

Mesolithic Bone Studies

- searching for patterns of human activity through the eyes of taphonomic analysis and bone craft.

Acknowledgements

Prologue

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Paper I

Gummesson, S., Molin, F. & Storå, J. 2017. Taphonomy, bone surface characteristics and assemblage history. Finding Mesolithic bone depositions at Strandvägen, Motala. *Journal of Archaeological Science: Reports* 13 (2017), 11–25.

Abstract

Through taphonomic analyses, in this study we evaluate bones surface characteristics and differences in bone accumulation on a Mesolithic settlement site, in Eastern Middle Sweden. The assemblage consists of faunal remains from the Mesolithic but also from activities dating to historical periods. All bones from the site, including indeterminate fragments, were analysed. Variation in bones surface characteristics were registered according to a set of taphonomic data, based on previously published studies. The variation were categorized as different texture scores and evaluated against species representation, radiocarbon datings and spatial distribution. The study underlines the potential of methodological approaches to taphonomic data and underlines the importance of including indeterminate fragments when studying human utilization of bones. The results present strong correlations between different species, bone tools and specific surface textures. It shows that a large part of the assemblage is of Mesolithic origin but also that activities dating to post-Mesolithic periods have contributed to the assemblage accumulation. Spatial analyses of the different surface textures helped to identify and separate Mesolithic activity areas of the site, thus providing an understanding of the spatial organization at intra site level, at the settlement of Strandvägen.

Paper II

Gummesson, S. & Molin, F. manuscript/in press. Points of Bone and Antler from the Late Mesolithic settlement in Motala, eastern central Sweden. In D. Groß, H. Lübke, J. Meadows & D. Jantzen (Eds.). (in prep.). *Working at the sharp end: from bone and antler to Early Mesolithic life in Northern Europe. Untersuchungen und Materialien in Schleswig-Holstein und im Ostseeraum* 10.

Abstract

*Excavations at Motala, eastern central Sweden, have yielded a large and diverse material of osseous tools dating from the Late Mesolithic, c. 6000-4500 cal BC. The assembled collection comprises some 1500 pieces. About half of the identified tool types consist of different types of bone points of which barbed points dominate. The utilized raw material was predominantly red deer (*Cervus elaphus*) metatarsals and antler but other element do occur, as do bones from moose (*Alces alces*) and roe deer (*Capreolus capreolus*).*

More than 450 fragments of barbed points have been identified and interpreted as leister points or harpoon heads. The morphology of the barbed points were classified according to the general appearance of the corpus of points (setting of barbs) but more specifically from the morphology of basal ends. Aside from harpoons eight different groups of leister points were defined. The leister points are interpreted as prongs or single hafted points for fish-spears. Plain bone points are the second largest group, and may be sorted into several types, primarily interpreted as projectiles like arrowheads. Small bullet-like arrowheads and some rhombic points as well as club-shaped points of antler are also present. Slotted points appear in two different types either with uni- or bilateral edges.

Based on the collection from the site Strandvågen and with help of morphological groups as well as a large number of radiocarbon dates, we have identified a change in the utilization of fishing implements at c. 5000 cal BC. The change is detected as a discontinuation in the use of barbed leister points and a possible shift from bilateral to unilateral slotted points in addition to overall decreasing human activities, despite a continued presence at the site.

Paper III

Gummesson, S., Sundberg, R., Knutsson, H., Zetterlund, P., Molin, F., & Knutsson, K., accepted. Lithic Raw Material Economy in the Mesolithic: an Experimental Test of Edged Tool Efficiency and Durability in Bone Tool Production. *Lithic Technology*.

Abstract

The foundation of this paper is lithic economy with a focus on the actual use of different lithic raw materials for tasks at hand. Our specific focus is on the production of bone tools during the Mesolithic. The lithic and osseous assemblages from Strandvågen, Motala in east-central Sweden provide the archaeological background for the study. Based on a series of experiments we evaluate the efficiency and durability of different tool edges of five lithic raw materials; Cambrian flint, Cretaceous flint, mylonitic quartz, quartz and porphyry, each used to whittle bone. The results show that flint is the most efficient of the raw materials assessed. Thus, a non-local raw material offers complements of functional characteristics for bone working compared to locally available quartz and mylonitic quartz. This finding provides a new insight into lithic raw material distribution in the region, specifically for bone tool production on site.

