

## Research article

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# *Youngeewa simillima* sp. nov. (Hemiptera: Cicadellidae: Mileewinae) from Eocene Baltic Amber

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**Abstract.** The paper describes *Youngeewa simillima* sp. nov. from Eocene Baltic amber as a new species within the tribe Mileewini Evans, 1947 (Mileewinae Evans, 1947). Due to its poor condition, the specimen is only tentatively placed in the genus *Youngeewa* Gębicki & Szwedo, 2001, differing from the other known species of the genus, *Youngeewa bicolorata* Gębicki & Szwedo, 2001, mainly by the elements of wing venation.

**Key words.** *Youngeewa*, Cicadellidae, Mileewinae, new species, Baltic amber.

## INTRODUCTION

A leafhopper specimen in Baltic amber is described as a new species in the present work. The described species is the third known fossil representative of the Mileewinae Evans, 1947 subfamily so far. Previously, *Youngeewa bicolorata* Gębicki & Szwedo, 2001 and *Eomileewa eridani* Gębicki & Szwedo, 2001 (Mileewinae: Mileewini) have been described from Eocene Baltic amber (Gębicki & Szwedo 2001). Specimens of these two species were better preserved than the new species described here and had well-preserved features for the subfamily. The specimen described here has details of its head obscured and is placed in the subfamily based mainly on its short clavus, an important diagnostic feature of the tribe Mileewini Evans, 1947, and it is tentatively placed in the genus *Youngeewa* Gębicki & Szwedo, 2001. Three other features characteristic of the extant Mileewini of the Old world have not been confirmed, i.e., vein RP (=Sc+R or R<sub>2+3</sub>) extending to the anterior rather than outer margin of the wing and the marginal vein reaching the wing margin before A<sub>1</sub> and fold between PCu and A<sub>1</sub>. Two other differences concerning the width and shape of the forewing apex are variable in Mileewini (see Dietrich et al. 2017; He et al. 2021). Mileewinae Evans, 1947 are an evolutionary old auchenorrhynchan group originating from the Early Cretaceous central Gondwanaland (Nielson & Knight 2000). The first representatives of the subfamily were estimated to have originated around 126 MA, based on molecular

analysis and incorporating *Youngeewa* Gębicki & Szwedo, 2001 as a calibration point (Dietrich et al. 2017). Mileewini seem to be closely related and probably derived from the subfamily Cicadellinae Latreille, 1825 and are also similar in wing venation to the subfamily Typhlocybinae Kirschbaum, 1868 (Balme 2007; Dietrich et al. 2010), especially to the extinct Protodikraneurini Gębicki & Szwedo, 2006 (Gębicki & Szwedo 2006) and Alebrini McAtee, 1926 but representatives of these taxa have an acute hind basitarsomere unique to all Typhlocybinae.

## MATERIAL AND METHODS

A male was examined. Only external structures were examined using a stereoscopic microscope Olympus SZX9 Nikon Eclipse. Photographs were taken with the Canon Eos camera with extension rings. All the equipment is available at the University of Silesia, Faculty of Natural Sciences, Institute of Biology, Biotechnology and Environmental Protection. All photographs and drawings were digitalised and worked on with CorelDRAW software.

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The holotype *Y. simillima* Gębicki & Walczak sp. nov. bears labels; quoting the labels of specimen is done in the following way: (/) is used to divide data in different rows

on the label, (;) is used to divide data on different labels, ([ ]) is used for the author's comments.

