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# DESCRIPTION OF A NEW FOSSIL GENUS AND SPECIES *HUAXIASCIOPHILITES JINGXIENSIS* (DIPTERA: ME- SOSCIOPHILIDAE) FROM EARLY CRETACEOUS JINGXI BASIN OF BEIJING, CHINA\*

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**Abstract** A new fossil genus and species of the family Mesosciophilidae, *Huaxiasciophilites jingxiensis* gen. et sp. nov. is described. The fossils of the new genus and species were collected from the Early Cretaceous Lushangfen Formation ( $K_1^4$ ) of Jingxi basin of Beijing China. The new genus is established based on the following characters: that Sc short, not exceed the forking of R and Rs, with branches; r-m longer than basal part of Rs; Rs very thick and undee; and radial cell very short. The phylogenetic tree of Mesosciophilidae superimposed on the geological time scale was also analyzed. The holotype is deposited in the Beijing Forestry University.

**Key words** Mesosciophilidae, *Huaxiasciophilites* gen. nov., Lower Cretaceous, Lushangfen Formation, new species

## 1 STRATIGRAPHICAL SEQUENCES OF JINGXI BASIN

The studies on Lower Cretaceous stratigraphy and palaeontology of the Jingxi basin of Beijing has a very long history. This basin yielded rich fossils. Its stratigraphical sequences are shown in table 1. The fossils of the new genus and species, *Huaxiasciophilites jingxiensis* gen. et sp. nov., described below were collected from the grayish-green thin-bedded shale and mudstone of Lushangfen Formation ( $K_1^4$ ).

**Table 1** The Lower Cretaceous stratigraphical sequences around the Jingxi basin of West Beijing.

Stratigraphical sequences		Entomofauna	Correspondent to Europe
Overlying strata: Changxindian Formation ( $E_2$ ch) or Quaternary sandstone or conglomerate (Q)			
K <sub>1</sub>	Xiazhuang Formation ( $K_1^{5-6}$ x) 332.5* - 597.0* * m	Xiazhuang Entomofauna	Aptian-Albian stage ( $K_1^{5-6}$ )
	Lushangfen Formation ( $K_1^4$ ) 1257.7 - 1043.4 m	Lushangfen Entomofauna	Barremian stage ( $K_1^4$ )
	Tuoli Formation ( $K_1^3$ t) 709.4 - 766.4 m	Jehol Entomofauna	Hauterivian stage ( $K_1^3$ )
	Dahuichang Formation ( $K_1^2$ ) 160.9 - 127.2 m	Jehol Entomofauna	Valanginian stage ( $K_1^2$ )
	Donglanggou Formation ( $K_1^1$ dl) 373.2 - 148.1 m	Jehol Entomofauna	Berriasian stage ( $K_1^1$ )
Underlying strata: Wumishan Formation dolomite of Middle Proterozoic			

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\* After Hong *et al.* 1982; \* \* after Xiao *et al.* 1994.

## 2 TAXONOMIC DESCRIPTION

### Family Mesosciophilidae Rohdendorf 1964

#### Genus *Huaxiasciophilites* gen. nov.

Type species: *Huaxiasciophilites jingxiensis* sp. nov.

Etymology: The generic name from 'Huaxia'-China and the existing extinct genus 'Sciophilites'.

Diagnosis: Sc short, not exceeds the forking of R and Rs, with branches; r-m longer than basal part of Rs; Rs very thick and undee; and radial cell very short.

