

中生代 Ceratocanthinae(Coleoptera: Hybosoridae)化石首次发现*

Georgy V NIKOLAJEV¹⁾ 王博²⁾ 刘煜³⁾ 张海春²⁾

1) Department of Biology, Al-Farabi Kazakh National University, al-Farabi Prospekt, 71, Almaty 050038, Kazakhstan;

2) 现代古生物学和地层学国家重点实验室,中国科学院南京地质古生物研究所,南京 210008, bowang@nigpas.ac.cn;

3) 长城钻探工程公司国际钻修公司, 盘锦 124010

摘要 记述内蒙古杨树湾子下白垩统义县组鞘翅目化石一新属新种 *Mesoceratocanthus tuberculifrons* gen. et sp. nov.。该标本隶属于驼金龟科 Ceratocanthinae 亚科 Ivieolini 族。这是 Ceratocanthinae 亚科在中生代的首次发现。化石表明 Ivieolini 族曾经广布全球, 尽管现在只局限于南美地区。

关键词 新属 驼金龟科 鞘翅目 义县组 下白垩统 中国

FIRST RECORD OF MESOZOIC CERATOCANTHINAE (COLEOPTERA: HYBOSORIDAE)

Georgy V NIKOLAJEV¹⁾, WANG Bo²⁾, LIU Yu²⁾ and ZHANG Hai-chun²⁾

1) Department of Biology, Al-Farabi Kazakh National University, al-Farabi Prospekt, 71, Almaty 050038, Kazakhstan;

2) State Key Laboratory of Palaeobiology and Stratigraphy, Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, Nanjing 210008, China, bowang@nigpas.ac.cn;

3) Drilling and Well Service Company International of Great Wall Drilling Engineering Corporation, Panjin 124010, China

Abstract *Mesoceratocanthus tuberculifrons* gen. et sp. nov. is described based on a well-preserved specimen from the Lower Cretaceous of Inner Mongolia, China. It is attributed to the tribe Ivieolini of Ceratocanthinae (Insecta; Coleoptera; Hybosoridae). The fossil is the first record of the subfamily Ceratocanthinae Martínez, 1968 from the Mesozoic, and suggests that Ivieolini was widely distributed around the world although it nowadays is restricted to South America.

Key words New genus, Hybosoridae, Coleoptera, Yixian Formation, Lower Cretaceous, China

1 INTRODUCTION

Hybosoridae, containing about 600 living species, is a small family of Scarabaeoidea and consists of five extant and one fossil subfamilies (Ocampo

and Ballerio, 2006; Nikolajev, 2007a). So far, eleven species are known within three subfamilies (Nikolajev, 2007b; Krell, 2007). Ceratocanthinae is undoubtedly the most diverse subfamily including more than 300 species within 40 genera of 3 tribes (Ocampo and Ballerio, 2006). Most of them

收稿日期: 2010-06-18

* 国家自然科学基金(40872015, J0630967), 中国科学院知识创新工程重要方向项目(KZCX2-YW-154)和国家重点基础研究发展计划项目(2006CB806400)联合资助。

are globose or nearly spherical when the head and pronotum are deflexed. Species within tribes Scarabotermitini Nikolajev, 1999 and Ivieolini Howden and Gill, 2000 are elongate, not capable to roll oneself up into a ball (Howden and Gill, 1988, 1995, 2000, 2001; Nikolajev, 1999). All living species of Ivieolini are restricted to South America. Fossil Ceratocanthinae have been reported recently in the Miocene Dominican Amber, but they still await a formal description (Krell, 2007). Recently, thousands of scarab fossils were discovered from the Middle Jurassic Daohugou deposits and the Lower Cretaceous Yixian Formation of northern China, and some of them can clarify the early radiation of scarabs. Herein, a well-preserved beetle belonging to Ceratocanthinae is described from the Lower Cretaceous of Inner Mongolia, China. The present fossil extends the record of Ceratocanthinae as early as the Early Cretaceous.

