



豫西济源盆地中—上三叠统谭庄组幻蝉类的首次发现及其地层学意义(英文)*

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摘要 本文根据一枚产自华中地区豫西济源盆地谭庄组上段的昆虫化石标本建立1新属新种——济源三叠幻蝉 (*Triasomaguviopsis jiyuanensis* Zhang Q. et Zhang H. gen. et sp. nov.), 归入原蝉总科幻蝉科(半翅目, 蝉亚目)。本新类群以盖翅较小且具瘤、ScP+RA在盖翅中部初次分支、MP脉三分支且初次分支水平处晚于ScP+RA脉、CuA脉弯曲无分支为特征。幻蝉科的古地理分布范围扩展至济源盆地, 该科分异度增加并具备生物地层对比潜力。谭庄组的昆虫化石可归入鄂尔多斯盆地的“铜川昆虫群”, 并且“铜川昆虫群”与吉尔吉斯斯坦的“Madygen昆虫群”关系密切。

关键词 *Triasomaguviopsis jiyuanensis* gen. et sp. nov. 谭庄组 中—晚三叠世 鄂尔多斯盆地 华中

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First maguviopseid cicada from the Middle–Upper Triassic Tanzhuang Formation in Jiyuan Basin, western Henan, and its stratigraphic significance

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Abstract A new fossil insect taxon, *Triasomaguviopsis jiyuanensis* Zhang Q. et Zhang H. gen. et sp. nov., is established based on a specimen from the Upper Member of the Tanzhuang Formation, Jiyuan Basin, western Henan Province, central China, and is assigned to the family Maguviopseidae of the superfamily Prosboloidea (Hemiptera, Cica-

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domorpha). This new taxon is characterized by smaller granular tegmen, ScP+RA first forked near its mid-length, MP forked more toward apex of ScP+R with three terminals, and singular and sinuous CuA₂. This new discovery extends the palaeogeographic distribution of Maguviopseidae to the Jiyuan Basin, increases diversity of this family and has the potential in biostratigraphic correlations. Insects from the Tanzhuang Formation may belong to the Tongchuan Entomofauna from the Ordos Basin, which has a close relationship with the Madygen Entomofauna from Kyrgyzstan.

Key words *Triasomaguviopsis jiyuanensis* gen. et sp. nov., Tanzhuang Formation, Middle–Late Triassic, Ordos Basin, central China

1 Introduction

The Jiyuan Basin, as a part of the Ordos Basin during the Triassic, is a Mesozoic continental basin with Early Triassic to Jurassic deposits (Fig. 1-A), including, in ascending order, the Liujiagou, Heshanggou, Ermaying, Youfangzhuang, Chunshuyao, Tanzhuang, Anyao, Yangshuzhuang, and Ma'ao formations (Yang *et al.*, 2014).

The Tanzhuang Formation, originally named by the Oil Team of Henan Geological Bureau as “Tanzhuang Bed” in 1960, was later elevated to the Tanzhuang Formation by the Henan Institute of Geological Sciences in 1962 (Pan *et al.*, 2008). Its holotype section is located in the vicinity of Tanzhuang Village, Chengliu Town, Jiyuan City, Henan Province (112°28'26.50"E, 35°03'51.73"N, elevation = 225.0 m; Figs. 1-B–1-C). The Tanzhuang Formation conformably overlies the Chunshuyao Formation and conformably underlies the Anyao Formation. The Tanzhuang Formation, with a thickness of 96–773 m in the Jiyuan Basin, is composed of gray-yellow shelly mudstone and calcareous clay, interbedded with yellow-gray and taupe-gray calcareous siltstone, containing seam, oil shale and black claystone, and bauxitic shale in its top part (Xi and Pei, 1997). The lacustrine deposits of the Tanzhuang Formation contain various fossils such as charophytes, plants (including spores and pollen), bivalves, clam shrimp, insects, ostracods, tentaculita (microconchids), fish scales, tetrapods (bones and teeth), and ichnofossils (Pan *et al.*, 2008; Shi *et al.*, 2023; Su, 2023; Yang *et al.*, 2023).

