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PTYCHOGROEHNIA REDUCTA GEN. AND SP. NOV. OF THE FOSSIL TRIBE PTYCHOPTILINI FROM THE EOCENE BALTIC AMBER (HEMIPTERA: FULGOROIDEA: ACHILIDAE)

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Abstract. — A new planthopper *Ptychogroehnia reducta* **gen.** and **sp. nov.** from the Eocene Baltic amber is described. The new genus represents the fossil tribe Ptychoptilini Emeljanov, 1990 (Achilidae). The characters of the tribe and its possible bionomics are discussed.

Key words. — Hemiptera, Fulgoroidea, Achilidae, Ptychoptilini, *Ptychogroehnia reducta* gen. and sp. nov., systematic position, Eocene, Baltic amber.

INTRODUCTION

The planthopper family Achilidae is regarded as one of the oldest planthopper families, present in the Lower Cretaceous deposits of Brazil (Hamilton 1990, 1996). Its representatives are quite common in Eocene Baltic amber inclusions (Szwedo and Kulicka 1999), but only three species have been described so far: *Protepiptera kaweckii* Usinger, 1939, and two species of the genus *Ptychoptilum* – *P. major* and *P. minor*, described in the tribe Ptychoptilini (Emeljanov 1990). Some species described in the 19th century in the genus *Cixius* (Germar and Berendt 1856) seem to be achilids, but their status needs further research, because the type material is probably lost (Szwedo in prep.)

Recent Achilidae are distributed world-wide, and reach cold regions of the temperate zone in North Europe (Ossiannilson 1978) and the Russian Far East (Anufriev and Emeljanov 1988); together with Cixiidae and Delphacidae, they seem to be the planthopper groups best adapted to temperate climates (O'Brien and Wilson 1985). Achilidae are more closely associated with gymnosperm plants: Pinaceae and Cupressaceae, particularly trees, some feed on dicotyledons of the family Ericaceae or monocotyledons: Poaceae and Arecaceae. Their nymphs feed on fungal hyphae under bark or in cavities of decaying logs (Wilson et al. 1994).

