CRAFTING BONE – SKELETAL TECHNOLOGIES THROUGH TIME AND SPACE

Proceedings of the 2nd meeting of the (ICAZ) Worked Bone Research Group

Editors

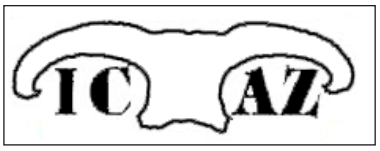
Alice M. Choyke & László Bartosiewicz

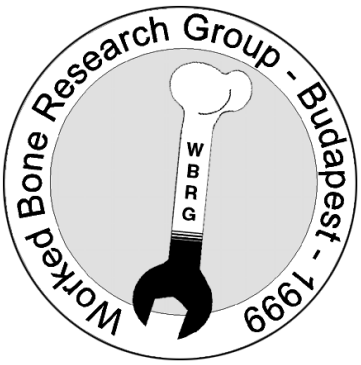
Technical editors

Krisztián Kolozsvári
Mrs. Katalin Kővágó - Szentirmai

Infrastructural support by

The staff of the Roman Department of the Aquincum Museum





Worked Bone Research Group 2nd Meeting
Budapest 31 August – 5 September 1999

BAR International Series
2001

Table of Contents

Special Assemblages

Participants in the WBRG 1999 Budapest conference (left to right): Ülle Tamla, Elisabeth Brynja, Tina Tuohy, Liina Maldre, Karlheinz Steppan, Heidi Luik, Gitte Jensen, John Chapman, Alice Choyke, Janet Griffitts, Andreas Northe, Noëlle Provenzano, Jörg Schibler, Nerissa Russell, Colleen Batey, Lyuba Smirnova, László Daróczi-Szabó, Daniella Ciugudean, Mária Bíró, Kordula Gostenčnik, Eszter Kovács, Christopher Morris, Sabine Deschler-Erb, Ans Nieuwenberg-Bron, Katalin Simán, Isabelle Sidéra, Mickle Zhilin

CRAFTING BONE - SKELETAL TECHNOLOGIES THROUGH TIME AND SPACE

Proceedings of the 2nd meeting of the (ICAZ) Worked Bone Research Group

Budapest, September 1999

Introduction

Archaeologists and Archeozoologists, both study worked osseous materials (bone, antler and tooth, including ivory, in short all referred to as "bone"). Such reports, however, are often buried at the very back of faunal analyses appended to site reports. Furthermore, the two groups of specialists have had little chance to interact, even within Europe since they tend to attend different conferences and write for different fora.

At the root of this problem lay the arbitrary, largely institutional division between pre- and proto-historians, often imposed on bone manufacturing experts by nothing but formalism in research tradition. The most exemplary series of studies n this field is entitled: "*Industrie de l'os neolithique et de l'age de metaux*" (Bone industry *from the Neolithic and Metal Ages*). Another classic, a book, is sub-titled "The Technology of Skeletal Materials *since the Roman Period*". In very early prehistoric assemblages, attention is often focused on the question of whether a particular piece of bone was worked or not. In later assemblages, it is the intensity of manufacturing that often renders objects zoologically non-identifiable, so that important aspects of raw material procurement, including long distance trade, remain intangible.

The history of raw material use, however, is continuous and many of the constraints and possibilities inherent in skeletal materials are the same whether one is dealing with Paleolithic or Medieval artifacts. Indubitably, the organization of manufacture, the function and value of bone artifacts (as well as some technological innovations such as the regular use of metal tools or lathes), differ substantially between simple and complex societies through time. On the other hand, fundamental questions of tensile characteristics, procurement strategies, style and certain technological requirements are not only similar diachronically, but also open up new vistas when apparently unrelated periods are compared. The function of these objects as social markers, for example, remains remarkably constant through time, even if details vary. The papers in this volume reflect these conceptual similarities and differences as did the papers delivered at the conference itself.

The first meeting of what was to become the Worked Bone Research Group (WBRG) was organized by Dr. Ian Riddler in the **British Museum, London, in January 1997**. The committment and enthusiasm of that first workshop has greatly inspired subsequent efforts in recruiting a wide range of bone specialists, capable of contributing to discussions concerning bone manufacturing.

