The Kakucs-Turján archaeological site was investigated by a Polish-Hungarian-German research team of archaeologists and various specialists. This volume contains the first, preliminary results of their work, giving the reader an insight into the complex history of the Bronze Age settlement and its economic activities as reflected in the multi-layered stratigraphy of the site.

The currently analysed materials from Kakucs-Turján may help to indicate the basic parameters of the development and functioning of the Middle Bronze Age Vatya culture; on the one hand strongly based on local tradition, on the other contextualized within a wider network covering the Carpathian Basin.




In Kommission bei Dr. Rudolf Habelt GmbH

Kakucs-Turján

Mateusz Jaeger, Gabriella Kulcsár, Nicole Taylor, Robert Staniuk (eds.)

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# Preface from series' editors

The following volume addresses the topic which is intensively covered in the 'Studien zur Archäologie in Ostmitteleuropa/Studia nad Pradziejami Europy Środkowej' series – Bronze Age settlement archaeology, especially the subject of fortified settlements.

The subject of fortified settlements and the various aspects related to their formation and functioning during European Bronze Age was covered in conference proceedings (volumes 5 and 9), a monograph (volume 17), as well as extensive reports on specific sites (the Únětice settlement in Bruszczewo; volumes 2, 6 (1 and 2), 13 and 14).

The following volume summarizes the first stage of Polish-Hungarian-German interdisciplinary research of the Kakucs-Turján settlement located in Central Hungary. Although the settlement was mostly related to Middle Bronze Age Vatya culture, it provided evidence of older, i.e. Early Bronze Age habitation. Excavations provided evidence of a complex stratigraphy related to centuries of habitation. Apart from stratigraphic information the site provided rich amount of archaeological material representing different types of material culture.

The presented volume summarizes the preliminary results of the archaeological and specialist analyses of the excavated archaeological material. It is the opinion of series' editors that it provides valuable input in studies of the dynamics of the communities inhabiting one of the key regions of the European Bronze Age – the middle Danube basin.

*Janusz Czebreszuk • Johannes Müller • Sławomir Kadrow*

# Preface

Multi-layered and fortified settlements are one of the most characteristic features of the Middle Bronze Age in the Carpathian Basin, especially the area of present-day Hungary. The extensive size of such settlements is often a logistical and financial challenges for modern archaeology. Despite the organizational challenges, studying such settlements provides invaluable information regarding the development of local Bronze Age communities.

One way of overcoming challenges related to studying multi-layered fortified settlements is by forming extensive scientific co-operations. The presented volume results from the collaboration of many people. The Polish-Hungarian-Germany scientific project aiming at studying the settlement in Kakucs-Turján was a collaboration of researchers from the Adam Mickiewicz University in Poznań, the Hungarian Academy of Sciences in Budapest and the University of Kiel. The research undertaken between 2013 and 2017 involved both field work and data-processing, which extended beyond the work of archaeologists and included specialists from other fields, students, sometimes simply friends from various institutions in Poland, Hungary and Germany.

Participation of such a large group of people coming from different personal backgrounds and representing different scientific practices and the exchange of experiences and knowledge is one of the main successes of the project. We would like to express our gratitude for all the work and help we received from everyone involved personally or simply supporting us throughout this journey. Special thanks go to the official representatives of the region – István Szalay – the mayor of Kakucs between 2013 and 2014; and Mária Toma Kendéné – the mayor of Kakucs since 2014. It is impossible not to mention the relentless organizational and technical support from István Greman and Pál Kulcsár, whom we would like to say thank you.

The scientific potential of the Kakucs-Turján settlement exceeds our current state of knowledge. We hope to continue our scientific project and work on other documented finds. The results of such works will be published in the upcoming volumes of Studien zur Archäologie in Ostmitteleuropa/Studia nad Pradziejami Europy Środkowej series.

*Mateusz Jaeger • Gabriella Kulcsár • Nicole Taylor • Robert Staniuk*

CHAPTER 7

# Finds

## 7.1 Preliminary results concerning the Middle Bronze Age (Vatya culture) bone tools from Kakucs-Turján, Central Hungary

*Erika Gál (Budapest)*

### Introduction

Recent excavations conducted by the Polish-Hungarian-German 'Kakucs Archaeological Expedition (KEX)' during 2013-2016 have opened a triple structured settlement segmented by ditches at Kakucs-Turján in Central Hungary (Fig. 1). Precursory magnetometer survey made on 4.5 hectars marked the traces of a number of centrally placed houses (Kulcsár et al. 2014: 5-6, Figures 7-8). The systematic archaeological survey focused to a house and its surrounding dated to 1900/1800–1700/1600 cal BC.

The excavations provided a rather abundant animal bone assemblage whose size is currently estimated to about 12,000-15,000

