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First record of *Nicobium* LeConte (Coleoptera: Ptinidae: Anobiinae) from Baltic amber with the description of a new extinct species

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Abstract

The first extinct Paleogene species of the Anobiinae genus *Nicobium* LeConte, 1861 is described based on an inclusion in Baltic amber. Two characteristic features distinguishing the extinct species (among other characters present in one combination or another in extant species) are sparse, inconspicuous elytral pubescence and rectangular, sharp posterior pronotal angles. The new species, *Nicobium necrocrator* **sp. nov.**, is just the second described extinct representative of the genus. Its discovery adds to our knowledge of the diversity of deathwatch beetles in the amberiferous forests of the Eocene—and establishes an important reference point for future studies of the origin and distribution of these wood-boring beetles living millions of years ago.

Key words: Cenozoic, fossil resin, paleobiodiversity, Eocene, inclusion

Introduction

Anobiinae, commonly known as deathwatch beetles, comprise a subfamily of wood-boring beetles in the family Ptinidae found worldwide. The Anobiinae genus *Nicobium* LeConte, 1861 is composed of eight extant species as well as one extinct species, the latter described from Upper Cretaceous Burmese amber (Viñolas 2020a; Schnepp 2023; Háva & Zahradník 2023). The genus is historically placed within the subfamily Anobiinae in the tribe Nicobiini White, 1982 together with three other genera: *Anobiopsis* Fall, 1905, *Nanodesma* Zahradník, 2019, and *Trichodesma* LeConte, 1861 (White 1982; Zahradník & Háva 2014; Zahradník 2019). The classification of the subfamily is not universally recognized: The validity of tribes (including the tribe Nicobiini) was recently disputed by several researchers (e.g., Viñolas 2020a; Schnepp 2023). The systematics of the subfamily and discussion about this subject are beyond the purpose of our study, although there remains a need for a clear delimitation of systematic groups of Anobiinae—an analysis that will likely draw from fossil data obtained in amber studies.

While a high number of Ptinidae have been described from Baltic amber, including 55 extinct species (Alekseev *et al*. 2023; Alekseev & Bukejs 2023 and references therein), there are no confirmed reports of the genus *Nicobium* from this fossil resin. A deathwatch beetle that appeared related to the extant genus *Nicobium* was first reported from Baltic amber by Klebs (1910) as "bei *Nicobium,*" and later cited by Larsson (1978) as "near *Nicobium*" and by Spahr (1981) as "*Nicobium*, unsichere Bestimmung" [i.e. "inexact identification"]. In the current contribution to the knowledge of fossil Ptinidae, we present the first photographically documented report of the genus *Nicobium* from Baltic amber and the first description of its extinct Paleogene representative in Baltic amber, based on a single adult in an amber specimen purchased by the Kaliningrad Regional Amber Museum in 2023.

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Material and methods

The material examined (the holotype) is deposited in the collection of the Kaliningrad Regional Amber Museum (Russia) [prefix KAM]. The amber piece was polished manually with emery papers of different grit sizes, allowing improved views of the included specimen. The amber piece was not subjected to any supplementary fixation. Measurements of the holotype were made using an ocular micrometer in a stereoscopic microscope MBS-9. Photographic documentation was performed using a Canon EOS 4000D camera mounted on a Zeiss microscope. Extended depth of field at high magnifications was achieved by combining multiple images from a range of focal planes using Helicon Focus v. 6.0.18 software, and the resulting images were edited to create figures using Adobe Photoshop 7.0. The material was studied using traditional comparative morphological methods.

The following references were used for the generic attribution and comparison with extant and extinct taxa: Cymorek (1975), Logvinovskij (1985), Bercedo & Arnáiz (2007), Toskina (2014), Zahradník (2019), and Háva & Zahradník (2023).

