

**FUXIAESCHNA HSIUFUNIA GEN. NOV., SPEC. NOV.,
A NEW LOWER CRETACEOUS DRAGONFLY
FROM NORTHWESTERN CHINA
(AESHNOPTERA: RUDIAESCHNIDAE)**

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The new gen. and sp. are described and illustrated from the Luohandong Formation of Huating Co., Gansu province, P.R. China, from a single, almost complete specimen. Holotype No. 123518, probably a ♀, deposited at IGPAS, Nanjing, China.

INTRODUCTION

Collections of fossil dragonflies have increased remarkably during the past few years. Recently, more than 30 species, collected from various localities in China, had been described (CARPENTER, 1992; BECHLY et al., 2001). The Upper Jurassic to Early Cretaceous dragonflies, which are represented by numerous larvae, are the most abundant in the Chinese Mesozoic insect record (ZHANG, 1999; HUANG & NEL, 2001; FLECK et al., 2002). There are fewer records described from other periods (before the Upper Jurassic or after the Late Cretaceous). The majority of odonate fossils come from northeastern China and few from the Northwest (LIN et al., 2002) and the South (ZHOU & WEI, 1980; LIN, 1992).

In the present paper, a new genus and species of Rudiaeschnidae (Aeshnoptera) (REN & GUO, 1996; BECHLY et al., 2001) are described from the Datai Valley, Shenyuhe Town (106°9' N, 45°2' E) of Huating County, Gansu Province. The extinct Rudiaeschnidae was erected by BECHLY et al. (2001). The male *Rudiaeschna limnobia* was described by LI & REN (2002).

The strata from which the new species was recovered belong to the Zhidan Group of the Lower Cretaceous. The site, located in the southwestern margin of the Orduosi region, NW China, is one of the richest fossil-bearing localities, where a large number

of insects, mainly aquatic Heteroptera, chironomids and fishes have been found. The geological sequence is as follows (in descending order):

Zhidan Group

- Jingchuan Formation
- Luohandong Formation – This is an insect-bearing bed, situated at the lower part of the formation, presenting a series of brown-reddish and blue-grayish mudstone, intercalated with white-grayish shale or mudstone. This bed has produced the new dragonfly described here, in addition to waterbugs, a beetle and chironomids.
- Huachi-Huanhe Formation
- Luohe Formation
- Yijun Formation
- Unconformate
- The underlying bed is Triassic or Lower Jurassic

This odonate assemblage represents a peculiar local, Early Cretaceous fauna. For example, all the dragonflies are Aeshnoptera. Other families, such as Aeschnidiidae and Gomphidae, which are common from other regions of China, are absent.

Terminology used in the present paper follows BECHLY et al. (2001).

SYSTEMATIC DESCRIPTION

Order: Odonata Fabricius, 1792

Suborder: Aeshnoptera Bechly, 1996

Family: Rudiaeschnidae Bechly et al. 2001

FUXIAESCHNA GEN. NOV.

Type species: *Fuxiaeschna hsiufunia* sp. nov.

E t y m o l o g y. – Derived from Chinese "Fuxi", a supernatural name of popular legend in the Chinese ancient history and Greek "Aeschna".

DIAGNOSIS (imago). – Compound eyes contiguous; anteclypeus with middle concave sutural groove, postclypeus narrow; the venation: presence of a Msp1; the discoidal triangle with one crossvein; the subdiscoidal triangle divided into 3 cells, PsA of the hindwing zigzagged; anal loop closed posteriorly, but weakly; a row stout spines furnished along inner margin of tibia of fore and middle legs; abdomen with a middle carina on terga 3-8.

SPECIES INCLUDED. – Only type species.

FUXIAESCHNA HSIUFUNIA SP. NOV.

Figures 1-2

M a t e r i a l. – The collection of Nanjing Institute of Geology and Palaeontology, Field No. SD-03; Cat. No. 123518. A single near complete imaginal specimen with both pairs wings apart from the apical tips. The body was preserved in dorsal view. It comes from the Datai Valley section, 1.5 km NW of the Shenyuhe town (106°9'N, 45°2'E), Huating County, Gansu Province, China; Lower Cretaceous, Luohandong Formation.