In keeping with the aims of the Worked Bone Research Group, since 2000 an official working group of the International Council for Archaeozoology (ICAZ), an effort was made to present these papers on the basis of what *connects* them rather than segregating them by archaeological period or region. Contributions mostly include articles based on papers delivered in September 1999 at the second Worked Bone Research Group meeting in Budapest, organized by the editors with the unfailing support of the Aquincum Museum (Budapest) and its staff. Several people who were unable to be present at this conference were also asked to contribute papers. Finally, five of the studies in this volume, originally delivered at a symposium on bone tools organized by Dr. Kitty Emery and Dr. Tom Wake, entitled "*Technology of Skeletal Materials: Considerations of Production, Method and Scale*", at the 64th Annual Meeting of the Society for American Archaeology (Chicago 1999), were added thereby expanding the academic spectrum both in terms of research tradition and geographic scope.

There are a total of 36 papers in this volume. Research was carried out on materials from Central and North America to various regions of Europe and Southwest Asia. The authors represent scientific traditons from Estonia, Hungary, Romania, and Russia, European countries in which, until recently, ideas developed in relative isolation. Other European countries represented include Austria, Denmark, France, Germany, Great Britain, Greece, and Switzerland. Last but not least, the North American scholarly approach is also represented here.

Schools of thought may be said to be exemplified by what used to be Soviet research, well known for pioneering works on taphonomy, experimentation and traceology. Bone manufacturing was first brought to the attention of Western scholars by the publication in 1964 of the translation of S. A. Semenov's *Prehistoric Technology*, published originally in 1957. Scholars in France have also carried out decades of co-ordinated work on operational chains in the manufacturing process from the selection

of raw materials to finished products, with special emphasis on prehistoric modified bone. An entire working group, "Unspecialized Bone Industries/Bone Modification", is directed by Marylene Patou-Mathis. This working group itself is part of a larger research program on bone industry "*La Commission de Nomenclature sure l'Indistrie de l'Os Prëhistorique*" headed my Mme. H. Camps-Fabrer. Several specialists such as Jörg Schibler in Switzerland, have created laboratories where ground laying work has been carried out for years on worked osseous materials, especially from Swiss Neolithic Lake Dwellings and Roman Period sites. Language barriers have often prevented these important bodies of work from being as widely disseminated as they deserve. Arthur MacGregor in England, writing in English, has had a decisive influence on specialists working on more recent Roman and Medieval worked bone assemblages in Europe.

The work of all of these groups as well as certain individual scholars is well known within limited circles. Otherwise, however, the overwhelming experience of most researchers on worked bone have been feelings of isolation and alienation from most archaeological or archaeozoological work related, most importantly, to the absence of an international forum where their often specialized work can be presented and problems discussed.

In spite of the fact that there have been many practical obstacles to information flow between specialists in this field, there are really remarkable similarities of approach which should ultimately lead to the development of more compatible paradigms in research. Agreement on methodologies will have a positive feedback on communications, helping the field to grow and develop properly.

It seems that, at last, archaeologists and archaeozoologists and other specialists are talking to each other and sharing methodologicial points of view. One striking example of this can be seen in the the emphasis on raw materials studied in parallel to types found in the majority of papers in this volume. Previously studies often concentrated on typo-chronological questions, ignoring the questions of raw material morphology and availability. The series published by the *Centre National de la Recherche Scientifique*, edited by Mme. Henriette Camps-Fabrer in France is largely to be credited for beginning this new trend. It contains many papers concentrating on understanding manufacturing sequences and, indeed, from Europe to North America there are papers which explicitly deal with manufacturing sequences in individual assemblages.

There is also a consistent emphasis on experiment and manufacturing techniques present in much of the work in this volume. The related but fraught question of function continues to tantalize and frustrate most specialists. A number of articles attempt to apply techniques of hard science, such as scanning electron microscopy or light microscopy, together with experiment to get objective, "processual" answers to this important group of questions. Other researchers rely deductively on analogy, archaeological context, gross morphology, and textual sources as they try understanding how these objects were used.

