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Four new species of the genus *Mongoliana* Distant (Hemiptera: Fulgoromorpha: Issidae) from southern China

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Abstract

Four new species in the planthopper genus *Mongoliana* Distant from southern China (Hemiptera: Fulgoromorpha: Issidae) are reported. Three of them, *M. bistriata* **sp. nov.**, *M. latistriata* **sp. nov.** and *M. albimaculata* **sp. nov.**, are described and illustrated; the fourth new one, *M. arcuata* **sp. nov.**, is briefly described for *M. triangularis* Chen, Zhang & Chang which was a misidentification of *M. triangularis* Che, Wang & Chou. *M. recurrens* (Butler, 1875) is re-described and remarks for its current status is given. A key to all known species of *Mongoliana* is provided. The distribution and morphological peculiarities of the genus are briefly discussed.

Key words: Fulgoroidea, Hemisphaeriini, planthopper, morphology, key, distribution

Introduction

The planthopper genus *Mongoliana* belongs to the tribe Hemisphaeriini of the family Issidae. It is easily separated from other genera in this tribe by the hemispherical body shape, by the brown to testaceous body color, by the wide frons usually coarse and rugose and by the tegmina distinctly widened at base of costal margin.

The genus *Mongoliana* was erected by Distant (1909) for the type species, *Hemisphaerius chilochorides* Walker, 1851, from China (Hong Kong). Meanwhile, *Hemisphaerius recurrens* Butler, 1875 from China (Fuzhou) was also assigned to this genus. Fennah (1956) recorded *Mongoliana chilocorides* (Walker, 1851) from Japan, described and illustrated the male of *Mongoliana recurrens* (Butler) for the first time based on specimens from Hubei and Guangdong Provinces of China. Liang (2001) proposed *Mongoliana recurrens* as synonym of *Mongoliana chilocorides* on the basis of the examination of relevant type material. Che *et al*. (2003) described five more species: *Mongoliana lanceolata* Che, Wang et Chou, 2003; *Mongoliana triangularis* Che, Wang et Chou, 2003; *Mongoliana naevia* Che, Wang et Chou, 2003; *Mongoliana sinuata* Che, Wang et Chou, 2003 and *Mongoliana serrata* Che, Wang et Chou, 2003 from China (Guangxi, Yunnan) and provided the first key to species of the genus. Most recently, Chen *et al*. (2014) added two more species from southern China (Yunnan, Guizhou): *Mongoliana pianmaensis* Chen, Zhang et Chang, 2014 and *Mongoliana qiana* Chen, Zhang et Chang, 2014. A list of all species is available in the FLOW website (Bourgoin 2015).

The Chinese fauna of *Mongoliana* represents the richest species diversity of this genus worldwide, comprising all known species to date. However, many species in this genus remain unknown and await descriptions. In the present paper, four species new to science are reported, including *Mongoliana arcuata* **sp. nov.** is described for *Mongoliana triangularis* as recorded in Chen *et al*. (2014), who misidentified the species. *Mongoliana recurrens* (Butler, 1875) is re-described and remarks are given for current status. An updated key to all known species of this genus is also provided.

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Material and methods

External morphology was observed under a Leica MZ 125 Microscope. All measurements are in millimeters (mm). Terminology used for the external morphology follows Chan & Yang (1994), hindwing venation pattern follows Bourgoin *et al.* (2015), female genitalia and male genitalia respectively follows Bourgoin (1993) and Gnezdilov *et al.* (2014). Genital segments of the examined specimens were dissected out and macerated in 10% NaOH solution at approximately 100°C for about 2–3 minutes, and subsequently transferred into glycerin. Photographs of the specimens were made using a Nikon SMZ1500 stereomicroscope with a Q-image CCD camera. Images were produced using the software Automontage (Synoptics, U.K.).

The material examined are deposited in the following collections:

BMNH	The Natural History Museum, London, UK
HBU	Hebei University, Baoding, China
IEGU	Institute of Entomology, Guizhou University, Guiyang, China
NWAFU	Entomological Museum of Northwest A&F University, Yangling, China
SHEM	Shanghai Entomological Museum, Chinese Academy of Sciences, Shanghai, China

Taxonomy

Family Issidae Spinola, 1839

Subfamily Issinae Spinola, 1839

Tribe Hemisphaerini Melichar, 1906

Genus *Mongoliana* Distant, 1909

Mongoliana Distant, 1909: 87.
Type species. *Hemisphaerius chilocorides* Walker, 1851, by original designation.

Diagnostic characters. Hemispherical, brown to testaceous issids. Head including eyes wider than pronotum. Vertex quadrilateral, anterior margin transverse, median carina distinct, posterior margin shallowly concave, all margins ridged, disc shallowly depressed. Frons slightly longer than wide, a little widened below antennae, with or without a linear series of small tubercles along lateral margins. Frontoclypeal suture straight or arcuate. Ocelli absent. Clypeus small, triangulate, with two round small depressions near frontoclypeal suture. Pronotum with small tubercles along anterior and posterior margins, disc slightly excavate, medially with a pair of pits; median carina faint. Carinae of mesonotum sometimes weak, with two round depressions, baso-lateral angles with tubercules. Tegmina coriaceous, convex, widened at basal costal margin, veins inconspicuous, claval suture absent. Hind wings 0.7–0.8 times length of tegmina, distinctly reticulate in distal half, ScP+R usually furcate in apical half, MP and CuA usually furcate submedially and highly branched distad, CuP and Pcu simple. Metatibiotarsal formula 2+(6-7)/(7-9)/2.

Male terminalia. Anal tube with apical margin convex, concave or nearly straight in middle. Pygofer relatively wide in lateral view, posterior margin convex near middle. Aedeagus shallowly U-shaped in lateral view, with pair of ventral processes; dorsolateral lobe of phallobase split into dorsal and lateral lobes from middle to apical 1/4, dorsal margin of lateral lobe smooth or serrate near apex. Genital styles triangular or rectangular in profile, narrowed at base and broadened apicad, hind margin weakly or distinctly concave, caudo-ventral angle widely rounded.

Female terminalia. Anal tube almost ovate. Gonoplacs wide and short in lateral view. Proximal part of posterior connective lamina of gonapophyses IX convex. Anterior connective lamina of gonapophysis VIII with three small teeth in apical group. Gonocoxae VIII nearly rectangular, hind margin concave.

Distribution. China, Japan.

Key to species of *Mongoliana* Distant (males)

1. Frons with aligned tubercles along inner side of lateral margins 2
- Frons without aligned tubercles along inner side of lateral margins. 10
2. Clypeus yellowish brown, without transverse fascia below frontoclypeal suture 3
- Clypeus black, with transverse yellow fascia below frontoclypeal suture 5
3. Aedeagus with lateral hooks asymmetrical, the left hook arising near middle and the right one arising at basal 1/3 (Figs 77, 79 & 80) . . . . . *M. sinuata* Che, Wang et Chou
- Aedeagus with lateral hooks symmetrical and both arising from middle 4
4. Anal tube with apical margin sinuate, slightly convex medially; dorsolateral lobe of phallobase semicircularly expanded ventrad at basal 1/3 on the right side (Figs 73–76). . . . . *M. triangularis* Che, Wang et Chou
- Anal tube with apical margin almost straight medially, dorsolateral lobe of phallobase not expanded at basal part (Chen *et al.* 2014: 71, Figs 2-28) . . . . . *M. pianmaensis* Chen, Zhang et Chang
5. Tegmina with inner margin has pale linear macula near middle (Fig. 51) . . . . . *M. chilocorides* (Walker)
- Tegmina without such macula. 6
6. Tegmina testaceous (Fig. 59). . . . . *M. recurrens* (Butler)
- Tegmina pale brown 7
7. Tegmina with five white small spots on the surface (Figs 21 & 23). . . . . *M. albimaculata* **sp. nov.**
- Tegmina without white small spots on the surface 8
8. Lateral lobes of phallobase with dorsal margin serrated near apex, ventral lobe with apical margin sinuate (Chen *et al.* 2014: 76, Figs 2-31) . . . . . *M. arcuata* **sp. nov.**
- Lateral lobes of phallobase with dorsal margin smooth, ventral lobe with apical margin concave 9
9. Anal tube with apical margin slightly convex in middle; lateral lobes of phallobase has a long, sword-shaped process medially; ventral hooks of aedeagus shorter than one-third of aedeagus in profile (Chen *et al.* 2014: 76, Figs 2-29) . . . . . *M. qiana* Chen, Zhang et Chang
- Anal tube with apical margin shallowly concave in middle; lateral lobes of phallobase has a short spinous process subapically; ventral hooks of aedeagus longer than one-third of aedeagus in profile (Figs 71 & 72) . . . . . *M. lanceolata* Che, Wang et Chou
10. Tegmina without stripe or fascia (Figs 64 & 65). . . . . *M. naevia* Che, Wang et Chou
- Tegmina with an oblique stripe at base and a long fascia in middle 11
11. Anal tube with apical margin convex in middle; lateral lobes of phallobase serrate dorso-caudally to ventrally (Figs 42–44) . . . . . *M. serrata* Che, Wang et Chou
- Anal tube with apical margin concave in middle, lateral lobes of phallobase serrate dorsally. 12
12. Lateral lobes of phallobase with serrated dorsal margin straight, shorter than half length of phallobase; aedeagus with curved hooks both arising from the right side (Figs 11–13) . . . . . *M. bistriata* **sp. nov.**
- Lateral lobes of phallobase with serrated dorsal margin concave, nearly half length of phallobase; aedeagus with the upper hook arising from the right side and the lower one arising from middle (Figs 31 & 32) . . . . . *M. latistriata* **sp. nov.**

