Bone Tool Production at Vésztő-Bikeri

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The transition between the Late Neolithic and the Early Copper Age in the Carpathian Basin at approximately 4,500 BC is an extremely interesting period to study because it is marked with many changes. Large tell sites are replaced by small, open horizontal sites more evenly distributed across the landscape. (Parkinson 1999: 130) Late Neolithic sites seem to have been occupied for long periods of time and archaeological evidence supports the idea that domesticated plants were an important part of their existence. ECA sites, on the other hand, show thin layers of cultural deposition with low intensity occupation. (Parkinson 2000: 15) These changes seem to indicate the adoption of a different type of lifestyle in the ECA. The evidence found thus far seems to say that this new lifestyle may have been more mobile with a higher dependence on domesticated animals.

One particularly interesting innovation found at Veszto 20 is an assemblage of bone tools that include bone points. The manipulation of bone is nothing new in the archaeological record. For nearly two millennia, humans and their ancestors have recognized the value of bones as tools. What makes this find particularly interesting is that they are the first bone points from this time period to have been found. Bone is an ideal medium in several ways. It is harder and more durable than wood but softer and more easily worked than stone. As such, bone provides a nice middle ground. The large number of bone tools found at Veszto 20 indicates that bone tools held a certain amount of importance in the everyday lives of the ECA people who inhabited this site. The main purpose of this paper is to provide a preliminary classificatory scheme based on the morphology analysis of the bone artifacts found after the 2001 excavation season at Veszto 20. The secondary purpose is to generate hypotheses as to the possible use, manufacturing techniques, and economic considerations possibly associated with this assemblage.

Bone Tool Analysis

The typologies listed below are based entirely on the morphologies of the objects and are not meant to imply function. In order to discuss function scientifically, one has to have evidence for functional use. Such evidence could be gleaned using magnification to examine microwear. Unfortunately, a microwear analysis is unavailable at this time due to limited time and access to high power magnification. When function is discussed below, it is in hypothetical terms only.

Before discussing the different classifications in detail, it is important to explain the terminology used in this paper. **Bone** refers to skeletal material from any animal and includes bone, antler, tooth, shell, and turtle shell. (Russell 521) A bone is considered a **bone artifact** when it shows evidence of deliberate alteration or use. Bone tools include manufacturing debris, preforms, ornaments as well as utilitarian tools. (Russell 521) A **point** refers to any object where it is hypothesized that this was the main working area of the tool. An **edge** is a characteristic longer than one millimeter and one millimeter or less in width. An edge is formed when two surfaces terminate along the same line. This means that an edge can be measured in degrees according to the severity of its angle.

A **surface** is an area greater than one millimeter in length and width that shows evidence of having been worked. A **facet** refers to the subdivision of the surface of a tip or point. A **crest** or **crestation** is a characteristic appearing as a slight rise along a line on a surface. It is similar to an edge but is usually more blunt. An example of this can be found on pointed tools that were probably used as projectile points. These points normally exhibit to varying degrees some form of crestation from the tip downward on the surface toward the base of the tool. The **base** refers to either the area opposite the point where use occurred or the place where attachment to another object aiding in use is most probable. The **tip** is the area opposite the base, which in pointed tools usually contains the point and where there are no diagnostic bases that would allow classification in another category. A **gouge** is a characteristic manifested as an elongated indentation or groove on a surface. A **shaft hole** is a circular indentation that extends through the tool but that does not exit opposite entry. A **haft** is piece of narrow, thin bone that protrudes from the base of the point and which was probably used for attachment purposes.