There are different opinions on the age of the Tanzhuang Formation: (1) later Norian to Rhaetian (late Late Triassic; Hu, 1991, 2014; Xi and Pei, 1997;

Pan *et al.*, 2008; Xu *et al.*, 2023); (2) Carnian to early Norian (early Late Triassic; Tong *et al.*, 2021); (3) Late Triassic suggested by the *Punctatisporites-Apiculatisporis-Chordosporites* palynological assemblage from this particular formation (Wang, 1983); (4) Middle to early Late Triassic for the Upper Member of the Tanzhuang Formation based on a palynological analysis by Mángano *et al.* (1994) and accepted by Zhang *et al.* (2005).

Recent LA-ICP-MS zircon U-Pb dating results imply an early Late Triassic age (233.1 ± 1.3 Ma, 232.9 ± 2.1 Ma) for the top of the Tanzhuang Formation (Lu *et al.*, 2021) or a late Middle to early Late Triassic age (238.4 ± 1.2 Ma, 233.9 ± 1.0 Ma; Ladinian–Carnian) for the Upper Member of the Tanzhuang Formation (Su, 2023), suggesting a Middle–Late Triassic age for the Tanzhuang Formation.

Fossil insects from the Tanzhuang Formation were first mentioned in Zhang *et al.* (2021), and a few beetle elytra with little biostratigraphic significance were later reported (Xu *et al.*, 2023; Yang *et al.*, 2023). Later, abundant insects have been reported from the Upper Member of the Tanzhuang Formation at the Shigou section in the Jiyuan Basin (Fig. 1-C); most of them are beetle elytra and bodies (Coleoptera: Archostemata, Myxophaga, Adephaga and Polyphaga) and a few cockroach forewings (Blattodea; Su, 2023). All these fossils lack taxonomic treatments at species or genus level.

Here, we describe a new genus and species assigned to the family Maguviopseidae (Hemiptera, Cicadomorpha, Prosboloidea) from the Upper Member of the Tanzhuang Formation in Chengliu Town, Jiyuan City, western Henan Province, central China (Figs. 1-A–1-B).