Systematic Paleontology

Family Ptinidae Latreille, 1802

Subfamily Anobiinae Fleming, 1821

Genus *Nicobium* LeConte, 1861

Type species: *Anobium hirtum* Illiger 1807

Taxonomic assignment. The specimen considered here is assigned to the genus *Nicobium* within the subfamily Anobiinae based on a combination of the following morphological characters: (1) antennae 11-segmented, with loose, distinct, 3-segmented club longer than the preceding antennomeres combined; (2) pronotum transverse, gibbose; (3) tarsal claws without basal tooth; (4) dorsal surface simply pubescent, without tufts of erect setae on elytra; (5) metasternum convex, not excavate anteriorly; (6) elytral punctation arranged in regular striae distinct throughout entire length of elytra; (7) all coxae separate; and (8) abdominal ventrite 2 wider than abdominal ventrite 1 and about as wide as abdominal ventrite 3.

Nicobium necrocrator sp. nov.

(Figs 1–5)

Type material. Holotype: No. KAM 8656 [KRAM]; "*Holotype / *Nicobium* / *necrocrator* sp. nov. / Alekseev, Háva, / Pankowski et Bukejs / des. 2024" [red handwritten label]; adult, sex unknown; prothorax is insufficiently visible due to legs position and gas bubbles on left side of inclusion. A complete beetle is included in a transparent, yellow, irregularly shaped amber piece with dimensions of 15×14 mm and a maximum thickness of 14 mm, preserved without supplementary fixation. Syninclusions: a few small stellate Fagaceae trichomes.

Type stratum. Baltic amber from Eocene amber-bearing Blaue Erde deposits; estimated age: middle–late Eocene.

Type locality. Yantarny settlement (formerly Palmnicken), Sambian (Samland) Peninsula, Kaliningrad Region, Russia.

Description. Measurements: body length (from anterior margin of pronotum to elytral apex along midline) 4.0 mm, body maximum width across both elytra 2.0 mm; head length (including mandible) 0.86 mm, head maximum width across eyes 1.13 mm; pronotal length 1.25 mm, pronotal maximum width 1.5 mm; elytral length 2.75 mm, elytral maximum width 2.0 mm.

Body shape elongate, subcylindrical; body color entirely dark brown, with appendages rufous. Dorsum with inconspicuous, semi-erect, fine, sparse pubescence; legs with shorter and denser pubescence; ventral surface of thorax apparently glabrous; abdominal ventrites with short pubescence.

FIGURES 1–2. *Nicobium necrocrator* **sp. nov.**, holotype, No. KAM 8656 [KRAM]: 1: Habitus, dorsal view; 2: Habitus, ventral view. Scale bars = 1.0 mm.

Head hypognathous, evenly convex; vertex with small granules, interspaces between granules about as wide as diameter of one granule; frons glabrous, with sparse, very fine punctures. Compound eyes large, oval, convex, entire, finely facetted, without ommatidial setae; distance between compound eyes nearly equal to 1.2× vertical diameter of one eye. Mandibles flat, robust, inner surface tridentate with apical tooth longest. Last labial palpomere triangular with widened apex, anterior margin tridentate. Antennal insertions widely separated by distance of 1.3× vertical diameter of one eye. Antennae with 11 antennomeres, with loose 3-segmented club, extending to basal one-sixth of elytron; relative length ratios of antennomeres 1–11 equal to 15-10-6-5-5-5-5-5-25-25-30. Scape elongate-oval; pedicel elongate, conical, 3.0× as long as wide; antennomere 3 conical, slightly longer than subsequent antennomere; antennomeres 4–8 subequal in size and shape, conical, elongate, slightly longer than wide, dilated apically; antennomere 9 and 10 subequal in shape and size, flattened, widened distally; antennomere 11 longest, elongate, narrowly spindle-shaped, pointed.