E t y m o l o g y. — The species is dedicated to the doyen of Chinese odonatology, the late Professor Chao Hsiufu.

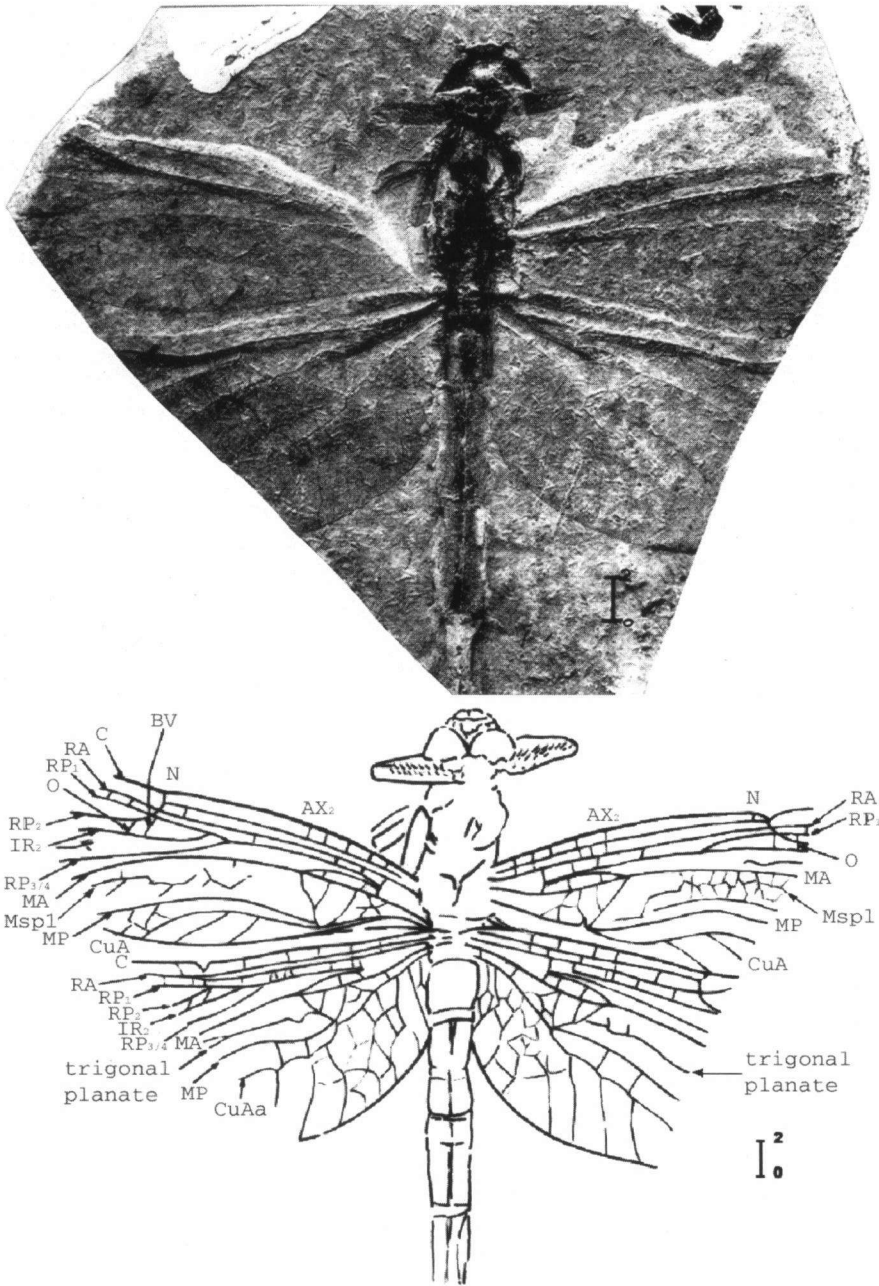
DESCRIPTION. — Imago, medium size. **H e a d** hemi-globular; two eyes rounded, contiguous, separated by a suture; anteclypeus with middle central sutural groove, postclypeus narrow; antennae preserved with 3 segments, the 1st large, the 2nd small, the 3rd spine-like, the exact number unknown. **P r o t h o r a x** small, width about one-third as wide as the posterior border of the head. **S y n t h o r a x**: the meso- and metathorax large, the length of the synthorax about two times its width. **F o r e w i n g**: It has two primary antenodal crossveins, Ax1 and Ax2. Ax2 situated distal to the discoidal triangle. Three secondary antenodals between Ax1 and Ax2. Nodus in mid-wing position. Two or three crossveins in the basal postsubnodal area. Arculus rather straight, with posterior part shorter than anterior part. Discoidal triangle rather broad, with a crossvein; subdiscoidal triangle divided into three cells, PsA curved; the hypertriangle with two crossveins, RP3/4 and MA more or less parallel. Msp1 weak and more or less parallel to MA; CuAa with three posterior branches. **H i n d w i n g**: Nodus break situated at the middle of the costal margin; two primary antenodal crossveins, Ax1 and Ax2, are distinct, Ax2 lies level with the distal angle of the discoidal triangle. Two secondary antenodal crossveins between Ax1 and Ax2. Shape of discoidal triangle is similar to forewing, and divided into two cells. Subdiscoidal triangle three-celled; PsA zig-zagged. Hypertriangle with two small crossveins; Mp smoothly curved toward posterior margin. Only one cell row between Mp and CuAa, near discoidal triangle. Subdiscoidal veinlet distinct; gaff short. CuAa strongly curved with at least three branches. Anal loop elongated, with five to six cells, its posterior weakly defined, anal margin rounded. Anal triangle not distinct, suggesting the specimen is a female. **F o r e l e g**: Coxa large. Trochanter smaller than coxa. Femura stout, furnished with strong hairs. Tibia as long as femur, with hairs and a row of spines at inner side. Tarsus incomplete with only two visible segments, the exact number is unknown. **M i d d l e - l e g** resembles, but rather larger than foreleg. **A b d o m e n**: long and narrow, with only five visible segments.

