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MEDIEVAL BONE AND ANTLER ARTEFACTS FROM THE SETTLEMENT  
LOCATED NEAR THE GORD OF CZERMNO (SITE 2)

ABSTRACT

In 2022-23, excavations were carried out at the settlement near the gord of Czermino (site 2), which is part of the settlement complex of the former Cherven. During the excavations, a large collection of animal osteological materials was obtained, including typologically and functionally diverse objects made of bone and antler. They were subjected to formal-typological, archaeozoological, and traceological analysis in order to identify the raw material and the methods of its processing and use by the communities inhabiting the settlement in the early Middle Ages (late 10<sup>th</sup> to 13<sup>th</sup> century). The collection comprised 35 items (varied in terms of function) with traces

of processing, and in some cases also of use. They included pawns/buttons, skates, linings, fragments of combs, game pieces, spikes, and a horse bit element, as well as semi-finished products and production waste. They were usually made from deer antlers or, less frequently, from various bone elements (long bones, often from the metapodial section, talus, radius and femur bones, and ribs) of domesticated animals, mainly horses and sheep or goats or (less frequently) cattle. Microscopic observations revealed the presence of various technological traces (chopping, planing, grinding, drilling holes) and functional traces (smoothing, polishing, linear marks).

**Keywords:** early Middle Ages, bone and antler artefacts, archaeozoology, traceology, Cherven Gords

## Introduction

The subject of the Cherven Gords and Cherven, with which the settlement complex in Czeremno is identified, has attracted the attention of researchers for over 200 years. Nevertheless, many issues still require in-depth research and interdisciplinary studies. In recent years, this gap has been intensively filled by a team of researchers from Lublin, Rzeszów, and Leipzig.<sup>1</sup> In 2022 and 2023, work was carried out at the settlement near the gord in Czeremno (site 2), which is one of the elements of the complex, under the supervision of Dr Tomasz Dzieńkowski from the Institute of Archaeology at the Maria Curie-Skłodowska University in Lublin.<sup>2</sup> The work was interdisciplinary and, in addition to non-invasive and excavation work, it also included laboratory analyses, absolute dating and study work.

Site No. 2 covers an area of approximately 5 ha and is located on an elevation (floodplain terrace) in the Huczwa River valley, at the confluence with the Sieniocha River. It is identified as a settlement area, functionally and chronologically linked to the gord. It was first investigated in 1972 and subsequently in 1976, 1979, 1985 and 1997, when a total area of approximately 100 square metres was explored. In 2010–2012, a surface survey was carried out, and in 2013 and 2014, non-invasive research was conducted.<sup>3</sup> The research carried out in 2022–23 was aimed at identifying the stratigraphy of the site and, on this basis, assessing the chronology and function of the place. Numerous features were documented, including utility pits, relics of wooden posts and wooden passageways, and remains of an embankment. Two chronological phases were identified – the first dating from the 10<sup>th</sup> to the early 11<sup>th</sup> century and the second from the mid-11<sup>th</sup> to the turn of the 12<sup>th</sup>/13<sup>th</sup> century.<sup>4</sup>

The movable artefacts excavated during the research included, among others, a collection of animal bone remains, among which typical post-consumption waste and objects made of bone and antler with traces of processing and/or use were identified, including semi-finished products and production waste. The collection comprised 35 artefacts, diverse in terms of function and material. It complements the previously known de-

scriptions of almost 100 bone and antler artefacts from Czeremno, created based on earlier research conducted since 1940, mainly in the years 2013–17 and 2010–11.<sup>5</sup>

Despite numerous analyses and a fairly extensive knowledge about the manufacture of bone and antler items in the Middle Ages,<sup>6</sup> this topic has not yet been sufficiently studied in south-eastern Poland, especially in the Cherven Gords, particularly in terms of the analyses of the materials used and, above all, traces found on artefacts. This paper studies the methods of manufacture and use of various types of objects by the communities inhabiting the settlement near Czeremno in the early Middle Ages, based on the analysis of the materials used and traces found on artefacts excavated during recent archaeological research.

## Material and Research Methods

The material for the study consisted of a collection of 35 bone and antler objects with traces of processing and workmanship, which were obtained during excavations carried out in the years 2022–2023 at the settlement near Czeremno (site 2; Fig. 1). The collection includes finished products belonging to various functional categories, as well as semi-finished products and production waste. The condition of the artefacts can be described as good. Most of the artefacts date back to the 11<sup>th</sup>–13<sup>th</sup> centuries, with the exception of two items from feature No. 1 and 16, which were dated to the end of the 10<sup>th</sup> or the beginning of the 11<sup>th</sup> century,<sup>7</sup> namely a pawn/button (cf. catalogue - No. 1) and a spike (cf. catalogue - No. 5). The other artefacts came from layers generally dated to the 11<sup>th</sup>–13<sup>th</sup> centuries.

The material was subjected to formal and functional, archaeozoological and traceological analysis, using macroscopic and microscopic observations. It should be emphasised that the typological and functional terminology used by authors describing the results of the research into bone and antler artefacts is often varied and inconsistent. For this reason, in this study, each separate category was defined using the findings presented in the works of E. Cnotliwy,<sup>8</sup> K. Jaworski<sup>9</sup> and D. Makowiecki.<sup>10</sup>

<sup>1</sup> Florek, Wołoszyn 2016; Wołoszyn 2017, 2018, 2022, 2023, 2024; Dzieńkowski, Wołoszyn 2019; Dzieńkowski *et al.* 2020.

<sup>2</sup> The research was financed as part of the Ministry of Culture and National Heritage project “Czeremno, site 2: a suburb – settlement – gord? An archaeological and conservation issue. Verification research” no. 03113/22/FPK/NID; Dzieńkowski *et al.*, forthcoming.

<sup>3</sup> Dobrowolski *et al.* 2018; Dzieńkowski *et al.* 2020.

<sup>4</sup> Dzieńkowski *et al.*, forthcoming.

<sup>5</sup> Pomarańska 2016; Rusin-Kaczmarek 2016; Wołoszyn *et al.* 2017; Dzieńkowski and Wołoszyn 2019; Sergeewa 2024.

<sup>6</sup> Cnotliwy 1964, 1973, 2013; Jaworski 1990; Antonowska-Gorączniak 2005, 2005a; Kalaga *et al.* 2013; Waszczuk and Gronek 2021.

<sup>7</sup> Dzieńkowski *et al.*, forthcoming.

<sup>8</sup> Cnotliwy 1973; 2013.

<sup>9</sup> Jaworski 1990.

<sup>10</sup> Makowiecki 2013.

<sup>11</sup> Krysiak *et al.* 2007; Lasota-Moskalewska 2008; Reitz, Wing 2008.

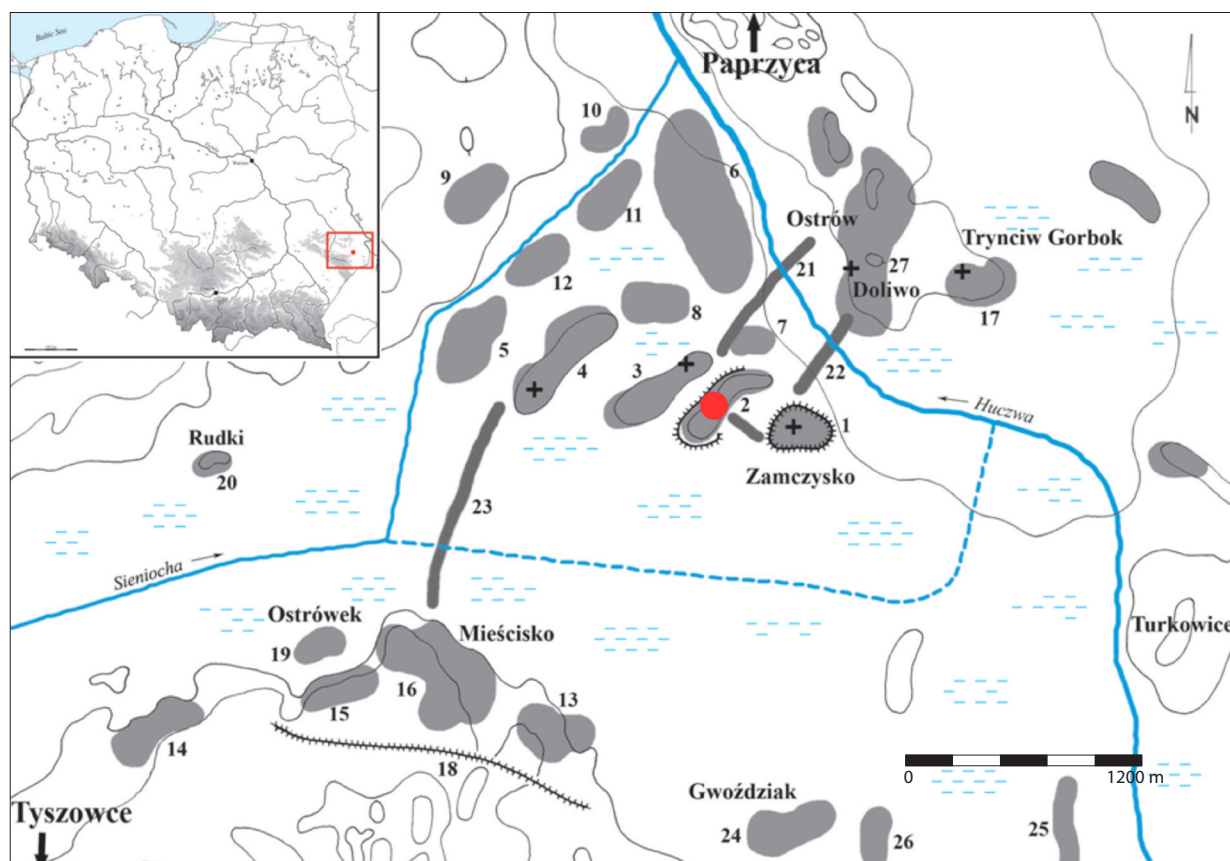


Fig. 1. Location of the early medieval settlement complex in Czerwno; 2 – Czerwno, site 2 (inner suburb: Wały, Zameczek, Mały Zameczek; prepared by M. Florek, drawing by J. Ożóg).

The raw material was identified taxonomically and anatomically,<sup>11</sup> with the support of the reference collection kept in the laboratory of the Department of Bioarchaeology of the Faculty of Archaeology at the University of Warsaw. The age of some animals was assessed based on the degree of fusion of the bone shafts with epiphyses.<sup>12</sup> All artefacts were measured in three dimensions with an accuracy to 0.5 cm. Some of the measurements obtained using the unified method according to A. von den Driesch<sup>13</sup> were used to assess the morphology of the animals and calculate the height at the withers of cattle and horses, using the appropriate coefficients according to L. Kiesewalter<sup>14</sup> and J. Fock.<sup>15</sup> Traces of anthropogenic origin and those resulting from post-depositional factors<sup>16</sup> were identified.

A Keyence VH-7000 digital microscope with diffused light illumination was used for microscopic observations. The material was viewed at magnifications ranging from 20 to 200x (most often 20x, 50x and 100x).

Technological traces were identified and, where possible, assigned to specific techniques and tools used to manufacture the objects. In order to determine their function, the morphology, arrangement and distribution of micro traces of use were analysed. This was supported by data taken from the literature, including the results of experimental studies.<sup>17</sup> The traces were assessed using the terminology proposed in the paper by M. Stelmasiak-Majorek,<sup>18</sup> which was based on descriptions most commonly used in the literature and supplemented with her own research, including experiments.

### Characteristics of Bone and Antler Artefacts

During excavations carried out at the settlement near Czerwno in 2022 and 2023, 35 bone and antler

<sup>12</sup> Kolda 1936.

<sup>13</sup> Driesch 1976.

<sup>14</sup> After Driesch and Boesneck 1974.

<sup>15</sup> Fock 1966.

<sup>16</sup> Lyman 1994.

<sup>17</sup> Gijn van 2005; Maigrot 2005; Sidéra, Legrand 2006; Legrand, Sidéra 2007; Diakowski 2014, 2019; Évora 2015; Stelmasiak-Majorek 2023.

<sup>18</sup> Stelmasiak-Majorek 2023, 66, tab. 2.

artefacts were discovered. They bore traces of processing and/or use, with varied forms and functions. These included mainly finished products or fragments thereof (24 items), semi-finished products (3 items), and production waste (8 items). The finished products included pawns/buttons, spikes, astragals, bone skates, a frame, linings of combs and unspecified objects, and a horse bit (Table 1). They came mainly from layers dating from the 11<sup>th</sup> to the 13<sup>th</sup> century, with only two items dating from the late 10<sup>th</sup> to early 11<sup>th</sup> century.

The raw material used for their production came mainly from deer or, less frequently, from domesticated animals – sheep and goats, horses and, to a lesser extent, cattle (Table 2). The results of the anatomical composition analysis indicate that mainly antlers were used for production, followed by postcranial skeletal elements – primarily long bones from the distal sections of the limbs (11 specimens) or, less frequently, from the proximal sections (4 specimens), and in a single case, an element of the torso, i.e. a fragment of a bovine rib. The artefacts made from bovine bones included one made from a radial bone. The bones of sheep and goat used to make the artefacts included three femoral bones, three tarsal bones, and one metatarsal bone. Objects made from horse bones were made exclusively from metapodial sections, i.e., the metacarpus and metatarsus. In the case of deer, apart from antlers, tarsal bones were also used. In the case of several categories, a correlation was found between the selection of raw material and the production of a specific type of object.

