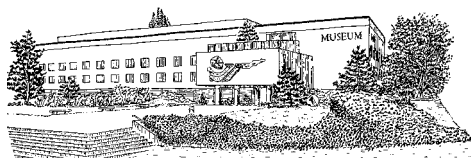


# R E V U E D E PALÉOBIOLOGIE

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## Skating with Horses : continuity and parallelism in prehistoric Hungary

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### Abstract

The prehistory and history of the Carpathian Basin have long been treated as a series of mostly discontinuous cultural events triggered by population movements largely from the East and South of an ambiguous nature. Twenty years of research into the nature of prehistoric bone working in Hungary, which lies at the center of this geographic region, has begun to reveal spatial and temporal continuities in bone tool. Some of these continuities, cross-cutting modern precepts of archaeological cultures, are found over very wide areas, some are limited to regions within the Carpathian Basin, while others clearly reflect continuous manufacturing traditions within a limited territory.

The very special case of bone skates will be examined here. On the one hand, there are skates from the Early and Middle Bronze Age in northwest Hungary that seem to mark continuity in their manufacturing tradition lasting over 1000 years. On the other hand, there are bone skates from the Late Bronze Age, Roman Period Sarmatian and later, Medieval contexts which display a similar use of horse bone to make skates but which represent less social continuity reflected in manufacturing traditions than parallel responses of disparate cultural groups to identical environmental and cultural pressures. This paper seeks to explore the question of both continuity in manufacturing traditions of bone skates in the Bronze Age of western Hungary and the broader relationship between the exploitation of horse in humid plain environments, apparently a necessary but not sufficient variable effecting the use of bone skates in both prehistoric and historic periods.

### Key words

Carpathian Basin, skates/runners, manufacturing tradition, Equid skeletal elements.

### Résumé

**Patiner à cheval: continuité et parallélisme en Hongrie préhistorique.**- La préhistoire et l'histoire du Bassin des Carpates a longtemps été considérée comme une succession discontinue d'événements culturels provoquée par des mouvements de population depuis le sud et l'est dont l'origine est encore mal comprise. Vingt ans de recherches sur la nature du travail préhistorique de l'os en Hongrie, qui se situe au centre de cette région géographique, ont commencé à montrer des continuités spatiales et temporelles dans les outils en os. Certaines de ces continuités débordent les découpages artificiels des cultures archéologiques, s'étendant sur de vastes territoires ou se limitant à des régions au sein du Bassin des Carpates, alors que d'autres reflètent clairement des traditions artisanales continues circonscrites dans un petit territoire.

Cet article examine le cas très singulier des patins en os. D'un côté, on trouve des patins datés du Bronze ancien et moyen du nord-ouest de la Hongrie, qui semblent montrer une continuité de fabrication de plus d'un millénaire. De l'autre, il y a les patins en os de l'âge du Bronze final, de la période romaine (Sarmatien et postérieur) et du Moyen Age qui tous sont fabriqués dans des ossements de chevaux, sans toutefois traduire une continuité des traditions artisanales entre les sociétés, reflétant plutôt une réponse identique à des contraintes naturelles et culturelles communes. Cette analyse permet d'examiner la question de la continuité des traditions de la fabrication des patins en os à l'âge du Bronze en Hongrie occidentale, de même que celle des liens avec l'exploitation du cheval dans les plaines humides, qui est apparemment une variable nécessaire mais pas suffisante, conditionnant l'utilisation de patins en os aux périodes préhistoriques et historiques.

### Mots-clés

Bassin des Carpates, patins, lame, tradition de fabrication, os de cheval.

### INTRODUCTION

The prehistory of the Carpathian Basin has long been treated as a series of largely discontinuous cultural events triggered by ambiguously defined population movements out of various regions, predominantly to the east and south. Archaeological cultures in Hungary have traditionally

been defined largely on the basis of stylistic differences in ceramic assemblages between groups of sites. Thus, these cultures represent modern heuristic constructs that by themselves define pottery type distributions rather than real prehistoric social units.

