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Nomenclatural changes in the planthopper tribe Hemisphaeriini (Hemiptera: Fulgoromorpha: Issidae), with the description of a new genus and a new species

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Abstract. Nomenclatural changes are made in three previously described genera in the planthopper tribe Hemisphaeriini (Hemiptera: Fulgoromorpha: Issidae: Issinae), viz *Gergithus* Stål, 1870, *Mongoliana* Distant, 1909 and *Hemisphaeroides* Melichar, 1903. In addition, a new genus, *Gnezdilovius* gen. nov., with *Gergithus lineatus* Kato, 1933 as its type species, is described for 40 species formerly included in *Gergithus*, and the generic characteristics of the latter genus is revised. One new species, *Gergithus frontilongus* sp. nov. from China (Yunnan), is described and illustrated. One additional *Gergithus* species, previously misidentified as *G. signatifrons* Melichar, 1906 from Siberut Island, is mentioned and illustrated. *Gergithus contusus* Walker, 1851 is transferred to *Mongoliana* and *Hemisphaerius atromaculatus* Distant, 1916 and *H. fuscoclypeatus* Distant, 1916 are transferred to *Hemisphaeroides*. Checklists for all four genera are provided detailing the nomenclatural changes and a key to the 19 genera of Hemisphaeriini is provided. Morphological diversity and distribution of the genera are briefly discussed.

Key words. Fulgoroidea, morphology, new combination, taxonomy.

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Introduction

The planthopper tribe Hemisphaeriini Melichar, 1906 was originally treated as the subfamily Hemisphaeriinae in the family Issidae Spinola, 1839, but was downgraded to a tribe of Issinae by Gnezdilov (2003). Representatives of the tribe occur throughout the Oriental region, marginally

advancing into the Eastern Palaearctic region (Japan, Korea) and the Australian region (New Guinea) (Gnezdilov 2013c).

Hemisphaeriini take their name from their hemispherical body with the tegmen convex, but can also be distinguished by the indistinct venation of the tegmen and the hind wing being either single-lobed or rudimentary. Members of the tribe seem to imitate beetles, in particular ladybirds (Butler 1875; Gnezdilov 2013a). Initially, eight genera were included in the tribe Hemisphaeriini (Melichar 1906), but after over a century of research, the group is considered to be the second largest issid tribe with currently 18 genera and 176 species.

The present study has revealed several misplaced species in three genera (*Gergithus* Stål, 1870, *Mongoliana* Distant, 1909 and *Hemisphaeroides* Melichar, 1903) and for several of those species described in *Gergithus* a new genus is described. A new species of *Gergithus* is also described. In addition, we give a key to all the genera of Hemisphaeriini. This key, together with the diagnoses for each genus, focuses mainly on external characters, as further studies are needed on the large number of genera requiring revision, with details of genitalia, in the future. Similarly, species recognition in the tribe, at present, is based mainly on colour pattern, which is distinct for all species so far studied. Although we redescribe *Gergithus*, it is not our intention to revise this genus at the present time, as this would require a much larger study, which it outside the scope of this paper. Instead, we provide a checklist to the species of this and three other studied genera with nomenclatural changes indicated. We also briefly discuss the distribution of the four studied genera, updating current information given for the tribe as a whole (Gnezdilov 2013c).

Material and methods

External morphology was observed under a Leica MZ 125 microscope. All measurements were in millimeters (mm). Morphological terminology follows Gnezdilov *et al.* (2014b), except that tegmen venation patterns follow Bourgoin *et al.* (2014). The genital segments of the examined specimens were dissected and macerated in hot 10% NaOH solution for about 3 minutes, and subsequently transferred into glycerin. Photographs of the specimens were made using a Leica M205A microscope with a Leica DFC Camera. Images were produced using the software LAS (Leica Application Suite) v. 3.7.

Material examined is deposited in the institutions abbreviated in the text as follows:

BMNH = The Natural History Museum, London, UK
MSNG = Museo Civico di Storia Naturale, Genova, Italy
HNHM = Hungarian Natural History Museum, Budapest, Hungary
NHRS = Naturhistoriska Riksmuseet, Stockholm, Sweden
NWAFU = Entomological Museum of Northwest Agriculture and Forestry University, Yangling, China

Results

Key to genera of Hemisphaeriini

1. Tegmen with claval suture ……2
– Tegmen without claval suture ……4

2. Tegmen with claval suture distinct in basal ¼ of wing; metope with median carina rudimentary in its apical part (Genezdilov 2015: figs 1–3) ……***Bruneastrum*** Gnezdilov, 2015
– Tegmen with claval suture well-developed; metope with complete median carina or median carina absent ……3

3. Metope elongate, with median carina, without tubercules (Chen *et al.* 2014: figs 2-35, 2-36) ……***Neohemisphaerius*** Chen, Zhang & Chang, 2014
– Metope almost as wide as long in middle line, without median carina, with a row of tubercules along lateral margin (Chen *et al.* 2014: fig. 2-33) ……***Paramongoliana*** Chen, Zhang & Chang, 2014

4. Metope with large bulge at center (Genezdilov 2013b: figs 2–4) …***Bolbosphaerius*** Gnezdilov, 2013
– Metope flat or slightly elevated in median area, without such bulge (Figs 1B, D, F–G, J, L, 2C, 8B, 9D, 10H) ……5

5. Tegmen depressed at base, costal margin moderately convex at basal one third as "relief shoulder" (Figs 1A, C, 7A) ……6
– Tegmen not as above (Figs 1E, H–I, K, 8A, 9A, 10A) ……8

6. Coryphe almost as wide as long, anteclypeus angularly rounded (Fig. 6A–B) …***Gergithus*** Stål, 1870
– Coryphe distinctly longer than wide, anteclypeus flat (Fig. 1A–D) ……7

7. Pronotum with median carina; anterior margin not foliate and elevated (Fig. 1C). Meta-tibiotarsal formula 6–8–2 ……***Neogergithoides*** Sun, Meng & Wang, 2012
– Pronotum without median carina; anterior margin foliate and elevated (Fig. 1A). Metatibiotarsal formula 6–10–2 ……***Macrodaruma*** Fennah, 1978

8. Coryphe elongate, more or less triangular (Fig. 1E) …***Choutagus*** Zhang, Wang & Che, 2006
– Coryphe broad, quadrangular (Figs 1H–I, K, 8A, 9A, 10A) ……9

9. Tegmen distinctly widened at basal costal margin (Figs 8B, 10A) ……10
– Tegmen not widened at basal costal margin ……11

10. Coryphe 4.5 times as wide as long; metope very broad below eyes (Fig. 10A, D) …… ……***Hemisphaeroides*** Melichar, 1903
– Coryphe 1.5 times as wide as long; metope not very broad below eyes (Fig. 8A–B) …… ……***Mongoliana*** Distant, 1906

11. Metope with lateral margin almost right-angled at mid-length ……12
– Metope with lateral margin not right-angled at mid-length ……13

12. Mesonotum elevated, length in midline almost equal to combined length of coryphe and pronotum; tegmen distinctly long, oblong (Melichar 1906: fig. 15) ……***Hysteropterissus*** Melichar, 1906
– Mesonotum flat, twice combined length of coryphe and pronotum in mid line; tegmen relatively wide, nearly rhomboidal (Fig. 1K) ……***Rotundiforma*** Meng, Wang & Qin, 2013

13. Clypeus with median carina (Melichar 1906: fig. 16) ……***Hysterosphaerius*** Melichar, 1906
– Clypeus without median carina ……14

14. Fore and mid femora dilated (Melichar 1906: fig. 14) ……***Hemiphile*** Metcalf, 1952
– Fore and mid femora not dilated ……15

15. Metope with a row of tubercles and median carina (Fig. 1G) ……***Gergithoides*** Schumacher, 1915
– Metope without tubercles and median carina (Figs 1J, 9C–D) ……16

16. Hind wing well-developed, longer than half length of tegmen ……***Gnezdilovius*** gen. nov.
– Hind wing shorter than half length of tegmen ……17

17. Aedeagus with two processes, suspensorium indistinct 18
– Aedeagus without process, suspensorium distinct .....***Hemisphaerius*** Schaum, 1850

18. Pygofer in profile with hind margin distinctly angulated; phallobase asymmetrical at apex (Chan & Yang 1994: figs 27–30) .....***Euhemisphaerius*** Chan & Yang, 1994
– Pygofer not distinctly angulated; phallobase symmetrical (Chan & Yang 1994: fig. 26) ....***Epyhemisphaerius*** Chan & Yang, 1994

