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动物分类学报

THE FIRST DISCOVERY OF FOSSIL EOMEROPIDS FROM CHINA (INSECTA, MECOPTERA)

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Abstract In this paper two new genera and two new species of fossil eomeropid are described: Tsuchingothauma shihi gen. et sp. nov., Typhothauma yixianensis gen. et sp. nov. Both of them were recovered from the Jurassic non-marine sedimentary strata of Northern China. This finding documents the first complete fossil eomeropid and the first record in China. The new material from China reveals that the early diversification of eomeropids with cockroach-like body was well underway by the Middle Jurassic.

Key words Eomeropidae, fossil, new genus, new species, Jurassic, China.

The family Eomeropidae Cockerell, 1909 (= Notiothaumatidae Esben-Petersen, 1921) is now a relict group represented by only one extant species, Notiothauma reedi MacLachlan, 1877. Rare and primitive N. reedi, often called "living fossils", has been found only in these recorded localities in the western slopes of the Andes of Southern Chile: El Salto, near Valparaiso; Valdivia; the Cordillera de Nahuelbuta; and Pucatrihue of Osorno Province (Remington, 1968; Pena, 1968). This remarkable and unique insect is the only scorpionfly with dark, shining body and flat incumbent wings, and readily attracted to oatmeal bait. Notiothauma reedi is active during humid nights in Nothofagus forests and oviposited on ferns in captivity (Pena, 1968).

Although fossils of this family are rare and controversial, occurrences in the Mesozoic of scorpionflies referable to eomeropids indicate that this family might have been more diverse and widespread (Carpenter, 1992).

The oldest eomeropids are from the Triassic (Ponomarenko & Rasnitsyn, 1974; Carpenter, 1972, 1992; Willmann, 1989). The general morphology has not changed very much during the Mesozoic and the Cenozoic eras.

Recently we recovered four fossil eomeropids from the Jurassic non-marine sedimentary strata from Northeast China (Ren et al., 1995, 1996). Tsuchingothauma shihi sp. nov. with 3 well-preserved fossils was collected from Middle Jurassic Jiulongshan Formation in Daohugou Village, Ningcheng County, Inner Mongolia, China. Typhothauma yixianensis gen. et sp. nov. was collected from the Late Jurassic Yixian Formation in Chaomidian Village, Beipiao City, Liaoning Province.

This finding documents the first complete fossil eomeropid specimen and the first record in China. Tsuchingothauma gen. nov. is unique among fossil eomeropids in displaying terminal features (Mickoleit, 1971, 1975). Despite its Jurassic age, the new Chinese eomeropids, especially Tsuchingothauma gen. nov. show extraordinary morphological similarity to its living descendants found in Chile (Crampton, 1930; Mickoleit, 1971). This similarity underscores the stasis with eomeropids anatomical evolution. Indeed, extant eomeropids can be regarded as "living fossils" whose structures have remained little changed for over 160 million years. Furthermore, the new material from China reveals that the early diversification of eomeropids with cockroach-like body or cockroach type (Crampton, 1931; Shields, 1988) was well underway by the Middle Jurassic.

Materials. This study is based on four specimens housed in the fossil insect collection of the Evolutionary Biology Laboratory (CNUB; Dong Ren, Curator), Department of Biology, Capital Normal University, Beijing, China.

Illustrations. Line drawings were prepared with the aid of a camera lucida attached to a Leica stereomicroscope.

The terminology used here is that of Mickoleit (1971, 1975).

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Eomeropidae Cockerell, **1909**

