

Glisachaemus jonasdamzeni gen. et sp. nov. of Cixiidae from the Eocene Baltic amber (Hemiptera: Fulgoromorpha)

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ABSTRACT

An extinct genus and species *Glisachaemus jonasdamzeni* gen. et sp. nov. is described from the Eocene Baltic amber. It is placed in the tribe Cixiini and seems to be related to the extant South African genus *Flachaemus* Van Stalle 1988. Fossil Cixiidae are discussed and a list of extinct Cixiidae is provided.

KEY WORDS : *Glisachaemus jonasdamzeni*. New genus, new species. Eocene. Baltic amber. Fossils.

INTRODUCTION

The family Cixiidae Spinola 1839, is a group of planthoppers with over 1500 described extant species comprised in over 170 genera (which may be about 40 percent of the actual world fauna) and cosmopolitan distribution (Larivière 1999, Holzinger *et al.* 2002). Within the family three subfamilies: Bothriocerinae Muir 1923, Borytheninae Emeljanov 1989 and Cixiinae Spinola 1839 are recognized, the latter with 15 tribes (Emeljanov 1997, 2002). Emeljanov (1989, 2002) discussed the problem of the higher classification of Cixiidae, but there is still no consensus on the tribal classification of this family. In addition, it is very probable that the Cixiidae is not a monophylum and within this paraphyletic unit up to six different lineages are included (Holzinger *et al.* 2001, Holzinger & Bourgoïn personal communication).

SYSTEMATIC PALAEONTOLOGY

Order: Hemiptera Linnaeus, 1758
Suborder: Fulgoromorpha Evans, 1946
Superfamily: Fulgoroidea Latreille, 1807
Family: Cixiidae Spinola, 1839
Subfamily: Cixiinae Spinola, 1839
Tribe: Cixiini Spinola, 1839

GENUS: *Glisachaemus* gen. nov.

Etymology. The genus name is a combination of the Old Prussian word 'glisis' meaning amber and *Flachaemus* – genus of planthopper. Gender masculine.

Type species: *Glisachaemus jonasdamzeni* sp. nov., here designated.

Diagnosis. The new genus is related to the extant *Flachaemus* Van Stalle 1988, but differs by the anterior portion of vertex, delimited by transverse carina, not in plane with the posterior portion of disc (both compartments in plane in *Flachaemus*); vertex shorter than broad (as long as broad to twice as long as broad in *Flachaemus*); five terminals of Sc+R on tegmen (less in *Flachaemus*); tegmen with cell C5 about half of cell C1 length (cell C5 distinctly longer in *Flachaemus*, about $\frac{3}{4}$ of cell C1 length); apical spines of hind tibia not divided into two groups (divided into two groups of three spines in *Flachaemus*); femoral tibio-tarsal formula 6 : 7 : 5 (formula 6 : 7 : $\frac{7}{8}$ in *Flachaemus*).

Description. Head with compound eyes distinctly narrower than pronotum. Vertex with distinct transverse carina, anterior portion of the disc not in plane with posterior portion; anterior and posterior compartments of vertex with distinct median carina; border between vertex and frons sharp, distinctly carinate. Face flat, with sharp median carina on frons and clypeus; median ocellus not visible. Frons in lateral margin as long as broad at widest point, at level of antennae; lateral carinae distinct. Fronotoclypeal suture strongly arcuate. Clypeus slightly convex, with distinct lateral carinae. Rostrum long, reaching tips of hind coxae. Antennae with second joint slightly elongated and long flagellum. Pronotum narrow, shorter than vertex in midline, distinctly excavated at posterior margin. Tegulae huge. Mesonotum with three strong carinae, median portion flat, slightly elevated at scutellum, lateral portion sloping down. Tegmen about 2.6 times as long as wide. Costal margin with basal