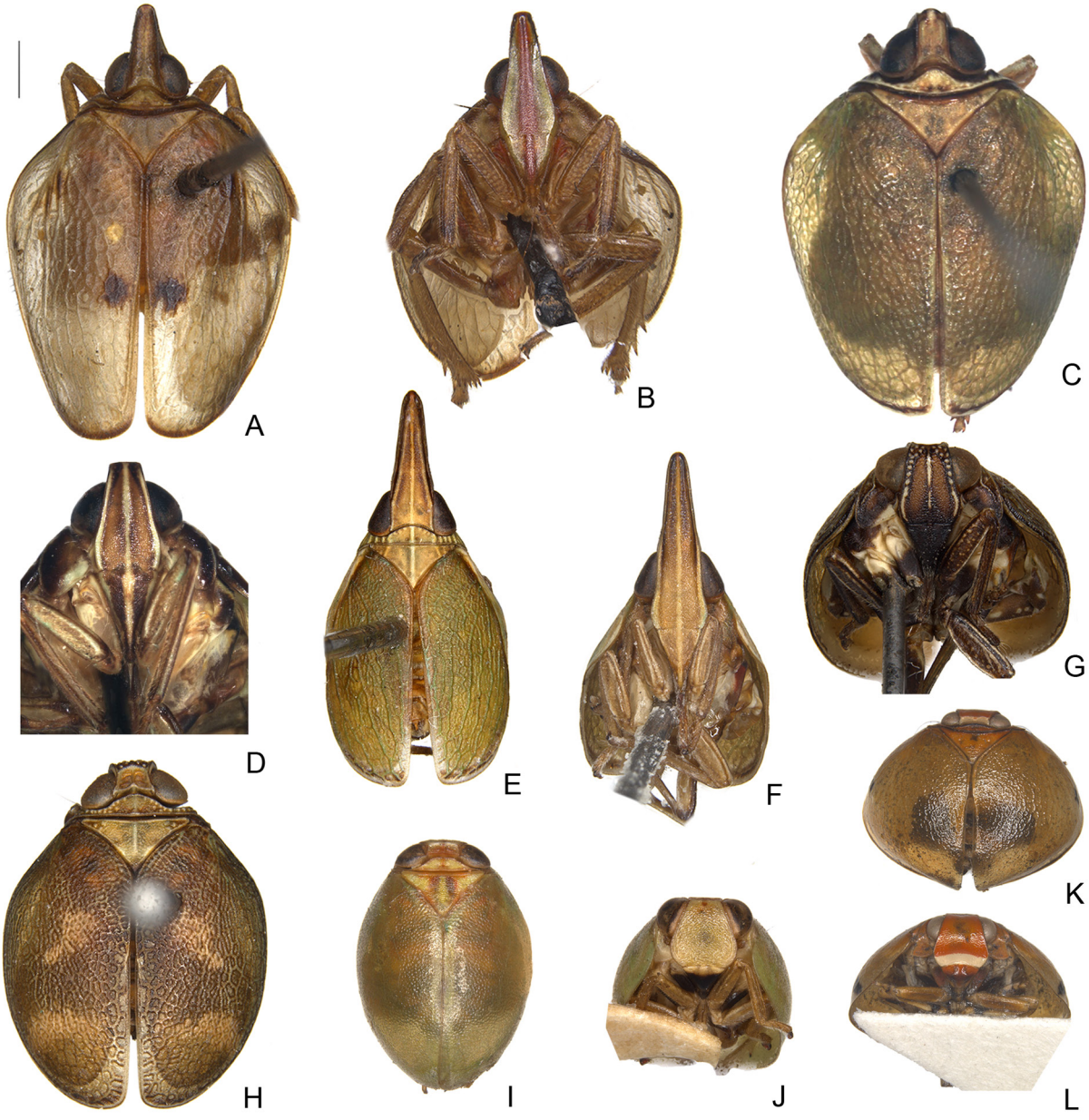

Fig. 1. Hemisphaerini. **A–B**. *Macrodaruma pertinax* Fennah, 1978. **A**. Habitus, dorsal view. **B**. Habitus, ventral view. — **C–D**. *Neogergithoides tubercularis* Sun, Meng & Wang, 2012. **C**. Habitus, dorsal view. **D**. Metope and clypeus, facial view. — **E–F**. *Choutagus longicephalus* Zhang, Wang & Che, 2006. **E**. Habitus, dorsal view. **F**. Habitus, ventral view. — **G–H**. *Gergithoides carinatifrons* Schumacher, 1915. **G**. Habitus, ventral view. **H**. Habitus, dorsal view. — **I–J**. *Hemisphaerius lysanias* Fennah, 1978. **I**. Habitus, dorsal view. **J**. Metope and clypeus, facial view. — **K–L**. *Rotundiforma nigrimaculata* Meng, Wang & Qin, 2013. **K**. Habitus, dorsal view. **L**. Metope and clypeus, facial view. Scale bar = 1 mm.

Class Hexapoda Blainville, 1816
Order Hemiptera Linnaeus, 1758
Infraorder Fulgoromorpha Evans, 1946
Family Issidae Spinola, 1839
Tribe Hemisphaeriini Melichar, 1906

Gergithus Stål, 1870
Figs 1–7

Gergithus Stål, 1870: 756. Type species: *Hemispharius schaumi* Stål, 1855, by original designation.

Diagnosis

Coryphe subquadrate (Figs 2A, 5A, D, 6A), metope elongate (Figs 2C, 5B, F, 6D, 7C), postclypeus nearly triangular and in same oblique plane with metope, anteclypeus angular (Figs 2D, 5C, E, 6B, 7B) and tegmen with costal margin moderately convex at basal one third as "relief shoulder" (Figs 2A, 5A, 6A, 7A).

Redescription

Coryphe subquadrate, margins carinate, anterior margin straight or weakly concave, posterior margin weakly concave (Figs 2A, 5A, D, 6C, 7A). Metope greatly elongate, slightly widening below antennae; upper margin straight (Figs 2C, 5B, F, 6D, 7C). Metopoclypeal suture straight (Figs 2C, 5B, F, 6D, 7C). Postclypeus nearly triangular and in same oblique plane, with lateral margins continuous with those of metope; anteclypeus extremely narrow in ventral view, and roundly angulately protruding ventrally in lateral view (Figs 2C–D, 5B–C, E–F, 6B, D, 7B–C). Ocelli rudimentary. Pronotum clearly short, as long as coryphe in middle line or slightly shorter than it, extremely narrow behind eyes, margins obviously ridged; lateral lobes large, fan-shaped in frontal view, ventral margins moderately oblique, lateroventral angles obtusely convex (Figs 2A, C, 5A–B, D, F, 6C–D, 7A, C). Mesonotum with anterior margin obviously ridged and shallowly concave, with two rounded pits medially on each side (Figs 2A, 5A, D, 6C, 7A). Tegula small. Tegmen ovate-oblong, depressed at basal surface, costal margin moderately convex at basal one third as "relief shoulder", longitudinal veins prominent, with many supernumerary branches and numerous irregular transverse veinlets; claval suture absent (Figs 2F, 5C–D, 6E, 7B). Hind wing mostly well-developed single lobe, veins netlike, sometimes reduced (Fig. 2G). Legs moderately long, not dilated; hind tibia with two spines distally.

Distribution

Sri Lanka, India, Burma, Thailand, China (Yunnan Province), Malaysia, Indonesia.

Remarks

From a total of 62 species previously included in the genus we transfer several species to a new genus described below and transfer *G. contusus* (Walker, 1851) to *Mongaliana*. However, a detailed revision of the latter genus is needed in the future. Twenty two species are retained in *Gergithus*, most of them after examination of the type (Butler 1875; Distant, 1906, 1916; Walker 1851) or of other specimens in the BMNH. Images of type specimens are provided for: *G. schaumi* (Stål, 1855) (Fig. 7A–D), *G. cribratus* Melichar, 1906 (Fig. 5D–F) and *G. signatifrons* Melichar, 1906 (Fig. 6A–F). The species *G. ignotus* Melichar, 1906, *G. lineolatus* Melichar, 1906, *G. pigrans* Melichar, 1906, *G. secundus* (Melichar, 1903) and *G. vidulus* Melichar, 1906 are known by their original descriptions only.

Checklist of species of *Gergithus* Stål, 1870

Species in BMNH indicated by *:

* *G. bipustulatus* (Walker, 1858). As *Hemisphaerius bipustulatus* Walker, 1858: 95, Sri Lanka
* *G. complicatus* Distant, 1916. Distant 1916: 103, fig. 77, Sri Lanka
* *G. conspicularis* Distant, 1916. Distant 1913: 103, Sri Lanka
* *G. cribratus* Melichar, 1906. Melichar 1906: 64, Sri Lanka (Fig. 5D–F)
* *G. dubius* (Butler, 1875). As *Hemisphaerius dubius* Butler, 1875: 97, pl. IV, fig. 17, Sri Lanka
* *G. elongates* (Distant, 1906). As *Hemisphaerius elongatus* Distant, 1906: 362, India
* *G. erebus* Distant, 1916. Distant 1916: 101, fig. 76, India
G. frontilongus sp. nov., China (Yunnan) (Figs 2–4)
* *G. herbaceous* (Kirby, 1891). As *Hemisphaerius herbaceous* Kirby, 1891: 147, Sri Lanka
G. ignotus Melichar, 1906. Melichar 1906: 66, Burma
G. lineolatus Melichar, 1906. Melichar 1906: 60, Sumatra
* *G. niger* (Walker, 1857). As *Hemisphaerius niger* Walker, 1857: 155, Indonesia, Malaysia, Thailand
As *Hemisphaerius walkeri* Butler, 1875: 100, replacement name for *Hemisphaerius chilocoroides* Walker, 1862: 308. Synomized by Liang (2001)
* *G. nilgiriensis* (Distant, 1906) As *Hemisphaerius nilgiriensis* Distant, 1906: 361, India
G. pigrans Melichar, 1906. Distant 1906: 64, Indonesia (Kei Island)
* *G. proteus* Distant, 1916. Distant 1916: 102, India
* *G. reticulatus* (Distant, 1906). As *Hemisphaerius reticulatus* Distant, 1906: 361, India
* *G. schaumi* (Stål, 1855). As *Hemisphaerius schaumi* Stål,1855: 191, Sri Lanka (Fig. 7A–D)
G. secundus (Melichar, 1903). As *Hemisphaerius secundus* Melichar, 1903: 75, Sri Lanka
G. signatifrons Melichar, 1906. Melichar 1906: 60, Indonesia (Sumatra) (Fig. 6A–F)
* *G. venosus* (Distant, 1906). As *Hemisphaerius venosus* Distant, 1906: 363, India
* *G. versicolor* Distant, 1916. Distant 1916: 102, Sri Lanka
G. vidulus Melichar, 1906. Melichar 1906: 62, India

