between suprahumeral horn apices: 1.6–1.8 mm.

Coloration. Brown. Male slightly darker than female overall. With the following parts black: head, pronotal callosity, femur and tarsal claws (female lighter), posterior pronotal process apical half except

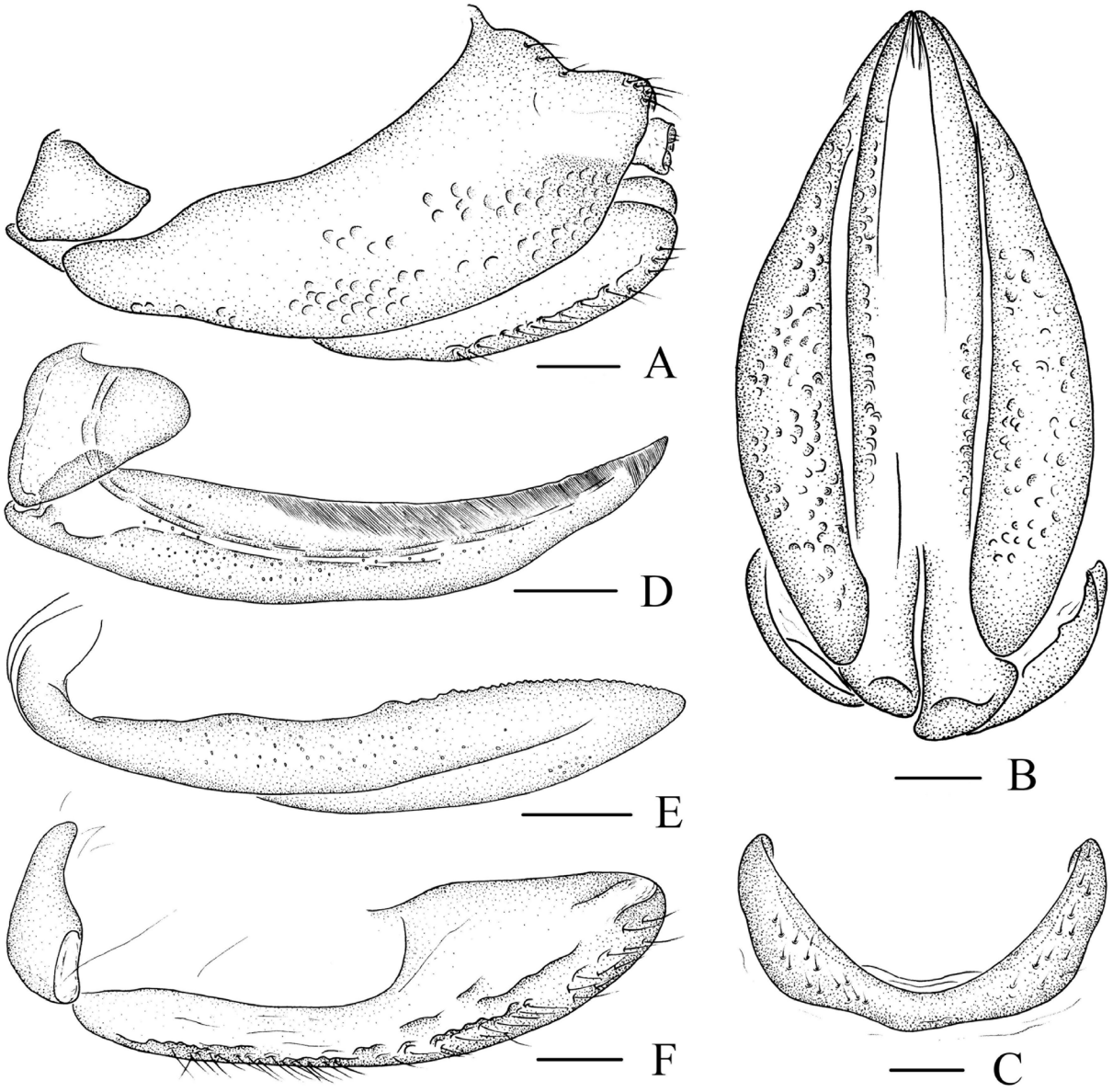

Fig. 4. *Machaerotypus stigmosus* Li & Chen sp. nov., paratype, ♀ (IEGU). **A–B**. Genitalia in lateral and ventral view. **C**. Sternite VII, ventral view. **D**. First valvulae, lateral view. **E**. Second valvulae, lateral view. **F**. Third valvulae (gonoplac), lateral view. Scale bars = 0.2 mm.

tip. Forewing veins brown with black on a few veins, pattern black, and brown brindle, with indistinct transverse white medial band; female with more extensive brown markings than male (Fig. 1). Abdomen black, with base of each segment narrowly yellow-white.