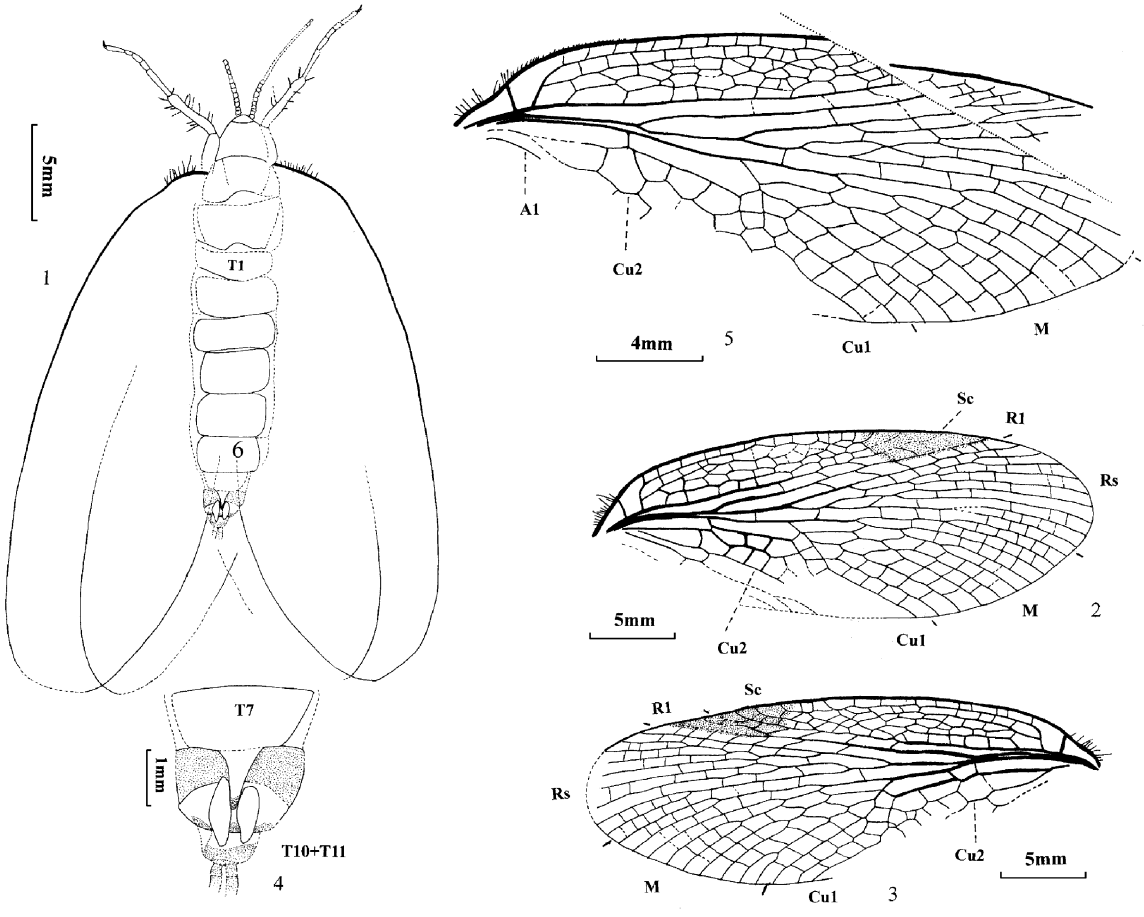
Tsuchingothauma gen. nov.

Type species: Tsuchingothauma shihi gen. et sp. nov.

Diagnosis. Apical margin of the fore wing somewhat sharp-pointed. The costal area is abruptly narrowed basally and broad beyond humeral crossveins, traversed by four main veinlets and forming 5 rows of cells, all of them arising anteriorly from its basal branch, parallel with the costal margin. Sc with 1-2 terminal branches. Pterostigma clearly present, apical branches of Sc and R1 vanished or obscure in this area. R1 single, bounded the posterior margin of pterostigma. Both Rs and M bifurcating, with 9 terminal branches. Cu1 forking almost at the point of Rs from R. The first branch of Cu1 fused with posterior branch of M for a short distance and then separated from it, at least with 2-3 terminal branches. Cu2 only with 1 terminal branches (preserved part) (Fig. 2).

Etymology. The genus name is dedicated to Mr Tsuching Shih, father of the junior author, for beingan excellent role-model and providing guidance, motivation and inspiration.

Comparison. In the general venation scheme the



Figs. 1-5. Tsuchingothauma shihi gen. et sp. nov. 1. Body with wings, wing venation are omitted, holotype, No. M-NN200401. 2. Venation of right forewing, holotype, No. M-NN200401. 3. Venation of left forewing, holotype, No. M-NN200401. 4. Terminal features, holotype, No. M-NN200401. 5. Venation of right forewing, paratype, No. M-NN200402-1.