Gergithus frontilongus sp. nov.
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Figs 2–4, 7E–F

Diagnosis

This new species can be distinguished from other congeners by its distinct colouration (see description). In general coloration it comes closest to *G. complicatus*, but can be distinguished by: 1) coryphe flavous with two black spots (in *G. complicatus*, coryphe ochreous with four castaneous spots); 2) metope and clypeus not concolorous, metope with red central fascia, clypeus with flavous central fascia (in *G. complicatus*, metope and clypeus concolorous, central fascia ochreous).

Etymology

The specific epithet is constituted from the Latin words "*frons*-" and "*longus*", referring to the elongate metope.

Material examined

Holotype

CHINA: ♂, Xishuangbanna City, Menglun, Botanical Garden, 21°54.710′ N, 101°16.941′ E, 652 m, 16 Nov. 2009, Guo Tang and Zhiyuan Yao leg. (NWAFU).

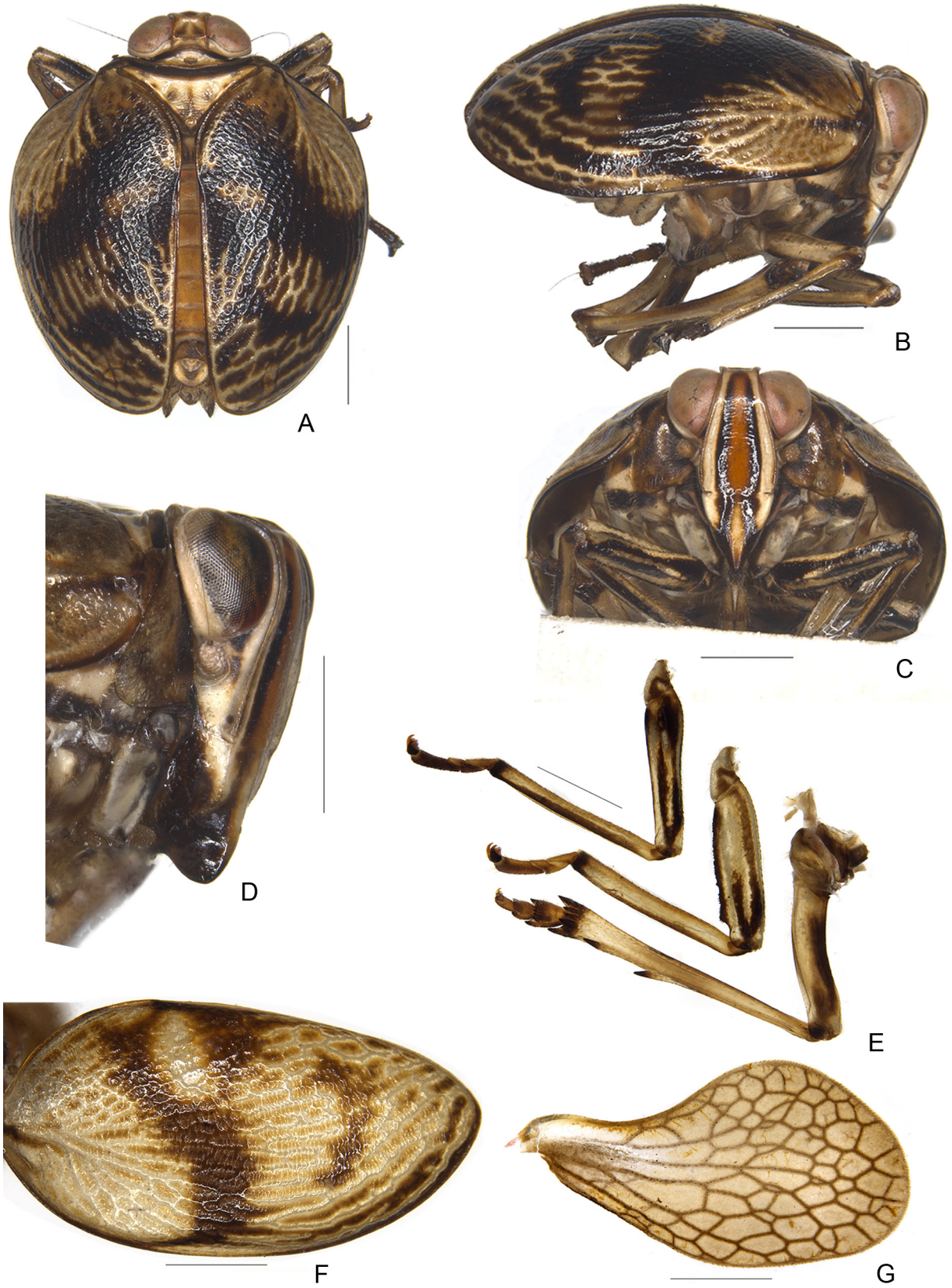

Fig. 2. *Gergithus frontilongus* sp. nov. **A**. Habitus, dorsal view. **B**. Habitus, lateral view. **C**. Metope and clypeus, facial view. **D**. Metope and clypeus, lateral view. **E**. Fore leg, mid leg, hind leg. **F**. Tegmen. **G**. Hind wing. Scale bars = 1 mm.

Paratypes

CHINA: 1 ♂, 2 ♀♀, Xishuangbanna City, Menglun, 21°54.459′ N, 101°16.750′ E, 640 m, 20 Nov. 2009, Guo Tang and Zhiyuan Yao leg.; 1 ♂, Xishuangbanna City, Menglun, Botanical Garden, 21°54.05′ N, 101°16.898′ E, 656 m, 13 Nov. 2009, Guo Tang and Zhiyuan Yao leg.; 5 ♂♂, 5 ♀♀, Xishuangbanna City, Menglun, Botanical Garden, 21°54.617′ N, 101°16.843′ E, 738±17 m, 8 Aug. 2011, Guo Zheng leg., collected by canopy fogging (all in NWAFU, 1 ♂ and 1 ♀ collected by Guo Zheng in BMNH).

Description

Measurements. Male length (N = 8) (including tegmen): 4.8–5.5 mm, length of tegmen: 3.9–4.6 mm; female length (N = 7) (including tegmen): 5.1–5.6 mm, length of tegmen: 4.1–4.6 mm.

Colouration. Body alternating luteotestaceous and black, with large black irregular maculations. Coryphe yellow, with two black speckles. Metope flavescent on both sides, with two lateral black fasciae and central red fascia. Gena flavescent with fuscous speckle. Clypeus with postclypeus same color pattern as metope, but central fascia fulvous, anteclypeus black. Eyes pale red or rufous. Pronotum yellow with fuscous speckles in middle, lateral lobes dark brown. Mesonotum flavous, with median carina, central pits and tip fuscous. Tegmen with wide fuscous fascia from basal one third of costal margin to posterior margin, connected with large subtriangulate fuscous macula after fascia and enclosing pale yellow spot, relatively short and narrow fuscous fascia near distal one third, with series of irregular infuscate speckles at gaps of pale veins. Hind wing pale brown, veins fuscous. Legs fulvous with black stripes, tips of teeth black. Abdomen fulvous (Fig. 2A–G).