Bone tools, as opposed to ornaments made from osseous materials, represent classes of objects that tend to change

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very slowly over time. Most of these tools and their manufacturing traditions are closely tied to hearth and home. They were never intended as objects of display, subject to rapid changes in fashion, or to signal social status. Such ornaments and elaborate implements are more likely to be copied and used as social boundary markers, to emphasize social distinctions. Twenty years of research into the nature of prehistoric bone working in Hungary, in the center of the Carpathian Basin, has revealed certain continuities in bone tool manufacturing over long periods of time in areas of various extent. Some of these continuities, cross-cutting modern, typochronological definitions of archaeological cultures, are found over very wide areas: some tool types were made throughout broad regions within the Carpathian Basin while others clearly reflect continuous manufacturing traditions within limited territories. What these territories actually represent in terms of ancient social boundaries is neither within the scope of this paper or a subject to be reasonably tackled using only a single source of data. Skates and runners made from horse radii, the earliest such finds in Europe to date, represent a clear example of a persistent local manufacturing tradition and use. Such runner/skates, although not very common, are nevertheless regularly found on Bell-Beaker culture sites of the Csepel-Háros (Fig. 1/1) group dated to around 2500 BC cal. Sites of this group are found closely scattered along both banks of the Danube River in the vicinity of Budapest. Based on similarities with ceramic types at earlier sites in Western Europe, it appears that the people producing these characteristic bell-shaped ceramics entered Hungary from the west although, unfortunately, no sites of comparable size or intensity of occupation are known elsewhere. The prehistoric site of Albertfalva (No. 43. 573), is located in the southern suburbs of Budapest on the right bank of the Danube river on what was an old channel (Fig. 1/2) This is a settlement of 12 “boat-shaped houses” characteristic of the Csepel-Háros group, with passageways between them and their associated pits and workshop areas. Altogether, 4 fragmented bone skates were found at this rural settlement.



Fig. 1: The map of Northwestern Hungary with sites mentioned in the text: 1 = Csepel-Háros, 2 = Albertfalva, 3 = Százhalombatta, 4 = Törökbálint, 5 = Lébény.

Very similar skates/runners have come to light in the region. These objects are similar in terms of the raw material chosen and their use wear striations, although their manufacturing technique seems somewhat less elaborate. The Middle Bronze Age tell site of Százhalombatta-Földvár overlooks the Danube River some 30 kilometers downstream (Fig 1/3; CHOYKE *et al.*, 2004). Altogether five skates or sled runners made from cattle and horse radii were recovered from the Middle Bronze Age Vatyá culture (1800-1500 BC cal) levels at this fortified tell site. Almost 1000 years separate these two sets of finds. Nevertheless, these sites are all located within the same geographic region and it is perfectly possible that manufacturing and use traditions from the earlier Bell-Beaker group survived and were incorporated into the local Vatyá cultural entity. The early finds are all made exclusively on horse radii. These were attached to the feet by straps passing through large holes drilled through the toe or what would be the distal epiphysis of the radius (Fig. 2-3). The wear pattern on the dorsal surface comprises a flat facet with longitudinally running uneven striations.



Fig. 2: The distal fragment of an Early Bronze Age horse radius skate from Albertfalva (No. 43. 573) (Scale bar: 50 mm).



Fig. 3: Side view of the same Early Bronze Age distal fragment from Albertfalva (No. 43. 573) (Scale bar: 50 mm).

By the Middle Bronze Age in the same region, the hole for the binding strap is no longer used although one of the objects, more probably a runner, from Százhalombatta has holes drilled into the posterior surface of the radius diaphysis near both the proximal and distal epiphyses, presumably for sled legs (Fig. 4). The wear facet on the anterior surface of these five skates is identical to that found on the skates from the nearby Bell-Beaker Csepel-Háros sites and the wear patterns on the skating facet are also the same (Fig. 5). What is striking is that although both cattle and horse bones were selected for skate manufacture at this later site, there is still insistence on using the radius despite its relative clumsiness compared to cattle and especially horse metapodia. Thus, in terms

of raw material selection, a good argument can be made for continuity in this particular manufacturing tradition. What this tradition reflects in terms of social continuity over the intervening millennium needs to be clarified using other supporting data. However, the very fact of this persistence in choosing radii should be a wake-up call for archaeologists to start asking questions about cultural continuity in their material. The skates from the Bell-beaker sites and this particular Vatia culture site, apparently, represent the earliest horse bone skates and runners known from Europe to date.

