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## ***Glesirhanis bercioi*, a new genus and species from Baltic amber (Coleoptera: Endomychidae: Leiestinae) with a checklist and nomenclatural notes regarding fossil Endomychidae**

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### **Abstract**

A new genus and species of handsome fungus beetle, *Glesirhanis bercioi* **gen. nov., sp. nov.** (Coleoptera: Endomychidae: Leiestinae) is described from Baltic amber. The newly described genus is compared with all known extant and extinct genera of the subfamily. A key to the genera of Leiestinae including fossils and a checklist of fossil Endomychidae are provided. The status of two taxa previously placed in Endomychidae, *Palaeoendomychus gymnus* Zhang and *Tetrameropsis mesozoica* Kirejtshuk & Azar, is discussed, and a new status for the latter, elevating it to the family-level as Tetrameropseidae **status nov.**, is proposed.

**Key words:** new genus, new species, new status, Coleoptera, Endomychidae, Leiestinae, Baltic amber, Tertiary, Eocene, key, checklist, fossil

### **Introduction**

Baltic amber (succinite) constitutes the largest known deposit of fossil plant resin and the richest repository of fossil insects of any age. Unfortunately, most references to Coleoptera in Baltic amber are only determined to family or generic levels. Thus far, only about 425 Coleoptera species have been described (Aleksseev 2013), leaving the knowledge of the fauna of Eocene Baltic amber forests still inadequate. Studies of fossils, particularly inclusions in amber, are necessary because they provide an additional line of evidence and source of character data for reconstructing the phylogeny and resolving the evolutionary history of extant groups, as well as for understanding present-day distributions of more recent lineages.

Endomychidae Leach, 1815, also known as the handsome fungus beetles, is a family with worldwide distribution, including 1782 extant species classified in 130 genera and 12 subfamilies (Shockley *et al.* 2009). The subfamily Leiestinae Thomson, 1863 is an exclusively Holarctic group with 13 extant species in 6 genera, restricted to North America (5 species from 3 genera), Europe (2 species from 1 genus) and Asia (7 species from 3 genera) (Shockley *et al.* 2009, Tomaszewska 2000a, Tomaszewska 2007). Tomaszewska (2000b) reviewed the adults of Leiestinae and performed a phylogenetic analysis of the extant genera, and Burakowski & Ślipiński (2000) treated the immature stages of Leiestinae. Neither study included any mention or discussion of the known fossils of Leiestinae.

Although endomychids have often been included in lists of fossil taxa, only Strohecker (1953), Shockley *et al.* (2009) and Kirejtshuk & Nel (2009) specifically provide checklists of the known fossil endomychids, but many of these names and fossils require examination to confirm taxonomic status. Prior to this study, 8 extant genera in 6 subfamilies of Endomychidae had been reported from Baltic amber (Table 1). Of those, only 1 species was from the subfamily Leiestinae: *Phymaphoroides antennatus* Motschulsky, 1856. In addition, two other endomychid species have been described, but from other amber formations: *Palaeoestes eocenicus* Kirejtshuk & Nel, 2009 (Leiestinae) from lowermost Eocene French amber and *Discolomopsis dominicana* Shockley, 2006 (Anamorphinae) from mid-Miocene Dominican amber.

Herein, we describe a new species of Endomychidae from Priabonian Baltic amber, which we place in a new genus.

**TABLE 1.** Fossil Endomychidae, with approximate age of formations. Ages of formations largely derived from Grimaldi and Engel (2005).

