

## Using X-ray microtomography to discriminate between dogs' and wolves' lower carnassial tooth

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As they belong to the same species, dogs (*canis familiaris*) and wolves (*canis lupus*) exhibit similar dental features. Zooarchaeologists have already considered the possibility to discriminate between these two taxa using size of isolated lower carnassial teeth (Pluskowsky 2006). Here we explore a new method to discriminate between the wild and the domestic forms, based on the analysis of the tooth internal structural signature. Using methods deriving from the field of virtual dental palaeoanthropology, we focus here on the study of the tooth tissue proportions and enamel thickness variation in various regions of the lower carnassial tooth. In this exploratory study, we analyzed the lower first molar of 18 recent dogs, three archaeological Holocene dogs from Slovenia, 11 extant Italian wolves, one extant zoo-wolf originating from a population of northern Europe and five Middle to Upper Palaeolithic wolves from Southern Italy. X-ray microtomographic analyses were performed at the *Abdus Salam* International Centre for Theoretical Physics (ICTP) of Trieste (Tuniz et al. 2013). Image segmentation was carried out using a semi-automatic threshold to separate different dental tissues. We estimated the relative amount of lateral crown enamel and dentine, by extracting the volumes comprised between two reference planes, one between the plane tangential to the cingulum, and the protoconid-paraconid plane in the region, and a second one above this plan in the cusp area. Tooth tissue proportions were assessed here by the ratio (normalized to 100) between dentine volume and total volume ( $V_{cdp}/V_c$  %). As shown in Figure 1, dogs show a higher percent of dentine (expressed by a lower value of  $V_{cdp}/V_c$  %), especially in the protoconid-paraconid region, also when tooth size is comparable to that of wolves. We also elaborated maps of enamel thickness distribution. This analysis also revealed to be able to discriminate between domestic and wild animals, with promising perspectives for zooarchaeological applications.

Pluwskoski, A., Where are the Wolves? Investigating the Scarcity of European Grey Wolf (*Canis lupus lupus*) Remains in Medieval Archaeological Contexts and its Implications. *Int. J. Osteoarchaeol.*, **16**, 279-295 (2006).

Tuniz, C., et al. The ICTP-Elettra X-ray laboratory for cultural heritage and archaeology. *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, **711**, 106-10 (2013).

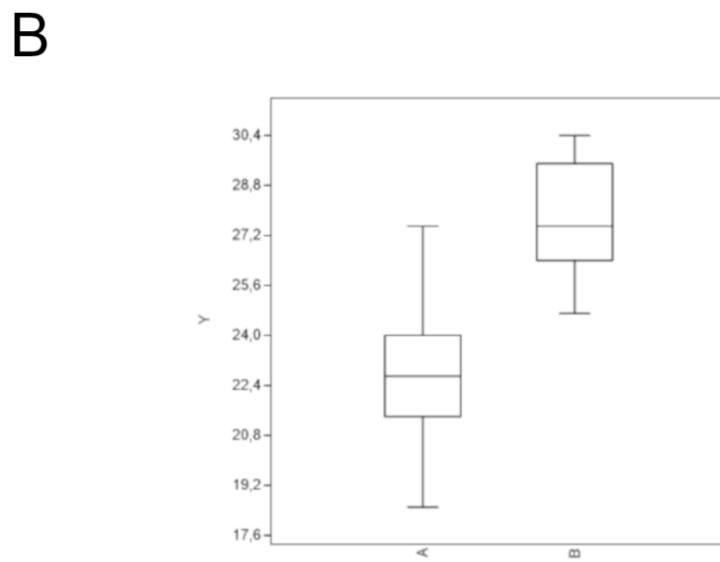
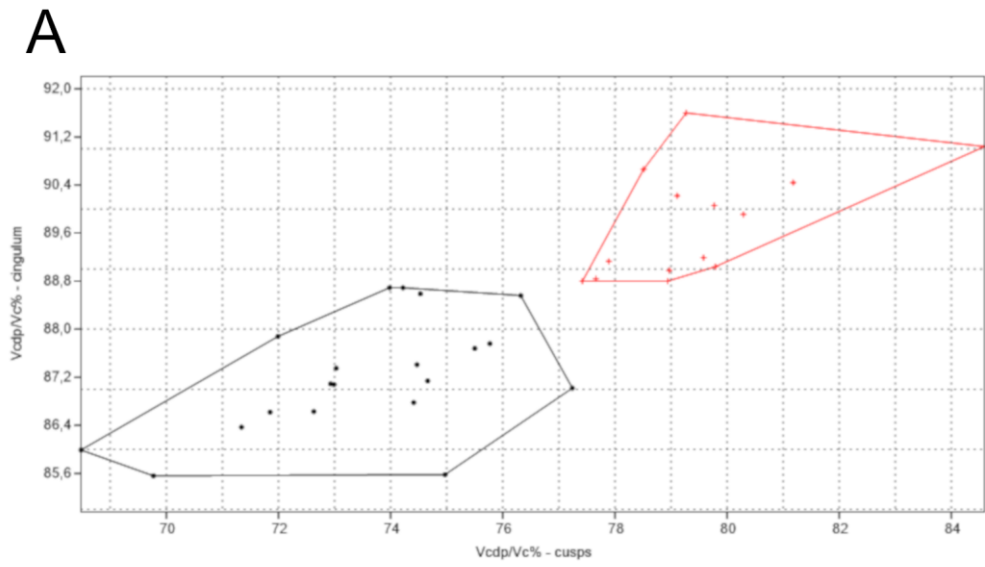


Figure 1. A: Lateral tooth crown tissue proportions in dogs (black) and wolves (red). B: length of analysed teeth; A: dogs; B: wolves.