

Two new cocoon-forming beetles (Coleoptera: Cucujoidea: Bothrideridae) from Baltic amber

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New extinct representatives of the family Bothrideridae Erichson, 1845 are described and illustrated from Baltic amber: *Pseudobothrideres rugiorum* sp.nov. and *P. criwecriwayto* sp.nov. All known fossil bothriderid beetles are discussed, compared and keyed.

Key words: taxonomy, Tertiary, Eocene amber, beetles, *Pseudobothrideres rugiorum*, *P. criwecriwayto*

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INTRODUCTION

Bothrideridae is a small family of poorly known beetles comprising four subfamilies (Teredinae, Xylariophilinae, Bothriderinae and Anommatainae) and more than 400 species in 38 genera (Ślipiński et al. 2010). Members of the family are found in all major zoogeographical regions of the world with the majority of diversity in the Old World tropics. Although little is known about the biology, most bothriderids are closely associated with the galleries of wood-boring insects. The members of the subfamily Bothriderinae are ectoparasites and predators as both larvae and adults. Members of the bothriderid subfamily feed on various larvae of wood inhabiting beetles such as Cerambycidae, Buprestidae, Curculionidae, Bostrichidae, Curculionidae, and Ptinidae, Hymenoptera and Lepidoptera. All known larvae of Bothriderinae are hypermetamorphic with an

active triangulin stage that seeks out and attaches itself to its host. The later instars are grub-like and modified as ectoparasitoids of larvae and pupae of wood borers (Ślipiński et al. 2010).

Bothriderids are exceedingly sparse in the fossil geological record, with only two species in Baltic amber to date: *Bothrideres kuenowi* Stein, 1881 and *B. succinicola* Stein, 1881. In the present paper, two further species of Bothrideridae from Eocene Baltic amber are described and illustrated.

MATERIAL AND METHODS

Two specimens from the private collection of Christel and Hans Werner Hoffeins (Hamburg, Germany) were examined during the study. The amber piece Nr. 1615-2 (CCHH) was obtained from commercial source (Amberif fair) in

2007; the amber piece Nr.273-1 was collected from the Baltic seacoast of the island Usedom (Mecklenburg-Vorpommern, Germany) in autumn 1991. The ambers are currently deposited in the private collection of Christel and Hans Werner Hoffeins (Hamburg, Germany) and will be deposited to the Senckenberg Deutsches Entomologisches Institut in Müncheberg, Germany (SDEI) as part of the institute's amber collection. The amber pieces from the CCHH are prepared manually and embedded in polyester resin (Hoffeins 2001).

The photos were taken with a Nikon Coolpix 4500 Nikon digital camera, attached to a Wild M3Z stereo-microscope.

The following sources were used for the generic attribution and comparison with recent taxa: Ślipiński et al. (1989) and Stephan (1989).

SYSTEMATIC PART

Family Bothrideridae Erichson, 1845

Subfamily Bothriderinae Erichson, 1845

Genus *Pseudobothrideres* Grouvelle, 1908

***P. rugiorum* sp.nov.**

(Figs. 1A, 2A-B, 3A-B)

Material examined. Holotype Nr. 273-1 [CCHH], sex unknown. The beetle inclusion is preserved in a polished piece of transparent amber with a yellowish shade, possibly thermal processed in an autoclave. The amber piece is embedded in polyester resin (total measurements are 14 x 10 x 6 mm). The syninclusions are represented by four fagacean stellate hairs.

Type strata. Baltic Amber. Eocene.

Description:

Body: elongate, subparallel, dark; dorsal surface with short and small setae that arise from punctures; ventral surface moderately shiny, glabrous. Length 5.25 mm. Width 1.5 mm (in humeral area).

Head: slightly narrowed anteriorly; without supra-ocular ridges, dorsolateral margin almost straight; punctures small and dense (distance between punctures is about twice less than diameter of puncture). Frontoclypeal suture indistinct in the middle, very fine laterally. Anterior margin of clypeus broadly arcuate. Antennal groove well-developed, impunctate. Antennae clavate, stout, sparsely setose, reaching apical 1/3 of pronotum; scape (antennomere I) and pedicel (antennomere II) wide (wider than antennal club), rounded; antennomeres with single transverse row of moderately long setae, setae extending at least to distal margin of antennal segment; antennal club segments with sparse setae, setae long and located at or near distal margin of the segment. Antennal club symmetrical, loose, 2-segmented. Penultimate segment broader than long and broader than last one. Eyes: strongly protuberant, coarsely faceted, lacking interfacetal setae.