In 1946, Rohdendorf established the subfamily Mesosciophilinae, which includes two genera, *Mesosciophila* and *Mesosciophilodes*. He (1946) ascribed Mesosciophilinae to the family Allactoneuridae, but later (1964) he transferred these two genera to the family Funginoridae. In 1985, Kalugina and Kovalev redescribed the subfamily Mesosciophilinae and promoted it to the family Mesosciophilidae because Rs<sub>1</sub> fused into R like a crossvein. Until now, 8 genera and 10 species were described in the family Mesosciophilidae: *Mesosciophila venosa* Rohd. 1946; *Mesosciophilodes angustipennis* Rohd. 1946; *M. similes* Rohd. 1964; *Mesosciophilina irinae* V. Kovalev 1985; *M. bolshakovi* V. Kovalev 1985; *Sciophilites ninae* Kovalev 1990; *Sinosciophila meileyingziensis* Hong 1992; *Liaoxifungivora simplicis* Hong 1992; *Atalosciophila yanensis* Ren 1995 and *Huaxiasciophilites jingxiensis* gen. et sp. nov.

The new genus defers from other genera in having the following characters: Sc short, not exceed the forking of R and Rs, r-m longer than basal part of Rs; Rs undee obviously, and radial cell short. So it should require a generic placement.

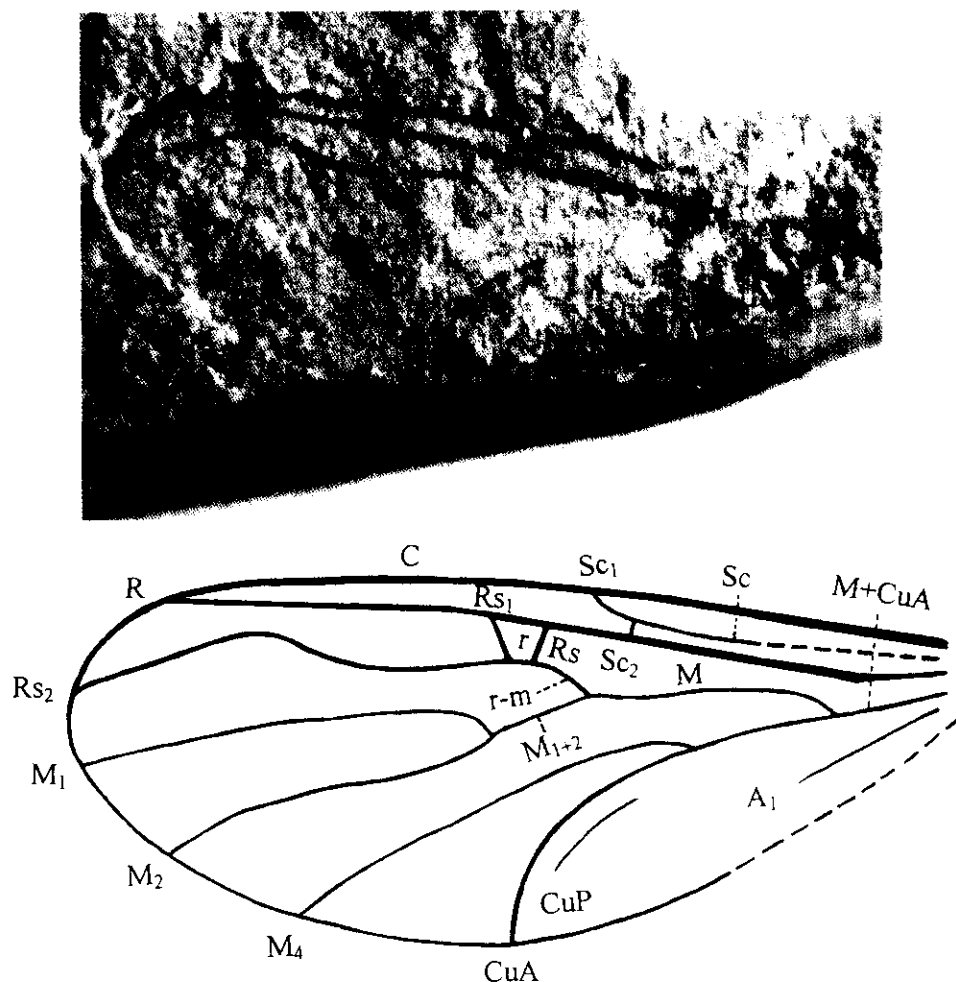
#### *Huaxiasciophilites jingxiensis* sp. nov. (Figs. 1 - 2)

Etymology: The species is named from the type locality 'Jingxi'.