Points

Tip

This is a type of point that is fragmented and contains no diagnostic features associated with the base of the instrument (i.e. shaft-hole, haft). It may be possible to further divide this category according to angle measurement of the tip. The tips seem to be either wide or narrow. Most of the points have two definite edges and display cresting to various degrees. These tips are probably the broken ends of what was a one time an impact point. They may have broken off during use or at any time during the post-depositional process. It may be possible to determine if these points are impact fractures by measuring each of the broken tips. Perhaps impact fractures occur at a specific length on the tip due to the physical construction of the points. Thirty-five tips were

Conical Tip

There are six bone tools that have been worked to points and that have more than two surfaces. On average they have five surfaces and all of them have a shaft hole. Two of these pieces have four surfaces. These holes extend inward into the interior of the tool approximately ten millimeters. Interestingly the thickness of these tools is all six millimeters with the largest being 6.8 mm and the smallest 6.0 mm. These tools may have been used to punch holes through a worked skin. The thickness of them makes these tools less likely to break than arrows or more slender multi-faceted points.

Grooved Tip

This is an interesting category because there is only one find that contains these defining characteristics. Instead of having two edges like a regular tip fragment, this piece looks as if the sides have been inverted. This creates two facets on either side with an inside edge. It does come to a point at the tip so that may have been used in a needle or awl-like fashion. The grooves may have been created for a specific purpose or they may have been viewed as decoration.

Long, Narrow-Bodied Point

There are only three pieces of bone in this category. They are needle-like in appearance although there is no eye present. The points usually have multiple surfaces but the narrowness of these artifacts is the defining characteristic and warrants them being placed in a separate category from other tips.

Tear Drop Points

These points are generally wider than 10.0 mm and tend to flare out from the haft. They exhibit pronounced cresting and generally have a notch on both surfaces where the haft meets the body of the point. One flake filed in SF 66 is burnt so that the color is black. This is the type point for this category. These points were probably used in hunting activities as projectile points. The notch indicates that they may have been hafted to a wooden pole. There are at least twenty-two pieces in this classification.

Narrow Triangle Points

These pieces all show evidence of hafting and exhibit less flare from the haft than the tear drop points. They are also generally smaller in size than the tear drop points. The angle of the tip on these points is smaller than that of the tear drop points, which tend to have wider angled tips.

Rounded-Edged Points

The defining characteristic of these points is that they have rounded edges and are triangular in shape. Instead of two surfaces meeting along a linear edge, they meet along a rounded edge. One of these points, SF 66, EU 2-121, has evidence of hafting. These points may have been used in cutting rather than projectile purposes. The rounded edges may be a product of wear. There are five bone tools in this category.

Square-Edged Points

There are four pieces in this category and all of them are medial fragments. They have been classified as points because the angle of the edges seems to indicate that if they were complete they would have been pointed. In this case what would normally be called an edge is actually another very thin surface.

Knife

There is only one piece in this category. It looks as though the tip and one edge are worked. This tool has been made from the long bone of an animal and the shaft is visible. It is difficult to determine whether or not it was used in slicing without a thorough microwear analysis. This piece is filed as SF 60.

Fragments

Double-Edged Thin Medial Fragments

The characteristics defining this group of tools are that they have two edges and are less than 2.0 mm thick. They are missing the tip as well as the base. Some of the fragments in this category may actually belong in the haft fragment category. This misidentification occurred as a result of coming to a realization too late to be included in this paper. They may be the very ends of hafts. There are eight pieces in this category.

Double Edged Thick Medial Fragments

There are thirteen pieces of bone that fall in this category. These pieces are greater than 3.0 mm thick and are missing tips and bases. Many exhibit varying degrees of crestation. It seems as though these pieces were created due to post-depositional stresses and were probably at one time the midsections of complete impact points.

Concave Fragments

The defining characteristic of these fragments is that one of the surfaces is concave. They are predominantly medial fragments that have rounded edges. These pieces could have been part of a larger instrument that may have been used in burnishing pottery. A microwear analysis would be very useful in determining whether this is true or not because pottery burnishing may leave specific marks on bone due to the temper in the material. There are four pieces total that fit into this category.

Haft Fragments

This category contains a large number of pieces and if all of these are indeed truly fragments it indicates that there were probably a lot more complete tools before deposition. These fragments are normally very thin and narrow. There is no doubt that some of them have been classified in error as unidentifiable and as double-edged thin medial fragments. This group can largely be recognized by the shape and angle of the edges. Sometimes pieces from this group actually contain the broken ends of the base. Hafts have been theorized as aiding in the attachment of a projectile point to a shaft of some sort. There are forty-one have fragments.