2 MATERIAL AND METHODS

The specimen (part and counterpart) was from the Lower Cretaceous Yixian Formation of Yangshuwanzi Village, Ningcheng County, Chifeng City, Inner Mongolia, China, and is preserved as an impression on the surface of yellow silty mudstone. It was examined dry and under alcohol, using a Nikon SMZ1000 stereomicroscope (Nikon Corporation, Tokyo, Japan). The photographs were prepared using a digital camera (DXM1200) connected to the above stereomicroscope, and the line drawings were readjusted on photographs using image-editing software (CorelDraw 14.0 and Adobe Photoshop CS). This fossil is deposited in the Nanjing Institute of Geology and Palaeontology (NIGP), Chinese Academy of Sciences.

3 SYSTEMATIC PALAEOLOGY

Superfamily Scarabaeoidea Latreille, 1802

Family Hybosoridae Erichson, 1847

Subfamily Ceratocanthinae Martínez, 1968

Tribe Ivieolini Howden and Gill, 2000

Genus *Mesoceratocanthus* gen. nov.

Type species *Mesoceratocanthus tuberculifrons* gen. et sp. nov., here designated.

Type locality and horizon Lower Cretaceous Yixian Formation; Yangshuwanzi Village, Ningcheng County, Chifeng City, Inner Mongolia, China.

Etymology The generic name refers to the era of its origin, and generic name *Ceratocanthus* (the type genus of this subfamily). Gender: Masculine.

Diagnosis Winged. Body large, about 13 mm. Labrum narrow, oval, about 1/4 as wide as head. Anterior margin of clypeus serrate. Pronotum posteriorly with a deep V-shaped; lateral margin groove sinuate. Abdomen with 6 visible ventrites. Pygidium not covered by elytra. Profe-mur wide, almost as wide as long. Metatibiae slender, not distinctly widened.

Remarks The genus is undoubtedly placed into Scarabaeoidea as evidenced by the 3-segmented antennal club and a dentate lateral margin of the protibia. It is similar to Glaresidae, but differs from the latter in having the body large, elongate and abdomen with 6 visible ventrites. It is definitely attributed into Hybosoridae by the following characters: mandibles and labrum prominent; antennal club three-segmented; and pro- and meso-coxae contiguous. It can be assigned to Ceratocanthinae in having antennal club elongate, meso- and metatibiae without transverse carinae and ventral position of protarsi basad to the anterior tibial tooth. Furthermore, it belongs to Ivieolini by its body elongate, pronotum posteriorly with a deep V-shaped groove, and labrum about 1/4 as wide as head.

The difference between the new genus and other Ceratocanthinae groups incapable of rolling into a ball is given in the following key. The anterior margin of clypeus is not serrate in the genus *Ivieolus* Howden and Gill, 2000. The serrate margin of clypeus is present in some species of Scarabatermitini (*Scarabatermes* and *Xenocanthus* in

Howden and Gill, 2000). Therefore, it is not a tribal character, but a generic character among Ceratocanthinae (or within Glaresidae).

Key to genera of Scarabotermitini and Ivieolini

1. Globose or nearly spherical when head and pronotum deflexed Ceratocanthini Martínez
- Elongate, incapable of rolling into a ball 2
2. Pronotum posteriorly lacking deep, inverted U- or V-shaped groove; labrum approximately 1/3 as wide as head Scarabotermitini Nikolajev 3
- Pronotum posteriorly with deep, inverted U- or V-shaped groove; labrum approximately 1/4 as wide as head Ivieolini Howden and Gill 6
3. Hind tibiae wide and distinctly flattened
..... *Trachycrusus* Howden and Gill
- Hind tibiae long, not distinctly widened and flattened 4
4. Pronotum evenly convex lacking distinct depressions *Scarabotermes* Howden
- Pronotum irregularly convex with distinct depressions 5
5. Anterior margin of clypeus serrate; lateral margin of pronotum sinuate; elytron with deeply impressed striae *Xenocanthus* Howden and Gill
- Anterior margin of clypeus evenly rounded; lateral margin of pronotum concave in the middle; elytron with slightly impressed striae
..... *Scarabaeinus* Silvestri
6. Body small (2.4—3.9 mm); pygidium covered by elytra; fore femur narrow (less than one-third as wide as long); anterior margin of clypeus not serrate *Ivieolus* Howden and Gill
- Body large (about 13 mm); pygidium not covered by elytra; fore femur wide (approximately as wide as long); anterior margin of clypeus serrate
..... *Mesoceratocanthus* gen. nov.

***Mesoceratocanthus tuberculifrons* gen. et sp. nov.**

(Text-figure 1)

Etymology Specific epithet refers to the structure of the head (presence of the tubercles on the frons).

