



A new fossil genus of the family Glaphyridae (Coleoptera: Scarabaeoidea) from the Lower Cretaceous Yixian Formation

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Abstract

Lithohypna chifengensis, **new genus and species** of the family Glaphyridae MacLeay, 1819 is described and illustrated from the Lower Cretaceous Yixian Formation of Liutiaogou of Inner Mongolia, China.

Key words: Coleoptera, Scarabaeoidea, Glaphyridae, new genus, new species, fossils, Mesozoic, Yixian Formation, China

Introduction

The extant Glaphyridae MacLeay, 1819 is comprised of about 200 species and subspecies in six genera (Carlson 2002; Nikodym 2005; Nikodym & Bezdek 2006; Nikodym & Keith 2007; Keith 2007, 2008a, 2008b; Keith & Uliana 2008; Sabatinelli & Uliana 2009; Uliana & Sabatinelli 2010). Most extant Glaphyridae genera are restricted to the Palaearctic (Medvedev 1960). The Nearctic region is home to only nine species within a single endemic genus, *Lichnanthe* Burmeister, 1844 (Carlson 2002). Species of the genus *Amphicomma* Latreille, 1807 occur in the Palaearctic and Oriental regions. The South American tribe Lichniini Burmeister, 1844 (Scarabaeidae: Melolonthinae) was recently transferred out of the family Glaphyridae based on morphological and DNA analysis (see Hawkins 2006).

The extinct species of the Glaphyridae have been placed into three genera. Species of the extant genus *Glaphyrus* Latreille, 1802 have been found in the Miocene of Germany (Krell 2007) and in the Yixian Formation of China (Nikolajev & Ren 2011). One species of the extant North American genus *Lichnanthe* has been found in the Oligocene of the USA (Carlson 2002, Krell 2007). The Mesozoic genus *Cretoglaphyrus* Nikolajev, 2005 has been described from the Upper Cretaceous of Siberia (Nikolajev 2005, Krell 2007).

Here we describe a recently collected species of the new Mesozoic genus based on two specimens from the Lower Cretaceous Yixian Formation. This species is placed in the family Glaphyridae based on the following characters: antennal club with three antennomeres, mandibles produced beyond apex of clypeus, eyes partially divided by canthus, and pygidium visible beyond elytra.

Material and methods

Fossils were collected from the Lower Cretaceous Yixian Formation of the Liutiaogou Village, Chifeng City, Inner Mongolia, China. These specimens were examined dry and under alcohol, using a Nikon SMZ1000 stereomicroscope. Illustrations were made with the aid of a camera lucida. The photographs were prepared using a digital camera (DXM1200) connected to the above stereomicroscope. All specimens are deposited in the Nanjing Institute of Geology and Palaeontology (NIGP), Chinese Academy of Sciences.

Systematic palaeontology

Genus *Lithohypna* Nikolajev, Wang, & Zhang, new genus

Type species. *Lithohypna chifengensis* new species here designated.

Etymology. The name is derived from lithos, which is Greek for stone, and the generic name *Anthypna* Eschscholtz, 1818. Gender: feminine.

Diagnosis. Winged. Body elongate, length about 15 mm. Labrum large, approximately twice as wide as long, somewhat bilobed, sinuate in the middle. Clypeus with truncate, straight apical margin. Scutellum exposed, U-shaped. Elytra elongate, without striae, dehiscent at apex. Elytral lateral margin arcuate. Pygidium visible beyond elytra. Mesocoxae moderately separated. Mesofemur narrow. Protibia with three large denticles on the outer margin. Protarsus longer than protibia, non-lamellate medially. Metatibia with single, transverse carina on the outer margin.

The key differences between *Lithohypna* and other Glaphyridae genera is given in the table 1.

TABLE 1. Glaphyridae generic characters—see Figs. 1–7 for further details of characters and character states.

