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New *Euthygramma* (Insecta: Caloneurida) from the Kulchumovo Formation (Vyatkian Stage, Upper Permian) of Vyazovka (Orenburg Region of Russia)

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Abstract

Euthygramma storozhenkoi Rasnitsyn, **sp. nov.** is described in the family Caloneuridae (order Caloneurodea) based on the unique fossil from the uppermost Permian Kulchumovo Fm. in the Orenburg Region of Russia. The new record is the latest for the family and for the entire order.

Key words: Upper Viatkian Substage, latest Permian insect fauna, new taxa

Introduction

The insect order Caloneurida (= Caloneurodea) is a small strictly Paleozoic group spanned from the Moscovian (Middle Pennsylvanian) through Vyatkian (latest Permian) (Bethoux *et al*. 2004; Rasnitsyn *et al*. 2004). Its boundaries and affinities are left a subject of discussion: I follow Rasnitsyn *et al.* (2004) here, except for *Boltonaloneura* Rasnitsyn, 2002 synonymized under *Caloneura* Brongniart, 1885 by Bethoux *et al.* (2004). The recent finding described herein extends the time limit of the order up to the Upper Vyatkian Substage which represents the very end of the Permian Period.

Material and methods

The fossil under description is collected at the Vyazovka Site 25, a lens of gray-colored sand-silt-clayey deposits belonging to the Kulchumovo Formation (Upper Vyatkian Substage, Uppermost Permian), 0.6 km NE of the village of Vyazovka (Orenburg Region of southern Urals). The site has yielded almost 200 fossil insects of about a dozen orders, with the more common, in a dominance order, being Mecoptera, Homoptera, Neuroptera and Blattodea, yet the only insect species *Permotanyderites pseudopolycentropoides* Bashkuev, 2022 (Mecoptera) is described from this locality thus far (Bashkuev 2022; Sukatsheva & Sinitshenkova 2025).

The material of the present publication consists of a part and counterpart fossil collected by the field party of the Paleontological Institute, Russian Academy of Sciences (PIN) in 2021. It is kept at that institution. The fossil represents a pure imprint in relief on a piece of clay, with no organic matter preserved (Fig. 1). The material was studied and imaged using the Leica M165C stereomicroscope with the attached Leica DFC 425 digital camera; images were handled with Adobe Photoshop CS6 to adjust brightness and contrast and to combine the part and counterpart images into a composite image as explained in the caption to Fig. 1. Nomenclature of the wing venation follows Rasnitsyn *et al*. (2004).

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Systematic paleontology

Class Insecta Linnaeus, 1758

Order Caloneurida Handlirsch, 1906

Family Caloneuridae Handlirsch, 1906

Genus *Euthygramma* Martynov, 1928

Euthygramma Martynov, 1928: 50; Bethoux *et al*. 2004: 308; Rasnitsyn *et al*. 2004: 218 (key); *Pseudogramma* Carpenter, 1943: 70 [nom. praeoccup., synonymy by Bethoux *et al*. 2004]; *Paleuthygrammella* Engel, 1995: 221 [nom. nov. pro *Pseudogramma*, synonymy by Bethoux *et al*. 2004].
Type and only species: *Euthygramma parallelum* Martynov, 1928, by monotypy.

Euthygramma storozhenkoi Rasnitsyn, sp. nov.

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(Fig. 1)

Diagnosis. Differs from the type species in having: SC approaching C in basal quarter of wing length and fused with it possibly near wing midlength (*vs*. approaching near wing midlength and fusing near its last quarter in the type species); the space between M_5 and CuA is about as wide as that between M and M_5 (*vs*. distinctly narrower); CuP disappears near the wing midlength (*vs*. reaching at least the apical quarter of the wing); 1A and 2A are distinctly apart near the base (*vs*. anastomosing or nearly so there); size small fore wing some 10 mm (*vs*. some 20 mm).

Description. Wing (unknown if fore or hind one) long and narrow (7.2 mm long and 2.35 mm wide as preserved, probable wing length 10–11 mm, some 3.5× as long as wide), with costal margin almost straight (slightly convex in basal and apical quarters). Costal space (between C and R) narrow throughout. All veins simple as preserved (that is, within basal 0.75 of wing length). SC approaching C since beginning of wing 2nd quarter and becoming invisible (ending at C?) near end of 2nd third. RS neutral (neither convex nor concave), starting near wing midlength. M concave, M_5 thick, convex, fork of M and M_5 near basal 0.2 of wing length, fork of M and CuA near its basal 0.1. CuA and CuP both concave, running almost touching each other, CuP ending near wing midlength. 1A and 2A distant from very beginning (with no subbasal anastomosis). All spaces between R, RS, M, M_5 and CuA, and between CuP, 1A, 2A and wing hind margin of comparable width (that one between M_5 and CuA not distinctly narrowed comparing that between M and M_5) and crossed with subvertical crossveins spaced almost regularly (even though often incompletely preserved).

Type material. Holotype PIN, 5516/99; Vyazovka-25, Upper Permian, Upper Vyatkian, Kulchumovo Formation; part and counterpart of wing lacking apex and with some deformation.

Etymology. The species is named in honor of the outstanding Russian entomologist Prof. Sergey Yu. Storozhenko (FSC Biodiversity FEB RAS, Vladivostok, Russia) on his 70th birthday.

