Biosis: Biological Systems (2020) 1(3): 109-115
https://doi.org/10.37819/biosis.001.03.0063

ORIGINAL RESEARCH

A New Fossil Genus of False Blister Beetles (Coleoptera: Oedemeridae) from mid-Cretaceous Burmese Amber

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ABSTRACT

A new genus containing four new species within the family Oedemeridae from mid- Cretaceous Burmese amber are described and illustrated in this paper. Notably, *Ditysparedrus* n. gen. differs from other genera of the subfamily because of the presence of a short ventrite I and pyriform elytra. We also provide a key for the new species within this genus.

ARTICLE HISTORY

Received 4 August 2020
Revised 17 September 2020
Accepted 25 September 2020

KEYWORDS

Calopodinae
New taxa
Myanmar
Cenomanian

Introduction

The recent description of *Sparedrus archaicus* Vitali & Ellenberger (2019) (Calopodinae) from Burmite has allowed dating back almost to the Cretaceous the origin of the false blister beetles. In fact, though Peris (2016) described a putative Oedemeridae from Burmese amber, the position of this fossil "must be considered as tentative" even inside the Tenebrionoidea since both metatarsi are not preserved (Batelka et al., 2018).

Moreover, as Calopodinae are not the most basal tribe of Oedemeridae (Švihla, 1986) and this family is also widespread in the Southern Hemisphere, false blister beetles might be dated back almost to the Jurassic, before the Gondwana breakup (Vitali & Ellenberger, 2019). In this paper, a new fossil genus and four species closely related to *Sparedrus* Dejean, 1821 are described, supporting that Oedemeridae were already almost diversified during the Cretaceous.

Materials and methods

Observations were made using an Antares Geminar 3 stereomicroscope with 20–40x eyepieces equipped with a micrometer system and a Zeiss Stemi-2000 stereoscopic microscope. The photographs were furnished by the seller and enhanced with the Ulead PhotoImpact SE software. The holotypes are deposited in the Institute of Systematics and Ecology of Animals (Russia: Novosibirsk) - ISEA and collection of F. Vitali (Luxembourg).

Concerning the age, the amber originated from mines in the Hukawng Valley, Myitkyina District, Kachin State, Myanmar. Burmite is found in sedimentary facies, greenish-grey shale layers interbedded in other sedimentary rocks like sand- and siltstones, micritic limestone and various organic materials, as well as thin layers of coal and amber bearing shale layers (Ross et al., 2010; Zherikhin & Ross, 2000; Cruickshank & Ko, 2003; Kyaw & Khin, 2017). Based on radiometric data, Burmese amber from this location is currently dated back to the earliest Cenomanian, mid-Cretaceous, with an age of 98.79 ± 0.62 Ma (Shi et al., 2012).

The terminology used in the descriptions is based on the study by Lawrence *et al.* (2010). Nomenclatural acts introduced in the present work are registered in ZooBank (www.zoobank.org) under LSID urn: lsid:zoobank.org:pub:E22B22AD-F5AA-465D-A87E-144499ECB516.

Results

Systematic palaeontology

Order Coleoptera Linnaeus 1758
Suborder Polyphaga Emery 1886
Superfamily Tenebrionoidea Latreille 1802
Family Oedemeridae Latreille 1801
Subfamily Calopodinae Costa 1852
Ditysparedrus n. gen.
LSID Zoobank:

Diagnosis: Body small; head across eyes mostly wider than pronotum; last maxillary palpomere securiform; eyes large and strongly protruding; antennal pit placed on tubercle; antennae 11-segmented, threadlike, simple; pronotum slightly transverse, sub-cylindrical, feebly restricted at the basal third; elytra stout, strongly dilated posteriorly, here with epipleura visible from the upperside; disc more or less flattened, with absent or very feeble nervation; ventrite I very short; metatarsomere I extremely long and covered with suberect spines at both sides; claws simple.