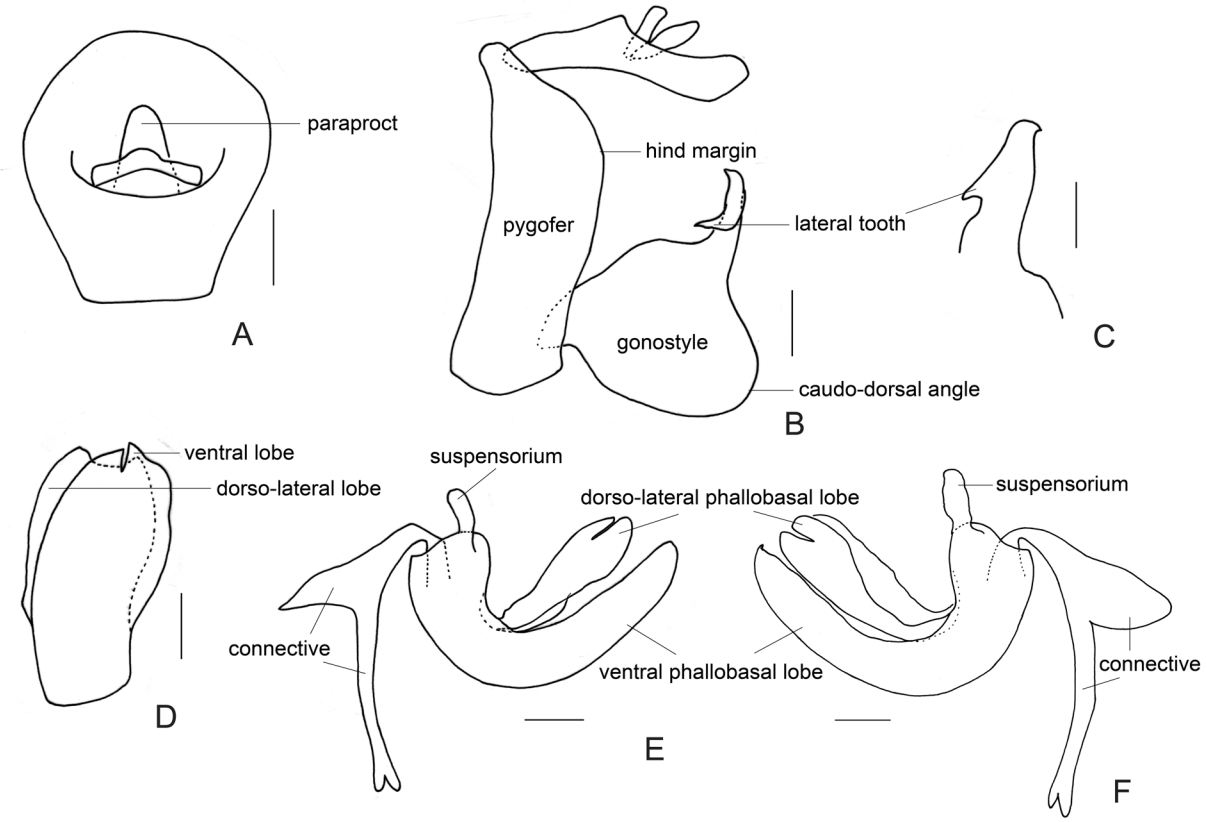

Fig. 3. *Gergithus frontilongus* sp. nov. **A**. Male anal tube, dorsal view. **B**. Male genitalia, lateral view. **C**. Capitulum of gonostyle, dorsal view. **D**. Phallobase, ventral view. **E**. Penis, left view. **F**. Penis, right view. Scale bars = 0.2 mm.

Head and thorax. Coryphe 1.3 times as wide between basal angles as median length, median carina present (Fig. 2A). Metope about 3.5 times as long in middle as width at upper margin, 2.0 times as wide at widest part below antennae as at narrowest upper margin (Fig. 2C). Mesonotum large, 2.6 times as long as pronotum in midline, approximately 2.5 times as wide at anterior margin as long in midline, median carina weak (Fig. 2A). Tegmen ovate-oblong, approximately 2.0 times as long in midline as wide at widest part; costal margin moderately convex at basal one third, apical margin acutely rounded, postclaval margin straight; postcostal cell very wide, basal cell moderately long; longitudinal veins distinctly multiramose throughout wing, with transverse veins more dense in basal third of wing (Fig. 2F). Hind wing veins net-like (Fig. 2G). Legs with fore femora roundly convex at apex, mid femora deeply concave subapically and roundly convex apically (Fig. 2E). Metatibiotarsal formula 6–11–2 (Fig. 2G).

Male genitalia. Anal tube nearly ovate in dorsal view, slightly longer than wide in midline, narrow at base, gradually widening to middle, semicircular at distal half, apical margin rounded (Fig. 3A). Paraproct digitate, 0.4 times as long as anal tube (Fig. 3A). Pygofer narrow, hind margin slightly roundly produced near dorsal margin (Fig. 3B). Dorso-lateral phallobasal lobes asymmetrical, distal part membranous, and furcated into two lobes laterally, obtusely concave dorsally; ventral phallobasal lobe large, longer than dorsolateral phallobasal lobe, right side clearly wider than left side in ventral view, apical part membranous and in form of two lobes, lobes pointed apically. Aedeagus without ventral hooks (Fig. 3D–F). Gonostyle stout, hind margin emarginate medially, anterior margin moderately convex at middle, caudo-dorsal angle rounded (Fig. 3B); capitulum of style long and thin, with a large lateral tooth and a small sharp apical process (Fig. 3C).

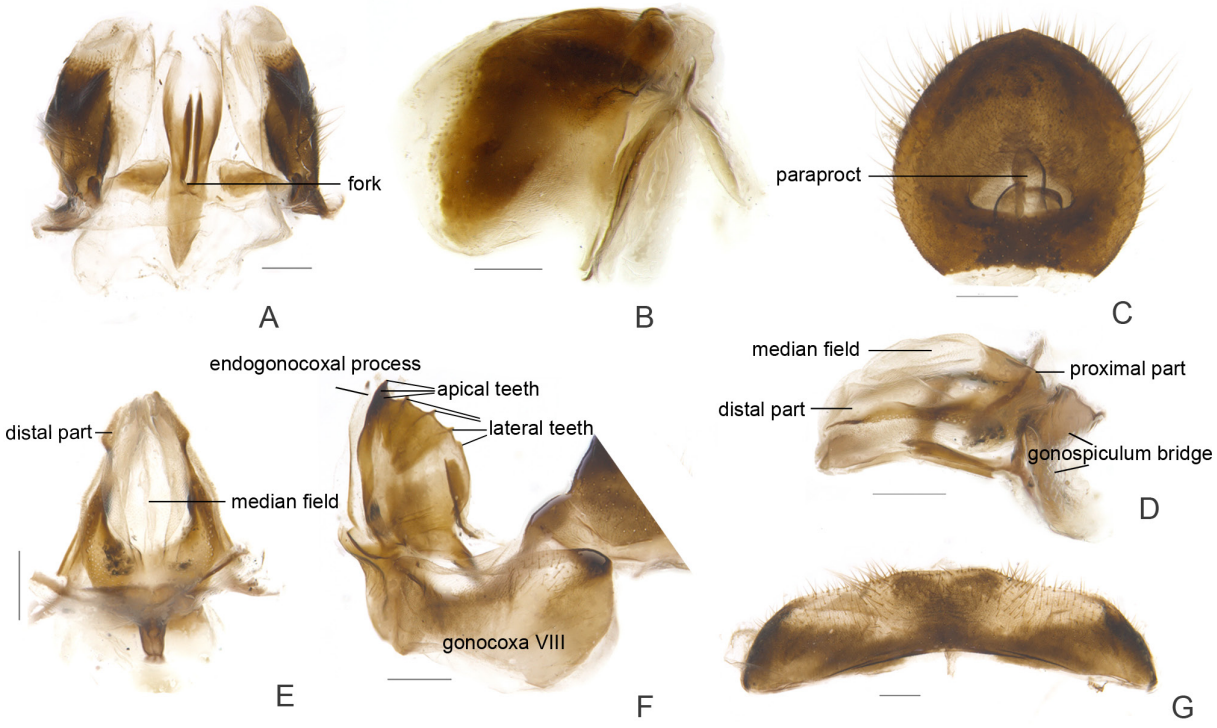

Fig. 4. *Gergithus frontilongus* sp. nov. **A**. Gonoplac, dorsal view. **B**. Gonoplac, right view. **C**. Female anal tube, dorsal view. **D**. Gonapophysis IX and gonaspiculum bridge, right view. **E**. Gonapophysis IX and gonaspiculum bridge, dorsal view. **F**. Gonocoxa VIII and gonapophysis VIII, right view. **G**. Sternum VII, ventral view. Scale bars = 0.2 mm.

Female genitalia. Anal tube peach-shaped in dorsal view, apical margin convex and with small angle at middle (Fig. 4C). Paraproct 0.3 times as long as anal tube (Fig. 4C). Gonoplac with disc relatively flat, nearly quadrate in lateral view, apical margin round and with wide membranous part, third gonoplac lobes fused at base, fork strongly sclerotized in dorsal view (Fig. 4A–B). Proximal part of posterior connective lamina of gonapophyses IX slightly protruded, distal part angularly convex near apex, median field divided into two lobes in dorsal view, and morderatly elevated medially in lateral view (Fig. 4D–E). Gonospiculum bridge moderately large, basal part nearly same length as apical part (Fig. 4D). Anterior connective laminae of gonapophysis VIII broad, with three small teeth in apical group and three keeled teeth in lateral group (Fig. 4F). Gonocoxae VIII with hind margin concave (Fig. 4F). Sternite VII with hind margin slightly widely convex at middle part (Fig. 4G).

Gergithus sp.
Fig. 5A–C

G. signatifrons Melichar, 1906 *sensu* Baker 1927: 403.

A specimen previously identified as *G. signatifrons* by Baker (1927) from Siberut Island was examined (BMNH). It differs from the type specimen of *G. signatifrons* by 1) frons with wide blood-red longitudinal fascia medially and green fasciae laterally from upper margin to the line of antennae, lateral green fasciae curved inwards and connected by yellow transverse band, between it and clypeus also blood-red (the latter frons with red longitudinal fascia reaching metopoclypeal suture), lateral area pale yellowish, with black fascia near lateral margin below antennae; 2) clypeus blood-red medially, yellow laterally near metopoclypeal suture, and black-and-red below (the latter clypeus yellow medially and black laterally); 3) tegmen fulvous with straw yellow veins (the latter tegmen straw yellow).

