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Third species of Salpinginae (Coleoptera: Tenebrionoidea: Salpingidae) from Baltic amber

VITALII I. ALEKSEEV

Abstract

A representative of the extant East Asian genus *Istrisia* LEWIS, *I. vithlandica* sp. nov., is described and illustrated from Eocene Baltic amber of Europe. The described Salpinginae from this fossil resin are keyed. The landscape and habitats of the Baltic amber forest are discussed. The overall character of the beetle assemblage of Baltic amber fits best to lowland.

Key words: Beetles, *Istrisia*, palaeoecosystem, Tertiary, Paleogene, Eocene, fossil resin.

1. Introduction

Salpingidae or narrow-waisted bark beetles are rarely studied in fossil material. Only two species have been described from Baltic amber to date (ALEKSEEV 2013a, 2013b): *Protolissodema ulrikae* and *Salpingus henricusmontemini*. One additional extant salpingin genus (*Lissodema* CURTIS, 1833) has been reported from the Baltic succinite by KLEBS (1910). One extinct monotypic genus *Eopeplus* KIREJTSHUK & NEL, 2009 (subfamily Inoeplinae) is described from lowermost Eocene French amber (KIREJTSHUK & NEL 2009).

In the present paper, a new species of Salpinginae from Eocene Baltic amber, assigned to the genus *Istrisia* LEWIS, 1895, is described, illustrated and compared with the single Recent representative, *I. rufobrunnea* LEWIS, 1895.

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2. Material and methods

This study is based on a unique fossil specimen from the private collection of CHRISTEL and HANS WERNER HOFFEINS (Hamburg, Germany) [CCHH]. The amber piece was obtained from a commercial source and will be eventually deposited at Senckenberg Deutsches Entomologisches Institut (Müncheberg, Germany) [SDEI]. The amber piece was subjected to thermal and high-pressure processing in an autoclave, what is evident according to charac-

ters mentioned by HOFFEINS (2012). Prior the examination, the amber piece was manually cut and polished. This piece is currently not embedded in artificial resin.

Photographs were taken with a Zeiss AxioCamICc 3 digital camera mounted on a Zeiss Stemi 2000 stereomicroscope. The measurements were made using an ocular micrometer in a stereoscopic microscope. Reconstructions were made based on free-hand drawings during examination of the original specimen. The figures were edited using Adobe Photoshop CS8.

The following references were used for the comparison: IABLOKOFF-KHNZORIAN (1985), NIKITSKY (1992).