Bone skates reappear in totally different forms and more familiar shapes in the Late Bronze Age, Sarmatian and Medieval times in Hungary. The interpretation of this

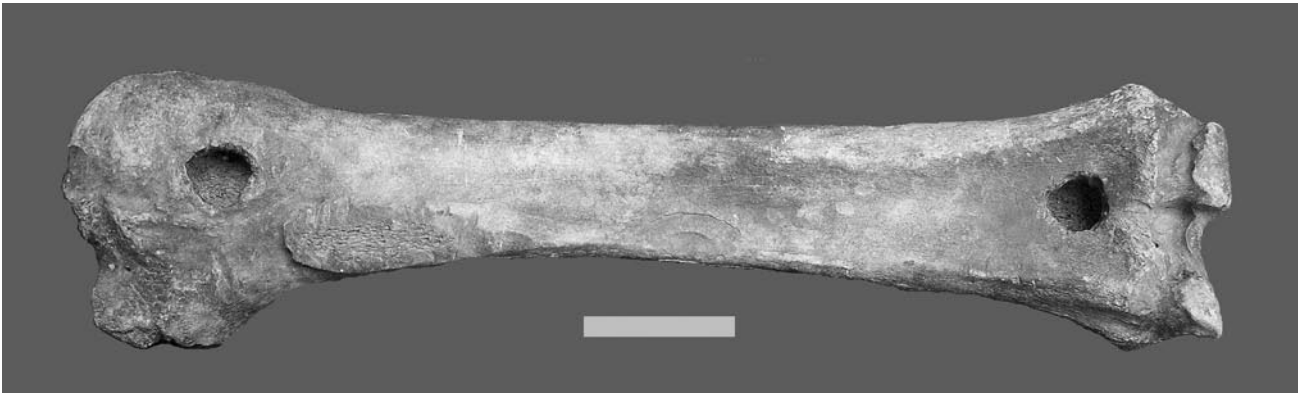


Fig. 4: Dorsal surface view of Százhalombatta–Földvár Middle Bronze Age horse radius runner with holes for sled legs (Scale bar: 50 mm).



Fig. 5: Typical wear facets on the surface of a Middle Bronze Age horse radius runner (upper object) and cattle radius skate (lower object) from Százhalombatta–Földvár.

material must be very prudent as well, since it is certain that other processes besides continuity in manufacturing traditions may create parallelism in form and choice of raw materials. The question of cultural continuity versus the larger relationship between the use of bone skates and exploitation of horses in humid plain environments will be discussed later in this paper.

### A SHORT REVIEW OF BONE SKATE RESEARCH

Prehistoric bone skates and runners represent an unusual type of bone artifacts whose widespread use, according to Ranke (quoted by HERMAN, 1980: 43), survived well into the 19<sup>th</sup> century: “*Schlitten deren Kufen man nicht mit Eisen, sondern mit Knochen unterlegte, sogenannte Beinschlitten, waren im Anfang des Jahrhunderts [19th] vielfach und weitverbreitet im Gebrauche und sind es zum Theile Heute noch*”.

Nevertheless, bone skates have not yet been encountered in Neolithic assemblages by the authors of this paper in spite of the sophistication of the bone/antler industries of that long, well-represented period. Although the use of bone skates in Hungary was earlier reported from Bronze Age sites (MACGREGOR, 1985: 143) these data were from insecurely dated find complexes. The bone skates and runners from well-dated, unmixed Early and Middle Bronze Age assemblages differ sharply from skate types following them in the Late Bronze Age and later periods in Hungary which are mostly made from horse metapodia as opposed to horse and later cattle radii. The Early Bronze Age skates/runners have holes to bind the feet onto to the skates running through the distal epiphyses in a medio-lateral direction and one of the Middle Bronze Age objects has holes on its palmar side suggesting that this artifact may have been used more as a sled runner (see Fig. 4). The ends of these early radius skates are blunt, not modified into points with upswept ends as in later periods in Hungary. This means that they must also have been propelled differently from later historic period bone skates. It is not clear whether the skates were used on both feet or singly. Neither is it clear how the skaters would have propelled themselves along the ice. Altogether both the Early Bronze Age and Middle Bronze Age skates are rather clumsy.

Finds of bone skates have been reported on the Middle Bronze Age Mad'arovce settlements of Veselé and Nitriansky Hrádok (FURMÁNEK *et al.*, 1999: 145). The drawings appear to indicate that these skates were made of horse radii drilled medio-laterally just above the distal epiphysis. There also seems to be a hole through the proximal end of the diaphysis on the posterior side (FURMÁNEK, 1999: fig 68.35, 43). This fact as well as more recent finds have brought into question whether all are actually skates or runners (see Endnote).

Probably, because these early skates were made from

a larger, less compact long bone, the skates themselves were less resistant to breakage so that only a few complete specimens have been found to date. In addition, sandy soil conditions at the Bell-Beaker sites do not favor the preservation of diagnostic bone surfaces. Nevertheless, all these early specimens display the coarse use wear consistent with contact with ice (Fig. 6). There are no finds yet of specimens that appear to have been newly made or blanks, broken during manufacture.