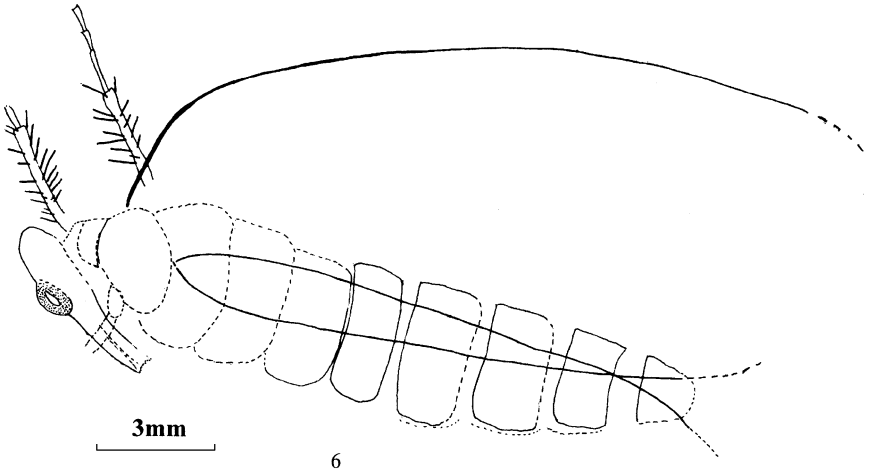
Tsuchingothauma gen. nov. somewhat resembles Notiothauma (Mickoleit, 1971), but new genus differs from latter by the costal area of forewing with four main veinlets, all of them parallel with the costal margin; Sc simple, single or with 2 terminal branches; both Rs and M with few branches; Cu1 forking almost at the point of Rs from R; apex of forewing sharp-pointed. The new genus also may be distinguished from Eomerope Cockerell by the costal area of forewing with four main veinlets; Sc single or with 2 terminal

branches.

Tsuchingothauma shihi sp. nov.

Description. The specimen shows the whole insect (Figs. 1-5, 8-10). Wings almost symmetrically arranged, with a pair on each side slightly overlapped; the veins of hindwings not discernible.

Head closely appressed to underside of the pronutum, and thus only partly visible from above; probably hypognathous, rostrum unknown; antennae incomplete, preserved part short and many segmented, filiform.



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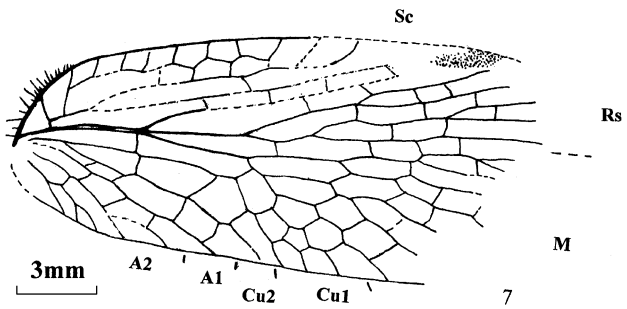

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Figs. 6-7. Typhothauma yixianensis gen. et sp. nov. 6. Body with wings, wing venation are omitted. 7. Venation of right forewing.

Prothorax with a large, shield-like pronotum, overlapping most part of the head. Meso- and metanota more or less rectangular and similar to each other; scutum and scutellum distinct on both.