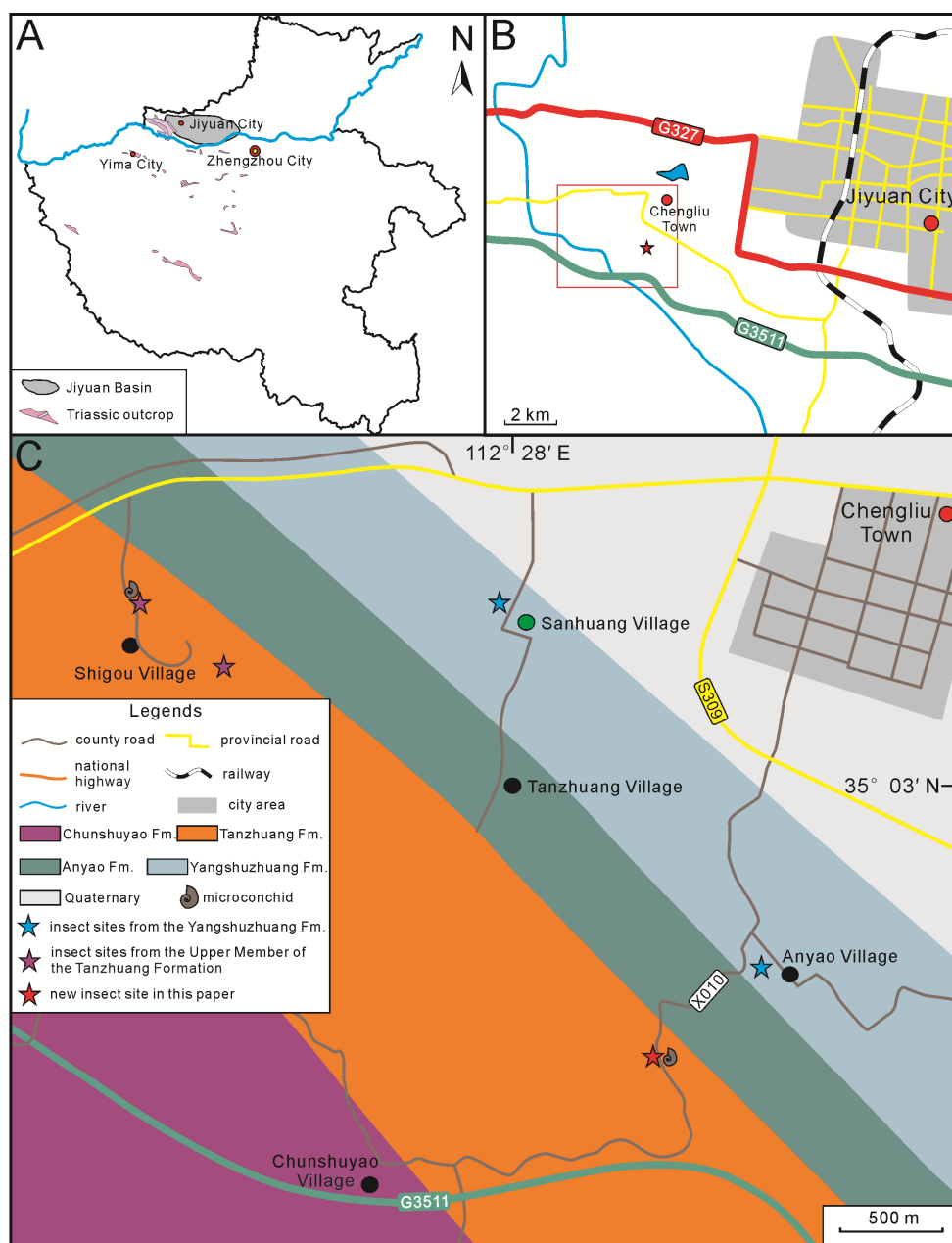


Fig. 1 Locations of the Jiyuan Basin, study area, and the fossil site

A. Location of the Jiyuan Basin and Triassic outcrops in Henan Province. B. Geographic locations of the fossil site (red star) and the study area (red square). C. Enlargement of the study area (red square in B) to show the detailed locations, simplified geological map of the fossil sites.

2 Materials and Methods

The specimen (NIGP205536) described here is an isolated tegmen collected from the Upper Member of the Tanzhuang Formation (Middle to Late Triassic) at the Nanshan section. Photos of the tegmen were obtained using a Zeiss Stereo Discovery V16 stereomicroscope system and Zen software at the

Nanjing Institute of Geology and Palaeontology (NIGPAS), Chinese Academy of Sciences, Nanjing, Jiangsu Province, China. Line drawings and reconstructions were completed using CorelDRAW 2019 software. The specimen (NIGP205536) is housed at NIGPAS. The venation terminology and nomenclature are adopted from Nel *et al.* (2012) and Bourgoin *et al.* (2015).

3 Systematic Palaeontology

Order Hemiptera Linnaeus, 1758

Suborder Cicadomorpha Evans, 1946

Superfamily Prosboloidea Handlirsch, 1906

Family Maguviopseidae Shcherbakov, 2011

Subfamily Maguviopseinae Shcherbakov, 2011

Tribe Maguviopseini Shcherbakov, 2011

**Genus *Triasomaguviopsis* Zhang Q. et Zhang H.
gen. nov.**

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Etymology Generic name is a combination of *Trias-* ('Triassic') and the type genus name (*Maguviopsis*) of Maguviopseinae.

Type species *Triasomaguviopsis jiyuanensis* sp. nov.; here designated.

Diagnosis Same as for the type species.

Age and occurrence Middle–Late Triassic; Jiyuan City, Henan Province, central China.

Included species Type species only.

