„Taphonomy of fossil resins based on ichnological and pelobiological data”
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Fossil resins are plant-derived polymers which, through fossilisation, preserve biological information in the form of inclusions. Although commonly referred to as “amber” these resinous fragments are understood differently depending on the scientific discipline—palaeobiology, geochemistry, or petrology. This doctoral dissertation presents an interdisciplinary approach to the topic, integrating ichnological, palaeontological, and petrographic data.

While most paleobiological studies on fossil resins have focused on the inclusions of preserved organisms, this work emphasizes trace fossils—both on the surface and within the resin (referred to herein as ichnoinclusions). These traces document the activity of organisms and the environmental variability in which they lived. They also indicate a successive colonization of resin by terrestrial, followed by marine, organisms. The ichnocoenosis Resinites is introduced as a characteristic assemblage of trace fossils associated with resins during their secretion by trees—an ichnological equivalent of a biocoenosis.

To test the proposed hypotheses, over three tons of Baltic amber from various localities were analysed, alongside comparative samples of fossil resins from around the world, including Mexican (Chiapas), Ethiopian, and Lebanese ambers.

The results are presented in four scientific publications, and the dissertation is supplemented by a comprehensive annex describing the relationship between fossil resin research and the petrology of lignite (brown coal) deposits. A new method for interpreting the taphonomic processes affecting resin during fossilisation is proposed—using the van Krevelen diagram to visualise the degree of resin diagenesis.

The primary outcome of this research is a taphonomic model for fossil resins, with particular emphasis on Baltic amber and incorporating material from multiple continents. The model outlines resin distribution pathways across different depositional environments, the formation of amber-bearing deposits, and ichnofossil succession. Characteristic traces are identified for each stage of the model. The study also proposes several new ichnotaxa, including new ichnofamilies, genera, and species.

Among the key discoveries is the identification of the oldest known *Teredolites clavatus* borings in Cretaceous amber from Lebanon, providing insights into the environments where these traces formed. The first documented case of barnacle (Balanomorpha) inclusions in fossil resins was recorded in the form of nine individuals preserved in Chiapas amber. The same resin also yielded over one hundred piddock (Pholadidae) inclusions, interpreted as having been preserved in a mangrove-like coastal environment through entrapment in resin.

The dissertation further describes a new ichnogenus and ichnospecies associated with fossilised wood—traces of xylophagous insects preserved in a unique piece of xylite from the Gdańsk Bay region. This fossilised plant stem turned out to be the most complete record to date of a tree whose resin contributed—at least in part—to the formation of Baltic amber deposits.

The results of this research demonstrate that fossil resins are not merely passive carriers of inclusions, but also bioerosion-prone, active taphonomic substrates.

This dissertation constitutes a comprehensive study of the taphonomy and ichnotaxonomy of fossil resins. The findings are relevant for interpreting amber-bearing deposits worldwide—from the Cretaceous resins of Lebanon and Myanmar, through the Eocene of Europe, to the Miocene of Central America. These investigations expand current knowledge of resin palaeobiology and illuminate their complex history at the interface of the palaeobiosphere and lithosphere.