Written in Bones

Studies on technological and social contexts of past faunal skeletal remains

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The Hamburgian *Zinken* perforators and burins – flint tools as evidence of antler working

Antler finds dated back to the Final Palaeolithic are rare in the Middle European Lowlands due to unfavourable depositional conditions. Moreover two important issues – antler working and flint tool utilization are considered separately in the Palaeolithic studies. Use-wear analysis of flint artifacts show traces of antler working mostly on burins and *Zinken* perforators. Nevertheless microscopic studies give information concerning worked material but do not discuss neither what type of flint tools were engaged in particular stage of antler working nor if were they multifunctional tools or a craftsman needed two or more types of tools in a particular stage of work. Experimental method allows to understand how flint tools were used and what kind of a tool edge is required in a particular activity. It also helps to determine efficiency of hafted and unhafted tools. In this paper I would like to discuss the use of burins and *Zinken* perforators in working antler. According to the general, morphological analysis of flint tools and antler artefacts, burins were used for making grooves and *Zinken* perforators for obtaining antler blades. Experimental research and use-wear analysis show that they were rather multifunctional tools.

Keywords: the Final Palaeolithic, Hamburgian, *Zinken* perforators, burins, use-wear analysis, antler working

Introduction

The Hamburgian culture represents the oldest colonization of the West and the Middle European Lowlands since the last glacial period. Settlements have been identified in north-western Germany (Schleswig-Holstein, Lower Saxony) and the Netherlands. A few sites are known from Denmark and southern Scandinavia (Larsson 1993; Eriksen 2002) as well as from Poland (Burdukiewicz 1987; Kabaciński *et al.* 2002; Kabaciński, Kobusiewicz 2007). Noteć and the middle part of the Vistula are believed to form the eastern border of the Hamburgian expansion (Bobrowski, Sobkowiak-Tabaka 2006). Assemblages have been dated back to the Bølling Interstadial (^{14}C years BP: 13,000-12,000) and the Older Dryas (^{14}C years BP: 12,000-11,800), which correspond with the beginning of the Final Palaeolithic (Burdukiewicz 1999). Faunal remains and pollen studies show that the European Lowlands were covered by tundra and birch park forest and that reindeer (*Rangifer tarandus*) were the most important prey (Bratlund 1994:60; Burdukiewicz *et al.* 2007:74). Together with shouldered points *Zinken* perforators and burins were the most numerous flint implements in the assemblages in question.

Zinken perforators and burins

Zinken perforators, characteristic in assemblages of the Hamburgian culture, first appeared at the Magdalenian sites from the Western and Central Europe (Burdukiewicz 1989, Fig 8). According to their morphology and fragmentation *Zinken* perforators were sometimes interpreted as tools for antler working (Leroi-Gourhan, Brèzillon 1966). A. Rust, who analysed antler artefacts from the excavations in Meiendorf and Stellmoor, claimed that *Zinken* perforators were used as wedges, but his hypothesis is based neither on functional analysis nor experimental research. Moreover a small fragment of the broken bone tool (wedge?) was found inside a groove incised in a reindeer antler from Meiendorf. M. Lindemann (2000) supported Rust's idea basing on his experimental studies.

It is generally accepted that the function of burins – the most universal tool types in the Upper and Final Palaeolithic – is very different, because of their typological differentiation (Knecht 1988:132-134). According to M. Brézillon's (2001) traditional idea a tip was used to make incisions in bone, antler or wood. However, E. Moss' use-wear studies on flint burins from the Hamburgian site Oldeholtwolde suggest that a burin spall was detached from a flake in order to blunt its edge. "The burin facet provides a blunt platform upon which to apply pressure by fingers" (Moss 1988:405).

