

## ORIGINAL ARTICLE

Middle Jurassic fossils of the genus *Sharasargus* from Inner Mongolia, China (Diptera: Archisargidae)Kuiyan ZHANG<sup>1</sup>, Ding YANG<sup>1,2</sup> and Dong REN<sup>2</sup><sup>1</sup>Department of Entomology, China Agricultural University, and <sup>2</sup>Key Laboratory of Insect Evolution and Environmental Changes, Capital Normal University, Beijing, China**Abstract**

To date, only two species of the genus *Sharasargus* are known. These Upper Jurassic species were found in Mongolia and Kazakhstan, respectively. We herein describe two new species from the Middle Jurassic, which were found in Inner Mongolia, China. They are the oldest known fossils of this genus. A key to *Sharasargus* species is given.

**Key words:** Archisargidae, China, Diptera, Middle Jurassic, new species, *Sharasargus*.

**INTRODUCTION**

Mostovski (1996) erected five new genera within the family Archisargidae, one of which was the genus *Sharasargus*, which consisted of the following two Upper Jurassic species: *Sharasargus ruptus* Mostovski, 1996 (Mongolia) and *Sharasargus spiniger* Mostovski, 1996 (Kazakhstan). The diagnostic characters of the genus *Sharasargus* are veins Sc, R<sub>1</sub>, Rs<sub>1</sub>, R<sub>2+3</sub> long, cell d slender, vein M<sub>3</sub> absent, mouths of cells sc, r<sub>1</sub>, r<sub>2+3</sub>, r<sub>4</sub> wide open, cell r<sub>4</sub> large, cell cup open, and anal lobe narrow.

We herein describe two new *Sharasargus* species from the Middle Jurassic. The fossils were found in Daohugou Village, Inner Mongolia, China. These are the oldest known fossils of this genus. This is the first time that *Sharasargus* has been found in China.

**MATERIALS AND METHODS**

This study is based on specimens housed in the fossil insect collection of the Key Laboratory 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 stereomicroscope (MZ12.5; Leica, Wetzlar, Germany). Basic terminology follows McAlpine (1981).

**SYSTEMATIC PALEONTOLOGY**

Order Diptera Linnaeus, 1758

Family Archisargidae Rohdendorf, 1962

Genus *Sharasargus* Mostovski, 1996*Type species. Sharasargus ruptus* Mostovski, 1996

*Diagnosis.* Head round. Antennal first flagellomere symmetrical, tapering (if preserved). Wing slender; anal lobe narrow. Vein Sc ending far beyond middle of wing; veins R<sub>1</sub> and R<sub>2+3</sub> long; vein R<sub>5</sub> ending beyond wing apex; vein Rs<sub>1</sub> long, arising from middle of wing; vein M<sub>3</sub> absent; mouths of cells sc, r<sub>1</sub>, r<sub>2+3</sub>, r<sub>4</sub> wide open; cell r<sub>4</sub> large, cell cup open (Mostovski 1996; Nagatomi & Yang 1998).

**KEY TO SHARASARGUS SPECIES**

1. Vein CuA<sub>1</sub> arising from cell d; cell bm much shorter than cell br .....2  
– Vein CuA<sub>1</sub> arising from cell bm; cell bm slightly shorter than cell br .....3
2. Vein R<sub>2+3</sub> extremely short, origin distal to crossvein r-m; crossvein r-m located at apical 1/3 of cell d .....*S. eximius* sp. nov.

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Received 11 September 2007; accepted 1 February 2008.

