

# The Oldest Species of the Genus *Glaphyrus* Latr. (Coleoptera: Scarabaeoidea: Glaphyridae) from the Mesozoic of China

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**Abstract**—*Glaphyrus ancestralis* sp. nov. is described from the Yixian Formation (Upper Jurassic or Lower Cretaceous). The species is not only one of the earliest records of the family Glaphyridae but also the oldest representative of an extant genus of the family.

**Keywords:** China, Mesozoic, Yixian, Scarabaeoidea, Glaphyridae, beetles.

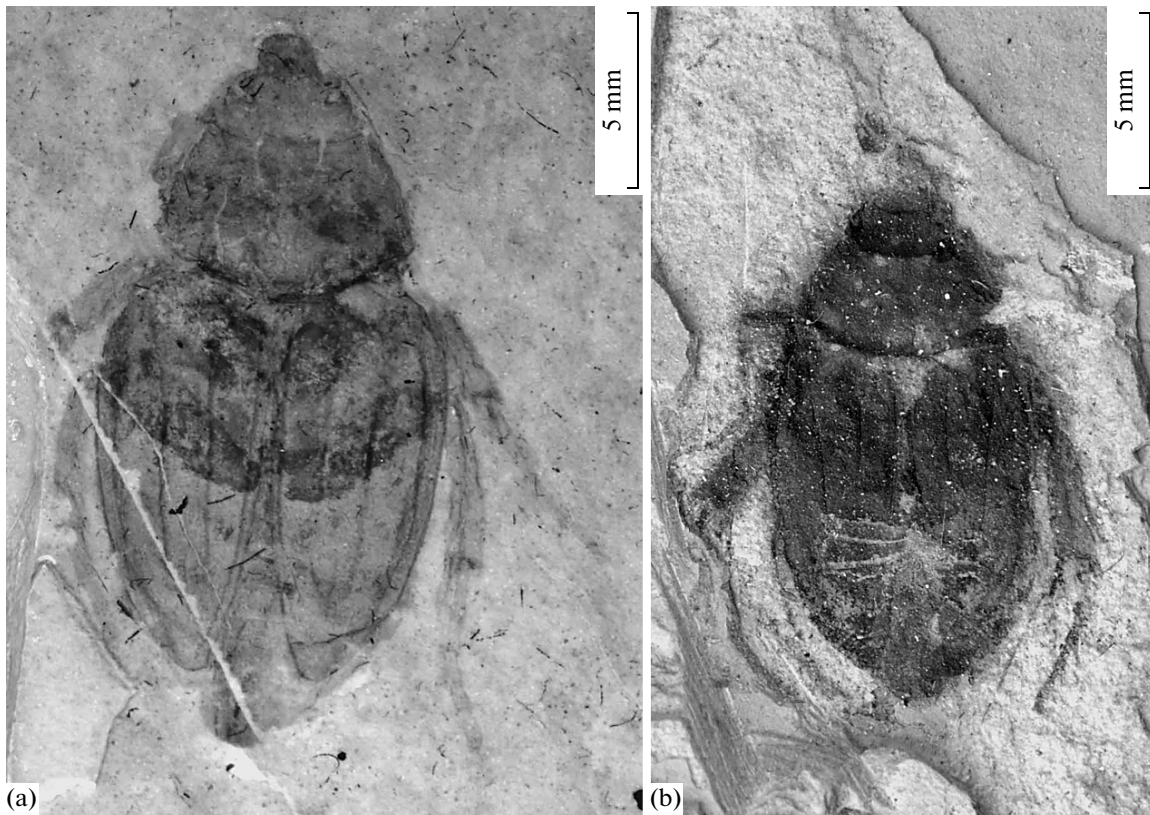
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## INTRODUCTION

The Glaphyridae is a small family represented in the present-day fauna by slightly over 200 species-group taxa of six genera. The genus *Lichnanthe* Burmeister, 1844 is endemic to the Nearctic and contains only nine extant species (Carlson, 2002). The areas of distribution of the type genus and the genera *Anthypna* Eschscholtz, 1818, *Eulasia* Truqui, 1848, and *Pygopleurus* Motschulsky, 1860 do not extend outside the Palearctic (Nikodým and Bezděk, 2006). Species of *Amphicomma* Latreille, 1807 are known from both the Palearctic and Oriental regions (Keith, 2008). It is noteworthy, however, that no single species is presently known to occur in both of these regions (Nikodým and Bezděk, 2006; Keith, 2008). DNA evidence has been used to justify the exclusion from the Glaphyridae of the South American subfamily Lichniinae Burmeister, 1844 (Hawkins, 2006; Smith, 2006), for a long time recognized as a part of that family, presumably due to convergent similarity associated with the flower-visiting habit.