Thorax: Pronotum almost as long as wide, widest near anterior 1/3; distinctly wider than head; trapezoidal in outline; dorsal surface flattened to slightly impressed at middle, convex laterally; anterior margin almost straight; anterior angles triangular, nearly right; posterior margin slightly sinuate, distinctly narrower than elytral bases; posterior angles pronounced. Lateral margins finely bordered basally, with small denticle behind the middle. Pronotal surface with small, dense, longitudinally oval punctures. Pronotal disc with tubercle enclosed by well impressed sulci, with additional more or less parallel sulci. Additional sulci reaching base of pronotum. Punctuation of hypomeron elongate and coarse. Prosternum with rounded punctuation, not foveate in front of coxae. Prosternal process between coxae widened apically, roundly impressed, but without transverse suture. Metasternum with long and deep femoral lines almost reaching metacoxa. Scutellum triangularly rounded.

Elytra: Elytra flattened dorsally, convex laterally; jointly rounded apically. Five alternate intervals on each elytron carinate, especially

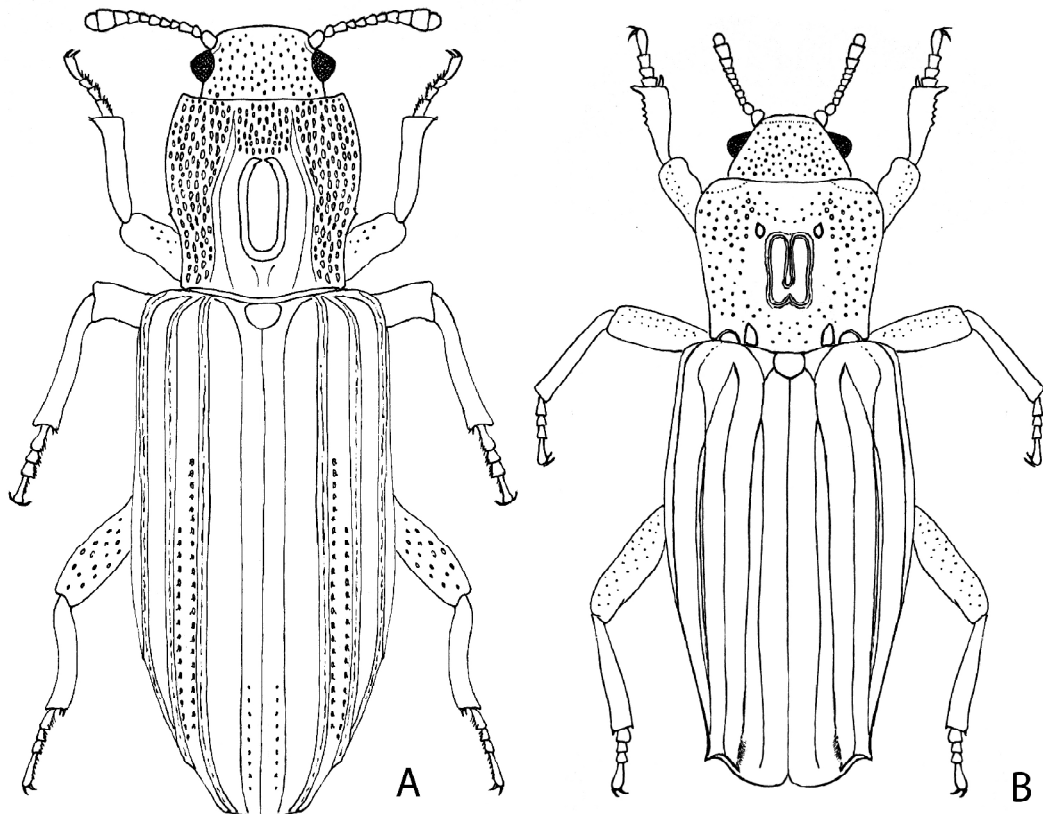


Fig.1. The Baltic amber *Pseudobothrideres*, reconstructions: A – *P. rugiorum* sp.nov.; B – *P. criwecriwayto* sp.nov.

apically. Suture carinate at apex only. Hind wings are not apparent.

