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Short communication

New taxa of Tarachoptera from Burmese amber (Insecta, Amphiesmenoptera)

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ABSTRACT

Retortocelis gen. nov. (Insecta, Tarachoptera) is established to accommodate three species from Cretaceous Burmese amber. The species are described as *R. longella* sp. nov., *R. minimella* sp. nov. and *R. tyloptera* sp. nov. The new genus is characterized by the presence of a costal fold on the forewings of the males. The fold is of different size and form, causing specific changes in the wing venation which allows distinguishing the three new species. In addition, a new species of the genus *Kinitocelis* is described as *K. sparsella* sp. nov. The species descriptions are based on male individuals. A key is provided to facilitate the identification of the hitherto described genera and species in Tarachoptera. The reasons for the extinction of the Tarachoptera are obscure. Some arguments are discussed that questions the extinction of the group.

1. Introduction

The order Tarachoptera was recently established on the basis of 14 inclusions from Burmese amber (Mey et al., 2017a). Shortly after the publication of the article, we received further specimens of Burmese amber containing inclusions of Tarachoptera. Surprisingly, the examination of this material resulted in the recognition of four different species, which could not be assigned to any of the hitherto described species. Some specimens were identified belonging to the genus *Kinitocelis* Mey, Wichard, Müller & Wang, 2017. A further three individuals were males bearing a costal fold or pouch on their forewings. The costal fold is a new morphological character in the Tarachoptera. In two species, the costal fold contained rows of androconial scales. Androconial scales are derived hairs and have been developed mainly in the evolution of the interspecific communication system of species. They are usually confined to males. In Tarachoptera, androconial scales are already known to occur in *Tarachocelis microlepidopterella* Mey, Wichard, Müller & Wang, 2017, the first species described from the order (Mey et al., 2017b). A costal fold or pouch in conjunction with androconial scales have been developed several times in different, unrelated Lepidoptera families, e.g. Gelechiidae, Tortricidae, Pyralidae, Crambidae. In Trichoptera, this androconial organ is present in several genera of Hydrobiosidae, Glossosomatidae, Hydroptilidae and Lepidostomatidae. Also, a costal fold without androconia, or vice versa, androconia without folding of the costal margin can be observed (cf. Neboiss, 1986; Schmid, 1989; Malicky, 2010). In extinct Trichoptera of Eocene Baltic amber a costal pouch is present in the hydroptilid *Agraylea cumsacculo* Wichard, 2013 and an androconial hairpencil occurs on the forewing costa of the leptocerid *Electrotriarnodes hexapterus* Wichard, 2013. Interestingly,

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the first three families belong to the basal lineages in Trichoptera, whereas in the basal-most families of Lepidoptera androconia or adroconial organs on the forewings are not known to occur (Kristensen, 1984, 1998).

The detection of further inclusions containing specimens of Tarachoptera was anticipated by Mey et al. (2017b). With the herein presented description of new taxa, this prediction was fulfilled rather quickly. The introduction of the new taxa brings the number of known species of Tarachoptera to eight distributed in three genera. The order is obviously more diverse and species-rich than previously thought.

2. Material and methods

This study is based on five inclusions from Burmese amber, which were provided by one of us (P. Müller). The amber pieces were collected in the Hukawng Valley in Tanaing Township, Myitkyina District of Kachin State. Cruickshank and Ko Ko (2003) provided an account on the history of amber mining and a short description of the geology and geographical setting of the Hukawng Basin. The determination of Palynomorphs collected by the authors suggests that the amber-bearing horizon is upper Albian to lower Cenomanian. The amber deposits have been dated in detail by Shi et al. (2012). We tentatively follow the age determination as earliest Cenomanian (98.8 ± 0.6 Ma) given by U–Pb dating of zircons from the volcanoclastic matrix of the amber (Shi et al., 2012). Although the presence of pholadid bivalve borings suggested the amber was older (Ross, 2015) it has been realised that the centres of the resin pieces were still soft when bored, so the formation of the amber is contemporaneous with the deposition of the bed (Smith and Ross, 2017).

The specimens are embedded in small amber blocks cut out from larger Burmese amber pieces. The adult insects are nearly completely preserved and often visible in ventral and dorsal view. The male genitalia are not visible, except for the comb of spines on the ventral margin of the last abdominal segment. The hindwings are mostly covered by the somewhat distorted forewings. The ventral head, thorax and abdomen often show signs of decomposition. Antennae and legs are completely preserved.