RA = Radius anterior vein (RA1)

RP = Radius posterior vein

#### Abbreviations for morphological terms

A = Anal vein (A1)

CuA = Cubitus anterior vein (CuA1 / CuA2)

CuP = Cubitus posterior vein

M = Media vein

MA = Media anterior vein

MP = Media posterior vein

PCu = Postcubitus vein

Sc = Subcosta vein

R = Radius vein (R / R2)

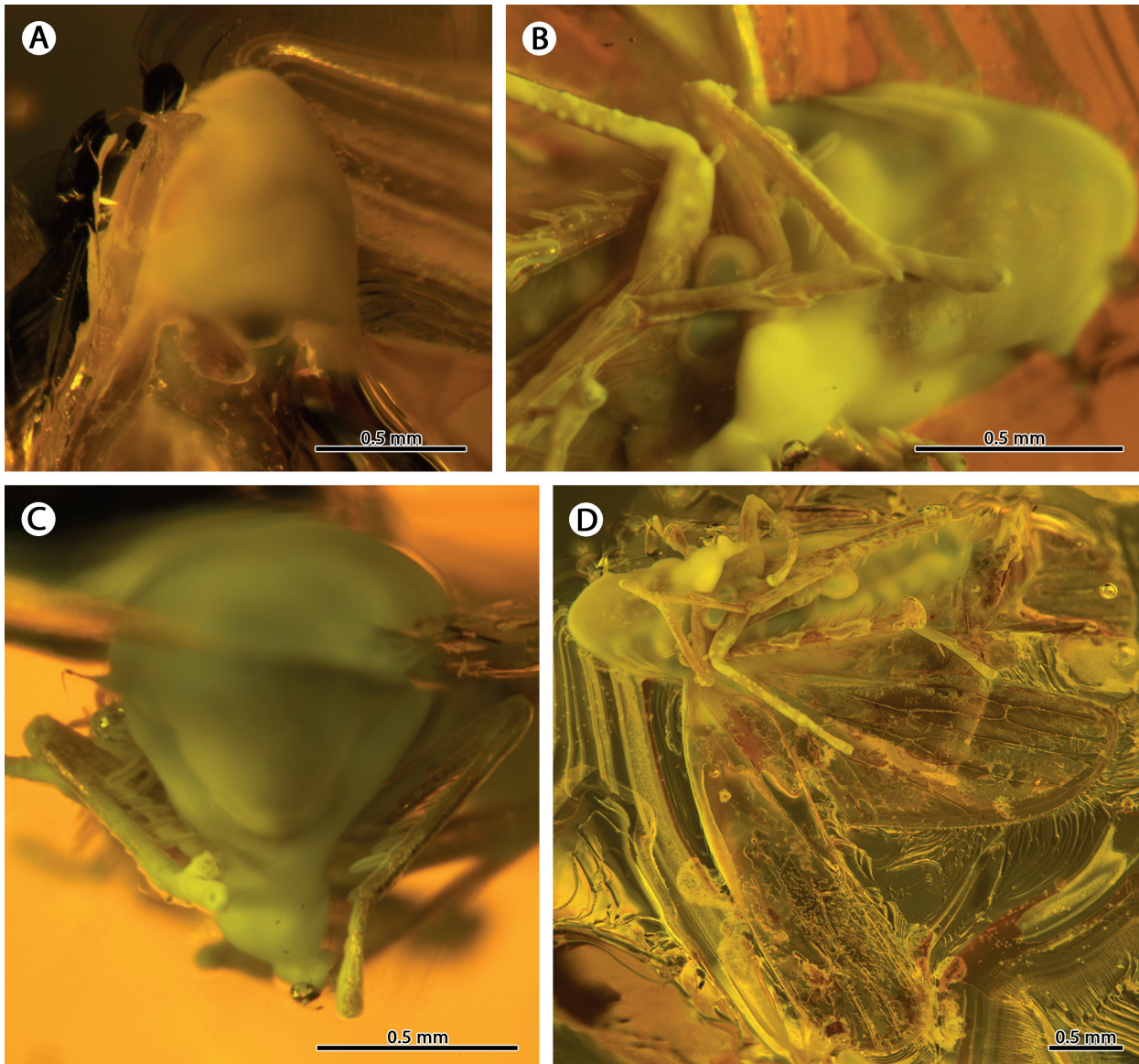
#### RESULTS

*Youngeewa simillima* Gębicki & Walczak sp. nov.

(Figs 1–4)

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**Type material.** Holotype ♂ [written in all caps], *Youngeewa simillima* / Gębicki & Walczak / sp. nov. [red label, written in bold]; Eocen Baltic amber / No. 5008 / coll. Carsten Gröhn.



