

The influence of environmental and climate conditions in Eocene Europe on contemporary fauna of nematoceran Diptera

The Eocene is a geological epoch that lasted from about 56 to 34 million years and is considered as a "dawn of modern fauna". The Eocene began with the episode of the highest temperature in the Cenozoic. At the end of the epoch, the climate in Europe was still subtropical but with lower annual temperature. In a long term, the warm climate of the Eocene influenced development of the fauna in Europe; the modern genera evolved in a tropical/subtropical climate and their direct descendants are present in recent fauna. The subtropical fauna of the Eocene has retreated southwards after the climate had cooled down in the Miocene, and was later erased from the territory of northern and central Europe by the Ice Age. Their closest recent relatives may now be found in various continents and document the once worldwide distribution of particular groups. History of the Eocene is captured in exceptionally abundant fossil record of insects from all stages of the epoch, which makes it especially informative to scientists, and a reliable source of data for the statistical methods. The main idea of a project is to find out how ecological, climatic and biogeographical conditions of the Eocene had influenced further evolution of chosen groups of flies to the recent times.



A chironomid fly in Baltic amber (from Zakrzewska et al. 2016).

The project is focused on groups of flies, which originated from the oldest lineages; therefore they are of the great importance for studies on evolution of the entire Diptera. Moreover, those families are abundant in fossil record, including the Eocene Baltic amber, where they constitute up to 70% of all fauna embedded. The dominating share of this group of flies in Baltic amber is related to their preferred habitats which were the same where the resin has been produced. These flies are usually perfectly preserved (see photo) being usually small enough to get completely and quickly covered by the single flow of resin. They often show details with the same accuracy as that observed in recent flies under the binocular. Therefore, the inclusions are often determinable to the species with accuracy comparable to that in recent species. Paleocology of Baltic amber forests will be investigated to find out communities sharing the same ecological conditions. The additional, but a very important purpose of our project will be the conclusion about the age of Baltic amber. The middle Eocene is a widely accepted period of the duration of Baltic

amber forests, which covered almost entire Europe and lasted several million years, but there are arguments for extension of this age into earlier and/or later Eocene. We will try to define the age of Baltic amber more detail by checking whether it contains the same species of flies which are present in other three localities of known age. Our study will be based on four localities: early Eocene Mo Clay (northern Jutland, Denmark), early Eocene Oise amber n. Paris, middle Eocene Baltic amber, and late Eocene Isle of Wight in Great Britain; these localities cover chronologically entire Eocene. This huge task will be realized in close cooperation of specialists from several European countries. Results are bound to raise a great interest of paleoentomologists, and other scientists and Baltic amber amateurs.