Kyra Lyublyanovics

BEFORE THE CATTLE TRADE. ANIMALS AND PEOPLE IN MUHI, A MEDIEVAL HUNGARIAN VILLAGE

MA Thesis in Medieval Studies

Central European University
Budapest
May 2008

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Kyra Lyublyanovics

(Hungary)

Thesis submitted to the Department of Medieval Studies,
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Accepted in conformance with the standards of the CEU

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Chair, Examination Committee

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Thesis Supervisor

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I, the undersigned, **Kyra Lyublyanovics**, candidate for the MA degree in Medieval Studies declare herewith that the present thesis is exclusively my own work, based on my research and only such external information as properly credited in notes and bibliography. I declare that no unidentified and illegitimate use was made of the work of others, and no part of the thesis infringes on any person's or institution's copyright. I also declare that no part of the thesis has been submitted in this form to any other institution of higher education for an academic degree.

Budapest, 26 May 2008

Signature

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Chapter One: INTRODUCTION

1.1 The village of Muhi in its historical context

The medieval Hungarian settlement of Muhi, first a small village, later a significant market town, flourishing in the fifteenth-sixteenth century, finally vanished in the 1640s during the Turkish-Ottoman wars. Archaeological research of the settlement began in the second half of the nineteenth and the beginning of the twentieth century, when a few excavations were organised in the area of the former town. While these early archaeological investigations are of little use from the point of view of a modern archaeozoologist, the "Muhi project," started by the Herman Ottó Museum in Miskolc in 1995, made it possible to organise large-scale excavations, where a large number of animal bones came to light and were collected. Thus, the project made available a completely new group of sources concerning this medieval settlement. In my thesis, I analyse the animal bones recovered during the excavations in order to shed light on the thirteenth century economic situation, animal husbandry, animal keeping practices and meat consumption customs in medieval Muhi. In this introduction I will provide a short summary of the settlement's history and development, not only in the thirteenth century, but also in later periods, in order to establish a historical context for the archaeological study in the following chapters.

Muhi was located in north eastern Hungary, between the small Sajó and Hejő rivers, south of the town of Miskolc and Diósgyőr, in an area surrounded by the villages of Ónod, Poga (which is called Muhi today, even though it is not identical with the medieval settlement, which did not survive), Hejőkeresztúr and Nyékládháza

(*Fig*. 1.1). The settlement has been called by many different names not only in historical sources but also in the historiographic tradition (Muhi, Muhy, Mohi, Mohy).

Even though an extensive literature exists about the battle of Muhi, only a few historians have been interested in the history of the settlement itself, so that the amount of secondary literature available is limited. János Szendrey organised a survey lasting several days in this area in 1878 in order to find the mass graves of the battle of Muhi. After this short excavation, Andor Leszih attempted to carry out larger scale research in 1934-1941, but this survey – due to the lack of proper documentation – is of little use today for modern researchers. Some of the results, however, were later published (in 1959) by Alajos Bálint and István Éri. In 1955, Lajos Marjalaki Kiss published a very short summary of the town's history. The most thorough study, however, was carried out by Péter Tóth and András Kubinyi, who edited the first two volumes of the monograph about Miskolc in 1996. Even though this work was not aimed at providing a detailed history of medieval Muhi, a number of charters, documents and other sources were used in this study which provide valuable information on the settlement.

The sources concerning the history of this area, especially for the early period, are few in number. A donation charter from 1262 mentions that the villages of Muhi and Nyárád were given to the *ispán* (administrative leader of a county) of Zemplén county by King Stephan V;[1] this is the first written document that reveals the existence of the settlement. In 1273, Muhi became a royal possession.[2] A 1284

[1] J. Karácsonyi, *A magyar nemzetségek a XIV. század közepéig* (Hungarian Kinship until the Middle of the Fourteenth Century), vol.1. (Budapest: Akadémiai Kiadó, 1900), 299.

[2] Gy. Györffy, *Az Árpád-kori Magyarország történeti földrajza* (Historical Geography of Hungary in the Period of the Arpad Dynasty), vol.1. (Budapest: Akadémiai Kiadó, 1963), 791. (henceforth: Györffy, *Az Árpád-kori Magyarország történeti földrajza Vol.I.)*

document mentions Muhi[3] as *terra*;[4] later in the text a road is mentioned which led from Muhi to Emőd, one of the nearby villages (*unam publicam stratam, que de Emwd ducit in Muhy*).

Even though the first written documents are dated to the second half of the thirteenth century, it is certain that a settlement existed here before the Mongol invasion. During the excavations, layers from the twelfth century also came to light which suggest that the area was inhabited continuously, except for the short period of the Mongol invasion itself (see Chapter 3, The reconstructed topography of the settlement). There is, however, no written evidence for the existence of a village before the arrival of the invaders. This, on the other hand, is not unusual; written evidence has been destroyed for lots of Arpadian Age settlements. In their report on the war, both Rogerius and János Thuróczy mention that King Béla IV met the Mongols in battle on a swampy area near the spot where the Sajó River enters the Tisza River although the name of Muhi is not mentioned at all.[5] A hundred years later in the *Annales Posoniensis*, however, it is explicitly said that the battle took place near the village Muhi,[6] which means that by 1350 the village was known and the memory of the battle was connected to the settlement. In 1241-1242, Borsod county was badly destroyed by the Mongol army and approximately a quarter of the settlements were devastated.[7] This ratio, however, is somewhat misleading, since this calculation only

[3] I. Nagy, F. Deák and Gy. Nagy ed. *Hazai Oklevéltár 1234-1536* (Budapest: Magyar Történelmi Társulat, 1879), 104. (hereafter: *Hazai Oklevéltár*)

[4] This term was often used for villages in the eleventh-thirteenth century, see I. Szabó, *A falurendszer kialakulása Magyarországon (X-XV. század)* (The Development of Village Network in Tenth-Fifteenth Century Hungary) (Budapest: Akadémiai Kiadó, 1966), 40.

[5] Rogerius, *Carmen miserabile,* chapter 28, János Thuróczy, *Chronicle of the Hungarians*, chapter 101 (*Thúróczy: A magyarok krónikája – Rogerius mester: Siralmas ének* (Thúróczy's Chronicle of the Hungarians, Rogerius' Carmen miserabile), Tr. I.Bellus, Gy.Kristó and J. Horváth (Budapest: Osiris, 2001)

[6] T. Katona (ed), *A tatárjárás emlékezete* (The Memory of the Mongol Invasion), Budapest: Magyar Helikon, 1981: 165.

[7] I. Draskóczy, „Miskolc birtoktörténete a középkorban" (Land Property in Miskolc in the Middle Ages), *Miskolc története, Vol.1.A kezdetektől 1526-ig* (The History of Miskolc, Vol. I: From the

takes into consideration those settlements for which some kind of written evidence existed before the invasion, but it is very probable that settlements without any trace in the documents existed in a high number. The battle of Muhi, a national catastrophe for the Hungarian Kingdom, indeed took place in this area. The settlement was probably destroyed and depopulated during the invasion but quickly recovered so that in the second half of the thirteenth century Muhi was once again inhabited. (This is also why there are no special archaeological traces of the Mongol destruction.) This rapid revival is remarkable, since only a small percent of the settlements devastated by the invasion were ever repopulated.

It has been assumed that Muhi had already taken over the function of a regional centre by the end of the thirteenth century.[8] The main reason for this development was that already in this period, Muhi lay at an important crossing point of public roads[9] related to its economically favourable topographical position. Muhi was situated in a region where the Bükk mountains met the Great Hungarian Plain, and since these two types of areas produced different products, the location was perfect for organizing trade. Already a 1284 document reports that a toll had to be paid when crossing the bridge in Muhi's possession.[10] The first written evidence for markets in Muhi comes from 1343, when the settlement was granted the right to

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Beginning until 1526), ed. P. Tóth and A. Kubinyi (Miskolc: Borsod-Abaúj-Zemplén Megyei Levéltár – Herman Ottó Múzeum, 1996) (henceforth*: Miskolc története, Vol.1.*), 92. (henceforth: Draskóczy, Miskolc birtoktörténete)

[89] P. Tóth, *Szempontok a borsodi mezővárosok középkori és kora újkori történetének vizsgálatához. Points of view to analysis of medieval and Early Modern history of market-towns in Borsod country*. Studia Miskolciensia 1 (Miskolc: Miskolci Egyetem Bölcsészettudományi Kar, 1994), 115.

[9] Draskóczy, Miskolc birtoktörténete, 115; É. Gyulai, "Miskolc középkori topográfiája" (The medieval Topography of the Town of Miskolc), *Miskolc története, Vol.1 .A kezdetektől 1526-ig* (The History of Miskolc, Vol. I: From the Beginnings until 1526), ed. P. Tóth and A. Kubinyi (Miskolc: Borsod-Abaúj-Zemplén Megyei Levéltár – Herman Ottó Múzeum, 1996), 189. (henceforth: Gyulai, Miskolc középkori topográfiája)

[10] The exact location of this bridge is not known, even though it appears in documents from time to time. (In a 1284 charter: Györffy, *Az Árpád-kori Magyarország történeti földrajza*, 791; in a 1332 charter: I. Nagy (ed) *Anjou-kori okmánytár* (Charters from the Anjou Period), Vol. II. (Budapest: A Magyar Tudományos Akadémia Könyvkiadó Hivatala, 1881), 619.)

organise weekly markets, already frequented by merchants in the first years.[11] It is very probable that the settlement was granted the right to hold large fairs by the Anjou Period; a 1433 document mentions the "usual fair" in Muhi.[12] There is, however, only very sparse written evidence on the economic function of this settlement from the thirteenth and fourteenth centuries.

Even though in 1321 the settlement was given away by the king, it is revealed in a 1332 document that Muhi was in the possession of the queen, and in 1340 it was attached to the Diósgyőr possessions, one of the landed properties of the royal family.[13] The settlement remained a royal property throughout the history of its existence, even though sometimes it was given away as a pawn .

The extensive trade activities resulted in the quick development of the settlement and in the fifteenth century, Muhi was already an oppidum, a market town of considerable regional importance.[14] This special kind of settlement was characteristic of Central and Eastern Europe. Oppidi were rather large villages than towns, and their economy was dominated by agricultural production even though they often had similar regional functions to urban centres and large towns.[15] Many of these

[11] É. Gyulai, "Termelés és kereskedelem a középkori Miskolcon" (Production and Trade in medieval Miskolc), *Miskolc története, Vol.1.A kezdetektől 1526-ig* (The History of Miskolc, Vol. I: From the Beginnings until 1526), ed. P. Tóth and A. Kubinyi (Miskolc: Borsod-Abaúj-Zemplén Megyei Levéltár – Herman Ottó Múzeum, 1996) , 322. (hereafter: Gyulai, Termelés és kereskedelem)
[12] J. Szendrei, *Miskolc város története és egyetemes helyirata. II. kötet: 1000-1800* (The History and General Description of the Town of Miskolc. Vol.2.: 1000-1800) (Miskolc, 1904), 65.
[13] Draskóczy, Miskolc birtoktörténete, 112.
[14] Gyulai, Termelés és kereskedelem, 332-333.
[15] On this topic, see: V. Bácskai, *Városok Magyarországon az iparosodás előtt* (Towns in Hungary before the Industrialisation) (Budapest: Osiris, 2002), 29-40; V. Bácskai, *Magyar mezővárosok a XV. században* (Hungarian Oppidi in the Fifteenth Century) (Értekezések a Történeti Tudományok Köréből 37, Budapest: Akadémiai Kiadó, 1965); E. Fügedi, "Mezővárosaink kialakulása a XIV. sz.-ban" (The Development of Hungaria Oppidi in the Fourteenth Century), *Kolduló barátok, polgárok, nemesek – Tanulmányok a magyar középkorról* (Mendicants, Burgeoisie, Noblemen – Studies on medieval Hungary), ed. E. Fügedi (Budapest: Magvető, 1981), 336-363; E. Mályusz, "A mezővárosi fejlődés" (The development of Oppidi), *Tanulmányok a parasztság történetéhez Magyarországon a XIV. században* (Studies on the History of Peasantry in Fourteenth-Century Hungary), ed. Gy. Székely, (Budapest: Akadémiai Kiadó, 1953), 128-191; T. Bellon, "Az alföldi mezővárosok fejlődésének gazdasági háttere" (The economic background of the development of oppidi in the Great Hungarian Plain), *Etnographia* 107 (1996): 85-101; Gy. Székely, "Vidéki termelőágak és az árutermelés

settlements took part in large-scale animal trade, especially cattle trade, which emerged as a leading branch of agriculture in the Late Middle Ages.

