

***Dicentrus mehli* sp. n. (Coleoptera: Cerambycidae) implies close trophic association between Opsimini and *Calocedrus*, dating the Baltic amber back to the Early Oligocene**

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A new fossil cerambycid from Baltic amber, *Dicentrus mehli* sp. n. (Cerambycinae, Opsimini) is described and compared to extant congeners. This species is characterised by larger eyes, narrower inter-ocular space and shorter pedicle and, possibly, uniform colouring. This discovery allows confirming and pointing out the assumed hypotheses concerning the evolution of the Opsimini. In particular, the assumed association with fossil *Calocedrus* implies to dating the Baltic amber back to the Early Oligocene.

Key words: Coleoptera, Cerambycidae, fossil, Baltic amber, new species.

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INTRODUCTION

Until short time ago, the tribe Opsimini was known for its split relict distribution at both sides of the Pacific Ocean, being present with a genus (*Japonopsimus* Matsushita, 1935) and three species in western Asia and two genera (*Opsimus* Mannerheim, 1843 and *Dicentrus* LeConte, 1880) and three species in Vancouverian. The discovery of two fossil species in succinite (*Eurosimus germanicus* Vitali, 2011 and *Japonopsimus balticus* Vitali, 2014) suggested that this tribe has not trans-Beringian distribution, as it appears today, but a

Tertiary origin in Laurentia or probably, only in Europe (Vitali 2011, 2014).

In this paper, the discovery of a third fossil species in succinite reveals that the extant Vancouverian genus *Dicentrus* was already present in Europe during the late Tertiary.

MATERIALS AND METHODS

The beetle is preserved inside a spherical piece of amber having a diameter of 11 mm. On both

upper and lower part, two spherical caps were cut parallel to the body of the beetle in order to obtain two circular windows having a diameter of 9 mm. The amber also includes several sawdust parts but no “stellate hairs” (trichomes covering inflorescences).

Observations on the fossils were made using a stereomicroscope Antares Geminar 3 with 20 - 40x eyepieces equipped with a micrometer system. Pictures were taken using a camera Imaging Source DFK 72AUC02 attached to a trinocular microscope Nikon SMZ 745T. The reconstruction of the habitus (Fig. 3) was obtained with mixed traditional-computer graphic techniques.

According to the owner’s intentions, type materials will be deposited at the Zoological Museum University of Copenhagen (Denmark).

SYSTEMATIC PART

Cerambycinae Latreille, 1802

Opsimini LeConte, 1873

Dicentrus LeConte, 1880

Dicentrus mehli sp. n.

(Figs. 1-2)

Holotype. Specimen ALDC0068. The beetle lacks the apical part of the right antenna, cut after half of the antennomere VI, due to the amber modelling.

The death position, with both hind wings partially opened and the distended position of the right hind leg, suggests that the specimen was attracted by flowing resin and drowned searching to escape.

This position corresponds to that already observed in *Europsimus germanicus* and *Japonopsimus balticus*; analogously, this amber does not contain stellate hairs but a large number of wood residuals.

Differential diagnosis

The pronotal shape and, especially, the position of the pre-basal spines make this fossil a patent representative of the genus *Dicentrus* LeConte, 1880.

Except for body size and colour, the differences between extant *Dicentrus* are slight: Linsley (1962) mentioned different head punctuation, but this character is undetectable in the fossil due to turbidity of the amber.

Sharing analogue body size, *D. mehli* sp. n. seems to be more closely related to *D. bluthneri* LeConte, 1880 than to *D. bidentatus* (Champlain & Knull, 1926); however, it differs from both extant species in larger eyes, narrower inter-ocular space and shorter pedicle. In addition, while both congeners of the Recent show a more or less extensive light colouring, the body colour of *D. mehli* sp. n. seems to be completely pitch-brown, as all other fossil and extant Opsimini.

Concerning the fossil *Europsimus germanicus* and *Japonopsimus balticus*, *D. mehli* sp. n. is easily distinguishable in the generic characters. Due to the double pronotal spines, *D. mehli* sp. n. is similar to *E. germanicus*, which principally differs in the 12-articulated antennae and the pronotum, having basal spines and straight base. Moreover, comparing the size of the antennomeres in relation with that of body, *D. mehli* sp. n. and *E. germanicus* show a similar trend, while they are very different from *J. balticus*.

