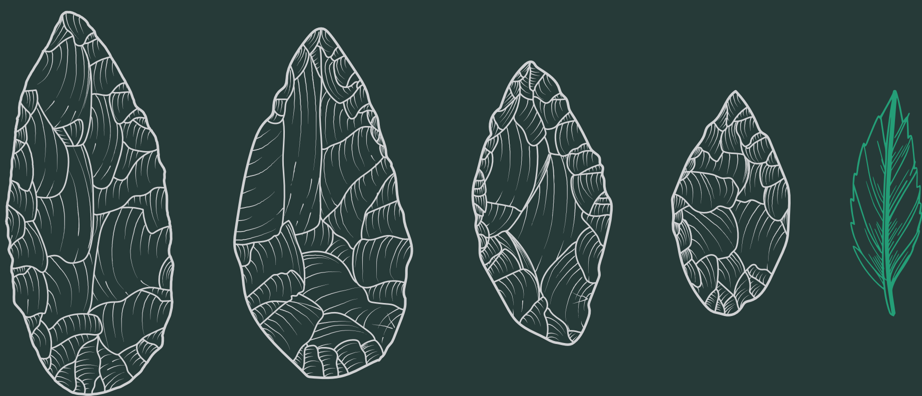
From tea leaves to leaf-shaped tools

STUDIES
IN HONOUR OF ZSOLT MESTER
ON HIS SIXTIETH BIRTHDAY



EDITED BY
ATTILA KIRÁLY

LITIKUM KÖNYVTÁR 2

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Editor:

Attila Király

ELTE
EÖTVÖS LORÁND
UNIVERSITY

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2023

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Animal “body techniques”

PROCESSING AND CONSUMPTION OF ANIMALS IN A LATE COPPER AGE SETTLEMENT IN BUDAPEST (HUNGARY)

Péter Csippán

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Abstract. A significant number of bone finds were uncovered from the LCA settlement located on the outskirts of Budapest, Hungary. The majority of the finds originated from domestic species, but some wild game remains were also discovered. In this study, the author attempts to apply the method of chaîne opératoire to gain a deeper understanding of contemporary meat processing and waste disposal practices. On the other hand, for interpreting the consumption of these animals, the author also focuses on Binford's functionalist approach, which includes utility curves and indices

Keywords: Archaeozoology, Late Copper Age, Meat processing, Utility curves, Utility indices, MAU%, FUI

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1. Introduction

In this case study, the author seeks to reconstruct processes of meat consumption in the Late Copper Age settlement of Rákoscsaba, Major-hegy. This experiment aims to capture the potential decisional or behavioural hubs which led to the known results: these animals were kept or hunted – killed off – skinned – butchered – cooked, fried – eaten and their bones were deposited as refuse.

The research question is: What is reconstructible from these activities above? Can we prepare an algorithmic table which includes all of these hubs like in the „simple" case of preparing tea (Holló *et. al.,* 2001, p. 53)?

Furthermore, we focus on another important problem of communal butchery. The author hypothesizes that butchery was not an "individualistic" activity of past contemporary households. The killing of one cattle produced approximately 250 kg of beef (Vörös, 1987, p. 28), more meat than a family of five could have consumed before it became rotten. So, we have to think that butchering these animals was a joint venture of more households or even the whole settlement. This hypothesis seems plausible, but what about smaller animals like sheep or pigs? Their small size suggests their exclusive consumption by single households. The present paper focuses on consumption and butchery patterns through the commonly used Food Utility Indices by Binford.

2. The site and its environment

Archaeologists of the Budapest History Museum (BTM) conducted a rescue excavation accompanying the M0 ring road construction in 2004 and 2005. The excavation was managed by Zsuzsanna M. Virág, László Reményi, Anita Korom and Anikó Tóth.

The Rákocscsaba, Major-hegy site was located on the southwestern side of the Major hill, east from the North-South anabranch of the Rákos

Figure 1. Location of the Rákoscsaba, Major-hegy site. Prepared by the author.

creek (Fig. 1). The extent of the site was approximately 2.5 hectares and it had three different phases: Ludanice period (Middle Copper Age), Protoboleráz period (Late Copper Age, LCA) and Roman imperial period.

The author of this study hereinafter will focus only on the LCA materials because the quantity of the other materials wasn't enough for a relevant archaeozoological observation.

Among the sparse archaeological features, simple refuse pits and beehive-shaped storage pits were dated to the LCA (M. Virág, 2009, p. 7). The excavators hypothesized that the contemporary buildings were positioned in empty spaces encircled by these storage and refuse pits. These buildings may have been light-frame houses with a breastsummer, which did not leave any structural traces (M. Virág, 2009, p. 7).

A trench system with traces of a palisade also came to light in the southern part of the settlement (M. Virág, 2009, p. 7).

3. Animal bones from the site

4344 pcs of animal bone fragments came to light from the LCA period in the Rákospalota, Major-hegy site (Fig. 2 and see Appendix). Based on their analysis, the most important species in the meat consumption of the Protoboleráz settlement was cattle. Almost all kinds of bones were

