# REVISION OF THE GENUS *EUXALDAR* FENNAH, 1978 (HEMIPTERA: FULGOROIDEA: ISSIDAE)

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**Abstract.**— *Euxaldar jehucal* Fennah, 1978 is redescribed. *Euxaldar lenis* **sp. nov.** is described from Southern Vietnam. Sexual dimorphism and asymmetry in male genitalia are recorded for the genus *Euxaldar* Fennah, 1978.

**Key words.**— Morphology, genital asymmetry, taxonomy, new species, Hemisphaeriini, Vietnam.

## INTRODUCTION

The genus *Euxaldar* was erected by R. G. Fennah for a single species *E. jehucal* described from Ninh Binh Province in Northern Vietnam (Fennah 1978). This species was also recorded from nearby Ha Noi, Vinh Phuc, Hoa Binh, and Haiphong Provinces and photos of the holotype of *E. jehucal* were published (Gnezdilov and Constant 2012). Our collecting in Lam Dong Province (Da Lat) of Southern Vietnam resulted in discovery of another species of this genus, which is well distinguished by the coloration, smooth surface of metope, and the structure of male genitalia. In this paper *E. jehucal* Fennah, 1978 is redescribed and a description of the new species from Da Lat is provided.

The genus *Euxaldar* was classified in the tribe Issini Spinola, 1839 of the subfamily Issinae (sensu Gnezdilov 2013a) until recently. Wang *et al.* (2016a) moved it to the tribe Hemisphaeriini Melichar, 1906 (see the discussion).

## MATERIAL AND METHODS

Nomenclature for external morphology follows Gnezdilov *et al.* (2014). Photographs of the specimen were made with Canon EOS 6 D camera with macrolens Canon MP-E 65 mm f/2.8 1-5X, images are produced using the software Helicon Focus ver. 5 and Photoshop. The drawings of male genitalia were produced using light microscope Leica MZ 16 with camera lucida attached.

The material mentioned below including the holotype and paratypes of the new species is deposited in:

MNHN – Muséum national d'Histoire naturelle, Paris, France;
ZIN – Zoological Institute of the Russian Academy of Sciences, Saint Petersburg, Russia.

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## Taxonomy

Family **Issidae** Spinola, 1839

Tribe **Hemisphaeriini** Melichar, 1906

***Euxaldar*** Fennah, 1978

*Euxaldar* Fennah, 1978: 267.

***Type species***. *Euxaldar jehucal* Fennah, 1978, by monotypy.

***Diagnosis***. Metope flat and elongate. Coryphe transverse, 2–3 times as wide as long. Fore wings elongate and wide, without hypocostal plate; venation poorly recognizable. Hind wings one-lobed reaching pygofer. Hind tibia with 2 lateral spines. First metatarsomere with 2 latero-apical spines and 6–7 intermediate spines. Gonoplacs rounded. Phallobase asymmetrical, narrow, with two pairs of subapical processes; ventral phallobase long and narrow. Aedeagus without ventral hooks. Male anal tube enlarged apically (in dorsal view).

***Description***. **Head**. Metope flat, elongate, enlarged above the clypeus, with keel-shaped and prominent lateral margins. Coryphe transverse. Metope and coryphe joint at nearly right angle (in lateral view). Pedicel enlarged apically asymmetrically. Ocelli absent. Second and third segments of rostrum nearly equal in length; third segment slightly narrowing to its apex. Rostrum reaching hind coxae.

**Thorax**. Fore wings elongate and wide, with a prominent basal angle of costal margin below the eye, without hypocostal plate. Venation of fore wings poorly recognizable, reticulate, CuP distinct. Hind wings one-lobed, reaching hind margin of pygofer, shorter than fore wings. Hind tibia with 2 lateral spines in its distal half and with 7 apical spines. First metatarsomere with 2 latero-apical spines and 6–7 intermediate spines.

