

Systematic Palaeontology/(Invertebrate Palaeontology)

# A new genus of Chifengiinae (Orthoptera: Ensifera: Prophalangopsidae) from the Middle Jurassic (Jiulongshan Formation) of Inner Mongolia, China

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## Abstract

The Middle Jurassic *Ashangopsis daohugouensis*, gen. et sp. n., of the prophalangopsid subfamily Chifengiinae is described based on two well-preserved specimens collected from the fossil locality near Daohugou at Ningcheng County, Inner Mongolia, Northeast China. The new genus is characterized by the particular shape of its pronotum, its hind leg, and stridulatory veins that only concern the cubital area but not the anal area, unlike in other Chifengiinae. **To cite this article:** *Q.-b. Lin et al., C. R. Palevol 7 (2008)*.

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## Résumé

**Un nouveau genre de Chifengiinae (Orthoptera : Ensifera : Prophalangopsidae) du Jurassique moyen de la formation Daohugou, en Mongolie intérieure, Chine.** Le Prophalangopsidae : Chifengiinae *Ashangopsis beigouensis*, gen. et sp. n., est établi à partir de deux spécimens bien préservés du Jurassique moyen de Daohugou, Ningcheng County, Chine. Il est caractérisé par un appareil stridulatoire très particulier, qui n'implique que des nervures du champ cubital et non du champ anal, contrairement au cas des autres Chifengiinae. **Pour citer cet article :** *Q.-b. Lin et al., C. R. Palevol 7 (2008)*.

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**Keywords:** Orthoptera; Prophalangopsidae gen. et sp. n.; Middle Jurassic; China

**Mots clés :** Orthoptera ; Prophalangopsidae gen. et sp. n. ; Jurassique moyen ; Chine

## 1. Introduction

Prophalangopsidae currently include six subfamilies [6]. Chifengiinae (sensu Gorokhov [6]) is a small subfamily that apparently ranged from the Middle

Jurassic to the Early Cretaceous. Its distribution is limited to Asia, e.g. Siberia, North and northeastern China. Daohugou biota from the Jiulongshan Formation yielded many orthopteran taxa such as prophalangopsid Aboilinae and Elcanidae, but no Chifengiinae were reported yet [7,13]. The Orthoptera represent a large and diverse group within the Daohugou biota [3,8–10]. The geology and stratigraphy of the Jiulongshan Formation was extensively studied in Zhang et al. [14]. Thus the

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present research provides a little trace of Orthoptera from Daohugou for educating more findings by other palaeontologists.

The nomenclature for tegmina venation follows Béthoux and Nel [1,2]. We use the following standard abbreviations: Ai branches of anal vein, CuA cubitus anterior, CuPa $\alpha$  and CuPa $\beta$  anterior branches of cubitus posterior, CuPb posterior branch of cubitus posterior, MA median anterior, MP median posterior, RA radius anterior, RP radius posterior, ScP subcosta posterior.

## 2. Systematic palaeontology

Order Orthoptera Olivier, 1789  
Suborder Ensifera Chopard, 1920

Family Prophalangopsidae, Kirby, 1906  
Subfamily Chifengiinae sensu Gorokhov, 2003 [6]  
Genus *Ashangopsis* gen. n.

**Type species.** *Ashangopsis daohugouensis* sp. n.

**Etymology.** Named after the genus name *Ashanga* and ‘opsis’ for similar.

**Diagnosis.** Pronotum narrow and long, tegmina broad and shortened. Precostal area prominent, limited by reduced ScA, and filled with fan-like veinlets; main longitudinal veins stout and strong; area between M + CuA and CuP broad in basal third of tegmen; a very strong cross-vein connecting bases of CuA and CuPa $\alpha$ , and forming a triangular cell, filled with three cross-veins; tarsus four-segmented; apex of tibia with three spurs, two little lobes of hind tibia being the bases of two out of the three strong spurs.

