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The diminutive fear of the Cretaceous edaphon: *Festenus microraptor* nov.sp. from 110 Ma old Hkamti-Burmese amber (Coleoptera, Staphylinidae, Steninae)

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A b s t r a c t : One new species of the genus *Festenus* ŻYŁA et al., 2017 is described from the Albian of the Cretaceous (Hkamti-Burmese amber, ca. 110 Ma): *Festenus microraptor* nov.sp. (Myanmar). A checklist of all *Festenus* species described so far is presented and the results are discussed.

K e y w o r d s : Coleoptera, new species, entomology, insect fossils, Mid Cretaceous, Burmese amber paleobiota.

Introduction

Fossils offer unique insights into the prehistoric biodiversity of planet Earth. Even the great Charles Darwin used fossils to substantiate his theory on the "Origin of Species" (DARWIN 1859). The same applies to modern evolutionary research, such as the phylogeny of the subfamily Steninae MACLEAY, 1825 (Staphylinidae). The basis for this must be the exact taxonomic description of all taxa that can be found. The mere use of working names for taxa and a focus on higher phylogeny would lead to a huge chaos in the long term, which would not be in the spirit of Carl von Linné.

The Steninae include two described recent genera (*Stenus* and *Dianous*) and a genus from Australia (CLARKE & GREBENNIKOV 2009) that has remained undescribed for some time. With slightly more than 3,000 described valid species (Volker Puthz in litt. 2024), *Stenus* is the second largest genus of animals. Steninae are well represented by fossils. An overview of described Steninae fossils is given by SHAW et al. (2023). One of the oldest Steninae fossils are known from mid-Cretaceous Burmese amber from northern Myanmar. For the Steninae of Burmese amber, ŻYŁA et al. (2017) established the genus *Festenus* ŻYŁA et al., 2017 and described the two species *Festenus gracilis* ŻYŁA et al., 2017 and *Festenus robustus* ŻYŁA et al., 2017 from Kachin-Burmese amber of Hukawng Valley, northern Myanmar (ca. 99 Ma).

MAINDA (2023) added a third species: *Festenus annodutt* MAINDA, 2023 from Hkamti-Burmese amber of Sagaing Region, northern Myanmar (ca. 110 Ma, according to XING & QIU 2020).

SHAW et al. (2023) referred to additional undescribed *Festenus* species and noted that *Festenus* are quite common. Accordingly, knowledge of the Cretaceous biodiversity of

Steninae will continue to grow in the future. Subsequently, one further remarkably diminutive species is described here, providing further insights into the diversity of the magnificent Steninae of the distant past.

Material and methods

The material mentioned below is deposited in the following collection: **cTM** – private collection Tobias Mainda, Greifswald, Germany.

The morphological studies were carried out using a stereoscopic microscope (Euromex DZ 1105). Images were basically taken following the methods of HÖRNIG et al. (2016). Differently, a Canon EOS 100 camera with a MP-E 65 mm macro lens and a Macro Twin Lite MT-26 EX flashlight was used. The CombineZP program was used to create the z-stacks. Figures 1B and 1C were taken using the equipment mentioned in BALKE et al. (2023).

The following acronyms are used: **BL** – length of body; **DE** – average distance between eyes; **EL** – maximal length of elytra; **EW** – maximal width of elytra; **FBL** – length of forebody (head, pronotum, elytra); **HW** – head width; **PL** – pronotal length; **PW** – pronotal width.

Results

Taxonomy

Festenus microraptor nov.sp. (Figs 1A–F)

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Type material: Holotype: “Myanmar: Hkamti, Sagaing Division, leg. local collector “ / “HOLOTYPE, *Festenus microraptor* nov.sp., design. Mainda, 2024” (cTM).

Locality and horizon: Hkamti site (Myanmar), Early/Middle Cretaceous (Albian, 110 Ma).

Description: Measurements: BL: ca. 1.64 mm, FBL: ca. 0.93 mm, DE: ca. 0.19 mm, EL: 0.37 mm, EW: ca. 0.37 mm, HW: 0.28 mm, PL: 0.32 mm, PW: ca. 0.29 mm.

Habitus as in Fig. 1A. Body brownish-blackish; elytra extensively reddish lightened, anterior fourth darkened; legs and antennae yellowish.

Head with broad median portion of frons, with coarse and dense puncture; eyes large, covering almost entire side of head, temples very short; maxillary palpomere III 2 times as long as wide, maxillary palpomere IV most possibly minute, not clearly visible (Fig. 1D); antennae robust (Fig. 1B), club antennomeres IX and XI slightly longer than wide, club antennomere X slightly wider than long (artefact?); length of antennomere IX: 0.03 mm; X: 0.03 mm; XI: 0.05 mm, ending in a small tip at apex.

Pronotum (Fig. 1C) coarsely and densely punctured, widest in middle, slightly convexly narrowed towards anterior margin, concavely narrowed towards posterior margin. Legs robust; metatibiae and -tarsi with distinct pubescence (Fig. 1F).

Elytra (Fig. 1E) widest in posterior third, humeral angles hinted; coarsely punctured, with

longitudinal furrows over entire length of each elytron, metathoracic wings fully developed (Fig. 1A).

Abdomen (Fig. 1F) with distinct coarse punctures; laterally distinct pubescence visible; paratergites not clearly visible, but probably present; structure of sternites not visible without significant grinding of amber piece (therefore no statement about sex of specimen possible).

Differential diagnosis: *Festenus microraptor* nov.sp. is distinguished from *F. gracilis* and *F. annodutt* by much smaller size and the distinct general different habitus. From *F. robustus*, possibly a close related species, the new species can be differentiated by its slightly smaller size, different coloration, relatively larger eyes, and differently shaped pronotum and elytra.

