A new damselfly genus and species from Baltic amber
(Odonata: Zygoptera: Euphaeidae)

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Abstract – The new euphaeid genus and species, Wolfgangueuphaea ferweri Nel, are described from the Middle Eocene Baltic amber. It belongs to the Paleogene subfamily Eodichrominae. This new discovery confirms to remarkable past diversity of this family that contains now as many extinct genera and recent ones. They were distributed in North America and Europe, while the family is now-a-day only present in the Old World. There seems to have been a “replacement” of the Euphaeidae by the Calopterygidae during the latest Oligocene and the Neogene.

Keywords: Insecta / Eodichrominae / Middle Eocene / gen. et sp. nov / past diversity

Introduction

If the small damselfly family Euphaeidae is supposed to have emerged during the Cretaceous (Dumont et al., 2005), its relatively diverse fossil record goes back only into the Paleocene-Eocene. It comprises nearly as many fossil genera as extant ones, as compressions in rocks and in the Eocene Baltic amber (Nel et al., 2013). Nevertheless, fossils of these rather large damselflies remain exceptional, especially in amber. Therefore, the present description of a new, well-preserved fossil of this family from the Baltic amber is of great interest to confirm the remarkable past diversity of this family.

Materials and methods

The fossil is included in a relatively clear piece of amber, together with an adult Chironomidae and a Brachycera. Its ventral surface is darkened by organic remains.

Systematic Palaeontology

Order Odonata Fabricius, 1793
Suborder Zygoptera Sélys-Longchamps, 1854
Family Euphaeidae Sélys-Longchamps, 1853 (=Epallagi- 
dae Needham, 1903)

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Subfamily Eodichrominae Cockerell, 1923
Genus Wolfganguphaea Nel gen. nov.
Type species Wolfganguphaea ferweri Nel sp. nov.
Diagnosis. Very long pterostigma, arculus close to Ax1, but not aligned with it; two concave longitudinal secondary veins and a net of small cells in very broad cubito-anal area; free discoidal cell; five rows of cells between AA and posterior wing margin; a very long and straight secondary concave vein between RP1 and IR1; absence of double rows of cells in area between C and RA distal of pterostigma.

Etymology for genus and species names. Named after the first author Dr. Wolfgang Ferwer and the genus Euphaea.

Wolfganguphaea ferweri Nel sp. nov.

Figure 1

Holotype. MNHN.F.A.71315 (coll. Wolfgang Ferwer, a fragment of mesothorax, metathorax complete, with a well preserved hindwing and the basal half of the other; two basal abdominal segments present), stored at the MNHN, Paris.

Diagnosis. As for the genus, wings with colored areas at apex and in its middle.

Description. Thorax and abdomen poorly visible; no visible secondary genital structures on second abdominal segment (possibly a female); hindwing hyaline at base, a colored zone between arculus and distal two third of wing and another one in the apical quarter, wing 24.0 mm long, 6.8 mm wide; distance from base to arculus 2.6 mm; nodus in a basal position, 42% of wing length, distance from arculus to nodus 7.3 mm; from nodus to pterostigma 8.2 mm; from pterostigma to wing apex 1.7 mm; pterostigma very long, 5.0 mm long, 0.5 mm wide, covering 12 cells, with basal and distal sides very oblique, but basal margin even more oblique than distal margin; pterostigmal brace absent, vein RA slightly bulged and thickened along pterostigma; one row of cells in distal part of area between RA and RP1, and in area between C and RA distal of pterostigma; postnodal area basal of pterostigma narrow, postnodal crossveins numerous (about 19), not aligned with 20 corresponding postsubnodal crossveins; 19 antenodal crossveins of first row, four between primary antenodal brackets Ax1 and Ax2; some antenodal crossveins of second row distal of Ax2 but none between Ax2 and Ax1; Ax1 slightly basal to arculus; Ax2 opposite fork of RP; antesubnodal space with ca. 20 crossveins in both its basal and distal halves; nodal veinlet slightly more oblique than subnodal veinlet; kink of ScP at nodus very abrupt and Z-like; bases of RP3/4 and IR2 between nodus and arculus, 0.1 mm distal of arculus and opposite level of MAb; base of IR2 very close to midfork; RP1/2 arising on RP with a secondary insertion, but not fused to RA; base of RP2 opposite subnodus; no antefurcal crossveins between basal parts of RP and MA; MA, MP and RP3/4 weakly curved; postdiscoidal area widened distally with three to four rows of cells between MA and MP along posterior wing margin; all other areas between main veins distinctly broadened distally; base of IR1 six cells distal of that of RP2; IR1 basically straight but distal part curved; a long and straight concave secondary longitudinal vein between RP1 and IR1, closely parallel to IR1, two other secondary longitudinal vein more zigzagged between it and RP1 with two rows of cells between them; no oblique vein “O”; discoidal cell free quadrangular elongate, with costal side nearly straight, distal side MA perpendicular to MP; basal closure of discoidal cell with a dorsal arcular bracket; median space free; submedian space free (only CuP present); subdiscoidal space free; one row of cells between MP and CuA in its basal part, greatly broadened distally; cubito-anal area very broad with up to six rows of cells and two concave secondary longitudinal veins between CuA and posterior wing margin (“accessory anal vein”); CuA weakly zigzagged distally but simple, ending on posterior wing margin well basad of nodus level.

4 Discussion

An attribution of Wolfganguphaea gen. n. to Caloptera Belyshev and Haritonov, 1983 is supported by the following synapomorphies: midfork recessed basally to a position between 12–26% of wing length; pterostigmatic brace vein obsolete; basal closure of discoidal cell in forewings including development of a dorsal arcular bracket.

