

## A new synonymy in the genus *Rhysostethus* (Hemiptera: Heteroptera: Reduviidae)

Dávid RÉDEI<sup>1,2</sup>, Shuzhi REN<sup>1,3</sup> & Wenjun BU<sup>1,4</sup>

<sup>1</sup>) College of Life Sciences, Nankai University, Weijin Road 94, Tianjin, 300071 China

<sup>2</sup>) Department of Zoology, Hungarian Natural History Museum, H-1088 Budapest, Baross u. 13, Hungary; e-mail: redei@nhmus.hu

<sup>3</sup>) e-mail: rensz@nankai.edu.cn

<sup>4</sup>) e-mail: wenjunbu@nankai.edu.cn

**Abstract.** Diagnostic characters of the genus *Rhysostethus* Hsiao, 1973 are discussed, microptery is recorded for the first time in the genus, and a revised diagnosis of the genus is provided. The following new synonymy is proposed: *Rhysostethus glabellus* Hsiao, 1973 = *Parascadra breuningi* Kerzhner & Günther, 2004, syn. nov. The male genitalia of *Rh. glabellus* are described and illustrated, and the morphology and possible function of its unique fore leg are discussed.

**Key words.** Heteroptera, Reduviidae, Ectrichodiinae, *Rhysostethus*, taxonomy, new synonymy, wing polymorphism, China, Oriental Region

### Introduction

The assassin bug genus *Rhysostethus* Hsiao, 1973 (Hemiptera: Heteroptera: Reduviidae: Ectrichodiinae) was proposed for accommodating *Rh. glabellus* Hsiao, 1973 and has remained monotypic so far. The type locality of the single included species was Mt. Emei in Sichuan Province of southwestern China; no further data on this species have been presented since its original description.

KERZHNER & GÜNTHER (2004) described two micropterous species of Ectrichodiinae from Sichuan. They discussed the difficulties of assigning them to any of the existing genera, and tentatively placed both of them to *Parascadra* Miller, 1954. RÉDEI & TSAI (2012) recently transferred one of them, *P. puetzi* Kerzhner & Günther, 2004 to *Haematoloecha* Stål, 1874. The identity and generic assignment of the other species, *P. breuningi* Kerzhner & Günther, 2004, has remained unresolved, and its clarification is the subject of the present paper.

## Material and methods

External and genital structures were examined using stereoscopic (Olympus SZX9) and optical (Olympus CX21) microscopes. Drawings were made by using a camera lucida. Male genitalia were dissected after short boiling in hypertonic KOH solution. Measurements were done using a micrometer eyepiece. Abbreviations for depositories:

NKUM Institute of Entomology, College of Life Sciences, Nankai University, Tianjin, China;

ZMAS Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia.

Type specimens of previously described species examined by us and distributional data verified by us are marked with ‘!’.

## Taxonomical part

### *Rhysostethus* Hsiao, 1973

*Rhysostethus* Hsiao, 1973: 64. Type species by original designation: *Rhysostethus glabellus* Hsiao, 1973.

**References.** HSIAO & REN (1981): 419 (in key), 429 (redescription); MALDONADO CAPRILES (1990): 71 (catalogue); PUTSHKOV & PUTSHKOV (1996): 154 (catalogue, Palaearctic).

**Revised diagnosis.** Macropterous or micropterous; integument of body dull, virtually glabrous; head elongate, posterior lobe with a tubercle (♂, Fig. 6: arrow) or obtuse angle (♀, Fig. 9: arrow) immediately posteriad to eye in dorsal view; antenniferous tubercle not surrounded by lamelliform process laterally; antennal segment III subdivided into two, segment IV into four secondary segments, therefore antenna 8-segmented; first apparent labial segment distinctly longer than combined length of second and third apparent segments; anterior lobe of pronotum distinctly shorter and narrower (macropterous morph, Fig. 6) or distinctly longer and slightly narrower (micropterous morph, Fig. 9) than posterior lobe, coarsely corrugate, provided with large tubercles separated by impressions, with 1+1 large, conspicuous submedian tubercles immediately posteriad of anterior collar, median longitudinal sulcus terminating before posterior margin of anterior lobe; posterior lobe of pronotum transversally rugose; scutellum strongly narrowed posteriad, with 1+1 closely situated lateral prongs apically; ventral margin of fore femora concave, abruptly narrowed in its distal one fourth, anteroposteriorly flattened thus forming a sharp keel provided with a series of minute, thick, conical spines; tibia curved and thickened apically, with a series of minute, thick, conical spines ventrally.

