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Achilidae from the Eocene Baltic amber

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Abstract

A short review of the representatives of the planthopper family Achilidae (Hemiptera Fulgoroidea) preserved as inclusions in the Eocene Baltic amber is given. Fossil records of the family and its subunits are presented in brief. The evolutionary history of the group is briefly discussed.

Key words: Hemiptera, Achilidae, Eocene Baltic amber, fossils, evolution.

Introduction

The Eocene lasted since 56.5 to 35.4 Ma (million years ago). It was much warmer time than present, with assemblages of warm temperate to subtropical biotas in medium to high latitude circumboreal distributions. N America and Eurasia were each separated into western and eastern portions by epicontinental seaways. At the same time western N America was connected to E Asia across the Beringian Land Bridge, while eastern N America was connected via Greenland to north-eastern Europe a connection known as the North Atlantic Land Bridge. Northern Hemisphere was divided into two biogeographic regions of which one was western N America plus most of Asia, and the other eastern N America plus Europe. Climates at high latitudes were warm and wet, and a forest community developed here mixing warm temperate, subtropical and, possibly, also tropical taxa (Milne, 2006). Scandinavian Peninsula, where the "amber forest" grows was placed in zone of paratropical climate.

Planthopper family Achilidae comprises about 460 extant and extinct species placed in over 150 genera. Achilidae are known in the fossil record in the Lower Cretaceous of Crato formation of Brazil, Bon-Tsagaan formation of Mongolia, Spanish, Lebanese and Burmese ambers. A few achilids are mentioned from the Palaeocene of Europe, from Denmark and France. The richest known source of specimens is the Middle Eocene Baltic amber. A few achilids are noted from the Eocene/Oligocene Isle of Wight deposits, Oligocene imprints of Florissant, Colorado, U.S.A. and Oligocene/Miocene Dominican amber.

Baltic amber Achilidae are of particular interest, as representatives of both extinct and extant tribes are present. The oldest specimens, which could be ascribed to Achilidae have been described by Germar and Berendt (1856). Later, Cockerell (1910) and Usinger (1939) added two more species from Baltic amber. Extinct Ptychoptilini have been described by Emeljanov (1990) Second extinct tribe – Waghilidini was described recently (Szwedo, 2006). The most common tribe among amber inclusions is Achilini; recently two new taxa were described (Lefebvre *et al*. 2007).

The Achilidae of amber forest

Achilidae are quite often found among Baltic amber inclusions, which could be biased by the collection samples. However, it could be connected with their relatively high abundance in the habitat and explained by close relationships of their mycetophagous nymphs with cracks and crevices of the trees and logs and trophic relationships of the adults with gymnosperms, maybe amber producing trees.

Ptychoptilini is highly derivative tribe of Achilidae, it shares some features with Derbidae a family regarded as sister group to Achilidae, in particular to its more basal tribes: Vinatini and Ipsnolini. Only two genera of Ptychoptilini are described, both with very particular pattern of Z-shaped folding tegmina and wings. Another genus is characteristic by more reduced venation and lacking pattern believed to be typical of tribe. However, all these genera share head capsule features, which allow to place them in the tribe Ptychoptilini.

Waghildini in general appearance are similar to Rhotalini, but clearly differing in tegminal venation pattern. This tribe could be placed close to Rhotalini and Mycarini, on the basis of retaining numerous lateral spines on hind tibia (plesiomorphic condition shared with Rhotalini) and not polymerized posterior branch of CuA on tegmen (apomorphic condition shared with other Achilinae).

The most common tribe among Baltic amber inclusions, distinctly exceeding half of number of specimens identified, is Achilini. Recent Achilini are divided into 3 subtribes, represented by about 30 genera and nearly 90 species, distributed worldwide. Achilini found among Baltic amber inclusions present morphological features exceeding beyond known disparity of the recent taxa of the tribe. In the recent fauna, this tribe is not very rich in taxa, which suggest it could be a relic group in modern faunas.

Plectoderini, the most numerous in recent fauna, is seldom found in the Baltic amber. Its representatives are more common in Oligocene/Miocene Dominican amber. Single specimen was found in the Lowermost Eocene Oise amber from France.

Other recently recognised Achilidae tribes are not identified yet with full proof.

Amber forest fauna of Achilidae appears very specific and differs distinctly from any fauna present in modern world.

Conclusion

Achilidae belongs to one of the oldest lineages among Fulgoroidea (figure 1). The group was widespread and diversified in Gondwana and Laurasia at time of Mid-Cretaceous biotic crisis. Biotic and climatic conditions during Palaeocene/Eocene Thermal Maximum allowed the group to spread to the high latitudes of Europe. This success was cut following the cooling and drying of the climate at the end of the Eocene and during the Oligocene, when many taxa of the boreotropical flora became extinct. These changes could be responsible for high extinction rate of Achilini. End of Oligocene and Miocene presented another challenge for Achilidae – open grassy habitats. This was very probable a trigger for diversification of Plectoderini. Conditions during Late Oligocene warming and Mid Miocene Climatic Optimum allowed achilids to spread wider again. Achilids living in megathermal moist forest could also be more widely distributed. However the tectonic events definitely influenced also pattern of achilds migrations and distribution. Tectonic, climatic and biotic changes during the Cretaceous, Palaeogene and Neogene strongly influenced evolution of Achilidae. Host plant shifting and adaptations to new conditions seems to be major evolutionary events reflected in the diversity and disparity of recent Achilidae.

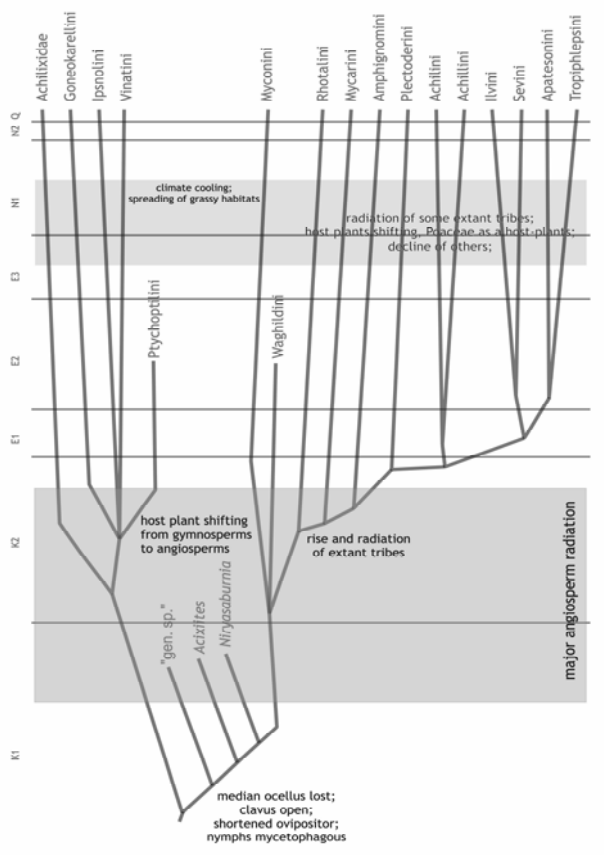

Figure 1. Hypothetic relationships among tribes of Achilidae, related tribes of Derbidae and Achilixidae based on fossil record and phylogenetic scheme proposed by Emeljanov (1991; 1992).

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