When editing the volume, we tried to concentate on the underlying main concepts represented by each paper rather than grouping them diachronically or by geographical region. As a result, contributions follow a line from the theoretical through the problems of raw material selection, manufacturing techniques, experimental work, technical function and socio-cultural interpretations. Obviously many of these papers deal with several of these aspects simultaneously. Finally, analyses of assemblages are grouped to show the current state of general application of these principles as illustrated in papers in the rest of the volume. Reports on bone tool types will ultimately benefit from more unified typologies and also provide researchers with comparitive databases from regions beyond their own.

Finally, a word on the organization of papers in this volume. Although the editors have tried to group these papers by what they see as the main theoretical and methodological thrust of the authors it should be understood that most papers, to a greater or lesser extent, overlap between these artificial sub-titles. Happily, almost all these works include considerations of raw material exploitation, manufacturing and functional analyses and all make some attempt to consider the social context from which these artifacts emerged. It is exactly this cross-cutting of boundaries which allows us to hope that the study of worked osseous materials is well on the way to developing into a discipline in its own right.

In addition to the generous support given by our sponsors and technical editors for this volume, organizing the conference would not have been possible without the active help of numerous colleagues. Special thanks are due to Paula Zsidy, Director of the Aquincum Museum, Katalin Simán, archaeologist and two students from the Institute of Archaeological Sciences (ELTE, Budapest): László Daróczi-Szabó and András Markó. The Hotel Wien, Budapest and its efficient manager provided a comfortable setting for our discussions at a reasonable price. Last but not least, help with abstract translations by Cornelia Becker, Noelle Provenzano as well as Marjan Mashkour and Turit Wilroy should also be acknowledged here.

NOTCHED IMPLEMENTS MADE OF SCAPULAE - STILL A PROBLEM

Andreas Northe

Abstract: The assemblage of a few Neolithic and early Bronze age cultures of central Europe often contains bone implements with notched or sharpened working edges, almost exclusively made of cattle scapulae. A closer look at the literature reveals, that these artefacts are not limited to certain Neolithic and Bronze age cultures, but are broadly spread in time and space. In contrast to the frequent appearance in settlements, these objects seem to be underrepresented in graves. Their interpretation as a tool for flax hackling is common. Exact analyses, in particular usewear analyses reveal, however, that a use for skin and tendon dressing is more probable.

Keywords: Central Europe, Neolithic/Bronze age, notched scapulae, use wear

Résumé: Les assemblages du Néolithique et du début de l'Age du Bronze d'Europe centrale livre souvent des instruments en os présentant une extrémité active dentelée ou aiguisée, presque toujours aménagés sur omoplate de boviné. Une étude approfondie de la littérature archéologique révèle que ces objets ne sont pas limités à quelques cultures du Néolithique et de l'Age du Bronze, mais sont plus largement présents dans le temps et l'espace. Fréquents dans les habitats, ces objets sont très rarement découverts en contexte funéraire. Ils sont communément interprétés comme des outils à carder le lin. Des analyses détaillées et notamment l'étude des traces d'utilisation montrent cependant qu'une utilisation pour le travail des peaux et de tendons est plus probable.

Mots-clés: Europe centrale, Néolithique, Age du Bronze, omoplates dentelées, traces d'utilisation

Zusammenfassung: Das Siedlungsinventar einiger neolithischer und frühbronzezeitlicher Kulturen Mitteleuropas enthält oft Knochengeräte mit gekerbter oder zugeschliffener Arbeitskante, die fast ausschließlich aus Rinderschulterblättern hergestellt wurden. Eine intensivere Literaturstudie machte deutlich, daß diese Artefakte nicht nur auf einige Kulturen des Neolithikums und der Frühbronzezeit beschränkt sind, sondern eine größere zeitliche und räumliche Verbreitung besitzen. Im Gegensatz zum häufigen Auftreten in Siedlungen erscheinen sie als Grabbeigaben nur in geringer Anzahl. Im allgemeinen werden diese Geräte als Werkzeuge zum Flachshecheln gedeutet. Genauere Untersuchungen, insbesondere Analysen der Gebrauchsspuren, zeigen jedoch, daß eine Verwendung bei der Bearbeitung von Tierhäuten und Sehnen wahrscheinlicher ist.