An attribution to Eucaloptera Bechly, 1996 is supported by the following synapomorphies: a rectangular discoidal cell; basal margin of pterostigma more oblique than distal margin; lestine oblique vein absent.

Affinities with Amphipterygida Bechly, 1996 are excluded because the secondary antenodal crossveins between ScP and RA distal of Ax2 are not suppressed and the antesubnodal space has crossveins in both its basal and distal halves. Philogangininae Kennedy, 1920 (Philoganga Kirby, 1890) also have these two characters but they have the base of IR2 very far distal of midfork, and RP1/2 not making a strong curve at its base, unlike in Wolfganguphaea gen. n.

An attribution to Calopterygomorpha is supported by the following synapomorphies: antenal area with very numerous antenodal crossveins that are very close together; kink of ScP at nodus very abrupt and Z-like; strong tendency towards a basal curving of RP1/2 which is arising on RP with a secondary insertion; discoidal cell clearly elongate.

Affinities with the Chlorocyphoidea Cowley, 1937 were excluded because the discoidal cell is not traversed by any crossvein; numerous rows of cells between MP and CuA; presence of numerous rows of cells between CuA and the posterior wing margin; basal part of the antesubnodal space...
with crossveins (no “chlorocyphoid gap”); RP3/4 not distinctly waving; MA not distinctly upward curved immediately after the discoidal cell.

Wolfgangueuphæa gen. n. has a set of characters present in Euphaeida Bechly, 1996 and Calopterygoidea Séllys-Longchamps, 1850, viz. strongly developed dorsal discoidal bract on the distal side MBA of the discoidal cell and on the subdiscoidal veinlet (basal CuA). Bechly (1996) proposed this character as autapomorphy of Euphaeida Bechly, 1996, but it is also present in Calopterygoidea; RP1/2 strongly curved after its base, arising on RP with a secondary insertion, even if not fused to RA for a short distance; discoidal cell rather elongate and narrow; both rows of antenalodan crossveins are strictly aligned and developed as bractlets so that the two primary antenalodan bractlets Ax1 and Ax2 cannot be clearly identified.

An attribution to Heliocharitidae or to Calopterygoidea (Calopterygida in Bechly, 1996, but see Fleck et al., 2012) is unlikely because the discoidal cell is free in Wolfgangueuphæa gen. n., unlike being traversed by at least one crossvein in these groups (but some Epallaginae also have a crossed discoidal cell, see below). Also, the family Heliocharitidae Tillyard et Fraser, 1939 is excluded because the primary antenalodan crossveins cannot be clearly distinguished from the secondary ones and the nodal veinlet is as oblique as the subnodal veinlet. An attribution to Calopterygoidea Séllys, 1850 is also unlikely because the submedian space (especially the subdiscoidal cell) is free, so that the CuP-crossing is identifiable, unlike in this superfamility.

Within Euphaeida, Polythoridae are excluded for the discoidal cell not touching RA. Within Epallaginae Needham et al., 2007, second group of Euphaeida, the base of IR2 very close to midfork would exclude affinities with Zacallitidae Cockerell, 1928 and Epallaginae Needham, 1903 (Cockerell, 1928).

Further significant distinctions from all extant Euphaeidae are the enlarged cubito-anal area with accessory concave “anal” veins (synapomorphy with Eodichrominae); the approximation of Ax1 and Ax2 (synapomorphy with Eodi-chrominae); the absence of antefurcal crossveins between the basal parts of RP and MA (synapomorphy with Eodichrominae).

Wolfgangueuphæa gen. n. differs from Parazacallites aquisextanea Nel, 1988 in the quite longer pterostigma, position of the arculus close to Ax1, but not aligned with it; and the less developed longitudinal secondary veins in cubito-anal area (Nel, 1988). Wolfgangueuphæa gen. n. differs from Eodichroma mirifica Cockerell, 1923 in the quite broader cubito-anal area; longer pterostigma, and its more basal position of the nodus (Cockerell, 1923). Wolfgangueuphæa gen. n. differs from Labaneardea Petrulević et al., 2007 in the different shape of cells in anal area (a net of small cells instead of a series of very long transverse cells), the longer pterostigma, the quite longer secondary concave vein between RP1 and IR1, and the absence of double row of cells in area between C and RA distal of pterostigma (Petrulević et al., 2007). Wolfgangueuphæa gen. n. shares with Litheuphæa ludwigi Bechly, 1998 (Eocene Baltic amber) the broad cubito-anal area, but it has two secondary concave veins in this area instead of one in L. ludwigi, it has no double rows of cells in area between C and RA distal of pterostigma, base of RP2 well aligned with the subnodus, and a very long and straight secondary concave vein between RP1 and IR1, not noticed by Bechly (1998).

5 Conclusion

The Euphaeidae are a relatively small family of damselflies compared to the Calopterygidae (ca. four extant genera and 69 species vs. 17 genera and 176 species) (Davis et al., 2011). Nevertheless, the situation seems to have been different during the Paleogene, as no less than eight described fossil genera contra four for the Calopterygidae. Also, the extant Euphaeidae are restricted to the old world while they are recorded during the Paleogene in North America and Europe. Thus, this family was probably more diverse and widespread during this period than now-a-day. The present discovery confirms this assumption. Also, if an Eocene genus and species of the extant Euphaeinae is described from the Baltic amber, all other representatives of the family belong to the extinct subfamily Eodichrominae. Dumont et al (2005) dated the diversification of the Euphaeidae ca. 110 Myrs ago and the beginning of the diversification of the Calopterygidae ca. 120 Myrs ago. Davis et al. (2011) proposed that the “lineage leading to Polythoridae + Calopterygidae” knew a significant upshift of diversification, but did not indicated its date. It seems to have been rather recent, during the late Paleogene and the Neogene.

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