***Composition.*** The genus comprises two species: *Euxaldar jehucal* Fennah, 1978 and *Euxaldar lenis* sp. nov.

***Distribution.*** Vietnam.

### Key to species of *Euxaldar*

1. Metope smooth, without any pustules (Fig. 23). Metopoclypeal suture incomplete medially. Males light green, females light brown yellowish, with brown bands on fore wing not reaching the costal margin (Figs 21, 22). Hind margin of pygofer rather straight (in lateral view) (Fig. 17). Male anal tube weakly concave posteriorly (in dorsal view) (Fig. 16). Left subapical process of phallobase curved to its ventral side (Fig. 13). Hind margin of female sternite VII widely concave . . . . . ***E. lenis*** sp. nov.

–. Metope with row of distinct pustules along its lateral margins (Fig. 20). Metopoclypeal suture complete. Males and females brown yellowish, with dark brown bands and spots on fore wings reaching its costal margin (Figs 18, 19). Hind margin of pygofer distinctly convex near its middle (in lateral view) (Fig. 4). Male anal tube deeply concave posteromedially (in dorsal view) (Fig. 6). Processes of phallobase directed to its dorsal side (Fig. 1, 2). Hind margin of female sternite VII with two lateral concavities (Fig. 11) . . . . . ***E. jehucal*** Fennah

***Euxaldar jehucal*** Fennah, 1978
(Figs 1–11, 18–20, 31–33)

*Euxaldar jehucal* Fennah, 1978: 268.
*Euxaldar jehucal*: Gnezdilov and Constant 2012: 572.

***Differential diagnosis***. *Euxaldar jehucal* can be easily differentiate from *E. lenis* sp. nov. by having metope with row of pustules, hind margin of male pygofer convex, male anal tube deeply concave posteromedially, phallobase processes directed to its dorsal side, hind margin of female sternite VII with two lateral concavities and males and females brown yellowish, with dark brown bands and spots on fore wings reaching its costal margin.

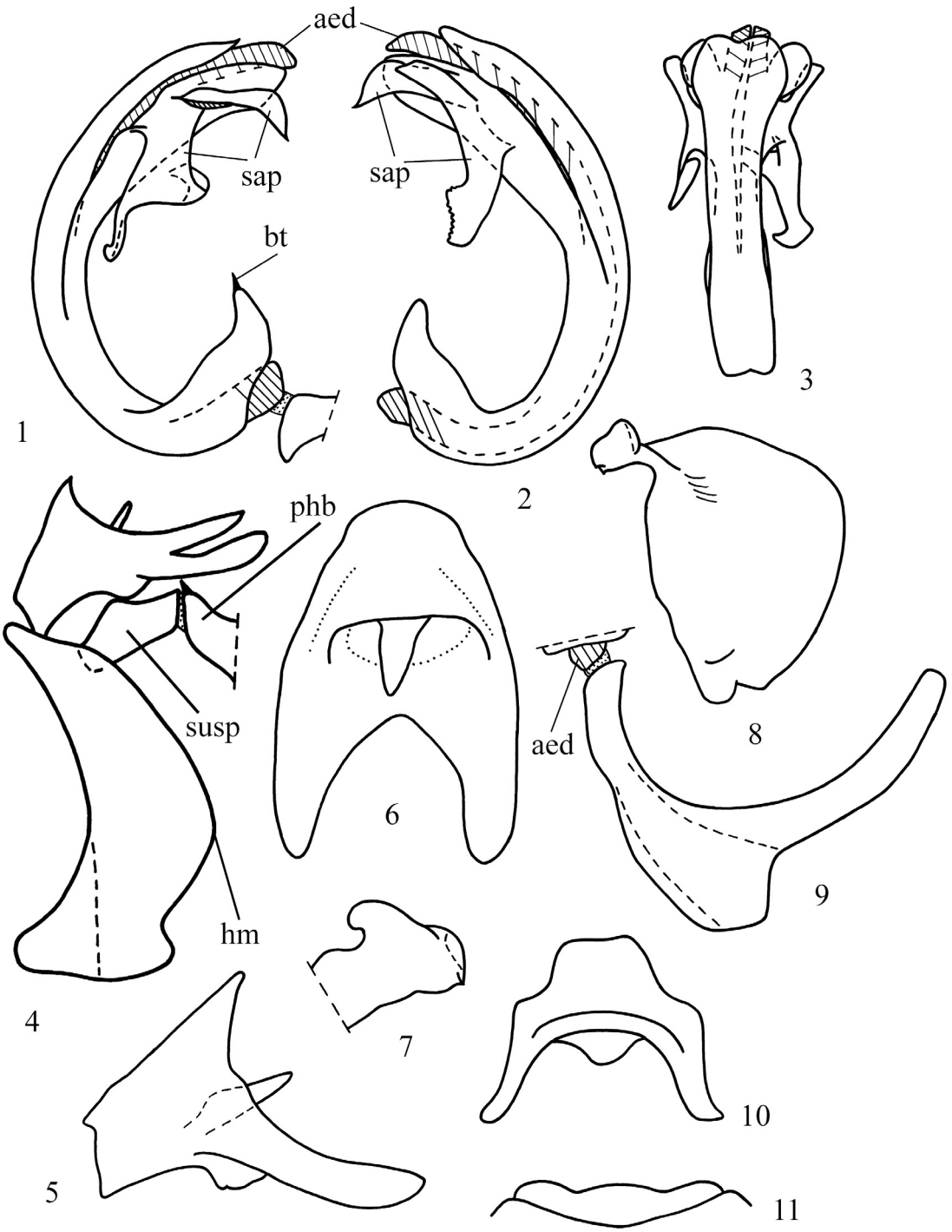
***Redescription***. Total length: males – 3.5–3.6 mm, females – 3.8–4.0 mm.