portion distinctly curved, then nearly straight, covered with distinct setiferous tubercles bearing long setae; stigma small, triangular; apical portion not elongate, with widely rounded margin, wide, striated, lacking setiferous tubercles; claval margin with setiferous tubercles bearing long setae; clavus reaching 0.7 of tegmen length. Basal cell elongate, stems Sc+R and M leaving basal cell at same point but not fused. Stem Sc+R forked distinctly basad of vein CuA forking, at level of claval veins junction; vein RA single, vein RP forked in apical portion of tegmen, apicad of veinlet *r-m*, with three terminals. Stem M forked at level of apex of clavus, branch M1+2 forked basad of branch M3+4 forking, vein M with five terminals. Vein CuA forked slightly distad of claval veins junction. Claval veins Pcu and A1 fused at half of clavus length. All veins with setiferous tubercles bearing long setae. Wing wide, stems Sc+R and M leaving basal cell separately. Stem Sc+R forked at level of wing coupling apparatus, vein ScRA reaching margin distinctly basad of wing apex, vein RP with two terminals. Vein M forked merely basad of veinlet *r-m*, branch M1+2 forked again, branch M3+4 fused with vein CuA1. Vein CuA forked slightly basad of veinlet *r-m*. Hind tibia with two small lateral spines and six apical teeth; basitarsomere distinctly longer than combined length of mid and apical tarsomeres, with seven apical teeth; mid tarsomere as long as apical tarsomere, with five apical teeth. Anal tube elongate, widened at apex with slightly asymmetrical apical lobe. Pygofer with median process.

Glisachaemus jonasdamzeni sp. nov.

Figures 1-20

Etymology. Species is named after the collector – Jonas Damzen.

Holotype. Amber specimen No. 20067, collection Jonas Damzen, Vilnius, Lithuania, to be deposited in the Museum of Amber Inclusions, University of Gdańsk, Poland under acquisition number MIB 5075. Specimen well preserved with wings spread, partly covered with internal layers and cracks. Right fore leg detached, placed near the specimen.

Syninclusions. The specimen preserved in amber is bearing a parasitic mite on dorsal portion (Fig. 21); others: unidentified Collembola, bubbles, plant pollen (?).

Occurrence. Middle Eocene, Baltic amber.

Diagnosis. Anal tube elongate, with lateral margins slightly concave, slightly asymmetric apical lobe directed ventrad; anal style short; median process of pygofer triangular; genital style with wide, rounded apex, covered with long setae. Periandrium without articulation between shaft and flagellum, with two spines on the right side, two spines on shaft, and two spines on flagellum. Teeth of mid tarsomere, with exception of external ones, with short subapical setae.

Description. Length of body 3.85 mm, wing span about 8 mm. Head with compound eyes 0.8 mm wide, length of

