



ISSN: (Print) (Online) Journal homepage: <https://www.tandfonline.com/loi/ghbi20>

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To cite this article: A.G. Kirejtshuk & C.A.M. Reid (2021): *Lobanoviella andreyi*, new genus and species of Lobanoviellini trib. nov. in the subfamily Palophaginae (Coleoptera, Megalopodidae) from the Eocene Baltic amber, with discussion of similarity with Phloeostichidae, Historical Biology, DOI: [10.1080/08912963.2021.1987428](https://doi.org/10.1080/08912963.2021.1987428)

To link to this article: <https://doi.org/10.1080/08912963.2021.1987428>



Published online: 11 Oct 2021.



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# *Lobanoviella andreji*, new genus and species of Lobanoviellini trib. nov. in the subfamily Palophaginae (Coleoptera, Megalopodidae) from the Eocene Baltic amber, with discussion of similarity with Phloeostichidae

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## ABSTRACT

*Lobanoviella* gen. nov. (type species: *Lobanoviella andreji* sp. nov.), for which a new tribe Lobanoviellini trib. nov. is proposed in Palophaginae, Megalopodidae, is described from Baltic amber. The new tribe differs from Palophagini *sensu stricto* in the head with rather long anterior part before eyes, lack of distinct anterior emargination of eyes, three apical antennomeres flat and dilated, elytra coarsely punctate to coarsely tuberculate and tarsi pseudotrimerous (4-4-4 with lack of true tarsomere 2). The described representative is the first fossil record of Palophaginae. A probable host plant of the new fossil species is discussed. Comparison of the new genus with structurally similar modern members of the family Phloeostichidae is made and it is shown that the attribution of *Pleuroceratos* Poinar et Kirejtshuk, 2008, as a member of Sphindidae is correct.

## ARTICLE HISTORY

Received 20 August 2021  
Accepted 27 September 2021

## KEYWORDS

Sphindidae; modern genera;  
Cretaceous; morphology;  
diagnostics; host plant

## Introduction



The subfamily Palophaginae Kuschel et May, 1990 is a small group known in the modern fauna from three genera proposed for four species spread in the Southern Hemisphere and associated with male strobili (cones) of *Araucaria* and presumably *Agathis* (gymnosperm family Araucariaceae), in Australia and southern South America. The first genus of this group (*Cucujopsis* Crowson, 1946) was described as an atypical Australian member of the tribe Sagrini Leach, 1815 in the subfamily Sagrinae, by Crowson (1946), who supposed that it maintained some appearance of its ‘Cucujoid ancestors’. However, at that time, Sagrinae included all supposedly primitive but not necessarily related members of the Chrysomelidae. Two other genera (*Palophagus* Kuschel et May, 1990 and *Palophagooides* Kuschel et May, 1996) were proposed for three species from Australia, Chile and Argentina and these authors erected a new subfamily (Palophaginae Kuschel et May, 1990) in Megalopodidae for these three genera. This paper aims to describe the first fossil palophagine as a new genus and species (*Lobanoviella andreji* gen. et sp. nov.) and place it in a new tribe (Lobanoviellini trib. nov.). Comparisons of *Lobanoviella* gen. nov. with genera of modern members of the family Phloeostichidae Reitter, 1911 demonstrating a certain similarity in some characters, and notes on the fossil *Pleuroceratos* Poinar et Kirejtshuk, 2008, are made.

## Materials and methods

The specimen examined was received for study from the collection of Baltic amber inclusions of Friedrich Kernegger from Hamburg, who bequeathed it to the collection of the Zoological Institute of the Russian Academy of Sciences, Saint Petersburg (hereafter ZIN). The amber piece was prepared by Friedrich Kernegger and put by him in an Epoxy rectangular

prism (12.0 × 11.0 × 6.0 mm). The amber piece examined is an irregularly flattened prism (10.0 × 9.0 × 3.0–4.0 mm) divided into two portions by a thin and opaque layer with a somewhat wavy surface. The beetle is partly submerged in this layer by its left side and, as a result, it is mostly observable only from its right side. The piece of amber originated from Kaliningrad Region, probably from Yantarny (Baltic amber), which is traditionally dated to the Paleogene, Eocene, Priabonian, 37.2–33.9 Ma.