3. Systematic palaeontology

Family Salpingidae LEACH, 1815

Subfamily Salpinginae LEACH, 1815

Tribe Istrisiini NIKITSKY, 1992

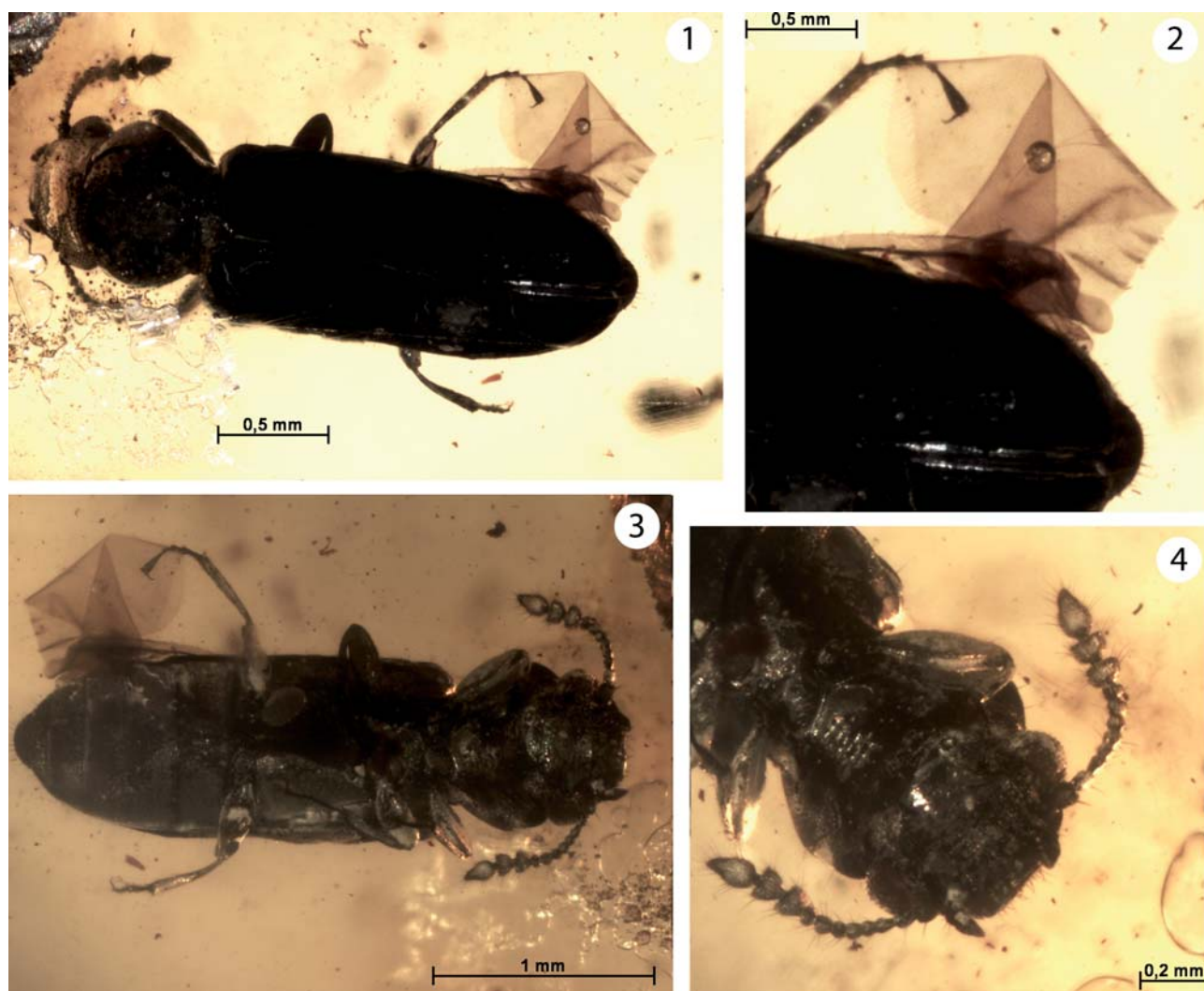
Genus *Istrisia* LEWIS, 1895

Istrisia vithlandica sp. nov.

Figs. 1–5

Etymology: Specific epithet is formed after the Old Prussian toponym Vithlandia [Witland] – the area in the westernmost part of the Sambian peninsula at the time of Crusades, famous for amber (or mythological immersed area in the Vistula lagoon).

Type material: Holotype, No. 1002-3 [CCHH]; adult, sex unknown. A complete beetle with partially exposed right metathoracic wing is included in the layered, oval, flat, cognac-like coloured, medium-sized amber piece with approximate dimensions: 28 × 19 × 4 mm. The syninclusions are represented by one specimen of Collembola, a fragment of Diptera and numerous small detritus particles.



Figs. 1–4. *Istrisia vithlandica* sp. nov., holotype: 1 – habitus, dorsal view; 2 – elytral apex, pygidium and wing, dorsal view; 3 – habitus, ventral view; 4 – forebody, ventral view.

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

Type horizon: Baltic Amber, Upper Eocene, Prussian Formation (Priabonian). Estimated age: 37.2–33.9 Ma.

Differential diagnosis: The specimen under study is placed within Salpingidae because of the 11-segmented clavate antennae not concealed from above by lateral expansion of the frons antennal insertions, the open procoxal cavities, the procoxae projecting above level of intercoxal process, tarsal formula 5–5–4, all tarsomeres non-lobed, and claws simple (Nikitsky 1992). The beetle from Baltic amber shows the combination of characters corresponding to the Salpinginae subfamily: the narrowly separated transverse procoxae, the full elytra, covering most of the abdomen, and the moderately flattened body. The species under consideration belongs to the genus *Istrisia* Lewis, 1895 of the tribe Istrisiini Nikitsky, 1992 on the basis of the following morphological characters: (1) pronotum

spatulate, transverse, (2) pronotal lateral margins simple, non-denticulate, (3) head not developed into a rostrum anteriorly, (4) antennal club 3-segmented, (5) elytra more than twice longer than wide, (6) elytral punctation confused, (7) last tarsomere the longest, (8) procoxae not contiguous, very narrowly separated by the prosternal process.