Actually, the 12th antennomere of *Europsimus* might be an optical illusion due to diffraction; consequently, *Europsimus* could be more similar to *Dicentrus* than previously supposed. However, antennae are ~1.5 times as long as body in *Europsimus*, analogous to current *Opsimus*, while they are ~1.25 times as long as body in *D. mehli* sp. n., analogous to current *Dicentrus*. This difference is not due to allometry since the species show analogue body



Fig. 1. *Dicentrus mehli* sp. n., holotype, dorsal side.



Fig. 2. *Dicentrus mehli* sp. n., holotype, ventral side.

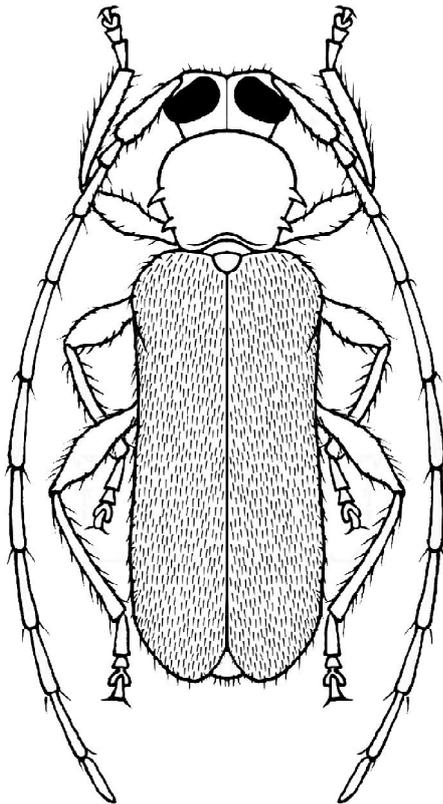


Fig. 3. *Dicentrus mehli* sp. n., reconstruction.

size (4.3 and 4.6 mm); hence, *Europsimus* is certainly a different taxon.

Long antennae characterise *Japonopsimus* as well; thus, they seem to be an archaic character of Opsimini.

Description

Male, body length 4.3 mm. General habitus small, flat, pitch-brown, densely covered with a dark pubescence.

Head short; forehead vertical, sculpture not detectable; antennal tubercles widely separated and scarcely elevated; inter-antennal space narrow, one-half as wide as the upper eye-lobes; inter-antennal furrow very fine, prolonged to the cranial base; eyes large, coarsely faceted, very strongly reniform, and scarcely prominent; under eye-lobes nearly occupying all space of cheeks. Maxillar palpomeres sub-equal, last palpomere evidently longer than the preceding one, elliptical, obliquely truncated at the apex. Antennae 11-segmented, 1.24 times as long as body (the apex of the antennomere VIII surpasses the elytral apex); antennomeres

