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A new fossil damselfly species (Insecta: Odonata: Zygoptera: Coenagrionidae: Ischnurinae) from Dominican Amber

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With 7 Figures

Summary

The new damselfly species *Ischnura velteni* n. sp. (Coenagrionidae: Ischnurinae) is described from Dominican amber. It is the first fossil record of the coenagrionid genus *Ischnura* and one of the smallest known fossil odonates.

Zusammenfassung

Die neue Kleinlibellenart *Ischnura velteni* n. sp. (Coenagrionidae: Ischnurinae) wird aus dem Dominikanischen Bernstein beschrieben. Es handelt sich um den ersten Fossilnachweis der Coenagrionidengattung *Ischnura* und um eine der kleinsten bekannten fossilen Libellen.

1. Introduction

SCHLEE & GLÖCKNER (1978: 26) and BARONI URBANI & SAUNDERS (1983: 216) were the first who reported the presence of damselflies (Coenagrionoidea) in Dominican amber (SPAHR, 1992: 12). POINAR (1992: 99, 287) still wrote that “undescribed Odonata also have been identified in Dominican amber ... and figured in SCHLEE (1990: 82, figs 60–61)”. ORR (1993) and DONNELLY (1993) reported about two further fossil odonates from this locality. GRIMALDI (1996: 78) figured a very nice damselfly in Dominican amber from a private collection. Even though about 18 fossil odonates are meanwhile known from Dominican amber according to BECHLY (1996a, 1998), only one species, *Diceratobasis worki* (Coenagrionidae), has yet been described by POINAR (1996), which was also mentioned by POINAR (1999: 34, 87, 91). Finally, an isolated wing of an aeshnid dragonfly which is exhibited at the Amber World Museum in Santo Domingo was recently figured by CARIDAD (1998: 86–87).

In this work I describe a new coenagrionid damselfly species from Dominican amber which represents the first fossil record of the widespread genus *Ischnura* and one the smallest known fossil odonates.

2. Material and methods

The drawings were made with a camera lucida and a Wild M5 binocular microscope, while the photo was made with a Canon SLR camera on a phototube for the same microscope. The nomenclature of the dragonfly wing venation is based on the interpretations of RIEK & KUKALOVÁ-PECK (1984), amended by NEL et al. (1993) and BECHLY (1996b), and the phylogenetic classification is based on BECHLY (1996b, 2000). The systematic analysis is based on the principles of consequent Phylogenetic Systematics (sensu HENNIG, 1966, 1969, and WÄGELE, 2000)

3. Systematic Palaeontology

Class Insecta LINNEAUS, 1758 (= Hexapoda LATREILLE, 1825)

Pterygota BRAUER, 1885

Order Odonata FABRICIUS, 1793

Suborder Zygoptera SELYS, 1854

Superfamily Coenagrionoidea KIRBY, 1890

Family Coenagrionidae KIRBY, 1890

Subfamily Ischnurinae¹ FRASER, 1957

Genus *Ischnura* CHARPENTIER, 1840

Ischnura velteni n. sp.

Figs 1–7

Holotype: Female specimen SMNS no. Do-5687 (old no. 4) in collection of the Staatl. Museum f. Naturkunde, Stuttgart, Germany. This specimen was kindly donated to this museum by Mr JÜRGEN VELTEN (Idstein).

Type locality: Dominican Republic. Unfortunately the mine from which this piece originated is not known.

Geological age: Tertiary, Eocene to Miocene (SCHLEE, 1990; POINAR, 1996) but precise age is unknown, Dominican amber.

Derivation of name: Named in honour of Mr JÜRGEN VELTEN (Idstein), the collector of the type specimen.

Diagnosis. – This new *Ischnura* species is characterized by the following combination of characters: Tiny size (female hindwing length only 11.5 mm); narrowed area between the bases of IR2 and RP3/4 in the hindwing (as e.g. in *I. capreola* and *I. hastata*); arculus aligned with Ax2 (contrary to *I. capreola*); anal vein separating from hind margin distinctly basal of CuP-crossing; pronotum is saddle-shaped with

¹ The subfamily name Ischnurinae FRASER, 1957 is a junior homonym of the scorpion family Ischnuridae SIMON, 1879. Therefore, a conservation of Ischnurinae as the correct spelling of Ischnurinae has been proposed as case 3120 to the ICZN by FET & BECHLY, 2000. Since this case is not yet decided, I here retained the original spelling.

the posterior part being strongly bulged, while the anterior part is distinctly dorsally projecting; mesepisternum and dorsal half of the metepisternum dark-coloured.