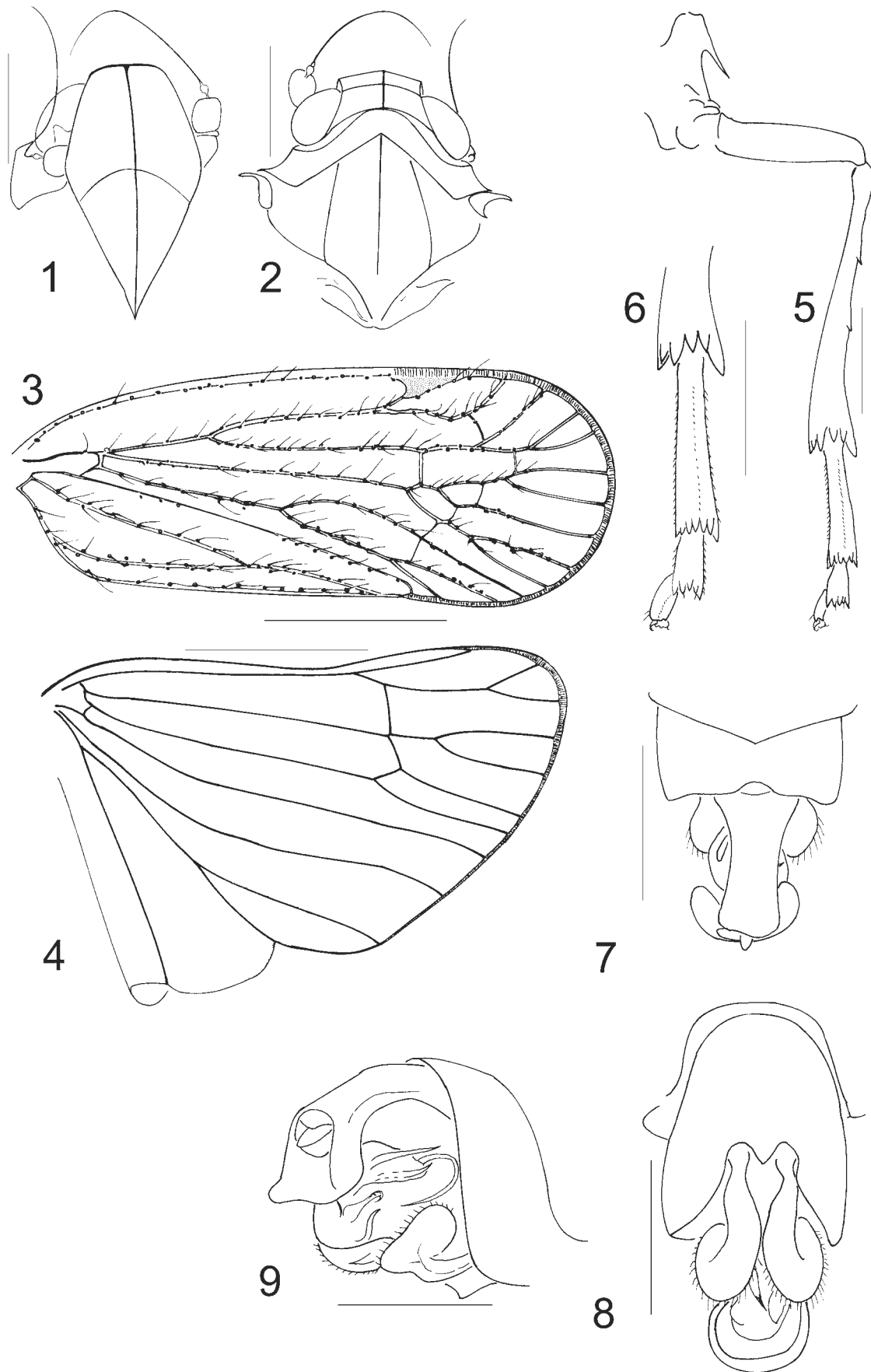
vertex in midline 0.17 mm, at lateral margins, width of vertex at anterior margin 0.36 mm, at posterior margin 0.45 mm. Face 1.07 mm long in midline; frons 0.41 mm in midline, 0.61 mm in lateral line, 0.36 mm wide at border with vertex, 0.6 mm at widest point at level of antennae, clypeus 0.6 mm in midline; rostrum 1.07 mm, apical segment shorter, 0.4 mm. Pronotum 0.1 mm long in midline, 1 mm wide; mesonotum 0.83 mm long in midline. Tegmen 3.4 mm long. Fore tibia 0.83 mm long, fore tarsus 0.36 mm, basitarsomere and mid tarsomere of same length, apical tarsomere slightly longer. Hind femur 0.77 mm, hind tibia 1.46 mm long, hind tarsus 1.03 mm long, basitarsomere 0.66 mm long, mid and apical tarsomere 0.28 mm long, respectively; mid tarsomere with short subapical setae on apical teeth, with exception of external ones. Pygofer 0.88 mm long, 0.57 mm in midline, 0.33 mm in lateral line, 0.64 mm wide. Anal tube 0.52 mm long, 0.17 mm wide at narrowest point, 0.32 mm wide at apical lobe. Genital style 0.57 mm long (visible portion). Venation of tegmen differs on left and right tegmen: nodal veinlet *r-m* apicad of nodal veinlet *m-cu* on left tegmen, opposite situation on right tegmen. Left wing with additional forking of vein A1.