The earliest known fossil records of the family are from the Lower Cretaceous. The genus *Creto-glaphyrus* Nikolajev has been recently described from two localities in Siberia (Nikolajev, 2005). In all the representatives of this genus the elytra have distinct longitudinal carinae. A large number of fossil scarabaeoids of the family Glaphyridae was found in the Yixian Formation near Chaomidian Village in Liaoning Province, China. All the specimens with longitudinal carinae on the elytra have been provisionally identified as *Creto-glaphyrus*. The excellent state of preservation of one of the impressions (Fig. 1a) has allowed not only a clear differ-

entiation of the new species from the type species of *Creto-glaphyrus* by the structure of the labrum and clypeus, but also a discovery of an interesting trait not previously noticed in *Creto-glaphyrus*: the elytra do not conceal the mesepimera, which are well visible in dorsal view between the pronotum and elytra. Among the extant Glaphyridae this character state is found in only two genera, *Lichnanthe* and *Glaphyrus*. *Glaphyrus* includes 37 valid recent species and subspecies; the genus is most diverse in the Mediterranean, but the eastern part of its range extends to the northwestern China. Because in the structure of the labrum, scutellum, and elytra the new species differs from the known species of *Lichnanthe*, the preserved characters of this beetle allow its placement only in the type genus of the family. These characters include the mandibles and labrum not concealed under the clypeus, clypeus with three teeth on its anterior margin, eyes incompletely divided by canthi, abdomen not fully concealed by elytra, mesocoxae not widely separated, and both meso- and metatibiae with a single transverse ridge on the outer surface. However, this combination of characters does not allow placing the new species in any of the three extant subgenera of *Glaphyrus* Latreille, 1807 because these characters occur in each of those subgenera. This can be the reason to treat the new species from Liaoning as representing a new subgenus. However, because the already recognized subgenera, except the nominotypical one, contain few species (one is monotypic, and the other includes only two species), recognition of any subgenera within *Glaphyrus* seems unwarranted. We, therefore, think it more logical to recognize within this genus only several species groups. Nikodým



**Fig. 1.** *Glaphyrus ancestralis* sp. nov., photographs of impressions: (a) male, holotype CNU-COL-LB2009604; (b) female, paratype CNU-COL-LB2009662.

and Keith (2007) have already defined two groups of closely related species within the nominotypical subgenus. A molecular study to elucidate relationships within the family is currently being planned by a team of scientists from several West European and Mediterranean countries. We have decided to leave the nomenclature of the genus *Glaphyrus* unchanged until the results of that study are published. Until now the oldest known record of the genus was *Glaphyrus antiquus* Heer, 1862 from the Miocene of Germany (Krell, 2007).

It should be noted that the age of the Yixian Formation is subject to discussion. Some authors estimated it as the Late Jurassic and some as the Early Cretaceous (Ren et al., 1995a, 1995b; Wang et al., 2005).

The material examined is deposited at the collection of the College of Life Sciences, the Capital Normal University, Beijing (CNU).

#### SYSTEMATIC PALEONTOLOGY

Superfamily Scarabaeoidea Latreille, 1802

Family Glaphyridae Macleay, 1819

Genus *Glaphyrus* Latreille, 1807

Type species. *Scarabaeus maurus* Linnaeus, 1758; extant.

**Diagnosis.** Oblong oval beetles, medium-size to large (including the largest of the extant representatives of the family, over 20 mm in length). Mandibles and labrum well visible in dorsal view; mandibles extend anteriorly beyond apex of labrum. Labrum narrow. Clypeus with two or three teeth on anterior margin. Eyes not large, divided by incomplete canthi. Mesepimera visible between pronotum and elytra in dorsal view. Elytra smooth or with four distinct longitudinal carinae; apices of elytra can be pointed. Mesocoxae not widely separated. Metafemora often strongly expanded. Protibiae with three teeth along outer margin; apices of basal and middle teeth directed noticeably posteriad. Meso- and metatibiae on outer surfaces with single transverse ridge. Male metatibiae often rather strongly curved; apex of their inner angle can be produced into long process.

**Species composition.** Twenty seven species (some including subspecies) in the extant fauna, *G. antiquus* from the Miocene of Germany, and the new species.

*Glaphyrus ancestralis* Nikolajev et Ren, sp. nov.