Type species: *Ditysparedrus serixioides* n. sp., designated here.

Included species: *Ditysparedrus serixioides* n. sp., *Ditysparedrus gigas* n. sp., *Ditysparedrus obscurus* n. sp., *Ditysparedrus uniformis* n. sp.

Figure 1. *Ditysparedrus serixioides* n. sp., body, dorsal view. Scale bar 1.0 mm.

Etymology: From the genus names *Sparedrus* and *Ditylus* Fischer von Waldheim, 1817.

Comparison: The new genus differs from other genera of the subfamily in the short ventrite I and pyriform elytra. Due to small size and elytra without ridges *Ditysparedrus* n. gen. is closely related to *Sparedrus*, more exactly to the most archaic *S. unicolor* species group (Švihla, 2006), due to its securiform palpomeres and the simple antennae. However, it differs from this genus in the pyriform stout elytra (2.2 times as wide as long at humeri) and the slightly transverse pronotum, while *Sparedrus* shows almost parallel-sided long elytra (2.9-3.5 times as wide as long at humeri) and elongate pronotum. For these characters, *Ditysparedrus* n. gen. looks somewhere similar to *Ditylus* (Nacerdinae: Ditylini).

Figure 2. *Ditysparedrus serixioides* n. sp., body, ventral view. Scale bar 1.0 mm.

Comments: Heteromerous tarsi, antennae threadlike, neck lacking and pronotum without lateral margin point clearly to the family Oedemeridae, while the antennal pit placed on a tubercle is the peculiar character of the subfamily Calopodinae (Vázquez, 2002).

Key to species of the genus *Ditysparedrus* n. gen.
1. Larger (body size 9.3 mm); body dull black *Ditysparedrus gigas* n. sp.
-. Smaller (body size up 5.2 mm); body blackish brown to reddish brown 2
2. Antennomere III longer than scape; elytra shorter (1.5 times as long as pronotum); legs brown. *Ditysparedrus obscurus* n. sp.
-. Antennomere III shorter than scape; elytra longer (2.2–3.1 times as long as pronotum); legs yellowish brown. 3
3. Antennomere V shorter than IV; apical three-fourths of antennomere V yellow *Ditysparedrus serixioides* n. sp.
-. Antennomere V longer than IV; antennomere V strictly yellow at apex *Ditysparedrus uniformis* n. sp.

Ditysparedrus serixioides n. sp. (Figures 1–2)
LSID Zoobank: urn:lsid:zoobank.org:act:1842D29D-42C3-4971-B9D8-A07F25F0CAC3

Etymology: Similar to the genus *Serixia* Pascoe, 1856 (Coleoptera: Cerambycidae: Lamiinae).

Type material: Holotype deposited in the coll. F. Vitali. The specimen is embedded in a cup-shaped piece of amber measuring 14.3 x 12.1 x 5.5 mm. Besides some air bubbles and plats rests, the amber includes an unidentified caddisfly (Trichoptera) and a partially abraded bug (Heteroptera Reduvidae?).

Type locality: Hukawng Valley southwest of Maingkhwan in Kachin State (26º200N, 96º360E), Myanmar, early Cenomanian (mid-Cretaceous).

Figure 3. *Dityspared rus gigas* n. sp., body, dorsal view. Scale bar 1.0 mm.

Description: Holotype (FSV9BS9). Female, body length 4.0 mm, stout, depressed; dorsal side reddish, without a clearly defined pattern; ventral side darker; pedicel entirely, antennomeres III, IV, VI, VIII and X at apex, and the apical three-fourths of the antennomeres V, VII and IX yellow; legs yellow, except for the apex of the femurs and the middle of the tibiae, which are black. Ventral side covered with fine dense punctures.