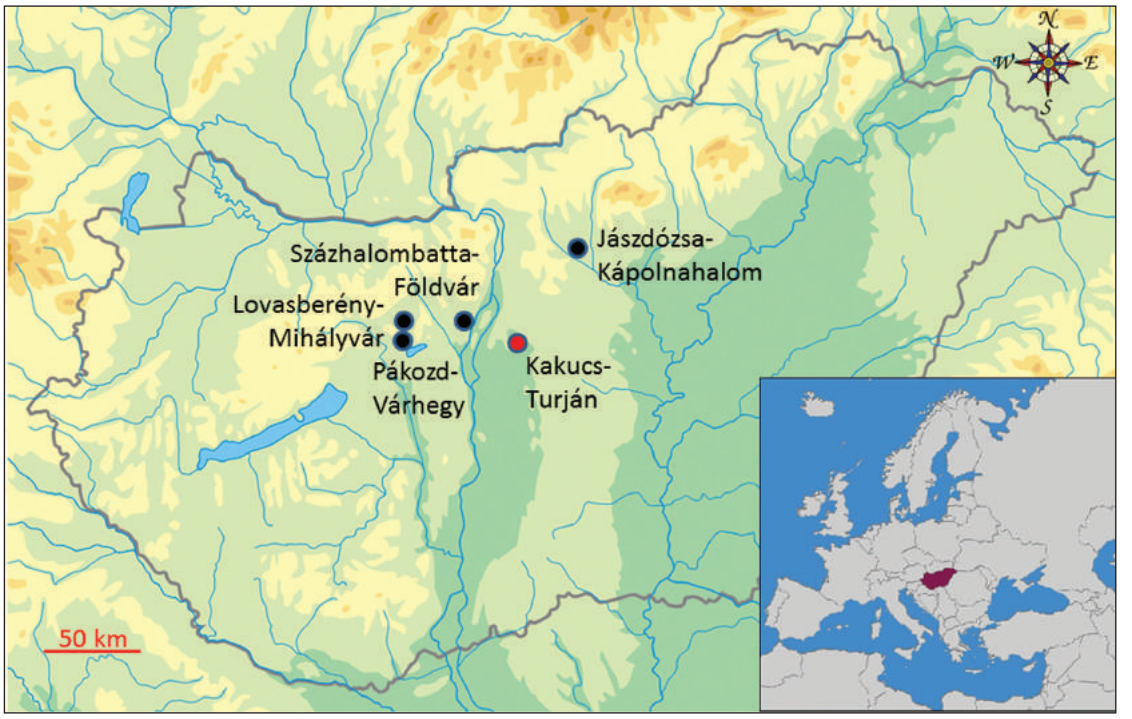


Fig. 1. Map showing the locations of sites mentioned in the paper.

remains. The collection of animal remains was made by hand collecting method and dry screening as well. Osseous finds displaying traces of human modification were separated from the rest of assemblage. The present paper is intended to present these 100 implements as the preliminary approach of the bone and antler manufacture techniques at Kakucs-Turján during the Middle Bronze Age.

## Results

### I. Typological characteristics

The total of 100 osseous artefacts consists of 95 bone and four antler tools, and a drilled pig tusk (Table 1). Pendants – whose majority were made from hare matapodia – and pointed tools dominate in the assemblage forming almost half of it by 28% and 21%, respectively (Fig. 2, top). Noteworthy is the frequency of small

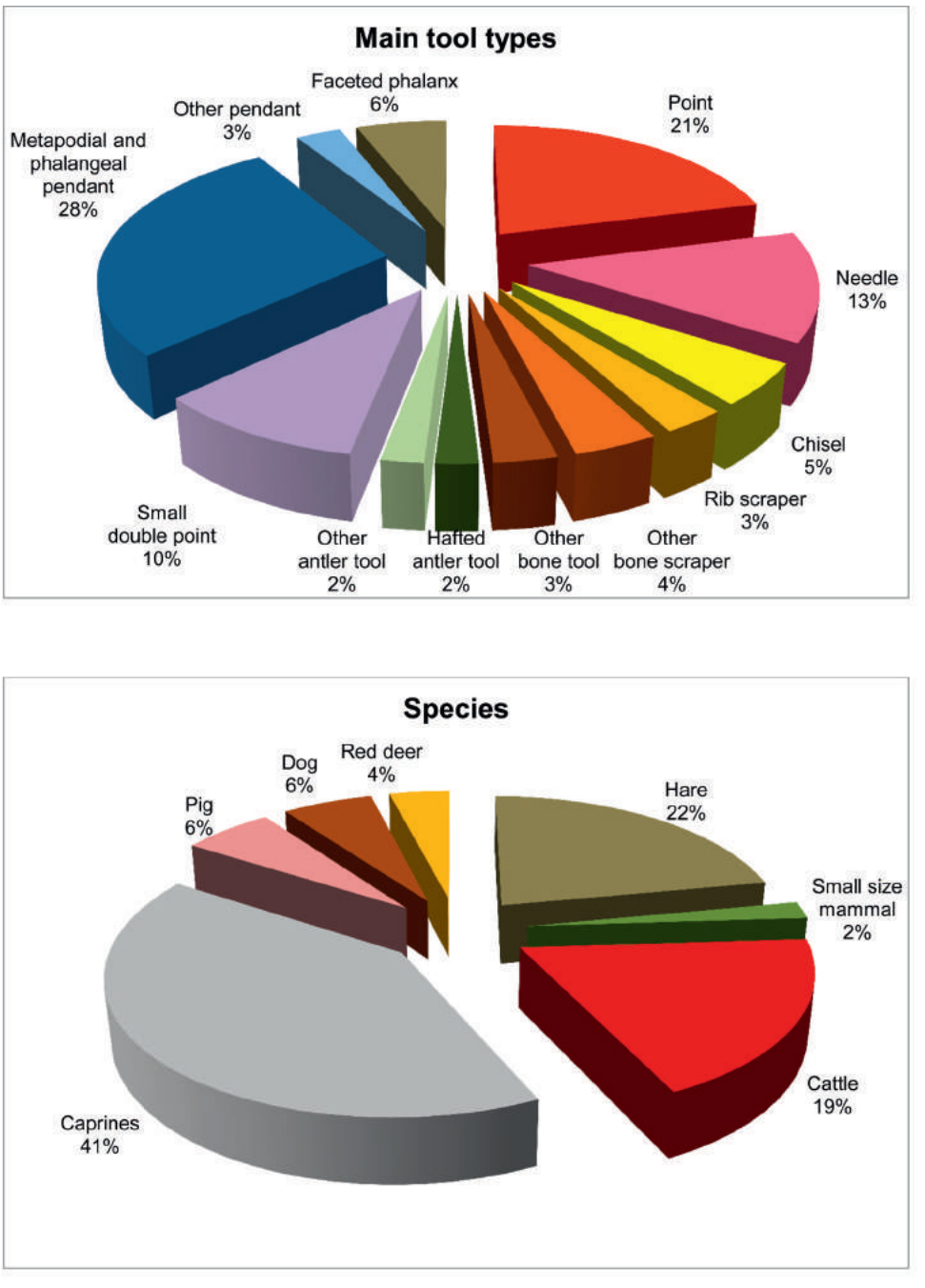


Fig. 2. The typological and taxonomic distribution of osseous tools.

double points (10%). Contrary, untypical is the small presentation of bevel-ended objects (12%) and antler tools (4%) that are common types in Bronze Age tool assemblages (Sofaer, Bender Jorgensen, Choyke 2013: 482-484). A concise description of artefacts according to the main typological groups is given in the following.

## 1. Pointed tools

### 1.1 *Awls*

This group of tools includes points of various type and size. Most of them (16 of 21) were made from long bones of caprines (sheep and goat) such as metapodiae and tibiae. The metapodial points were usually produced by longitudinally splitting the bone in two parts, keeping either the proximal or the distal epiphysis unmodified for the handle, and burnishing and pointing the other end of the diaphysis (Fig. 3/1–2).

