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

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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

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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.

BONE POINTS - NO LONGER A MYSTERY? EVIDENCE FROM THE SLAVIC URBAN FORTIFICATION OF BERLIN-SPANDAU

Cornelia Becker

Abstract: Although bone points of various types are among the most commonly recovered artefacts in European prehistory, their respective functions often remain obscure. From a multifactoral analysis of 189 bone points which were brought to light during long-term excavations at the Slavic urban fortification of Berlin-Spandau (7th to 12th century AD) an attempt is made to reconstruct the particular function of at least some of the pointed implements. The criteria considered include osteological features, analysis of shape, dimension, cross-section, traces of manufacturing, use wear as well as the context to settlement structures and stratigraphy. As a result, the occurrence of basketry pins, large pegs and leather perforators could be postulated while about half of the items evade precise interpretation.

Keywords: Berlin-Spandau, Germany, urban fortification, Slavic period, bone points, reconstruction of function

Résumé: Bien que les différents types de pointes en os soient parmi les artefacts les plus fréquents de la préhistoire européenne, leurs fonctions respectives demeurent souvent obscures. L'analyse multifactorielle de 189 pointes en os découvertes lors des campagnes de fouilles successives des fortifications urbaines slaves de Berlin-Spandau (VIIe-XIIe s. de notre ère) permet de proposer l'identification de la fonction particulière d'une partie des outils pointus. Les critères retenus prennent en compte l'origine anatomique, la morphologie, la morphométrie, la section, les traces de fabrication et d'utilisation aussi bien que le contexte stratigraphique et de structuration spatiale. Les résultats de l'analyse permettent d'émettre l'hypothèse que certaines pointes ont été utilisées comme poinçon à vannerie, comme cheville et pour perforer le cuir, une moitié des objets résistant à toute interprétation fonctionnelle précise.

Mots-clés: Berlin-Spandau, Allemagne, fortifications urbaines, Période Slave, pointes en os, étude fonctionnelle

Zusammenfassung: Obwohl Knochenspitzen zu den am häufigsten nachgewiesenen Artefakten in der europäischen Vorgeschichte zählen, ist ihre genaue Funktion zumeist ungeklärt. Anhand einer multifaktoriellen Analyse von 189 Knochenspitzen, die während langjähriger Ausgrabungen in der slawischen Burgwallanlage von Berlin-Spandau (7.-12. Jh. n. Chr.) freigelegt wurden, wird der Versuch gemacht, die Funktion zumindest einiger Stücke zu rekonstruieren. Dabei wurden sowohl osteologische Kriterien als auch Daten zur Größe und Gestalt, zum Querschnitt, zu Bearbeitungs- und Gebrauchsspuren sowie zum Siedlungskontext und zur Stratigraphie berücksichtigt. Das Vorkommen von sogenannten Flechtnadeln, Knochenpflöcken und kurzen Lederahlen kann belegt werden. Allerdings entzieht sich etwa die Hälfte aller Knochenspitzen einer konkreten Zuweisung.

Schlüsselworte: Berlin-Spandau, Deutschland, slawische Burgwall-Siedlung, Knochenspitzen, Funktionsdeutung

The site of Berlin-Spandau and its history

From 1961 to 1993 members of the Museum for Pre- and Protohistory/Berlin, under the guidance of A. von Müller, carried out excavations on a large Slavic urban fortification in the north-western part of the city (Berlin-Spandau). This research produced a body of solid information on the social, cultural and economic development at this site. Architecture and fortification structures, typology of pottery, occurrence of imported items and dozens of coins as well as dendrochronological results played an immense role in unveiling Spandau's history (von Müller & von Müller-Muči 1983, 1987; von Müller 1995; Häussner 1999). Eight phases and several subphases could be distinguished (fig. 1): From a small village on an island in the river Havel near the confluence of the river Spree, a fortified settlement emerged which gave home to the gentry of the region. In the direct neighbourhood, another island settlement, less well fortified, was inhabited by a more rural society (phase 1). Both sites enjoyed a first blossoming in the early 9th century (phase 2b). Political developments brought with them a hiatus in occupational activities for c. 100 years (phases 3, 4). From 940 onwards, a new chapter in local history was opened when by filling the channel with tons of sand, both locations could be unified. An era of prosperity followed and the proto-urban centre grew to a maximum of 600 inhabitants (phase 6b). In the second half of the 12th century, 500 years after the founding, a migration to other areas began until the Slavic settlement was abandoned.

Subsistence patterns and exploitation of raw material

Because of its richness in archaeological material, Spandau is among the outstanding sites in the scenario of Slavic settlements. The faunal assemblage uncovered amounts to about 200,000 bones of which a sample of 70,000 was analysed (Becker 1993a). One remarkable result of the archaeozoological analyses concerns the subsistence strategy practised here. In general, the ratio of wild mammals in the slaughter refuse of Early Middle Age sites south of the Baltic Sea did not surpass 5% (Benecke 1986, fig. 4), hence hunting could not have played an important role in the procurement of meat and raw material. In Spandau, however, bones of wild mammals do occur in large numbers (c. 30%); venison must have been an indispensable part of everyday diet. The reason for this can be sought in favourable environmental conditions and an easy access to plentiful resources. In the vicinity of the site, the landscape was dominated by larger and smaller rivers and lakes, swamp areas, fringe forest and, on higher terrain, mixed woodland as well as coniferous forest (Seyer 1987; Brande 1999). These environments offered an adequate habitat to a variety of species such as aurochs, red deer and elk, wild boar, beaver, bear, wolf, otter and other carnivores along with hare, birds and fishes which are all found in the Spandau record (for details cf. Becker 1993a). Over the centuries, a major impact of the Spandau people on nature was to be expected (ibid.; Brande 1990, 1991).

Considering the availability of raw material for bone and antler processing, this resource must have been easily attainable over the whole sequence of occupation. The interplay between availability and choice was discussed at length previously (Becker 1993b). For the manufacturing of implements of whatever shape or function, most obviously a purposeful selection of raw material had taken place. It may have been influenced by a need for specific tools and/or a previous idea of how the finished items should look (cf. Choyke 1982/83). If we compare the results from slaughter refuse and the assemblage of artefacts in Spandau (fig. 2), the choice of raw material was clearly focused on antler (35% among the artefacts vs. 3% among the bone garbage), on bones from wild ungulates (50% vs. 30%, red deer being the most important species) and among the postcranial elements on metapodials and fibulae.

The artefacts

Both antler and bone implements are represented in different numbers, antler was the less numerous category (tab. 1). The spectrum of tools is considerably wide, exhibiting among the antler finds many imported products and among the bones mostly home-made items (cf. Becker 1989, 1990, 1993c). Antler artefacts as well as some outstanding bone implements such as skates have already been published (ibid.). About 350 bone artefacts remained for future analysis among which points are the most frequently encountered items (n = 189).

The bone points

Bone points seem to be the unloved children in our discipline, although they are found in nearly all prehistoric cultures and periods and were a prerequisite of everyday equipment until the Middle Ages. Of course, this lack of interest has different reasons of which only two shall be mentioned here. At least in German prehistoric research, bone artefacts traditionally are analysed by archaeologists who - quite understandably - are more interested in the presentation of meaningful artefacts with considerable symbolic value or particular relevance towards trade and professional handicrafts than in unspectacular items. Analyses of bone points, which in turn usually lack any decoration or outstanding character, quite often don't go beyond the surface if outlined at all. A second reason may lie in the difficulty of finding out precisely what function these points once possessed. An overall trend exists in literature towards mixing up names and proposals concerning the uses of points. They are put into the context of leather work, basketry, perforation of felt or rough linen, rope production, thread-twisting, wood-work, mesh knitting, weaving, decoration of pottery, writing on bark and even hunting activities[1]. In my opinion, most definitions have been given intuitively without really considering the whole variety of possible analytical steps. The assemblage of bone points from Spandau presents the possibility for an attempt towards a more precise characterisation.

Definition of bone point

In the Spandau material, two categories of pointed implements may be demonstrated, which can be distinguished quite easily by their general shape, dimension as well as their anatomic provenance. I made a close distinction between pins and points, pins being a homogeneous group of very slender, elongated implements, made exclusively from pig fibulae. The shape of the finished item is almost entirely dictated by the dimensions of the unworked bone, the fibula[2]. The term "bone points" encompasses a large variety of quite different implements, which are made of skeletal elements other than fibulae (with one exception which will be described later on). Furthermore, they comprise a broad variety of shapes and specific characters.

Method

The material considered here, opens some possibilities for a consecutive interpretation.

The uses of points of any kind share a fundamental similarity: The purpose of a sharpened or narrowed tip is to ease the penetration through a specific material. My basic assumption was that a certain number of them had only one particular function which through handling, moving and the contact with a specific material affected the points' shape considerably. Those items should be more easily identifiable than the so-called multifunctional tools and represent the focus of this paper. The search for the telling facts was based on the following criteria: The bone points were analysed according to their assignment to species and anatomy, age structure, fragmentation, intentional shaping with various instruments and patterns of use wear. Their absolute length, the diameter of the tip (measured 3-5 mm beyond its very end), cross-sections at various points of the item as well as relevant osteological measurements were taken (von den Driesch 1976; Schibler 1980, 1981; Voruz 1984)[3]. The mapping of bones in the con-

Category	Number	%
antler total	326	35.0
bone - finished items	351	37.5
bone - half-finished items and type-specific raw material	229	24.5
questionable bone artefacts*	28	3.0
Total	934	100.0

* = cutting pads, large ad-hoc handles, irregularly perforated bones

Tab. 1 Spandau. Number and categories of artefacts

Category	Number	Category	Number	%
massive points	56	with joints without joints	28 28	50 50
less massive points	133	with joints without joints	94 39	71 29

Tab. 2 Spandau. Bone points. Splitting up into categories

Species/Group	N, total	Scapula	Metacarpus + Metatarsus	Tibia	Fibula	Radius	Ulna	Femur	Long bones
Ovis + Capra total	86		78	8					
Bos taurus	10		8	1			1		
Sus domesticus	4			2		1		1	
Equus caballus	6		6*						
Canis familiaris	3			2				1	
Cervus elaphus	30	1	29						
Capreolus capreolus	35		35						
Sus scrofa	1				1				
Canis lupus	1					1			
Large mammals	8								8
Middle-sized mammals	4								4
Aves (Grus grus)	1		<1>						
Total	189	1	156+<1>	13	1	2	1	2	12

Tab. 3 Spandau. Bone points. Frequency per species/group and skeletal element (* Mc/Mt II,IV; <> Tarsometatarsus)

Skeletal part/Age	Roe deer	Ovicaprines	Red deer	Total
Metacarpus distal+	4	2	1	7
Metatarsus distal+	11	4	1	16
Metacarpus proximal+	1		1	2
Metatarsus proximal+	1		1	2
Metacarpus distal-	4			4
Metatarsus distal-	4	2		6
Metapodium shaft	1	2	2	5
Tibia distal+		3		3
Tibia shaft		1		1
Total	26	14	6	46

Tab. 4 Spandau. Basketry pins. Assignment to species, elements and age structure

text of habitation or fortification structures as well as chronological considerations were carried out routinely. I understand these data as a language that can be read, and in fact through a combined monitoring of all aspects a certain differentiation of this material became possible.

