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# A redescription of *Perittopus maculatus* PAIVA, 1919 (Insecta: Hemiptera: Veliidae) from India

K. Zenz\* & H. Zettel\*

## Abstract

The riffle bug *Perittopus maculatus* PAIVA, 1919 was described from the Garo Hills in Northeast India, but its taxonomic definition was not clear, because the original description did not consider sexual characters that are important for a modern taxonomic interpretation. Therefore, a full redescription is provided based on specimens collected near the type locality and deposited in the Natural History Museum Vienna. The newly recognized characters of *P. maculatus* confirm a close relationship with the species of Southeast Asia, but not with the species known from southern India.

**Key words:** Perittopinae, taxonomy, description, Meghalaya.

## Zusammenfassung

Der Bachläufer *Perittopus maculatus* PAIVA, 1919 wurde von den Garo Hills in Nordostindien beschrieben, doch blieb seine taxonomische Abgrenzung unklar, da die Originalbeschreibung nicht jene Sexualmerkmale berücksichtigt, welche für eine moderne taxonomische Interpretation entscheidend sind. Deshalb liefern wir eine vollständige Wiederbeschreibung dieser Art. Diese basiert auf Exemplaren, welche nahe der Typuslokalität gesammelt wurden und im Naturhistorischen Museum in Wien aufbewahrt sind. Die neu erkannten Merkmale von *P. maculatus* bestätigen eine nahe Verwandtschaft mit den Arten Südasiens, aber nicht mit jenen aus dem Süden Indiens.

## Introduction

Perittopinae CHINA & USINGER, 1949, is a small subfamily of the family Veliidae (riffle bugs). Hitherto, it contains a single genus, *Perittopus* FIEBER, 1860, with sixteen described species from the Oriental Realm. Their distribution spans from Sri Lanka and India over Southeast Asia and South China to the western Sunda Islands (Sumatra, Java, Bali, and Borneo). The first and only revision of *Perittopus* was published by LUNDBLAD (1933) and is outdated because eleven species have been described since (ZETTEL 2001a, b, 2011, YE et al. 2013). LUNDBLAD (1933) treated all species known at that time except one, *Perittopus maculatus* PAIVA, 1919, which was unknown to him.

PAIVA (1919) described *P. maculatus* from two localities near Tura in the Garo Hills, Meghalaya (formerly “Assam”), Northeast India. His description includes both macropterous and apterous specimens, and is complemented by a figure of the macropterous form. However, the species was never re-evaluated afterwards. From the original description, *P. maculatus* is only recognizable by unique black spots at the anterolateral angles of the pronotum. This character and the close vicinity of the sampling sites, make

\* Katharina ZENZ & Herbert ZETTEL, 2<sup>nd</sup> Zoological Department, Natural History Museum, Burgring 7, A-1010 Vienna, Austria. – [katharina.zenz@gmx.net](mailto:katharina.zenz@gmx.net), [herbert.zettel@nhm-wien.ac.at](mailto:herbert.zettel@nhm-wien.ac.at)

us sure that the specimens deposited in the Natural History Museum Vienna belong to *P. maculatus*. The original description does not include many other characters that are useful for species identification. Notably, primary and secondary sexual characters used in modern taxonomic papers like the grasping comb and genitalia of the male as well as abdominal pilosity and terminalia structures of the female remained hitherto unknown. These characters are important to define the identity of *P. maculatus* and to determine its relationship with congeners in South and Southeast Asia (comp. ZETTEL 2001b). For this purpose, we herein present a detailed redescription of this poorly known species.

### Material and methods

The redescription is based on 22 specimens including both sexes and both morphs. They are deposited in the Natural History Museum Vienna.

Insects were examined with binocular microscopes (max. 80× magnification). The paramere was studied under a Leica MZ12 compound microscope; the drawing was made with the help of a camera lucida.

Stacked digital images were taken with a Leica DFC450 camera attached to a Leica Z16APO optics carrier, using Leica Application Suite V3.8. Images were stacked with ZereneStacker 64-bit and processed with Adobe Photoshop 7.0.

