

New fossil gall midges from the earliest Eocene French amber (Insecta, Diptera, Cecidomyiidae)

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KEY WORDS

Insecta,
Diptera,
Cecidomyiidae,
Tertiary,
Palaeogene,
early Eocene,
amber,
France,
new genera,
new species.

ABSTRACT

Three new genera and five new species of Cecidomyiidae are described from the earliest Eocene amber of Oise (France). The new taxa belong to the Lestremiinae, the oldest representatives of the genus *Lestremia* (Lestremiini), *L. eocenica* n. sp. and *L. deploegi* n. sp., *Neurolyga magnifica* n. sp. (Micromyini), *Proacoenonia olgae* n. gen., n. sp. (Acoenoniini), and to the Porricondylinae Winnertziini, *Electroxylomyia eocenica* n. gen., n. sp. All these taxa are closely similar to their nearest recent relatives, showing a high morphological stability in these groups, maybe related to their biotopes in decaying vegetation.

RÉSUMÉ

Nouvelles cécidomies (Insecta, Diptera, Cecidomyiidae) de l'ambre éocène basal français.

Trois nouveaux genres et cinq nouvelles espèces de Cecidomyiidae sont décrits de l'ambre éocène basal de l'Oise (France). Les nouveaux taxons appartiennent aux Lestremiinae, les plus anciens représentants du genre *Lestremia* (Lestremiini), *L. eocenica* n. sp. et *L. deploegi* n. sp., *Neurolyga magnifica* n. sp. (Micromyini), *Proacoenonia olgae* n. gen., n. sp. (Acoenoniini), et aux Porricondylinae Winnertziini, *Electroxylomyia eocenica* n. gen., n. sp. Tous ces taxons sont très proches des taxons modernes apparentés, montrant une grande stabilité morphologique pour ces groupes, peut-être liée à leur milieu de vie dans la végétation en état de décomposition.

MOTS CLÉS

Insecta,
Diptera,
Cecidomyiidae,
Tertiaire,
Paléogène,
Éocène basal,
ambre,
France,
nouveaux genres,
nouvelles espèces.

INTRODUCTION

Fossil remains of Cecidomyiidae are rather frequent but mainly known from the late Eocene Baltic and Rovno ambers, Oligocene Mexican amber, and few records in Late Cretaceous amber (Meunier 1904; Gagné 1973, 1977; Arillo & Nel 2000; Perkovsky & Fedotova 2004; Fedotova & Perkovsky 2004, 2005). There are some reports from the Early Cretaceous (Gagné 1981), but with no species described. The Paleocene and the early Eocene faunas are nearly unknown. We describe several new genera and species that we attribute to three recent tribes of Lestremiinae and one of Porricondylinae, showing that cecidomyiid diversity was already rather high in the early Eocene. Lestremiine and porricondyline larvae are mycophagous and terrestrial. They are found in decaying vegetation and wood, in plant wounds, and in mushrooms (Gagné 1981). There are very few morphological differences between these early Eocene fossils and the corresponding recent taxa. Such a great morphological stability can be found in the Eocene Psocoptera that also live in a similar stable environment (Nel *et al.* 2005). The gall-forming Cecidomyiinae are still unknown in the Oise amber and comparatively under-represented in the world fossil record. Nevertheless, galls have been found from the Oise amber layers but they are probably related to Cynipidae (Hymenoptera).

All the fossil material comes from the same place, viz. the lowermost Eocene, in amber, *c.* -53 My, Sparnacian, level MP7 of the mammal fauna of Dormaal (Feugueur 1963; De Plöeg *et al.* 1998; Nel *et al.* 1999), farm Le Quesnoy, Chevreière, region of Creil, Oise department (northern France). All the material belongs to the collection Langlois-Meurinne/De Plöeg, both mounted in Canada balsam, deposited in the Département Histoire de la Terre, Muséum national d'Histoire naturelle, Paris.

SYSTEMATICS

Family CECIDOMYIIDAE Newman, 1835
Subfamily LESTREMIINAE Rondani, 1840

Tribe LESTREMIINI Rondani, 1840
Genus *Lestremia* Macquart, 1826

Lestremia eocenica n. sp.

(Fig. 1)

TYPE MATERIAL. — Holotype specimen PA 5314 1/2 (male), paratypes PA 3296, PA 2540, PA 1303, PA 5135, PA 8106 1/5, PA 157 1/3 (males).

ETYMOLOGY. — After the Eocene age of the fossils.

DIAGNOSIS. — Male flagellomeres with nodes four times as long as necks; palpal segment 4 just slightly longer than third; male gonostylus large and broad, divided into a large side lobe and an apical lobe, both with apical macrosetae.

DESCRIPTION

Head 0.11 mm long, 0.23 mm wide, 0.32 mm high; eyes very broad, nearly meeting below antennae; eye bridge complete and long; two ocelli well developed just above the eyes; antenna 0.81 mm long, scape 0.01 mm long, 0.02 mm wide, pedicel 0.04 mm long, 0.03 mm wide, 14 long flagellomeres of nearly the same size, all longer than wide (0.05 mm long, 0.03 mm wide), and with distinct neck, but flagellomere nodes distinctly longer than necks (ratio length of node/length of neck 0.25), last flagellomere 0.06 mm long; flagellomeres with three rows of setae, the two basal ones being crenulate; digitate sensoria absent on flagellomeres; gena short; palpus very long, 0.28 mm long, with four long segments visible, with palpal segment 1 short and stout, distal three palpal segments elongate, palpal segment 2 0.1 mm long, palpal segment 3 0.11 mm long, palpal segment 4 0.12 mm long; presence of rather long setae on palpal segments 3 and 4.

Thorax 0.34 mm long, 0.20 mm high, 0.29 mm wide, longer than broad.

Wing 1.14 mm long, 0.44 mm wide, hyaline, with microtrichia and macrotrichia, especially in posterior part of wing and along posterior margin; veins of posterior part of wing sclerotized but less than those of anterior part; Costa not ending at apex of R5 but continuing around wing, although the strong anterior portion of C ends up with R5; humeral vein present, 0.13 mm from wing base;