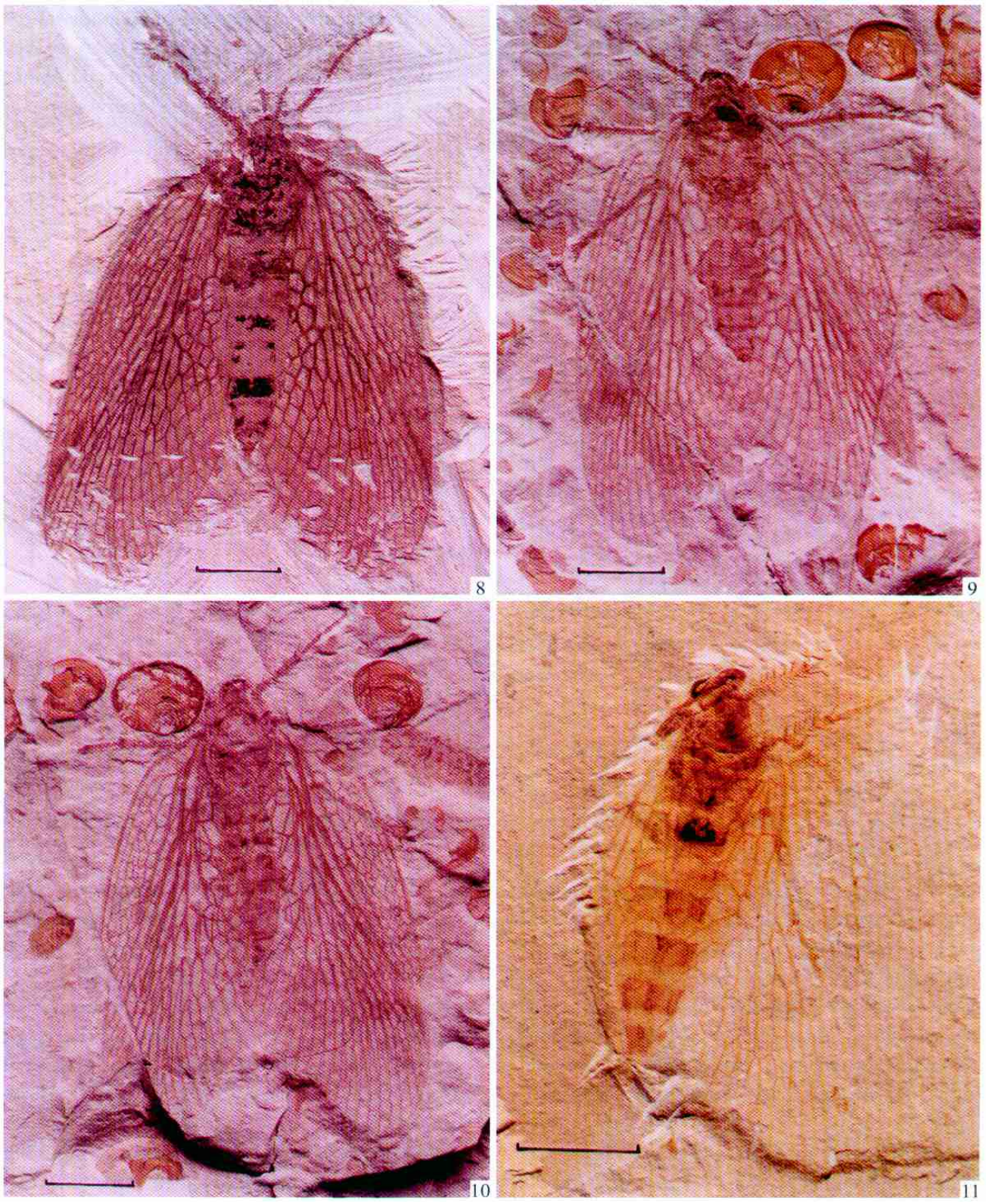
Legs densely clothed with transverse rows of short setae. Femora stout. Tibiae somewhat longer and slender, with many conspicuous spurs and 2 terminal spurs. Tarsi 5-segmented, basitarsus longest. Pretarsus with 2 claws.

The margins of both pairs of wings closely set with dot-like thickenings, from which arise short hairs.

Abdomen elongate, tapering apically, with 10 visible segments. Basitergum (T1) fused to metathorax, slightly shorted but not constricted at attachment to thorax. Posterior end of the T7 with a distinct unpaired median tergal process (monocornus). Segments 7-10 abruptly more slender than 2-6, without an enlarged genital bulb indicating female character (Fig. 4). Abdominal segments 8-9 completely sclerotised, without membranous pleura. The gonocoxosternites of segment 8 represented by two ventrally situated, sclerotised plates lying below tergite 9. T10 and T11 fused together, both of them sclerotised. Cerci at least 2-segmented, arising from T10 + T11. Basal segments of cerci not fused with each other. Sternum 8 smaller, divided into 2 sclerites, forming a paired prolonged gonocoxosternite.