***Mongoliana bistriata* sp. nov.**
(Figs 1–3 & 7–20)

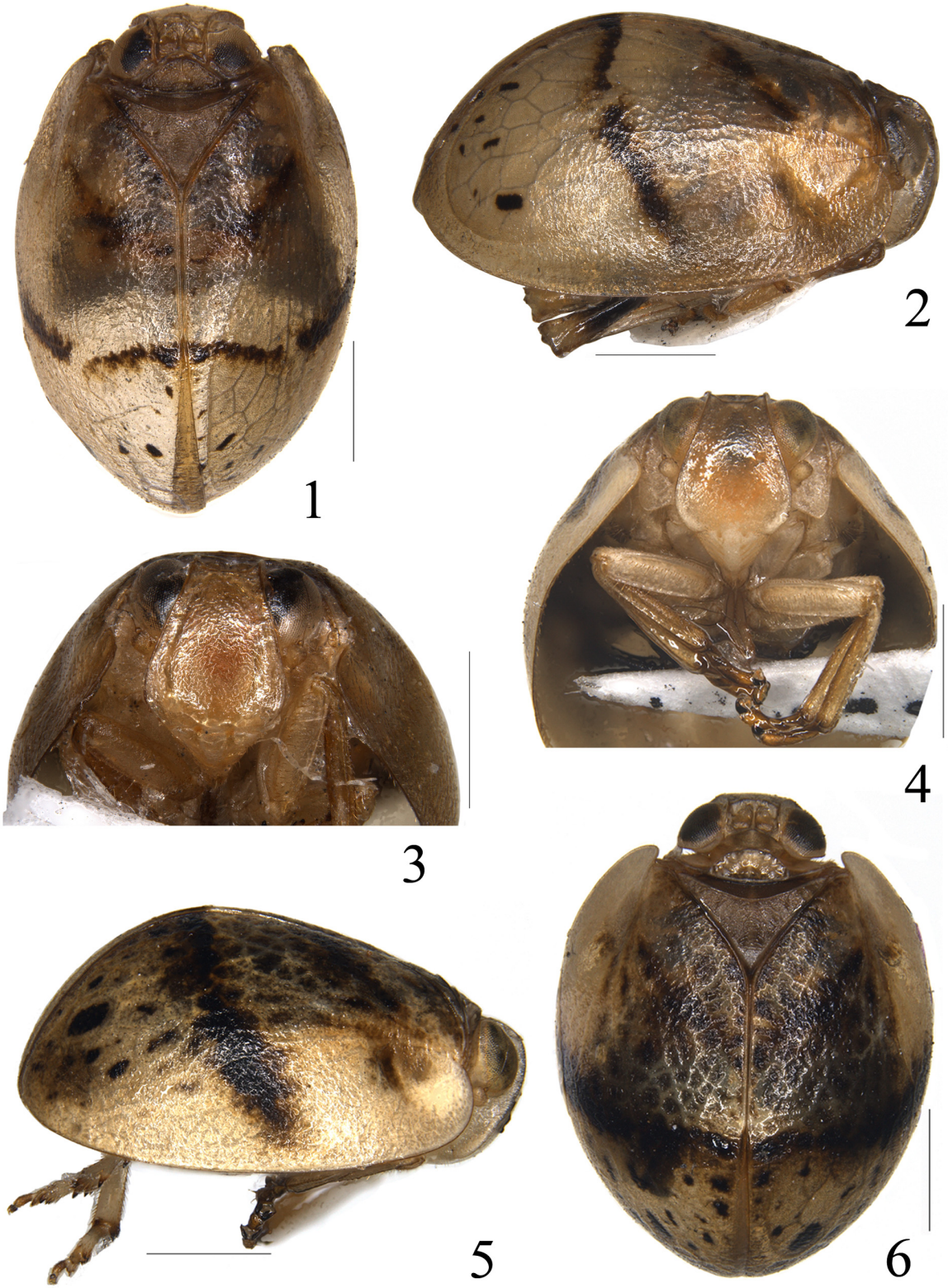
Diagnosis. The new species is similar to *M. serrata* Che, Wang et Chou (Figs 42–44), but differs from the latter in tegmina and male genitalia (features of *M. serrata* in parentheses): transverse fascia of tegmina interrupted in middle (transverse fascia continuous, not interrupted in middle); apical margin of male anal tube deeply concave (apical margin distinctly convex); lateral lobes of phallobase long and separated from dorsal lobe at its apical 1/3, apical margin subacute, serrate on dorsal side; aedeagus with paired elongate hooks both deriving from the right side and close to each other (lateral lobes of phallobase short and separated from dorsal lobe near apex, apical margin blunt, serrated from dorso-caudally to ventrally, aedeagus with paired hooks both deriving from midline in ventral view and situated far away from each other).

Description. Male length (N=1) (including tegmina): 4.2 mm, length of tegmina: 3.7 mm; female length (N=1) (including tegmina): 4.5 mm, length of tegmina: 4.0 mm.

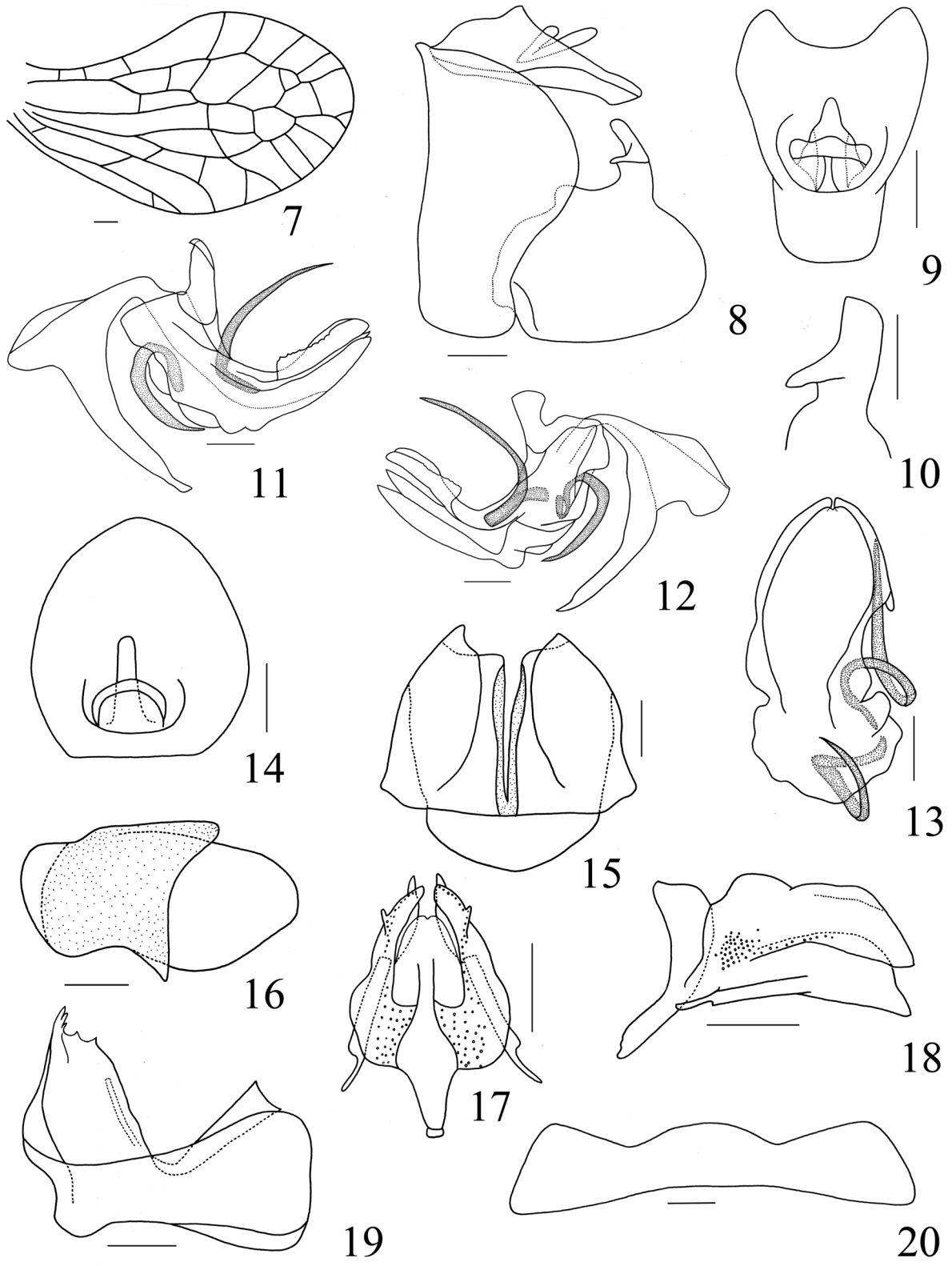
Coloration. Body fulvous. Frons reddish in middle. Pronotum and mesonotum fuscous, pronotum with small tubercles along inner side of anterior margin. Tegmina with a short black stripe at basal 1/4, an interrupted black fascia in middle and three big and several small black blotches at apical part. Hind wings light brown, veins dark fulvous. Leg with hind femur and tip of spines black (Figs 1–3).