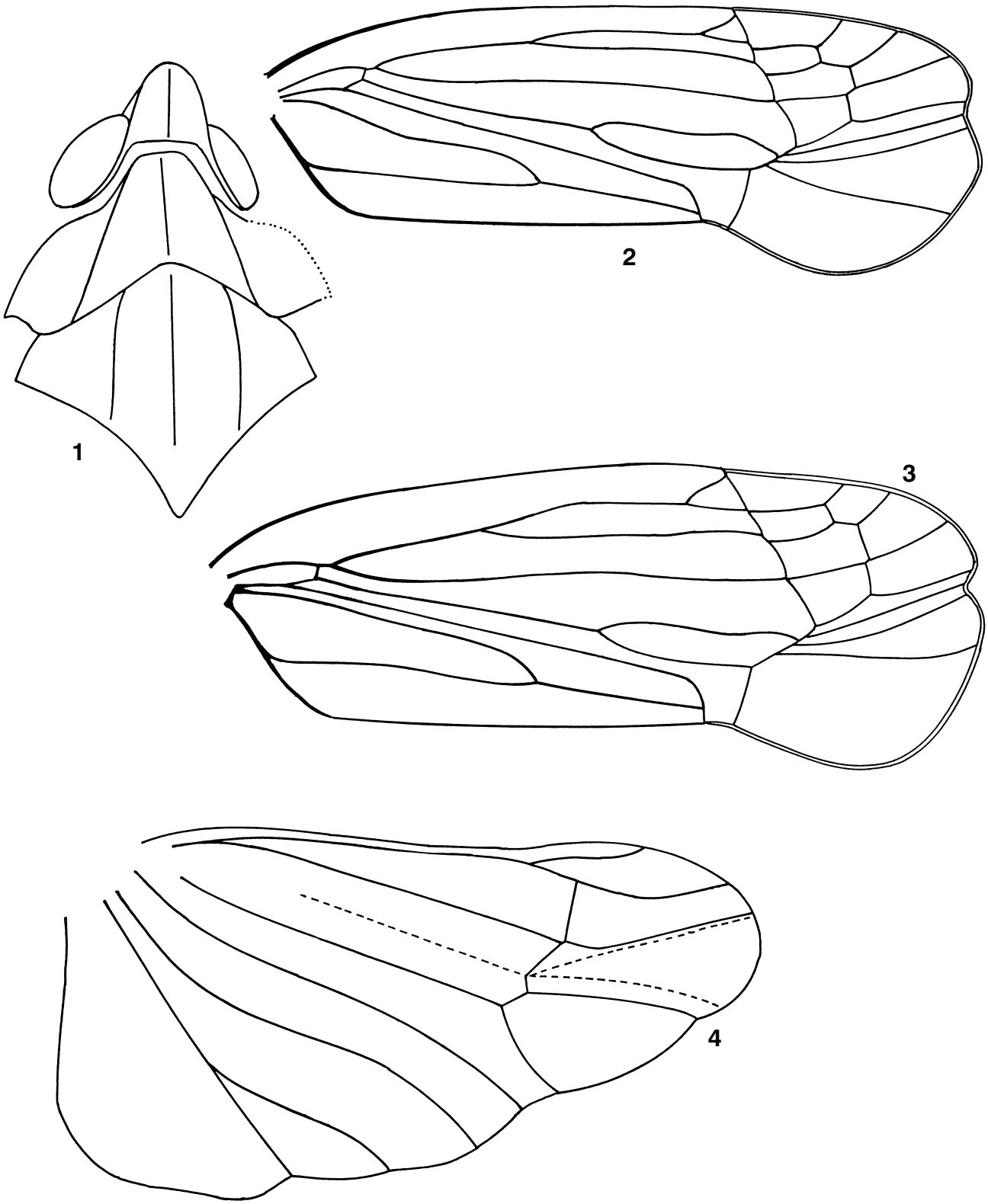
About 80 genera and 250 species of Achilidae have been described so far, comprising three subfamilies: Bebaiotinae, Achilixinae and Achilinae (Emeljanov 1991). The status of the two former groups is still debatable; they used to be treated as representatives of a distinct family – Achilixiidae (O'Brien and Wilson 1985, Wilson 1989, Wilson et al. 1994). Emeljanov (1991, 1992) divided Achilinae into 3 supertribes and 12 tribes: Myconites (Rhotalini, Myconini, Mycarini, Amphignomini, Breddiniolini and Plectoderini) – regarded as a paraphyletic unit (Bourgoin, personal communication), Achilites (Achilini and Achillini) and Apatesonites (Seviini, Ilvini, Apatesonini and Tropiphlepsiini). In 1990, Emeljanov described a fossil tribe Ptychoptilini, which is not placed in his (Emeljanov 1992) classification scheme.