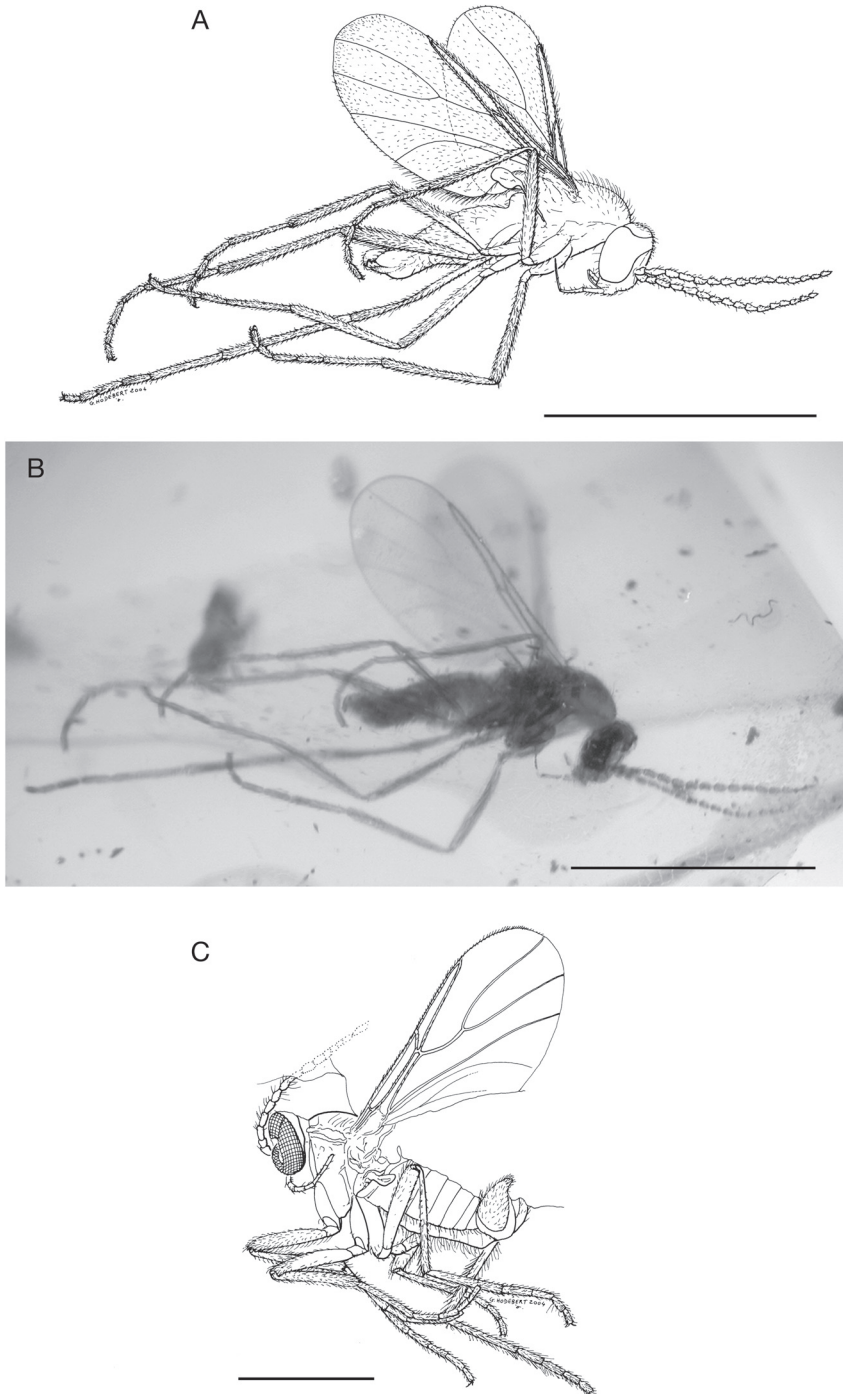


FIG. 1. — *Lestremia eocenica* n. sp., general habitus: **A**, holotype (PA 5314 1/2), drawing; **B**, same specimen, photograph; **C**, paratype (PA 2540), drawing. Scale bars: A, B, 1 mm; C, 0.5 mm.

subcostal vein incomplete, 0.34 mm long, not reaching wing margin; vein R1 short, reaching anterior wing margin 0.23 mm basal of apex of Rs; vein Rs 0.16 mm long, emerging from R close to apex of R1 (0.32 mm basal of apex of R1); cross-vein r-m present but very short, 0.08 mm long; sector of M1+2 basal of fork into M1 and M2 0.36 mm long, distinctly shorter than branches of fork; M1 complete and curved basally; M2 complete basally; vein m-m absent; vein M3+4 distinct, simple and nearly straight, basally vanishing close to M (visible in specimen PA 5314 1/2) but basally replaced by a fold (visible in other specimens), very close to base of M; CuA simple, curved; CuP present, parallel to CuA and 0.38 mm long; A1 curved and long, complete basally and ending close to posterior wing margin; A2 not visible, probably absent.

Haltere with large knob, 0.05 mm wide and 0.11 mm long, and stem 0.05 mm long, bearing only two setae at its apex.

Legs slender, without scales; fore femur 0.41 mm long, tibia 0.44 mm long, tarsi 0.57 mm long; mid femur 0.43 mm long, tibia 0.46 mm long, tarsi 0.60 mm long; hind femur 0.44 mm long, tibia 0.46 mm long, tarsi 0.61 mm long; femora and tibiae not especially swollen; tibial spurs absent; tarsal claw with basal lobe with small teeth; all legs with five tarsomeres, with tarsomere 1 longer than 2.

Abdomen (male) with eight segments before genitalia, 0.63 mm long, 0.26 mm wide, bearing numerous long setae; segment 8 unmodified; parameres very narrow in distal portion; gonocoxites bearing numerous setae; gonostylus large and broad, 0.18 mm long, 0.10 mm wide, bilobed, with main lobe cylindrical and bearing three to four short megasetae, with side lobe directed inwards, terminating in a long megasetae.

DISCUSSION

Following the key to dipteran families of McAlpine (1981), *L. eocenica* n. sp. falls in the Cecidomyiidae Lestremiinae because of the following characters: vein A2 absent, R with only two branches, C continuing around wing, first tarsomere longer than second, each tarsus five-segmented, two ocelli present (although some Lestremiinae have no ocelli, see Gagné 1995). After Wood & Borkent (1986,

1989), *L. eocenica* n. sp. falls in the Cecidomyiidae rather than in Sciaridae, because of the following synapomorphies: presence of an eye bridge (character also present in Sciaridae and Scatopssoidea), tibial spurs absent (see also Gagné 1994) (but character also present in Scatopsidae); setae of flagellomeres arranged in encircling whorls.

Gagné (1994) proposed a phylogeny of the Cecidomyiidae, with the Lestremiinae as sister group of all other representatives of the family, but without giving any synapomorphy supporting the clade Lestremiinae. Jaschhof (2000) proposed to consider the Catotrichinae as most basal clade and the Lestremiinae as sister group of the Porricondylinae + Cecidomyiinae, supporting the monophyly of the Lestremiinae by the presence of crenellate whorls in male flagellomeres. *L. eocenica* n. sp. has two crenellate whorls of long setae, longer than the width of the flagellomere. Thus, we place *L. eocenica* n. sp. in the Lestremiinae.

Following the keys to Nearctic and European genera proposed in Gagné (1981, 1994) and Skuhravá (1997), *L. eocenica* n. sp. falls in the Lestremiinae Lestremiini because of the following characters: only two ocelli present, tarsi five-segmented, metatarsus distinctly longer than second tarsal segment, M1+2 present, with its fork longer than its stem, legs without scales, macropterous, CuA simple, M3+4 distinct, R5 more than two-thirds length of wing, 14 (more than six) flagellomeres, each longer than wide, tibiae without disto-ventral spines, Rs shorter than r-m. Jaschhof (1998: fig. 236, characters 7, 8) characterized the Lestremiini after the relative sizes of the scape, pedicel, and flagellomeres. *L. eocenica* n. sp. has a broad and large scape and pedicel, distinctly broader than its flagellomeres.

According to Jaschhof (1998: fig. 237), the phylogeny of the Lestremiini is imperfectly understood. Nevertheless, the genera *Anarete* Haliday, 1833 and *Conarete* Pritchard, 1951 can be excluded because of the presence of 14 long-necked flagellomeres, instead of six to eight with short or indistinct stems. Within the Palaearctic and Nearctic faunas, the presence of two crenellate whorls on flagellomeres excludes affinities with genera other than *Lestremia* Macquart, 1826 and *Anarerella* Enderlein, 1911 (Gagné 1981; Skuhravá 1997). The absence of

digitate flagellomere sensoria (also excluding affinities with *Allaretella* Meyer & Spungis, 1994), the parameres very narrow in distal portion, together with M3+4 with proximal end close to M, well before level of r-m, exclude the genus *Anaretella* and are characters diagnostic of recent *Lestremia* (Edwards 1938a; Meyer & Spungis 1994; Skuhrová 1997; Jaschhof 1998).

After Mani (1935, 1945), the Indian genus *Neolestremia* Mani, 1935 (two species *N. boerhaaviae* Mani, 1935 and *N. longipalpsa* Deshpande, Shaikh & Sharma, 2002) has a three-segmented palpus, instead of a four-segmented palpus in *Lestremia* and in *L. eocenica* n. sp.