***Triasomaguviopsis jiyuanensis* Zhang Q. et Zhang
H. sp. nov.**

(Figs. 2-A–2-D, 3-D)

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Etymology The specific epithet is from Jiyuan City where the fossil site is located.

Holotype NIGP205536, housed at NIGPAS, part and counterpart of a tegmen with incomplete clavus.

Diagnosis Tegmen with round apex and densely distributed granular ornamentations. Stem ScP+R subparallel to costal margin, stem ScP+RA merge into CA, first forked near basal 2/5 of tegmen length; vein ScP+RA first forked near midtegmen; vein RP curved posteriorly, with three terminals; first fork of stem MP more apical than that of stem ScP+R, with three terminals; stem CuA single and sinuous; crossvein *ir* absent, crossvein *mp-cua* approximate vertical near level as ScP+RA forking. Cells C2 and C3 closed, C2 much wider than C3.

Description Tegmen small, round-triangular, length 4.66 mm, maximum width 2.69 mm, length/width ratio 1.73. Costal margin strong and curved at base, nearly straight along anterior margin, rounded at apical angle. Costal space narrowed at

base. Anteroapical angle greater than posteroapical angle (tornus angle). Clavus partly preserved. Basal cell absent. Stems ScP+R and MP+CuA fused into stem ScP+R+MP+CuA at base. Stem ScP+R curved anteriorly, parallel to basal CA, first forked into stem ScP+RA and vein RP at about basal 0.40 of tegmen length (before mid-tegmen); vein ScP+RA bifurcated into veins ScP and RA at basal 0.56 tegmen length, vein ScP curved into CA at basal 0.60 tegmen length; vein RA single, stretched towards anteroapical angle; vein RP curved posteriorly first and turned apically with three terminals developed, vein RP first forked into RP₁ and RP₂ at basal 0.79 tegmen length, vein RP₂ dichotomous. Crossvein *rp-mp* long and straight, connected veins RP₂ and MP₁₊₂. Stem MP+CuA separated into stems MP and CuA soon after leaving stem R+MP+CuA. Stem MP curved first, then straight on middle tegmen, forked into veins MP₁₊₂ and MP₃₊₄ at basal 0.68 tegmen length, much apical of first forking level of vein ScP+RA, basal of crossvein *rp-mp* level, vein MP₃₊₄ dichotomous with two terminals. Vein CuA₁ entirely fused with stem MP, stem CuA₂ presented first diverging from stem MP+CuA at base, single and sinuous, closet to stem MP at level of crossvein *mp-cua* (near same level as RA forked), then curved to end of straight vein CuP. Cells C2 and C3 closed, C2' and C3' open. Granular ornamentations distributed densely on tegmen, dark-coloured ribbons not preserved on tegmen.

Locality and horizon Nanshan section from Anyao Village to Chunshuyao Village, Chengliu Township, Jiyuan City, Henan Province, central China; Upper Member of the Tanzhuang Formation (Ladinian–Carnian).

4 Discussion

Triasomaguviopsis jiyuanensis Zhang Q. et Zhang H. gen. et sp. nov. is assigned to the family Maguviopseidae mainly based on the following characters: broad and sculptured tegmen, absence of base cell, vein ScP+R proximally forked, MP forked distally, and single CuA₂ and RA (Shcherbakov, 2011).

The little-known extinct family Maguviopseidae was established based on a tegmen collected from the