In 1520, Louis II granted Muhi the right to hold two annual markets on St Luke's Day and on Pentecost, in addition to the weekly market held every Thursday.[16] Sixty years later, the right to organise a third annual market was donated to the settlement.[17] By the sixteenth century, Muhi emerged as a centre for grain production and as an oppidum for intensive trading activities; its role in the regional trade, however, seems to remain more important than its participation in international commerce, and there was more emphasis on weekly markets than on annual fairs. The first detailed information on Muhi derives from 1563, when all tax bearers in the Diósgyőr possession were conscribed. At this time there were 149 plots in Muhi with three or four houses built on some of them.[18]

In Late medieval times, cattle trade was the leading branch of commerce, not only on a regional, but also on an international scale. This trading activity was especially emphasised in the economy of the oppidi on the Great Hungarian Plain. It is not clear to what extent Muhi participated in the cattle trade. The route of cattle herds driven to the crossing at Vác after being assembled on the Great Hungarian

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Magyarországon a XV-XVI. században" (Rural agriculture and production in fifteenth-sixteenth-century Hungary), *Agrártörténeti Szemle* 3 (1961), 309-322; L. Novák and L. Selmeczi ed. *Falvak, mezővárosok az Alföldön* (Villages and Oppidi in the Great Hungarian Plain) (Nagykőrös: Arany János Múzeum, 1986); L. Makkai, "A magyar városfejlődés történetének vázlata" (An Outline of the Development of Hungarian Towns) *Vidéki városaink* (Our Countryside Towns), ed. J. Borsos (Budapest: Közgazdasági és Jogi Kiadó, 1961), 25-76; A. Kubinyi, *Városfejlődés és vásárhálózat a középkori Alföldön és az Alföld szélén* (The Development of Towns and the Network of Markets in the Great Hungarian Plain and on its Peripheral Ranges in the Middle Ages) (Dél-alföldi évszázadok 14, Szeged: Agapé, 2000).

[16] J. Bessenyei, *Diósgyőr vára és uradalma a XVI. században* (The Castle and Possession of Diósgyőr in the Sixteenth Century) (Miskolc: Borsod-Abaúj-Zemplén Megyei Levéltár – Miskolci egyetem, Történelem Segédtudományai Tanszék, 1997), 208.

[17] J. Szendrei, *Miskolc város története és egyetemes helyirata. III. Kötet: Források* (The History and General Description of the Town of Miskolc. Vol.3: Sources) (Miskolc, 1890), 251.

[18] L. Marjalaki Kiss, Muhi puszta és környéke (The Wasteland of Muhi and its Environs) (Miskolc: Borsod-Abaúj-Zemplén Megyei Tanács Népművelési Osztálya, 1955), 14.

Plain, led by Muhi. Animals driven to the northern markets in Nagyszombat and Pusztapécs (Moravia) might have stopped for the Muhi fairs as well. The fattening of cattle for beef production had always been practiced to some extent but in the fifteenth-sixteenth centuries the importance of this branch of agriculture noticeably increased.[19] Open wastelands suitable for animal herding were available in large quantities.

In 1563, when the commissioners of the Hungarian Chamber evaluated the incomes in the Diósgyőr possession, they emphasized that the animal husbandry and the trade in living animals as well as animal products in this area was very remunerative, and that this branch represented a source of remarkable economic opportunities.[20] Even though Muhi is not mentioned in written documents as a centre for the cattle trade, it is notable that in the time of the great recession in animal husbandry, only two settlements became depopulated in this area, Petri and Muhi. In all probability, Muhi was forced to abandon its leading role in crop production because the Turkish Ottoman wars and fluctuations in the population made proper land cultivation almost impossible. It is a known tendency that in such areas people turned to animal husbandry instead of land cultivation, since living animals could be

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[19] On the cattle trade, see: I. Blanchard, "The continental European cattle trades, 1400-1600," *Economic History Review*, 2nd Ser. XXXIX, 3 (1986): 427-460; E. Westermann ed. *Internationaler Ochsenhandel 1350-1750: Akten des 7th International Economic History Congress, Edinburgh 1978* (Stuttgart: Klett-Cotta, 1979); Makkai László: "Der ungarische Viehhandel 1550-1650," *Der Aussenhandel Ostmitteleuropas 1450-1650*, Hrsg. Ingomar Bog (Cologne-Vienna: Bohlau Verlag, 1971), 483-506; S. Takáts, "A magyar tőzsérek és kereskedők pusztulása" (The Decline of Hungarian Cattle Traders and Merchants) *Szegény magyarok* (Poor Hungarians), ed. S. Takács (Budapest: Génius, 1927), 129-247; S. Takáts, "Az auspitzi (pusztapécsi) magyar marhavásárok régi kiváltságlevelei" (Privileges on the Hungarian Cattle Markets in Auspitz), *Magyar Gazdaságtörténeti Szemle* 12 (1906), 228-232; J. Szabadfalvi, *Az extenzív állattenyésztés Magyarországon* (Extensive Animal Breeding in Hungary) (Műveltség és Hagyomány 12, Debrecen: Kossuth Lajos Tudományegyetem Néprajz Tanszék, 1970)

[20] É. Gyulai, "Gazdálkodás, termelés és árucsere a kora újkori Miskolcon" (Economy, Production and Trade in Miskolc in the Early Modern Period), *Miskolc története II. kötet: 1526-tól 1702-ig* (The History of Miskolc, Vol.2.: From 1526 until 1702), ed. F. Szakály, (Miskolc: Borsod-Abaúj-Zemplén Megyei Levéltár – Herman Ottó Múzeum, 1996), 176, 182, 184.

driven away in time of danger and sold when necessary, and because Turkish authorities had a great interest in maintaining the already existing animal trade.[21] Thus, the great crisis in this branch of trade destroyed the economic potential of the settlement and it is very probable that this was one of the reasons that Muhi became depopulated in the first half of the seventeenth century..

The quick recovery of the village after the Mongol invasion and its fast development in the Late Middle Ages suggests that the favourable geographical position and the trade connections ensured access to financial resources which were not available for other settlements in the immediate region. In my thesis, I will investigate the first phase of this development on the basis of the thirteenth-century animal bone assemblage.

[21] L. Bartosiewicz, "Animal exploitation in Turkish Period Hungary. The osteological evidence," *OTIVM. Journal of Everyday Life History*, 5-6 (1997-1998): 47.

1.2 Research questions

Animal bones recovered from archaeological sites are artefacts in the sense that their deposition is influenced by a number of cultural filters such as the preference for certain taxa (kept and hunted), the preference for age classes and sexes, animal exploitation, butchering methods, cooking traditions or the way garbage was deposited (in open air or in covered pits). Thus, animal remains reveal information on past animal and human populations, their mutual interactions and the way animal products are manipulated during various kinds of social negotiations. In cases when no written evidence is available – as in Muhi –, the analysis of such remains can contribute significantly to our present knowledge. The main aim of my analysis is to provide information on animal keeping and meat consumption patterns in this settlement and the way variability in these patterns may reflect social differentiation within the early village. These are all topics which have never been investigated before at Muhi and for which animal remains represent the only source available in large quantities.

My research questions are as follows:

1. **What animal species were kept and hunted in Muhi, and in what proportions?**
2. **In what ways were the domestic animals exploited?**
3. **What meat consumption patterns can be established in different parts of the settlement?**
4. **Is any level of social differentiation, connected to later developments in the village, reflected in the kitchen refuse?**

In order to answer these questions, in the following chapters, I will analyse the animal bones recovered from the site, their ratio and character (Chapter 4), bone artifacts recovered from the site (Chapter 5), and then I will discuss signs of butchering and the waste dicarded in these three site areas. (Chapter 6). Finally, I will analyse the similarities and differences between Muhi and a coeval village near present-day Budapest, Kána.

Some of the figures are embedded in the main text, but some additional and explanatory figures were included in the Appendix as well. Figures with number format 9.x were placed in the Appendix. Unfortunately, it did not prove possible to photograph or acquire pictures of all interesting finds.

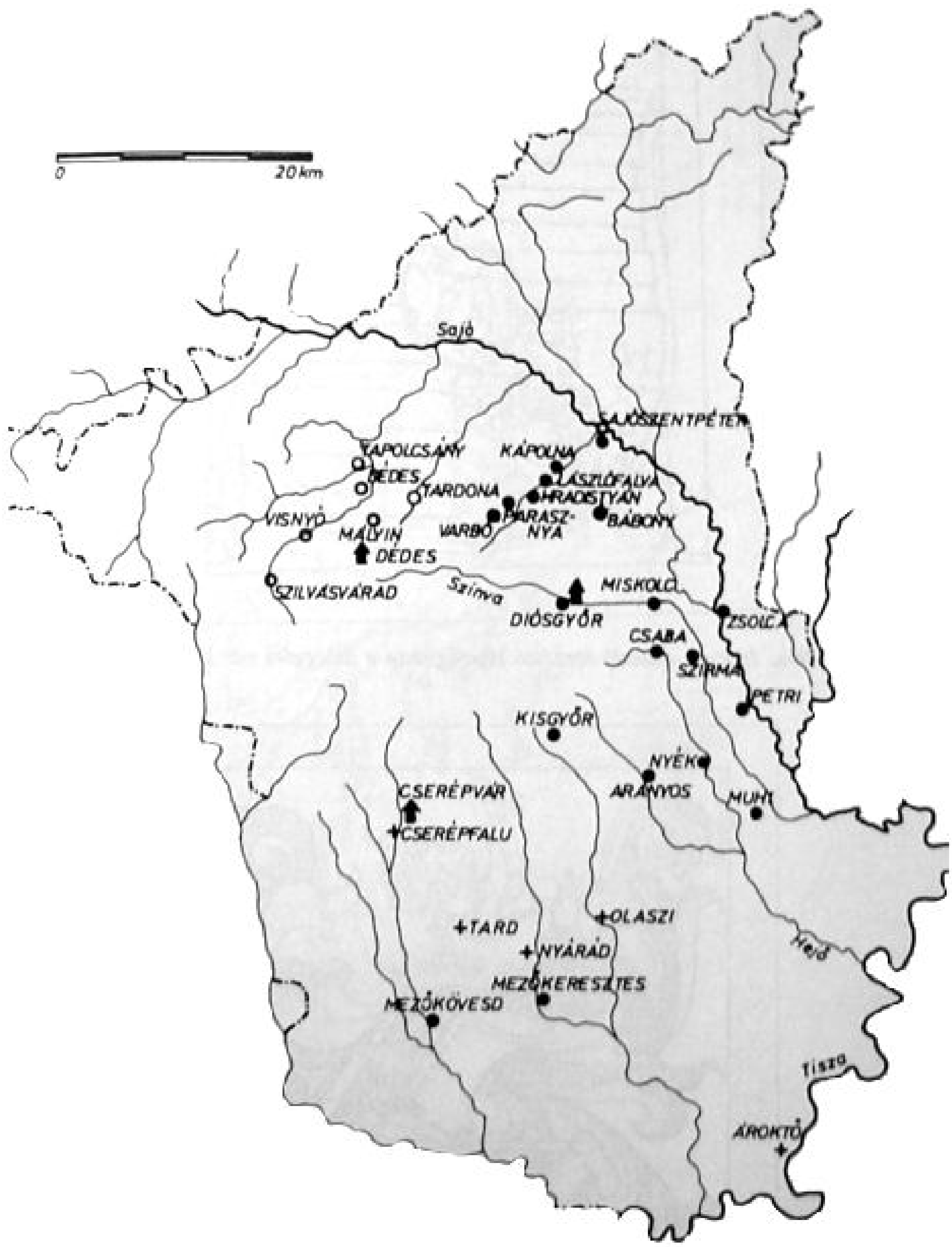

Fig.1.1 *The map of Borsod county in the first half of the fifteenth century (from P.Tóth – A. Kubinyi ed. Miskolc története, I. kötet: A kezdetektől 1526-ig (The History of Miskolc, Vol.1. From the Beginning until 1526) (Miskolc: Borsod-Abaúj-Zemplén Megyei Levéltár – Herman Ottó Múzeum, 1996), Fig.10*

Chapter Two: MATERIAL AND METHODS

2.1 The assemblage

The bone assemblage recovered during the excavations in Muhi are stored in the Herman Ottó Museum in Miskolc. The bones were processed, identified and measured partly in this museum, partly in the bioarchaeological laboratory of the Aquincum Museum in Budapest.