Osteology

Firstly, I separated the points by their massiveness, in other words by their provenance from large or middle-sized animals[4]. Two-thirds of the bone points at Spandau are manufactured from bones of middle-sized species (= less massive points; tab. 2), namely caprines and roe deer (fig. 3), whereas among the massive points bones from red deer predominate. Bones from other domestic or wild species including birds[5] are encountered in small numbers only. From the long list of skeletal elements theoretically available for bone point production, the decision was made for metapodials (156 out of 189); other elements were chosen less often (tab. 3).

The overwhelming majority of points were manufactured from elements of grown-up animals, recognisable by the fused epiphyses; only very few derive from non-adults. The presence or absence of joints which represent natural handles turned out to be extremely constructive for narrowing down the possible functions (tab. 2). Among the massive points, the percentage of those with and without a natural handle is equal (50% : 50%), whereas in less massive points those with a natural handle largely prevail (71%).

Typology and function

1. Basketry pins

Focusing on less massive points with natural handles from middle-sized ungulates, an assemblage of items from roe deer metapodials stands out because of a specific combination of features: These points have extremely elongated, smoothly widening tips of flat-oval cross-section and rounded rather than sharpened tips (fig. 4,1-3). If we imagine the nature of the perforation these tools would create, they would look like slits rather than holes. From a more schematic point of view, these items can also be described with the criteria developed by J. Schibler for Neolithic bone points from Switzerland and which, in my opinion, could well be used for assemblages of other periods and regions too. Concerning the shape of the tip as well as the cross-section, the Spandau implements refer to Schibler's types 3/5 and 5, respectively (Schibler 1981, 16). The tips are covered with striations of considerable length and number and are mostly oriented along the axis of the bone (fig. 5). They imply the repeated contact of the tool with a rough material. Silica-rich plants could cause such wear patterns (although this needs to be verified through experimental research). I can imagine only one activity for which such an implements would be useful and which would produce such traces: basketry, in particular coiled work (cf. Seymour 1998; Thomas 1984, 44; Furger & Hartmann 1983, 145). These implements are almost perfectly shaped for being passed through packages of plant material such as raffia or reed to make the slits through which the wrapping was passed. In addition, from the shape of the tips a splitting apart of the fibres would be prevented. The handling of these basketry pins seemed to have been uncomplicated because the condyles of the metapodials were completely preserved.

A number of basketry pins made also from ovicaprine metapodials and tibiae as well as red deer metapodials (fig. 4.4), could be recognised which closely resemble those pins made from roe deer elements (tab. 4). Even the large red deer pins comprise the whole set of relevant criteria with one exception: The joints are not completely preserved, but cut into a half or a third of the complete joint. The basketry pins measure between 60 and 182 mm in length with a peak between 90 and 130 mm (fig. 6).

Their stratigraphic context implies that basketry pins were used throughout the whole occupational sequence in Spandau (fig. 7). They were manufactured on-site as several half-finished items (cf. fig. 4.5) and blanks indicate. Finished basketry pins were mainly found in houses (houses 1, 2, 3; fig. 8) in association with other implements. They seem to form part of a typical household equipment. Some basketry pins were found near or under planked tracks outside the houses. Perhaps they were lost there or used for another purpose. The latter will be dealt with in the chapter about pegs.

It would be advantageous to excavate not only particular tools, but also the relevant products. Unfortunately, baskets and coiled work have not been recovered from Spandau itself. Most probably their absence from the archaeological record is a matter of local preservation conditions. Furthermore, from a number of other Slavic settlements a variety of items is attested such as baskets from Gdansk and Behren-Lübchin (Hensel 1965, 192ff.) as well as fish traps and ropes from Groß Raden, too (Schuldt 1985, 159). E. Cnotliwy (1958, 224) assumes the production of shoes made from raffia in Wolin, a traditional footwear well-known in Poland and Russia until recent times. Basketry pins would be the adequate tool for producing such shoes and in fact, at least one typical basketry pin can be recognised from the spectrum of points found at Wolin (ibid. pl. 1.16). Comparable specimens are present in Groß Raden too (Schuldt 1985, no. 77, 157, 165, 177 in figs. 103-106). Particularly the large pins would be most useful utensils for the construction and the repairing of wattle walls, recorded from many Slavic sites including Spandau (von Müller & von Müller-Muči 1987, 19; von Müller 1995, 63; Hensel 1965).

There is one product connected with coiled work which deserves detailed mention: beeskeps. From ethnographic sources we know that coils of straw were sewn together by using bone awls for piercing the straw to insert the binding material. These awls resemble the pins excavated in Spandau and other Slavic sites almost perfectly (see Crane 1983, 102f.). It is repeatedly shown that the exploitation of bees was an important branch of economy in those times (Brachmann

Elements	Sheep + Goat	Roe deer	Cattle	Pig	Large mammal
Metacarpus distal +	13	1	1		
Metatarsus distal +	11	3			
Metacarpus proximal +	1				
Metapodium shaft	1		1		
Tibia distal +	1				1
Femur shaft				1	
Long bone shaft					1
Total	27	4	2	1	2

Tab. 5 Spandau. Perforators with short tips. Assignment to species, elements and age structure

Species/ Element	Pegs	Pegs/ Basketry pins	Pseudo-pegs
Red deer antler	3		2
Red deer metapodials	12	5	
Boar fibula			1
Wolf radius			1
Cattle metapodial			1
total	15	5	5

Tab. 6 Spandau. Pegs and peg-like implements. Assignment to species and skeletal elements

1978, 187): The Slavs were acquainted with the brewing of mead; particular names of Slavic places are related to bees; a Slavic law said that apiculture was liable to taxation. A vital yet unanswered question points to the degree of bee-management involved: Did the Slaves practise so-called forest bee-keeping inside of trees and trunks or did they already use beehives, hence a greater demand for basketry pins for the production of those hives could be assumed? There is contentious evidence for hives in Late Bronze Age Berlin-Lichterfelde; other hints, although rare in number, do exist which imply a long-lasting tradition of bee-management in Central Europe (Needham & Evans 1987). This topic as a whole in fact needs a greater understanding through future research.

2. *Perforators with short and sharpened tips*

Within the category of middle-sized metapodial points from Spandau, a considerable number of implements occur whose working ends embody a completely different character than those implements discussed in the previous chapter. They have strikingly short and sharpened tips (fig. 9). The tips are carved out symmetrically on the frontal side of the bone or, less often asymmetrically at one of the lateral sides of the blanks. They are very sharp, almost round in cross-section, measure only 1-2 mm in diameter and are sometimes clearly set off from the bone's shaft. Furthermore, the tips are highly polished. By steady hand pressure, tools like this could penetrate even delicate material and would produce round small holes of a few millimetres depth. I propose that these implements have been used as perforators for dense and soft material such as hides.

The most frequently encountered elements within this category are distal parts of sheep and goat metapodials with fused epiphyses (75%; tab. 5). Only in one case each, a proximal metacarpus and a diaphysis fragment were used as blanks. In addition, four roe deer metapodials, a pig's femur as well as four massive implements comprise the same type of working end: two cattle metapodials and two fragments of long bone diaphyses from large mammals (tab. 5; fig. 9.5). The latter may have been used for the penetration of thicker material which demands greater pressure and thus a more solid handle. Another aspect is worth mentioning: If a point is used as perforator, the tip has to be carved out as sharp as possible. The use-life of such an implement might have been quite short, because the sharpened tip breaks easily and would have to be re-sharpened several times, ensuing a successive shortening of the tool. In fact, six perforators from the Spandau assemblage were out of use because of broken tips. The latter range in the size group between 61 and 82 mm length, thus they were too small for being re-sharpened (cf. fig. 9.3). In total, perforators with sharp tips accumulate in a size category around 61- 90 mm length with a peak between 71 and 80 mm. They clearly comprise another size variation than do basketry pins (fig. 10).

Perforators of this kind are found in every occupational phase from Spandau, but most frequently in phase 5b (fig. 11). Particularly in this phase, indications for an autonomous craft of shoemaking emerge, such as tannery pits which were used in the preparation of skins, pieces of hide, remains of shoes as well as tiny iron awls. The distribution map clearly outlines the location of tannery pits and postulated perforators within the same phase and in close proximity to each other (fig. 12). As mentioned above, the perforators were part of household equipment in other phases too (cf. fig. 8).

The technique of fabrication can be studied from the remains of shoes themselves[6]. In Spandau shoes were mostly made from goat skin and cattle hides. The stitches on these shoes vary in size, many of them in fact being very fine. Shoemakers in Spandau mainly used thin iron awls of about 8 cm length, which would allow a very accurate and precise perforation of the leather. The bone perforators could have been used only occasionally (von Müller-Muči, pers. comm.). From other Slavic sites, a quite similar type of shoes as well as a variety of other leather products such as saddles or sheaths for daggers are present, which in fact would demand a manifold equipment for production (cf. Schuldt 1985, figs. 117, 119, 122; Hensel 1965, fig. 159). The question still remains open how the sewing of the leather was practised. In the literature, pig fibula pins are sometimes designated as needles for sewing purposes (cf. Hruby 1957, pl. 3.5). In the context of leather processing, this is a less feasible assumption, because those implements are much too thick for any perforation of this kind[7]. It could well be done in a technique that K. von Müller-Muči experienced from actual shoemaking in the Vojvodina (Serbia). There, using an age-old practise, large leather boots were manufactured for fishermen living near the Tisza river. A boars' bristle was split, a tiny sewing fibre inserted, some pitch smeared over it to connect bristle and fibre to a close unit, and the sewing commenced. Sewing utensils of this kind of course cannot expected to be recovered from the archaeological record. Reverse oriented comparisons like these are not as far-fetched as they may seem at first glance, because a variety of old traditions in fact have survived in many parts of Southeast Europe until today. Moreover, those regions in particular were the main homelands of Slavic tribes (cf. Krauss and Jeute 1998). In my opinion, today's observations and ethnographic parallels can well be employed to shed light on prehistoric techniques (cf. Gallay et al. 1992; Bernbeck 1997, 104f).

