ANNALES ZOOLOGICI (Warszawa), 2007, 57(4): 827-832

THE EARLIEST SPECIES OF THE EXTINCT GENUS *ARCHISARGUS* FROM CHINA (DIPTERA: BRACHYCERA: ARCHISARGIDAE)

KUIYAN ZHANG[1, 2], DING YANG[1, 2, *], DONG REN[2, *] and CHUNGKUN SHIH[2]

[1]*Department of Entomology, China Agricultural University, Beijing 100094, China*
[2]*Key Lab of Insect Evolution and Environmental Changes, Capital Normal University, Beijing 100037, China*
[*]*To whom the correspondence and reprint requests should be addressed; dyangcau@yahoo.com.cn and rendong@mail.cnu.edu.cn*

Abstract.— Archisargidae, a Jurassic extinct family, is found only in Kazakhstan, China and Mongolia. *Archisargus* Rohdendorf, 1938 is a small genus with two known species from the Middle/Late Jurassic of Kazakhstan. In this paper, two new species from the Middle Jurassic of China, *Archisargus spurivenius* **sp. nov.** and *A. strigatus* **sp. nov.**, are described, and a key to the species of the genus is given. These two species are possibly the earliest representatives of the genus *Archisargus*.

Key words.— Diptera, Archisargidae, *Archisargus*, Middle Jurassic, new species, China.

INTRODUCTION

The family Archisargidae, which was erected as a new monotypic family by Rohdendorf in 1962, is an endemic Jurassic group of brachyceran Diptera consisting of about 23 described species in 8 genera (Hong 1983, Mostovski 1996a, Mostovski 1996b, Mostovski 1997, Nagatomi and Yang 1998, Zhang and Zhang 2003). Most of them were discovered in the Middle/Late Jurassic of Kazakstan. Furthermore, genera *Archirhagio* Rohdendorf, 1938, *Mesosolva* Hong, 1983, *Prosolva* Hong, 1983 have been found in China. These three genera were deposited in the Middle Jurassic of Northern China.

Recently, the Daohugou Biota located at Inner Mongolia of China became prominent, because of abundant discoveries of animal and plant fossils (Ren *et al.* 1995, Mi *et al.* 1996, Ji and Yuan 2002, Gao and Shubin 2003, Zhang *et al.* 2006). Its geological age should be earlier than that of the Jehol biota and is of the Middle Jurassic (Wang 2000, Ren and Krzeminski 2002). In the Daohugou, two genera and two species of Archisargidae were discovered: *Mesosolva daohugouensis* Zhang *et* Zhang, 2003 and *Archirhagio striatus* Zhang *et* Zhang, 2003. In the present paper, the genus *Archisargus* is recorded from China for the first time with two new species from the Daohugou village, *A. spurivenius* sp. nov. and *A. strigatus* sp. nov.

MATERIAL AND METHODS

This study is based on two specimens housed in the fossil insect collection of the Key Lab of Insect Evolution and Environmental Changes, Capital Normal University, Beijing, China.

Line drawings were prepared with the aid of a camera lucida attached to a LEICA MZ12.5 stereomicroscope.

Basic terminology follows McAlpine (1981).

TAXONOMY

Key to genus *Archisargus*

1. Crossvein r-m located at middle of cell d; cell r_4 short ..... ***pulcher***
–. Crossvein r-m located at basal part of cell d; cell r_4 long **2**
2. Spurious vein absent from cell br; mouth of cell m_1 wider than that of cell m_2 ..... ***maximus***
–. A spurious vein present in cell br; mouth of cell m_1 narrower than that of cell m_2 ..... **3**
3. Vein R_5 shorter than distance between crossvein r-m and fork of veins R_4 and R_5 in length; cell m_3 convergent but wide open ..... ***spurivenius*** sp. nov.
–. Vein R_5 longer than distance between crossvein r-m and fork of veins R_4 and R_5 in length; cell m_3 closed at wing margin ..... ***strigatus*** sp. nov.