Legs: Relative distances between coxae 3-1-6. Procoxae separated by distance twice width of coxal diameter. Femora and tibiae irregularly and densely punctate. All tibiae with two acute short apical spurs. Protibiae with sharp and long terminal outer teeth, mesotibiae with short apical teeth. Tarsal formula 4-4-4. Last tarsomere the longest; basal tarsomere distinctly longer than second segment and 1.5 times shorter than segments II and III combined; segments II and III equal in size and form. All tarsomeres with sparse long setae ventrally. Tarsal claws are simple, large, equal in size.

Abdomen: with five similarly articulated ventrites; ventrite length proportions according

to the formula: 35-15-12-8-15. Ventrite V more densely punctured than preceding segments, impressed. The intercoxal process of abdominal ventrite I truncate, straight.

Differential diagnosis: The specimen 273-1 can be referred to the subfamily Bothriderinae due to the procoxae widely separated by the prosternal process and the full combination of morphological characters of the family (elongate shape, 4-4-4 tarsi, capitate antennae with 11 segments, antennal insertions exposed, five abdominal ventrites). The new fossil species is assigned to the genus *Pseudobothrideres* Grouvelle, 1908 because of the following characters: elongate, striate-punctate elytra without tubercles and with carinate alternate intervals; 11-segmented antennae with 2-segmented antennal club; upper

surface without scales; the trapezoidal in outline pronotum without carinae but with tubercle enclosed by well impressed sulci; not foveate in front of coxae prosternum; apical teeth on mid and anterior tibiae present; apically prosternal process expanded; metasternum with long femoral lines. *Pseudobothrideres rugiorum* sp.nov. can be distinguished from extant representatives of the genus by the indistinct transverse suture of prosternal process, by the absence of the row of denticles along outer margin of anterior tibia, by the not subequal in length tarsomere I-III (basal meso- and metatarsomere distinctly longer than second one), by the finely bordered pronotum with small denticle behind the middle, by the upper surface with short hair-like setae and by presence of additional sulci on pronotum.

Remarks. The femoral lines of ventrite I, an important character for diagnosis are not visible on the specimen because of the legs position.

Derivatio nominis. Specific epithet is formed from the Rugians (also Rugii, Rygir, Ulmerugi, or Holmrygir), a Germanic tribe of Scandinavian origin, inhabiting the territory of the southern Baltic Sea coast and the island Usedom until the 5th century AD.

Pseudobothrideres criwecriwayto sp.nov.
(Figs. 1B, 4A-B)

Material examined. Holotype Nr. 1615-2 [CCHH], sex unknown. The beetle inclusion is preserved in a polished piece of transparent amber with a yellowish shade, thermal processed in an autoclave. The amber piece is embedded in polyester resin (total measurements are 13 x 8 x 5 mm). The syninclusions are represented by one fagacean stellate hair and small pieces of organic matter. Ventral surface of the beetle is covered by opaque milky foam, the ultimate right metatarsomere of the beetle is lost.

Type strata. Baltic Amber. Eocene.

Description:

Body: Length 4.5 mm. Width (in the middle of elytra) 1.5 mm. Elongate, subparallel, dark; dorsal surface glabrous, shiny, without visible setation or pubescence (except the apical elytral teeth).

Head: slightly narrowed anteriorly, convex; without supra-ocular ridges; punctures distinct, small and dense. Frontoclypeal suture not well apparent. Anterior margin of clypeus broadly arcuate. Antennal groove well-developed. Antennae clavate, sparsely setose, reaching apical 1/4 of pronotum; scape and pedicel wide (wider than antennal club), rounded; antennal club segments with sparse, long, setae located at or near distal margin of the segments. Antennal club symmetrical, weakly expressed, 2-segmented. Eyes: strongly protuberant, finely faceted, lacking interfacetal setae.

