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# *Redeicephala taylori*, a new genus and species of Reduviidae from New Guinea, with notes on a few morphological features of the Tribelocephalinae (Hemiptera: Heteroptera)

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**Abstract.** *Redeicephala taylori* gen. & sp. nov. (Hemiptera. Heteroptera: Reduviidae: Tribelocephalinae: Opistoplatyini) is described from Torricelli Mountains, New Guinea. The phylogenetic affinities of the new genus are discussed. Morphological characters which could be useful in a systematic analysis of Tribelocephalinae are also noted.

**Key words.** Heteroptera, Reduviidae, Tribelocephalinae, Tribelocephalini, Opistoplatyini, phylogeny, new genus, new species, genitalia, gular sulcus, New Guinea

## Introduction

Tribelocephalinae is a predominantly Palaeotropical, moderately speciose subfamily of Reduviidae, comprising 17 genera and 130 species. Tribelocephalines are subdivided into three tribes: the first two, Tribelocephalini and Opistoplatyini, are characterized by the absence or presence of the fore wing's m-cu cross vein, respectively (Villiers 1943, Weirauch et al. 2014). The third tribe, the Xenocaucini, is characterized primarily by a combination of characters in the type genus *Xenocaucus* China & Usinger, 1949 absent in the other two subfamilies (e.g. lack of eyes, apterous condition, tarsi 1-segmented), most probably resulting from a specialized life style and paedomorphosis (Rédei 2007). The recently discovered genus *Tribelocodia* Weirauch, 2010 from the Neotropics was tentatively assigned to this tribe based on leg morphology (Weirauch 2010). The subfamily reaches its greatest diversity in the Oriental Region, with only four genera in the Afrotropics and one in the Neotropics (Maldonado Capriles 1996, Weirauch 2010). Even though the monophyly of Tribelocephalinae is supported by both morphological and molecular data (Weirauch 2008, Weirauch & Munro 2009), the relationships within the subfamily remain largely unresolved (Weirauch 2010).

Due to their cryptic nature, tribelocephalines are seldom collected and many described species are known only by a limited number of specimens. Adding to this situation, descriptions and illustrations of most Oriental species, mainly by W. L. Distant and N. C. E. Miller, are inadequate and of little taxonomic value. Luckily, the past few years, interest in tribelocephalines has been steadily increasing and excellent studies are being published on a regular basis. The most recent taxonomic changes were the description of *Enigmocephala* Rédei, 2007 and the transfer of *Acanthorhinocoris* Miller, 1940 from Tribelocephalini to Opistoplatyini by Rédei (2007). Ishikawa et al. (2015) described two new species of *Opistoplatys* Westwood, 1835 and 6 new species of *Abelocephala* Maldonado Capriles, 1996 from Japan. For a detailed list of the described tribelocephaline genera and keys to their identification the works by Maldonado Capriles (1996), Rédei (2007) and Weirauch (2010) can be consulted.

Among unidentified material deposited at the Natural History Museum (BMNH), London, United Kingdom, a large tribelocephaline assassin bug was found and is hereby described as new genus and species.

## Materials and methods

For the present study, all known genera of Opistoplatyini were examined directly, except for the Afrotropical genus *Distantus* Villiers, 1943. External structures were examined using an optical microscope (Wild Heerbrugg M5). Measurements were taken using a micrometer eyepiece. Male genitalia were examined after immersion to 10% KOH for 10 minutes. Dissections of *Opistoplatys* sp., *Tribelocephala peyrierasi* Villiers, 1970 and *T. walkeri* China, 1940 were made with medical razor blades. Images were taken using a Leica M165c binocular equipped with a Leica DFC490 camera, while stacked images were combined using Helicon Focus.

I follow the terminology of Sweet (1996) for the morphology of the pregenital abdomen and that of Tsai et al. (2011) regarding genitalic morphology. The wing venation scheme of Davis (1961) and Weirauch et al. (2014) is applied.