L. eocenica n. sp. differs from the recent *Lestremia* species in the longer flagellomere nodes that are four times as long as the necks, instead of being shorter or of the same length or nearly so (Kieffer 1913; Jaschhof 1998). This is especially the case for the male flagellomeres in recent species. But this character can be variable as the necks can be very short in the female flagellomeres of the recent *L. cinerea* Macquart, 1826 (see Jaschhof 1998: fig. 26G). Nevertheless, *L. eocenica* n. sp. is characterized by its forked gonostylus, unlike the recent Palaearctic *Lestremia* species. The shape of the bilobed gonostylus of *L. eocenica* n. sp. is very close to that of *Insulestremia sinclairi* Jaschhof, 2005 (Galapagos Islands), with a side lobe slightly narrower than that of the latter (Jaschhof 2005: fig. 2). *L. eocenica* n. sp. does not present the main character of *Insulestremia*, i.e. presence of flattened sensillae on the antennal flagellum.

We provisionally include *L. eocenica* n. sp. in the genus *Lestremia*, but this attribution needs confirmation after a global phylogenetic revision of the world *Lestremiini*.

Note: if the *Lestremiinae* are relatively well known in the Oriental, Palaearctic, and Nearctic regions, it is not the case for the Neotropical and Afrotropical faunas, especially for Africa (Harris 1980). Thus, it is not possible to propose any biogeographical inference after the present discovery.

COMPARISON WITH OTHER FOSSIL LESTREMIINI

Lestremia pinites Meunier, 1904 from the late Eocene Baltic amber is the only known fossil attributed to

Lestremia (Spahr 1985; Evenhuis 1994). It differs from *L. eocenica* n. sp. in its long necks of flagellomeres and the relative length of its palpal segments (Meunier 1904: 31, pl. 3, figs 3, 5). Nothing is known on the male genitalia of *L. pinites*.

The fossil genus and species *Lithomyza condita* Scudder, 1877 (lacustrine Green River Formation, middle Eocene, Chagrin Valley, Colorado, USA) is considered as a “*Lestremiinae*” (= *Lestremiini*) by Felt (1911), but with affinities with the genera *Microcerata* Felt, 1908 (junior synonym of the *Lestremiini* *Anarete* Haliday, 1833, after Pritchard 1951), and *Tritozyga* Loew, 1862 (Catochini). This fossil would need a revision. Nevertheless, it has nine jointed antennae, unlike *L. eocenica* n. sp. (Scudder 1877; Felt 1911).

Lestremia deploegi n. sp.

(Fig. 2)

TYPE MATERIAL. — Holotype specimen PA 1842 2/3, paratype PA 1608 1/7.

ETYMOLOGY. — After our friend Gaël De Ploëg, collector of the type specimen.

DIAGNOSIS (MALE). — Flagellomeres with nodes and necks of nearly equal length, eyes meeting above by only one point; fourth palpal segment is 1.7 as long as the third palpal segment; male gonostylus simple, not divided into a large inner lobe and an apical lobe.

DESCRIPTION

Head 0.11 mm long, 0.13 mm wide, 0.33 mm high; eyes very broad; eye bridge incomplete with eyes meeting in only one point; two ocelli well developed just above the eyes; antenna 1.08 mm long, scape 0.05 mm long, 0.03 mm wide, pedicel 0.04 mm long, 0.02 mm wide, 14 long flagellomeres, of nearly the same sizes, all longer than wide (0.08 mm long, 0.03 mm wide), and with a distinct neck, nodes of flagellomeres slightly shorter than necks (ratio length of node/length of neck 1.7), last flagellomere 0.05 mm long; flagellomeres with three rows of setae, the two basal one being crenulate; digitate sensoria absent on flagellomeres; gena short; palpus very long, 0.17 mm long, with four visible long segments, with palpal segment 1 short and stout,

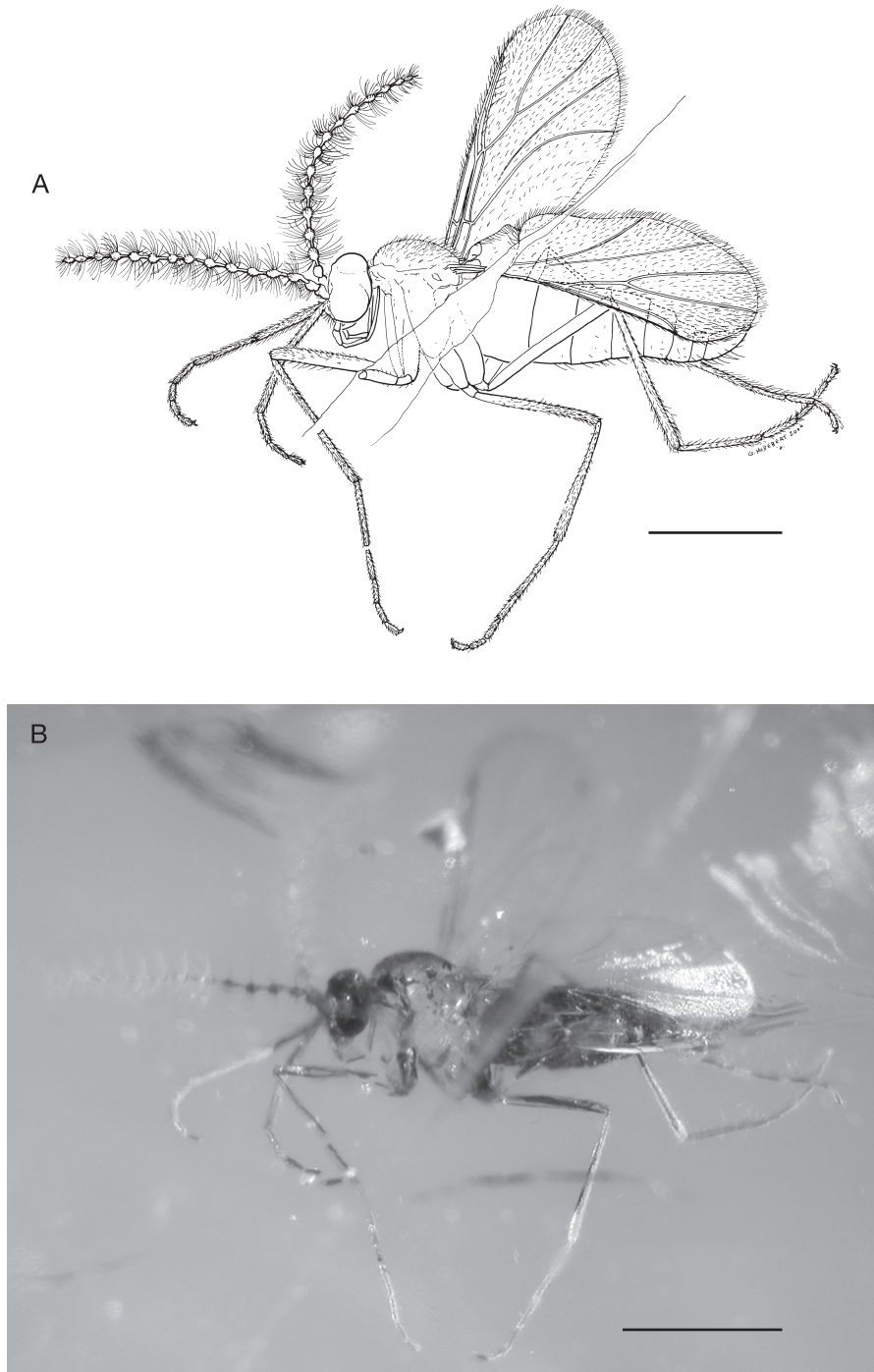


FIG. 2. — *Lestremia deploegi* n. sp., holotype (PA 1842 2/3), general habitus: **A**, drawing; **B**, photograph. Scale bars: A, 0.5 mm; B, 1 mm.

distal three palpal segments elongate, palpal segment 2 0.05 mm long, palpal segment 3 0.05 mm long, palpal segment 4 0.07 mm long; presence of rather long setae on palpal segments 3 and 4.