Single-Edged Unidentifiable Fragments

These fragments have no identifying characteristics except for one edge. They usually contain evidence of cresting but no actual crest. The pieces in this group look as though they would have been part of an impact point before breaking. There are thirty-four pieces in this category. Most come from EU 2-121.

Unidentifiable Fragments

These bones have been worked in some way but because of their fragmentary state cannot be placed into a defining category. Most of these pieces are small and less that 5 mm in length and width. There are seventy-five pieces in this category with over half originating from EU 2-121. Some of these pieces may not actually be worked pieces. This unit contained a very large number of bone tools. Because of this, I began to place all bone from this unit into the worked bone. This category should definitely undergo further analysis.

Shaft-Hole Medial Fragments

There are ten pieces that fit into this category and were probably at one point part of a complete shaft-holed point. The tips of these pieces are missing. They would probably be better classified in the category of shaft-holed points because it seems obvious from the bases that this is what they were during use.

Hyper Porous Fragments

This is a difficult category to define because it is not based on shape. Some of these pieces may not even be worked bone. They are labeled as hyper porous because it is possible to see the matrix of the bone. These bones may actually antler that was used in the producing tools.

Resin

This is a special separation because these pieces, although they may be completely different in shape, are common in that they bear traces of resin. There are three pieces in this category and they come from SF 66, 47 and 65. These pieces provide direct evidence that bone tools were attached to other implements. They could definitely be chemically analyzed to determine what the resin was made from. The problem with this is that there is only a small amount and any chemical analysis would likely destroy the resin.

Cut-End

The defining characteristic of this category is that each piece seems to have an end that was manipulated by cutting. These tools might show the beginning of the tool making process. They may have been cut in order to prepare the bone for manipulation. There are only three pieces in this category.

Experiments

There are many ways in which bone can be worked. According to Russell, “The simplest is not to alter it at all but merely to use the bone in its unmodified state.” (541) This implies that fracturing provides the most efficient method for making tools. The tools at Veszto 20, however, have definitely undergone severe modification beyond simple fracturing. Russell goes on to explain that shaping, “can be achieved by fracture (including splitting), flaking, cutting (including grooving), scraping, chopping, grinding, perforating, or frequently by a combination of these methods.” (541) The experiments discussed in this paper focus on the efficiency of bone preparation prior to and during the production of tools. Boiling and defleshing with a metal knife are compared as preparation processes. Splitting and grinding are compared as methods of shaping bone. Unfortunately, antler was unavailable for study. Instead the author used pig ribs bought from a local butcher. Although there are many problems associated with this methodology it is the only viable avenue of exploration at the time this paper was written.

Because bone is a porous material, my hypothesis is that boiling would be the preferred method of manipulation. The heat softens the bone temporarily just long enough to aid formation. The manufacturing process takes place in several steps to allow for contraction and expansion due to the heat. The bone is first defleshed and boiled. After boiling, the bone is taken out and immediately worked into the first stage of preparation. This might involve taking away unnecessary bone and leaving the core from which the tool is eventually formed. After the completion of this step the bone dries out again and is replaced in the boiling water. Once the bone is boiled again to a workable softness it is taken out and worked down into a crude shape. At this point it is allowed to dry completely before being further soaked. The last step involves working the finer details of the bone tool. At this stage it is imperative that the tool remain warm and saturated.

The water serves several functions in this hypothesis. First it softens the bone in preparation for manipulation. Secondly, it provides a lubricant and acts as glue when working so that shaping is more controlled and the possibility of error reduced. The water and the boiling in general give the maker a finer control over fracturing techniques. Allowing the bone to expand and contract while working lets the material adjust to the manufacturing process. Each time the bones dry and contract the work that was performed upon it while wet is reduced to the form it will take during utilization. It is during this dry sate that the toolmaker can access the progress of her work. In order to test this hypothesis I conducted a series of experiments in order to compare this method with various other techniques of working bone.