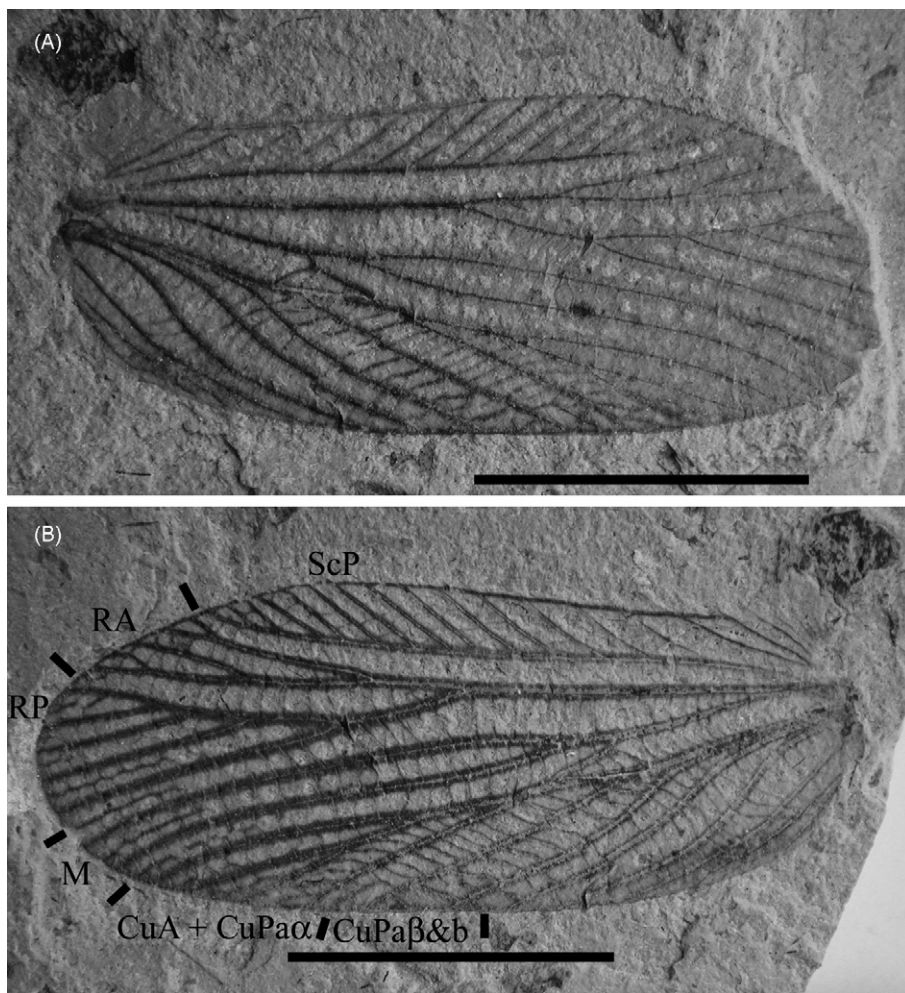


Fig. 1. *Ashangopsis daohugouensis* gen. et sp. n., holotype NIGP 143692a-b, tegmen: **A**, print; **B**, counterprint (scale bar = 10 mm).

Fig. 1. *Ashangopsis daohugouensis* gen. et sp. n., holotype NIGP 143692a-b, «tegmen». **A**: empreinte; **B**: contre-empreinte (barre d'échelle = 10 mm).

**Discussion.** Gorochov [6] characterized the subfamily Chifengiinae within prophalangopsids by the following characters: reduction of tegmina false C; stridulatory apparatus similar to those of Aboilinae. The first character is present in *Ashangopsis* gen. n. Our fossils have tegminae similar to that of the female of *Parahagla* Sharov, 1968 and *Habrohagla* Ren et al., 1995, but also to the male tegminae (except in the anal area structures) of *Ashanga* Zherikhin, 1985 and *Chifengia* Hong, 1982 [4,7,11,15]. *Ashangopsis* is characterized by a particular pattern of the medio-cubital veins, e.g. a broad area between M+CuA and CuP, and a very strong cross-vein connecting the bases of CuA and CuPa $\alpha$ , forming a triangular cell, filled with three weaker cross-veins. This structure could well correspond to a stridulatory function, as it certainly has no special function in flight. Such a structure is absent in female Chifengiinae, but present in some male Orthoptera (*Angarohagla* Zherikhin, 1985). *Ashangopsis* differs from the males of the other chifengiine genera in the absence of strong flexures and points of contact between branches of anal veins. Thus its stridulatory structure is ‘simpler’ than those of other male Chifengiinae. The broader and shortened tegmen of the new genus also differs from other known genera.

Five genera of Chifengiinae sensu Gorochov are currently known [5,6], all based on tegmina only. Present fossils of *Ashangopsis* give the first direct information of the body structures in this group. Sharov [12] reconstructed the body of the prophalangopsid *Aboilus aullietus* (long antenna and tegmina; hind leg strong and large; pronotum narrow with a sharp posterior part). The body shape of the new genus is similar to that of this Aboilinae. However, *Ashangopsis* differs from it in the rather broader and shortened tegmina and smaller hind leg. The present discovery shows that *Ashangopsis* and probably the other Chifengiinae were jumpers, but probably not strong fliers.

