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Honghea xui gen. et sp. nov., the second Earliest Jurassic damsel-dragonfly (Odonata: Campterophlebiidae) from the Junggar Basin, NW China

Honghea xui *gen. et sp. nov. Le deuxième exemple de demoiselle-libellule (Odonata : Campterophlebiidae) du Jurassique inférieur du bassin de Junggar, Chine nord-occidentale*

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ABSTRACT

A new campterophlebiid damsel-dragonfly, *Honghea xui* gen. et sp. nov., is described from the Lower Jurassic Badaowan Formation of the Junggar Basin, NW China. This is the second Chinese Campterophlebiidae recorded for the earliest Jurassic, reflecting the quick diversification and radiation of the damsel-dragonflies during this period. *H. nouveau onghea* gen. nov. is closely related to Chinese genera *Zygokaratawia* and *Ctenogampsophlebia*, both from the Middle Jurassic of the Daohugou Biota; but differs from these genera in having a larger wing size, RP2 slightly distal of Sn, and a narrower area between IR2 and RP3/4.

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RÉSUMÉ

Un nouveau camptérophlébiidé, *Honhea xui* gen. et sp. nov., demoiselle-libellule est décrit dans la formation Badaowan du Jurassique inférieur du bassin de Jungaar, Chine nord-occidentale. Il s'agit du deuxième Camptophlebiidae chinois répertorié dans le Jurassique le plus ancien, qui reflète la diversification et la radiation rapides des demoiselles-libellules pendant cette période. *Honghea* gen. nov. est très proche des genres chinois *Zygokaratavia* et *Ctenogamsophlebia*, tous deux du Jurassique moyen du Daohugou Biota, mais en diffère par une plus grande taille des ailes, RP2 légèrement distal de Sn et une zone plus étroite entre IR2 et RP3/4.

Mots clés :
Campterophlebiidae
Demoiselle-libellule
Odonata
Jurassique le plus ancien
Bassin de Jungaar
Chine

1. Introduction

Campterophlebiidae Handlirsch, 1920 is the largest family of the clade Isophlebiida Bechly, 1996 (Fleck and Nel, 2002). Ten genera were recorded from the Lower Jurassic–Lower Cretaceous of northern China, mostly from the Middle Jurassic of Inner Mongolia (Zheng et al., 2016). In this paper, we describe a very well-preserved campterophlebiid dragonfly attributable to a new genus and species from the Lower Jurassic Badaowan Formation of the Tuziakeneigou outcrop of the Junggar Basin, northwestern China. This outcrop yielded hundreds of insect fossils including another campterophlebiid damsel-dragonfly: *Dorsettia sinica* Zheng et al., 2016. The insect assemblage of this outcrop closely resembles that of the Lower Lias of Dorset, England, and both insect faunas probably exchanged during Early Jurassic.

2. Material and methods

The damsel-dragonfly described herein was collected from the middle part of the Badaowan Formation of the Tuziakeneigou outcrop, Karamay City, Xinjiang, northwestern China (locality in Zheng et al., 2016: fig. 1). Abundant bivalves, gastropods, spinicaudatans, insects, sporopollen, and plants were reported from the Badaowan Formation (Deng et al., 2010), which was considered to be uppermost Rhaetian–Sinemurian stages (Sha et al., 2015). The insect fauna in this section is represented by *Protorthophlebia latipennis* and *Dorsettia*, both have recorded in the Lower Lias of England, and was regarded as earliest Sinemurian in age (Zheng et al., 2016).

The specimen was examined dry using a Nikon SMZ1000 stereomicroscope. Observation was augmented by temporary wetting with laboratory alcohol which improved the contrast between the fossil and the matrix, eliminating the surface irregularity of the latter. Photographs were taken using a Canon 5D digital camera and the line drawings were prepared from photographs using image-editing software (CorelDraw X7 and Adobe Photoshop CS6). The specimen is housed in the Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences (NIGPAS).

The higher classification of fossil and extant Odonatoptera is based on the phylogenetic system of Bechly (1996). The nomenclature of the dragonfly wing venation used in this paper is based on the interpretations of Riek (1976) and Riek and Kukalová-Peck (1984), as modified by Nel et al. (1993) and Bechly (1996). Wing abbreviations are as follows: AA: anterior anal; AP: posterior anal; Arc: arculus; Ax: primary antenodal crossvein; C: costa; Cr: nodal crossvein; CuAa: distal branch of anterior cubitus; CuAb: proximal branch of anterior cubitus; CuP: posterior cubitus; DC: discoidal cell; IR: intercalary radial vein; MAa: anterior branch of anterior median; MAb: posterior branch of anterior median; MP: posterior median; N: nodus; "O": oblique vein; Pt: pterostigma; RA: anterior radius; RP: posterior radius; Sn: subnodal crossvein; ScP: posterior subcosta.

3. Systematic palaeontology

Order ODONATA Fabricius, 1793
Subordinal clade ISOPHLEBIOPTERA Bechly, 1996
Subclade ISOPHLEBIIDA Bechly, 1996
Superfamily ISOPHLEBIOIDEA Handlirsch, 1906–1908
Family CAMPTEROPHLEBIIDAE Handlirsch, 1920

Genus ***Honghea*** gen. nov.

Type species. *Honghea xui* sp. nov.

Etymology. The generic name is after the Chinese palaeobotanist Dr Honghe Xu, in gratitude for his help with fieldtrip.

Diagnosis. Wing length ca. 45 mm; distal angle of discoidal cell not quite acute; Ax1 and Ax2 of convergent obliquity; no antefurcal crossveins; basal area between MAa and MP slightly narrower than that between MP and CuA; Pt broad, not braced; MAa short, ending on MP just below IR1 base; RP2 base slightly distal of Sn; CuAa with one row of long cells between it and MP; CuAa with one or two rows of cells between it and posterior wing margin; RP2, IR2, RP3/4 nearly straight; one row of long cells between MAa and MP, IR2 and RP3/4, and RP2 and IR2.

Honghea xui sp. nov. (Figs. 1–5)

Etymology. The specific name is after Dr Honghe Xu.

Material. Holotype, NIGP165288a, b, part and counterpart of a well-preserved male damsel-dragonfly (Fig. 1A–B); deposited in the NIGPAS.

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