

The study of extinct mammals is often conducted by the observation of modern analogues. A good example is the study of mammoths whose habits are reconstructed on the basis of observing closely related elephants. While large degree of analogy is undeniable, the major handicap of such approach is related to the completely different climate conditions favored by mammoths (cold climate) and elephants (hot climate). This creates necessity for inventing tools that would allow direct reconstructions of the mammals' habits on the basis of the available geo-archaeological material. An insight into life habits of extinct species such as mammoths can be provided by studying variation of isotope composition record in tooth enamel. Tooth enamel, unlike other tissues (e.g. bones), is very resistant to post-mortem alterations, and thus it bears a record of animals living conditions. Sr isotopes do not measurably fractionate in a food chain and correspond to the biologically available Sr isotopic signature of the area where animal fed during formation of a tissue. The relatively high concentration of Sr in animal or human tissues, due to favored substitution for Ca (teeth chemically are calcium phosphate), along with wide variations of Sr isotope composition in rocks, water and soils, makes Sr an extremely useful tool for studying past and present ecology of animals and humans. Investigation of oxygen isotope composition in the same material additionally provides information on evolving climate conditions (due to sensitivity of oxygen isotope fractionation to temperature). Furthermore, one of the major advantages of reconstructing animals' habits using teeth is that they develop in a predictable chronology during ontogeny and may provide a continuous life record up to tens of years in an individual mammoth. Studying mammoths' of different age (determined by ^{14}C carbon dating) allows long term (even thousands of years) reconstruction of mammoths' customs.

The main focus of our research is Kraków Spadzista site which is a Gravettian (Upper Paleolithic) site located in southern Poland and discovered in 1967. In central Europe only Moravian localities and Kraków Spadzista are Gravettian open-air sites where large mammoth bone assemblages were found. Certainly mammoth remains belong to animals which were killed by Palaeolithic hunter-gatherers and later butchered. The assemblages could be a disposal or storage area. At the site about 23 000 randomly mixed bones and teeth of late Pleistocene mammals were found. The vast majority (c. 97%) of all excavated remains belong to woolly mammoth which gives at least 97 individuals on a few hundred m². Most of those remains (belonging to minimum 86 individuals) were discovered at even smaller area of about 150 m².

Detailed isotopic, geochemical and histological teeth analyses proposed in this study will provide a wealth of information on proboscidean migrations during the late Pleistocene in Central Europe. The studied period (24-20 thousand years BP) directly precedes the Last Glacial Maximum dated at 20-18 000 years BP (before present) after which mammoths in this region practically disappeared. We will determine potential migration paths of mammoth population from Kraków Spadzista site which seemed to be triggered by seasonal weather changes. Application of modern techniques will allow us to provide high time resolution (few months) isotopic record of Sr and O which was not achievable by "conventional" methods that have been applied so far. Such detailed reconstruction will contribute to better understanding of woolly mammoths' habits, living immediately before major climatic change that led to major reduction of their population, but also to our knowledge of humans whose life strategy during late Pleistocene was strongly linked to mammoths' customs.