

# Investigating sheep management practices at the site of Perdigões (4<sup>th</sup> millennium BC, South Portugal) via sequential carbon and oxygen isotopic analyses of tooth enamel

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## INTRODUCTION

- Perdigões, a Late Middle Neolithic — Bronze Age site, was a centre of social and ceremonial importance with diverse funeral traditions.
- The region has a Mediterranean climate, characterized by hot and dry summers, and relatively rainy and cold winters (e.g., Figure 1).
- Palaeoenvironmental analysis suggests a temperate and humid climate with a relatively open park-like environment (Wheeler, 2010; Danielsen and Mendes, 2013; Zalaite et al., 2018).
- Previous isotopic studies (Zalaite et al., 2018; Valera et al. 2020) have shown subtle differences in animal management practices in domesticated animals, and significant mobility of humans and animals.

**OBJECTIVES:** The present study aims at providing a more detailed picture of sheep husbandry in Perdigões and possible variations related to seasonal mobility.

## MATERIALS & METHODS

Teeth samples, specifically second (n=5) and third molars (n=3), were selected from 7 mandibles of sheep from the Late Middle Neolithic Perdigões. Samples were taken sequentially along the growth access (Figure 2), and processed following Balasse et al. (2002). Carbon and oxygen isotopes were measured at Cardiff University, Walles, United Kingdom.

## DISCUSSION & CONCLUSIONS

- Carbon isotopic values ( $\delta^{13}\text{C}$ ) vary between -10.2‰ to -13.6‰ ( $\delta^{13}\text{C}=-12.1\text{‰}\pm0.9$ ), while oxygen isotopic values ( $\delta^{18}\text{O}$ ) range from -2.6‰ to 3.9‰ ( $\delta^{18}\text{O}=0.6\text{‰}\pm1.5$ ).
- Close correlation between isotopes is potentially an indication of a season signal within plants isotopes, suggesting environmental changes and/or change in animal foraging and water drinking locations;
- Low carbon values indicate winter dietary intake (e.g. woodlands, waterlogged pasture).
- $\delta^{13}\text{C}$  suggests a  $\text{C}_3$  plant-based diet, reflecting similar subsistence patterns obtained in previous isotopic studies.
- Further research will enable to comprehend seasonal variability detected and possibly relate it to the mobility of humans and animals.

