UAB DIVULGA
BARCELONA RECERCA I INNOVACIÓ

15/01/2024

# Revealing changes in climate through hippopotamus teeth

Researchers from Spanish and Italian institutions, including the National Museum of Natural Sciences and the Universitat Autònoma de Barcelona, have uncovered key aspects about climate changes of the Lower Pleistocene by analysing fossil hippopotamus teeth. The study of teeth from European sites dating back 1.9 to 0.8 million years highlights the hypoplasia of tooth enamel as an indicator of a climate marked by aridity and food shortages.

The Early Pleistocene, especially between 1.9 and 0.8 million years ago, was an epoch of particular interest in understanding how the climate we enjoy in Europe today was established. The recent study entitled "Increase on environmental seasonality through the European Early Pleistocene inferred from dental enamel hypoplasia", published in the prestigious scientific journal *Scientific Reports* (part of the *Nature Portfolio*), takes a closer look at these changes. This study analyses fossil hippopotamuses (*Hippopotamus antiquus*) found across different regions of the continent as silent narrators that shed light on the changes in climate during that period.

The heart of the research lies in the hypoplasia of tooth enamel. This dental disorder could be the key to understanding the climatic changes of that time, thanks to the close relationship between this phenomenon and the characteristics of the environment in which these large creatures lived.

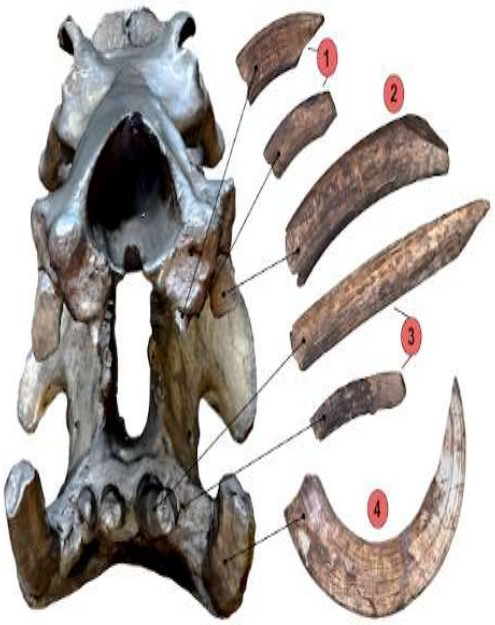
When researchers from several Spanish and Italian institutions, including the Museo Nacional de Ciencias Naturales (CSIC) and the Universitat Autònoma de Barcelona, delved

into the dental records of European hippopotamuses from several fossil sites, they came across a noteworthy pattern: the recurrent presence of a disease that stopped the production of tooth enamel in the anterior teeth of these creatures. This pathology pointed to severe nutritional problems, which hypothetically could be related to changes in environmental conditions.

Analysis of 310 incisor and canine teeth from central and western Europe, including notable finds from the Vallparadis Estació and Cal Guardiola sites in Tarrasa, revealed 105 instances of tooth enamel production- related pathologies. Interestingly, these issues appeared with varying frequencies at different Early Pleistocene sites, providing valuable insight into the historical health of these ancient hippopotamus populations.

All the data presented above highlight the existence of periods of nutritional restrictions for the hippos, which would represent phases of particular aridity or lack of pasture. This allowed an approximation of changes during this time in factors such as glacial cycles, humidity, and plant community structure. By focusing on two specific time intervals, 1.8 million years ago and 0.86 million years ago, an increase in the frequency of dental hypoplasia was observed between these chronological milestones, supporting the idea of increased seasonality in circum-Mediterranean environments during the Early Pleistocene, culminating in a temporal structure of seasons similar to the present.

In essence, this study opens a new window into the study of past climate change and highlights the challenges faced by Europe's ancient inhabitants, both fauna and early human populations.




Skeletal fossil elements from hippopotam (*Hippopotamus antiquus*) with hypoplasia of tooth enamel included in the analysis. Skull specimen: AC3864. 1: upper incisors, 2: upper canines, 3: lower incisors, 4: lower canines.

**Darío Fidalgo**

National Museum of Natural Sciences, CSIC
Universidad de León
dfidal01@ucm.es

**Joan Madurell-Malapeira**
Departament of Geology
Universitat Autònoma de Barcelona
joan.madurell@uab.cat

## References

Madurell-Malapeira, J., Fidalgo, D., Rosas, A., Bartolini-Lucenti, S., Boisserie, J-R., Pandolfi, L., Martínez-Navarro, B., Palmqvist, P., & Rook, L. (2023). **Increase on environmental seasonality through the European Early Pleistocene inferred from dental enamel hypoplasia.** *Scientific Reports, 13(1), Article 16941*. https://doi.org/10.1038/s41598-023-42936-y

View low-bandwidth version