Other description as that of the genus. The details of the wing venation depicted in Figs. 2-3, 5.

Male unknown. Holotype ♀, specimen No. M-NN200401; an almost complete well-preserved body with wings. Fore wing length 28 mm, width 10.5 mm; body length (excluding antennae) 22 mm; antenna length (preserved part) at least 5 mm. Paratypes, 2 specimens, almost complete well-preserved body with wings, sex unknown, part and counterpart, No. M-NN200402-1, No. M-NN200402-2. Fore wing length



Figs. 8-10. Tsuchingothauma shihi gen. et sp. nov. 8. Holotype, No. M-NN200401. 9. Paratype, No. M-NN200402-1. 10. Paratype, No. M-NN200402-2. Fig. 11. Typhothauma yixianensis gen. et sp. nov., holotype, No. M-LB200401. Scale bars = 5 mm.

27 mm, width 11 mm; body length (preserved part) at least 18 mm.

Locality and horizon. Daohugou Village, Shantou Township, Ningcheng County (41.6°N, 119.3°E), Inner Mongolia, China; Jiulongshan Formation, Middle Jurassic (Aalenian-Bajocian) (Ren, 1994; Ren et

al., 2002, 2003).

Typhothauma gen. nov.

Type species: Typhothauma yixianensis gen. et sp. nov.

Diagnosis. The costal area is not narrowed basally, traversed by only two main veinlets and forming 3 rows of cells. Humeral crossvein absent. R and M forks as in Tsuchingothauma. Cu1 not forking at the point of Rs from R, coalesced with posterior branch of M for a short distance and then separated from it. Cu2 single. 3 anal veins simple. Whole wing with fewer crossveins and cellules.

Comparison. The differences between Typhothauma gen. nov. and Tsuchingothauma gen. nov. are readily apparent by considering Figs. 2-3 and 7. In Typhothauma gen. nov. the costal area is not narrowed basally, traversed by only two main veinlets and forming 3 rows of cells; humeral crossvein absent; Cu1 not forking at the point of Rs from R.

Etymology. The genus name is a combination of typh- (Greek, meaning cloud) and Notiothauma (type genus of the family).

Typhothauma yixianensis sp. nov.

Description. The specimen shows the whole insect in lateral view (Figs. 6-7, 11). Only left forewing discernible.

Head distinct hypognathous, rostrum well-developed. Antennae unknown.

Prothorax poor-preserved. Meso-and metanotum distinctly bigger.

Tibiae with many conspicuous spurs and 2 terminal spurs.

The margins of both pairs of wings closely set with dot-like thickenings, from which arise short hairs.

Abdomen elongate, tapering apically, 7 basal segments visible. Basitergum (T1) fused to metathorax, not constricted at attachment to thorax. Terminal segment not preserved, sex unknown. The details of the wing venation depicted in Fig. 7.

Holotype, specimen No. M-LB200401; an incomplete well-preserved body with wings. Fore wing length (preserved part) at least 18 mm, width 8 mm; body length (preserved part) at least 18 mm.

Locality and horizon, Chaomidian Village, Shangyuan Township, Beipiao City (41.8°N, 120.7°E), Liaoning Province, China; Yixian Formation, Late Jurassic (Tithonian) (Ren et al., 1995, 1996).

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美蝎蛉化石在中国首次发现 (昆虫纲，长翅目)

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摘 要 描述了美蝎蛉化石 2 新属 2 新种: Tsuchingothauma shihi gen. et sp. nov., Typhothauma yixianensis gen. et sp. nov.。化石采自于中国东北侏罗纪非海相地层中。这是美蝎蛉化石在中国的首次发现。新的化石表明美蝎蛉的早期分异在中侏罗世就已存在。

关键词 美蝎蛉科，化石，新属，新种，侏罗纪，中国.
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