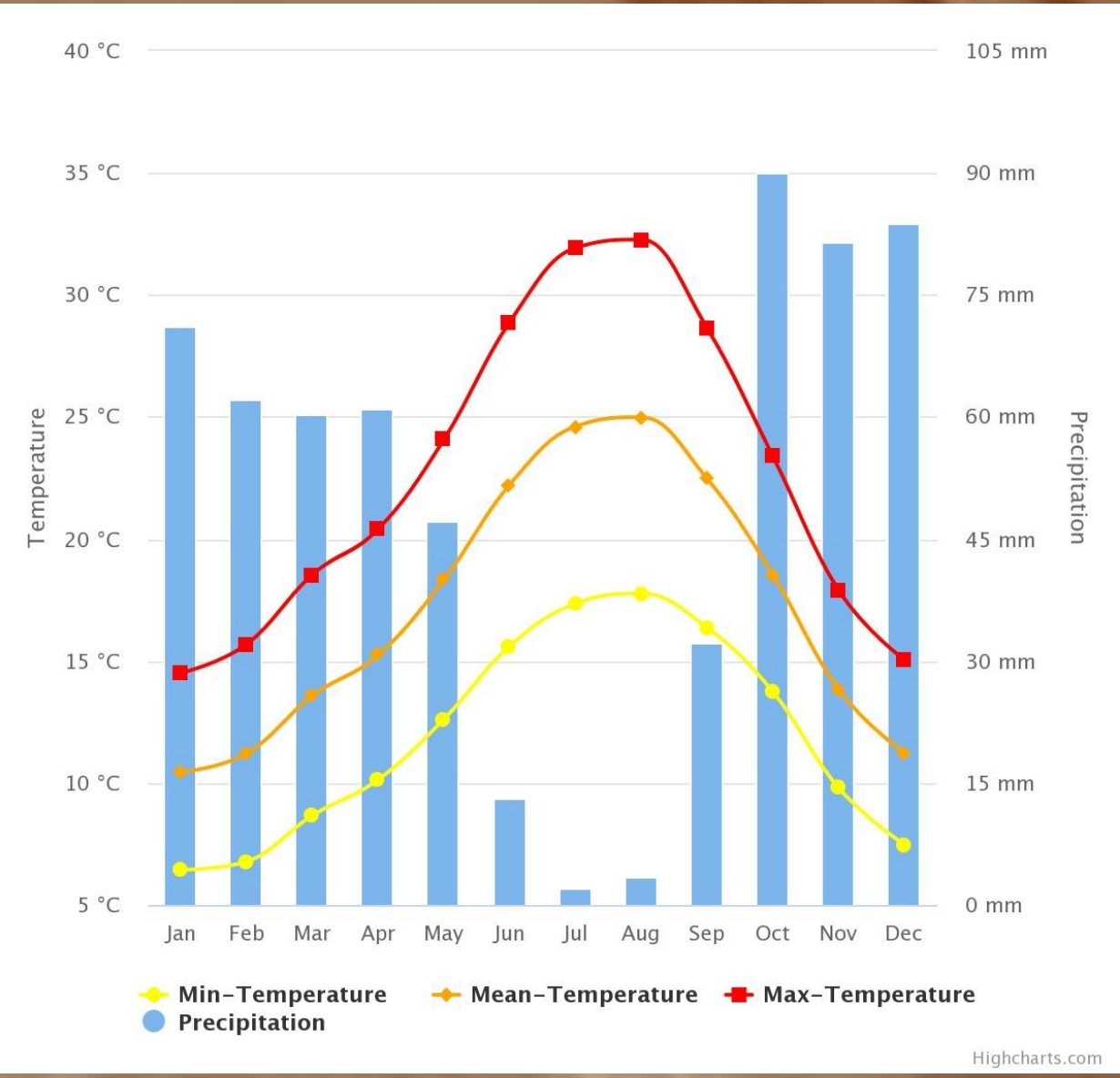
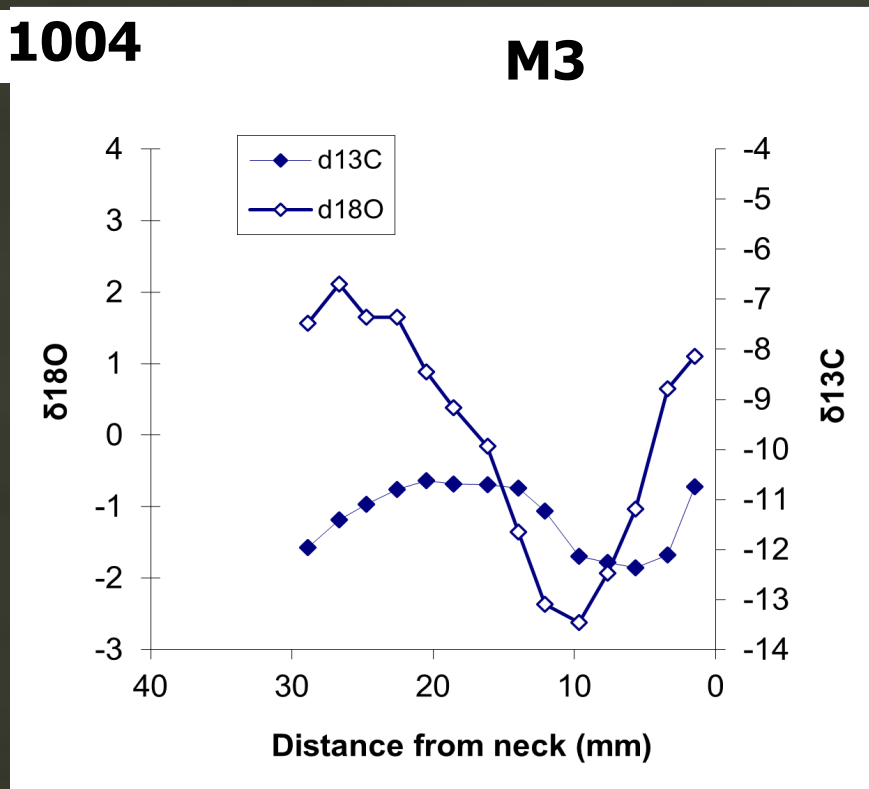
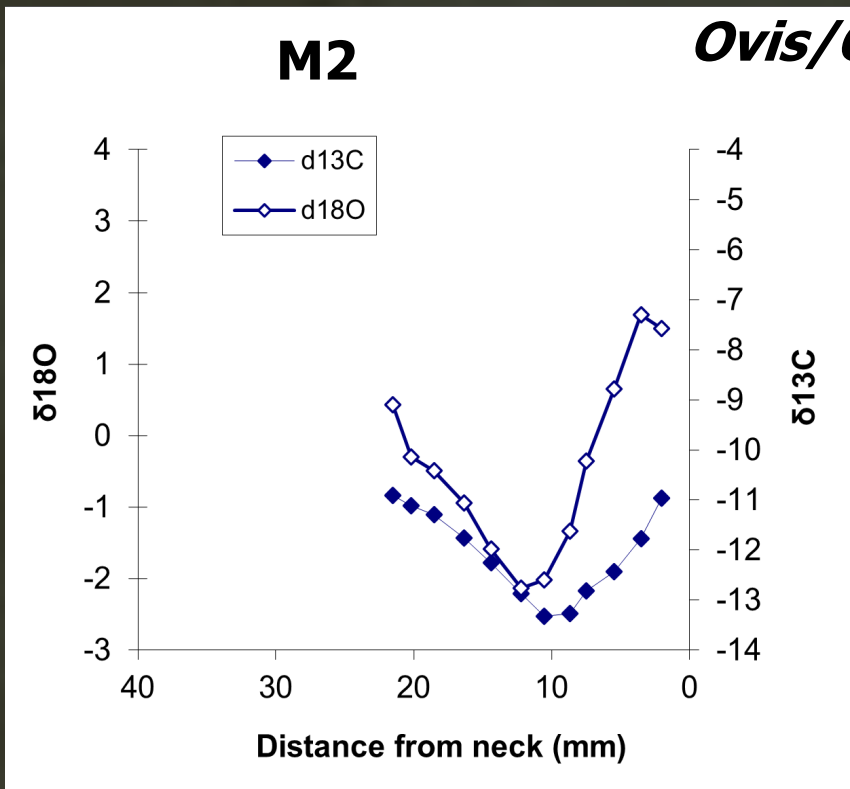
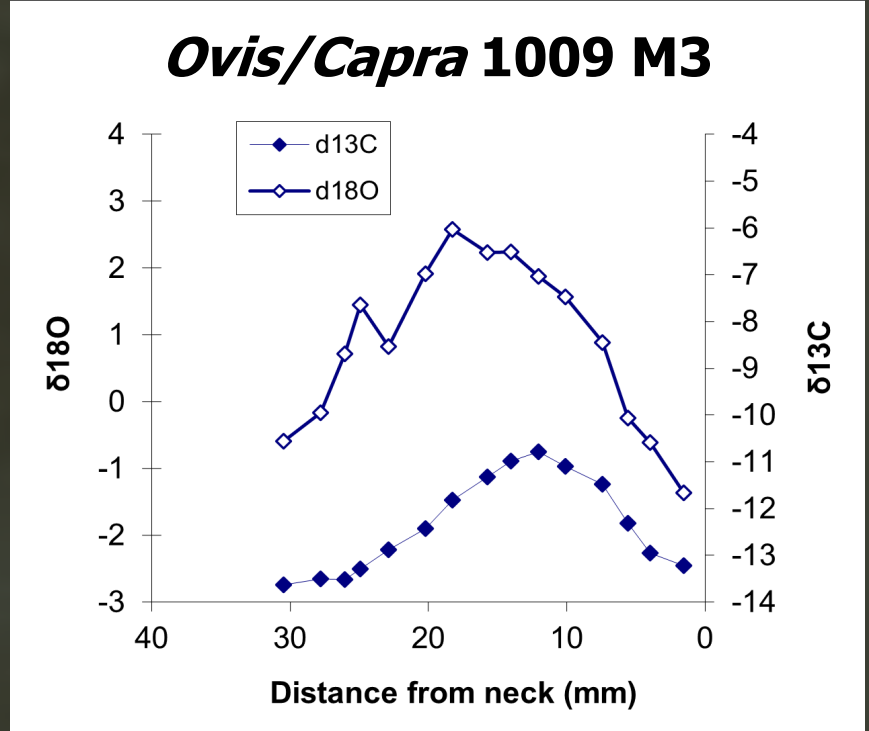
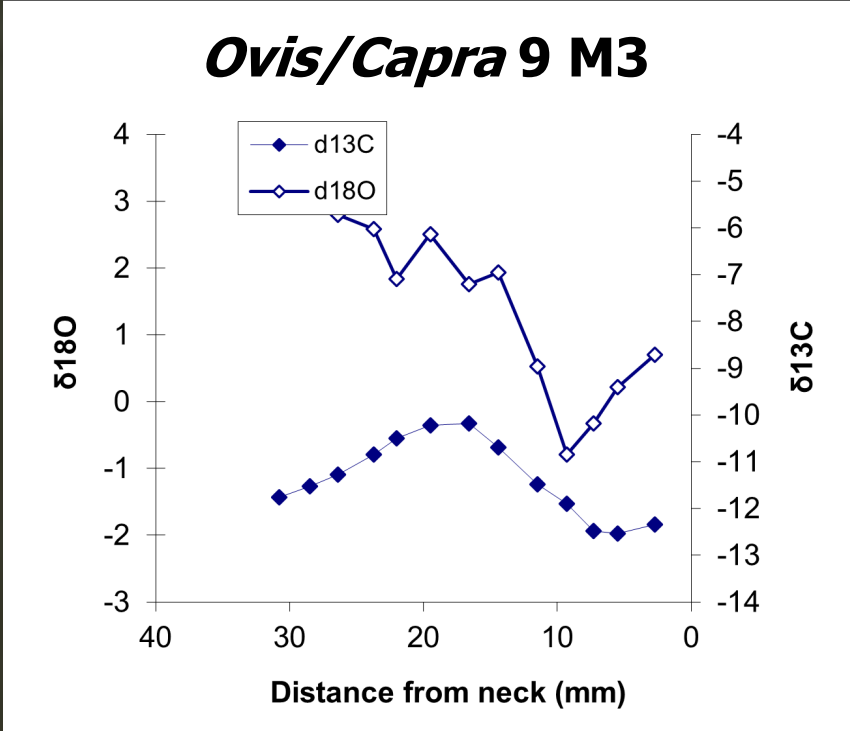