Taxon	Reference(s)	Fossil Type	Age
Endomychidae	Kulicka & Ślipiński 1996; Larsson 1978	Baltic amber	48.6–40.4 my
Endomychidae	Poinar & Poinar 2008	Lebanese amber	125 my
Endomychidae	Poinar 1992; Wu 1996	Dominican amber	20–17 my
Endomychidae	Poinar & Poinar 2008	Burmese amber	95 ma
Anamorphinae			
<i>Discolomopsis dominicana</i>	Shockley 2006	Dominican amber	20–17 my
<i>Symbiotes</i> sp.	Klebs 1910; Handlirsch 1925; Bachofen-Echt 1949; Larsson 1978; Poinar 1992	Baltic amber	48.6–40.4 my
Leiestinae			
<i>Glesirhanis bercioi</i>	Present paper	Baltic amber	37.2–33.9 my
<i>Leiestes</i> sp.	Klebs 1910; Handlirsch 1925; Bachofen-Echt 1949; Larsson 1978; Poinar 1992	Baltic amber	48.6–40.4 my
<i>Palaeoestes eocenicus</i>	Kirejtshuk & Nel 2009	French amber	53 my
<i>Phymaphoroides antennatus</i>	Motschulsky 1856; Handlirsch 1925; Bachofen-Echt 1949; Larsson 1978; Poinar 1992; Alekseev 2013	Baltic amber	48.6–40.4 my
Lycoperdininae			
<i>Gerstaeckerus alviolatus</i>	Hong 1983; Zhang 1989	Diatomaceous compression	17.5–15 my
<i>Hylaia</i> sp.	Klebs 1910; Handlirsch 1925; Bachofen-Echt 1949; Larsson 1978; Poinar 1992	Baltic amber	48.6–40.4 my
<i>Lycoperdina</i> sp.	Berendt 1845; Menge 1856; Handlirsch 1925; Bachofen-Echt 1949; Poinar 1992	Baltic amber	48.6–40.4 my
<i>Mycetina</i> sp.	Helm 1896; Handlirsch 1925; Bachofen-Echt 1949; Larsson 1978	Baltic amber	48.6–40.4 my
<i>Trycherus castaneus</i>	Hope 1837; Handlirsch 1925	Malabar kino	<1.6 my
Merophysiinae			
<i>Holopamecus</i> sp.	Klebs 1910; Handlirsch 1925; Bachofen-Echt 1949; Larsson 1978	Baltic amber	48.6–40.4 my
Mycetaeinae			
<i>Mycetaea</i> sp.	Klebs 1910; Handlirsch 1925; Bachofen-Echt 1949; Larsson 1978; Poinar 1992	Bitterfield amber	40–35 my
Pleganophorinae			
<i>Trochoideus cruciatus</i>	Dalman 1825	Madagascan copal	<1.6 my
<i>Trochoideus</i> sp.	Hieke & Pietrzeniuk 1984; Poinar 1992	Baltic amber	48.6–40.4 my

## Materials and methods

The beetle inclusion is preserved in a polished piece of amber, yellowish in color, without supplementary fixation. The amber piece is relatively flat and elongate (18.5 x 7.0 mm) and was obtained from a commercial source in the Yantarny settlement (Kaliningrad region) in 2012. It was polished by hand, thus allowing dorsal and lateral views of the included beetle. Additional inclusions of obvious animal or plant origins are lacking. Photos were taken with a Zeiss AxioCamICc 3 digital camera mounted on a Zeiss Stemi 2000-c stereomicroscope. Illustrations were made based on free-hand drawing during examination of the original specimen.

Although most estimates of the age of Baltic amber have placed it as deriving from the early Middle Eocene (Lutetian) (48.6–40.4 my), based largely on K-Ar dating (Ritzkowski 1997), palynological biostratigraphy of the specific region where the sample originated suggests a younger, Priabonian age (37.2–33.9 my) (Aleksandrova & Zaporozhets 2008). For the purposes of this study, we follow the Priabonian estimation, as discussed by Perkovsky *et al.* (2007).

## Systematics

### *Glesirhanis*, gen.nov.

Type species: *Glesirhanis bercioi*, sp. nov.

**Diagnosis.** *Glesirhanis* gen. nov. can be diagnosed from all other extant and fossil leiestine endomychids by the following combination of characters: 1) lateral and basal sulci clearly and deeply impressed; 2) antennae with distinct 3-segmented club, without enlarged 9<sup>th</sup> antennomere; 3) abdomen with 5 freely articulated ventrites; and 4) scutellum strongly transverse, widest basally and narrowing apically.