Pronotum convex medially, with bump in middle, narrower than elytra at base, transverse, 1.2× as wide as long, with maximum width in anterior one-third; lateral sides and posterior edge flattened. Pronotal granulation larger, coarser, and denser than granulation on head, denser at base and medially; distance between granules about equal to 0.5–1.0× diameter of one granule. Pronotal pubescence fine, erect, with setae inconspicuous on disc and longer laterally and at anterior edge. Posterior pronotal angles distinct, rectangular, sharp; anterior angles protruding, forming short lobes, slightly upturned, flattened, rectangular, sharp. Anterior pronotal edge margined, rounded medially; posterior edge margined, widely rounded along entire length; lateral edges concave at base, rounded anteriad, finely serrate.

Scutellar shield triangular, with rounded angles, as long as wide. Elytra subparallel, elongate, about 1.4× longer than wide, moderately convex, with well-developed humeri. Elytral punctation dense, moderately large, arranged in striae; striae distinct throughout entire length of elytron; elytral strial punctures elongate, rectangular with rounded angles medially, more rounded and smaller posteriad and laterad; interstrial intervals flat; distance between striae narrower at base and wider apicad, about 1.0–2.0× as wide as one strial puncture. Shortened scutellar stria present, consisting of five punctures. Elytral pubescence fine, semierect, discernible only on lateral sides. Epipleura glabrous, with sparse granulation; wide near humeri and gradually narrowing postriad, but not reaching elytral apex. Metaventrite with disc convex, not excavate anteriorly; covered with rather dense granulation; discrimen distinct in posterior one-third.

Legs rather short and moderately robust. Mesocoxae globose, separated by 1.3× transverse diameter of mesocoxa; metacoxae elongate, transverse, separated by one length of metacoxa. Trochanters subglobose. Femora and tibiae nearly equal in length; femora weakly thickened; tibiae straight, not widened apically. Tarsal formula: 5-5-5. Tarsomere 1 longer than tarsomere 2 or 3 (first metatarsomere 1.25× as long as second metatarsomere); tarsomeres 2 and 3 subequal in length; tarsomere 4 widened apically, lobed; tarsomere 5 rather short, triangular, about as long as tarsomere 4. Tarsal claws about 0.5× as long as tarsomere 5; swollen, without tooth basally.