Most skates/runners must have been discarded off-site or on-site after irreparable damage. None of the skates, however, come from find contexts where the two parts of the skate were found together suggesting that after they were thrown away, external taphonomic factors such as subsequent village landscaping, animal damage etc. played a significant part in their final deposition.

Several hundred years were to pass before prehistoric populations in the same local region near Budapest again used bone skates to get around in the winter. These objects, however, represent two totally different types from the earlier specimens. The skates come from a chance find in a Late Bronze Age pit in Törökbálint near Budapest (Fig. 1/4), discovered during a rescue excavation. The find comprised a matching pair of skates made on small Equid metacarpal bones and what has been interpreted as a sled runner made from a red deer (*Cervus elaphus* L., 1758) metatarsus. The pair of skates had a complex binding technique with multiple holes through the sides for leather straps and a hole through the proximal, “back” end and another crudely cut hole on the palmar surface of the diaphysis below the proximal epiphysis. The distal end was carved to sweep up, exploiting the sagittal crest of the epiphysis. Wear was, more or less, even down the length of the skates. These two skates, obviously a pair, were not worn to the same degree suggesting that one was much newer than the other and was possibly a replacement for a broken skate. The larger runner was made from a complete red deer metatarsus with numerous binding holes and a very narrow skating facet. It is far too long and narrow to have been used as a skate (OTTOMÁNYI *et al.*, 2005).

Beyond the Budapest region, similar Late Bronze Age, Urnfield culture (an early phase), skates have been found in closed pit contexts during rescue excavations on the M1 motorway near the city of Győr. The skates thus, date to between 1200-1000 BC. A complete skate, very similar to the Törökbálint skates, comes from Feature 100 at the site of Lébény-Kaszás-domb (Fig. 1/5) and now on display in the Hanság Museum in Mosonmagyaróvár. There is only one binding hole through the toe section of this skate. The hole on the palmar side is elegantly carved out in the form of a rounded cross. On this skate the sagittal crest of the distal/palmar surface was also carved to sweep up. The wear on the skating facet was much more extreme towards the proximal, “rear” half of the skate with the front of the facet almost rounded and polished. Feature 145 from the same excavations contained the fragment

of another skate with the proximal part of the horse metacarpus retained while another skate fragment comes from another pit context.

A skate-like find was reported at the late Bronze Age site of Šarovce in Slovakia, dated to the Tumulus culture period (NOVOTNÝ & NOVOTNÁ, 1981: 237). They report finding a fragmented skate or, more likely runner, made from a cattle radius with three vertical holes through the proximal epiphysis and a skating facet on the anterior surface (NOVOTNÝ & NOVOTNÁ, 1981: 244-245). The authors also mention older examples from the Middle Bronze Age in the region

Simple bone skates based on horse metapodia have been found regularly on sites coeval with the Roman occupation, especially from the AD 3rd century onwards, east of the Danube in the so-called Sarmatian *Barbaricum* on the Great Hungarian Plain. Bone skates are hardly ever found in the territory of Pannonia occupied by Roman forces, west of the Danube. From this period similar skates, mostly without binding holes, all have upturned toes and facets with striations consistent with skating on ice on their dorsal surfaces. They are similar as well to skates found later on Medieval sites elsewhere in the Carpathian Basin (CHOYKE, 1989: 626). These types of skates are well known in the archaeological literature elsewhere in Europe (BECKER, 1991; MACGREGOR, 1985; KAVÁNOVÁ, 1995; KÜCHELMANN & ZHIDAROV, 2005). Most provocatively, this style of skate manufacturing has been found at contemporary sites outside the province of Pannonia, in Austria and must represent the same technological traditions (STOPP & KUNST, in press).

## RAW MATERIALS

The selection of raw materials is an important, culturally idiosyncratic step within the manufacturing continuum, related both to function and stylistic choice (CHOYKE, 1997: 66). Bone, in general, is a solid and resilient material that is resistant to high pressure, but can be relatively easily worked. Large ungulate metapodia are an evident, apparently logical choice for the purpose of manufacturing skates for at least three reasons:

