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Short communication

A new genus and species of damsel-dragonfly (Odonata: Stenophlebiidae) from the Lower Cretaceous of Inner Mongolia, China

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ABSTRACT

A taxon of the Stenophlebiidae, *Yixianstenophlebia magnifica* gen. et sp. nov., is described from the Lower Cretaceous Yixian Formation at Liutiaogou, Ningcheng County, Inner Mongolia of China. Its closest relative is the Late Jurassic European genus *Stenophlebia*. This new discovery is helpful to understand the Jehol Biota assemblage at Liutiaogou Locality. It also confirms that the Stenophlebiidae was a very diverse and widespread family during the Early Cretaceous. The causes of its extinction in the Late Cretaceous remain enigmatic.

1. Introduction

The damsel-dragonfly clade Stenophlebioptera is exclusively distributed in the Mesozoic, flourishing between the Late Jurassic and the Early Cretaceous. Its youngest known representative comes from the Cenomanian of France (Nel et al., 2015). This clade is currently considered as the putative sister group of the Anisoptera and has been the subject of a relatively recent revision by Fleck et al. (2003). It seems it was widespread as fossils are known from South America, Europe, and Central Asia. Up to now, only one badly preserved Chinese fossil has been attributed to the family Stenophlebiidae (Hong, 1984). Here we describe a well-preserved new fossil from the Lower Cretaceous of China and attribute it to a new genus and species, closely related to the type genus *Stenophlebia*.

2. Material and methods

The specimen is preserved on a large slab of fine, laminated, yellowish shale from the Lower Cretaceous Yixian Formation at Liutiaogou, Xiangyang Township, Ningcheng County, Chifeng City, Inner Mongolia, NE China (Fig. 1). The Liutiaogou locality has yielded a relatively new assemblage of the famous Jehol fauna, particularly abundant lampreys (Chang et al., 2006, 2014). The precise age is likely around 129.7–122.1 Ma (Barremian to early Aptian) (Chang et al., 2009; Yan et al., 2012). The Liutiaogou assemblage also yielded a very rich entomofauna, including diverse dragonfly groups. Until now, there are two dragonfly genera and species described from this locality, *Sinahemeroscopus magnificus* and *Mongoliaeshna sinica* (Huang and Nel, 2010; Nel and Huang, 2010).

It was examined and measured using an incident light stereomicroscope (Olympus SZX9) and a stereomicroscope (Nikon SMZ 1500), and a Leitz Wetzlar binocular microscope. Photographs were taken using a Zeiss Discovery V20 microscope system. Optical instruments are equipped by drawing tubes and digital camera and combined using Adobe Photoshop software.

We follow the wing venation nomenclature of Riek and Kukalová-Peck (1984), amended by Nel et al. (1993) and Bechly (1996). The higher classification of fossil and extant Odonatoptera, as well as familial and generic characters followed in the present work are based on the phylogenetic system proposed by Bechly (1996, 2014) and Fleck et al. (2003) for the revision of the Stenophlebioptera. Abbreviations for wing venation are as follow: AA = analis anterior; CuA = cubitus anterior; CuP = cubitus posterior; discoidal triangle = t, hypertriangle = h, IR = intercalary

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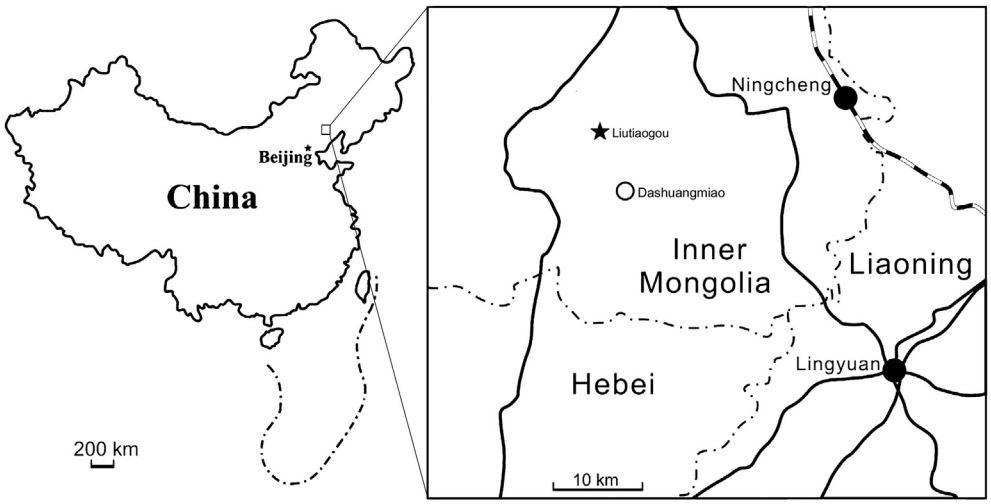

Fig. 1. Map showing the location of the type locality.

radial vein; MA = media anterior; MP = media posterior; N = nodus, nodal crossing = Cr, Pt = pterostigma, RP = radius posterior, subcostal posterior = ScP, subnodus = Sn.

3. Systematic palaeontology

Order: Odonata Fabricius, 1793

Infrasuperorder: Stenophlebioptera Bechly, 1996
Superfamily: Stenophlebioidea Pritykina, 1968
Family: Stenophlebiidae Needham, 1903

Type genus. Stenophlebia Hagen, 1866.

Other genera. Sinostenophlebia Hong, 1984, *Cretastenophlebia* Fleck et al., 2003, *Hispanostenophlebia* Fleck et al., 2003, *Mesostenophlebia* Fleck et al., 2003, *Cratostenophlebia* Bechly, 2007, *Gallostenophlebia* Nel et al., 2015, *Yixianstenophlebia* gen. nov.

Yixianstenophlebia gen. nov.

Derivation of name. Named after the Yixian Formation and "Stenophlebia". Gender feminine.

Type species. Yixianstenophlebia magnifica sp. nov.

Diagnosis. Wing characters only. Discoidal triangles well transverse with a nearly right angle between MAa and MAb; hind wing with a broad anal area with three rows of cells between AA and posterior wing margin; wings very shortly petiolate; subnodus Sn not aligned with nodal Cr; hind wing vein CuAa short, ending on posterior wing margin well basal of nodus level; presence of four rows of cells in postdiscoidal area just distal of discoidal triangle (autapomorphy, as all Stenophlebiomorpha have three row of cells or less).

Yixianstenophlebia magnifica sp. nov.
Figs. 2–10.

Derivation of name. Named after the large size and good condition of preservation of the type specimen.

Type material. Holotype NIGP162224, Nanjing Institute of Geology and Paleontology, Academia Sinica, China.

Type locality and horizon. Lower Cretaceous Yixian Formation; Liutiaogou, Ningcheng County, Inner Mongolia, China.

Fig. 2. *Yixianstenophlebia magnifica* gen. et sp. nov., holotype NIGP162224, photograph of general habitus. Scale bar represents 10 mm.

Fig. 3. *Yixianstenophlebia magnifica* gen. et sp. nov., holotype NIGP162224, photograph of body. Scale bar represents 5 mm.