Since the proximal epiphysis of metacarpus and metatarsus is already ossified at birth in caprines, the age of slaughtered animals did not matter in producing such kind of points. Contrary, when the distal epiphysis was preserved for making the handle of tool, sheep and goat older than 1.5-2 years had to be killed according to the age when the ossification of these bone types is completed (Chaix, Méniel 2001). Concerning the awls made carved out from tibiae, the handles does not seem to have played an important role. They are either broken or bones of animals with unossified distal epiphysis (younger than 1.5-2 years) were modified (Fig. 3/3–4).

The rest of points were carved out from the long bones (usually metapodiae) of cattle, but a pig fibula also served as raw material for producing awl. Some of these objects were less carefully shaped than the previously presented points, but only the top of a randomly picked up diaphysis fragment was sharpened (Fig. 3/5).


Fig. 3. Class I awls made from caprines metatarsus (1-2) and tibia (3-4), and an ad-hoc point made from cattle metapodium (5).

### 1.2 *Needles*

In addition to the larger pointed tools, 13 needles – of which three are fine needles – were also found in the bone assemblage. They were usually carved out from the long bones (most often the metatarsus) of sheep or goat, but two pig fibulae were also drilled and sharpened into needle. The majority of needles were broken either at the hole or at the tip. The only complete large needle is 93 mm long. The small and narrow fine needles were made from the longitudinally split ribs of caprines and pig. The length of the single complete fine needle is 46.7 mm (Fig. 4).

### 1.3 *Small double points*

Ten of the pointed bones represented small double points. These artefacts whose role is at issue were carved out from long bone diaphyses of large ruminants (most likely cattle) and matapodiae of caprines alike. Most of them were found broken, but they generally represent small implements whose size varied between 25.6-51.2 mm (Fig. 5).


Fig. 4. Pins and fine needle made undefined long bone (left), metatarsus (middle), and rib (right) of caprines.


Fig. 5. Series of small double points

## 2. Bevel-ended tools

### 2.1 *Chisels and long bone scrapers*

This group of implements is mostly formed by massive utensils, the only exception being a chisel and a scraper made from caprines long bone. The other pieces represent two large ulna chisels as well as two chisels and four scrapers made from the other long bones (e.g. metapodium) of cattle (Fig. 6).

### 2.2 *Rib scrapers*

In addition to the long bone bevel-ended tools, three rib scrapers were also found in the assemblage. All of them were made from the corpus of rib of a large size mammal, most probably cattle. All of them are rather well preserved, 10-15 cm long tools with rounded working end (Fig. 7).


Fig. 6. Cattle ulna (left) and metapodial (middle) chisel, and scraper made from caprines long bone (right).


Fig. 7. Rib scrapers.

## 3. Pendants

### 3.1 *Tooth pendants*

The single drilled natural tooth in the assemblage is from a female pig. The root of lower canine was bored by a hole of 5 mm diameter in a medio-lateral direction (Fig. 8, left). The next pendant on the image is an imitation of red deer canine tooth. The nicely prepared ornament was produced from a long bone diaphysis of a large ruminant, most possibly a cattle radius or tibia (Fig. 8, middle). Although both sexes in red deer have upper canines, they develop to a size that makes them suitable for ornaments only in stags. Therefore this raw material is hard to procure which makes the canine beads valued items, often falsified during the historical periods.


Fig. 8. Pig tusk pendant (left); red deer tooth pendant imitation (middle); and anthropomorphic amulet (right).


Fig. 9. Hare metapodial pendants.

### 3.2 *Metapodial and phalangeal pendants*

This category of artefacts represents the most frequent type in the assemblage at this stage of the bone analyses by 28 pieces. Mostly hare metatarsals (a total of 22 metatarsus II, III, IV and V) were drilled through at their distal epiphyses in dorso-plantar direction (Fig. 9). In addition, four dog metatarsi (mostly metatarsus IV) and two dog phalanges were also bored in a similar way (Fig. 10).


Fig. 10. Dog metapodial and phalangeal pendants.

### 3.3 *Amulets*

Anthropomorphic figurines carved out from bones would represent the third type of pendants. So far a single such kind of artefact was found at Kakucs-Turján. The 58.1 mm long piece was cut from a long bone diaphysis of sheep or goat. The middle and distal part of the amulet is well preserved, but the proximal part of it broke at the 4 mm diameter hole (Fig. 8, right).

Fig. 11. Faceted proximal phalanges of various wear stage from young caprines (1-3) and pig (4).

## 4. Faceted bones

A total of six faceted bones were found in the assemblage. All of them are proximal phalanges from caprines and pig. Four originate from sheep lambs that were younger than 7–10 month according to the yet unossified proximal epiphyses (Chaix, Méniel 2001). Further two faceted pha-

langes belonged to pig. One of them had completely ossified epiphyses indicating its age of older than 13 month. The other pig phalanx had a partly ossified proximal epiphysis that identifies the age of animal to about one year old (Fig. 11).

## 5. Antler tools

### 5.1 *Hafted adze or axe like tools*

So far only two hafted antler tools were found in the assemblage. The bigger implement was made from the basic part of the antler. The brow tine was cut off from the antler, while the beam was drilled through by a hole of 13.7 mm in a medio-lateral direction. Since the tool broke at the hole, and the sharpened end was not found, we don't know whether it functioned as an adze or axe. According to the rather well preserved antler rose this implement was used for a relatively short time (Fig. 12, top).


Fig. 12. Broken hafted antler tools.

The smaller hafted antler tool was carved out from a cut off section of beam. This end represented the base of implement, which is polished and therefore evidences its use in flatting and smoothing. The edged end of the implement is missing in this case as well. The diameter of the (broken) hole is slightly smaller (15.2 mm) than in the aforementioned hafted tool (Fig. 12, bottom).

### 5.2 *Other antler tools*

In addition to the hafted antler tools, two other utensils were made from this raw material. One of them is a broken top of a harpoon. It has two small holes on it of which the larger and proximal is broken (Fig. 13, left). The second artefact is a carefully produced piece. The handle is hollow and ribbed on the surface, while the (broken) distal part is elongated and narrow (Fig. 13, right).

#### II. Taxonomical characteristics

Forty-one percent of artefacts found at Kakucs-Turján were made from the skeletal parts of caprines (Fig. 2, bottom). The distinction of sheep and goat bones is likely in the case of certain skeletal parts only, and it is usually impossible concerning the modified bones since the identification of species would require a number of criteria such as the complete ossification of epiphyses on the one hand and intact osteological features on the other.