Altogether 20,145 animal bones were found and identified from the archaeological site of Muhi. This includes material collected by hand, but not sieving or flotation; the hand collection, however, was very precise and fragments of 0.5-1 cm were also picked up. Within this assemblage, a total of 7834 bone fragments came to light from the layers dated to the twelfth-thirteenth century, thirteenth century and thirteenth-fourteenth century. These faunal remains were studied as a single unit, because they overlap temporally, and since the bulk of this sample comes from the thirteenth century, these remains principally reflect animal keeping in the same historical period. Some fragments (2055 pieces) could not be identified precisely because they were too fragmented. Thus, they were not included in the species ratio calculations, although they could still be studied from a taphonomic point of view. Human bones were also omitted from the analysis. Thus, altogether 5759 precisely identified bone finds (NISP)[22] were available for close study.

[22] Number of identified specimens (NISP) is the standard term in archaeozoology for the number of precisely identified fragments included in the faunal analysis. This number is taken as 100% in relative frequency calculations. A group of fragments obviously deriving from the same bone counts as a single item.

2.2 Taphonomy

The taphonomic history of an assemblage always illustrates loss of information and decline in its integrity: first through the alteration of the bones before, during and after their burial, and secondly during the excavation, through the recovery and storage, and finally during the scientific analysis and interpretation.[23] The first factors are not influenced by the archaeologist, but the second and the third factors are. The effects of the excavation and interpretive methods, although different from the natural and anthropogenic damage caused to the evidence before recovery, are still parts of the taphonomic history, and affect the assemblage to a similar extent. The choice of where the excavation is carried out, how the faunal sample is recovered, or how complete the analysis should be all change our perception of the archaeological deposit,[24] and such choices are being made continually during work.

All the remains of the animals exploited at a settlement will never be found: the animals raised locally could be transported and butchered somewhere else, their remains could be discarded beyond the excavation area or their anatomical parts were sometimes not durable enough to survive. At every stage in the taphonomic process, a loss of information is to be expected: not all animals end up in one of the refuse pits of the settlement, not all bones survive, not all the surviving bones will be found and collected, and not all of the collected material will be suitable for precise description and analysis. Thus, the bone material recovered at an archaeological site always represents only a small part of the animals kept, butchered and consumed in a certain

[23] E.J.Reitz and E.S. Wing, *Zooarchaeology* (Cambridge: Cambridge University Press, 2004), 110. (hereafter: Reitz and Wing, *Zooarchaeology*)
[24] Reitz and Wing, *Zooarchaeology,* 112

period. This also means that sample size heavily influences whether an assemblage is representative or not.

The taphonomic process is illustrated in the figure below.

Life assemblage: animals living on and around the site in a certain period

Cultural filters: animal keeping and hunting traditions, consumption and cooking customs, meat preference, butchering techniques, ethnic dynamics, social status

↓

Death assemblage: animal remains on the site in a certain period

Deliberate deposition (refuse pits, ritual deposits) and transportation of waste by carnivores, pigs, rats, and other scavengers

↓

Deposited assemblage

Post-depositional processes (both biotic and abiotic):
Biotic disturbance (plant roots, rodents, burrowing animals), abiotic disturbance (wind, rain, floods), climatic conditions, soil pH, building and levelling work at the settlement, foot traffic etc.

↓

Faunal assemblage on the site

Excavation, documentation, storing, transportation, identification

↓

Assemblage included in a scientific analysis

Fig. 2.1 The taphonomic process

In the case of Muhi, the large sample size helps representativity. The three excavation areas reflect three different environments and, presumably, different social strata (see Chapter 3), yielding a cross-section of the village, even though it was impossible to excavate the whole area.

The bone material from Muhi is heavily fragmented. The average length of the finds is 6.7 cm; the majority of the finds (5648 pieces, ca. 72%) fall between 3 and 10 cm. The average length, however, varies from one species to the other: 5.62 cm for sheep and goat remains, 5.82 cm for pig bone fragments, 7.84 cm for cattle and 10.9

for horses. Fragmentation is influenced by the morphology of the bones, processes which took place before the assemblage was covered with soil, as well as by processes affecting the bones after they were covered. Butchering, cooking traditions or the gnawing of carnivores, as well as mechanical damage, temperature conditions, the presence or absence of water contributed to different degrees in the fragmentation. Long bones from domestic animals tend to be broken during food processing anyway. The bones of animals consumed were cut up to pieces small enough to fit into the pot for cooking,[25] and it was also easier to extract the bone marrow from broken bones. This results in a large number of diaphysis fragments. Large mammals tend to be overrepresented in heavily fragmented assemblages, simply due to the fact that their bones produce more pieces of a "standardised" length then do those of small ruminants or pigs.[26]

A special type of damage that can also cause fragmentation is burning. Depending on the temperature, different kinds of discolorations may occur. Two levels of burning was observed on the bones: some pieces were burnt black ("carbonized" bones, 64 pieces), which occurs between about 390 and 525 °C. Some others were burnt white (calcinated, 10 pieces), which happens at about 645 °C.[27] Elements exposed to heat often alter in size.[28] These phenomena are not necessarily connected to cooking processes, since the accidental burning of waste is also a possibility. The burnt pieces were, however, not concentrated in one or two stratigraphical units but were scattered throughout the excavation area. Even if several

[25] This practice may still be found in some villages on the Great Hungarian Plain, where the meat is not filleted before cooking, but the small bone splinters are cooked into the stew. (Dr Alice Choyke, personal communication.)

[26] L. Bartosiewicz, "Faunal material from two Hallstatt Period settlements in Slovenia," *Arheoloski Vestnik* 42 (1991): 199-205.

[27] P. Shipman, G. Foster, M. Schoeninger, "Burnt bones and teeth: an experimental study of colour, morphology, crystal structure and shrinkage,, *Journal of Archaeological Science* 11 (1984): 307-325.

[28] Reitz and Wing, *Zooarchaeology*, 169.

pieces from a unit were burnt, the others were not. This rather signifies that the pieces were burnt before they were thrown into the refuse pit.

Carnivores and pigs not only gnaw bones but sometimes also remove them from the actual area, influencing the composition of the assemblage. The amount of bones removed is, however, impossible to estimate, but the proportion of bones gnawed by dogs or pigs may signify the extent of their activity in the settlement. A high number of gnawed bones may also indicate that kitchen rubbish was not covered with soil. Only 352 pieces were gnawed at Muhi, or about 4.5% of the whole material. This may indicate two things: either the rubbish was stored in places where animals did not have access to it easily, or the overwhelming majority of the pieces picked up by dogs and pigs ended up somewhere outside the excavation area (which is unlikely).

In seven cases, characteristic traces left by roots of plants were discovered on the bones. These damage the surface somewhat, without significantly influencing the condition of the find (bone tools are an exception, where roots can heavily damage microscopical wear patterns).

In two cases there were metal discolorations on the bones. This only indicates that the bone lay next to a metal object in the ground. These two pieces were found in two different pits.

2.3 Software used during the analysis

Two software programs were used during the identification and analysis of the bones: Microsoft Excel and the so-called ”*Csontász*”.

The "Csontász" software program was constructed by Péter Csippán, an archaeozoologist of the Aquincum Museum in Budapest. The software is based on Microsoft Access and has been designed for the data management of bone assemblages. The software is used through a special interface in which there is room for different kinds of data: the species, the name of the bone, bone part, age and sex of the animal, the length of the find (not identical with the total length of whole long bones, which is a bioarchaeological value that can only be measured on unfragmented bones; the length of the find is only used in judging fragmentation), various taphonomical factors, and pathological phenomena. There are separate data sheets for butchering and bone measurements. After the identification of the bones, the database can be converted into an excel file, and the statistical analysis is carried out with the help of this software. One advantage of Csontász is that the databases can be merged within excel files, something that is important if the examination of the bone material takes place in different places, on different computers.

2.4 Primary and secondary data

Primary archaeozoological data are collected directly from the bone material. These data are mostly biological in nature. They include information on the taxa and skeletal elements. These biometrical data, however, cannot be placed directly into a cultural context. It is necessary, therefore, to collect secondary data, which are based on the primary data. These are not direct measurements but ratios, estimations, distributions and tendencies, which lend themselves to cultural interpretation.

Primary data

Primary data were recorded during the identification phase when all fragments were examined and described individually. These data include taxonomic identification (species), specimen counts, the identification of the skeletal element and its part, pathologies, age and sex of the animal, bone measurements, and notes of special phenomena such as butchering marks, bone working or clearly recognizable taphonomic alterations. (Specimen weight is sometimes also measured but in this case it was not feasible due to the lack of a proper instrument.)

Bone measurements were taken using the methods of Angela von den Driesch, published in her book *A Guide to the Measurement of Animal Bones from Archaeological Sites* in 1976,[29] which is now regarded as an international standard and is used by specialists in Europe as well as in the United States. Another measurement, the length of the fragment (L), was also recorded; it has no biological value, but helps to judge fragmentation. In an ideal case, fifteen or more different data could be recorded for a single find:

1. specimen count
2. taxon
3. skeletal element
4. part of the skeletal element
5. body side
6. age of the animal

7-14. seven bone measurements[30]

15. notes (butchering, sex, pathology, taphonomy, traces of bone working)

[29] Angela Von Den Driesch, *A Guide to the Measurement of Animal Bones from Archaeological Sites*, (Peabody Museum Bulletin 1, Harvard: Peabody Museum, 1976).
[30] Only for long bones. For irregularly shaped bones, other kinds of measurements are necessary.

In most cases, however, not all these data are recorded; sometimes only the skeletal element can be identified. In cases where the taxon is uncertain due to the absence of proper anatomical features on the fragment, zooarchaeologists use larger categories. The size of the animal can usually be judged even from a small fragment; the larger taxonomic group it belongs to can usually be identified, even though the precise taxon is unknown. These, taxonomically unidentified pieces were not included in the close analysis in the further chapters.

The bones of sheep and goat are not easily separated taxonomically in the record. It is widely accepted in archaeozoology that they should be handled together as two closely related species. There are only a very few anatomical differences between their skeletons, and usually it is not possible to say whether a fragment derives from a sheep or a goat. In some cases, nevertheless, the two species can be separated especially on cranial features, metapodia and horn cores.[31]

The identification of the animal's age was based on the fusion of the epiphysis and tooth wear. I have used the epiphysial fusion table published by Chaix and Méniel for main domesticates[32] and the method of R.N. Smith for cats.[33] In some cases, it was possible to identify the precise age of death. The following age categories were used here: neonatal, infantile, juvenile, subadult, adult and senile (maturus).

[31] On the differences between sheep and goat skeletons, see the following: J. Boessneck, "Osteological Differences between Sheep (*Ovis aries* Linné) and Goat (*Capra hircus* Linné)," *Science in Archaeology*, ed. D.R. Brothwell and E. Higgs (New York: Praeger, 1969), 331-358,

[32] L. Chaix and P. Méniel, *Archéozoologie. Les animaux et l'archéologie* (Paris: Éditions Errance, 2001).

[33] R.N. Smith, "Fusion of ossification centres in the cat," *Journal of Small Animal Practice* 10 (1969) : 523-530.

Secondary data

Secondary data derive from the primary data, and include estimates of body dimensions (withers height), age and sex ratios, relative frequencies of species, frequencies of skeletal elements, and dietary contribution (including the methods of butchering). These data are used when the assemblage is evaluated and placed into various cultural contexts.