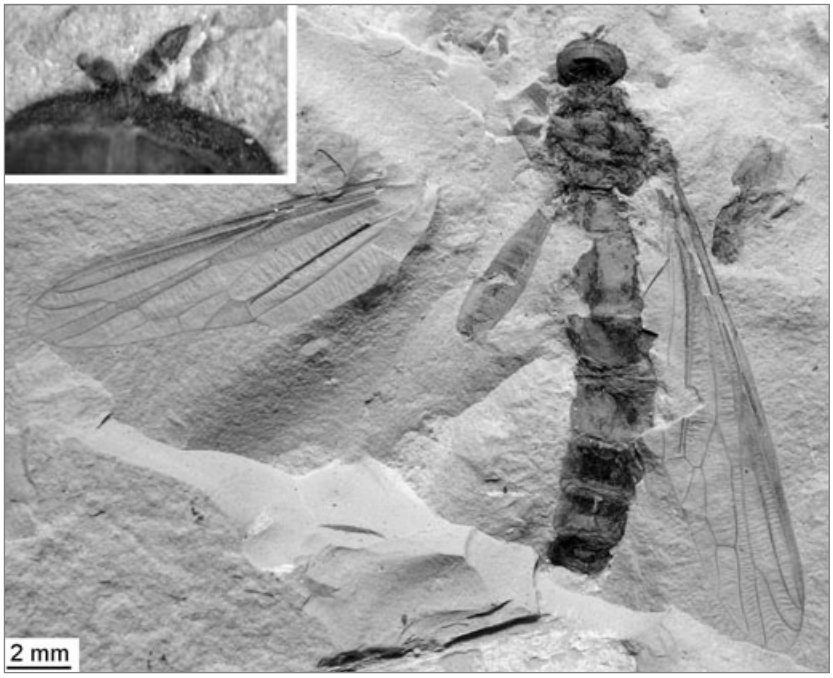


Figure 1. *Archisargus spurivenius* sp. nov. Body with wings, photograph in dorsal view.

Diptera Linné, 1758
Archisargidae Rohdendorf, 1962

Archisargus Rohdendorf, 1938

Type species. *Archisargus pulcher* Rohdendorf, 1938

Diagnosis. Body large, stout. Vein Sc long; vein R_5 ending behind wing tip; veins M_2, M_3, CuA_1 and CuA_2 short. Vein CuP present. Cell sc wide open, mouth of cell sc wider than distance between ends of veins R_1 and R_5; mouth of cell r_1 narrowly open (or nearly closed); mouth of r_{2+3} narrower than that of cell r_4. Cell d distinctly enlarged, adjacent to wing margin. Cell cup closed, apical part truncate. Abdomen slender, almost parallel-sided.

Stratigraphic and geographic range. the Middle to the Late Jurassic; Kazakhstan and China.

Archisargus spurivenius sp. nov.
(Figs 1–4)

Etymology. The specific name refers to the Latins *spuri* (spurious) and *ven* (vein).

Holotype. CNU-DB-NN2007002, an almost complete adult body with both wings in dorsal view.

Type locality and horizon. Daohugou Village, Shantou Township, Ningcheng County, Inner Mongolia, China; Jiulongshan Formation, the Middle Jurassic (Aalenian-Bajocian).

