Putative and novel fossils of insect-associated fungi from Polish Baltic amber

Conference Paper  |  September 2015

Some of the authors of this publication are also working on these related projects:

- Interactions between ants and Laboulbeniales fungi [View project]
- Notes for genera in Ascomycota [View project]

Julia Pawłowska  |  University of Warsaw  |  58 publications  |  441 citations  |  See Profile

Marta Wrzosek  |  University of Warsaw  |  81 publications  |  459 citations  |  See Profile

All content following this page was uploaded by Marta Tischer on 04 December 2015. The user has requested enhancement of the downloaded file.
Putative and novel fossils of insect-associated fungi from Polish Baltic amber
Marta Tischer1, Michał Gorczak1, Katarzyna Szczepaniak2,3, Julia Pawłowska1, Marta Wrzosek1
1Department of Molecular Phylogenetics and Evolution, Faculty of Biology, University of Warsaw
2Department of Palaeontology, Faculty of Geology, University of Warsaw
3Museum of Earth of Polish Academy of Science in Warsaw

ABSTRACT
Fossil material is very important for better understanding of phylogenetic relationships and evolution of fungi (Beimfoerde et al. 2014). Unfortunately due to the low preservation potential, only few fossilized fungal structures are found among conservation Lagerstätten (as Rhynie Chert) (Barberby et al. 2014) where especially conducive taphonomic conditions occur. A core of knowledge about ancient organisms including mycoenoses, relatively rare is fossil resin, amber. Hitherto only few species of fossil fungi from Baltic amber (dated for Eocene epoch), especially those related with insects, were described (Rossi et al. 2005). Our research focused on light-microscopic analysis of inclusions shared by Museum of Earth of Polish Academy of Sciences in Warsaw and Museum of Amber Inclusions of University of Gdańsk - especially those containing beetles, flies, ants and other invertebrates. During investigation we found filamentous fungal forms on insect remains, as well as Mortierella – like structures associated with rove beetles (Staphylinidae: Pselaphinae).

INTRODUCTION
Baltic amber (sucininite) is the most popular of all fossil resins. It is dated to the Eocene epoch (about 50 Ma) (Wolfe et al. 2009). It comes from forests growing in the past in the area of the Baltic countries. Chemical composition of this resin is unclear but in contrast to other fossil resins (Matuszewska 2009), Baltic amber almost always contains 8 % succinid acid (Grimaldi 1996). It is not known which tree produced this amount of resin. Contrary to what is generally considered it was not only pine Pinus succinifera but probably also Agatis australis, Pseudolarix wehrii, Sciadopitys sp. and other species (Wolfe et al. 2009).

It is known over a dozen examples of fungi from amber usually from Dominican and Baltic amber (Rikkinen&Poinar 2000, Schmidt et al. 2013, Thomas&Poinar 1988, Tuovila et al. 2013) but there are only few records of fungus associated with insects from Baltic amber, such as Aspergillus collembolorum (Dörfert&Schmidt 2005) and Stigmatomyces succini (Rossi et al. 2005). Hitherto nobody has looked for them deeply in Polish collections or nor published this data. The main aim of this research was to find and and describe insect-associated fungi from two Polish collection of Baltic Amber. During this work we expected insect-associated fungi such as Laboulbeniales on beetles or flies, Aegeritella sp. on ants and a entomophthoralean fungi or an anamorphic form of representative of Clavicipitaceae.

MATERIAL AND METHODS
During the research 1230 pieces of amber with inclusions from two Polish collections of Baltic amber: the first from Museum of Earth of Polish Academy of Science and the second from Museum of Amber Inclusions of University of Gdańsk were reviewed and examined using a stereo microscope and light microscope (Nikon SMZ800). Photographs of selected specimens of amber were made using Nikon DX-1200. Selected fragments of amber were cut and polished manually with wet sandpaper to remove external impurities and to minimize light scattering for the investigation.

RESULTS
Among 798 pieces of amber from first collection only 3 inclusions contained insect associated fungi- few thalli about 0,1 mm long with globose sporangium-like structures on stalk have been observed on mouthparts of rove beetle (subfamily Pselaphinae) (Fig. 1a - micrograph, 1b - whole body), traces of mycelium on the body of Dyschirius sp. (Carabidae) (Fig. 2a, 2b - micrograph) and two small mould like patches on Melyridae sp. (Fig. 3) and 25 with unidentified filamentous fungal forms in clear fossil resin or on plant remains. In the second collection among 441 pieces of amber up to 11 contained traces of insect – associated fungi and at least 6 contained filamentous fungal forms. White hyphae growing between the segments of legs and body of flies (Dolichopodidae sp. And Fig. 4, Mycetophilidae sp. Fig. 5) and similar with ants (Fig. 6).

Fig. 1a, 1b. Mouthparts of Pselaphinae sp. (fot. Marta Tischer), on the left side Mortierella sp., on the left side mouthparts of rove beetle (subfamily Pselaphinae) (Fig. 1a - micrograph, 1b - whole body), traces of mycelium on the body of Dyschirius sp. (Carabidae) (Fig. 2a, 2b - micrograph) and two small mould like patches on Melyridae sp. (Fig. 3) and 25 with unidentify filamentous fungal forms in clear fossil resin or on plant remains. In the second collection among 441 pieces of amber up to 11 contained traces of insect – associated fungi and at least 6 contained filamentous fungal forms. White hyphae growing between the segments of legs and body of flies (Dolichopodidae sp. And Fig. 4, Mycetophilidae sp. Fig. 5) and similar with ants (Fig. 6).

DISCUSSION AND CONCLUSIONS
These new undescribed findings including about 14 putative insects-associated fungi require further and more precise analysis. It is most likely that the fossil insects had been already dead before have been overgrow by fungus. The association was presumably saprotrophs.

ACKNOWLEDGEMENTS
We are grateful for sharing material from collection of Museum of Amber Inclusions of University of Gdańsk and Museum of Earth in Warsaw and especially dr Elżbieta Sontag for her help and photos.

REFERENCES
Grimaldi, D. A. (2001): amber, where in the past?