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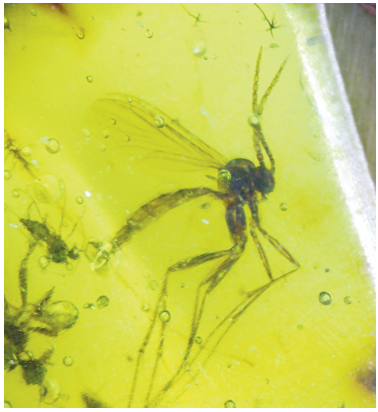
VLADELEKTRA, AN ENIGMATIC NEW GENUS OF KILLER FUNGUS GNATS (DIPTERA: KEROPLATIDAE: *INCERTAE SEDIS*) FROM MID-CRETACEOUS BURMESE AMBER)

NEAL L. EVENHUIS



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Cover photo: *Vladelektra blagoderovi* Evenhuis, gen. et sp. nov., paratype male from mid-Cretaceous Burmese amber.

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Vladelektra, an enigmatic new genus of killer fungus gnats (Diptera: Keroplatidae: *incertae sedis*) from mid-Cretaceous Burmese amber

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Abstract. A new genus and species of keroplatid fly, *Vladelektra blagoderovi*, **gen**. **nov**. **et sp**. **nov**. from mid-Cretaceous Burmese amber is described and illustrated. It marks only the third described keroplatid from Burmese amber.

INTRODUCTION

The family Keroplatidae known from ca. 1,000 species worldwide (see Evenhuis 2006; Pape *et al*. 2011) is fairly well represented in the fossil record with 55 species in 20 genera, primarily from Tertiary deposits, with five previously described species known from the Cretaceous: *Burmacocera petiolata* Cockerell, 1917 (Orfeliini) and *Adamacrocera adami* Ševčik *et al*., 2020 (Adamacrocerinae) from mid-Cretaceous Burmese amber; *Schlueteromyia cenomanica* Matile, 1981 (Orfeliini) from Upper Cretaceous French amber, and *Hegalari antzinako* Blagoderov & Arillo, 2002 and *H. minor* Blagoderov & Arillo, 2002 (?Macrocerinae) from Lower Cretaceous Spanish amber. The discovery here of a new genus and species from Burmese amber marks third named species of the family from Burmese amber.

MATERIAL AND METHODS

The two amber pieces studied were collected from the Hukawng Valley of Kachin State in northern Myanmar and are deposited in the Bishop Museum entomology collection. Radiometric dating of the amber-bearing horizon and palaeontological evidence restrict the age of the amber to 98.79 ± 0.62 Ma (Early Cenomanian to Late Albian) based on U-Pb zircon dating of the volcanoclastic matrix (Shi *et al*., 2012; Yu *et al.*, 2019). The amber was originally secreted by araucarian pines in a humid tropical environment (Ross *et al*., 2010; Yu *et al*., 2019).

The holotype specimen is preserved in a flat, rounded semi-ovular piece of yellow amber (Fig. 1a) measuring 12 mm × 10 mm and containing a few impurities and a number of syninclusions including an empidoid fly, two cecidomyiid flies, an unidentified brachyceran fly, a psocodean, an oribatid mite, and one other (undetermined) mite. The second piece with paratype male is smaller and more reddish in color. Extended depth of field images were accomplished by using a Leica M165C stereo dissecting scope via the Leica Microsystems LAS Multifocus software (v. 4.12.0) and using Zerene Stacker® software (v. 1.04) (Zerene Systems, LLC, Richmond, Washington, USA) to align and stack-focus each final image. Morphological terminology follows Cumming & Wood (2017).