Schlüsselworte: Zentraleuropa, Neolithikum/Bronzezeit, gekerbte Schulterblätter, Gebrauchsspuren

Preface

Typical of the Neolithic Bernburg Culture (3300-2800 BC) in central Germany and the Central European early Bronze Age cultures Aunjetitz (2300-1600 BC), Veterov and Mad'arovce (1800-1500 BC), the assemblage of settlements often contains flat bone implements made of scapulae of cattle (fig. 1), mostly notched or sharpened along one edge, and frequently pierced in several places (Bak 1985, 72). A closer look at the literature, however, reveals a time insensitivity of this type of implement and its broader spatial distribution. Besides their frequent appearance in settlements, such artefacts also appear occasionally as grave goods.

Despite their interesting shape, this group has not until now received the attention it deserves in the literature. Although more specific individual investigations and comparisons have been conducted in the last few decades, the artefacts were mostly mentioned only in passing.

Since September 1999 the author has been conducting his own research at the Institute of Prehistoric Archaeology, Martin-Luther-University, into the production technique and possible use of such notched implements as part of a broader work on Neolithic bone tools from central Germany.

However, since the experiment is just beginning, no concrete results can be reported as yet. This paper, however, should serve to present anew to a broader public this little considered type of implement and the current status of research.

History of research - distribution in time and space

The first discoveries related to this group of implements appeared in the literature as early as the beginning of the twentieth century. These were exclusively Neolithic finds, which were interpreted, based on their shape, as meat knives (Grössler 1902, p. 217) or saws (Götze/Höfer/Zschiesche 1909, 458). In his work on the "Walternienburg-Bernburger-

Kultur", Niklasson (1925, 26, 107) mentions similarly pierced implements as "Falzbeine" (groovebones), without describing their features in more detail.

Lehmann (1931, 37) was the first to offer a more comprehensive work on these artefacts and how they might have been used. He investigated certain prehistoric, mainly Neolithic finds from Thuringia and interpreted them, on the basis of their shape and use traces, as tools used for carding flax. This interpretation was borrowed without critisisim by various authors. Indreko (1961, 418) interprets a late Bronze age find as a flax comb or weaver's tool. In his work on the Neolithic of the Elbe-Saale-Region, Behrens (1973, 104) mentions in passing "so-called toothed flax combs". A find also described by Müller (1975, 158, 178) as a hatchel dates back to the early Iron Age.

Some authors also offered other other interpretations rather than this most common one. Rossius (1933, 50) already hypothesised that the lengthwise pierced, flat and non-notched implements of the Iron Age were scrapers, used for tanning. Tihelka (1958, 91) considers it possible that the early Bronze age notched bone tools were used as potter's tools. An implement from the late Hallstatt Period of northeastern Poland is interpreted similarly by Malinowski (1961, 65) as a skin deflesher. The use of similar implements to refine plant fibres is also considered by Nuglisch (1964, 800) as unlikely. He believes such tools were used in the preparation of twine.

In the middle of the 1960s, these instruments were compared for the first time with others belonging to a broader time and space range (Hásek 1966, 225). Hásek does not think the implements were limited to a single function. Based on corresponding use traces, he believes a soft, elastic working material was pulled under pressure through the working edge.

Feustel (1980) closely investigated the production and possible function of these instruments using Neolithic implements from Thuringia. He too interpreted the notched implements as tanning tools. A work by Walter & Möbes (1988, 242) made the results of Feustel's investigations even more concrete. Based on specific stone tools found together with implements made of scapulae in pits from early Bronze age settlements in Thuringia and using ethnographic parallels, they proposed varying and multiple uses related to the butchering process. Besides its use as a tanning tool and in the fabrication of ropes, they considered that these devices might possibly have been used in gut cleaning.