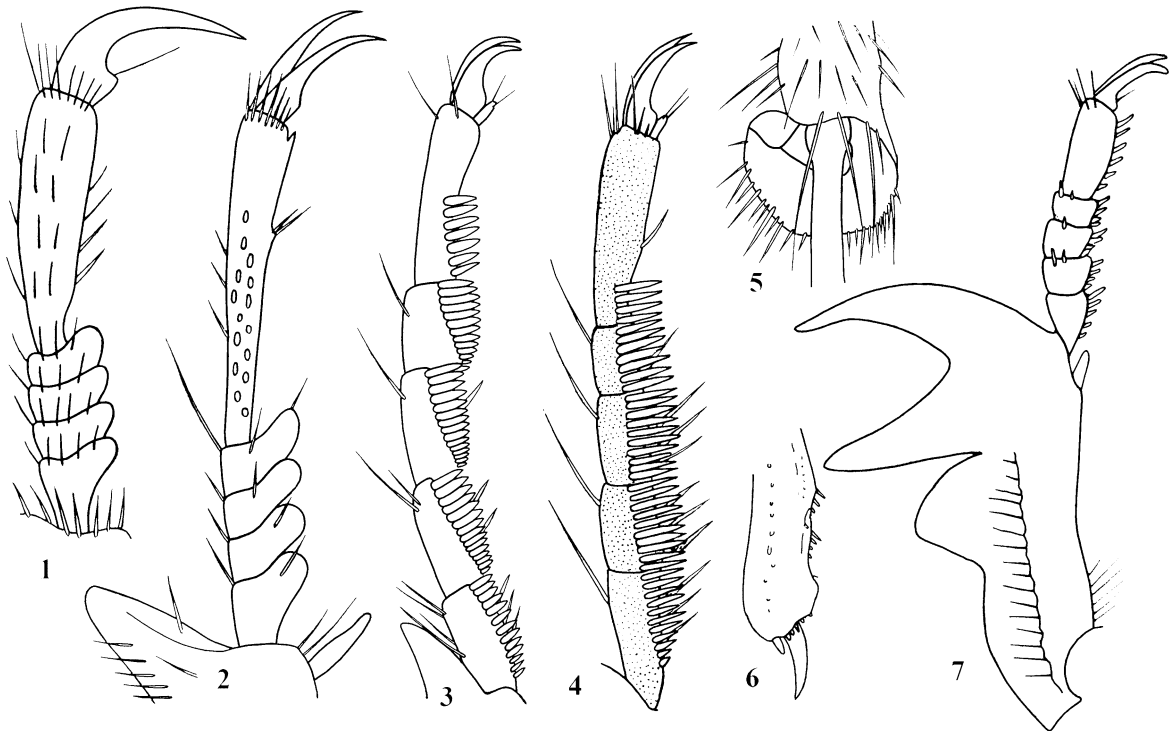
Genera	Males characters										
	1	2	3	4	5	6	7	8	9	10	11
<i>Anthypna</i> Eschscholtz, 1818	b	b	b	b	a	a	c	a	a	b	a
<i>Amphicomma</i> Latreille, 1807	b	a	b	b-c	a	b	b	b	a	b	a
<i>Cretoglaphyrus</i> Nikolajev, 2005	a?	?	b	a	c	?	?	a	a	b	a
<i>Eulasia</i> Truqui, 1848	b	b	b	b	a	a	b	a	a	b	a
<i>Glaphyrus</i> Latreille, 1807	a	b	b	a	a-b	b	a	a	b	a	a-b
<i>Lichnanthe</i> Burmeister, 1844	b	a	a	b	a	a	a	a	a	a	a
<i>Lithohypna</i> Nikolajev, Wang, & Zhang, 2011	a	b	a	b	a	a	?a	a	a	a	c
<i>Pygopleurus</i> Motschulsky, 1860	b	b	b	a	a	a	c	a	a	b	a