- Vein  $R_{2+3}$  long, origin proximal to crossvein r-m; crossvein r-m located at apical 3/7 of cell d.....  
.....*S. spiniger* Mostovski
- 3. Mouth of cell  $r_4$  approximately twice as wide as that of cell  $r_{2+3}$ ; cell d wide, and distinctly longer than vein  $M_1$  .....*S. fortis* sp. nov.
- mouth of cell  $r_4$  narrower than that of cell  $r_{2+3}$ ; cell d slender, and slightly shorter than vein  $M_1$  .....  
.....*S. ruptus* Mostovski

***Sharasargus eximius* sp. nov.** (Figs 1,2)

*Diagnosis.* Vein Sc long, extending far beyond middle of wing; vein  $Rs_1$  arising from middle of wing, approximately 2 times as long as vein  $Rs_2$ ; vein  $R_{2+3}$  extremely short, its origin distal to crossvein r-m; crossvein r-m long, located at apical 1/3 of cell d; vein  $CuA_1$  arising from cell d; veins  $M_1$ ,  $M_2$  and  $CuA_1$  subparallel; cell bm narrow, cell br (= basal radial) much longer than cell bm (= basal medial); cell d wide, and distinctly longer than vein  $M_1$ .

*Description.* Head small, round, distinctly narrower than thorax. Eyes large, bare, ommatidia clearly visible.

Thorax black, distinctly hunched. Legs pubescent; fore and hind tibiae slender; hind first tarsomere distinctly longer than following tarsomeres, pulvilli small. Wing slender; vein C ending at wing tip; vein Sc long, extending far beyond middle of wing. Vein  $R_1$  long; vein  $Rs_1$  arising from middle of wing, approximately 2 times as long as vein  $Rs_2$ ; vein  $R_{2+3}$  extremely short, its origin distal to crossvein r-m; veins  $R_4$  and  $R_5$  short; vein  $R_5$

ending beyond apex of wing, relative lengths of veins  $Rs_3$  and  $R_5$  approximately 3:2. Crossvein r-m long, located at apical 1/3 of cell d. Vein  $M_3$  absent, vein  $CuA_1$  arising from cell d; veins  $M_1$ ,  $M_2$  and  $CuA_1$  subparallel. Vein CuP present. Cell sc wide open, mouth of cell sc approximately 2.5 times as wide as that of cell  $r_4$ . Mouth of cell  $r_1$  narrow, approximately 1/2 as wide as that of cell  $r_{2+3}$ . Cell bm narrow; cell br much longer than cell bm. Cell d wide, and distinctly longer than vein  $M_1$ ; mouth of cell  $m_1$  approximately 1/2 as wide as that of cell  $m_2$ . Mouth of cell  $cua_1$  wide open, approximately four times as wide as that of cell cup. Anal lobe narrow.

Abdomen slender, cylindrical, covered with setulae; slightly narrower than head, approximately 1/2 as wide as thorax. Five segments visible. Segment I evidently short.

*Measurements:* Body length 8.2 mm as preserved; wing length 8 mm, wing width 2.1 mm.

*Holotype.* CNU-DB-NN2007014. An adult body with both wings in lateral view, sex unknown, housed in the Key Laboratory of Insect Evolution and Environmental Changes, Capital Normal University, Beijing, China.

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

*Relationship.* *Sharasargus eximius* sp. nov. is similar to *S. spiniger* Mostovski, 1996 in the following respects:



Figure 1 Photograph of *Sharasargus eximius* sp. nov.

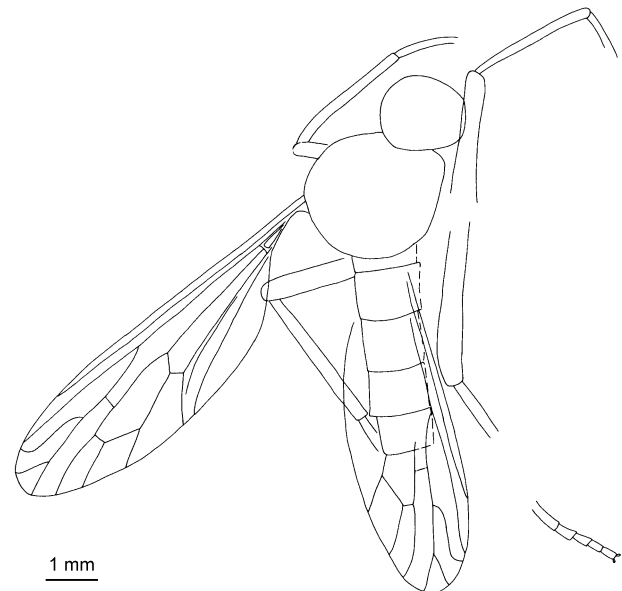


Figure 2 Camera lucida drawing of *Sharasargus eximius* sp. nov.