Paper IV

Gummesson, S., Sjöström, A., & Molin, F. Manuscript. The spatial organization of bone craft during the Middle and Late Mesolithic.- A case study of well persevered settlement remains from two site in southern Sweden.

Abstract

This paper focuses on the spatial distribution of bone tool production waste from two Mesolithic sites in Sweden; Ringsjöholm and Strandvågen, with well-preserved faunal remains including high numbers of osseous artefacts. A local production of bone tools on both sites have generated a variety of identifiable waste products deriving from complete chains of productions, including unmodified bones to finished products. Identified categories include; anatomical and technical blanks, removed epiphyses, bone flakes and preforms. Identification of species and element distribution shows that antler and metapodial bone from red deer was the preferred raw material. The study includes technological characteristics of the bone craft, it is also concluded that specific contexts have impacted on different taphonomic patterns of the two assemblages. Through spatial statistical analyses of production waste it is suggested that blanks and preforms may have been stored under water for future use, and that delimited clusters of bone flakes at Strandvågen represents intentional craft areas, or "bone knapping floors". It is concluded that different stages of bone tool production have been organized within separate areas of the sites, and that larger waste products were discarded in the water along the shorelines adjacent the settlements.

Paper V

Gummesson, S. & Molin, F. 2016. The Mesolithic cemetery at Strandvägen, Motala, in eastern central Sweden, in: J. Grünberg, B. Gramsch, L. Larsson, J. Orschiedt and H. Meller (ed.) *Mesolithic Burials – Rites, Symbols and Social Organisation of Early Postglacial Communities*. Halle: Tagungen des Landesmuseums für Vorgeschichte Halle 13:145-159.

Summary

Mesolithic burials are uncommon in eastern central Sweden. The geology of the region does not preserve osteological material well and archaeological excavations have until now only revealed a few burials and isolated finds of human bones. The recent discovery of 19 Mesolithic burials at the site Strandvägen in Motala provides new information about burial practices of the region and represents one of the northernmost Mesolithic cemeteries in Scandinavia.

Paper VI

Eriksson, G., Frei, K.M., Howcraft, R., Gummesson, S., Molin, F., Lidén, K., Frei, R. & Hallgren, F. 2016. Diet and mobility among Mesolithic hunter-gatherers in Motala (Sweden) – the isotope perspective. *Journal of Archaeological Science: Reports*.

<http://dx.doi.org/10.1016/j.jasrep.2016.05.052>

Abstract

Recent excavations at the sites of Strandvägen and Kanaljorden in Motala, Eastern Central Sweden, have unearthed complex and varied funerary remains from the Mesolithic. The two sites are situated on opposite banks of the river Motala Ström. While geographically close and roughly covering the same time span (c. 8000–7000 cal. BP), the funerary remains reveal differences and similarities in the treatment of the dead between the two localities. While at Strandvägen human bones were mostly found either scattered along the river bed or in inhumation graves, Kanaljorden contains wetland depositions of disarticulated skulls. We have conducted multi-isotope analyses of $\delta^{13}C$, $\delta^{15}N$, $\delta^{34}S$ and $^{87}Sr/^{86}Sr$ of human and animal remains with the aim of reconstructing the dietary patterns, geographic provenance and mobility of the interred. A series of faunal reference samples and, in the case of $^{87}Sr/^{86}Sr$, soil samples have been analysed in order to establish relevant isotopic baselines. The results show a protein intake dominated by aquatic resources, probably consisting of both freshwater and marine fish in varied proportions. The strontium isotope data indicate an interesting distinction between the individuals buried on either side of the river Motala Ström. Five out of six sampled individuals from Strandvägen have isotope ratios consistent with a local provenance, whereas ratios from seven out of eight Kanaljorden individuals indicate a non-local origin. The $\delta^{34}S$ analysis proved problematic as a majority of the samples appear to be affected by diagenesis. This is probably the result of contamination by exogenous Sulphur from surrounding fluvial and lacustrine sediments, as has previously been reported from other waterlogged sites.

The focus and overall intention with this thesis has been to examine and scrutinize quantitative osteoarchaeological patterns through the study of bone craft, taphonomy and spatial context. The ambition has been to highlight human actions and events in relation to observed patterns and spatial organization. Six assemblages of Mesolithic osseous artefacts and production waste (Ageröd V, Bökeberg III, Kanaljorden, Ringsjöholm, Segebro and Stranvägen) have been studied with the following general aims;

- What actions/processes are responsible for observed osteoarchaeological patterns of accumulation?
- Is it possible to identify human practice/-s responsible for observed patterns?
- Is it possible to identify spatial patterns of bone depositions relating to the human activities?
- Is it possible to identify spatial patterns of osseous tool production, comparable with lithic distribution patterns?
- Finally what does the result of these above posed questions tell us about social organization in both a local and regional perspective?