Head and thorax. Vertex approximately 1.5 times wider than long in midline (Fig. 1). Frons smooth, approximately 1.1 times longer than its maximum width, 2.1 times wider at widest part than upper margin (Fig. 3). Frontoclypeal suture straight (Fig. 3). Pronotum with six small tubercles laterally (Fig. 1). Mesonotum about 2.2 times wider at widest part than long in midline (Fig. 1). Tegmina approximately twice as long as wide at widest

part. Hind wings semitransparent, about 0.8 times length of tegmina, veins ScP+R (2), MP (4), CuA (2), CuP (1), Pcu (1); ScP+R branched in apical half, with three transverse veinlets between ScP+R and costal margin, between radius and median posterior with several oblong cells, median posterior firstly furcates beyond wing middle, and again in apical part of the wing, MP_4 and CuA_1 curvilinear, cubitus anterior furcates before wing middle, and again branched in apical part of wings (Fig. 7). Metatibiotarsal formula 2+6/7/2.



FIGURES 1–6. 1–3. *Mongoliana bistriata* **sp. nov.**; 4–6. *Mongoliana latistriata* **sp. nov.** 1, 6. habitus, dorsal view; 2, 5. habitus, lateral view; 3, 4. frons and clypeus. Scale bars = 1 mm.



FIGURES 7–20. *Mongoliana bistriata* **sp. nov.** 7. hindwing; 8. male terminalia, lateral view; 9. male anal tube, dorsal view; 10. capitulum of genital style, dorsal view; 11. penis, left view; 12. penis, right view; 13. penis, ventral view; 14. female anal tube, dorsal view; 15. gonoplac, dorsal view; 16. gonoplac, right view; 17. gonapophyses IX and gonaspiculum bridge, dorsal view; 18. gonapophyses IX and gonaspiculum bridge, left view; 19. gonocoxa VIII and gonapophysis VIII, right view; 20. sternum VII, ventral view. Scale bars = 0.2 mm.

Male terminalia. Anal tube with apical margin deeply concave in dorsal view, lateroapical angles strongly prominent (Fig. 9). Anal column located at middle (Fig. 9). Pygofer in profile with posterior margin strongly produced near middle, anterior margin slightly concave in upper half, ventral margin relatively straight, dorsal margin oblique (Fig. 8). Aedeagus asymmetrical, with a pair of curved processes deriving from basal half at right side, the longer one near middle, circled at basal third and directed caudad at apex, the shorter one shifted more basad, circled in middle and directed caudad apically; lateral lobes of phallobase separated from dorsal lobe at apical 1/3, blade-shaped, dorsal margin dentate; ventral lobe gradually narrowing from middle to apex, apical margin slightly concave medially (Figs 11–13). Genital styles with hind margin strongly concave, caudo-ventral angle rounded, dorsal margin has a large obtusely rounded process at middle (Fig. 8). Capitulum of genital style short and narrow, with a large lateral tooth (Fig. 10).

Female terminalia. Anal tube with apical margin arcuately convex (Fig. 14). Anal column located in basal half. Gonoplacs nearly rectangular in lateral view, disc moderately elevated, fused at base and fork slightly sclerotized (Figs 15 & 16). Proximal part of posterior connective lamina of gonapophyses IX strongly convex in lateral view; median field membranous with wide single lobe, apical margin slightly emarginate at middle, distal part of posterior connective lamina with a pair of small spines (Figs 17 & 18). Gonospiculum bridge elongate in lateral view (Fig. 18). Anterior connective laminae of gonapophysis VIII almost quadrate, with three small teeth in apical group and two parallel teeth in lateral group (Fig. 19). Sternum VII with posterior margin distinctly convex at middle (Fig. 20).

Material examined. Holotype: male, China, Guizhou Province, Wuyanqiao, Libo County, Maolan National Nature Reserve, 29 July 2012, coll. Lifang Zheng. Paratype: 1 female, same data as holotype (NWAFU).

Etymology. The specific epithet "*bistriata*" refers to two dark fasciae of the tegmina.

Distribution. China (Guizhou) (Fig. 81).

***Mongoliana latistriata* sp. nov.**
(Figs 4–6 & 27–44)

Diagnosis. This new species is similar to *M. bistriata* **sp. nov.**, but differs from the latter in tegmen and male genitalia (features of *M. bistriata* in parentheses): tegmina with the fascia relatively broad and continuous at middle and irregular blotches numerous from base to apex (fascia relatively narrow and interrupted at middle, blotches sparse in distal 1/3); apical margin of anal tube almost straight in middle (apical margin semicircularly concave); lateral lobes of phallobase with serrate dorsal margin concave, aedeagus with a pair of flexuous processes deriving from basal part at right side and middle line (lateral lobes of phallobase with serrate dorsal margin relatively straight, aedeagus with paired elongate processes only on the right side).

Description. Male length (N=7) (including tegmina): 4.2–4.6 mm, length of tegmina: 3.7–4.1mm; female length (N=2) (including tegmina): 4.5–4.7 mm, length of tegmina: 4.0–4.2 mm.

Coloration. Body ochraceous. Vertex dark fulvous. Frons pale fusco-rufous, lateral margins dark fulvous, with a large black blotch in middle. Clypeus pale yellow, disc strongly elevated, below frontoclypeal suture with oblique stripes laterally and two small pale testaceous depressions in middle. Rostrum pale brown. Pronotum dark brown, with grayish-white small tubercles, anterior and posterior margins black in middle. Mesonotum fuscous. Tegmina pale brown, scattered with black maculae, the narrow fascia at base and wide transverse band in apical third black. Hind wings light brown, veins dark fulvous. Leg pale brown (Figs 4–6).

Head and thorax. Vertex with median carina thick, anterior margin arcuately convex, posterior margin angularly concave, about 2.0 times wider at base than long in midline (Fig. 6). Frons densely wrinkled, approximately 1.1 times longer than wide at widest part (Fig. 4). Frontoclypeal suture arcuate (Fig. 4). Mesonotum about 2.0 times wider at widest part than long in midline (Fig. 6). Tegmina about 2.0 times longer than maximum width. Hind wings subtranslucent, about 0.8 times length of tegmina, veins ScP+R (2), MP (2), CuA (2), CuP (1), Pcu (1); ScP+R branched in apical part, with three transverse veinlets between ScP+R and costal margin, median posterior furcates before wing middle, cubitus anterior furcates at apical part of wing, between median and cubitus anterior with one secondary vein forming a small trianglular cell (Fig. 27). Metatibiotarsal formula 2+6/7/2.

Male terminalia. Anal tube with apical margin concave in dorsal view, lateroapical angles strongly protuberant (Fig. 30). Anal column located at middle (Fig. 30). Pygofer in lateral view with posterior margin obtusely convex

near middle, concave at basal 1/3 (Fig. 29). Aedeagus asymmetrical, with pair of ventral hooks at basal half, the right one bent to left, and the left one bent to right, tips directed towards to each other; lateral lobes narrow and long in apical half, dorsal margin dentate; ventral lobe gradually expanded from middle to apex, apical margin slightly concave medially (Figs 31–33). Genital style with hind margin slightly concave submedially, caudo-ventral angle rounded, dorsal margin with a large subquadrate process at middle (Fig. 29). Capitulum of genital style nearly rectangular, with large lateral tooth (Fig. 28).

Material examined. Holotype: male, China, Hunan Province, Zhangjiajie City, Sangzhi County, Badagongshan National Nature Reserve, 700 m, 31 July 2016, coll. Lifang Zheng (NWAFU). Paratypes: 2 males, same data as holotype (NWAFU); 1 male, China, Hunan Province, Changde City, Taoyuan County, Wuyunjie National Nature Reserve, 12 August 2013, 240 m, coll. Lifang Zheng (NWAFU); 1 female, China, Hunan Province, Changde City, Shimen County, Huping Mountain, 350 m, 17 August 2007, coll. Lingfei Peng (NWAFU); 1 male and 1 female, China, Hunan Province, Changde City, Shimen County, Huping Mountain, 17 August 2004, coll. Jiliang Wang (HBU); 2 males, Hunan Province, Zhangjiajie City, Zhangjiajie National Forest Park, 13 August 2004, coll. Jiliang Wang (HBU).

Etymology. The specific epithet is derived from Latin word "*latus*" and "*striatus*", referring to the wide fascia in the middle of the tegmina.

Distribution. China (Hunan) (Fig. 81).

Notes. The specimens used for erecting *M. latistriata* **sp. nov.** have the aedeagus bearing variably shaped ventral hooks, these differences are here considered to represent intraspecific variation and noted as below:

A. Specimen from Badagongshan National Nature Reserve of Zhangjiajie City (Figs 34 & 35), from Wuyunjie National Nature Reserve of Changde City (Fig. 36) and from Zhangjiajie National Forest Park of Zhangjiajie City (Fig. 41) with the ventral hooks curved semicircularly, the same feature as that of the holotype.

B. Specimen from Huping Mountain of Changde City, the ventral hooks with the upper one curved caudad at base and then bent cephalad, the lower one circled at base and bent caudad apically (as shown in Figs 37 & 38).

C. Specimen from Zhangjiajie National Forest Park of Zhangjiajie City, the ventral hooks with the upper one directed caudad and bent cephalad at basal 1/3, the lower one curved at base and thence directed to the right side (as shown in Figs 39 & 40).

Mongoliana albimaculata sp. nov.