Head and thorax. Vertex with dorsal margin trapezoidal, ocelli slightly closer to inner margin of eyes than to each other; frontoclypeus more than two-thirds length of vertex ventral margins, apex expanded (Fig. 1C–D), frontoclypeal lobes distinct, length more than half as long as frontoclypeus. Pronotum with punctures evenly distributed. Callosity nearly triangular, with sparse setae, surface smooth. Suprahumeral horns short. Posterior pronotal process ending at anal angle of forewing at rest, depressed at base, strongly expanded near middle in lateral view (Fig. 1E–F). Basal fourth of forewing punctate with opaque sclerotization, veins M and Cu fused on the first brown brindle area, veins M+Cu and R fused at center of opaque sclerotization (Fig. 2A–B).

Male genitalia. Pygofer with dorsal margin slightly convex in lateral view, sternite IX longer than wide in lateral view (Fig. 3A). Lateral plate upper half narrow and pointed, depressed slightly on bottom half, with setae on margin (Fig. 3G). Basal half of subgenital plate fused (Fig. 3D). Style clasp angled dorsally; distally recurved, distal half slender, dorsal surface with setae; connective n-shaped (Fig. 3A, F). Aedeagus in lateral view U-shaped, shaft with slight convexity near base, tapered distally with coarse denticles in distal half of dorsal margin; gonopore oblong, preapical on posterior surface (Fig. 3B, E).

Female genitalia. Sternite VII in ventral view with posterior margin deeply concave, both sides with setae (Fig. 4C). Pygofer longer than wide in lateral view with numerous setae; drop-shaped in ventral view (Fig. 4A–B). First valvulae gradually narrowed and tapered to acute apex (Fig. 4D). Second valvulae gradually widened from base to near midlength with slight dorsal hump near base, distal half of dorsal margin irregularly and finely dentate, apex bluntly pointed (Fig. 4E). Third valvulae (gonoplac) broadly rounded distally, ventral margin with numerous setae (Fig. 4F).

Distribution

China (Guizhou) (Fig. 7).

Remarks

This species is similar to *M. sibiricus* (Lethierry, 1876), but differs from the latter as follows: 1) forewing with many spots and brown wide stripe (hyaline in *M. sibiricus*); 2) posterior pronotal process depressed at base, strongly expanded near midlength (flat a base and center in *M. sibiricus*); 3) ocelli slightly closer to inner margin of eyes than to each other (equidistant in *M. sibiricus*).

Machaerotypus nodulus Li & Chen sp. nov.
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Figs 5–7, 8M

Diagnosis

Forewing membrane mostly hyaline with irregular transverse brown band near base and distinct nodules along veins (Fig. 5B, D). Aedeagal shaft abruptly narrowed at distal third in lateral view with small preapical hump (Fig. 6F). Lateral plate apex blunt (Fig. 6D).

Etymology

The species name '*nodulus*' is derived from the Latin word '*nodus*' (knot), referring to the nodules along the forewing veins.

Material examined

Holotype

CHINA • ♂; Guizhou Province, Dafang Country; 27°19′ N, 105°61′ E; Mar. 2019; Xiu-dong Huang leg.; collected with yellow pan traps; IEGU.

