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Electroadicella unipetra sp. nov., a new fossil species of Leptoceridae (Insecta: Trichoptera) from Eocene Rovno amber

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Abstract

A new caddisflies species *Electroadicella unipetra* sp. nov. (Leptoceridae) is described and illustrated from Rovno amber (upper Eocene, 36 million years old). Now the family Leptoceridae is represented by five named species among 38 named species of caddisflies known from Rovno amber.

Key words caddisflies, *Electroadicella*, *Erotosis*, paleontology, taxonomy, Priabonian.

Introduction

The collections of caddisflies from the Rovno amber were studied for the first time in the early second decade of the 21st century (Melnitsky & Ivanov 2010, 2013, 2016 a, 2016b, 2023a, 2023b; Ivanov et al. 2016; Perkovsky 2017; Melnitsky et al. 2021a, 2021b, 2021c). Now forty-eight species of caddisflies are known from Rovno amber (Melnitsky & Ivanov 2023b).

The family Leptoceridae (long-horned caddisflies) comprises some 2000 species in the world fauna, of which 23 species reported from amber (Morse 2024). The genus *Electroadicella* known only from Eocene European amber is represented by six fossil species in the Paleogene resins of Europe: *Electroadicella eocaenica* Wichard, 2013, *Electroadicella succina* Wichard, 2013, *Electroadicella kuenowi* Wichard, Neumann et Werneburg, 2018 from Baltic amber, *Electroadicella bitterfeldi* Wichard, 2013 from Baltic and Bitterfeld amber, and *Electroadicella evidens* (Mey, 1986) and *Electroadicella concinnula* (Mey, 1988) from Bitterfeld amber. This paper describes a new species of this family from the Rovno amber originating from north-west of Ukraine. *Electroadicella* is the most

specious Eocene leptocerid genus that includes a third of the known long-horned caddisflies diversity in European ambers. All in all, four specimens and four species of *Electroadicella* are known from Baltic amber and four specimens and four species of *Electroadicella* were reported from Bitterfeld and Rovno amber; it indicates that the genus was more abundant in the warmer Bitterfeld and Rovno amber forests than in the Baltic amber forest: it is common for many cryophobic amber taxa (e. g. Telnov et al. 2021; Jenkins Shaw et al. 2023 and references therein).

Changing toponyms in the modern Ukraine requires some clarification. In the last ten years, the majority of the Rovno amber inclusions with known localities were collected in the former Vladimirets and Zarechnoje districts (now Varash District) (Colombo et al. 2021; Olmi et al. 2022) and former Dubrovitsa District (Fedotova & Perkovsky 2008; Khaustov et al. 2021) of the Rovno Region. Inclusions from Perebrody (Dietrich et al. 2021) and, particularly, Stare Selo (former Rokitne District, now Sarny District) in the northeast of the Rovno Region are significantly less documented. These inclusions were indicated mainly as originating from “Rovno Region”, especially when amber mined in former Rokitne District and Perebrody was mixed with smaller amount of amber mined in Varash District (e. g. Turbanov et al. 2023; Klesov in ‘Material examined’ indicated by mistake). The amber seller indicated that the piece containing the new species described here was mined in Dubrovitsa, Perebrody or Stare Selo. Earlier only one species, *Holocentropus flexiflagrum* Melnitsky et Ivanov, 2010 was documented from Dubrovitsa; all other species from Rovno Region with well-known locality were from Klesov except one species from Vyrka (Perkovsky 2017).

Material and methods

Rovno amber is the southern coeval with Baltic amber (Mitov et al. 2021). The inclusion was found in the piece with length 38 mm, width 37 mm and height 13 mm (weight 13.3 g after primary treatment). We have used the conventional methods for studying the insects in ambers (Rasnitsyn & Quicke 2002). Photographs were made with a Nikon SMZ1500 microscope; drawings were traced by these photographs with corrections based on microscope observations. The holotype of new species is housed in the Schmalhausen Institute of Zoology, Kiev (SIZK).