Description. – A tiny female damselfly preserved in a small piece of clear Dominican amber (13 mm x 20 mm). The distal parts of the wings and the apex of the abdomen are missing.

Body: The head is max. 2.9 mm wide and 1.5 mm long; the compound eyes are widely separated, and the median lobe of the labium is broadly fissured; the dorsum of the head is totally dark without visible postocular spots, but this might be due to an artifact of preservation; the 3 ocelli are visible and look like those of all Coenagrionidae. The pronotum is saddle-shaped with the posterior part being strongly bulged, while the anterior part is distinctly dorsally projecting. The pterothorax is 3.2 mm long and max. 1.5 mm high, thus rather slender; the mesepisternum and the dorsal half of the metepisternum are dark-coloured, without obvious bright spots. The legs are relatively short (lengths of segments: profemur 1.3 mm and protibia 1.5 mm; mesofemur 1.5 mm and mesotibia 1.8 mm; metafemur 1.9 mm and metatibia 2.1 mm) with few and short spines. The tarsal claws have an apical tooth. Lengths of abdominal segment I 0.6 mm and of segment II 1.3 mm (segment III-V are incompletely preserved and the rest of the abdomen is missing). The dorsum of the first abdominal segment is dark-coloured. There is no secondary copulatory apparatus on the second and third abdominal segment, thus it is a female specimen.

Forewing: Only the bases of the forewings are preserved. Distance from base to arculus 2.4 mm; Ax1 and Ax2 are aligned and bracket-like; Ax2 is aligned with arculus and 0.8 mm distal of Ax1; no secondary antenodal crossveins; no antesubnodal crossveins; arculus kinked (“broken”); origins of RP and MA (sectors of arculus) distinctly separated at arculus; discoidal cell basally closed and with acute distal angle (length of basal side 0.21 mm; length of ventral side 0.57 mm; length of the very short dorsal side 0.15 mm; length of distal side MAb 0.43 mm); MAb aligned with subdiscoidal veinlet; basal space free; cubital cell free (except for CuP-crossing, 1.9 mm distal of wing base); anal vein separates from wing margin 0.5 mm basal of CuP-crossing; wing base very narrow, and distinctly petiolated (length of petiole 1.4 mm).

Hindwing: Only the base of the right hindwing is preserved, while the left hindwing is preserved for half of its length. Estimated total length, 11.5 mm (based on a comparison of the corresponding wing portion with the tiny extant species *Ischnura capreola* which has the nodus at 39% of the hindwing length); width at wing base 0.4 mm; width at nodus 1.8 mm; distance from base to nodus 4.5 mm; distance from base to arculus 2.5 mm; Ax1 and Ax2 are aligned and bracket-like; Ax2 is aligned with arculus and 0.9 mm distal of Ax1; no secondary antenodal crossveins; no antesubnodal crossveins; arculus kinked (“broken”); origins of RP and MA (sectors of arculus) distinctly separated at arculus; postnodal crossveins aligned with the postsubnodal crossveins and the rows of crossveins below; discoidal cell basally closed and with acute distal angle (length of basal side 0.16 mm; length of ventral side 0.75 mm; length of dorsal side 0.39 mm; length of distal side MAb 0.36 mm); the discoidal cell is more elongate than in the forewing; MAb aligned with subdiscoidal veinlet; basal space free; cubital cell free (except for CuP-crossing, 2.0 mm distal of wing base); anal vein separates from wing margin 0.4 mm basal of CuP-crossing; wing base very narrow, and distinctly petiolated (length of petiole 1.5 mm); cubito-anal area with only one row of cells; CuA basally straight but distally zigzagged; MP