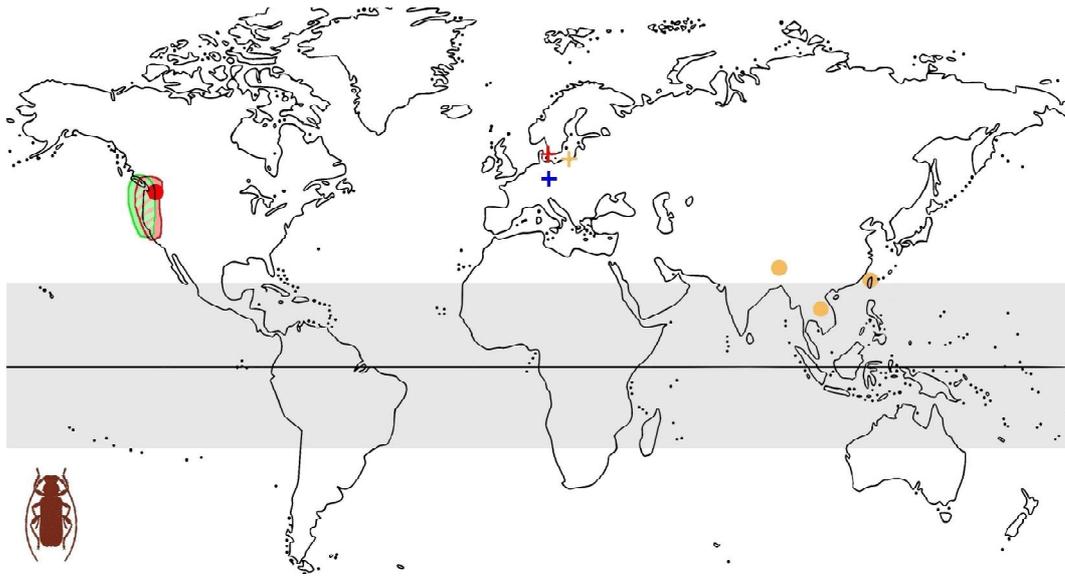


Fig. 4. Distribution of fossil (crosses) and extant genera (circles) of Opsimini: *Dicentrus* (red), *Europsimus* (blue), *Japonopsimus* (yellow) and *Opsimus* (green). Crosses and circles indicate spot distributions; areas indicate wide distribution of extant species.

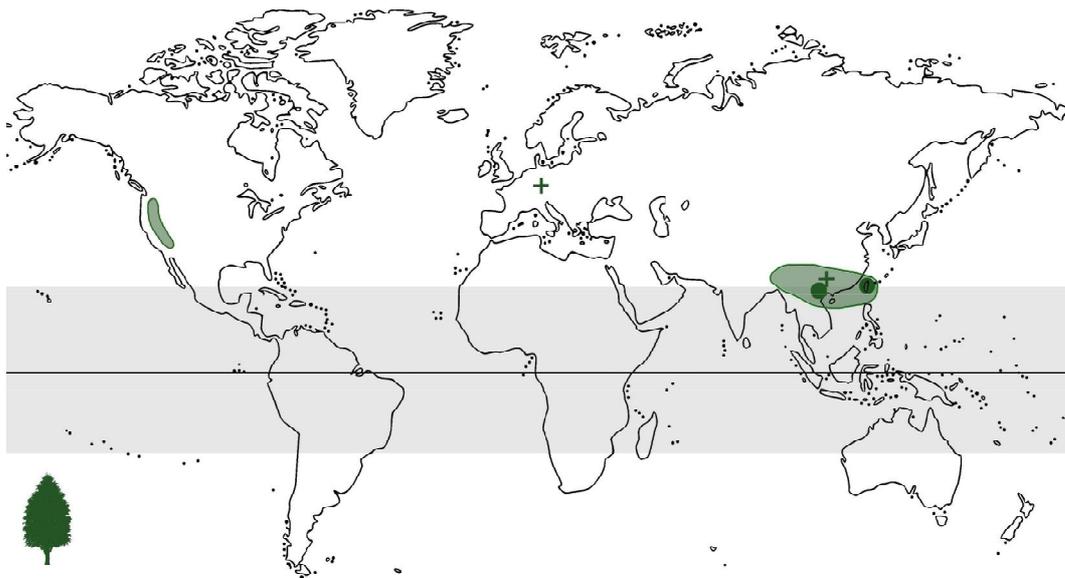


Fig. 5. Distribution of fossil (crosses) and extant species (circles) of *Calocedrus*. Crosses and circles indicate spot distributions; areas indicate wide distribution of extant species.

cylindrical, covered with a fairly dense semi-recumbent pubescence; scape sub-conical, fairly elongated (surpassing the anterior margin of the pronotum); pedicel elongated, twice as long as wide, one-third as long as scape; antennomere III two-thirds as long as scape; antennomere IV one-fourth longer than previous; antennomere V longest, one-half longer than previous; antennomere VI-VII equal, as long as scape; the remaining gradually shortened (antennomere proportions according to the formula: 1.2: 0.4: 0.8: 1.0: 1.5: 1.2: 1.2: 1.1: 1.0: 1.0: 0.8, the measure of the last three antennomeres is unsure due to their position among the legs).

Prothorax weakly transverse, hardly larger than head and narrower than elytra; apex feebly convex; sides posteriorly convergent, each armed with two backward directed acutely conical spines, one at the middle and the other shortly before the base; base anteriorly concave in the middle; disc flat, densely covered with a fine puncturing. Scutellum small, semicircular, transverse.