Head: Head short, broad; frons oblique; antennal tubercles widely separated and strongly elevated; interantennal space broad, as wide as the first two antennomeres together; eyes large, prominent, finely faceted and very strongly reniform; upper eye-lobes well developed; distance between upper eye-lobes one-half as wide as the interantennal space; under eye-lobes nearly occupying all space of genae. Maxillary palpomeres sub-equal; last palpomere oviform. Antennae hardly reaching the elytral apex; scape long; pedicel elongate, twice as long as wide, about one-third as long as scape; antennomere III a bit shorter than scape; antennomeres IV-X progressively decreasing in length; antennomere XI longer, as long as V; antennomere proportions according to the formula: 3.5: 1.0: 3.3: 2.3: 2.0: 1.8: 1.6: 1.5: 1.4: 1.0: 2.0.

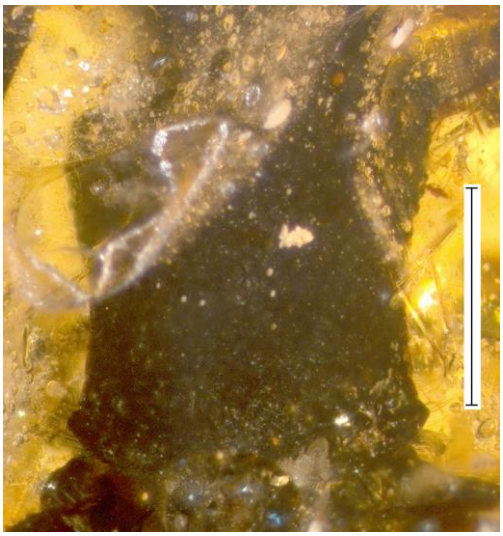

Figure 4. *Dityspared rus gigas* n. sp., pronotum, dorsal view. Scale bar 1.0 mm.

Pronotum: Pronotum finely furrowed along both margins; apex a bit narrower than base, anteriorly feebly convex; base posteriorly convex in the middle; disc feebly convex, covered with fine punctures. Scutellum shaped as an isosceles right triangle.

Elytra: Elytra pyriform, 2.2 times as long as wide at humeri and 3.3 times as long as pronotum, inflated at the apical fifth, here one-fourth wider than at base; base straight, almost twice as wide as pronotum; humeri rounded; apices largely rounded together, without apical spine; disc depressed, covered with fine regular punctures.

Abdomen: Ventrite I short; ventrite II 1.7 times as long as ventrite I; ventrite III 1.4 times as long as ventrite II; ventrites IV and V subequal in length; ventrite IV 0.6 times as long as ventrite III;

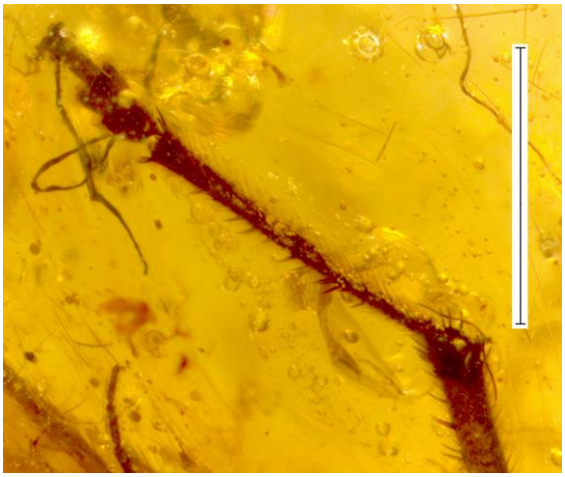

Figure 5. *Dityspared rus gigas* n. sp., metatarsus, ventral view. Scale bar 1.0 mm.

Legs: Legs relatively short and thin, covered with short semi-recumbent pubescence; femora slightly club-shaped; tibiae linear: mesotibiae without furrow; tarsi short; metatarsus as long as metatibia; metatarsomere I 4 times as long as metatarsomeres II and III together, covered with dense suberect spines at both sides; metatarsomeres II-IV subequal.