Istrisia vithlandica sp. nov. clearly differs from extant *I. rufobrunnea* Lewis, 1895 in the following combination of characters: larger eyes; shorter temples; comparatively shorter last tarsomere (longer than previous tarsomere, but shorter than all tarsomeres combined); smaller body length (about 2.9 mm compared with 4.5–6.0 mm in *I. rufobrunnea*); and dark body colour.

Description. Total body length 2.85 mm, maximum body width 0.85 mm; pronotum 0.57 mm long, maximum width 0.79 mm; elytral length 1.88 mm; maximum combined width of elytra 0.85 mm. Habitus elongate, glabrous, nearly parallel-sided, flattened dorsally; body and appendages appear uniformly dark brown. Head, pronotum and elytra sparsely covered

with dark, long, thin, erect setae; apical tergite and antennae with denser pubescence.

Head prognathous, transverse (about $2 \times$ wider between eyes than long), with large strongly protuberant eyes. Interfacetal setae not apparent. Anterior clypeal margin rounded. Head margined antero-laterally; margin discernible till one-half of eye length. Apical part of left mandible visible from above. Temples short, about $4 \times$ shorter than eye diameter. Head punctation sparser and finer medially and coarser and denser towards eyes; distance between punctures equal to $1.0\text{--}3.0 \times$ diameter of puncture. Maxillary palpus short; palpomere 4 spindle-shaped, $2.5 \times$ longer than penultimate palpomere. Antennal insertions not concealed. Antennae short, extending to base of pronotum; 11-segmented; with distinct, 3-segmented loose club. Scape rounded, nearly as long as wide, distinctly wider

than antennomeres 2–8; antennomeres 2–6 cylindrical (antennomere 3 slightly longer than pedicel and antennomeres 4–6); antennomeres 7–8 rounded, as long as wide; antennomeres 9–10 strongly transverse; antennomere 11 pear-shaped, longest.

Pronotum transverse (about $1.4 \times$ as wide as long), sub-cordiform, widest before middle and narrowed posteriad; pronotal base distinctly narrower than anterior margin of elytra; with two symmetrical shallow longitudinal impressions latero-basally (as long as one-fourth of pronotal length). Anterior angles widely rounded; posterior angles almost rectangular. Posterior margin straight; anterior margin slightly rounded; lateral margins rounded in anterior half and concavely constricted posteriorly; anterior and posterior margins finely bordered, lateral margins without bordering and denticulation. Punctuation of pronotal disc slightly larger and denser than head punctuation; distance between punctures equal to $1.0\text{--}2.0 \times$ diameter of puncture). Hypomeron almost smooth. Prosternum and mesothorax densely punctate; punctuation of metathorax sparse and obsolete. The ratio of relative lengths of prothorax to mesoventrite to metaventrite to abdomen: $3.5\text{--}1.5\text{--}4.0\text{--}7.0$. Procoxal cavities open, mesocoxal cavities closed laterally.

Scutellar shield rounded, as long as wide. Elytra subparallel, elongate, about $2.2 \times$ as long as wide combined, $3.3 \times$ as long as pronotum; covered abdomen except of apical part of pygidium. Humeral angles rounded. Elytral punctures deep, dense and large; distance between punctures approximately $0.5\text{--}1.0 \times$ diameter of single puncture; punctuation confused, smoothed, forming inaccurate rows in median part of elytron, irregular apically and laterally. Hind wings apparently well developed, partially exposed; margin with fringe of long and very fine hairs. Epipleura widest at humeri, reaching first ventrite.

Abdomen with five visible, similarly articulated ventrites; densely covered with shallow, obsolete punctuation. Relative length ratios of ventrites 1–5 equal to $12\text{--}9\text{--}6\text{--}6\text{--}3$. Intercoxal process of abdominal ventrite 1 triangular. Apical part of exposed pygidium semicircular, with long erect pubescence.

Legs moderately short. Procoxae conical, transverse, projecting above level of intercoxal process, very narrowly separated by prosternal process; mesocoxae rounded; meso- and metacoxae separated by distance lesser than its diameter. Femora incrassate; trochanters elongate; tibiae slender. Tibia as long as femur. Tarsal formula $5\text{--}5\text{--}4$. All tarsomeres simple, non-lobed. Relative length ratios of metatarsomeres 1–4 equal to $3.0\text{--}2.0\text{--}1.0\text{--}4.5$. Claws simple, falcate, symmetrical, long (about $0.4 \times$ as long as last tarsomere).