Seven typological and functional categories were identified in the group of finished products. Two objects did not have a clearly defined function; perhaps they were a strap separator and an arrowhead. The characteristics of the individual groups are as follows:

*Pawns/buttons* – these are objects with a cone-like shape, with a flat base and a convex and rounded opposite side, with a central hole.

Three pawns/buttons made from the epiphyses of femoral bones of sheep or goats killed at a young age (under three years) were found in Czeremno. Due to their shape, the epiphyses of femoral bones of young individuals did not require much force to be shaped into the desired form, although some of them had an additional hole drilled in them. They vary in size, with a base diameter ranging from 2.6 cm to 1.8 cm and a height of approximately 1.0 cm. In the central part, they have drilled holes with a diameter of approximately 0.5–0.8 cm (Fig. 2:1–3).

Microscopic observations showed that the technological traces were limited primarily to the drilling of holes. In two cases, they had a regular diameter along their entire length, which indicates that they were made with a metal drill. The edges of the holes are irregular, with slight burrs and slight chipping. In the case of one specimen (no. 1), the entrance to the hole on the convex

side is narrower than at the base, and its edges are slightly rounded (Fig. 3:A).

In addition to the holes, technological traces were observed on the flat base of two larger specimens. They have the form of irregular, fairly deep lines running in different directions (Fig. 3:B). They were created as a result of grinding the surface to even out the unevenness and rough texture of the bone of an individual killed at a young age, before it had finished growing. Despite these treatments, the typical structure has been preserved on a part of the surface.

Traces of use were visible on one piece (no. 1) in the form of two smoothed and slightly polished stripes on the flat side (Fig. 3:C). They could have been caused by friction. No other traces were observed; the surfaces of the preserved epiphyses of femoral bones are natural, with no signs of use.

In addition to technological and usage traces, these artefacts showed signs of post-depositional damage and destruction, visible as chips on the outer edges at the base (Fig. 3:D).

*Spikes* are objects distinguished by a pointed working part formed at one end.

Two spikes (piercers, awls, graters) of slightly different shapes and made of different materials were found in the settlement (Fig. 2:4–5). The first one, made from the metatarsal bone of a sheep or goat, was 8.4 cm long and approximately 1.5 cm wide. It had a preserved distal epiphysis and a working end formed by a diagonal cut through the shaft roughly halfway along its length. The second spike, made from a fragment of a bovine rib, was similar in length (8.4 cm), width (2.1 cm), and thickness (0.7 cm). A pointed tip was formed on one of the shorter edges.

Microscopic observations of the specimen made from metatarsal bone revealed technological traces of chopping in the middle of the shaft to form the working part. The edges of the break were smoothed by grinding, which resulted in parallel, closely spaced, fairly deep linear marks (Fig. 4:A). The edges of the breaks are rounded, as is the tip of the working part. Traces of use were clearly visible in the form of smoothing and polishing of the entire surface of the shaft down to the tang, accompanied by multidirectional, short and shallow linear marks (Fig. 4:B). They were visible on the entire surface of the tool, except for the tip. The nature of the polishing, described as “greasy”, suggests that the tool was used to work with leather materials.

Technological traces found on the spike made from bovine rib included the chopping off of an appropriate fragment of the raw material, which is clearly visible on the edge opposite the blade. In addition, the side edges were cut off to give the tool a regular shape, and the working part was shaped into a tip approximately halfway



Table 1. List of bone and antler artefacts found at the suburban settlement in Czermino (site 2) during the excavations carried out in 2022–2023. Compiled by J. Piatkowska-Malecka

Zoological identification	Sheep/ goat	Cattle	Sheep/ goat	Sheep/ goat	Red deer	Horse	Horse	Horse	Cattle	Red deer
Anatomical element/ Type of object	Femur	Rib fragment	Metatarsal bone	Talus	Talus	Metacarpal bone	Metatarsal bone	Metapodium	Radius	Antler fragment
Pawn / Button / Spindle whorl	3	-	-	-	-	-	-	-	-	-
Spike	-	1	1	-	-	-	-	-	-	-
Astragal	-	-	-	3	1	-	-	-	-	-
Skate	-	-	-	-	-	1	1	-	1	-
Skate, fragment	-	-	-	-	-	-	-	4	-	-
Mount	-	-	-	-	-	-	-	-	-	1
Comb covering	-	-	-	-	-	-	-	-	-	2
Comb insert	-	-	-	-	-	-	-	-	-	2
Object of unknown function (strap separator? or point?)	-	-	-	-	-	-	-	-	-	2
Horse bit sidebar	-	-	-	-	-	-	-	-	-	1
Semi-finished product, block	-	-	-	-	-	-	-	-	-	3
Waste, shaving / Scraping chip	-	-	-	-	-	-	-	-	-	3
Waste, shaving / Scraping chip	-	-	-	-	-	-	-	-	-	5

Table 2. Species and anatomical composition of bone remains used as raw material for various categories of objects found in Czeremno (site 2). Compiled by J. Piątkowska-Małecka

Part of carcass	Anatomical element	Cattle	Sheep/goat	Horse	Red deer	Total
Head	Antler	-	-	-	19	19
Trunk	Rib	1	-	-	-	1
Forelimb, proximal segment	Radius	1	-	-	-	1
Forelimb, distal segment	Metacarpal bone	-	-	1	-	1
Hind limb, proximal segment	Femur	-	3	-	-	3
Hind limb, distal segment	Metatarsal bone	-	1	1	-	2
	Talus	-	3	-	1	4
	Metapodium	-	-	4	-	4
Total		2	7	6	20	35

across the width of the rib (Fig. 4:C). A slight rounding is also visible on this part. On both sides of the rib – the outer (convex) and inner (concave) sides – there are traces of using the blade in the form of slight wear, accompanied by numerous shallow and multidirectional linear marks concentrated mainly in the apex (Fig. 4:D). In addition, sub-depositional traces in the form of small black stains and splintering were found on the cut-off edge.

*Astragals (game pieces)* – objects made of talus bone.

Another category of items found in Czeremno are astragals interpreted as elements used in games or possibly fortune-telling. Four artefacts of this type were found (Fig. 2:6-9). They were made of talus bone, in three cases from small ruminants, and in one case from deer. The astragals made from sheep or goat bones had similar dimensions of  $2.8 \times 1.7 \times 1.5$  cm. Two of them showed traces of processing in the form of slight thinning and levelling of the side surfaces, but no holes, while the third had a hole drilled on both sides with a diameter of 0.4 cm (Fig. 2: 8). A specimen made of deer talus bone, measuring  $5.5 \times 3.4 \times 2.8$  cm, had a hole with a diameter of 0.7 cm in its central part (Fig. 2:9). No other technological traces were observed.

Objects made from talus bones of small ruminants were also examined under a microscope. Specimens without holes showed technological traces in the form of grinding on the side surfaces. In addition, traces of use were observed in the form of smoothing and slight polishing of these surfaces. On one of them, a linear ornament was engraved on the temporal side of the bone (Fig. 5:A). On the specimen with a hole (no. 8), in addition to the hole

drilled on both sides in the central part of the bone (Fig. 5:C), there was a trace of an attempt to drill another one (Fig. 5:B). Between them, there is a single trace of a diagonal, deep cut, most likely made with a metal knife. No traces of use were found. Post-depositional traces were noted, though – minor abrasions on the natural edges of the bone and traces of gnawing by dogs (Fig. 5:D).

*Bone skates* are objects made from long bones, most often radial and metapodial segments of horse and bovine bones, with a flat-shaped cranial aspect and a naturally preserved caudal aspect, with various traces of processing, including holes, on one or both epiphyses.<sup>19</sup>

Three skates differing in details of workmanship and the raw material used were found at the settlement near Czeremno. They were made from horse metacarpal and metatarsal bones and bovine radial bones. Only one of them, made from a horse's metatarsal bone, had a single hole with a diameter of 0.5 cm located on the block, on the caudal side. The other skates did not have any holes, nor did they have separate toe pieces (Fig. 6:10-12). All skates were made in a similar way. The processing consisted of cutting off about 1 cm of the compact substance on the cranial side of the bone along the shaft, almost along its entire length, and cutting and levelling the protruding elements near both ends so that the spongy bone was exposed. Specimen no. 10 shows traces of deep cuts on the running surface (Fig. 7:A), which are not visible on the other specimens, probably due to wear and tear. The caudal side shows no traces of technological processing. The exception is the skate made from horse metacarpal bone, where short and deep cuts are visible at the point of contact with splint bones.

<sup>19</sup> Makowiecki 2013, 186.

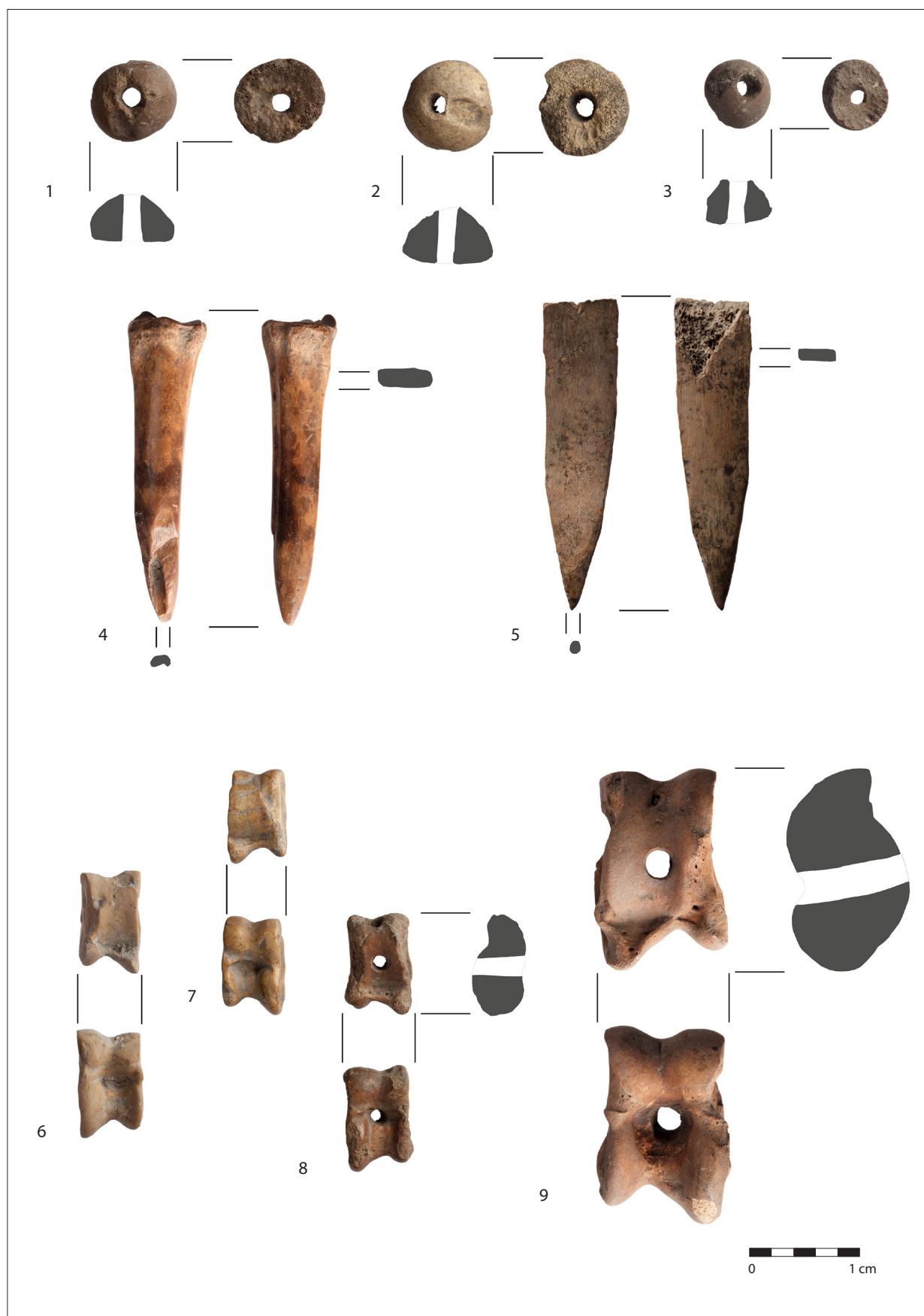


Fig. 2. Finished products: 1–3 – gaming pieces/buttons; 4–5 – spikes; 6–9 – astragali (photo by M. Bogacki; compiled by O. Synkovska).