Elytra more than 2.5 times as long as wide at shoulders, feebly enlarged posteriorly, flat above; base straight; shoulders rounded; apices largely separately rounded; disc without longitudinal ridges, covered with semi-recumbent pubescence and punctuation extremely dense and finer than that of the pronotum.

Ventral side hardly observable due to a dense covering of sawdust and numerous small bubbles. It shows a fine sparse puncturing and some short recumbent setae; procoxae globose, procoxal cavities rounded externally, not observable posteriorly; mesocoxal cavities not observable; visible urosternite I as long as II, remaining urosternites progressively shortened.

Legs relatively short, covered with a dense short recumbent pubescence; femora clavate; tibiae linear; tarsi short; metatarsi less than one-half

as long as metatibiae; metatarsomere I as long as the remaining tarsomeres together.

Etymology

This new species is dedicated to the recently departed specialist in Fennoscandian cerambycids Ole Mehl, who opened to the second author the possibility to start with the study of amber.

DISCUSSION

Assumed evolution of Opsimini

The new paleontological data corroborate the dependence of the Opsimini on Cupressaceae, as previously assumed (Vitali 2011).

Considering the hosts of the current taxa, only those of the American ones are known (Linsley 1962): *Abies*, *Pinus*, *Pseudotsuga*, *Sequoia* and *Calocedrus*. Both *Abies* and *Pinus* - still present here - cannot explain the extinction of the whole tribe in Europe. Moreover, since *Pseudotsuga* migrated from North America to Asia (Schorn & Thompson, 1998) and *Sequoia* appeared in Europe during the Miocene (Chaney 1951), Opsimini should have begun to depend on these genera only in the Neogene.

Since no other hosts are known for current Opsimini, *Calocedrus* seems to be the original host of this tribe. As Opsimini, it includes species in mountains of Vancouverian, China, Taiwan, Indochina and a fossil species - *Calocedrus suleticensis* (Brabenec) Kvaček - which lived in central Europe from the Early Oligocene to the Early Miocene (Kvaček 1999). Another Oligocene fossil was discovered in south China (Shi et al. 2012), where most of the extant congeners are widespread (Fig. 5).

The updated distribution of this tribe strengthens and points out the assumed hypotheses (Vitali 2011, 2014) concerning the evolution of the Opsimini: (1) the oldest known

fossil records are from late Tertiary of Europe, which can be supposed the evolution centre of the tribe (2) the tribe depends primarily on Cupressaceae, *Calocedrus* being the most probable original or preferential host; (3) the tribe spread eastwards following this plant, possibly already during the Oligocene; (4) *Dicentrus* and *Opsimus* (the latter extremely similar to *Japonopsimus*) are trans-Beringian genera with European ancestors, which possibly colonised North America during the Miocene. Conversely, the current absence of *Dicentrus* in Asia is hardly explicable. The supposed Laurentian distribution of this genus (Vitali 2011) seems to be too ancient to allow the survival of the same genus since that epoch. A possible explanation might be that ancient *Dicentrus*, colonised colder Eurasian localities and widespread through Bering without ever reaching Indochina. Or, further *Dicentrus* species should be still discovered in South-eastern Asia.

Assumed biology of *Dicentrus mehli* n. sp.

Currently, the genus *Dicentrus* includes two species widespread in the temperate coniferous forests covering the middle-mountain ranges along the Western coast of the United States (Fig. 4). *Dicentrus bluthneri* shows a large distribution, being widespread from California to British Columbia, while *D. bidentatus* seems to be present only in Oregon. The latter species was also recorded from California, but the examples were considered as doubtful (Linsley, 1962).

Hence, the same hypotheses given for the other fossil Opsimini (Vitali, 2011; 2014) may be inferred for *O. mehli* n. sp.: this species was a temperate or even cold element of the Baltic fauna, which shared the same habitat of *Nothorhina granulicollis* Zang, 1905. But, in contrast to this genus, typically related to the Pinaceae (Vitali, 2006), the dependence on temperate Cupressaceae made *Dicentrus* more vulnerable to the dramatic climatic changes occurred during the Neogene, causing its extinction.

