Proceedings of the Zoological Institute RAS Vol. 329, No. 1, 2025, pp. 59–63 10.31610/trudyzin/2025.329.1.59



UDC 595.753

To the knowledge of the genus *Hysterosphaerius* Melichar, 1906 (Hemiptera: Fulgoroidea: Issidae)

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Submitted February 4, 2025; revised February 18, 2025; accepted February 21, 2025.

ABSTRACT

Hysterosphaerius sexpunctatus Melichar, 1906, the type species of the monotypical genus *Hysterosphaerius* Melichar, 1906, is redescribed based on new materials from Singapore along with male genitalia structures described and illustrated for the first time. Relationships of the genus *Hysterosphaerius* within the tribe Hemisphaeriini Melichar (Issinae) are discussed.

Key words: Hemisphaeriini, Issinae, Mongolianina, morphology, Oriental Realm

К познанию рода *Hysterosphaerius* Melichar, 1906 (Hemiptera: Fulgoroidea: Issidae)

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Представлена 4 февраля 2025; после доработки 18 февраля 2025; принята 21 февраля 2025.

РЕЗЮМЕ

Hysterosphaerius sexpunctatus Melichar, 1906, типовой вид монотипического рода Hysterosphaerius Melichar, 1906, переописан по новым материалам из Сингапура. Генитальные структуры самца H. sexpunctatus впервые описаны и проиллюстрированы. Обсуждены родственные отношения рода Hysterosphaerius в пределах трибы Hemisphaeriini Melichar (Issinae).

Ключевые слова: Hemisphaeriini, Issinae, Mongolianina, морфология, Ориентальное царство

INTRODUCTION

The genus *Hysterosphaerius* Melichar, 1906 was erected for a single species, *Hysterosphaerius sexpunctatus* Melichar, 1906, described after a single male from Singapore nearly 120 years ago (Melichar 1906). It belongs to the tribe Hemisphaeriini Melichar, 1906 of the subfamily Issinae Spinola of the family Issidae (Gnezdilov 2013; Gnezdilov et al. 2020, 2022). Since Melichar's publication no data on *H. sexpunctatus* appeared in the literature. Below I describe three males of this species collected in Malaise trap in Singapore since 2005 to 2006, with male genitalia structures illustrated and analysed in the sense of establishing of relationships of *H. sexpunctatus* within the tribe Hemisphaeriini.

General morphological terminology following Anufriev and Emeljanov (1988) and Gnezdilov with coauthors (Gnezdilov et al. 2014) – for male genitalia structures.

Photographs were taken using a Canon 5D Mark IV digital camera equipped with a lens Canon MP-E 65 mm f/2.8 $1-5\times$ macro and Canon Macro Twin Lite MT-26EX-RT flash. Images were produced using Helicon Focus v. 7.6.4 and Adobe Photoshop software. The genital segments of the examined specimen were macerated in 10% NaOH and figured in glycerin jelly (Brunel Micro Ltd, UK) using a Leica MZ9.5 stereomicroscope with a camera lucida.

The specimens examined are deposited in the Royal Belgian Institute of Natural Sciences, Brussels, Belgium (RBINS) and in the Zoological Institute of the Russian Academy of Sciences, Saint Petersburg, Russia (ZIN).

TAXONOMY

Family Issidae Spinola, 1839

Subfamily Issinae Spinola, 1839

Tribe Hemisphaeriini Melichar, 1906

Subtribe Mongolianina Wang, Zhang et Bourgoin, 2016

Genus Hysterosphaerius Melichar, 1906

Hysterosphaerius Melichar, 1906: 98.

Type species: *Hysterosphaerius sexpunctatus* Melichar, 1906, by original designation and mono-typy.

Diagnosis. Metope elongate, enlarged below eyes, without carinae, but with two lateral rows of traces of larval sensory pits (pustules). Coryphe transverse, twice as wide as long medially, concave. Postclypeus curved almost at right angle in lateral view, with strong median carina. Fore wings slightly concave or flat on clavus, with large semicircular projections of the costal margins basally under eyes in lateral view, with relief reticulate venation and cells with dense punctation. Fore wings not narrowing apically – nearly truncate from the apex of clavus, without hypocostal plate, claval suture indistinct. Hind wings nearly as long as fore wings, with deeply concave costal margin and reduced anal lobe. Hind tibia with two lateral spines distally and with five apical spines.