The results in relation to these aims may be summarized as follows:

Actions/processes responsible for accumulative patterns vary in and between assemblages, detailed taphonomic analysis and contextual analysis provides means to describe and assess such causes. Osseous production is obviously one reason for the accumulation of the investigated assemblages. Paper I, specifically shows how different depositional events have affected accumulation of osteological remains at Strandvägen, Motala, Östergötland and how detailed taphonomic analysis may identify Mesolithic activity areas and help understanding site organization. Paper II, IV, V and VI relate to preservation and describe many different variables that affects taphonomic patterns in different find contexts, thereby providing a basis for informed interpretations of the Mesolithic activities which are in main focus. Paper V and VI concern among other issues the general preservation of osteological remains exemplified at the two different types of sites, Strandvägen and Kanaljorden in Motala Östergötland. Paper II and IV specifically evaluate depositional patterns in relation to osseous artefacts and waste products and their impact on quantitative patterns in faunal assemblages.

Through detailed taphonomic analyses it has been possible to identify human practices responsible for different osteoarchaeological patterns. All patterns, however, may not be linked to a specific causal agent or process. All papers included in the thesis in different ways examine and answer questions related to the identification of human practices in osteoarchaeological materials. Paper II and IV most explicitly exemplify patterns of osseous tool production and human utilization of bone tools. Furthermore, Paper III also provides a

basis for discussion and evaluation of lithic raw material accumulation and mobility based on experiments on the efficiency and durability of lithic tools in relation to osseous production.

Identification of spatial patterns through GIS analyses of bone depositions relating to human activities are exemplified in Papers I and IV. Paper I shows how the osteoarchaeological assemblage at Strandvägen has been formed by different depositional events. Paper II and IV describe depositional patterns of osseous artefacts and production waste, and how taphonomic patterns must be understood in relation to the archaeological contexts. Paper IV further shows how osseous tool production is organized on an intra-site level at two geographically and chronologically separated Mesolithic sites. Paper III connects osseous tool production with lithic raw material acquisition and larger geographical distribution patterns. Finally, Paper V describes the burial practices and depositions of human remains and their spatial arrangement at Strandvägen.

The osseous tool production is linked to lithic craft, exemplified by Paper III and IV. As mentioned above Paper III links the production of bone tools to the lithic technology as it evaluates functional aspects in relation to raw material mobility and transport. Paper IV shows how osseous production is organized at an intra-site level, “knapping floors” for osseous production have been identified in spatial connection to knapping floors for lithic production and activity areas. Raw materials in the form of osseous blanks and preforms seem to have been stored for future utilization in the waters adjacent to the sites. This highlights aspects of Mesolithic raw material management as well as depositional patterns. The associations between osseous and lithic tool production also imply that variation in the techniques applied on bone or antler may be related also to general changes in lithic craft.

The overall results from the work presented in the thesis give evidence of an organization of osseous tool production that comprise both the intra-site organization but also patterns of landscape use. Raw material (both lithic and osseous) was evidently acquired off site, both regionally and interregional, and deposits of raw materials were left at different locations in the landscape for future use. There is a variation in the representation of different kinds of waste products at the sites which suggests functional differences related to the site location. The technological analysis, complemented through practical experiments and the results of Paper III, suggest that the required know-how for Mesolithic osseous craft was “common knowledge” within society and grave goods from the burials at Strandvägen, presented in Paper V, signal some importance of craft. Some people probably had better skill or were exclusively allowed to create special objects but, still, production was likely not performed as a part time of full time occupation “financed” by the rest of society.

Some vertical social stratification within Mesolithic society has been suggested by other researchers, based on e.g. analyses of grave goods. The result of paper IV, V, VI and also recent evidence of food storage on Mesolithic sites provide a picture of a society with a continuous presence in the landscape enabling production of surplus. Taken together the study of Middle and Late Mesolithic osseous production in Sweden, the deposits of raw material

PM Closing seminar, Sara Gummesson

and spatial organization indicate at continuous presence in the region and a scheduling of activities both at site and in the landscape and the possibility the conditions for a society with some stratification based on personal know-how or other personal attributes.