**Diversity and distribution.** The genus is currently monotypic with the species occurring in Southwest China (Sichuan).

**Note.** Since the original description (HSIAO 1973) was based only on macropterous males, a revised diagnosis is provided above which allows recognition of macro- and micropterous morphs as well.

### *Rhysostethus glabellus* Hsiao, 1973

*Rhysostethus glabellus* Hsiao, 1973: 64. HOLOTYPE (!): ♂, China: Sichuan, Emeishan [Mt.], Hongchuping (NKUM).

*Parascadra breuningi* Kerzhner & Günther, 2004: 227. HOLOTYPE (!): ♀, China: Sichuan, “Ta-t sien-lu” [= Kangding] (ZMAS). **New synonymy.**

**References** (all under the name *Rh. glabellus*). HSIAO & REN (1981): 430 (redescription, photo of holotype, figures, distribution); MALDONADO CAPRILES (1990): 71 (catalogue); PUTSHKOV & PUTSHKOV (1996): 154 (catalogue); HUA (2000): 210 (listed); LIN (2003): 128 (listed, distribution); CUI et al. (2007): 173 (type material).

**Type material examined.** *Rhysostethus glabellus*. HOLOTYPE: ♂ (macropterous): “[‘Sichuan Emeishan’, in Chinese script, printed] \ [‘Hongchunping’, in Chinese script] 1500m. [printed] \ 57. 6. 13. [handwritten] \ [‘Zheng Le-Yi · Cheng Han-Hua’, in Chinese script, printed]” [square with black frame], “*Rhysostethus* [handwritten] \ *glabellus* [handwritten] \ Hsiao [handwritten] \ ‘Holotype Hsiao Tsai-Yu identified 19’ [in Chinese script, printed]” [red square with frame]; pinned, left antenna distad of segment IIIa, right antenna distad of segment IIIb and right hind tarsus missing (NKUM) (Figs. 1–3).



Figs. 1–5. Holotypes (1–2, 4) and their labels (3, 5). 1–3 – *Rhysostethus glabellus* Hsiao, 1973; 4–5 – *Parascadra breuningii* Kerzhner & Günther, 2004. Scale bar in mm; labels not to scale. (Figs. 4–5: © ZMAS, photographed by D. A. Gapon, published with permission.)

*Parascadra breuningi*. HOLOTYPE: ♀ (micropterous): “Ta-tsien-lu \ Sztschwan, China \ *St. Breuning* ded.” [printed], “Holotypus \ *Parascadra breuningi* n. sp. \ Kerzhner & Günther det. 2003” [red square, printed], “Zoological Institute \ Russian Academy of Sciences \ St. Petersburg \ Russia” [printed]; mounted on card, antennae and left fore tarsus missing (ZMAS) (Figs. 4–5).

**Additional specimens examined.** CHINA: SICHUAN: Emeishan, Jiulaodong, 1800–1900 m, 13.vi.1957, Y. C. Lu leg., 2 macropterous ♂♂ labelled as paratypes of *Rh. glabellus* (one of them used for preparing Figs. 13–19) (NKUM). Although these two males have been labelled as paratypes, they were not included in the original description, therefore they have no type status.

**Diagnosis.** As the single member of the genus *Rhysostethus* it can be readily recognized by the characters defining the genus. The original description (Hsiao 1973), subsequent redescription and illustrations (Hsiao & Ren 1981), and the present photos (Figs. 1–2) and drawings (Figs. 6–8) based on the holotype of *Rh. glabellus* allow recognition of the macropterous male. The external genitalia of a non-type male are described and illustrated (Figs. 13–19). The original description and illustrations together with the present photo (Fig. 4) and drawings (Figs. 9–12) based on the holotype of *P. breuningi* (Kerzhner & Günther 2004) allow recognition of the micropterous female.