1. Mesoepimeron: a—clearly visible from above between pronotum and elytron; b—completely covered by elytra and not visible from above.
2. Antennal club: a—second antennomere free (antennal club usually elongate); b—second antennomere partially enclosed by the first antennomere (antennal club usually short).
3. Labrum: a—about 2.2 times wider than long; b—about 4–6 times wider than long.
4. Scutellum: a—triangular; b—U-shaped and broad; c—U-shaped and narrow.
5. Elytron: a—without longitudinal carinae; b—with low and wide longitudinal carinae; c—with sharp and thin longitudinal carinae.
6. Protibia: a—shorter than protarsus (Fig. 7); b—longer than protarsus.
7. Protarsus: a—tarsomeres 1–4 unmodified (Fig. 7); b—tarsomeres 1–4 lamellate on inside (Figs. 1–2); c—tarsomeres pectinate on inside (Figs. 3–4).
8. Mesotibia: a—apex unmodified; b—apex lamellate (Fig. 5).
9. Metafemur: a—slender; b—wide.
10. Lateral margin of metatibia: a—with one carina; b—without carinae.
11. Apex of metatibia: a—unmodified; b—with immobile spur; c—lamellate, like apex of mesotibia of *Amphicomma* species (see Fig. 5).

Composition. Only the type species is known.

Remark. *Lithohypna* characters may be a complex of plesiomorphies, synapomorphies and autapomorphies. Characters such as a large labrum, long protarsus with unmodified tarsomeres 1–4 in males, and unmodified apex of mesotibia in males are likely plesiomorphic. The mesoepimeron being clearly visible from above is a possible synapomorphy with the genera *Glaphyrus* and *Lichnanthe*. The antennal club with second antennomere partially enclosed by the first antennomere is a possible synapomorphy with the genera *Anthypna*, *Eulasia*, and *Pygopleurus*. Undoubtedly, the modified apex of the metatibia in males is an autapomorphy. A phylogenetics analysis will be needed to determine if the genus *Lithohypna* is a sister group to any of the extant taxa of the same rank. The Mesozoic genus *Cretoglaphyrus* might also be a sister group to *Lithohypna* as *Cretoglaphyrus* has characters such

as a short upper lip (autapomorphy or possible synapomorphy with the extant Glaphyridae genera) and an unmodified apex of the mesotibiae and metatibiae in males (possible plesiomorphies). Until a thorough phylogenetic analysis provides better evidence for evolutionary relationships among Glaphyridae taxa, the genus *Lithohypna* should be considered as *incertae sedis* and not placed in any of the Glaphyridae subfamilies.



FIGURES 1–7. Extant Glaphyridae genera, leg features: 1–2—*Amphicomma*, protarsus [1—*A. fairmairei* (Semenov), 2—*A. latouchei* (Fairmaire)]; 3—*Eulasia*, protarsus of *E. (Solskiola) analis* (Solsky); 4—*Pygopleurus*, protarsus of *P. vulpes* (Fabricius); 5—*Amphicomma*, mesotibia apex of *A. latouchei* (Fairmaire); 6–7—*Glaphyrus festivus* Ménétriés (6—mesotibia apex, 7—proleg) (after Medvedev [1960]).

***Lithohypna chifengensis* Nikolajev, Wang, & Zhang, new species**

(Figs. 8–10)

Holotype. A well-preserved imprint of the dorsal side NIGP152467 (Figs. 8–9, 11). Deposited in the Nanjing Institute of Geology and Palaeontology (NIGP), Chinese Academy of Sciences.

Paratype. A single well-preserved imprint of the abdominal side NIGP152468 (Figs. 10, 12). Deposited in the Nanjing Institute of Geology and Palaeontology (NIGP), Chinese Academy of Sciences.

Etymology. Named for the type locality, Chifeng City.

Diagnosis. See the generic diagnosis above.

Description. Body length nearly 15 mm. Dorsal surface of clypeus with short, horn-shaped tubercle. Pronotum as wide as long, trapezoidal, narrowing anteriorly, with rounded lateral margins; anterior angles acute; posterior angles widely rounded. Elytra widest in the middle; about 2.8 times as long as wide. Protibia with three teeth on the outer margin; apex of the middle denticle is directed outward.

Measurements (Holotype) Body length 14.2 mm (from mandibular apex to pygidial apex); head width 2.63 mm; pronotum length 3.0 mm pronotum width 4.26 mm; elytron length 8.31 mm, width 2.95 mm; profemur width 0.81 mm; protibia length at least 2.27 mm; protarsus length at least 2.29 mm (excluding the apex of fifth protarsomere); mesofemur width 1.06 mm; mesotibia length 2.33 mm; mesotibia apical width 0.57 mm; metafemur width 1.23 mm; metatibia length 3.47 mm; metatibia apical width 0.79 mm.