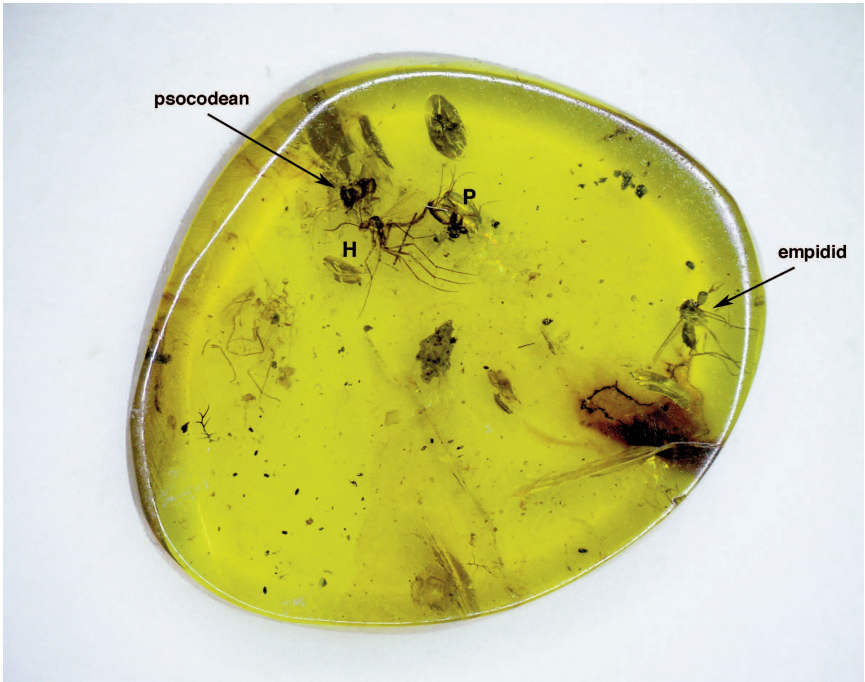

Fig. 1. Amber piece containing type specimens of *Vladelektra blagoderovi* Evenhuis, gen. nov. et sp. nov. Abbreviations: H = holotype male; P = paratype female.

SYSTEMATIC PALAEONTOLOGY

Order Diptera Linnaeus, 1758
Family Keroplatidae Rondani, 1856
Subfamily *incertae sedis*

Vladelektra Evenhuis, gen. nov.

Type species: *Vladelektra blagoderovi* Evenhuis, sp. nov., by present designation.

Diagnosis. Mouthparts reduced. Palp three-segmented, moniliform, apicalmost segment downturned with subapical palpal pit, segment setose apically; antennae with 14 cylindrical flagellomeres, longest basally, becoming shorter apically; mesonotum with long erect hairs anteriorly and posteriorly; scutellum with long hairs on posterior apex; wing hyaline, with bases of medial and cubital veins effaced; radial-medial fusion (Rs+M) not visible; vein R_{2+3} (in male) ending in C closer to end of R_{4+5} than to R_1 (R_{2+3} absent in female); vein CuP absent; coxa long, all same length; tibiae with setae not arranged in rows; tarsi shorter than body length; abdomen long, thin, sparse hirsute dorsally; male hypopygium with long thin gonocoxae and gonostyli; gonostylus with darkly sclerotized bifid tip; epandrium narrow, with round villose apex; tergal apodeme present.

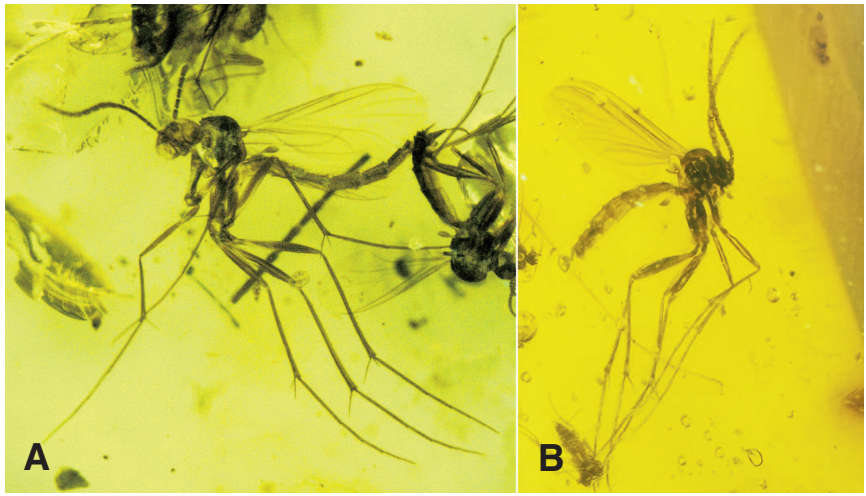

Fig. 2. *Vladelektra blagoderovi* Evenhuis, sp. nov., **a**. male holotype and female paratype *in situ*. **b**. male paratype *in situ*.

