



Revision of *Shurabia postiretis* (Reculida: Geinitziidae) from the Jurassic of Yiyang Basin, Jiangxi, China

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Abstract

Meixiella postiretis Huang *et al.*, 1991, was originally described as a new genus and species assigned to the distinctive family Geinitziidae (Reculida), based on a single forewing from the Lower Jurassic Menkoushan Formation (= Shuibe Formation in the present study) in the Yiyang Basin, Jiangxi Province, east China. *Meixiella postiretis* was subsequently transferred to *Shurabia* Martynov, 1937, a taxonomic assignment with which we concur. In the present study, we provide a detailed revision of the morphological characters of *Shurabia postiretis*. Based on its redefined diagnostic features and a holistic analysis of Jurassic insect-bearing strata in China, we discuss the evolutionary trajectory of *Shurabia*. Our findings provide support for its stratigraphic positioning from the late Early Jurassic to the early Middle Jurassic.

Keywords: Mesozoic, geinitziids, Polyneoptera, Yanliao biota, Middle-Late Jurassic

Introduction

Meixiella postiretis Huang *et al.*, 1991 was initially established for a new genus and species from the Lower Jurassic Menkoushan Formation at the Yiyang Basin, Jiangxi Province, China (Huang *et al.*, 1991). Subsequently, *Meixiella* was transferred to *Shurabia* by Storozhenko (1997, 1998) based on general characters of wing venation, a taxonomic reassignment with which we concur. However, the detailed morphological features of this species remain unrevised.

Geinitziidae, was first described by Handlirsch (1906) based on fossils from the Upper Jurassic of Dobbertin,

Germany, with *Geinitzia* Handlirsch designated as the type genus. Geinitziids, including *Shurabia*, represent significant components of several renowned fossil assemblages, such as those from the Madygen and Daohugou localities, which date from the Early to Middle Mesozoic (Rasnitsyn, 1982; Huang *et al.*, 2008; Aristov *et al.*, 2009; Cui *et al.*, 2012; Lian *et al.*, 2021). Geinitziids are represented by four species from the Jurassic of China: *Geinitzia aristovi*, *Sinosepididontus chifengensis*, and *Megasepididontus grandis* from the Daohugou biota, and *Shurabia postiretis* from the Yiyang Basin (Huang *et al.*, 2008; Cui *et al.*, 2012).

Shurabia was originally established by Martynov (1937), with a geological range extending from the middle Permian to the Early Cretaceous (Aristov, 2015, 2020). Recognized as one of the most diverse genera within Geinitziidae (Jouault *et al.*, 2022), the genus encompasses 25 described species distributed across South Africa, Kyrgyzstan, Australia, Ukraine and Russia, among other regions (Storozhenko, 1997, 1998; Jouault *et al.*, 2022). In Asia, *Shurabia* exhibits a widespread distribution, with 18 recorded species from Kyrgyzstan, Russia (Lower Lyulyuikta-1, Khasurty, Ust-Baley), Tajikistan, Japan, South Korea and China (Martynov, 1937; Fujiyama, 1973; Aristov *et al.*, 2009; Aristov, 2011; Cui *et al.*, 2012). Here we provide a detailed revision of the morphological characters of *Shurabia postiretis* and discuss its evolutionary significance.

Material and methods

The single forewing was preserved in the upper grey-black mudstone of the lower section of the Menkoushan Formation (= Shuibe Formation in the present study) near the Meixi village, Yiyang County, Jiangxi Province

as a shallow brown film. The Menkoushan Formation has been reclassified as the Shuibe Formation (Jiangxi Provincial Bureau of Geology and Mineral Resources, 1997). Within this stratigraphic unit, fossil remains of mesoblattinids, orthophlebiids, and cupedids have been documented. Photographs were taken with a digital camera attached to examined and photographed with a Zeiss AxioZoom V16 stereomicroscope. Line drawings were made using Adobe Illustrator 2019 graphic software. The sole specimen is deposited in the Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, Nanjing, China. The venational terminology is based on the nomenclature of Schubnel *et al.* (2020) to take into account the presence of a post-cubital vein in the Neoptera, rather than that of Huang *et al.* (2008) and Aristov (2015).

