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A new Late Cretaceous genus and species of polypore fungus beetles (Coleoptera, Tetratomidae) from northern Myanmar

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A B S T R A C T

A new polypore fungus beetle is described and illustrated, under the name of *Thescelostrophus cretaceus* gen. et sp. nov., representing the first documented occurrence of the tribe Eustrophini. The well-preserved specimen was collected from the Upper Cretaceous (Cenomanian, ca. 99 Ma) amber near the Hukawng Valley of northern Myanmar. This fossil species can be assigned to the extant subfamily Eustrophinae based on its elongate oval and strongly narrowed posteriorly body, simple and narrow tarsi, and somewhat clubbed antennomeres. The comparison among the extinct and extant eustrophines supports the previous hypothesis that antennal morphology of early eustrophines was very diverse. Additionally, an overall similarity between *Thescelostrophus* and extant eustrophines suggests a potential fungivory of this fossil species. Morphological characters preserved in the Burmese amber highlight the diversity of tetratomids during the Late Mesozoic and provide data for future phylogenetic studies of Tetratomidae.

1. Introduction

The family Tetratomidae Billberg, 1820 known also as the polypore fungus beetles, is a small family of little known tenebrionoid beetles with about 150 extant species classified in 13 genera. Tetratomids are distributed predominantly in the Northern Hemisphere with *Notopisenus boleti* Nikitsky & Lawrence from Chile being a notable exception (Lawrence and Leschen, 2010). Larvae and adults of Tetratomidae are fungivorous. They feed on the fresh or softer fruiting bodies of various Hymenomycetes, especially Polyporaceae and Tricholomataceae, thus, they are most commonly found under fungus infested bark and in softer shelf fungi, where adults tend to graze primarily on the surface while larvae bore into the hyphal tissues (Young and Pollock, 2002; Lawrence and Leschen, 2010; Hsiao et al., 2015). Based on morphological characters of larvae and adults Nikitsky (1998) divided this family into five subfamilies Eustrophinae, Hallomeninae, Penthinae, Piseninae and Tetratominae, and presented an overview of the world generic classification of the entire family.

The constitution and the phylogenetic position and the monophyly of Tetratomidae have been controversial. Historically most members of this family in particular Eustrophinae, Hallomeninae and Penthinae have been placed in Melandryidae, while Piseninae were though to be related to Mycetophagidae (Arnett, 1968; Lawrence and Newton, 1995; Lawrence and Leschen, 2010). The most recent molecular phylogenetic studies have further challenged the classification of Tetratomidae revealing obvious polyphyly of this family (Gunter et al., 2014; Kergoat et al., 2014; McKenna et al., 2015). However, the results of the molecular analyses of Tenebrionoidea so far are very inconsistent and fragmentary as few tetratomids were included in the analyses focused on other tenebrionoid groups. Kergoat et al. (2014) recovered polyphyletic Tetratomidae and Melandryidae with *Penthe* Newman (Penthinae) and *Synstrophus* Seidlitz (Eustrophinae) placed in a clade with Mycetophagidae, Ripiphoridae and Mordellidae while *Holostrophus* Horn (Eustrophinae) and two genera of Hallomeninae were placed in a separate clade with Zopheridae. McKenna et al. (2015) recovered polyphyletic Tetratomidae with clades formed by *Tetratoma* Fabricius (Tetratominae) and *Eustrophopsis* Champion

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(Eustrophinae) + *Penthe* (Penthinae) placed in separate branches of the Tenebrionoidea.

Six genera and numerous species of Eustrophinae are widely distributed in the Neotropical, Afrotropical and Oriental Regions and consist morphologically distinctive group (Pollock, 2012). Crowson (1966) and Viedma (1971) considered Eustrophinae to be a link between Melandryidae and Tetratomidae but retained it in Melandryidae (Arnett, 1968; Lawrence and Newton, 1995). Nikitsky (1998) argued that the eustrophines should be placed within a redefined Tetratomidae and that has been generally accepted (Lawrence and Leschen, 2010). Members of Eustrophinae are associated with various fungi found in and on coarse woody debris in forest habitats (Pollock, 2008). Adults are active at night, when they emerge from daytime hiding places and occupy exposed surfaces, on dead wood or on associated fungal bodies (Pollock, 2012).

The fossil record of Tetratomidae is sparse. Klebs (1910) and Larsson (1978) reported tetratomid specimens from Baltic amber determined as *Eustrophus* or *Hallomenus*, but no taxon in Baltic amber has been formally described until Alekseev (2013). Currently, only four fossil tetratomid species have been described, all from Cretaceous amber deposits (Nikitsky, 1977; Soriano et al., 2014; Cai et al., 2016) except one from Baltic amber (Alekseev, 2013). The earliest fossil taxon of this family, *Synchrotronia idinineteena* Soriano and Pollock was described from the Lower Cretaceous amber originated at Archingeay-Les Nouillers (southwestern France), the most fossiliferous Cretaceous amber deposit in France (Perrichot and Néraudeau, 2009); Soriano et al. (2014) were able to place *Synchrotronia* in the tribe Holostrophini but *Cretosynstrophus* Cai, Hsiao and Huang, 2016 from the Burmese amber has not been classified beyond the subfamily Eustrophinae. *Pseudohallomenus* Nikitsky, 1977 from the Late Cretaceous amber of Kheta Formation, recently Alekseev (2014) assign it to the subfamily Hallomeninae.