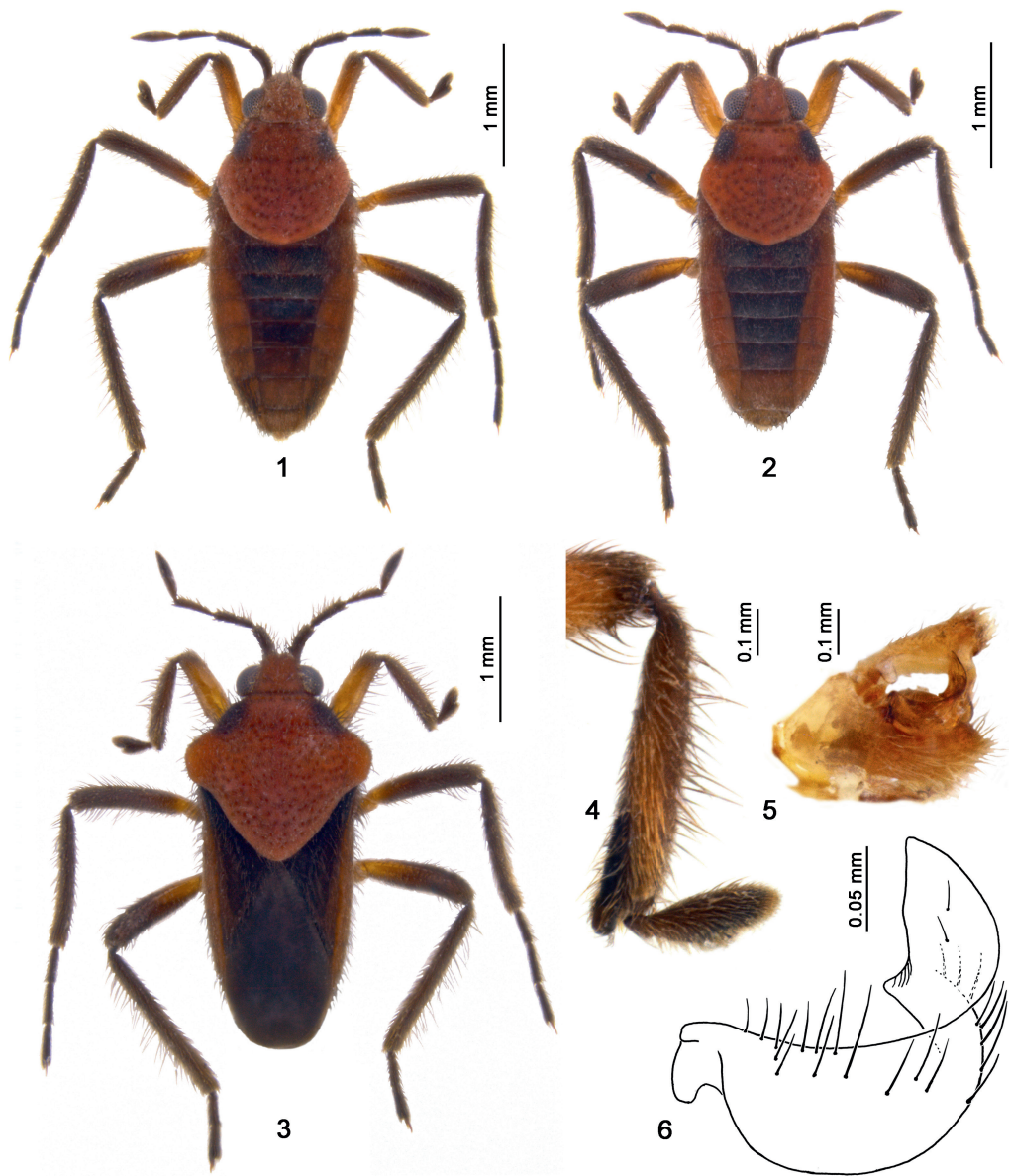
Measurements were performed with a Nikon SMZ6 binocular microscope at magnifications from 15× to 60× and are given in millimetres. They refer to the maximum length or width of the respective structure. Measurements on the trunk were done in dorsal view of specimens, except body lengths of winged specimens, which were measured in the lateral view excluding wings. Comb index equals tibia length / tibial comb length. A randomly chosen specimen of each morph (named by its inventory number) has been measured, and ranges are given for all available specimens of the respective morph.

### *Perittopus maculatus* PAIVA, 1919 (Figs 1–6)

**Material examined:** 4 apterous females, 12 apterous males, 2 macropterous females, 4 macropterous males, India, Meghalaya, West Garo Hills District, 3 km east of Tura, N25°30', E90°14', 1150 m a.s.l., 19.IV.1999, leg. L. Dembický & P. Pacholátko, in Natural History Museum Vienna (Inv.-nrs #14,034–14,055).