As can easily be seen, this group of instruments is not limited in time and space to the central German Bernburg Culture. Some implements can already be attributed to the Baalberge (4100-3500 BC) or Salzmünde phase (3600-3300 BC) (Götze et al. 1909, 458, Taf. VII). In isolated cases, they have also been found in Corded Ware graves from Poland (2700-2500 BC; Uzarowiczowa 1970, 208). However, they appear more often in the early Bronze age of central Germany, Bohemia and Moravia and in the central German and northeast Polish early Iron Age. They also occur, in smaller numbers, in the pre-Roman Iron Age of Central Europe (Pic 1907).

Description of the implements

Despite the great number of finds, most of the implements have only been found preserved in fragmentary form. On the basis of the complete or almost complete specimens, two types may be distinguished, one of which appears in two variants (Feustel 1980, 10).

Type A includes objects whose sharpened working edge has no notches (fig. 2). They can be described as cutting edge-like. Most of them are made from the region of the *margo thoracicus* and *fossa infra spinam* of the scapulae of large mammals. Some wide pieces are also made from the mandibulae.

The highly polished working edge is generally made from the cortical bone of the *fossa infra spinam*. Some implements also display use wear in the area of the former *margo vertebralis*. The working edge may be concave, straight or convex. Apart from the working edge itself, the opposite side (*margo thoracicus*) may also be worked.

As a rule, the partly proximal handle-like implements have no holes.

The length of the implements varies between ca. 10 and 20 cm with a width of approximately 3-6 cm. The sharpened working edge is generally between 1-4 cm wide.

Type B instruments possess a notched working edge and holes (fig. 3). For most of these implements, the area around the *spina scapulae* constitutes the main body of the tool. The notched working edge, which as opposed to type A, is often rounded, is covered with a strong polish, and is also made from the area of the *fossa infra spinam*. The varying depth and breadth of the notches create either a straight working edge with teeth or a wavelike edge. The notching also often varies in strength. The notches sometimes seem so worn out that the working edge is very similar to type A, except that the line of the working edge appears very irregular. In many instruments, the *margo thoracicus* and *margo vertebralis* areas are also put to use.

Contrary to type A, this type possesses biconical perforations. The number and position of these holes define two variants. The first variant is generally perforated with only one hole, located mainly in a, more or less, clearly discernible grip. The length of the instrument is between 14-20 cm. The second variant has two to three holes, mainly located on the side opposite to the working edge (fig. 4). These implements are generally smaller than variant 1. The diameter of the holes varies between 0.5-0.7 cm.

Type B1 appears more frequently in the Neolithic and the early Bronze age, while type B2 is apparently limited to the early Iron age.

How were they fabricated?

Since the implements mostly show a strong degree of wear, it is very difficult to reconstruct the original form and preparation techniques.

As experiments have shown to date, efficient fabrication becomes possible only after the bones have been made softer. Contrary to the methods described by Żurowski (1973, 201, 1974, 3), it has been demonstrated that soaking in water for a few (10-20) days or cooking for one or two hours are sufficient. After softening, the neck may be broken into pieces using a blunt hammerstone, provided some force is applied. It is just as easy to separate the *spina scapulae*. This separation is made easier and more precise, however, if one uses chisel or adze-like implements.

The basic shape of the implements can already be achieved by simply breaking the unneeded parts of scapula into pieces. But the later working edge then usually unfolds along an irregular curve. Using a chisel, the scapula can then be separated with a vertical blow to the *margo vertebralis*. A clean separation can be obtained by hitting the cortical bone along a straight splitting line with a sharp stone tool. Even without too much practice, this separating process can be achieved within 30 minutes. On some implements, it is possible to distinguish longer grooves located close to the working edge. These grooves are similar to the traces left by the detachment of the separating groove in our experiments.

The half-finished objects were then, more or less, sharpened. The *spina scapulae* was sometimes completely flattened. The breaking edges of the proximal part were then generally rounded so that they could be used as handles. The distal part was then worked to form an arc. Oblique and closely formed parallel lines show that the working edges were also sharpened. Since the typically strong gloss on these implements also covers these lines, it is unlikely that they were produced during use.

Since the sharpening surfaces are rarely totally flat, the use of smaller hand held grindstones should be supposed, although our experiments show that sharpening on a large sandstone slab on the ground appears easier.