In the present paper, we describe a new genus and species of Tetratomidae based on a specimen preserved in the Burmese amber. The new genus exhibits enough diagnostic features to warrant its placement within the extant subfamily Eustrophinae and tribe Eustrophini. It represents the oldest fossil record for this tribe. We also discuss the possible paleobiology of this new species.

2. Material and methods

The study is based on a single specimen which is derived from amber deposits in the Hukawng Valley of northern Myanmar (see details in Cruickshank and Ko, 2003). The mining is done at a hill named Noije Bum, near Tanai Village (26° 21′ 33.41″ N, 96° 43′ 11.88″ E). Burmese amber is one of the most important of the fossiliferous resins from the Cretaceous and is renowned for yielding rich and exquisitely preserved insect group such as Coleoptera, Dermaptera, Isoptera, Neuroptera and Strepsiptera (Grimaldi et al., 2002; Engel et al., 2007; Engel and Grimaldi, 2008, 2014; Ross et al., 2010; Cai et al., 2016). The age of the amber deposits generally considered to be the earliest Cenomanian (Grimaldi et al., 2002) or possibly latest Albian (Ross et al., 2010). Recently, an important work based on U–Pb zircon dating has established and suggested that this amber deposits most likely to be restricted to 98.79 ± 0.62 Ma in age, which is equivalent to the Late Cretaceous (see details in Shi et al., 2012).

The material was prepared using a razor table, polished with emery papers with different grain sizes and finally lustrated with polishing powder. The specimens were examined and photographed with a Leica MZ12.5 stereomicroscope. The morphological terminology follows Lawrence et al. (2011) and the classification of subfamilies and tribes of Tetratomidae follows Nikitsky (1998). The nomenclatural acts established herein are registered under ZooBank LSID urn:lsid:zoobank.org:pub:24840EA8-2B23-4F07-9FBC-72AC09EE605A.

3. Systematic palaeontology

Order Coleoptera Linnaeus, 1758
Family Tetratomidae Billberg, 1820
Subfamily Eustrophinae Gistel, 1856
Tribe Eustrophini Gistel, 1856

Genus *Thescelostrophus* gen. nov.
Type species: *Thescelostrophus cretaceus* sp. nov.

Etymology. The genus name is composed of the prefix of Greek origin, Thescelos- meaning "marvelous, wondrous" and the root -*strophus* derived from the common ending in many eustrophine genus names. It is masculine in gender.

Differential diagnosis. *Thescelostrophus* is most similar to extant *Synstrophus* Seidlitz, but differs from this genus in having slender and longer antenna (exceeding the humeri of elytra) with antennomeres 6–11 mostly longer than wide and not densely tomentose, much longer and slender tarsi and short tibial spurs. *Thescelostrophus* can be distinguished from *Cretosynstrophus* Cai, Hsiao and Huang, 2016, by its elytra almost glabrous and bearing regular rows of punctures, the antennal scape and pedicel subequal, the terminal antennomere pointed apically and the protibia with two apical spurs. *Thescelostrophus* differs from *Pseudohallomenus* by having glabrous body, narrowed posteriorly scutellum and nearly contiguous eyes, and from *Synchrotronia* by having filiform antennae, incomplete and short prosternal process, rows of punctures on the elytra and nearly contiguous eyes.

Description. Body small, oblong-oval, narrowing posteriorly; cuticle yellowish brown throughout. Both dorsal and ventral surfaces without apparent pubescence.

Head small, strongly declined, not abruptly constricted posteriorly. Eyes large, laterally protruding and almost meeting dorsally. Antennal insertions exposed from above; subantennal groove absent. Frontoclypeal suture invisible. Labrum transverse. Antennae 11-segmented, filiform with short and not very apparent pubescence; scape and pedicel subequal in length. Mandible short and broad. Gular sutures invisible. Maxillary palps 4-segmented, apical palpomere cylindrical, slender.

Prothorax 0.6 times as long as wide, at base as broad as elytral bases, narrowed anteriorly; lateral pronotal carinae complete, visible from above; anterior angles not produced forward, posterior angles obtuse; posterior edge bisinuate, moderately produced forming mesal lobe. Prosternum in front of coxae shorter than shortest diameter of procoxal cavity, moderately convex. Procoxae very large and protruding. Prosternal process incomplete and short, narrowed apically, ending near middle of procoxae, apex rounded. Procoxal cavity strongly transverse, externally broadly open. Scutellum without dense light contrasting pubescence. Scutellary striole absent. Elytra 1.4 times as long as combined width, and 2.6 times as long as pronotum, without distinct setae and with ten regular rows of punctures. Mesocoxal cavities rounded, narrowly separated, open laterally to mesepimeron. Mesoventrite separated by complete sutures from mesanepisterna. Metaventrite with complete discrimen. Metanepisterna distinctly subdivided into a short triangular anterior and an elongate-quadrangular posterior piece. Metacoxae transverse, narrowly separated, obliquely oriented, not extending laterally to meet elytra; coxal plates absent.

Legs long and slender. Tibiae elongate, without modifications and with short paired spurs; outer edge of protibia with longitudinal carina formed by short, closely set spines; and outer edges of