By the frequency of metapodial pendants, hare is the next best represented animal in the bone tool assemblage by 22%. In addition, cattle bones (19%) seem to have been manufactured commonly. Pig and dog are equally underrepresented in the assemblage by 6% each. Red deer is the only large size hunted animal whose skeletal parts were identified. Nevertheless, all four objects belonging to this species were made from antler that can be gathered and therefore does not necessarily imply the killing of game.


Fig. 13. Antler harpoon (left) and net weaver (right).

### III. Qualitative characteristics

In addition to the typological and taxonomic grouping of artefacts, there is a manufacture quality continuum along which each tool may be characterised according to the method developed on prehistoric implements by Alice M. Choyke. The two extremes of this continuum were termed Class I or planned and Class II or opportunistic. Tools falling into the former category may be described by a number of qualitative characteristics such as the selection of raw material (regarding both the species and the skeletal part), multi-stage manufacturing schedule and often curation as well. The bones serving as raw material for Class II or ad-hoc tools are usually collected from refuse bones, only slightly modified, and almost never reworked (Choyke 1997).

The majority (69%) of osseous artefacts identified so far from Kakucs-Turján belong to Class I tools. They include the antler tools, the pendants, the faceted bones, the rib scrapers, and the greatest part of points (Table 1).

## Discussion

The analysis of Bronze Age bone, antler and tusk tools has a tradition back for decades in Hungary. The Middle Bronze Age assemblages are especially well represented among the studied materials (e.g. Choyke 1984; 1998, Choyke, Bartosiewicz 2009).

Vatya culture tools made from hard animal tissue were described from a number of sites, among which the most abundant assemblages were found at Pákozd-Várhegy (Choyke 1979), Lovasberény-Mihályvár (Choyke 1984) and Százhalombatta-Földvár (Choyke, Vretemark, Sten 2004, Vretemark, Sten 2010). The mentioned localities are also the geographically closest located settlements to Kakucs-Turján (Fig. 1).

The afore-listed rich assemblages included 88 to 155 artefacts, which is in proportion with the size of the assemblage under study. Large rib scrapers, assumingly used on soft pliant animal materials based on macro-wear analyses (Sofaer, Bender Jorgensen, Choyke 2013: 482), seem to have been the most frequent tools in the previously published Vatya tool assemblages. Class I and Class II awls and scrapers were also common. In addition, the number of hare metapodial pendants as well as of small double points was striking in the material found at Százhalombatta-Földvár (Choyke, Vretemark, Sten 2004: 183, Fig. 8). At the latter site, not only hare metapodiae but similar bones and teeth from dogs were also drilled and used as amulets (Vretemark, Sten 2010). It has been suggested that these artefacts would have been expressed the social identity of the Vatya culture people. Similarly, the earlier unidentified small double points from Vatya sites have been suggested to represent body decoration unique to this settlement and group of people (Choyke, Vretemark, Sten 2004: 186-187, Fig. 16).

Concerning the implements made from antler, the flat butted heavy duty antler tools described from Pákozd-Várhegy, Százhalombatta-Téglagyár and Százhalombatta-Földvár in a greater number (Choyke 1979; 1984) have been associated with the Vatya identity of people. It has been presumed, that the hollowed and butt end could be fitted with a groundstone or a metal blade Contrary, the hafted antler tools with oblique end seem to have been characteristic of Middle Bronze Age sites located in the eastern part of the country (Choyke 1998; Choyke, Vretemark, Sten 2004; Choyke, Bartosiewicz 2009).

The exploitation of red deer in the Carpathian Basin dates back to the Palaeolithic period (Vörös 2003: 56-60, Fig. 18). Antler – either obtained by killing the animal or by gathering – became an important raw material by the late Neolithic, when the hafted heavy duty implements became employed in earth works such as digging and smoothing, as well as splitting wood (Choyke 1987; Sofaer, Bender Jorgensen, Choyke 2013: 483). The abundance of antler tools and semi-products, and workshop debitage at certain Early and Middle Bronze Age structured settlements such as Kaposújlak-Várdomb in Southwestern Hungary and Jászdózsa-Kápolnahalom in Northern Hungary suggest that antler may even have been traded (Choyke, Bartosiewicz 2009; Sofaer, Bender Jorgensen, Choyke 2013: 485; Gál 2017: 63-82).

At the Middle Bronze Age site of Jászdózsa-Kápolnahalom, flattened short bones such as phalanges and astragali from small and large ungulates (sheep and goat, pig, cattle, horse and red deer) were particularly common, likewise at Százhalombatta-Földvár. These objects have usually been associated with ritual and gaming activities, but they could have been used as burnishers as well (Choyke, Bartosiewicz 2009: 363; Sofaer, Bender Jorgensen, Choyke 2013: 483–484, Fig. 26.4). Their functional role will perhaps be detected by use-wear studies.

Similarly, use-wear analyses may bring us closer to the other type of 'enigmatic' objects that are the small double points found in Vatya culture assemblages. Although these analyses request a specialist trained in traceology as well as testing experiments, the preliminary microscopic examination of small double points from Kakucs-Turján suggests that they were shaped on a rough surface by longitudinal polishing, their tips are rounded and polished, while criss-crossing lines run in the middle. These marks do not exclude their earlier interpretation as fishing gorges (Magyar Néprajzi Lexikon 1979; Choyke 1984: 40-41, Table 2; Gál 2014: 329-331, Figure 235) or their newer understanding as body decorations (Choyke, Vretemark, Sten 2004: 186-187).

The forthcoming archaeozoological study of the bone assemblage may bring direct evidence for fishing at Kakucs-Tur-

ján. In addition to the probable 'fish gorges', the net weaving antler artefact (Fig. 13, right) points to the seasonal acquisition of fish.

Personal adornments seem to have been generally important to the people living at Kakucs-Turján according to the pendants of various shape, size and origin. The rarest object in the context of the Bronze Age is the red deer canine imitation by all means. Real canine tooth beads and imitations are world-wide known from archaeological deposits, but seem to have been especially typical of the Late Neolithic period. Sometime considerable quantities of canines were found symbolising the social status of people and the continuity of group as the burials uncovered at the Late Neolithic village site of Polgár-Csőszhalom-dűlő 6 in the north of the Great Hungarian Plain evidence. Statistically based analyses carried on the over 300 red deer canines and imitations found in 11 graves (males and females, juveniles and adults) closely associated with houses at this settlement suggest that the imitations were larger than the real canines. The size of the item from Kakucs-Turján exceeds even the largest beads among the collection from Polgár. It has been also suggested that the imitations belonged to the female sphere, since the male graves contained only natural canine beads in addition to wild boar tusks and mandibles symbolising the hunting role of this gender (Choyke 2001).