Systematic paleontology

Order Trichoptera Kirby, 1813

Suborder Integripalpia Martynov, 1924

Family Leptoceridae Leach, 1815

Genus *Electroadicella* Wichard, 2013

***Electroadicella unipetra* sp. nov.**

<https://zoobank.org/urn:lsid:zoobank.org:act:902F21BD-133B-4015-A5AA-82F09CA3899A>

(Figs 1 – 4)

Type material: Holotype. Male. SIZK UA–29640, Rovno amber, late Eocene. Syninclusions: stellate hairs.

Description. Body length 5.2 mm; forewing length 6.5 mm. Head, antennae yellow, abdomen and thorax grey-brown. Antennae very slim, with light trichoid sensilla. Pedicellus very narrow smaller than scapus. Wings light brown with long dark brown hairs. Mxp with long brown hairs, lbp with short white hairs. In forewing fork I short, DC closed. Legs narrow, spurs 1–2–2.

Male genitalia. Inferior appendages have two branches: long medial finger-shaped with rounded apex, and short tubercle-shaped lateral. The apex of lateral branch with bunch of long hairs; medial branch with numerous long hairs. A pair of long, narrow, pointed and recurved processes of unknown homology visible above inferior appendages are attached to the base of the inferior appendages. Segment X shorter than inferior appendages with extended elongate lateral processes. Preanal appendages elongate with numerous very long setae.



Figure 1. *Electroadicella unipetra* sp. nov. (holotype, male, Rovno amber, SIZK UA–29640, photo), general view, ventral. Scale bar = 1 mm.



Figure 2. *Electroadicella unipetra* sp. nov. (holotype, male, Rovno amber, SIZK UA–29640, photo), genitalia, ventral view. Scale bar = 0.1 mm.