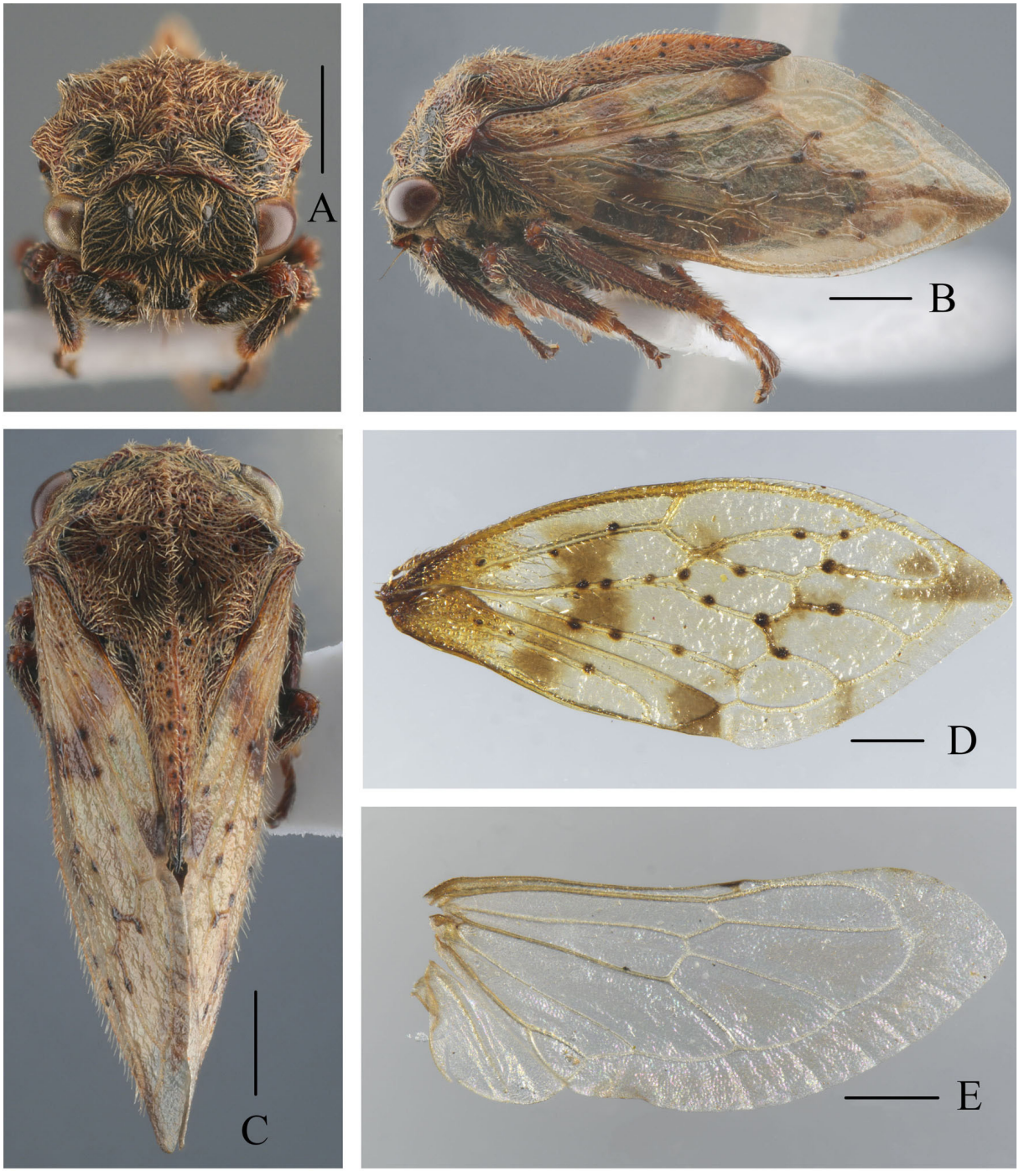

Fig. 5. *Machaerotypus nodulus* Li & Chen sp. nov., holotype, ♂ (IEGU). **A–C**. Habitus in frontal, lateral and dorsal view. **D**. Forewing. **E**. Hind wing. Scale bars: A–C = 1 mm; D–E = 0.5 mm.

