



Lepidoptera (moths and butterflies) thrived in gymnosperm forests following the end-Triassic extinction

Bas van de Schootbrugge (1), Timo van Eldijk (1), Torsten Wappler (2), Paul Strother (3), Carolien van der Weijst (1), Hossein Rajaei (4), and Henk Visscher (1)

(1) Utrecht University, Institute of Earth Sciences, Marine Palynology, Utrecht, Netherlands (B.vanderSchootbrugge@uu.nl), (2) Rheinische Friedrich-Wilhelms Universität Bonn, Steinmann Institute of Geology, Bonn, Germany, (3) Boston College, Weston Observatory, Department of Earth & Environmental Science, Weston, United States, (4) Staatliches Museum für Naturkunde Stuttgart Museum, Stuttgart, Germany

The oldest evidence for Lepidoptera (moths and butterflies) and the Coelolepida (hollow-scaled moths and butterflies) is presented based on an assemblage of fossilized scales encountered in uppermost Triassic and lowermost Jurassic sediments from a core drilled in northern Germany. The diverse assemblage of scales points to a Triassic origin of the Lepidoptera and a radiation of some lineages just before or right after the end-Triassic mass extinction (201 Ma). These findings confirm molecular clock estimates for splits within the Amphiesmenoptera that led to the evolution of true butterflies. Not only did Lepidoptera survive the end-Triassic extinction, they also appear to have radiated directly following this environmental crisis, which could be related to the dramatic changes in paleoclimate triggered by the eruption of the CAMP, especially an increase in humidity. Seen in combination with high-resolution palynological records that show an Early Jurassic dominance of conifer pollen, the presence of scales derived from angiospermivorous Coelolepida likely signifies a host-shift (for multiple lineages of crown group Lepidoptera) from gymnosperms to angiosperms during the Mesozoic.