thorax distinctly hunched; wing slender; vein  $Rs_1$  and crossvein r-m long; vein  $CuA_1$  arising from cell d; veins  $M_1$ ,  $M_2$  and  $CuA_1$  subparallel; cell bm narrow, cell br much longer than cell bm; cell d wide; anal lobe narrow. However, the new species can be easily differentiated from *S. spiniger* on the basis of the following characters: vein  $R_{2+3}$  extremely short, its origin distal to crossvein r-m; crossvein r-m located at apical 1/3 of cell d; cell d much longer than vein  $M_1$ ; mouth of cell  $cua_1$  approximately four times as wide as that of cell cup. In *S. spiniger* Mostovski, vein  $R_{2+3}$  is long, its origin is proximal to crossvein r-m; crossvein r-m is located at the apical 3/7 of cell d; cell d is slightly longer than vein  $M_1$ ; and the mouth of cell  $cua_1$  is approximately twice as wide as that of cell cup.

**Etymology.** From the Latin word *eximius* (exceptional), referring to the exceptional position of the origin of vein  $R_{2+3}$ .

***Sharasargus fortis* sp. nov.** (Figs 3,4)

**Diagnosis.** Vein  $Rs_1$  slightly longer than vein  $Rs_2$ ; vein  $R_5$  long, relative lengths of veins  $Rs_3$  and  $R_5$  approximately 6:5.5; crossvein r-m long, located at basal 3/7 of cell d; vein  $CuA_1$  arising from cell bm; mouth of cell  $r_4$  approximately twice as wide as that of cell  $r_{2+3}$ ; cell bm wide, cell br slightly longer than cell bm; mouth of cell  $m_1$  distinctly wider than that of cell  $m_2$ ; mouth of cell  $cua_1$  wide open, approximately twice as wide as that of cell  $m_2$ .

**Description.** Thorax black. Hindleg pubescent, robust. Wing broad. Vein C ending at wing tip; vein Sc long,

extending far beyond middle of wing. Veins  $R_1$  and  $R_{2+3}$  long; vein  $Rs_1$  arising from middle of wing, slightly longer than vein  $Rs_2$ ; vein  $R_5$  long, ending beyond apex of wing, relative lengths of veins  $Rs_3$  and  $R_5$  approximately 6:5.5. Crossvein r-m long, located at basal 3/7 of cell d. Vein  $M_3$  absent. Vein  $CuA_1$  arising from cell bm. Vein CuP present. Cell sc wide open; mouth of cell sc approximately 2.5 times as wide as that of cell  $r_4$ ; mouth of cell  $r_1$  narrow; mouth of cell  $r_4$  approximately twice as wide as that of cell  $r_{2+3}$ . Cell br slightly longer than cell bm. Cell d wide, and distinctly longer than vein  $M_1$ ; mouth of cell  $m_1$  distinctly wider than that of cell  $m_2$ . Mouth of cell  $cua_1$  wide open, approximately twice as wide as that of cell  $m_2$ , and approximately 12 times as wide as that of cell cup.

Abdomen robust, cylindrical, covered with setulae; slightly narrower than thorax. Seven segments visible. Segment I evidently short.

**Measurements:** Body length 11.7 mm as preserved; wing length 9.7 mm, wing width 3.1 mm.

**Holotype.** CNU-DB-NN2007015. An adult body with both wings in dorsal view, sex unknown, housed in the Key Laboratory of Insect Evolution and Environmental Changes, Capital Normal University, Beijing, China.