SYSTEMATICS

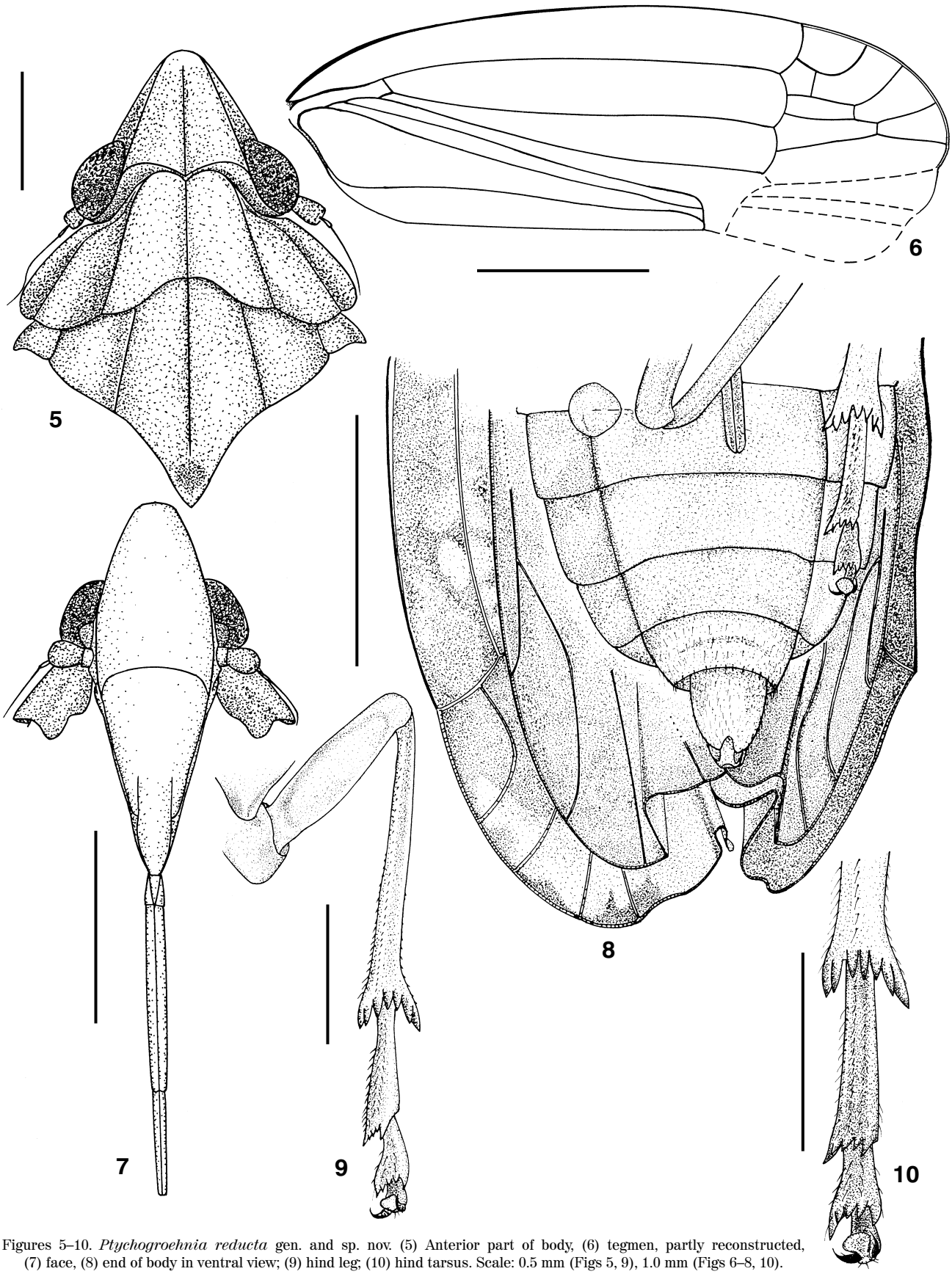
The fossil tribe Ptychoptilini described by Emeljanov 1990, composed of two genera *Ptychoptilum* and *Ptychogroehnia* gen. nov., is characteristic by the uncommon type of tegmina folding: the membrane is folded down at both sides of CuA_1 from the nodal crossvein to the apex of the tegmen, and folded upward along CuA_{2a} for the same distance, then along CuA_{2b}. This deflects the tegmen into three wedges (layers) forming a Z-shaped structure (in cross-section) in the left tegmen in apical view and its mirror image on the right (Figs 8, 15). This produces transverse deflection along the nodal line and the second longitudinal deflection. The latter is unknown in recent Fulgoroidea. Venation of wing scarce, vein M not bifurcated, with a wedge-like system of folds, starting from the bend of nodal line mcu, on which, analogous to tegmen folding, the apical parts of wings are folded (Figs 4, 8, 15).