***Vladelektra blagoderovi* Evenhuis, sp. nov.**
(Figs. 1–7)

Type material. Holotype male (BPBMENT 0000016434) and paratype female (BPBMENT 0000016435) from MYANMAR: Kachin State: Hukawng Valley in the same amber piece. *Other paratype*: a separate amber piece with male (BPMENT 0000016436) from same locality. The amber pieces containing the holotype and paratypes are deposited in the entomological collection of the Bernice Pauahi Bishop Museum, Honolulu, Hawai'i, USA.

Etymology of genus and species epithets. The generic (combining *Vlad* + the Greek Ἠλέκτρα *"elektra*" = "amber") and specific names honor my good friend and colleague Vladimir Blagoderov for his significant contributions to fossil dipterology and for increasing our knowledge of Sciaroidea.

Diagnosis. As for genus.

Description. **Male**. Based on two specimens, each with head, legs and abdomen cleared internally. Lengths: Body: 2.2–2.3 mm; wing: 1.5–1.6 mm. (Habitus Fig. 2). *Head*. Occiput and frons pale brown. Face and clypeus dark brown. Eyes without inter-ommatidial setae; facets of two sizes, upper half of eye with larger ommatidia than lower half. Ocelli not discernable due to opacity of head capsule. Palp (Fig. 3) moniliform, three-segmented, each segment lozenge-shaped, subequal in length, apicalmost segment setose on apical half, with subapical palpal pit. Antennae (Fig. 4): brown, scape and pedicel discoid. Flagellum: 14 segments; segments 1–4 cylindrical, ca. two times longer than wide; segments 5–14 length subequal to width; terminal segment (14) subconical.

Thorax. Dark brown. Notum with sparse long hairs irregularly arranged. Scutellum with long hairs at apex. Pleura brownish black (vestiture not viewable). Halter stem pale brown, knob brown.

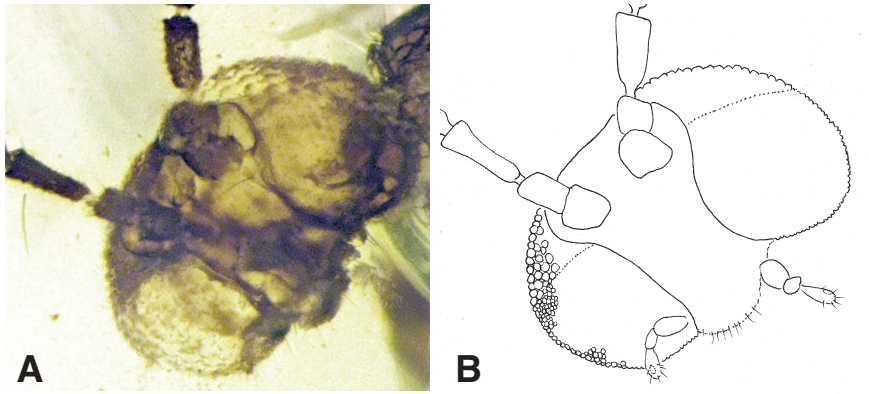

Fig. 3. *Vladelektra blagoderovi* Evenhuis, sp. nov., lower portion of male head showing palpi and eye divided into upper and lower ommatidia. **a**. *in situ*. **b**. illustration to clarify structures.

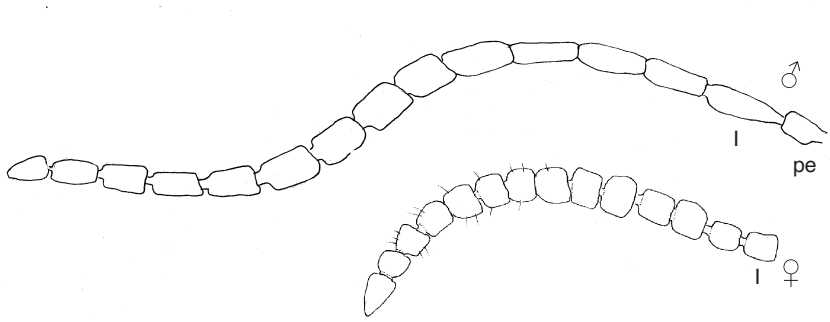

Fig. 4. *Vladelektra blagoderovi* Evenhuis, sp. nov., antennae: male above, female below, both to scale. Abbreviations: I = flagellomere I; pe = pedicel.