Thorax 0.38 mm long, 0.36 mm high, 0.25 mm wide, longer than broad.

Wing 1.10 mm long, 0.53 mm wide, hyaline, with microtrichia and macrotrichia, especially in posterior part of wing and along posterior margin; veins of posterior part of wing nearly as strong as those of anterior part; Costa not ending at apex of R5 but continuing around wing, although the strong anterior portion of C ends up with R5; humeral vein present, 0.11 mm from wing base; subcostal vein incomplete, 0.37 mm long, not reaching wing margin; vein R1 short, reaching anterior wing margin 0.44 mm basal of apex of R5; vein Rs emerging from R close to apex of R1 (0.42 mm); cross-vein r-m present but very short, 0.02 mm long; vein M1+2 never fused to Rs; sector of M1+2 basal of fork into M1 and M2 0.18 mm long, distinctly shorter than branches of fork; M1 complete and curved basally; M2 complete basally; vein m-m absent; vein M3+4 distinct, simple and nearly straight, basally vanishing close to M but basally replaced by a fold, very close to base of M; CuA simple, curved; CuP present, parallel to CuA and 0.38 mm long; A1 curved and long, complete basally and ending close to posterior wing margin; A2 not visible, probably absent.

Haltere with large knob, 0.08 mm wide and 0.1 mm long, and stem 0.09 mm long, bearing only two setae at its apex.

Legs slender, without scales; fore femur 0.50 mm long, tibia 0.45 mm long, tarsi 0.70 mm long; mid femur 0.63 mm long, tibia 0.50 mm long, tarsi 0.75 mm long; hind femur 0.65 mm long, tibia 0.58 mm long, tarsi 0.82 mm long; femora and tibiae not especially swollen; tibial spurs absent; tarsal claw with large basal lobe with small teeth; all legs with five tarsomeres, with tarsomere 1 longer than 2.

Abdomen (male) with eight segments before genitalia, 1.05 mm long, 0.38 mm wide, bearing numerous long setae; segment 8 unmodified; parameres not visible, hidden by wings; gonostylus simple, short and broad, curved, 0.21 mm

long, 0.09 mm wide, bearing numerous curved setae.

DISCUSSION

For the same reason as *Lestremia eocenica* n. sp. above, *L. deploegi* n. sp. falls in the genus *Lestremia*. *L. deploegi* n. sp. differs from *L. eocenica* n. sp. in its simple gonostylus, and also the nodes of flagellomeres slightly shorter than the necks, instead of being distinctly longer. This character of *L. deploegi* n. sp. is also present in the recent *Lestremia* species and in the Baltic amber *L. pinites* (Kieffer 1913; Jaschhof 1998). Also, the eyes of *L. deploegi* n. sp. meet dorsally at only one point, unlike those of *L. eocenica* n. sp. and in the recent *Lestremia* species in which the eye-bridge is three or four facets broad (Edwards 1938a: 25). Nothing is known about the eye-bridge of *L. pinites*, but Meunier (1904) indicated that the male fourth palpal segment of this last species is 1.3 as long as its third palpal segment. In *L. deploegi* n. sp., the fourth palpal segment is 1.7 as long as the third palpal segment.

Tribe MICROMYINI Rondani, 1856

Genus *Neurolyga* Rondani, 1840

Neurolyga magnifica n. sp.

(Fig. 3)

TYPE MATERIAL. — Holotype specimen PA 1678 2/3 (female).

ETYMOLOGY. — After the wonderful state of preservation of the fossil.

DIAGNOSIS (FEMALE). — Antenna 14-segmented, flagellomeres without distal sensory collar but with numerous long setae arranged in three rows, palpus with four visible long segments, compound eyes completely divided into two lateral portions and one dorsal portion, ocelli three, tibiae without disto-ventral spines and spurs, empodia well developed and very setose, macropterous; cubital fork forming almost a right angle, vein M1+2 ending on posterior wing margin, M3+4 very faint, appearing as a fold distally vanishing, M1+2 simple, R5 as long as wing, R1 more than three times length of Rs basal of r-m, cubital fork forming almost a right angle, strong anterior portion of Costa extending well beyond R5 for half distance between R5 and M1+2, along wing margin.

DESCRIPTION

Head 0.9 mm long, 0.3 mm wide, 0.33 mm high; eyes very broad, separated by a distinct space (0.04 mm long) into two large lateral eyes, 0.1 mm long, 0.25 mm wide, and an upper eye, 0.07 mm long, 0.09 mm wide; three ocelli well developed just above the upper eye; antenna 0.71 mm long, scape 0.03 mm long, 0.03 mm wide, pedicel 0.05 mm long, 0.04 mm wide, 12 long flagellomeres, of nearly the same sizes, all longer than wide (0.06 mm long, 0.07 mm wide), and with a distinct neck, but nodes of flagellomeres distinctly longer than necks (ratio length of node/length of neck = 3), last flagellomere 0.06 mm long, three complete rows of rather long setae on flagellomeres but no collar-shaped sensoria; palpus not very long, 0.18 mm long, with four long visible segments, with palpal segment 1 short and stout, palpal segment 2 0.05 mm long, palpal segment 3 0.04 mm long, palpal segment 4 rather long, but its apex is hidden by the fore tibia.

Thorax 0.48 mm long, 0.35 mm high, 0.40 mm wide, longer than broad; with numerous setae on scutum.

Wing 2.0 mm long, 0.94 mm wide, hyaline, with microtrichia and few macrotrichia on membrane; veins of posterior part of wing less strong than those of anterior part; strong anterior portion of Costa not ending at apex of R5 but continuing for 0.24 mm, close to apex of M1+2; humeral vein absent; subcostal vein very close to R, incomplete, 0.4 mm long, not reaching wing margin; vein R1 1.15 mm long, five times longer than basal part of Rs, reaching anterior wing margin 2.1 mm basal of apex of R5; R5 ending close to wing apex; vein Rs emerging from R 10.4 mm from wing base; Rs basal of cross-vein r-m very short (0.16 mm long); cross-vein r-m longer than Rs, 0.18 mm long; vein M1+2 not forked into M1 and M2, and distinctly weaker than radius, almost vanishing near its apex; vein M3+4 absent, replaced by a basal fold; CuA forked 0.72 mm from wing base, curved, fork very opened with branches of CuA nearly at right angle; CuP absent; A1 and A2 absent; anal area weakly convex; presence of at least one pore ("Sinnesporen" *sensu* Jaschhof 1998) on R1, two on basal part of Rs, two on part of Rs just distal r-m, and three on CuA basal of its fork.

Haltere with large knob, 0.05 mm wide and 0.18 mm long, and stem 0.16 mm long, bare.

Legs slender, without visible scales but with numerous short setae; fore femur 0.45 mm long, tibia 0.46 mm long, tarsi 0.61 mm long; mid femur 0.45 mm long, tibia 0.5 mm long, tarsi 0.6 mm long; hind femur 0.58 mm long, tibia 0.57 mm long, tarsi 0.85 mm long; femora and tibiae not especially swollen; tibial spurs absent; empodia well developed and very setose; all legs with five tarsomes, with tarsomere 1 twice as long as 2.

Abdomen (female) 1.10 mm long, 0.32 mm wide, bearing numerous long setae; sternite 8 0.09 mm long, tergite 9 0.05 mm long, cerci 2-segmented, 0.08 mm long, with apex rounded and with few short setae, shorter than those of sternite 8; spermathecae not visible.