The shape of large ungulate metapodia is straight, flat with thick walls. This results in a strong structure of almost geometric regularity that needs little modification for producing skates. Thus, *later* skates all tend to be made from this skeletal element with rare exceptions (KARÁNOVÁ, 1995: 251; plates 7-8). In the Carpathian Basin, almost all known skates from the Late Bronze Age onwards are made from horse metapodia, although bones of other species occasionally show up, at least elsewhere in Central Europe (KARÁNOVÁ, 1995: 251). The use of cattle and particularly horse radii in the Early and Middle Bronze Age may be regarded as a culture specific manufacturing tradition, perhaps representing a separate, early technical innovation later abandoned in favor of

the more effective skates made from horse metapodia. Nevertheless, in the two earlier Bronze Age periods, horse bone seems to be preferred as the raw material for this particular tool type. Otherwise horse bone is virtually never used to produce bone implements in the rest of the worked bone inventory from either Albertfalva or Százhalombatta! This possibly argues for some kind of close cognitive relationship between skates and horse exploitation, even in these early periods.

Another favorable property of bone was described by Olaus Magnus (I/25, 1976: 57), the 16th century archbishop of Uppsala: “bone skates are not hindered or limited in their travel by frozen droplets, which ... rise from the pores of ice, the same way as is the case with iron ... no lubrication can be as good for iron as the grease on the bones of deer or cattle which have a slippery quality by nature”. MACGREGOR (1985, 144) has suggested that bone skates with pointed, upswept ends made on horse metapodia have been used since the Roman Iron Age in Scandinavia. However, the specimens from Hungary and Slovakia show that this kind of skate is earlier by at least 500 years in Central Europe.

Owing to their minimal meat and marrow content (UERPMANN, 1973), ungulate metapodia, and especially those of Equids, have little value other than the bone material itself. Therefore, they have never been exposed to intensive butchering, i.e. could be set aside for the purposes of manufacturing without nutritive loss. In fact, it is likely that these bones would be taken away with the hide after the animal was flayed to act as anchors and weights as the hide was stretched suggesting that there may be a link between the subsequent manufacturing of these bones and hide production. An AD 16th century woodcut from Nürnberg shows how dry limb bones are still attached to the raw hides taken to the tannery (BARTOSIEWICZ, 2003a: figure 3). The dominance of bones from adult and mature cattle further supports the hypotheses of hide processing (SCHIBLER & STOPP, 1987: 327). This makes all the odder to find radius being used for the early skate types.

Thus, the preferred raw material for runner/skate manufacturing almost always comes from horse (*Equus caballus* L., 1758). In the earlier periods this meant horse radii (and some cattle bones) and in later periods almost exclusively the horse metacarpus or less often metatarsus. The metapodia of domestic cattle (*Bos taurus* L., 1758) or even red deer (*Cervus elaphus* L., 1758) would also have been available for this purpose throughout the Neolithic, although no examples of Neolithic skates are known. Even in later, historic times cattle, metapodium skates are few and far between (CHOYKE, 1989), probably because the distal end is not as suitable for carving into a point. Until now, no bone skates made from red deer have been found in Hungary, with the exception of the single “sled-runner” from the aforementioned Urnfield culture context.

The very early occurrence of bone skates in the Carpathian Basin therefore seems to be closely associated with the

appearance of domestic horse in the region. The single, 3rd metapodium of horse is more symmetrically tubular than the fused 3rd and 4th metapodia of even-toed ungulates such as cattle or red deer. All long bones that can be used in the manufacture of skates or runners are usually 'D'-shaped in cross-section. The capital crest on the distal epiphysis of horse metapodia can easily be carved into the upwardly sweeping point, apparently favored by the makers/users of Late Bronze Age, Samatian, Migration period and Medieval skates. This shape would not have been permitted by the "forked" distal metapodia of cattle or red deer.

Although many later sled runners were made from metapodia, horse radii or even mandibles were often also used as a raw material for larger medieval runners (KASSAI & TAKÁCS, 1985: 853; PÁLÓCZI HORVÁTH, 1989: 114; BECKER, 1991: 22; CHOYKE, 1996; STOPP & KUNST, 2005). Although, logically radii are far too long and arched to be worn on feet like skates, the earliest 'first attempts' were made on this skeletal element for several hundred years from the Early to Middle Bronze Age in western Hungary.

## MANUFACTURING

The dorsal (that is, the anterior) surface of radii, shaped like an arched "belly", is usually carved or chopped flat to rest flush on the ice, while the flat, palmar surface is retained to serve as a foothold. However, the facet on the Early and Middle Bronze Age specimens appears to have been created from use rather than shaped prior to contact with the ice (Fig. 5). If there was any shaping it was minimal enough to have any trace of it destroyed by subsequent use wear.