*Glesirhanis* can be distinguished from the other fossil leiestine from Baltic amber, *Phymaphoroides antennatus* Motschulsky, 1856, based on the size and shape of stalk antennomeres and structure of the tarsi, e.g., 1st and 2nd tarsomeres in *Phymaphoroides* are distinctly lobed and only weakly lobed in *Glesirhanis*. The original description by Motschulsky (1856) is verbatim as follows: “Phymaphoroides antennatus Motsch., un Endomychide de la forme des Phymaphorus, mais avec le 9<sup>ième</sup> article des antennes brusquement élargi. Long. 1 lign.” [Translation: An endomychid beetle in form of Phymaphorus, but with the sharply dilated ninth segment of antenna. Length 2.25 mm]. While *Phymaphoroides* has a greatly inflated 9<sup>th</sup> antennomere, *Glesirhanis* does not. However, we cannot rule out the possibility that this difference is sexually dimorphic (i.e., Motschulsky described a male while we describe a female herein) since dimorphism in antennal structure is known within Leiestinae. *Glesirhanis* can be distinguished from *Palaeoestes* Kirejtshuk & Nel by the distinctly impressed lateral and basal sulci, which are at most only weakly impressed in *Palaeoestes*.

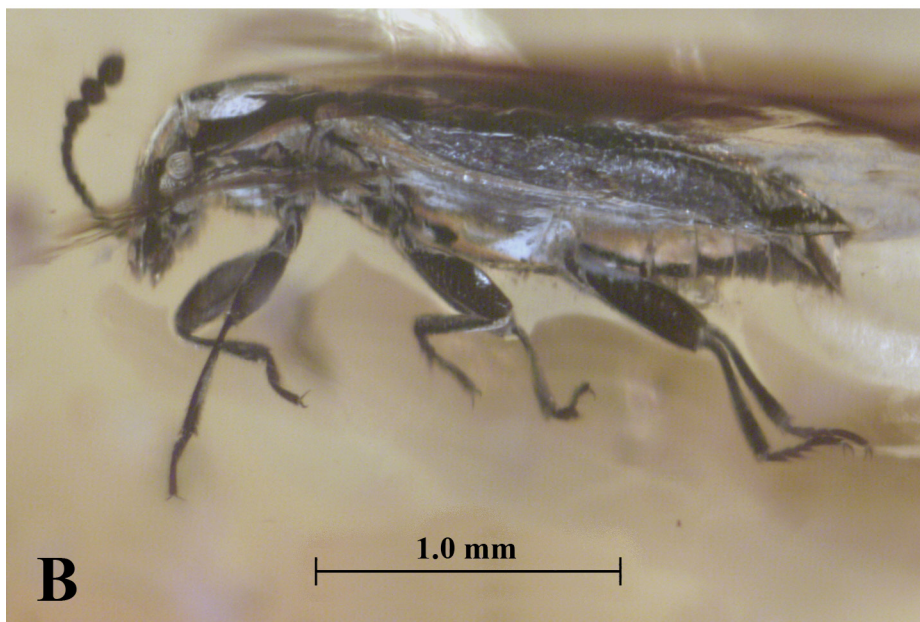
*Glesirhanis* can be distinguished from all extant genera other than *Leiestes* Chevrolat based on having the 3<sup>rd</sup> tarsomere not significantly reduced relative to the 2<sup>nd</sup>. Similarly, *Glesirhanis* can further be separated by virtue of antennomeres 9 and 10 appearing equal in size and shape rather than differing in size and shape, a feature previously reported as an autapomorphy of *Panaleis*. Finally, *Glesirhanis* has an abdomen with 5 freely articulated ventrites while *Panaleis* (as well as *Panamomus* and *Rhanidea*) have 6.

**Etymology.** This new genus-group name is a combination of the Old Prussian word “glêsîs” or “glîsis” (amber) and Rhanis, one of the travelling companions of the goddess Diana. The gender is feminine.