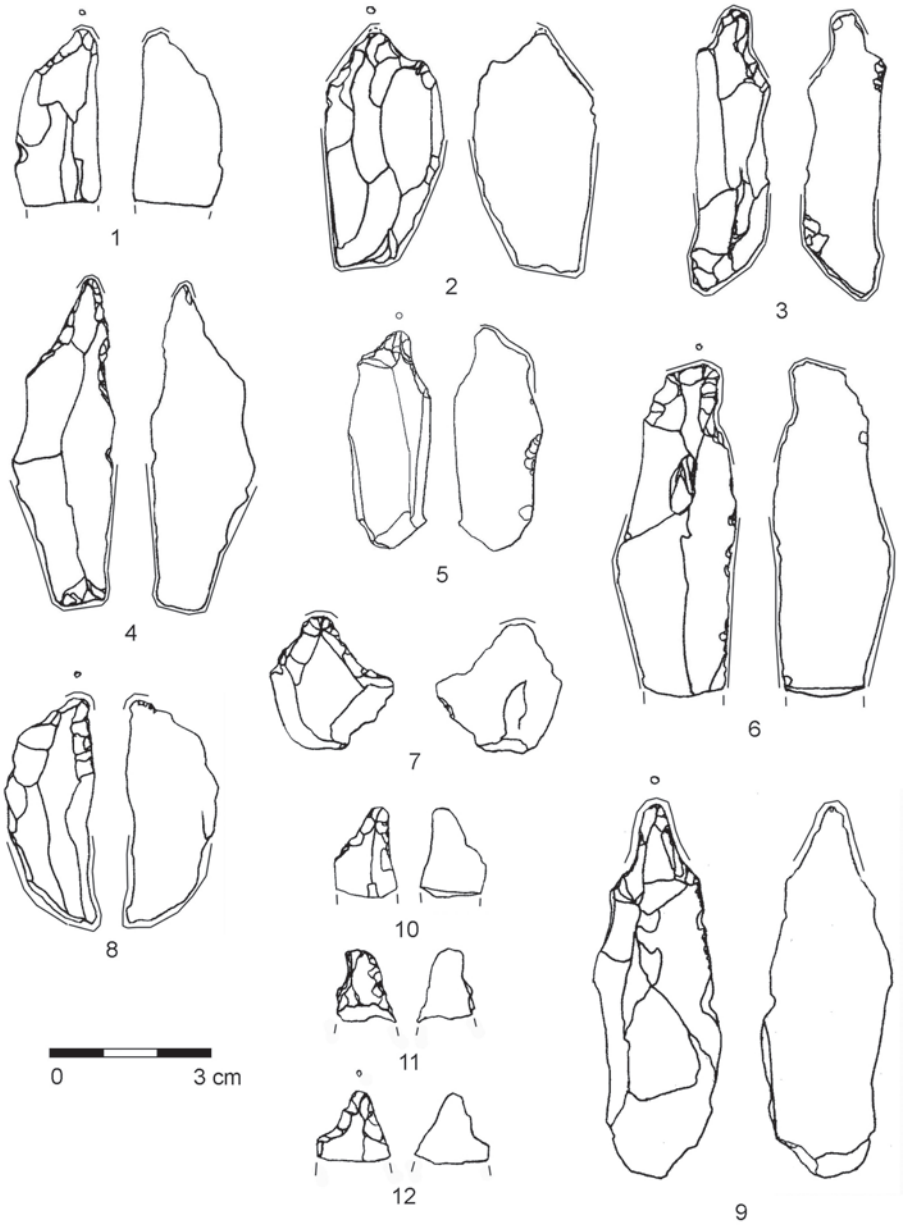

Fig. 1. *Zinken* perforators from Olbrachcice 8

Bone and antler remains

Faunal remains, bone and antler with traces of work, particularly tools (awls, projectiles and so called "hide knives" – *Riemenschneider*) were found in large numbers at only a few of the Hamburgian sites, i.a. Meiendorf and Stellmoor in the Ahrensburg Valley excavated by A. Rust in the 1st half of the 20th century (Rust 1937, 1943). Even though in recent years several Hamburgian sites have been found in Poland (see Kabaciński, Kobusiewicz 2007), they have not unfortunately produce any bone artefacts, only tiny pieces of what are probably reindeer bones in Olbrachcice 8 and the remains of small animals and fish in Mirkowice 33 (Kabaciński *at al.* 2002:112; Makowiecki 2003:170). This poor collection is the result of extremely unfavourable depositional conditions which is true of most of the Polish Final Palaeolithic sites. However, bone and antler must have played important role in life of hunting groups existing in such a harsh climate and following reindeer herds. In this case the process of bone and antler working and the bone tool kit of reindeer hunters living in the area of Middle European Lowlands in the beginning of the Final Palaeolithic remains unknown.