The Late Bronze Age skates and runners were carved to shape using stone tools, especially at the distal end. In the later specimens, however, this work was done with a metal axe or chopping tool. The dorsal surfaces of these skates are sometimes covered with rough transverse chop marks deliberately left unsmoothed, presumably to increase friction and thus, improve the stability of the skate. From the Late Bronze Age onwards in Carpathian Basin, the anterior surface of the epiphyses were most often carved to create an upswept appearance. Strap holes are only rarely found and these are always set horizontally, that is, medio-laterally, through the toe part of the skate. In general, it can be said that in comparison with skates from northern Europe, skates from later periods in Hungary are simpler and not so heavily modified.

The Early and Middle Bronze Age skates display clear continuity in the style of their manufacture. Horse radii were set aside for use after being separated them from the carcass, perhaps together with the hide. While the consumption of horse flesh was less regular by the Middle Bronze Age (BÖKÖNI, 1974; CHOYKE, 1983, 1984; CHOYKE, VRETEMARK & STEEN, 2004), horse carcasses

were butchered like that of any other large meat animal, such as cattle, in the Bell-Beaker Csepel-Háros sites (LYUBLYANOVICS, pers. comm. 2003). Thus, the radii of mature animals must have been deliberately and carefully selected for the manufacture of these objects since otherwise the region of the radius produces relatively good quality meat and the bone itself contains reasonable quantities of marrow. The front part of the Early Bronze Age skate apparently comprised the distal epiphysis which had a large hole drilled in a medio-lateral direction from both sides. A surface was scraped away to provide a firm basis for the ca. 1.5-2 cm hole that was drilled or gouged from both sides. The flatter proximal epiphysis of these radii were left unmodified. The Middle Bronze Age horse radius runner had holes drilled for the sled legs at each end of the posterior surface of the diaphysis. The manufacturing of Late Bronze Age skates differs radically from these earlier types. Details of their manufacture will be discussed elsewhere in a later publication. Here, it will be sufficient to add that the form is more similar to that described for Sarmatian skates although several binding holes were drilled at the toe, mid-skate and the heel in the Törökbálint pair and only one drilled medio-laterally near the toe of the Lébény-Kaszás-domb specimen. The facets on the anterior surface were created using a stone blade and the posterior surface, where the foot was intended to sit, was also slightly modified.

The skates from later periods may be reconstructed using a modern ethnographic analogy (KOVÁCS, 1908: 19). The simple process of carving skates was described by a child in early 20th century Transylvania (PETÉNYI, 1994: 111), demonstrating that the manufacture of even relatively elaborate skates was not particularly complicated.

Since bone grease actually enhances the quality of skates it is unlikely that once any of these bones were taken from the carcass it would have undergone further processing such as boiling. Simple manufacturing was reconstructed on the basis of Sarmatian specimens (CHOYKE, 1999: 151). However, these observations concerning retaining bone grease can be applied to bone skates and runners from all time periods in the Carpathian Basin.

The most typical, minimal modifications required to manufacture a simple horse metapodium skate begins with the removal of the rudimentary, 2nd and 4th metacarpal spurs. Then the dorsal end of bone's distal end is carved into an upward bending curve. The (anatomically) dorsal "ice" surface of the bone is usually carved or chopped into a facet with sharp edges, further flattened as the result of continuous use wear. Sometimes, the bone of the diaphysis thins down to the point where the medullary cavity is exposed and the bone cracks or breaks. This would have most often occurred off-site which accounts for the relatively rare discovery of skates. The skating facets in this later period were often renewed. That, in addition to the natural wear on the ice, meant that the width of the skating facet is proportional to the length of time the skate was used.

The AD 3rd-4th century, unperforated Sarmatian skates were not only the forerunners of far more complex types, but also re-occurred during the Hungarian Middle Ages (e. g. Aquincum–Pacsirtamező Street [CHOYKE unpublished], Doboz–Hajdúirtás, Endrőd 170, Kardoskút, Tiszaeszlár–Bashalom, Tiszalök–Rázom, and Túrkeve–Móric, Vác–Music School [BARTOSIEWICZ, 1995]). This ancient, undrilled type actually survived into the late 19th century and even the 20th centuries throughout rural Hungary. As HERMAN (1885: 164-165) wrote in 1885: “Bone skates exist even today. The children of the poor in Szeged, Zenta, Doroszló and other places merrily slide on them. These specimens usually show no sign of drilling...”. Children in eastern Hungary in the 1940s were using such improvised single skates even after World War II (János MAKKAY, pers. comm.).