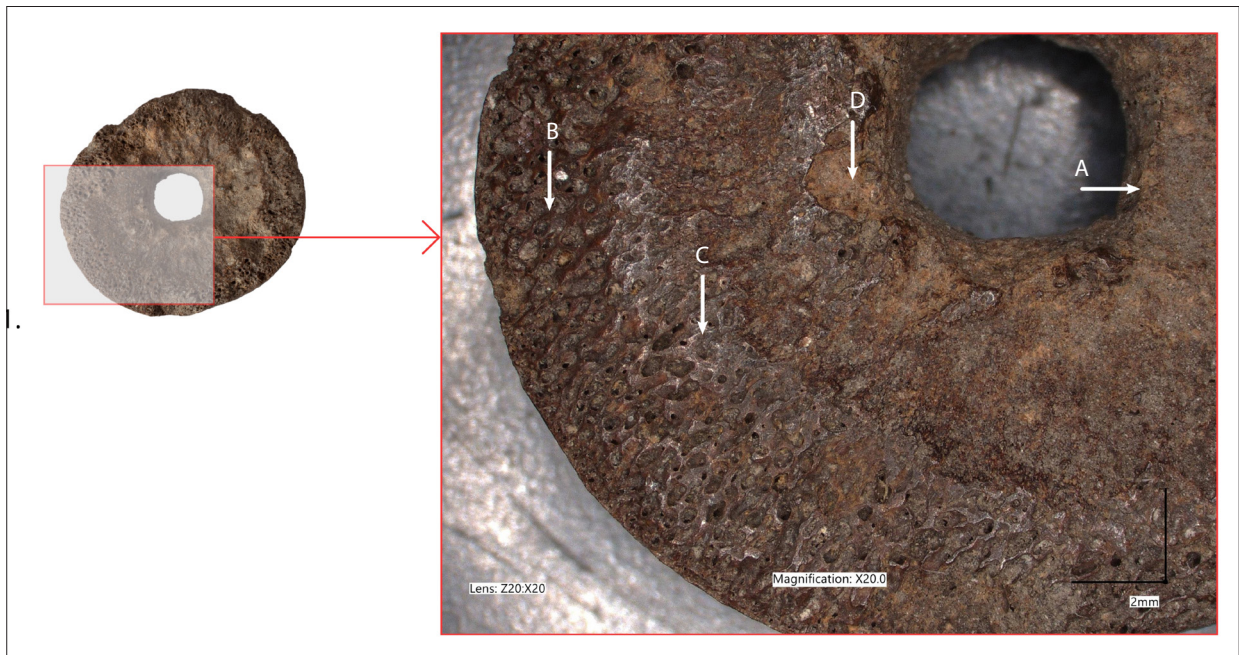


Fig. 3. Traces on gaming piece/button no. 1: A – technological traces: drilled hole, rounded edges; B – technological traces: polishing of the base of the gaming piece/button; C – use-wear traces: fine smoothing striations and polish on the underside; D – taphonomic traces: chipping on the edge of the base (drawing by O. Synkovska).

Traces of use in the form of smoothing and polishing of the running surface were visible on all skates (Fig. 7:B). Microscopic observations also confirmed the presence of small linear marks along the bone shafts. Slight marks of slippage are also visible on the caudal side, on the protruding elements of the block, near the distal ends. Most likely, they were caused by contact with footwear.

The lateral length of the horse metapodial bones was measured, on the basis of which the height at the withers of two individuals was calculated; it was 133.3 and 141.3 cm. The height at the withers of cattle, calculated on the basis of the length of the radial bone, was 106.3 cm.

In addition to the three skates preserved in their entirety in the collection of bone remains, four more fragments of the metapodial section, possibly of a small horse's radial bone, were found, with technological traces in the form of planing to form the sliding surface (two fragments) or traces of use in the form of smoothing and slight polishing of the surface (two fragments). It is highly likely that these are parts of damaged skates.

*The frame* is a sleeve-shaped object cut from a fragment of antler with a hole created by removing the spongy substance.

One artefact was classified as a frame. It was made from a fragment of deer antler; it has a cylindrical shape with a hole created by hollowing out the spongy bone. This specimen was quite stocky, with a length of 20.3 cm,

a width of 17.8 cm, and a hole with a diameter of 1.0 cm (Fig. 8:13). Microscopic observations revealed various technological traces and, to a lesser extent, traces of use. The former were the traces of sawing, visible in the form of parallel lines at the breaks. Numerous traces of circumferential planing and scraping of the entire surface are visible on the outer surface (Fig. 9:A). It is not known how and with what tool the spongy bone was removed, but it was done carelessly, and some fragments remain in the gap (Fig. 9:B).

Traces of use in the form of light and delicate polishing are visible mainly in the lower, slightly wider part of the frame (Fig. 9:C). On the outer surface, there is a crack running along its length and grey discolouration resulting from post-depositional factors (Fig. 9:D).

*Linings* are objects in the form of plates with traces of processing on at least one surface.

Two objects made from deer antler in the form of flat plates that were found in Czeremno could have been linings of unspecified objects. The first one, measuring  $7.8 \times 1.5 \times 0.3$  cm, was cut from the compact bone of a deer antler. The outer side was stripped of its pearling and smoothed, while spongy bone is visible on the inner side (Fig. 8:14). Microscopic observations revealed mainly traces of smoothing on both surfaces and polishing on the outer surface.

The second lining is a tile cut from a deer antler measuring  $6.1 \times 1.4 \times 0.7$  cm. It mainly consists of com-





Fig. 4. Traces on spikes no. 4 and no. 5: A – technological traces on spike no. 4: polishing of edges formed by chopping off a part of the bone and shaping a pointed tip; B – use-wear traces on spike no. 4: smoothing, polish, and linear marks on the shaft surface; C – technological traces on spike no. 5: carving, polishing of edges, tip shaping; D – use-wear traces on spike no. 5: linear marks, smoothing and polish near the tip (drawing by O. Synkovska).

pact bone, with only a thin layer of spongy bone on the inside (Fig. 8:15). Microscopic observations revealed a number of technological traces and a few traces of use. The technological traces mainly include traces of scraping and grinding of the outer surface, probably in order to remove the natural pearling and even out the surface

(Fig. 10:A). The remains of grinding are numerous linear marks arranged parallel to each other, running across the length of the lining. Most likely, this process was carried out using a stone pad. At approximately 2/3 of the length of the object there is an engraved cross-shaped ornament (Fig. 10:B). On the underside, only





Fig. 5. Traces on astragali no. 7 and no. 8: A – technological traces on astragalus no. 7: deep incisions made with a metal knife (ornamentation); B – technological traces on astragalus no. 8: initial hole; C – technological traces on astragalus no. 8: hole drilling; D – post-depositional traces on astragalus no. 8: gnaw marks from dogs. Drawn by O. Synkovska.



Fig. 6. Finished products: 10–12 – bone ice skates (photo by M. Bogacki; compiled by O. Synkovska).

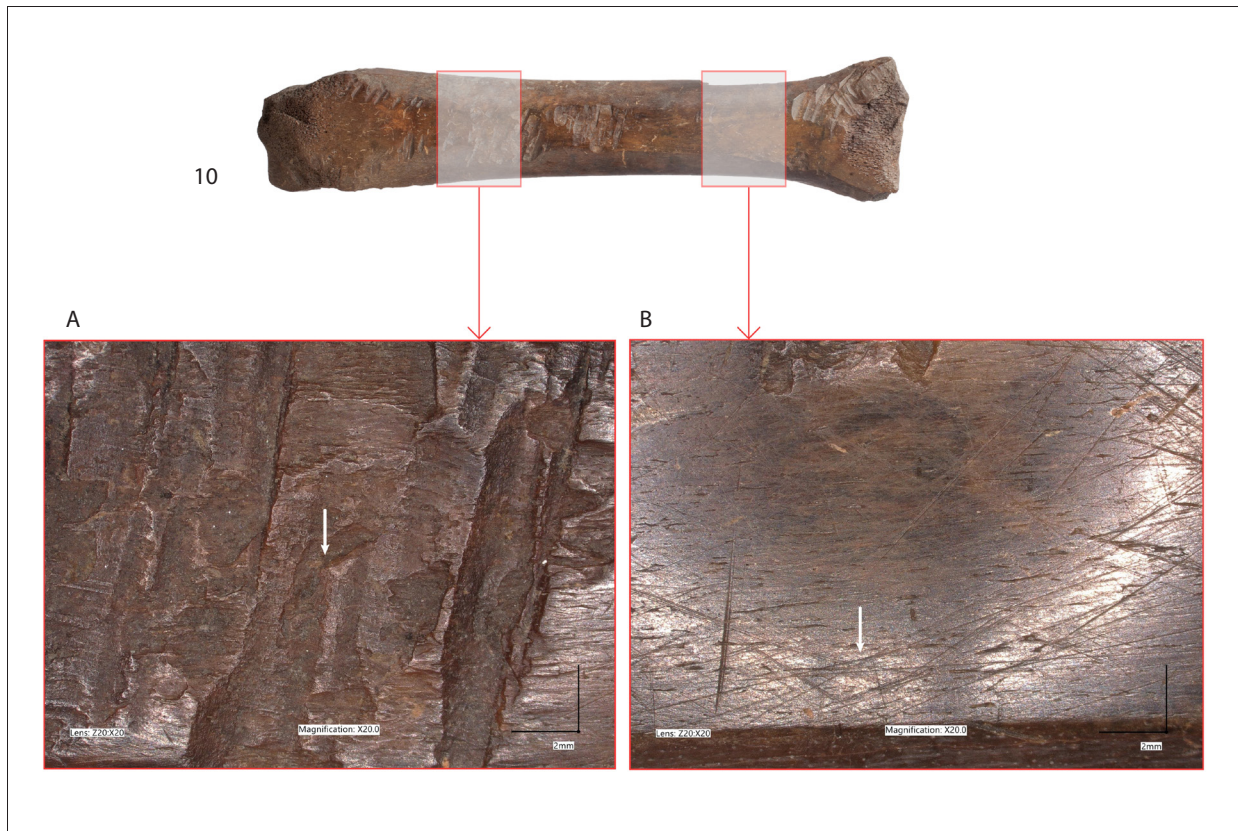


Fig. 7. Traces on bone ice skate no. 10: A – technological traces: deep incisions on the cranial side; B – use-wear traces: smoothing, polish, linear and multidirectional marks within the sliding zone (drawing by O. Synkovska).

traces of small and shallow incisions arranged slightly diagonally across the entire surface are visible (Fig. 10:C). Traces of use are limited to slight smoothing and polishing of the outer surface, although they are clearly more intensive around the cross-shaped ornament (Fig. 10:D).

*The comb insert* is a thin plate with preserved remnants of teeth, without lining.

Two small fragments were classified as comb inserts due to the presence of characteristic remnants of broken comb teeth. These were small, flat plates measuring  $1.2 \times 1.2 \times 0.2$  cm and  $1.2 \times 1.0 \times 0.2$  cm (Fig. 8:16-17). Due to the degree of processing, small size and state of preservation, it is difficult to identify the material from which they were made. The plates were cut from compact bone, but due to the lack of preserved traces of spongy bone, it is impossible to determine whether it was a long bone or antler. Most often, elements of this type were cut from the compact substance of deer antlers. They were a component of the comb, but despite the typical decoration, it is not possible to classify them as a specific type or

variety.<sup>20</sup> This is confirmed by microscopic observations, which revealed traces of broken teeth regularly spaced along the edges (Fig. 11:A).

*Sidebar* – an element preventing the bit from slipping out of a horse's mouth.

The object was made from a fragment of deer antler with a slightly arched shape and dimensions of  $9.5 \times 1.8$  cm. It has two holes with a diameter of 0.6 cm located 4.3 cm and 6.4 cm from the base (Fig. 8:20). On the side, there is an engraved eye-shaped ornament, next to which a motif of hatched triangles is visible (Fig. 14:A, B). Technological traces include a diagonal cut visible on one of the shorter edges, the surface of which was subsequently smoothed, and traces of planing the outer surface to remove pearling and smooth the surface. Spongy texture is visible on the cross-section. The opposite tip is damaged and broken. The holes were made carefully and have the same diameter along their entire length. On the underside, their edges are slightly chipped, which may have happened during use (Fig. 14:C). In addition,

<sup>20</sup> Cnotliwy 1973.



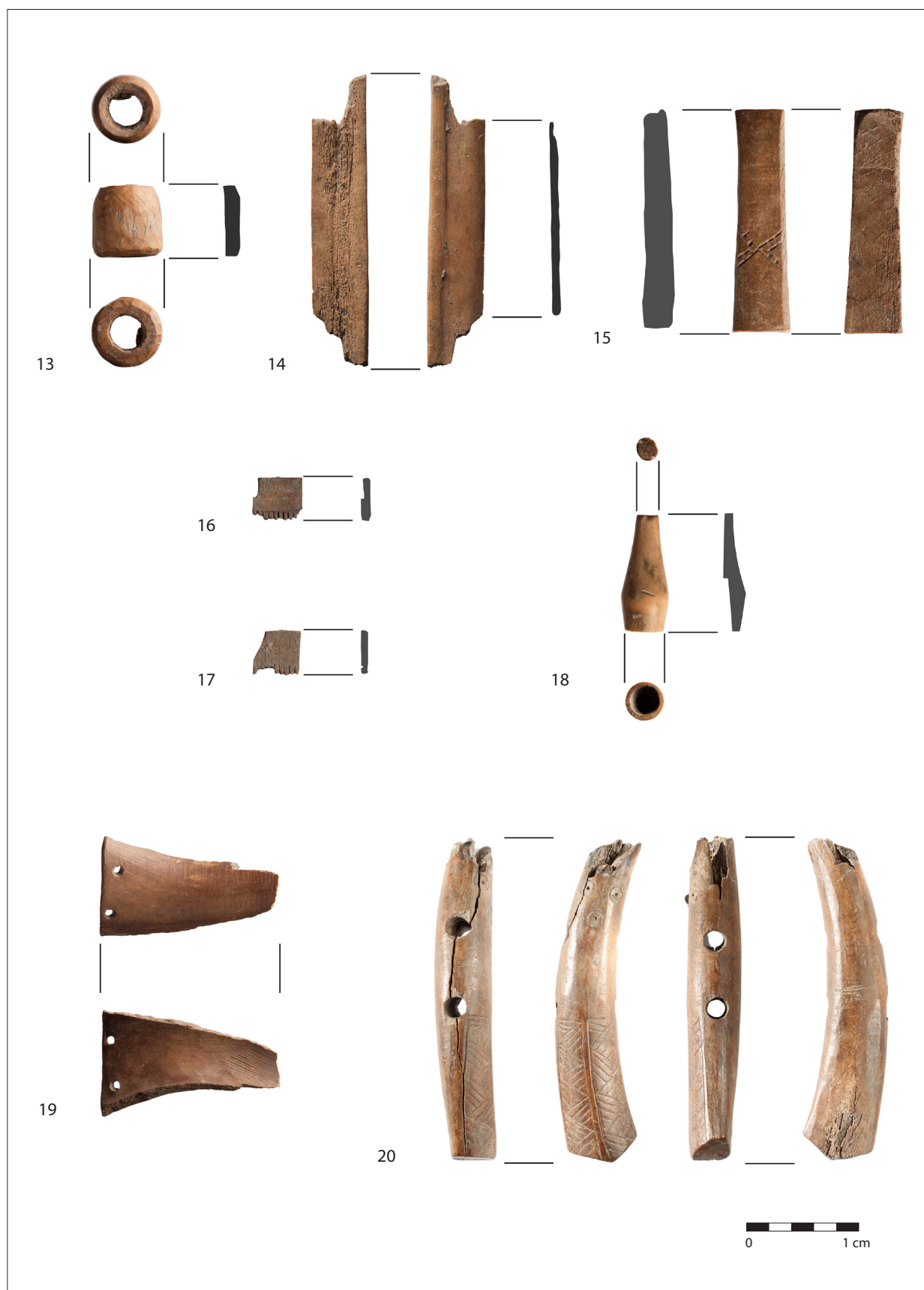


Fig. 8. Finished products: 13 – fitting; 14–15 – claddings; 16–17 – comb inserts; objects of unknown function: 18–19; sideplate – 20 (photo by M. Bogacki, compiled by O. Synkovska).