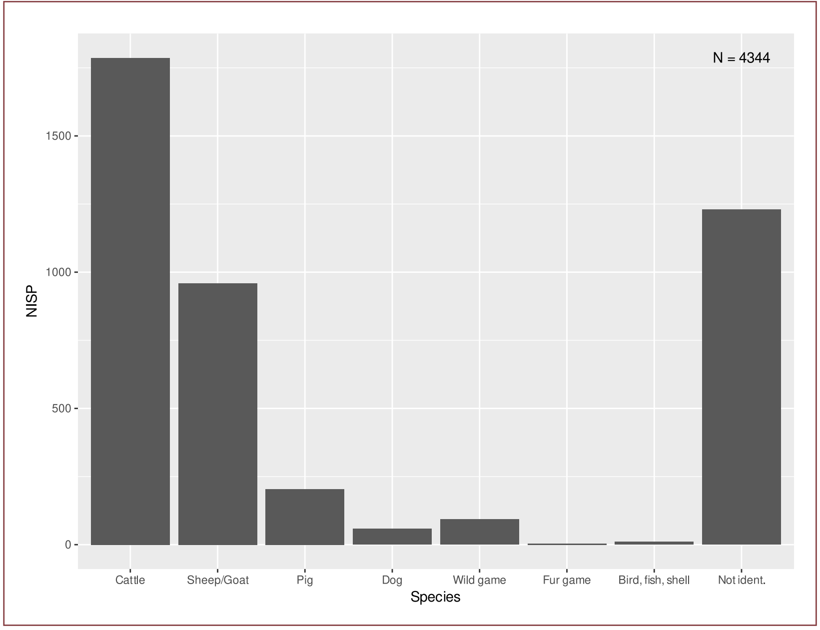

Figure 2. Distribution of the main species from the site. Prepared by the author.

found in the refuse and storage pits. This phenomenon reflects not only the consumption of the animals but also the techniques of butchery practices in the settlement. Furthermore, the small ruminant (sheep or goat) and pig bone fragments were also frequent.

*3.1. Cattle (*Bos taurus* L.)*

1786 pcs of cattle bone fragments were encountered, which is 60.5% of all fragments from the main domestic species (excluding dogs). This considerable percentage indicates their dominance in the meat-eating of the inhabitants of the settlement. However, we do not have a clear picture of these animals, because we were able to ascertain withers height and sex based on metapodials only in six cases (Matolcsi, 1970; Nobis, 1954). The calculated withers heights fit perfectly to the minimum-maximum body height range of LCA cattle in the Carpathian Basin, indeed they were a little bit higher than average (Fig. 3).

With Nobis's method, all individuals were identified as cows. This phenomenon is possibly connected with the exploitation techniques and keeping methods of this species. So, the consumption of dairy products was possibly significant also in the settlement.

Only a few pathological lesions were found from the whole LCA material, but almost all of them were on cattle bones. The first lesion was an abnormal abrasion on the neck of a mandibular incisor of a cattle. This lesion is a common phenomenon on the teeth of grazing animals, but it doesn't mean that their environmental condition was worse than average in the period (Bartosiewicz & Gál, 2013, p. 176).

The second case was arthritis on the proximal epiphysis of a secondary phalanx, which symptom correlated with the possible usage of the animals. However, increased body weight or cold temperature can also result in joint inflammation (Bartosiewicz & Gál, 2013, p. 109).

The third case was a healed fracture on a diaphysis of a humerus. The breakage of this important bone probably restricted the mobility of the animal, but the fully healed bone is evidence that

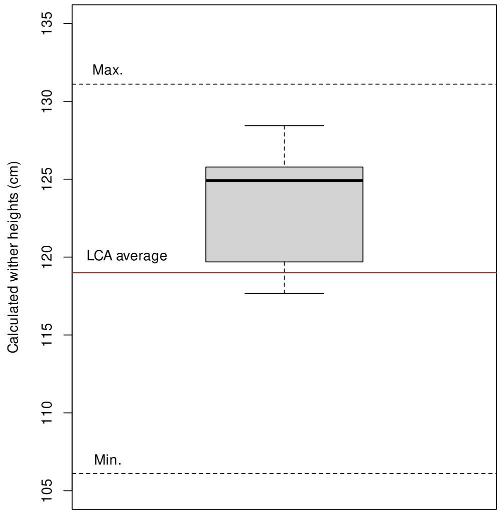

Figure 3. Calculated withers heights of cattle from the site. Prepared by the author.

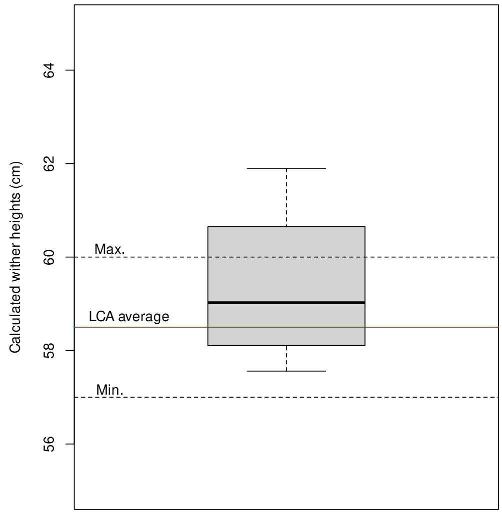

Figure 4. Calculated withers heights of sheep from the site. Prepared by the author.

the animal survived the trauma and was probably attended by its owner (Bartosiewicz & Gál, 2013, p. 219).

Finally, the last case was an enlargement of a distal epiphysis of a right metacarpus III–IV. These lesions are usually connected to the straining of the legs and the usage of the animals (Bartosiewicz & Gál, 2013, p. 145).

*3.2. Sheep (*Ovis aries *L.) and goat (*Capra hircus *L.)*

The number of small ruminant bones was approximately half of the cattle bones, 959 pcs which is 32.52% of the bones of the main domestic species. Because of their similar shape, sheep and goat bones could be distinguished only in a few cases, but the majority of the bones are assumed to be sheep. Based on the measurable sheep bones, the withers heights of a few animals were calculated with the Teichert 1975 method (Teichert, 1975) (Fig. 4). Their mean was 59.4 cm, slightly above the average of the period (Bökönyi, 1974, p. 171). During the transition from LCA to the Bronze Age, sheep sizes increased, possibly in correlation with a change of breeds in the Carpathian Basin. These animals fit the picture of gracile sheep in the Neolithic and Copper Age (Vörös, 2005, pp. 212–213).