### *Glesirhanis bercioi* sp. nov.

(Figs. 1–2)

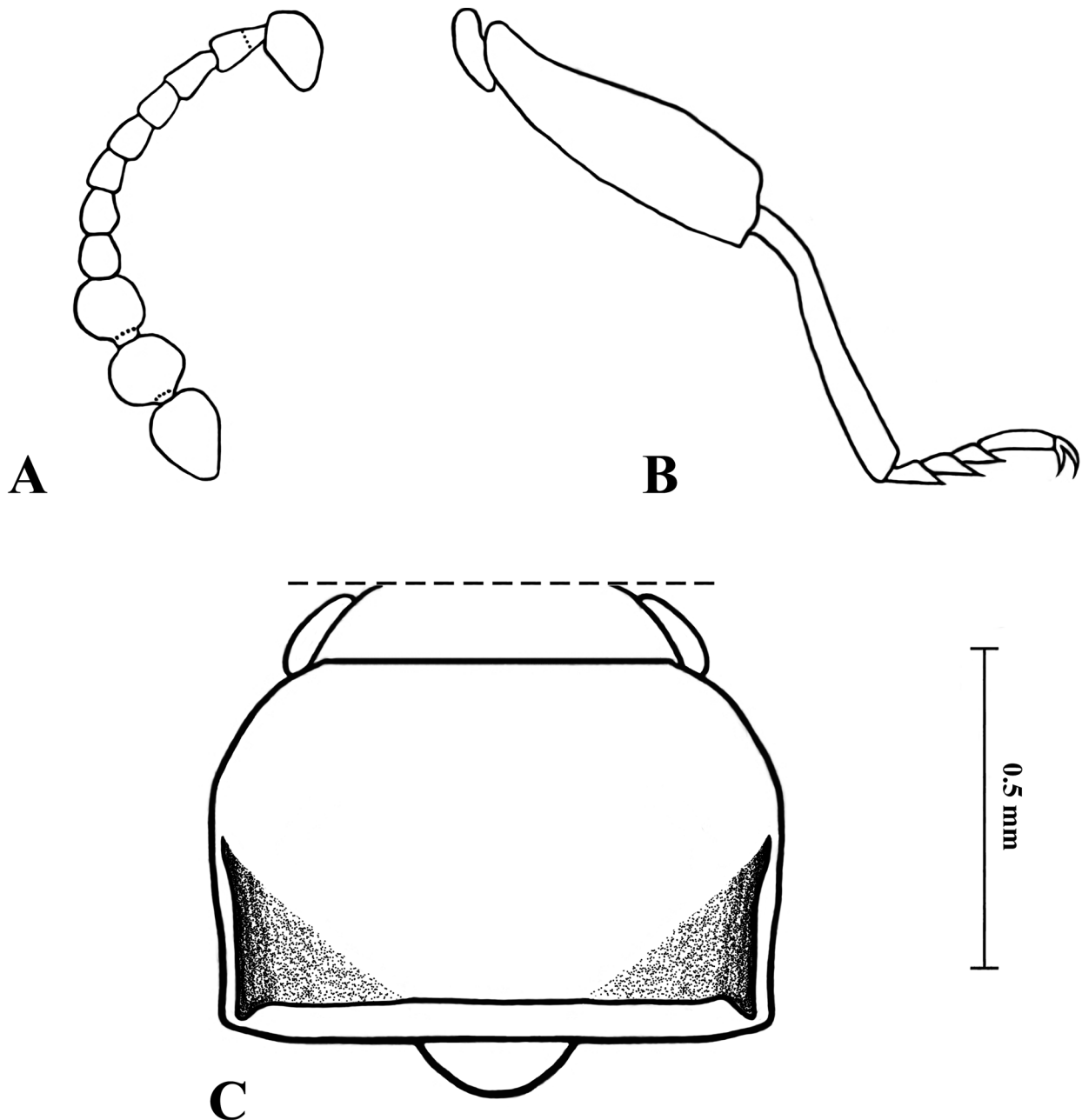
**Description.** Body length = 2.5 mm; width (at widest point) = 1 mm. Highly elongate habitus; dorsal and ventral surfaces, head, and appendages are dark brown, almost black (Fig. 1). Head, pronotum and elytra conspicuously but variably punctate.