Legs. Brown. Coxae long, all same length. Hind femur with yellow color basoventrally and thin yellow stripe ventrally on basal two-thirds. Tibiae with trichia not arranged in rows. Tibial spurs long: 1: 2: 2. Tibial length 1.25 times femoral length; basitarsus length 1/2 length of tibia. Tarsi shorter than body length. Claws minute.

Wing (Fig. 5). Hyaline. Costa with minute spicules along entire length; microchaetae on R_1, all other veins bare. Costa ends beyond end of R_{4+5} two-thirds distance to end of M_1. Sc incomplete. R_{2+3} ending in C two-thirds distance from end of R_1 to end of R_{4+5}. Base of M_1 and M_2 effaced, junction of M_1 and M_2 faintly evident. M_4 effaced at base, curved downward on apical fourth. CuA complete, curved downward at apical one-fourth. CuP absent. Alula reduced.

Abdomen. Brown with spot of yellow at posterolateral corner of each tergite. Long, thin, slightly dorso-ventrally compressed, with sparse hairs dorsally, laterally, and ventrolaterally.

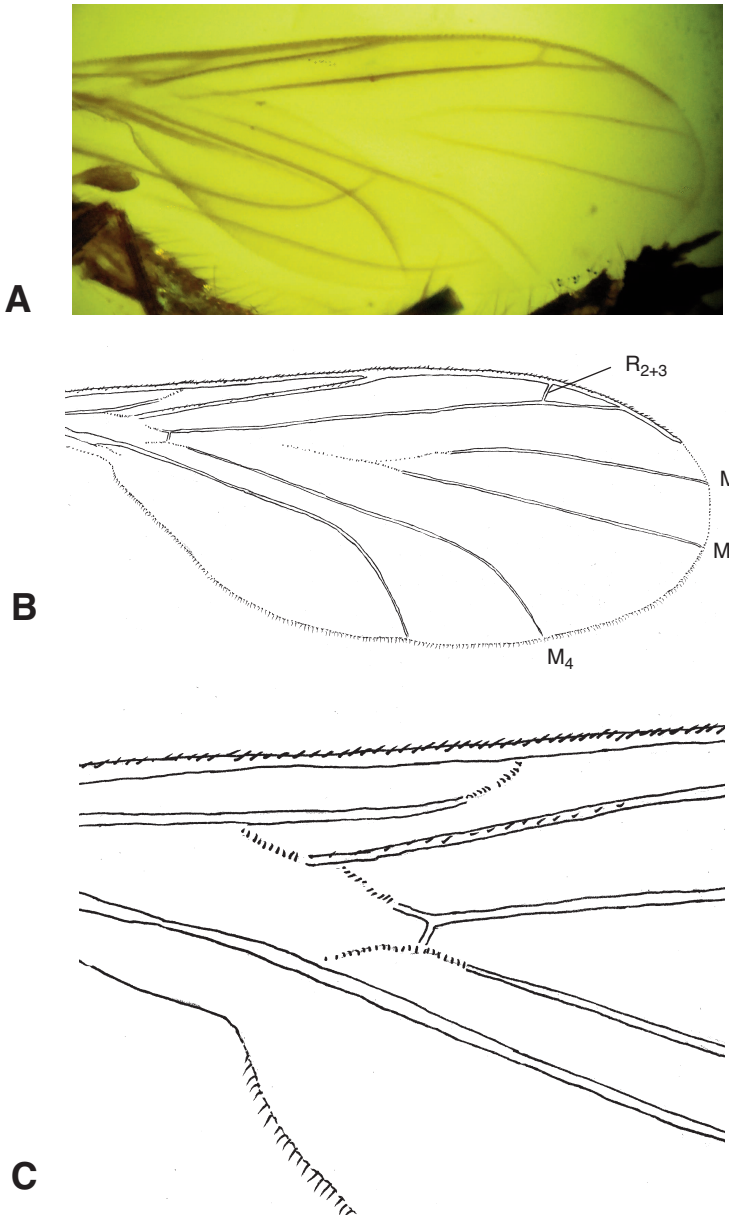

Fig. 5. *Vladelektra blagoderovi* Evenhuis, sp. nov., male wing. **a**. *in situ*. **b.** illustration to clarify venation. **c**. detail of wing base showing effaced veins.