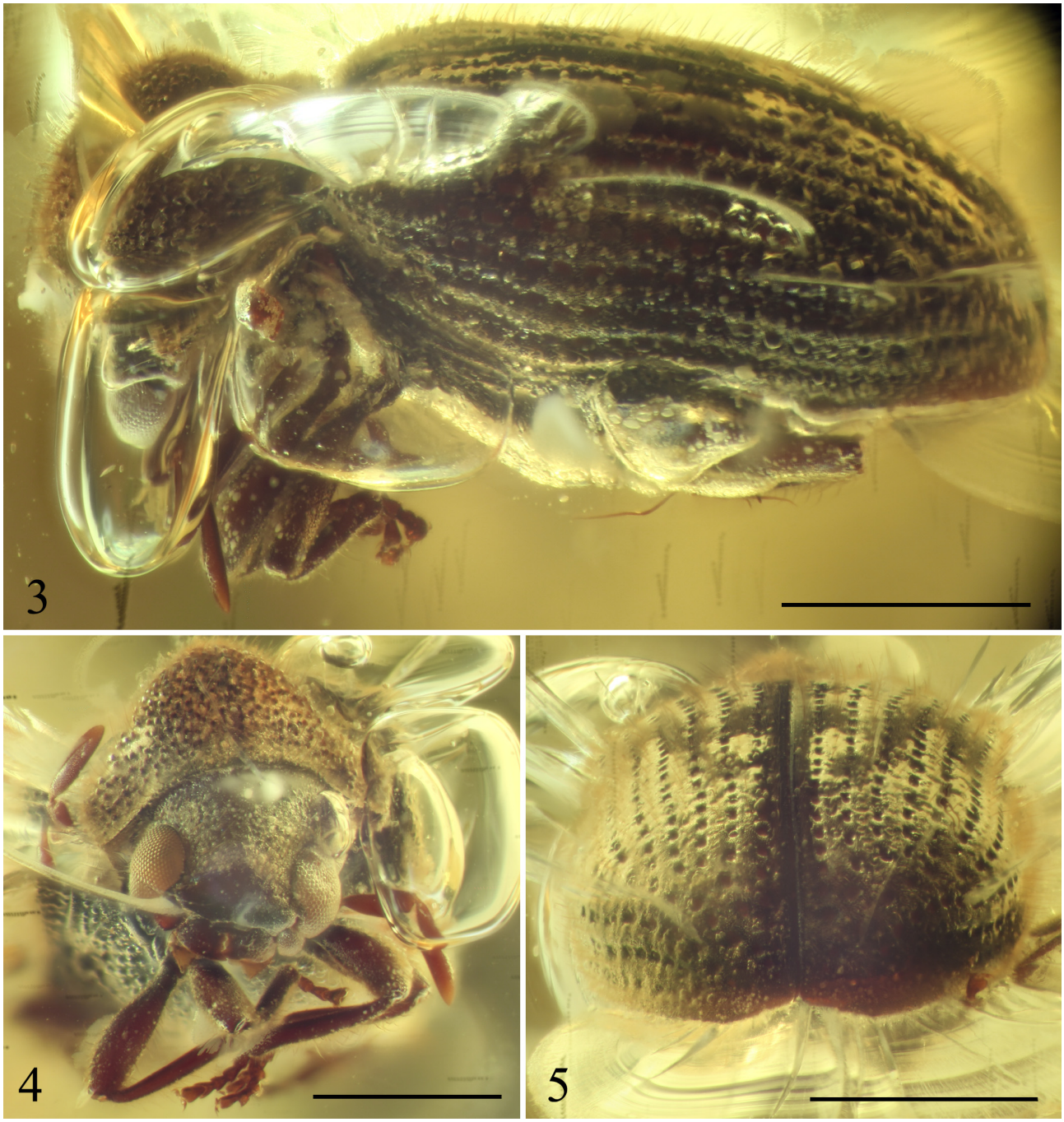
Abdomen with five visible ventrites covered with fine and short pubescence; ventrite 5 rounded apically. Relative length ratios of ventrites 1–5 equal to 10:16:15:8:18 (measured medially).

Differential diagnosis. *Nicobium necrocrator* **sp. nov.** differs from all extant congeners in the combination of the following characters: (1) elytral pubescence sparse and inconspicuous, not forming a pattern or even uniform cover on the disc (in contrast to double pubescence on dorsum of *N. zuzartei* Bercedo et Arnáiz, 2007; to uniformly pubescent elytra on *N. castaneum* (Olivier, 1790); to elytral pubescence arranged in transverse bands on *N. hirtum* (Illiger, 1807)); (2) posterior pronotal angles rectangular and sharp, and pronotal lateral sides concave at base (in contrast to widely rounded pronotal posterior angles in *N. gorbatovskyi* Toskina, 2014 and to evenly rounded lateral edges of pronotum in *N. schneideri* Reitter, 1878); (3) mesocoxae separated by distance equal to 1.3× their transverse diameter (in contrast to mesocoxae separated by distance equal to 0.5× coxal diameter in *N. hirtum* and to mesocoxae separated by distance less than 0.5× coxal diameter in *N. gorbatovskyi*); (4) elytral interstrial intervals flat (in contrast to convex interstrial intervals in *N. hirtum* and *N. schneideri*); elytra about 1.4× longer than wide (in contrast to elytra 1.6–1.8× longer than wide in *N. castaneum*); and (5) elytral strial punctures elongate (in contrast to rounded strial punctures in *N. castaneum* and *N. schneideri*).

The newly described extinct species, *Nicobium necrocrator* **sp. nov.**, can be distinguished from the Mesozoic congener *Nicobium cretaceum* Háva et Zahradník, 2023 in the granulate pronotum (in contrast to a punctate pronotum in *N. cretaceum*), larger body size (2.1 mm in *N. cretaceum*), pronotal bump without furrow (furrow present in *N. cretaceum*), antennomere 11 the longest (antennomere 11 not longer than antennomere 10 in *N. cretaceum*), and abdominal ventrites of different lengths (in contrast to all ventrites of equal length in *N. cretaceum*).