Only one lesion has been identified on sheep bones, arthritis on a proximal phalanx. This disorder was a possibly painful inflammation, restraining the mobility of the animal.

*3.3. Pig (*Sus domesticus *Erxl.)*

Based on the number of fragments, the importance of pigs in meat consumption was lower. The 204 pieces of pig bones constitute 6.92% of the main domestic species’ assemblage.

Because of their fragmentation, the body size of the animals couldn’t be reconstructed. No lesion was observed on pig bones.

*3.4. Dogs (*Canis familiaris *L.)*

Although dog bones were infrequent (58 pcs, together with a dog coprolite, they testify to the presence of dogs in the settlement. No information is recorded about Copper Age dog meat consumption in the Copper Age, but Bökönyi suggested its possibility in the Bronze Age (Bökönyi, 1974, p. 320).

3.5. Hunted animals

Bones of hunted animals were extremely rare compared to domestic species but the number of prey species indicates diverse – at the same time, undirected and not intensive – hunting practices.

3.6. Aurochs (Bos primigenius Boj.)

Although the ratio of auroch remains was 32.25% in the entire wild game bones, they indicate the important role of this species in meat consumption. In two cases the withers heights of the animals could be calculated due to complete metapodials, by Matolcsi's method (130.7 cm and 136.5 cm). All bones originated from bulls, which is significant because, on the one hand, their body sizes were quite huge, hence hunting these animals should not have been a lone venture. And from the other hand, these animals could be dangerous also for domestic stocks and cultivated fields.

3.7. Red deer (Cervus elaphus L.)

In the bone assemblage, 28 red deer bones were encountered. The hunting of these animals was a common phenomenon in the LCA due to benefits like meat, bone, antler, and fur. Albeit the bones were highly fragmented, we assume that these animals completely fitted to the general picture of the LCA red deer population of the Carpathian Basin (Vörös, 1979, p. 641).

3.8. Roe deer (Capreolus capreolus L.)

The number of roe deer bones was 11, so their role in meat consumption was less prominent than that of aurochs or red deer. Hunting of larger-bodied animals could be a better investment than the small-bodied roe deer. Based on the whole bones, only one wither height could be calculated (85.6 cm) by the method of Godynicki (Godynicki, 1965).

3.9. Wild boar (Sus scrofa L.)

The number of wild boar bones was the lowest from the prime wild games (6 pcs, so their consumption couldn't have an important role. Bone fragmentation prevented us to calculate body size.

3.10. Wild horses (Equus sp.)

The number of bone fragments from unidentifiable wild equids (18 pcs is higher than the number of fragments from wild boars. Albeit the presence of these animals is not exceptional in LCA materials, it is not observed so often. We hypothesize that before the massive spread of domestic horses, these animals were hunted for their meat.

Other wild animals were also hunted over the prime game, mainly for fur, such as the common beaver (*Castor fiber* L.), the ground squirrel (*Spermophilus citellus* L.), and the brown bear (*Ursus arctos* L.), the latter being a rare prey in the LCA (Gál, 2005, p. 167).

The remains of wild birds were also remarkable, the few bones of grey cranes (*Grus grus* L.) and wild ducks (*Anas sp.*) suggest a wetland environment.

The information encoded in wild and domestic animal bones allows us to draft the environment around the settlement as a freshwater swamp milieu.

Based on the bones, the inhabitants of the settlement mainly ate their domestic stocks and exploit less of their natural meat resources.

4. Algorithmic reconstruction of processing animal bodies (*chaîne opératoire*)

Meat consumption in ancient societies is strongly connected to the technologies by which bodies of slaughtered or hunted animals were processed. These techniques are well known in

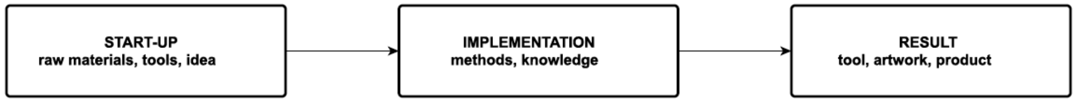

Figure 5. Pillars of *chaîne opératoire*. Figure: Péter Csippán, After Holló *et al.*, 2001.

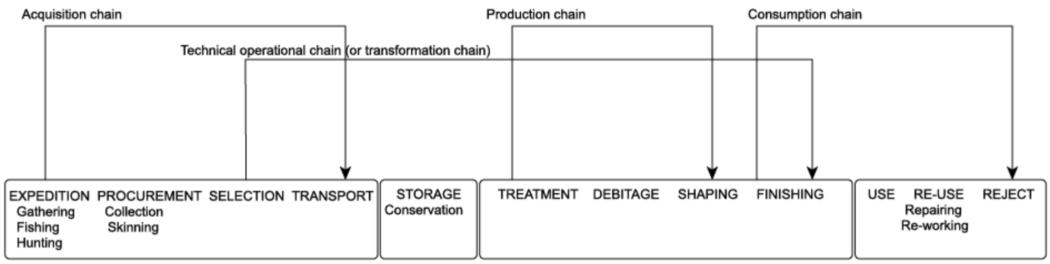

Figure 6. Techno-economic scheme of worked osseous materials: extensions of the different chains. Prepared by the author, after Averbouh, 2001.

the antique and medieval periods, based on written sources (e.g., Csippán, 2007a; Patou-Mathis, 1997; Seetah, 2018; Vörös, 1992). Compared to these sources, our data about the processing of animal bodies in prehistory are more humble, due to the lack of metal tools, which can make an identifiable and massive mark on the surface of the bones, and the long-term effects of taphonomic processes.