In this paper I discuss results of experimental research in context of use-wear analysis of flint tools (*Zinken* perforators and burins) from the Hamburgian site in Olbrachcice 8, Lower Silesia, Poland. In my studies I have tried to determine the types of antler tools made and stages of antler working at the site. In Palaeolithic studies the methods of bone and antler working, methods of use of stone tools and wear patterns on bone projectiles are usually ex-

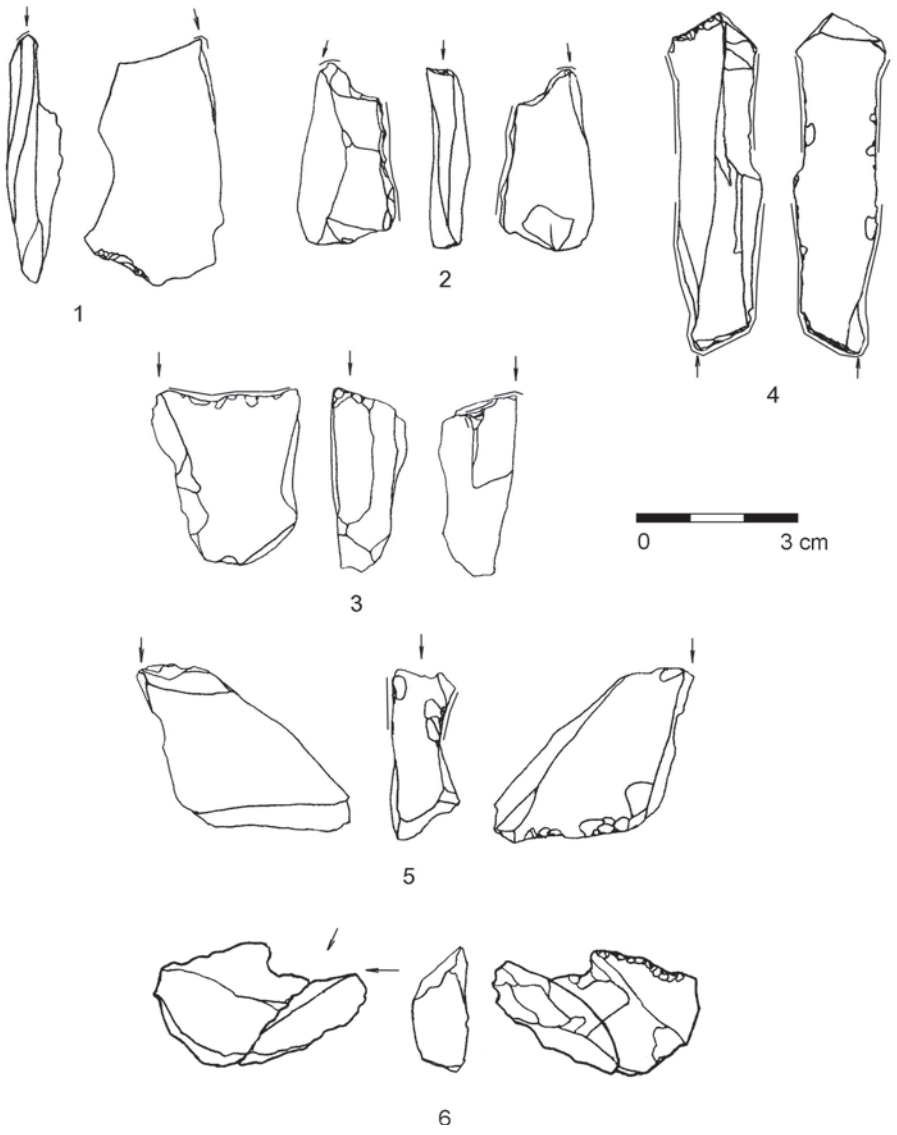

Fig. 2. Burins from Olbrachcice 8

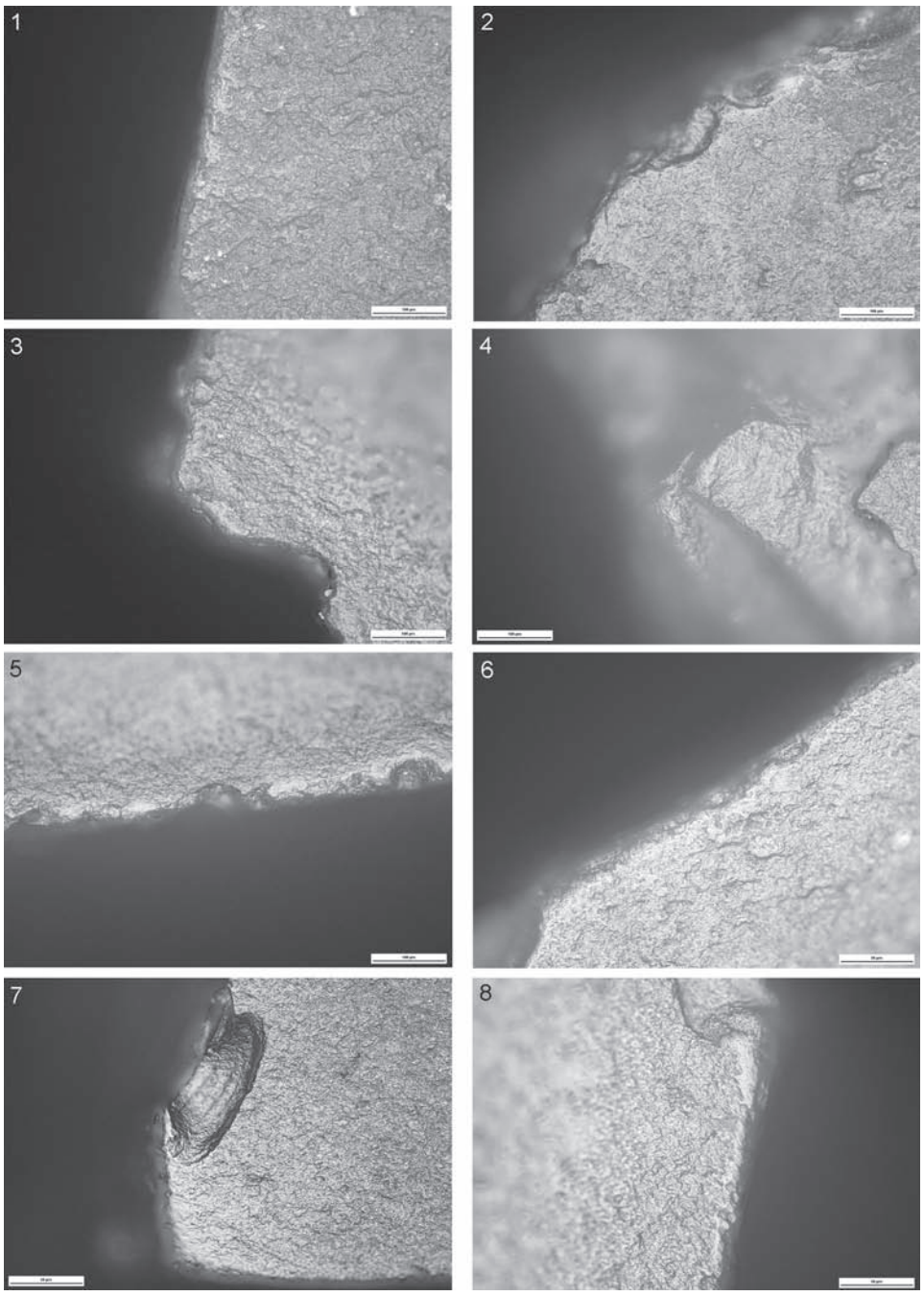

Fig. 3.
1 – use-wear polish on experimental *Zinken* perforator from scraping antler awl; 2-6 – use-wear polish on archaeological *Zinken* perforators from scraping antler; 7 – use-wear polish on experimental burin from incising antler; 8 – use-wear polish on archaeological *Zinken* perforator from incising antler

amined separately (*e.g.* Šajnerová-Dušková 2007; Petillion 2008). We do not know what types of stone implements were used for making particular bone or antler tools. I believe that some conclusions might be drawn from experiments combined with use-wear analysis of flint tools.

Microscopic analysis

A dozen complete Hamburgian concentrations were excavated by J. Burdukiewicz in the Kopanica valley, southern Poland (Burdukiewicz 1987, 1999; Burdukiewicz *et al.* 2007). Site no. 8 at Olbrachcice (Burdukiewicz 1984) represents the richest scatter and numbers over 5500 flint artefacts, including 53 burins and 49 *Zinken* perforators (together 26,7% of all retouched tools). *Zinken* perforators from Olbrachcice 8 were made from massive, mostly crested blades and blunt, slightly curved tips were mostly formed in the proximal part of blades by abrupt or semi-abrupt retouch (Fig. 1:1-9). Flake and blade burins were produced by removing at least one burin spall (Fig. 2:1-6).