M e a s u r e m e n t s (mm). — Width of head including eyes 4.0, and 2.5 in length; width of prothorax 2.0; width of synthorax 3.5; width of the forewing 6.5; width of the hindwing 9.0. Foreleg: coxa length 0.9, femur 3.6, tibia 3.5. Middle-leg: femur length 4.0.

SYSTEMATIC POSITION

Fuxiaeschna gen. nov. resembles *Rudiaeschna* Ren & Guo, 1996 in the follow characters: (i) subdiscoidal triangle divided into three cells; (ii) PsA of the hindwing zig-zagged; and (iii) presence of a Msp1. However, it differs from *Rudiaeschna* in possessing a small body and has a discoidal triangle with only one crossvein.

BECHLY et al. (2001) indicated that the normal features of Aeshnida include: presence of a Msp1, compound eyes enlarged and medially contiguous, with a dorso-longitudinal carina on the abdominal terga 3-8. The body of *Fuxiaeschna* has the above characters suggesting the new genus belongs to Aeshnida. The new genus has a zig-zagged PsA in the hindwing, thus it could probably be classified in Rudiaeschnidae.



Figs 1-2. *Fuxiaeschna hsiufunia* gen. n., sp. n., imago, holotype: (1) photograph; – (2) line drawing of Fig. 1. – [Scale bar 2 mm]

Many features of the venation of *Fuxiaeschna* are similar to *Rudiaeschna*, but with some differences (see below).