First metatarsomere with two latero-apical and five intermediate spines in whole straight row. Male anal tube large, enlarged and deeply concave apically in dorsal view. Penis symmetrical; each dorso-lateral lobe of phallobase with triangular-shaped basally, but strongly narrowing apically and curved at right angle apical process. Capitulum of style on long neck.

Composition and distribution. Monotypical genus known from Singapore Island.

Hysterosphaerius sexpunctatus Melichar, 1906

Hysterosphaerius sexpunctatus Melichar, 1906: 98, Fig. 16.

(Figs 1–10)

Material examined. Singapore: 1 male, Nee Soon, swamp forest, Malaise trap 4, Station 25391, 14 October 2005, P. Grootaert leg. (RBINS); 1 male, Nee Soon, swamp forest, Malaise trap 1, Station 25281, 5 August 2005, P. Grootaert leg. (ZIN); 1 male, Nee Soon, Malaise trap 3, 24 May 2006, K.L. Yeo leg. (RBINS).

Emended description. Structure. Metope visible from above, elongate, enlarged below eyes, wrinkly, without carinae, but with two lateral rows of traces of larval sensory pits (pustules); lateral margins hanging above antenna; upper margin weakly concave (Figs 1, 2). Metopoclypeal suture weakly concave. Postclypeus not convex, but curved almost at right angle in lateral view, with strong median carina. Rostrum short, barely reaching hind coxae; 3rd segment shorter than 2nd one, slightly narrowing apically. Coryphe transverse, twice as wide as long medially, concave; anterior margin convex; posterior margin nearly straight. Coryphe and metope joint at obtuse angle in lateral view. Eves large, diameter of each eve is nearly as width of upper part of metope between eves or even more. Pronotum small, deeply concave, with keel-shaped anterior margin; paradiscal fields very narrow - filiform behind eyes; paranotal lobes rather narrow, smooth. Mesonotum three times as long as pronotum, without carinae. Tegulae large, elongate. Pedicel mushroom-shaped – enlarged apically. Fore wings slightly concave or flat on clavus, with large semicircular projections of the costal margins basally under eyes in lateral view, with relief reticulate venation; cells densely covered with punctures. Fore wings not narrowing apically – nearly truncate from apex of clavus, without hypocostal plate, claval suture indistinct. Hind wings large, nearly as long as



Figs 1–4. Hysterosphaerius sexpunctatus Melichar, 1906, male. 1 – dorsal view; 2 – frontal view; 3 – genital block, caudal view; 4 – right hind wing. Scale bar – 1 mm.

fore wings, with deeply concave costal margin and reduced anal lobe, coupling lobe indistinct (Fig. 4). Hind wing branching vein sequence: R 1; M 1; CuA 1; CuP 1; Pcu 1; with many transverse veins in its apical 2/3. Legs not flattened neither foliated. Hind tibia with two lateral spines distally and with five apical spines. First and second metatarsomeres are nearly equal in length, but first one is wider, ventral surface of both tarsomeres with dense long setae. First metatarsomere with two latero-apical and five intermediate spines. Second metatarsomere with only two latero-apical spines in whole straight row. Each claw with three long setae. Hind margin of arolium of pretarsus convex, protruding beyond claw apices in dorsal view.

Coloration (Figs 1–3). Generally yellowish light brown. Pronotum light yellow. Fore wing veins dark brown behind apex of clavus. Each forewing with three black spots across corium and clavus – one small and two larger ones. Hind wings light yellow. Hind femora dark brown proximally. Spines of hind legs dark brown, with black apices. Claws brown to dark brown. Abdominal tergites and hind margins of styles brown, except light yellow tergites VII and VIII and pygofer. Abdominal sternites III, IV, and VIII light yellow, sternite V light yellow, with dark brown to black hind margin, sternites VI and VII mainly dark brown to black.