DISCUSSION

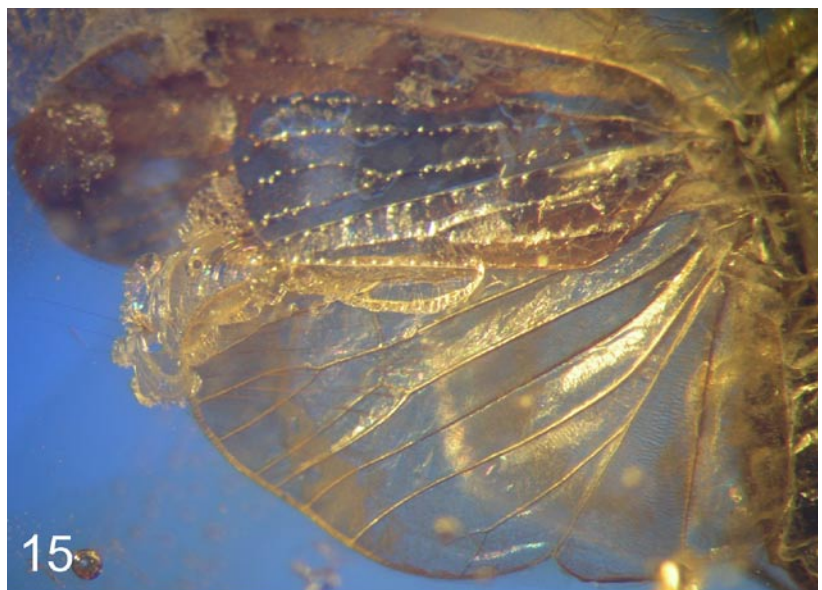
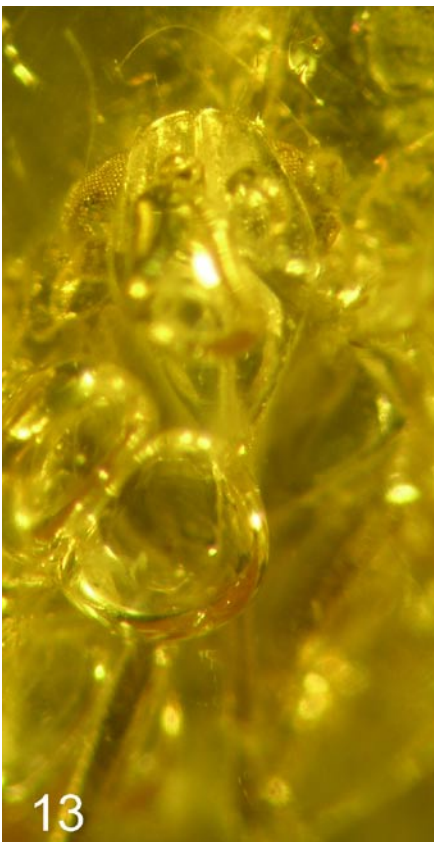
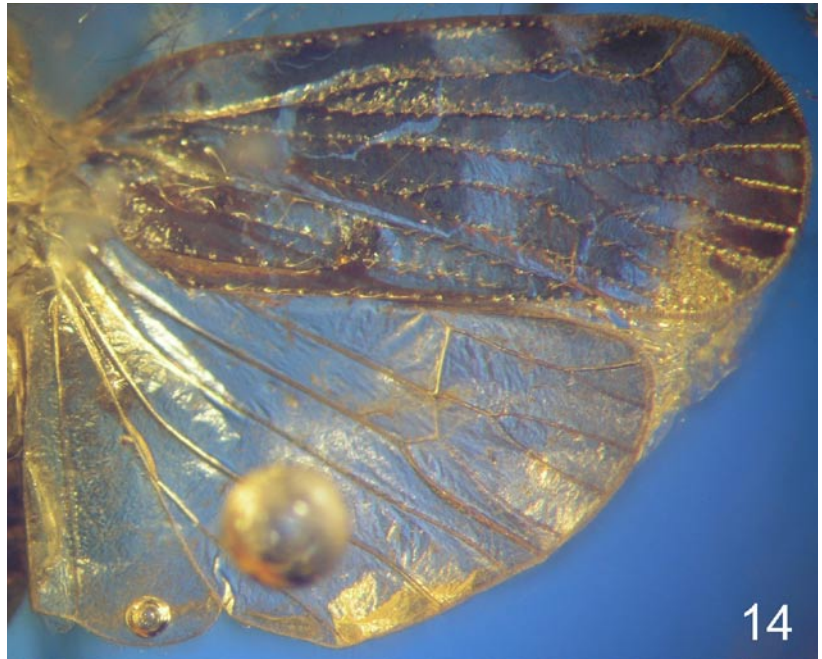
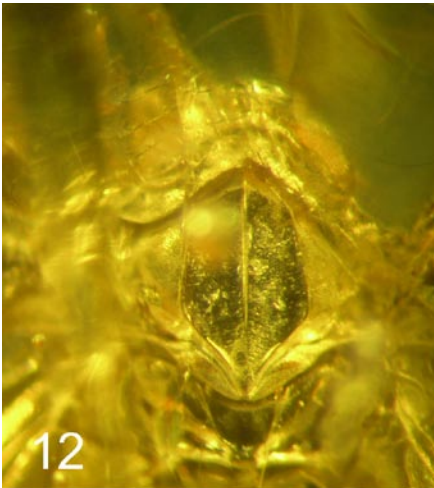
The fossil record of the Cixiidae (Table 1) is not very rich (Szwedo *et al.* 2004), and numerous taxa previously ascribed to Cixiidae are excluded from this family or need to be re-considered and revised. The oldest forms are mentioned from the Upper Jurassic/Lower Cretaceous of Siberia (Shcherbakov & Popov 2002). True cixiids have been found as follows – a species named ‘*Cixius petrinus*’ Fennah 1961 in the Lower Cretaceous, Barremian of Surrey in England (Fennah 1961), *Karebodopoides aptianus* (Fennah 1987) from Hauterivian–Aptian Lebanese amber (Fennah 1987), *Cretofennahia cretacea* (Martins-Neto 1989) and another un-named specimen from Aptian of Brazil (Martins-Neto 1989, Hamilton 1990). The other fossil forms ascribable to Cixiidae, very probably tribe Pentastirini, are reported from Lower Cretaceous Burmese amber (Grimaldi *et al.* 2002).