The technological repertoire of this period differs from other archaeological periods. The identification of battering marks that open the cavum of long bones is very difficult.

Thus, the main research question is, how can we reconstruct the processing of animals and how can we build an algorithmic model to describe it?

The functional-technological investigation of stone tools is a well-known process in the study of prehistoric lithic artefacts. These process analyses help to understand not only the manufacturing techniques and use of prehistoric stone tools but also imply the intention(s) of the toolmaker.

The study about body techniques of Marcel Mauss in 1934 changed the approaches of ethnologists and sociologists about movements and their functions. He stated that the human body is explainable like a tool, so some acts and their functions can be different from culture to culture (Mauss, 1979, p. 73).

The so-called body techniques are specified that they have to help the person executing them to his or her aims. The methods are learned and culturally specified as well. As Mauss said: *"The constant adaptation to a physical, mechanical or chemical aim (e.g. when we drink) is pursued in a series of assembled actions, and assembled for the individual not by himself alone but by all his education, by the whole society to which he belongs, in the place he occupies in it."* (Mauss, 1979, p. 76)

The theory of Mauss was applied to tools by Marcel Maget. He introduced ideas of the chain of fabrication (*chaîne de fabrication*) or elemental gestures (*gestes élémentaires*) (Pelegrin *et. al.*, 1988, p. 57).

Maget reminded the different quality and working phases of the tools. His observations were modified by Leroi-Gourhan as he said that the working technique through tools and move-

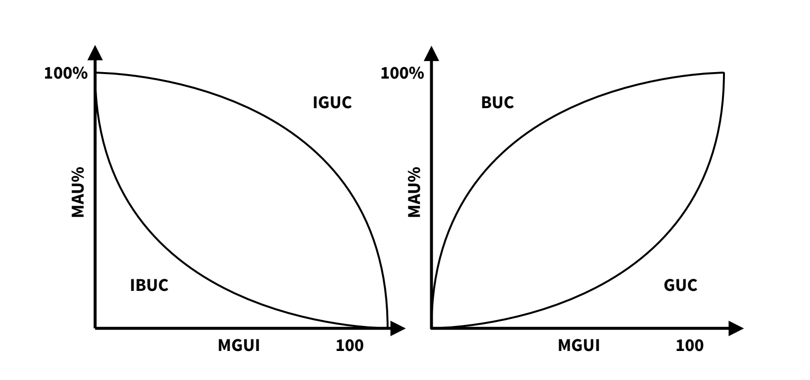

Figure 7. The inverse and normal forms of the bulk and utility curves. Prepared by the author.

ments is organized into a chain with real syntax. This chain of operations shows its stability and adaptivity (Pelegrin *et. al.*, 1988, p. 57).

The concept of *chaîne opératoire* is based on the production phases of artefacts (Holló *et. al.*, 2001, p. 51). P. Lemonnier suggests three approaches for the analysis of tool production (Pelegrin *et. al.*, 1988, p. 58):

Tools (*objets*) that are defined by a special raw material or manufacturing technique.

Order of movements (*suites de gestes ou d'opérations*), which means the sequence of acts or movements.

Special knowledge (*connaissances spécifiques*) of what is needed for tool production.

Similar approaches aren't unknown in the Hungarian archaeological literature, mainly in the case of stone tools (e.g., Antoni, 1990). In the Hungarian literature, the usage of the concept of *chaîne opératoire* was introduced in the pioneer studies of Zsolt Holló, György Lengyel and Zsolt Mester (Holló *et al.*, 2001, 2002, Holló *et al.*, 2004). In these methodological papers, the authors summarized the main steps of the *chaîne opratoire* (Fig. 5).

The *chaîne opératoire* itself includes the following steps in the case of stone tools (Holló *et al.*, 2001, p. 54):

1. *acqusition*
2. *production*
   (a) *débitage*
   (b) *façonnage*
   (c) *retouch*
3. *consommation*
4. *abandon*

The authors suggest that the sum of these technical activities above constitutes a special technological system (*système technique*), which was different from culture to culture. In contrast, various *chaîne operatoires* could also lead to similar results (Holló *et al.*, 2002, p. 99).

In the case of animal bone finds, the concept of *chaîne opératoire* can be applied to animal body processing and bone tool production (Averbouh, 2001; Patou, 1987; Patou-Mathis, 1997; Choyke & Tóth, 2013). In the case of bone tools, the *chaîne opératoire* is complemented with further phases such as conservation or re-use, which the original concept did not contain in the case of stone tools.

To apply the *chaîne opératoire* concept on bones as kitchen waste, we have to re-interpret it, especially in the case of the bones from Rákoscsaba, Major-hegy, where cut- and butchery marks were rare on such items. To solve this problem we focused on animal body part representation. This way, the consumption of animal species could be reconstructed not only by butchery marks but also by the over- and under-representation of the different body regions (Csippán, 2007b, p. 93).