More sophisticated skates in Late Bronze Age and medieval as well as modern contexts were drilled in transversal directions for the purposes of fastening. Characteristically, skates were perforated all the way through on their “sides” medio-laterally, i. e. parallel to the ice surface: such holes served to strap the toes to the skate. Thus, drilled medieval specimens in Hungary have

been found in Esztergom (PETÉNYI, 1994: 117, figure XXIX) as well as a 13th century context in Budapest. These latter specimens were drilled through the toe end.

#### USE WEAR

MACGREGOR (1975: 385-390) has demonstrated that the wear observed on the facets of skates or runners is directly related to the way they were worn and used on ice, which, given the differences in raw material, form and attachment, necessarily differ from the way metal blades are used. Use wear on the dorsal surface facet produces a facet of varying width, tending to become broader as the skate was used. Faint polish also may occur on the palmar surface where the foot was in contact with the bone. Under a light microscope at 15x-20x magnification, striations of varying widths and directionally more irregular than the patterns left by hide, bark or wood working, may be observed (MACGREGOR, 1985; BECKER, 1991). These striations are less dense than those seen on tools used in the various crafts mentioned above. The striations derive from irregularities in and pieces of grit of various



Fig. 6: Criss-crossing striations wear on Middle Bronze Age cattle radius skate from Százhalombatta-Földvár (magnification : 8x).



diameters lying on the ice surface (Fig. 6). The striations differ from those found on the bottom of modern skate runners because the foot is never lifted off of the skate and the skate itself is never lifted from the ice. However, the exact style of skating depends on whether one or two skates are used and the form of the skate itself. Pairs of skate from the Late Bronze Age tend to be heavily worn toward the rear of the skate, with the compacta at the proximal end of the bone sometimes worn through most heavily, exposing the medullary cavity in a v-shape with the wide end toward the proximal end.

Experimentation has only been carried out on Medieval skates with binding holes and not for the Bronze Age or simple Sarmatian skates also discussed here. Unlike modern metal skates, only one skate was used in later times in Hungary rather than a pair as seems to have been the case in the Late Bronze Age find. It is unclear from their find context whether the Early and Middle Bronze Age skates/runners were used in pairs or singly.

Probably many skates were actually discarded where they broke rather than being brought back to the settlement since there are no examples from any period of skates being re-worked or curated into other tools. Indeed, fragments of medieval bone skates and runners have often been found in the places of former moats, such as the 11th-12th century specimens recovered from Potzlow-Burgwall (HERMAN, 1980: 53, fig. 22).

#### BONE TOOL TYPE WITH SIMILAR SHAPES

Sled runners, although also used on snow or ice, must be distinguished from skates. Two fundamentally different large ungulate metapodium implements are also often mistaken for skates, while a third, special bone tool may be functionally related to them.

Sled runners are mostly drilled half way through the long axis of the bone in a dorso-palmar direction, perpendicular to the ice. Legs or pegs for attachment were fitted within these holes created on the bones' "upper", palmar/plantar surface (e. g. HALSTEAD MIDDLETON, 1972: 61; HERMAN, 1980: 49, fig. 19; CLASON, 1978: fig. 6; VAN WIJNGAARDEN-BAKKER, 1980: 46, Afb. 2). In fact, metapodia may have been more a preferred raw material for skates: only 7 of the 44 bone "skates" recovered from the 10th-11th century layers of York were drilled in such a dorsopalmar direction (RADLEY, 1971: 55).

Most commonly skates/runners are confused with beamers for leather scraping (SEMENOV, 1964; CORNWALL, 1968: 96, fig. 2a). In Hungary, Neolithic and Chalcolithic bone beamers made on the metapodia of aurochs (*Bos primigenius* BOJANUS, 1827), domestic cattle or sometimes even red deer display longitudinal striations but these occur on their strongly concave working surfaces created by continual re-working of the surfaces with flint scraping tools to maintain the sharp edge (CHOYKE, in press). While the dorsopalmar surfaces of beamers may be flat initially,



Fig. 7: Copper age Red deer metatarsus beamer from Győr-Szabadrét-domb with the centrotarsal bone attached to the proximal articular surface (Scale bar: 50 mm).

they quickly grow concave during use. The medial and lateral sides are also frequently used creating prism-like forms (Fig. 7).