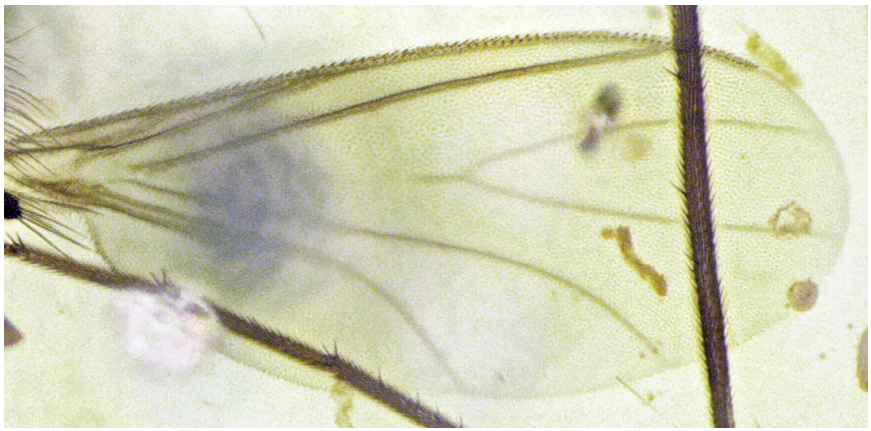

Fig. 6. *Vladelektra blagoderovi* Evenhuis, sp. nov., female wing showing effaced medial vein and lack of vein R_{2+3}.

Genitalia (Fig. 7) Gonocoxa linear-conical, long, thin. Gonostylus long, thin, tapering to darkly sclerotized bifid apical one-fifth, with short setae along dorsal surface, other short setae subapically on ventral surface. Tergal apodeme short, narrow, slightly flared basally. Epandrium subquadrate, slightly tapered to apex, ca. two times longer than basal width, with rounded apex, and patch of minute villi on apical fifth.

Female. As in male except lack of vein R_{2+3} (cf. Fig. 6) and shorter antennae (cf. Fig. 4). Basal connection of veins M_1 and M_2 not effaced; vein M_1 not reaching wing margin.

Remarks. The close proximity of the tips of the abdomens of the holotype male and paratype female lead to the possibility that they became trapped while *in copula* and separated during their struggle to escape.

DISCUSSION

Vladelektra intriguingly exhibits features of both Keroplatidae (s. str.) (wing venation) and the former Lygistorrhinidae [now a subfamily within Keroplatidae (*teste* Matic *et al*. 2020)] (male genitalia with tergal apodeme). Although lacking a well developed proboscis as in many lygistorrhinids (*Seguyola* Matile, 1990 also lacks them) and possessing male genitalia reminiscent of many lygistorrhinids, especially in the presence of the tergal apodeme (see Fig. 6), the wing venation with effaced basal portions of medial and cubital veins, and the presence of R_{2+3} in the male (although lacking in the female) would seem to better place *Vladelektra* within Keroplatidae (s. str.) for now. The radial-medial fusion (characteristic of Keroplatidae) that is not seen in this species could be there, but is not discernable due the effaced base of the medial veins. The dimorphism between males and females is most striking in the presence (males) or absence (females) of R_{2+3} and also evident in the differences in length of the antennae and in shape of the antennal flagellomeres (cf. Fig. 4).

Within Keroplatidae (s. str.), the specimens appear similar in some respects to the extant Afrotropical *Asynaphleba* Matile, 1974 (both having 14-segmented flagellomeres; short R_{2+3}, and moniliform palpal segments). However, it is clearly not that genus based