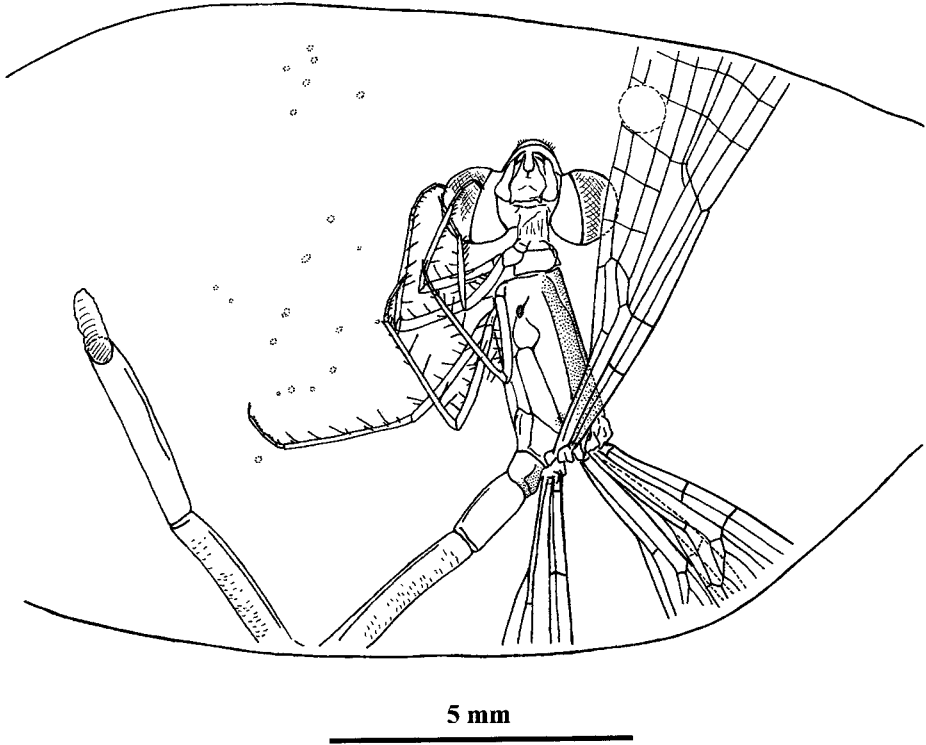


Fig. 1. *Ischnura velteni* n. sp., female holotype SMNS no. Do-5687 (see also Fig. 6). Scale 5 mm.

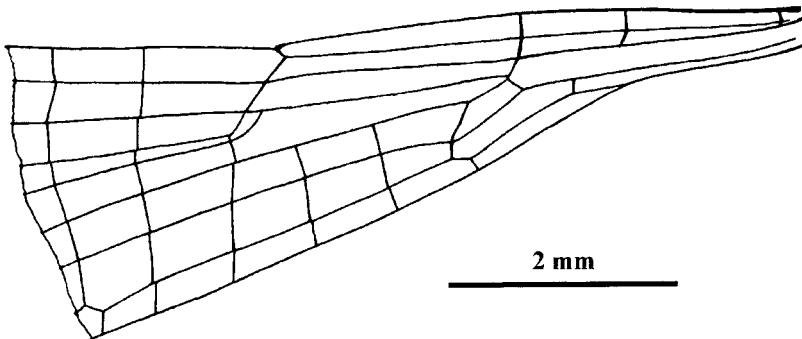


Fig. 2. *Ischnura velteni* n. sp., female holotype SMNS no. Do-5687, left forewing (in ventral aspect). Scale 2 mm.

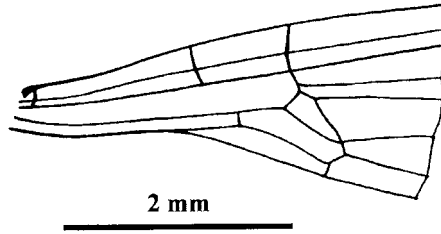


Fig. 3. *Ischnura velteni* n. sp., female holotype SMNS no. Do-5687, left hindwing. Scale 2 mm.

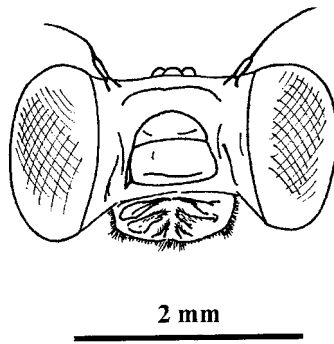


Fig. 4. *Ischnura velteni* n. sp., female holotype SMNS no. Do-5687, head (frontal aspect). Scale 2 mm.