Discussion

The newly described species represents an important addition to our knowledge of the extinct insect order Caloneurida. It extends the stratigraphic range of the order up to the very end of the Permian. Before, the latest Caloneuridae, and the order Caloneurida in general, have been recorded a stage lower, from the uppermost Severodvinian deposits of Isady (= Mutovino) in Vologda region of Russia (Aristov *et al*. 2013). The new record shows also that the genus *Euthygramma*, previously monotypical and known as characteristic of the Lower Kazanian deposits in the East European Platform (abundant in the Iva-Gora Beds, Arkhangelsk Reg., and present in *Lingula* Beds, Tatarian Rep.), survived unnoticed until a new appearance with another species at the very end of the Permian Period. This implies a great potential of the Vyasovka deposits as a source of important information about the insects diversity and evolution at the last segment of the Permian Period before the famous (and still enigmatic: cf. Rasnitsyn 2012) P/T event.

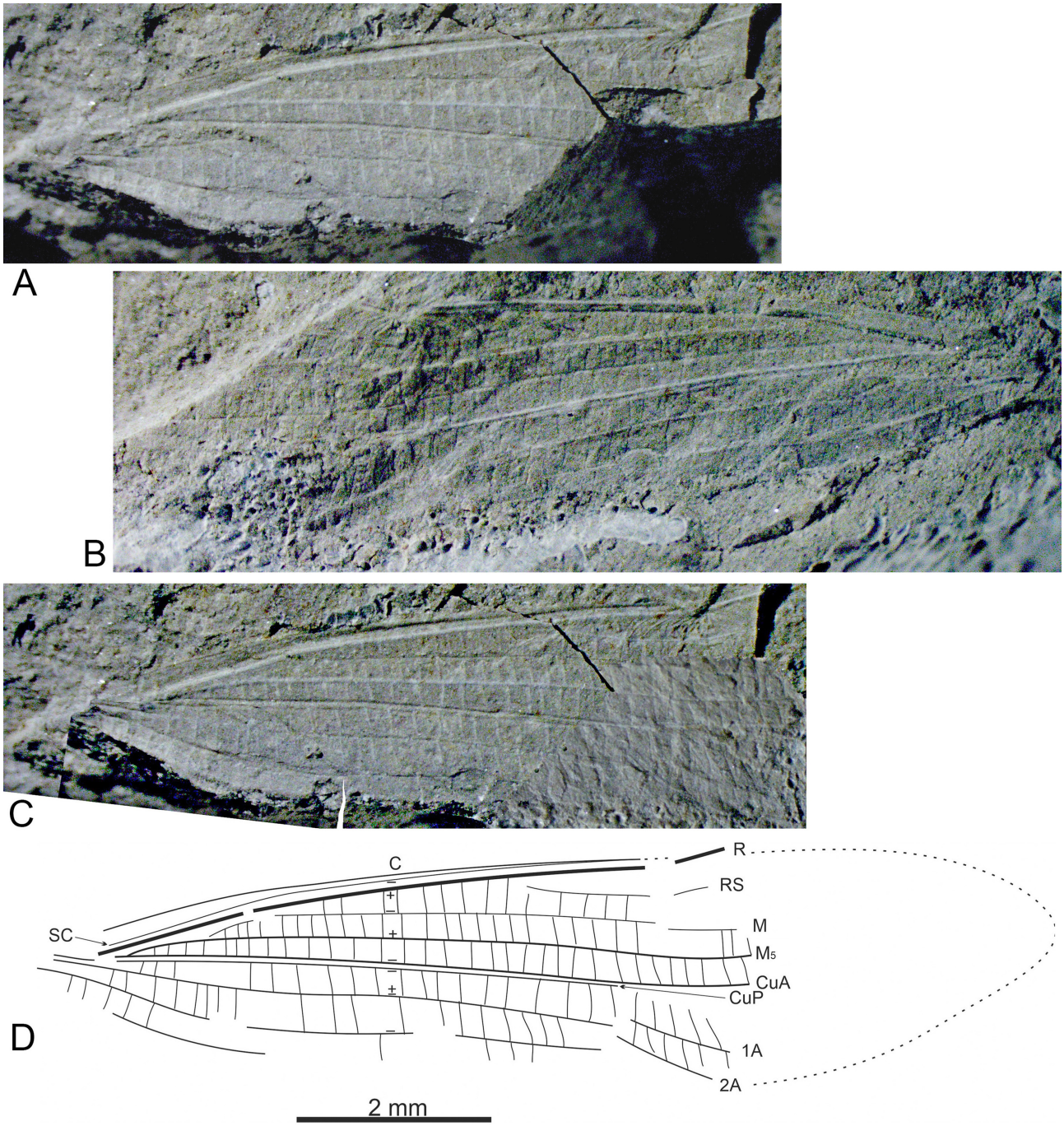

FIGURE 1. *Euthygramma storozhenkoi* **sp. nov.**, holotype PIN, 5516/99; Vyazovka-25, Upper Permian; wing. A part. B counterpart. C part and counterpart combined, with the counterpart twice mirrored (optically and digitally), to fit the part, and the resulted picture is locally corrected to turn the partially torn piece of wing to its original place. D Interpretation. Vein nomenclature standard. Dashed line denotes outline of missed wing apex restored after *Euthygramma parallelum* Martynov based on Béthoux *et al*. (2004, fig. 24), with bases of RS and M (RP and MA in their nomenclature, respectively) taken as landmarks for the outline restoration. Scale bar 2.0 mm; all images are to scale.

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