Cretaceous Research 78 (2017) 84–88

Contents lists available at ScienceDirect

Cretaceous Research

journal homepage: www.elsevier.com/locate/CretRes

Short communication

Another amber first: A tiny tetraphalerin beetle (Coleoptera: Archostemata) in Myanmar birmite

Edmund A. Jarzembowski [a, b, *], Bo Wang [a, c], Daran Zheng [a, d]

[a] State Key Laboratory of Palaeobiology and Stratigraphy, Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, Nanjing 210008, China
[b] Department of Earth Sciences, Natural History Museum, London SW7 5BD, UK
[c] Key Laboratory of Zoological Systematics and Evolution, Institute of Zoology, Chinese Academy of Sciences, 1, Beichen West Road, Beijing 100101, China
[d] Department of Earth Sciences, University of Hong Kong, Hong Kong Special Administrative Region, China

ARTICLE INFO

Article history:
Received 26 April 2017
Received in revised form
17 May 2017
Accepted in revised form 22 May 2017
Available online 31 May 2017

Keywords:
Burmese amber
Myanmar
Coleoptera
Cupedid
Tetraphalerus
New species

ABSTRACT

A new tetraphalerin beetle, *Tetraphalerus lindae* sp. nov. (Insecta: Coleoptera: Archostemata) is described from mid-Cretaceous Burmese amber from northern Myanmar. This is the first species of this Jurassic-recent genus of archaic beetles to be described from amber inclusions, and is the first tetraphalerin cupedid from Burmese amber. This small, unusual Cretaceous *Tetraphalerus* is considered to belong to the *T. bruchi* species group of this now relict South American genus.

1. Introduction

With over 300,000 described species, beetles (Insecta: Coleoptera) are by far the largest order in the animal kingdom; the Cupedina, however, is the smallest and most archaic beetle 'suborder', totalling just over 100 living species, and now commonly split into the smaller suborders Archostemata and Myxophaga (Hörnschemeyer, 2005). Several hundred fossil species have been described from the Permian onwards and archostematans are notable constituents of Mesozoic insect faunas, even occurring in regions from where they have now vanished (such as Europe; Kirejtshuk and Ponomarenko, 2015). Such finds are usually preserved as adpressions, some exceptionally well preserved as in northeastern China, but they have also been discovered recently as amber inclusions in northern Myanmar (Xia et al., 2015). Archostematans are, nevertheless, scarce in Burmese amber which is surprising considering that most recent archostematans are associated with wood in both active stages (larval and adult) and sometimes the adults visit flowers. Here we describe a unique archaic beetle from this deposit which shows affinity with the still-living tetraphalerins, the sister of the ommatins or typical ommatines (Yan, Beutel and Ponomarenko, 2017). Opinion is divided as to whether ommatines are a subfamily of cupedids *sensu lato*, the reticulated beetles (Kirejtshuk and Ponomarenko, 2015), or a separate family (Beutel et al., 2008). For consistency with work on the Burmese ommatins (Jarzembowski et al., 2017), we consider cupedids and ommatines in the broad sense, cupedids including ommatines, and ommatines including tetraphalerins and ommatins (as well as extinct brochocoleins) as tribes (cf. Tan et al., 2012).

The beetle described below belongs to an uncommon species, only a single example being known so far from over 100,000 inclusions examined. Extant tetraphalerins are also rare insects, two species now only occurring in South American brushland, unlike in the Mesozoic when they were widespread across Eurasia (20+ species; Soriano and Delclòs, 2006). Like the ommatins, they are a

* Corresponding author. State Key Laboratory of Palaeobiology and Stratigraphy, Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, Nanjing 210008, China.
E-mail address: jarzembowski2@live.co.uk (E.A. Jarzembowski).

http://dx.doi.org/10.1016/j.cretres.2017.05.023
0195-6671/

relict group of "living fossils", no 'Tertiary' tetraphalerins having yet been described, *Tetraphalerites* Crowson, 1962 now being considered a brochocolein, the extinct sister of the ommatins and tetraphalerins (Kirejtshuk et al., 2016).

2. Geological setting

Burmese amber (burmite or birmite) from northern Myanmar contains the most diverse biota in amber (fossil resin) known from the Cretaceous (Wang et al., 2015). 34 orders are represented, beetles being one of the most diverse, but most species are undescribed. The amber is currently dated stratigraphically and radiometrically from late Albian to early Cenomanian (Cruickshank and Ko, 2003; Ross et al., 2010; Shi et al., 2012). The amber shows signs of reworking and we therefore consider the age as mid Cretaceous (circa 100 Ma).

Amber has been found in several districts of Myanmar over the years, but the current supply is from Myitkyina District, Kachin State, in the Hukawng Valley of northern Myanmar: a working mine is located near Noije Bum Village in Tanaing (Tanai) Township (Kania et al., 2015: fig. 1; Jarzembowski et al., 2017: fig. S1). The amber is prepared for the foreign jewellery trade and inclusions are affected by polishing as well as natural deformation so that additional specimens for taxonomic study are often useful.