For comparisons of the new species with other modern and fossil beetles, the authors used collections of ZIN, Muséum national d’Histoire naturelle (Paris: MNHN), Australian Museum (Sydney: AMS) and Australian National Insect Collection (CSIRO, Canberra: ANIC). These specimens were examined using a Leica MZ 12.0 stereomicroscope with a DFC290 digital camera (Leica Microsystems GmbH, Wetzlar, Germany) at the ZIN and at AMS and an Olympus SCX9 stereomicroscope equipped with an Olympus camera at MNHN. In ZIN, the photographs of the general appearance (habitus) of the holotype of the new species were taken using an EOS 11 40D digital camera (Canon, Tokyo, Japan) equipped with a Canon MP-E 65 mm objective and were combined using Zerene Stacker 1.04 software (Zerene Systems LLC, Richland, WA, USA). In addition to usual optics, this holotype was investigated in the Paris museum under Nikon TE300 fluorescence microscope (Tokyo, Japan) with the excitation at 475–490 nm (blue) and emission at 506–533 nm (green) and some reconstructions were made using Helicon Focus Pro 4.60 software and in St. Petersburg under a DM 6000B microscope (Leica Microsystems GmbH, Wetzlar, Germany) with 2.5 and 5 objectives, Leica DFC 345 FX camera and Leica Application Suite 3.7 software with an Image MultiFocus module (Leica). The filter set applied was in most cases N21 or sometimes L5 (Leica Microsystems).

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This article has been corrected with minor changes. These changes do not impact the academic content of the article.

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## Systematic Palaeontology

Family **Megalopodidae** Latreille, 1802

Subfamily **Palophaginae** Kuschel et May, 1990

Tribe †**Lobanoviellini** trib. nov.

urn:lsid:zoobank.org:act:D3DFBAB6-6C0B-4B73-BC97-7E585630231E

Type genus *Lobanoviella* gen. nov.

## Diagnosis

Dorsum coarsely sculptured (particularly on head and pronotum) and with longitudinal rows of very coarse punctures on parasutural parts of elytra (apparently without scutellar striole), body pubescence not visible, except sparse long hairs; eyes large and suboval, not clearly emarginate; head with rather long anterior part before eyes, gradual postocular constriction and subvertical transverse inflation; labrum moderately long; terminal labial palpomere subfusiform and subacuminate apically; terminal maxillary palpomere subfusiform; antennae rather long, consisting of elongate and mostly subcylindrical articles, with pedicel (antennomere 2) shortest and three apical antennomeres flat and dilated; prothorax with median lateral tubercle and weak lateral carinae; strongly transverse procoxal cavities closed behind by curvature of prohypomeral lobe abutting apex of prosternal process; pro- and mesocoxae projecting and apparently narrowly separated or subcontiguous; mesoventrite simple; metacoxal cavities strongly transverse; metepisterna moderately wide; elytral sides steeply (subvertically) sloping; epipleura laterally visible, apparently extending to apex; free abdominal ventrites; tibiae with short and thin spurs and without outer carinae or ridges and all tarsi pseudotrimerous (4–4–4 with lack of true tarsomere 2), tarsomere 2 (true tarsomere 3) short and laminate with indication of deep lobes by median suture nearly along entire length, tarsomere 3 (true tarsomere 4) rather small, tarsal claws thin and simple.

## Comparison

The specimen examined is assigned to the Palophaginae because it has the head somewhat wider than thorax, with labrum moderately long; terminal labial and terminal maxillary palpomeres more or less subfusiform; prothorax with weak lateral carinae, laterally produced at about middle and anterior angles not produced; antennae long and filiform except three apical antennomeres; transverse procoxal cavities closed behind by the process of prohypomera; subconical and projecting pro- and mesocoxae and a pair of spurs at tibial apices; tarsomere before preapical one with large paired lobes, tarsal claws simple and long.