Boiling

The first step in the process is to prepare the water so that it is boiling when the edible meat has been removed. The second step is to remove the edible meat. This was done using a metal knife and took approximately six minutes and thirty seconds. The bone was then place into the boiling water. The bone remained in boiling water for thirty-eight minutes. A stopwatch was used in order to time how long each step took. At the end of the thirty-eight minutes, the little remaining meat film was cooked on the bone and in order to process it further this would have to be removed with a knife.

Scraping With a Metal Knife

This method took about twenty minutes before the bone was ready to be shaped. While the bone was being scraped, however, it fractured due to downward pressure. Five minutes was spent removing the edible meat. About fifteen minutes of the entire twenty were spent stripping off the think layer of film holding the meat to the bone.

Fracture (Splitting)-With Boiling Water

The first step involved scraping the bone until very little to no meat was left remaining. Then the bone was boiled for half an hour and then taken out. After being taken out of the water, the author used a metal knife to split the bone lengthwise to expose the entire shaft. This is difficult because ribs are curved. I wanted to use the curvature inherent in the bone in order to burnish pottery made by our visiting guest lecturer Kostalena. The tip of the knife was inserted into both the proximal and distal ends of the rib and worked towards the opposite end. In order to test my hypothesis as to whether heated water aids in controlling fracture, I placed the bone back into the boiling water once during the process when it appeared that the bone had become too dry and fracturing along a preconceived line became more difficult.

Fracture (Splitting) – Without Boiling Water

Again the first step in this process involved scraping the meat and the thin, fatty attachment off of the bone. Then I took a metal knife and proceeded to split the bone lengthwise in the same manner described above. The main difference between these two methods is the presence or absence of water. I was unable to control the fracture in this experiment and the bone broke laterally midway done the rib.

Grinding

The first step involves defleshing the bone with a metal knife removing all edible meat and the thin, fatty meat attachment. This took only five minutes. Afterwards I rubbed the distal end against the sidewalk in a back and forth motion. This produced a worked point in about three minutes.

Conclusions

It seems the most efficient way to produce a worked bone tool is to scrape the meat off with a metal knife and then grind it down. A piece of sandstone has been found that has definite striation marks on it. These marks could be from something other than bone and it might be useful to conduct a chemical analysis in the future. Scraping the meat off and then boiling, according to these experiments is the least efficient method for preparing.

Acquiring Raw Material

Determining how the raw material used in the production of bone tools was acquired could shed light on various aspects of the daily lives as well as the importance of bone tools at Veszto 20. There are four ways in which bone can be acquired:

1. Killing a domesticated animal
2. Hunting wild animals
3. Scavenging/ Accidental Discovery
4. Trade

It seems unlikely that a group of people with domesticated animals would kill one simply to fulfill the demand for bone tools. If bone tools were made from domesticated animals, it would almost certainly be of secondary consideration to the other resources gathered from the slaughter. One reason for t his is that domesticated animals are expensive in terms of time and energy expenditure. Ethnographic studies have shown that slaughtering a domesticated animal is a last resort in many cultures dependent upon domesticated animals. Of much higher importance to pastoralist societies are the secondary products such as milk and blood acquired while the animal is still alive. Pastoralist societies are known for their extremely mobile lifestyle.

Evidence of short-term occupation at Veszto 20 includes a thin cultural floor. There may actually be two or more living floors separated by a thin layer of non-cultural stratification but this is difficult to determine due to the fact that there is hardly any difference in soil color. Because a complete faunal analysis is unavailable it is difficult to tell what animal has the largest MNI. The available evidence indicates that sheep and goats have the highest number of bones on the site. Based on my own experience excavating in block two, there also seems to be a high number of cattle remains. Whether these are wild or domesticated has yet to be determined. It is almost certain that if the inhabitants of Veszto 20 had sheep that they were domesticated and that they came from the south because these animals are not indigenous to the area. The evidence found thus far seems to indicate a settlement with higher mobility when compared to their Late Neolithic predecessors. As noted in Parkinson's dissertation, Siklodi writes, "In the course of hunting, attention was subsequently focused on rounding up young animals, and thus herds were increased considerably by the Aeneolithic Age, as a consequence of which stock-breeding and pastoralism grew in importance. (133) While there is no evidence of full scale pastoralism it doesn't seem far fetched to hypothesize a semi-pastoralist society combined with hunting, gathering and horticulture or small scale agriculture. Given that the Early Copper Age is associated with a secondary products revolution coupled with evidence of short term occupation, it seems unlikely that domesticated animals would have been the first choice for raw material in the production of bone tools at Veszto 20.