(Figs 21–23 & 45–50)

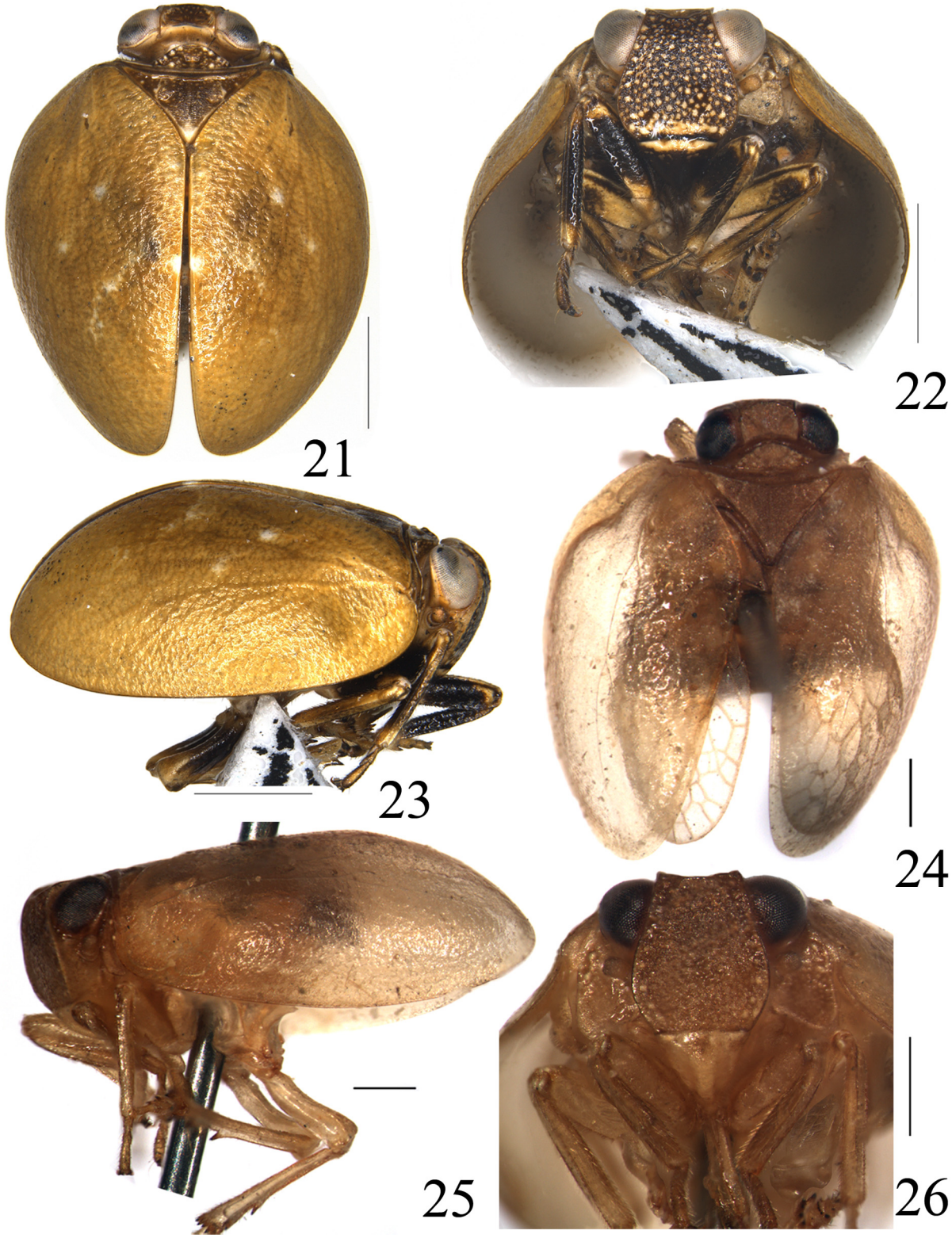
Diagnosis. This species is similar to *M. lanceolata* (Figs 71 & 72), but differs from the latter in tegmina and male genitalia (features of *M. lanceolata* in parentheses): tegmina pale flavovirens with five white blotches (tegmina fuscescent with a pale linear macula near middle of inner margin); anal tube in dorsal view with apical margin convex medially (apical margin concave medially); lateral lobes of phallobase with five denticles caudodorsally, aedeagus with pair of processes, crenated caudoventrally (lateral lobes of phallobase without denticles, aedeagus with paired processes smooth caudoventrally).

Description. Male length (N=1) (including tegmina): 4.1 mm, length of tegmina: 3.5 mm; female length (N=1) (including tegmina): 4.6 mm, length of tegmina: 4.1 mm.

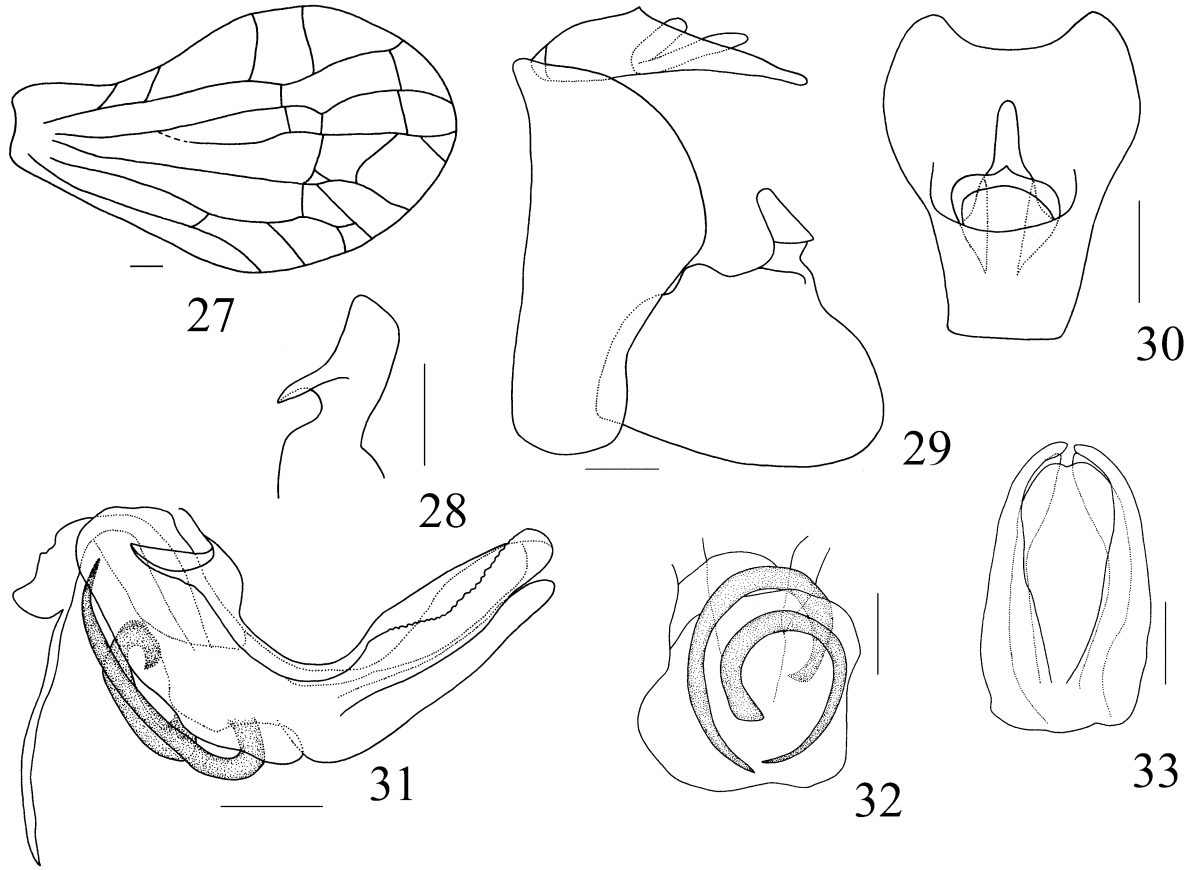
Coloration. Body yellow green. Vertex, frons and pronotum fusco-piceous. Vertex with fulvous spots. Frons yellow at apex, with numerous tubercles. Frontoclypeal suture and clypeus black except a transverse yellow fasciae at base of clypeus. Mesonotum and rostrum fuscous. Pronotum with light tubercles. Mesonotum scattered with pale tubercles or granules, white at apex. Tegmina yellow green, with five small white maculae, the largest one at middle of posterior margin. Hind wings light brown, veins fulvous. Fore leg black, pro-femur and tibia dark yellow at base and apex; median leg dark yellow with black longitudinal stripes and maculae; hind leg dark yellow, post-femur black. Abdomen dark brown (Figs 21–23).

Head and thorax. Vertex with anterior margin moderately straight, approximately 2.1 times wider at base than long in midline (Fig. 21). Frons rugous and granulose, median length almost equal to maximum width, about 1.9 times wider at widest part than at upper margin (Fig. 22). Frontoclypeal suture straight (Fig. 22). Pronotum coarse, with six large tubercles laterally and numerous small pustules (Fig. 21). Mesonotum large and rugose, pustules numerous, median carina weak; about 2.1 wider at widest part than long in midline (Fig. 21). Hind wings translucent, about 0.8 times length of tegmina, veins ScP+R (2), MP (4), CuA (2), CuP (1), Pcu (1); ScP+R furcate

before wing middle and shortly branched in apical half of the wing, with three transverse veinlets between ScP+R and costal margin, and with secondary veins forming quadrangular cells, median posterior furcates in apical part, cubitus anterior furcates beyond middle, and shortly branched at apical part of wing (Fig. 45). Metatibiotarsal formula 2+6/7/2.