**Description of external male genitalia.** *Genital capsule* (Figs. 13–14) short; anterior and posterior apertures separated by narrow transverse bridge-like portion; cuplike sclerite immovably fused with genital capsule, provided with a broad, apically truncate and weakly emarginate posteromedian process (Fig. 15); with a protuberance above paramere socket. *Paramere* (Figs. 16–17) curved, terminating in a blunt tubercle. *Phallus* (Figs. 18–19) with articulatory apparatus short and thick, arms of basal plate strongly curved posteriad; dorsal sclerotized plate posteriorly narrowed and apically broadly truncate; with 1+1 broad, posterolaterally protruded, membranous lobes below dorsal sclerotized plate; struts parallel and fused in their basal two thirds, separated in their apical thirds, but fused at extreme apex; endosoma with a broad, elongate, laterally reflexed (U-shaped in cross-section) and apically excised sclerite.

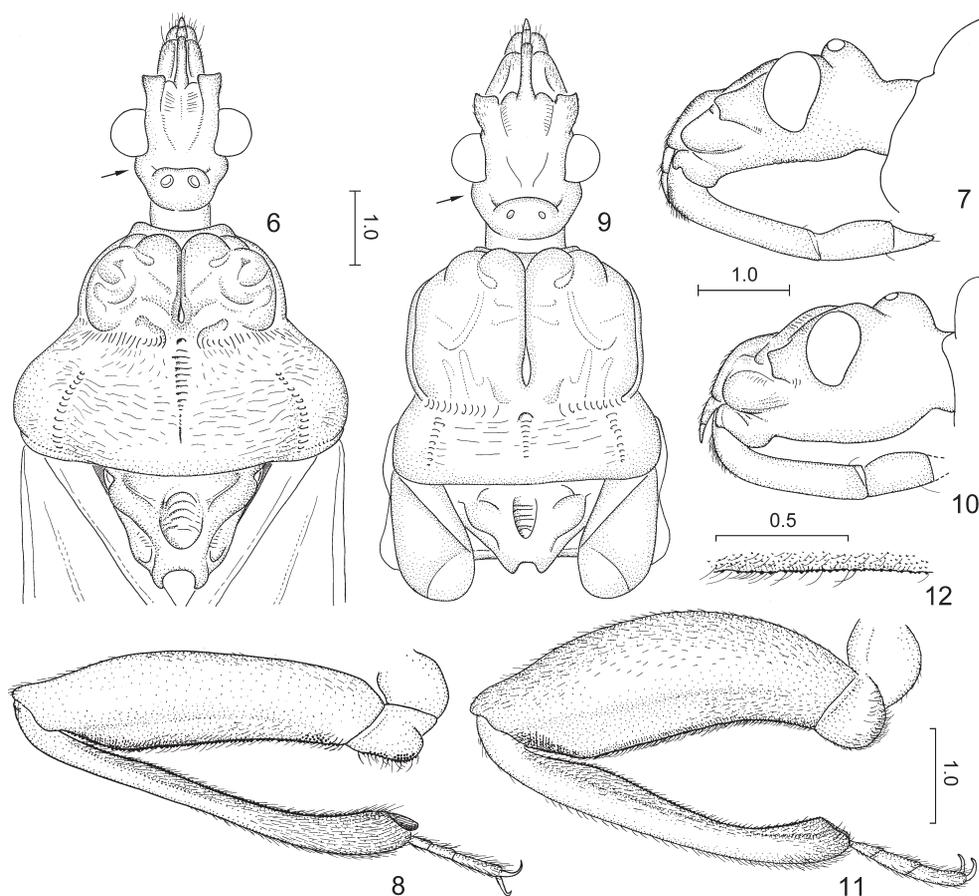
**Biology.** Unknown, perhaps preys on diplopods (see below).