**Head**. Metope flat, with weak median carina running from its upper margin and reaching its middle, with a row of distinct pustules along its lateral margins and rather weak pustules inside (Figs 20, 33). Metopoclypeal suture complete, straight or weakly concave. Postclypeus flattened laterally. Postclypeus and anteclypeus with distinct median carina. Coryphe transverse, about 3 times as wide as long at the middle, without carinae (Fig. 31).

**Thorax**. Pronotum and mesonotum without carinae. Mesonotum 2.5 times as long as pronotum. First metatarsomere with 6 intermediate spines.

**Coloration**. General coloration of males and females light brown yellowish, with dark brown bands on fore wings reaching its costal margin (Figs 18–19, 31–33). Pustules of metope light. Middle episternae dark brown. Claws dark brown. Apices of leg spines black. Male: hind margins of IV–VII abdominal sternites brown reddish; pygofer, styles, and anal tube brown yellowish. Female: abdominal sternites VI–VII and genital block brown yellowish; sometimes sternites III–V dark brown.

**Male terminalia**. Hind margin of pygofer distinctly convex near its middle (Fig. 4). Suspensorium well sclerotized, trapezoidal (Fig. 10). Anal tube wide,




Figures 1–11. *Euxaldar jehucal* Fennah (Tonkin), genitalia (1–10 – male, 11 – female). (1) Penis, left lateral view; (2) penis, right lateral view; (3) penis, ventral view; (4) pygofer, anal tube, and suspensorium, lateral view; (5) anal tube, lateral view; (6) anal tube, dorsal view; (7) capitulum of gonostylus, dorsal view; (8) gonostylus, lateral view; (9) connective, lateral view; (10) suspensorium, caudal view; (11) VII sternite, ventral view. Abbreviations: aed – aedeagus; bt – basal tooth of the phallobase; hm – hind margin of pygofer; phb – phallobase; sap – subapical phallobase processes; susp – suspensorium.

deeply concave medially (in dorsal view) (Fig. 6), its dorsal part in shape of visor (in lateral view) (Fig. 5). Anal column (paraproct) relatively long (0.25 times as long as anal tube laterally). Phallobase asymmetrical, narrow, strongly curved (in lateral view), with a tooth basally (Figs 1–2). Phallobase with two pairs of subapical processes on each side – one of them narrowing apically and another one furcating (with straight branch on right side, one of which with marginal denticles, and curved branch on left side). Ventral phallobase lobe long and narrow, enlarged before apex, with concavity (Fig. 3). Apical aedeagal processes narrowing apically, apices simple (not furcating), slightly exceeding upper margin of the phallobase. Connective in shape of long and narrow cup (Fig. 9). Gonostylus with convex hind margin, caudo-dorsal angle widely rounded (Fig. 8). Capitulum with neck, wide (in dorsal view), with wide lateral tooth and two teeth apically (Fig. 7).