FIGURES 21–26. 21–23. *Mongoliana albimaculata* **sp. nov.**; 24–26. *Mongoliana triangularis* Che, Wang et Chou, 2003 (holotype). 21, 24. habitus, dorsal view; 22, 26. frons and clypeus; 23, 25 habitus, lateral view. Scale bars = 1 mm.



FIGURES 27–33. *Mongoliana latistriata* **sp. nov.** 27. hindwing; 28. capitulum of genital style, dorsal view; 29. male terminalia, lateral view; 30. male anal tube, dorsal view; 31. penis, left view; 32. penis, basal half, ventral view; 33. penis, apical half, ventral view. Scale bars = 0.2 mm.

Male terminalia. Anal tube subtriangular, apical margin sinuate in dorsal view, angularly convex medially, laterocaudal angles slightly projected (Fig. 47). Anal column situated in the middle of anal tube (Fig. 47). Pygofer in lateral view with posterior margin roundly convex submedially, slightly concave in basal $^{2}/_{5}$ (Fig. 46). Aedeagus with a pair of long hooks from middle, reaching to the base of aedeagus; lateral lobes of phallobase distinctly sclerotized and sword-shaped, with five teeth on dorsal margin near apex; ventral lobe narrow in ventral view, apical margin slightly convex (Figs 49 & 50). Genital style with hind margin obviously concave (Fig. 46). Capitulum of style short and acute at apex, with a large lateral tooth (Fig. 48).

Material examined. Holotype: male, China, Guizhou Province, Wuyanqiao, Libo County, Maolan National Nature Reserve, 28 July 2012, coll. Lifang Zheng (NWAFU). Paratype: 1 female, same data as holotype (NWAFU).

Etymology. The specific epithet is derived from the Latin words "*albus*" and "*macula*", referring to the white maculae of the tegmina.

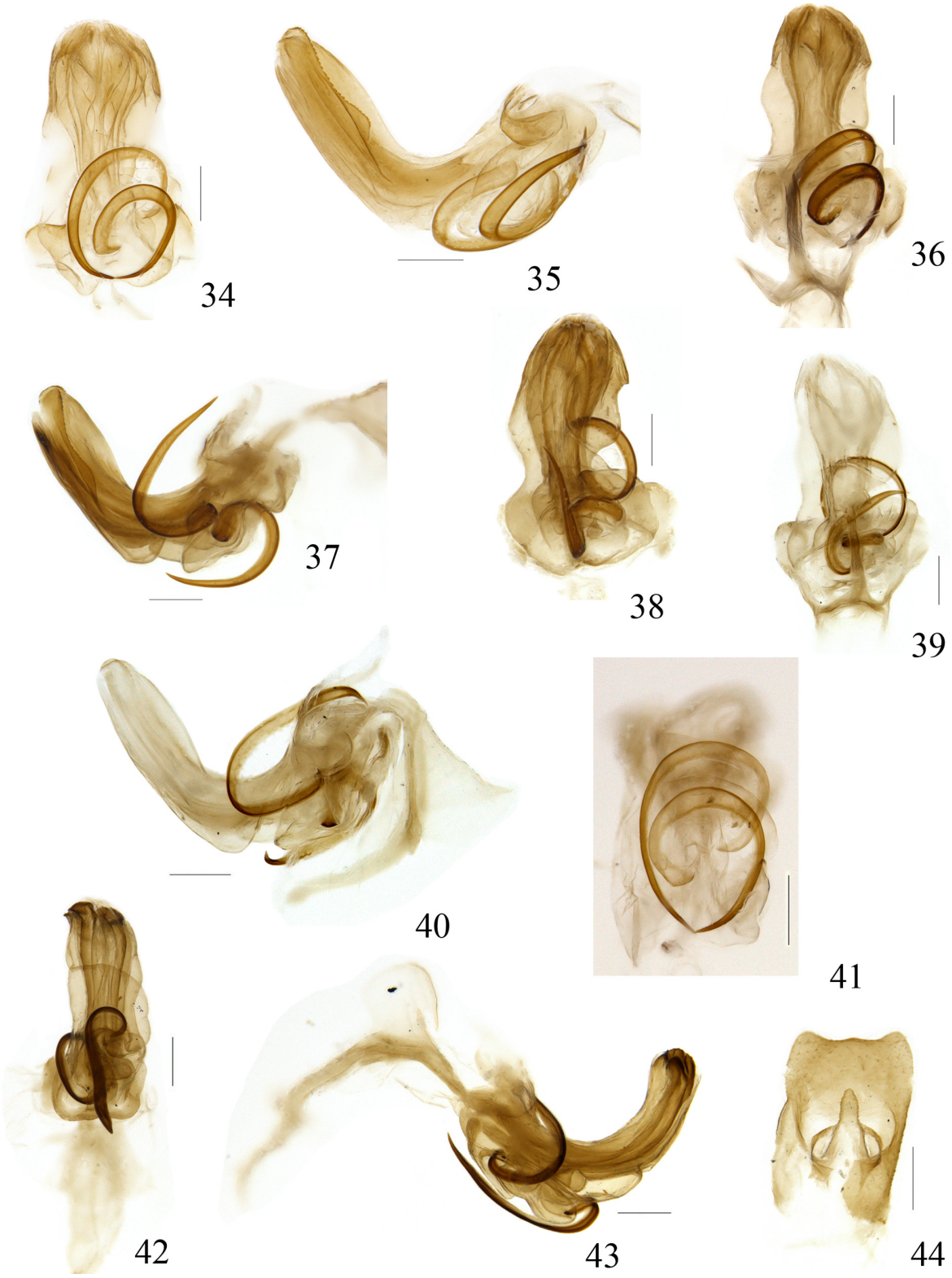
Distribution. China (Guizhou) (Fig. 81).

Mongoliana arcuata sp. nov.

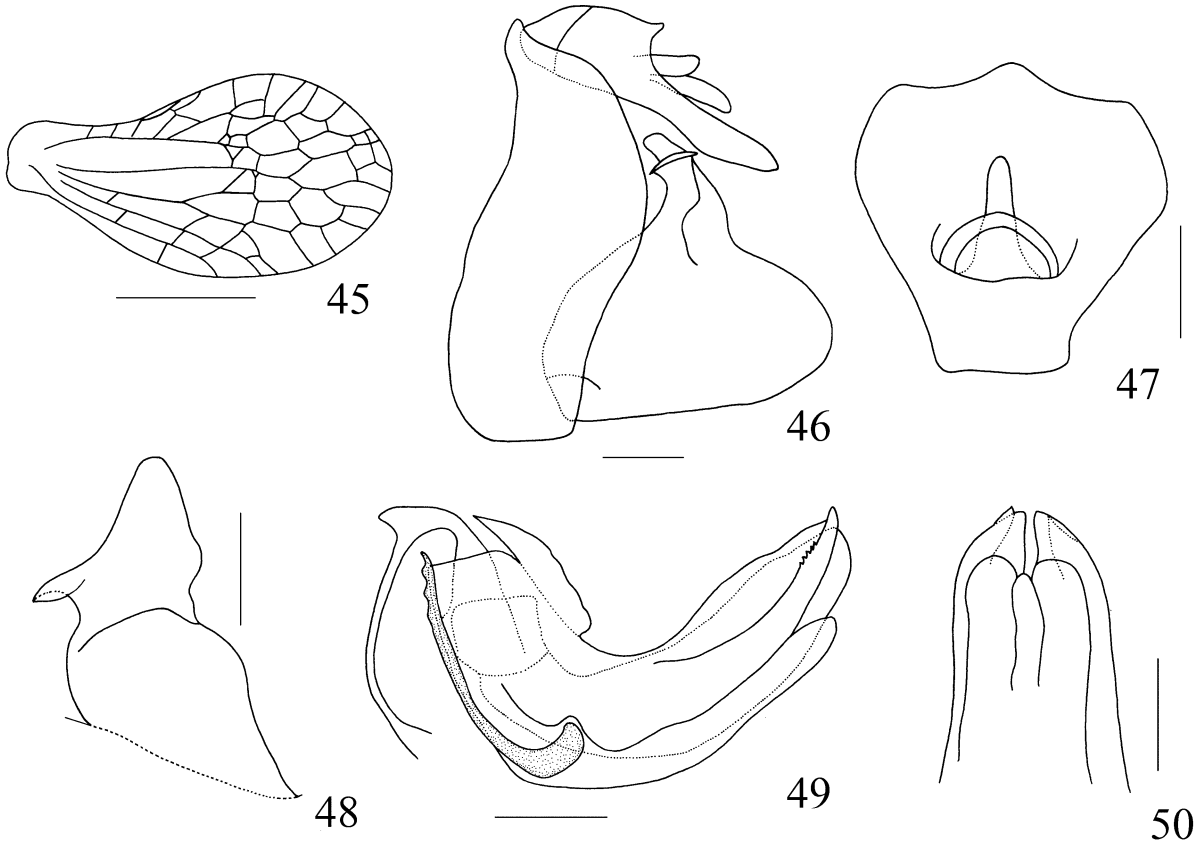
Gergithus triangularis [sic!] = *Mongoliana triangularis* Chen, Zhang & Chang, 2014: 76, non *Mongoliana triangularis* Che, Wang & Chou, 2003: 38.