3. *Pegs*

From the very beginning of my analyses of the Spandau bone points, one group of implements had aroused my curiosity: They were made out of red deer metapodials and show traces of manufacturing with a knife (for facetting the blank) and a file (for finishing touches on the piece). Their tips extend over the entire length of the tool (fig. 13, 14.2-4). To produce such points, shafts of metapodials of red deer were cut lengthwise and transversally. The joints are either integrated and then cut into a half or a third, or they are lacking altogether. From earlier analyses of the antler tools, I remembered similarly sized and shaped implements (cf. in fig. 14.1) which had been discovered in-situ during excavations near the western gate (Becker 1989, 128f.; von Müller & von Müller-Muči 1983, 70). Archaeologists assumed that these implements had been hammered into the wooden planks to join them closely, hence these implements can be labelled as pegs. In the archaeological description (ibid.), a certain number of similar items was mentioned which in fact turned out to be the outstanding large elongated bone points described above. In addition to these red deer metapodial pegs, very few have been made out of other raw material: a radius of a wolf, a metatarsus of a cattle and a fibula of a boar (tab. 6; cf. fig. 14. 5, 6). Because of their similar overall shape and length (fig. 15) as well as the same context of recovery the latter were labelled as pseudo-pegs. It is worth mentioning that only 50% of these long pegs are completely preserved; their proximal ends are broken. As the dark colouring of the break indicates this could not have happened during excavation but only long ago, maybe even during their first utilisation. The completely preserved pegs did not carry any traces of hammering on their upper parts[8]. Maybe the wood was pre-perforated and the pegs were knocked in with only two or three effective blows which would not necessarily damage the bone's surface.

From a stratigraphical point of view, pegs in Spandau mostly date to phases 1 to 2b (700-830 AD), only very few were found in later contexts (fig. 16). The pegs were mainly excavated from plot 20 and plot 12/14. Two additional pegs were found in plot 23 and 15, two further items have been discovered in a large pit in plot 22 (Becker 1993c, pl. 3.2, 3). They all match the relevant criteria. In plot 12/14 the pegs are distributed over parts of the fortification wall, at the corner of houses, between planked tracks and outside the fortification where board walks are supposed to have been erected (fig. 17). From this pattern of distribution, their function as pegs is largely supported. At the same locations, four large basketry pins were discovered which in my opinion might well have had a double function: firstly as basketry pins, as indicated by typical wear patterns, and secondly as peg substitutes[9]. In plot 20 the situation is quite similar (fig. 8). Four pegs from antler and six from bone were recovered under and between the planks either at the western gate or in the course of the planked tracks between houses. Again, one large basketry pin was found among the proper pegs at the western gate which might well have served as peg substitute.

Concluding remarks

For the Spandau bone points, a total of 40 basketry pins, 36 perforators with short and sharpened tips as well as 20 pegs could be distinguished. I am aware that the interpretation proposed here is a mixture of hypotheses and facts. Altogether, I am not sure if I have actually reached a satisfactory degree of interpretation, but I think if one adds up the utmost number of circumstantial proof to gain a result of c. 50% identified items, this would seem to be a useful starting point for future investigations. What I have learned from the analyses of the Spandau artefacts is that patterns of the function of an artefact cannot be read from an isolated analysis of the item as such, but only from a combined monitoring of all data available[10].

Notes

1. If they have blunter tips they may be used as projectiles to stun smaller game.
2. One exception must be mentioned: A long slender pin (entirely in the shape of a pig fibula pin) was made of the lateral part of an ovicaprine tibia; the broadened head of a fibula pin is imitated almost prefectly here.
3. Detailed data will be quoted in the final publication (Becker, forthcoming).
4. (large = horse, red deer, cattle, boar, wolf; middle-sized = sheep, goat, roe deer, pig, dog and bird)
5. For the identification of the tarsometatarsus of a crane (*Grus grus*) I owe many thanks to my colleague Norbert Benecke.
6. A publication on the Spandau shoes is underway. I owe Klara von Müller-Muči who carried out this research many thanks for generously providing me with much helpful information.
7. A detailed analysis and discussion of possible uses for these pins from European Early Middle Age sites is given by G. Schwarz-Mackensen (1976).
8. Many thanks go to my colleague Jörg Schibler who drew my attention to this particular point.
9. During excavation activities in these particular areas, unfortunately only in one case - at the western gate (cf. fig. 8) - attention was paid to the precise position of the implements. The other evidence (cf. fig. 4.4) came to light only through the final mapping.
10. My warmest thanks go to Emily Schalk who kindly corrected my English.

References

Becker, C. 1989. Die Geweihfunde vom Spandauer Burgwall. In *Ausgrabungen, Funde und naturwissenschaftliche Untersuchungen auf dem Burgwall in Berlin-Spandau*, eds. A. von Müller & K. von Müller-Muči. Berliner Beiträge zur Vor- u. Frühgeschichte 6, Archäologisch-historische Forschungen in Spandau 3, Wissenschaftsverlag Volker Spiess, Berlin, pp. 101-142.

Becker, C. 1990. Bemerkungen über Schlittknochen, Knochenkufen und ähnliche Artefakte, unter besonderer Berücksichtigung der Funde aus Berlin-Spandau. In *Festschrift für Hans R. Stampfli. Beiträge zur Archäozoologie, Archäologie, Anthropologie, Geologie und Paläontologie*, eds. J. Schibler, J. Sedlmeier & H. Spycher. Helbing & Lichtenhahn, Basel, pp. 19-30.

Becker, C. 1993a. Zur slawisch-frühmittelalterlichen Großwildjagd im Havel-Spree Gebiet. In *Die Ausgrabungen auf dem Burgwall von Berlin-Spandau*, eds. A. von Müller & K. von Müller-Muči. Berliner Beitr. zur Vor- und Frühgeschichte N. F. 3, Archäologisch-historische Forschungen in Spandau 1/1-2, Wissenschaftsverlag Volker Spiess, Berlin, pp. 100-112.

Becker, C. 1993b. Zur Aufdeckung von Kausalitäten zwischen Ernährungsgepflogenheiten und Knochenverarbeitung. In *Bioarchäologie und Frühgeschichtsforschung. Berichte des*

Symp. der Kom. f. Frühmittelalterforschung 13.-15. Nov. 1990, Stift Zwettl, Niederösterreich, eds. H. Friesinger, F. Daim, E. Kanelutti & O. Cichocki. Archaeologia Austriaca 2, Institut für Ur- u. Frühgeschichte der Universität Wien, Wien, pp. 133-157.

Becker, C. 1993c, Tierknochen aus Grubenfüllungen - zwei aufschlußreiche Befunde aus dem slawisch-frühmittelalterlichen Berlin-Spandau. In *Die Keramik vom Burgwall in Berlin-Spandau*, eds. A. von Müller, K. von Müller-Muči & V. Nekuda, Wissenschaftsverlag Volker Spiess, Berlin, pp. 95-99.

Becker, C. forthcoming, Die Knochenartefakte vom Spandauer Burgwall - Osteologie und Typologie. *Acta Archaeologica et Praehistorica* (autumn 2001).

Benecke, N. 1986. *Die Entwicklung der Haustierhaltung im südlichen Ostseeraum*. Beiträge zur Archäozoologie 5, Weimarer Monographien zur Ur- und Frühgeschichte 18, Museum f. Ur- und Frühgeschichte, Weimar.

Bernbeck, R. 1997. *Theorien in der Archäologie*. Francke Verlag, Tübingen & Basel.

Brachmann, H. 1978. *Slawische Stämme an Elbe und Saale. Zu ihrer Geschichte und Kultur im 6. bis 10. Jahrhundert auf Grund archäologischer Quellen*. Schriften zur Ur- u. Frühgeschichte 32, Akademie Verlag, Berlin.

Brande, A. 1990. Eine Synthese zur säkularen Landschaftsentwicklung in Berlin (West). *Verhandlungen des Berliner Botanischen Vereins* Bd. 8, pp. 21ff.

Brande, A. 1991. Klima und Vegetationsgeschichte. In *Berlin und Umgebung. Ein Führer zu archäologischen Denkmälern in Deutschland*, ed. A. Kerndl. Berlin, pp. 14-18.

Brande, A. 1999. in press, Botanische Untersuchungen auf dem Burgwall Spandau - eine Übersicht. *Berliner Blätter zur Vorgeschichte* 9.

Choyke, A. 1982/83. An analysis of bone, antler and tooth tools from Bronze Age Hungary. *Mitteilungen des Archäologischen Instituts der Ungarischen Akademie der Wissenschaften* 12-13, pp. 13-57, pls. 1-5.

Cnotliwy, E. 1958. Wczesn(sredniowieczne przedmioty z rogu i ko(ci z Wolina, ze stanowiska 4. *Materialy Zachodnio-Pomorskie* 4, pp. 155-240.

Crane, E. 1983. *The Archaeology of Beekeeping.* Duckworth, London.

Driesch, von den, A. 1976. *Das Vermessen von Tierknochen aus vor- und frühgeschichtlichen Siedlungen*. Institut für Paläoanatomie, Domestikationsforschung und Geschichte der Tiermedizin der Universität München.

Furger, A. R. & Hartmann, F. 1983. *Vor 5000 Jahren... So lebten unsere Vorfahren in der Jungsteinzeit.* Haupt, Bern & Stuttgart.

Gallay, A., Audouze, F. & Roux, V. 1992. *Ethnoarchéologie, Justification, Problemes, Limites*. Actes de Rencontres 17-19 oct. 1991, Association Pour la Diffusion des Connaissances en Archéologie, Juan-les-Pins.