Representatives of Mnemosynini are described from Fance, in uppermost Palaeocene of Menat as *Mnasthaia arverniorum* Szwedo, Bourgoin et Lefebvre 2006 and in Lowermost Eocene amber of Oise as *Stalisyne lutetiorum* Szwedo, Bourgoin et Lefebvre 2006, *Stalisyne veromanduiorum* Szwedo, Bourgoin et Lefebvre 2006 and *Mnaomaia bellovaciorum* Szwedo, Bourgoin et Lefebvre 2006 (Szwedo *et al.* 2006).

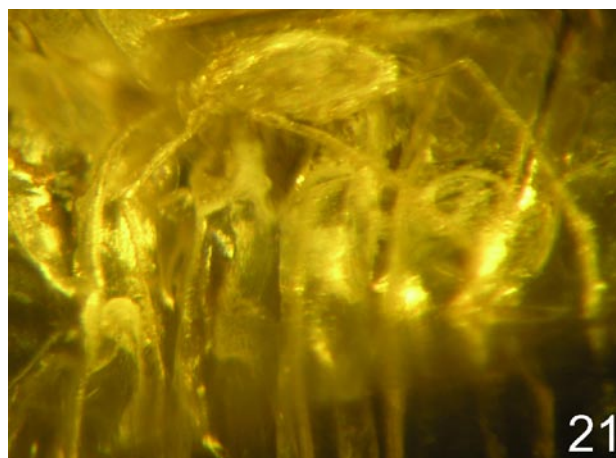
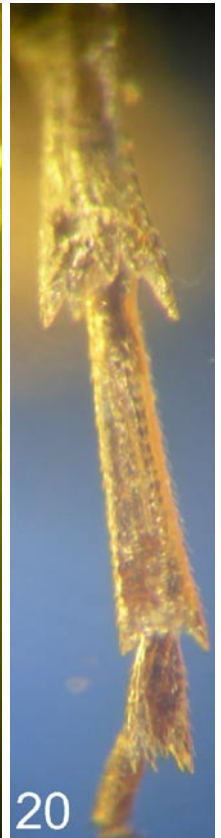
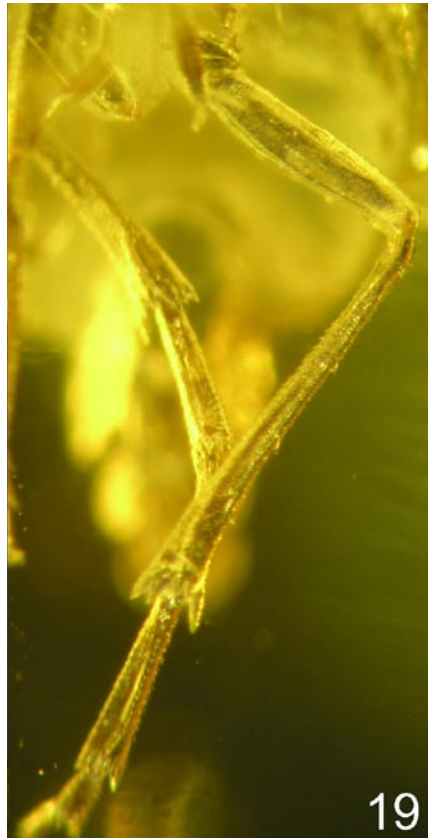
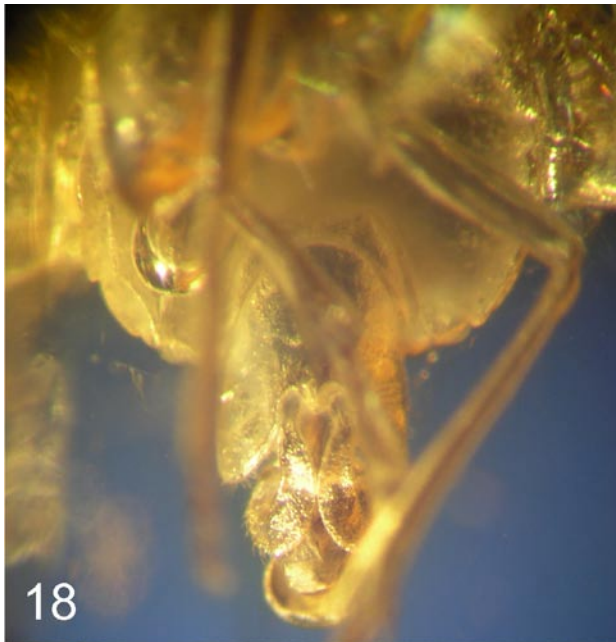