**FIGURE 1.** *Glesirhanis bercioi* Shockley & Alekseev, sp. nov. **A.** Dorsal habitus. **B.** Lateral habitus.

Head with coarse, sparse punctation; eyes large, prominent. Frontoclypeal ridge weakly arcuate. Antennae relatively long, extending to base of elytra; 11-segmented with loose, conspicuous 3-segmented club (Fig. 2A). Antennomere length proportions according to the formula: 2.0: 1.3: 1.3: 1.0: 1.0: 1.0: 1.0: 1.0: 1.7: 1.7: 2.0. Antennomeres 3–11 distinctly pubescent. Antennomeres 9–11 twice as wide as antennomere 8, as wide as long. Terminal antennomere subconical and narrowing apically. Maxillary palpomeres 3 and 4 only visible; palpomere 3

approximately twice as wide as 4; palpomere 4 conical, weakly rounded apically, 2.3 times as long as palpomere 3. Pronotum weakly convex, transverse, 0.71X as long as wide; disc coarsely and moderately densely punctate; interspaces 1.5–2.0X puncture diameter. Lateral sulci clearly visible, triangular in form; basal sulcus distinct and deep medially, becoming indistinct laterally (Fig. 2C). Lateral margins of pronotum arcuate from anterior margin to midlength, weakly convergent just beyond midlength, and subparallel at posterior angles. Anterior pronotal angles appearing obtuse when viewed dorsally, posterior angles nearly right-angled (Fig. 2C). Prosternal process partially obscured ventrally, but apparently narrow, short. Procoxal cavities externally open, internally closed.



**FIGURE 2.** *Glesirhanis bercioi* Shockley & Alekseev, **sp. nov.** (punctures and setae not illustrated). **A.** Left antenna. **B.** Left metathoracic leg. **C.** Head, prothorax and scutellum.

Elytra elongate, moderately convex, shining; disc coarsely, densely punctate, punctures lacking visible pubescence; punctures forming irregular rows, interspaces 1.0–2.0X, denser medially, sparser laterally. Sutural striae present, fine, entire (running from base to apex). Scutellum visible, highly transverse (about 2 times wider than long), widely rounded apically (Figs. 1A, 2C). Mesoventrite bicarinate, mesocoxa circular in outline, trochantin concealed. Mesoventral process boat-shaped, subequal in width to mesocoxal cavity diameter.

Legs (Fig. 2B) with tarsal formula 4-4-4. Femur subclavate, sparsely punctate. All tibiae simple (without any angulations or projections), but conspicuously curved basally with short spines apically. Tarsomere 1 small but distinct; tarsomere 2 weakly lobed ventrally. Tarsal claws simple.

Abdomen with five ventrites (Fig. 1B). Ventrite 1 longer than V2 and V3 combined; V2 slightly longer than V3; V3 and V4 subequal in length; V5 1.5 times longer than V4. Apex of terminal tergite widely rounded. Unfortunately, the reproductive system is obscured, making definite sexual determination impossible.

**Material examined.** Holotype: Nr. AWI-035. Sex unknown. Locality data are as follows: Russia: Kaliningrad region: the Sambian [Samland] peninsula: Yantarny village [formerly Palmnicken].

**Type strata.** Baltic Amber. Upper Eocene, Prussian Formation (Priabonian). Estimated age: 37.2–33.9 my.

**Type Depository.** The type is currently housed in the private collection of the second author, Vitaly I. Alekseev (Kaliningrad, Russia), but will be deposited in the Paleontological Institute, Russian Academy of Science (Moscow) for permanent preservation.

**Etymology.** The specific epithet is a patronym for Dr. Hans Bercio, an Eastern Prussian coleopterologist and one of the authors of the last catalogue of beetles of the former Eastern Prussia.

### Key to the genera of Leiestinae

The following key to the genera of Leiestinae has been modified from Tomaszewska (2000b) to include the two previously known fossil taxa and the new genus *Glesirhanis*.