**Female**. Hind margin of sternite VII with two lateral concavities (Fig. 11).

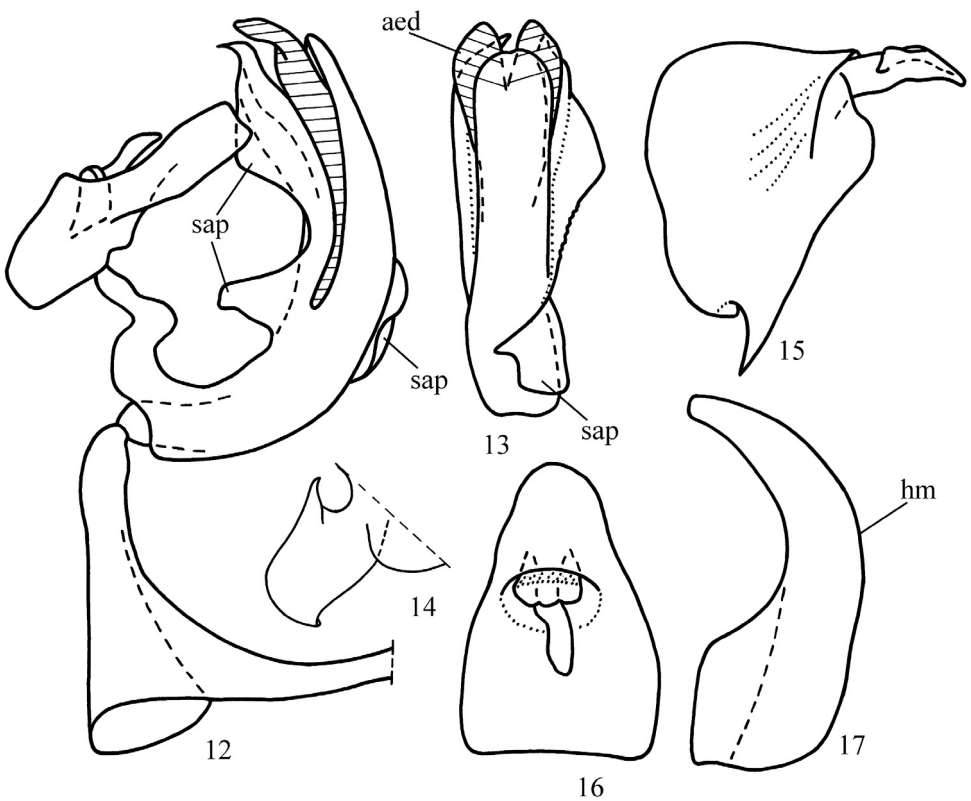
***Material examined***. **Vietnam**: 1♂, Ninh Binh Province, Cuc Phuong, 20°20’59”N, 105°36’09”E, “chasse”, “fauchage”, 376 m, 16.IX.2014, T. Bourgoin leg. (MNHN); 1♀, Ninh Binh Province, Cuc Phuong, 20°21’03”N, 105°35’50”E, “chemin forestier”, 270 m, 14.IX.2015, A. Soulier-Perkins leg. (MNHN); 1♂, 4♀♀, “Tonkin, reg. de Hoa Binh, A. de Cooman, 1926–1930” (MNHN); 1♂, “Tonkin, Hoa Binh, 4.I.1936, R.P.A. de Cooman” (MNHN).

***Distribution***. Vietnam, Provinces: Haiphong, Ha Noi, Hoà Bình, Ninh Binh and Vinh Phuc.

### ***Euxaldar lenis*** sp. nov.
(Figs 12–17, 21–30)

*Euxaldar* sp.: Wang *et al*. 2016: 228, 229, 231.

***Etymology***. The species name refers to smooth surface of metope without any pustules.




Figures 12–17. *Euxaldar lenis* sp. nov., male genitalia. (12) Anal tube, penis, and connective, lateral view; (13) penis, ventral view; (14) capitulum of gonostylus, dorsal view; (15) gonostylus, lateral view; (16) anal tube, dorsal view; (17) pygofer, lateral view. Abbreviations: aed – aedeagus; hm – hind margin of pygofer; sap – subapical phallobase processes.