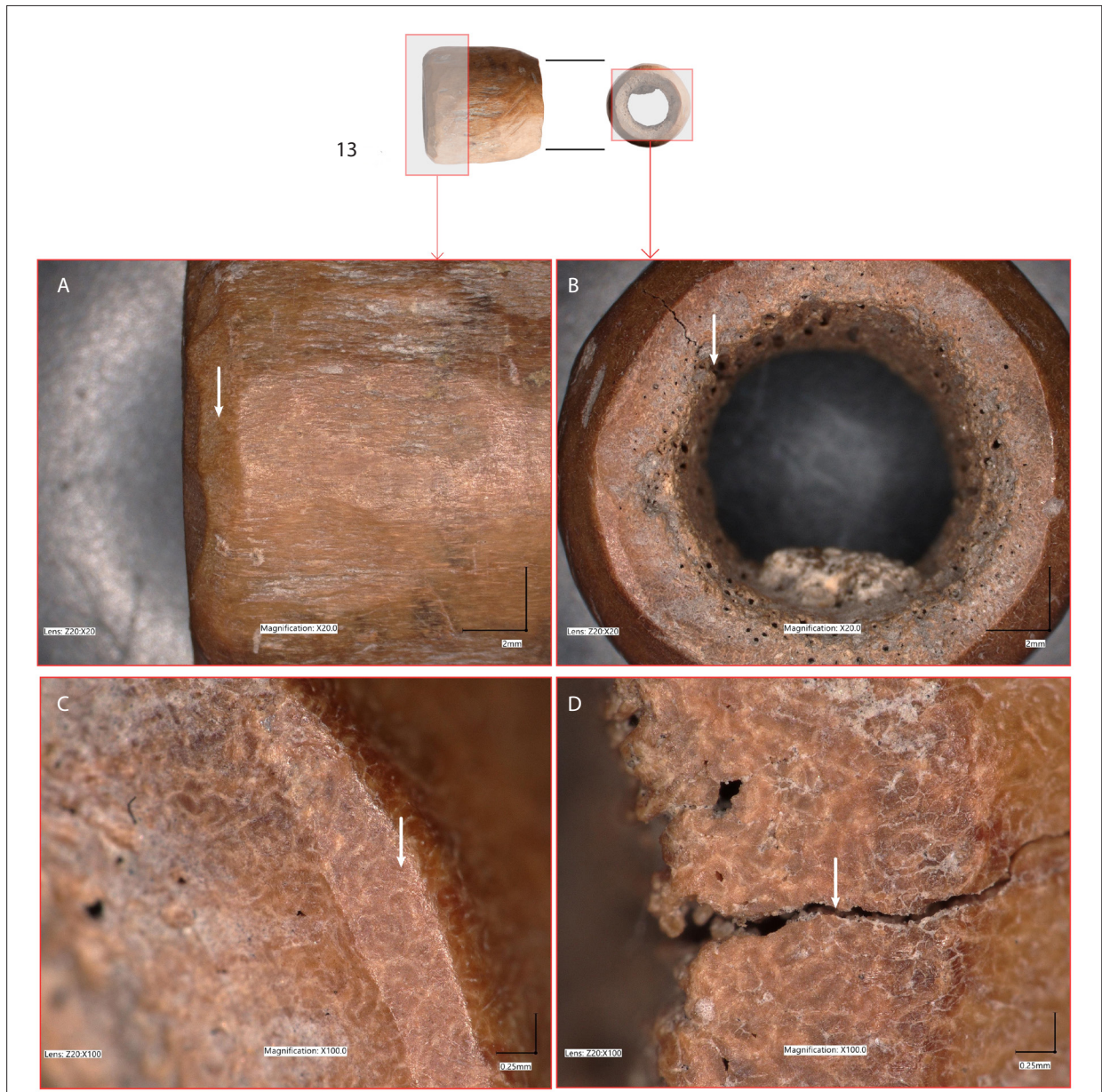


Fig. 9. Traces on fitting (no. 13): A – technological traces: sawing, carving, smoothing of the outer surface; B – technological traces: removal of spongy bone tissue; C – use-wear traces: light polish; D – post-depositional traces: cracking (drawing by O. Synkovska).

traces of use in the form of slight polishing have been found on the entire surface; they are particularly clear on the inner surface, on which there are no ornaments (Fig. 14:D).

#### *Objects of unknown function*

Two of the objects found were not assigned a specific function. The first object, shaped like a tapered cone, was made of deer antler. It had the following dimensions: length 3.0 cm, width 1.0 cm at the base and 0.5 cm at the tip (Fig. 8:18). Microscopic observations revealed the presence of technological traces and traces of use.

The former included traces of sawing visible at the base of the object, probably resulting from sawing off the material. Additionally, in this area, around the edge, traces of hollowing out of the spongy bone are visible (Fig. 12:A). On the outer surface of the object, there are intense traces of grinding, which gave the object the desired shape (Fig. 12:B). There are also three deep, short cuts (Fig. 12:C). Traces of use include smoothing and slight polishing of the entire outer surface of the object, accompanied by multidirectional linear marks, which are particularly intense in the upper, narrower part of the artefact (Fig. 12:D). The upper edge is slightly rounded.



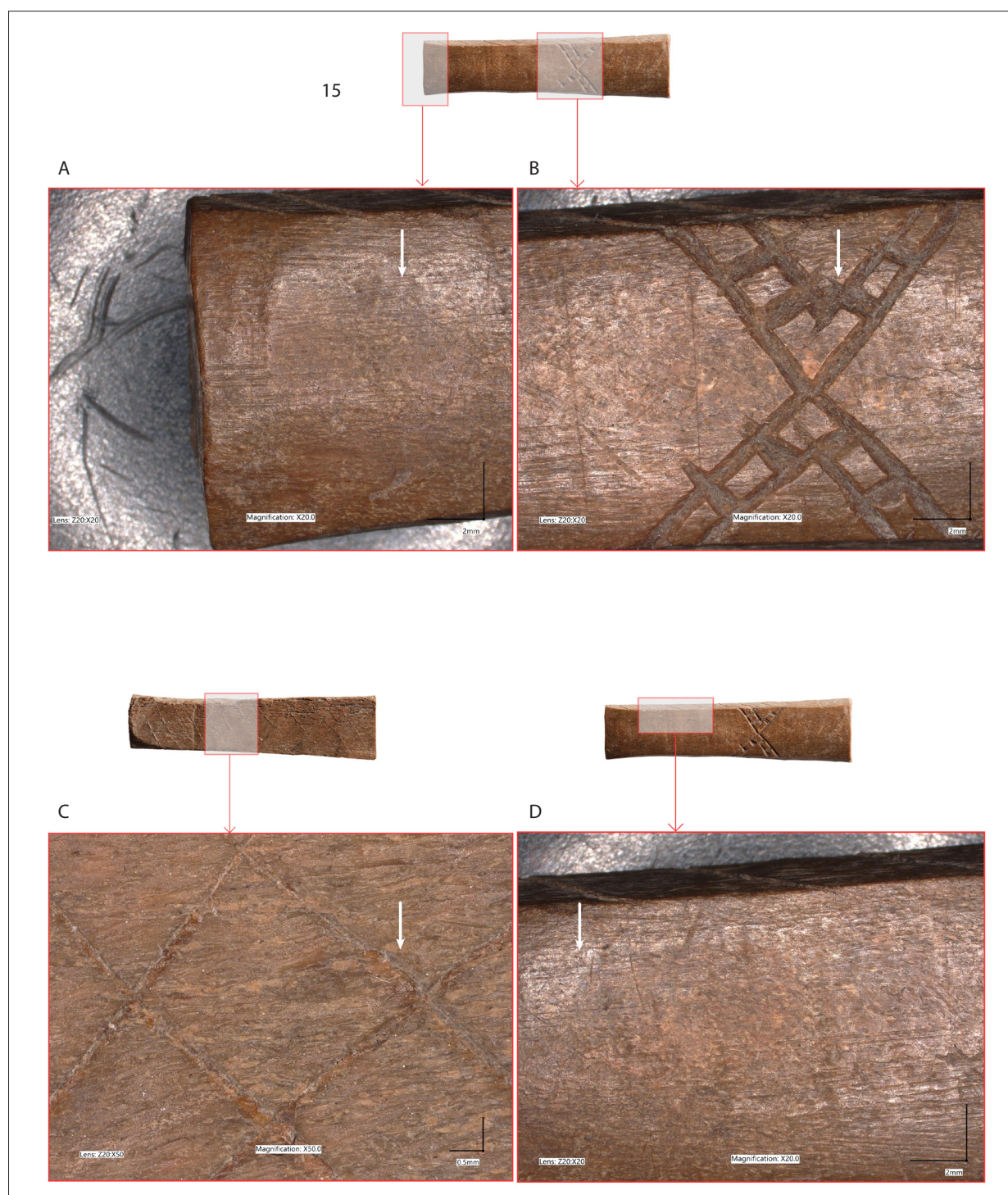


Fig. 10. Traces on cladding no. 15: A – technological traces: scraping, polishing of the outer surface; B – technological traces: incised cross-shaped ornamentation; C – technological traces: shallow incisions on the inner side; D – use-wear traces: smoothing and polish of the outer surface (drawing by O. Synkovska).

The other object of unknown function is a thin plate cut from deer antler, measuring  $4.8 \times 2.7\text{--}1.2 \times 0.2$  cm, with two holes on the shorter edge, each 0.2 cm in diameter (Fig. 8:19). Observations revealed technological traces of intensive scraping and planing

of almost the entire surface. There are numerous linear marks running along and across the plate on both sides. A metal tool was probably used for planing. The two holes have a regular cross-section (Fig. 13:A). Traces of use in the form of smoothing and slight pol-

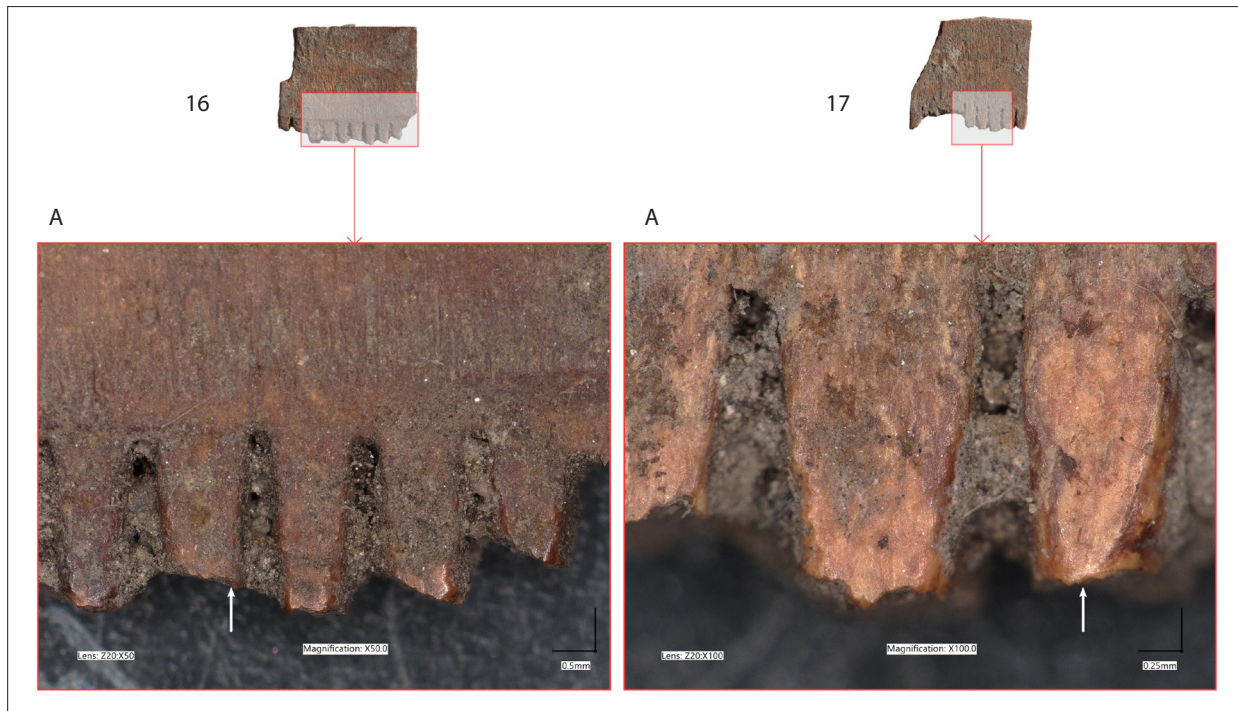


Fig. 11. Traces on comb inserts no. 16 and no. 17: A – technological traces: regularly spaced teeth along the edge (drawing by O. Synkovska).

ishing were visible only on the outer side, which was slightly convex.

