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al-Fudhaili, Najat; De Winter, Niels; Kaskes, Pim; Claeys, Philippe; De Baets, Kenneth

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Belemnite growth dynamics and trace elemental composition across the Pliensbachian-Toarcian boundary event

Najat al-Fudhaili, Niels de Winter, Pim Kaskes, Philippe Claeys, and Kenneth De Baets
GeoZentrum Nordbayern, Friedrich-Alexander-University Erlangen-Nürnberg, Loewenichstraße 28, 91054 Erlangen, Germany

Recent work suggested a marked impact of the Pliensbachian-Toarcian boundary event on marine invertebrate communities [1]. This event resulted in a decrease in belemnite body size in assemblages as well as the dominant species in the Toarcian GSSP [2], but it remains unclear to what degree this lilliput effect reflects changes in growth and reproductive strategies [3, 4]. Increments in the concentric calcitic layers of the belemnite rostrum indicate their growth, where their width variation is reflecting the changes in the surrounding conditions (e.g., temperature). The preservation of these calcitic layers has been assessed using the micro X-ray fluorescence (μ-XRF) heatmap. Combining sclerochronological analysis and high-resolution elemental records from the rostrum yields valuable insights into the influence of the environmental changes on the organisms' physiological and morphological features. Six specimens of two belemnite species (*Catateuthis longiforma* and *Passaloteuthis bisculcata)* were analysed from three different stratigraphic levels (before, during and after the Pliensbachian-Toarcian boundary) in the Peniche section of the Lusitanian Basin in Portugal. The current research aims to investigate **a)** whether there are any differences in the environmental preferences seen within the species across the Pliensbachian-Toarcian boundary. **b)** Whether there are any environmental differences between the three ontogenetic (juvenile, neanic and adult) stages of the two species. Point-by-point μ-XRF [5] line scans across the rostrum widest part produced high-resolution (25 μm) trace element profiles. From across the two sides of the apical growth line in the rostrum; symmetrical trace elemental records (e.g., Sr/Ca, Mg/Ca, and S/Ca) can be interpreted as environmental proxies across the different stratigraphic levels of the Pliensbachian-Toarcian boundary. The variation of the trace elemental records throughout the different ontogenetic stages reveals how the ontogenetic trajectory affects the belemnites sensitivity to changes on the ambient conditions.

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