Remarks: The elytral integument dorsally is roasted and details of elytral punctuation are not well discernible because processing of amber with the inclusion in an autoclave. The dark monochrome body colour of the holotype specimen may be result from the discolouration during the “improving” of the amber piece, too.

Three species of Salpingidae are currently known to occur in the Baltic amber forests. The key provides characters for identification of Salpingidae from this Lagerstätte:

1. Head rostrate; antennal club 5-segmented; pronotum with two deep rounded foveae basally; body length 3.7 mm *Salpingus henricusmontemini* ALEKSEEV, 2013
- Head without rostrum; antennal club not as above; pronotum without deep rounded basal impressions; body size smaller 2

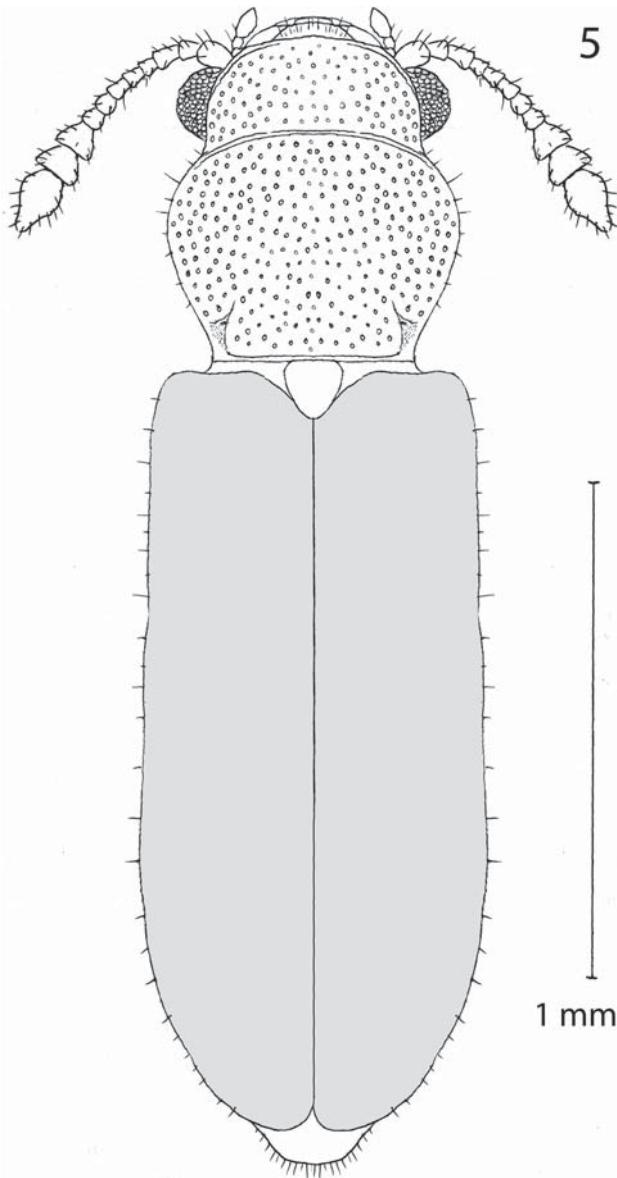


Fig. 5. *Istrisia vitthlandica* sp. nov., reconstruction of habitus, dorsal view. Elytral punctuation is not shown.

2. Antennal club 7-segmented; pronotal lateral margins bordered, with two small denticles on each side; elytra $1.6 \times$ as long as wide combined; body length 2.25 mm *Protolissodema ulrikae* ALEKSEEV, 2013
- Antennal club 3-segmented; pronotal lateral margins not bordered, without denticles; elytra $2.2 \times$ as long as wide combined; body length 2.85 mm *Istrisia vithlandica* sp. nov.