The notches were then probably cut or worked with correspondingly small grindstones. The experiments carried out to date used the sharp edge of a large sandstone. Notching using the push and pull movement of sufficiently rough and solid strings is also possible, although this process would be more time consuming. A more precise and certain reconstruction is not possible, however, since the manufactuing traces on the notches have disappeared with use.

The holes are located on both sides. As far as may be ascertained, irregularities that could be caused by the sand required for the piercing of organic drills, seem to occur at the perforation wall. Because of the often oblique direction of the holes, a free-hand type of work with bow drills may be hypothesised (Feustel 1988, 11).

What were they used for?

Despite sometimes very precise investigations, it is difficult to reconstruct the original purpose for which these instruments were used. On the one hand, most of the implements have been preserved only as fragments, on the other, there are hardly any ethnographic parallels for flat tools with a notched working edge.

The type and location of the use traces, however, gives approximate indications of the working material and type of manipulation.

Particularly typical for the implements under consideration is a general and unequal rounding of the edges and a generally high level of polish. It is often accompanied by very fine scratches running obliquely from the working edge which can mostly be seen only under a microscope. These traces reveal that the material used must have been relatively soft and elastic.

In toothed instruments, the gloss due to use wear can be observed on the teeth themselves as well as in the spaces between them. If used for hackling of flax, the use wear would be limited to the spaces between the teeth.

The distribution of the use traces is always more dense on one side than on the other. It may therefore be surmised that the implements were applied from an acute angle to the worked material. The unequal degrees of wear and the irregular line of the working edge may lead us to suppose that the implement was not applied along its full length to the material. Particularly for the implements with a toothed working edge, it must be supposed that certain parts were given preference and that the material was worked employing only a small area of the instrument (Feustel 1988, 16).

Based on the features mentioned above, it appears very likely that the instrument was used to work the skins and hides of animals. The varying degrees of wear on the different parts of the notched implements points more toward the cleaning, stretching and smoothing of tendons and guts.

Since the holes on type B1 are partly linked to a low degree of gloss, one can suppose that a rope went through the hole so as to ensure an eventual fastening of the instrument to the belt. The numerous holes on the flat sides of type B2 may point to attachment to a wooden handle.

Ethnography provides only few examples of comparable implements. Notched tools are hardly known. A parallel can be drawn with the notched tools of the Pueblo-Indians used for removing hair from and softening hides and skins (Mason 1889, 583). The tools made from parts of reindeer scapulae, which are used by the Inuit for defleshing and softening

hides, are also relatively similar to the implements with a smooth working edge (McGhee 1972, 94).

Future experiments, in which the author compares all the proposed uses in accordance with their traces, should provide more precise indications as to the actual use of these tools.

Sources of figures

Fig. 2, 3: Unpublished drawings (thanks for permission to publish to Dr. D. Walter, Arch. Landesamt Weimar)
Fig. 1, 5,6: Feustel 1988 (modified).
Fig. 4: Nuglisch 1964.

References

Bąk, U. 1985. Knochenerzeugnisse aus der frühbronzezeitlichen Siedlung Jędrychowice, Woiw. Opole. In *Frühbronzezeitliche befestigte Siedlungen in Mitteleuropa*, ed. M. Gedl. Materialien der internationalen Arbeitstagung vom 20. bis zum 22. September 1983 in Kraków. Archaeologia interregionalis 6, Wydawn. Uniwersytetu Warszawskiego, Warszawa. pp. 69-85.

Behrens, H. 1973. *Die Jungsteinzeit im Mittelelbe-Saale-Gebiet*. Veröff. Landesmus. Vorg. Halle 27, Berlin.

Feustel, R. 1980. Neolithische Gerberwerkzeuge aus Knochen. *Alt-Thüringen* 17, Weimar, pp. 7-18.

Götze, A., Höfer, P. & Zschiesche, P. 1909. *Die vor- und frühgeschichtlichen Altertümer Thüringens*. Würzburg.

Grössler, H. 1902. Geschlossene vorgeschichtliche Funde aus dem Kreise Mansfeld, Querfurt und Sangerhausen. *Jahresschr. Vorg. sächs.-thür. Länder* 1, Halle (Saale), pp. 125-244.