The relative frequency of species is used to establish the ratio of the different taxa in the assemblage. It is usually calculated on the basis of the NISP data (the number of pieces recorded for each taxa), the minimum number of individuals (MNI) and specimen weight.[34] Even though NISP represents primary data, it is used in frequency calculations, which is an analytical product. The minimum number of individuals is calculated from the number of paired skeletal elements of the same type and side (left or right); e.g. if there are four left humeri, two right astragali, one left ulna and three right ulnas of cattle in a hypothetical assemblage, the bones must derive from at least four individuals, since one cattle has only one left humerus. Minimum counts of different species do not necessarily reflect their economic importance since they provide different amounts of meat and other products (wool, milk, hides), which has to be kept in mind.[35] With very fragmented assemblages like Muhi, counting MNI is not a reliable method, since one single bone might consist of a number of fragments, and it is not always possible to recognize whether the fragments belong together or not.

However, the NISP and MNI only describe the archaeological sample and not the whole death assemblage they derive from, so it must be kept in mind that the they

[34] Reitz and Wing, *Zooarchaeology*, 191.
[35] S.J.M. Davies, *The Archaeology of Animals* (London: Routledge, 2002), 36 (henceforth: Davies, *The Archaeology of Animals)*

lack validity beyond the immediate sample. Methods based on the NISP are also biased if some of the taxa involved have more identifiable bones per individual than others because of morphological differences or variations in butchery methods. By using NISP as a starting point, cultural and non-cultural fragmentation is taken as being uniform, and it is assumed that recovery rate is, more or less, the same for each taxon. This is one of the most debated and most complicated methodological problems in archaeozoology, a problem which has not yet been resolved either by introducing the minimum number of individuals, or the weighting of the finds, or the semi-quantitative categories used in archaeobotany.[36] Counting methods have actually been ardently criticized by many specialists from the 1950s onwards.[37] In my view, NISP calculations and percentages can be used with caution, not taking them as face values but rather as indicators of tendencies and significant differences in various distributions. Taphonomy is a crucial point, since fragmentation influences the number of identifiable pieces; the bone assemblage that ends up on the desk of the archaeozoologist is a product of a complex, multifactorial taphonomic process, and the possibilities of its reconstruction are limited. This problem, however, has a wider

[36] T. O'Connor, *The Archaeology of Animal Bones* (Thrupp: Sutton Publishing, 2004), 54-67. (hereafter: O'Connor, *The Archaeology of Animal Bones*)

[37] On this problem, see the following: T.E. White, "A method of calculating the dietary percentage of various food animals utilized by the aboriginals peoples," *American Antiquity* 18/4 (1953): 396-398; G.S.Krantz, "A new method of counting mammal bones," *American Journal of Archaeology* 72/3 (1968): 286-288; S. Bökönyi, "A new method for the determination of the number of individuals in animal bone material," *American Journal of Archaeology* 74 (1970): 291-292; J.P.N. Watson, "Fragmentation analysis of animal bone samples from archaeological sites," *Archaeometry* 14/2 (1972): 221-228; D.K.Grayson, "On the methodology of faunal analysis," *American Antiquity* 38 (1973): 432-439; R.W. Casteel, "Characterization of faunal assemblages and the minimum number of individuals determined from paired elements: continuing problems in archaeology," *Journal of Archaeological Science* 4/2 (1977): 125-134; J.P.N. Watson, "The estimation of relative frequencies of mammalian species: Khirokitia 1972," *Journal of Archaeological Science* 6/2 (1979): 127-137; N.R.J.Fieller and A.Turner, "Number estimations in vertebrate samples," *Journal of Archaeological Science* 9/1 (1982): 49-62; D.N.Schmitt and K.D. Lupo, "On mammalian taphonomy, taxonomic diversity, and measuring subsistence data in zooarchaeology," *American Antiquity* 60/3 (1995): 496-514.

scope than that of archaeozoology, but it is an issue for all archaeological and historical fields of study.

The frequency of specimens from different parts of the skeleton within a taxon is important in studies of butchering, meat consumption and food preparation. Skeletal frequencies may also be used to distinguish among species kept for their meat and those kept for their draught power, those that were killed on the site and those killed outside the settlement and transported to the village.[38] The frequency of anatomical regions and butchering units is used to reconstruct dietary habits and the quality of meat available, since different anatomical regions provide different kinds of meat. Thus, the frequency of skeletal elements is also used as an indicator of dietary contribution. A practical method for meat quality evaluation on the basis of the frequency of anatomical regions was developed by Hans-Peter Uerpmann[39] (see Chapter 6).

One of the most important secondary data is body size estimation. It helps to judge the character and quality of the livestock, and supports a number of interpretations, especially comparisons with other assemblages. Body dimensions may indicate types within a taxon, livestock health, weather conditions, the way the animals were exploited as well as nutritional conditions; body size, however, is also related to sex, geographical region and individual variation.[40] The easiest and most widespread method is the estimation of withers height, calculated from the greatest

[38] Reitz and Wing, *Zooarchaeology*, 202-204.
[39] H.-P.Uerpmann, "Animal bone finds and economic archaeology: A critical study of the 'osteo-archaeological' method," *World Archaeology* 4/3 (1973): 307-322. (henceforth: Uerpmann, Animal bone finds and economic archaeology) Another method was published by Miklós Kretzoi in 1967 (M. Kretzoi, "Étude plaeontologique," *La station du la paléolithique moyen d'Érd, Hongrie*, ed. M Gábori and V. Csánk (Budapest: Akadémiai Kiadó, 1967), 59-104). Kretzoi's method is more precise in terms of identifying the actual anatomical region, but I used Uerpmann's method, because it is much more accepted in international archaeozoological scholarship.
[40] Reitz and Wing, *Zooarchaeology*, 172.

length of the long bones. Different mathematical formulae are used for different species. The formulae I have used are accepted in modern zooarchaeology (even though other methods exist): Kiesewalter's method for horses,[41] Matolcsi's method for cattle,[42] Schramm's method for goat,[43] Teichert's method for sheep and pig,[44] Godynicki's method for red deer[45] and Harcourt's method for dog.[46] This type of calculation, however, is only possible if whole and undamaged long bones are available. Withers height is not calculated for young animals whose epiphyses are not yet fused. Young animals have not reached their maximum size at the time of death and thus, calculating their height would distort the picture of the adult animal population.

Age classes, based on the age at death, provide information on the use of the animal (there is an optimal slaughtering age) and sometimes on seasonality (offspring are usually born at a particular time of year). Age clusters may indicate whether the species was produced and consumed on the site (wide ranges of ages are present), imported (restricted age range) or largely raised for export and slaughter elsewhere (young animals missing).[47] A large ratio of adult animals may also signify some secondary use such as for blood, milk, wool or hair. This ratio is, however, influenced

[41] L. Kiesewalter, *Skelettmessungen am Pferde* (Leipzig: Inaugural Dissertation, 1888)

[42] J. Matolcsi, "Historische Erforschung der Körpergrösse des Rindes auf Grund von ungarischem Knochenmaterial," *Zeitschrift für Tierzüchtung und Züchtungsbiologie* 63 (1970): 155-194.

[43] Z. Schramm, "Kosci dlugie a wysokosc w klebie u kozy" (Long bones and withers height in goat), *Roczniki Wyższej Szkoły w Poznaniu* XXXVI (1967): 89-105.

[44] M. Teichert, "Osteologische Untersuchungen zur Berechnung der Widerristhöhe bei Schafen", *Archaeozoological studies*, ed. A. T. Clason (Amsterdam - New York: North Holland and American Elsevier, 1975): 51-69.; M. Teichert, "Osteometrische Untersuchungen zur Berechnung der Widerristhöhe bei vor- und frühgeshcichtlichen Schweinen" *Kühn Archiv* 83/3 (1969): 237-292.

[45] Sz. Godynicki, "Okreslanie wysokosci jeleni na podstawie kosci sródrecza i sródstopia" (Determination of deer height on the basis of metacarpal and metatarsal bones), *Roczniki Wyższej Szkoły w Poznaniu* XXV (1965): 39-51.

[46] R.A. Harcourt, "The dog in prehistoric and early historic Britain", *Journal of Archaeological Science* 1 (1974): 151-175.

[47] Reitz and Wing, *Zooarchaeology*, 179.

by the fact that bones of young animals are exposed to more serious damage during their taphonomic history, and thus are less likely to survive.

Sex ratios can be useful for the interpretation of hunting strategies and food preferences. It is, however, often impossible to identify the sex of the animal. In taxa where a clear sexual dimorphism is present, for example the antlers of stags and bucks, the hollow-rooted tusks of male wild boars or the canine teeth of stallions, identification of sex is an easy task if these skeletal elements are present. In cattle and goat, where males tend to be considerably larger than females, the sex ratio can be estimated if complete bones of adult individuals are present in sufficiently large quantities.[48] With small bone fragments, however, such a precise identification is rarely feasible, since clear signs of sexual dimorphism are missing from most skeletal elements of domestic species. Even though there is a difference in size between males and females, there is also considerable overlap and thus, except in some extreme cases, it is mostly impossible to specify on the basis of the size of a small fragment only whether it came from a male or a female. Besides, size is influenced by a number of different factors such as individual variation, types within the species or nutrition. The presence of castrated animals within a species further complicates the picture since their bone growth is influenced by the altered quantities of hormones in their blood and the age of castration. Therefore, I only used sex identification in cases where there was an unambiguous anatomical sign. Nobis has published a mathematical method for cattle which helps to identify sex on the basis of bone measurements;[49] with this formula some of the complete metapodia can be sexed with

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[48] Davies, *The Archaeology of Animals,* 44.
[49] G. Nobis, "Zur Kenntnis der ur- und frühgeschichtlichen Rinder Nord- und Mitteldeutschlands," *Zeitschrift für Tierzüchtung un Züchtungsbiologie* 63 (1954): 155-194.

certainty although there is still some overlap between males, females and castrates. Unfortunately, no similar formulae exist for other species.

The Appendix contains some explanatory figures on the anatomy of domestic species and withers height measurements (*Figs.* 9.1-9.3).

2.5 Basic statistics used in the analysis

In my thesis I use some statistical methods to evaluate the finds. In most cases, I give the ratios in percentages because they are more easy to assess and because these figures are based on samples of sufficient size. For the withers height calculations I also provide an average value and standard deviation from the mean. The former is simply calculated as an arithmetic mean; there was no point in calculating weighted or truncated means for the withers heights due to the small number of data available. The standard deviation (σ) is calculated as the root mean square deviation of values from their arithmetic mean. This calculation is the most common measure of statistical dispersion; it shows how widespread the values are in a particular sample or data set. If many data points are close to the mean then the standard deviation will be small; if many data points are far from the mean, then the standard deviation is large.

Another method I use in Chapter 6 is the so-called Chi-square (χ^2) test. This test was used to determine whether the difference between the observed and the theoretical (normal) distribution is statistically significant. If the calculated value of χ^2 is bigger than the so-called critical value for a given degree of freedom (the number of variables), then the difference between the theoretical (normal) and the observed distribution will be considered statistically significant. Critical values for the Chi-square distribution were provided on the website of the 'MedCalc' statistical software (http://www.medcalc.be/manual/chi-square-table.php, accessed on 21 May, 2008).[50]

[50] On the statistical methods, see the following: A. Vargha, *Matematikai statisztika pszichológiai, nyelvészeti és biológiai alkalmazásokkal* (Mathematical Statistics and its Applications in Psychology, Linguistics and Biology) (Budapest: Pólya Kiadó, 2000)

Chapter Three: THE RECONSTRUCTED TOPOGRAPHY OF MUHI AND THE EXCAVATED AREAS

Even though archaeological excavations have been carried out in Muhi, the topography of the whole settlement is not known in detail since only a small segment of the former market town has been excavated. Muhi was deserted in the 1640s, and the settlement never revived; now the area is open plough land. No written evidence is available regarding Muhi's topography, neither is there a coeval map which could help us to identify features. Aerial photos and the field survey, however, provided valuable information on Muhi's medieval structure prior to the most recent excavation.

