Approaches to determine reservoir effects in elk/moose

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Antler and skull bone of the same individual. The antler is built up during the summer season, when elk are reported to consume the largest proportion of aquatic plants. Therefore, the reservoir effect should be greater in the antler than in bone. Here, the lack of an age difference between antler and skull bone indicates the absence of a reservoir effect.

The samples were kindly provided by Per Lysdahl, Vendsyssel Historiske Museum.

Introduction

The elk/moose (*Alces alces*) was an important resource for prehistoric societies. In prehistoric art, it is often depicted in connection with water. Also, biologists find that elk spend a lot of time in water and consume considerable amounts of aquatic plants. As freshwater plants can have reservoir ages of hundreds or even thousands of years, there is a risk of a significant reservoir effect in elk bones and antler, and artefacts made of these materials. This study followed several approaches to investigate the possibility of a freshwater reservoir effect (FRE) in elk. We analysed modern, historical and archaeological bones and antler from several sites across Eurasia. Skull bone and antler of the same individual were radiocarbon dated, as antler is formed in summer, when the proportion of aquatic diet is supposed to be highest.

Aldersro, Denmark

Elk antler found together with a twig of yew/juniper, appeared to be a good paired sample.

Sample	¹⁴ C age
Bone (<i>A. alces</i>)	7825±44
Wood (<i>Taxus/Juniperus</i>)	10869±43

The twig is significantly older and must thus have been redeposited or already been present in the bog when the antler was deposited.

The samples were kindly provided by Henrik Skousen and Uffe Rasmussen, Moesgård Museum.

Friesack 27, Germany

The elk samples are not older than the other samples from the same layer complex. Therefore, a reservoir effect cannot be found in these cases.

The samples and information about the site were kindly provided by Charlotte Hegge and Daniel Groß, Kiel University.

Conclusions

The maximum reservoir effect measured in this study was about 500 years, and only found in one individual. A difference between bone and antler could not be determined. The reservoir effect appears to be smaller than estimated from accounts of elk diet, even in regions where a substantial freshwater reservoir effect is expected. Therefore, the hypothesis of a large proportion of aquatic diet can be rejected for several of the individuals studied here. Future studies should focus on elk from Northern America, where observations of elks with partly aquatic diet are most numerous.

Modern elks from Norway

In the study area, a freshwater reservoir is expected because of numerous hardwater lakes.

Three individuals with well-known year of death have been radiocarbon dated. The green bars mark the year of death. Comparison with simulated dates shows that these individuals appear to have only very small reservoir effects - about 100 years in the worst case (the individual from Bratsberg, at the bottom).

The samples were kindly provided by Jørgen Rosvold, NTNU Vitenskapsmuseet, Seksjon for arkeologi og kulturhistorie

Stanovoye, Russia

The elk antler mattock is significantly older than the wooden shaft to which it had been attached. This is a clear indication of a reservoir effect in elk, unless old antler had been re-used for the mattock.

The samples were kindly provided by Mikhail Zhilin, Institute of Archaeology, Russian Academy of Sciences.

Beregovaya, Russia

Although the oldest sample from this layer is an elk bone, the elk bones and antler are not generally older than the reindeer bones or food residues from the same layer. Therefore, we cannot detect a reservoir effect.

The samples were kindly provided by Mikhail Zhilin, Institute of Archaeology, Russian Academy of Sciences.

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