The new tribe differs from Palophagini *sensu stricto* in the head with rather long anterior part before eyes, lack of distinct anterior emargination of eyes, three apical antennomeres flatly dilated, markedly wider metepisterna, elytra coarsely punctate to coarsely tuberculate and tarsi pseudotrimerous (4–4–4 with complete reduction of true tarsomere 2).

## Included genera

Type genus only.

Genus †**Lobanoviella** gen. nov.

urn:lsid:zoobank.org:act:6095AF73-AEDD-444B-AB5E-34509EA5AD67

Type species *Lobanoviella andreysi* sp. nov.

## Diagnosis

As in the new tribe.

The new tribe includes only one genus and one species. Therefore, it is difficult to foresee group characteristics between probable other genera and species of this new tribe and traditional principle ‘*descriptio generica specifica*’ is here used.

## Deviation of the name

The name of this genus is formed from the family name of Andrey L’vovich Lobanov, closer colleague of the senior author of this paper and founder of the largest coleopteran website ‘Beetles (Coleoptera) and Coleopterists’, who passed away in 2020, and also suffix ‘ella’.

## Included species

Type species only.

†**Lobanoviella andreysi** sp. n. (Figures 1–3)

urn:lsid:zoobank.org:act:CCEF5898-1CEB-40AF-9E54-60569D9B3925

## Material

Holotype ‘10/1997’, sex unknown, complete beetle included. The amber piece consists of two layers of polymerised resin separated by an opaque layer. Organic syninclusions: few small pieces of organic matter different in size are located on the opaque layer.

## Deviation of the name

Epithet is formed from the first name of Andrey L’vovich Lobanov, close colleague of the senior author of this paper and founder of the largest coleopteran website ‘Beetles (Coleoptera) and Coleopterists’, who passed away in 2020.

## Occurrence

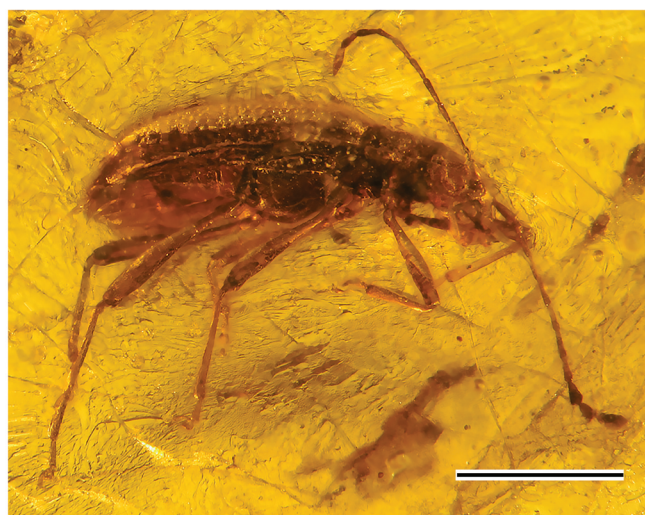
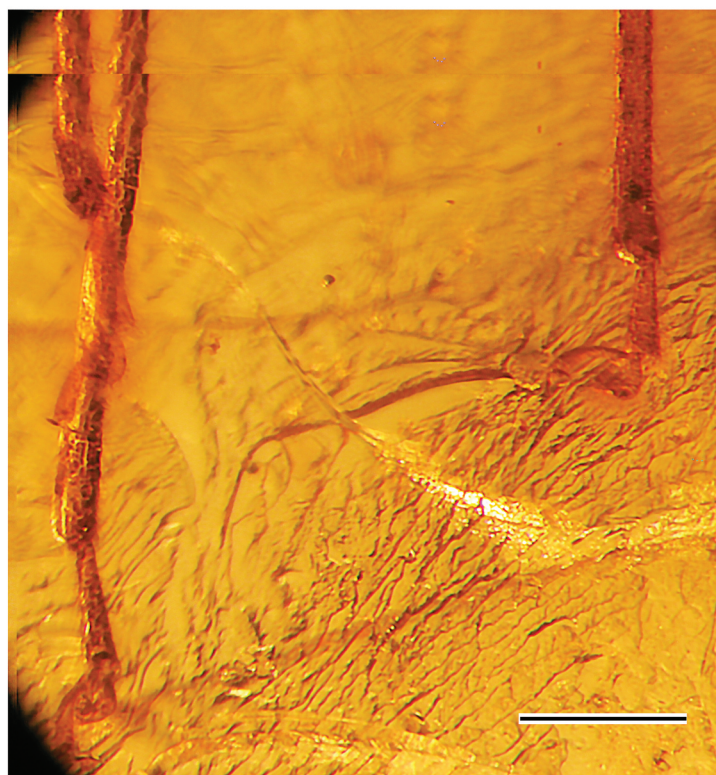
Probably found at settlement Yantarny, Kaliningrad Region, Russia. Baltic amber, Paleogene, Eocene, Priabonian or Bartonian age, probably from the amber-bearing Blue Earth layers.