Some skate-like artifacts used between the early medieval period and recent ethnographic periods in the Carpathian Basin take the form of fish-net weights-stiffeners (HERMAN, 1885). These objects are drilled through the epiphyses of horse or cattle metapodia and other long bones from these large domestic animals either in a medio-lateral or antero-posterior direction but completely lack any faceting. They were strung around the circumference of a net used in river fishing and were intended to help the keep its shape. Ethnographic parallels to these artifacts may be found even today in eastern Hungary among fisher folk (SIKLÓDI, 1996: 74; KUNKOVÁCS, 2001: 34, fig. 49).

With skillful balancing, skates without any sort of fastening could be kept under the foot by the sheer pressure of the foot on the bone's rough palmar/plantar surface as the skater propelled him/herself along with a pointed pole held between the legs rather than off to one side (KÜCHELMANN & ZIDAROV, 2005; ORTUTAY, 1977: 638). Some heavy, crudely made, evidently hafted bone points have been found in Sarmatian contexts. Although there is no direct evidence available to support this hypothesis, one may speculate whether these crude points or "points of digging sticks" were used to strengthen the working ends of poles used in skating as was described by MACGREGOR (1985: 174, figure 93/23a-b) and CHOYKE (1999). Such poles are also mentioned in Fitz Stevens' 1180 "Description of London" as skaters were "...showing themselves with a little picked staffe..." (HALSTEAD & MIDDLETON, 1972: 61).

#### CONCLUSIONS

Skates and runners made from horse radii and metapodia are special types of bone tools in that they represent the complex interaction between environment, availability of a particular species and culture (BARTOSIEWICZ, 2003a: 62). Although it seems likely that there is continuity between the manufacturing traditions of the first known

European skates made from horse and later horse and cattle radii from the Early and Middle Bronze Age, this is not necessarily true of later skates. In the Late Bronze Age, skates take on a radically different form and it is likely they were also used differently, for example in pairs. Skates from later periods are similar in general shape but greatly simplified in terms of the manner of their manufacture and most often used as single pieces. Furthermore, well known historic discontinuities in the populations inhabiting the Carpathian Basin suggest that this skate form was widespread in later times being repeatedly re-introduced by new, better documented population groups moving into the Carpathian Basin from the Late Bronze Age onwards, during the Roman Period and the Middle Ages.

What is striking is the dominant use of horse bone in all these periods suggesting in several ways an interaction between environment and culture in shaping manufacturing traditions in the lowland areas of Eastern Central Europe. It is probably no accident that recently found prehistoric skates in Hungary came to light in the proximity of the flat marshy floodplain areas of the Danube River (Fig. 1). The fact that this tradition continued throughout almost one thousand years is most probably related to how easy it was for both people and thus ideas (manufacturing methods and use of certain tools) to move up and down the Danube River, resulting in a continuous exchange of know how and people along the way.

Although relatively less is known of the history of the Early and Middle Bronze Age peoples who left these skates behind, an analogous situation in Hungarian prehistory is worth considering. Sarmatian and Early Hungarian skates from the Great Hungarian Plain have been discussed in relation to horse as an animal apparently kept (and therefore slaughtered) in relatively great numbers by Migration Period peoples in the Carpathian Basin. Considering the extensive water surfaces and continental winters, skating may already even have been a rather important form of getting around for a number of Migration Period peoples, in their original homelands, the plains of the Eurasian steppe belt (BARTOSIEWICZ, 2003b: 116, figure 16). During the harsh continental winters, extensive floodplains along the rivers froze and created a “demand” for these objects.

On the other hand, in the Early Bronze Age, horse keeping suddenly became of fundamental importance. It also meant that what may have been the preferred raw material for these skates – radii – also became readily available. The question of the cognitive relationship between skating as an activity and horse remains to be elucidated.

Although the Bronze Age skates and the mass occurrence of their Migration Period counterparts mostly made by this time from horse metacarpals, are well separated by time, space and culture from each other, they share two features: the people concerned inhabited extensive

floodplain areas under continental climates and kept horses, whose long bones were used preferentially in skate making. The question of why horse bone and not the long bones of cattle must remain an open question.

## ENDNOTE

Since writing this article, Alice M. CHOYKE has had the opportunity to examine these faceted radius finds from the end of the Middle Bronze Age in western Slovakia. They were found in large numbers, made from a variety of species (including sheep and domestic pig), not only horse. This, as well as sharp differences in the degree of faceting on them now make it clear that they could not have been used as skates/runners. In contrast to the Hungarian finds, they have a medio-lateral hole just above or through the distal epiphysis and sometimes are drilled through the proximal epiphysis in a proximal-distal direction. More objects of this related type have also recently come to light at a coeval site near Budapest (Pécel – M0 ring-road).

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