1. Antennomere 9 greatly enlarged relative to 10 & 11 ..... *Phymaphoroides* Motschulsky
- Antennomere 9 not enlarged or 10 & 11 also enlarged. .... 2
2. Prosternal process very narrow and short; procoxae contiguous or almost so ..... 3
- Prosternal process moderately broad, distinctly separates procoxae ..... 5
3. Body glabrous; antennomeres 9 and 10 subequal in length and shape; lateral edges of pronotum widely bordered, crenulate . . . . . *Panaleies* Tomaszewska
- Body pubescent; antennomere 9 of club distinctly shorter and narrower than 10; lateral edges of pronotum narrowly bordered, smooth or almost so. .... 4
4. Pronotal disc with two longitudinal, subparallel grooves medial to the sulci extending from basal margin to about middle of disc; antennomere 5 distinctly longer than 4 or 6. .... *Rhanidea* Strohecker
- Pronotal disc without additional longitudinal grooves; antennomeres 4-6 subequal in length. .... 7
5. Wingless; meso- and metaventrites equal in length; elytra with regular rows of micropunctures. .... *Panamomus* Gorham
- Wings present; mesoventrite distinctly shorter than metaventrite; regular rows of micropunctures visible only on cleared specimens. .... 6
6. Wings well-developed; antennae dissimilar in both sexes (antennal club modified in male); larger species (3.50–4.50 mm length). .... *Phymaphora* Newman
- Wings reduced (long but narrow); antennae similar in both sexes; smaller species (2.37–2.60 mm length). .... *Stethorhanis* Blaisdell
7. Lateral sulci weakly impressed; antennomere 3 subequal to 4. .... *Palaeoestes* Kirejtshuk & Nel
- Lateral sulci strongly impressed; antennomere 3 longer than 4 ..... 8
8. Basal sulcus strongly impressed; antennomeres 9 and 10 subequal in size and shape. .... *Glesirhanis* Shockley & Alekseev
- Basal sulcus weakly impressed; antennomere 9 distinctly smaller than 10 ..... *Leiestes* Chevrolat

### Discussion

The correct placement of the type of *Phymaphoroides antennatus* Motschulsky within Leiestinae cannot be confirmed. Motschulsky (1856) stated that this species had antennae like *Phymaphora*, which later workers may have misinterpreted as Motschulsky suggesting it should be placed within the group of Mycetaeinae that would eventually be separated and elevated to form the Leiestinae. In fact, the antennae of *Phymaphora* males have all antennomeres of the club enlarged whereas the illustrations accompanying the description by Motschulsky clearly show an antenna with only the 9<sup>th</sup> antennomere enlarged. This condition is not found in any extant leiestine taxon, although it is known from taxa in other endomychid subfamilies: Danascelinae (*Hadromychus* Bousquet & Leschen, *Danascelis* Tomaszewska); Lycoperdininae (*Pseudindalmus* Arrow); and Stenotarsinae (*Danae* Reiche, *Tragoscelis* Strohecker). We have not studied the Motschulsky type so we are reluctant to suggest an alternative placement based solely on the illustrations and description, both of which lacked sufficient detail for definitive subfamilial assignment. However, at least one other specimen closely fitting the illustration and description by

Motschulsky is known from the commercial trade and is clearly identifiable as a member of Leiestinae (Figure 3). Therefore, we choose to continue including *Phymaphoroides* within Leiestinae.



**FIGURE 3.** Non-type specimen of *Phymaphoroides antennatus* Motschulsky. **A.** Dorso-lateral habitus. **B.** Close-up of head, thorax and antenna. Images courtesy of Mr. Marius Veta (AmberTreasure4U.com, Lithuania).