Material: Three specimens were examined. The holotype labeled with KL1010 and deposited in Beijing Forestry University. Wing length 5 mm, width 2 mm.

Description: Wing 2.5 times as long as wide; C, R and Rs thick and others weak obviously; C reaching Rs; Sc short, not exceeding forking of R and Rs, running before the center of wing and forking into Sc<sub>1</sub> and Sc<sub>2</sub>, Sc<sub>1</sub> curved to C at basal 2/5 of wing, Sc<sub>2</sub> fused with R erectly, like a crossvein; R long and straight, exceeding 9/10 of wing length; Rs undulate, basal part of Rs straight, arising from R with 60° inclination, Rs<sub>1</sub> short and straight, fused with R at the middle of wing, and being at the same level of M forking; r-m 1.6 times as long as basal part of Rs, just like the basal part of Rs; M<sub>1</sub>, M<sub>2</sub> nearly straight to wing margin, only curved at forking part; M<sub>4</sub> slightly arched, fused with CuA then with M<sub>1+2</sub>; CuA curved towards posterior margin of wing strongly; CuP obsolete; anal area small, A<sub>1</sub> weak and not reaching to wing margin; Radial cell short, trapezoid inversely.

Type locality and horizon: Lower Cretaceous Lushangfen Formation (K<sub>1</sub><sup>4</sup>1), Fangshan District of Beijing.

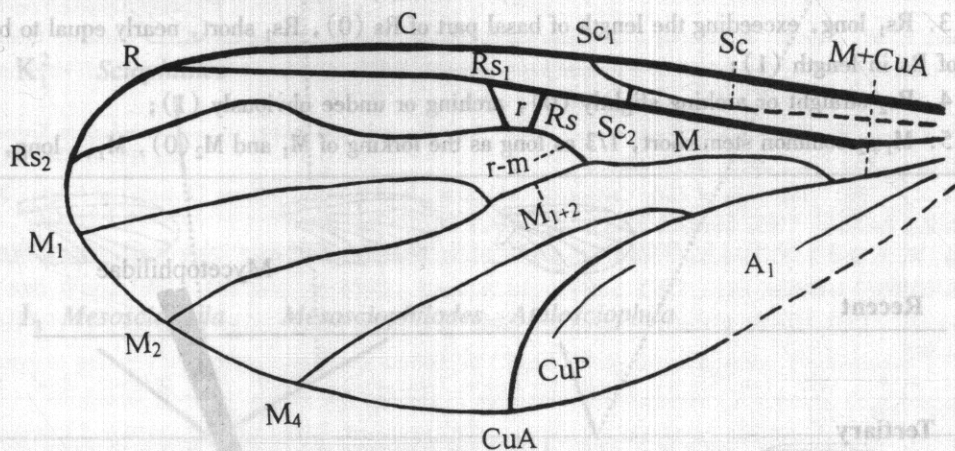
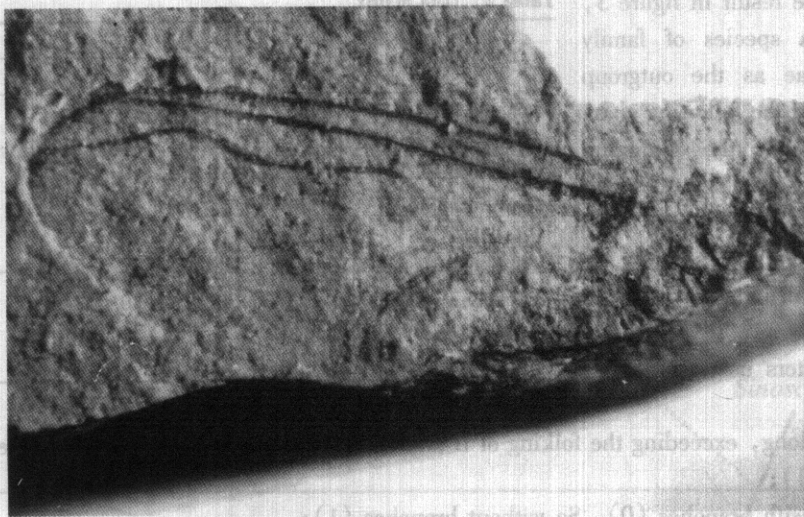