Häussner, U. 1999. in press, Dendrochronologische Datierungen an Hölzern vom Burgwall Spandau. *Berliner Blätter für Vorgeschichte* 9.

Hensel, W. 1965. *Die Slawen im Frühen Mittealter. Ihre materielle Kultur*. Akademie Verlag, Berlin.

Hruby, V. 1957. Die slawischen Beingegenstände und ihre Erzeugung in Mähren. *Pamatky Archeologicke* 48, pp. 213-118 and 217, pls. 1-27.

Krauss, R. & Jeute, G. H. 1998. Traditionelle Getreideverarbeitung in Bulgarien. *Ethnographisch-Archäologische Zeitschrift* 39, pp. 489-528.

von Müller, A. 1995. *Neue Forschungsergebnisse vom Burgwall in Berlin-Spandau. Archäologie in Berlin und Brandenburg 1990-1992*. Theiss, Stuttgart.

von Müller, A. & von Müller-Muči K. 1983. *Die Ausgrabungen auf dem Burgwall von Berlin-Spandau. Berliner Beitr. zur Vor- und Frühgeschichte* N. F. 3. Archäologisch-historische Forschungen in Spandau 1/1-2, Wissenschaftsverlag Volker Spiess, Berlin.

von Müller, A. & von Müller-Muči, K. 1987. *Ausgrabungen und Funde auf dem Burgwall in Berlin-Spandau, Berliner Beiträge zur Vor- und Frühgeschichte* N. F. 5, Archäologisch-historische Forschungen in Spandau 2, Wissenschaftsverlag Volker Spiess, Berlin.

Needham, S. & Evans, J. 1987. Honey and dripping: Neolithic food residues from Runnymede Bridge. *Oxford Journal of Archaeology* 6/1, pp. 21-28.

Schibler, J. 1980. Osteologische Untersuchungen der cortaillodzeitlichen Knochenartefakte. *Die neolithischen Ufersiedlungen von Twann* 8. Schriftenreihe der Erziehungsdirektion des Kantons Bern, herausgegeben vom Archäologischen Dienst des Kantons Bern, Staatlicher Lehrmittelverlag, Bern.

Schibler, J. 1981. Typologische Untersuchungen der cortaillodzeitlichen Knochenartefakte *Die neolithischen Ufersiedlungen von Twann* 15. Schriftenreihe der Erziehungsdirektion des Kantons Bern, herausgegeben vom Archäologischen Dienst des Kantons Bern, Staatlicher Lehrmittelverlag, Bern.

Schuldt, E. 1985. *Ein slawischer Tempelort des 9. /10. Jahrhunderts in Mecklenburg.* Schriften z. Ur- u. Frühgeschichte 39, Akademie Verlag, Berlin.

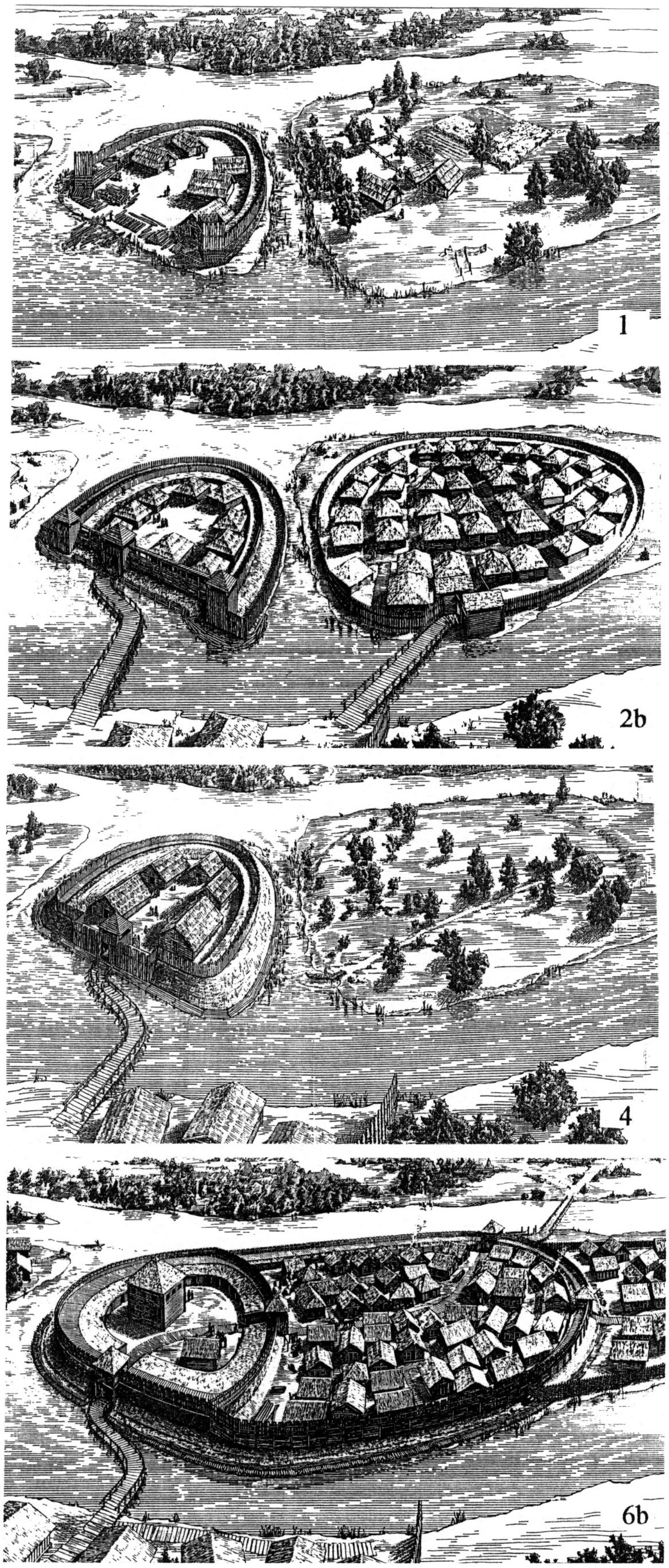
Schwarz-Mackensen, G. 1976. *Die Knochennadeln von Haithabu*. Berichte über die Ausgrabungen in Haithabu 9, Wachholtz, Neumünster.

Seyer, H. 1987. Die naturbedingten Landschaften in und um Berlin. In *Berlin im Mittelalter. Die Entstehung einer mittelalterlichen Stadt*, Berlin.

Seymour, J. 1998. *The Forgotten Arts* (German edition: Vergessene Künste). Urania Verlag, Berlin.

Thomas, D. H. 1984. Three Generations of Archaeology at Hidden Cave, Nevada *Archaeology* 37/5, pp. 40-47.

Voruz, J.-L. 1984. *Outillages osseux et dynamisme industriel dans le Néolithique jurassien*. Cahiers d'Archéologie Romande 29, Lausanne.



Berlin-Spandau

Phase	Dating AD
1	ca. 700
2a	700 - 800
2b	800 - 830
3	830 - 900
4	900 - 940
5a	940 - 970
5b	970 - 983
6a	983 - 1030
6b	1030 - 1100
7	1100 - 1150
8	1150 - 1200

Fig. 1 Reconstructed scenario at the site of Berlin-Spandau during different phases of occupation (cf. dating in the table enclosed; after von Müller & von Müller-Muči 1983, Beilage 1, 3, 5, 9)

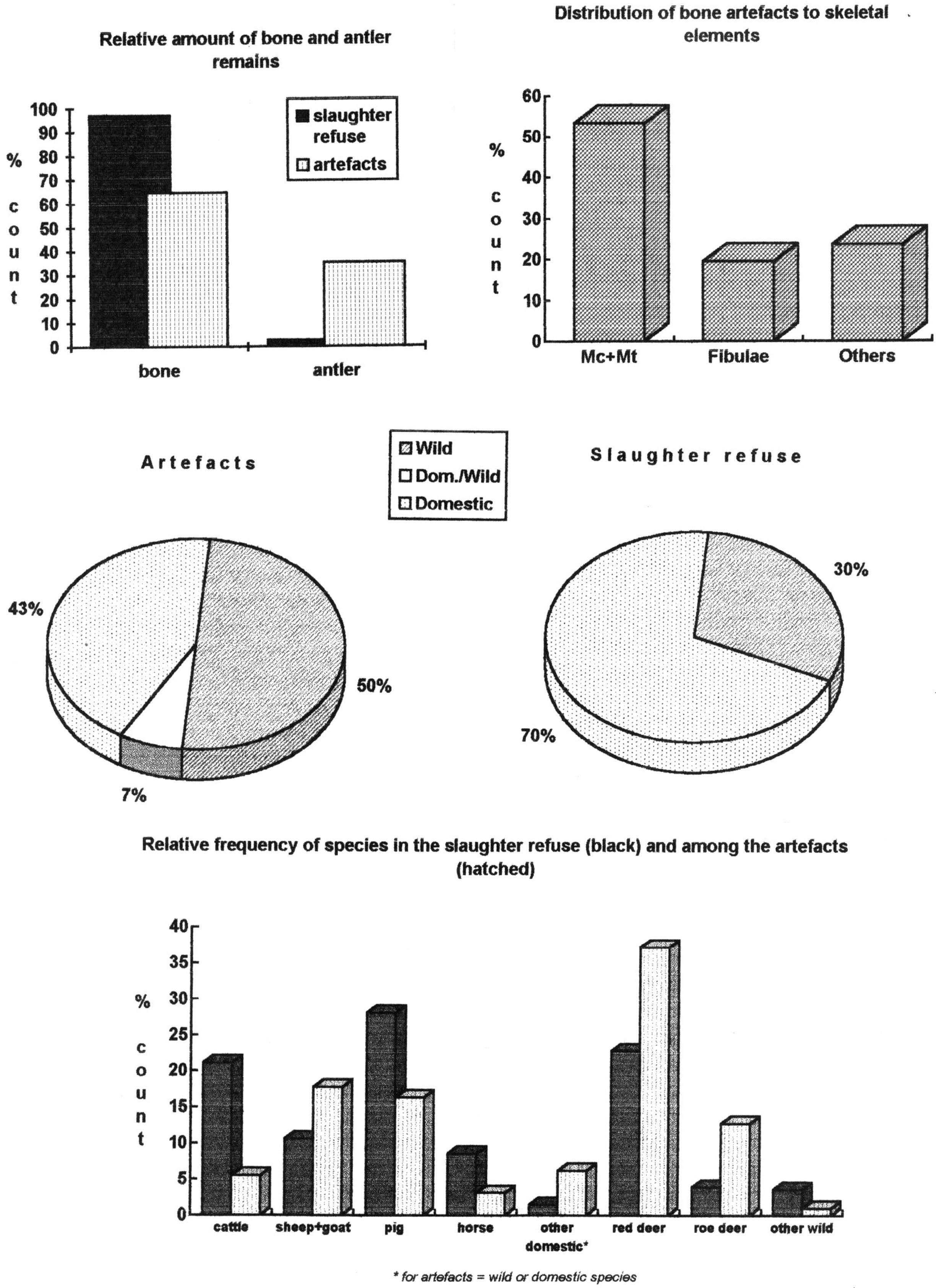


Fig. 2 Comparison of slaughter and consumption residue (n c. 70.000) versus artefacts (n = 934; basis: bone count)