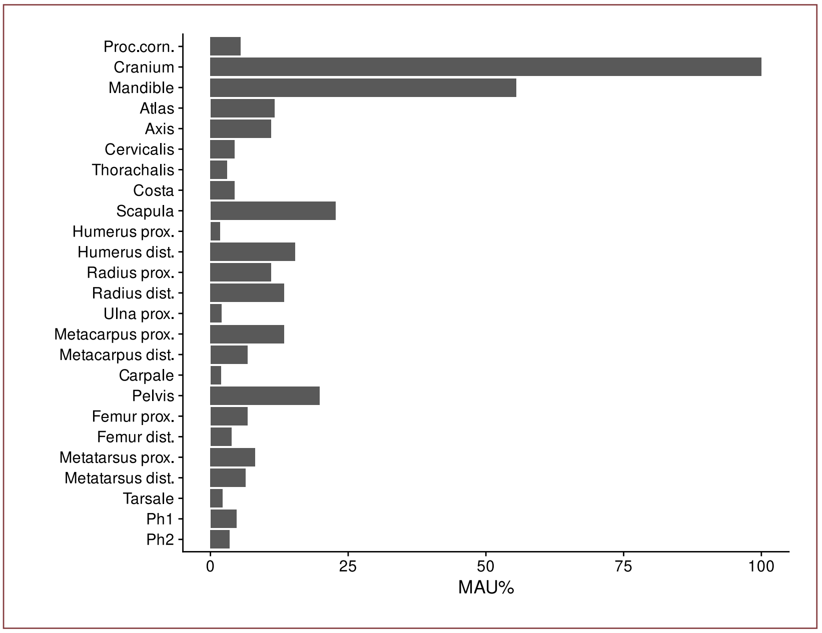

Figure 8. MAU% distribution of cattle. Prepared by the author.

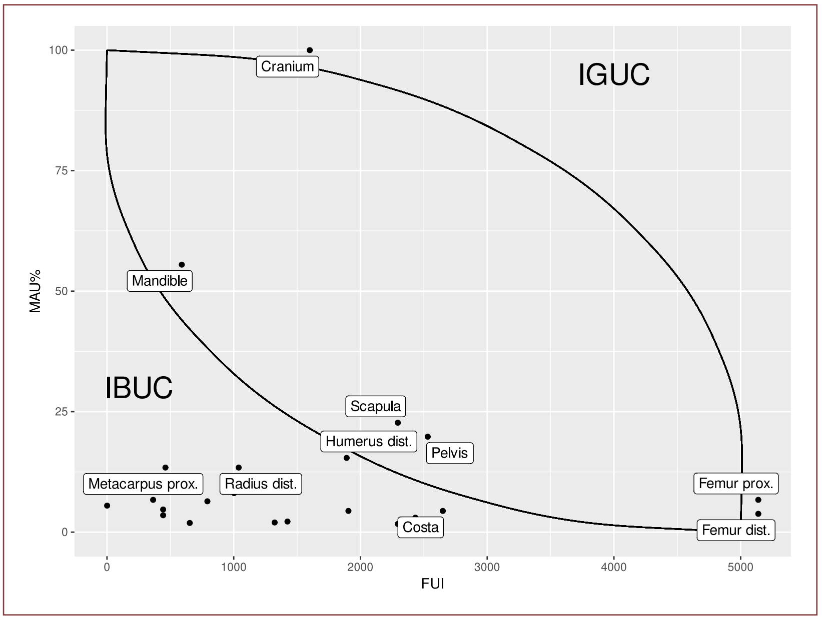

Figure 9. Utility curves of cattle. Prepared by the author.

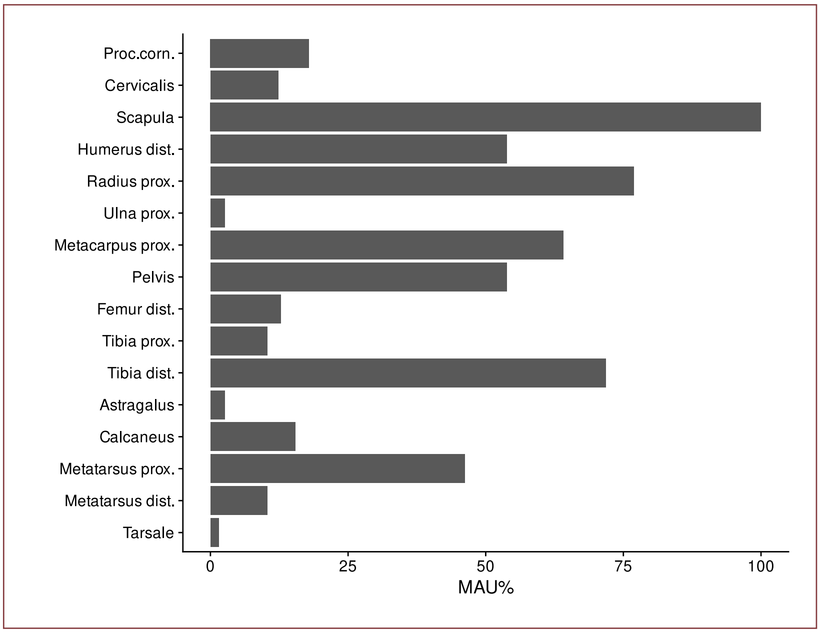

Figure 10. MAU% distribution of small ruminants (sheep/goat). Prepared by the author.

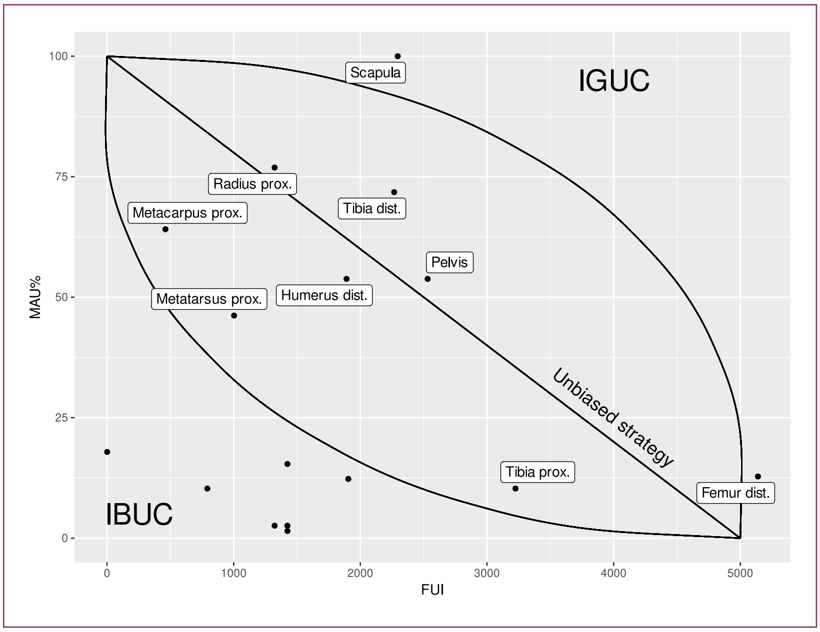

Figure 11. Utility curves of small ruminants (sheep/goat). Prepared by the author.