Diagnosis. The new species differs from *M. triangularis* Che, Wang et Chou by (features of *M. triangularis* Che, Wang et Chou in parentheses): clypeus black (Chen *et al*. 2014, Fig. 2–31E) [clypeus pale brown (Fig. 26)]; anal tube with apical margin convex, lateroapical angle obtuse (Chen *et al*. 2014, Fig. 2–31H) [apical margin of anal

tube sinuate, lateroapical angle protruding (Fig. 73)]; aedeagus with pair of asymmetrical processes both arising from base (Chen *et al*. 2014, Fig. 2–31K, L) [processes symmetrical and both arising from middle (Figs 74–76)]; pygofer in profile with posterior margin slightly convex near middle (Chen *et al*. 2014, Fig. 2–31I) [pygofer in profile with posterior margin concave in dorsal one-third, strongly convex near middle (Che *et al*. 2003, Fig. 2B)].



FIGURES 34–44. 34–41. *Mongoliana latistriata* **sp. nov.**; 42–44. *Mongoliana serrata* Che, Wang et Chou, 2003 (holotype). 34, 36, 38, 39, 41, 42. penis, ventral view; 35, 37, 40. penis, right view. 43. penis, left view; 44. male anal tube, dorsal view. Scale bars = 0.2 mm.



FIGURES 45–50. *Mongoliana albimaculata* **sp. nov.** 45. hindwing; 46. male terminalia, lateral view; 47. male anal tube, dorsal view; 48. capitulum of genital style, dorsal view; 49. penis, left view; 50. penis, apical half, ventral view. Scale bars = 0.2 mm.

Description (modified after Chen *et al.*'s original description). Body brown. Frons fuscous, with yellow tubercules and numerous yellow spots. Frontoclypeal suture and clypeus black except a yellow transverse fascia at the base of clypeus.

Male terminalia. Anal tube with apical margin convex in middle, lateroapical angle obtuse. Pygofer in lateral view with posterior margin slightly convex near middle. Lateral lobes of phallobase arcuate at apex, dorsal margin serrated near apex; ventral lobe with apical margin slightly sinuate; aedeagus with paired asymmetrical processes at base. Genital style with hind margin nearly straight near middle, dorsal margin with moderate subquadrate process at middle.

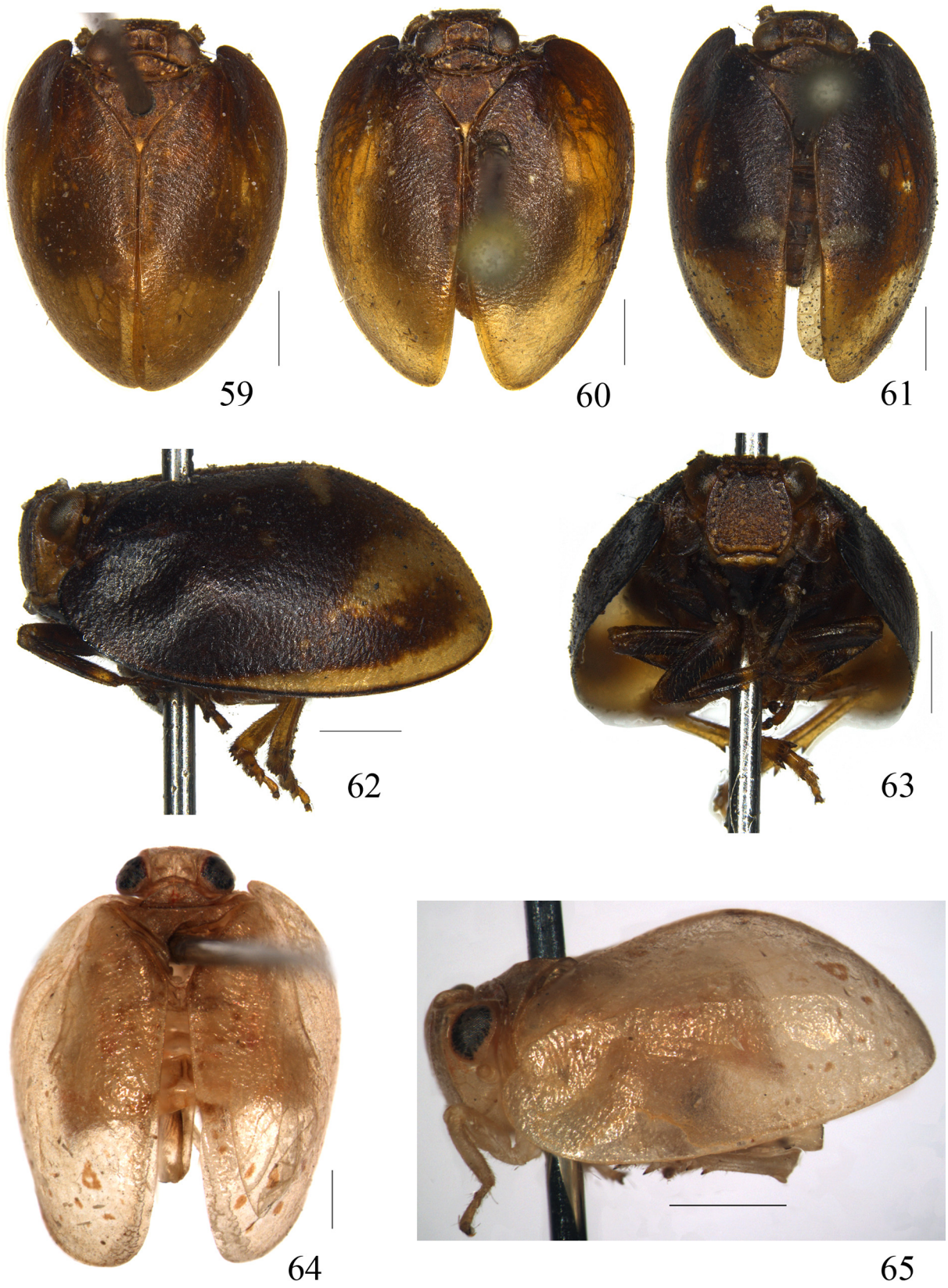
Material examined. One male (holotype), China, Yunnan Province, Gaoligong Mountains National Nature Reserve, Baihualing, 8 May 2009, Zaihua Yang; two males (paratypes), same data as holotype (IEGU, examined from images only).

Etymology. The specific epithet "*arcuata*" refers to arcuate apical margin of the anal tube.

Distribution. China (Yunnan) (Fig. 81).

Notes. Recently, Chen *et al.* (2014) re-described *M. triangularis* based on three males from Yunnan, China. Although Chen *et al.* (2014) misspelled *Gergithus triangularis*, as Gnezdilov (2015) mentioned: "There are several misprints:…….p. 76—*Gergithus triangularis* should be changed to *Mongoliana triangularis*". The redescriptions and figures by Chen *et al.* (2014) show patterns of clypeus coloration and configuration of male genitalia for the species identified by them (see Chen *et al.* 2014: 76, 77, Figs 2–31) apparently differ from the holotype of *M. triangularis* Che, Wang et Chou (now deposited in NWAFU). We considered that it was misidentified and regard as to be a new species in the genus *Mongoliana.* The photographs of habitus and male genitalia of the holotype of *M. triangularis* Che, Wang et Chou, 2003 are provided here (see Figs 24–26 & 73–76).

FIGURES 51–58. 51–54. *Mongoliana chilocorides* (Walker, 1851) (syntype); 55–58. *Mongoliana recurrens* (Butler, 1875) (syntype), 51, 55. habitus, dorsal view; 52, 56. head and thorax, lateral view; 53, 57. frons and clypeus; 54, 58. labels.



FIGURES 59–65. 59–63. *Mongoliana recurrens* (Butler, 1875) (specimens from Fujian); 64, 65. *Mongoliana naevia* Che, Wang et Chou, 2003 (holotype). 59, 64, 65. male; 60–63. female. 59–61, 64. habitus, dorsal view; 62, 65. habitus, lateral view; 63. frons and clypeus. Scale bars = 1 mm.

***Mongoliana recurrens* (Butler, 1875)**
(Figs 55–63 & 66–70)

Hemispharius recurrens Butler, 1875: 98. Synonymized by Liang (2001) with *M. chilocorides* (Walker, 1851): 236.
Mongoliana recurrens, Distant, 1909: 87; Fennah, 1956: 504; Che *et al.*, 2003: 36; Chen *et al.*, 2014: 73.

Redescription. General color testaceous, some females deep testaceous. Vertex with two depressions brown, margins and median carina yellow. Frons fuscous, adorned with yellow brown tubercules and speckles. Frontoclypeal suture brown to black. Clypeus black except yellow transverse stripe at extreme base. Pronotum and mesonotum dark brown, tubercules on pronotum and tips of three carinae of mesonotum yellow. Tegmina with the streak near apex and the transverse dash from inner margin towards apex testaceous. Leg brown to fuscous, femora and tibiae of fore and median legs fuscous, hind leg brown with black spines (Figs 55–63).

Vertex approximately 1.8 times wider than long in midline (Figs 55 & 59–61). Frons about 1.8 times wider at widest part than at upper margin, length in midline almost equal to width at widest part (Figs 57 & 63). Frontoclypeal suture straight (Figs 57 & 63). Pronotum with six large tubercles laterally along anterior margin (Figs 55 & 59–61).