Following several excavation attempts from the 1870s until recently,[51] two precise, large-scale excavations were carried out in the area of the former village and later market town in 1995-1997. The excavation areas (M30/41 and M30/42) were dictated out by the path of the motorway construction, which destroyed this part of the site (there was some deliberate choice, however, on the part of the archaeologist in the case of site M30/41). Site M30/42 was located in the core of the settlement, while site M30/41 was located on the southern border of the settlement, and included two small

[51] János Szendrey organised a survey lasting several days in this area in 1878 in order to find the remains of the village church. He was able to locate the dwelling areas of the settlement, and on the basis of written sources, he drew the basic conclusion about Muhi's destruction in the seventeenth century: the population (houses) grew continuously until the turning point in 1564 and then began to decrease. He showed his results on a map which was later lost. After this short excavation, Andor Leszih attempted research on a larger scale in 1934-1941, but this survey – due to the lack of proper documentation – is of little use for recent studies. (Animal bones were, unfortunately, not collected.) Some of the results, however, were published by Alajos Bálint and István Éri in 1959. (T. Pusztai, "A középkori Mohi mezőváros építészeti emlékei" (Architectural remains of the medieval market town of Muhi), *Népi építészet a Kárpát-medencében a honfoglalástól a 18. századig* (Folk Architecture in the Carpathian Basin from the Hungarian Conquest to the Eighteenth Century), ed. M. Cseri and J. Tárnoki (Szentendre-Szolnok: Damjanich János Múzeum - Szabadtéri Néprajzi Múzeum, 2001), 331-363 (henceforth: Pusztai, A középkori Mohi mezőváros építészeti emlékei); B. Éri and A. Bálint, *Muhi elpusztult középkori falu tárgyi emlékei* (Material remains from Muhi, a destroyed medieval village) (Régészeti Füzetek Ser. II/4, Budapest: Budapesti Történeti Múzeum, 1959)

areas. In preparation for the excavations, an intensive field-survey and a preliminary survey were carried out in 1993. The results of the preliminary surveys and the excavations were published by Tamás Pusztai (Herman Ottó Museum, Miskolc) and Gábor Tomka (Hungarian National Museum, Budapest).

The illustrations, excavation photos and drawings were put into the Appendix, since they would have taken up too much space in the main text.

3.1. The results of aerial photos and surface collecting

Aerial photos had been taken earlier for mapping purposes (1971-1972) and new photos were made in 1995 (*Figs. 9.4 and 9.5 in the Appendix*). The settlement appears on the photos as a long, 50-100 m wide, white - light brown stripe running in a northeast – southwest direction, with a narrow, dark line on its axis. The light stripes run parallel to each other and widen in the middle of the settlement area around a clear, white spot (which can be observed best on the colour photos). The colour photos made it clear that the white stripes are not homogenous, but consist of two, parallel stripes on both sides, with two somewhat darker, yellowish, 25-30 m wide belts right beside the dark stripe. The dark line was hypothetically identified as the main road of the settlement, while the light stripes on its sides were assumed to be the remains of former dwelling tofts under the surface: the narrow, yellowish stripe indicates the remains of the actual buildings, while the lighter, white and light brown areas are backyards.[52] Some written evidence indicated that the remains of the former

[52] T. Pusztai, "Muhi középkori mezőváros régészeti kutatásának topográfiai előkészítéséről" (The topographical preparations for the excavation of the market town of Muhi), *A Herman Ottó Múzeum Évkönyve* 33-34 (1996): 35-36. (henceforth: Pusztai, Muhi középkori mezőváros régészeti kutatásának topográfiai előkészítéséről)

main street were still visible in the 1950s as a stony, destroyed road. The remains of this road were found on the plough land in the form of narrow tracks, deep traces left in the soil by heavy cart traffic. (*Fig. 9.6*) This former road continues outside the settlement area (distinguishable on the larger aerial photos), and is identical with the road which connected Muhi to Ónod, a village in the vicinity. On the later photograph the clear, bright white spot, with widening stripes of the former buildings around it, indicated the location of the church; this is also the spot of a small elevation which was present at the same time as the other features (the so-called Templomdomb or Church Hill). A specific feature could be observed northeast of the church. Right beside the church, a light spot indicates the presence of a building, probably identical with the one mentioned in the short documentation from the 1930s excavation; it may also be identical with one of the "two mansions" mentioned in a 1563 document.[53] Further to the northeast, ruins of buildings set parallel to the main street were detected. These ruins appear on the main street itself and close it down at some 80 meters' distance to the church. This closure cannot be linked with the results of the systematic surface collection; the feature has not been identified yet. Features in the southern part of the settlement are sometimes also difficult to identify since this segment of the settlement is cut through by a modern highway. (See the interpretation of the aerial photos, *Fig. 9.7.*)

A systematic field walk and surface collecting was conducted. The area of the whole settlement (2.28 ha) was researched: it was divided into small, 10 m x 10 m grid segments and all finds brought to the surface by ploughing were collected and documented in order to gain a more or less precise picture of features under the

[53] Pusztai, A középkori Mohi mezőváros építészeti emlékei, 335.

ground.[54] All kinds of finds were collected: pieces of pottery, metal objects, glass, stone tools, animal bones, remains of bricks etc. The average density of finds was 150-500 pieces/square (a 10 x 10 m grid-segment), but a large variability was prevalent.[55] The results (*Figs. 9.8 and 9.9*) showed that there was a line with low find density, which was identical with the long, dark stripe on the aerial photos, identified as the main street. On its sides, the find density varied from very high to low; in general, the areas previously identified as the remains of former buildings showed a high density of finds collected from the surface (600-700 pieces/square as a maximum number). On the southern ranges of the settlement, the results of the survey helped to identify the area later excavated. The survey also made it clear that the area of the actual excavations is not the one with the highest density of finds (the excavations took place as the result of a motorway construction, so the spots chosen for excavation were prescribed); the map of the survey serves as a firm starting point for further excavations in the area of the settlement, and helped to place the excavated area within a broader topographical context.

With these two methods, aerial photography and field walking, the main structure of the settlement was already identified, without any form of excavation. Muhi was a so-called "one-street settlement",[56] which is a well-known structure in Hungarian villages even today.[57] The life of the village was organised along the main

[54] This method is based on the fact that if the intensity of ploughing is the same in the whole area, the number of finds that rise to the surface on a certain location is directly related to the number of finds under the surface. Therefore, spots with a high density of finds indicate rich archaeological features in the soil. C. Renfrew and P. Bahn, *Archaeology. Theories, Methods and Practice* (London: Thames and Hudson, 1996), 85; Pusztai, Muhi középkori mezőváros régészeti kutatásának topográfiai előkészítéséről, 40-41.
[55] Pusztai, Muhi középkori mezőváros régészeti kutatásának topográfiai előkészítéséről, 40.
[56] Pusztai, Muhi középkori mezőváros régészeti kutatásának topográfiai előkészítéséről, 42.
[57] About one-street settlements and their structure, see the following: F. Maksay, *A magyar falu középkori településrendje* (Settlement Structure in medieval Hungarian Villages) (Budapest: Akadémiai Kiadó, 1971), 92-97; I. Szabó, *A középkori magyar falu* (The medieval Hungarian Village) (Budapest: Akadémiai Kiadó, 1969), 131-148.

street, which also served as a part of the trade route. The main square with the church was probably the venue of weekly markets. (The larger, annual fairs organised from the 1520s onwards may have taken place outside the actual settlement.)

3.2. The results of the excavations: site M30/42

The site located in the settlement core, ca. 200 m far from the church, was excavated between 1995 and 1997. This 60 m x 100 m area represents a cross-section of the main road and the dwelling area (*Fig. 9.10; see also the additional legend, Fig. 9.26*). A number of buildings came to light from layers dated to different periods between the thirteenth and seventeenth centuries; 15 constructions could be identified as buildings (object numbers 74, 77-82, 87-89, 94 (cellar), 98 (cut by the cellar), 102, and nr. 99, nr. 100 and nr. 101 underneath the later building nr. 82, see *Figs. 9.11-9.17*). Constructions from the sixteenth-seventeenth century were mainly destroyed by ploughing, thus the latest period regarding which conclusions could be drawn was the end of the fifteenth and beginning of the sixteenth century. The stratigraphical conditions, however, made it possible to date the layers and observe the changes in material culture from the thirteenth to the sixteenth century.

The length of the main street was ca. 720 m in the settlement's hey-day; its breadth varied between 27-36 m. In the fifteenth-sixteenth century, the street was covered with pebbles.[58] The material collected from the road surface had an interesting distribution: potsherds and bones were few in number, but more metal objects were discovered, as if only fragments which were deposited as traffic passed

[58] Pusztai, A középkori Mohi mezőváros építészeti emlékei, 341.

would have been left on the road. The artefacts that did come to light show that the street was kept clean. Household garbage, on the other hand, was more likely deposited behind the houses.[59]

The houses were built perpendicular to the main street at right angles. The ground plan of the excavated dwelling houses was, more or less, the same: their size varied between 5 m x 16 m and 6 m x 21 m, and consisted of two or more separate rooms. The frame of the walls was constructed of wooden posts dug deep into the ground; the floors were made of a yellowish layer of clay.[60] Some features could be observed behind the dwelling houses: a cellar was excavated (nr. 94) behind house nr. 82, dated to the sixteenth century; two other buildings of presumably agricultural purpose were found behind the same house (nr. 88 and 89).

The building complex under and near house nr.82

This complex was of special interest, since altogether 8 constructions were observed under house nr. 82 and in its vicinity. In addition to the attached buildings (the cellar, nr. 94, and the two agricultural buildings, nr. 88 and 89), another house was found under the floor of house nr. 82, an earlier pit-dwelling (nr. 99), whose construction destroyed another, thirteenth-century building (nr. 100), cut by another, circular house (nr. 101), used at the end of the thirteenth century.[61] In addition to all that, traces of a former building (nr. 98) came to light during the excavation of the cellar itself. This clearly shows that the area was continuously inhabited and new constructions were built from time to time.

[59] Dr. József Laszlovszky, personal communication.
[60] Pusztai, A középkori Mohi mezőváros építészeti emlékei, 340.
[61] Pusztai, A középkori Mohi mezőváros építészeti emlékei, 348-356.

House nr. 82 had three stages of construction, of which the last stage was dated to the end of the fifteenth and beginning of the sixteenth century. This rectangular, northwest-southeast positioned building has a considerable size (15 m x 6 m) and represents the latest feature of this chronological complex. The floor was repeatedly refilled on the spot where it sank due to the underlying remains of house nr. 101. On the basis of its size and the location of the ovens, Tamás Pusztai assumed that the house might have had three separate rooms and that the entrance was probably located on the western side of the building.[62]

The underlying building, pithouse nr. 99, was oriented in the same way as house nr. 82 and had a similar rectangular shape. This construction was dated to the end of the thirteenth and the beginning of the fourteenth century. Its main entrance was located on the street front. This house was somewhat smaller than the one above it: 5.6 m x 4.2 m; the floor was 1.1 m deeper than the coeval ground level. The wooden supports and the special mixture of soil and pebbles used for the building of the walls attest to meticulous construction work. It was possible to identify three different stages of construction here as well: at the end of the first and second stage the walls collapsed due to the pressure of the soil; thus, the house was rebuilt twice, until its floor was filled so high that it almost reached the coeval ground level.[63]

During the construction of house nr. 99, an earlier building, house nr. 100 was destroyed. This small (6 m x 8 m) rectangular construction was dated to the middle of the thirteenth century and seems to have been the earliest feature of this segment of the site. (It is sure, however, that another building was there prior to this house, but only its oven survived on the south-western wall of house nr. 100, and only a relative

[62] Pusztai, A középkori Mohi mezőváros építészeti emlékei, 351.
[63] Pusztai, A középkori Mohi mezőváros építészeti emlékei, 352.

dating was feasible.) The remains of house nr. 100 were repeatedly disturbed during later construction works, so only the south-western wall, the oven and one pit survived. On the basis of pottery finds and the radiocarbon dating of the wooden post for the wall, it was probably used in the first half of the thirteenth century, before the Mongol invasion. This building supports the theory that a settlement of surface-built houses (not pithouses) was destroyed by the Mongolians; thus in the thirteenth century Muhi must have represented a more developed form of settlement than other villages in the vicinity, which mainly consisted of pithouses (e.g. Hejőkeresztúr - Vizek köze, excavated by Mária Wolf).[64]

The layer of house nr. 100 was cut by house nr. 101; it was impossible, however, to establish a firm chronology between house nr. 101 and house nr. 99. This building was presumably used at the end of the thirteenth or at the beginning of the fourteenth century. House nr. 101 stands out from the constructions of this area because of its circular shape; the floor of this sunken hut was 80 cm deeper than the coeval ground level.