Finally, qualitative indicators of implements from Kakucs seem to have fit into the earlier (Choyke 1984: 42–54) and later published (Choyke, Vretemark, Sten 2004: 185-186, Fig. 12) trends regarding the Vatya tool assemblages. The current proportion of good quality artefacts (69%) may even increase if further rib scrapers and antler tools characteristic of this culture will be recognised in the bone refuse material.

## Conclusions

Although it is expected that the bone tool material from Kakucs-Turján will be doubling by the identification of archaeozoological material (butchery and food remains) from this site, a basic tendency regarding the favourite types can probably be already traced.

At the recent stage of analyses, the tool assemblage from Kakucs-Turján shows scarcity in some characteristic Vatya culture implements such as the rib scrapers from large mammals, and butt-ended hafted antler tools. On the other hand, it seems to have been a typical material of this period by including emblematic types of the Vatya culture such as the hare and dog amulets as well as the small double points which so far have been thought to be unique of Százhalombatta-Földvár.

A more reliable distribution of types and the question whether cervids were not hunted or only antler was rarely gathered around the site shall be answered by the complete analysis of the archaeozoological material. Likewise, details concerning the structure and life span of the settlement shall provide information regarding the manufacture and deposition of artefacts as well as possible diachronic changes in technology.

## Acknowledgements

László Bartosiewicz and Alice M. Choyke are thanked for their help with the identification of objects yet unknown by me and inspiring conversations.

**Table 1. The distribution of worked material by skeletal parts and species**

| Tool Type (Schibler's Typology) | Bone | Class | Base | Tip | GL | GB | GD | LMF | GSB | No. and Feature Type | Inventory no. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Small ruminant point (Type 1/1) | Metapodium | 1 | 0 | 3/1 | 73.2 | 9.8 | 5.2 | - | 3.7 | KEX14-16: 30006 | f2 30210 | Broken base, curated top |
| Small ruminant point (Type 1/1) | Metapodium | 1 | 1 | | 102.5 | 9.7 | 4.9 | - | - | KEX13-15: 40022 | f1 50830 | Rounded handle, broken top |
| Small ruminant point (Type 1/1) | Metapodium | 1 | 1 | 7/3 | 124.9 | 17.8 | 13.8 | - | - | KEX13-15: 11101 | f1 112848 | |
| Small point with articular end (Type 1/4) | Metacarpus (small ruminant) | 1 | 1 | 7/1 | 89.6 | 9.2 | 15.9 | - | 3.4 | KEX13-15: 13161 | m1 13272 | Groove and split (G&S) tehnique, curated |
| Large, massive point with articular end (Type 1/6) | Tibia (small ruminant) | 1 | 1 | 10/1 | 97.4 | 18.9 | 12.1 | - | 3.0 | KEX13-15: 40009 | f1 102545 | |
| Small point without articular end (Type 1/7) | Long bone (small ruminant) | 2 | 0 | 2/2 | 27.5 | 7.2 | 3.0 | - | 4.1 | KEX14-16: 30006 | f2 40141 | Only the distal end is preserved |
| Small point without articular end (Type 1/7) | Long bone (small ruminant) | 2 | 0 | 5/11 | 28.2 | 6.5 | 4.3 | - | 2.6 | KEX14-16: 30006 | f2 50176 | Fragment |
| Small point without articular end (Type 1/7) | Metatarsus (cattle) | 2 | 11 | 3/3 | 57.0 | 12.1 | 6.1 | - | 4.1 | KEX13-15 40008 | m1 4149 | Curated |
| Small point without articular end (Type 1/7) | Metacarpus (small ruminant) | 1 | 11 | 2/1 | 58.6 | 17.2 | 4.3 | - | - | KEX13-15: 12135 | f1 123147 | Broken tip |
| Small point without articular end (Type 1/7) | Long bone (small ruminant) | 2 | 0 | 7/10 | 61.7 | 6.0 | 3.9 | - | 3.2 | KEX13-15: 14164 | f1 143813 | Possibly curated |
| Small point without articular end (Type 1/7) | Metapodium (small ruminant) | 1 | 0 | 2/1 | 64.1 | 7.3 | 3.7 | - | 1.9 | KEX14-16: 90004 | m2 11032 | Possibly curated |
| Small point without articular end (Type 1/7) | Metapodium (small ruminant) | 1 | 0 | 2/1 | 64.7 | 7.3 | 4.9 | - | 3.1 | KEX14-16: 10094 | m1 102502 | Fragment of a Type 1/1 point (?) |
| Middle sized point without articular end (Type 1/8) | Fibula (pig) | 2 | 0 | 12/5 | 80.0 | 6.2 | 4.0 | - | 2.0 | KEX13-15: 12121 | f1 133416 | |
| Middle sized point without articular end (Type 1/8) | Tibia (small ruminant) | 2 | 11 | 12/11 | 82.2 | 11.8 | 8.0 | | 2.6 | KEX13-15: 40006 | m1 4117 | |
| Middle sized point without articular end (Type 1/8) | Tibia (small ruminant) | 2 | 11 | 7/11 | 85.1 | 6.1 | 15.5 | - | 3.1 | KEX14-16: 30006 | f2 40108 | |
| Middle sized point without articular end (Type 1/8) | Tibia (small ruminant) | 1 | 11 | 10/1 | 85.7 | 14.3 | 7.4 | - | 2.4 | KEX13-15: 13159 | f1 143634 | Curated |