Male terminalia. Anal tube subtriangular, apical margin shallowly concave in middle (Fig. 69). Pygofer in lateral view with posterior margin slightly convex submedially (Fig. 66). Aedeagus with pair of hooked processes near middle, the right one a little longer than the left one; dorsolateral lobes of phallobase obtuse apically in dorsal view, not split in profile, slightly widened subapically; ventral lobe bifurcate near apex (Figs 68 & 70). Genital styles with hind margin weakly concave submedially, caudoventral angle rounded (Fig. 66). Capitulum of style short and obtuse apex, with a large lateral tooth (Fig. 67).

Type material examined. Two syntype males of *M. chilocorides* (Walker) (BMNH), labelled as: type [round label with green margin] / 4. *Hemispharius chilocorides* [printed] / Hong Kong [round label, handwritten].

One syntype female of *M. recurrens* (Butler) (BMNH), labelled as: type [round label with red margin] / *recurrens* [handwritten] / China [round label, handwritten].

Other material examined. 1 male 1 female, China, Fujian Province, Longyan City, Changting County, Sidu Town, 7 May 1959 (SHEM); 1 male 7 females, Fujian Province, Longyan City, Changting County, Datong Town, Dongpu, 22 April 1959, coll. Yintao Jin, Yangming Lin (SHEM); 2 males 2 females, China, Jiangxi Province, Jiulian Mountain, 28 April 1986, 400–550 m, coll. Luo and Liu (SHEM).

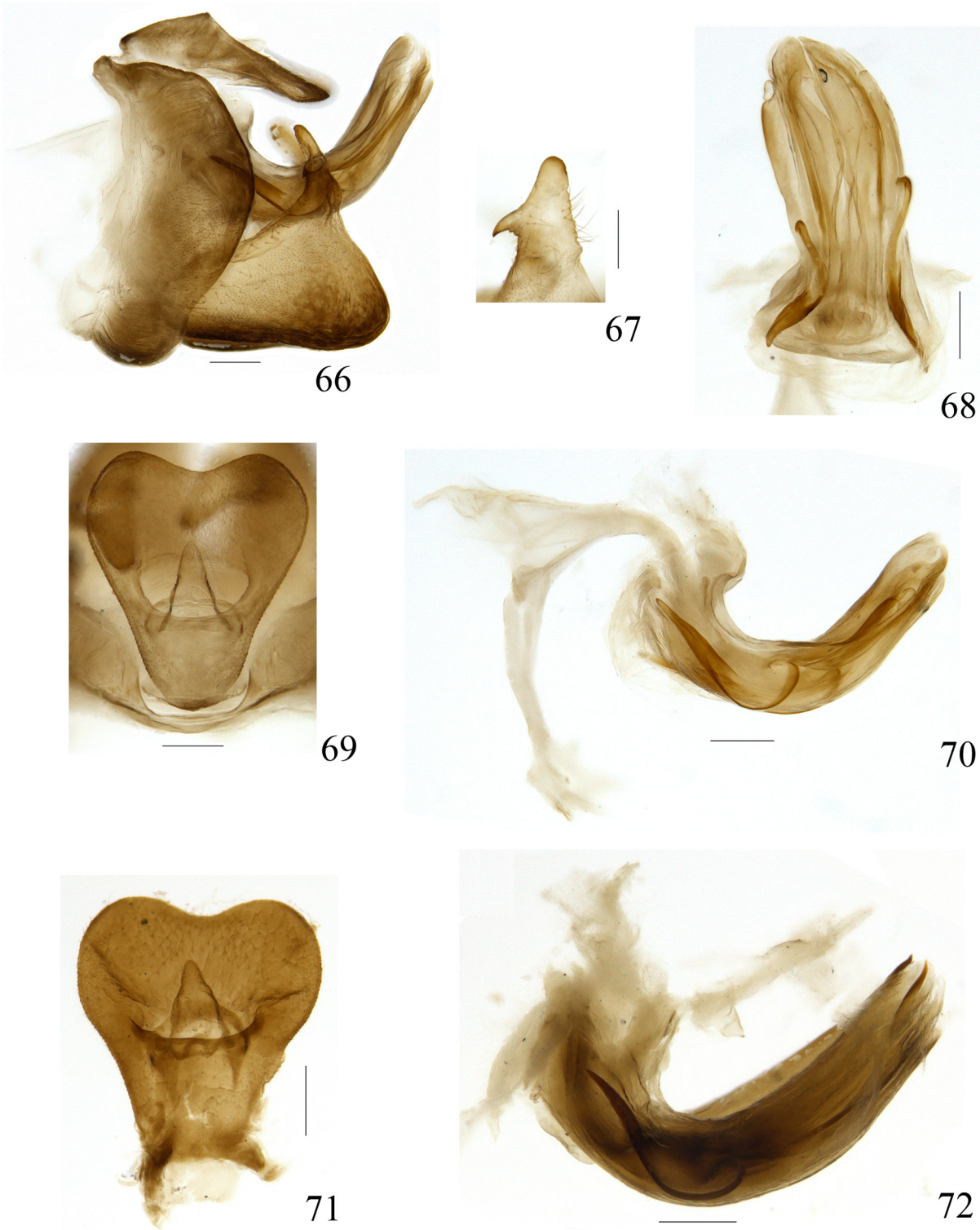
Distribution. China (Fujian, Jiangxi, Guangdong, Hubei) (Fig. 81).

Remarks. Liang (2001) proposed *Mongoliana recurrens* (Butler, 1875) as a synonym of *Mongoliana chilocorides* (Walker, 1851) on the basis of the examination of relevant type material. However, Liang (2001) did not provide any evidence for the synonym. *Mongoliana recurrens* was treated as valid species thereafter by Che *et al*. (2003), Chen *et al*. (2014) and Bourgoin (2015), especially the work of Chen *et al*. (2014) which provided some illustrations of Chinese *Mongoliana* species, including the first illustrations of male genitalia of *Mongoliana chilocorides* after its establishment (see Chen *et al.* 2014, Figs 2–27). Chen *et al*.'s study showed distinct differences in genital characters between these two species (see Chen *et al*. 2014, Figs 2–27 and Figs 2–30).

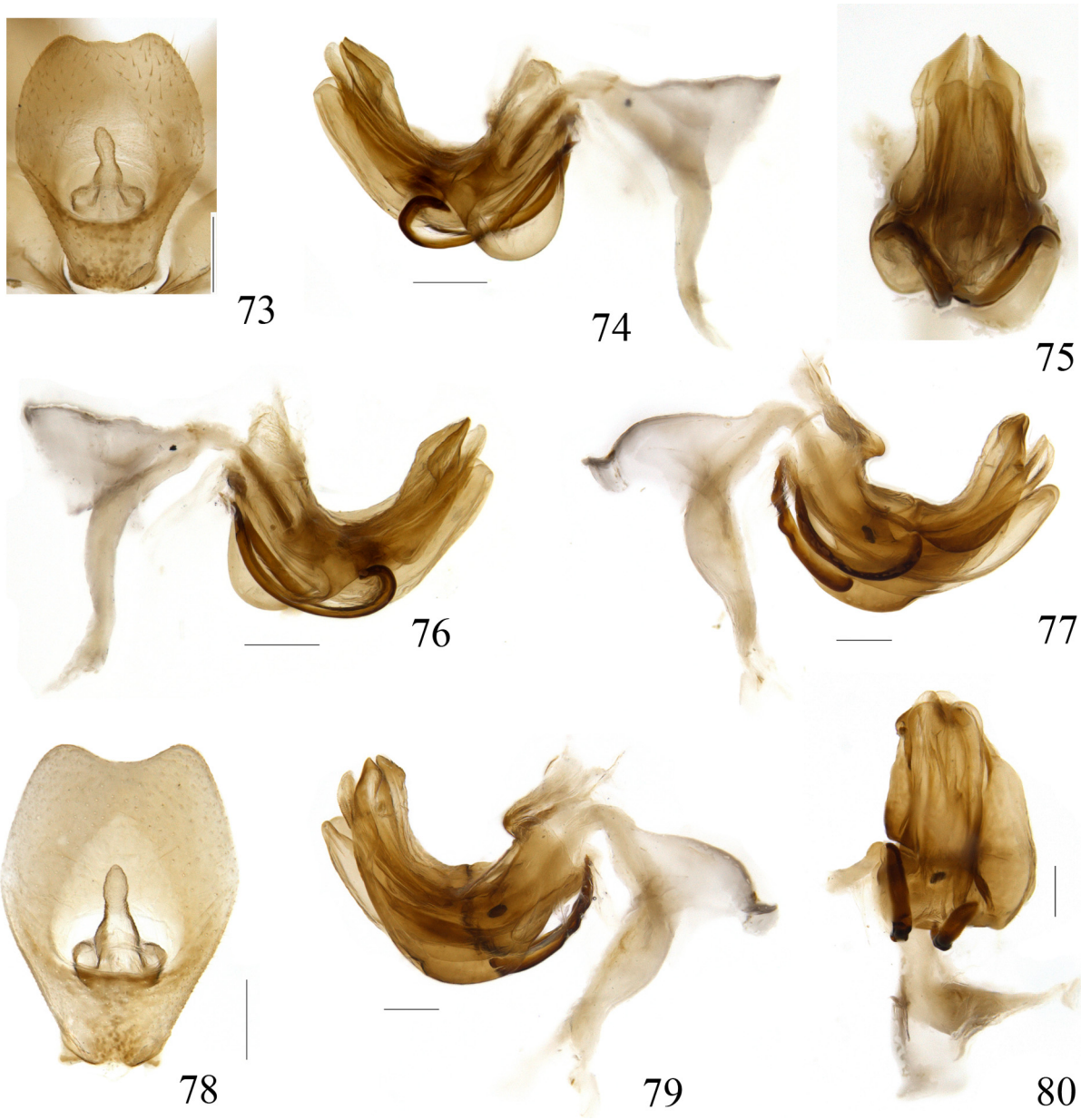
Mongoliana recurrens was described by Butler (1875) based on two females from Fowchowfoo (Fuzhou). With the aim of clarifying the identity of this species, the type specimens of *Mongoliana chilocorides* (see Figs 51–54) and *Mongoliana recurrens* (see Figs 55–58) (now deposited in BMNH) were checked and photographed with the help of Mr. Mick Webb, images of both species show differences in body color, macula of tegmina and length-width ratio of vertex. Female specimens of *Mongoliana recurrens* in this study show much similarities as that of the syntype females in body appearance; males of *Mongoliana recurrens* in this study, especially the genital characters, accord well with the description and illustrations of Chen *et al*. (2014), but different from that of *Mongoliana chilocorides*. For the above reasons, *Mongoliana recurrens* is considered as a valid species in this study, following the treatment of Che *et al.* (2003), Chen *et al*. (2014) and Bourgoin (2015). This study confirms the species *Mongoliana recurrens* differs from *Mongoliana chilocorides* by (features of *Mongoliana chilocorides* in parentheses): vertex about 1.8 times wider than long in midline (about 2.2 times wider than long in midline); anal tube with apical margin obtusely concave (apical margin acutely convex); aedeagus with a pair of ventral hooks near middle (one hook near middle and the other one at base).