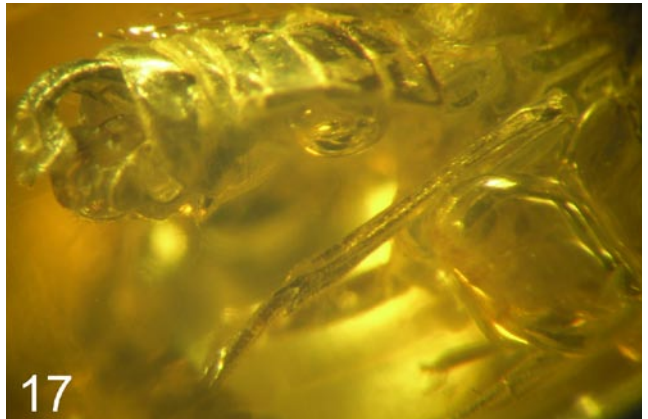
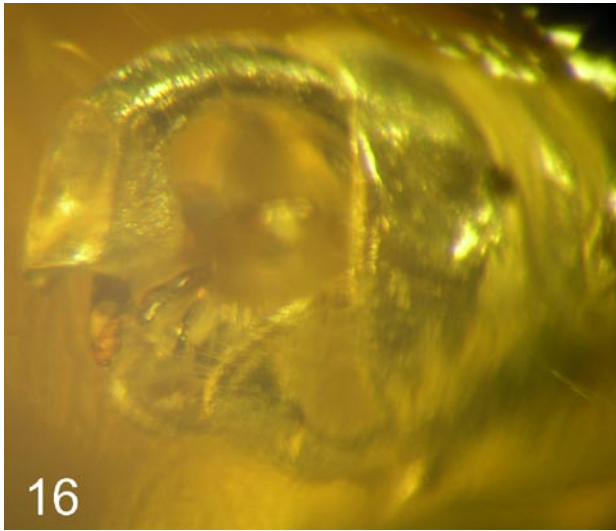
Cixiidae are quite common in the Eocene Baltic amber inclusions (Szwedo & Kulicka 1999a, b, Szwedo *et al.* 2004). The first description of representatives of this family from Baltic amber comes from the second half of the 19th century (Germar & Berendt 1856). In this work nine species have been ascribed to the genus *Cixius* Latreille, 1804 although some of them seem to represent Achilidae, Tropicuchidae or other genera of Cixiidae (Szwedo *et al.* 2004, Shcherbakov 2006). Another species — *Oliarus*