The presence of both stridulatory and tympanal organs on the fore tibia of *Ashangopsis* shows that they probably had habits similar to those of the recent grylloids. Stridulatory organs on orthopteran wings are very old, dating back to the Late Permian, so finding tympanal organs in Middle Jurassic ‘crickets’ is not surprising.

*Ashangopsis daohugouensis* sp. n. (Figs. 1–4).

**Description** (based on both specimens). Body large. Prothorax rather wide anteriorly, gradually reduced and rounded posteriorly; tegmina broad and short, with very

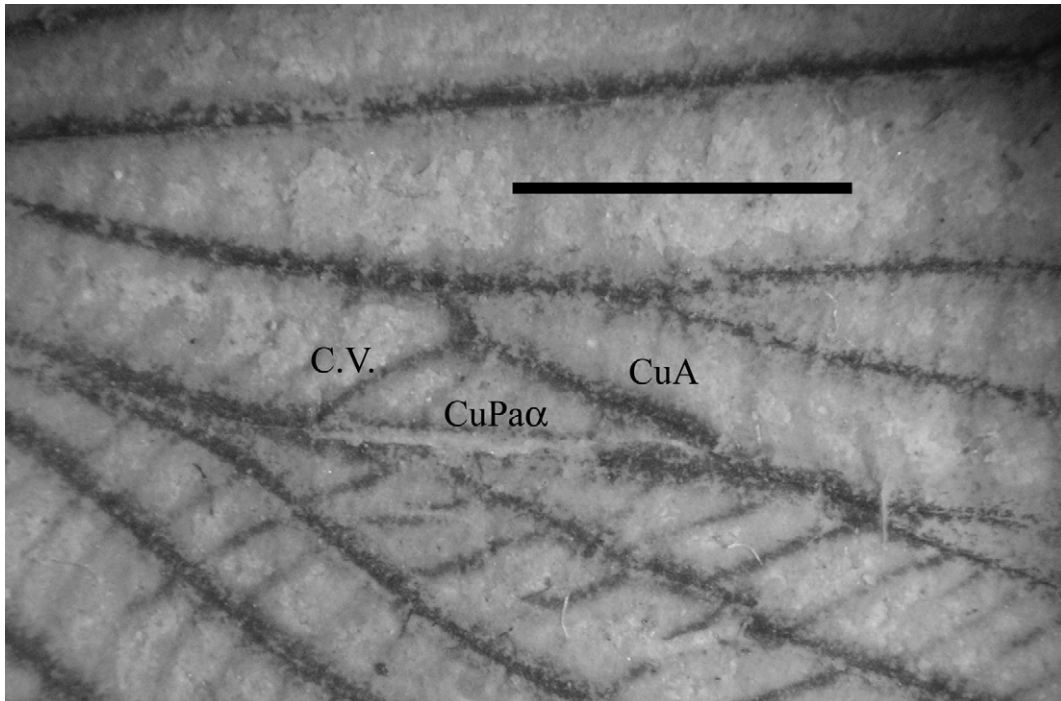


Fig. 2. *Ashangopsis daohugouensis* gen. et sp. n., holotype NIGP 143692a-b, detail of triangular cell between strong cross-vein (C.V.) connecting bases of CuA and CuPa $\alpha$  (scale bar = 2.5 mm).

Fig. 2. *Ashangopsis daohugouensis* gen. et sp. n., holotype NIGP 143692a-b, détail d'une cellule triangulaire entre un gros croisement de veine (C.V.) reliant les bases CuA et CuPa $\alpha$  (barre d'échelle = 2,5 mm).

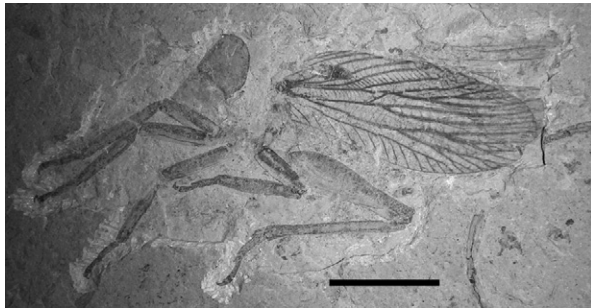


Fig. 3. *Asharegopsis daohugouensis* gen. et sp. n., paratype NIGP 143691a, body in lateral view (scale bar = 10 mm).