DISCUSSION

Following the keys to Nearctic genera of Gagné (1981), *Neurolyga magnifica* n. sp. falls in the Micromyini subgroup of genera *Campylomyza* Meigen, 1818, *Neurolyga* Rondani, 1840 (under the name *Cordylomyia* Felt, 1911 as junior synonym, see Jaschhof 1997), and *Corinthomyia* Felt, 1907 (all in Campylomyzini), because of its CuA forked, M3+4 very faint, appearing as a fold distally vanishing, R5 as long as wing, tibiae without disto-ventral spines, C extending well beyond R5 for half distance between R5 and M1+2, along wing margin, R1 more than three times length of Rs, empodia broad. The new taxon has the following synapomorphies of the clade Micromyini, as outlined by Jaschhof (1998: fig. 236): anal area weakly convex, veins h, sc-r, CuP, and A absent, M1+2 simple, M3+4 reduced to a fold between M1+2 and CuA, density of macrotrichia reduced on wing membrane. Following the key to European genera of Skuhrová (1997), *N. magnifica* n. sp. falls in the Campylomyzini because of the following characters: ocelli three, M1+2 simple, R5 as long as wing, few macrotrichia on wing membrane, eye bridge narrowed laterally, forming medially the apparent third eye, empodia well developed and very setose. Furthermore, *N. magnifica* n. sp. has not the synapomorphies of the Acoenoniini, sister group of Campylomyzini, viz. tibia with distal rigid and sharp setae, shortening of R5 and of distal part

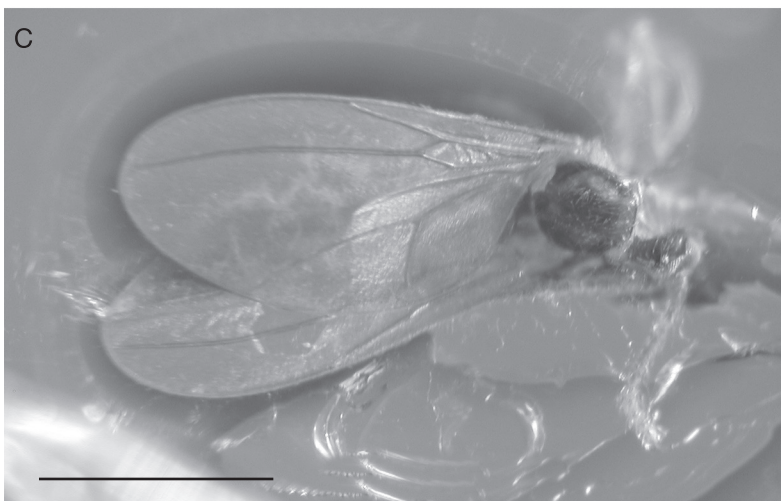
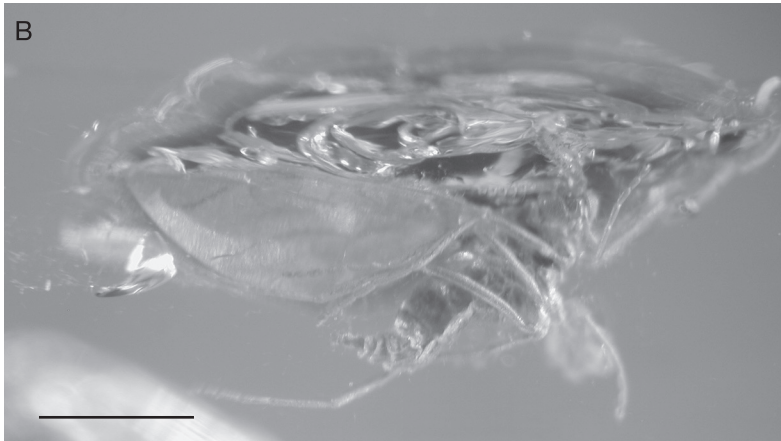
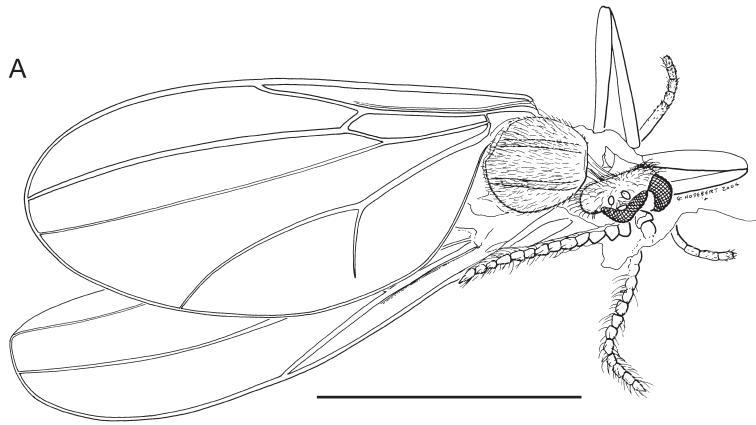


FIG. 3. — *Neurolyga magnifica* n. sp., holotype (PA 1678 2/3), general habitus: **A**, drawing; **B**, photograph of lateral view; **C**, photograph of dorsal view. Scale bars: 1 mm.

of C, “Sinnesporen” few (Meyer & Spungis 1994; Jaschhof 1998).

Following the key to Campylozini genera of Skuhrová (1997), *N. magnifica* n. sp. would fall near the genus *Corinthomyia* because of the following characters: female flagellomeres without distal sensory collar (the presence of a sensory collar is a synapomorphy of the group of genera *Excrescentia* + *Micropteromyia* + *Campylomyza*); macropterous; cubital fork forming almost a right angle, more acute in *Neurolyga* (Edwards 1938c). This character is probably subject to variation and of little value. Other differences between *Neurolyga* and *Corinthomyia* concern male structures and female spermathecae, not available in our fossil (Jaschhof 1998).

More precisely, *N. magnifica* n. sp. differs from *Micropteromyia* Mamaev, 1960 in its antennae 14- instead of 12-segmented and palpus 4-segmented (Mamaev 1960, 1963; Jaschhof 1998). The female of *Excrescentia* Mamaev & Berest, 1991 has 14-segmented antennae, but most of them with a well developed collar-shaped sensoria, unlike in *N. magnifica* n. sp. (Mamaev & Berest 1991; Økland 1995). The female *Campylomyza* have also a collar-shaped sensoria. Among the non Holarctic faunas, the Neotropical genus *Psadaria* Enderlein, 1940 has a female identical to those of *Corinthomyia brevicornis*, after Freeman (1953). Gagné (1994) indicated that it could be a junior synonym of this last genus but after the revision of Lagrange (1980: fig. 2), the wing venation of *Psadaria pallida* Enderlein, 1940 strongly differs from that of *C. brevicornis* and of *N. magnifica* n. sp. in its reduced vein M1+2, and veins R1, R5 and CuA not reaching wing margin. Other known Neotropical taxa correspond to genera recorded from the Holarctic. Kieffer (1919) described the genus African *Tricampylomyza* (Cameroun) in the tribe “Campylomyzariae”. It has antennae with eight flagellomeres and a one-segmented palp. The Asiatic and Australian faunas are very incompletely known with species belonging to Holarctic genera.

The type female of *N. magnifica* n. sp. differs from the female of the recent unique species *Corinthomyia brevicornis* (Felt, 1907) in the following

characters: 14 antennomeres instead of 11; presence of numerous long setae on flagellomeres disposed in three rows, instead of only a “subapical band of very numerous short sensory spines and some a little longer” (Edwards 1938c: 203, fig. 13b). Thus, we can exclude the genus *Corinthomyia*. We tentatively attribute this fossil to the genus *Neurolyga*, but only the discovery of the male will allow to precise its exact position.