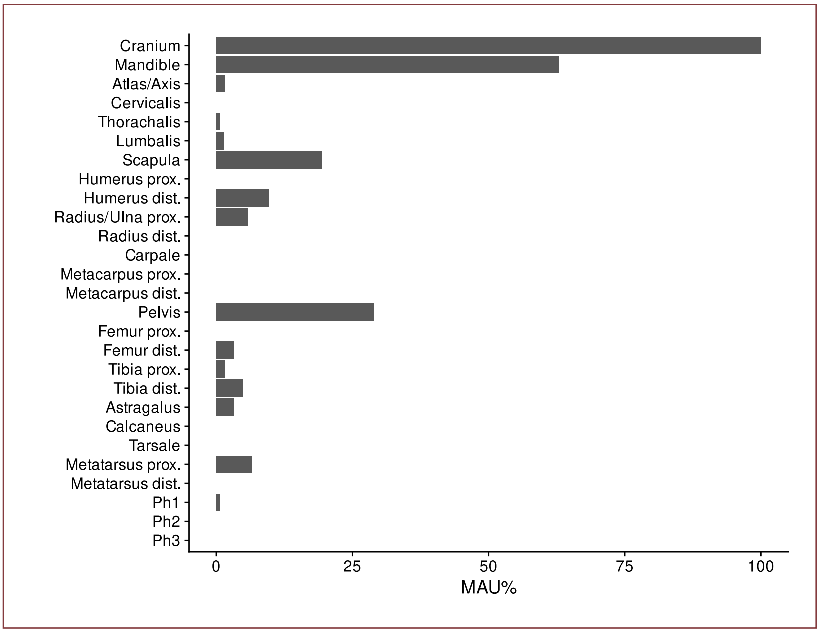

Figure 12. MAU% distribution of pig. Prepared by the author.

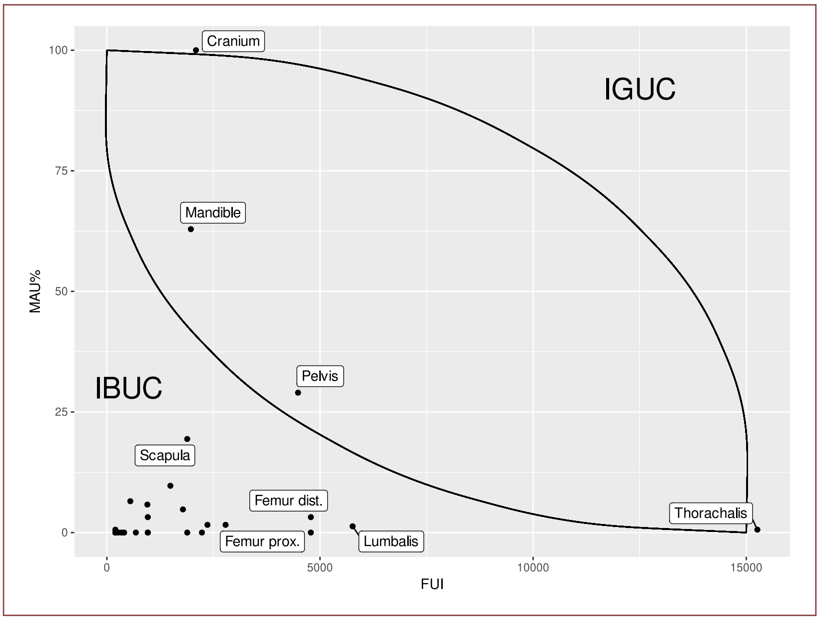

Figure 13. Utility curves of pig. Prepared by the author.

Based on the above, the concept of *chaîne opératoire* will be modified in the case of animal bones as kitchen waste:

1. acquisition – The killing of both domestic and wild animals.

2. production – It is equal to the processing of animal bodies. The sub-processes of these phases are equal to dismembering the body into smaller/larger or useable/unusable portions.

(a) *débitage* – Primal cuts.

(b) *façonnage* – Portion cuts.

(c) *retouch* – Direct kitchen preparation.

3. *consommation* – The consumption of meat.

4. *abandon* – Deposition of bones and unusable parts as kitchen waste.

Consequently, understanding the *chaîne opératoire* of animal processing seems impossible without exact observations of butchery marks and analysis of the number of bones or parts of the bones. The reason is that they are strongly dependent on different body regions. Apart from anatomy, these body parts represent different meat values and energetic investment in their preparation for consumption.

Utility Indices in archaeology were applied first by Lewis R. Binford in his 1978 monography titled Nunamiut Ethnoarchaeology (Binford, 1978). In this influential work – based on the traditional processing of one reindeer and two sheep – Binford set down the standards to show the utility of the different animal body parts.

Later Binford defined these indices not according to the number of individuals or bone fragments but by special units, which he called the Minimum Number of Elements (MNE) and the Minimum Animal Unit (MAU) (Binford, 1984, pp. 50–51). He admitted that he introduced these units to diminish ambiguities. The MNE is nothing else but the number of anatomical units used for the analysis (Binford, 1984, p. 51), by which Binford did not consider sides, sex or age, only the anatomical parts.