Thorax: Pronotum trapezoidal in outline, slightly transverse, widest near anterior 1/4, distinctly wider than head, not bordered laterally; dorsal surface convex, flattened in the middle; anterior margin weakly arcuate; anterior angles produced, widely rounded; posterior margin sinuate, distinctly narrower than elytral bases; posterior angles pronounced, triangular. Pronotal disc with irregular, small, sparse, round punctures. Pronotum with longitudinally almost divided in two parts tubercle enclosed by well impressed sulci and two pairs of symmetrical oval pits around: two near anterior angles of sulci and two near the pronotal basis. Metasternum with long femoral lines almost reaching metacoxa. Scutellum rounded.

Elytra: Elytra flattened dorsally, convex laterally, separately rounded. Five alternate intervals on each elytron carinate. Suture without carina. The 2-4 carina form an acute, triangular protuberance at the apex. Hind wings are not apparent.

Legs: Femora and tibiae irregularly and finely punctate. Protibiae widened apically, with short and sharp terminal outer teeth, with four small acute denticles along outer margin. Meso- and metatibiae without distinct apical teeth. Tarsal



Fig.2. *Pseudobothrideres rugiorum* sp.nov. Habitus: a) Dorsal view; b) Ventral view.

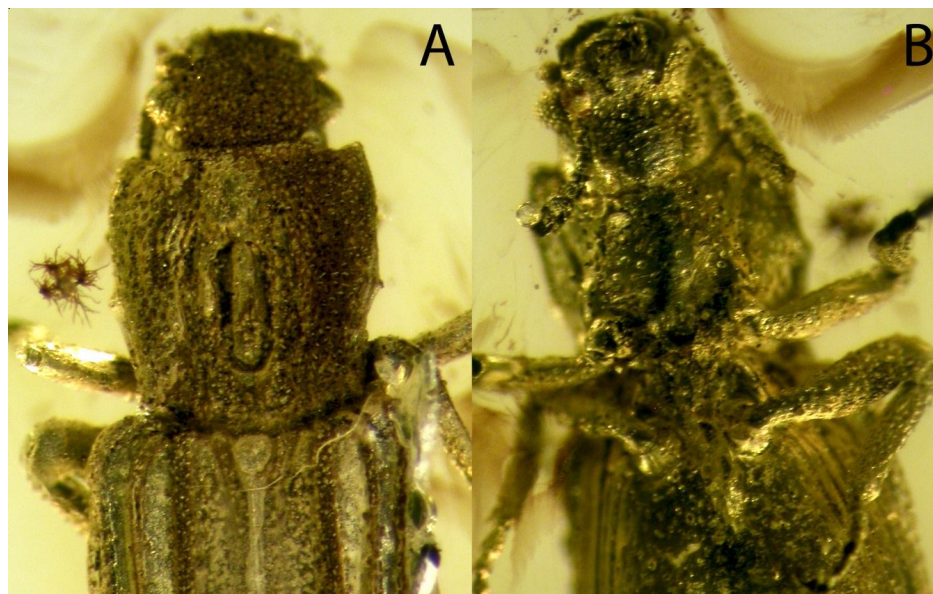


Fig.3. *Pseudobothrideres rugiorum* sp.nov. Forebody: a) Dorsal view; b) Ventral view