One “spectacular” character of *N. magnifica* n. sp. is its composed eyes completely divided into two lateral eyes and one dorsal eye, unlike *Corinthomyia*, in which the eyes are 2-3 facets wide at narrowest point (Edwards 1938b). The eyes are completely divided into three parts in *Campylomyza* (Edwards 1938c) and *Tricampylomyza* (Kieffer 1919). The situation is variable (divided or not) in the different *Neurolyga* species (Edwards 1938c), and the eyes are not divided in *Excrescentia* (after Mamaev & Berest 1991). Thus, this character alone is not sufficient to correctly separate the new species *N. magnifica* n. sp. from other Campylozini.

Gagné (1977) described the Cretaceous genus and species *Cretocordylomyia quadriseries* from the Cedar Lake amber (Canada). He considered that it is “close to *Cordylomyia* and *Campylomyza*” on the basis of the “long, broad empodium and long R1”. Gagné indicated that the female flagellomeres of *Cretocordylomyia* are “similar to those of *Cordylomyia* spp.” but, after his figure 7, they bear a row of long basal setae, absent in recent *Neurolyga* (see Edwards 1938c: figs 11, 12). Nevertheless, *Cretocordylomyia* differs from *N. magnifica* n. sp. in the presence of only one row of long setae on female flagellomeres, its fork of CuA forming an acute angle, and its vein M1+2 vanishing in wing membrane and not ending on posterior wing margin.

It is nearly impossible at this stage to be precise about the phylogenetic affinities of *Cretocordylomyia* within the Campylozini because of the following problems: the Neotropical and African genera were not introduced in the analysis of Jaschhof; our knowledge is still very incomplete, as the Asiatic and Australasian fauna are poorly known, with probably new taxa to discover. Nevertheless, the presence of fossil representatives of this clade

in the Late Cretaceous and Early Tertiary demonstrates its great antiquity.

Campylomyza crassitarsis Meunier, 1904, from the Eocene Baltic amber, has 12 flagellomeres with row(s) of long setae. Meunier (1904: figs 16, 18-20) did not figure any collar-shaped sensoria, unlike in the recent *Campylomyza* species. The female antennae of *C. crassitarsis* look very similar to those of *N. magnifica* n. sp., in number and ornamentation of flagellomeres. Meunier (1904) indicated nearly nothing on the wing venation and eye structure of *C. crassitarsis*. Thus, the exact generic position of this species is uncertain and this species should be revised. *C. crassitarsis* differs from *N. magnifica* n. sp. in its pilose wings ("ailes bien poilues", after Meunier 1904: 29). Fedotova (in Fedotova & Perkovsky 2004) described *Campylomyza falciformis*, *C. superposita*, and *Neurolyga declinata* from the Eocene Rovno amber, without indicating or figuring anything on the collar-shaped sensoria of flagellomeres, the female spermathecae, and their eyes. Thus, their exact affinities are questionable. They remain difficult to compare to *N. magnifica* n. sp. Nevertheless, *C. superposita* has wings 0.9 mm long, *C. falciformis* has wings 1.1 mm long, instead of 2.0 in *N. magnifica* n. sp. *Neurolyga declinata* is based on a poorly preserved male specimen, apparently smaller than *N. magnifica* n. sp.

Tribe ACOENONIINI Pritchard, 1960

Genus *Proacoenonia* n. gen.

TYPE SPECIES. — *Proacoenonia olgae* n. sp. by present designation.

ETYMOLOGY. — After its similarity with the recent genus *Acoenonia* Pritchard, 1947.

DIAGNOSIS (MALE). — Four palpal segments, three ocelli, 14 flagellomeres, eyes holoptic, with mediodorsal part not separated from the two lateral parts, tibiae with distoventral long setae, tarsomere 1 distinctly shorter than tarsomeres 2-4, macropterous, M1+2 simple, CuA forked, M3 absent, R5 abbreviated, much shorter than wing, wing membrane with macrotrichia, especially in the area between R5 and M1+2.

Proacoenonia olgae n. sp. (Fig. 4)

TYPE MATERIAL. — Holotype specimen PA 1599 1/2, paratype PA 1599 2/2 (in the same piece of amber).

ETYMOLOGY. — After Olga Prokopová, wife of one of us (J.P.).

DIAGNOSIS. — That of the genus.

DESCRIPTION

Head 0.15 mm long, 0.20 mm high; eyes holoptic, with mediodorsal part not separated from the two lateral parts; three ocelli; antenna 0.58 mm long, scape 0.06 mm long, 0.04 mm wide, pedicel 0.04 mm long, 0.04 mm wide, 14 flagellomeres, of nearly the same sizes, all longer than wide (0.06 mm long, 0.04 mm wide), and with a distinct neck, but nodes of flagellomeres distinctly longer than necks (ratio length of node/length of neck = 0.75), last flagellomere 0.05 mm long, flagellomeres with three rows of long curved setae, slightly longer than the width of the flagellomere; palpus with four visible long segments, with palpal segment 1 short and stout, palpal segment 2 0.05 mm long, palpal segment 3 0.05 mm long, palpal segment 4 0.10 mm long.

Thorax 0.32 mm long, 0.20 mm high, longer than broad.

Wing 0.92 mm long, 0.46 mm wide, hyaline, macropterous, wing membrane with macrotrichia, especially in the area between R5 and M1+2; veins of posterior part of wing less strong than those of anterior part; strong anterior portion of Costa ending at apex of R5; humeral vein absent; subcostal vein very close to R, incomplete, 0.26 mm long, not reaching wing margin; vein R1 0.36 mm long, 18 times longer than Rs, reaching anterior wing margin 0.22 mm basal of apex of R5; R5 abbreviated, much shorter than wing; Rs emerging from R 10.4 mm from wing base; Rs basal of cross-vein r-m very short (0.02 mm long); cross-vein r-m distinctly longer than Rs, 0.04 mm long; vein M1+2 not forked into M1 and M2, and distinctly weaker than radius; vein M3+4 absent; CuA forked 0.43 mm from wing base, fork not very opened; CuP absent; A1 and A2 absent; anal area weakly convex; no visible pore ("Sinnsporen" *sensu* Jaschhof 1998) on

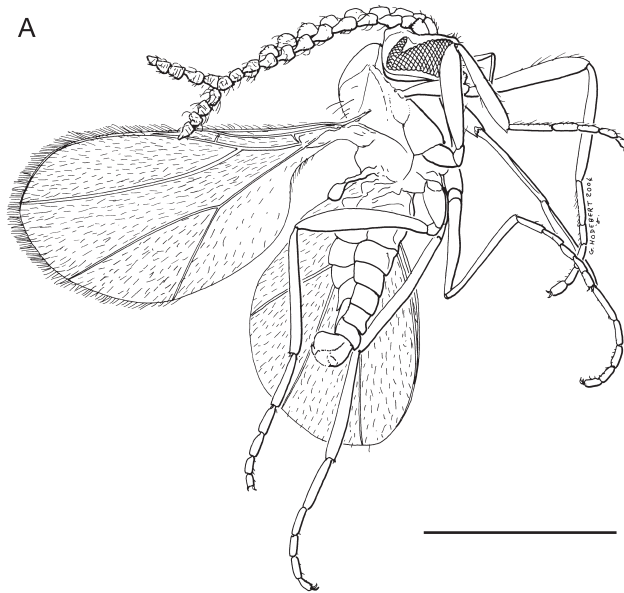


FIG. 4. — *Proacoenonia olgae* n. gen., n. sp., holotype (PA 1599 1/2), general habitus: **A**, drawing; **B**, holotype and paratype (PA 1599 2/2), photograph. Scale bars: A, 0.5 mm; B, 1 mm.

R1, Rs, R5, and CuA (preservation?).