**Etymology.** The species epithet means "ancestral."

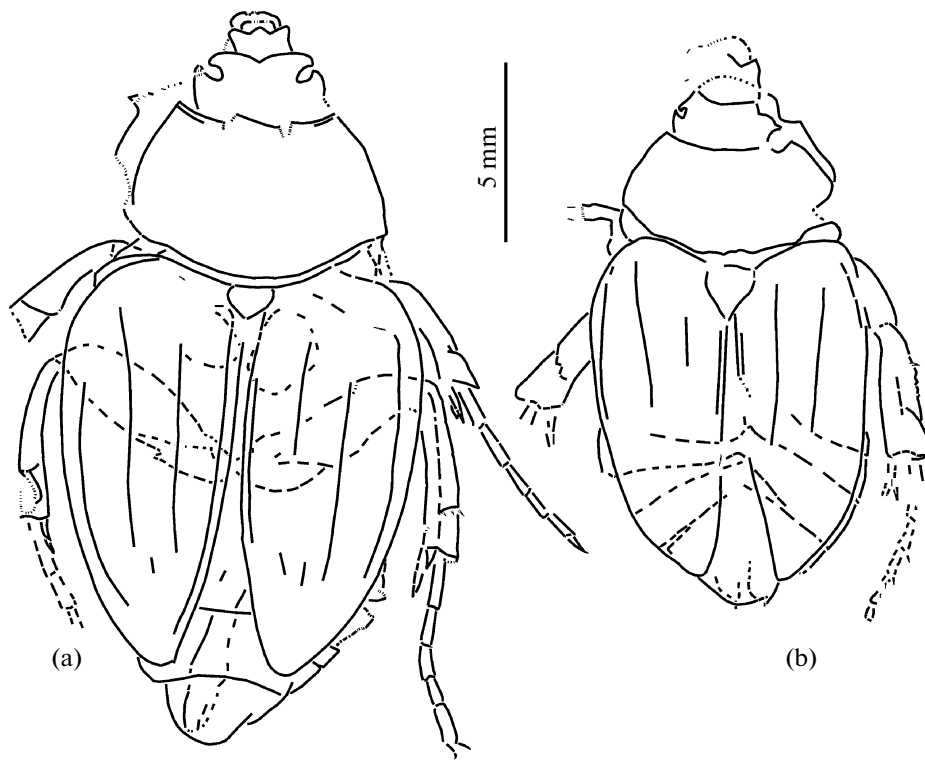


Fig. 2. *Glaphyrus ancestralis* sp. nov., line drawings: (a) male, holotype CNU-COL-LB2009604; (b) female, paratype CNU-COL-LB2009662.

**H o l o t y p e.** CNU-COL-LB2009604, nearly complete impression of a male without the right foreleg and with only partly preserved left protibia; People's Republic of China, Liaoning Province, near Chaomidian Village; Upper Jurassic or Lower Cretaceous, Yixian Formation.

**D e s c r i p t i o n** (Figs. 1, 2). An elongate beetle. The eyes are large, partly divided by ocular canthi. The pronotum with a narrow, leathery anterior margin, with acute anterior and broadly rounded posterior angles. The lateral margin of the pronotum is convexly arched, with an inconspicuous emargination before the posterior angle. The elytra with four distinct longitudinal carinae, with rounded apices. The metafemora are relatively slender, approximately three times as long as wide. Each metatibia with two spurs along its posterior margin; the upper spur is shorter and directed more inwards.

**M e a s u r e m e n t s** (mm), holotype: body length from mandible apex to pygidium apex, 20.7; maximum body width (near elytra midlength), 10.1; distance between outer angles of clypeus, 1.5; maximum head width, 3.7; distance between inner eye angles, 2.1; pronotum length at midline, 4.5; pronotum maximum width, 7.5; elytron length, 11.3; elytron maximum width, 5.3; mesotibia length (to apex of its outer margin), about 3.6; mesotibia apical cross-section width, 0.9; mesotibial apical spur length, 1.2; mesotarsus length, 6.0; 1st mesotarsomere length, 2.2; 2nd meso-

tarsomere length, 0.75; 3rd mesotarsomere length, 0.75; 4th mesotarsomere length, 0.6; 5th mesotarsomere length (with claw), 1.7; metafemur length, 5.6; metafemur maximum width, 1.8; metatibia length, 5.2; metatibia apical cross-section width, 1.2; metatibial short apical spur length, 0.8; metatibial long apical spur length, 1.3; metatarsus length, 6.1; 1st metatarsomere length, 1.6; 2nd metatarsomere length, 1.06; 3rd metatarsomere length, 0.9; 4th metatarsomere length, 0.7; 5th metatarsomere length (with claw), 1.8.

**C o m p a r i s o n.** The characters of the new species occur in other subgenera and species groups of *Glaphyrus*, with the only possible exception being the *G. maurus* group (Nikodým and Keith, 2007). However, no previously known species displays such a combination of characters. Three teeth on the anterior margin of the clypeus occur more often in females and only sometimes in males (*G. superbus* Champenois, 1898 and *G. turkestanicus* Semenov, 1889). Elytra with four distinct longitudinal carinae, as in the new species, are typical of many species of the *G. oxypterus* species group from the nominotypical subgenus. Very wide metafemora, only twice as long as wide, are found in most species of the genus. Yet, for example, in *G. modestus* Kiesenwetter, 1858 the metafemur is 2.4 times as long as wide (in the Mesozoic species it is almost 3 times as long as wide).

**R e m a r k s.** The female differs from the male in its smaller size (entire impression length, 15.5 mm; elytra

maximum width, 7.8 mm), practically straight metatibia, with its apical spur not pointing inwards, and abdominal sternites strongly curved forwards: the median part of the anterior margin of sternites 3 to 5 is closer to the abdomen's base than the lateral parts of the posterior margin of the corresponding preceding sternite.

**Material.** Besides holotype, paratype CNU-COL-LB2009662 (Figs. 1b, 2b): a female, not nearly as well preserved, with the anterior part of its head poorly distinct, in which the clypeus with three teeth is barely discernible; the forelegs are incompletely preserved; the right metatibia is relatively well distinct.

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