**Figs. 1-2** The wings of *Huaxiasciophilites jingxiensis* sp. nov.

C-Costa; Sc<sub>1</sub>, Sc<sub>2</sub>-1st and 2nd branches of Subcosta; R-Radius; Rs<sub>1</sub>, Rs<sub>2</sub>-1st and 2nd branches of Radial Sector; M<sub>1</sub>, M<sub>2</sub>, M<sub>4</sub>-1st, 2nd and 4th branches of Media; CuA-anterior Cubitus; CuP-posterior Cubitus; A<sub>1</sub>-1st Analis; r-m-crossvein of Radius-Media; r-radial cell.

### 3 PHYLOGENETIC ANALYSIS

Mesosciophilidae is an extinct family and its fossils were found only in Jurassic and Cretaceous. It was ascribed to Mycetophiloidea, together with Pleciomimidae, Pleciofungivoridae, Protopleciidae, Bolitophilidae and Mycetophilidae (Rasnitsyn 1990). The cladistic analysis of the phylogenetic relationships among these families done with Hennig 86 (Farris 1988) indicates that the Mesosciophilidae is an independent branch that derived from Protopleciidae (Fig. 3). In this paper, a cladistic analysis was performed to reveal the phylogenetic relationships among the genera in Mesosciophilidae, and the phylogenetic tree was plotted together with geological time scale. The characters and matrix are as follows:



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Based on the result in figure 3, we chose a species of family Protopleciidae as the outgroup and polarized the following characters through the outgroup analysis and ontology method. The scores of 7 characters for 8 genera of family Mesosciophilidae are list in data matrix as in table 2.

Characters used in cladistic analysis:

1. Sc long, exceeding the forking of R and Rs (0), Sc short, not exceeding the forking of R and Rs (1);
2. Sc with branches (0), Sc without branches (1);
3. Rs<sub>1</sub> long, exceeding the length of basal part of Rs (0), Rs<sub>1</sub> short, nearly equal to basal part of Rs in length (1);
4. Rs<sub>2</sub> straight or arching slightly (0), arching or undee obviously (1);
5. M<sub>1+2</sub> common stem short, 1/3 as long as the forking of M<sub>1</sub> and M<sub>2</sub> (0), M<sub>1+2</sub> long, 1/2

Table 2 Data Matrix.

Taxa	Characters						
	1	2	3	4	5	6	7
outgroup	0	0	0	0	0	0	0
<i>Mesosciophila</i>	0	1	1	0	0	0	0
<i>Mesosciophilodes</i>	0	1	0	0	1	0	0
<i>Mesosciophilina</i>	0	0	1	0	1	0	0
<i>Sciophilites</i>	0	1	0	0	0	0	1
<i>Sinosciophila</i>	0	0	1	1	2	0	1
<i>Liaoxifungivora</i>	0	1	0	1	1	0	0
<i>Atalosciophila</i>	0	0	1	0	0	0	1
<i>Huaxiasciophilites</i>	1	0	1	1	0	1	1

