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Discovery of three new mordellids (Coleoptera, Tenebrionoidea) from the Yixian Formation of western Liaoning, China

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Abstract

In this paper one new genus and three new species *Bellimordella capitulifera* gen. et sp. nov., *B. longispina* gen. et sp. nov., *B. robusta* gen. et sp. nov., all placed within the subfamily Praemordellinae of the family Mordellidae, are described and illustrated. The specimens were recovered from the Yixian Formation of Beipiao City, Liaoning Province, NE China. The key to the species of this new genus is given. Furthermore, we discuss evolution of the pygidium and possible food for those ancient mordellids.

Keywords: Fossil; Mordellidae; Praemordellinae; New taxa; Late Jurassic; Early Cretaceous; Yixian Formation; Liaoning

1. Introduction

The extinct subfamily Praemordellinae represented a basal group in the family Mordellidae. It was thought to be the precursor of modern mordellids based on its plesiomorphic characters such as only apical ridges on hind tibiae and tarsi, simple tarsi and claw, small hind coxal plates, slender hind femora, the anterior position of epicoxae, and no elongated last tergum (Liu et al., 2007). It is an extremely small subfamily for only one genus and species has been described: *Praemordella martynovi* Scegoleva-Barovskaja, 1929, which was from the Late Jurassic of Karatau Range in Kazakhstan (Scegoleva-Barovskaja, 1929). Therefore, the new discovery of three relatively complete mordellid fossils from the Yixian Formation of western Liaoning, China is significant, for which allows us to bridge the gap in the fossil record of the family Mordellidae and guides to study the origin of the modern mordellids.

The age of Yixian Formation was proved to be contentious and three opinions have been produced: Late Jurassic (Ren et al., 1997; Zheng et al., 2003), the transition from Late Jurassic to Early Cretaceous (Chen et al., 2004; Wang et al., 2004, 2005), and Early Cretaceous (Swisher et al., 1999; Li et al., 2001; Pang et al., 2002; Zhou et al., 2003). At the present, we cannot draw a definite conclusion about its certain age solely based on our current mordellid data.

2. Materials and methods

The specimens were examined under a Leica MZ12.5 dissecting microscope and illustrated with the aid of a camera lucida attached to the microscope. We follow Crowson (1953) and Franciscolo (1954, 1957) in considering Anaspidinae as a subfamily of Scraptiidae rather than Mordellidae, and Lawrence and Newton (1995) for systematic paleontology. The type specimens studied in this paper are housed in the Key Lab of Insect Evolution and Environmental Changes, College of Life Science, Capital Normal University, Beijing, China (CNUB; Ren Dong, Curator).

3. Systematic paleontology

Order: Coleoptera Linnaeus, 1758
Superfamily: Tenebrionoidea Latreille, 1802

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Family: Mordellidae Latreille, 1802
Subfamily: Praemordellinae Scegoleva-Barovskaja, 1929

Diagnosis. Praemordellinae has only contained one species *Praemordella martynovi*, until now. Based on the new materials from the Yixian Formation of western Liaoning Province, the diagnosis of Praemordellinae can be emended as follows: body wedge-shaped and arched; head deflexed strongly, constricted behind eyes to form a neck; apex of abdomen exceeding elytral apices; last tergum without prolongation; claws simple; penultimate segments of fore and middle tarsi simple; hind tibiae and tarsi only with apical ridges; hind coxae enlarged to a small but transversely elliptical plate; hind femora slender, not as enlarged as those of modern mordellids.

Genus *Bellimordella* gen. nov.

Derivation of name. From the Latin prefix *bell* (meaning "exquisite") and the genus *Mordella* Linnaeus, 1758; gender feminine.

Holotype. *Bellimordella capitulifera* gen. et sp. nov.

Species included. Three species described herein.

Diagnosis. Maxillary palpi linear, last segment without distinct enlargement. Antenna filiform, inserted in front of eyes, shorter than pronotum. Elytra flat, gradually narrowing caudad; apex rounded slightly. Epicoxa present in front of hind coxal plate and immediately juxtaposed to metepisternum. Middle and hind tibiae with one apical spur respectively, with straight truncate apex, much shorter than their tarsi. Abdomen with 5 visible abdominal segments, last two segments exceed elytral apices.

Comparison. The new genus described here can be referred to Praemordellinae based on agreement with the diagnosis of this subfamily. It can be distinguished from the known genus *Praemordella* by the following: abdomen with 5 visible segments; elytra flat, gradually narrowing caudad, apex rounded slightly; tarsal formula 5-5-4; hind tarsi longer than tibiae; the presence of epicoxa anterior to hind coxal plate and immediately juxtaposed to metepisternum. The species within the genus *Bellimordella* can be distinguished by the following key.