**Fig. 1.** *Youngeewa simillima* Gębicki & Walczak sp. nov. **A.** Head and pronotum from the dorsal side. **B.** Face and right leg of the first pair, right leg of the second pair, and foot of third pair of legs. **C.** Face and fore legs. **D.** Specimen from the ventral side.



**Diagnosis.** In general outline the species is close to *Y. bicolorata* but differs in the following characteristics: straight lateral margins of genae (no deep incision below the eye), apex of rostrum reaching beyond bases of middle coxae, veins  $Sc+RA_1$  and transverse r-m and m-cu on fore wings are arranged in one line (as in Fig. 3C), and the distance between distal terminations of veins  $CuA_2$  and  $CuP$  on hind wings is only  $2.1 \times$  as long as that between  $MP+C_uA$  and  $CuA_2$  (measured on hind wing marginal vein), (in *Y. bicolorata*  $2.3 \times$ ). Hind wing cell delimited by veins R and M is somewhat broader starting from transverse vein r-m to the wing apex than the cell delimited by veins MA and  $MP+C_uA_1$ . Fore wings distinctly lighter than those in *Y. bicolorata* and lacking any clear colour pattern.

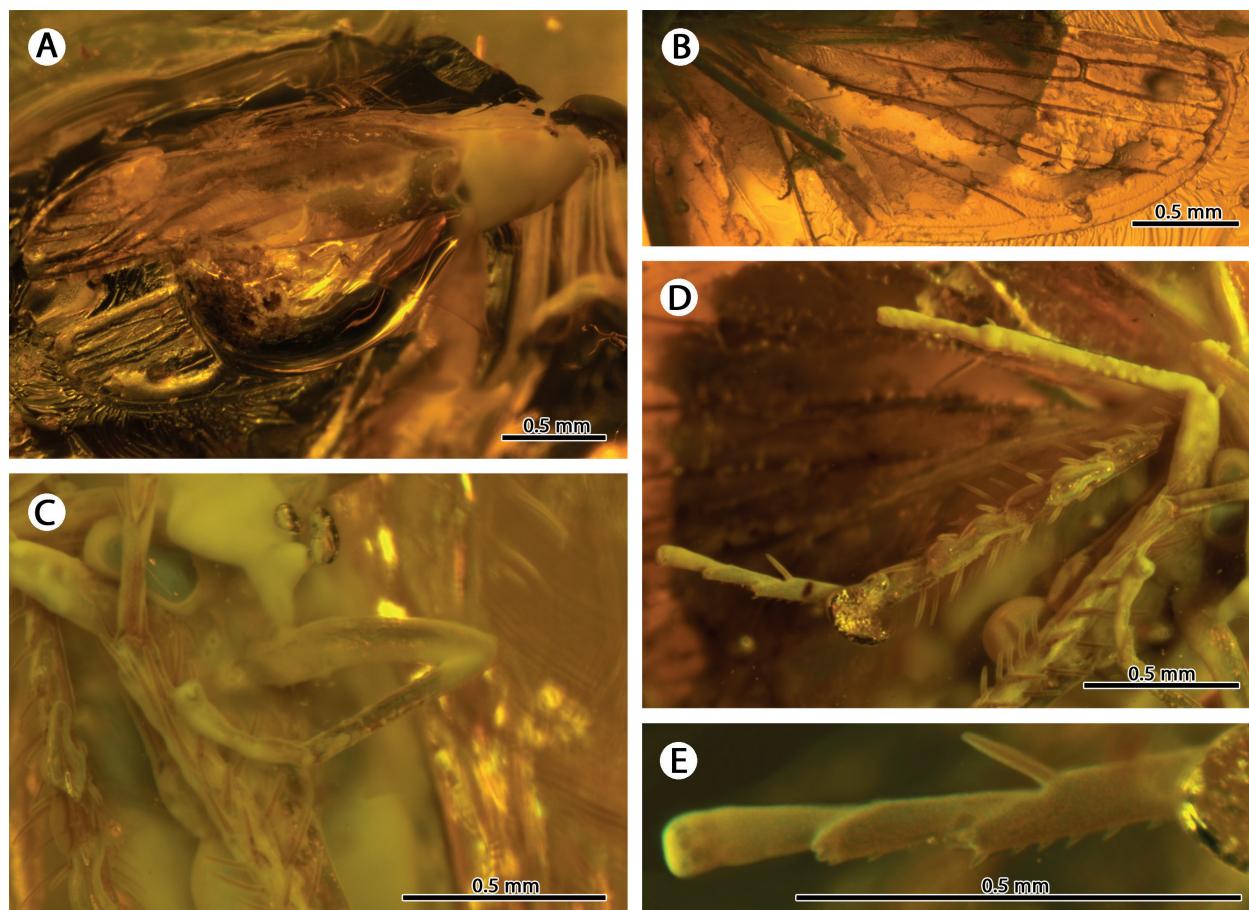
**Description.** Total body length 3.70 mm (sex: male), detailed data showing the dimensions of selected parts of the body are included in Table 1.