***Dityspared rus gigas* n. sp.** (Figures 3–5)
LSID Zoobank: urn:lsid:zoobank.org:act:F7D24A06-950B-4E0D-9913-D97234A6D43A

Etymology: From the Old Greek "*gigas*", i.e. giant, with reference to the body size in comparison with that of other species.

Type material: Holotype (No. MA2019/2) deposited in the ISEA. The specimen is embedded in an oval piece of amber measuring 25 x 18 x 3 mm, it misses the right antenna and the legs are kneed under the body. The amber includes numerous rests of plants and insects, among which two Coleoptera (one Scydmaenidae), one Diptera Brachycera and at least 5 different Diptera Nematocera.

Type locality: Hukawng Valley southwest of Maingkhwan in Kachin State (26º200N, 96º360E), Myanmar, early Cenomanian (mid-Cretaceous).

Description: Holotype. Female, body length 9.3 mm, distinctly depressed, dull black; covered with light dense thin hairs; legs brownish. Ventral side covered with fine dense punctures and a fine recumbent pubescence.

Head: Head short, broad; forehead oblique, wide; antennal tubercles widely separated and strongly elevated; interantennal space broad, slightly longer than first two antennomeres together; eyes large, prominent, finely faceted and almost reniform. Antennae not reaching elytral apex; scape long; pedicel elongate, twice as long as wide, about one-third as long as scape; antennomere III a bit shorter than scape; antennomeres IV-X progressively decreasing in length; antennomere XI longer, as long as VI; antennomere proportions according to the formula: 3.6: 1.0: 3.3: 2.7: 2.6: 2.4: 2.2: 1.8: 1.5: 1.4: 2.5.

Pronotum: Pronotum finely furrowed along both margins; subequal to wide at base; base posteriorly convex in middle; disc flattened, covered with coarse dense punctures. Scutellum triangular.

Elytra: Elytra pyriform, 2.3 times as long as wide at humeri and 3.8 times as long as pronotum; base concave, 1.4 times as wide as pronotal base; humeri rounded; apices largely rounded separately, without apical spine; disc flattened, covered with fine irregular punctures.

Abdomen: Ventrite I short; ventrite II 1.7 times as long as ventrite I; ventrite III 1.4 times as long as ventrite II; ventrites IV and V subequal in length; ventrite IV 0.6 times as long as ventrite III.

Legs: Legs relatively long and thin, covered with short subdecumbent pubescence; femora slightly club-shaped; tibiae linear, with two apical spurs, covered with suberect spines; tarsi long; metatarsus slightly shorter than metatibia; metatarsomere I 6.3 times as long as metatarsomere II, covered with fine pubescence, 6-8 suberect spines at both sides, and 4 spines at the apex; metatarsomere II 2.5 times as long as metatarsomere III; metatarsomeres IV 2.5 times as long as metatarsomere III; metatarsomere proportions according to formula: 9.5: 1.5: 1.0: 2.5.

Figure 6. *Dityspared rus obscurus* n. sp., body, dorsal view. Scale bar 1.0 mm.

***Dityspared rus obscurus* n. sp.** (Figure 6)
LSID Zoobank: urn:lsid:zoobank.org:act:9904A3C3-8A38-4C02-9779-BB583E108642

Etymology: From the Latin "*obscurus*", i.e. obscure, with reference to the general colour and to some ununsual characters (genrneral habitus, antennomere proportions) that puzzled the description.

Type material: Holotype (No. MA2019/3) deposited in the ISEA. The specimen is embedded

in a nearly spherical piece of amber measuring approximately 16 x 12 x 7 mm, it misses the left antenna and the legs are kneed under the body.

Type locality: Hukawng Valley southwest of Maingkhwan in Kachin State (26º200N, 96º360E), Myanmar, early Cenomanian (mid-Cretaceous).

Description: Holotype. Female, body length 5.2 mm, depressed, entirely blackish brown; covered with light, short hairs. Ventral side covered with fine dense punctures.