## Taxonomy

### *Redeicephala* gen. nov.

**Type species.** *Redeicephala taylori* sp. nov, here designated.

**Diagnosis.** Recognized among Tribelocephalinae by a combination of the following characters: clypeal process short but acute, directed anteriad, not surpassing labrum; maxillary plates strongly elevated, directed anteriad, deeply impressed along their margin; antenniferous tubercle very strongly (even for a tribelocephaline) produced dorsolaterally; eyes medium sized, broadly separated from each other dorsally and ventrally; vertex short and stout, not forming a long 'neck'; anterior pronotal lobe devoid of processes, humeri of posterior pronotal lobe distinctly elongate triangular; inner discal cell of hemelytron subdivided basally by m-cu crossvein; hypopleurites VII quadrangular, with rounded apex, not completely covering apex of pygophore, giving the posterior margin of the pregenital abdomen a bilobate appearance.

**Description of macropterous male.** Body robust, stout, covered by stiff, adpressed hairs of varying density (Figs 1–11). Legs slender and rather long. Integument and hemelytra moderately sclerotised.

Figs 1–2. Habitus images of *Redeicephala taylori* gen. & sp. nov. 1 – dorsal view; 2 – lateral view.

***Vestiture.*** Head uniformly covered by dense, stiff, semierect pubescence much longer and curlier on vertex. Scapus and pedicellus with very short, adpressed pubescence, intermixed with rows of very long, erect and semierect setae (Fig. 3). Labrum, labium and tarsus covered by long, downward facing setae. Prothorax, thoracic sterna and pleura and mesoscutellum covered by dense, adherent, long pubescence. Posterior pronotal lobe and abdomen covered by uniformly dense, bristle-like pubescence. Ventral surface of coxae and trochanters bearing dense, short setae. Femora covered by dense, very short, adherent setae, with lateral rows of slightly longer, semierect setae. Tibiae with similar setation, gradually becoming denser distally. Corium with dense, bristle-like setation, extending to veins R, M and m-cu cross vein.