Systematic palaeontology

Order Reculida Handlirsch, 1906

Family Geinitziidae Handlirsch, 1906

Genus *Shurabia* Martynov, 1937

Type species. *Shurabia ovata* Martynov, 1937

Shurabia postiretis Huang *et al.*, 1991

1991 *Meixiella postiretis* Huang, Li & Lin, 1991

1997 *Shurabia postiretis* (Huang, Li & Lin, 1991) Storozhenko, 1997

Holotype. NIGP109269, imprint of a nearly complete forewing.

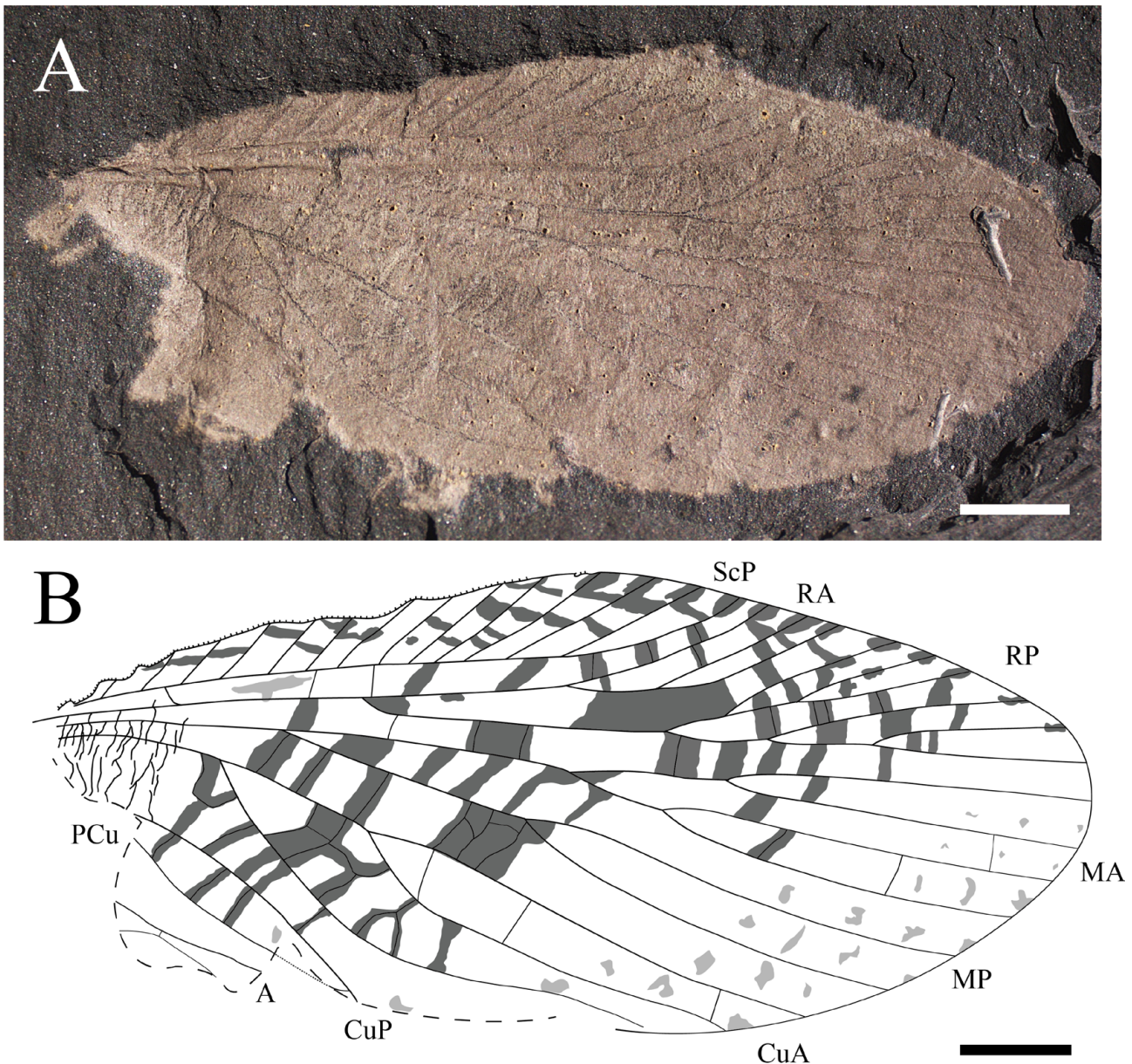


FIGURE 1. *Shurabia postiretis* Huang *et al.*, 1991, Holotype NIGP109269. Forewing. **A**, Photograph. **B**, Line drawing. Scale bars = 2 mm.