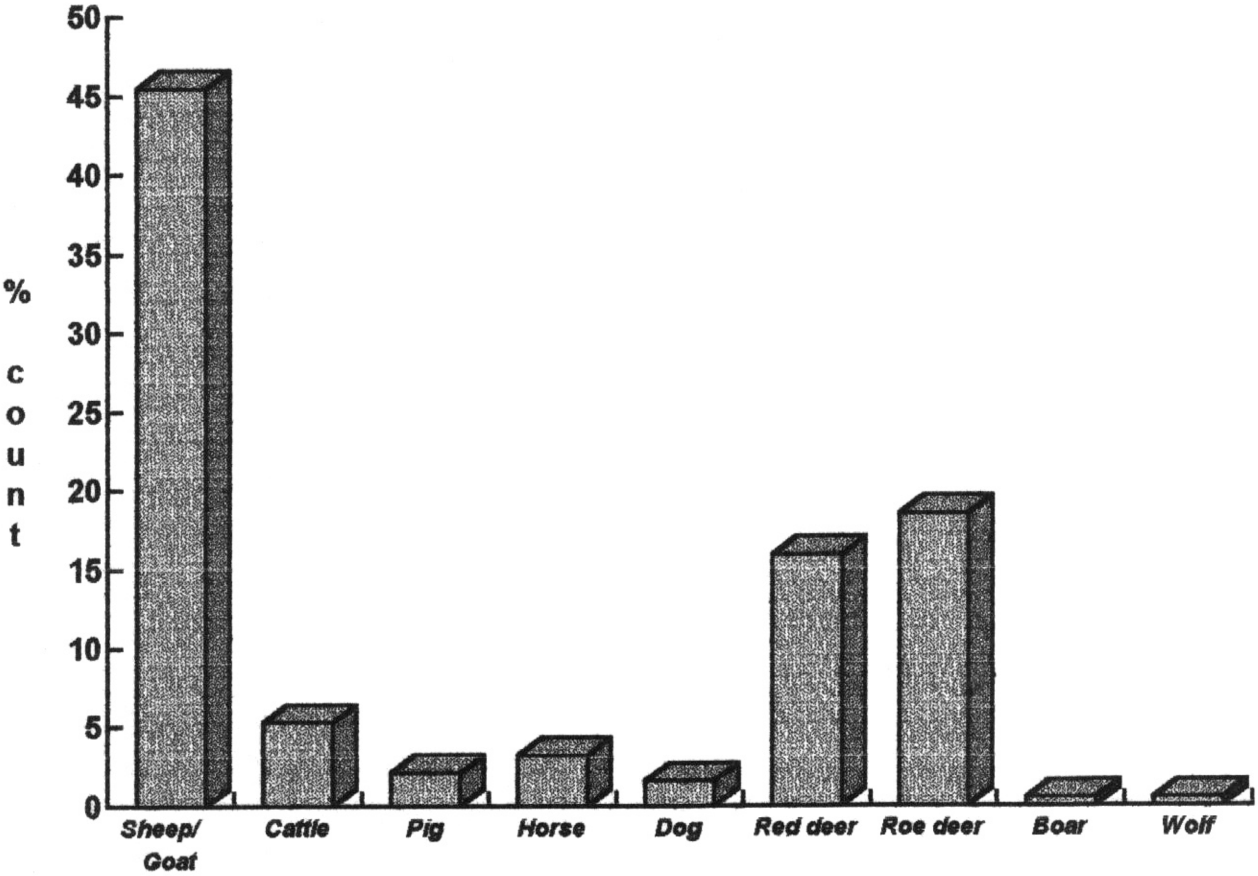


Fig. 3 Bone points. Relative amount per species

Fig. 4 Basketry pins. 1-3, 5 Roe deer metapodials; 4: red deer metatarsus (scale in cm; photos: D. Wolf)

Fig. 5. Basketry pins from roe deer metapodials. Close-up of tips (scale in mm; photos: D. Wolf)

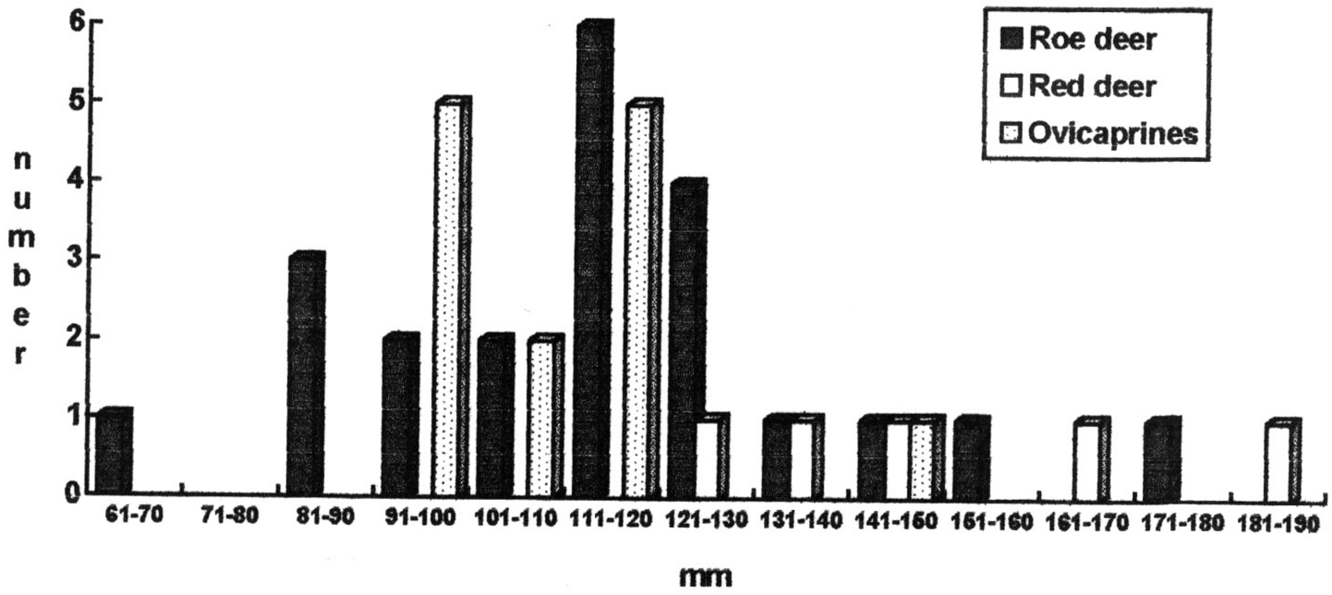


Fig. 6 Basketry pins. Variability of length

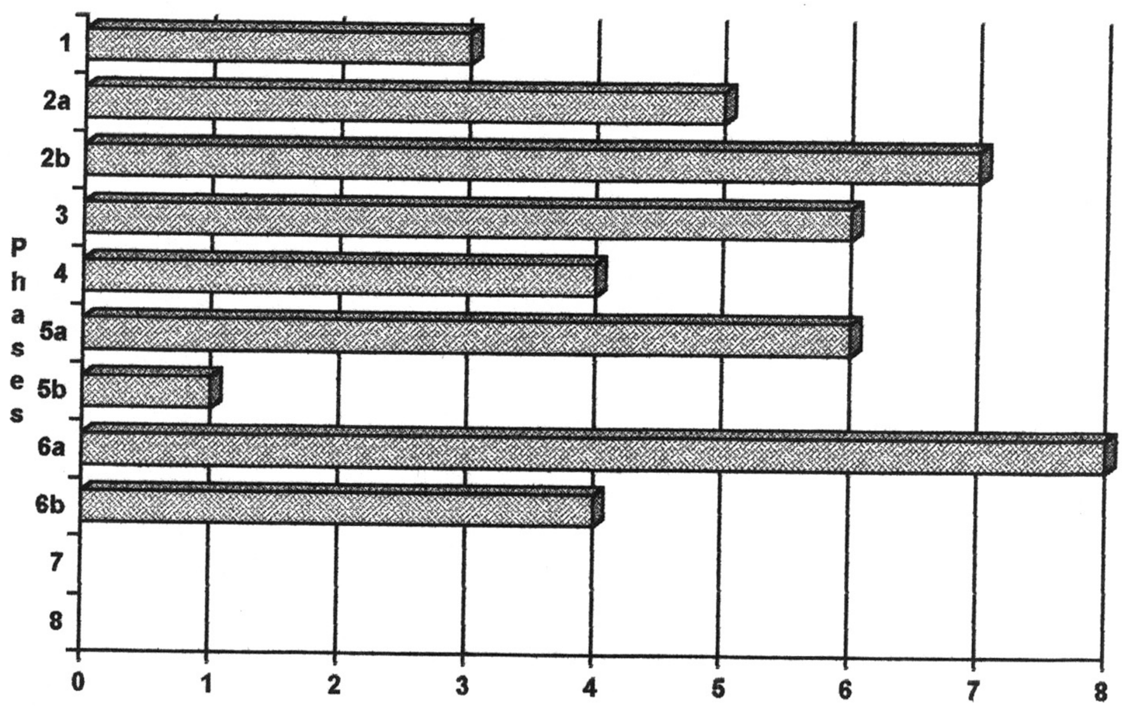


Fig. 7 Basketry pins. Stratigraphic distribution (n = 44)