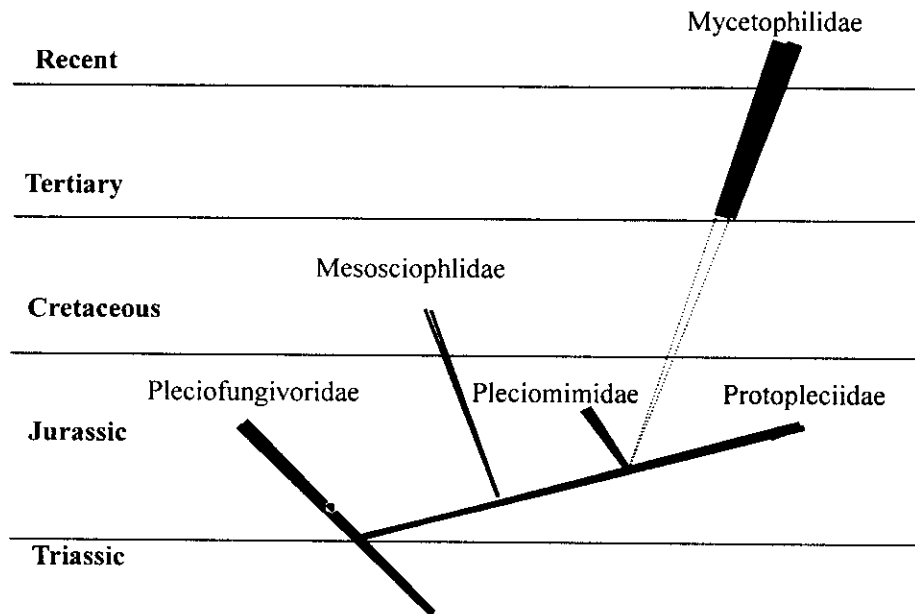
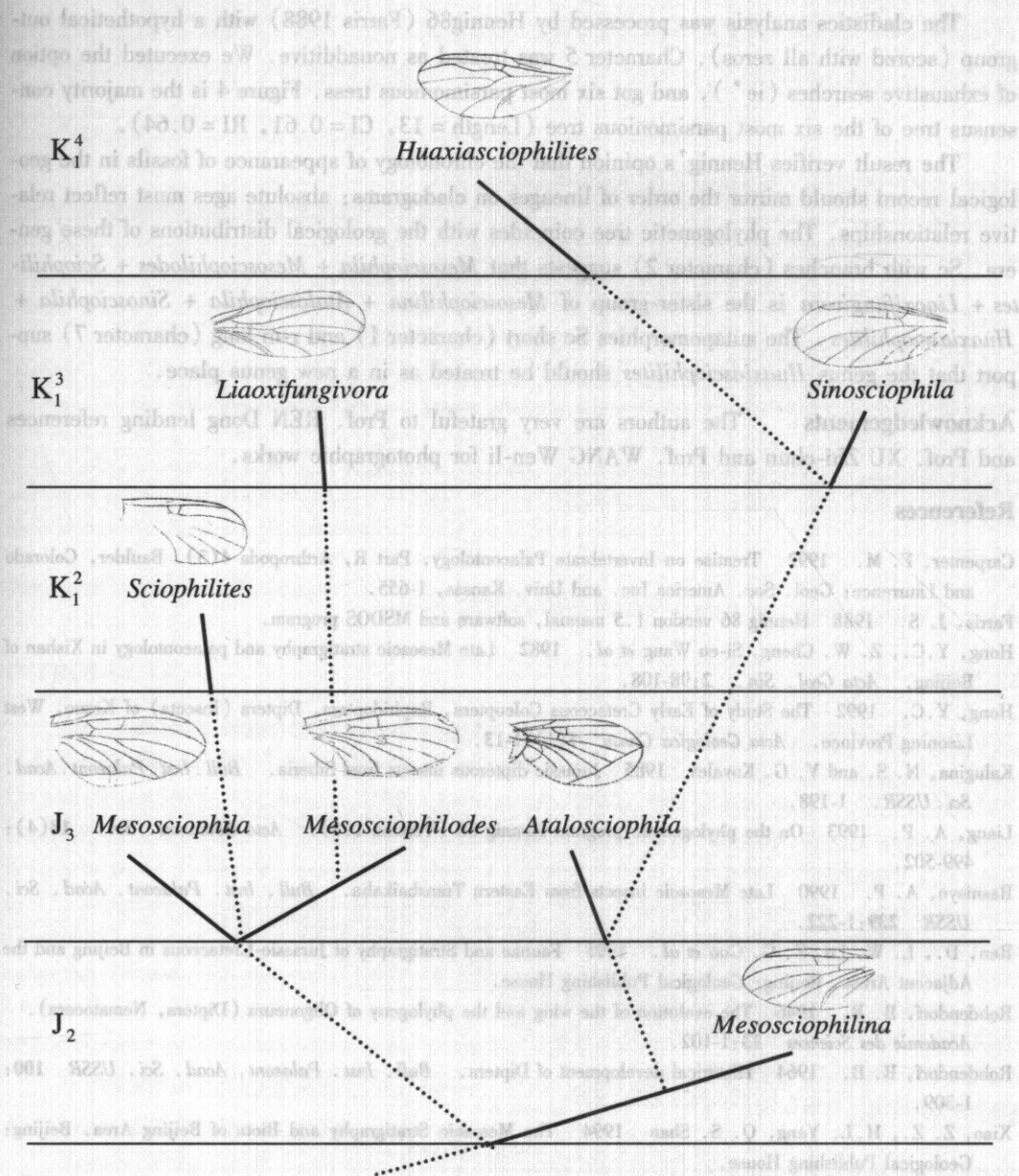