Holotype NIGP151840 (part and counterpart), an almost complete beetle with antennal

club clear.

Diagnosis As for the genus, by monotypy.

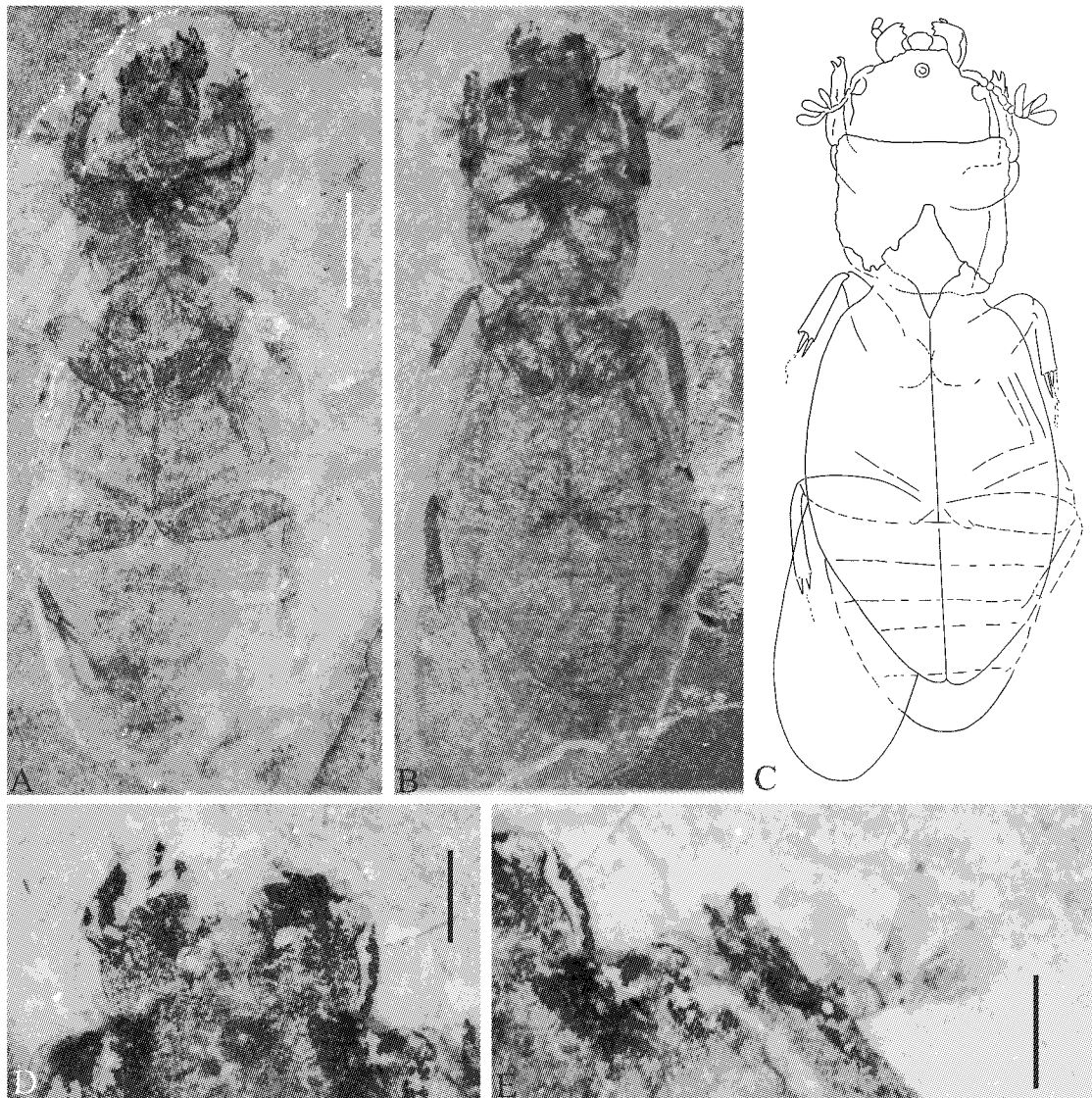
Description Body large, elongate. Labrum oval. Head square, nearly as wide as long. Anterior margin of clypeus serrate. Front with one tubercle. Antennae with 3-segmented antennal club clear. Pronotum transverse, slightly narrowing posteriorly, 1.3 times as wide as head; anterior margin slightly concave, concealing the base of the head dorsally; lateral margin sinuate; posterior angles obtuse. Scutellum small, triangular. Pro- and mesocoxal cavities rounded, contiguous. Mesotibiae slightly longer than mesotarsi. Meso- and metatibiae without transverse carinae. Metafemur slightly longer than metatibia. Mesotarsomere 1 slightly longer than tarsomere 2.