**Head.** Coronal part of head strongly convex especially at apex, broad, “delta”-like in outline. Ocelli, along with entire surface of head, completely invisible, covered by a felt-like sheath (Fig. 1A). Coronal and frontal sutures invisible. Antennae slightly longer than head, located

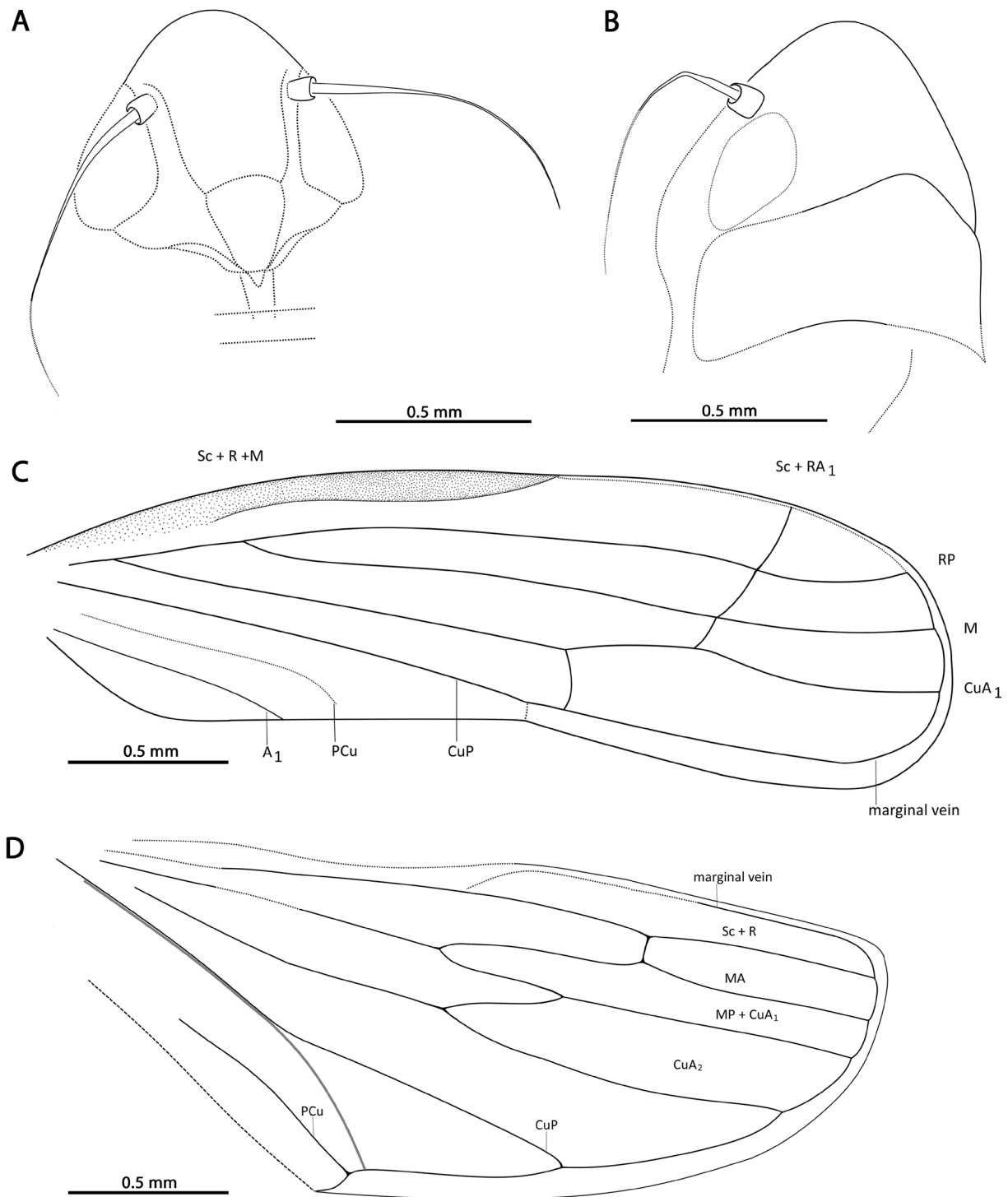
in distinct antennal pits in front of the eyes at inner eye margin (Figs 1B–C, 3A). Scapus short and cylindrical, pedicellus relatively narrow, strongly elongated, many times longer than first segment. Antennal flagellum about  $3 \times$  narrower than pedicellus. Lateral margins of facial part of head almost straight, lacking a clear-cut incision under eyes. Frontoclypeus convex, distinctly broader in apical part, strongly tapered distally. In subapical part of frontoclypeus there is an arcuate concavity located in place of epistomal suture (Figs 1B, 3A). Anteclypeus almost square in shape, small, about  $5 \times$  narrower than postclypeus at its widest point and separated from it by a deep transclypeal suture. Indistinct, 3-segmented rostrum reaching beyond bases of middle coxae (Fig. 1D).