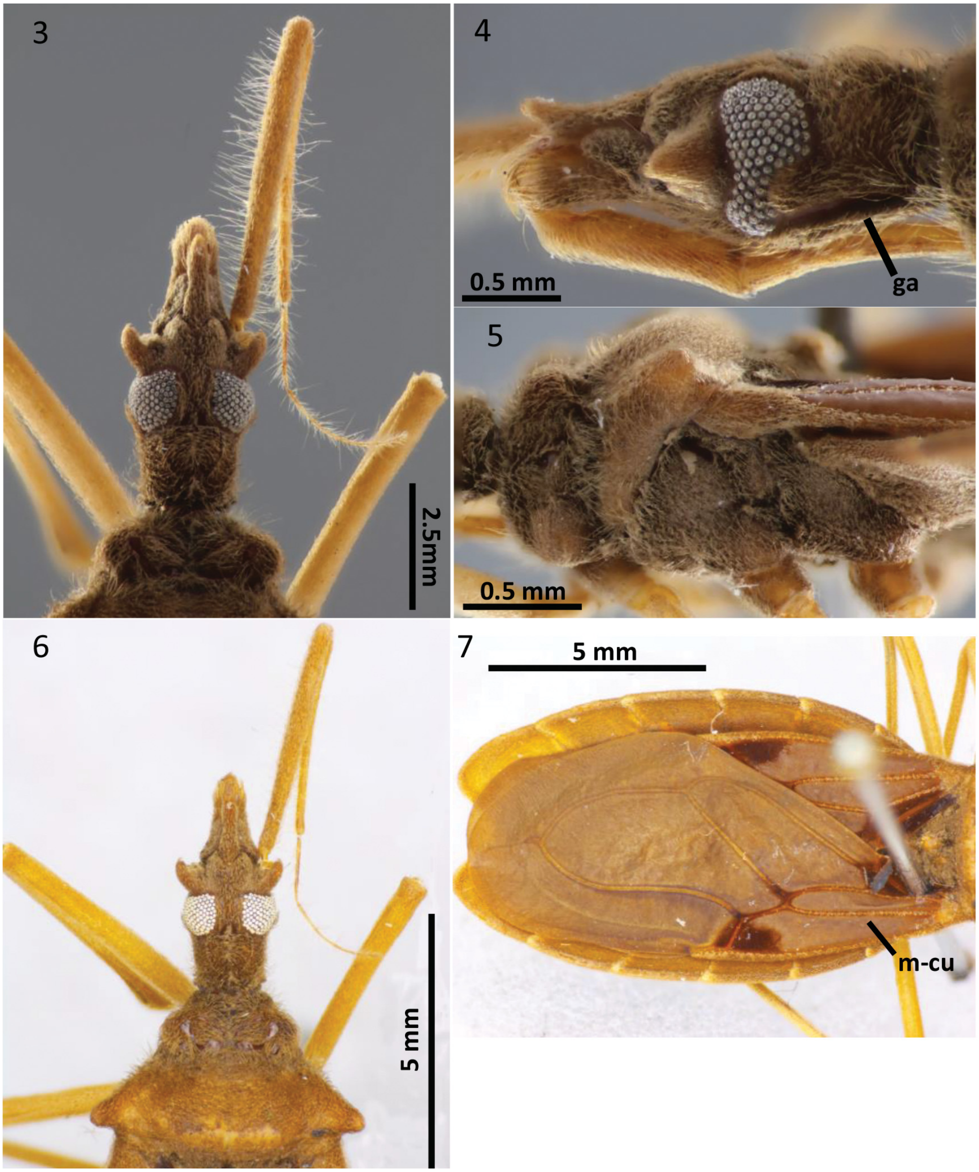
***Structure***. *Head.* Elongate but stout (Figs 1–4, 6, 11). Anteocular 2.2 times longer than vertex (postocular). Vertex short and distinctly tapered posteriorly, not forming a distinct 'neck'. Eyes medium sized, reniform, adpressed to head capsule, composed of relatively few facets. Interocular distance about one fourth of width of head across eyes. Ocelli absent. A pair of minute pits in the posterior interocular region (Figs 3, 6) could either represent ocellar rudiments, internal cuticular structures corresponding to an inner apodeme, or simply a glabrous area with no particular morphological significance. Clypeal process projecting anteriorly, acute, not surpassing level of apex of labrum (Figs 2, 4). Mandibular plates large, broad in dorsal view (Fig. 3). Maxillary plates large, elevated, kidney-shaped, separated from clypeus and mandibular plates by a deeply impressed, narrow suture along their exterior margin (Fig. 4). Labrum slender, triangular. *Labium* (Fig. 4). Labial segment II (first apparent) the thickest and longest, reaching posterior margin of eyes, distinctly notched ventrally in proximal area. Segment III (second apparent) slightly curved ventrally, barely shorter that segment II, surpassing base of head. Segment IV (third apparent) obsolete, attaining prosternum. Vertex bearing laterally an elongate glabrous area, extending from posterior margin of eyes to base of head (Fig. 4: ga). Antenniferous tubercle prominent, strongly diverging laterally (Figs 3, 6). *Antenna.* Base of scapus notched, scapus the longest and thickest segment, slightly longer than head (Fig. 3). Scapo-pedicellar articulation bent. Pedicellus thin, slightly shorter than scapus. Flagellomeres slender, filiform, of roughly the same length. Basiflagellum and distiflagellum each subdivided into 3 secondary segments.

*Prothorax* about 1.5 times wider than long, slightly declivent, collar indistinct. Anterior pronotal lobe small, subdivided by a median tergal ridge into two rounded lobes with impressed, wavy sculpture (attachment points for tergocoxal leg muscles). Posterior pronotal lobe wider than long, disc smooth, posterolateral angles (humeri) prominent, triangular, directed slightly posteriad (Figs 1, 6). Mesoscutellum small, rounded, almost semicircular. Propleuron almost trapeziform in lateral view. Prosternum without process, mesosternum without median longitudinal carina, metasternum with rounded median elevation. Acetabula small, not pronounced, coxae greatly exposed (Fig. 5).