*Semi-finished products and production waste* is a group comprising fragments of objects with traces of processing, whose future form is clear (semi-finished products) and irregularly shaped fragments whose function cannot be identified (waste).

The collection of bone remains from Czeremo also includes fragments of deer antlers with traces of processing, where a specific stage of processing can be identified with high probability. These are semi-finished products and production waste. The first group includes so-called blocks, i.e., fragments of antlers with marks of chopping or sawing on both sides, which resulted in the separation of fragments that could be further processed.<sup>21</sup> Three such fragments were found, measuring 7.5 cm, 10.0 cm and 11.5 cm in length, with natural “pearled” outer surface preserved, two of which were additionally cut lengthwise (Fig. 15:21-23). All specimens were processed by cutting around the compact bone and then breaking off the antlers, which resulted in uneven break edges. This procedure could have been performed without softening the material.

The remaining antler fragments with traces of processing were classified as production waste. They included three fragments of the crown of the antlers and five chip-like fragments resulting from planing. The first fragment of the crown, 15.2 cm long, had traces of chopping at the base, which caused breaking off of this element. The outer surface was pearled, and the tip was naturally smoothed. The second fragment, 11.3 cm long, was sawn off from the rest of the antler, probably after the raw material had been softened. In addition, its outer surface shows signs of circular planing approximately halfway along its preserved length, while the other half, closer to the tip, shows signs of gnawing, probably by dogs, as indicated by the morphology of the indentations left by teeth. The last fragment, 3.8 cm long, is a damaged and weathered part of the antler crown with no visible traces of processing, except for being cut off from the rest of the antler (Fig. 15:24).

The remaining waste comprises shavings left over from planing the outer, pearled surface of the antlers (Fig. 15:25 (1-3)). They vary in size from 2.8 cm to 10.0 cm, and most of them have no visible marks on the surface, except for one fragment, which has traces of cuts on the outer surface.

<sup>21</sup> Makowiecki 2013.



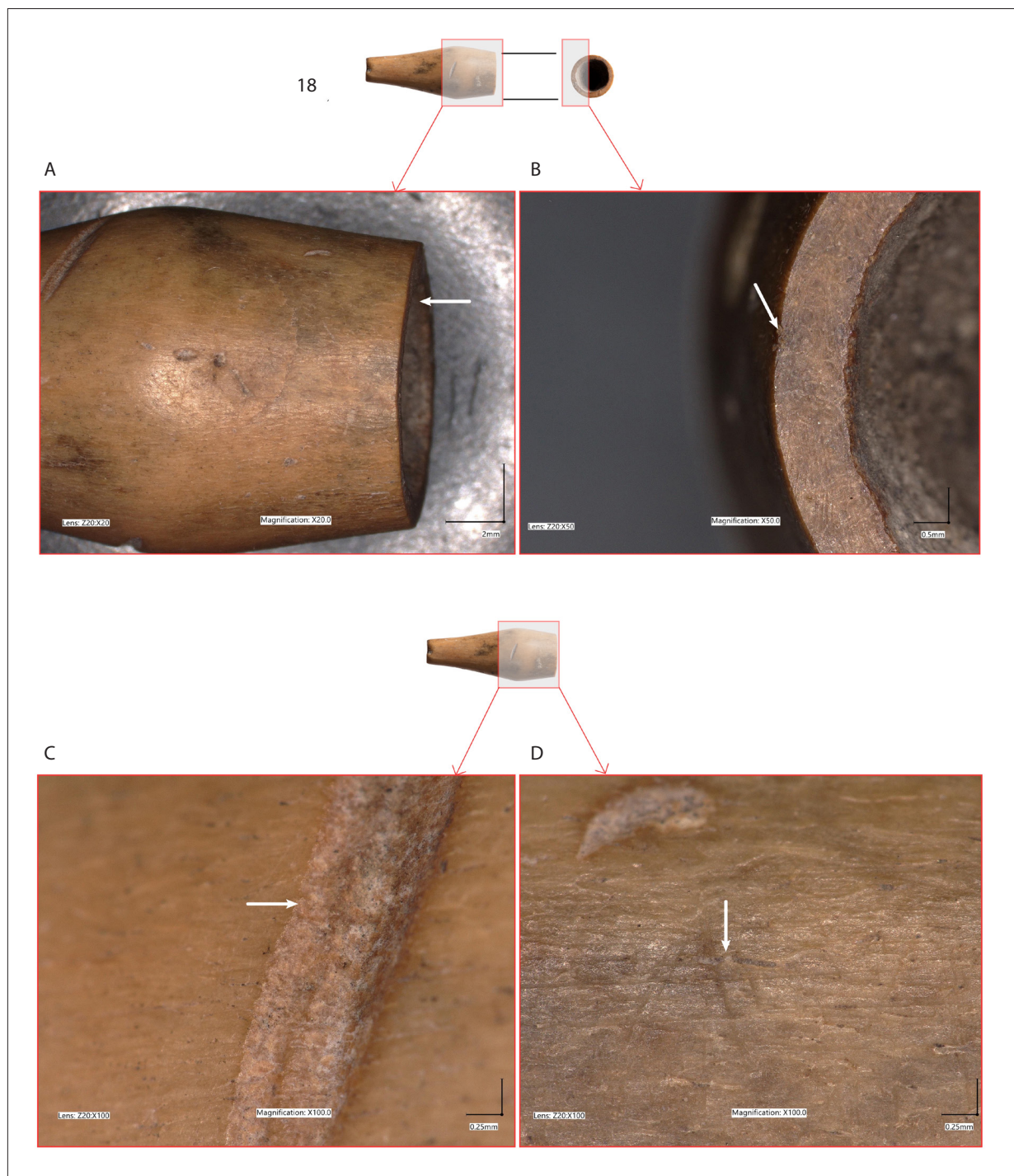


Fig. 12. Traces on object of unknown function no. 18: A – technological traces: sawing at the base of the object; B – technological traces: hollowing out of compact bone tissue; C – technological traces: carving and incisions; D – use-wear traces: smoothing, polish, and linear marks (drawing by O. Synkovska).

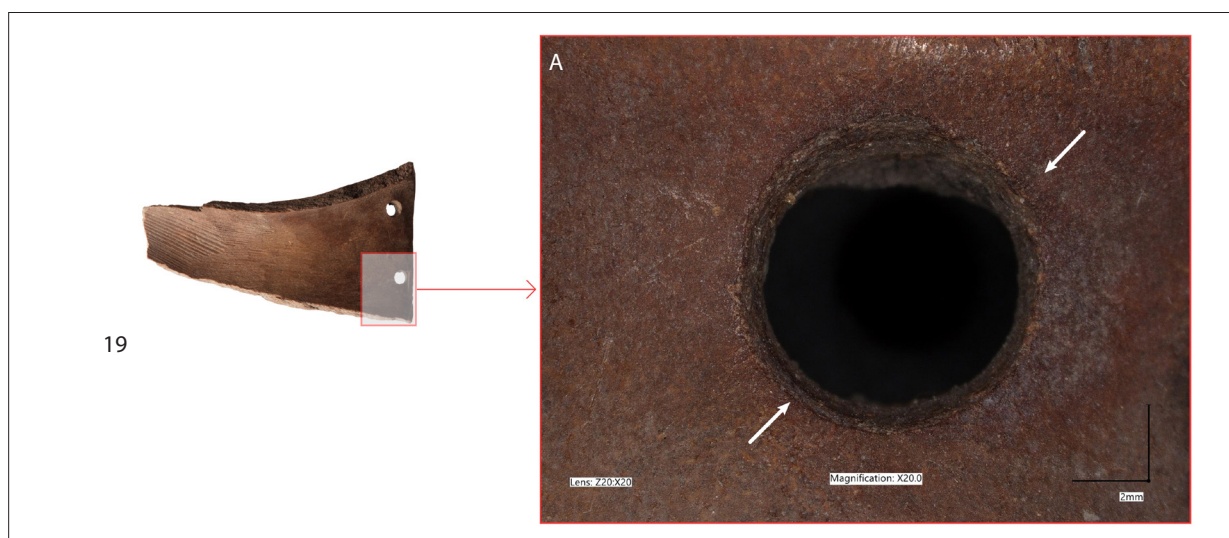


Fig. 13. Traces on object of unknown function no. 19: A – technological traces: hole drilling (drawing by O. Synkovska).

### The Use of Bone Material by the Inhabitants of the Settlement near Czermino in the Early Middle Ages

In the Middle Ages, bone was commonly used to make various types of objects for everyday use.<sup>22</sup> The most frequently used materials were bones from various animals and antlers periodically worn by male representatives of various species of the deer family, mainly deer, less often elk and roe deer. Antlers were particularly popular, but in the late Middle Ages and early modern period they were replaced by long bones, mainly metapodial (metacarpal and metatarsal) bones of cattle. This is confirmed by raw material analyses of bone products from centres such as Elbląg,<sup>23</sup> Kołobrzeg<sup>24</sup>, and Wrocław.<sup>25</sup>

In Czermino, in the early Middle Ages, deer antlers were most commonly used. Next in line were various bone elements from domesticated animals and, less frequently, wild animals. Both materials – bone and antler – have a similar structure, but different physical and chemical properties.<sup>26</sup> Compared to bone, antlers are less brittle and slightly more elastic, and their processing did not require degreasing.<sup>27</sup> This is due to the proportions of organic and inorganic components. Antlers contain

approximately 44% of organic matter (protein compounds) and 56% of inorganic substances (phosphates and calcium carbonates), while in bone these proportions are 35% and 65% respectively.<sup>28</sup>

A preference for antlers over bone was also noted in other early medieval centres, including Janowo Pomorskie,<sup>29</sup> Wolin,<sup>30</sup> and Santok<sup>31</sup>. However, this is not a universal rule, as it is known that in some places animal bones were more frequently used, for example in Ostrów Tumski in Wrocław<sup>32</sup> and in Gniezno<sup>33</sup> (site no. 14).

Antlers could be obtained in various ways: by hunting, by collecting shed antlers, or through exchange. It is difficult to identify the origin of the material used in Czermino with certainty, as the post-consumption material did not contain any fragments of antler base, which would indicate shed antlers, or any fragments with preserved elements of skull, which would suggest that they came from hunted animals.<sup>34</sup>

Antlers were used to make various objects. A horse bit side piece, a frame, linings of various objects, comb inserts, objects of unknown function, semi-finished products and production waste were found in the settlement. In addition to antlers, various bones were also used, mainly from domesticated mammals. Deer astr-

<sup>22</sup> e.g. Hilczerówna 1961; Cnotliwy 1964, 2013; Jaworski 1990 and others.

<sup>23</sup> Marcinkowski 2005.

<sup>24</sup> Rębkowski 1999.

<sup>25</sup> Jaworski 1998.

<sup>26</sup> Sawicki 2000.

<sup>27</sup> Virtuous 1964, 152.

<sup>28</sup> Krysiak *et al.* 2001, 35; Lasota-Moskalewska 2008.

<sup>29</sup> Cnotliwy 2013; Makowiecki 2013.

<sup>30</sup> Cnotliwy 1958; Cnotliwy and Słowiński 2016.

<sup>31</sup> Zamelska-Monczak 2019.

<sup>32</sup> Jaworski 1990.

<sup>33</sup> Waszczuk 2023, 208.

<sup>34</sup> Czermino, state 2 – own research; Makowicz-Poliszot 2016, 440, tab. 4.