All of the above characteristics show Baker's identified specimen to be distinct from *G. signatifrons* and probably a new species. As the specimen is a female we prefer to wait for males to become available in order to formally describe the species.

Material examined

INDONESIA: ♂, Meita wei, Siberut Island, 2 Oct. 1924, H.H. Karny (BMNH).

Mongoliana Distant, 1909
Fig. 8

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

Diagnosis

Coryphe 1.5 times as wide as long, with median carina. Metope slightly longer than wide, a little widened below antenna, with or without a linear series of very small tubercles along lateral margin. Metopoclypeal suture straight. Tegmen widened at basal costal margin, veins inconspicuous, claval suture absent. Hind wing 0.7–0.8 times length of tegmen, distinctly reticulate in distal part. Anal tube nearly cup-shaped. Pygofer with hind margin convex medially. Aedeagus with pair of ventral processes. Gonostyle with hind margin weakly or distinctly concave, caudo-ventral angle widely rounded.

Distribution

China, Japan, Indonesia (Sula Islands).

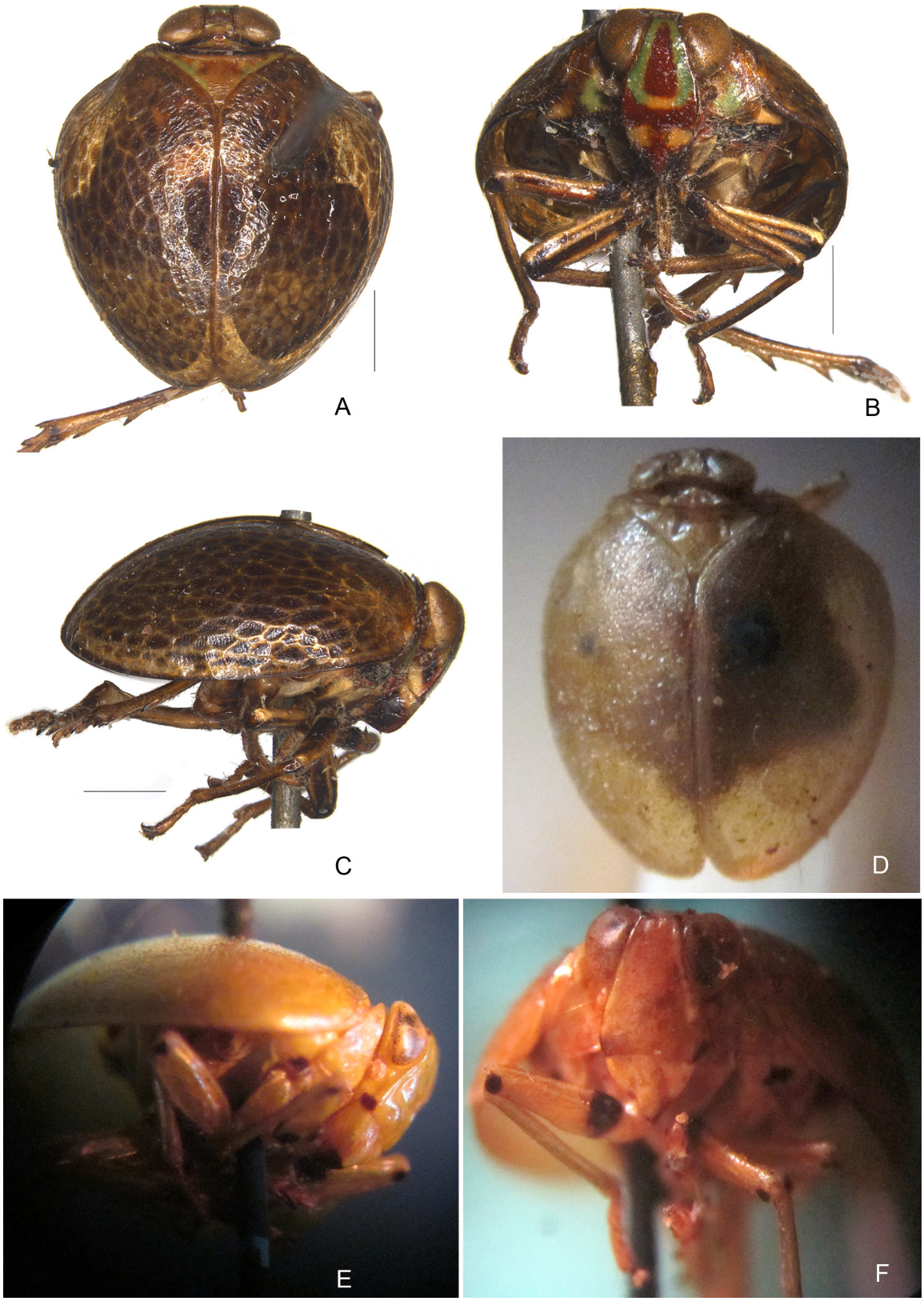

Fig. 5. *Gergithus* spp. **A–C**. *Gergithus* sp. **A**. Habitus, dorsal view. **B**. Habitus, frontal view. **C**. Habitus, lateral view. — **D–F**. *Gergithus cribratus* Melichar, 1906**. D**. Habitus, dorsal view. **E**. Habitus, lateral view. **F**. Frons and clypeus, facial view. Scale bars = 1 mm.

Fig. 6. *Gergithus signatifrons* Melichar, 1906**,** syntype. **A**. Habitus, dorsal view. **B**. Metope and clypeus, frontolateral view. **C**. Head and thorax, dorsal view. **D**. Metope and clypeus, facial view. **E**. Habitus, lateral view. **F**. Labels.

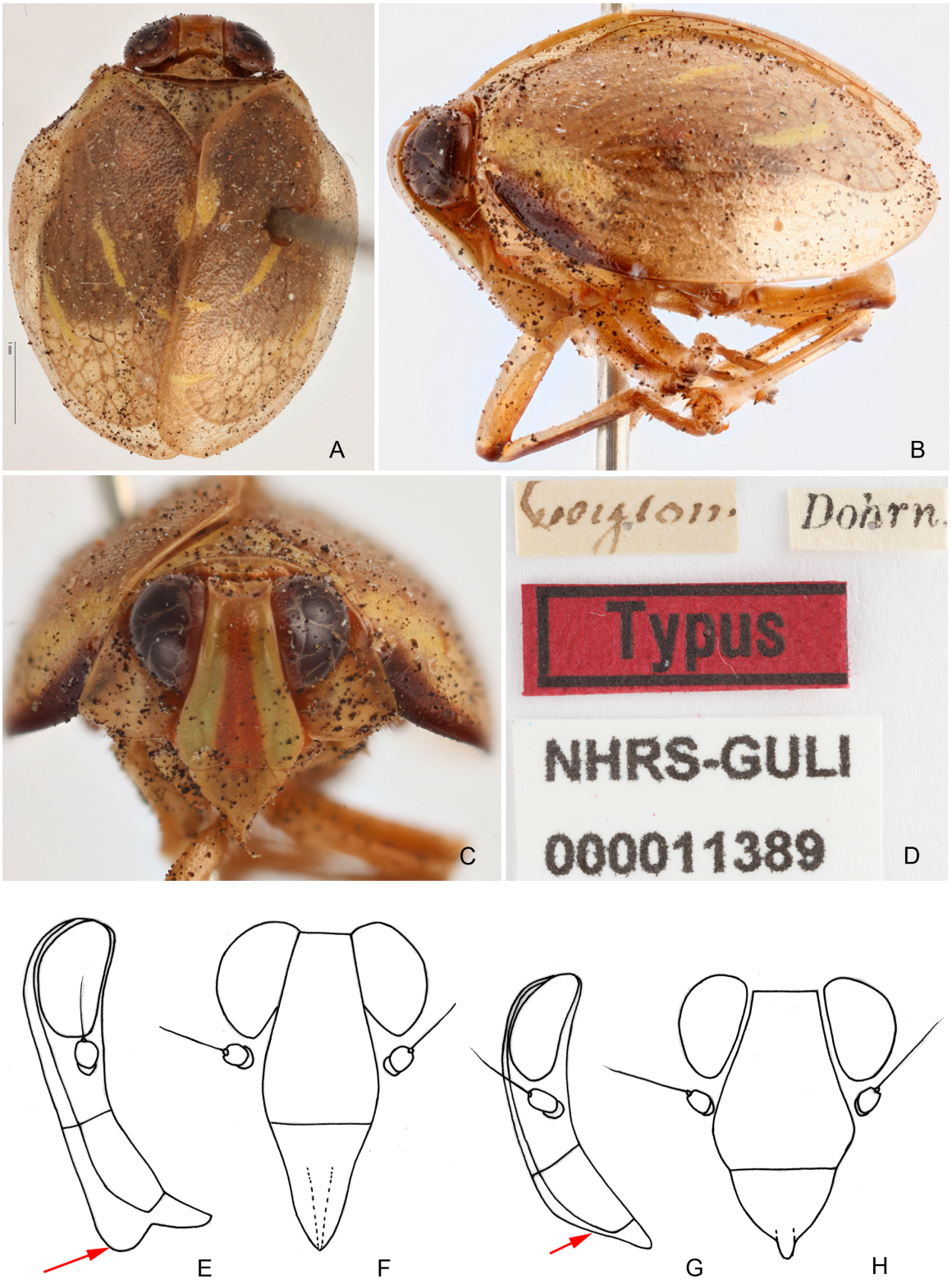

Fig. 7. Hemisphaerini. **A–D**. *Gergithus schaumi* (Stål, 1855), syntype. **A**. Habitus, dorsal view. **B**. Habitus, lateral view. **C**. Metope and clypeus, facial view. **D**. Label. — **E–F**. *Gergithus frontilongus* sp. nov. **E**. Metope and clypeus, lateral view. **F**. Metope and clypeus, facial view. — **G–H**. *Gnezdilovius iguchii* (Matsumura, 1916) comb. nov. **G**. Metope and clypeus, lateral view. **H**. Metope and clypeus, facial view. Arrows points the anteclypeus angular or compressed.