4. Discussion

The present distribution of *Istrisia rufobrunnea* LEWIS is restricted to the eastern Palaearctic [Russian Far East including Sakhalin and southern Kuril Islands; Japan: Honshu, Hokkaido]. Current record of *Istrisia vithlandica* sp. nov. from Baltic amber indicates the presence of the genus in the western Palaearctic region during the Eocene. The past distribution emphasizes the relict status of the genus *Istrisia*. The extant *I. rufobrunnea* develops in decaying pinaceous (HAYASHI 1969; NIKITSKY 1992) and also some deciduous trees (NIKITSKY 1992). According to IABLOKOFF-KHNZORIAN (1985) the species occurs in dead logs of *Pinus koreanus* (humid, brown rotten wood). Some extant Salpinginae are satellite of bark beetles and facultative predators of bark beetles (NIKITSKY 1980; PÉREZ MORENO 2005), but predominately they are mycophagous and associated with Deuteromycetes, Ascomycetes and partly also with Myxomycota (NIKITSKY et al. 1996; NIKITSKY 2016). For the fossil species, a similar trophic connection and association with rotten pine trunks on humid forest ground can be assumed. The species described herein possesses distinctly larger eyes, whereas extant congener can be designated as comparatively microphthalmous. The Eocene *Istrisia vithlandica* sp. nov. has metathoracic wings with fringe of long hairs on margins. The wing fringe is present in different groups of minute beetles, but such structure in Salpingidae is reported for the first time.

Recent papers (SCHMIDT & FAILLE 2015; SCHMIDT et al. 2016a, b) concerning occurrence of blind and flightless *Trechus eoanophthalmus*, flightless *T. balticus* and *T. exhibitorius* (Carabidae) in Baltic amber interprets those species as possible indicators of mountainous habitats. Taking in account different coleopteran groups, two partly contradictory conclusions concerning the same Eocene biocenosis forming by the resin-producing tree could be made. On the one hand, there were microphthalmous and even blind, brachypterous and wingless species of the carabid beetles. The wing and eye atrophy as adaptation by insects is often occurred especially between cave-living, subterranean and mountainous species. So, the mountainous landscape could be really hypothesized in relation to *Trechus* spp. On the other hand, numerous tiny, full-

winged species with well-developed eyes of Aderidae, Cryptophagidae, Jacobsoniidae, Latridiidae, Monotomidae, Melandryidae, Salpingidae etc. were recorded from Baltic amber (ALEKSEEV & BUKEJS 2012, 2015; REIKE 2012; LYUBARSKY & PERKOVSKY 2013; ALEKSEEV & GRZYMALA 2015; BUKEJS & ALEKSEEV 2015a, b; CAI et al. 2016). Species with the eye or wing reduction or atrophy are known in some of these groups at present, but are unknown from Baltic amber so far. In the contrary, *Derolathrus groehni* CAI, LESCHEN, LIU & HUANG, 2016 from Baltic amber is described as an unusually macrophthalmous representative of the extant genus (CAI et al. 2016). *Istrisia vithlandica* sp. nov. has also more pronounced eyes than extant species. The evident predominance of the representatives with non-reduced eyes contradicts to the supposed mountain landscape and indicates diverse plant community of the natural mixed forest. The proposed compromise settlement could be found in the layered structure and vertical differentiation of the forest ecosystem.

The Eocene amber forest should be predominantly consisting of over-matured and large-dimensioned old trees: living and standing, hollowed on base, and lying trunks. The conditions of the lower layer were shadowy and humid. Numerous lying rotten trunks and hollow trees correspond to the conditions, which can be successfully occupied by various edaphic insect inhabitants. Some of them were apterous or with reduced eyes. In the same time, various old trees could represent diverse habitats for wood-associated beetles with the active dispersal and normally developed eyesight and migrations abilities. The ground beetles could live in more stable and uniform conditions of forest soil layer, whereas arboreal beetles in the same forest should be active searcher of suitable wood in various degrees decomposed by fungi. This hypothesis describes amber forest as the complicate layered ecosystem in plains with altitudes of 200–300 meters above sea level. It allows to locate the forested area in whole Fennoscandia (where mountains, i.e. elevations of the earth surface above 600 meters, are unknown, except the narrow areas of the Scandes in the west and of the Urals in the east). This hypothesis explains the different life styles of coexistent members of the assemblage and their different dispersal abilities and generally correspond to botanical reconstructions of amberiferous forest as “swamps and riparian forests, as well as mixed-mesophytic conifer-angiosperm forests” (SADOWSKI et al. 2016).

Beyond all doubt, the discoveries of additional interesting beetle species preserved in Baltic amber and new discussions concerning this Lagerstätte are highly likely. The abovementioned hypothesis is debatable and can be discussed involving data and interpretations from different fossil organisms of Baltic amber.

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