Head: Head short, broad; forehead flattened, wide; antennal tubercles widely separated and strongly elevated; interantennal space broad, slightly longer than first two antennomeres together; eyes large, little prominent, finely faceted. Antennae not reaching elytral apex; scape long; pedicel elongate, almost twice as long as wide, less than one-fourth as long as scape; antennomere III slightly longer than scape; antennomeres IV-X progressively decreasing in length; antennomere XI longer, as long as VI; antennomere proportions according to the formula: 3.4: 1.0: 3.9: 2.9: 2.9: 2.6: 2.3: 2.1: 1.8: 1.7: 2.7.

Pronotum: Pronotum finely furrowed along both margins; 1.3 times as long as wide at apex, equal to wide in middle, 1.1 times as long as wide at base; disc flattened, covered with fine and dense punctures.

Elytra: Elytra pyriform, 2.5 times as long as wide at humeri and 1.5 times as long as pronotum; base weakly concave, 1.4 times as wide as pronotum base width; humeri rounded; apices largely rounded together, without apical spine; disc flattened, covered with fine irregular punctures.

Legs: Legs relatively long and thin, covered with short pubescence; femora slightly club-shaped; tibiae linear, without furrow, with two apical spurs; tarsi not guessable.

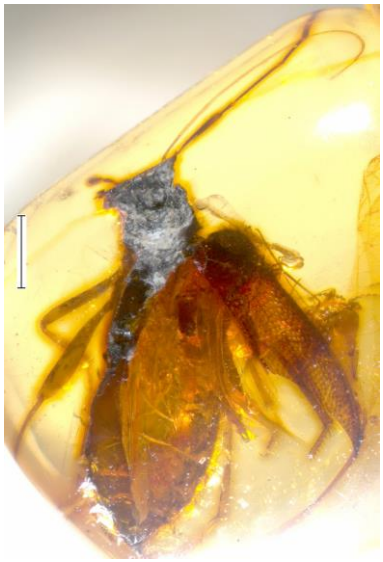

Figure 7. *Ditysparedrus uniformis* n. sp., body, dorsal view. Scale bar 1.0 mm.

***Ditysparedrus uniformis* n. sp.** (Figures 7–9)
LSID Zoobank: urn:lsid:zoobank.org:act:A2239310-45DD-441B-9B0A-027F2CBBC539

Etymology: From the Latin "*uniformis*", i.e. uniform, with reference to the uniform antennal colour.

Type material: Holotype (No. MA2019/4) deposited in the ISEA. The specimen is embedded in a prismatic piece of amber measuring approximately 18 x 18 x 4 mm. It is strongly damaged: pronotal disc, left elytral disc, right elytral third, right antennomeres after the apical half of VII and left antenna missing, due to the amber cut.

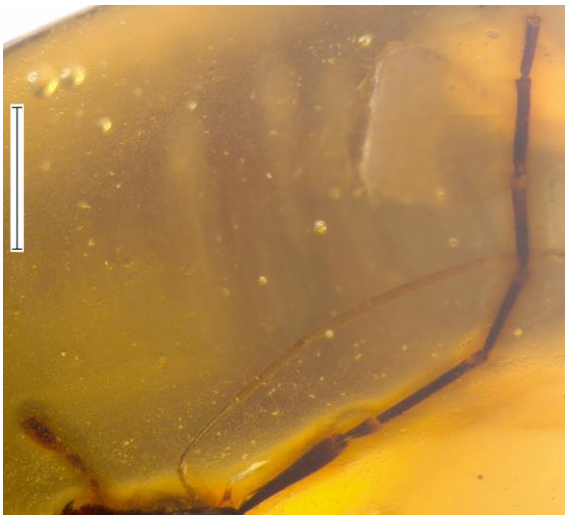

Figure 8. *Ditysparedrus uniformis* n. sp., left antenna, dorsal view. Scale bar 1.0 mm.