Remarks

Fourteen species are included in *Mongoliana*, of which nine were examined in NWAFU. Type specimens of *H. chilocorides* (BMNH(E) 1705797) and *H. recurrens* (BMNH(E) 1705798) were also examined and their images are provided here. Although no material of *Hemisphaerius contusus* is available for study and the type could not be found in BMNH, the species is transferred to *Mongoliana* based on its original description which states: "front darker along each side is adorned with a row of little yellow tubercles" and "fore-wings widened on the border at the base near which they are slightly concave".

Fig. 8. *Mongoliana* spp. **A–B**. *Mongoliana chilocorides* (Walker, 1851), holotype. **A**. Habitus, dorsal view. **B**. Frons and clypeus, facial view. — **C–D**. *Mongoliana recurrens* (Butler, 1875), holotype. **C**. Habitus, dorsal view. **D**. Frons and clypeus, facial view.

Similarly, the specimen of this species recorded by Butler (1875) from Sula Islands could also not be found in BMNH, where other Butler specimens are deposited.

Checklist of species of *Mongoliana* Distant, 1909

Specimens deposited in NWAFU indicated by **:

** *M. albimaculata* Meng, Wang & Qin, 2016. Meng, Wang & Qin 2016: 107, figs 21–23, 45–50, China (Guizhou)

M. arcuata Meng, Wang & Qin, 2016. Meng, Wang & Qin 2016: 109, China (Yunnan); Chen *et al.* 2014: 76, fig. 2-31

** *M. bistriata* Meng, Wang & Qin, 2016. Meng, Wang & Qin 2016: 103, figs 1–3, 7–20, China (Guizhou)

M. chilocorides (Walker, 1851). As *Hemisphaerius chilocorides* Walker, 1851: 379, China (type locality, Hongkong), Japan; Fennah 1956: 504; Chen *et al.* 2014: 69, fig. 2-27 (Fig. 8A–B)

M. contusus (Walker, 1851) comb. nov. As *Hemisphaerius contusus* Walker, 1851: 378; Butler 1875: 95, plate IV, fig. 11, China

** *M. lanceolata* Che, Wang & Chou, 2003. Che, Wang & Chou 2003: 36, fig. 1, China (Guangxi); Meng *et al.* 2016: figs 71–72

** *M. latistriata* Meng, Wang & Qin, 2016. Meng, Wang & Qin 2016: 106, figs 4–6, 27–44, China (Hunan)

** *M. naevia* Che, Wang & Chou, 2003. Che, Wang & Chou 2003: 38, fig. 3, China (Yunnan); Meng *et al.* 2016: figs 64–65

** *M. pianmaensis* Chen, Zhang & Chang, 2014. Chen, Zhang & Chang 2014: 71, fig. 2-28, China (Yunnan)

M. qiana Chen, Zhang & Chang, 2014. Chen, Zhang & Chang 2014: 73, fig. 2-29, China (Guizhou)

M. recurrens (Butler, 1875). As *Hemisphaerius recurrens* Butler, 1875: 98, plate IV, fig. 20, China (Fujian); Fennah 1956: 504, figs 17G–H, 18A–C, 19B; Chen *et al.* 2014: 73, fig. 2-30; figs 55–63, 66–70 (Fig. 8C–D)

** *M. serrata* Che, Wang & Chou, 2003. Che, Wang & Chou 2003: 41, fig. 5, China (Guangxi); Meng *et al.* 2016: figs 42–44

** *M. sinuata* Che, Wang & Chou, 2003. Che, Wang & Chou 2003: 40, fig. 4, China (Yunnan); Meng *et al.* 2016: figs 77–80

** *M. triangularis* Che, Wang & Chou, 2003. Che, Wang & Chou 2003: 38, fig. 2, China (Yunnan); Meng *et al.* 2016: figs 73–76

Gnezdilovius gen. nov.

urn:lsid:zoobank.org:act:75C438A6-C66E-4718-8233-32E6D926FBC1

Fig. 9

Type species

Gergithus lineatus Kato, 1933.

Diagnosis

This new genus is similar to *Gergithoides* and *Hemisphaerius*. It differs from the former by the following characters: 1) coryphe nearly quadrangular (in *Gergithoides* coryphe nearly subtriangular); 2) metope smooth without tubercles or median carina (in *Gergithoides* metope with a row of tubercles and median carina); 3) genital style with hind margin slightly convex, or nearly straight, or weakly concave in middle (in *Gergithoides* genital style with hind margin strongly concave in middle). The new genus differs from *Hemisphaerius* by the following characters: 1) body medium-sized, male body length varies from 4.0 to 7.0 mm, most often length range from 5.0 to 6.5 mm (in *Hemisphaerius* body small, male body length varies from 3.0 to 4.6 mm); 2) hind wing well-developed, longer than half length of tegmen, usually 0.7

Fig. 9. *Gnezdilovius* spp. **A–C**. *Gnezdilovius multipunctatus* (Che, Zhang & Wang, 2007) comb. nov., paratype. **A**. Habitus, dorsal view. **B**. Habitus, lateral view. **C**. Metope and clypeus, facial view. — **D–F**. *Gnezdilovius lineatus* (Kato, 1933) comb. nov. **D**. Metope and clypeus, facial view. **E**. Habitus, lateral view. **F**. Habitus, dorsal view. Scale bars = 1 mm.

times as long as tegmen (in *Hemisphaerius* hind wing shorter than half length of tegmen, about 0.3 times as long as tegmen); 3) aedeagus usually with variable processes (in *Hemisphaerius* aedeagus without any process, phallobasal lobes with variable shape).

Etymology

Named after Dr. Vladimir M. Gnezdilov, who is a great specialist in systematic research of the family Issidae. The name is masculine.

Description

Head and thorax. Coryphe 2.4 times as wide as long, disc depressed, without carina (Fig. 9A, F). Metope with disc slightly elevated, without median carina, almost as long in midline as at widest point below level of antennae (Fig. 9C–D). Clypeus not angulate, always in same plane as metope (Fig. 9C–D). Rostrum long, reaching metatrochanter. Pronotum slightly longer than coryphe (Fig. 9A, F). Mesonotum smooth, disc slightly elevated. Tegmen elliptical, strongly convex and without claval suture, apical margin usually acutely rounded, longitudinal veins usually weakly prominent or inconspicuous (Fig. 9B, E). Hind wing well-developed, reticulate, more than half length of tegmen. Legs relative long, hind tibia with two lateral spines. Metatibiotarsal formula (6–9)/(8–16)/2.

Male genitalia. Anal tube subtriangular, mushroom-shaped or cup-shaped. Pygofer in lateral view with hind margin roundly or spinously produced caudad. Phallobase with dorsal lobe usually reflexed at apex. Aedeagus with processes. Genital style with caudo-dorsal angle rounded, hind margin slightly convex, or nearly straight, or weakly concave in middle. Capitulum of style short, in caudal view with apical margin obtuse or acute, with small processes, lateral tooth spinule-shaped.

Female genitalia. Sternum VII with middle of posterior margin clearly convex or concave. Anal tube nearly ovate in dorsal view, base wider than apex. Paraproct short. Gonoplac slightly elevated in median area, border between first and second gonoplac lobes obsolete, third gonoplac lobes faintly sclerotized and pigmented. Proximal part of posterior connective lamina of gonapophyses IX convex in lateral view, median field with notch in apical part. Gonocoxa VIII nearly rectangular, dorsal margin slightly protruding in proximal part. Anterior connective lamina of gonapophysis VIII with three teeth in apical group and with two to four carinate teeth in lateral group.

Distribution

China (Hainan, Yunnan, Guangxi, Guangdong, Hong Kong, Fujian, Taiwan, Zhejiang, Guizhou, Chongqing), Japan, Vietnam.

Remarks

The new genus can be distinguished by the wide coryphe (more than twice as wide as long), metope almost as long as wide, clypeus small and compressed and hind wing well developed.