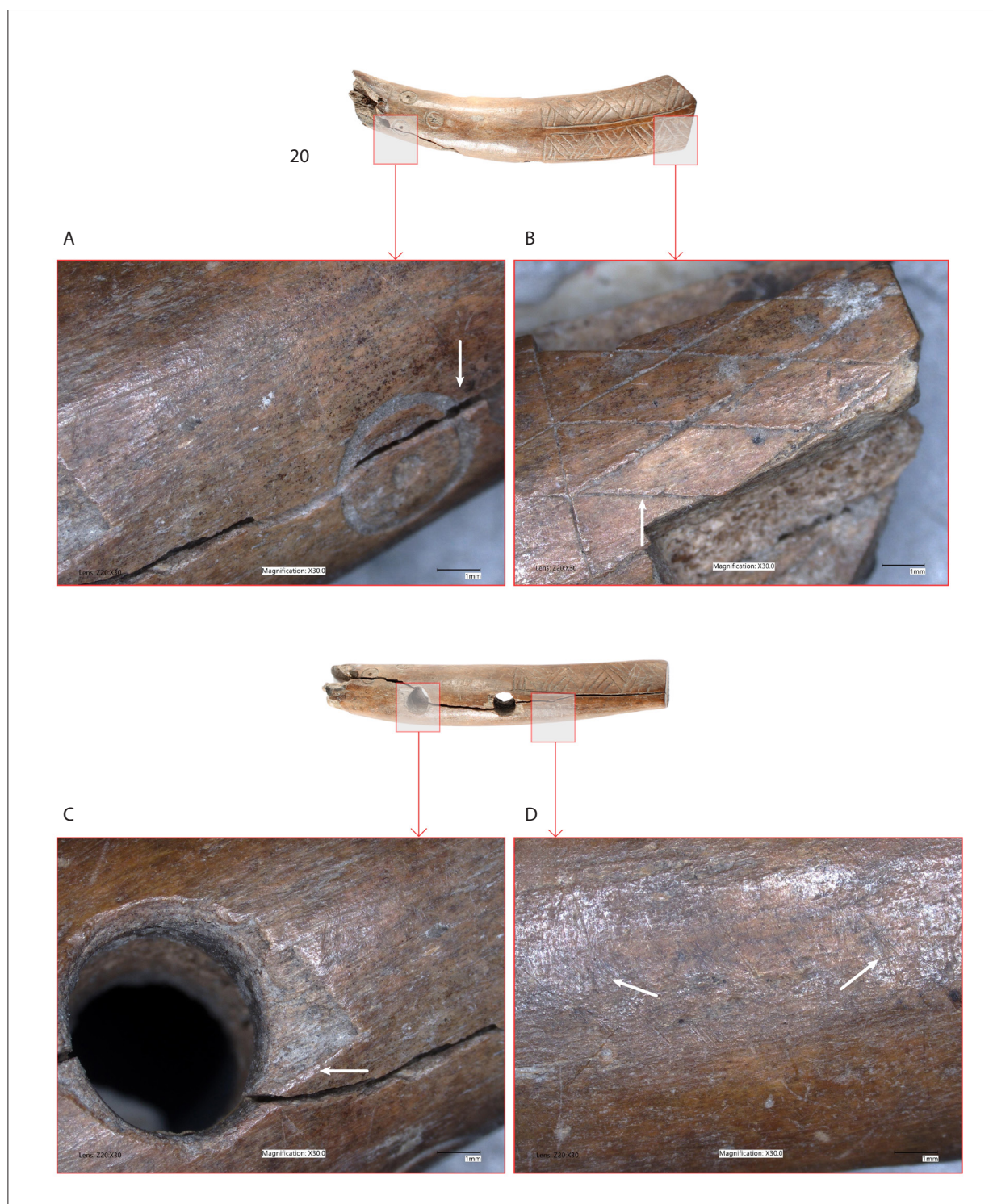


Fig. 14. Traces on sideplate (no. 20): A, B – technological traces: engraved ornamentation (eye motifs and hatched triangles), and diagonal incision on the shorter edge; C – use-wear traces: chipping around the holes; D – use-wear traces: polish on the inner surface (drawing by O. Synkovska).



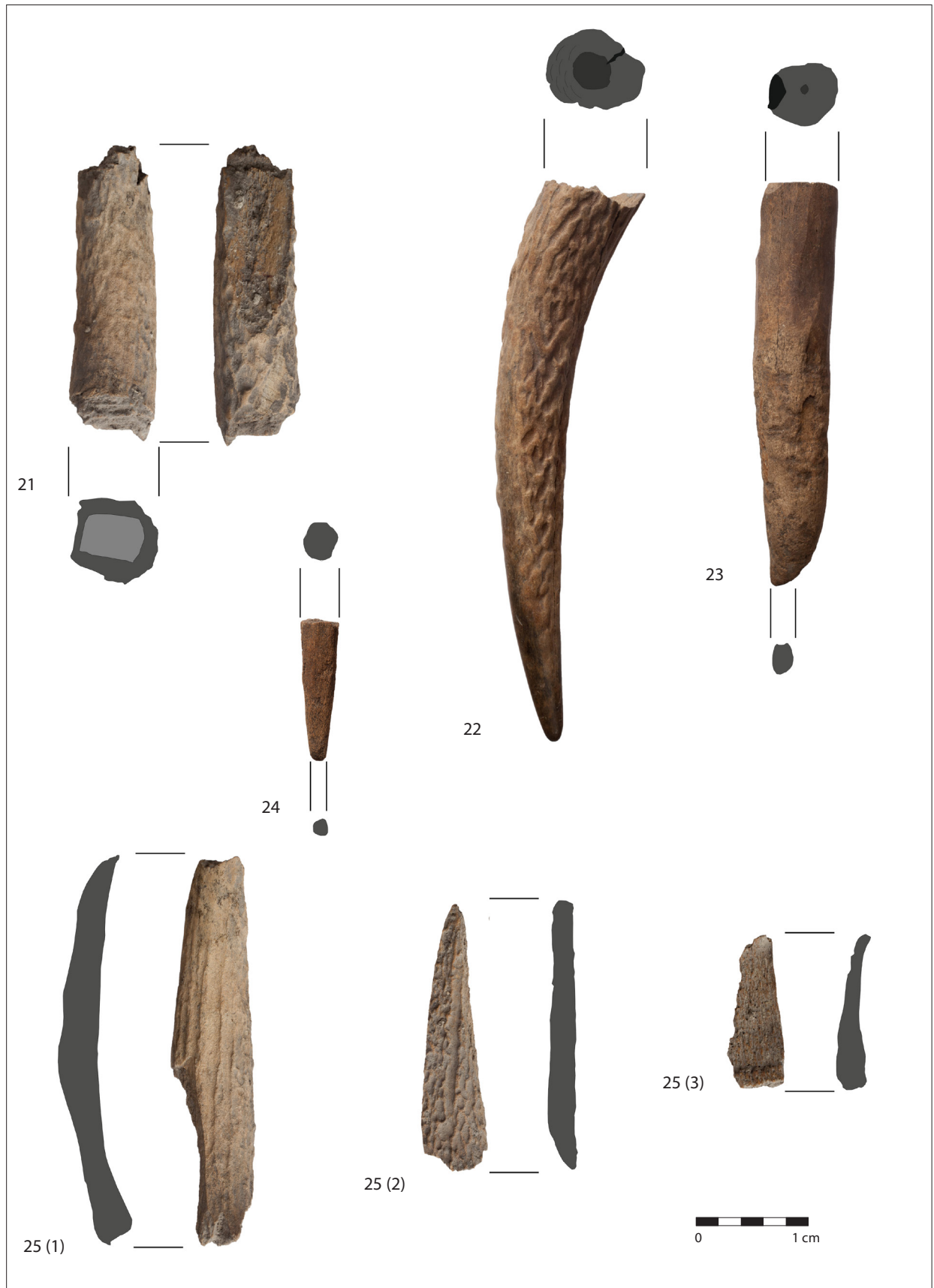


Fig. 15. Semi-finished products: 21–24 and production waste: 25 (1–3); (photo by M. Bogacki; compiled by O. Synkovska).

galus was an exception. Among the remains of domestic mammals, horse metapodial bones were most commonly used to make skates. Next in line were the bones of small ruminants, predominantly astragalus and femoral bones, which were used to make objects used in games and/or buttons. A metatarsal bone of a sheep or goat was used to make a spike. Bovine bones were used much less frequently – a skate was made from a radial bone, and a spike was made from a fragment of a rib.

Bones from parts of the carcass of little value for consumption, associated with the distal sections of the limbs (metapodial and tarsal bones), were used twice as often as those from valuable parts of the carcass. In the latter case, elements of the torso (rib), proximal section of the forelimb (radial bone) and hind limb (femur) were noted. The predominance of bones from less valuable parts of the carcass was also noted in other centres, e.g. in medieval Kalisz.<sup>35</sup> Such elements are of little value for consumption and are usually cut off from the rest of the carcass at the first stage of its division. The metacarpal and metatarsal bones are characterised by high strength due to the large proportion of compact bone, which was also a reason for selecting these skeletal elements. In some cases, a correlation was found between the raw material used and the type of object made from it.

The most numerous category of finished products found at the settlement near Czeremno were skates – three complete specimens and four small fragments with a characteristically worked sliding surface were discovered. They are also known from earlier studies.<sup>36</sup> They were made from the metapodial section of horse bones and radial bones of cattle. These anatomical elements are distinguished by their thick, compact substance, long shaft with a straight, flat posterior surface and a slightly convex cranial side. After selecting the raw material, preliminary processing consisted of filleting (separating the meat) and degreasing the bones. The surface was then cut and levelled, which is well documented on the preserved specimens, and a so-called sliding surface approximately 1.0-1.5 cm wide was formed by grinding. Microscopic observations confirmed the use of planing and grinding. In the case of one skate, a hole was drilled, which was probably used as an element for attaching the skate to the sole. The specimens found in Czeremno are distinguished by their simple form, while at many

other sites more elaborate specimens were found, containing many details, such as a precisely shaped toe or a larger number of holes. They are known, among others, from Kalisz,<sup>37</sup> Janowo Pomorskie,<sup>38</sup> and Wrocław.<sup>39</sup>

The raw material used to make skates was standard and similar at many sites. Horse bones predominated, followed by cattle bones, with occasional bones from other species. An analysis of more than 700 specimens shows that 62% were made from horse bones, 27% – from cattle bones, and the remaining 10% were made from bones of one of these two species.<sup>40</sup> Metapodial and radial bones were used the most frequently. In the case of bones of the horse, which were not of major importance for the economy, it is sometimes suggested that they may have been obtained at some stage of leather production.<sup>41</sup>

Fragments of skates and whole skates found in Czeremno show traces of use in the form of a smooth and shiny sliding surface, accompanied by small, short and shallow linear marks. These objects are thought to have been used for moving across frozen surfaces, with those with holes intended for longer distance travel, and those without holes used exclusively locally for playing on snow and ice.<sup>42</sup> It is sometimes pointed out that specimens without holes for attaching them to the foot were used as runners placed under feet or transported goods. Both types of skates were discovered in Czeremno, and the location of the settlement in the centre of the River Bug basin at the confluence of the Huczwa and Sieniocha valleys provided favourable conditions for this type of activity. Other possible uses for such objects are sometimes mentioned in literature, such as fishing equipment<sup>43</sup> or smoothers.<sup>44</sup> It cannot be ruled out that some of these objects changed their function during use, as evidenced by some specimens found in Kruszwica.<sup>45</sup> The results of traceological analyses and evaluation of linear traces are decisive. Many analyses of such objects from various sites and experimental studies rule out these assumptions and confirm the use of skates on ice.<sup>46</sup> Linear marks observed on specimens from Czeremno, running along the shafts, also confirm their use in contact with ice. In addition, all specimens show traces of chipping – deep lines running across the shafts, which were not evened out. They are interpreted as an intentional measure aimed at increasing friction on ice and improving stability.<sup>47</sup>

<sup>35</sup> Piątkowska-Małecka 2023, 326.

<sup>36</sup> Pomarański 2016; Rusin-Kaczmarek 2016; Sergeeva 2024.

<sup>37</sup> Piątkowska-Małecka 2023.

<sup>38</sup> Cnotliwy 2013.

<sup>39</sup> Jaworski 1990.

<sup>40</sup> Küchelmann and Zidarov 2005, 426.

<sup>41</sup> Choyke and Bartosiewicz 2005, 321.

<sup>42</sup> Waszczuk *et al.* 2014.

<sup>43</sup> Rulewicz 1994, 214.

<sup>44</sup> Drzewicz 2004, 19.

<sup>45</sup> Stempin 2023, 475.

<sup>46</sup> Diakowski 2011; Waszczuk *et al.* 2014; Choyke and Bartosiewicz 2015; Stempin 2023.

<sup>47</sup> Choyke and Bartosiewicz 2015, 322.

Skates were common in early medieval centres,<sup>48</sup> especially those located in river valleys and wetlands; they have been found in many gords, e.g. in Kruszwica,<sup>49</sup> Opole,<sup>50</sup> Gniezno,<sup>51</sup> Wrocław,<sup>52</sup> Międzyrzecz<sup>53</sup> and others. In many centres, as in Czeremno, they were most often made from metapodial bones of horses or, less frequently, from radial bones of cattle.

