

CORRESPONDENCE

Electraesalopsis beuteli gen. & sp. nov., the first lucanid beetle from the Cretaceous Burmese amber (Coleoptera: Scarabaeoidea)

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Abstract The first stag beetle found in Cretaceous Myanmar amber, *Electraesalopsis beuteli* Bai, Zhang & Qiu **gen. & sp. nov.**, is described and illustrated on the basis of one well-preserved specimen. This specimen provides more detailed morphological characters compared with compression fossils, e.g. the highly setose antennae and the punctured elytra. However, the systematic position of the new genus is still questionable and we provisionally place it as Lucanidae *incertae sedis*. In addition, the discovery of *Electraesalopsis* Bai, Zhang & Qiu **gen. nov.** also indicates that there is very high biodiversity in Burmese amber. The new discoveries in future studies on Burmese amber will provide more information and improve our knowledge of biogeography and early evolution of the Lucanidae.

Key words Lucanidae, Cretaceous, Myanmar amber, new genus.

1 Introduction

The family Lucanidae is a relatively small group when compared with other groups in superfamily Scarabaeoidea Latreille, only about 1300 species, which including four extant subfamily Lucaninae, Aesalinae, Syndesinae, Lampriminae and three fossil subfamily Protolucaninae, Paralucaninae, Ceruchitinae (Bouchard, 2011). It has attracted many traditional taxonomists and amateur collectors' attention, due to the remarkable development of the male mandibles. Stag beetles have been considered one of the most primitive groups of scarab beetles (Lawrence & Newton, 1995). Lucanidae fossils has been found in Mesozoic and Tertiary (Krell, 2000, 2007). Up to now, 25 fossil lucanid species have been reported, of which earliest lucanid species *Juraesalus atavus* (Nikolajev *et al.*, 2011) was found in Middle Jurassic deposits in Daohugou Village, Chifeng City, Inner Mongolia, China. However, all published Mesozoic fossils Lucanidae were compression fossils, and recently published amber fossils species was *Syndesus ambericus* from Miocene Dominica Amber (Woodruff, 2009). Until now, no Cretaceous Burmese amber species of Lucanidae have been described. In this study, we report a new extinct beetle species of Lucanidae, *Electraesalopsis beuteli* **gen. & sp. nov.** based on one well-preserved specimen from the Cretaceous Burmese amber deposited in the Hukawng Valley of Myanmar.

2 Materials and Methods

This specimen was derived from amber deposited in the Hukawng Valley of Myanmar. The mining locality is at Noije

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Bum, near Tanai Village (26°21'33.41"N, 96°43'11.88"E) (Grimaldi *et al.*, 2002; Cruickshank & Ko, 2003), where many important materials were found including vertebrates and invertebrates (Bai *et al.*, 2016a, b, 2017; Boucher *et al.*, 2016; Oliveira *et al.*, 2016; Xing *et al.*, 2016a, b; Jałoszyński *et al.*, 2017). These deposits were investigated and dated in detail by Cruickshank and Ko (2003) and by Shi *et al.* (2012). We tentatively followed the age (98.8 ± 0.6 Ma) determined by U-Pb dating of zircons from the volcaniclastic matrix of the amber (Shi *et al.*, 2012).

The (type) specimen is currently on long-term loan in the Institute of Zoology, Chinese Academy of Sciences (IZCAS) (specimen available for study by contacting MB or WWZ). From 2026 it will be deposited in the currently established Three Gorges Entomological Museum, Chongqing, China. The piece of amber containing the specimens was cut and polished and examined with a LEICA MZ 12.5 dissecting microscope with a drawing tube attachment. Specimen macrophotography was conducted using a Visionary Digital photography station, consisting of a Canon EOS 5D DSLR camera equipped with a Canon MP-E 65 mm Macro Photo Lens and tube extensions. An extended depth of field at high magnifications was achieved by combining multiple differently focused images using Helicon Focus 5.1® (Helicon Soft, Kharkov, Ukraine) software. Final figures were prepared in Adobe Photoshop CS5®.

3 Taxonomy

Order Coleoptera Linnaeus, 1758

Superfamily Scarabaeoidea Latreille, 1802

Family Lucanidae Latreille, 1804

Genus *Electraesalopsis* Bai, Zhang & Qiu, gen. nov.

Type species. *Electraesalopsis beuteli* Bai, Zhang & Qiu, **sp. nov.**

Etymology. The specific name is form three word, *electr* (amber in Latin), *aesal* (from genus *Aesalus*) and *opsis* (means looks like).

Diagnosis. This genus could be classified into Lucanidae by a combination of the following characters: mandibles extremely developed; number of antennomeres 10, partly geniculate, with a small three-segmented club, club loose; Mesotarsus with 5 distinct tarsomeres; abdomen with five-segmented.

***Electraesalopsis beuteli* Bai, Zhang & Qiu, sp. nov.** (Figs 1–5)

Holotype. Sex unknown (see discussion for details), a nearly complete specimen, registration No. BU-001838, with most appendages still attached except metatarsus and antenna on the left side. The piece of amber containing the specimen was ground and polished to 20.0×18.0×5.2 mm (1.18 g in weight).

Etymology. This species is named in honor of Prof. Rolf G. Beutel (FSU Jena University, Germany) in recognition of his extraordinary contributions to research on insects.