Fig. 3. *Asharegopsis daohugouensis* gen. et sp. n., paratype NIGP 143691a, corps, vue latérale (barre d'échelle = 10 mm).

strong longitudinal veins; anterior margin slightly wavy, apical margin rounded, broadest part in the apical third of the wing length; precostal area with weak fan-like veinlets, limited by ScA (= false C sensu Gorokhov [5]); ScP more stout and straight with 12–13 simple branches connected by simple cross-veins; R, M and CuA fused into a stout basal stem, running a while and then divided into R and M + CuA; stem of R very long, running to the middle of the tegmen before it forks into RA and RP, both forked again nearly at the same level; RA with 3–5 branches, all ending in the anterior wing margin; RP with 4–5 pectinate branches, ending in the postero-apical margin of the tegmen; M + CuA separating from R + M + CuA, running to the basal third of the wing length, and then divided into M and CuA; M divided into MA and MP at the middle of the wing length, both simple and ending in the posterior margin; area between R and M filled with dense and thin cross-veins; CuA arising from M + CuA, then obliquely fused with CuPa $\alpha$ , forming a complex system (CuA + CuPa $\alpha$ ), with four branches ending in the posterior wing margin; CuPa $\beta$  and CuPb parallel to CuPa $\alpha$ ; A1 more bowed than CuPa $\beta$  and CuPb; base of M + CuA and CuP space broad, with several thin and curved cross-veins; in the basal third of the tegmina, very strong cross-vein connecting bases of CuA and CuPa $\alpha$ ,

forming a triangular cell filled with three cross-veins (in NIGP No. 143691); CuPa $\beta$  slightly sigmoidal; CuPb and A1 moderately sigmoidal; A2 and A3 shorter than A1.

Legs covering fine setae; fore legs extending forward; fore trochanter rather small, inner side of the femur armed with a row of spines, tibia broadest at the median section, armed with ca. 5–6 inner spurs and three apical spurs, tarsi four-segmented, first tarsal segment elongate, second and third segments very short and oblique, fourth one as long as the first segment, narrow at the base and swollen at the apex, a pair of tarsal claws short, strong and curved; middle leg similar to that of fore leg, but slightly longer; hind legs distinctly stronger than fore and mid legs, of jumping type, hind femur very stout, tibia very long and straight, armed with a row of strong spines at the inner side, and three strong apical spurs. Two tympanal structures are visible near the base and the apex of inner side of fore tibia (Fig. 4, black arrows), similar in size and shape, i.e. both have an elongate elliptical shape. The proximal one looks rather smooth, while the distal one is formed by many rounded small plates, like in some recent haglid taxa such as *Cyphoderris monstrosa* Uhler, 1864 (Mason 1991).

**Dimensions.** In millimetres, holotype NIGP 143692a-b: length tegmen 25.5, width 10; paratype NIGP 143691a-b: Length of body 34–35, length tegmen 26, width 10; pronotum 4.5 long; mid femur 6 long, mid tibia 8 long; first mid tarsal segment 1 long, second 0.9, third 0.7, fourth 1.5; hind femur 1.28 long; hind tibia 13.5 long.

**Material.** Holotype. NIGP 143692a-b (print and counterprint of well-preserved male tegmina). Paratype NIGP 143691a-b (male body, with head, prothorax, more poorly preserved tegmina, and fore, middle and hind legs).

**Etymology.** Named after the Latinized spelling of the type locality 'Daohugou'.

**Age and locality.** Middle Jurassic, Jiulongshan Formation, volcanic tuff deposits near the Daohugou village, Ningcheng County, Inner Mongolia, China.

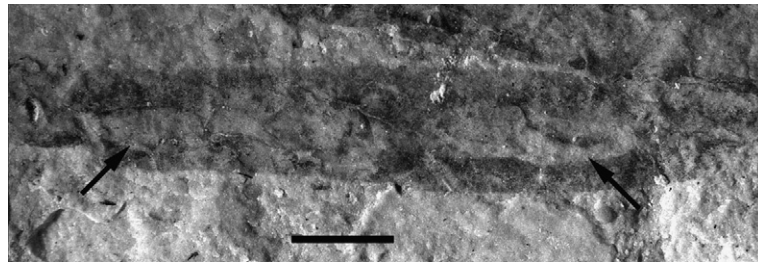


Fig. 4. *Asharegopsis daohugouensis* gen. et sp. n., paratype NIGP 143691a, tympanal structures [arrows] (scale bar = 1 mm).

Fig. 4. *Asharegopsis daohugouensis* gen. et sp. n., paratype NIGP 143691a, structures du tympan [flèches] (barre d'échelle = 1 mm).

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