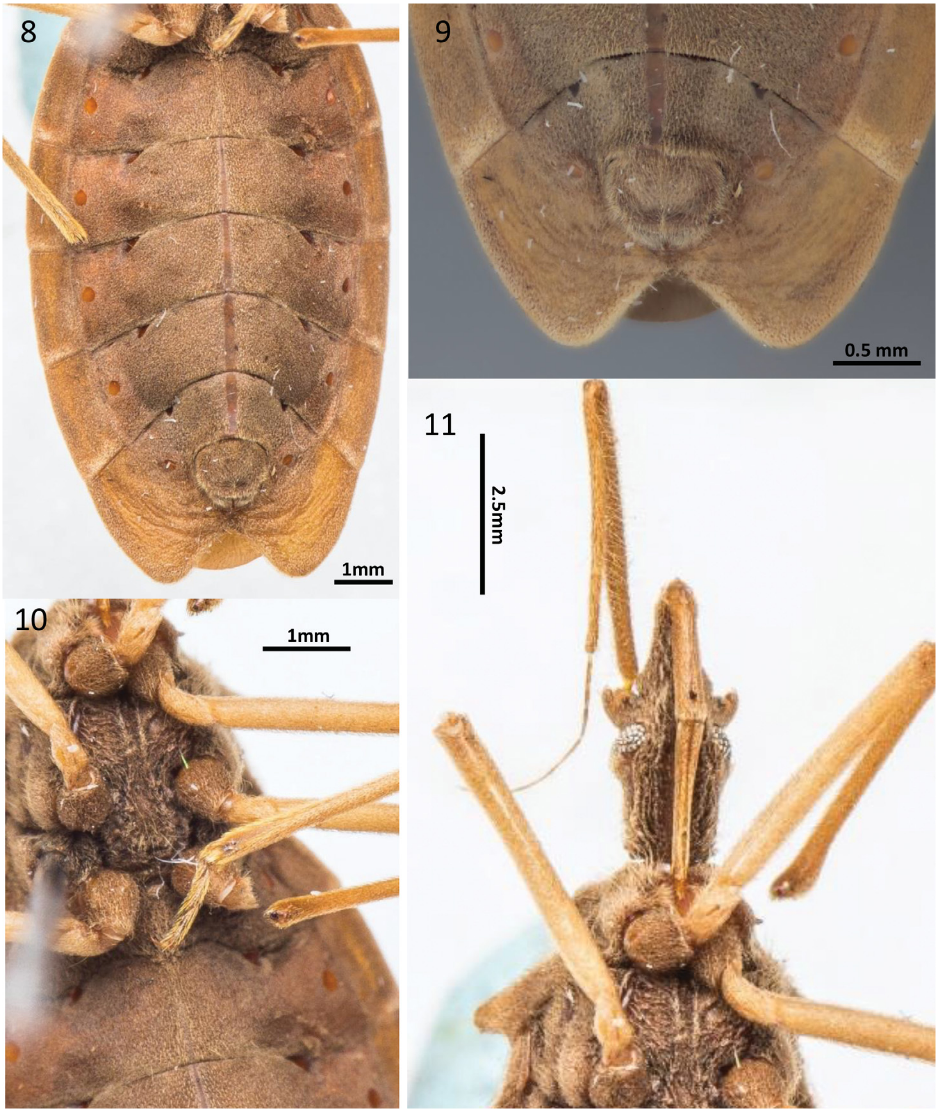
*Legs* moderately long and straight, coxae globular, as wide as long. Proximal part of metacoxal margin with a minute opening (furcal apophysis). Trochanter small, quadrangular. Femur straight, almost as long as tibia. All tibiae without fossula spongiosa, tibial comb present on fore leg. Tarsus (preserved only in mid tibia) 3-segmented, tarsal claws simple, symmetrical (Fig. 10).

***Wings*** not reaching apex of abdomen, 2.5 times longer than their greatest width (Figs 1, 7). Corium narrow and short. Veins M, Cu and PCu thick. R reaching middle of hemelytron, m-cu cross vein present (Fig. 7).

***Pregenital abdomen*** wide oval, with a medial longitudinal keel extending from sternite III to posterior margin of sternite VII (Figs 8–10). Connexival margin simple. Sternites III–VII about 6 times wider than hypopleurites. Mediotergites concealed by hemelytra. Epipleurites broad, raised, obscuring proximal portion of hemelytra in lateral view. Glabrous patches corresponding to dorsoventral muscle attachments present on lateral edge of mediotergites. Hypopleurites III–VI relatively narrow, quadrangular, slightly longer than sternites. Hypo-



Figs 3–7. Close up habitus images of *Redeicephala taylori* gen. & sp. nov. 3 – dorsal view of head and thorax, emphasizing antennal setation; 4 – lateral close-up of head; 5 – thorax, lateral view; 6 – head and thorax, dorsal view; 7 – hemelytra and abdomen, dorsal view, with emphasis on wing venation. Abbreviations: m-cu cross vein; ga – glabrous area.