## Description

Body length 3.3, width 1.2 and height 1.1 mm; elongate, rather convex dorsally and ventrally; unicolourous yellowish, shining with golden lustre; integument of body without visible pubescence and legs with shot and fine setae. Dorsum coarsely sculptured to microtuberculate; finer and denser on head and pronotum; somewhat smoothed, coarser and rather sparser on elytra. Underside apparently smoothed.

Head and pronotum with rough coarse punctures and coarse microsculpture between them; anterior part of frons (‘frontoclypeus’) and labrum finely and densely punctured. Elytra with diffuse very coarse punctures at base and with apparently nine longitudinal rows of coarse punctures on each elytron, without distinct outlines and becoming diffuse at sides, interspaces between rows convex but more or less smooth. Epipleura with coarse punctures, apparently less coarse than punctures in longitudinal rows on elytra. Prohypomera and prosternum apparently with punctuation similar to that on pronotum and head. Metaventrite and abdominal ventrites with fine and sparse punctuation.



**a****b****c**

**Figure 1.** *Lobanoviella andreyi* gen. et sp. nov. Body length 3.3 mm. A-B. body, lateral. C. distal parts of intermediate and posterior legs, lateral. Scale bars: 1.1 mm to fig. A, 1.3 mm to fig. B, 0.3 mm to fig. C.

Head comparatively large and somewhat longer than prothorax, with large oval and scarcely emarginate eyes comprising about third of total length of head, frons between antennal insertions apparently flattened with slight trace of 'frontoclypeal' suture, with postocular vertical inflation, but without paracocular grooves or longitudinal suture. Antennal insertions anterior to eyes and opening laterally. Labrum transverse but comparatively long. Terminal labial palpomere subacuminate apically and more than 2.0× as long as wide at apex. Terminal maxillary palpomere nearly 4.0× as long

as wide at middle. Antennae (both apparently become dislocated from their sockets) slightly longer than half of body length and reaching metacoxae, subfiliform with all segments elongate, scape (antennomere 1) long and moderately thickening apically, pedicel (antennomere 2) short (about third of length of scape) and subcylindrical, antennomeres 3–8 narrow and 2.0–2.5× as long as pedicel, antennomeres 9–10 flattened and triangularly dilated apically, somewhat shorter than each of antennomeres 3–8, antennomere 11 flat and fusiform, about as long as antennomere 8.