**Illustrations examined:** Photographs of three syntype specimens (1 apterous female, 1 apterous male, 1 macropterous specimen, in Zoological Survey of India, Central Entomological Laboratory, Kolkata) labelled “8379 HI”, “Zool. Surv. Ind. Above Tura, Garo hills. Assam 3500–3900 ft., 15.VII–30.VIII.17. S. Kemp.”, “*Perittopus maculatus*, Paiva TYPES”.

**Diagnosis:** Body colour (Figs 1–3) reddish orange, with pair of black patches at anterior corners of pronotum; tergites 1–6 (7) of apterous morph infuscated. Head deflected. Small black spinulae present posterolaterally on head and anteriorly on prosternum. Pronotal lobe of apterous morph moderately wider than anterior part of pronotum, of approximately semicircular shape. – Female: Laterotergites 6 and 7 with black, moderately long, posteriorly directed setae. Proctiger short, directed posteriad. – Male: Profemur of male hardly incrassate. Protibial grasping comb long, 0.34–0.39 times as long as protibia (Fig. 4). Protarsus of male not incrassate. Genital capsule small (Fig. 5). Paramere distally helicoid, with acute apex (Fig. 6).



Figs 1–6: *Perittopus maculatus*: Habitus of (1) apterous female, (2) apterous male, and (3) macropterous male. (4) Protibia and protarsus of male (anterior aspect showing protibial comb). (5) Genital capsule of male, lateral aspect. (6) Left paramere, lateral aspect. Photographs (1–5) by KZ, drawing (6) by HZ.

**Apterous female:** Measurements (Inv.-nr #14,053; n = 4): Body length 3.13 (3.09–3.21); maximum body width (at metapleura) 1.25 (1.25–1.28). Head width 0.72 (0.72–0.75). Pronotum length 1.02 (1.02–1.10), width 1.14 (1.14–1.22). Antennomeres: 0.35, 0.32, 0.32, 0.41. Legs: profemur 0.76, protibia 0.74, protarsus 0.06 + 0.30, mesofemur 0.98,

mesotibia 1.10, mesotarsus  $0.30 + 0.30 + 0.31$ , metafemur 0.99, metatibia 1.35, metatarsus  $0.06 + 0.21 + 0.27$ .

Colour: Dorsally dull, reddish orange. Pronotum with pair of characteristic anterolateral black patches, posteriorly extending to base of lobe; as variations, entire pronotal lobe of one specimen slightly brownish infuscated, left humerus with irregular blackish mark in another one. Mediotergites 1–6 blackish, in variable intensity; mediotergites 7 and 8 slightly brighter; laterotergites brownish orange. On sides, a variably developed blackish or brownish fascia extending from meso- or metapleuron to sternite 6; in some specimens hardly traceable on sternites. Antenna blackish brown. Legs dark brown; coxae, trochanters, profemur (in some specimens slightly infuscated at flexor side or apex), and bases of meso- and metafemur brownish yellow.

Structural characteristics (measurements refer to Inv.-nr #14,053): Head strongly deflected; ventral lobes touching prosternum, both with a very few black spinulae. Head anteriorly and dorsally with long black setae. Antennomeres 1–3 with numerous long black setae.

Pronotum 1.12 times as wide as long, with lobe separated laterally by a strong constriction at anterior third, and on disk by a transverse pit row; another pit row just behind fore margin; remaining surface with few scattered pits. Lobe of approximately semi-circular shape, posteriorly almost evenly rounded, moderately wider than anterior pronotum at constriction ( $1.10 : 0.87$ ). Pronotum with numerous long, black, erect setae, except disk of lobe with short, black, posteriorly directed setae. Legs unmodified; femora and tibiae with long black setae; longer on flexor sides of femora and extensor sides of tibiae.

Abdomen moderately slender; connexival margins convex, moderately convergent. All mediotergites wider than long, 3 and 8 shorter than 2, and 4–7. Mediotergites 2, 3, 7, and 8, and all laterotergites with short pale pilosity, 4–6 almost bare, with few pale setae laterally. Laterotergites 6 and 7 with more or less distinct tufts of black, moderately long, posteriorly directed setae. Proctiger small, knob-shaped, directed posteriorly. Gonocoxa simple, with short pale pilosity.

Ventral and lateral surface of thorax and abdomen with pale, moderately long pilosity, with some longer hairs on mesosternum; lateral parts additionally with scattered long black setae.