3.1. Key to the species of Bellimordella

1. Body large (more than 8 mm long); pronotum narrower than head, basal lobe very short and indistinct.............. *B. robusta* gen. et sp. nov.
   Body small (less than 4 mm long); pronotum broader than head, basal lobe distinct and round..............2
2. Pronotum nearly parallel on anterior 1/3, then sharply curved inside; elytral epipleuron extending to nearly 3/4 of elytra; middle and hind tibiae with one short apical spur respectively..............*B. capitulifera* gen. et sp. nov.
   Pronotum parallel, elytral epipleuron extending to 1/2 of elytra, middle and hind tibiae with one long apical spur respectively..............*B. longispina* gen. et sp. nov.

Bellimordella capitulifera gen. et sp. nov.
Figs. 1, 2

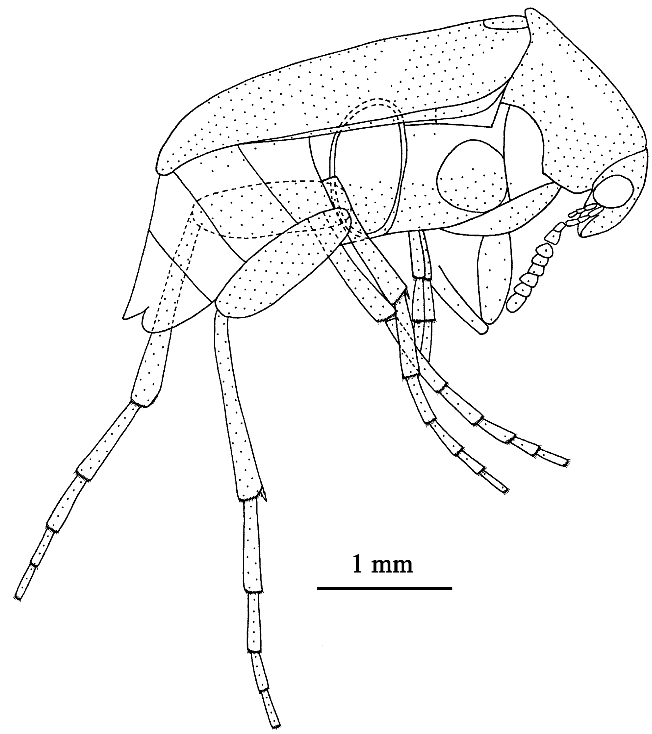

Fig. 1. ***Bellimordella capitulifera* gen. et sp. nov.,** line drawing of holotype, No. CNU-C- LB2006202-1.

Derivation of name. From the Latin *capitulifer* referring to the small head.

Holotype. CNU-C-LB2006202-1, CNU-C-LB2006202-2, part and counterpart impressions of a nearly complete mordellid in ventrolateral position.

Type locality and horizon. Yixian Formation, Huangbanjigou, Chaomidian Village, Beipiao City, Liaoning Province, China.

Diagnosis. Head very small; eyes oval, not reaching occiput; lateral sides of pronotum nearly parallel on anterior 1/3, then sharply curved inside, basal lobe distinct and round; elytral epipleuron distinct, extending to nearly 3/4 of elytra; middle and hind tibiae with one short apical spur respectively.

Description. Form wedge-shaped, elongate, arched, broadest slightly behind base of pronotum. Head, pronotum, elytra, middle and hind legs darker than the rest. Elytra, tibiae and tarsi with short pubescence. Head very small, strongly deflexed. Eyes oval, not reaching occiput. Mandibles long and triangular from ventrolateral view. Maxillary palpi linear, ratio of 3 visible segments 9:5:6, terminal one without enlargement. Antenna filiform, 11 visible segments, inserted in front of eyes, slightly exceeding base of pronotum, shorter than pronotum; segments 1–4 longer than wide; segments 5–10 wider than long, nearly rectangular; last one longest, oval. Pronotum 1.7 times as long as head, broader than head; lateral sides nearly parallel on anterior 1/3, then sharply curved inside; basal angles rectangular, base arcuate, basal lobe distinct and rounded. Scutellum long, triangular or rectangular, obtusely pointed posteriorly. Elytra flat, 2.2 times as long as pronotum, broadest slightly behind the base, gradually narrowing caudad, apex rounded;