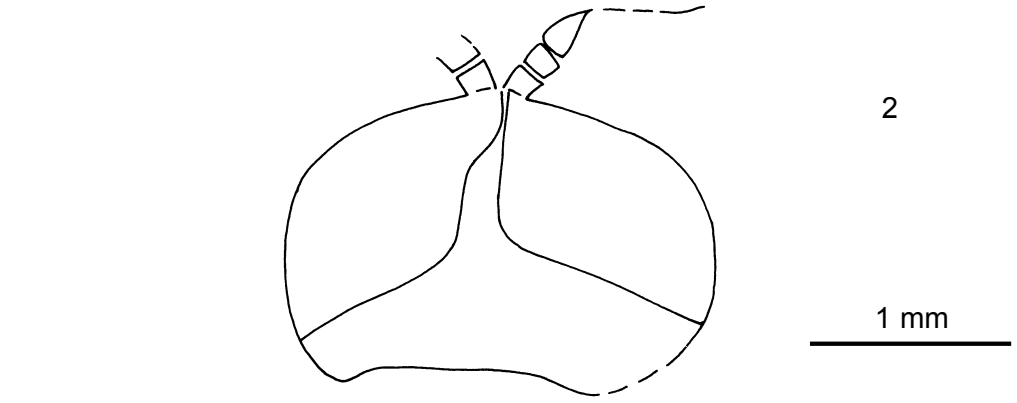
Diagnosis. Antennae bare; postpedicel tapering, arista bristle-like; hind femur long, distinctly swollen; an unattached longitudinal vein called spurious vein present in cell br, vein A_2 adjacent to posterior margin of wing, cell m_3 convergent but wide open, cell cup closed with a short petiole apically.

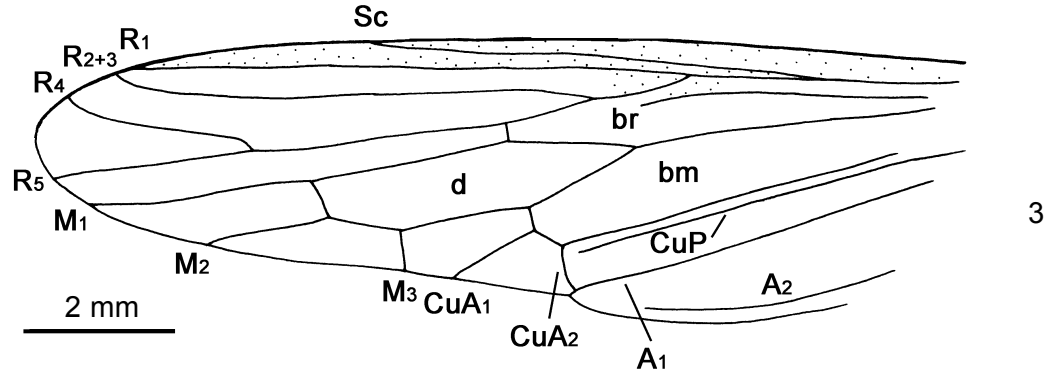
Description. Body length 17.5 mm as preserved; wing length 16.5 mm, wing width 3.8 mm; Antenna length 0.6 mm (excluding arista).

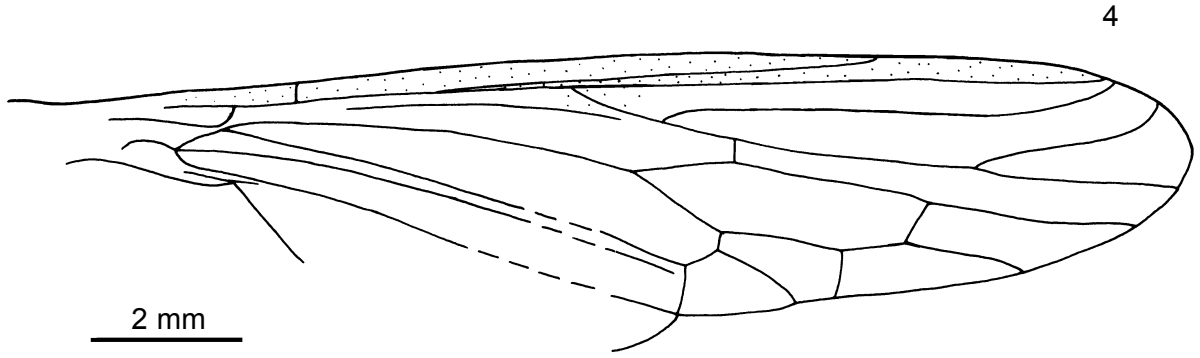
Head elliptic in dorsal view, width about 2.5 mm. Eyes large, bare, dichoptic, ommatidia visible clearly. Antennae bare; postpedicel tapering, arista bristle-like. Relative widths of head and thorax about 0.7:1.