Etymology: The species epithet "*microraptor*" (gr. *mikrós*, small and lat. *raptor*, predator) refers firstly to the small size of the new species and the typical predatory biology of all Steninae. Secondly, the name is reminiscent of the genus *Microraptor* XU et al., 2000, a genus of small, four-winged, dromaeosaurid dinosaurs from the Early Cretaceous, which also refers to the time horizon of *F. microraptor* nov.sp.

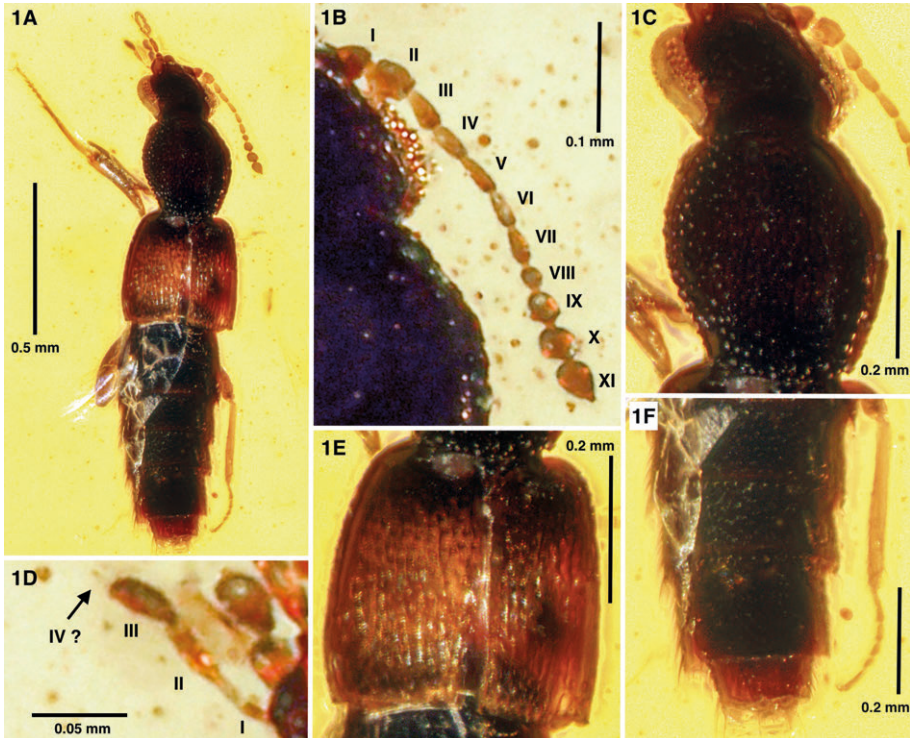


Fig. 1: *Festenus microraptor* nov.sp. habitus (1A), antennomeres I–XI (1B), details of pronotum (1C), maxillary palpomeres I–IV (1D), details of elytra (1E) and details of abdomen (1F).

Checklist of Steninae known from Burmese amber

Festenus gracilis ŽYLA et al., 2017

Festenus robustus ŽYLA et al., 2017

Festenus annodutt MAINDA, 2023

Festenus microraptor nov.sp.

Discussion

The discovery of one further species of *Festenus* increases the knowledge of the diversity of Cretaceous Steninae. *Festenus microraptor* nov.sp. is a remarkable new species with a BL of only ca. 1.6 mm. With an FBL of only ca. 0.9 mm, this species is probably even smaller than the smallest known recent *Stenus* species: *Stenus pernanus* PUTHZ, 2006 from China.

In addition, the discovery of the new species provides further evidence for the time horizon of the appearance of the subfamily. MAINDA (2023) failed to elaborate on the exact locality and horizon of the Burmese amber examined by him. Unlike the two species *F. gracilis* and *F. robustus*, which ŽYLA et al. (2017) described from ca. 99 Ma Kachin-Burmese amber of the Hukawng Valley, *F. annodutt* was described from Hkamti-Burmese amber of the Sagaing Region. This fossil resin is dated to an age of ca. 110 Ma (XING & QIU 2020). The new species described here also originate from Burmese amber of the Hkamti site.

Consequently, the subfamily Steninae already existed in the Late Albian, i.e. at least 10 Ma earlier than so far known (ŽYLA et al. 2017). Only two similarly old Steninae were previously known: *Stenus imputribilis* RYVKIN, 1988 and *Stenus inexpectatus* SCHLÜTER, 1978 (PUTHZ 2010, SHAW et al. 2023). The exact genus affiliation of these two representatives is questionable. The morphological diverse extant species of the genus *Stenus* are assigned to different species groups and not different genera or subgenera (PUTHZ 2008). Are *S. imputribilis* and *S. inexpectatus* possibly also (a) *Festenus*, (b) a hitherto undescribed genus, (c) or do they all (including *Festenus*) merely represent species groups of the genus *Stenus*? Future research and the discovery and description (!) of further extinct Steninae from Burmese amber will therefore not only provide further insights into the diversity of Cretaceous Steninae, but will also contribute to a better understanding of the evolution and systematics of the subfamily.

Acknowledgment

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Zusammenfassung

Das winzige Grauen des kreidezeitlichen Edaphons: *Festenus microraptor* nov.sp. aus 110 Ma altem Hkamti-burmesischem Bernstein (Coleoptera, Staphylinidae, Steninae). Eine neue Art der Gattung *Festenus* ŽYLA et al., 2017 wird aus dem Albium der Unterkreide (Burmesischer Hkamti-Bernstein,

ca. 110 Mio. Jahre alt) beschrieben: *Festenus microraptor* nov.sp. (Myanmar). Eine Checkliste der bisher beschriebenen *Festenus*-Arten wird vorgestellt und die Ergebnisse werden diskutiert.

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