The new species can be easily distinguished from all other Ptinidae described from Baltic amber by the combination of genus-level differences mentioned in the paragraph "taxonomic assignment" as well as its comparatively large body size (4 mm), wide subparallel elytra with developed humeri, and regularly striate-punctate elytra. *Nicobium necrocrator* **sp. nov.** resembles representatives of the genus *Trichodesma* with its four coeval species known from Baltic amber and keyed in Bukejs *et al*. (2018). The newly described species, however, differs from these taxa in the tarsal claws without basal tooth, distinct posterior pronotal angles, a less-developed convex pronotal bump, and the elytra and pronotum without tufts of erect setae.

Derivatio nominis. The specific epithet *necrocrator* is derived from Ancient Greek νεκρός (dead body) and κράτος (power), meaning "dead lord." The name is used as a noun in apposition.



FIGURES 3–5. *Nicobium necrocrator* **sp. nov.**, holotype, No. KAM 8656 [KRAM]: 3: Habitus, left lateral view; 4: Habitus, frontal view; 5: Habitus, caudal view. Scale bars = 1.0 mm.

Discussion

Nicobium is a cosmopolitan genus with representatives living worldwide today. The Recent fauna includes eight valid extant species (Schnepp 2023): *N. auroguttatum* Reitter, 1908 (Asia: Syria); *N. castaneum* (Olivier, 1790) (pest, distributed worldwide by humans); *N. gorbatovskyi* Toskina, 2014 (Asia: Turkmenistan, Uzbekistan); *N. hirtum* (Illiger, 1807) (pest, widely distributed by humans); *N. schneideri* Reitter, 1878 (North Africa: Egypt; Asia: Iran, Turkey, Caucasus; southeastern Europe: southern Russia and Ukraine); *N. velatum* (Wollaston, 1854) (Africa: Madeira Archipelago); *N. villosum* (Brullé, 1838) (western Mediterranean, introduced in Brazil); and *N. zuzartei* Bercedo et Arnáiz, 2007 (Europe: Portugal). The native area of the genus in Recent times is probably southern

parts of the western Palaearctic (mostly to the Mediterranean subregion). The human introduction of *N. castaneum* and probably *N. hirtum* (the species are very similar externally and were treated as synonyms for a long time) to almost all continents is likely the result of global shipping introducing these rather frost-intolerant beetles across the Earth.

It's unknown what type of wood *Nicobium necrocrator* **sp. nov**. consumed in the Baltic forests of the Eocene. But we can get a few clues from living species of *Nicobium.* Certain species (*N. castaneum* and *N. hirtum*) are some of the world's most economically significant wood-destroying Anobiinae pests, damaging boxes, packing cases, house flooring, wood strips, furniture, woodwork, etc. (White 1982), and serious specific pests in libraries (where larvae feed on paper). Unfortunately, comparatively little is known about the habitat requirements of species in nature. Notably, *N. hirtum* was successfully mass-bred in the laboratory, feeding on hardwood, softwood, and an artificial diet (e.g., Krishanti *et al.* 2022); available information on natural feeding for other species is scarce. *N. castaneum* is reported from wood of *Quercus* and conifers; *N. villosum* [=*N. albofasciatum*] develops in *Euphorbia canariensis*, *Ficus carica*, *Morus*, and *Salix canariensis* (Viñolas 2020b), and also was reared from *Euphorbia balsamifera* and *Launaea arborescens* in the Canary Islands (Bercedo & Arnáiz, 2007). Larvae of *N. schneideri* feed mainly in dry conifer wood (Logvinovskij 1985) with wood humidity of 14–20%; however, researchers also recorded damage to products (mainly furniture) made of hardwood and softwood (Toskina & Provorova 2007). Clearly, additional studies are needed to learn more about the types of wood these species consume and prefer in their natural habitats.

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