Binford's indices can be divided into two main groups. The first group contains Modified Utility Index (MGUI) and the indexes that belong to it: Meat Utility Index (MUI), Marrow Index (MI), White-Grease Index (WGI) and General Utility Index (GUI). MGUI is a calibration of the GUI, considering the so-called „riders" meaning terminal parts joined to the regions of the most meat value. In light of all this, it also represents a sort of predictive transferring value in connection with the given body part (Metcalfe & Jones, 1988, p. 487).

Binford presumed that seasonal or other environmental conditions played a role in the processing of hunted animals on the killing site (Gifford-Gonzalez, 2018, p. 438). On this basis, he attempted to define regularities, which, he thought could indicate the rational decisions of the hunters. To illustrate, Binford created so-called Utility curves to show MAU% as MGUI values function. On these curves the number of body regions with lower MGUI values is determinant. Because these fragments reflect intensive butchering, according to Binford their density describes the place of mass butchering, as opposed to body regions with higher MGUI values which indicate direct consumption (Gifford-Gonzalez, 2018, p. 438). The diagrams of the bones from these sites result in a so-called Inverse Bulk Utility Curve (IBUC), while more selective butchery techniques show a higher number of low- and middle-valued body regions. The latter, according to Binford, implies a gourmet-type of meals, which can be illustrated by an Inverse Gourmet Utility Curve (IGUC) (Binford, 1978, p. 81). The differences between the place of butchering and the actual consumption can be seen as the functions of MAU% and MGUI, by which Binford, similarly to the ones above, defined the Bulk Utility Curve (BUC) and the Gourmet Utility Curve (GUC) (Binford, 1978, p. 81). (Fig. 7)

Although Binford also discusses the limited utility of his indices (Binford, 1978, p. 473), the

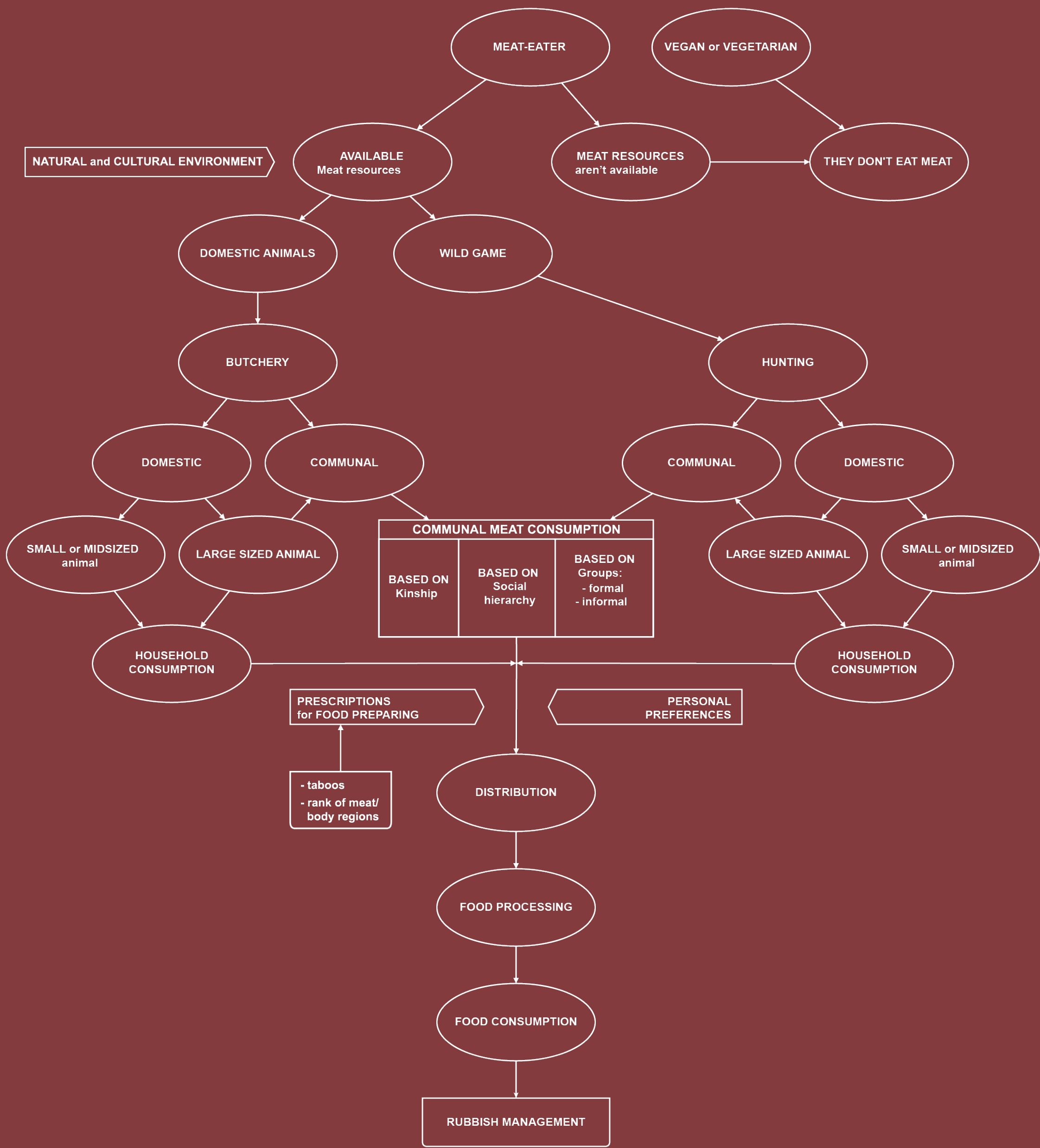

Figure 14. Algorithmic approach of meat consumption at the site of Rákoscsaba, Major-hegy. Prepared by the author.

indices he defined have since been revised by several researchers. Metcalfe and Jones, in their 1988 paper, point out that the correlation between their economic indices and human behaviour is determined by three fundamental aspects of Binford's method:

1, the extent to which the management of reindeer body regions is related to economic efficiency and their use accordingly

2, the extent to which Binford's indices are indicative of the actual utility of each body region.