Based on two wholly preserved horse bone skates, the height at the withers of the animals was calculated, which made it possible to assess their morphology. Values of 133.3 and 141.3 cm were obtained. This means that the bones belonged to individuals of two size groups distinguished by H. Kobryń,<sup>54</sup> medium-low (132–135 cm) and medium-high (136–142 cm). They represented the local population of horses, which resembled the tarpan. This also corresponds to the findings of osteometric studies of bones of this species found in the collection of post-consumption remains both in the settlement (own research) and in the gord and other sites of the settlement complex, including the distant settlement.<sup>55</sup> Based on the length of the skate made from the radial bone of cattle, the height at the withers of the individual was calculated to be 106.3 cm. This element, therefore, came from a short-legged animal belonging to the *Bos taurus brachyceros* form, a typical representative of the local population. The morphological data obtained from the remains used to make the bone skates indicate that the material was probably obtained from post-consumption waste. Cattle and horses were among the species kept by the communities inhabiting the settlement complex in Czeremno. The former was the prevailing species in the livestock structure. In various parts of the settlement complex, cattle bones accounted for about 40%, while horse remains ranged from 4% to nearly 8%.<sup>56</sup> It is also highly likely that horse meat was consumed, as evidenced by traces of consumption found on some bones of this species.<sup>57</sup>

The next largest category of bone and antler artefacts discovered at the settlement near Czeremno comprised objects interpreted as elements used for various games or possibly fortune-telling. They include astragals and pawns made from femoral bone epiphyses. Astragals, obtained mainly from domesticated small ruminants, are quite com-

mon finds in many centres in Poland (e.g. Sasiadka, Opole, Giecz, Kruszwica), the Czech Republic, the northern part of the Carpathian Basin and Ruthenia.<sup>58</sup> In Czeremno, apart from four specimens from the 2022 and 2023 excavations, more objects of this type were found, including a pig's astragalus decorated with an ornament engraved in the form of parallel lines and a cattle astragalus with a hole in the central part<sup>59</sup>. Some believe that the specimens with holes may have been used as sound toys.<sup>60</sup>

Although astragals are most often interpreted as elements used for games or fortune telling,<sup>61</sup> other uses cannot be ruled out. They were usually subjected to various forms of processing, but unprocessed specimens are also found. Some, such as the specimen from the settlement near Czeremno, showed signs of minor processing, limited to levelling the side surfaces of the bone and sometimes drilling a hole. One of the specimens from Czeremno has a hole in the central part of the bone and traces of another, initial hole. Similar indentations have also been described in the case of some other specimens, e.g., those found in Gniezno. The holes and indentations are sometimes interpreted as spaces that were filled with lead to increase the weight and cheat during the game.<sup>62</sup> Others believe that they were pawns, so-called *bity/bitki*, used for knocking down.<sup>63</sup> A rather unusual specimen made from deer astragalus with a centrally located hole was also found in Czeremno. Astragals of this type, sometimes with two holes, are often interpreted as sound toys that make sounds when spun with a string.<sup>64</sup> Still other specimens, e.g., with asymmetrically placed holes, are sometimes interpreted as pendants or amulets.<sup>65</sup> Other studies indicate that they may have been used as tools, e.g. for the production of linen and/or wool fabrics,<sup>66</sup> as scrapers for leather or smoothing tools used in the production of ceramics.<sup>67</sup> It therefore seems that these objects could have served various functions, even though they are often attributed the role of game pieces. The side walls of the bones were flattened and polished to prepare these surfaces for being used in games.<sup>68</sup> Such objects were known in the Middle Ages in Poland, the Czech Republic, the northern part of the Carpathian Basin and Bulgaria.<sup>69</sup>

<sup>48</sup> Cyngot 2017.

<sup>49</sup> Cnotliwy 1999, 2000; Stempin 2023.

<sup>50</sup> Norska-Gulkowa 1985.

<sup>51</sup> Waszczuk *et al.* 2014.

<sup>52</sup> Jaworski 2015.

<sup>53</sup> Makowiecka, Makowiecki 2015.

<sup>54</sup> Kobryń 1984.

<sup>55</sup> Makowicz-Polisztot 2016, tables 49 and 51.

<sup>56</sup> Makowicz-Polisztot 2016, 440, table 3.

<sup>57</sup> Makowicz-Polisztot 2016.

<sup>58</sup> Hrubý 1957; Jaworski 1990; Semaško 2008.

<sup>59</sup> Sergeeva 2024, 713.

<sup>60</sup> Dovženok *et al.* 1966, 97; Miadźwiedzieva 2013, 89.

<sup>61</sup> Holmgren 2004.

<sup>62</sup> Jaworski 1990, 93.

<sup>63</sup> Sergeeva 2011, 99.

<sup>64</sup> Dovženok *et al.* 1996, 97; Miadźwiedzieva 2013, 89; Sergeeva 2015, fig. 82:7.

<sup>65</sup> Affanni 2006, 84.

<sup>66</sup> Vitezović 2011.

<sup>67</sup> Meier 2010, 168.

<sup>68</sup> Stempin 2023, 432.

<sup>69</sup> Hrubý 1957; Hilczerówna 1961; Lysenko 1985; Jaworski 1990; MacGregor *et al.* 1999; Rudenko 2005; Paszkiewicz 2013; Stempin 2023.

Three pawns made from sheep or goat femoral bone epiphyses can also be associated with entertainment or games. The interpretation of such objects is not straightforward. Similar specimens made from deer antlers and horse teeth, or even bones of marine mammals (right whale) found in Janowo Pomorskie are considered to be pieces for a board game popular in the Middle Ages among the Scandinavian population, called *hnefataf*.<sup>70</sup> They are also known from other early medieval sites, including the gord in Kruszwica, where they were made from the femoral bones of pigs or wild boars.<sup>71</sup> The specimens from Czeremno may be a kind of imitation, or these objects may have had other functions – they are sometimes interpreted as spindle whorls<sup>72</sup> or buttons, or other decorative elements.<sup>73</sup> It seems that due to their low weight, these objects could not have served as weights for the spindle, or they could have been used only in the preparation of wool, but not in the production of linen fibre. In addition, some authors point out to their short period of use, which seems incomprehensible in the case of such a widespread activity and the great popularity of clay and stone spindle whorls.<sup>74</sup> A more likely explanation is that they were a type of button; a strap or ribbon was threaded through the drilled hole, and they could then be used to fasten the outer layers of clothing.<sup>75</sup> They were commonly manufactured in Southern Ruthenia in the 12<sup>th</sup>–13<sup>th</sup> centuries, especially in Kiev, where more than 180 waste items and semi-finished products of this category were found within the city area.<sup>76</sup>

Pawns or buttons were commonly made from epiphyses of femoral bones, less often from humeral bones of various animal species – mainly cattle, small ruminants and pigs. Some of them were richly ornamented. The structure and properties of the raw material meant that these items did not require any special technological processes during their manufacture. The specimens from Czeremno came from animals that died at a young age, which resulted in the separation of the epiphysis from the shaft of the bone due to the fact that growth had not been completed. The processing was limited to slight levelling of the base and drilling a hole. It therefore seems likely that they could have been used as buttons. Traces of use were found on only one specimen, on which slight

smoothing and polishing of narrow strips on the flat surface of the object were observed. It is difficult to clearly associate them with a specific activity.

Spikes (referred to in the literature as awls, piercers, gravers, and needles), i.e. objects with a sharpened working end, were another product of domestic craftsmanship. In Czeremno, two specimens were found in a settlement near the gord – one made of sheep or goat metatarsal bone and the other one made of a fragment of a cattle rib. They are also known from earlier research, as several tools of this type were found in various parts of the settlement complex.<sup>77</sup> They were made from compact bone of long limbs, mainly of cattle, and fragments of unidentified bones.

All of them have a sharpened, pointed working part and were used as piercing tools. This is a very common form known from most early medieval sites, and in many of them it even outnumbers other bone artefacts, as e.g. in the gord in Santok<sup>78</sup> and the gord and settlement in Międzyrzecz.<sup>79</sup> It is believed that such objects occurred in layers dating back to the turn of the 12<sup>th</sup>/13<sup>th</sup> century, when they were replaced by metal tools.<sup>80</sup> In addition to the metapodial bones of small ruminants, the radial and tibial bones of sheep and goats, and the fibulae of pigs were also often used in their production.

Regardless of the raw material and form, these were multifunctional objects used for piercing various materials, e.g. in leatherworking as pegs for fastening leather,<sup>81</sup> in the production and repair of footwear,<sup>82</sup> or in weaving and tailoring.<sup>83</sup> They could also be used as gravers for decorating ceramics.<sup>84</sup> It is not known whether their form was related to their function; the types identified so far have not been associated with any specific function,<sup>85</sup> although attempts are being made to do so, by analysing not only the form of the artefacts, but also the presence and degree of wear.<sup>86</sup> On this basis, three groups of artefacts of this type from Grzybowo were distinguished, and within them, different categories of tools. The first group, comprising objects polished over their entire surface, included needles, awls/basketry tools and piercers. The second group, with polishing visible only in the blade area, included awls, and the third group, with traces of polishing visible only on the tip and edges, included smoothing tools and gravers.<sup>87</sup>

<sup>70</sup> Adamczyk 2011; 2012; Makowiecki 2013; Jagodziński 2015.

<sup>71</sup> Stempin 2023.

<sup>72</sup> MacGregor *et al.* 1999, 1665; Cnotliwy 2013, 89; Paszkowska 2015.

<sup>73</sup> Becker 2005; Antonowska-Gorączniak 2005a; Sergeeva 2014.

<sup>74</sup> Stempin 2023.

<sup>75</sup> Sergeeva 2014.

<sup>76</sup> Sergeeva 2011, 6, 207: tables 36–38.

<sup>77</sup> Sergeeva 2024, 712.

<sup>78</sup> Zamelska-Monczak 2019.

<sup>79</sup> Makowiecka, Makowiecki 2015.

<sup>80</sup> Jaworski 1990; Matuszewska-Kola 2000; Antowska-Gorączniak 2005a.

<sup>81</sup> Voïnarovs'kyj 2017, 71.

<sup>82</sup> Cnotliwy 1983, 276.

<sup>83</sup> Lenc 2002.

<sup>84</sup> Norska-Gulkowa 1985.

<sup>85</sup> Kneisel 2010; Waszczuk 2023.

<sup>86</sup> Waszczuk, Gronek 2021, 233.

<sup>87</sup> Waszczuk, Gronek 2021, 233.

In the case of the artefacts from Czeremno, a specimen made of sheep or goat metatarsal bone, belonging to the first, most numerous group according to K. Jaworski's classification,<sup>88</sup> was most likely used for working with leather, which is confirmed by typical traces of use. The second specimen from Czeremno, made from a fragment of a cattle rib, can be classified in the second group according to K. Jaworski's classification,<sup>89</sup> i.e. specimens made from fragments of broken bones that vary in terms of anatomy and species. Objects of this type were found in large numbers in many early medieval centres, including Sasiadka,<sup>90</sup> Kalisz,<sup>91</sup> Wrocław,<sup>92</sup> Poznań,<sup>93</sup> Radom<sup>94</sup> and many others.

Two fragments of toothed comb plates were discovered in Czeremno. They are small in size and severely damaged, with all teeth broken off, so it is impossible to determine what type of combs they came from. Other single-sided and double-sided combs, both intact and in fragments, were also discovered in the settlement complex in Czeremno.<sup>95</sup>

The process of producing combs was complicated and required specialised tools such as axes, chisels, knives, saws, drills, files, anvils, decorative tools and even lathes,<sup>96</sup> as well as expertise, hence the conviction that these items were made in specialised craft workshops.<sup>97</sup> The production process consisted of preparing toothed plates and roller linings, which were cut from antlers and then joined together with rivets, and only in the next step were the teeth cut out. It was necessary to soften the material before planing. After joining the plates, the teeth were cut out with saws and then ornamented. So far, no traces of a specialised horn workshop have been found in the settlement complex in Czeremno. However, it is assumed that there may have been traveling craftsmen who had ready-made semi-finished products and made combs for local markets, in accordance with local aesthetic needs. The presence of combs and their elements in Czeremno indicates contacts with Ruthenia and its influence on horn craftsmanship in the borderlands.<sup>98</sup> Combs were used to comb hair, and those with densely arranged teeth could have also been used for hygienic purposes, i.e. to remove insects.

Other items found at the settlement near Czeremno include two ornamented linings in the form of plates cut from deer antlers. Their purpose is unknown; items of this type are often interpreted as knife linings, but they could also have been decorative fittings for other, unspecified objects.<sup>99</sup> It is believed that they were made in craft workshops. It cannot be ruled out that they were elements of combs, especially ornamented forms, or knife linings.

A slightly different object of unknown function is an originally rectangular plate cut from deer antler and smoothed, with small holes in two preserved corners. It is similar to weaving plates, which were slightly smaller and square-shaped, though.<sup>100</sup> The plate could belong to a group of objects related to transport, as it could have been used as a strap separator. A similar plate was found e.g. in Grzybów.<sup>101</sup> The surfaces of what was probably the main antler were sanded down to remove the pearly on one side and the spongy bone on the other, and then holes were drilled in the corners. The edges of the holes show no signs of intensive use, so it is not known whether the plate was used for this purpose. Early medieval objects referred to as separators took various forms and were often richly decorated.<sup>102</sup>

Another object of unknown function found in Czeremno has the shape of a cone closed at the top, similar to a pawn or a plug (a type of peg). It was made of deer antler. Similar specimens are interpreted as knife holders. A similar specimen was found at the Monastery of St. Michael the Archangel in Kyiv and is dated to the 14<sup>th</sup>-15<sup>th</sup> century.<sup>103</sup> Another interpretation suggests that objects of a similar shape were used as blunt-ended arrowheads for hunting fur-bearing animals<sup>104</sup> or birds.<sup>105</sup> The specimen from Czeremno was a simple form made from the crown of antlers, which, after being softened, was cut from the base to the top to form a cone. The base of the object was hollowed out, creating a sleeve that could be mounted on a shaft. In addition, three other arrowheads with sleeves made of bone are known from Czeremno.<sup>106</sup> They were also found at other early medieval sites, especially in eastern and southern Europe. They had various forms, sometimes with barbs and/or ornamenta-

<sup>88</sup> Jaworski 1990.

<sup>89</sup> Jaworski 1990.

<sup>90</sup> Paszkowska 2013, 108.

<sup>91</sup> Piątkowska-Małecka 2023.

<sup>92</sup> Jaworski 1990.

<sup>93</sup> Antonowska-Gorączniak 2005a.

<sup>94</sup> Paszkowska 2018.

<sup>95</sup> Pomarańska 2016; Rusin-Kaczmarek 2016; Sergeeva 2024.

<sup>96</sup> Cnotliwy 2013, 89.

<sup>97</sup> Cnotliwy 1970; 1973; 2013.