Photos were taken using a Leica stereomicroscope M 420 Apozoom in combination with a Canon EOS 600D, EOS utility software and the Zerene Stacker software.

The fossils were examined under incident and transmitted light using a stereomicroscope (Leica MZ125). Line drawings were produced with a Leica camera lucida and digitally processed using Adobe Photoshop CS4. Measurements were made with the ocular micrometer of the stereomicroscope.

All taxonomic acts established in the present work have been registered in ZooBank (see below), together with the electronic publication LSID urn:lsid:zoobank.org:pub:CDF367BE-974D-474C–B98D-278CE4EB917D.

3. Systematic palaeontology

Order: Tarachoptera Mey, Wichard, Müller & Wang, 2017.
Family: Tarachocelidae Mey, Wichard, Müller & Wang, 2017.

Key to the genera and species

1. Forewings with androconial scales or androconial organs present (male)……5
- Forewing without androconial scales or organs (male and female) ……***Kinitocelis*** 2
2. Sc of forewing unbranched apically……3
- Sc with terminal branches Sc1 and Sc2 present……4
3. Forewings covered with dark and pale scales, Sc also in hindwings unbranched……*K. sparsella* sp. nov.
- Forewings with mono-colored scales, Sc in hindwings branched……*K. divisinotata*.
4. Sc2 in forewings atrophied, humeral vein absent…*K. brevicostata*
- Sc2 in forewing well developed, humeral vein present…*K. hennigi*.
5. Forewing of male with costal fold or pouch…***Retortocelis*** gen. nov. 6
- Costal fold or pouch absent, androconial scales on veins of R and M on fore- and hindwings……***Tarachocelis*** *microlepidopterella*.
6. Costal fold small, not reaching radial cell on underside……*R. minimella* sp. nov.
- Costal fold longer, covering parts of the radial cell……7
7. Costal fold as bulbous pouch, two anal veins to hind margin……*R. tyloptera* sp. nov.
- Costal fold flat, with rows of androconia inside, one anal vein to hind margin……*R. longella* sp. nov.

Review of new taxa

Kinitocelis Mey, Wichard, Müller & Wang, 2017.

Kinitocelis sparsella sp. nov.
(urn:lsid:zoobank.org:act:BF210216-0EAB-433A-A9B1–C8C030658C35)
Fig. 1A–C.

Material: Holotype ♂, BUB 1937, deposited in Museum für Naturkunde, Berlin (MB.I.7284)
Locality and horizon. Burmese amber (Northern Myanmar, Kachin State, Myitkyina District, Tanaing Township, Hukaung Valley), Upper Cretaceous, lowermost Cenomanian.
Etymology. The name is derived from Latin “sparsus”, speckled, on account of the mixed dark and pale scales on the forewings.
Description (Holotype). Length of forewing 3.1 mm, length of body 2.2 mm. Vertex and frons with two stripes of erect, piliform scales close to the fronto-genal sutures; maxillary palpi small, apical segment acute; labial palpi 3-segmented, of moderate length; antenna with 24, densely scaled flagellomeres, scape as long as the following two segments, covered by long, elongate scales; pedicellus of same form as first flagellomer; forewing with dense scaling of normal, spindle-shaped scales on costal field and radial cell, mixed with darker scales, also on underside of forewings, hindwings sparsely scaled or without scales in cubital and anal fields; fringes on termen with long and short scales with acute apex, anal margin of hindwing with long hairs. Venation (Fig. 1C) with costal crossvein absent, apical subcosta seemingly not furcate (difficult to see under dense and dark scaling), distance between sc-r and r1-r2 is two times the length of the latter crossvein, A1 and A2 looping, jugum in form of a slender, rod-like appendage; hindwings slightly broader than forewings, Sc simple, without apical bifurcation, crossvein r1-r2 not shorter than crossvein sc-r1. Male genitalia (Fig. 1B): comb of stiff spines present on ventrocaudal margin of apical segment.
Diagnosis. The species differs from other species of the genus by the presence of dark and pale scales irregularly distributed on the forewings, which gives the wings an irrorate pattern. The rod-like jugum of the forewing is shared with *K. hennigi* Mey, Wichard, Müller & Wang, 2017. Also the shape of the wings with the slightly broader hindwing is similar to that species. The absence of the costal cross-vein and the unbranched subcosta, however, separates the new species from *K. hennigi*. According to the wing venation,