



## Steppe bison paleobiology through the scope of stable isotopes and zooarchaeology

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Bison are one of the most abundant and widely distributed species of large mammal during the Late Pleistocene. In the southern steppes of Eastern Europe, steppe bison (*Bison priscus*) is ubiquitous in zooarchaeological assemblages, particularly during the Upper Palaeolithic when a model of economic "specialization" is proposed. Specialization, in this context, implies the deliberate selection of a preferred species, which becomes the key food resource. The applicability of a specialised hunting model for the Upper Palaeolithic of Europe has recently been challenged, however (Grayson & Delpech 2002). In this research, therefore we re-examine bison acquisition strategies during the Upper Palaeolithic in the Ukrainian steppes in the light of biogeochemical and zooarchaeological data.

The acquisition strategies used to procure a prey species are directly related to its social and spatial behaviour. A synthesis of ethological information for contemporary bison (Julien 2009) demonstrates the behavioural diversity of this taxa, linked mainly to local environmental variability, climatic conditions and population density. It is therefore necessary to propose a paleoethological model for the steppe bison before attempting to identify the acquisition strategies used by prehistoric hunters. In this research, we reconstruct the behaviour of the steppe bison using a combination of zooarchaeological tools, stable isotope analysis (intra-tooth isotope variation of carbon, oxygen and strontium ratios) and traditional paleobiological approaches. The advantages of using a combined approach are demonstrated through the examination of a case study: the site of Amvrosievka (Ukraine).

Amvrosievka is a complex of Epigravettian sites composed of a camp and kill site, where more than 500 bison are represented (Krotova & Belan 1993). Twenty-five permanent lower teeth ( $M_3$ ) representing twenty-five individual bison were selected from the kill and camp site for isotopic analysis. Intra- and inter-individual variations of  $\delta^{18}O$  from the enamel carbonate were analysed in order to track seasonal temperatures changes; the  $^{87}Sr/^{86}Sr$  ratio was examined to determine the spatial behaviour of the animals and  $\delta^{13}C$  was used to examine changes in diet. The relatively large number of individuals represented in this study allowed us to interpret the resulting data in terms of intra-populational variability. In addition to the isotopic analysis, zooarchaeological study of a recently excavated portion of the kill site enabled us to determine the age at death and sex-ratio of the kill-population as well as examine patterns of carcass treatment. We use the combined information from the isotopic and zooarchaeological analyses to reconstruct the social composition of the herds, their spatial behaviour, seasonality and the existence of different sub-herds through the identification of different isotopic groups. Ultimately, we are able to suggest that the site represents a palimpsest of different hunting episodes.

Finally, the impact of steppe bison palaeoethology on the choice of hunting strategy and subsistence economy of the Epigravettian occupants of Amvrosievka is examined. The non migratory behaviour of steppe bison in the study region is shown to have affected the season of acquisition as well as the hunting and butchering strategies developed by the Epigravettians. The combined paleoethological and palethnographical reconstruction offered here has direct implications for understanding the relative contribution of hunting pressure vs climatic change in the demise of the "mammoth steppe" faunas at the end of the Late Pleistocene.

Cited references:

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