<sup>98</sup> Rusin-Kaczmarek 2016, 449.

<sup>99</sup> Soroka 1994; MacGregor *et al.* 1999.

<sup>100</sup> Hrubý 1957; MacGregor *et al.* 1999, 1969.

<sup>101</sup> Waszczuk, Gronek 2021.

<sup>102</sup> Żak 1952.

<sup>103</sup> Sergeeva 2011, 157, fig. 58:3.

<sup>104</sup> Gajdukow, Makarow 1993.

<sup>105</sup> Kurnatowska, Tuszyński 2003, 258.

<sup>106</sup> Sergeeva 2024, 709.



tion, such as the specimens from Grzybów,<sup>107</sup> Radom,<sup>108</sup> Opole<sup>109</sup> and Truso<sup>110</sup>.

A frame also comes from the settlement near Czermino. Such items are believed to have been made in specialised workshops, often comb-making workshops, where antler waste was used to produce frames.<sup>111</sup> This is confirmed by the discovery of large accumulations of frames in centres where comb production has been documented, mainly in Pomerania and Greater Poland.<sup>112</sup> However, it seems that it only applies to conical forms, often richly ornamented, whereas simpler forms – cylindrical and undecorated – could have been produced at home, which was probably the case with the specimen from Czermino. After cutting out an appropriate fragment of antler, the pearling was removed from the outer surface, and it was planed to achieve the appropriate stepped shape and then slightly smoothed. The spongy bone was removed from the inside, most likely with a knife. Local production of frames was also found at the settlement in Sasiadka,<sup>113</sup> where two fragments of deer antlers with traces of cutting and chopping were found, interpreted as initial forms of frames. K. Jaworski<sup>114</sup> also mentions local production of frames using only a file and a knife. Other frames are also known from Czermino, more carefully made, some also decorated with, among other things, geometric ornaments.<sup>115</sup> At other early medieval sites, the proportions of decorated and undecorated frames vary, e.g. in Grzybowo only three out of the 23 items of this type were ornamented,<sup>116</sup> while in Truso all of them were,<sup>117</sup> and almost half of the nearly 150 specimens from Pomerania were decorated.<sup>118</sup>

It is believed that the frames could have been used as mouthpieces for hunting calls, game pieces (pawns), spindle whorls and beads,<sup>119</sup> although recently the prevailing view is that they were used to reinforce wooden knife handles.<sup>120</sup> This possibility has been confirmed by finds from the cemetery in Dziekanowice.<sup>121</sup> The frames, especially the larger ones, could also have been used to reinforce other tools. They were commonly found at many Slavic sites, primarily in gords dating from the 9<sup>th</sup>

to the 13<sup>th</sup> century,<sup>122</sup> and their origins are associated with the Danube region. It is sometimes pointed out that they were part of luxury furnishings.<sup>123</sup>

Among the items related to transport, an ornamented horse bit sidebar made from a fragment of deer antler is worth mentioning. Such items served to prevent the bit from slipping out of the horse's mouth. The specimen from Czermino is decorated with a motif of hatched triangles and three "eyes" made with a compass. Both motifs were popular on various items.<sup>124</sup> Sidebars are known from other sites in Poland,<sup>125</sup> as well as in Eastern Europe,<sup>126</sup> and are associated with nomadic groups migrating from the East.

In addition to finished products, a few semi-finished products and waste items were also found in the settlement near Czermino. All of them were fragments of deer antlers. Their small number may result from the greater importance of cottage industry, which was dispersed throughout the settlement; moreover, some of the waste may have been scattered by dogs.

The types of objects found in Czermino indicate that the vast majority of production took place at home rather than in specialised workshops. Home production satisfied individual needs and did not require complex and precise tools or technological processes.<sup>127</sup> The discovered items were standard everyday objects, which did not change over time and did not vary from one region to another. Only a few items, such as the horse bit and linings, can be interpreted as having been made in specialised workshops. They could have been imported from Ruthenia. The recent discoveries do not reveal the entire range of items known from the settlement complex in Czermino. In addition to the artefacts described above, elements of weaponry were also found there, including a decorated quiver, bow linings, arrowheads, and a fragment of lining interpreted as part of a saddle or quiver,<sup>128</sup> as well as various forms of brooches and an amulet made from a bear's fang. The whole collection represents a set of items typical for Central and Eastern Europe in the period from the 10<sup>th</sup> to the 13<sup>th</sup> century.

<sup>107</sup> Waszczuk, Gronek 2021.

<sup>108</sup> Paszkowska 2018.

<sup>109</sup> Norska-Gulkowa 1985.

<sup>110</sup> Cnotliwy 2013.

<sup>111</sup> Cnotliwy 1973; 2001; 2013, 79.

<sup>112</sup> Cnotliwy 1983; 2013.

<sup>113</sup> Paszkowska 2013, 105.

<sup>114</sup> Jaworski 2015, 238.

<sup>115</sup> Pomarańska 2016; Rusin-Kaczmarek 2016; Sergeeva 2024.

<sup>116</sup> Waszczuk, Gronek 2021, 80.

<sup>117</sup> Virtuous 2013, 80.

<sup>118</sup> Cnotliwy 1973, 223.

<sup>119</sup> Cnotliwy 1958; Norska-Gulkowa 1985, 282; Flerova 2001; Kurnatowska, Tuszyński 2003.

<sup>120</sup> Hrubý 1957; Cnotliwy 2001; Cnotliwy 2013, 139.

<sup>121</sup> Wrzesińska, Wrzesiński 2003.

<sup>122</sup> Kavan 1958; Cnotliwy 1973; Lysenko 1985.

<sup>123</sup> Kurnatowska, Tuszyński 2003, 260.

<sup>124</sup> e.g. Cnotliwy 2013; Paszkowska 2018.

<sup>125</sup> Nadolski 1954.

<sup>126</sup> Sedov 1982.

<sup>127</sup> Cnotliwy 1964.

<sup>128</sup> Sergeeva 2024, 708.

## Summary

During excavations carried out in 2022-23 at the settlement near Czeremo, a collection of finished objects, semi-finished products and waste items of animal origin was found, varying in terms of form, type, function and material. The materials used included primarily deer antlers, followed by bones of domesticated mammals (horses, sheep, goats and cattle) and, occasionally, wild animals (deer). The raw material was mainly obtained from post-consumption waste or separated during the cutting and division of carcasses or the preparation of meat for consumption. Antlers could be obtained from hunted animals or be collected in forests (shed antlers). Among the bones of domestic mammals, elements from low-value parts of the carcass prevailed, mainly metapodial sections and tarsal bones. Next in line were parts of high consumption value (femur, radius, rib fragments). The raw material was selected based on knowledge of its properties and availability, and it seems

that materials that did not require a lot of work were preferred.

Among the finished products, the most numerous were items related to transport – skates and a horse bit and, possibly, a strap separator. Next in line were game pieces (astragals, pawns), tools (spikes), fragments of personal items (combs), decorative items (frames, linings), and possibly weapons (arrowheads?). It seems that most of these items were made on site, according to current demand, using rather simple methods, and were often undecorated. Some required greater precision and more work, such as combs, the horse bit, linings or a plate of unknown function, possibly a strap separator and possibly an arrowhead.

No traces of a horn workshop have been found in the settlement complex in Czeremo. It seems, therefore, that some of the items, such as combs, may have been imported from other centres, e.g. those located in Ruthenia. However, it cannot be ruled out that they were manufactured locally, even if their manufacture required more work and a higher level of craftsmanship.

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Catalogue of bone and antler artefacts from the suburban settlement in Czeremno (site 2). Compiled by J. Piątkowska-Malecka

No.	Trench	Layer/ Feature	Type of object	Dimensions				Species identification	Anatomical identification	Technological traces	Use-wear traces	Taphonomic traces	Other
				L	W/H	Th	Ø						
1.	1/22	19a/1-S	pawn	1.8	1.1	-	0.5	sheep/goat	femoral head	drilled hole	-	chipping on the edge at the base	young animal < 3 years
2.	2/22	1	pawn	2.6	12	-	0.5-0.8	sheep/goat	femoral head	drilled hole; slightly ground base	-	numerous edge chips at the base	young animal < 3 years
3.	1/22	2/3a	pawn	2.2	1.1	-	0.5	sheep/goat	femoral head	drilled hole; ground base	slight smoothing and burnishing of the base	chipping on the edge at the base	young animal < 3 years
4.	1/22	2	spike	8.4	2.1- 1.2	1.8	-	sheep/goat	metatarsal bone	splitting at mid-shaft; edge scraping	smoothing and burnishing of the entire shaft surface	preserved proximal end	-
5.	4/23	-/16-N	spike	8.4	2.1	0.7	-	cattle	rib	splitting; trimming side edges; forming the working part	-	post-depositional damage; dark spots; minor chipping	-
6.	5/23	51/53	astragal	2.9	1.7	1.5	-	sheep/goat	talus	grinding of lateral surfaces	-	-	-
7.	2/22	23	astragal	2.8	1.6	1.4	-	sheep/goat	talus	grinding of lateral surfaces; notches on cranial surface	-	-	-



No.	Trench	Layer/ Feature	Type of object	Dimensions				Species identification	Anatomical identification	Technological traces	Use-wear traces	Taphonomic traces	Other
				L	W/H	Th	Ø						
8.	3A/23	43	astragal	2.8	1.8	1.5	0.4	sheep/goat	talus	hole in central part	wear of natural bone edges	gnawing	-
9.	4A/23	57	astragal	5.5	3.4	2.8	0.7	red deer	talus	hole in central part	-	-	-
10.	4A/23	59	skate	GL 228.7	Bp 48.1	SD 341	0.5	horse	metacarpal bone	scraping; grinding; incisions	smoothing of the working surface	-	Ll=220,5; WH=141,3
11.	5/23	63	skate	GL 257.8	Bp 49.2	SD 47.3	-	horse	metatarsal bone	scraping; grinding; incisions	smoothing of the working surface	-	Ll=250,2; WH=133,3
12.	3/23, 4/23	35, 36	skate	GL 247.4	Bp 67.4; Bd 62.4	-	-	cattle	radius	scraping; grinding	smoothing of the working surface	preserved in 3 fragments, broken; gnawing on the caudal side near the distal end	GL=247,4; WH=106,3
13.	5/23	bottom of plough- hed layer	mount / ring	20.3	17.8	-	2.2-0.9	red deer	antler fragment	cutting; scraping	slight burnishing of part of the object	crack; grey discoloration	-
14.	1/22	1,2- ploughing heap	comb insert	1.2	1.2	0.2	-	unidentified (deer?)	unidentified (antler fragment?)	tooth-like notches	-	-	-
15.	1/22	1-3- ploughing heap	comb insert	1.2	1.1	0.2	-	unidentified (deer?)	unidentified (antler fragment?)	tooth-like notches	-	-	-
16.	5/23	51/53	covering?	7.8	1.5	0.3	-	red deer	antler fragment	scraping; grinding	-	-	-





No.	Trench	Layer/ Feature	Type of object	Dimensions				Species identification	Anatomical identification	Technological traces	Use-wear traces	Taphonomic traces	Other
				L	W/H	Th	Ø						
17.	2/22	25	covering?	6.1	1.4	0.7	-	red deer	antler fragment	scraping; grinding; cutting; incising	slight smoothing	-	-
18.	5/23	66	unknown (plate, strap separator?)	4.8	2.7- 1.2	0.2	0.2	red deer	antler fragment	intensive scraping; grinding; holes	smoothing; burnishing; linear marks on the outer surface	-	-
19.	5/23	53	unknown (point?)	3.1	1.1- 0.5	-	-	red deer	antler fragment	edge sawing; grinding; incisions	-	-	-
20.	1/22	3	horse bit sidebar	9.5	1.8	1.6	0.6	red deer	antler fragment	scraping; eyelet and linear ornament in the form of outlined triangles	smoothing; slight burnishing on one side	longitudinal crack; broken tip	-
21.	5/23	ploughing heap	block x 3 fragments	7.5; 10.1; 11.5	-	-	-	red deer	antler fragment	circumferen- tial incisions	-	-	-
22.	5/23	63=53	waste	15.2	-	-	-	red deer	antler fragment	splitting at the base; breakage	-	-	-
23.	3/23	turf	waste	11.3	-	-	-	red deer	antler fragment	sawing at the base; scraping of outer surface	-	gnawing	-



No.	Trench	Layer/ Feature	Type of object	Dimensions				Species identification	Anatomical identification	Technological traces	Use-wear traces	Taphonomic traces	Other
				L	W/H	Th	Ø						
24.	1/22	ploughing heap	waste	3.8	-	-	-	red deer	antler fragment	splitting at the base	-	weathering	-
25.	5/23	51/53	shaving x 3	10.2; 7.2; 4.0	-	-	-	red deer	antler fragment	scraping	-	-	-
26.	2/22	24	shaving	4.0	-	-	-	red deer	antler fragment	scraping	-	-	-
27.	5/23	53	shaving	2.8	-	-	-	red deer	antler fragment	scraping; incisions	-	-	-
28.	4/23	38	skate fragment	4.5	1.1	0.5	-	horse	metapodium	-	smoothing; burnishing	-	-
29.	3/23	sieved heap	skate fragment	2.9	1.5	0.6	-	horse	metapodium	-	smoothing; burnishing	-	-
30.	4A/23	57	skate fragment	7.1	2.6	0.8	-	horse	metapodium	scraping	-	-	-
31.	2/22	?	skate fragment	3.4	2.1	0.7	-	horse	metapodium	scraping	-	-	-