In this study, the male genital characters of *Mongoliana recurrens* accord with the description and illustrations of Chen *et al*. (2014), but looks inconsistent with that of Fennah (1956) (specimens from Hubei). In Fennah's

illustrations, the apical margin of anal tube almost straight (Fennah 1956, Fig. A); ventral hooks of aedeagus thin and long, surpassing the base of phallobase (Fennah 1956, Fig. B); present study and Chen *et al.*'s illustrations have the apical margin of anal tube obtusely concave (Fig. 69; Chen *et al.* 2014, Fig. 2–30H); ventral hooks of aedeagus relatively thick and short, not reaching the base of phallobase (Fig. 70; Chen *et al.* 2014, Fig. 2–30L). These inconsistencies lead to the necessity to check Fennah's (1956) specimens, and also more specimens from Hubei Province in the future.



FIGURES 66–72. 66–70. *Mongoliana recurrens* (Butler, 1875); 71, 72. *Mongoliana lanceolata* Che, Wang et Chou, 2003 (holotype). 66. male terminalia, lateral view; 67. capitulum of genital style, dorsal view; 68. penis, ventral view; 69, 71. male anal tube, dorsal view; 70, 72. penis, left view. Scale bars = 0.2 mm.



FIGURES 73–80. 73–76. *Mongoliana triangularis* Che, Wang & Chou, 2003 (paratype); 77–80. *Mongoliana sinuata* Che, Wang et Chou, 2003 (holotype). 73, 78. male anal tube, dorsal view; 74, 79. penis, right view; 75. penis, apical half, ventral view; 76, 77. penis, left view; 80. penis, ventral view. Scale bars = 0.2 mm.

Discussion

The genus *Mongoliana* Distant is the third largest group in the tribe Hemisphaeriini, 13 species are known so far (Walker 1851; Distant 1909; Butler 1875; Fennah 1956; Che *et al.* 2003; Chen *et al.* 2014). The distribution map of *Mongoliana* is shown in Fig. 81, which shows that members of *Mongoliana* are mainly distributed in southern China of the Oriental Region, only one species, *M. chilocorides* has extended into the southern area of the Palaearctic Region (Okinawa and Mimasaka, Japan)—Fig. 81. However, the distribution of *Mongoliana* requires further investigation, because Hori (1969) doubted the occurrence of *M. chilocorides* in Japan which probably might be a misidentification of Fennah (1956), the true identity maybe *Gergithus okinawanus* Matsumura, 1936 or *G. variabilis* (Butler, 1875). Therefore, more works are needed to clarify the identity of *M. chilocorides*, and also the distribution of *Mongoliana* species.

After analyze of morphological characters of *Mongoliana* species known to date, this study found that some species in this genus (*M. albimaculata* **sp. nov.**, *M. arcuata*, **sp. nov.**, *M. chilocorides*, *M. recurrens*, *M. lanceolata*, *M. triangularis*, *M. sinuata*, *M. pianmaensis* and *M. qiana*) show some similarities for they share common characters by the coarse frons, brown to deeply testaceous tegmina or having few pale yellow fascia and ventral hooks of aedeagus almost parallel. Some other species (*M. bistriata* **sp. nov.**, *M. latistriata* **sp. nov.**, *M. naevia* and *M. serrata*) also have more closer relationship for they share common features by the smooth frons, pale brown tegmina having dark fasciae and spots and ventral hooks of aedeagus variable in shape and usually unparallel. It seems that this genus could be divided into two species groups. The phylogeny of this genus need to be studied in the future (including molecular methods) to better understand the evolutionary process of the genus *Mongoliana.*

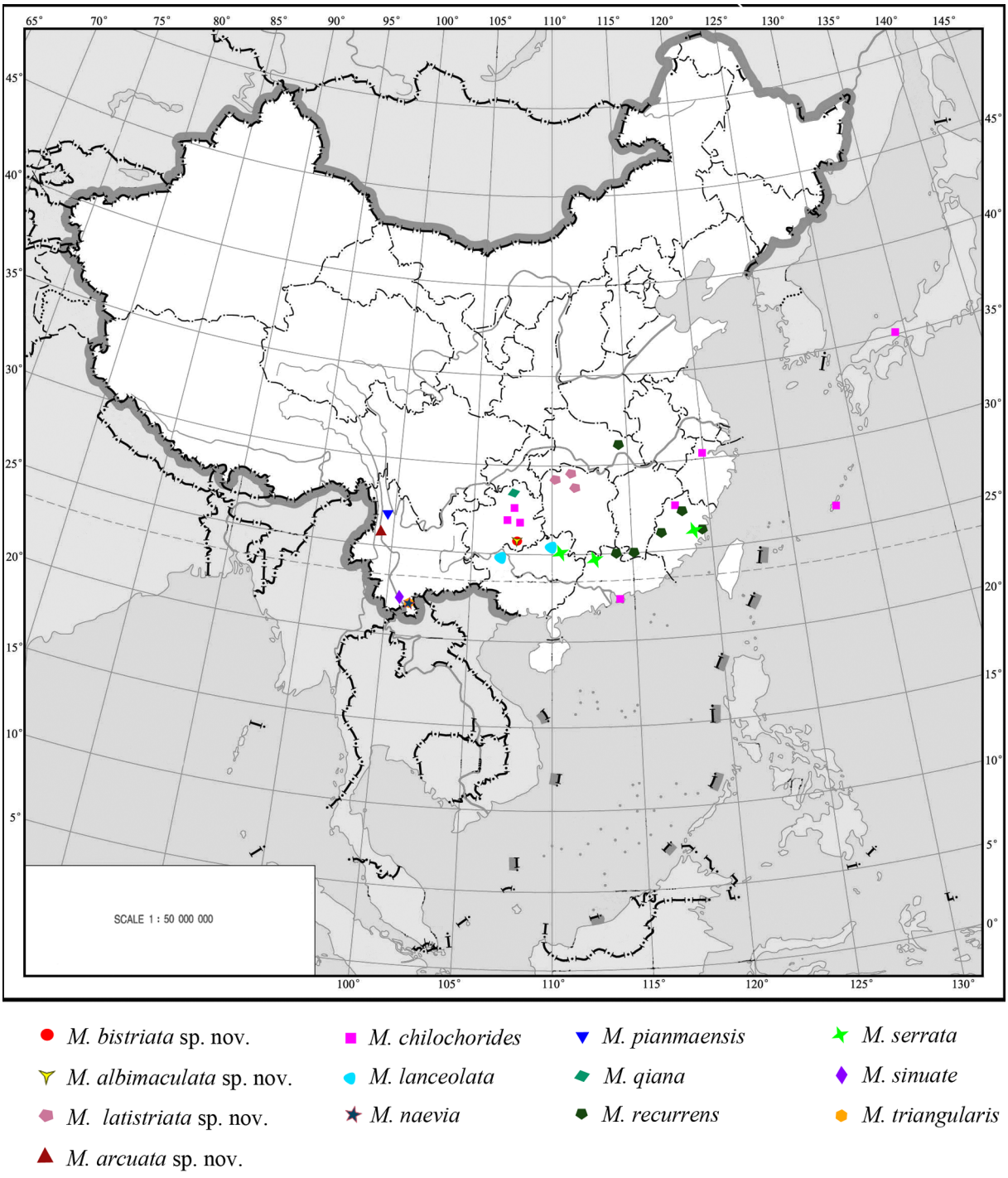


FIGURE 81. Geographic distribution of *Mongoliana* species. Data is based on materials observed and references cited with each species.

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