***Differential diagnosis***. This species can be easily differentiate from *Euxaldar jehucal* Fennah by smooth metope, without any pustules, pygofer with rather straight hind margin, weakly concave posteriorly male anal tube, left process of phallobase curved to its ventral side, hind margin of female sternite VII widely concave and males light green, but females light brown yellowish, with brown bands not reaching the costal margin of fore wings.

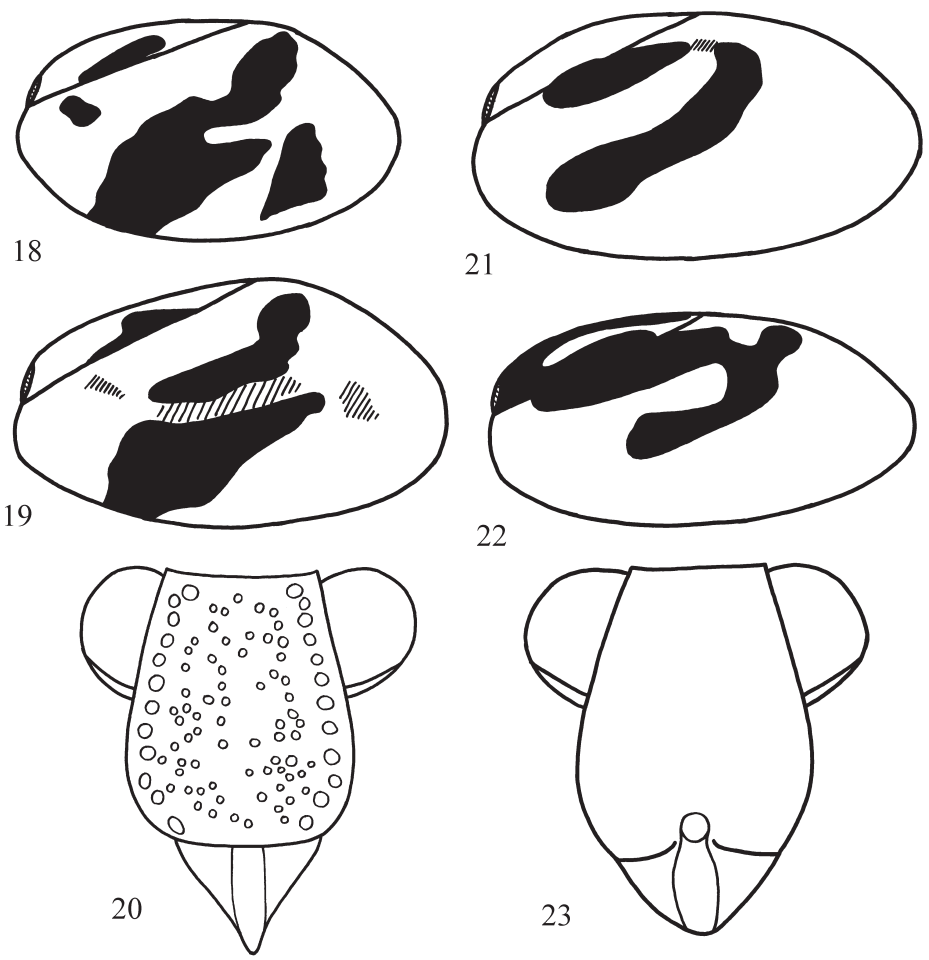
***Description***. Total length: males – 4.1 mm, females – 4.2–4.6 mm.

**Head**. Coryphe transverse, twice as wide as long at midline; without carinae; hind margin slightly angularly concave (Figs 24, 27). Surface of metope smooth, without pustules (Fig. 23, 26, 29). Metopoclypeal suture straight. Postclypeus with wide median carina.

**Thorax**. Pronotum short, with keel-shaped margins. Paradiscal fields very narrow behind the eyes (Figs 24, 27). Mesonotum 3 times as long as pronotum, without carinae. Fore wings with smoothed, poorly recognizable reticulate venation; CuP distinct. Costal margin of fore wing semicircularly projecting below the eye (in lateral view). First metatarsomere with 7 intermediate spines.

**Coloration**. General coloration of males light green, with coryphe light brown medially (Figs 24–29). Females light brown yellowish, with distinct curved brown band on fore wings or proximal parts of the wings totally dark brown.