Type locality: Hukawng Valley southwest of Maingkhwan in Kachin State (26º200N, 96º360E), Myanmar, early Cenomanian (mid-Cretaceous).

Description: Holotype. Female, body length 4.8 mm, distinctly depressed, brown; legs and apical part of antennomeres yellow, covered with light sparse thin hairs. Ventral side covered with dense punctures.

Head: Head short, broad; forehead flattened, wide; antennal tubercles widely separated and strongly elevated; interantennal space broad, slightly shorter than first two antennomeres together; eyes large, prominent, finely faceted. Penultimate palpomere 2.0 times as long as wide; last palpomere securiform, 2.1 times as long as wide, 2.5 times as long as and 2.3 times as wide as penultimate palpomere. Scape long, 3.6 times as long as pedicel; pedicel elongate, 3 times as long as wide; antennomere III a bit shorter to scape, 1.4 times as long as antennomere IV; IV-VI progressively decreasing in length; antennomere proportions according to the formula: 3.7: 1.0: 3.6: 2.5: 2.9: 3.7: >2.2: ?: ?: ?: ?.

Pronotum: Pronotum subequal in length and wide.

Elytra: Elytra pyriform, 2.2 times as long as pronotum; humeri rounded; apices largely rounded together, without apical spine; disc weakly flattened, covered with fine irregular punctures.

Legs: Legs relatively long and thin; procoxae conical, separated; femora slightly club-shaped; tibiae linear, with two apical spurs, covered with suberect spines; mesotarsomere I long, nearly 6 times as long as mesotarsomere II; other parts not guessable; metatarsomere proportions according to formula: 4,5: 0.8: ? : ?.

Thorax: Procoxal portion of prosternum long, longer than procoxal cavity. Postcoxal portion very short. Procoxal cavities separated. Metaventrite equal in length to metacoxal cavity length. Metanepisterna 3.6 times as long as wide at base.

Abdomen: Ventrite I short, 0.3 times as long as metacoxal cavity length; ventrite II 1.9 times as long as ventrite I; ventrite III 1.5 times as long as ventrite II; ventrites IV and V subequal in length; ventrite IV two times shorter than ventrite III.

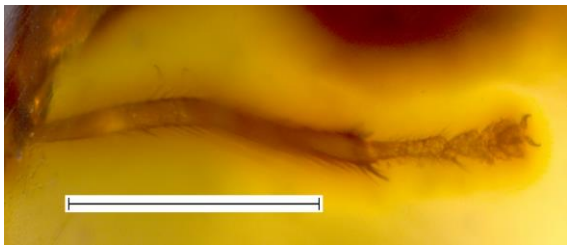

Figure 9. *Ditysparedrus uniformis* n. sp., mesotibia and mesotarsus, ventral view. Scale bar 1.0 mm.

Discussion

According to Švihla (1986), who revised systematics and phylogeny of this family, Dityilini is the most basal tribe inside Oedemeridae and, according to Lawrence (2005), *Ditylus* is the most plesiomorphic genus. *Ditylus* is characterised by stout body, last maxillary palpomere securiform, long pedicel (which separate it from Oedemerinae), protibiae with two terminal spurs and antennae 11-segmented in both sexes (which separate it from Nacerdini). Vertex without antennal tubercle and mesepisterna widely separated at midline separate it from Calopodinae, which represent an almost basal, lateral branch of Oedemeridae. Sharing with *Ditylus* a stout body, *Ditysparedrus* n. gen. fits this schema, supporting the hypothesis that primitive false blister beetles were stout, dark, frequenting trunks or stumps and somewhere similar to other Heteromera, e.g. Tenebrionidae.

Acknowledgments

The study of the second author was supported by the Federal Fundamental Scientific Research Programme for 2013–2020 (grant number AAAA-A16-116121410121-7) and the Russian Foundation for Basic Research (grant numbers 18-04-00243-a and 19-04-00465-a).

Conflict of interest statement

The authors declare no conflict of interest.

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