Thorax black. Hind femur long, distinctly swollen.

Wing elongate, rather narrow; wing hyaline, cells c and sc portion brown: Vein C ending at wing tip; vein Sc long, far beyond middle of wing. Veins R_1 and R_{2+3} nearly convergent at wing margin; vein Rs short, length of that subequal to distance between origin of R_{2+3} and crossvein r-m; vein R_{2+3} arising slightly distal of base of cell d; vein R_5 ending far beyond apex of wing, relative lengths of vein R_5 and distance between crossvein r-m and fork of veins R_4 and R_5 about 0.79:1. An unattached longitudinal vein called spurious vein present in cell br, arising from base of wing, not reaching apex of cell br. Crossvein r-m located at basal 2/5 of cell d. Veins M_2, M_3, CuA_1 and CuA_2 distinctly short, vein CuA_1 arising from cell bm, vein CuP present. Mouth of cell r_4 about twice as wide as that of cell r_{2+3}. Cell bm







Figures 2–4. *Archisargus spurivenius* sp. nov. Camera lucida drawings of (2) head and antennae; (3) left wing; (4) right wing.

distinctly larger than cell br in width (but less than twice). Cell d large, adjacent to wing margin, longer than vein M_1 in length. Five posterior cells wide open, Relative widths of mouths of cell m_1, m_2, m_3 and cua_1 about 1:1.5:0.4:1. Cell cup closed with a short petiole apically. Anal lobe narrow, vein A_2 adjacent to posterior margin of wing.

Abdomen brown, slender, cylindrical; 9 segments visible. Segment III longest and broadest. Gender unknown.

Remarks. *Archisargus spurivenius* sp. nov. is similar to *Archisargus maximus* Mostovski, 1997 in the following respects: cell R_4 long, crossvein r-m located at basal part of cell d, cell m_3 wide open. However, in *Archisargus spurivenius* sp. nov., a spurious vein is present in cell br, veins M_1 and M_2 are subparallel, vein A_2 is present, mouth of cell m_1 is narrower than that of cell m_2, cell bm is distinctly larger than cell br in width (but less than twice). In *Archisargus maximus* Mostovski, 1997, the spurious vein and vein A_2 are absent, veins M_1 and M_2 are distinctly divergent, the mouth of cell m_1 is wider than that of cell m_2, cell bm is about twice as wide as cell br.

Archisargus strigatus sp. nov.
(Figs 5–6)

Etymology. The specific name refers to the Latin *strigatus* (stripe).

Holotype. CNU-DB-NN2007003, an almost complete adult body with a wing in dorsal view.

Type locality and horizon. Daohugou Village, Shantou Township, Ningcheng County, Inner Mongolia, China; Jiulongshan Formation, the Middle Jurassic (Aalenian-Bajocian).

Diagnosis. Eyes large, bare, dichoptic; an unattached longitudinal vein called spurious vein present in cell br, vein A_2 adjacent to posterior margin of wing, cell d enlarged, adjacent to wing margin, longer than vein M_1 in length, cell m_3 closed at wing margin, cell cup closed with a short petiole apically.

Description. Body length 14.5 mm as preserved; wing length 10.0 mm, wing width 3.2 mm.

Head semicircular in dorsal view, width about 2.5 mm. Eyes large, bare, dichoptic, ommatidia visible clearly. Relative widths of head and thorax about 0.7:1.

Thorax black. Hind femur slightly swollen.