Ptychogroehnia gen. nov.
(Figs 5–10, 14–15)

Diagnosis. This genus differs from *Ptychoptilum* Emeljanov in the pronotum with five longitudinal carinae



Figures 1–4. 1–3. *Ptychoptilum major* Emelianov. 4. *Ptychoptilum minor* Emelianov. (1) Anterior part of body, (2–3) tegmen, (4) wing. After Emeljanov 1990b



Figures 5–10. *Ptychogroehnia reducta* gen. and sp. nov. (5) Anterior part of body, (6) tegmen, partly reconstructed, (7) face, (8) end of body in ventral view; (9) hind leg; (10) hind tarsus. Scale: 0.5 mm (Figs 5, 9), 1.0 mm (Figs 6–8, 10).

(Figs 5, 14); three carinae are present in *Ptychoptilum* (Fig. 1). Claval veins not united, longitudinal venation of tegmen reduced, veins R and Cu – bifurcate in *Ptychoptilum* (Figs 2–3) – not branching before nodal line (Figs 6, 14).

Description. See description of *Ptychogroehnia reducta* sp. nov.

Type species. *Ptychogroehnia reducta* sp. nov., here designated. Gender: feminine.

Etymology. Combination of the name of the fossil genus *Ptychoptilum* and the name of the collector and owner of a rich collection of Baltic amber inclusions, Mr. Carsten Gröhn.

Ptychogroehnia reducta sp. nov.
(Figs 5–10, 14–15)

Diagnosis. See diagnosis of the genus.

Description. Total length 5.2 mm. Head elongate, head with compound eyes 0.63 times as wide as pronotum. Vertex subtriangular, with median carina distinct; about 2/3 of its length produced before eyes, slightly longer than pronotum, as long in the middle line as wide at base, anterior margin bluntly round-convex, 1.2 times wider at the basal margin than in anterior angles of eyes (Figs 5, 14). Frons elongate, flat, without median carina, lateral edge distinct, 1.42 times longer in the middle line than in the widest part (at the level of antennal bases). Frontoclypeal suture slightly arcuate, complete. Postclypeus elongate, in the middle line about 2/3 as long as frons. Lora fused with postclypeus, the suture vanishing. Anteclypeus long, seems to be pressed into postclypeus, the sutures between anteclypeus and the lower portion of the lora weakly visible; the ratio of length of anteclypeus measured in the middle line to length of postclypeus measured in the lateral line about 1 : 1.25 (Figs 7, 15). Lateral surface of head and lateral portion of pronotum slightly concave, compound eye round in lateral aspect, ocellus placed below the compound eye. Antenna placed posteriad, slightly below the compound eye, on a small protuberance. Basal segment collar-like, second antennal segment knob-like, third segment small, terminated with quite long flagellum. Rostrum long, reaching half of the length of abdomen, almost to the posterior margin of third abdominal segment, subapical segment longer, about 1.8 times as long as apical (Figs 7, 15).

Pronotum with three dorsal and two lateral carinae, produced anteriad, reaching 2/3 of the length of compound eyes, posterior margin distinctly arcuate, incised anteriad in 1/3 of the length measured in the middle line from the anterior margin to the level of posterior angles. The distance between carinae subequal, pronotal disc between carinae slightly concave, stepwise (Figs 5, 14).

Mesonotum tricarinate, about 1.2 as wide as long, about twice as long as pronotum measured in the middle line.

Tegmina semicoriaceous, elongate, about 2.97 times as long as wide, surface of tegmen convex between longitudinal veins. Longitudinal veins eminent, veins Sc+R, M and Cu not bifurcated before nodal line. Veins RA_2 and RP almost parallel, distinctly curved distad (Figs 6, 14). Media divided on membrane into veins MA and MP. Membrane delimited by the nodal line, membranous part occupying about 1/3 of the tegmen length.

Clavus closed, long, reaching 2/3 of the tegmen length, claval veins PCu and A_1 reaching the end of clavus separately (Figs 6, 14).

Hind wing venation weakly visible, at rest folded into a Z-shaped structure (Figs 8, 15).