Forty species are here transfered to *Gnezdilovius* gen. nov. from *Gergithus*, of which we have examined type specimens of 11 species in NWAFU and specimens of several species in BMNH, where paratypes are present of *G. chihpensis*, *G. rosticus* and *G. pendulus* and syntypes of *G. flavimaculata*. All other species are known to us only by their descriptions and illustrations. Images are provided of *G. lineatus* (type species) based on specimens collected in Taiwan and deposited in NWAFU (Fig. 9D–F).

Checklist of species of *Gnezdilovius* gen. nov.

Specimens deposited in BMNH indicated by * and in NWAFU by **:

* *G. affinis* (Schumacher, 1915) comb. nov. As *Gergithus affinis* Schumacher, 1915: 135, China

(Taiwan); Hori 1969: 55, fig. 2: 12–13, pl. 2 fig. 13; Chan & Yang 1994: 23, fig. 6

** *G. bimaculatus* (Zhang & Che, 2009) comb. nov. As *Gergithus bimaculatus* Zhang & Che, 2009: 185, figs 16–27, China (Yunnan); Meng & Wang 2012: 11, figs 43–64

* *G. bistriatus* (Schumacher, 1915) comb. nov. As *Gergithus bistriatus* Schumacher, 1915: 136, China (Taiwan); Chan & Yang 1994: 31, fig. 11

G. carbonarius (Melichar, 1906) comb. nov. As *Gergithus carbonarius* Melichar, 906: 65, China (Taiwan), Japan; Chan & Yang 1994: 29, fig. 90

** *G. chelatus* (Che, Zhang & Wang, 2007) comb. nov. As *Gergithus chelatus* Che, Zhang & Wang, 2007: 617, figs 24–32, China (Hainan)

* *G. chihpensis* (Chan & Yang, 1994) comb. nov. As *Gergithus chihpensis* Chan & Yang, 1994: 38, fig. 14, China (Taiwan)

G. flaviguttatus (Hori, 1969) comb. nov. As *Gergithus flaviguttatus* Hori, 1969: 56, pl. 2: 16, China (Taiwan), Japan

* *G. flavimacula* (Walker, 1851) comb. nov. As *Hemisphaerius flavimacula* Walker, 1851: 378, China (Hong Kong); Butler 1875: 98, pl. IV, fig. 19

* *G. formosanus* (Metcalf, 1955) comb. nov. As *Gergithus formosanus* Metcalf, 1955: 263, China (Taiwan), Japan; Chan & Yang 1994: 38, fig. 15

G. gravidus (Melichar, 1906) comb. nov. As *Gergithus gravidus* Melichar, 1906: 61, China (Guangxi), Vietnam; Che *et al.* 2007: 612, figs 1–4; Chen *et al.* 2014: 52, fig. 2-15A–I

G. horishanus (Matsumura, 1916) comb. nov. As *Gergithus horishanus* Matsumura, 1916: 102, China (Taiwan); Hori 1969: 56, pl. 2: 12

G. hosticus (Chan & Yang, 1994) comb. nov. As *Gergithus hosticus* Chan & Yang, 1994: 31, fig. 10, China (Taiwan)

G. iguchii (Matsumura, 1916) comb. nov. As *Gergithus iguchii* Matsumura, 1916: 98, China (Zhejiang, Fujian, Guangdong), Japan, Vietnam; Hori 1969: 60, fig. 2: 1–4, pl. 2 fig. 6; Chen *et al.* 2014: 52, fig. 2–16A–I

* *G. lineatus* (Kato, 1933) comb. nov. As *Gergithus lineatus* Kato, 1933: 461 (type species), China (Taiwan), Japan; Chan & Yang 1994: 43, fig. 17 (Fig. 9D–F)

G. longulus (Schumacher, 1915) comb. nov. As *Gergithus longulus* Schumacher, 1915: 135, China (Taiwan), Japan; Hori 1969: 56, pl. 2 fig. 14; Chan & Yang 1994: 47, fig. 20

G. luteomaculatus (Constant & Pham, 2016) comb. nov. As *Gergithus luteomaculatus* Constant & Pham, 2016: 6, figs 1, 2A–B, 3–4, Vietnam

** *G. multipunctatus* (Che, Zhang & Wang, 2007) comb. nov. As *Gergithus multipunctatus* Che, Zhang & Wang, 2007: 621, China (Hainan); Constant & Pham 2016: 9, figs 1, 2C–D (Fig. 9A–C)

* *G. nigrolimbatus* (Schumacher, 1915) comb. nov. As *Gergithus nigrolimbatus* Schumacher, 1915: 134, China (Taiwan); Chan & Yang 1994: 45, fig. 18

** *G. nonomaculatus* (Meng & Wang, 2012) comb. nov. As *Gergithus nonomaculatus* Meng & Wang, 2012: 5, figs 1–5, China (Hainan); Constant & Pham 2016: 10, figs 2E–F (Figs 1, 2E–F)

* *G. nummarius* (Chan & Yang, 1994) comb. nov. As *Gergithus nummarius* Chan & Yang, 1994: 23, fig. 7, China (Taiwan)

G. okinawanus (Matsumura, 1936) comb. nov. As *Gergithus okinawanus* Matsumura, 1936: 82, Japan; Hori 1969: 55, fig. 1: 1–3, pl. 2 fig. 10

** *G. parallelus* (Che, Zhang & Wang, 2007) comb. nov. As *Gergithus parallelus* Che, Zhang & Wang, 2007: 619, figs 33–41, China (Hainan)

* *G. pendulus* (Chan & Yang, 1994) comb. nov. As *Gergithus pendulus* Chan & Yang, 1994: 47, fig. 7, China (Taiwan)

** *G. pseudotessellatus* (Che, Zhang & Wang, 2007) comb. nov. As *Gergithus pseudotessellatus* Che, Zhang & Wang, 2007: 623, figs 51–59, China (Hainan); Chen *et al.* 2014: 55, fig. 2-18A–I

** *G. quinquemaculatus* (Che, Zhang & Wang, 2007) comb. nov. As *Gergithus quinquemaculatus* Che,

Zhang & Wang, 2007: 615, figs 5–13, China (Guangxi, Guizhou); Chen *et al.* 2014: 58, fig. 2-19A–I

G. robustus (Schumacher, 1915) comb. nov. As *Gergithus robustus* Schumecher, 1915: 127, China (Taiwan); Hori 1969: 56, pl. 2 fig. 15; Chan & Yang 1994: 50, fig. 21

* *G. rosticus* (Chan & Yang, 1994) comb. nov. As *Gergithus rosticus* Chan & Yang, 1994: 34, fig. 12, China (Taiwan)

G. rotundus (Chan & Yang, 1994) comb. nov. As *Gergithus rotundus* Chan & Yang, 1994: 36, fig. 12, China (Taiwan)

** *G. rugiformis* (Zhang & Che, 2009) comb. nov. As *Gergithus rugiformis* Zhang & Che, 2009: 183, figs 1–15, China (Chongqing, Guangxi)

G. satsumensis (Matsumura, 1916) comb. nov. As *Gergithus satsumensis* Matsumura, 1916: 101, Japan; Hori 1969: 52, fig. 1: 4–6, pl. 2 figs 5–8

** *G. spinosus* (Che, Zhang & Wang, 2007) comb. nov. As *Gergithus spinosus* Che, Zhang & Wang, 2007: 615, figs 14–23, China (Hainan)

G. stramineus (Hori, 1969) comb. nov. As *Gergithus stramineus* Hori, 1969: 58, pl 3 fig. 3, China (Taiwan)

G. taiwanensis (Hori, 1969) comb. nov. As *Gergithus taiwanensis* Hori, 1969: 54, fig. 1: 7–9, pl. 2 fig. 9, China (Taiwan)

G. tamdao (Constant & Pham, 2016) comb. nov. As *Gergithus tamdao* Constant & Pham, 2016: 11, figs 1, 2G–H, 5–6, Vietnam

G. tessellatus (Matsumura, 1916) comb. nov. As *Gergithus tessellatus* Matsumura, 1916: 102,China (Zhejiang, Fujian, Taiwan), Japan; Chan & Yang 1994: 50, fig. 21; Meng & Wang 2012: 11, figs 65–73; Chen *et al.* 2014: 60, fig. 2-20A–I

** *G. tristriatus* (Meng & Wang, 2012) comb. nov. As *Gergithus tristriatus* Meng & Wang, 2012: 8, figs 19–38, 40, 42, China (Yunnan)

* *G. unicolor* (Melichar, 1906) comb. nov. As *Gergithus unicolor* Melichar, 1906: 66, China (Taiwan); Chan & Yang 1994: 27, fig. 8

G. variabilis (Butler, 1875) comb. nov. As *Hemisphaerius variabilis* Butler, 1875: 98, 99, pl. IV, fig. 21, China (Hong Kong)

* *G. yayeyamensis* (Hori, 1969) comb. nov. As *Gergithus yayeyamensis* Hori, 1969: 55, fig. 1: 10–11, pl. 2 fig. 11, China (Taiwan, Japan)

** *G. yunnanensis* (Che, Zhang & Wang, 2007) comb. nov. As Gergithus yunnanensis Che, Zhang & Wang, 2007: 625, figs 60–67, China (Yunnan)

Hemisphaeroides Melichar, 1903
Figs 10–11

Hemisphaeroides Melichar, 1903: 75. Type species: *Hemisphaeroides aeneoniger* Melichar, 1903, by original designation.