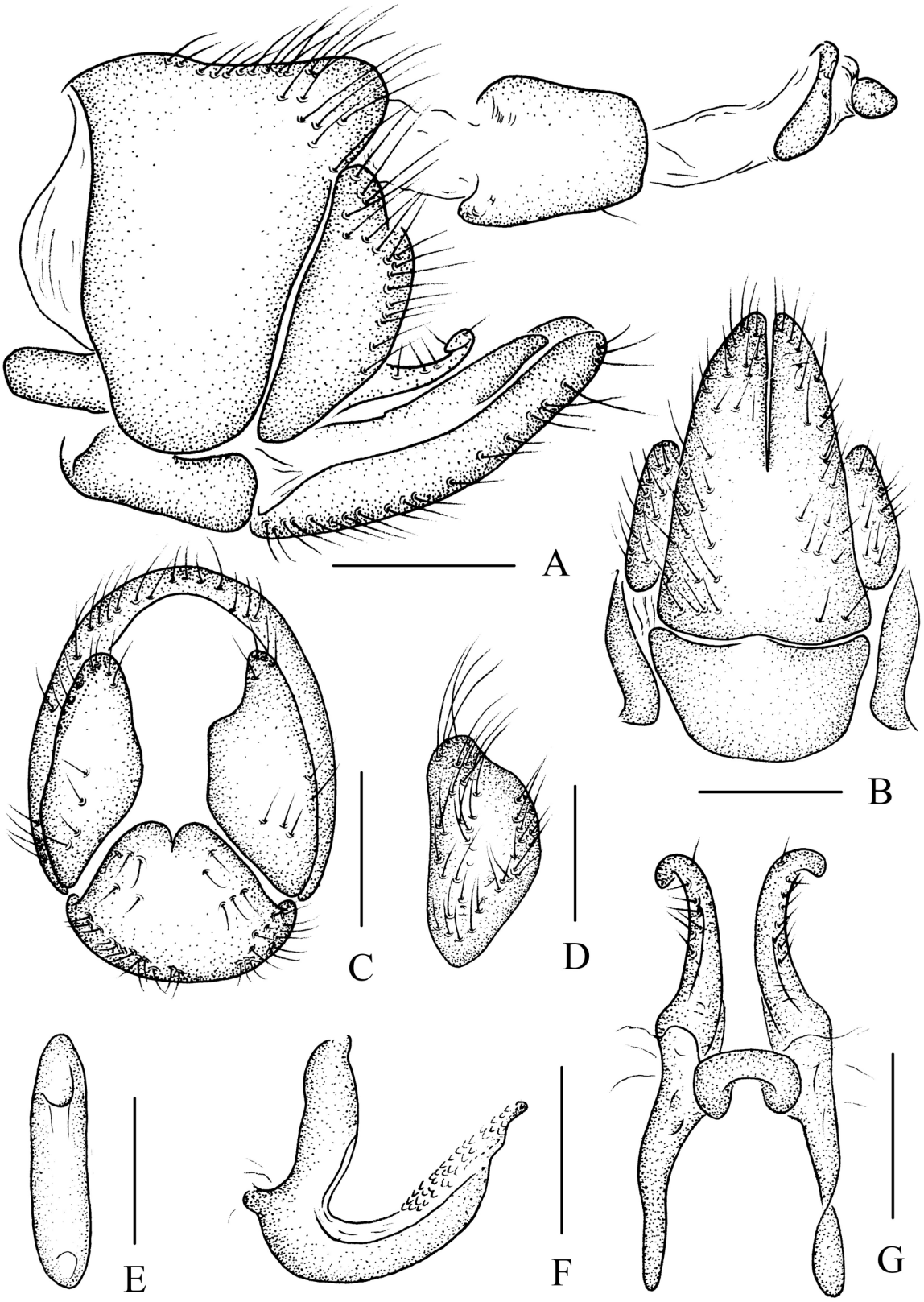

Fig. 6. *Machaerotypus nodulus* Li & Chen sp. nov., holotype, ♂ (IEGU). **A–C**. Genitalia in lateral, ventral and posterior view. **D**. Lateral plate. **E–F**. Aedeagus in posterior and lateral view. **G**. Style, dorsal view. Scale bars = 0.2 mm.

Description

Measurements. Male (n = 1) body length: 4.9 mm, forewing length: 4.1 mm, width between humeral angle apices: 1.9 mm, width between suprahumeral horn apices: 1.6 mm.

Coloration. Orange-brown marked with golden yellow except the head, ocelli, callosity, apical of humeral angle and posterior pronotal process, inner of legs black, surfaces of legs rusty red. Forewing and veins pale yellow with the following parts brown: nodulations, apical, anal angle, apical and one-third of apical, crescent-shaped stripe near basal fourth forewing.