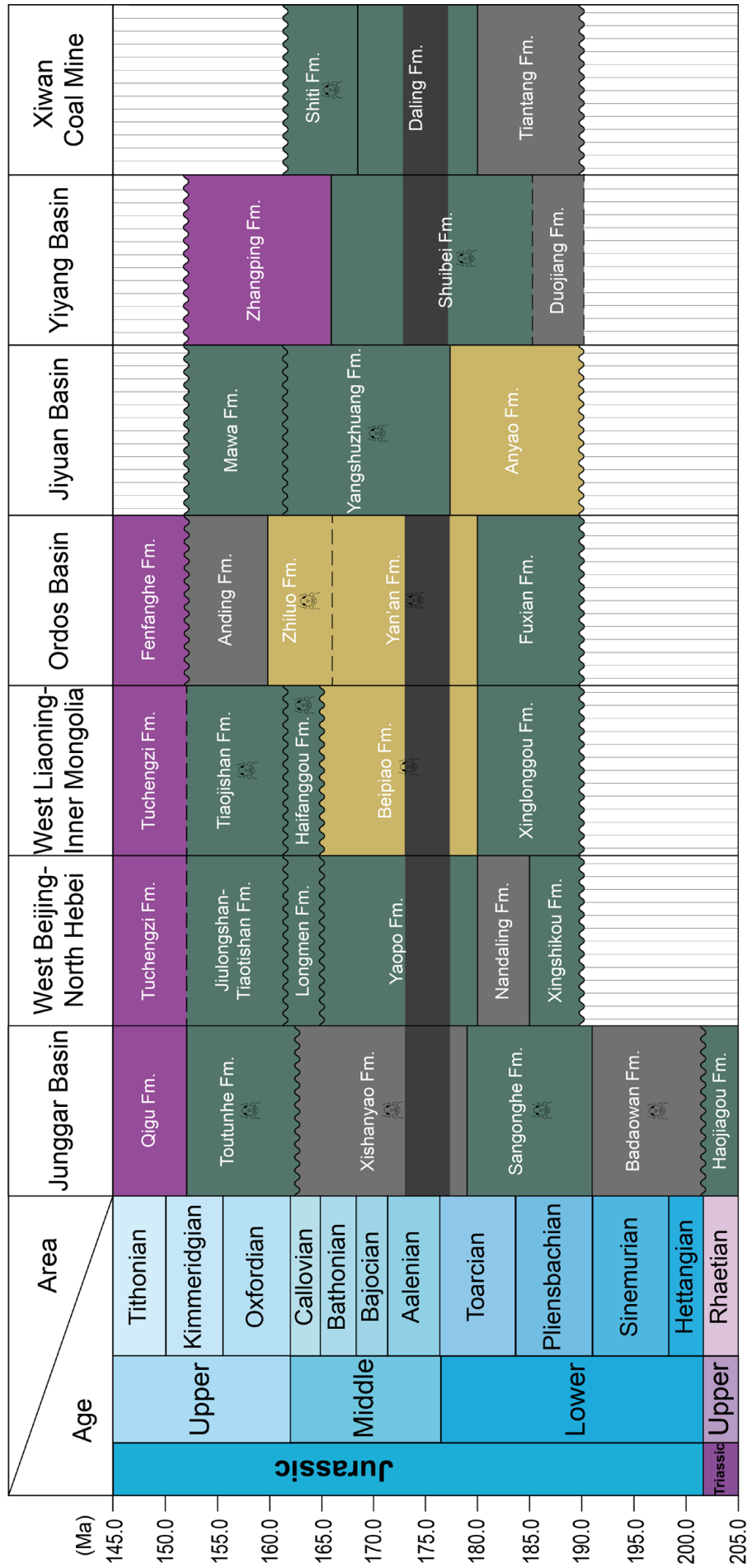


FIGURE 2. Correlation table of Jurassic insect-bearing strata in China.