**Pronotum.** Shorter than vertex with indistinct lateral carina (Figs 1A, 2A, 3B).

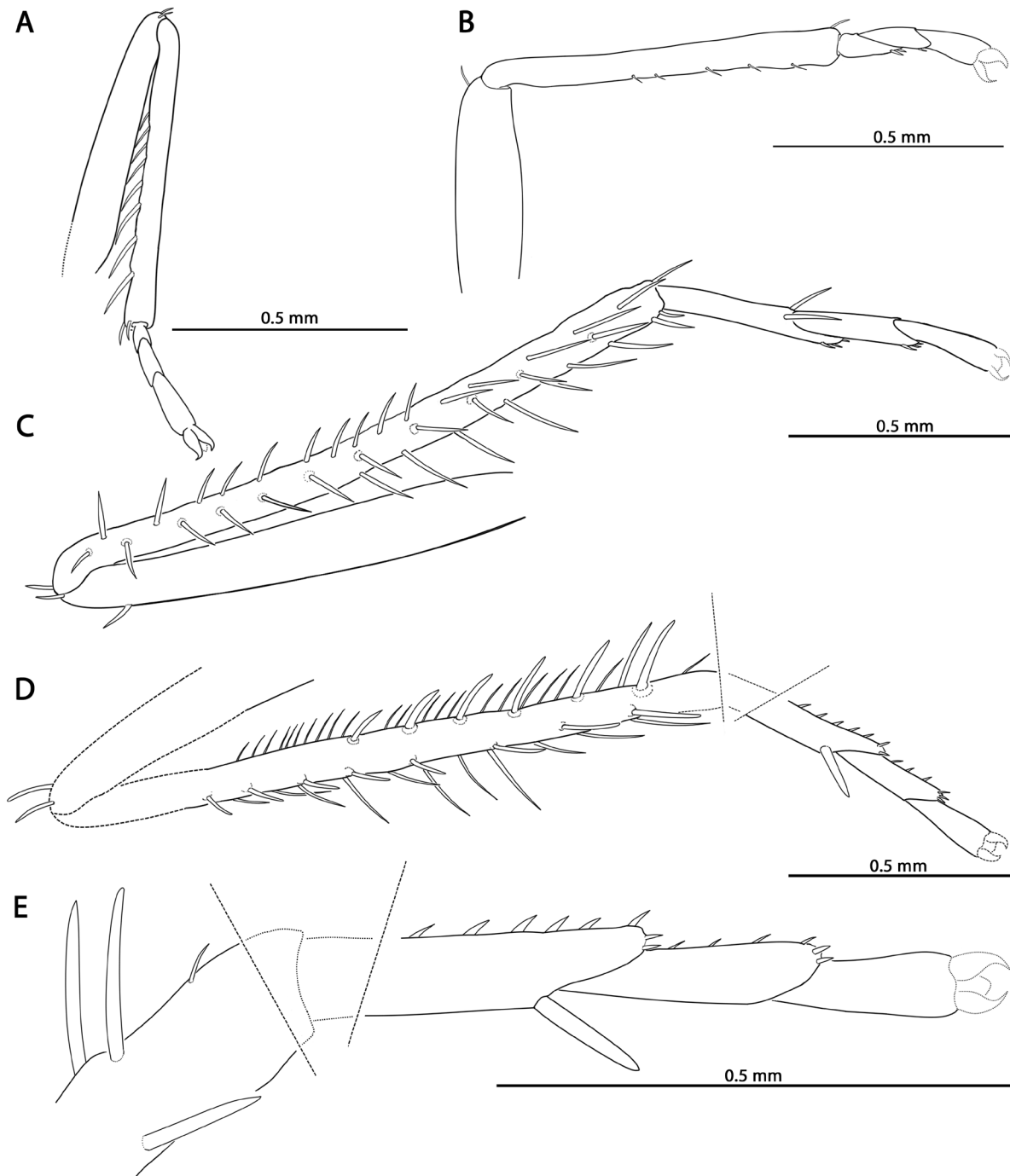
**Wings.** Fore wings relatively narrow and elongate, evidently reaching beyond the abdomen, at apex nearly as wide as corium and slightly rounded. Transverse veins of three apical cells (2–4) arranged in a single somewhat slanting line. Inner apical field longest, and largest, delimited by  $CuA_1$ , which is slightly “S”-like; apical fields 1 and 3 narrow, rectangular in outline; outer field



**Fig. 2.** *Youngeewa simillima* Gebicki & Walczak sp. nov. **A.** Specimen from the dorsal side. **B.** Hind wing (ventral view). **C.** Left mid leg. **D.** Right mid and hind leg. **E.** Hind leg tarsus in large magnification.



**Fig. 3.** *Youngeewa simillima* Gębicki & Walczak sp. nov. (reconstruction). **A.** Head from the ventral side. **B.** Head and pronotum from the dorsal side. **C.** Fore wing. **D.** Hind wing.



**Fig. 4.** *Youngeewa simillima* Gębicki & Walczak sp. nov. (reconstruction). **A.** Right fore leg from the ventral side. **B.** Right mid leg from the ventral side. **C.** Left hind leg from the dorsal side. **D.** Right hind leg from the ventral side. **E.** Hind leg tarsus in large magnification.

**Table 1.** Biometric data of *Youngeewa simillima* Gębicki & Walczak sp. nov. [\*data difficult to measure]

Male	Size [mm]
head length in midline	0.41 mm
head width	probably 0.7 mm*
frons length in midline	0.69 mm
frons width	probably 0.73 mm*
antennae length	0.99 mm
pronotum length in midline	0.38 mm
abdomen length in midline	1.74 mm
profemur	0.58 mm
protibia	0.63 mm
protarsus	0.31 mm
mesofemur	0.53 mm
mesotibia	0.78 mm
mesotarsus	0.31 mm
metafemur	1.04 mm
metatibia	1.49 mm
metatarsus	0.82 mm
fore wing length	2.95 mm
fore wing width	0.88 mm
hind wing length	2.62 mm
hind wing width	1.08 mm