Hásek, I. 1966. Praveké kostené a parchové nástroje s ozubenou pracovní hranou. *Sborník Národního Muz. Praze* 20, Praha, pp. 225-267.

Indreko, R. 1961. Die Asva-Kultur. In *Berichte V. intern. Kongress für Vor- und Frühgeschichte*, ed. G. Bersu. Hamburg–Berlin, pp. 416-421.

Lehmann, E. 1931. Gezähnte Knochenwerkzeuge aus Mitteldeutschland. Jahresschrift für die Vorgeschichte der sächsisch-thüringischen Länder 19, Halle (Saale), pp. 37-43.

Malinowski, T. 1961. Badania Archeologiczne grodziska kultury Lucyckiej w Smuszewie. pow. Wągrowiec. *Sprawozdania archeologiczne* 1959, pp. 65-78.

Mason, O. T. 1891. *Aboriginal skin dressing*. Rept. Nat. Mus. 1889, Washington, pp. 553-589.

McGeeh, R. 1972. *Copper Eskimo Prehistory*. Nat. Mus. Canada Publ. Arch. 2, Ottawa.

Müller, D. W. 1975. Der ur- und frühgeschichtliche Besiedlungsablauf innerhalb der Gemarkung Oberbösa, Kr. Sondershausen. *Alt-Thüringen 13*, Weimar, pp. 132-195.

Niklasson, N. 1925. Studien zur Walternienburg-Bernburger Kultur I. Jahresschrift für die Vorgeschichte der sächsisch-thüringischen Länder 13, Halle (Saale), pp. 1-183.

Nuglisch, K. 1964. Einige Typen von früheisenzeitlichen Knochengeräten im Ostharzgebiet. *Wissenschaftliche Zeitschrift der Universität Halle* 13G, 11/12, Halle (Saale), pp. 799-812.

Pic, J.L. 1907. *Die Urnengräber Böhmens*. Leipzig

Rossius, K. O. 1933. Die sogenannten Pfahlbauten Ostpreußens. *Prähistorische Zeitschrift* 24, pp. 22-95.

Tihelka, K. 1958. Der Věteřov-Typus in Mähren. *Kommision für Aeneolithikum und ältere Bronzezeit*, Nitra, pp. 77-109.

Uzarowiczowa, A. 1970. Groby kultury ceramiki sznuroweij z cmentarzyska wielokulturowego w Mierzanowicach, pow. Opatów. *Wiadomości Arch*. 35, pp. 201-205.

Walter, D. & Möbes, G. 1988. Gerätschaften des Schlächters aus Siedlungsgruben der Aunjetitzer Kultur in Thüringen. *Ausgrabungen und Funde* 33, Berlin, pp. 242-246.

Żurowski, K. 1973. Methoden zum Weichmachen von Geweih und Knochen in frühslawischen Werkstätten. *Berichte, II. Internationaler Kongress Slaw. Archäologie* 3, Berlin, pp. 483-490.

Żurowski, K. 1974. Die altertümlichen und mittelalterlichen Methoden der Geweih- und Knochenaufweichung. *Archaeologia* 4, Toruń, pp. 3-23.