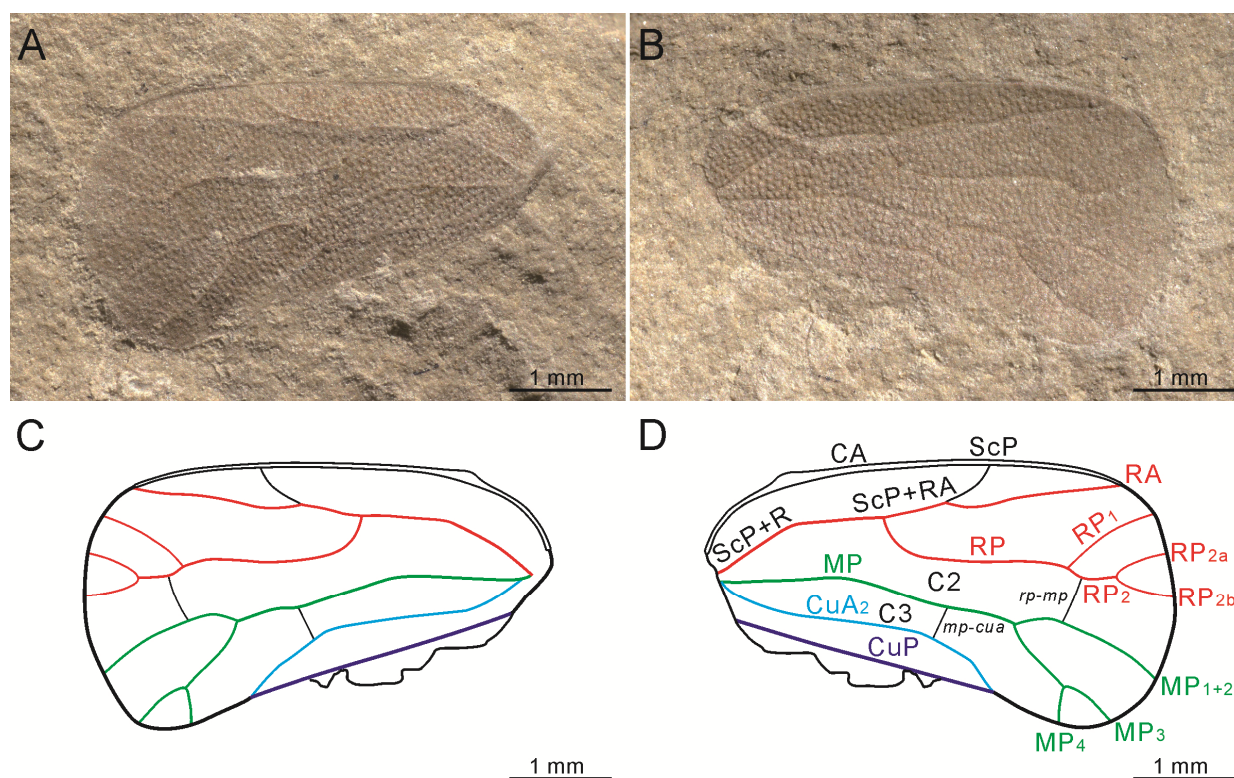


Fig. 2 *Triasomaguviopsis jiyuanensis* gen. et sp. nov., holotype (NIGP205536), tegmen

A, B. Photographs of part and counterpart of the specimen. C. Line drawing of the part. D. Line drawing of the counterpart showing tegminal venation (granules not illustrated in C and D).

Middle–Upper Triassic (Ladinian–Carnian) Madygen Formation of Kyrgyzstan (Shcherbakov, 2011). So far, twelve maguviopseid species have been reported from the well-known Madygen Entomofauna from the Madygen Formation, and one from the Tongchuan Entomofauna from the Middle Triassic Tongchuan Formation (= Yanchang Formation, Shaanxi Province, NW China) (Shcherbakov, 2011; Fu and Huang, 2022). Of these species, *Krendelia ansata* Shcherbakov, 2011 from the Madygen Entomofauna (Fig. 3-B) and *Archaeomaguviopsis magicus* Fu et Huang, 2022 from the Tongchuan Entomofauna (Fig. 3-A) are similar to the new taxon described herein.

From the preserved tegminal features, *T. jiyuanensis* differs from the above two taxa in having a shorter tegmen (less than 5 mm vs. more than 5 mm), a smaller diameter of granules (larger areolae in *A. magicus*), four terminal branches of R (four terminals and a blind vein in *A. magicus*), three branches of MP with dichotomous MP_{3+4} (dichotomous MP_{1+2} in

K. ansata, five MP terminals in *A. magicus*), vein ScP+R curved (straight and strong in *K. ansata*), and a narrower postcostal area (wider in *K. ansata*) (Figs. 3-A–3-C).