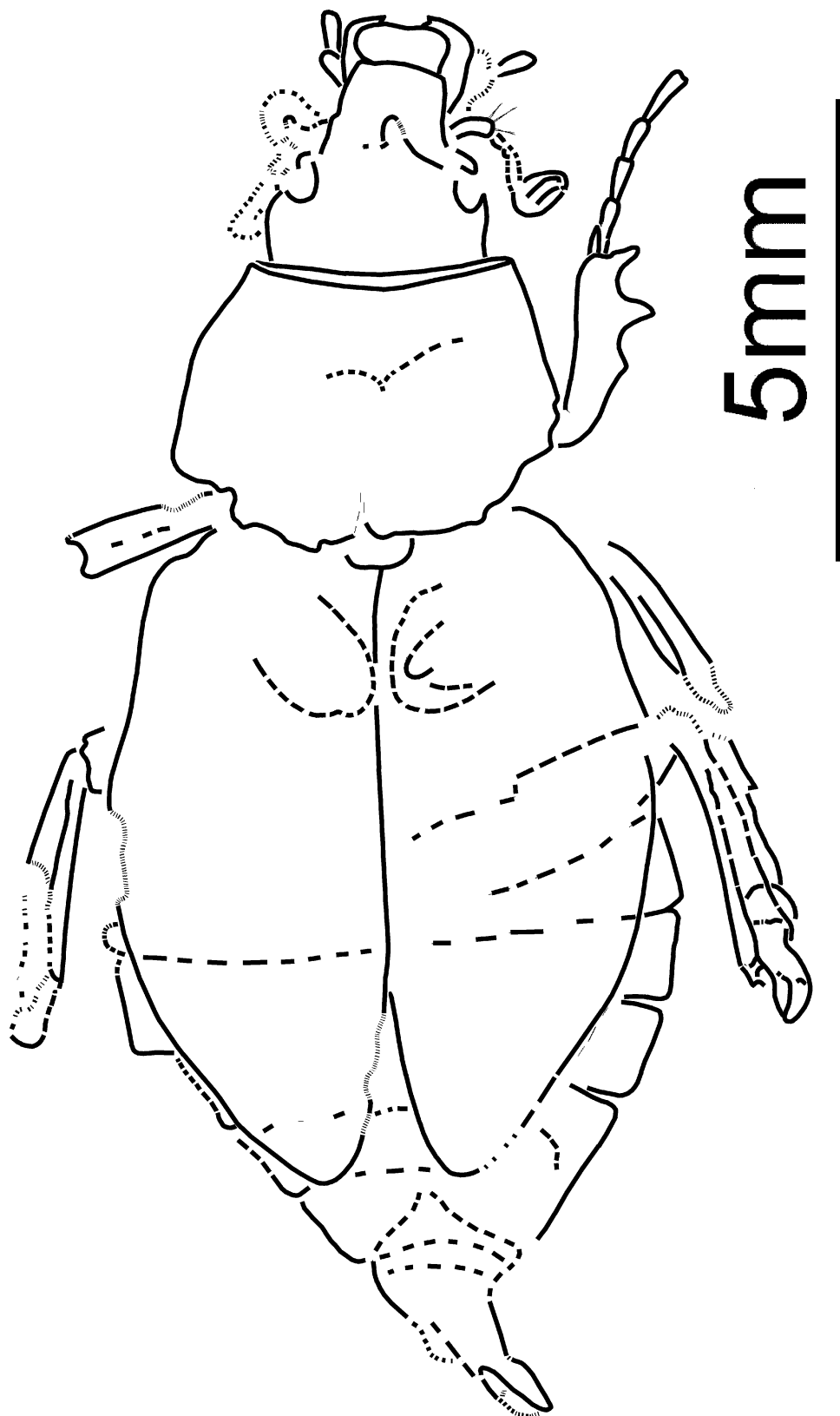
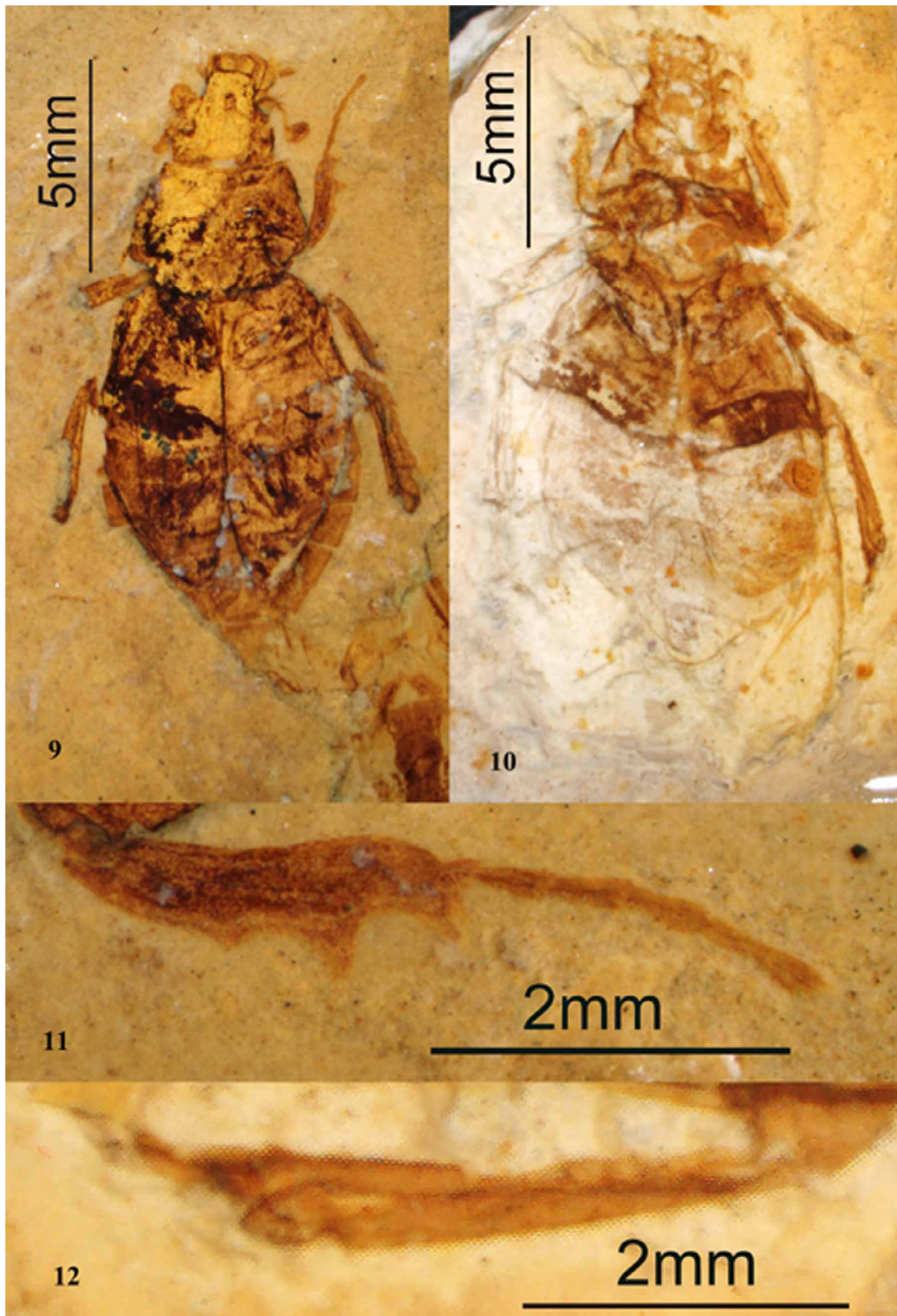


FIGURE 8. *Lithohypna chifengensis* new genus and species, holotype NIGP152467, dorsal view.



FIGURES 9–12. *Lithohypna chifengensis* new genus and species, photographs of imprints: 9, 11—holotype NIGP152467 (9—general view (excluding the imprint in the lower right corner), 11—proleg); 10, 12—paratype NIGP152468 (10—general view, 12—metatibia).

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