Consequences on Baltic climate and dating

Opsimini of the Recent are widespread in mountains of temperate areas and in relict mountain localities of subtropical areas (Fig. 4), evidencing their temperate or cryophilic bioclimatic preferences. This suggests that Baltic forests had temperate and not subtropical conditions, a fact confirmed by the well-known extraordinary abundance of the genus *Nothorhina* in Baltic amber (Zang 1905; Klebs 1910; Hieke & Pietrzeniuk 1984; Vitali 2006; 2009, 2011).

According to the temperature curve based on oxygen isotope measurement (Buchardt 1978), such temperate conditions occurred in Europe only since the Early Oligocene.

The fact that *Calocedrus* was present in Europe just since this age agrees in supporting a more modern dating for Baltic amber, referring it to the Early Oligocene (Vitali 2009, 2011, 2014, 2015), as already supposed in the past (Noetling 1883, 1888).

REFERENCES

- Buchardt B. 1978. Oxygen isotope paleotemperatures from the Tertiary period of North Sea Area. *Nature*. 275: 121-123.
- Chaney R.W. 1951. Revision of fossil *Sequoia* and *Taxodium* in western North America based on the recent discovery of *Metasequoia*. *Transactions of the American Philosophical Society*. 40: 171-263.
- Hieke F. & Pietrzeniuk E. 1984. Die Bernstein-Käfer des Museums zur Naturkunde, Berlin (Insecta, Coleoptera). *Mitteilungen aus dem Zoologischen Museum für Naturkunde in Berlin*. 60 (2): 297-326.
- Klebs R. 1910. Über Bernsteineinschlüsse in allgemeinen und die Coleopteren meiner Bernsteinsammlung. *Schriften der*

- Physikalisch-ökonomischen Gesellschaft. 51: 217-242.
- Kvaček Z. 1999. An ancient *Calocedrus* (Cupressaceae) from the European Tertiary. *Flora* 194: 237-248.
- Linsley E.G. 1962. The Cerambycidae of North America. Part III. Taxonomy and classification of the subfamily Cerambycinae, tribes Opsimini through Megaderini. University of California Publications in Entomology 20, University of California Press, Berkeley and Los Angeles. 188 pp.
- Noetling F. 1883. Über das Alter der samländischen Tertiärformation. *Zeitschrift der Deutschen Geologischen Gesellschaft*. 35: 671-694.
- Noetling F. 1888. Die Fauna des samländischen Tertiärs. Teil 2 (Gasteropoda, Pelycypoda, Bryozoa). *Abhandlungen zur geologischen Spezialkarte von Preußen und den Thüringischen Staaten*. 6: 1-109.
- Shi G., Zhou Z., Xie Z. 2012. A new Oligocene *Calocedrus* from south China and its implications for transpacific floristic exchanges. *American Journal of Botany*. 99 (1): 108-120.
- Schorn H.E., Thompson A. 1998. The genus *Pseudotsuga*: a revision of the fossil record and inferred paleo-biogeographical and migrational patterns. Poster of the meeting "Integrative Paleontology and the Future", The University of California, Berkeley Museum of Paleontology. 28 February 1998.
- Vitali F. 2006. Taxonomic, biological and evolutionistic notes on the Spondylidinae included in Baltic amber (Coleoptera, Cerambycidae). *Entomapeiron* (P. S.). 1 (3): 29-44.
- Vitali F. 2009. The cerambycids included in Baltic amber: current knowledge status with the description of new taxa (Coleoptera, Cerambycidae). *Denisia*. 69: 231-242.
- Vitali F. 2011. Six new fossil Cerambycids included in Baltic and Saxon amber (Coleoptera Cerambycidae). *Entomapeiron* (P. S.), 4 (1): 1-34.
- Vitali F. 2014. New fossil cerambycids (Coleoptera: Cerambycidae) from Baltic amber belonging to the collection Hoffeins. *Baltic Journal of Coleopterology*. 14 (1): 103-112.
- Vitali F. 2015. *Mesalocerus tetropoides* n. gen. n. sp. from Baltic amber: the first fossil member of the tribe Anisarthrini Mamaev & Danilevsky, 1973 (Coleoptera, Cerambycidae). *Les Cahiers Magellanes NS*. 18: 65-69.
- Zang R. 1905. Coleoptera Longicornia aus der Berendtschen Bernsteinsammlung. *Sitzungsberichte der Gesellschaft Naturforschender Freunde zu Berlin*. 1905: 232-245+1 Tab.

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