Head and thorax. Vertex nearly rectangular with dorsal and ventral margins slightly arcuate and oblique respectively, ocelli oblong, eyes oval, ocelli slightly closer to inner margin of eyes than to each other; frontoclypeus length more than half of vertex ventral margins, apical expanded slightly, frontoclypeal lobes distinct, length more than half of frontoclypeus, extended slightly across vertex ventral margins (Fig. 5C–D). Pronotum with big punctures on near middle carina, and small punctures evenly distributed. Callosity nearly oval, with small amounts of setae and puncture. Suprahumeral horn short and not exceeding humeral angle, nearly flat. Posterior pronotal process ending at Cu_1, with triangular bulge on center and apex. Forewing with more than 15 nodules on veins evenly distributed. Basal one-fifth of forewing punctate with opaque sclerotization, veins M and Cu fused for nearly half length and divergent,

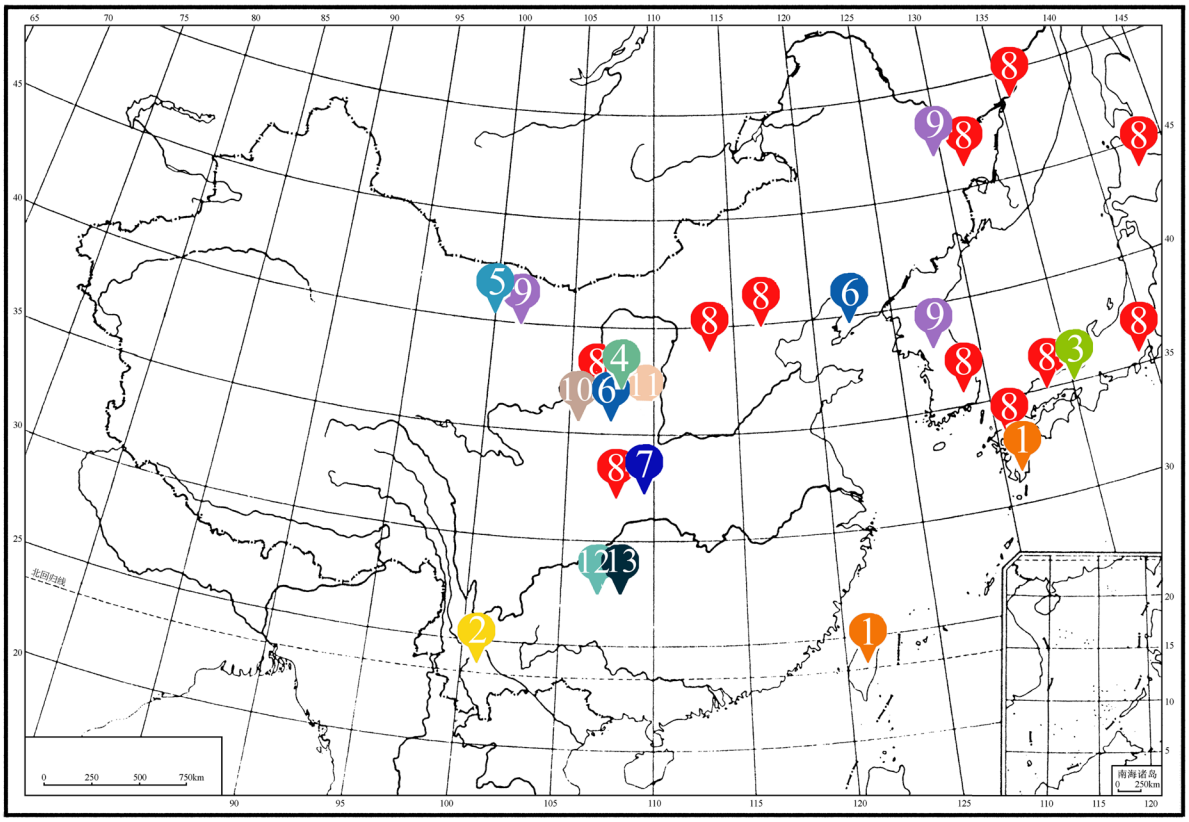

Fig. 7. Geographic distribution of species of *Machaerotypus* Uhler, 1896: **1**. *M. arisanus* (Kato, 1928). **2**. *M. camelliae* Chou & Yuan, 1981. **3**. *M. ishiharai* Kato, 1940. **4**. *M. mali* Chou & Yuan, 1981. **5**. *M. rubronigris* Funkhouser, 1938. **6**. *M. rubromarginatus* Kato, 1940. **7**. *M. semirubronigris* Yuan & Chou, 1992. **8**. *M. sibiricus* (Lethierry, 1876). **9**. *M. subinermis* Lindberg, 1927. **10**. *M. taibaiensis* Yuan, 2002. **11**. *M. yananensis* Chou & Yuan, 1981. **12**. *M. stigmosus* Li & Chen sp. nov. **13**. *M. nodulus* Li & Chen sp. nov.