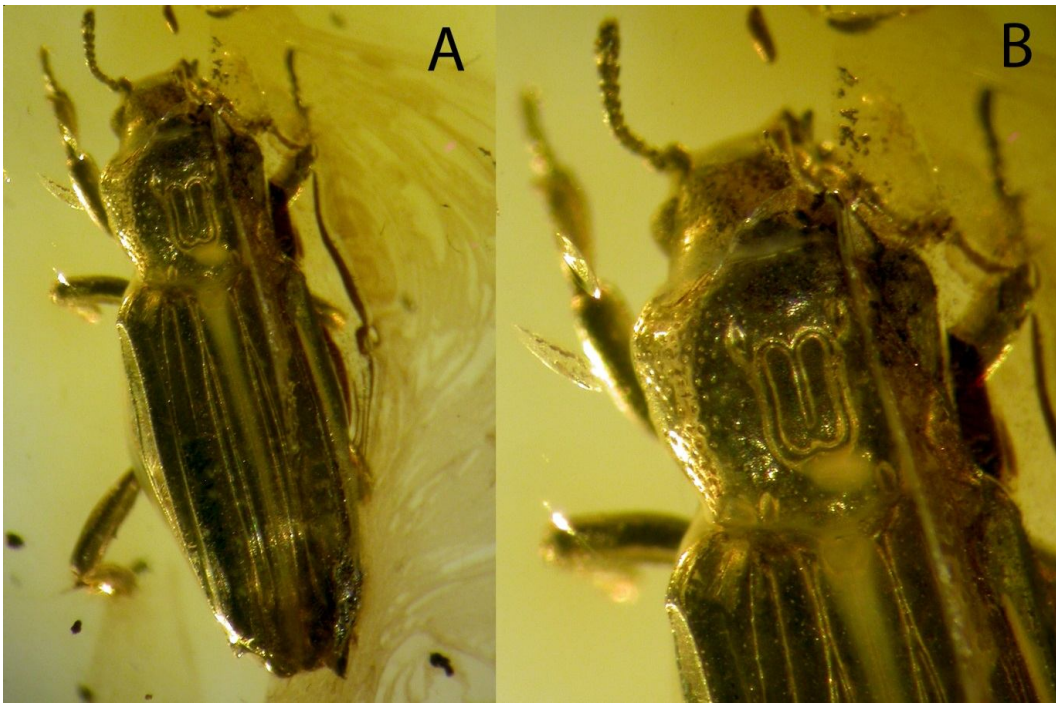


Fig.4. *Pseudobothrideres criwecriwayto* sp.nov. Dorsal view: a) Habitus; b) Forebody

formula 4-4-4. Tarsomere IV the longest, tarsomeres I-III equal in size. Tarsal claws are simple, large, equal in size.

Abdomen: with five ventrites. Ventrite I as long as ventrites II and III combined; with long femoral line visible laterally.

Differential diagnosis: The new fossil species can be referred to the genus *Pseudobothrideres* Grouvelle, 1908 due to a combination of morphological characters (elytra without tubercles, elongate, striate-punctate, alternate intervals carinate apically; antennae 11-segmented with 2-segmented antennal club; upper surface shiny and without scales; pronotum without carinae, trapezoidal in outline, with tubercle enclosed by well impressed sulcus; metasternum and ventrite I with long femoral lines; anterior tibia widened apically, with row of small denticles along outer margin and well-marked apical teeth, inner spine long and curved; tarsi with segments I-III subequal in length). *P. criwecriwayto* sp. nov.

differs from all extant representatives of the genus by the pronotal sculpture and by the presence of the triangular protuberance at the elytral apex. The new species can be easily distinguished from all other described species from Baltic amber with the use of the key (see chapter “discussion”).

Remarks. Two important characters are not visible on the specimen because of milky foam: prosternum and prosternal process.

Derivatio nominis. The species name is a combination of the Old Prussian “Criwe Criwayto” [Kriwe of Kriwes; Lithuanian: krivių krivaitis; Latvian: krīvu krīvs). This is a title of the high pagan priest in the Old Prussian religion. The chief priest or “pagan pope” lived at Rikojoto/Romuva and ruled over the religion of all the Balts.

DISCUSSION

Prior to this study, Stein (1881) described two species assigned to *Bothrideres* Haldeman, 1843 from Baltic amber. The images are absent in the paper, the descriptions are short and formal. According to Hieke and Pietrzeniuk (1984) the type material is deposited in the Künow collection in the Museum of Natural History, Berlin.