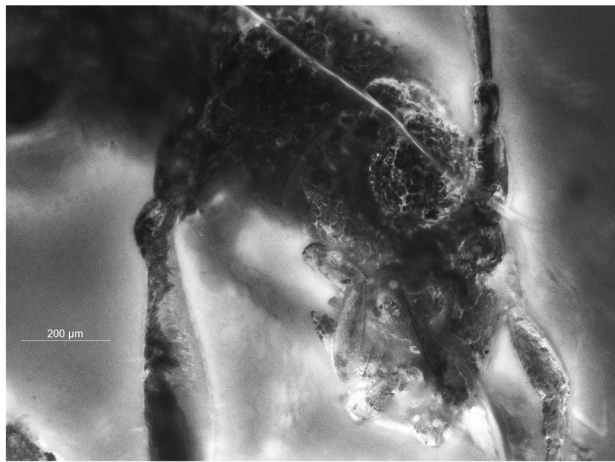




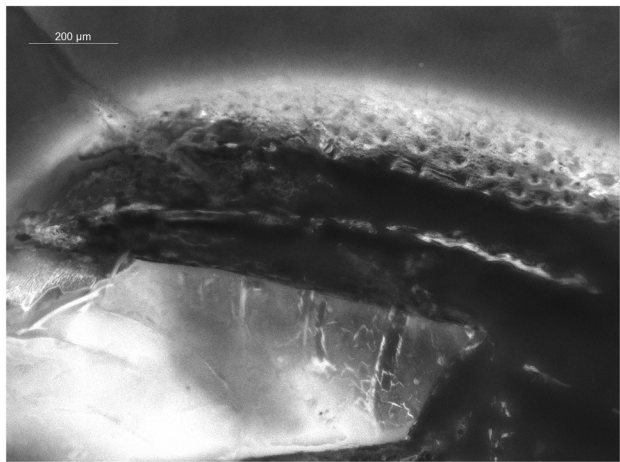
**a**



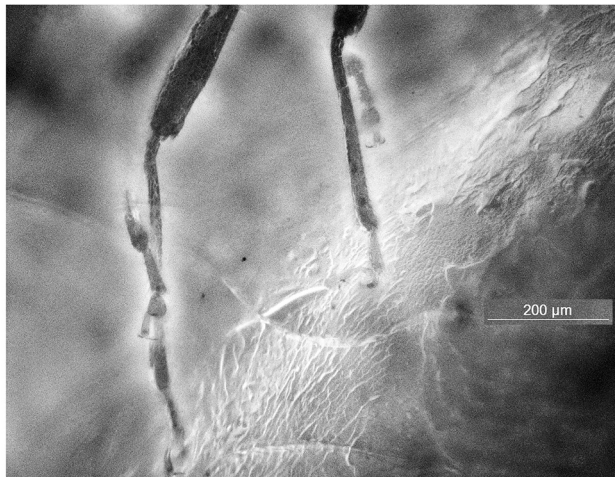
**b**



**c**



**d**

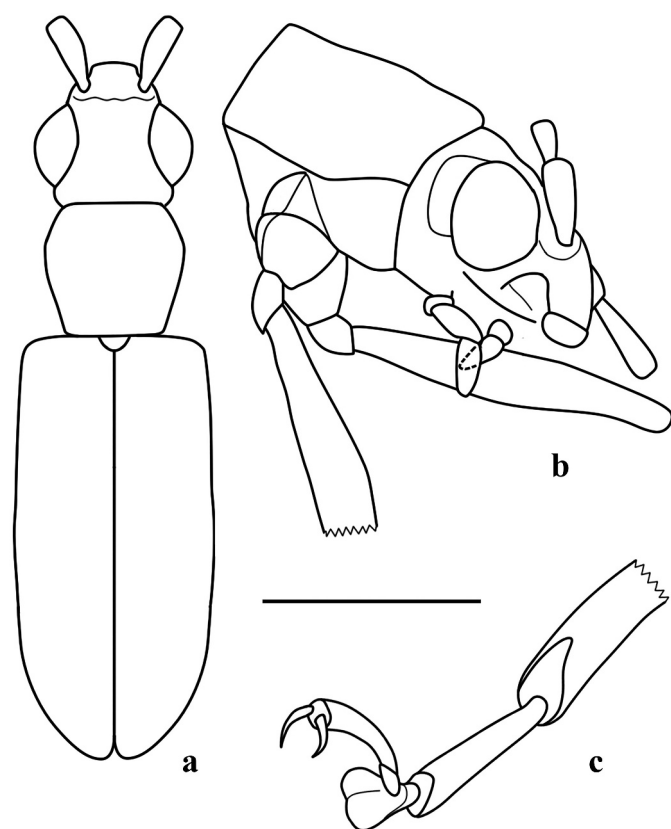


**e**



**f**

**Figure 2.** *Lobanoviella andreyi* gen. et sp. nov. Body length 3.3 mm. A-B. body, lateral; C. prothorax and head, lateral; D. elytron, metacoxal and abdomen, lateral; E. distal parts of intermediate and posterior legs, lateral; F. mesotibia and mesotarsi, lateral. Scale bar in each picture.