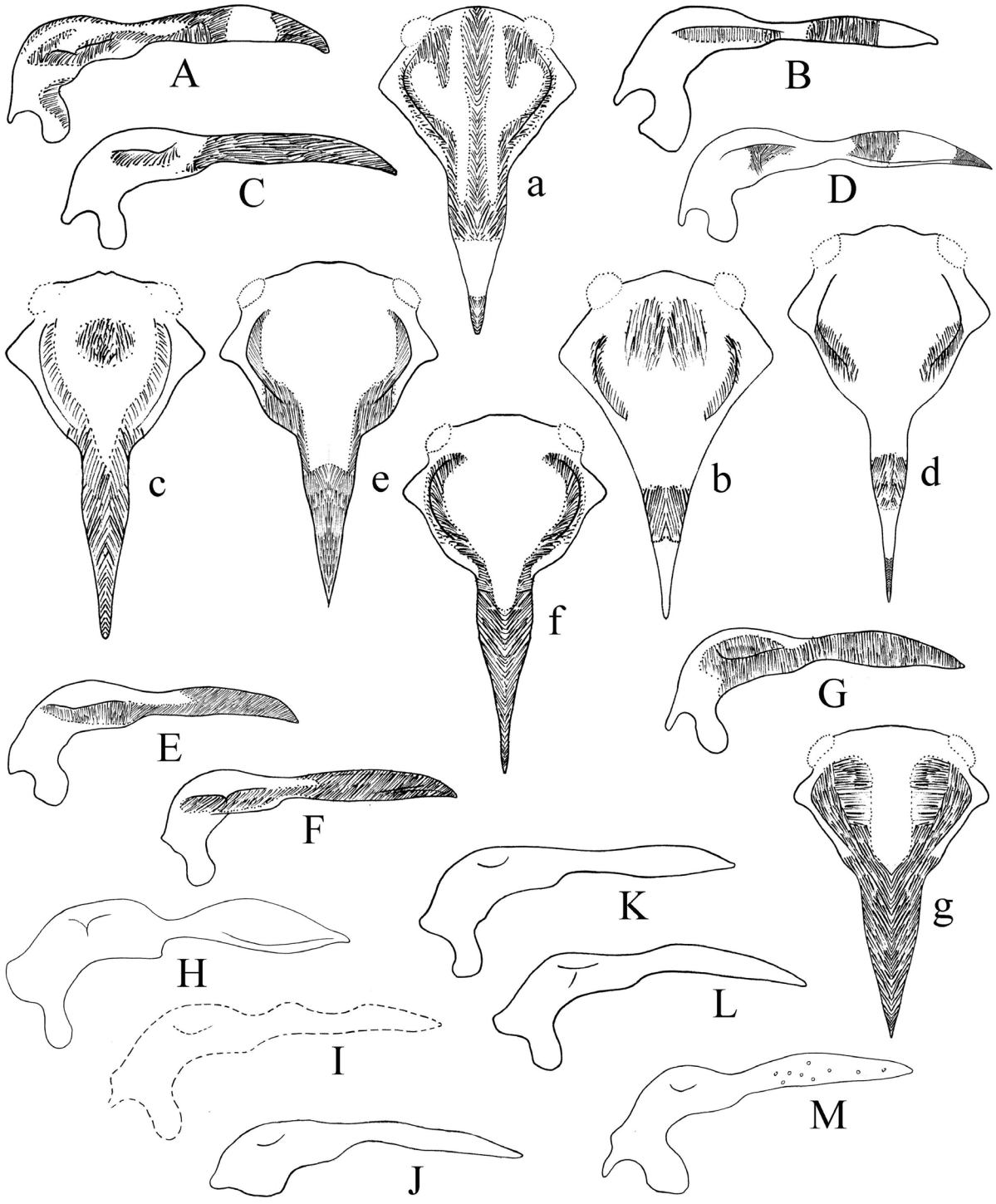

Fig. 8. Pronotum of 13 species of genus *Machaerotypus* Uhler, 1896. **A–M**. Lateral view. **a–g**. Dorsal view. **A, a**. *M. camelliae* Chou & Yuan, 1981. **B, b**. *M. rubronigris* Funkhouser, 1938. **C, c**. *M. rubromarginatus* Kato, 1940. **D, d**. *M. semirubronigris* Yuan & Chou, 1992. **E, e**. *M. taibaiensis* Yuan, 2002. **F, f**. *M. yananensis* Chou & Yuan, 1981. **G, g**. *M. mali* Chou & Yuan, 1981. **H**. *M. stigmosus* Li & Chen sp. nov. **I**. *M. ishiharai* Kato, 1940. **J**. *M. subinermis* Lindberg, 1927. **K**. *M. sibiricus* (Lethierry, 1876). **L**. *M. arisanus* (Kato, 1928). **M**. *M. nodulus* Li & Chen sp. nov. Figures based on Lindberg (1927), Kato (1928) and Yuan & Chou (2002). The dotted line represents the simulation diagram.

veins M+Cu and R fused basally (Fig. 5D). Metathoracic tibia with three longitudinal rows of cucullate setae.

Male genitalia. Pygofer with dorsal margin concave slightly on the central in lateral view, sternite IX slightly curved, longer than wide in lateral view (Fig. 6A, C). Lateral plate apex blunt, depressed slightly on the central, with long setae on margin (Fig. 6D). Subgenital plates fused for more than half length (Fig. 6B). Style clasp angled dorsally; distally recurved, dorsal surface with setae; connective N-shaped (Fig. 6G). Aedeagus in lateral view nearly hook-shaped, abruptly narrowed at distal third and with slight preapical hump, narrow in anterior view, more than half of anterior surface and margin densely clothed with coarse denticulation (Fig. 6E–F).

Distribution

China (Guizhou) (Fig. 7).

Remarks

This species is similar to *M. subinermis* Lindberg, 1927, but differs from the latter in: 1) frontoclypeal lobes more than half as long as frontoclypeus (subequal in *M. subinermis*); 2) apex of frontoclypeus transverse (arcuate in *M. subinermis*); 3) posterior pronotal process arched (flat in *M. subinermis*).