Figs 8–11. Morphological details of *Redeicephala taylori* gen. & sp. nov. 8 – abdomen, ventral view; 9 – apex of abdomen with pygophore; 10 – thorax, abdomen and mesotarsus; 11 – head and thorax, ventral view.

pleurites VII broad, not fused to each other at apex of pygophore, posterolaterally rounded, giving the abdominal extremity a bifid appearance (Figs 1, 7, 8–9).

**Etymology.** Named after Dávid Rédei (Nankai University, Tianjin, China), my mentor and dear friend. The name is formed by combination of the surname Rédei and *Tribelocephala*, the type genus of the subfamily Tribelocephalinae. The gender is feminine.

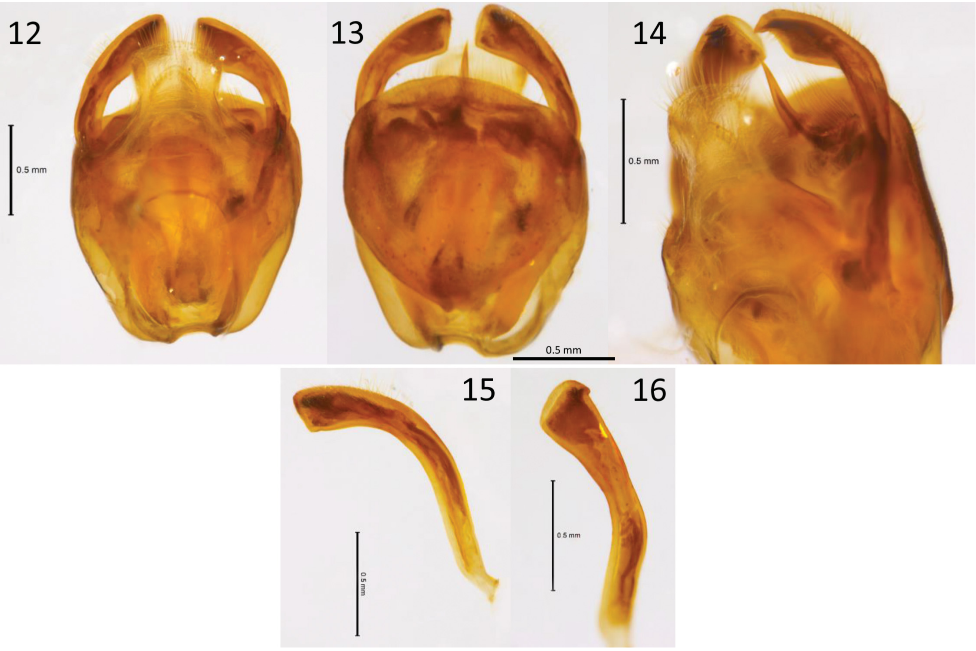
## *Redeicephala taylori* sp. nov.

**Type locality.** Papua New Guinea, Sandaun Province, Torricelli Mountains (misspelled as Torecella in label of holotype, see below).

**Type material.** Holotype: ♂ (macropterous), 'N.GUINEA / Torecella Mts // G.P.Moore / B.M. 1939-479 [printed, white label] // tape label [description]' (BNHM). Pygophore and phallus preserved in glycerine microvial, pinned along with the specimen.

**Description.** ***Colour.*** General colouration light brown. Head and anterior lobe of pronotum darker than rest of body, eyes silvery white, rostrum, antennae and legs yellow. Abdomen light brown, posterior margin of epipleurites and hypopleurites with a whitish suffusion, cephalic and thoracic sutures and glabrous patches of abdomen marking inner muscle attachments orange. Hemelytra pale ochraceous, clavus blackish, distal portion of R, base of free distal portion of Cu, m-cu crossvein and a broad surrounding area at the apex of corium with dark suffusion. Body setation light brown, setae on labrum, labium, legs and abdomen yellow.