**Figure 3.** *Lobanoviella andreji* gen. et sp. nov. Body length 3.3 mm. Reconstruction drawings. A, body, dorsal; B, prothorax and head, lateral; C, distal parts of mesotibia and mesotarsus. Scale bar: = 0.9 for fig. A; = 0.7 mm for fig. B; = 0.3 mm for fig. C.

Pronotum slightly elongate, with anterior edge slightly convex and posterior edge nearly straight, steeply sloping at sides, with lateral median tubercle and weak lateral carina. Elytra about twice as long as their combined width at base, with strong shoulders, shallowly convex longitudinally, strongly convex transversely with sides rather steeply (subvertically) sloping; epipleura rather wide, obliquely inclined towards body but entirely visible laterally, with raised upper edge and gradually narrowed to apex. Prosternum about as long as procoxal cavity. Prohypomera apparently joining prosternal process behind procoxae. Procoxae strongly transverse, their mesal part subconical and projecting below, narrowly separated or subcontiguous. Mesocoxal cavities suboval. Mesocoxae medially globular and apparently narrowly separated or subcontiguous. Mesoventrite simple, convex along middle and apparently without postcoxal depressions. Metaventrite convex and about as long as prosternum and mesoventrite combined. Metepisterna moderately wide, at base about as wide as epipleura. Abdomen with five ventrites, shortest ventrite 1, ventrites 2–4 subequal in

length and hypopygidium apparently more than 2.0× as long as each of ventrites 2–4; ventrite surfaces forming a continuous plane in lateral view, without basal transverse grooves or depressions; at least basal ventrites free, slightly overlapping each other.

Femora without ventral teeth; pro- and mesofemora equally widened to middle, and metafemur markedly longer than pro- and mesofemora. Tibiae without longitudinal keels, not expanded or excised at apex, very slightly thickening apically, with two small and thin spurs. Tarsi thin, narrower than apices of tibiae, 4-segmented with minute preapical tarsomere at base of last tarsomere (pseudotrimerous), mesotarsi slightly less than half mesotibial length, metatarsi slightly more than half metatibial length; tarsomeres 1 and 4 subequal in length, tarsomeres 2 and 3 very short and tarsomere 2 strongly lobed with a flat lamella apparently ventrally divided along most of its length; tarsal claws simple and very narrow, without visible empodium.

## Discussion

The new tribe best fits the modern members of poorly known Palophaginae among Coleoptera, although it is distinct from them in the characters mentioned in the above comparison. The tribal rank of the new suprageneric taxon is proposed to indicate the significance of unique characters among the Palophaginae, such as antennae and tarsi. In contrast to most megalopodids, the coarsely faceted eyes of the modern palophagins (*Palophagini sensu stricto*) are anteriorly shallowly emarginate, while those of *Lobanoviella andreji* sp. nov. are very similar but show a weak emargination under a usual optic microscope and look unemarginate under a fluorescence microscope. The lateral pronotal carinae of the modern palophagins and new fossil genus apparently are similarly smoothly expressed and give an additional evidence of their close relationship. Besides, the metacoxae of the palophagins and those of *Lobanoviella* gen. nov. are clearly extended laterally to meet elytra.