**Male terminalia**. Hind margin of pygofer nearly straight (in lateral view) (Fig. 17). Anal tube wide, enlarged apically, with weakly concave posterior




Figures 18–23. *Euxaldar* spp. (18–20) *Euxaldar jehucal* Fennah (Ninh Binh); (21–23) *Euxaldar lenis* sp. nov.; (18) male fore wing; (19, 21–22) female fore wing; (20, 23) female face.

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Figures 24–29. *Euxaldar lenis* sp. nov., habitus. (24–26) male. (27–29) female. (24, 27) dorsal view; (25, 28) lateral view; (26, 29) frontal view.


Figures 30–33. *Euxaldar* spp, habitus. (30) *Euxaldar lenis* sp. nov.; (31–33) *Euxaldar jehucal* Fennah (Ninh Binh); (30, 32) lateral view; (31) dorsal view; (33) frontal view.

margin (in dorsal view) (Fig. 16). Anal column (paraproct) relatively long (0.3 times as long as anal tube laterally). Phallobase asymmetrical, widely curved (in lateral view), with pair of semicircular subapical processes and with pair of nearly triangular processes – one process on its right side near its middle and one process on its left side near its middle which is turned ventrally (Figs 12–13). Each dorso-lateral lobe with hook-shaped apical process. Ventral phallobase lobe long, but not reaching the aedeagal apex; narrowing apically (Fig. 13). Aedeagus with apical process curved subapically, narrowing apically, simple (not furcating), exceeding the upper margin of the phallobase. Connective in shape of long and narrow cup (Fig. 12). Gonostylus with straight hind margin, caudo-dorsal angle widely rounded (Fig. 15). Capitulum with neck wide, almost rectangular (in dorsal view), with wide lateral tooth and apical tooth (Fig. 14).

**Female**. Hind margin of sternite VII slightly and widely concave.

***Type material***. Holotype, ♂, Vietnam, Lam Dong Province, Bi Doup massif, Da Lat, Hon Giao, 1567 m, 12°11.262'N, 108°42.851'E, 10.VI.2008, "beating rain forest", "S/Melastomataceae", T. Bourgoin leg. (MNHN). Paratypes: 2♂♂, 5♀♀, same data as holotype (MNHN and 1♂: ZIN); 4♀♀, same data as holotype, except A. Soulier-Perkins leg. (MNHN and 1♀: ZIN).

***Distribution***. Vietnam, Lam Dong Province.

## Discussion

Generally, sexual dimorphism in coloration is rare within Issidae and the unusual sexual dimorphism exhibited by *E. lenis* sp. nov. with light green males *versus* light brown yellowish females with dark brown bands on the fore wings (Figs 24–29) represents an interesting aspect of this study. In *E. jehucal* Fennah both males and females are brown yellowish with dark brown bands and spots

on fore wings and sexual dimorphism is not observed (Figs 31–33).

*Euxaldar lenis* sp. nov. was involved in a recent molecular phylogeny of Issidae under the name – *Euxaldar* sp. (Wang *et al*. 2016a) and according to that study the genus *Euxaldar* Fennah founded its place within the Hemisphaeriini. This is in agreement with our present study, which reports for both species of the genus an asymmetrical phallobase not reported previously by Fennah (1978). This condition has never been recorded for the Issini but is well known for some members of the tribe Hemisphaeriini (Chen and Yang 1994, Gnezdilov 2013b). Asymmetry of genitalia is an interting condition, which might have important implications in better understanding genital evolution and sexual selection (Eberhard 2010). More generally in planthoppers, male or female genitalia asymmetry has already been mentioned is several other taxa and is well known in Delphacidae (Guglielmino and Bückle 2010) or Tropiduchidae (Fennah 1982, Wang *et al*. 2013, Wang *et al*., 2016b).

Venation analysis shows that *Euxaldar* species exhibit a well developed cubitus posterior vein (CuP) of fore wings, a character also present in the Issini and Parahiraciini but considered as a plesiomorphic state. In reverse, *Euxaldar* presents an evolved, smoothed, poorly recognizable reticulate venation, which is again rather characteristic and supports its transfer to the tribe Hemisphaeriini.

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