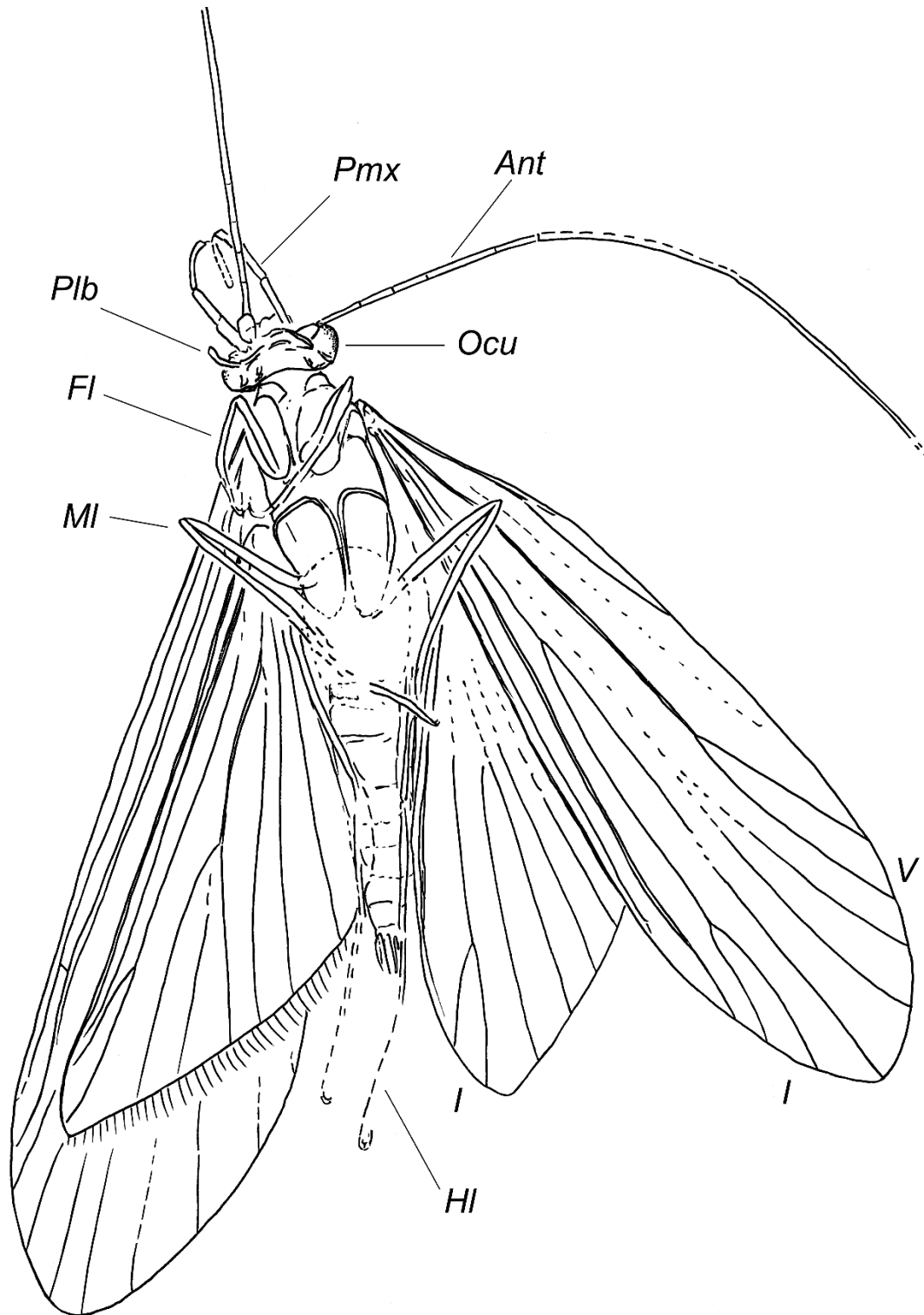


Figure 3. *Electroadicella unipetra* sp. nov. (holotype, male, Rovno amber, SIZK UA–29640, drawing), general view, ventral. Abbreviations: Ant – antenna, Fl – fore leg, HI – hind leg, MI – middle leg, Ocu – compound eye, Plb – labial palp, Pmx – maxillary palp; Latin numbers – wing forks I and V.

Comparison. Wing venation and genital structures suggest the new species to belong to the genus *Electroadicella* Wichard, 2013. The new species is similar to *Electroadicella succina* Wichard, 2013 from Baltic amber (Wichard 2013) in the general shape of genitalia. The new species *Electroadicella unipetra* sp. nov. differs from that species in very long medial branches of inferior appendages, reduced lateral branches, and in broad short X segment significantly shorter gonopods.

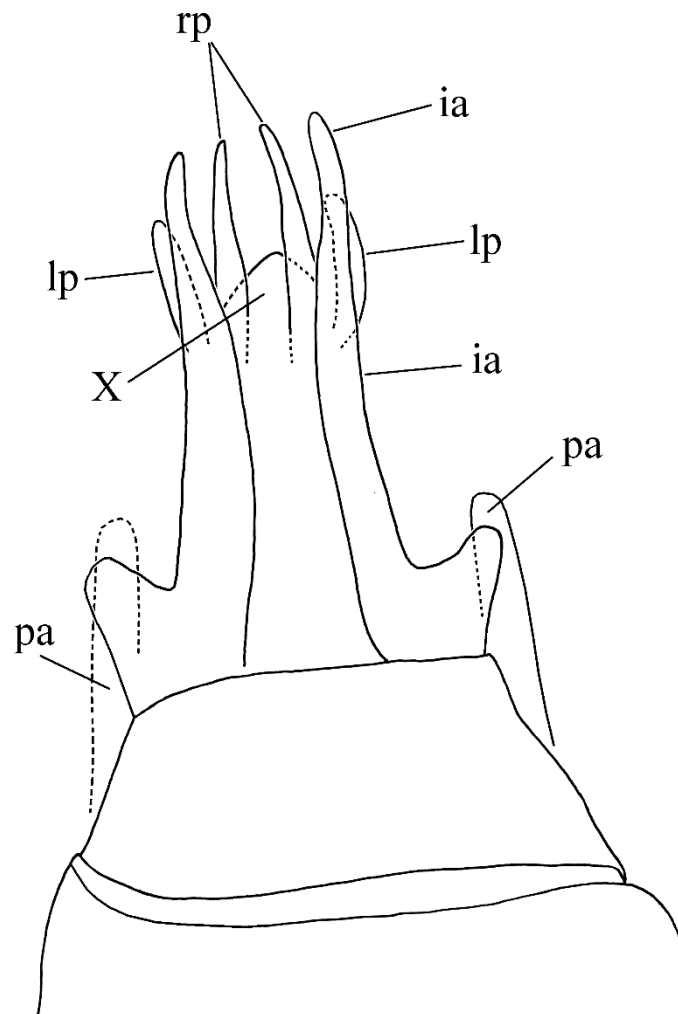


Figure 4. *Electroadicella unipetra* sp. nov. (holotype, male, Rovno amber, SIZK UA–29640, drawing), genitalia, ventral view. Hairs are omitted. Abbreviations: X – 10th segment; ia – inferior appendages, lp – lateral processes, pa – preanal appendages, rp – recurved processes.