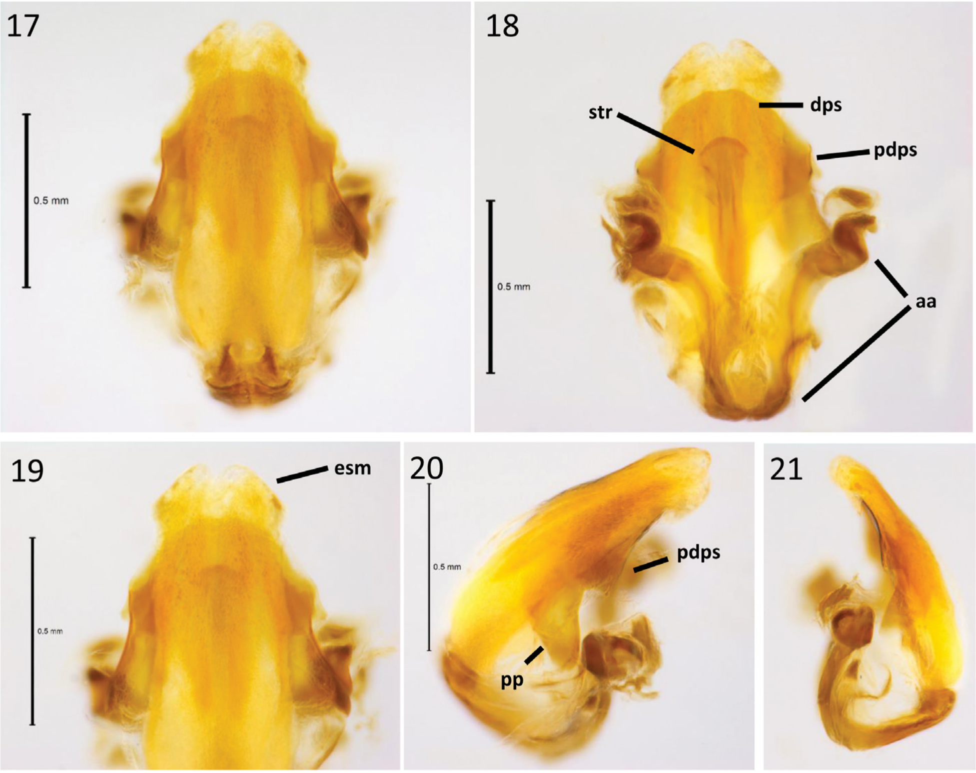
***Structure.*** *Genitalia.* Pygophore (Figs 12–14) rounded, strongly sclerotized. Posterior portion of cup-like sclerite forming a spiniform projection protruding from genital capsule, somewhat curved ventrad, very thin and acute apically. Parameres (Figs 15–16) slender, strongly bent, apex truncate and provided with a small, rounded projection dorsally (Fig. 16). Phallus: articulatory apparatus somewhat U-shaped (Fig. 18: aa). Ductifer broad, arms not adjoined to each other, thickest medially, very thin at level of ductifer (Fig. 18). Dorsal connectives as in Fig. 18, somewhat inflected inwards. Capitate processes small; no ponticu-



Figs 12–16. Pygophore of *Redeicephala taylori* gen. & sp. nov. 12 – dorsal view; 13 – ventral view; 14 – dorsolateral view, spiniform cup-like sclerite strongly visible; 15 – right paramere, outer view; 16 – left paramere, inner view.

lus transversalis visible; pedicel extremely narrow; phallotheca extremely flat (Figs 20–21), apically with 1+1 very large, flattened wing-like prolongations (phallothecal projections) (Fig. 20: pp); dorsal phallothecal sclerite (Fig. 18: dps) somewhat spatulate, extremely broad, forming 1+1 processes tapering apically (projections of dorsal phallothecal sclerite) (Figs 18, 20: pdps); endosomal struts separate basally, fuse medially and continue as a narrow spatulate structure until approximately the first two-thirds of the dorsal phallothecal sclerite (Fig. 18); endosoma extremely flattened, apically slightly bilobate (Figs 17–18, 19: esm); endosomal surface covered by a unique pattern composed of hundreds of minute denticles (Fig. 19).