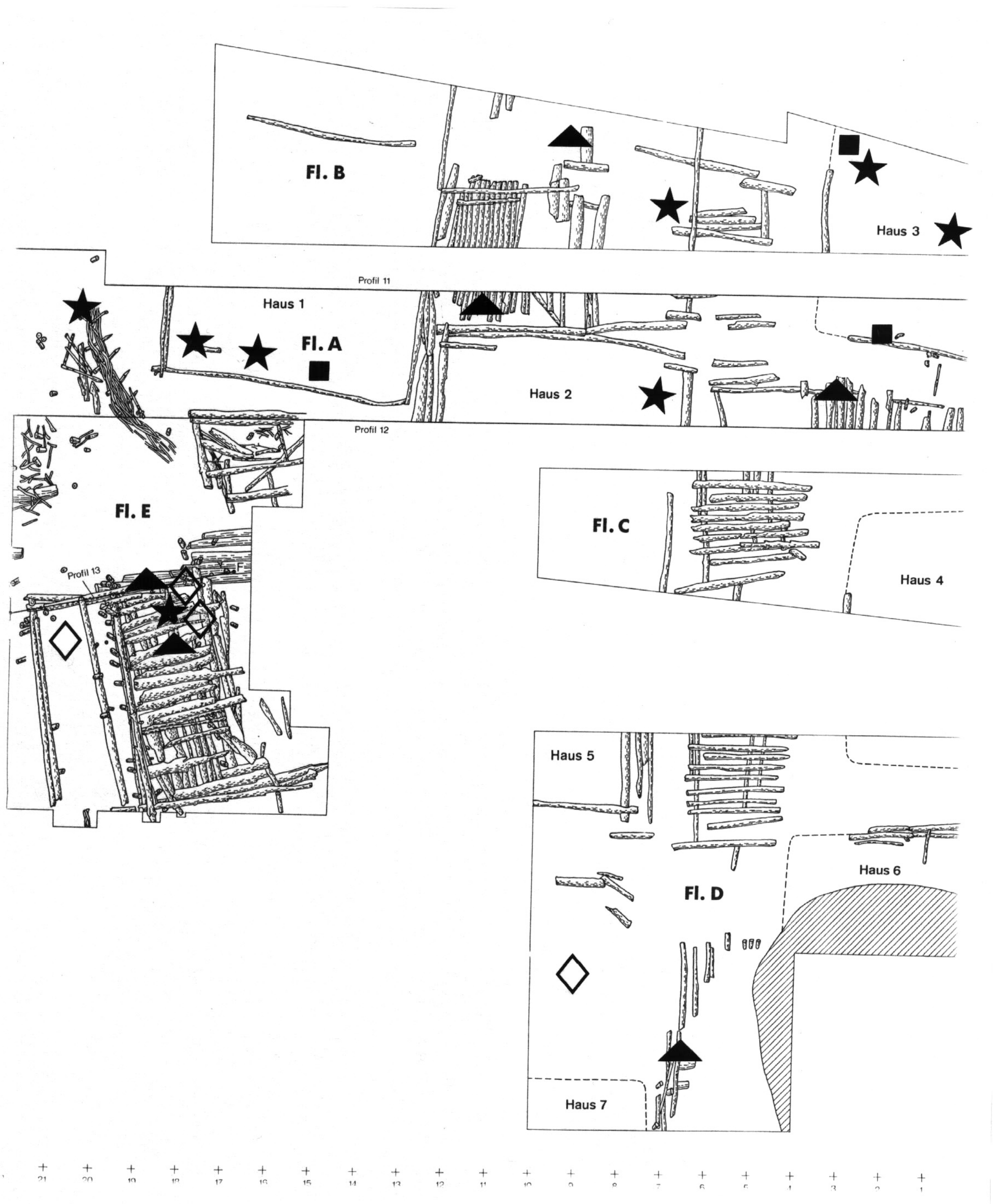


Fig. 8 Plot 20, phases 2a, b. Distribution patterns of basketry pins (stars), perforators (square) and pegs (antler: white rhombus; bone: black triangle) at the western gate (Fl. E) and within the fortified area

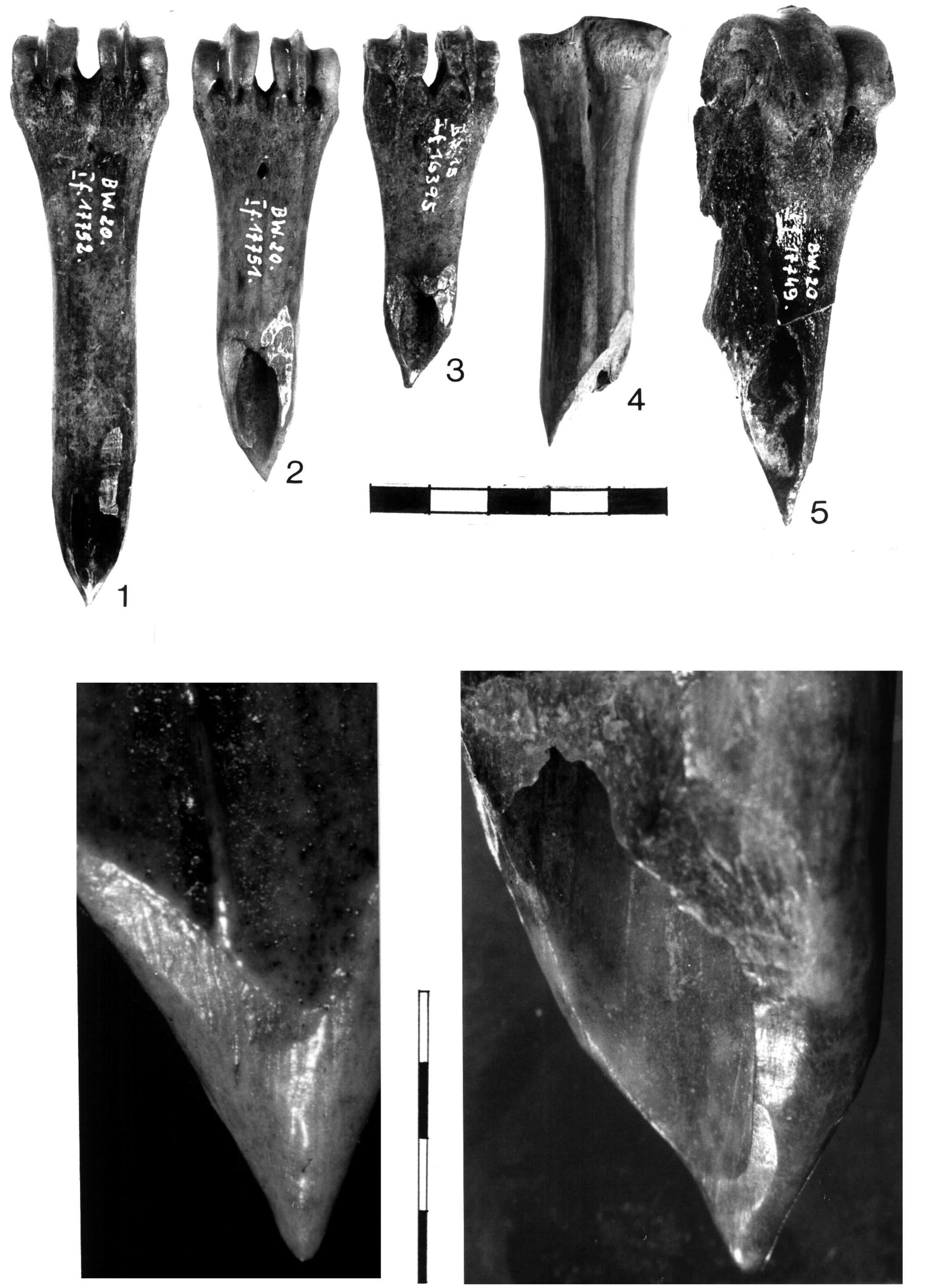


Fig. 9 Perforators with short and sharpened tips. 1-4 ovicaprine metapodials, 5 cattle metacarpus (scale in cm); below close-up of tips (scale in mm; photos: D. Wolf)

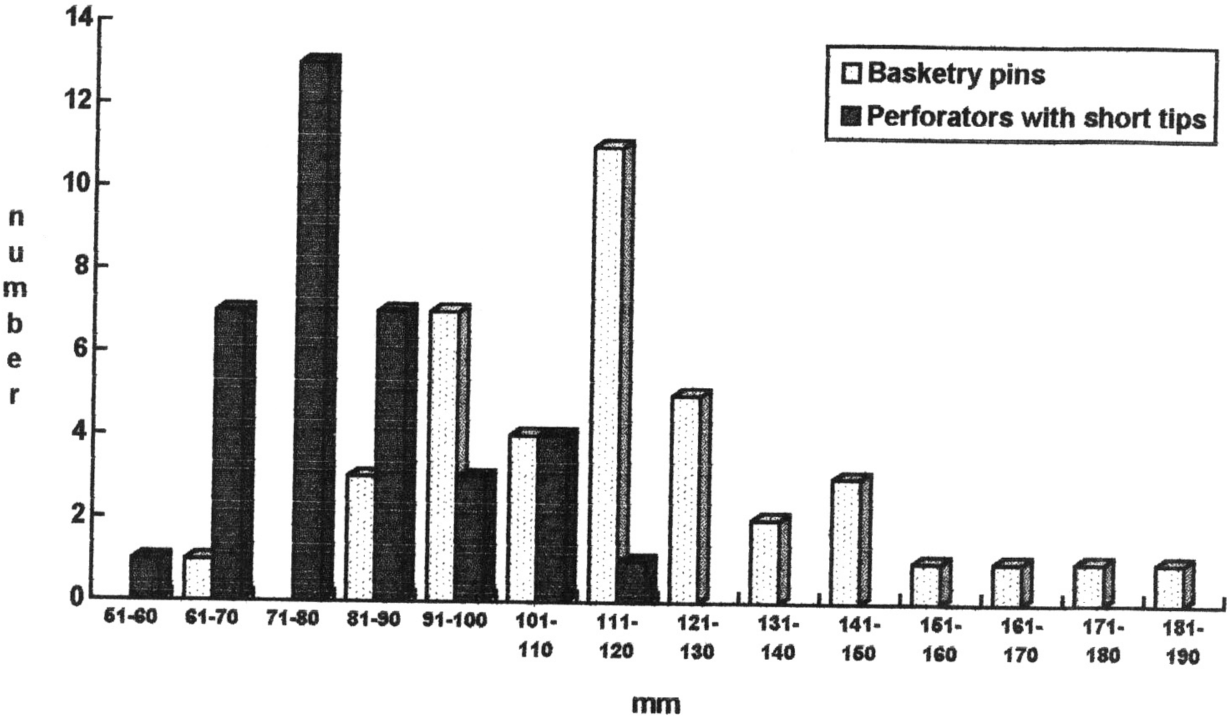


Fig. 10 Comparison of variability in length of basketry pins and perforators with short and sharpened tips