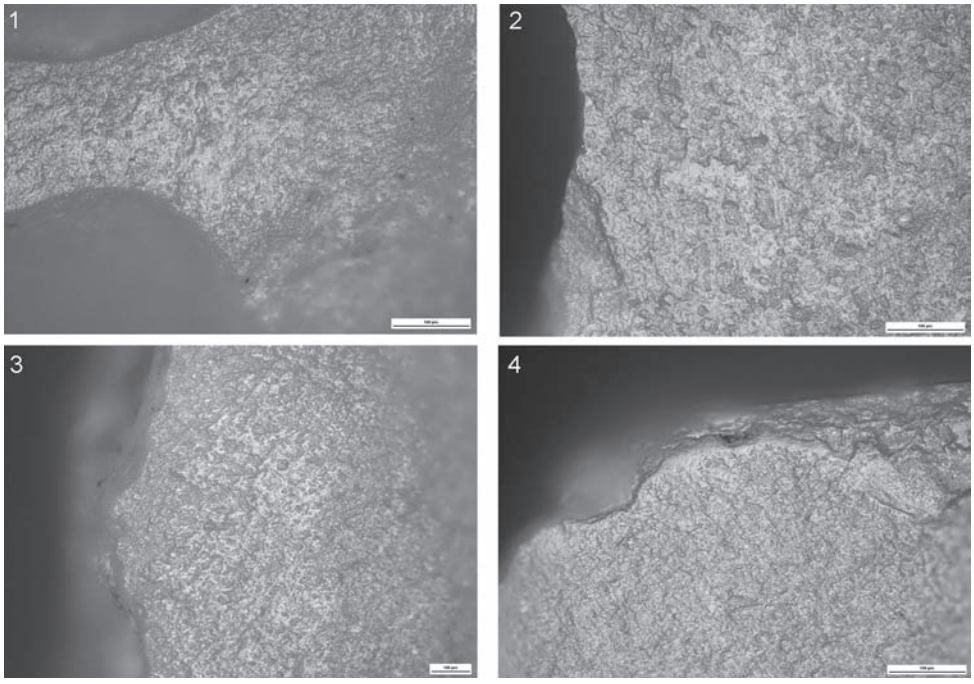

Fig. 4. 1-2 – use-wear polish on experimental *Zinken* perforator and blade from sawing antler; 3 – antler hafting polish on archaeological *Zinken* perforator; 4 – use-wear polish on archaeological burin from scraping animal hard material

Twenty one burins (on the unmodified end, with truncation and dihedral burins) and 31 *Zinken* perforators were selected for the macroscopic and microscopic observations in order to determine their function. The tools were examined using a reflected-light microscope at magnifications up to 57× and a metallographic microscope at magnifications 100-500×.

Microscopic use-wear traces were identified on 14 *Zinken* perforators (a further 8 specimens could have been used), mostly on the very edge of their tips or concave edges of tips, more rarely on the blade's edges. Moreover, a few *Zinken* perforators are broken (as a result of use?) and only curved tips were found during excavations (Fig. 1:10-12). Microwear traces are difficult to identify, but they mostly indicate the working of unspecified hard animal material. Traces of use (rounding and bright or matt polish) concentrated on one, concave edge of a tip (Fig. 3:2-6, 8). There are also step fractures that could have resulted from use or retouching (re-sharpening?) and it is not possible to differentiate between these two activities. Hafting traces were recorded on 3 implements (Fig. 4:3).

Microscopic traces of use were identified on 9 burins. Bright polish and scratches mostly appear on the tips and edges of burin facet, more seldom on the flake edges. Use-wear traces are characteristic for the working of antler, bone or unspecified hard material (Fig. 4:4). No hafting traces were recorded, only traces related to prehension on 1 implement.

Experiments

The main aim of the experimental program was to re-enact various methods of use of *Zinken* perforators and burins in order to test their efficiency in the working of antler, as well as to examine use-wear traces, their formation and dynamic. Since the working of antler was most probably done by men and required many years of training, all experiments were carried out by Marcin Diakowski, an archaeologist skilled in bone and antler working. Red-deer (*Cervus elephus)* and reindeer (*Rangifer tarandus)* antler and *Zinken* perforators, burins and blades knapped from erratic flint from Poland (Lower Silesia) and Germany (Rügen) were used in experiments. Antlers were softened by soaking in water before and during work.