Wing elongate; wing hyaline, cells c and sc portion brown: Vein C ending at wing tip; vein Sc long, far beyond middle of wing. Veins R_1 and R_{2+3} nearly convergent at wing margin; vein Rs short, length of that distinctly shorter than distance between origin of R_{2+3} and crossvein r-m; vein R_{2+3} arising slightly proximal of base of cell d; vein R_5 ending far beyond apex of wing, length of vein R_5 slightly longer than distance between crossvein r-m and fork of veins R_4 and R_5. An unattached longitudinal vein called spurious vein present in cell br, arising from base of wing, not reaching apex of cell br. Crossvein r-m at basal 2/5 of cell d. Veins M_2, M_3, CuA_1 and CuA_2 distinctly short, vein CuA_1 arising from cell bm, vein CuP present. Mouth of cell r_4 about twice as wide as that of cell r_{2+3}. Cell bm distinctly larger than cell br in width (but less than twice). Cell d enlarged, adjacent to wing margin, longer than vein M_1 in length. Mouth of cell m_2 about twice as wide as that of cell m_1; cell m_3 closed at wing margin; Cell cup closed with a short petiole apically. Anal lobe narrow, vein A_2 adjacent to posterior margin of wing.

Abdomen slender, cylindrical; 7 segments visible; tergite 1 with a brown longitudinal stripe located at middle, tergites 2–7 each with a brown cuniform longitudinal stripe at middle. Segment II longest and broadest.

Remarks. *Archisargus strigatus* sp. nov. is similar to *Archisargus spurivenius* sp. nov. in the following respects: a spurious vein present in cell br, veins M_1 and M_2 subparallel, vein A_2 present, cell r_4 long, mouth of cell m_1 narrower than that of cell m_2, cell bm distinctly larger than cell br in width (but less than twice). However, *Archisargus strigatus* sp. nov. can be easily separated from *Archisargus spurivenius* sp. nov. by vein Rs shorter than distance between origin of vein R_{2+3} and crossvein r-m in length, vein R_5 slightly longer than distance between crossvein r-m and fork of veins R_4 and R_5 in length, cell m_3 closed at wing margin, a series of brown longitudinal stripe running through middle of each segment of abdomen. In *Archisargus spurivenius* sp. nov., vein Rs and distance between origin of vein R_{2+3} and crossvein r-m are subequal in length, vein R_5 is shorter than distance between crossvein r-m and fork of veins R_4 and R_5 in length, cell m_3 is convergent but wide open, the abdomen has no brown longitudinal stripe.

Figure 5. *Archisargus strigatus* sp. nov. Body with a wing, photograph in dorsal view.