The original description of *Bothrideres kuenowi* by Stein (1881) is verbatim as follows: “5.5 mm. Der Kopf ist undeutlich punktiert. Das Halsschild nach hinten wenig verengt; die Vorderecken etwas spitz vorspringend, die Hinterecken abgestumpft; der Längseindruck ziemlich tief, inwendig vorn nicht punktiert, sondern gekörnelt, hinten mit einer schmalen, länglichen Grube. Die Flügeldecken sind in den Streifen fein punktiert, die Zwischenräume ziemlich breit und ohne wahrnehmbare Punkte. Die Beine sind verhältnissmässig kurz und kräftig, die Schienen abgeplattet und nach der Spitze hin allmählig etwas verbreitert; die Hinterbeine stehen ziemlich weit auseinander. Diese Art ist der neuholländischen *B. vittatus* Nwm. sehr ähnlich, und nur wenig grosser”. [Translation: 5.5 mm. The head indistinctly punctured. Pronotum slightly narrowed posteriorly; anterior angles acutely prominent, posterior angles obtuse; longitudinal impression quite deep, anteriorly not punctured, but granulated, behind with narrow elongate pit. Elytra finely punctate, interstices wide and without distinct points. Legs comparatively short and strong, tibiae flattened and gradually widened to apex; hind legs broadly placed. This species is very similar to *B. vittatus* Nwm. from New Holland, and a little greater only].

Since XIX century, the systematic of the genus *Bothrideres* was changed. At present, “*B. vittatus* Nwm.” from New Zealand is *Ascetoderes vittatus* (Newman 1842). I have no

possibility to work with holotype of the Stein’s species, but the assignment of *Bothrideres kuenowi* Stein, 1881 to the genus *Ascetoderes* Pope, 1961 is probable. The study of prosternal process and presence/absence of femoral lines on the holotype should be important for generic conclusions. Redescription of the type is needed.

The original description of *Bothrideres succinicola* by Stein (1881) is shorter and verbatim as follows: “4.5 mm. Etwas kleiner als der vorige und der Längseindruck auf dem Halsschild kaum wahrnehmbar. Die Flügeldecken mit ziemlich regelmässigen Schimmelstreifen. Während bei *B. Künowi* die Fühler, schlecht zur Betrachtung liegen, sind selbe bei diesem Stücke sehr deutlich sichtbar, indem sie vom Kopfe fast rechtwinklig abstehen. Die Flügeldecken sind fein gestreift, in den Streifen eine Punktierung nicht wahrnehmbar.” [Translation: 4.5 mm. Lesser than previous and longitudinal depression on the pronotum indistinct. Elytra with regular mold striae. Whereas the antennae by *B. kuenowi* are bad for examination, the antennae of this specimen are gut visible and directed almost perpendicular to head. Elytra finely striate, the striae punctuation is not visible].

The correct generic placement of *Bothrideres succinicola* Stein, 1881 also cannot be confirmed. The detailed study of underside of the type material is needed. On the base of the above cited description, the generic or specific separation of *B. kuenowi* and *B. succinicola* is under question. The bothriderid beetles as the genus *Deretaphrus* Newman, 1842 can be highly variable in size, coloration, and sculpturing, possibly due to their ectoparasitic lifestyle (Lord & McHugh 2013). In particular, the ornamentation of the pronotal disc and the carination of the elytral interstitial intervals can vary intraspecifically (Lord & McHugh 2013). Restudy of the Stein’s type material is needed.

Key to Bothrideridae in Baltic amber, including Stein's species.

1. Pronotum without tubercle, with longitudinal impressions or simple.....2
 - Pronotum with tubercle enclosed by well impressed sulci.....3
 2. Pronotum with longitudinal impression basally, granulated anteriorly, elytra with distinct punctures in striae.....*Bothrideres kuenowi* Stein, 1881
 - Pronotum without impression, elytra without punctuation in striae.....
*B. succinicola* Stein, 1881
 3. Protibia denticulate, elytron with triangular protuberance at the apex, central pronotal tubercle almost divided in two parts, additional symmetrical pronotal pits present, anterior pronotal angles rounded.....*Pseudobothrideres criwecriwayto* sp.nov.
 - Protibia without denticles, elytra without protuberances, central pronotal tubercle simple, additional pits on pronotum absent, pronotum with small denticle behind the middle, anterior angles triangular..... *P. rugiorum* sp. nov.

The recent Bothriderinae are found under the bark of dead or dying trees or in the surrounding litter and are commonly associated with wood-boring insects. For the fossil species, a similar biology (arboreal in forest habitats with numerous over-matured trees, abundance of rotten wood and wood-borers hosts) can be assumed. The distribution of extant *Pseudobothrideres* with 18 described species in Afrotropic, Indo-Malayan and Australian regions suggests warm or tropical affinities of the Baltic amber fauna.

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