Diagnosis. Relatively large forewing, not very transparent except for approximately three irregular rows of small spots along posterior inner edge. RA with three branches; RP beginning at one third of wing, with six straight branches; M branching earlier than R; MA with two dichotomic branches; MP with two long branches; PCu forming together with CuP a single anal loop-like structure.

Type locality and horizon. Meixi, Yiyang County, Jiangxi Province, south-eastern China; Early-Middle Jurassic Shuibe Formation.

Description. Forewing 19.4 mm long, 8.3 mm wide; wing base armed with dense transverse wrinkles; costal area relatively broad; ScP with at least fourteen anterior branches, reaching two-thirds of wing length apically; R bifurcating into RA and RP at one third of wing, RA with three branches; RP with six branches in two trifurcation; MA₁ reaching wing apex; MP forking nearly at same level as MA branching, both with two branches; CuA₁ with two branches, CuA₂ simple, fork of CuA₁ at same level as first fork of RP; CuA₂ slightly curved with S-shape; PCu simple; A with two branches; cross-veins simple all over wing except forked in Cu area, along with wing spots.

Remarks. Huang *et al.* (1991) proposed that *Meixiella* closely resembles *Shurabia*, differing mainly in having more branches of RA and RP; M forking near first fork of RA; cross-veins between CuA branches, anterior branches of RP, and anal vein forming a H or-Y shape. However, these features are actually quite common within the genus *Shurabia* (Cui *et al.*, 2012). Therefore, the taxonomic reassignment of *Meixiella postiretis* to *Shurabia* (Storozhenko, 1997) is both justified and supported by our study.

The Late Triassic *Shurabia taewani* from South Korea demonstrates significant morphological affinities with *Shurabia postiretis*, yet these species can be distinguished by several key characteristics. *S. taewani* exhibits five non-pectinate RP branches (versus six in *S. postiretis*) and possesses MA₄ reaching the wing apex (contrasting with MA₁ in *S. postiretis*). Furthermore, *S. taewani* is characterized by distinctly smaller wing dimensions compared to *S. postiretis*.

Discussion

Shurabia postiretis was discovered in the lower section of the Shuibe Formation, a coal-bearing stratigraphic unit (Huang *et al.*, 1991). While previously considered Early Jurassic in age, recent high-precision U-Pb zircon geochronology (CA-ID-TIMS) has provided precise ages ranging from 173.992 ± 0.053 Ma to 171.975 ± 0.047 Ma for the middle section of the Yan'an Formation in the North

Ordos Basin (Zhang *et al.*, 2021). These data suggest that the coal-bearing strata are more likely to span between the late Early Jurassic to the Middle Jurassic (Huang *et al.*, 2021). Moreover, the Shuibe Formation has yielded the diagnostic plant fossil *Coniopteris hymenophylloides* (Cai *et al.*, 1979), supporting a Middle Jurassic age. Consequently, *Shurabia postiretis* is distinctly younger than the geinitziids from the Daohugou biota.

Shurabia postiretis offers valuable insights into the evolutionary trajectory of *Shurabia* during the Triassic and Jurassic. The complex branching patterns of RA and RP veins in *S. postiretis* closely resemble those observed in many Triassic specimens, such as *S. aleda*, *S. kapokraalensis*, and *S. elegans* (Fujiyama, 1973; Wappler, 2001) yet differing markedly from geinitziids of the Daohugou biota. Notably, Daohugou geinitziids, including *Sinosepididontus chifengensis* and *Megasepididontus grandis*, typically exhibit simpler venation, with one to two RA branches and three to four RP branches (Huang *et al.*, 2008). Additionally, the single post-cubital anal-loop-like structure in *S. postiretis* represents an intermediate morphology between the absence of an anal loop in Triassic geinitziids and the two-celled anal loop structure characteristic of Daohugou species.

Recent studies by Nel *et al.* (2024) have identified the biota within the Yan'an Formation as representing the initial stage of the Yanliao biota, supported by shared morphological similarities with other forms (*e.g.*, Huang, 2023; Xu *et al.*, 2023). The available evidence suggests that the older forms of the Yanliao biota may have originated in south China, further highlighting the biogeographic significance of *S. postiretis* and its stratigraphic context.

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