5 Stratigraphic Notes

Apart from the new insect taxon described here, some other fossils were also found from the same layer at the Nanshan section (Fig. 1-C, red star; Fig. 4-A–4-C). The freshwater microconchids and beetles at the new fossil site are very similar to those from the Upper Member of the Tanzhuang Formation at the Shigou section (Fig. 1-C, purple star) (Su, 2023; Yang *et al.*, 2023). The fossil-bearing interval at the Nanshan section (Fig. 1-C, red star) can also be correlated with the top of the Lower Member of the Tongchuan Formation (~237–237.4 Ma; Zheng *et al.*, 2018), where another maguviopseid (*Archaeomaguviopsis magicus* Fu et Huang, 2022) was found (Fu and Huang, 2022). The finding of *Triaso-*

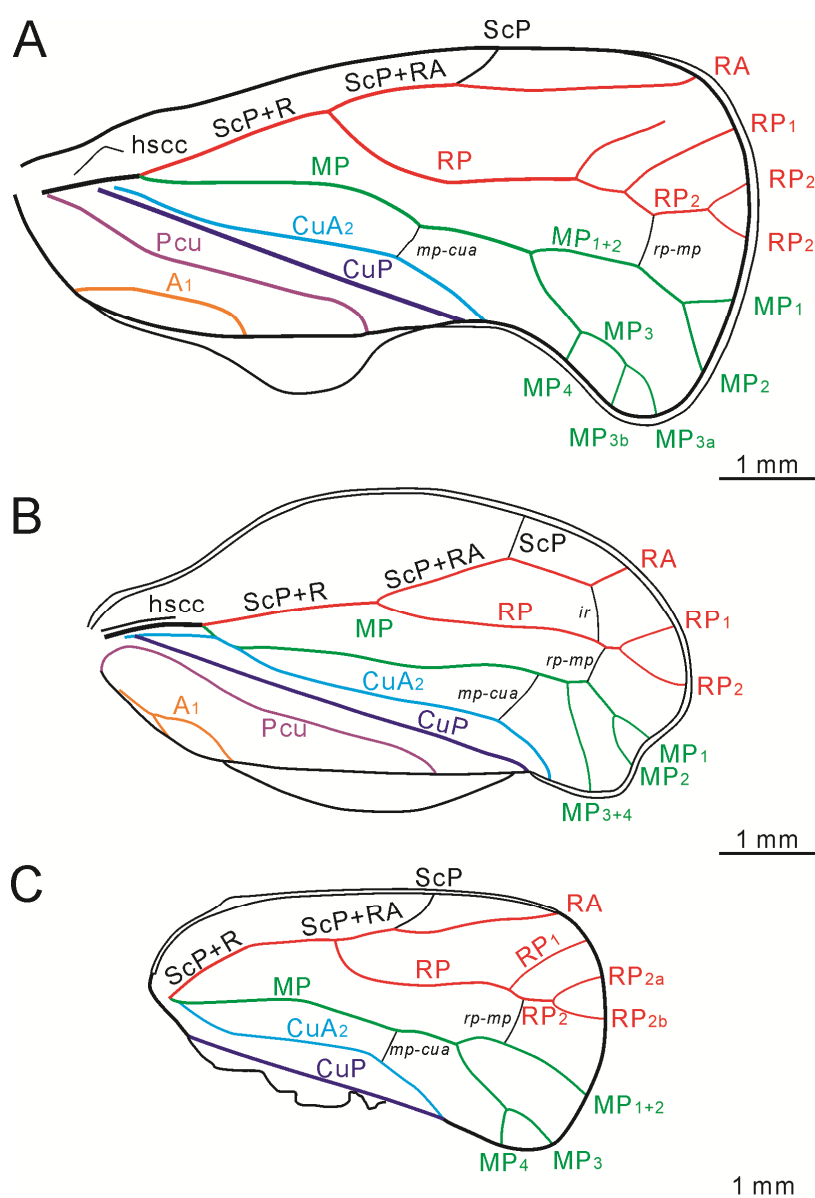


Fig. 3 Comparison of tegminal venation of some Maguviopseidae

A. *Archaeomaguviopsis magicus* Fu et Huang, 2022. B. *Krendelia ansata* Shcherbakov, 2011. C. *Triasomaguviopsis jiyuanensis* gen. et sp. nov.