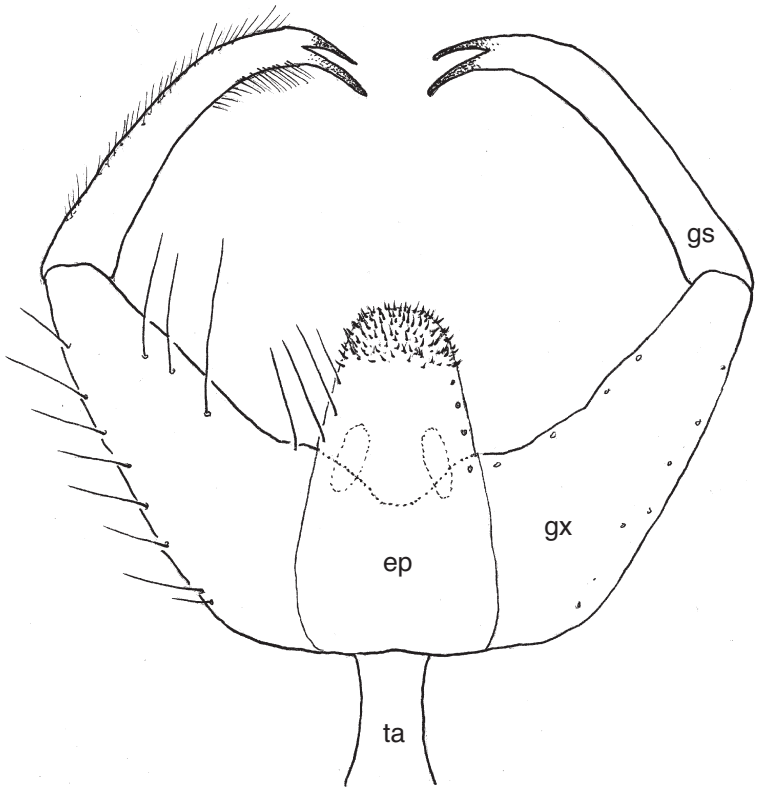

Fig. 7. *Vladelektra blagoderovi* Evenhuis, sp. nov., male genitalia. Abbreviations: ep = epandrium; gx - gonocoxa; gs = gonostylus; ta = tergal apodeme.

on the presence of CuP (absent in *Vladelektra*), and R_{2+3} ending in C closer to the end of R_1 than R_{4+5} (ending closer to R_{4+5} in *Vladelektra*). Additionally, *Asynaphleba* has a distinct stem of M, base of M_4, and m-cu, all of which are effaced in *Vladelektra*.

Vladelektra gen. nov. is also similar to the keroplatine Papuan and Oriental *Xenokeroplatus* Matile, 1981 in wing venation (especially effaced bases of medial vweins) and lacks vein CuP, which characterizes the latter genus among Keroplatini in those keys, but (besides having three instead of two palpal segments) *Vladelektra* differs in having legs much shorter (tarsi longer than body length in *Xenokeroplatus*), external tibial spurs present (absent in *Xenokeroplatus*), shorter mediotergite (more pronounced in *Xenokeroplatus*), male antennal flagellomeres more cylindrical (compressed and shorter in overall length in *Xenokeroplatus*), and distinctly different male genitalia with tergal apodeme present (absent in *Xenokeroplatus*).

Blagoderov & Arillo (2002) described a keroplatid, *Hegalari* Blagoderov & Arillo, 2002 from the Lower Cretaceous amber of Alava, Spain that also lacks vein CuP. They

were unsure of the placement of the genus within the family, but its features were most similar to those belonging to Macrocerinae. *Hegalari* is not the same as *Vladelektra* in that the antennae of the type species, *Hegalari antzinako* Blagoderov & Arillo, are somewhat compressed and the overall length is much shorter than those in males of *Vladelektra* (probably due to the type of *H. antzinako* possibly being a female). However, the second species described in that paper, *Hegalari minor,* is much more similar to *Vladelektra* and has much longer antennae with more cylindrical flagellomeres as in *Vladelektra* males and slightly different wing venation than *H. antzinako* and might be better removed to a separate genus. *Vladelektra* differs from *H. minor* in having R_4 closer to the apex of the wing than in *H. minor*, the base of M_1 effaced (present in *H. minor*), and the apicalmost male flagellomere length subequal to width (two times as long as wide in *H. minor*).

This marks the third described species of Keroplatidae from Burmese amber (Guo *et al.* 2017 [species of which are treated in Mycetophilidae]; Ross 2019). Cockerell (1917) described *Burmacrocera* (now placed in Orfeliini). Ševčík *et al*. (2020) described a second species (in the new genus *Adamacrocera*) belonging to a new putative primitive subfamily with similarities to Macrocerinae.

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