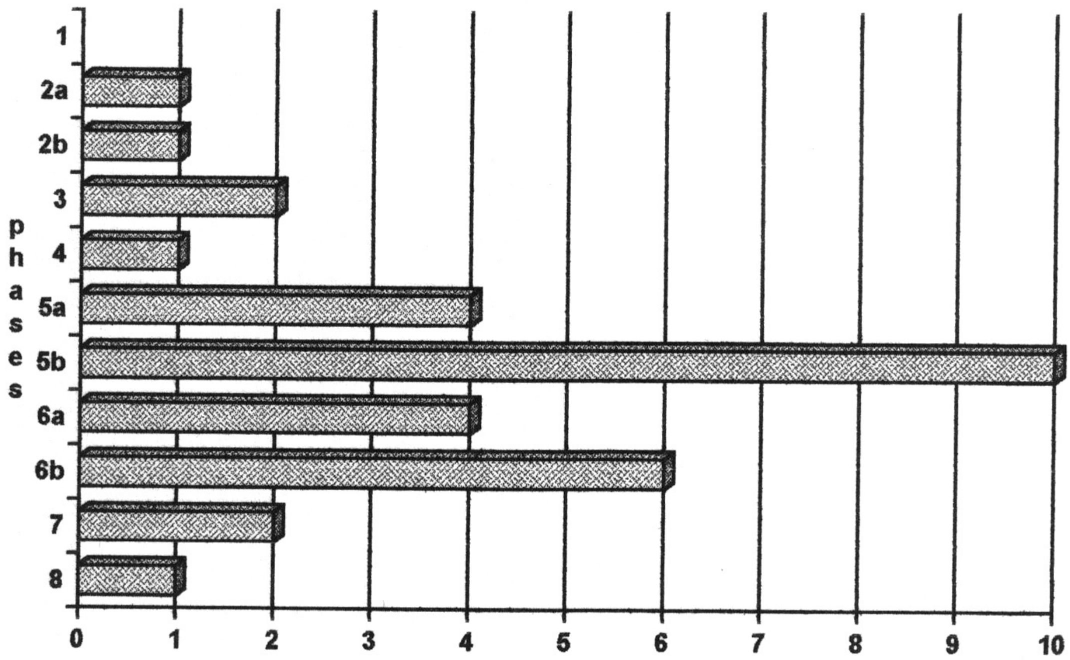


Fig. 11 Perforators with short and sharpened tips (n = 24). Stratigraphic distribution

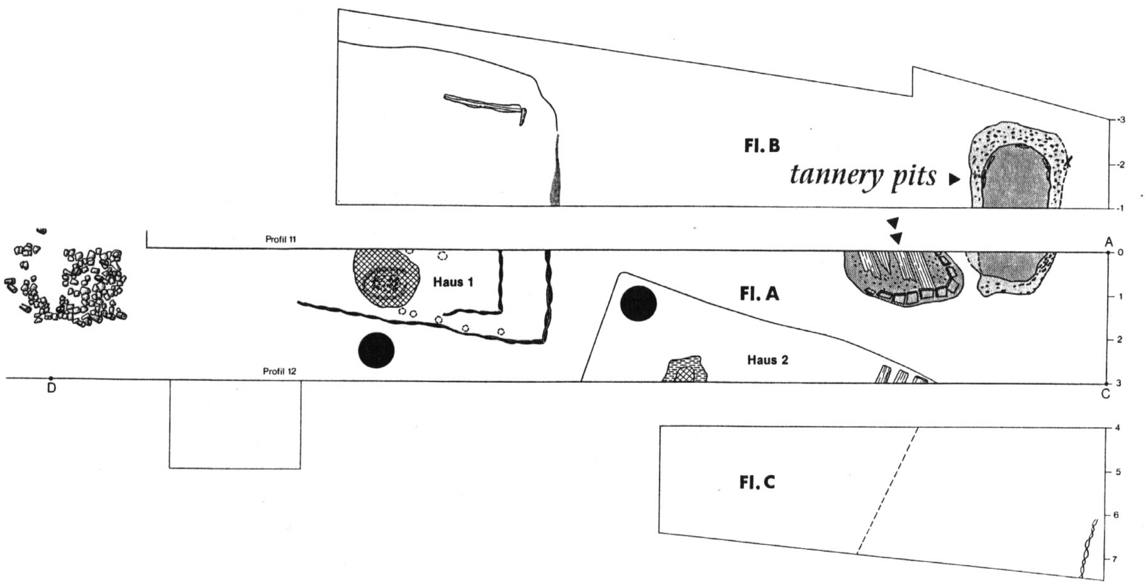


Fig. 12 Plot 20, phase 5b. Distribution patterns of perforators (circle)

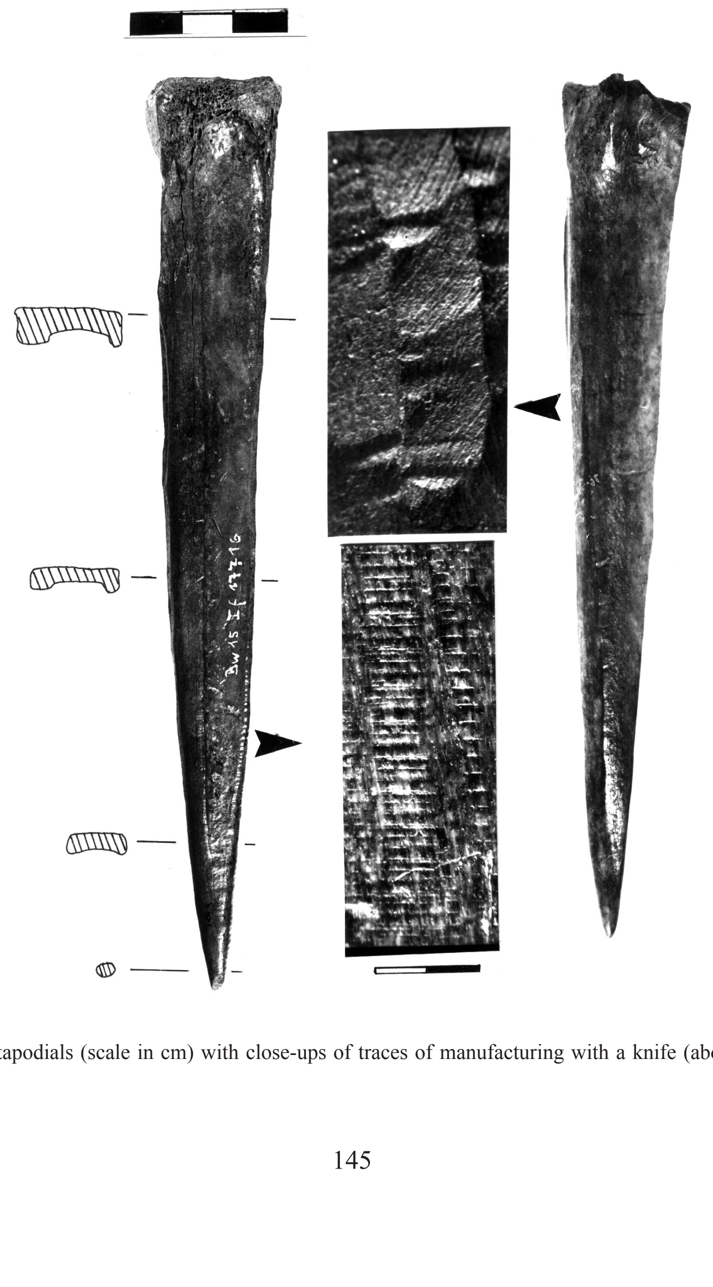


Fig. 13 Pegs made from red deer metapodials (scale in cm) with close-ups of traces of manufacturing with a knife (above) and a file (below; scale in mm; photos: D. Wolf)

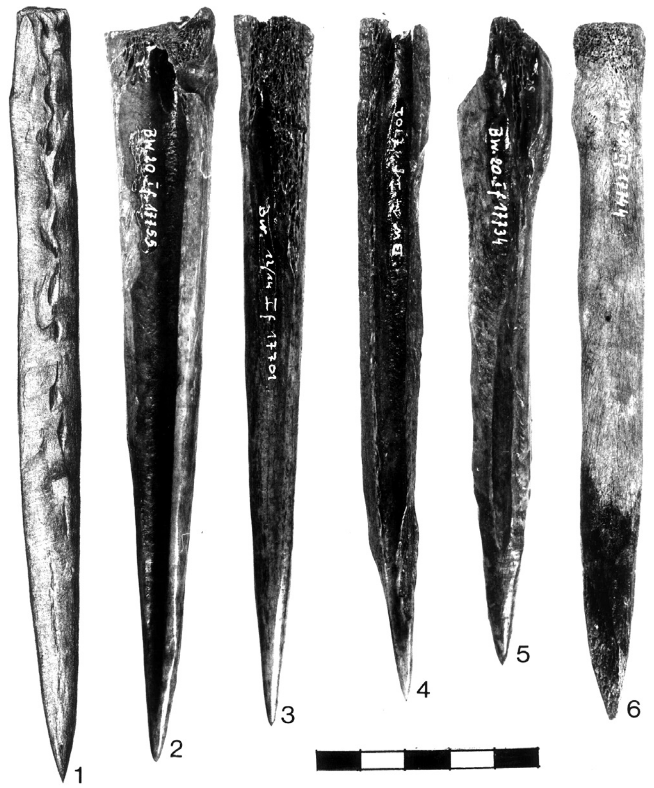


Fig. 14 Pegs and pseudo-pegs. 1: red deer antler; 2-4 red deer metapodials, 5 cattle metatarsus, 6 wolf radius (scale in cm; photos: D. Wolf; drawing: J. Klang)