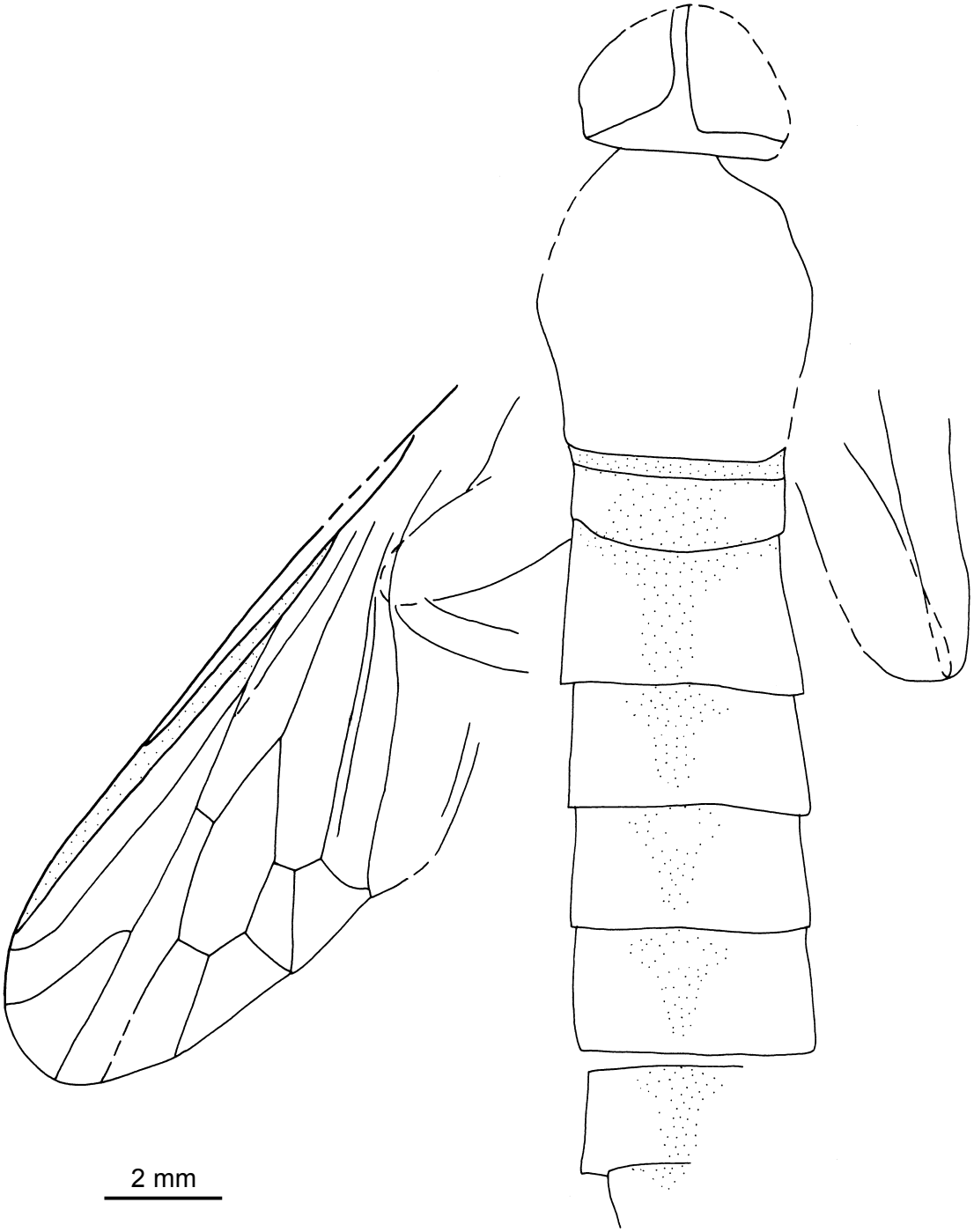


Figure 6. *Archisargus strigatus* sp. nov. Camera lucida drawing, based on the original photograph, in dorsal view.

Discussion

Extinct *Archisargus* Rohdendorf, 1938 is the type genus of the family Archisargidae. It was originally described in the family Stratiomyidae. According to this genus, Rohdendorf erected a new family – Archisargidae in 1962. Before 1997, only one species *Archisargus pulcher* Rohdendorf, 1938 belonged to this genus. Mostovski found the second species *Archisargus maximus* in 1997. Both of them came from the Middle/Late Jurassic of Kazakhstan. Now, we documented the second locality of the genus – two new species of the genus *Archisargus* found in Daohugou village, Inner Mongolia of China. It is the first finding of *Archisargus* in China, which is possibly the earliest record of this genus. So far, four species are classified

in *Archisargus*. All of them are endemic Jurassic species.

And, in *Archisargus spurivenius* sp. nov., a complete antenna is preserved, which is bare with the postpedicel tapering and arista bristle-like. This character should belong to higher Orthorrhapha. It is inconsistent with the synapomorphic family character: "antennal postpedicel entirely bristle-like (if the widened part before arista is not the postpedicel but the pedicel)" (Nagatomi and Yang, 1998). Then we may believe that some genera (such as the genus *Archisargus*) have the tapering postpedicel. This means the widened part before the arista is the postpedicel but not the pedicel in these genera.