***Measurements*** (in mm). Total body length 14.0; greatest width of abdomen 5.40; length of head 2.80; anteocular 1.63; vertex 0.70; width across eyes 1.12; interocular width 0.30; lengths of antennal segments I : II : III : IV = 2.83 : 2.33 : 0.76 : 1.48; maximum widths of antennal segments I : II : III : IV = 0.23 : 0.09 : 0.046 : 0.046; lengths of labial segments II : III : IV = 1.42 : 1.30 : 0.21; maximum widths of labial segments II : III : IV = 0.24 : 0.19 : 0.09; entire length of prothorax 2.20; anterior pronotal lobe length/width 0.93/1.56; posterior



Figs 17–21. Internal male genitalia of *Redeicephala taylori* gen. & sp. nov. 17 – phallus, ventral view; 18 – phallus, dorsal view; 19 – ventral view of phallotheca with apex of endosoma; 20 – phallus, ventrolateral view; 21 – phallus, lateral view. Abbreviations: aa – articulatory apparatus; esm – endosoma; dps – dorsal phallothecal sclerite; pdps – projection of dorsal phallothecal sclerite; pp – phallothecal projection; str – struts.

pronotal lobe length/width 1.25/3.38; length/width of mesoscutellum 0.50/0.67; length of fore wing from base to membrane 8.90; length of abdomen in lateral view 7.75; lengths of coxa : trochanter : femur : tibia : tarsus of fore leg 0.60 : 0.60 : 3.12 : 3.43; mid leg 0.60 : 0.60 : 3.31 : 2.81 : 0.90; hind leg 0.70 : 0.64 : 4.38 : 3.43 : –; maximum widths of coxa : trochanter : femur : tibia : tarsus of fore leg 0.60 : 0.30 : 0.38 : 0.25: –; mid leg 0.55 : 0.30 : 0.38 : 0.25 : 0.1; hind leg 0.53 : 0.30 : 0.38: 0.25 : –.

**Etymology.** It is a pleasure to dedicate this species to my supervisor Graham K. Taylor, for his support, which greatly encourages me during my newly-started Ph.D. studies.

**Biology.** Unknown.

**Distribution.** Known only from an unspecified location in the Torricelli Mountains, Sandaun Province, north-western Papua New Guinea.

## Discussion

**Relationships.** *Redeicephala* gen. nov. exhibits the typical fore wing venation of Opistoplatyini, defined by the presence of the m-cu crossvein (or cu-pcu following Rédei 2007) and is thus placed in this tribe. Among Oriental Opistoplatyini, the new genus shares many similar features with the genera *Acanthorhinocoris* and *Centrogastocoris* Miller, 1958. These taxa are recognized among Opistoplatyini by heads of uniform width, whose vertex does not become distinctly constricted posteriorly, forming a long ‘neck’, as in many *Opistoplatys* (L. R. Davranoglou, pers. observ.). Another potential synapomorphy is the bilobate abdominal apex, which is also shared with the Afrotropical genus *Distantus* (see below).

It is not easy to speculate which genus is most closely related to *Redeicephala* gen. nov. *Centrogastocoris* has a somewhat similar prothorax, its eyes are of medium size, the interocular distance is relatively large (for a tribelocephaline) and is considerably pilose. However, the clypeal process is longer, hypopleurites VII are much narrower and their apex is distinctly acute. *Acanthorhinocoris*, on the other hand, possesses a short clypeal process and broad hypopleurites VII which are similar to those of *Redeicephala* gen. nov., but less pronounced. The overall body length of *Acanthorhinocoris* and *Redeicephala* gen. nov. is much larger than that of *Centrogastocoris*, but this is probably not a reliable indicator of taxonomic relatedness, as body length is extremely variable in species of *Tribelocephala* Stål, 1853 (L. R. Davranoglou, pers. observ.). In addition, the eyes of *Acanthorhinocoris* are much larger, the interocular space much smaller, the prothorax is completely different and the animal is considerably less pilose than *Redeicephala* gen. nov. *Plectrophorocoris* Miller, 1958 is very different from all aforementioned genera, based on overall morphology (e.g. presence of a distinct ‘neck’, very large eyes, an extremely long clypeal process, largely glabrous integument and a much more slender habitus). The holotype of *R. taylori* sp. nov. was directly compared to representatives of all aforementioned genera of Opistoplatyini in the BMNH.