Haltere with large knob, 0.05 mm wide and 0.04 mm long, and stem 0.09 mm long, bare.

Legs slender, without visible scales but with numerous short setae; all tibiae with 3-4 distoventral rigid and sharp setae, stronger than other setae on the tibia but narrower than those of the recent *Acoenomia* (Jaschhof 1998: fig. 42h); fore femur 0.31 mm long, tibia 0.35 mm long, tarsi 0.32 mm long; mid femur 0.34 mm long, tibia 0.18 mm long, tarsi 0.22 mm long; hind femur 0.35 mm long, tibia 0.33 mm long, tarsi 0.37 mm long; femora and tibiae not especially swollen; tibial spurs absent; empodia well developed and very setose; all legs with five tarsomes, with tarsomere 1 distinctly shorter than tarsomeres 2-4.

Abdomen (male) 0.52 mm long, 0.20 mm wide, bearing numerous long setae; genital appendages poorly visible.

DISCUSSION

Following the keys to genera of Gagné (1981) and that of Skuhravá (1997), *Proacoenonia* n. gen. would fall in the Acoenoniini because of the following characters: three ocelli, macropterous, M1+2 simple, CuA forked, M3 absent, R5 abbreviated, much shorter than wing, tibiae with distoventral spines. After the phylogenetic analysis of Jaschhof (1998), *Proacoenonia* n. gen. has two of the three autapomorphies of *Acoenonia* Pritchard, 1947, unique recent genus of this tribe, viz. tibia with distal rigid and sharp setae (although narrower than those in *Acoenonia*), and shortening of R5 and of distal part of C. The third apomorphy, "Sinnesporen" few, cannot be observed in *Proacoenonia* n. gen.

Proacoenonia n. gen. differs from *Acoenonia* in numerous characters: wing membrane with macrotrichia, especially in the area between R5 and M1+2; male antenna with 14 flagellomeres, instead of 12; eyes holoptic, with mediadorsal part not separated from the two lateral parts, instead of the presence of "three" eyes in *Acoenonia*; tarsomere 1 distinctly shorter than tarsomeres 2-4, instead of being of the same length (at least in *A. nana* Meyer & Spungis, 1994) (Pritchard 1947, 1960; Meyer & Spungis 1994). One further difference is the presence of four

palpal segments in *Proacoenonia* n. gen., instead of 2-3 in the *Acoenonia* species.

Subfamily PORRICONDYLINAE Kieffer, 1913 Tribe WINNERTZIINI Panelius, 1965

Genus *Electroxylomyia* n. gen.

TYPE SPECIES. — *Electroxylomyia eocenica* n. sp. by present designation.

ETYMOLOGY. — After Electron and recent genus *Cryptoxylomyia*.

DIAGNOSIS. — Ocelli absent, eleven flagellomeres in both male and female, no band-shaped or digitate, horseshoe-shaped, star-like or fan-like sensorium on flagellomeres, palpus very strongly reduced, not visible, absent or with only one segment, tarsomere 1 much shorter than 2, fifth tarsal segment only slightly longer as fourth, without sensorial bristles on the ventral surface, vein A2 absent, R with only two branches, R5 as strong as other veins, C continuing around wing, M1+2 absent, CuA simple, female cercus two-segmented.

Electroxylomyia eocenica n. sp. (Fig. 5)

TYPE MATERIAL. — Holotype specimen PA 3004 1/8 (male), allotype specimen PA 3004 2/8 (female), in the same piece of amber with two Hymenoptera, three insect larvae and an arachnid. Paratype specimen PA 5468 1/2 (female), together with a Diptera Psychodidae.

ETYMOLOGY. — After the Eocene age of the fossils.

DIAGNOSIS. — That of the genus.

DESCRIPTION

Head 0.16 mm long, 0.15 mm high; eyes well separated, rounded, 0.12 mm diameter; ocelli absent; antenna 0.37 mm long, scape 0.3 mm long, 0.2 mm wide, pedicel 0.3 mm long, 0.2 mm wide, 11 flagellomeres in both male and female, of nearly the same size, all longer than wide (0.3 mm long, 0.1 mm wide in male; 0.2 mm long, 0.1 mm wide in female), and with a distinct neck in male (ratio length of node/length of neck = 2), neck inconspicuous in female, last flagellomere 0.15 mm long, flagellomeres not band-shaped or digitate,

horseshoe-shaped, without visible star-like or fan-like sensorium, palpus very strongly reduced, not visible in both male and female, absent or with only one segment.

Thorax 0.25 mm long, 0.20 mm high, longer than broad.

Wing 0.76 mm long, 0.25 mm wide (male), 0.95 mm long, 0.35 mm wide (female), hyaline, macropterous, wing membrane with few visible macrotrichia, wing margin with numerous long macrotrichia; Costa continuing around wing; humeral vein absent; subcostal vein very close to R, incomplete, 0.30 mm long (female), not reaching wing margin; vein R1 0.43 mm long (female); R5 simple, not thickened, vanishing in wing membrane 0.17 mm from posterior wing margin (female); Rs emerging from R 0.10 mm from wing base; Rs basal of cross-vein r-m very short (0.01 mm long); part of vein M distal of fusion with Rs absent; CuA simple, vanishing in wing membrane 0.03 mm from posterior wing margin; CuP absent; A1 and A2 absent.

Haltere with large knob, 0.04 mm wide and 0.08 mm long, and stem 0.10 mm long, bare.

Legs slender, without visible scales but with numerous short setae; fore femur 0.20 mm long, tibia 0.22 mm long, tarsi 0.21 mm long; mid femur 0.18 mm long, tibia 0.19 mm long, tarsi 0.19 mm long; hind femur 0.24 mm long, tibia 0.27 mm long, tarsi 0.20 mm long; femora and tibiae not swollen; tibial spurs absent; all legs with five tarsomes, tarsomere 1 much shorter than 2, fifth tarsal segment only slightly longer as fourth, without sensorial bristles on the ventral surface.

Abdomen (male) 0.50 mm long, 0.10 mm wide, mid part; genital appendages poorly visible, but gonostyles with few small hairs and no claw at apex.

Abdomen (female) elongate, 0.80 mm long, 0.15 mm wide in mid part, cercus two-segmented, 0.45 mm long.

DISCUSSION

After Wood & Borkent (1986, 1989), *Electroxylomyia eocenica* n. gen., n. sp. falls in the Cecidomyiidae rather than in Sciaridae, because of the following synapomorphies: presence of an eye bridge (character

also present in Sciaridae and Scatopsoidea), tibial spurs absent (see also Gagné 1994) (but character also present in Scatopsidae); setae of flagellomeres arranged in encircling whorls. After the partial phylogenetic analysis of the cecidomyiid subfamilies of Jaschhof (2000), *Electroxylomyia* n. gen. has the two synapomorphies of the Porricondylinae + Cecidomyiinae, viz. the lack of ocelli and first tarsomeres shortened. Following the key to dipteran families of McAlpine (1981), *Electroxylomyia* n. gen. falls in the Porricondylinae because of the following characters: vein A2 absent, R with only two branches, C continuing around wing, ocelli absent, tarsomere 1 much shorter than 2, M1+2 absent, R5 as strong as other veins, female cercus two-segmented. Following the keys to Nearctic and European genera proposed by Gagné (1981, 1994) and Skuhrová (1997), *Electroxylomyia* n. gen. shares with the Heteropezini its wing veins greatly reduced and CuA simple. But similarly reduced wing can be found in some Winnertziini (Mamaev & Zaitzev 1998). Also, both the male and female of *Electroxylomyia* n. gen. have eleven flagellomeres, instead of 10 or less as in recent Heteropezini. This last character would exclude affinities with this last tribe.