3, Binford's observations are restricted only to the Nunamuit's reindeer utilization (Metcalfe & Jones, 1988, p. 487).

Metcalfe and Jones, among others, referring to the above problems, have introduced the Food Utility Index (FUI), which can be interpreted as a simplification, taking into account economic considerations, but which is also more appropriate to the anatomical parts represented (Metcalfe & Jones, 1988, pp. 491, 493). A derivation of this index has also been carried out by Rowly-Conwy and colleagues, for wild boars specifically (Rowley-Conwy *et. al.,* 2002).

Based on the MAU% distribution of cattle bones, the bones of the head and mandibles display extreme importance. However, head bones are more fragile than other bones, so their fragmentation may be a consequence of taphonomic effects.

Following the head region, the meaty body parts gained importance. Interestingly, the cranial part of the animal seems to be more preferred than the caudal part (Fig. 8).

In light of the FUI, the distribution of MAU% shows a typical IBUC curve, almost all of the animal body parts are represented in the bone assemblages, so their butchering took place close to the households (Fig. 9).

The picture of the MAU% distribution of small ruminants seems different than the other domestic species, however, their MAU calculation method does not include the whole skull, just the horn cores and mandibles. Despite this, the differences are obvious, the regions of the front leg and the tibia were more preferred than others (Fig. 10).

Focusing on the MAU% from the point of FUI, instead of a typical IBUC consumption pattern, an unbiased strategy can be reconstructed. It means that the animals were slaughtered near the households (Fig. 11).

The MAU% distribution of pigs seems similar to that of cattle. A significant difference between the consumption of cattle and pigs is the importance of the pelvic region. However, a lot of bones weren't represented in the bone assemblages (Fig. 12).

The FUI values distribution shows a more or less similar curve than the cattle's (Fig. 13).

5. Conclusions

In conclusion, the Protoboleráz bone assemblage of the site of Rákoscsaba, Major-hegy shows typical LCA meat consumption patterns. Meat-eating is mainly based on domestic species (cattle, sheep, goat, pig) and it was sometimes complemented by wild game such as red deer, aurochs, roe deer, and wild boar in different proportions. Fur animals were also hunted by the inhabitants of the settlement.

Considering the consumed MAUs, the main domestic species show more or less similar patterns, but the slaughtering and body part distribution of small ruminants seem different than those of other species. This phenomenon may be connected to the number of animals and/or their value.

The processing of these animals clearly shows special knowledge and a mechanism which was regulated by both social and individual decisions. This regulation can be described as the *chaîne opératoire* of animal body processing. But this kind of processing is rooted in another decision mechanism, which is connected to other segments of the culture and/or to the affordances presented by the natural environment. The draft of this decision (yes/no) algorithm is in Fig. 14.

On this flowchart, decision-making is apparently influenced by a lot of effectors (e.g., natural environment, social regulation, size of the animal) from the choice of eating meat to waste management. Using this algorithmic table we can understand the complex system of meat eating better in the future.

Acknowledgments and statements

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Appendix

Animal bones from the LCA site:

Species	NISP
Cattle (*Bos taurus* L.)	1786
Sheep/Goat	953
Sheep (*Ovis aries* L.)	5
Goat (*Capra hircus* L.)	1
Pig (*Sus domesticus* Erxl.)	204
Dog (*Canis familiaris* L.)	58
Domestic animals:	**3007**
Red deer (*Cervus elaphus* L.)	28
Roe deer (*Capreolus capreolus* L.)	11
Wild boar (*Sus scrofa* L.)	6
Aurochs (*Bos primogenius* Boj.)	30
Wild horse (*Equus* sp.)	18
Brown bear (*Ursus arctos* L.)	1
Common beaver (*Castor fiber* L.)	2
Ground squirrel (*Spermophilus citellus* L.)	1
Wild mammals:	**97**
Grey crane (*Grus grus* L.)	1
Wild duck (*Anas* sp.)	4
Bird (*Aves*)	1
Shell (*Unio* sp.)	4
Other:	**10**
Large ungulate	882
Small ungulate	338
Dog-sized mammal	10
Total:	**4344**

Calculated withers heights from the LCA site:

Bone	Measure-ments (in mm)	Sex	Withers height (in cm)
Cattle			
metacarpus III-IV sin.	GL=198.5; BP=55.8	cow	119.69
metacarpus III-IV sin.	GL=213.0; BP=58.1	cow	128.44
metacarpus III-IV sin.	GL=206.6; BP=55.3	cow	124.58
metatarsus III-IV sin.	GL=215.1; BP=48.2	?	117.66
metatarsus III-IV dex	GL=235.0; BP=45.8	cow	125.25
metatarsus III-IV dex	GL=236.0; BP=51.1	cow	125.78
Sheep			
metatarsus III-IV sin.	GL=126.8; BP=18.8		57.18
metatarsus III-IV dex	GL=129.2; BP=19.5		58.27
radius sin.	GL=148.0		59.2
radius dex.	GL=154.2		
Aurochs			
metacarpus III-IV sin.	GL=206.5; BP=63.9	bull	130.71
metacarpus III-IV dex.	GL=215.7; BP=71.0	bull	136.53
Roe deer			
metatarsus III-IV dex.	GL=210.1; BP=23.0		85.68