**Apterous male:** Measurements (Inv.-nr #14,030;  $n = 12$ ): Body length 3.00 (2.80–3.00); maximum body width (at metapleura) 1.17 (1.11–1.19). Head width 0.72 (0.68–0.72). Pronotum length 1.02 (0.98–1.05), width 1.02 (0.98–1.06). Protibia length 0.74 (0.66–0.75); protibial comb length 0.27 (0.25–0.27); comb index 0.37 (0.35–0.39).

Colour: Similar as in female. Mediotergite 7 orange, often strongly contrasting with blackish mediotergite 6, similarly coloured as laterotergites. In some specimens middle of mediotergites 2 and 3 slightly paler than the rest.

Structural characteristics: Profemur hardly widened. Protibia grasping comb longer than one third of protibia length (Fig. 4). Protarsus simple (Fig. 4). Dorsal surface of abdomen (medio- and laterotergites) with scattered long black setae.

Genitalia small. Proctiger elongated. Paramere (Fig. 6) with a helicoid distal part bearing an anteriorly projecting corner; apex very narrowly rounded (appearing acute at low magnification); lateral surface with numerous long setae.

**Macropterous female:** Measurements (Inv.-nr #14,054, #14,055; n = 2): Body length 3.54, 3.46; maximum body width (at metapleura) 1.43, 1.46. Head width 0.76, 0.75. Pronotum length 1.54, 1.50, width 1.61, 1.63.

Colour: Circular black patches anterolaterally on pronotum as in apterous morph. In one aberrant specimen small black patches on humeral corners and one asymmetric black dot on left side of disk. Lateral infuscated stripes less developed than in apterous morph, especially on sternites vague or absent. Hemelytra brown on cells and membrane; veins basally and posteriorly (relative to wing!) black, anteriorly and distally orange.

Structural characteristics: Pronotum with strongly developed humeri, hardly wider than long, with distinct constriction in front of humeral corners; posterior part more strongly protruded, subtriangular. Veins of forewing with moderately long erect brown setae. Abdomen of simple morphology, posteriorly broadly rounded. Connexival margins anteriorly straight, moderately convergent.

**Macropterous male:** Measurements (Inv.-nr #14,047; n = 4): Body length 3.21 (3.17–3.29); maximum body width (at metapleura) 1.35 (1.30–1.35). Head width 0.71 (0.71–0.74). Pronotum length 1.39 (1.37–1.42), width 1.54 (1.50–1.54). Protibia length 0.75 (0.71–0.77); protibial comb length 0.26 (0.26–0.27); comb index 0.34 (0.34–0.38).

Colour: As in macropterous female, with some variation.

Structural characteristics: Similar to macropterous female. Pronotum slightly longer. Foreleg and genitalia as in apterous male.

**Distribution:** This species is only known from the Garo Hills in Meghalaya.

## Discussion

The species identity of the treated material is based on the characters given in the original description (PAIVA 1919) and the vicinity (including information about elevation) of the type locality and the new sampling site. We also could compare the specimens at hand with photographs of three syntypes. Whereas the body length of our specimens is roughly 3 mm (2.8–3.5 mm), PAIVA (1919) stated a length of “2 millim.”. This is a typing error, because body length of five syntypes ranges between 3.0 and 5.2 mm (new measurements by Dr. Sheela Gosh, pers. comm.).

The colour pattern of *P. maculatus* is unique. Black spots and stripes on the pronotum are known in several species of *Perittopus*, most notably in the species from South India, but also, e.g., in *P. zimmermannae* ZETTEL, 2011 from Myanmar. However, all those species bear the black lateral marks (if any) on the humeral angles, not at the anterior corner of the pronotum (e.g., LUNDBLAD 1933, ZETTEL 2011).

*Perittopus maculatus* shares many diagnostic characters with the species of Southeast Asia, e.g., the small black spinulae posterolaterally on the head and anteriorly on the prosternum; the short, posteriad directed proctiger of the female; the relatively long



protibial grasping comb of the male (Fig. 4); and – most of all – the distally helicoid paramere (Fig. 6). These characters deviate from all other known species inhabiting India. A closer relationship of the Meghalayan and Southeast Asian water bug faunas is also known from other taxa: e. g., in the water strider genus *Metrocoris* MAYR, 1865 (CHEN & NIESER 1993a, b, BASU et al. 2016), in the velvet water bug genus *Timasius* DISTANT, 1909 (ZETTEL 2004), or in the semiglobose backswimmer genus *Helotrephes* STÅL, 1860 (JEHAMALAR et al. 2018). The relationships within Perittopinae will be the topic of a forthcoming study by the authors.

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