**Distribution.** China: Sichuan: Mt. Emei; “Ta-Tsien-Lu” [= Kangding].

**Note on type depository.** The holotype of *R. glabellus* is deposited at the Tianjin Museum of Natural History according to the original description (HSIAO 1973), and at the Institute of Zoology of the Chinese Academy of Sciences according to PUTSHKOV & PUTSHKOV (1996). The labels of the male (Fig. 3) located at NKUM leave no doubt about its status as holotype.

## Discussion

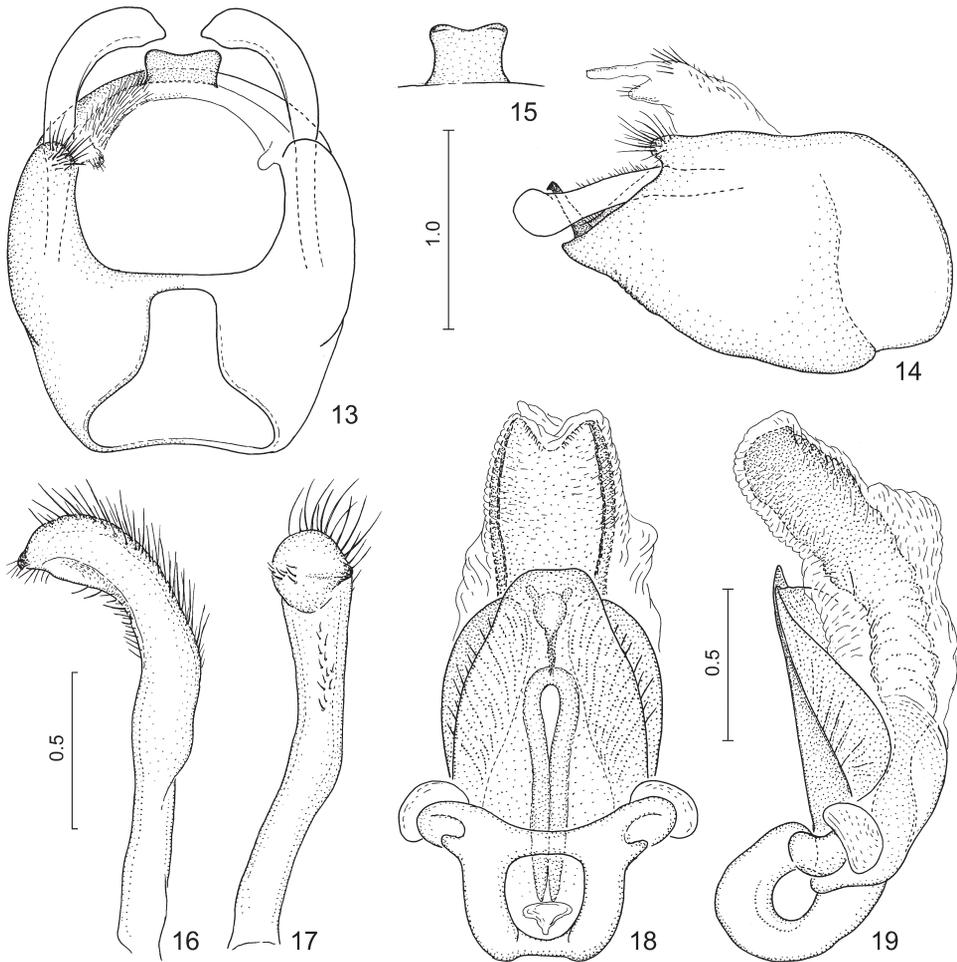
**Generic placement and synonymy.** *Parascadra breuningi* was placed to *Parascadra* by KERZHNER & GÜNTHER (2004) following the key of COOK (1977). However, *P. breuningi* does not exhibit the following important diagnostic characters of *Parascadra*: postocular portion of head including neck relatively long, distinctly longer than anteocular portion, and first apparent labial segment strongly elongate, with its apex surpassing posterior margin of eye. In contrast with *P. breuningi*, all species of *Parascadra* have an entirely smooth pronotum, and some additional characters, especially the structure of the fore leg, also excludes this species from *Parascadra*.