Building nr. 94, the rectangular cellar behind house nr. 82 *(Fig.9.13)* was relatively large (5 m x 5 m). A small, burnt surface appeared on the floor. A 20 cm high, 60 cm wide wall-seat was constructed on the south-eastern wall. Absolute dating was not possible, but the cellar cut pithouse nr. 98, which was dated to the thirteenth century. This building had a northwest-southeast orientation, and its floor lay 1.12 m deeper than the coeval ground level. The circular oven was built on a 60 cm high elevation by the south-eastern wall; pieces of thirteenth-century pottery were recovered from the oven.

[64] Pusztai, A középkori Mohi mezőváros építészeti emlékei, 358, note 63.

In addition to buildings, five wells were also excavated in the settlement core.[65] These are located on the sides of the main street, indicating that they was used by the whole community (*Fig.9.10*). These wells were constructed using the same method: first a 4-5 m deep, circular pit was dug in order to reach ground water; the walls of the well was built of wood forming a rectangle, 1 m x 1 m in size (*Fig. 9.18).* A herring barrel was used in the construction of one of the wells, which – based on the wood it was made from – came from Poland and must have been transported to Muhi by trade. The ceramic material recovered from the wells (*Fig.9.19*) made it clear that they were not used at the same time. Fragments of elaborate, beautifully decorated pieces of tableware from the sixteenth century bear witness to a certain level of luxury in this central part of the settlement.[66] In one case, the posthole of the sweep-pole was also discovered.[67]

These constructions embrace 300 years of history; it was common from the thirteenth-fourteenth century onwards to construct new buildings in the place of previous constructions and thus these form a set of layers. The earliest layer of this segment of the site is dated to the period when the fluctuation of village settlements in space stopped due to the introduction of regular phase farming. The landed property of peasants (strictly speaking, the peasants only had right to use a certain piece of land, although this land could be inherited by their family) became the basis of the new economic system, giving rise to a stabile pattern of streets and houses. This

[65] About the wells, see the following article: A. Grynaeus, "Die Brunnen im Oppidum Muhi," *Antaeus* 26 (2003), 255-264.
[66] J. Laszlovszky, T. Pusztai and G. Tomka, "Középkori falu, mezőváros és út a XI-XVII.századból: Muhi Templomdomb – medieval village, market town and road from the 11th-17th century," *Utak a múltba. Az M3-as autópálya régészeti leletmentései – Paths into the Past. Rescue excavations on the M3 motorway*, ed. .Raczky, T. Kovács and A. Anders (Budapest: ELTE Régészettudományi Intézet – Magyar Nemzeti Múzeum, 1997), 197.
[67] Zs. Visy et al. ed., *Magyar régészet az ezredfordulón* (Hungarian Archaeology at the turn of the Millennium) (Budapest: Nemzeti Kulturális Örökség Minisztériuma Műemléki Főosztálya, 2003), 404.

process started by the middle of the thirteenth century. References in sources to tofts in villages appear East of the Danube typically from the fourteenth century onwards.[68]

Considering that these buildings were located close to the settlement core, it may be assumed that their inhabitants had a relatively high social status. This part is, however, not the richest segment of the former settlement; the highest ranking individuals undoubtedly lived in the stone buildings located close to the church on the market place, excavated earlier by Andor Leszih.[69]

3.3. The results of excavations: site M30/41

This site, excavated in 1995, consisted of two areas: one in the actual settlement area, and one in a watercourse surrounding the medieval settlement. Excavations of the latter focused on spots with a high density of finds collected on the surface.

The southern range of the settlement

Three houses (nr. 23, 37, 43), three wells, some pits and ovens were discovered in the southern area of the settlement (*Fig. 9.20*). These late medieval – early modern age buildings were located ca. 200 m from the church and 40-70 m from the main street. They can be regarded as small, simple constructions with one room. The form of the construction and the assumed purpose of the buildings, however, were different.

[68] J. Szűcs, *Az utolsó Árpádok* (The Last Arpads) (Budapest: História – A Magyar Tudományos Akadémia Történettudományi Intézete, 1993), 204-206
[69] Pusztai, A középkori Mohi mezőváros építészeti emlékei, 337.

House nr.23 (*Fig. 9.21*) was a small (6.8 m x 4.2 m) northwest-southeast oriented, rectangular building. The floor lay 50-60 cm deeper than the coeval ground level. The earlier floor, which was identical with the undisturbed subsoil, was later covered with a 15-20 cm thick layer of clay. The oven was built in the north-eastern corner, its structure continuing outside the wall. A whole complex of pits was discovered under the building, with a large number of pottery fragments, predominantly from the Period of the Arpad Dynasty. However, pot fragments from the fourteenth-fifteenth century were recovered from the pits as well. A so-called "peasant-knife" was found in the fill of the building, a characteristic object from the fifteenth century. It is assumed that the building was deserted at the beginning of the sixteenth century at latest.[70]

House nr. 42 had the same northwest-southeast orientation and a similar size: 7.5 m x 6 m (*Fig. 9.22*). The entrance was probably in the south-eastern corner. The floor was covered with a thin layer of pebbles. The building was filled quickly, and was almost entirely emptied before being filled in: only a very few, Arpadian Age pottery fragments were discovered. However, a number of finds came to light from the fill soil, among which some pieces of glazed ceramic jugs dated the layer to the 1530s at the earliest. Presumably, the building was used from the beginning of the fifteenth until the first half of the sixteenth century.[71]

House nr. 37 (*Fig. 9.23*) was also positioned in a northwest-southeast direction, even though its entrance was placed in the north-eastern wall. The building has a regular square shape (7 m x 7 m). The floor was, unfortunately, destroyed. The

[70] T. Pusztai, "Késő középkori épületek Muhiból – a periféria" (Late medieval buildings from Muhi – the periphery), *A Herman Ottó Múzeum Évkönyve* 35-36 (1997): 7-9. (henceforth: Pusztai, Késő középkori épületek); Pusztai, A középkori Mohi mezőváros építészeti emlékei, 343.
[71] Pusztai, Késő középkori épületek, 10-11.

position of postholes suggest that the building was divided into several rooms, but there is no unambiguous evidence to demonstrate this.

Houses nr. 23 and 42 were completely emptied when they were deserted; no traces of destruction were found. This suggests that they were no longer being used by the middle of the sixteenth century. The dating of house nr. 37 is debated, but it was certainly in use at the beginning of the sixteenth century, and no finds were discovered from the second half of the same century.[72] All three buildings were oriented perpendicular to the main street. Peculiarly for this period, they seem to have had only a single room. Attila Michnai conducted research on the structure of late medieval buildings and stated that there is scarcely any data for houses with less than two rooms from the fifteenth century onwards.[73] These buildings may have been used for agricultural purposes or as out-buildings; in case of house nr. 37, the strange position of the postholes and the form of construction suggests that animals may have been kept here.[74] Indeed, as Márta Belényessy stated, working animals were sometimes kept in stables, especially from the fourteenth century onwards.[75] The use of these buildings as human dwellings, however, cannot be ruled out. As the ethnographic analogies published by Lajos Kiss reveal, as late as the 1930s there were villages with houses where six people lived in a single room; interestingly, in the example observed by Kiss, the house had a similar oven to that of house nr. 23: its structure continuing outside the walls. The people who inhabited this modern village house had a very low social status and could actually survive only with the support of

[72] Pusztai, Késő középkori épületek, 13.
[73] A. Michnai, "Középkori népi építészetünk régészeti emlékei – Archäologische Denkmäler der mittelalterlichen volkstümlichen Baukunst Ungarns," *Folia Archaeologica* 32 (1981): 231.
[74] Pusztai, A középkori Mohi mezőváros építészeti emlékei, 345; Pusztai, Késő középkori épületek, 14.
[75] M. Belényessi, "Az állattartás a XIV.században Magyarországon" (Animal husbandry in fourteenth-century Hungary), *Néprajzi Értesítő* 38 (1956): 42, 50. (henceforth: Belényessi, Az állattartás a XIV.században Magyarországon)

their neighbours.[76] In the Muhi case, the marginal position of these buildings also suggests the weak financial position of their inhabitants. The excavating archaeologist, Tamás Pusztai, concluded on the basis of the finds that house nr. 37 was probably used for agricultural purposes, but the other two were, in all probability, in spite of their size and structure, dwellings.[77]

The area outside the settlement.

The third excavation area was outside the actual settlement. South of the modern highway nr. 35 that now divides the settlement into two, a system of watercourses served as a natural border for the dwelling area *(Fig. 9.24)*. It was previously assumed that this place would be of little archaeological interest, but spots with large density of finds were detected at this location during the surface collecting. This area differs from the other two in many aspects. Segments, separated from each other with ditches, mostly lacking in any kind of anthropogenic finds, were created here in the Middle Ages; in the last stage of the area's use, some buildings were added as well (*Fig. 9.25*).

The earliest feature here was a circular ditch, most probably a sheepfold (nr. 16), identified by Gábor Tomka as part of the agricultural zone of the settlement

[76] L. Kiss, "Földházak Szabolcs vármegyében – Erdhütten im Komitat Szabolcs," *Néprajzi Értesítő* 18 (1936): 80, figs. 8 and 10, cited by Pusztai, Késő középkori épületek, 14.

[77] Pusztai, Késő középkori épületek, 14. About the functions of buildings and the survival of one-room dwelling houses into late medieval times, see the following: J. Laszlovszky, "Későközépkori falusi lakóház Tiszaugon" (The late medieval rural house of Tiszaug), *Studia Caroliensia* 3-4 (2006), 295-314; I.M.Balassa, *A parasztház évszázadai – A magyar lakóház középkori fejlődésének vázlata* (Centuries of the Peasant's House – An Outline of the Development of Hungarian Dwelling Houses in the Middle Ages) (Békéscsaba: A Békés Megyei Tanács Végrehajtó Bizottságának Tudományos-Koordinációs Szakbizottsága, 1985), 45-46, 71-73. About medieval village architecture in Northern Hungary, see M. Wolf's article, "Régészeti adatok Észak-Magyarország népi építészetéhez – Archäologische Angaben zur volkstürmlichen Architektur in Nordungarn während des Mittelalters," *Népi építészet a Kárpát-Medence északkeleti térségében* (Folk Architecture in the Northeastern Area of the Carpathian Basin), ed. M. Cseri, I.M. Balassa and Gy. Viga (Miskolc-Szentendre: Szentendrei Szabadtéri Múzeum – Herman Ottó Múzeum, 1989), 47-61;

behind the dwelling area.[78] The chemical analysis of the soil (high phosphate readings from deposited manure) made it likely that this feature was used for animal husbandry,[79] but the exact way it was used cannot be identified. The ditch was created right next to a watercourse in the east. No traces of buildings or any anthropogenic objects were found; the entrance of the ditch could not be located either. It seems that the fold was only used for a short period of time, otherwise there should have been some waste in the area. Hypothetically it was dated to the late Arpadian Age.[80]

Ditch nr. 16 was cut by two other ditches, nr. 13 and nr. 15. Ditch nr. 13, had a rectangular shape, altered only on its north-eastern side, probably due to the presence of the watercourse. It was oriented in a northwest-southeast direction. The positioning of ditch nr. 15 is almost the same. Since it was only possible to excavate a part of these ditches, their exact size is unknown; the size of ditch nr. 15 was estimated at 380 m^2. This latter ditch was created, more or less, over the same location as nr. 16. A gap was observed on the south-western side, which might indicate the position of the entrance; it is, however, only 1 m wide, which means that it was too small for animals to be driven through. The small number of finds, however, suggests an agricultural purpose.[81]

The stratigraphical relation of these two ditches was, unfortunately, impossible to reconstruct. Their positioning and the few archaeological objects recovered in them