Hind tibia without lateral spines, with 7 spines apically, 1.12 mm long. Basitarsomere with 5 apical spines, 1.25 times longer than the cumulative length of second and apical tarsomeres. Second tarsomere with 5 apical spines, twice as long as apical. Tarsal claws distinct, arolium wide (Figs 9–10, 15).

Pygofer with a shallow median incision (Figs 8, 15), covered with scarce hairs.

Measurements are given in table 1.

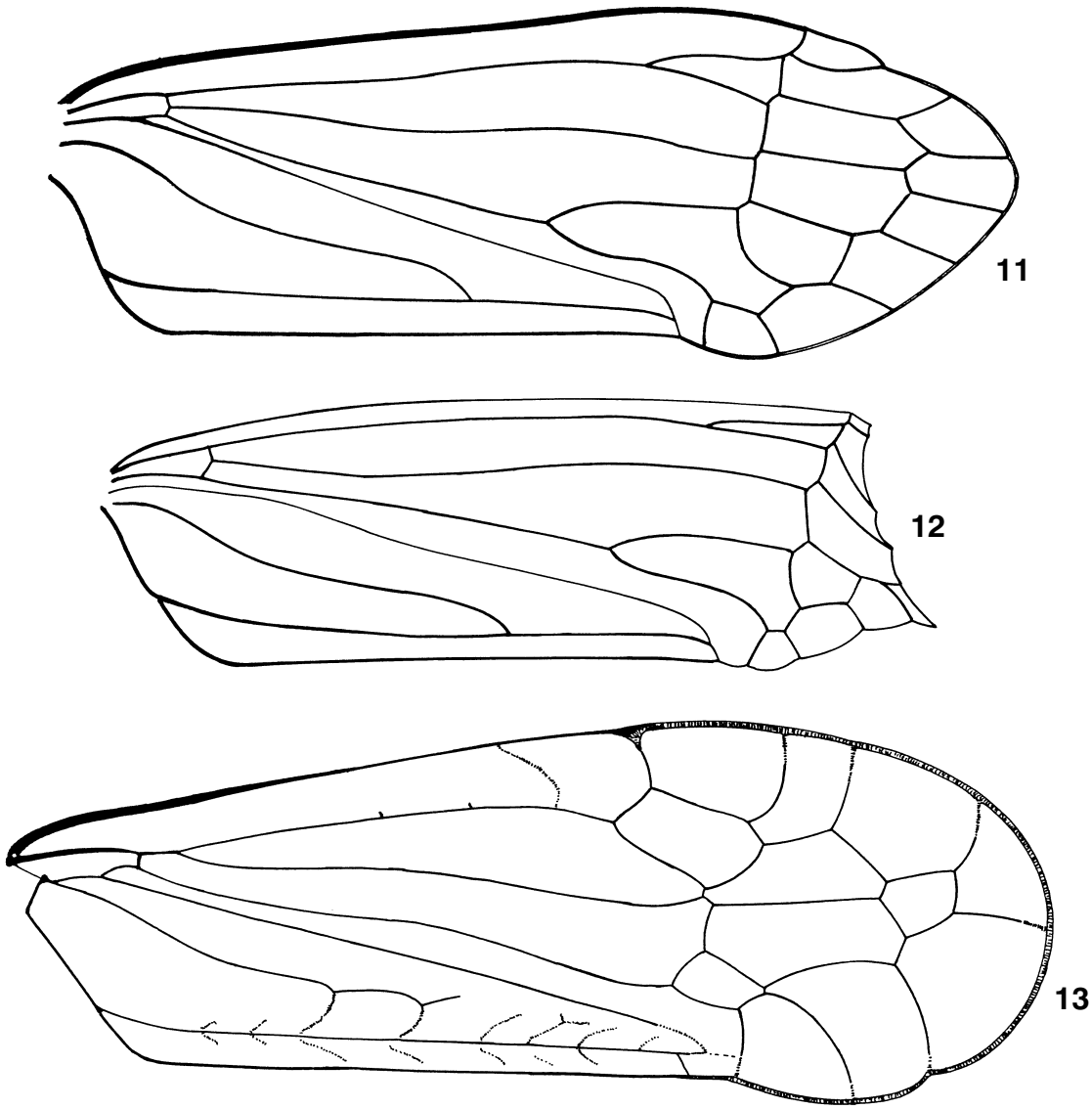
	measurements in mm
total length	5.20
width of head with compound eyes	0.86
length of vertex	0.48
maximum width of vertex	0.46
length of face (to labrum)	1.82
width of face	0.60
length of frons (in middle line)	0.84
length of postclypeus (in middle line)	0.42
width of postclypeus (at level of clypeal suture)	0.48
length of anteclypeus (in middle line)	0.52
width of anteclypeus	0.16
length of labrum	0.20
length of subapical segment of rostrum	0.88
length of apical segment of rostrum	0.48
length of pronotum(in middle line)	0.44
maximum width of pronotum	1.34
length of mesonotum	0.94
width of mesonotum	1.06
length of tegmen	3.80
width of tegmen	1.28
length of claval suture	2.44
length of clavus at vein A_2	1.90
length of hind femur	0.62
length of hind tibia	1.10
length of hind basitarsomere	0.51
length of hind second tarsomere	0.30
length of hind apical tarsomere	0.16
length of pygofer	0.32
width of pygofer at base	0.32
length of pregenital segment	0.21
width of pregenital segment	0.48