It seems far more likely that bone tools would have been made from the remains of wild animals that had been hunted**.** The availability of bone fluctuates with the seasons. Rackham notes, "Mating, migration, and birth generally take place during specific seasons, and the cycle of feeding and the availability of food are also seasonal in many parts of the world." (12) Late summer and early fall provide the most food in terms of hunting activities and thus resources for bone tools while winter and spring are the least plentiful seasons. Even though bone availability may have been limited by season, it was still more readily available on the Great Hungarian Plain.

Because a majority of the bone tools have been found in block two, it would be very useful to conduct a thorough analysis on the bones labeled unworked and compare them to those found in block three as well as future blocks to be excavated. If the inhabitants of Veszto 20 made bone tools from non-domesticated animals inside or near the structure excavated at blocks two, I would expect to find a higher percentage of these bones in this area as compared to other areas on the site. I would also expect to find certain animal bones over others due to the transportation of wild animals carcasses back to the living area. White suggests that hunters at a kill site would carry off animal parts of greatest utilization value. Rackham states, "Theoretically the skin, probably with feet attached, the rib cattle and the upper limb bones would be taken away with other meat stripped ROM the vertebrae and rump." (36-37) If this pattern of skeletal remains is found at

Veszto 20 of a particular animal it would indicate that this animal had been hunted rather than domesticated. Further if a higher number of bones or a particular bone from this animal(s) are found in block two, it would point towards this area as a production site.

Another method of bone acquirement is scavenging or accidental discovery. This doesn't seem out of the question according to the results of my own bone experiments. As stated earlier, the most efficient method of manipulating bone is with a combination of fracturing and grinding. Accidental discovery of a carcass would leave at least some fractured bones that would be suitable later for worked tools. It doesn't appear likely that this would have been a primary method of acquiring raw material because of other subsistence strategies associated with the site.

Yet another method by which raw material can be acquired is through exchange. This would have been necessary for some more exotic bone material such as ivory. There is little evidence that bone was acquired from outside sources and there was probably no need. There may be, however, evidence of exchange regarding other materials. This would have been particularly true in the lithic area more so than the bone. Stone may have been preferred but the lack of it at this site may have been the catalyst for the utilization of bone. The fact that so many bone tools were left behind indicates that it was an easily acquired local resource. Perhaps the lack of stone in this region led the people who lived here to become experts in bone manipulation. If this is the case, bone tools may have been objects exchanged for other materials. Stone being a precious material in this region would not have been left behind so it is not surprising that so little lithic material has been found at the site.

Conclusion

The varied types of bone tools found at Veszto 20 provide only a small glimpse at what must have at one time been a rich cultural assemblage. Even though many of them are fragmented, it is still possible to tell what they were when they were complete. The sheer number of bone tools in relation to the other artifacts found here points towards easy access to raw bone material. Although this raw material may have been acquired in a variety of ways, it seems most likely that they used the bone acquired from hunting rather than domesticates. This in combination with other evidences such as house size and site organization lead me to believe that this site was occupied for a short period of time.

According to the experiments, the most efficient way to create a bone tool is through a combination of scraping and grinding. This is only a suggestion as there is no overwhelming abundance of evidence linking the results of the experiment to the bone tools found at Veszto. Future research into this bone tool assemblage should concentration on microwear analysis. Nerissa Russell's analysis of the bone tools at Selevac provides a good example by which to guide future work in this area.

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