Figures 1–9. *Glisachaemus jonasdazeni* gen. and sp. nov. (1) Face; (2) anterior dorsal part of the body; (3) right tegmen; (4) right wing; (5) left hind leg; (6) left hind tarsus; (7) pygofer and anal tube from above; (8) male genital block from below; (9) male genital block in posterolateral view. Scale bars 0.5 mm for 1, 2, 5–9; 1 mm for 3 and 4.



Figures 10–15. *Glisachaemus jonasdamzeni* gen. and sp. nov. (10) General dorsal view; (11) general ventral view; (12) anterior part of the body; (13) face; (14) right tegmen and wing; (15) left tegmen and wing.



Figures 16–21. *Glisachaemus jonasdamzeni* gen. and sp. nov. (16) male genital block in posterolateral view; (17) abdomen and right hind leg in posterolateral view; (18) male genital block from below; (19) left hind leg; (20) left hind tarsus. (21) parasitic mite on the specimen.

oligocenus Cockerell 1910, ascribed to cixiids (Cockerell 1910) can not be placed in the extant genus *Oliarus* Stål 1862 and according to the original description and drawing should be placed in Achilidae, but with an unresolved position until the type material will be accessible and revised. *Kulickamia jantaris* Szwedo et Gebicki, 2000 and the tribe Pentastirini genus *Perkunus* Szwedo et Stroiński 2007, with two species have been also described from the Baltic amber (Szwedo & Gebicki 2000, Szwedo & Stroiński 2002). Recently, *Autrimpus sambiorum* Szwedo 2004 has been described, as representative of tribe Mnemosynini (Szwedo 2004).

The placement of '*Myndus*' *wilmattae* Cockerell 1926 from the Lowermost Oligocene of Bembridge Marls, Isle of Wight (Cockerell 1926) in Cixiidae is doubtful, and this taxon has been placed in Tropiduchidae (Szwedo in prep.). A few other taxa of Cixiidae were described from the Oligocene strata of Germany (Statz 1950), and are currently under revision. *Oligocixia electrina* Gebicki & Wegierek 1993 and *Oliarius kulickae* Szwedo 2002 were described from the Oligocene/Miocene Dominican amber (Gebicki & Wegierek 1993, Szwedo 2000). The fossil ascribed to genus *Mnemosyne* Stål 1866 was identified on the basis of the partly preserved tegmen by Fennah (1963), from Oligocene/Miocene Mexican amber.

The genus described above is placed in the tribe Cixiini and related to the South African genus *Flachaemus* Van Stalle 1988 (Van Stalle 1988). A few other taxa described from the Baltic amber could be placed in the same tribe – '*Cixius*' *insignis* Germar & Berendt 1856, and *Kulickamia* Gebicki & Szwedo 2000. The tribal placement of other '*Cixius*' species described by Germar and Berendt (1856) remain unresolved. Other genera *Perkunus* Szwedo et Stroiński 2007 and *Autrimpus* Szwedo 2004 known from Baltic amber are placed in tribes Pentastirini and Mnemosynini respectively, while *Bothriobaltia* Szwedo 2002 represents other subfamily – Bothriocerinae (Szwedo 2002). According to the phylogenetic scheme proposed by Emeljanov (1997, 2002), Cixiini, Pentastirini and Mnemosynini are regarded as "higher" Cixiinae. It contradicts with fossil data, as other recognised tribes of Cixiinae are not recorded as fossils. The origins of these tribes is discussed by Szwedo *et al.* 2006. The tribal status of Cretaceous fossils of the family is still not resolved.