Fig.3 The phylogenetic tree of Mycetophiloidea, superimposed on geological time scale.



**Fig.4** The phylogenetic tree of mesosciophilidae, superimposed on geological time scale.

Note: the real line represents distributive ranges of genera.

- as long as the forking of  $M_1$  and  $M_2$  (1),  $M_{1+2}$  near equal long to the forking of  $M_1$  and  $M_2$  (2);
- 6. r-m short (0), longer than the basal part of Rs (1);
- 7. r-cell long, the part between forking of Rs and r-m longer than the basal part of Rs (0), r-cell short, the part between forking of Rs and r-m shorter than the basal part of Rs (1).

The cladistics analysis was processed by Hennig86 (Farris 1988) with a hypothetical out-group (scored with all zeros). Character 5 was treated as nonadditive. We executed the option of exhaustive searches (ie\*), and got six most parsimonious trees. Figure 4 is the majority consensus tree of the six most parsimonious trees (Length = 13, CI = 0.61, RI = 0.64).

The result verifies Hennig's opinion that the chronology of appearance of fossils in the geological record should mirror the order of lineages on cladograms: absolute ages must reflect relative relationships. The phylogenetic tree coincides with the geological distributions of these genera. Sc with branches (character 2) suggests that *Mesosciophila* + *Mesosciophilodes* + *Sciophilites* + *Liaoxifungivora* is the sister-group of *Mesosciophilina* + *Atalosciophila* + *Sinosciophila* + *Huaxiasciophilites*. The autapomorphies Sc short (character 1) and r-m long (character 7) support that the genus *Huaxiasciophilites* should be treated as in a new genus place.

**Acknowledgements** The authors are very grateful to Prof. REN Dong lending references and Prof. XU Zhi-chun and Prof. WANG Wen-li for photographic works.

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### 京西盆地早白垩世中生黏蚊一新属新种(双翅目:中生黏蚊科)

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记述了京西盆地早白垩世中生黏蚊一新属新种——京西华夏中生黏蚊 *Huaxiasciophilites jingxiensis* gen. et sp. nov.。新属区别于其它属的特征为:Sc具分支;r-m长于Rs基部之长;Rs明显呈波纹状;径室较小。化石采自卢尚坟村卢尚坟组昆虫的典型剖面,时代属早白垩世巴列姆期(Barremian Stage),归卢尚坟昆虫群。对其系统发育及在地史上的分布进行了初步探讨。模式标本保存于北京林业大学。

**关键词** 中生黏蚊科 华夏中生黏蚊属 早白垩世 卢尚坟组 新属 新种