is smallest, triangular in shape. Distances between main stems of longitudinal veins R, M and Cu nearly equal. Clavus reaching halfway along the wing, with two distinct, almost parallel veins PCu and A<sub>1</sub> running close to each other. Corium and costal cell lacking any transverse veins (Figs 1D, 3C). Fore wings slightly darker than hind wings, with darker colouration along the fields adjacent to main longitudinal veins (Fig. 2A).

Hind wings almost as long as fore wings. Veins R and M parallel in distal part and connected by a transverse vein r-m, which is located somewhat before nodus. Costal margin (lacking a distinct, deep incision) similar to that in species representing the genus *Mileewa* and to *Y. bicolorata*. Marginal vein reaching nodus; in proximity to the costal margin it runs parallel and joins internal wing margin outside vein A<sub>1</sub>. Membranous wing margin is narrowest between termination of veins MA and MP+CuA<sub>1</sub> whereas it is broadest at internal margin opposite termination of vein PCu (Figs 2B, 3D).

**Legs.** Fore legs. Profemur slightly longer than protibia. Protibia with quite large setae along inner margin. Segments of protarsus small, third segments longest (Figs 1B–C, 4A). Middle legs. With sparse fine setae along inner margin of mesotibia (Figs 2C–D, 4B). Hind legs. Spines on hind metatibia long, distinctly longer than metatibia thickness. Apex of metafemur with macrochaetae in pattern 2+1+1 (Figs 1D, 2D, 4C–D). Basal segment of metatarsus longest and at apex expanded into a pro-

cess with two spines, outer margin with five sharp spines and two elongate marchochaetae, which are situated near the apex on the inner side. The middle segment with three blunt apical spines and a single sharp lateral one. Hind pretarsus shortest (Figs 2E, 4E).

**Male.** Copulatory block relatively short, details not clearly visible in examined specimen.

**Etymology.** Species name originates from the Latin word “simillima” due to the fact that the species presented here is very similar to the *Youngeewa bicolorata* described earlier.

**Remarks.** Substantial areas of head including rostrum, parts of prothorax and some parts of legs covered with white, felt-like substance which blurs the details of the structure. Accordingly, it is impossible to determine the location of the ocelli, which constitutes an important taxonomic feature. Right fore- and hind wings are well-visible and their venation is clear. In the male the apex of abdomen is partly covered by the left hind wing, which makes analyses difficult. There are no animal syninclusions. For reasoning of the taxonomic placement of the new species, see introduction and species diagnosis.

## DISCUSSION

The species of the genus *Youngeewa* are close to many extant Mileewini (Mileewinae Evans, 1947) species in having a large dome-shaped head, a convex clypeus (also in Cicadellinae Latreille, 1825), reduction of forewing venation, a distinct fore wing appendix and shortened fore wing clavus. These features are also found in the South American genus *Orsalebra* Young, 1952 (belonging to the Typhlocybinae tribe Alebrini, see Introduction). However, in this genus the marginal vein of the forewing does not reach the apex of vein RP, which is typical of most Mileewi, but reaches only the apex of vein M; in most Alebrini the marginal vein is fused with the apical wing margin. Reduced fore wing venation in Mileewinae is typical of Typhlocybinae as well as some Cicadellinae and Nirvanini Baker, 1923 (Evacanthinae Metcalf, 1939 sensu Dietrich 2004). Hind wing venation is similar in the above mentioned tribes while veins R and M running parallel along their entire length (not only in their apical part) are found in Protodikraneurini Gębicki & Szwedo, 2006 (extinct Typhlocybinae) and in the extant neotropical mileewine genus *Amahuaka* Melichar, 1926, as well as in South American representatives of the tribe Turgurahualini Dietrich, 2011 of the subfamily Mileewinae (Dietrich 2011; Krishnankutty & Dietrich 2011).

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