ACKNOWLEDGEMENTS

I would like to give my sincere thanks to Mr. Jonas Damzen, Vilnius, Lithuania, who made the studies on this specimen possible. I wish also thank Dr Lois B. O'Brien, Green Valley, Arizona, USA, Dr Vincent Perrichot, Université Rennes, France and Dr Vicente Ortuño, Universidad de Alcalá, Madrid, Spain for very valuable help and discussions.

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Appendix 1. Geological distribution of described taxa of Cixiidae

Age	Name	Location	Reference
Neogene	<i>Mundopoides cisthenaria</i> Cockerell 1925	Kudia River, Maritime Territory, Russian Far East	Cockerell 1925, Szwedo <i>et al.</i> 2004
	' <i>Cixius</i> ' sp.	Rott, Germany	Statz 1950
	' <i>Hyalesthes</i> ' <i>rottensis</i> Statz 1950	Rott, Germany	Statz 1950
	<i>Mnemosyne</i> sp.	Hispaniola I., Dominican Republic, Dominican amber	Fennah 1963, Szwedo 2004
	<i>Oeclixius amphion</i> Fennah 1963	Hispaniola I., Dominican Republic, Dominican amber	Fennah 1963
	<i>Oligocixia electrina</i> Gebicki & Wegierek 1993	Hispaniola I., Dominican Republic, Dominican amber	Gebicki & Wegierek 1993
	<i>Oliarius kulickae</i> Szwedo 2002	Hispaniola I., Dominican Republic, Dominican amber	Szwedo 2000
Palaeogene	' <i>Cixius</i> ' <i>fraternus</i> Germar & Berendt 1856	Baltic amber	Germar & Berendt 1856, Szwedo <i>et al.</i> 2004
	' <i>Cixius</i> ' <i>insignis</i> Germar & Berendt, 1856	Baltic amber	Germar & Berendt 1856, Szwedo <i>et al.</i> 2004
	' <i>Cixius</i> ' <i>vitreus</i> Germar & Berendt 1856	Baltic amber	Germar & Berendt 1856, Szwedo <i>et al.</i> 2004
	<i>Kulickamia jantaris</i> Gębicki & Szwedo 2000	Baltic amber	Gębicki & Szwedo 2000
	<i>Bothriobaltia pietrzeniukae</i> Szwedo 2002	Baltic amber	Szwedo 2002
	<i>Perkumus bruziorum</i> Szwedo & Stroiński 2002	Baltic amber	Szwedo & Stroiński 2002
	<i>Perkumus sudoviorum</i> Szwedo & Stroiński 2002	Baltic amber	Szwedo & Stroiński 2002
	<i>Autrimpus sambiorum</i> Szwedo 2004	Baltic amber	Szwedo 2004
	<i>Stalisyne lutetiorum</i> Szwedo, Bourgoin & Lefebvre 2006	LeQuesnoy, France	Szwedo <i>et al.</i> 2006
	<i>Stalisyne veromanduiorum</i> Szwedo, Bourgoin & Lefebvre 2006	LeQuesnoy, France	Szwedo <i>et al.</i> 2006
	<i>Mnaomaia bellovaciorum</i> Szwedo, Bourgoin & Lefebvre 2006	LeQuesnoy, France	Szwedo <i>et al.</i> 2006
	<i>Mnasthaia arverniorum</i> Szwedo, Bourgoin & Lefebvre 2006	Menat, France	Szwedo <i>et al.</i> 2006
<i>Glisachaemus jonasdazeni</i> Szwedo 2007	Baltic amber	this paper	
Cretaceous	<i>Cretofennahia cretacea</i> Martins-Neto 1989	Crato Formation, Brazil	Martins-Neto 1989
	<i>Karebodopoides aptianus</i> Fennah 1987	Jouar Es-Sous, Lebanon, Lebanese amber	Fennah 1987, Szwedo 2001
	' <i>Cixius</i> ' <i>petrinus</i> Fennah 1961	Upper Weald Clay Group, United Kingdom	Fennah 1961

Received: 21st December 2006Accepted: 5th March 2007