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

**Relationship.** *Sharasargus fortis* sp. nov. is similar to *S. ruptus* Mostovski, 1996 in the following respects: vein  $Rs_1$  slightly longer than vein  $Rs_2$ ; vein  $R_5$  long; vein



Figure 3 Photograph of *Sharasargus fortis* sp. nov.

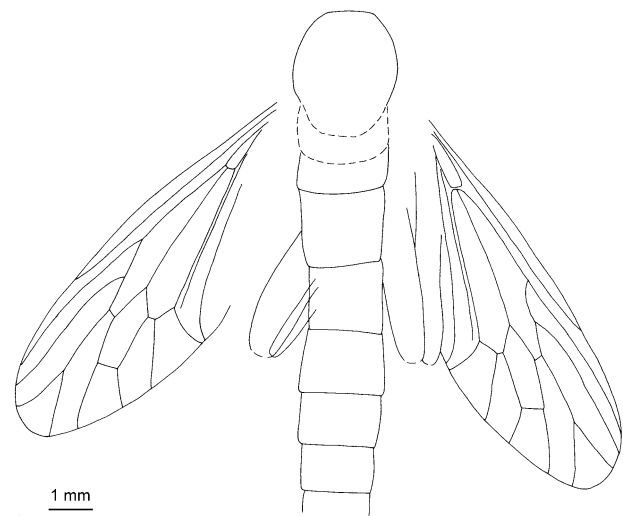


Figure 4 Camera lucida drawing of *Sharasargus fortis* sp. nov.

CuA<sub>1</sub> arising from cell bm; cell bm wide, cell br slightly longer than cell bm; mouth of cell m<sub>1</sub> wider than that of cell m<sub>2</sub>; mouth of cell cua<sub>1</sub> wide open, approximately twice as wide as that of cell m<sub>2</sub>. However, the new species can be easily differentiated from *S. ruptus* on the basis of the following characters: body large; mouth of cell r<sub>4</sub> approximately twice as wide as that of cell r<sub>2+3</sub>; cell d wide, and distinctly longer than vein M<sub>1</sub>. In *S. ruptus* Mostovski, the body is small; the mouth of cell r<sub>4</sub> is narrower than that of cell r<sub>2+3</sub>; and cell d is slender and slightly shorter than vein M<sub>1</sub>.

*Etymology.* From the Latin word *fortis* (strong), referring to the large and robust body.

## DISCUSSION

In *S. eximius* sp. nov., vein R<sub>2+3</sub> is extremely short, and its origin is distal to crossvein r-m. It is an exceptional character state in *Sharasargus*, which is not found in other species of the genus. Both *Sharasargus ruptus* Mostovski, 1996 and *S. fortis* sp. nov. undoubtedly belong to the genus *Sharasargus*. The two species share many characters. However, *S. spiniger* Mostovski, 1996 was tentatively placed in the genus *Sharasargus* when Mostovski described this species. In the present paper, we describe *S. eximius* sp. nov., which is very similar to *S. spiniger*. *Sharasargus eximius* and *S. spiniger* are evidently different from *S. ruptus* Mostovski, 1996 and *S. fortis* sp. nov. with respect to the positions of

crossvein r-m and vein CuA<sub>1</sub>, and the shape of cells br and cup. Therefore, it seems doubtful that *S. spiniger* Mostovski and *S. eximius* sp. nov. belong to the genus *Sharasargus*. In our opinion, the two species groups may represent subgenera.

## ACKNOWLEDGMENTS

We sincerely thank Dr Chung Kun Shih (College of Life Sciences, Capital Normal University, Beijing) for his improvement of our manuscript. This research was supported by the National Natural Science Foundation of China (no. 30430100, 30370184, 30225009) and the PHR Project of Beijing Municipal Commission of Education.

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