Figs. 6–12. Diagnostic characters of *Rhysothethus glabellus* Hsiao, 1973 (6–8 – macropterous male, 9–12 – micropterous female). 6, 9 – head and thorax, dorsal view; 7, 10 – head, lateral view; 8, 11 – left fore leg, posterior view; 12 – detail of ventral margin of fore femur. Figs. 6–8 drawn after holotype of *Rh. glabellus*, Figs. 9–12 after holotype of *P. breuningi*. Scale bars in mm.

The general habitus of the holotypes of *Rh. glabellus* and *P. breuningi* is quite dissimilar, and there are several differences in the shape of head, eye, thorax, fore leg, and abdomen. However, these characters are usually strongly affected by pterygopolymorphism, as similar differences have been documented in several genera of Ectrichodiinae (e.g. VILLIERS 1948; MILLER 1950, 1952; DOUGHERTY 1995).

*Parascadra breuningi* shares with *Rh. glabellus* the strongly sculptured pronotum (the presence of 1+1 submedian tubercles at the anterior margin of the disc of the anterior lobe is particularly conspicuous) and the peculiar ventral surface of the fore femur and tibia as described in detail under the diagnosis of the genus. No ectrichodiine genus is known where



Figs. 13–19. External male genitalia of *Rhysostethus glabellus* Hsiao, 1973. 13 – genital capsule, dorsal view, proctiger omitted; 14 – genital capsule with proctiger, lateral view; 15 – process of cuplike sclerite, posterior view; 16–17 – left paramere, two different views; 18 – phallus, dorsal view; 19 – same, lateral view. Scale bars in mm.

these characters are affected by pterygopolymorphism. Since all of these characters are diagnostic (moreover, the structure of the fore leg is unique) for *Rhysostethus*, *P. breuningi* certainly belongs to this genus. Other characters of smaller importance which have no diagnostic value but clearly support its inclusion within *Rhysostethus* are the similar body size and colour, the shape of the posterior lobe of the head, the moderately elongate first apparent labial segment, the broad lateral margin of the anterior lobe of the pronotum conspicuous in dorsal view, the transversely wrinkled integument of the posterior lobe of the pronotum, and the closely situated lateral prongs of the scutellum.

Unfortunately both *Rh. glabellus* and *P. breuningi* were described based on a single specimen of different sex representing different wing morphs, therefore no conclusive evidence supporting their conspecificity can currently be provided. Taken into consideration that both species were described from Sichuan, and the differences between the male and female are mainly those which usually occur between wing morphs in other pterygopolymorphic genera, it seems the most probable that *P. breuningi* represents the micropterous female of *Rh. glabellus*. As long as no positive evidence arises that two species of *Rhysostethus* do occur in Sichuan, we tentatively consider them as conspecific, therefore the following new synonymy is proposed: *Rhysostethus glabellus* Hsiao, 1973 = *Parascadra breuningi* Kerzhner & Günther, 2004, syn. nov.

**Functional morphology of fore leg.** The fore femur and tibia of *Rhysostethus* are highly specialized, both having concave ventral surfaces which enclose a gap when the femorotibial articulation is completely flexed. In Heteroptera a more or less similar structure has so far only been documented in species of the enicocephalid genus *Xenicocephalus* Wygodzinsky & Schmidt, 1991 (Wygodzinsky & Schmidt 1991, Štys & Baňar 2008), but the modification in *Rhysostethus* is even more striking: besides of the concave ventral surfaces of the femur and the tibia, also the abruptly narrowed distal portion of the fore femur mechanically restricts flexion of the femorotibial articulation.

Štys & Baňar (2008) suggested that *Xenicocephalus* must be trophically specialized and probably catches the prey by a unique method: the femur and tibia form a raptorial organ serving for holding a rounded, potentially strongly sclerotized prey. Several species of the reduviid subfamily Ectrichodiinae have been reported to feed on members of Diplopoda (FORTHMAN & WEIRAUCH 2012), however, aside from thickened and ventrally variously armed fore femur occurring in several genera (see e.g. DOUGHERTY 1995), no morphological adaptation to grabbing specifically diplopod prey have been documented so far. The specialized fore femur and tibia of *Rh. glabellus* are probably adapted to grabbing and holding cylindrical and heavily sclerotized diplopods.

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