Table 1. *Ptychogroehnia reducta* gen. and sp. nov., measurements of the holotype.

Coloration (in amber): anterior part of the body brown, tegmina tawny with irregular lighter patches. Face and ventral surface of the body seem lighter. Hind wings apparently fumose (Figs 14–15).

Etymology. The species name refers to the reduced longitudinal venation of tegmen.

Material. Holotype, male, Baltic amber, Coll. Carsten Gröhn, No. 244, labelled [244 / Geflügelte Zikade (selten)



Figures 11–13. 11–12. *Vinata* sp. specimens from Vietnam. 13. *Ipsnola sextuberculata* Signoret. (11) Venation of tegmen, (12) shape of folded tegmen, (13) tegmen (after Emeljanov 1994b).

/ Zuckmucke ♂ / Sternhaare]; to be stored in the Paläontologisches Museum of Hamburg University. The specimen well preserved, posterior part of tegmen venation not clearly visible because of a crack in the amber, tegminal membrane folded, end of abdomen partly covered with milky veil. Right fore- and mid leg missing.

Discussion

The fossil tribe Ptychoptilini Emeljanov, 1990 is well defined by the characters of wing folding at rest and their venation (Figs 2–3, 6), but its taxonomic position is unclear. No recent Achilidae have characters similar to Ptychoptilini, but there are some similarities between Ptychoptilini and the recent Derbidae of the tribes: Ipsnolini (monotypic genus from Chile) and Vinatini (two genera from Oriental Region). These two families, Achilidae and Derbidae, are very closely related (Emeljanov 1990a, 1994b). Nevertheless, among primitive Derbidae there are tribes with the "achilid-like" type of clavus structure and venation, Ipsnolini, Goneokarellini, Phrygiini, Vinatini and Cedusini, as well as more advanced tribes, most representatives of Derbini and some Cenchreini s. str. (Emeljanov 1994b).

Tegmen folding in the posterior part is not common in recent Achilidae. Tegmina are placed flat or tectiform, overlapping distally, neither wrapped nor bent on nodal line as they are among Ptychoptilini. Tegmina of the representatives of this tribe are divided into two parts, the distal seems to be softer (membranous), and is bent on nodal line onto the abdominal part of the insect body. The membrane is also folded wedge-like along cubital veins, at rest forming a Z-shaped structure. These characters are somewhat similar to those of Vinatini: Derbidae. The

Figures 14–15. *Ptychogroehnia reducta* gen. and sp. nov. in amber. (14) Dorsal and (15) ventral view.

family Derbidae is notable for the highly differentiated tegminal positioning at rest: they can be placed in moth-like style, tectiform, rolled in tubes at a 45° angle from the body or wrapped around the abdomen in the distal portion (O'Brien 1982; O'Brien and Wilson 1985; Emeljanov 1992b, 1994b). The latter character is observed among Vinatini, the tegmen is folded along the nodal line, and its apical portion partly wrapped (Figs 11–12).