3. Material and method

The specimens were examined under an Olympus SZX7 binocular microscope with fibreoptics and top and bottom illumination; they were photographed with a Zeiss Axiocam 506 digital camera with Combine ZP software mounted on a Zeiss AX10 Zoom.v16 binocular microscope. Drawings were prepared from both photographs and specimen by hand (EAJ). Only standard degreasing and wetting were undertaken during examination; glycerol under a cover slip was applied temporarily to reduce surface interference. For morphology, we follow the terminology in Jarzembowski et al., 2017: figs 2, S2. Drawing conventions are: solid line, distinct margin; dashed, indistinct or damaged; dotted, extrapolated. The abbreviations used are NIGP and NIGPAS, Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences.

4. Systematic palaeontology

Class INSECTA Linnaeus, 1758
Order COLEOPTERA Linnaeus, 1758
Suborder ARCHOSTEMATA Kolbe, 1908
Family CUPEDIDAE Laporte, 1836 s.l.
Subfamily OMMATINAE Sharp & Muir, 1912
Tribe TETRAPHALERINI Crowson, 1962

Remark. With the exclusion of *Tetraphalerites* (Section 1) this tribe (sometimes subfamily) is now monobasic.

Genus *Tetraphalerus* Waterhouse, 1901
Type species: *Tetraphalerus wagneri* Waterhouse, 1901 by monotypy; recent, Brazil.

Diagnosis. Small to medium-size beetles with dorso-ventrally compressed body; head long (1.3×[+] longer than wide), antennal grooves sometimes visible; antennae with apical antennomere (flagellomere) rounded distally, appearing inflated; eyes forward with distance between posterior end of head and eyes equal to or more than half the eye diameter; ridge-like protuberance above eye present; mandibles very long and distinctly protruding (prognathous); labrum broad, as wide as clypeus and truncate anteriorly, gula sutures present or absent; meso- and metafemora short, not extending past edge of body; elytral disc with little relief; rows of window punctures present on elytra but generally inconspicuous.
Remarks. At the time of Ponomarenko's 1969 classical monograph of fossil archostematans, only a single species of Cretaceous *Tetraphalerus* was known (discussed below), the others being earlier (Jurassic) or recent. The diagnosis is therefore augmented by Ponomarenko and Yan (2012) and Tan et al. (2012) combining adpression and living features, the inclusion described herein adding small size (medium size is about 12 mm body length, cf. Ponomarenko and Yan, 2012), the eye protuberance ('P2'), and head length: width ratio (cf. Hörnschemeyer, 2009). The diagnosis is abridged, e.g. excluding family group characters, viz. adjacent procoxae present and abdomen with flat (coplanar) ventrites, as well as fourth tarsomere not being bilobed, and long third antennomere present, plus relatively short antennae.

Earlier, Ponomarenko (1969) cautioned that, notwithstanding the development of ridges and furrows on the forebody, the only readily observable difference between fossil tetraphalerins and ommatins is the short temples on the latter (not exceeding half the eye diameter, as recently seen in Burmese amber *Omma lii* Jarzembowski, Wang and Zhang, 2017). In recent cladistics analyses, Hörnschemeyer (2009) recognized seven possible autapomorphies for crown-group tetraphalerins, but Tan et al. (2012), including fossils (adpressions), recognised only two (presence of antennal grooves ventrolaterally and lack of gular sutures on head). Unfortunately, as noted earlier, these head characters can be difficult to observe, even in amber inclusions. The wide labrum and short metafemur were suggested proxies to which may now be added the head ratio (in combination) and shape of the eye protuberance (see above).

Tetraphalerus lindae sp. nov.
(urn:lsid:zoobank.org:act:BDE6FC25-64B0-4CA5-96AC-D3345164B437)
Figs. 1, 2

Derivation of name. After Linda Wang (Nanjing), daughter of B. W.
Holotype. NIGP 166152, beetle body in tumbled and polished small, yellow, amber cabochon.
Locality and horizon. Probably mined near Noije Bum Village, Tanaing Township, Myitkyina District, Kachin State, Myanmar, 26° 15′ N., 96° 33′ E.; unnamed horizon, mid Cretaceous, upper Albian or lower Cenomanian.
Diagnosis. Very small Cretaceous species of *Tetraphalerus* with elongate prothorax as well as head, ridge-like paired longitudinal protuberances on the latter developing spines as well as tubercles, clavate antennae reaching prothorax anteriorly, large anterior ventrite on abdomen with posterior ventrite only a little larger than penultimate one, and moderately well-developed elytral venation and epileuron on the broad hindbody.
Description. Small, black beetle, 4.7 mm long (from anterior end of mandibles to posterior end of folded elytra), 1.3 mm wide (across folded elytra). Body flattened (dorsoventrally); hirsute, covered with small setae (especially on fronto-clypeal area and fronting labrum); spurred and spinose locally (notably above and behind the eyes). Cuticle generally coarsely tuberculate.

Head some 1.4× longer than wide with well-developed neck; temples subrectangular, short; eyes elongate and rounded laterally, prominent ventrally, appearing small dorsally as each overlapped by longitudinal, ridge-like protuberance (P2) above eye which continues posteriorly (P3) adorned by 3/4 backward-directed spines. Antennae longer than head but not reaching middle of