| Tool Type (Schibler's Typology) | Bone | Class | Base | Tip | GL | GB | GD | LMF | GSB | No. and Feature Type | Inventory no. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Middle sized point without articular end (Type 1/8) | Metapodium (cattle) | 2 | 11 | 7/10 | 97.7 | 20.9 | 7.3 | - | 6.1 | KEX13-15: 40011 | f1 61104 | Blunt tip |
| Middle sized point without articular end (Type 1/8) | Metacarpus (small ruminant) | 1 | 0 | 7/3 | 98.4 | 21.3 | 10.1 | - | 3.2 | KEX14-16: 30006 | f2 070087 | |
| Double point from long bone (Type 2/1) | Metapodium (small ruminant) | 2 | - | 4/4 | 25.6 | 5.5 | 3.1 | - | 3.8 | KEX13-15: 40011 | m1 5222 | Fragment |
| Double point from long bone (Type 2/1) | Long bone (cattle) | 2 | - | - | 31.1 | 7.0 | 3.5 | - | - | KEX14-16: 130001 | m2 13003 | Fragment |
| Double point from long bone (Type 2/1) | Long bone (cattle) | 2 | - | 7/1 | 32.0 | 5.0 | 3.6 | - | 2.0 | KEX13-15: 40009 | f1 40481 | Fragment |
| Double point from long bone (Type 2/1) | Metapodium (small ruminant) | 2 | - | - | 33.3 | 6.2 | 4.4 | - | 3.2 | KEX13-15: 80007 | f2 080244 | Fragment |
| Double point from long bone (Type 2/1) | Metapodium (small ruminant) | 2 | 0 | 4/4 | 34.0 | 5.5 | 4.4 | - | 3.2 | KEX13-15: 12121 | f1 123195 | |
| Double point from long bone (Type 2/1) | Metapodium (small ruminant) | 2 | - | 3/1 | 36.3 | 7.5 | 4.1 | - | 4.6 | KEX13-15: 40011 | m1 6301 | Fragment |
| Double point from long bone (Type 2/1) | Metapodium (small ruminant) | 2 | 0 | 4/4 | 36.6 | 5.2 | 4.1 | - | 3.8 | KEX 14-16: 60016 | f2 070176 | |
| Double point from long bone (Type 2/1) | Long bone (cattle) | 2 | 0 | 4/1 | 44.1 | 7.3 | 6.1 | - | 5.5 | KEX14-16: 30006 | m3 6002 | Fragment |
| Double point from long bone (Type 2/1) | Long bone (cattle) | 2 | 0 | 3/1 | 46.9 | 7.4 | 6.8 | - | 4.1 | KEX14-16: 30006 | f2 30302 | |
| Double point from long bone (Type 2/1) | Metapodium (small ruminant) | 2 | 0 | 2/1 | 52.2 | 7.7 | 4.4 | - | 3.5 | KEX13-15:14164 | m1 14445 | Curated |
| Massive chisel (Type 4/3) | Metapodium (cattle) | 2 | - | 29/25 | 64.4 | 20.2 | 8.7 | 13.3 | 19.2 | KEX13-15: 40006 | m1 4… | Only the distal end is preserved. Curated |
| Small chisel (Type 4/5) | Long bone (small ruminant) | 2 | 0 | - | 73.5 | 18.2 | 7.5 | 7.2 | 5.5 | KEX13-15: 40005 | m2 5083 | Very fragmented |
| Small chisel (Type 4/5) | Tibia (small ruminant) | 2 | 0 | 31/23 | 78.4 | 16.0 | 8.0 | 32.0 | 6.5 | KEX14-16: 30006 | f2 40077 | |
| Massive ad hoc chisel (Type 4/7) | Metapodium (cattle) | 2 | 0 | 31/21 | 48.3 | 15.6 | 7.4 | 2.1 | 8.5 | KEX14-16: 30006 | m2 5016 | Only the distal end is preserved |
| Massive ad hoc chisel (Type 4/7) | Long bone (cattle) | 2 | - | 32/21 | 64.6 | 22.3 | 4.8 | 14.9 | - | KEX14-16: 30006 | f2 40245 | Broken base, probably curated top |
| Massive ad hoc chisel (Type 4/7) | Long bone (cattle) | 2 | 11 | - | 98.8 | 17.2 | 9.0 | 7.4 | 10.0 | KEX13-15: 10078 | m1 10789 | |

| Tool Type (Schibler's Typology) | Bone | Class | Base | Tip | GL | GB | GD | LMF | GSB | No. and Feature Type | Inventory no. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rib chisel (Type 4/10) | Rib (cattle) | 1 | 11 | 33/25 | 99.7 | 17.5 | 7.2 | 18.8 | 17.2 | KEX13-15: 40009 | m1 5236 | |
| Rib chisel (Type 4/10) | Rib (cattle) | 1 | 11 | 29/25 | 150.2 | 24.4 | 7.1 | - | - | KEX14-16: 30006 | m2 3021 | |
| Rib chisel (Type 4/10) | Rib (cattle) | 1 | 11 | 22/21 | 154.6 | 20.7 | 10.1 | 13.5 | 19.6 | KEX14-16: 60014 | f2 080134 | |
| Large ulna chisel (Type 4/12) | Ulna (cattle) | 2 | - | 22/24 | 44.8 | 18.3 | 9.0 | 8.0 | 17.2 | KEX13-15: 30004 | m1 20008 | Recently broken, only the distal end is preserved |
| Large ulna chisel (Type 4/12) | Ulna (cattle) | 2 | 11 | 22/24 | 119.0 | 33.3 | 25.4 | 7.1 | 15.7 | KEX13-15: 30003 | m1 30058 | |
| Drilled bone (Type 21) | Phalanx proximalis (dog) | 1 | - | - | 26.4 | 5.9 | 5.2 | - | - | KEX14-16: 90012 | m2 10055 | Pendant. Hole of 1.0 mm diameter |
| Drilled bone (Type 21) | Phalanx proximalis (dog) | 1 | - | - | 27.0 | 6.1 | 5.1 | - | - | KEX13-15: 90060 | m1 11089 | Pendant. Hole of 1.5 mm diameter |
| Drilled bone (Type 21) | Long bone (small ruminant) | 1 | - | - | 58.1 | 8.8 | 3.4 | | | KEX13-15: 13151 | f1 133409 | Pendant. Broken et the hole of 4.0 mm diameter |
| Needle (Type 21/1) | Long bone (small mammal) | 1 | 0 | 1/1 | 13.3 | 1.9 | 1.4 | - | 1.3 | KEX13-15: 90060 | f1 42419 | Very small artefact |
| Needle (Type 21/1) | Metapodium (small ruminant) | 1 | 0 | - | 32.6 | 15.6 | 8.8 | - | - | KEX14-16: 100027 | m2 13001 | Only the proximal end with a hole of 5.3 mm diameter is preserved |
| Needle (Type 21/1) | Long bone (small ruminant) | 1 | 0 | - | 37.7 | 3.7 | 3.4 | - | - | KEX14-16: 30006 | m3 6002 | Both the proximal and distal parts are broken |
| Needle (Type 21/1) | Long bone (small ruminant) | 1 | 0 | - | 37.8 | 3.4 | 2.3 | - | - | KEX13-15: 13163 | f1 133454 | The proximal part is broken |
| Needle (Type 21/1) | Metapodium (small ruminant) | 1 | 0 | - | 40.1 | 13.5 | 7.5 | - | - | KEX14-16: 90012 | m2 10055 | Hole of 2.1 mm diameter, broken top, polished stem |
| Needle (Type 21/1) | Rib (small ruminant) | 1 | 0 | - | 41.6 | 5.9 | 2.2 | - | - | KEX14-16: 90019 | f2 100018 | Fine needle. The proximal part is broken |
| Needle (Type 21/1) | Rib (small ruminant) | 1 | 12 | - | 46.7 | 4.1 | 1.6 | - | 1.7 | KEX13-15: 40009 | f1 102567 | Fine needle |
| Needle (Type 21/1) | Rib (small ruminant) | 1 | - | - | 47.1 | 5.1 | 2.0 | - | - | KEX14-16: 60014 | f2 070277 | Fragment of fine needle, broken at the hole of 1.5 mm diameter |
| Needle (Type 21/1) | Fibula (pig) | 1 | 1 | - | 50.3 | 12.7 | 5.4 | - | 3.5 | KEX14-16: 30006 | m3 9016 | Hole of 2.1 mm diameter, broken top, polished stem |