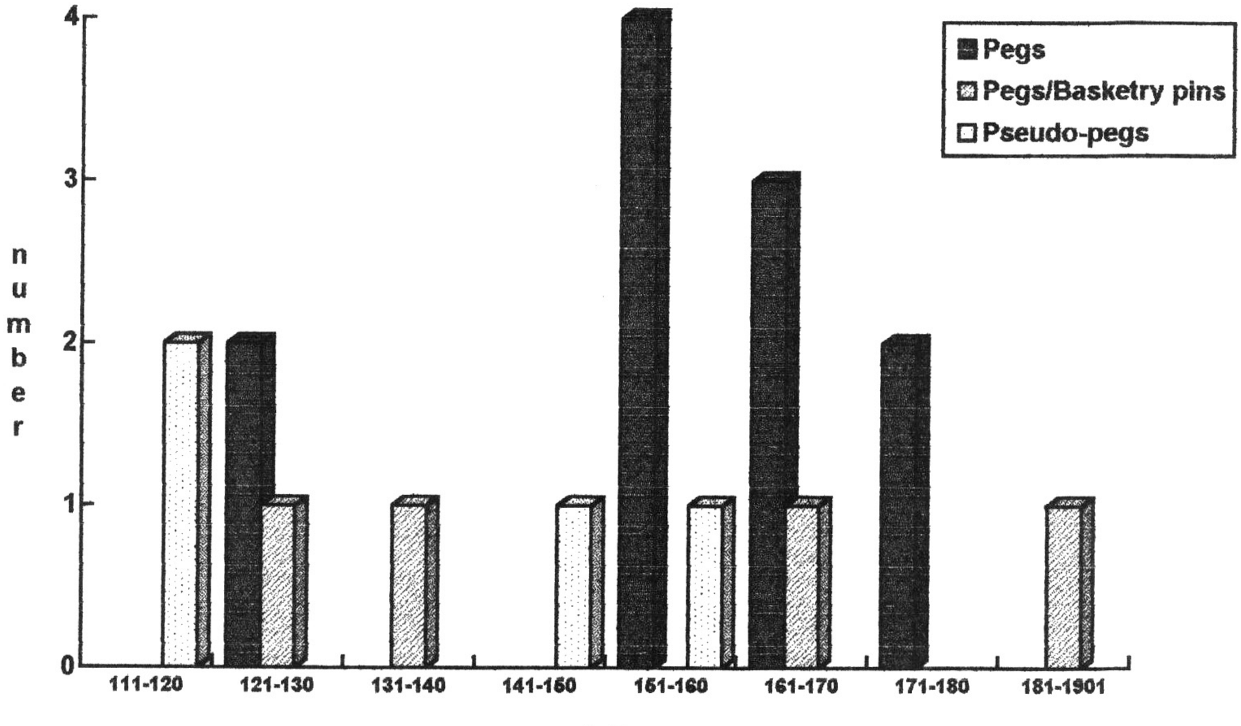


Fig. 15 Pegs, pseudo-pegs and peg-like implements. Variability in length.

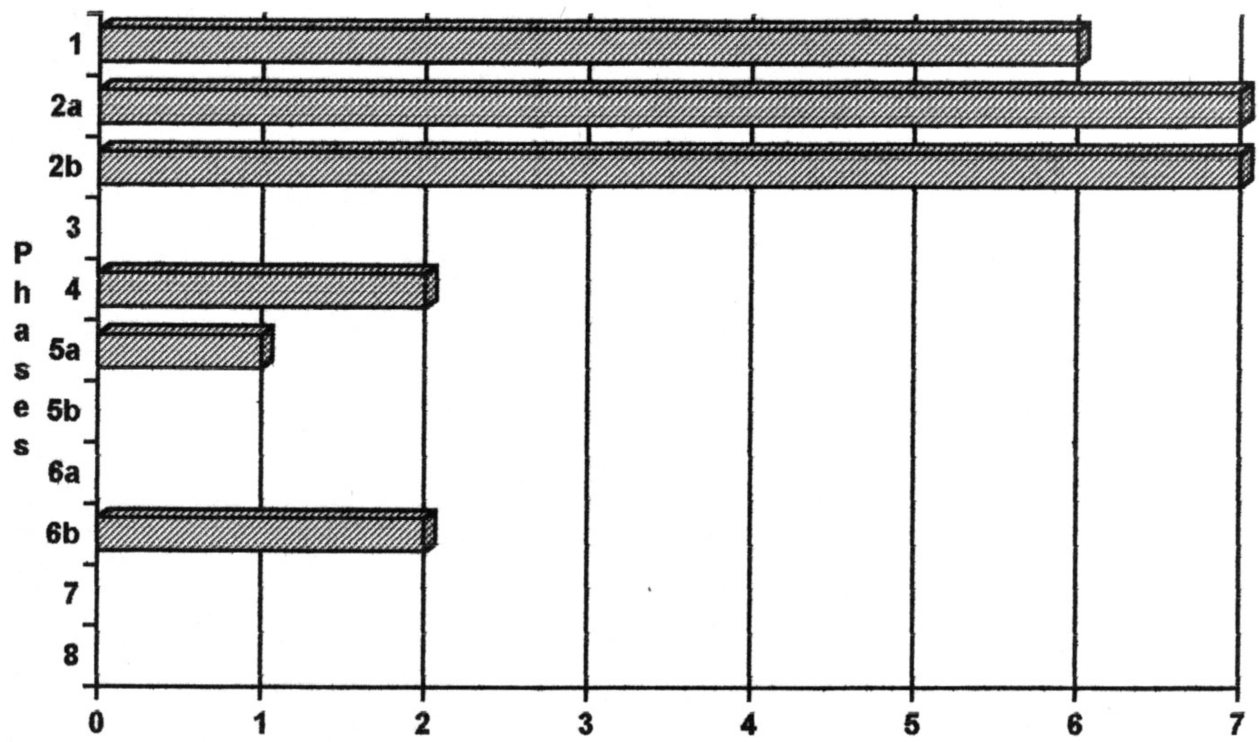


Fig. 16 Pegs and pseudo-pegs (n = 25). Stratigraphic distribution

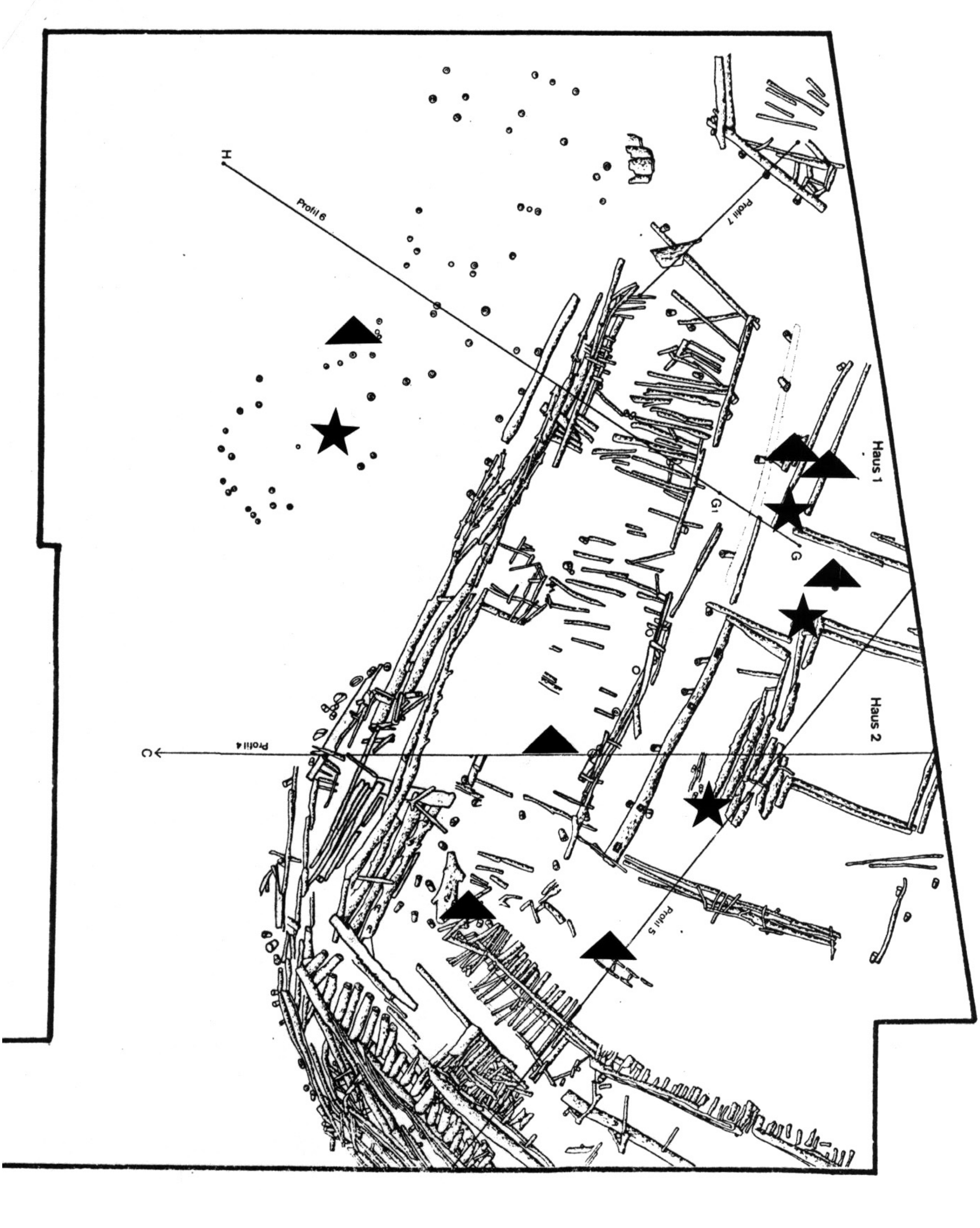


Fig. 17 Plot 12/14, different phases. Distribution patterns of pegs and pseudo-pegs (triangle) as well as basketry pins in postulated double function (star)