*Lobanoviellini* trib. nov. also shows some 'diffuse' similarity with different modern representatives of Phloeostichidae. Palophaginae and Phloeostichidae are externally similar. Both are 3–7 mm long, narrow bodied and relatively flat, have large head and pronotum compared with elytra, prognathous head, prominent rather globular eyes, well-defined clypeus, antennae inserted near anterior edge of eyes, quadrate to elongate and at least slightly tuberculate pronotum, elytra largely subparallel-sided with confused or only partly striate punctures and scattered long setae, evenly attenuated epipleura, and thin and simple legs without femoral teeth or tibial ridges and with thin tarsi. Both groups include species with a lobed tarsomere.

Phloeostichidae is a small but structurally rather heterogeneous family. *Lobanoviella andreji* sp. nov. is most similar to species of *Rhopalobrachium* Boheman, 1858 (revised by Lawrence 1995) in the general appearance of body and its appendages, namely, in the very elongate and convex body; extremely long antennae with shortest pedicel and very weak club; elongate prothorax narrower

**Table 1.** Key differences between Phloeostichidae and Palophaginae compared with *Lobanoviella* gen. nov.

Character	Phloeostichidae	Palophaginae	<i>Lobanoviella</i>
antennal insertion	on side of tubercle or lateral fold of frons	not on tubercle, frons not laterally folded	not on tubercle, frons not laterally folded
three apical antennomeres	swollen or elongated	not swollen or elongated	expanded but flat
procoxae	slightly projecting from cavities	almost conical, strongly projecting from cavities	almost conical, strongly projecting from cavities
mesepimeron and mesocoxal cavity	short, not reaching mesocoxal cavity, cavity closed by mesanepisternum	long, reaching mesocoxal cavity, cavity closed by mesanepisternum and mesepimeron	long, reaching mesocoxal cavity, cavity closed by mesanepisternum and mesepimeron
metepisternal edge	shallowly curved posteriorly towards elytra	abruptly curved posteriorly	abruptly curved posteriorly
abdominal ventrites	deeply transversely depressed at base	not depressed at base	not depressed at base



than head, with lateral prominences and anterior orifice without lateral expansion to anterior angles; procoxae transverse; steeply sloping elytral sides, very long legs with femora narrowed at base and very thin incarinate tibiae; much longer tarsomere 1 than that in other modern phloeostichids and shortest preapical tarsomere. *Lobanoviella* gen. nov., in contrast to *Rhopalobrachium*, has the fusiform terminal maxillary palpomere (not expanded apically), strongly projecting pro- and mesocoxae, elytra with partly seriate punctation but without both tubercles and carinae on the disc, wide elytral epipleura, lack of outer border of tibiae, four-segmented tarsi with tarsomere 2 (true third) strongly lobed (not tarsi 5–5–5 in males and 5–5–4 in female with subcylindrical to subconical tarsomeres before apical one). *Lobanoviella* gen. nov. is also similar to the phloeostichid *Bunyastichus* Leschen, Lawrence et Ślipiński, in the coarse punctation with longitudinal rows on elytra and lobes of tarsomere 3 looking like a lamina and reduced preapical tarsomere. But this genus has a rather wide prothorax with three teeth on each side, considerably shorter antennae without subflattened and dilated last three antennomeres and subulate terminal labial palpomere. The new genus is also reminiscent of phloeostichid *Hymaea* Pascoe, 1869 in the extremely coarse elytral punctation arranged in longitudinal rows and rather steeply sloping elytral sides, but this genus has clavate antennae. The differences of *Lobanoviella andreyi* sp. nov. from all modern phloeostichids are as follows (Table 1): antennae not on tubercle or lateral fold of frons, strongly projecting pro- and mesocoxae, very wide epipleura, mesocoxae closed by both mesanepisternum and mesepimeron, ‘pseudotrimerous’ tarsi with strongly lobed tarsomere 2, smooth abdominal ventrites without basal grooves. Other characters shown by *Lobanoviella* gen. nov. and not generally found in Phloeostichidae are: lateral prothoracic carinae weak, curved and somewhat ‘tuberculate’ (not dentate) at its midlength (three other phloeostichid genera have more or less raised four to six sharp teeth along the sharp carinae), strongly projecting pro- and mesocoxae; wide and long epipleura (phloeostichid epipleura are narrow and extending nearly to apex), tarsi 4–4–4 (not 5–5–5 in females and 5–5–4 in males as in phloeostichids). In contrast to the opinion of Tihelka et al. (2020), the family Phloeostichidae has no representative in the current fossil record (see below).

