Madygen - a unique mid-Triassic Lagerstätte

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Madygen, named after a small farmers' settlement in southwest Kyrgyzstan, Central Asia, is one of the world's most famous continental Triassic fossil sites. Biostratigraphic and isotopic data suggest a mid-Triassic (late Ladinian to early Carnian) age for the fossiliferous sediments.

The Madygen fossil record, comprising a variety of aquatic and non-aquatic invertebrates and vertebrates as well as one of the most diverse Mesozoic floras of Eurasia, correlates with favorable living conditions within and around a perennial lake. It offers a unique taphonomic window into an Early Mesozoic ecosystem of a warm to temperate climatic zone with year-round rainfall in an area of mid-northern latitudes and several hundred kilometers away from the nearest marine shoreline.

The Madygen Formation comprises an up to 560 m thick succession of complexly interbedded flood plain, alluvial fan, and lacustrine deposits in a tectonically active, overfilled lake basin. Three lacustrine sequences (lake 1-3) can be recognized within the sedimentary succession. The minimum extent of the former Madygen lake environment was three to five km. It is possible, however, that Madygen just represents the marginal remnants of a much larger lake ranging tens of kilometers in length.

Main sedimentary subfacies are referred to alluvial fan, conglomerates, sand-, silt-, and claystones. The Madygen Formation contains one of the most diverse Mesozoic floras of Eurasia, comprising plants such as liverworts, ferns, horsetails, seed ferns, lycopsids, and conifers, as well as insects, crustaceans, and fishes.

Oxygen isotope ratios of fossil and strontium of the Madygen water body. Together with the unequivocal freshwater conditions fish tooth enameloid indicate low sulphur content of coals from the base of the formation and its position in palinspastic maps for the Triassic of Eurasia, this firmly substantiates the interpretation of the Madygen lake system as a purely freshwater environment.