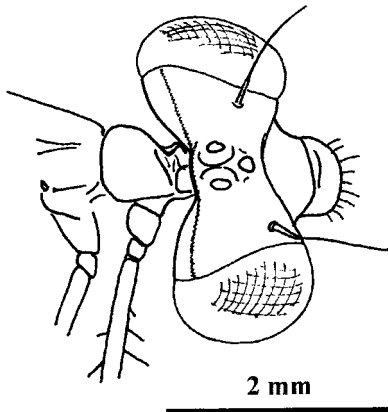


Fig. 5. *Ischnura velteni* n. sp., female holotype SMNS no. Do-5687, head (dorsal aspect) and prothorax (lateral aspect) (see also Fig. 7). Scale 2 mm.

is not bent directly distal of the discoidal cell; postdiscoidal area narrow with only one row of cells; MA basally straight; RP3/4 and MA with only one row of cells between them; first branching of RP only 0.15 mm basal of subnodus; base of IR2 aligned with subnodus; area between the bases of IR2 and RP3/4 consequently very narrow; nodal crossvein and subnodus are oblique; the area of the potential lestine oblique vein 'O' between RP2 and IR2 is not preserved, but probably there was none as in all other Coenagrionoidea. Unfortunately, the distal half of the wing with the pterostigma is not preserved.

Systematic position. – This new species can be attributed to Euzygoptera BECHLY, 1996 because of the following synapomorphies: Only one row of cells between CuA and the hind margin of wings in the groundplan; only the two primary antenodal brackets Ax1 and Ax2 are retained in the antenodal space; antesubnodal space without any crossveins; no antefurcal crossveins present in the space between RP and MA from arculus to midfork.

It shares with Coenagrionomorpha BECHLY, 1996 the following synapomorphies: Postnodal and postsubnodal crossveins aligned; lestine oblique vein secondarily absent; basal closure of discoidal cell in forewings.

It shares with Coenagrioniformia BECHLY, 1996 the following synapomorphies: Subnodus aligned with the base of IR2 that is at least somewhat strengthened and dorsally united with the subnodus by a common sclerotisation (interradial bracket); hexagonal and pentagonal cells secondarily absent; postnodal crossveins aligned with the rows of crossveins below, formation of several pseudo-transverse veins in the distal part of the wing, caused by an alignment of the postnodal rows of crossveins between the costal margin and the hind margin; intercalary veins (except IR1 and IR2) secondarily absent.

It shares as synapomorphy with Coenagrionodea BECHLY, 1996 the complete suppression of a terminal kink of CP at nodus and a nodal membrane sclerotisation.

It shares as synapomorphy with Coenagrionidae KIRBY, 1890 that the distal discoidal vein MAb is very oblique, so that the anterior side of the discoidal cell is much shorter than the posterior side.

It lacks the autapomorphies of the coenagrionid subfamilies Argiinae TILLYARD, 1917, Agriocnemidinae FRASER, 1957, Leptobasinae DAVIES & TOBIN, 1984 listed by Bechly (1996, 2000). For the coenagrionid subfamilies Coenagrioninae KIRBY, 1890 and Pseudagrioninae TILLYARD, 1917 no autapomorphies are known yet, and the only known putative autapomorphy of Ischnurinae FRASER, 1957 (viz the presence of a prominent ventral vulvar spine on the apical margin of the 8th abdominal segment in adult females) is variable in extant *Ischnura* species and not visible in the fossil holotype anyway since the apex of the abdomen is missing. The very narrow area between the bases of IR2 and RP3/4 in the hindwing, is a distinctive feature that occurs in several species of Ischnurinae (e.g. *Ischnura capreola*), but is rather variable as well. Nevertheless, this fossil specimen can be attributed to the extant genus *Ischnura* because of the following diagnostic characters: Very small size; wings strongly petiolated with the anal vein separating from the hind margin well before the CuP-crossing; legs relatively short; tibial spurs few and short. All visible characters of this fossil completely agree with the diagnosis of *Ischnura*. Even though this evidence appears to be somewhat weak, the attribution based on the general habitus is rather well-founded. WESTFALL & MAY (1996: 438) wrote about extant *Ischnura* that this genus is “usually easy to recognise but rather hard to characterize precisely”.



Fig. 6. *Ischnura velteni* n. sp., female holotype SMNS no. Do-5687. Without scale (compare Fig. 1).



Fig. 7. *Ischnura velteni* n. sp., female holotype SMNS no. Do-5687, head and pronotum. Without scale (compare Fig. 5).

Discussion. – The genus *Ischnura* is probably the most truly cosmopolitan genus of Zygoptera, occurring almost wherever Odonata are found (WESTFALL & MAY, 1996). Some of the species of this genus rank among the smallest extant odonates. The discovery of this new fossil species demonstrates that this genus already existed in the Oligocene/Miocene at least.

4. Acknowledgements

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