Description. Sex unknown, Body small, oval, slightly flattened to moderately convex, body length 5.6 mm (including mandibles and apex of fifth ventrites), entirely red brown. Head transversely, subquadrate, width 1.6 mm at maximum, broadest at eyes; with anterior margin emarginated; anterior angles of clypeus produced forward rounded, clypeus not defined posteriorly. Dorsal surface broadly punctured. Eyes large, without canthus. Mandibles extremely developed, longer than frons, triangular, with sharp apical tooth and smaller tooth on middle of the inside edge. Surface with long hair, more densely at the outer edge. Antenna length 1 mm, with 10 antennomeres, weakly geniculate between scape and antennomere 2; scape long, latter part spheroidal expand; antennomere 2 subconical and nearly as long as wide; antennomere 3–7 short; club with 3-segmented, formed by antennomeres 8–10, entirely tomentose, weakly lamellate in shape, with antennomeres 8 and 9 transverse but antennomere 10 apparently longer. Pronotum transverse, 1.6 times wider than long, obviously wider than head, and widest near the middle; anterior margin slightly concave, which carina in the middle, posterior margin nearly straight, lateral margin roundly curved and slightly serrate, anterior and posterior angles obtuse; dorsal surface densely punctured. Scutellum subtriangle, slightly longer than width, surface punctured. Elytron length 3 mm, width 2.5 mm, about 1.2 times as long as width; surface with evenly and densely punctured, without striae. Abdomen: five ventrites. Legs: moderately long, all tibiae and tarsi densely setae; protibia expanding from base to middle, outer lateral margin with five clear denticles, denticles reduces in size from apex to end; inner lateral margin with a spur; protasus slightly longer than protibia; claws large and simple; mesocoxae narrowly separated; mesotibia with two inner distal spurs, a short spur on ventral



Figures 1–4. *Electraesalopsis beuteli* Bai, Zhang & Qiu, **gen. & sp. nov.**, Holotype, registration No. BU-001838. 1. Habitus photograph, dorsal view. 2. Line drawing, dorsal view. 3. Habitus photograph, ventral view. 4. Line drawing, ventral view. Scale bars = 1.0 mm.

surface and a longer spur on dorsal surface; outer lateral margin with a denticle; first mesotarsomere longer than the second one; metatibia with two inner distal spurs, a shorter one on ventral surface and a longer one on dorsal surface; apex projected inwards; outer lateral margin with a clear denticle near the end of 1/3.

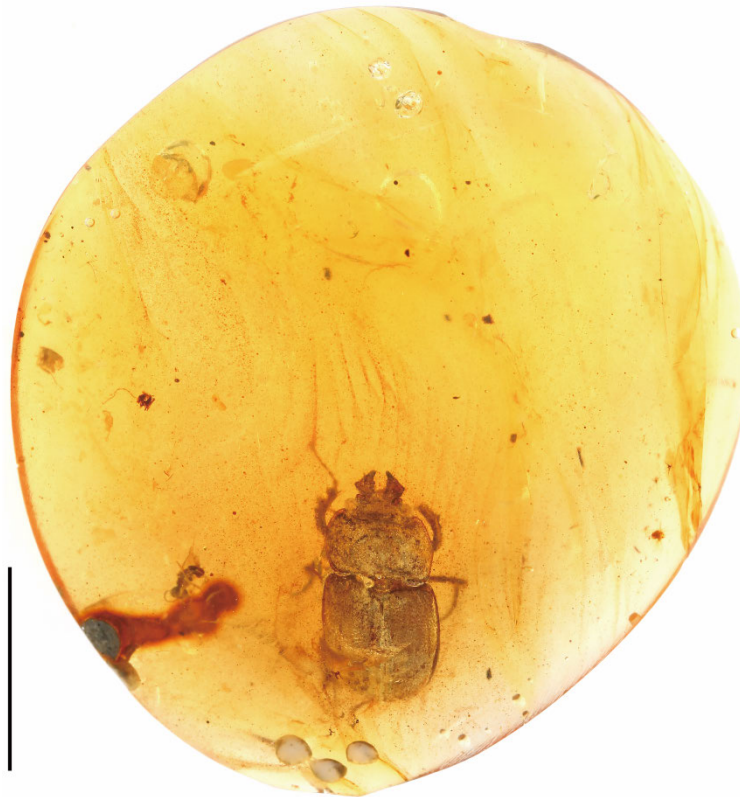


Figure 5. *Electraesalopsis beuteli* Bai, Zhang & Qiu, **gen. & sp. nov.**, Holotype, registration No. BU-001838, complete view of the amber piece. Scale bars = 5.0 mm.

4 Discussion

4.1 Systematic position of *Electraesalopsis* Bai, Zhang & Qiu, **gen. nov.**

On the basis of the characters that were observed clearly in the fossil specimen, we can conclude that the new genus does not belong to Lampriminae and Syndesinae, because it has a smaller body size and upper surfaces of body with evenly and densely punctured. The close relationships between *Electraesalopsis* Bai, Zhang & Qiu, **gen. nov.** and Aesalinae could be supported by some characters. Such as small body, antenna weakly geniculate and eyes not divided by a canthus. However, it probably does not belong to Aesalinae, because of the impurities in the ventral view of amber we are not sure if it has the raised and anteriorly lobed prosternal process or not. Additionally, it probably does not belong to any known Mesozoic fossil lucanids. This specimen has an obviously smaller body when compared with other Lucanidae fossil species in the Mesozoic. Thus, the systematic position of *Electraesalopsis* is still questionable and we provisionally place it as Lucanidae *incertae sedis*.

4.2 Sexual dimorphism

For Lucanidae, most species are characterized by pronounced sexual dimorphism owing to the extremely development of the mandibles in the males. In some tropical species, the male mandibles usually are long and strong, with large, developed tooth and dense small denticle, in contrary, females short, less than head length, only a few denticle. For this amber specimen, mandible length subequal with head and a few denticle, these characters might indicate it to be female. However, this specimen mandible belongs to proodont, which male and female mandible are very little difference (Wan *et al.*, 2009). Since

we have only found a single specimen, it is not possible to make sure the gender of this specimen.

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