[78] Pusztai, A középkori Mohi mezőváros építészeti emlékei, 348; G. Tomka, "Közép- és kora újkori településrészlet Mohi mezőváros belterületének peremén" (The ranges of the medieval market town of Mohi from the middle and early modern ages), *A Herman Ottó Múzeum Évkönyve* 37 (1999), 417-446. (henceforth: Tomka, Közép- és kora újkori településrészlet)
[79] A similar fold was excavated and analysed by J. Laszlovszky (J. Laszlovszky, "Karámok Árpád-kori falvainkban" (Folds in Hungarian Arpadian Age villages), *Archaeologiai Értesítő* 109 (1982): 283). The problem, however, is not completely solved, since the high levels of phosphate in the soil may not only indicate animal keeping, but also the use of manure. (Tomka, Közép- és kora újkori településrészlet, 423, note 3.) If the latter is the case, it indicates a high level of horticulture.
[80] Tomka, Közép- és kora újkori településrészlet, 421.
[81] Tomka, Közép- és kora újkori településrészlet, 424.

may indicate that ditch nr. 13 was created earlier than nr. 15, but this relation is rather a hypothetical one.[82]

Ditches nr. 18 and 19 embrace an area that was called the "western garden" by the excavator. Ditch nr. 18 had a northwestern-southeastern orientation. Three other ditches were connected to it, of which only ditch nr. 19 was excavated. There was no trace of buildings, and the small number of finds suggests that this area was also used for a short period of time, and for agricultural purposes. The feature was dated to the fifteenth or to the beginning of the sixteenth century.[83]

Building nr. 6 was surrounded by a number of ditches (nr. 12, 14, 17) and pits (nr. 10 and 20). The house consisted of two rooms of the same size, which together added up to 11.7 m x 4.5 m in size. The building had a northwestern-southeastern orientation. Unfortunately, ploughing had destroyed most of this construction. Gábor Tomka has suggested that the house was continuously inhabited, one room was used as a kitchen and the other as a room with an attic.[84] The piece of land that belonged to the house is presumably the one surrounded by ditches nr. 12 and 17 and divided into two by ditch nr. 14. Pit nr. 21 contained a vessel fragment, whose counterpart was found in ditch nr. 17, so these two surely belong to one and the same period. (A partial animal skeleton in anatomical order was also found in this pit.) Pit nr. 10 (inside the building) was supposedly a storage pit, but its context is not completely understood. House nr. 6 and its connected features (even though their relative chronology is not always clear) seem to represent the very last stage of Muhi's

[82] Tomka, Közép- és kora újkori településrészlet, 422.
[83] Tomka, Közép- és kora újkori településrészlet, 424.
[84] Tomka, Közép- és kora újkori településrészlet, 425-426.

existence: they were destroyed in the second half of the sixteenth or at the beginning of the seventeenth century.[85]

The chronology of this segment of the settlement is not totally clear, but in all probability, ditch nr. 16 represents the earliest stage of the area's use. Ditch nr. 13 was established in the second phase, while the "western garden" in the third phase, which is dated to the fifteenth – early sixteenth century. Ditch nr. 15 belongs to the fourth phase of the area, while house nr. 6 and the connected features represent the last use stage. This means that the area was used throughout almost the whole of the Middle Ages, even though the individual features themselves were not in use for a long period of time.

Even though it was impossible to identify precisely all the features found here, this third excavation area shows clearly that inhabitants of the expanding settlement had difficulties in finding a place for new agricultural features. The area around Muhi was rather swampy and unsuited for agricultural activities, therefore new agricultural areas, buildings, gardens, etc. were sometimes established south of the watercourse embracing the settlement, on locations lying relatively far from the dwelling area.[86] This, however, was common only in the later stages of development, with the expansion of Muhi.

3.5. Conclusions

The excavated area in the settlement core reveals that Muhi was a relatively densely built-up "one-street" settlement, even though the houses did not all stand at the same time. The limited character of the possible dwelling area was due to the

[85] Tomka, Közép- és kora újkori településrészlet, 427.
[86] Tomka, Közép- és kora újkori településrészlet, 430.

swampy marshes around the settlement that forced the inhabitants to use the dry bits on Templomdomb and in its vicinity. Thus, inhabitants tried to use every piece of land available. The density of houses over the whole settlement and their actual distribution can only be researched, however, if large-scale excavations would be undertaken in Muhi.

Inhabitants tried to find proper cultivation and dwelling areas outside the settlement core as well; the third excavation area shows clearly that at first agricultural activities took place in these peripheral areas, and later a dwelling house was built. This development may indicate population increases and expansion of the settlement. Animal keeping for commercial purposes demanded large open spaces; a few animals could, however, be kept in small tofts.

The three excavation areas offer insight into life at the settlement: they represent different social layers, activities and architectural structures associated with them. The structures of the houses support the hypothesis that some degree of social difference existed between the inhabitants of these areas. Therefore, it is expected that the composition of kitchen refuse will differ in accordance with the social status of the inhabitants. The investigation of kitchen refuse associated with separate areas may also shed some light on the system of meat distribution and supply.

Chapter Four: ANIMALS IN THE LANDSCAPE

This chapter contains an analysis of which species were present on the archaeological site and in what ratios. A few words should be said about the type, health and quality of the livestock as well a summary of the mortality profiles for each species. In addition, I provide a short summary of the forms of animal exploitation.

4.1 The ratio of species

A total of 5759 precisely identified bones of animals were investigated in the study. The remains of the following species were recovered in Muhi:

<u>Domestic species</u>
Cattle (*Bos taurus L. 1758*)
Horse (*Equus caballus L. 1758*)
Donkey (*Equus asinus L. 1758*)
Sheep (*Ovis aries L. 1758*)
Goat (*Capra hircus L. 1758*)
Pig (*Sus domesticus Erxl. 1777a*)
Dog (*Canis familiaris L. 1758*)
Cat (*Felis catus L. 1758*)
Domestic hen (*Gallus domesticus L. 1758*)

<u>Wild species</u>
Red deer (*Cervus elaphus L. 1758*)
Roe deer (*Capreolus capreolus L. 1758*)
Wild boar (*Sus scrofa ferus L. 1758*)
Hare (*Lepus europaeus L. 1758*)
Wolf (*Canis lupus L. 1758)*
Hamster (*Cricetus cricetus L. 1758*)
European ground squirrel (*Spermophilus citellus L. 1766*)
Great sturgeon (*Huso huso L. 1758*)
Catfish (*Esox lucius L. 1758*)
Carp (*Cyprinida sp.*)

The diversity of species is usually low in village assemblages since they are dominated by the same domesticates: cattle, sheep, goat, pig, horse, and sometimes dog or domestic hen. (Since the assemblages mainly consists of kitchen refuse, dog and cat remains tend to be relatively rare.) Wild animals represent usually around 2% of the whole faunal assemblages from villages.[87] Thus, the ratio of the species in Muhi reflect proportions commonly found in villages. The number of domestic animals is overwhelming compared to wild species. Wild animals compose up to 1.62% of the whole, including fish remains. (The fish taxa recovered in Muhi lived in the Tisza River, not far from the settlement.[88] Fish remains are few in number, which might be explained by the fact that the sample I investigated did not include seived material Only the bones of very large individuals will be recognized under these excavation conditions.)

The absence of wild species is usually explained by hunting prohibitions. These taxa were usually kept on estates as animals to be hunted for the amusement of nobles, rather than as sources of food for urban merchants, artisans or peasants.[89] In most cases, it was a privilege of the landowner to hunt and peasants were excluded from this kind of sporting activity, so it may be expected that no large game remains will be found in villages. However, some finds seem to contradict this prohibition. Peasants sometimes seem to have complemented their diet with the meat of deer or wild boar.

[87] M. Daróczi-Szabó, "Állattartás középkori falvainkban" (Animal Husbandry in Our Medieval Villages), unpublished (hereafter: Daróczi-Szabó, *Állattartás középkori falvainkban*)
[88] Fish remains were identified by László Bartosiewicz, towards whom I would like to express my gratitude.
[89] O'Connor, *The Archaeology of Animal Bones,* 168.

Cattle dominates the picture, while both small ruminants (sheep and goat)[90] and pigs constitute a fifth of the whole material. Horse remains are relatively few but still not negligible. Other species make up only a small percentage. (See *Table 4.1*)

Shotwell defines MNI as the smallest number of individuals which is necessary to account for all skeletal elements (specimens) of a particular species.[91] Here, MNI (minimum number of individuals)[92] was only calculated in the case of the main domesticates; this type of calculation may result in a distorted picture in case of highly fragmented assemblages, so it must be handled with care. (About MNI see Chapter 2).

Table 4.1. *The ratio of species at Muhi. Partial and whole skeletons are counted as one piece.*

Species	**NISP (Number of identified specimens)**	**MNI**	**Ratio of the whole (100% = 5759 pieces – 15 antler fragments = 5744)** [93]
Cattle	2810	100	48,92%
Horse	496 (incl. one partial skeleton)	20	8,64%
Donkey	1		0,02%
Sheep and goat	1138	21	19,81%
Pig	1 000	36	17,41%
Dog	61 (incl. one partial skeleton)[94]		1,06%
Cat	17		0,30%
Domestic hen	71		1,24%
Domestic animals total	**5594**		**97.39%**
Red deer	12		0,21%
Roe deer	8		0,14%
Wild boar	11		0,19%
Hare	5		0,09%

[90] Sheep and goat are counted together since the bones of these small ruminants are very difficult to distinguish and the zooarchaeological literature usually handles them together as small ruminants.
[91] J.A.Shotwell, "An approach to the Paleoecology of Mammals," *Ecology* 36/2 (1955): 330.
[92] Calculations were based on White's method. T.E. White, "A Method of Calculating the dietary Percentages of Various Food Animals Utilized by Aboriginal Peoples," *American Antiquity* 18 (1953): 396-398.
[93] The antlers are not included in the percentage. There were ten antler fragments of red deer and five antlers of roe deer at the site. Antlers are usually treated separately since this raw material usually does not come into the settlement from hunted animals but as shed antler gathered during the early spring. The presence of antler at a site is not necessarily an indication of meat consumption.
[94] Partial or whole, articulated skeletons are counted as one find, since they surely belong to one and only one individual. Counting all skeletal elements in such a case would bias the picture.

Wolf	1		0,02%
Hamster	77 (incl. two skeletons)		1,34%
Souslik	1		0,02%
Fish	35		0,61%
Wild animals total	**78**		**2.61%**
TOTAL	**5744**		**100%**

One fragment may be identified either as a large cattle or as an aurochs. This wild ancestor of domestic cattle is thought to have been an animal of open grassland and parkland habitats.[95] This specimen comes from a layer dated to the twelfth-fourteenth centuries. Aurochs would have been a very rare wild species in the Carpathian Basin in the Late Middle Ages due to destruction of its habitat and overhunting. According to István Vörös, this species was, in fact, already extinct in the thirteenth century;[96] however, there may be some doubt about making such a definitive statement. There are still a number of representations of aurochs as late as in the fifteenth century, although some confusion exists in the pictorial references, because visual sources are zoologically imprecise so that sometimes European bison is represented as aurochs, or *vice versa*. It cannot be ruled out that isolated populations of aurochs inhabited the Carpathian Basin; its eventual disappearance from the assemblages is likely explained, as mentioned above, by loss of its forest habitat and overhunting. Eventually, it may be zooarchaeology that unravels this contradiction if further coeval assemblages can be analysed. The identification of aurochs is easy for skulls and horn cores, but more complicated in the case of long bones. It is possible to identify the fragment in question as aurochs because the compact substance of the diaphysis is extremely thick, which is quite characteristic

[95] L. Bartosiewicz, "People and Animals. The Archaeozoologist's Perspective," People and Nature in Historical perspective, ed. J. Laszlovszky and P. Szabó (CEU medievalia, Budapest: CEU, 2003), 31.
[96] I. Vörös, "Early medieval Aurochs (Bos primigenius Boj.) and his Extinction in Hungary," *Folia Archaeologica* 31 (1985): 219; S. Bökönyi, *History of Domestic Mammals in Central and Eastern Europe* (Budapest: Akadémiai Kiadó, 1988), 104. (hereafter: Bökönyi, *History of Domestic Mammals*)

for this wild species.[97] Nonetheless, given the absence of morphological evidence on the fragment, it is necessary to be cautious and say that the bone derives from an extremely large cattle.