Male terminalia (Figs 3, 5–10). Pygofer wide, with strongly convex hind margins (Fig. 5). Anal tube long and wide, enlarged and deeply concave apically in dorsal view (Figs 3, 6). Anal column short, ¼ of anal tube, narrow. Penis symmetrical, wide, horseshoe-shaped in lateral view, with weakly sclerotized dorso-apical part, which apparently may swell.



Figs 5–10. *Hysterosphaerius sexpunctatus* Melichar, 1906, male genitalia. 5 – pygofer and anal tube, lateral view; 6 – anal tube, dorsal view; 7 – penis and connective, lateral view; 8 – penis, ventral view; 9 – style, lateral view; 10 – style, dorsal view. *Abbreviations*: apd – apical process of aedeagus; apph – apical process of phallobase; susp – suspensorium; vl – ventral phallobase lobe. Not to scale.

Each dorso-lateral lobe of phallobase with triangular-shaped basally, but strongly narrowing apically and curved at right angle apical process (Fig. 7, *apph*). Ventral phallobase lobe wide, as long as dorsolateral lobes, almost not narrowing to truncate apex (Fig. 8, *vl*). Phallobase fused with anal tube and pygofer by suspensorium (Figs 5, 7, *susp*). Aedeagus not visible above the phallobase, with pair of narrowing apically apical processes bearing denticles distally, without ventral hooks (Fig. 7, *apd*). Style with rounded plate (Fig. 9). Capitulum of style on long neck, with large lateral tooth and smooth apical tooth. Capitulum wide, widely rounded apically in dorsal view (Fig. 10).

Total length. Males – 3.5–3.8 mm.

DISCUSSION

Within the tribe Hemisphaeriini the genus *Hys*terosphaerius Melichar, 1906 is closely related to the monotypical genus Bruneastrum Gnezdilov, 2015, known from Brunei, by the structure of male genitalia, in particular, by presence of triangular-shaped basally, but narrowing apically and curved at right angle apical processes of dorso-lateral phallobase lobes, wide anal tube deeply concave apically in dorsal view, and absence of ventral hooks of aedeagus (Figs 6, 7) (Gnezdilov 2015, figs 6, 9, laphp). Externally Bruneastrum Gnezdilov clearly differs from Hysterosphaerius by smooth metope and fore wings, with convex clavus, as well as peculiar bright coloration (Gnezdilov 2015, figs 11-14). Some species of the genus Mongoliana Distant, 1909 are also characterized by dorso-lateral lobes of phallobase narrowing apically (Zhang et al. 2020, figs 51-56) and Bruneastrum, Hysterosphaerius, and Mongoliana have fore wings with large semicircular projections of costal margins basally under eyes in lateral view. Thus Hysterosphaerius may be formally placed in the subtribe Mongolianina Wang, Zhang et Bourgoin. However, hind wing characters listed by Wang with coauthors (Wang et al. 2016) to distinguish Mongolianina, e.g. elongate hind wings with margins subparallel and anal lobe reduced, with distinct venation, CuA and CuP not apically merged, but running parallel, and CuP and first anal vein partially merged, cannot be interpreted as unique features of this subtribe as these characters are also present in the taxa of another subtribe, Hemisphaeriina Melichar, 1906, in particular, in the genus *Gergithoides* Schumacher, 1915 (Constant and Pham 2017, figs 1E, 3E) while the monotypical genus Eusudasina Yang, 1994 placed by Wang with coauthors (Wang et al. 2016) in the subtribe Mongolianina has rudimentary hind wings (Chan and Yang 1994, fig. 34E). Thus, two subtribes of the tribe Hemisphaeriini suggested by Wang with coauthors (Wang et al. 2016) and revealed from the molecular analysis are still in need of verification and morphological confirmation.

ACKNOWLEDGEMENTS

I thank Dr. Vladimir Neimorovets (Saint Petersburg, Russia) for taking photos, Mr. Jérôme Constant (Brussels, Belgium) for his kind permission to study the specimens, and Dr. Dmitry Tishechkin and Dr. Dmitry Shcherbakov (Moscow, Russia) for their valuable comments on the manuscript.

My study is performed in the frameworks of the Russian State Research project No. 125012901042-9.

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