Intra-tooth isotopic profiles of canines from extant *Hippopotamus amphibius* and late Pliocene hippopotamids (Shungura Formation, Ethiopia): Insights into the seasonality of diet and climate

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**ABSTRACT**

We investigated the potential use of intra-tooth variations of stable carbon and oxygen isotopes in hippopotamid canines to retrieve signals of seasonality in continental contexts. A high-resolution serial isotope analysis of enamel was performed on both lower and upper canines of one extant common hippopotamus from the Sarh region (Chad). We discussed three methodological points: canine growth rates, optimal sampling resolution, and record of seasonality within hippopotamid canine enamel. In this 21-year-old specimen, growth rates of 39.1 mm/year and 31 mm/year were established for the lateral part of lower and upper canines respectively. Our results suggest that the optimal sampling resolution to capture the seasonality is ca. 1–3 mm. Seasonal changes were observed in both δ13C and δ18O values, indicating an important C4 component in the diet during the rainy seasons (up to 50%) and a diet dominated by C3 grasses during the dry seasons (around 70%). Next, we performed a similar test on two fossils from the Shungura Formation (south-western Ethiopia). Seasonal variations in δ13C of the diet were also observed in the fossil specimens and the palaeoenvironmental implications are discussed. Preliminary conclusions from the δ18O and δ13C sequences seem consistent with a rise of seasonality during the Pliocene, synchronous with the global aridification and opening of the environments.

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