Discussion

Machaerotypus is closely related to *Maurya* Distant, 1916, but differs from the latter as follows: 1) suprahumeral horn weak (well developed in *Maurya*); 2) suprahumeral horns consisting of crescent-shaped ridges arranged parenthesis-like in dorsal view, not extended laterad of humeral angle (triangular, even with or surpassing humeral angle in *Maurya*); 3) base of posterior pronotal process with slight to distinct depression (vs flat or with small teeth in *Maurya*); 4) with bright red markings except *M. arisanus*, *M. ishiharai*, *M. sibiricus*, *M. stigmosus*, *M. nodulus* (without bright red markings in *Maurya*). From an evolutionary point of view, the two genera appear to be closely related. Further research is needed to elucidate the phylogenetic status and relationships of these genera, as well as their historical biogeography and pronotal evolution.

Acknowledgments

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References

Cai P. & Xu R.X. 2004. A new species of the genus *Antialcidas* Distant (Hemiptera: Membracidae) from China. *Entomotaxonomia* 26 (4): 261–263.

Chou I. & Yuan F. 1981. A discussion on the genus *Machaerotypus* Uhler with descriptions of its Chinese species (Homoptera: Membracidae). *Entomotaxonomia* 3 (2): 103–110.

Deitz L.L. 1975. Classification of the higher categories of the New World treehopper (Homoptera: Membracidae). *North Carolina Agricultural Experiment Station Technical Bulletin* 225: 1–177.

Dietrich C.H., McKamey S.H. & Deitz L.L. 2001. Morphology-based phylogeny of the treehopper family Membracidae (Hemiptera: Cicadomorpha: Membracoidea). *Systematic Entomology* 26: 213–239. https://doi.org/10.1046/j.1365-3113.2001.00140.x

Funkhouser W.D. 1950. Homoptera. Fam. Membracidae. *In*: Wytsman P. (dir.) *Genera Insectorum Fasc. 208.* Luis Desmet-Verteneuil, Bruxelles. Available from https://www.biodiversitylibrary.org/page/18036561 [accessed 22 Nov. 2021].