ACKNOWLEDGEMENTS

Our sincere thanks are due to Dr. M. B. Mostovski (Pietermaritzburg) for his critical review of our the manuscript. This research was supported by the National Natural Science Foundation of China (No. 30430100, 30225009, 30025006), PHR Project of Beijing Municipal Commission of Education.

REFERENCES

Gao, K. Q. and N. H. Shubin. 2003. Earliest known crown-group salamanders. Nature, 422: 424–428.

Hong, Y. C. 1983. Middle Jurassic fossil insects in North China. Geological Publishing House, Beijing. 133–135.

Ji, Q. and C. X. Yuan. 2002. Discovery of two kinds of protofeathered pterosaurs in the Mesozoic Daohugou biota in the Ningcheng region and its stratigraphic and biologic significances. Geological Review, 48(2): 221–224. (In Chinese).

McAlpine, J. F. 1981. Morphology and terminology – adults, pp. 9–63. *In*: McAlpine, J. F., Peterson, B. V., Shewell, G. E., Teskey, H. J., Vockeroth, J. R. and D. M. Wood (eds.). Manual of Nearctic Diptera, Vol. 1, Research Branch Agriculture Canada, Monograph No. 27, Ottawa, 674 pp.

Mi, J., Sun, Ch., Sun, Y., Cui, Sh. and Y. Ai. 1996. Early – Middle Jurassic phytoecology and coalaccumulating environments in Northern Hebei and Western Liaoning. Geological Publishing House, Beijing, 1–169. (In Chinese).

Mostovski, M. B. 1996a. New species of the genus *Mesosolva* Hong, 1983 (Diptera, Archisargidae) from the Jurassic of Kazakhstan and Mongolia. Museum of Northern Arizona Bulletin, 60: 329–332.

Mostovski, M. B. 1996b. To the knowledge of Archisargoidea (Diptera, Brachycera). Families Eremochaetidae and Archisargidae. Russian Entomological Journal, 5(1–4): 117–124.

Mostovski, M. B. 1997. To the knowledge of fossil dipterans of superfamily Archisargoidea (Diptera, Brachycera). Paleontologicheskii Zhurnal, 1: 72–77.

Nagatomi, A. and D. Yang. 1998. A review of extinct Mesozoic genera and families of Brachycera (Insecta, Diptera, Orthorrhapha). Entomologist's Monthly Magazine, 134: 95–192.

Ren, D., Lu, L. W., Guo, Y. G. and S. A. Ji. 1995. Faunae and Stratigraphy of Jurassic – Cretaceous in Beijing and the adjacent areas. Dizhen Press, Beijing, 105–106. (In Chinese).

Ren, D. and W. Krzeminski. 2002. Eoptychopteridae (Diptera) from the Middle Jurassic of China. Annales Zoologici, 52(2): 207–210.

Rohdendorf, B. B. 1938. Dipterous insects of the Mesozoic Karatau. I. Brachycera and Nematocera. Trudy Paleontologicheskogo Instituta Akademii Nauk SSSR, 7(3): 29–67. (In Russian).

Rohdendorf, B. B. 1962. Order Diptera, Flies. 307–345. *In*: Rohdendorf, B. B. (ed.). Fundamentals of Paleontology, Vol. 9, Izdatel'stvo Akad. Nauk, Moscow. (In Russia).

Wang, S. 2000. The Stratigraphical Monographies of China: Jurassic. Geological Publishing House, Beijing, 1–154. (In Chinese).

Zhang, J. F and H. C. Zhang. 2003. Two new species of Archisargids (Insecta: Diptera: Archisargidae) from the Upper Jurassic Daohugou Formation (Inner Mongolia, Northeastern China). Paleontological Journal, 37(4): 409–412.

Zhang, K. Y., Yang, D. and D. Ren. 2006. The first snipe fly (Diptera: Rhagionidae) from the Middle Jurassic of Inner Mongolia, China. Zootaxa, 1134: 51–57.

Received: June 12, 2007
Accepted: October 12, 2007