The modern representatives of Palophaginae are known to breed in the male cones of gymnosperm Araucariaceae in the South Hemisphere (Kuschel and May 1990, 1996). Thus, the finding of a new leaf beetle in Baltic amber with modern relatives associated with Araucariaceae and widespread in the Southern Hemisphere is analogous with the record of a Baltic amber weevil with the same peculiarities (Legalov 2016). However, this plant family has only rather doubtful mentions in the European fossil record beginning from the Eocene (Oskolski 2015). It is possible that the new beetle genus and *Scuccinalophus* Legalov, 2016 could be associated with plants from the families Podocarpaceae or Sciadopityaceae related to Araucariaceae and definitely present in the Eocene of Europe or have come into the resin from a plant with another systematic attribution. The Podocarpaceae belongs to the order Araucariales and recorded in the ‘blue earth’ bearing Baltic amber (Alekseev 2018). The Sciadopityaceae is traditionally included in Cupressales and it has modern species with resin demonstrating some chemical similarity with Baltic amber (Wolfe et al. 2009). The plant genus *Sciadopitys* was known from the Paleocene of Spitzbergen, Greenland and west of North America (Christophel 1973) and recently, the remains of this genus were found in Baltic amber (Sadowsky et al. 2016).

### On placement of *Pleuroceratos* Poinar et Kirejtshuk, 2008

Tihelka et al. (2020) put the genus *Pleuroceratos* in Phloeostichidae based largely on the character matrix of Leschen et al. (2005). They found that 33 characters out of 99 could be scored in the fossil taxon. However, the scoring of this matrix is ambiguous, using such undefined alternatives as ‘(26) Procoxal cavity: (1) strongly transverse; (2) slightly transverse’, which was distilled from a sequence in Leschen et al. (2005): ‘(26) Procoxal cavity: (1) strongly transverse (Fig. 26); (2) slightly transverse; (3) about as long as wide.’ In this character, the shape of the procoxal cavity is too variable in phloeostichids to be useful. Characters not considered by Tihelka et al. (2020) may be important, such as the carinae on pronotal and elytral discs. These carinae are not included in the mentioned matrix. However, this character discriminates phloeostichids and protosphindines: only rather short carinae on interstitial elytral spaces are sometimes present in some phloeostichids, while the carinae of members of protosphindines are very long, sharp and with complex configuration. All members of *Pleuroceratos* (two described and some undescribed species) show dorsal carinae like *Protosphindus*. Besides, the deeply concave ‘frontoclypeal’ suture and convex anterior part of frons are characteristic of sphindids and this feature is very slightly expressed in some phloeostichids (in *Rhopalobrachium*). Some important characters to distinguish these groups are not present in the now available fossils, although new materials can change this situation. Thus, in contrast to the initial taxonomic interpretation (Poinar et al. 2008), the systematic position and diagnosis of this genus proposed by Kirejtshuk et al. (2019) still remain preferable.

### Acknowledgments

Currently, the study of the first author was supported by the Russian Foundation for Basic Research (grant № 19-04-00465-a) and was partly carried out within the framework of the Russian State Research Project AAAA-A19-119020690101-6. The authors greatly appreciate B.A. Anokhin (ZIN) and C. Willig (MNHM) for their valuable assistance in preparation of the pictures of the new species with usage of the fluorescence microscopes and also consultations from J.F. Lawrence and S.A. Ślipiński (ANIC) and also R.A.B. Leschen (New Zealand Arthropod Collection, Auckland). The drawing reconstructions were prepared with a great assistance by P.A. Kirejtshuk. CAMR is grateful to Adam Ślipiński in ANIC for letting him loose on the collection. The authors appreciate very useful comments and suggestions by three anonymous reviewers.

### Disclosure statement

No potential conflict of interest was reported by the authors.

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