Diagnosis

Body semicircular, smooth. Head including eyes wider than pronotum. Coryphe wide, 4.5 times as wide as long. Metope passing smoothly onto coryphe, greatly expanded laterally below antennae. Clypeus broadly triangular, placed horizontally and at right angle to surface of metope. Pronotum short, slightly longer than coryphe. Mesonotum large, triangularly convex. Tegmen semicircular, strongly convex, basal costal margin slightly protruding anteriorly. Hind wing with single lobe, slightly shorter than tegmen. Hind tibiae with two spines.

Distribution

Sri Lanka.

Fig. 10. *Hemisphaeroides* spp. **A–E**. *Hemisphaeroides aeneoniger* Melichar, 1903, syntype. **A**. Habitus, dorsal view. **B**. Habitus, lateral view. **C**. Labels. **D**. Habitus, ventral view. **E**. Habitus, caudal view. — **F–I**. *Hemisphaeroides atromaculatus* Distant, 1916, syntype. **F**. Habitus, dorsal view. **G**. Habitus, lateral view. **H**. Metope and clypeus, facial view. **I**. Labels. Scale bar = 1 mm.

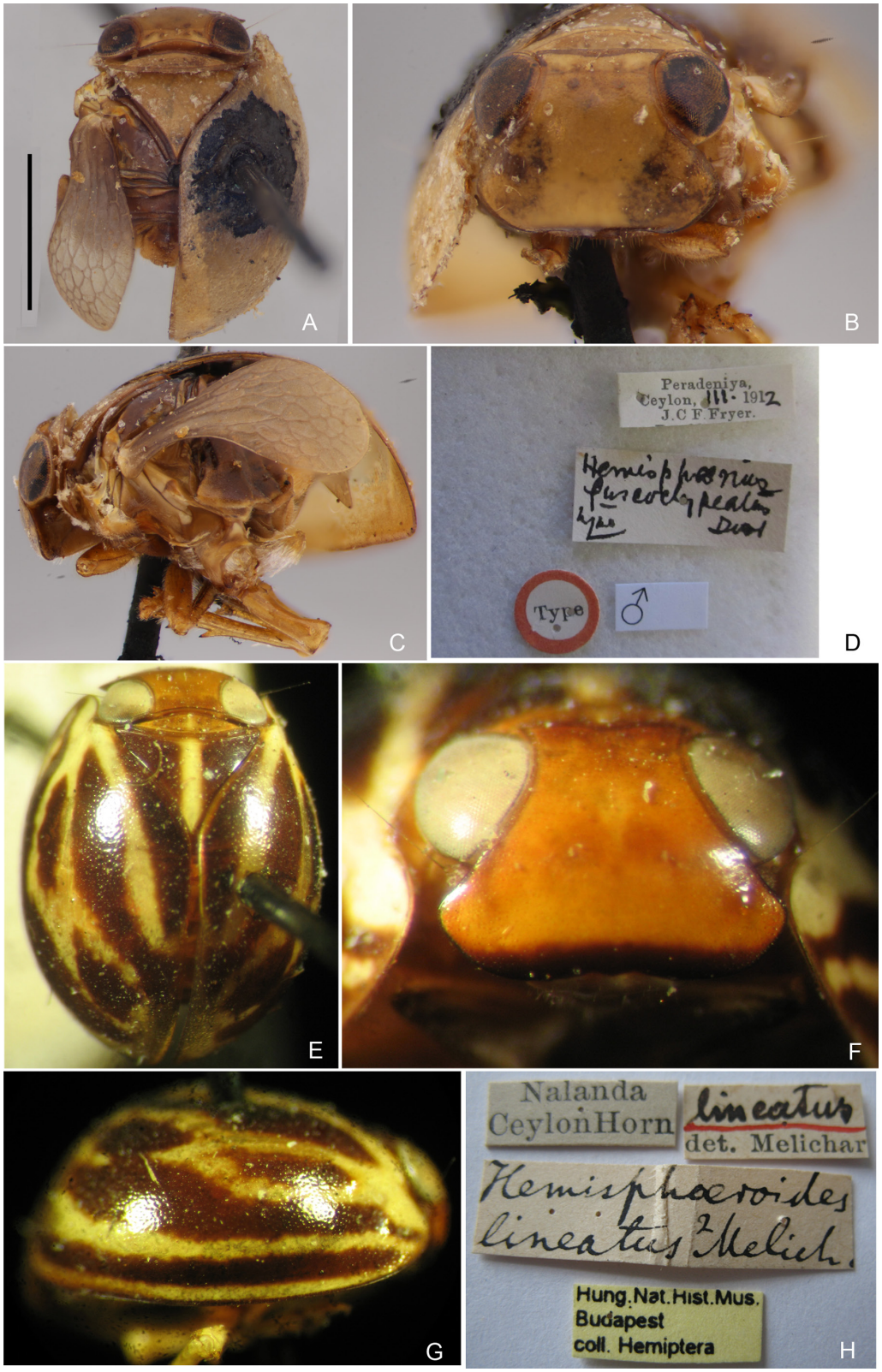

Fig. 11. *Hemisphaeroides* spp. **A–D**. *Hemisphaeroides fuscoclypeatus* Distant, 1916, holotype. **A**. Habitus, dorsal view. **B**. Metope and clypeus, facial view. **C**. Habitus, lateral view. **D**. Labels. — **E–H**. *Hemisphaeroides lineatus* Melichar, 1903, syntype. **E**. Habitus, dorsal view. **F**. Metope and clypeus, facial view. **G**. Habitus, lateral view. **H**. Labels. Scale bar = 1 mm.

Checklist of species of *Hemisphaeroides* Melichar, 1903

H. aeneoniger Melichar, 1903. Melichar 1903: 75 (type species), Sri Lanka; Distant 1906: 364, fig. 188 (Fig. 10A–E)

H. atromaculatus Distant, 1916 comb. nov. As *Hemisphaerius atromaculatus* Distant, 1916: 105, Sri Lanka (Fig. 10F–I)

H. fuscoclypeatus Distant, 1916 comb. nov. As *Hemisphaerius fuscoclypeatus* Distant 1916: 105, Sri Lanka (Fig. 11A–D)

H. lineatus Melichar, 1903. Melichar 1903: 76, Sri Lanka (Fig. 11E–H)

Remarks

Hemisphaeroides aeneoniger and *H. lineatus* are known to us from images of their type specimens (HNHM) provided here. Images of the type specimens examined of *H. atromaculatus* (BMNH(E) 1705790) and *H. fuscoclypeatus* (BMNH(E) 1705791) are also provided here.

Discussion

Most genera in the tribe Hemisphaeriini, including *Gnezdilovius* gen. nov., have the coryphe transverse and relatively wide (Fig. 7F) and the metope also relatively wide (Fig. 10D). Exceptions are the genera *Neogergithoides* (Fig. 1C), *Macrodaruma* (Fig. 1A) and *Choutagus* (Fig. 1E), where the coryphe and metope are longer than wide, and *Gergithus*, where the coryphe is nearly quadrate (Fig. 6A) and the metope very elongate (Fig. 6C). *Gergithus* also differs from all other Hemisphaeriini by the angular anteclypeus in lateral view (Fig. 6B). In addition, although *G. iguchii* and *G. quinquemaculatus* (see Che *et al.* 2007: figs 5–6; Chen *et al.* 2014: fig. 2-19A–E) have the metope slightly longer than wide and therefore fall between *Gergithus* and *Gnezdilovius* gen. nov., they do not have the angular anteclypeus found in *Gergithus*. On this basis, these two species are transferred to *Gnezdilovius* gen. nov.

The genera *Gergithus* and *Gnezdilovius* gen. nov. are both widely distributed in the Oriental region. Compared to *Gergithus*, which is found mainly on the Indian subcontinent and also SE Asia (Thailand, Burma, Indonesia), *Gnezdilovius* gen. nov. is found mainly in southern China and also SE Asia (Vietnam) and the Palaearctic region (Japan) (see Checklists). Additionally, the genus *Hemisphaeroides* seems to be limited in its distribution to Sri Lanka. *Mongoliana* is mainly distributed in southern China.

Data on the ecology of Hemisphaeriini are meagre. It has been observed that the unnamed host plant of *Hemisphaerius lysanias* Fennah, 1978 withered when fed on in open areas in Hainan Island of China (Y.-L. Che, pers. comm. 2003). Both *Hemisphaerius cattiensis* Constant & Pham, 2011 and *H. hippocrepis* Constant & Pham, 2011 were collected in a forest (Constant & Pham 2011); *H. hippocrepis* occurs on forest undergrowth and forest roadsides in Vietnam (Gnezdilov 2013b), while *H. interclusus* was usually collected in open sunlit areas, particularly along roads and in glades, on the plant *Saccharum spontaneum* (L.) (Poaceae) (Gnezdilov 2013b); *Rotundiforma nigrimaculata* Meng, Wang & Qin, 2013 was collected in China on bamboos (*Gigantochloa ligulata* Gamble and *Dendrocalamus* sp.) by canopy fogging (Meng *et al*. 2013). The new species *Gergithus frontilongus* sp. nov. was also collected by forest canopy fogging (Zheng & Li 2013).

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