| Tool Type (Schibler's Typology) | Bone | Class | Base | Tip | GL | GB | GD | LMF | GSB | No. and Feature Type | Inventory no. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Needle (Type 21/1) | Long bone (small ruminant) | 1 | 0 | - | 56.0 | 3.5 | 3.0 | - | - | KEX13-15: 13163 | m1 13275 | Both the proximal and distal parts are broken |
| Needle (Type 21/1) | Metatarsus (small ruminant) | 1 | 1 | - | 71.9 | 17.7 | 9.5 | - | - | KEX13-15: 90060 | m1 12196 | Hole of 2.7 mm diameter, broken top |
| Needle (Type 21/1) | Fibula (pig) | 1 | 18 | 12/10 | 74.9 | 8.0 | 4.0 | - | 3.5 | KEX13-15: 50030 | f1 51048 | Broken at the hole of 3.5 mm diameter |
| Needle (Type 21/1) | Long bone (small ruminant) | 1 | 1 | - | 93.0 | 14.6 | 4.6 | - | - | KEX14-16: 30006 | f2 080106 | Hole of 2.6 mm diameter, polished |
| Bone with manufacturing/use wear (Type 22) | Unidentifiable bone (small ruminant) | 2 | - | - | 24.7 | 5.5 | 2.4 | - | - | KEX13-15: 40009 | f1 82301 | Fragment |
| Bone with manufacturing/use wear (Type 22) | Metatarsus (small ruminant) | 2 | - | - | 74.4 | 18.3 | 7.8 | - | - | KEX13-15: 13157 | f1 143638 | Fragment |
| Tooth pendant (Type 23/2) | Long bone diaphysis (large ruminant) | 1 | - | - | 27.2 | 11.5 | 9.7 | - | - | KEX14-16: 30006 | f2 30181 | Red deer canine imitation with hole of 3.0 mm diameter |
| Tooth pendant (Type 23/2) | Canine (pig) | 1 | - | - | 48.5 | 10.1 | 8.5 | - | - | KEX13-15: 11115 | f1 123010 | Holes of 5.0 mm and 3.0 mm diameter, respectively |
| Metapodial pendant (Type 23/3) | Metatarsus III (hare) | 1 | - | - | 35.0 | 5.3 | 9.5 | - | - | KEX13-15: 11104 | m1 11024 | Dark brown, broken at the hole |
| Metapodial pendant (Type 23/3) | Metatarsus V (hare) | 1 | - | - | 37.5 | 7.5 | 7.8 | - | - | KEX13-15: 60034 | m1 10751 | Broken at the hole of 1.7 mm diameter |
| Metapodial pendant (Type 23/3) | Metatarsus (hare) | 1 | - | - | 37.7 | 6.4 | 4.6 | - | - | KEX13-15: 40009 | m1 8593 | Fragment. Hole of 1.5 mm diameter |
| Metapodial pendant (Type 23/3) | Metatarsus IV (hare) | 1 | - | - | 45.5 | 5.7 | 8.0 | - | - | KEX14-16: 70001A | m2 7036 | Fragment, broken at the hole of 3.3 mm diameter |
| Metapodial pendant (Type 23/3) | Metatarsus (hare) | 1 | - | - | 46.0 | 8.2 | 5.6 | - | - | KEX13-15: 10093 | m1 10859 | Broken at the hole of 1.7 mm diameter |
| Metapodial pendant (Type 23/3) | Metatarsus (hare) | 1 | - | - | 47.8 | 6.3 | 8.3 | - | - | KEX13-15: 40009 | m1 5253 | Broken at the hole of 2.6 mm diameter |
| Metapodial pendant (Type 23/3) | Metatarsus (hare) | 1 | - | - | 48.8 | 6.6 | 6.6 | - | - | KEX14-16: 30006 | m2 5016 | Fragment. Hole of 1.5 mm diameter |
| Metapodial pendant (Type 23/3) | Metatarsus V (hare) | 1 | - | - | 49.5 | 9.1 | 7.3 | - | - | KEX13-15: 90060 | f1 102696 | Hole of 1.5 mm diameter |
| Metapodial pendant (Type 23/3) | Metatarsus (hare) | 1 | - | - | 50.0 | 8.4 | 4.1 | - | - | KEX13-15: 40011 | m1 4182 | Hole of 1.5 mm diameter |

