

Biting midges (Diptera, Ceratopogonidae) in the Late Eocene Rovno amber: syninclusions tell us about autecology and synecology in an ancient forest

Evgeny E. PERKOVSKY¹ & Alexandr P. RASNITSYN²

1- Schmalhausen Institute of Zoology, National Academy of Sciences of Ukraine, 01601, Kiev, Ukraine. E-mail: perkovsk@gmail.com

2- Palaeontological Institute, Russian Academy of Sciences, 117997 Moscow, Russia, and Natural History Museum, London SW7 5BD, UK. E-mail: rasna36@yahoo.com

Sontag and Szadziewski (2011) consider fauna of biting midges as similar in Klesov and Gdansk Bay amber. Unlike their results, we have found ceratopogonid assemblages in various Late Eocene ambers to be nearly as different as those of ants (Dlussky & Rasnitsyn 2009). They are equally indicative of geographically different sources of the respective ambers. Most similar are biting midges in Rovno and Skandinavian amber, as the presence of *Leptoconops*, opulence of *Eohelea* and of *Meunierohelea* suggests. *Eohelea sinuosa* appears to be the most numerous species of biting midge in Rovno amber. We demonstrated that extinct Ceratopogonini with reduced plume (*Eohelea*, *Gedanohelea*) are found en masse as syninclusions of both males and females in one and the same piece of amber. As many as 63% of all Rovno amber *Eohelea* are found in the both-sexes syninclusions, and share of *Eohelea* and *Gedanohelea* is 3 times as high as that of all remaining Ceratopogonidae in such syninclusions. This suggests substrate mating of *Eohelea* and *Gedanohelea* unlike the air mating of the biting midges with plumose male antenna.

In the Late Eocene, *Leptoconops* is recorded in the Rovno and Danish ambers only. *L. rovnensis* Sontag & Szadziewski, 2011 has long cerci (Sontag & Szadziewski 2011) suggesting oviposition into saline sandy soil which evidently occurred adjacent the amber forests. Rovno amber is generally rather poor in aquatic insects comparing the Baltic one (Perkovsky et al. 2010a; Zelentsov et al. 2012), so the saline soil could be indicative of dry climate. Supporting this inference is the record of *Cryptophagus harenus* Lyubarsky & Perkovsky, 2012 from group unknown in the Baltic amber and now characteristic of steppes and deserts. The tribe Protomicroidini Antropov (Crabronidae), the highest ranked endemic taxon in Rovno, is close to Oxybelini, also characteristic of arid biotopes.

Co-occurrence of biting midges with other insects in syninclusions in Rovno amber sheds light on biocenotic structure of the amber forest. Some 2.5 thousand pieces of unselected Rovno amber are studied for their contents of syninclusion depending on amber piece weight class and taxonomic position of syninclusion