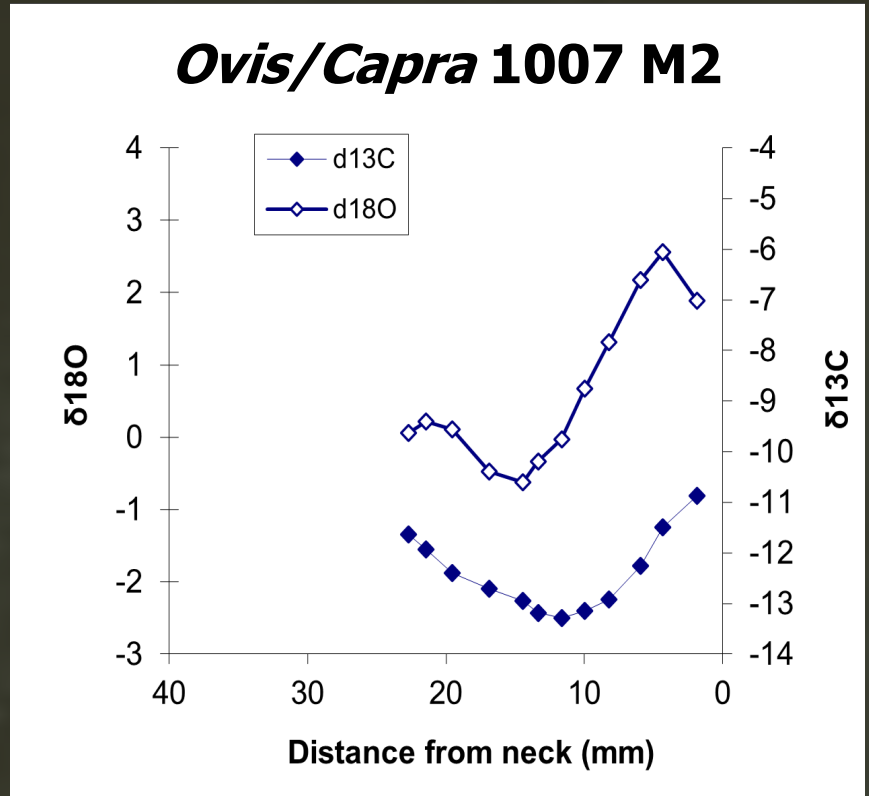
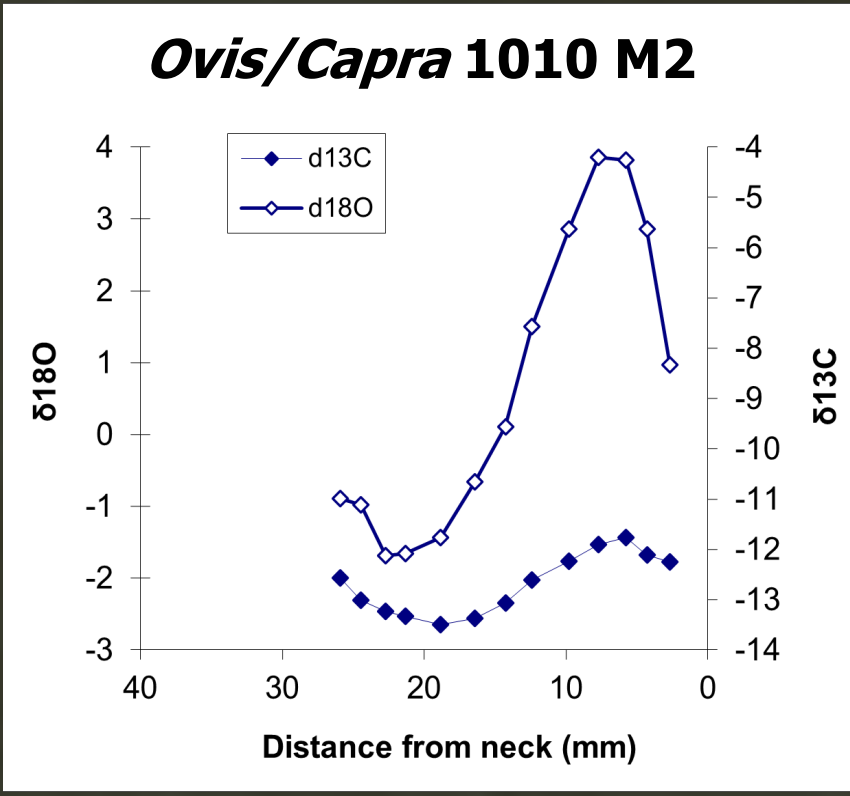
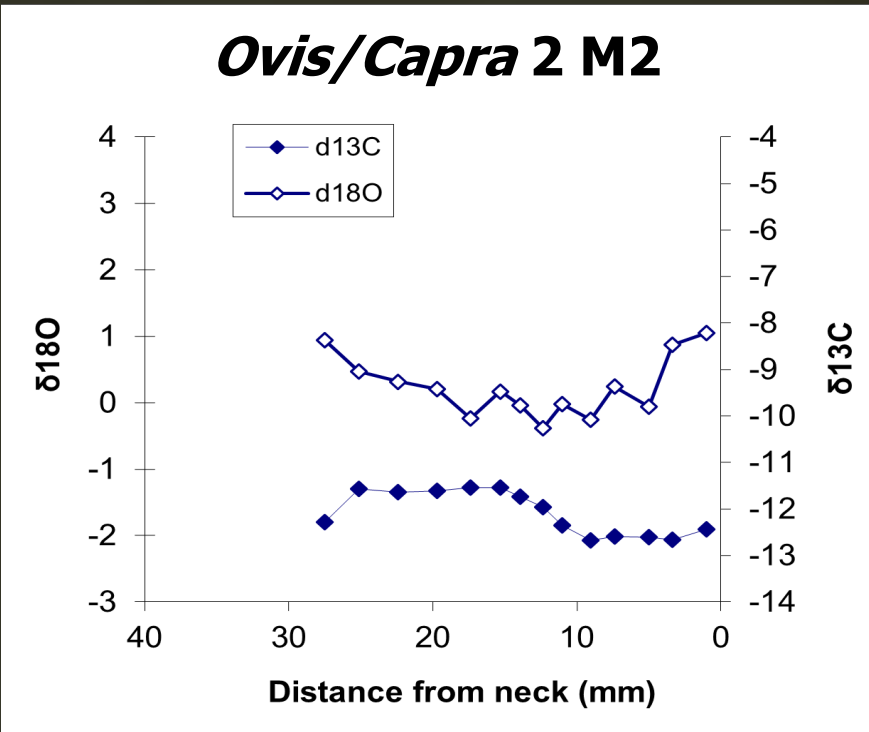
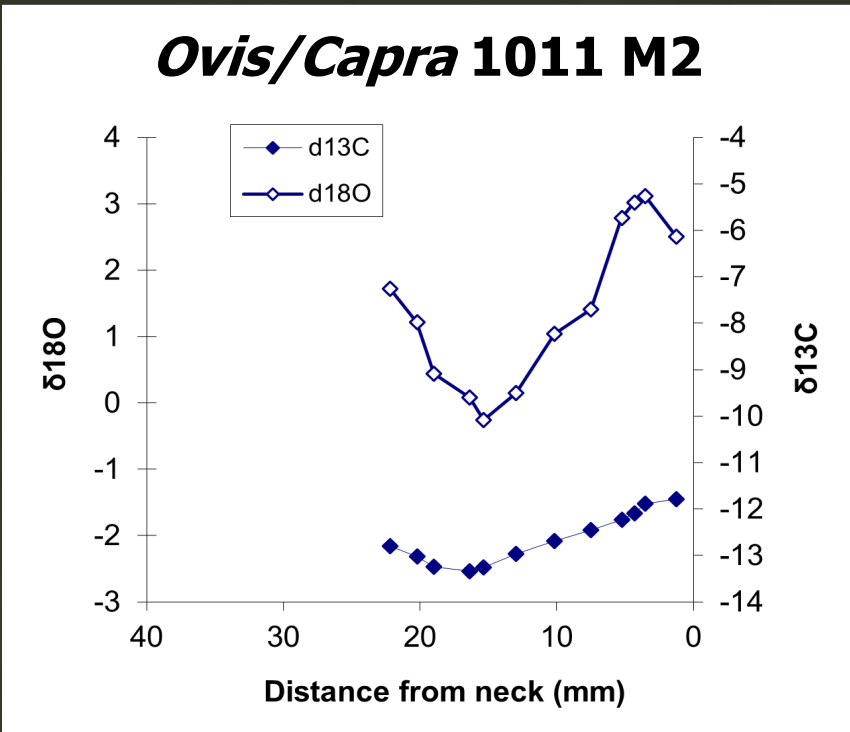


Figure 1 — Monthly climatology of minimum temperature, mean temperature, maximum temperature and precipitation from 1991-2020 in the region (Évora) where the archaeological site is located.



Figure 2 — Photograph of sequential enamel sampling procedure in Ovis/Capra 9 third molar from the archaeological site of Perdigões (Portugal).

## RESULTS



Figures 3 to 10 — Scatter plot of  $\delta^{13}\text{C}$  and  $\delta^{18}\text{O}$  values of Ovis/Capra samples (n=7) from the archaeological site of Perdigões, Portugal.

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