Based on the description and illustrations of Villiers (1943) the new genus also shares a similar abdominal extremity with the Afrotropical *Distantus oculatus* (Distant, 1903), but lacks other traits present in the genus *Distantus*, most notably the slightly longer clypeal process and smoother humerus of the posterior pronotal lobe. In the absence of a cladistic analysis of Tribelocephalinae, it cannot be asserted whether the bilobate abdominal extremity is a synapomorphy of the two genera or a result of convergent evolution. However, the overall morphological similarity of the two genera is quite striking, and *Distantus* is probably closely related to the above mentioned South-East Asian genera. It should be noted that in *Distantus* the abdominal extremity of females is considerably less bifid than that of the male (Villiers 1943). Antennal setation is also reduced in female Tribelocephalinae (Weirauch 2008). Therefore it is possible that the currently unknown female of *R. taylori* sp. nov, also differs from the male in these characters.

**Internal genitalia of Tribelocephalinae.** The extreme dorsoventral flattening of the phallotheca, its poor sclerotisation, the presence of lateral wing-like flaps and struts which fuse medially are highly similar in several *Opistoplatys* species examined during this study and *Redeicephala* gen. nov.

*Tribelocephala*, a genus superficially similar to some genera of Opistoplatyini in habitus but belonging to Tribelocephalini, does not possess this peculiar genital morphology: its phallotheca is not flattened, its struts are unfused (L. R. Davranoglou, pers. observ.). In these characters *Tribelocephala* is more similar to *Abelocephala* (cf. Ishikawa et al. 2015), a possibly early offshoot of Tribelocephalini (Weirauch 2010). The aforementioned genital characters of *Opistoplatys* and *Redeicephala* gen. nov. therefore probably represent synapomorphies for the tribe Opistoplatyini. It should also be noted that for identification based on genitalia, components of the endosoma, the articulatory apparatus and the dorsal phallothecal sclerite seem to vary most significantly between species of Opistoplatyini (L. R. Davranoglou, pers. observ.). Future work on the systematics of this group should examine the usefulness of all the aforementioned characters in a morphological analysis.

**A gular sulcus in Tribelocephalinae?** All genera of Tribelocephalinae examined directly or via illustrations of previous authors [*Abelocephala* in Ishikawa et al. (2015); *Afrodecius* Jeannel, 1919; *Apocaucus* Distant, 1909; *Tomolus* Stål, 1874 in Maldonado Capriles (1996); *Tribelocephala*, *Xenocaucus* and all Opistoplatyini], possess an elongate glabrous area, with somewhat thinner cuticle, situated posteriorly from the posterior margin of the eye (Fig. 4: ga). In Opistoplatyini and *Tribelocephala*, characterized by elongate heads, this surface is linear, while in the rest of Tribelocephalini, which possess more rounded and compact heads, it is located somewhat anteriorly, forming a circular or U-shaped surface (e.g. *Abelocephala* and *Apocaucus*).

These glabrous areas lie topographically very closely to the attachment area of *musculus retractor pistilli* (mrp) (Parsons 1968, 1966, 1959; Weber 1930). Dissection of a few specimens of *Opistoplatys* and *Tribelocephala peyrierasi* Villiers, 1970 revealed that this glabrous area does not correspond with an inner cuticular invagination and thus does not represent an attachment point of neither the above mentioned nor any other muscle. In addition, at least under light microscopy, this area did not possess any structural modifications of its surface which would imply the presence of sensory organs.

Recently, Štys & Baňař (2013) described a gular sulcus in *Ulugurocoris* Štys & Baňař, 2013 (Enicocephalomorpha: Aenictopecheidae), which they assume is somehow involved in ecdysis or is the result of this process. Given the remarkable topographical and structural similarity with the glabrous area of Tribelocephalinae, it is possible that the latter is also the result of ecdysis. Other reduviids (e.g. species of Harpactorinae, Stenopodainae) also possess an identical (but less developed) glabrous area with somewhat thinner cuticle (L. R. Davranoglou, pers. observ.). It should be noted that the term gular sulcus is somewhat misleading, as this structure (at least in reduviids) does not form a cuticular invagination and is thus not a sulcus, while the boundaries of the true gular area are undefined in Heteroptera. Scanning electron microscopy of this region and observations of live specimens undergoing ecdysis will clarify what this structure actually is.

**Outlook.** It is evident that the relationships within and between the tribes of Tribelocephalinae are still poorly understood. Given that statements of systematic nature are best evaluated in a phylogenetic framework, it is hoped that the characters and hypotheses presented here will aid future workers of the group and will be rigorously tested in a cladistic analysis.

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