Goding F.W. 1931. Classification of the Old World Membracidae. *Journal of the New York Entomological Society* 39: 299–313.

Holt B.G., Lessard J.P., Borregaard M.K., Fritz S.A., Araújo M.B., Dimitrov D., Fabre P.H., Graham C.H., Graves G.R., Jønsson K.A., Nogués-Bravo D., Wang Z.H., Whittaker R.J., Fjeldså J. & Rahbek C. 2013. An update of Wallace's zoogeographic regions of the World. *Science* 339: 74–78. https://doi.org/10.1126/science.1228282

Kato M. 1928. Notes on Formosan Membracidae, with descriptions of one new genus and some new species. *Insect World* 32: 2–15.

Kato M. 1940. Notes on Membracidae from Easterm Asia. *Entomological World* 8: 1–21.

Li F.E., Yang L., Long J.K., Chang Z.M. & Chen X.S. 2019. A review of the genus *Sinocentrus* Yuan (Hemiptera, Membracidae, Centrotinae) with description of a new species from China. *ZooKeys* 886: 135–144. https://doi.org/10.3897/zookeys.886.36672

Lindberg H. 1927. Zur Kenntnis der paläarktischen Cicadina IV. *Notulae Entomologicae* 7: 23–30.

McKamey S.H. 1998. Taxonomic catalogue of the Membracoidea (exclusive of leafhoppers): Second supplement to fascicle 1 – Membracidae of the general catalogue of Hemiptera. *Memoirs of the American Entomological Institute* 60: 1–377.

Medler J.T. 1966. Leafhoppers and membracids in yellow pan water traps (Homoptera). *Journal of the Kansas Entomological Society* 39: 493–494.

Mejdalani G. 1998. Morfologia externa dos Cicadellinae (Homoptera, Cicadellidae): comparação entre *Versigonalia ruficauda* (Walker) (Cicadellini) e *Tretogonia cribrata* Melichar (Proconiini), com notas sobre outras espécies e análise da terminologia. *Revista Brasileira de Zoologia* 15: 451–544. https://doi.org/10.1590/S0101-81751998000200015

Metcalf Z.P. & Wade V. 1965. *General Catalogue of the Homoptera. A Supplement to Fascicle I — Membracidae of the General Catalogue of the Hemiptera. Membracoidea in two Sections*. North Carolina State University, Raleigh. https://doi.org/10.5962/bhl.title.6822

Uhler P.R. 1896. Summary of the Hemiptera of Japan, presented to the United States National Museum by professor Mitzukuri. *Proceedings of the United States National Museum* 1108: 255–297. https://doi.org/10.5479/si.00963801.1108.255

Wood T.K. 1993. Diversity in the new world Membracidae. *Annual Review of Entomology* 38: 409–433. https://doi.org/10.1146/annurev.en.38.010193.002205

Yuan F. & Chou I. 1988. Advances in the research of systematics of Membracoidea from China (Homoptera: Auchenorrhyncha). *In*: Vidano C. & Arzone, A. (eds) *Proceedings of 6th Auchenorrhyncha Meeting*: 71–78. Consiglio Nazionale delle Ricerche, Turin.

Yuan F. & Chou I. 2002. *Fauna Sinica. Insecta Vol. 28. Homoptera Membracoidea*. Science Press, Beijing.

Yuan F., Chou I. & Cui Z.X. 1992. Homoptera: Membracoidea. *In*: Chen S.-X. (ed.) *Insects of the Hengduan Mountains Region. Vol. 1*: 192–219. Science Press, Beijing.

Yuan X.Q., Hu K. & Yuan F. 2020. The discovery of the buffalo treehopper *Stictocephala bisonia* Kopp & Yonke, 1977 (Hemiptera: Membracidae) in Taibai County, Shaanxi — a newly recorded subfamily in China. *Journal of Plant Protection* 47 (2): 461–462.
https://doi.org/10.13802/j.cnki.zwbhxb.2020.2019092

Zeng Y. 2005. A new species of the genus *Maurya* Distant (Hemiptera: Membracidae) from China. *Entomotaxonomia* 27 (4): 266–268.

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