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Oxygen isotopes from hybodont shark tooth enameloid – Palaeoenvironmental implications for the late Triassic Central European Basin

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The biogenic fluor-apatite in shark teeth enameloid is highly resistant against diagenetic alteration. The oxygen isotopic composition of teeth reliably reflects the ambient water chemistry at time of mineralization, and thus provides information about the ancient hydrological cycle, the palaeoenvironment and the migration behavior of taxa. Small hybodont sharks, with a regarded durophagous bottom-dwelling lifestyle, occur in marine and non-marine deposits. The palaeoecology of these taxa is controversially discussed. Because of the continuous tooth replacement in sharks, their tooth $\delta^{18}O$ values can be used to differentiate between marine or freshwater signatures to decipher a stationary or diadromous lifestyle.

In the present study, the oxygen isotopic composition of teeth from the hybodont sharks *Lissodus* and *Hybodus* were analyzed from different late Triassic (Rhaetian) localities in the Central European Basin (CEB). The majority of teeth are derived from Rhaetian bone beds in England and Germany, which are interpreted as transgressive deposits. Two teeth are derived from the Tethyan Kössen Beds in Switzerland. In total, the enameloid of 107 teeth was analyzed by single tooth measurements. The mean $\delta^{18}O$ values are 15.7±0.8 ‰ VSMOW for the German sites north of the Vindelizian-Bohemian High and 18.5±0.7 ‰ VSMOW for the English sites in the western part of the CEB. The mean $\delta^{18}O$ value of the Tethyan Kössen Beds is 20.7±1.1 ‰ VSMOW. The latter value is in very good agreement with published oxygen isotope data derived from brachiopods of the Kössen Beds in the Dolomites, which represent full-marine conditions and a low-latitude $\delta^{18}O$ signal of the late Triassic Tethys.

The $\delta^{18}O$ values of teeth from the German sites are fractionated by 4–5 ‰ relative to the Tethyan signal. This strong difference in $\delta^{18}O$ indicates tooth mineralization from an extensive brackish or even freshwater environment within the CEB. It also suggests a substantial freshwater supply into the basin by drainage from the Vindelician-Bohemian High. The low variability of tooth-$\delta^{18}O$ indicates that *Lissodus* and *Hybodus* occupied a non-marine environment without substantial habitat migration. The mean $\delta^{18}O$ values recorded from the English Westbury Formation are less fractionated than the German ones, and possibly indicate brackish to marine conditions at the same time, possible referring to the Rhaetian transgression into the CEB. This transgression could have served as moisture source during the late Triassic climate change towards more humid conditions, reflected by increased fluvial discharge.