Measurements (mm) Body length 12.6 (including mandibles and apex of pygidium); head width 2.3; median length of pronotum 2.6, width 3.0; elytron length at least 7.0, width 2.3; profemur length 1.5, width 1.0; protibia length 2.0; mesofemur length 2.2, width 0.8; mesotibia length 1.5; metafemur length 1.9, width 0.9; metatibia length 1.8.

4 DISCUSSION

Krell (2006) suggested that Ceratocanthinae (sometimes upgraded to family level) originated during the Late Jurassic–Early Cretaceous based on the combined analysis of the phylogenetic system and fossil records of Scarabaeoidea. The present fossil supports his conclusion and provides clear evidence that Hybosoridae were diversifying during the Jurassic and Cretaceous. Furthermore, it suggests that Ivieolini was widely distributed around the world although it nowadays is restricted to South America.

Acknowledgments We are greatly indebted to Ponomarenko A G (Paleontological Institute, Russian Academy of Sciences) who made a considerable and very valuable assistance to this study.



Text-figure 1 Holotype of *Mesoceratocanthus tuberculifrons* gen. et sp. nov., from the Lower Cretaceous Yixian Formation of Inner Mongolia. A. photograph of NIGP151840a; B. photograph of counterpart NIGP151840b; C. line drawing of NIGP151840b; D. photograph of mouthpart; E. photograph of antennae. A, B and C to scale. Scale bar=2 mm in A. Scale bar=0.5 mm in D and E.

References

- Howden H, Gill B D, 1988. A fourth genus of unusually modified Ceratocanthinae from South America. *Canadian Journal of Zoology*, **66**: 2077—2079.
- Howden H, Gill B D, 1995. *Trachycrusus*, a new genus of Ceratocanthinae with two new species from Peru. *The Canadian Entomologist*, **127**: 587—593.
- Howden H, Gill B D, 2000. Tribes of New World Ceratocanthinae, with keys to genera and descriptions of new species. *Sociobiology*, **35**(2B): 281—329.
- Howden H, Gill B D, 2001. A new species of *Ivieolus* and a new type species designation for *Aulisostes*. *Sociobiology*, **38**(3A): 531—538.
- Krell F Th, 2006. Fossil record and evolution of Scarabaeoidea (Coleoptera; Polyphaga). *Coleopterists Bulletin*, **60**(5): 120—143.
- Krell F Th, 2007. Catalogue of fossil Scarabaeoidea (Coleoptera; Polyphaga) of the Mesozoic and Tertiary (Version 2007). Denver Museum of Nature and Science Technical Report, 2007-8: 1—79.
- Nikolajev G V, 1999. New data on the systematics of the scarab beetles of the subfamily Hybosorinae, the establishment of the new tribe comprising four monotypic South American genera, and description of some new taxa from the lower Cretaceous of Transbaikalia. *Tethys Entomological Research*, **1**: 173—182 (in Russian with English abstract).
- Nikolajev G V, 2007a. A new subfamily of the Hybosoridae (Coleoptera; Scarabaeoidea) from the Mesozoic of Asia. *Izvestiya NAN RK. Seriya biologicheskaya i meditsinskaya*, **2**: 47—48 (in Russian with English abstract).

Nikolajev G V, 2007b. The Mesozoic Stage of Evolution of the Scarabaeoid Beetles(Insecta;Coleoptera;Scarabaeoidea). Almaty; Kazak Universiteti. 1—222 (in Russian with English abstract).

Ocampo F C, Ballerio A, 2006. Phylogenetic analysis of the scarab

family Hybosoridae and monographic revision of the New World subfamily Anaidinae. 4. Catalog of the subfamilies Anaidinae, Ceratocanthinae, Hybosorinae, Liparochrinae, and Pachyplectri-
nae. *Bulletin of the University of Nebraska State Museum*, **19**: 178—209.