Another group similar to Ptychoptilini with regard to tegminal venation are Ipsnolini, the most primitive representatives of Derbidae, with the margin of membrane incised, the posterior part of tegmen divided into two lobes, and the tendency to shift veins (Fig. 13).

The tribes Ipsnolini, Vinatini and Ptychoptilini seem to lie near the basal stock of the Achilidae-Derbidae lineage. The "achilid-like" form of head and pronotum, and the structure of the claval venation are similar within these two groups. Also the apical segment of rostrum in these tribes is elongated. The second antennal segment is short and globular in Ipsnolini and Ptychoptilini, but elongate in Vinatini. On the other hand, Ipsnolini and Vinatini are notable for typical derbid genitalia (Fennah 1952, Emeljanov 1994b). The hind tibia in Ipsnolini bears a small lateral spine, in Vinatini it bears two lateral spines (achilid-like character), unlike in fossil Ptychoptilini, which do not have lateral spines on the hind tibiae (derbid-like character).

The tendency to shifted wing venation and nodal folding observed in the most primitive Derbidae (*Ipsnola* Sign., *Vinata* Dist., *Anerana* Em.) and fossil Ptychoptilini (*Ptychoptilum* Em. and *Ptychogroehnia* gen. nov.) seem to be inherited from the common ancestor of these two families, because in Eocene Baltic amber there are other, more advanced Derbidae – *Positrona* Em. of the tribe Otiocerini (Emeljanov 1994a) and yet undescribed Cedusini.

The most derivative character of *Ptychogroehnia* gen. nov. is the arrangement of claval veins. The typical Y-shaped arrangement of PCu and A_1 veins of all recent planthoppers is lacking. In this respect the venation is similar to the claval venation of recent Cicadomorpha, but within this group of insects there are also some, so called, aberrant forms, e.g. Coloborrhinini: Ulopidae with a Y-shaped arrangement of claval veins. According to Shcherbakov (1996), the Y-shaped arrangement of claval veins is one of the synapomorphies shared by Fulgoromorpha (Coleoscytoidea + Fulgoroidea) and Cicadomorpha (Prosboloidea + Hylicelloidea + Cercopoidea + Cicadoidea + Membracoidea + Palaeontinoidea + Pereboroidea). In the most primitive members of Cicado-

morpha – Prosbolopseidae, this character was still present (Shcherbakov 1996).

A long rostrum, as that of *Ptychogroehnia* gen. nov., is quite common in Baltic amber inclusions of Cixiidae and Achilidae (e.g. "*Cixius*" *longirostris* Germ. et Ber.), as well as other groups of sap-sucking insects, e.g. *Germaraphis* spp. – Aphidoidea: Thelaxidae (Heie 1967, Larsson 1978, Carpenter 1992). The elongate rostrum and well developed tarsal claws suggest that the animal lived on bark of trees, scabrous, with cracks and crannies, and the elongated stylets helped to penetrate thick layers of bark, to reach phloem. The patchy, camouflage colour pattern of tegmina also may indicate such a habit.

It seems that an elongate rostrum was an adaptation to a special host-plant, possibly an amber producing tree "*Pinus succinifera*" (probably a collective name). The question of what the amber tree was is still unresolved. It has been proposed that it could have been a tree (or trees) of the family Pinaceae or Araucariaceae, or form(s) intermediate between these two gymnosperm tree families (Larsson 1978; Beck 1999; Kosmowska-Ceranowicz 1999).

The study of Baltic amber and its inclusions is vital not only for taxonomical and phylogenetic purposes, but for taphonomy, paleoecology and paleoclimatology as well. Further research will certainly help advance our knowledge also in these fields.

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