| Tool Type (Schibler's Typology) | Bone | Class | Base | Tip | GL | GB | GD | LMF | GSB | No. and Feature Type | Inventory no. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Metapodial pendant (Type 23/3) | Metatarsus (hare) | 1 | - | - | 52.2 | 6.7 | 5.9 | - | - | KEX13-15: 60060 | f1 112839 | Fragment. Hole of 1.5 mm diameter |
| Metapodial pendant (Type 23/3) | Metatarsus (dog) | 1 | - | - | 53.8 | 7.0 | 10.7 | - | - | KEX14-16: 30006 | m2 3011 | Hole of 2.6 mm diameter |
| Metapodial pendant (Type 23/3) | Metatarsus II (hare) | 1 | - | - | 55.0 | 6.6 | 9.2 | - | - | KEX13-15: 90060 | f1 112843 | Hole of 2.0 mm diameter |
| Metapodial pendant (Type 23/3) | Metatarsus III (hare) | 1 | - | - | 56.3 | 6.4 | 9.0 | - | - | KEX14-16: 30006 | m2 3077 | Hole of 1.5 mm diameter |
| Metapodial pendant (Type 23/3) | Metatarsus III (hare) | 1 | - | - | 57.0 | 6.4 | 9.3 | - | - | KEX13-15: 13161 | m1 13269 | Hole of 2.0 mm diameter |
| Metapodial pendant (Type 23/3) | Metatarsus (hare) | 1 | - | - | 57.1 | 6.7 | 8.7 | - | - | KEX13-15: 30004 | m1 30066 | Hole of 1.5 mm diameter |
| Metapodial pendant (Type 23/3) | Metatarsus III (hare) | 1 | - | - | 57.8 | 6.8 | 7.0 | - | - | KEX13-15: 400099 | m1 10737 | Hole of 2.6 mm diameter |
| Metapodial pendant (Type 23/3) | Metatarsus IV (dog) | 1 | - | - | 57.8 | 7.7 | 10.5 | - | - | KEX14-16: 30006 | f2 40336 | Hole of 2.0 mm diameter |
| Metapodial pendant (Type 23/3) | Metatarsus IV (hare) | 1 | - | - | 58.5 | 6.5 | 9.2 | - | - | KEX14-16: 60014 | m2 6143 | Hole of 3.3 x 2.5 mm |
| Metapodial pendant (Type 23/3) | Metatarsus II (hare) | 1 | - | - | 59.1 | 6.8 | 8.9 | - | - | KEX13-15: 40009 | m1 10746 | Hole of 2.6 mm diameter |
| Metapodial pendant (Type 23/3) | Metatarsus III (hare) | 1 | - | - | 59.6 | 6.5 | 8.4 | - | - | KEX13-15: 40009 | m1 7573 | Hole of 1.5 mm diameter |
| Metapodial pendant (Type 23/3) | Metatarsus (dog) | 1 | - | - | 60.7 | 7.6 | 11.5 | - | - | KEX13-15: 40009 | m1 5321 | Hole of 1.8 mm diameter |
| Metapodial pendant (Type 23/3) | Metatarsus III (hare) | 1 | - | - | 60.9 | 6.4 | 9.2 | - | - | KEX14-16: 30006 | m2 3055 | Hole of 2.0 mm diameter |
| Metapodial pendant (Type 23/3) | Metatarsus (hare) | 1 | - | - | 61.1 | 6.1 | 9.0 | - | - | KEX13-15: 30003 | m1 3067 | Hole of 1.5 mm diameter |
| Metapodial pendant (Type 23/3) | Metatarsus IV (dog) | 1 | - | - | 67.9 | 7.3 | 9.8 | - | - | KEX14-16: 20002 | m2 2065 | Hole of 2.6 mm diameter |
| Knuckle bones (Type 35) | Phalanx proximalis (small ruminant) | 1 | - | - | 33.3 | 12.0 | 12.7 | - | - | KEX13-15: 50024 | m3 6011 | Palmar surface polished |
| Knuckle bones (Type 35) | Phalanx proximalis (small ruminant) | 1 | - | - | 34.6 | 13.1 | 11.2 | - | - | KEX13-15: 30003 | m1 30051 | Palmar surface polished |

| Tool Type (Schibler's Typology) | Bone | Class | Base | Tip | GL | GB | GD | LMF | GSB | No. and Feature Type | Inventory no. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Knuckle bones (Type 35) | Phalanx proximalis (small ruminant) | 1 | - | - | 36.8 | 12.4 | 11.2 | - | - | KEX13-15: 20001 | m2 2064 | Palmar surface polished |
| Knuckle bones (Type 35) | Phalanx proximalis (pig) | 1 | - | - | 37.3 | 16.9 | 16.4 | - | - | KEX13-15: 13161 | f1 123201 | Palmar surface polished |
| Knuckle bones (Type 35) | Phalanx proximalis (pig) | 1 | - | - | 38.0 | 15.8 | 14.7 | - | - | KEX14-16: 30006 | m2 09143 | Palmar surface polished |
| Knuckle bones (Type 35) | Phalanx proximalis (small ruminant) | 1 | - | - | 38.6 | 13.0 | 12.5 | - | - | KEX13-15: 40003 | m2 5022 | Palmar surface polished |
| Point fragment | Long bone (small ruminant) | 1 | - | - | 27.5 | 7.2 | 3.1 | - | - | KEX14-16: 30006 | f2 40141 | Broken and blunt tip of a point |
| Point fragment | Long bone (cattle) | - | - | 7/5 | 33.3 | 5.6 | 6.9 | | 2.8 | KEX13-15: 30003 | f1 30280 | Only the distal end is preserved |
| Point fragment | Metapodium (small ruminant) | 1 | 0 | - | 37.0 | 5.7 | 1.8 | | | KEX14-16: 60012 | m2 6124 | Fragment of a fine tool |
| Point fragment | Long bone (cattle) | - | - | 7/1 | 68.6 | 5.9 | 3.9 | - | 2.2 | KEX13-15: 30003 | m1 3099 | Only the distal end is preserved |
| Chisel fragment | Long bone (cattle) | - | - | 29/21 | 19.3 | 17.2 | 3.9 | - | - | KEX13-15: 40009 | m1 5264 | Only the distal end is preserved |
| Hafted rose and beam antler tool | Antler (red deer) | 1 | - | - | 106.5 | 38.5 | 20.7 | - | - | KEX13-15: 13157 | f1 143869 | Broken at hole of 13.7 mm diameter. The brow tine was cut off. The tool was used for a short time according to the well preserved antler rose |
| Hafted beam antler tool | Antler (red deer) | 1 | - | - | 80.5 | 32.8 | 20.7 | - | - | KEX13-15: 30004 | f1 20004 | Cut and polished base. Broken tool at the hole of 15.2 mm diameter |
| Antler net weaver | Antler (red deer) | 1 | - | - | 55.0 | 12.5 | 12.2 | - | - | KEX14-16: 50002 | f2 50338 | Broken |
| Antler harpoon | Antler (red deer) | 1 | - | - | 87.1 | 28.5 | 12.2 | - | - | KEX13-15: 80053 | f1 92484 | Fragment |

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