In our experiments we adopted a method of antler working in the Final Palaeolithic described over 40 years ago by A. Rust (1943) and R. Feustel (1973) and improved by other scholars (for references see *e.g.* Petillon 2008, Bokelmann 1988). They described "groove and splinter technique" – a method of antler blades production. First of all a beam was divided into several parts, depending on a kind of a final product and tines were cut off (activities: sawing and breaking; tools: *Zinken* perforators, burins, blades; Fig. 5:1). Then parallel grooves 5mm wide and of various length were incised in a beam through compact layer along natural vessel canals (activity: incising; tools: burins, blades; Fig. 5:2-3) in order to

Fig. 5. Experiments:
1 – dividing antler beam (using a blade);
2-3 – groove and splinter technique (using a flint burin);
4 – obtaining antler blades;
5-8 – use of *Zinken* perforator;
5 – obtaining antler blades;
6 – making a projectile (scraping);
7 – making a haft (drilling);
8 – making a harpoon (drilling)

obtain antler blades (activity: wedging; tools: *Zinken* perforators; Fig. 5:4-5) – semi-products for making projectiles and awls (activity: scraping; tools: *Zinken* perforators, burins; Fig. 5:6). We also made hafts and harpoons from antler beams (activity: drilling and scraping; tools: *Zinken* perforators; Fig. 5:7-8). For microscopic analysis flint tools used in experiments were cleaned in ultrasonic tank.

Replicas of *Zinken* perforators were the most efficient tools for drilling holes (making hafts and harpoons) and scraping antler blades (making projectiles and awls). To obtain antler blades a craftsman needed to have a bone chisel or a different kind of wedge, because the tips of *Zinken* perforators were too thick and incising wider grooves would have been wasteful. *Zinken* perforators were robust long-life tools, but the concave edges of the tips used for scraping had to be re-sharpened from time to time. Microscopic traces of scraping and drilling are well observed on tips and are the most similar to traces on archaeological artefacts from Olbrachcice 8 (Fig. 3:1-6). *Zinken* perforators broke most often while holes were being drilled. It is worth to mention that using hafted *Zinken* perforators is more comfortable than using unhafted tools. Finally, we found *Zinken* perforators universal tools which can be used for various tasks when working with antler.

Burin tips are highly efficient for incising grooves (instead of sawing). Moreover they are much better than the edges of flint blades, because the tips do not get worn so quickly. The edges of burin facets are perfect for scraping antler blades (making projectiles). These two activities produce microscopic wear patterns that are almost identical to traces found on archaeological tools (Fig. 3:7-8; 4:4).

Discussion and conclusions

According to use-wear and experimental studies, *Zinken* perforators from Olbrachcice 8 were most probably used as "scrapers" and "borers" for antler working, which suggests that they were more or less multifunctional tools. Moreover one implement could have been repeatedly used for similar activity. Traces of hafting suggest curation – a phenomenon associated with mobile hunting groups. In this case the characteristic curve-shaped tips would be a result of re-sharpening. Thus *Zinken* perforators may represent formal tools that were used not only for making but essentially for repairing antler weapons. Burins from Olbrachcice 8 were most probably used for incising, grooving and scraping of antler. All analyzed burins are thick and irregular in shape, what could cause problems with hafting. Moreover, microscopic observations of 3 burin spalls, which were found close to burins, show similar traces of use. It means that burin spalls are the waste products of re-sharpening. Burins were produced, used and discarded at the same place.

Different traces of use observed on archaeological implements correspond with experimentally produced traces of incising, scraping and drilling of antler. It can be concluded from this study that *Zinken* perforators and burins from Olbrachcice 8 compose an actually complete toolkit for antler working. The large number of these two types of flint tools indicates that antler working was very important activity for reindeer hunters. It is possible that the whole process was performed at the site in Olbrachcice, including the preparation of semi-product, obtaining antler blades, the manufacture of tools and hafts, as well as repairing or broken antler weapons. Despite the fact that no antler artefacts were retrieved from this site, it can be suggested that hunters from Olbrachcice 8 made different antler items, that required such actions as scraping, incising and drilling (probably projectiles, awls, hafts and harpoons).

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