Fuxiaeschna has Mspl; compound eyes, enlarged and post-medially contiguous; a very distinct dorso-longitudinal carina on the abdominal terga 3-8 of adults. These are synapomorphy of cymatophlebioid type of the wing venation. PsA of the hindwing is zigzagged, the discoidal triangle broad, elongated in the both pairs of wings, relatively broad and posteriorly closed anal loop of the hindwing are similar to those in *Rudiaeschna*.

Detailed information concerning the classification of Odonata, based mostly on wing venational characters, has been completed by BECHLY et. al, 1998. Based on this information, we have analysed the venation of *Fuxiaeschna* and are giving here a list for comparison with *Rudiaeschna* for 20 wing venation characters [F = *Fuxiaeschna*; R = *Rudiaeschna*; the character numbers, such as (1), (2), (3) etc., adopted in the list follow BECHLY et al., 1998; (F = R) indicates the character is the same for the two genera], viz.:

- (1) 0 = the primary antenatal AX2 is situated distal of the discoidal triangle in the forewings. (F = R)
- (2) 1 = only 2-3 (rarely 4) secondary antenodals between Ax1 and Ax2. (F = R)
- (3) 0 = wing with crossveins in the distal antensubnodal area. (F = R)
- (5) 0 = wing with crossveins in the basal postsubnodal area. (F = R)
- (6) 0 = nodus in mid wing position in forewing. (F = R)
- (10) 0 = arculus broken, and the posterior part not shortened. (R)
1 = arculus rather straight, and the posterior part much shorter than the anterior part. (F)
- (21) 0 = RP3/4 and MA more or less parallel. (F = R)
- (22) 1 = at least a weakly defined Mspl, more or less parallel to MA. (F = R)
- (23) 0 = hindwing Mp not shortened and smoothly curved towards the hind margin. (F = R)
- (24) 0 = the hindwing area between Mp and CuAa is narrow, with only one row of cells near the discoidal triangle. (F = R)
- (25) 0 = the subdiscoidal veinlet (basal part of cuA that is aligned with the distal trigonal vein Mab) is distinct in hindwing. (F = R)
- (26) 0 = gaff (= basal part of CuA between the subdiscoidal veinlet and its first branching into CuAa and CuAb) is short in hindwing. (F = R)
- (27) 0 = the hindwing CuAa is smoothly curved, and has many posterior branches. (R)
1 = the hindwing CuAa is more strongly curved and has only four or less posterior branches. (F)
- (31) 1 = the hindwing anal loop is posterior closed. (F = R)
- (32) 2 = the anal loop is elongated with at least more than 5 cells. (F = R)
- (34) 0 = anterior margin (MA) of hypertriangle more or less curved. (R)
1 = anterior margin of hypertriangle distinctly curved. (F)
- (35) 0 = hypertriangles without crossveins. (R)
1 = hypertriangles divided by several parallel crossveins. (F)
- (36) 1 = the discoidal triangle in both wings elongate and both are similarly shaped. (F = R)
- (38) 1 = forewing discoidal triangle divided by one cross vein. (F)
2 = forewing discoidal triangle divided by more than two crossveins. (R)
- (40) 1 = forewing subdiscoidal triangle traversed by one or more crossveins. (F = R)

Fifteen of the characters of *Fuxiaeschna* are similar to *Rudiaeschna*, and five are different.

Table I
Correlation of wing venation characters for *Fuxiaeschna* gen. nov. and *Rudiaeschna* Ren & Guo, 1996*

Taxa/characters	(1)	(2)	(3)	(5)	(6)	(10)	(21)	(22)	(23)	(24)
<i>Fuxiaeschna</i>	0	1	0	0	0	1	0	1	0	0
<i>Rudiaeschna</i>	0	1	0	0	0	0	0	1	0	0
Taxa/characters	(25)	(26)	(27)	(31)	(32)	(34)	(35)	(36)	(38)	(40)
<i>Fuxiaeschna</i>	0	0	1	1	2	1	1	1	1	1
<i>Rudiaeschna</i>	0	0	0	1	2	0	0	1	2	1

* Character numbers, such as (1), (2), (3) etc, follow BECHLY et al. (1998).

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