Within the Porricondylinae with more than 10 flagellomeres, *Electroxylomyia* n. gen. would fall in the Winnertziini because it has only 11 flagellomeres, and no circumfila on its flagellomeres. Thus, we tentatively attribute it to this tribe rather than to the Heteropezini. Nevertheless, a phylogenetic analysis of the whole subfamily Porricondylinae is necessary before any definite conclusion. *Electroxylomyia* n. gen. could as well have been a Heteropezini with 11 flagellomeres.

After the key to genera of Winnertziini of Mamaev & Zaitzev (1998), *Electroxylomyia* n. gen. could fall in *Kronomyia* Felt, 1911 because of the following characters: fifth tarsal segment only slightly longer as fourth, without sensorial bristles on the ventral surface; no band-shaped or digitate, horseshoe-shaped sensorium on flagellomeres; antennae of male with 2 + 11 segments, as in female. But *Electroxylomyia* n. gen. strongly differs from *Kronomyia* in its vein M absent and its palpus very strongly reduced, not visible, absent or with only one segment (Parnell 1971; Skuhrová 1997). *Electroxylomyia* n. gen.

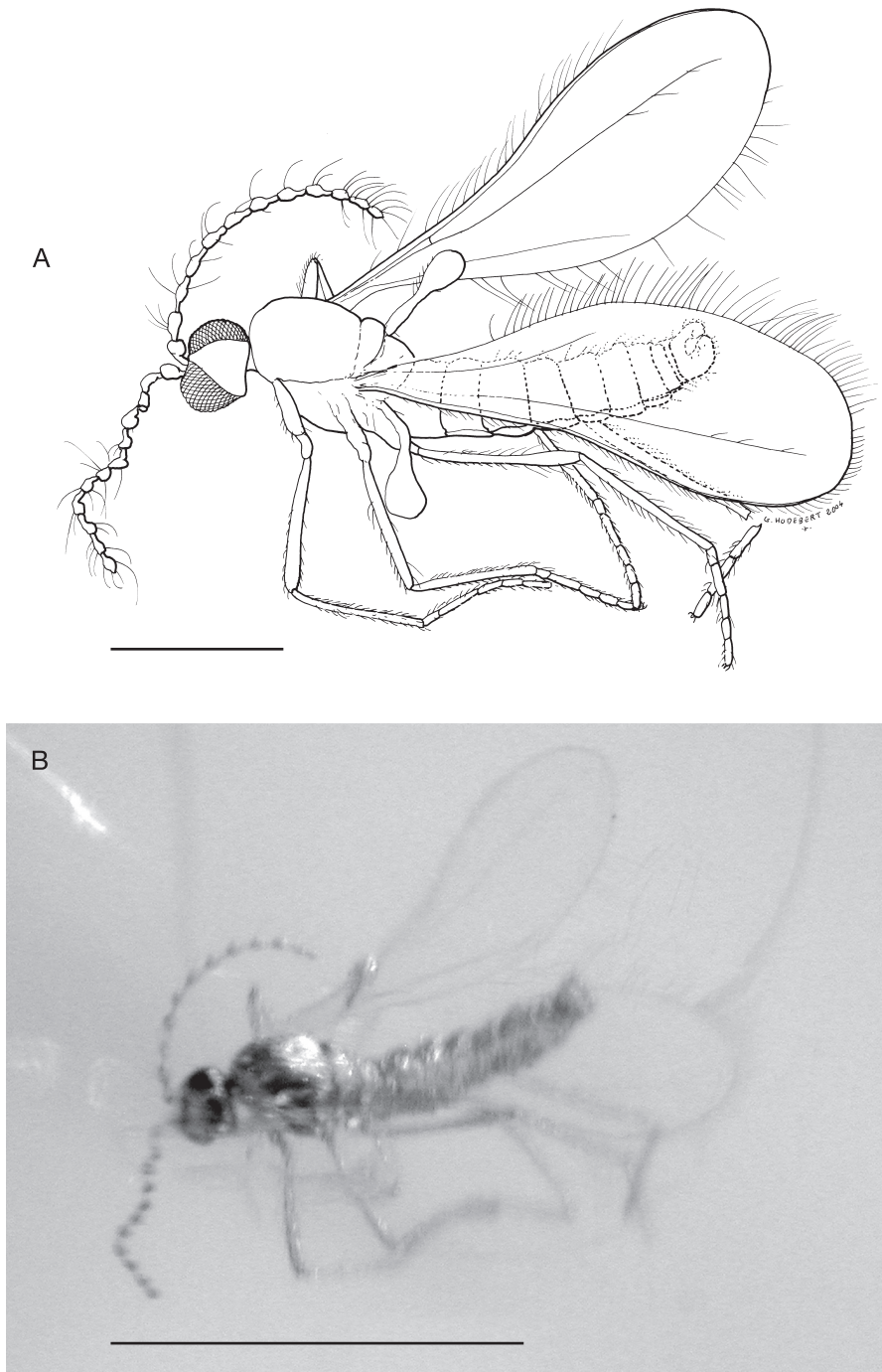


FIG. 5. — *Electroxylomyia eocenica* n. gen., n. sp., holotype (PA 3004 1/8), general habitus: **A**, drawing; **B**, photograph. Scale bars: A, 0.3 mm; B, 0.25 mm.

differs from *Rhipidoxylomyia* Mamaev, 1964 in its median veins absents and in the absence of star-like or fan-like sensorium on flagellomeres (Mamaev 1964). It differs from *Clinorrhytis* Kieffer, 1896 in its male antennae 11-segmented and its vein M absent (Kieffer 1913). It also differs from *Sylvenomyia* Mamaev & Zaitzev, 1998 in its male antennae 11-segmented. It differs from *Winnertzia* Rondani, 1861 and *Parwinnertzia* Felt, 1919 in the absence of digitate, horseshoe-shaped sensorium on flagellomeres. *Electroxylomyia* n. gen. shares with *Cryptoxylomyia* Mamaev & Zaitzev, 1998 the reduction of the mouth parts and that of wing venation, but it has no trace of forked or digitate sensorium on flagellomeres, unlike this last genus.

Electroxylomyia n. gen. differs from the fossil genus and species *Cretowinnertzia angustala* Gagné, 1977 (Late Cretaceous amber of Canada) in its female antenna with 11 flagellomeres instead of ten, and its palpus strongly reduced instead of being four-segmented (Gagné 1977).

Evenhuis (1994) listed four species of *Winnertzia* in the late Eocene Baltic amber, viz. *W. affinis* Meunier, 1904, *W. cylindrica* Meunier, 1904, *W. radiata* Meunier, 1904, and *W. separata* Meunier, 1904. These species are rather poorly described and their exact generic position remains uncertain because several characters diagnostic of the genus *Winnertzia* are not recorded in Meunier (1904). *W. radiata* differs from *Electroxylomyia* n. gen. in the presence of 12 flagellomeres in female and four-segmented and rather long palpus (Meunier 1904: 25, 26, pl. 4, figs 7, 8). *W. cylindrica* differs from *Electroxylomyia* n. gen. in the same characters, plus the presence of a free vein M (Meunier 1904: 26, pl. 4, figs 9, 10). Meunier (1904: 27) indicated that *W. affinis* is very similar to *W. cylindrica*, the differences between the two concerning the relative lengths of the tarsomeres. *W. separata* differs from *Electroxylomyia* n. gen. in the presence of four-segmented palpus (Meunier 1904: 27). *Winnertzia burmitica* (Cockerell, 1917), from the upper Albian Burmese amber, is the oldest record of the tribe. It has large, three-segmented palpus and antennae probably 12-jointed, unlike *Electroxylomyia* n. gen. Fedotova & Perkovski (2005) described *Winnertzia bellata* and *W. isotoma* from the Rovno amber. They differ from

Electroxylomyia n. gen. in their broader wings with more complete venation.

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