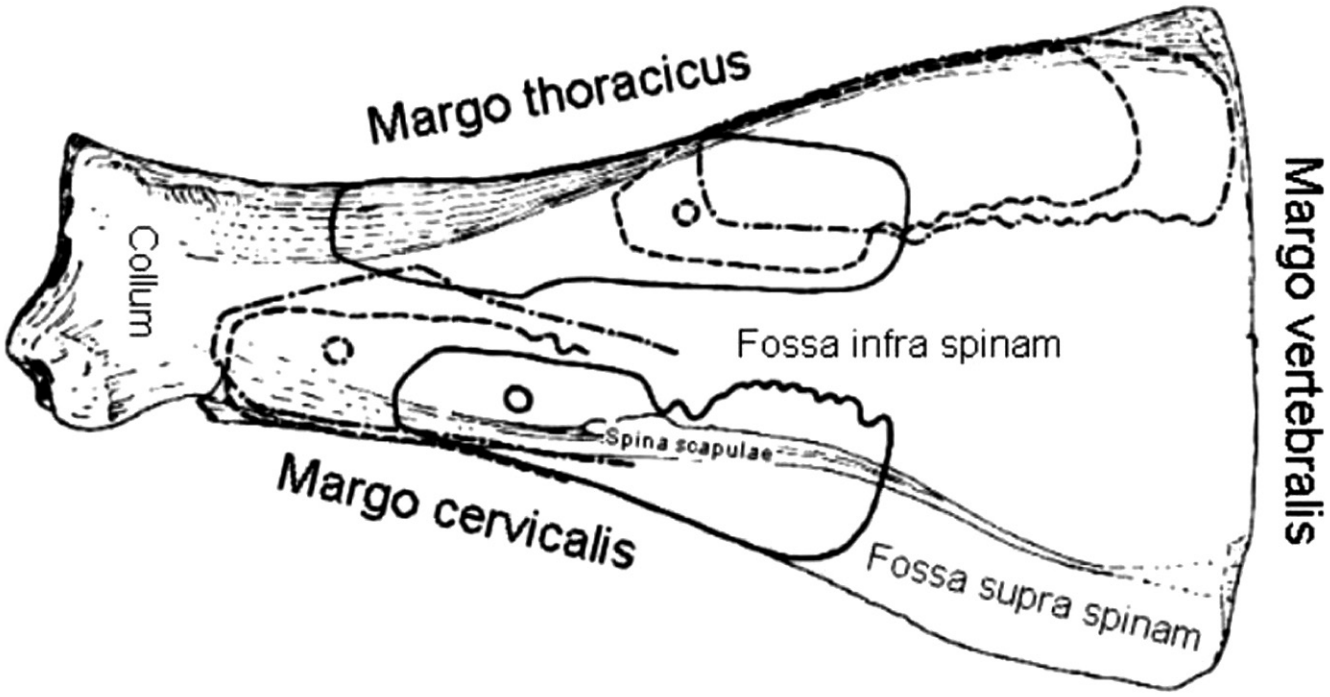


Fig. 1 Notched implements made of Scapulae of large mammals

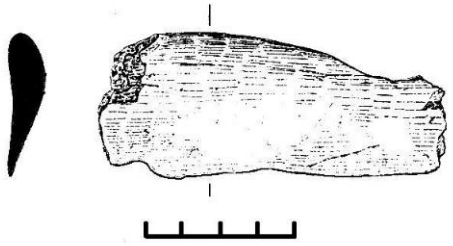


Fig. 2 Implements without notched working edge (from the Bernburg-earthwork at Krautheim, Thuringia)

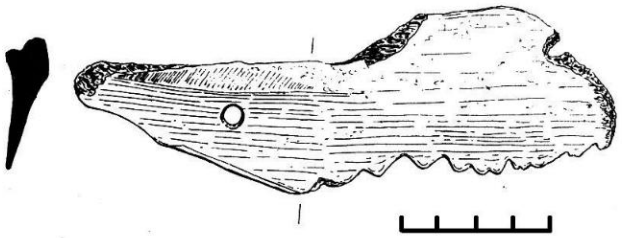


Fig. 3 Notched Implements - variant 1 (from the Bernburg-earthwork at Krautheim, Thuringia)

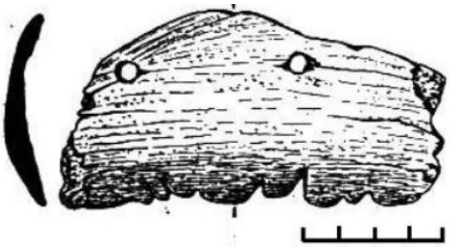


Fig. 4 Notched Implements - variant 2 (from the Iron Age settlement of Quedlinburg-Boxhornschanze)

Fig. 6 Implements without notched working edge (from the Bernburg-Settlement Lohberg, Thuringia)

Fig. 5 Implements with notched working edge (from the Bernburg-settlement Lohberg, Thuringia)