maguviopsis jiyuanensis gen. et sp. nov. from the Jiyuan Basin expands the palaeogeographic range of Maguviopseidae from Tongchuan eastward to Jiyuan in the Ordos Basin, increases the diversity of this family, and suggests that this family possess the potential for biostratigraphic correlations of lacustrine strata.

6 Conclusions

A new maguviopseid cicada, *Triasomaguviopsis jiyuanensis* Zhang Q. et Zhang H. gen. et sp. nov., is

described from the Middle–Upper Triassic Tan-zhuang Formation of the Jiyuan Basin, central China. This species is the second representative of Maguviopseidae from China. The new taxon is characterized by its smaller granular tegmen with ScP+RA first forked near its mid-length; MP forked much apical of ScP+R with three terminals, and CuA₂ singular and sinuous. The new finding expands the palaeogeographic range of Maguviopseidae, increases the diversity of this family, and possess the potential for biostratigraphic correlations of non-marine strata.

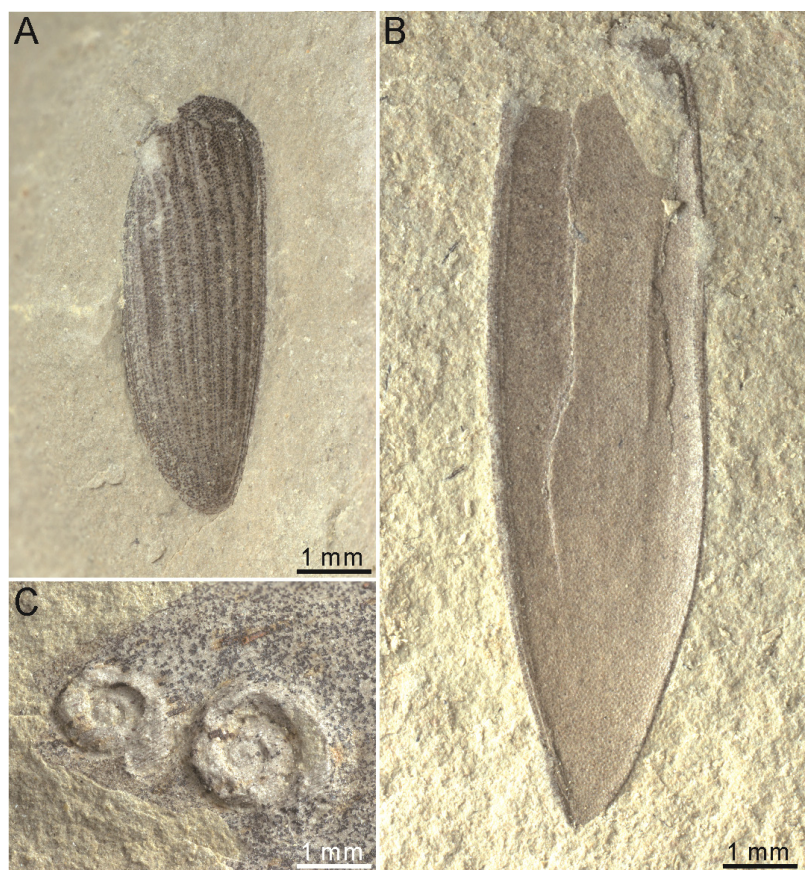


Fig. 4 Other fossils preserved in the same layer of the Tanzhuang Formation with *Triasomaguviopsis jiyuanensis* gen. et sp. nov. A, B. Beetle elytra. C. Microconchid.

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