Some checklists of fossil Endomychidae also include *Palaeoendomychus gymnus* Zhang, 1992, which was originally described as an endomychid. Kirejtshuk & Nel (2009) correctly concluded that this species is not actually an endomychid, suggesting it was better placed in the family Peltidae Kirby, 1837. However, Peltinae is now a subfamily of Trogossitidae Latreille, 1802. Similarly, Kirejtshuk & Azar (2008) described *Tetrameropsis mesozoica* Kirejtshuk & Azar, creating a new subfamily Tetrameropsinae to accommodate it and placed it within the family Latridiidae. That placement was later questioned by Reike (2012), who suggested that it was actually a subfamily of Endomychidae. The habitus of the type is most similar to corticariine Latridiidae and the condition of having the prothorax constricted anteriorly is unusual for many beetle groups, particularly similar looking Cucujoidea (R. Leschen pers. comm.). The 4-4-4 tarsal formula is one line of evidence presented by Reike (2012) in support of the transfer to Endomychidae. However, Hartley *et al.* (2007) and Lord *et al.* (2010) discussed pseudosegmentation of the basal tarsomere in Akalyptoischiidae, a family previously placed within Latridiidae,

and proposed that it may represent a transitional state from tetramerous to trimerous tarsi. Therefore, it is not unreasonable to conclude that *Tetrameropsis* should actually be in its own family *incertae sedis* with respect to recent Latridiidae, perhaps as a common ancestor of Latridiidae and/or Akalyptoischiidae.

Since Kirejtshuk & Azar (2008) based their subfamily name on an incorrect original stem (*Tetrameropsi-*), we use the amended name provided by Bouchard *et al.* (2011) based on the correct stem (*Tetrameropse-*) in proposing elevation of the group to the family-level.

**Family Trogossitidae Latreille, 1802**

**Subfamily Peltinae Kirby, 1837**

**Genus *Palaeoendomychus* Zhang, 1992**

***Palaeoendomychus gymnus* Zhang, 1992**

**Family Tetrameropseidae Kirejtshuk & Azar, 2008 (status nov.)**

**Subfamily Tetrameropseinae Kirejtshuk & Azar, 2008**

**Genus *Tetrameropsis* Kirejtshuk & Azar, 2008**

***Tetrameropsis mesozoica* Kirejtshuk & Azar, 2008**

Although Carpenter (1992) suggested that the family Endomychidae originated in the Eocene, the description and definitive placement of *Palaeoestes eocenicus* Kirejtshuk & Nel within the subfamily Leiestinae described from 53 my French amber suggested a much older origin, perhaps during the Palaeocene (65–54.8 my). Kirejtshuk (2000) also favored a Palaeocenic origin for Endomychidae, but more recent estimates by Ponomarenko (2002), propose an origin during the late Cretaceous. The report of Endomychidae in Burmese (95 my) and Lebanese amber (125 my) by Poinar & Poinar (2008) further support a much older origin for the family. The sheer number and apparent diversity of endomychid inclusions reported in Baltic amber alone suggests that past diversity, particularly during the late Eocene and early Oligocene, may have been higher than previously known.

Although several major fossil catalogues (Klebs 1910, Spahr 1981, Carpenter 1992) included Endomychidae and recent catalogues of Endomychidae (Strohecker 1953, Shockley *et al.* 2009) have included fossils, the description of *Glesirhanis bercioi* Shockley & Alekseev marks only the second endomychid species to be described from Baltic amber and one of only 7 species that have been properly named and fully described (Table 1), despite recent interest in insect fossils preserved in resins. Undoubtedly, many more fossil endomychids remain in museums and private collections left undetermined beyond the family-level or putatively assigned only to extant genera. When dealing with Baltic and older ambers, this can be problematic because it leads to underestimation of generic diversity and makes it difficult or impossible to objectively evaluate the validity of known fossil taxa because individual specimens cannot be readily identified and hypotheses of species definitions re-evaluated, tested, and confirmed/refuted. Furthermore, there is growing evidence that many of the families of the superfamily Cucujoidea (and perhaps the superfamily itself) most likely evolved in the Cretaceous so specimens in Cretaceous ambers are often difficult to place into existing families since they have characters not found in extant taxa, have characters that are shared with taxa from multiple families, or lack characters currently identified as synapomorphies for defining extant families.

We hope that this paper will generate additional interest in the fossil beetle fauna of Baltic amber and stimulate others to locate and describe these previously reported, undescribed species of Endomychidae, as well as to identify additional material that may not have previously been identified to family-level, particularly those from older amber deposits.

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