Etymology. From Saint Petersburg State University (Universitas Petropolitana, in Latin) to commemorate its 300th anniversary in 2024.

Distribution. Priabonian Rovno amber.

Discussion

Thirty-eight named species of caddisflies are currently known from Rovno amber (Ivanov et al. 2016; Perkovsky 2017; Melnitsky et al. 2021a, 2021b, 2021c; Melnitsky & Ivanov 2010, 2013, 2016b, 2023a, 2023b; this paper). Only ten of these species (26%) are known also from Baltic amber. All Baltic amber species are reported from Rovno amber years ago (Melnitsky & Ivanov 2016b; Perkovsky 2017); on the other hand, many endemic species still await the description (Melnitsky & Ivanov 2016b). With addition of the undescribed species (Melnitsky et al. 2021c) these common faunal elements comprised only 17% of all Rovno caddisfly species (Melnitsky et al. 2021c); later three Rovno amber endemic species were added to the list (Melnitsky & Ivanov 2023 a, 2023b; this paper).

Supposed share of Rovno amber caddisflies species common with Baltic amber looks comparable with the share of beetles (14–15%, Sokolov et al 2024; Legalov et al. 2024a). Specifically, only one Baltic amber leptocerid species (20% of all named Rovno amber leptocerid species), i.e.

Erotesis aequalis Ulmer, 1912, is known from Rovno amber (Perkovsky 2017; this paper); *Ceraclea* sp. is reported from Rovno amber (Melnitsky & Ivanov 2016b) but the species remains undescribed; with addition of this species (genus *Ceraclea* Stephens, 1829 is unknown from Baltic amber) the share of Baltic amber species in Rovno leptocerid fauna will be 16.7%. Leptocerids are known as good fliers, but also thermophile or cryophobic (extant relict species *Erotesis baltica* McLachlan, 1877 is a rare exception), and this could be the main reason of the rarity of the common leptocerid species in the different amber faunas. *Electroadicella* and *Erotesis* McLachlan, 1877 (Bitterfeld *Erotesis* species missed in Ivanov et al. 2016) are two long-horned caddisflies genera reported from three European amber faunas.

The degree of similarity between the Baltic and Rovno amber faunas, strongly varies depending on the studied orders and superfamilies (Telnov et al. 2023). It was supposed that the high degree of similarity between the Danish and Baltic amber faunas (Legalov et al. 2024b) for a particular group might depend on a predominance of temperate elements in their compositions and/or a close connection with the resin-producing tree and the amber forest community as a whole. The Baltic and Rovno amber faunas also have apparent similarity. Both Baltic and Rovno amber caddisfly faunas include certain temperate elements such as genera *Beraeodes* Eaton, 1867 and *Plectrocnemia* Stephens, 1836 (Perkovsky 2013; Ivanov et al. 2016). The aquatic larvae of caddisflies have no connections with the amber trees, although the adult insects might have localities for mating and estivation. Warmer (Belokobylskij et al. 2023; Kirichenko-Babko & Perkovsky 2023) and supposedly more dry climate of Rovno as compared with Baltic amber forest as well as insularity of the Volhynian Uplift in late Eocene may result in more than 80% of Rovno amber caddisfly species being endemics or having northern distribution boundary at the late Eocene lying along the southern coast of the Subparatethys (Sokolov & Perkovsky 2020). The caddisflies of Baltic amber are well-studied (Ulmer 1912; Wichard 2013, etc.); with this background, importance of the Rovno amber caddisflies studies for the better understanding of European amber biota is difficult to overestimate.

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