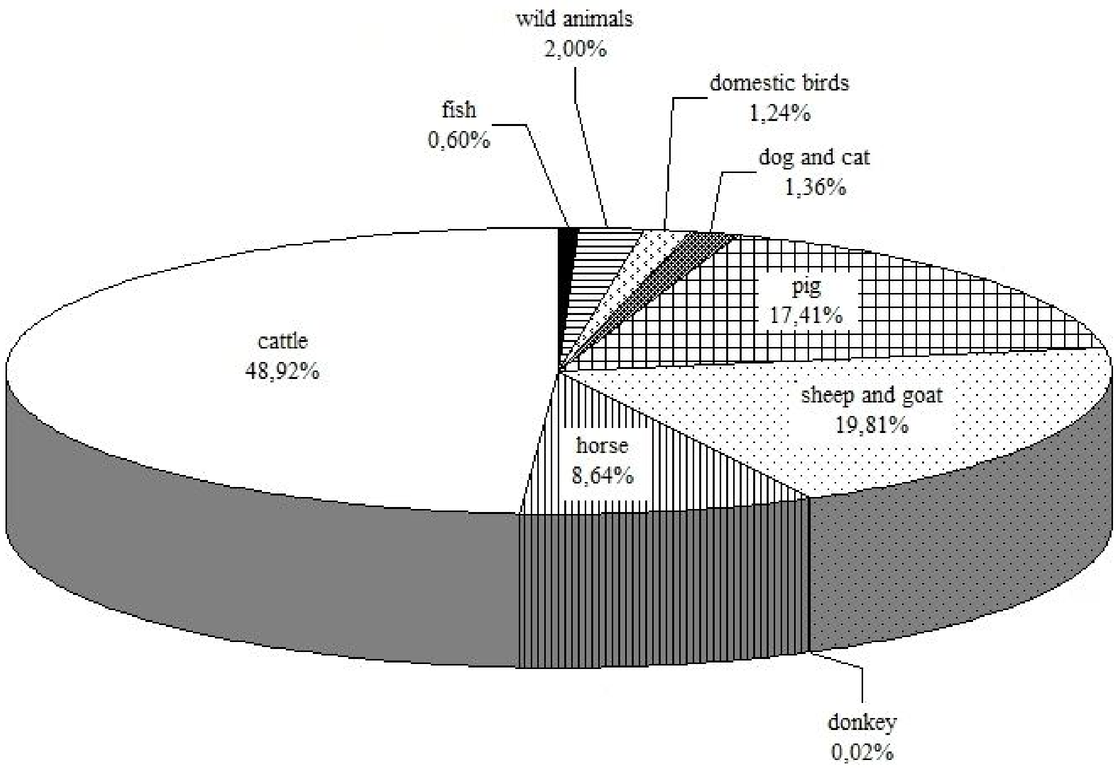

Fig 4.1. Species ratio at Muhi

4.2 Characterizing the livestock

The character of the livestock can be examined by calculating withers heights. These values provide information on the animals' size and, sometimes, stature. Several scientific methods are commonly used to calculate this number; here the most accepted methods were employed (see Chapter 2). Withers height estimation may be of assistance in the characterisation of a certain animal population, but one has to bear in mind that calculating average values eliminates the differences between

[97]Bökönyi, *History of Domestic Mammals,* 107.

individuals. It is also important to consider that in the case of a highly fragmented assemblage such as the one brought to light at Muhi, the calculated withers height values are only based on a few bones, and are not necessarily representative of the entire coeval domestic animal population in the area. However, these bones, as a kind of random sample, reflect a stratum of the population as a whole and may contribute to our knowledge when compared to other finds from similar archaeological contexts.

Only bones of adult individuals are appropriate for this kind of study since the bones of young animals had still not reached their maximum size at the time of slaughtering. This is also true in the determination of the animal's sex: bones of young individuals do not show sexually determinate features yet. Thus, only adult individuals can be identified from this point of view. Fortunately, bones of juveniles are easily recognisable since the epiphysis, the rounded joint end of the bone, and the diaphysis, the middle, cylindrical part, are not yet fully fused in those specimens.

Withers height calculations are based on the long bones, especially on metapodia (metacarpal and metatarsal bones), since these usually preserve better due to their dense compact tissue and because they are less likely to be broken up to extract marrow. Thus, another reason why preserved metapodia are found on archaeological sites is that this skeletal element does not enter the food chain, but is often deliberately kept in the hide after the animal is flayed. Other long bones from domestic animals either preserve badly or tend to be broken during food processing. Consequently, it is not surprising that only a small number of remains could provide a basis for withers height estimation. Altogether 23 bones of horse, 10 bones of cattle, two from pig, seven from sheep, two from goat and two from dog were complete enough for this wither's height calculation.

The best preserved long bones derive from horse. A possible explanation is that horses were rarely consumed. However, metapodia belong to a body part which does not represent good quality meat, so they were often not damaged, even if the meat of the animal was consumed. In addition, the metapodia of horse are considered the most resistant bones; according to Schmalz, horse metapodia can resist the pressure of a weight of 7,000 kg.[98]

The average withers height for horse (based on 23 bones) is 139 cm (minimum 129.3, maximum 160.1 cm, where the standard deviation is 8.32). This is approximately the same value as the calculated average size for horses in this period, based on measurements published by Sándor Bökönyi, which is 138.5 cm (the values fall between 124.2-151.3 cm).[99] Half of the individuals whose withers height were estimated were between 130 and 140 cm at the withers. However, the deviation is somewhat greater than that in the sample measured by Bökönyi, indicating a heterogeneous population. While the largest horse Bökönyi recorded reached 151.3 cm, in the Muhi assemblage considerably larger animals of 160 cm also appear. The largest specimens may be geldings, since bone growth continues for a longer period in castrated individuals.[100] However, the proportions of these bone fragments do not display the typical features of bones from castrated animals, and it is difficult to demonstrate this supposition. The different uses to which different types of horses were put (riding horses and horses used for traction or as draught animals usually differ in stature) may be one explanation for the great variability in withers height at Muhi.

[98]Quoted by Gy. Fehér, *A háziállatok funkcionális anatómiája* (Functional Anatomy of Domesticates) (Budapest: Mezőgazda, 2004), 32.
[99]Bökönyi, *History of Domestic Mammals*, 535, 540, 555.
[100]Reitz and Wing, *Zooarchaeology*, 189

There are only a few unambiguous features of sexual dimorphism on the bones of horse, and morphologically only whole pelvis bones and skulls may be used to determine sex. It was therefore possible to identify the sex of the animal only in six cases: five of these specimens were from stallions and one was from a mare. Even though body size has some relevance to the animal's sex, there is no unambiguously accurate method to distinguish between males and females on the basis of withers height, especially not in samples where only a few calculations can be made. In this case, there are no measurement groups which could be identified for the two sexes: the estimated values are continuous from 125 cm to 160 cm. It seems that the horse population at Muhi was mixed and heterogeneous.

The individual identified as a donkey is represented by only one fragment. It had a withers height of 103.7 cm. (The calculation was based on a radius.) It is very likely that the fragment came from a donkey or a small mule, but unfortunately, there are no morphological features that can help in distinguishing the radii of taxa within the family *Equidae*. There are very few reports on donkeys from medieval Hungarian archaeological deposits, even though they appear quite often on representations. However, remains of animals not kept for their meat but only for their draught power, appear relatively rarely in excavation materials since such material comes mostly from deposited kitchen garbage.[101] Bökönyi notes that donkeys appear in the Period of the Arpadian Dynasty,[102] and he mentions an individual from Garvan, Romania, from the ninth-twelfth centuries, whose withers height was calculated to 118 cm.[103] Márta Daróczi-Szabó also identified five donkey remains from the medieval village of Kána, with an individual with a withers height of 110 cm.[104] The individual from Muhi,

[101]L. Bartosiewicz, "Beasts of Burden from a Classical Road Station in Bulgaria," *Archaeozoology of the Near East,* ed. H. Buitenhuis and A.T.Clason (Leiden: Universal Book Services, 1993), 107.
[102]Bökönyi, *History of Domestic Mammals*: 304.
[103]Bökönyi, *History of Domestic Mammals*: 305.
[104]Márta Daróczi-Szabó, personal communication.

with its withers height of 103.7 cm, seems to be a relatively small animal even for donkey.

In the case of cattle, an average withers height of 117.03 cm (with a minimum size of 110.3 and a maximum of 132.9 cm, where the standard deviation is 7.89) was calculated. (Size variability is clearly shown in *Figs. 9.29* and *9.30*.) Such small individuals are characteristic of the medieval cattle population; a well-known representation of these animals may be seen in the Hungarian *Illuminated Chronicle.* However, just as in the case of horses, the estimated values show a continuous growth without larger gaps so that no significant differences appear between the size of the sexes. However, the extremely small individuals reported by Bökönyi are missing from the Muhi sample (which of course does not prove that they were not present). The difference is striking when these animals are compared to the famous Hungarian Grey, a large cattle breed used for meat export that may be found in Early Modern assemblages from the seventeenth century onwards.

The average withers heights calculated from the measurements published by Bökönyi is almost the same as that calculated for cattle in Muhi, 117.03 cm.[105] Matolcsi calculated a very similar number, 111 cm for the average withers height of ninth-fifteenth century cattle.[106] Regarding body size, individuals found in Muhi do not deviate from the norm. It seems that small brachyceros cattle were raised in this village, an idea also supported by the shape of the few preserved skull fragments (*Fig. 9.27* in the Appendix).

[105]Bökönyi, *History of Domestic Mammals*: 470, 499.
[106]J. Matolcsi, "A szarvasmarha testnagyságának változása a történelmi korszakokban Magyarországon" (Changing of the Body Size of Cattle in Hungary During the Centuries), *Agrártörténeti Szemle* 1-2 (1968): 21-24

In this species, a more or less clear sexual dimorphism should make the remains of the two sexes easier to distinguish. Of the 10 measured metapodia, eight derived from cows and two from oxen (castrates).

Two pig bones, one radius and one humerus, were well enough preserved to serve as a basis for withers height calculation. One of these bones came from an individual with a withers height of 75 cm while another individual had a withers height of 76.2 cm. Unfortunately, pig bones are usually very fragmented since these animals tended to be slaughtered young and bones of young animals do not preserve well. In addition, these bones were exposed to the effects of cooking and gnawing and thus damaged. (Bones were often gnawed by dogs as well as other pigs that roamed the villages and served as "natural street cleaners".)[107]

Metapodia, from which withers height is calculated, is one of the few bones in goat and sheep that can be distinguished for these two species Seven bones of sheep (three metacarpal and four metatarsal) proved suitable for withers height estimation. The estimated average value is 57.34 cm (minimum 52.2 cm – maximum 61.3 cm, where the standard deviation is 3.64). Hornless individuals occur in the assemblage, which indicates the presence of the Hungarian steppe type of sheep described by Matolcsi, of which ewes tend to be hornless.[108] Bökönyi distinguished two main groups of sheep in medieval Central Europe: the, more or less, homogeneous

[107] I have already mentioned in the previous chapter that the main street of Muhi seemed to have been constantly cleaned and the garbage was deposited in the backyards, not on the street. Pigs roaming freely on the streets of medieval settlements could sometimes cause problems; in the sixteenth-century law-book of Pozsony (Pressburg, Bratislava) it is explicitly said that all the swine must have a ring in their nose so that they don't want to root around and to break the paving in the town. (J. Király (ed), *Pozsony verso joga a középkorban* (The law of Pozsony in the Middle Ages) (Budapest, 1894), 414.) It is, however, quite clear that pigs were only banned from city centres once there was a certain level of infrastructure and a dense enough population. Therefore, it is more than likely that pigs roamed free in Muhi, being gathered into herds periodically or stalled behind houses before slautering or when they were raising babies

[108] J. Matolcsi, *A háziállatok eredete* (The Origins of Domestic Animals) (Budapest: Mezőgazdasági Kiadó, 1975), 150-151. (hereafter: Matolcsi, *A háziállatok eredete*)

European "breed",[109] and the medieval Hungarian sheep.[110] One of the main features of the latter are their twisted horn cores, usually associated with the modern-day racka sheep, which appeared in the Carpathian Basin only at the end of the Middle Ages.[111] Twisted horn cores are missing from the Muhi sample. However, the medieval sheep population was rather heterogeneous, where hornless animals as well as individuals with small, underdeveloped, thick or curved horns were present.[112] Goats, as it is expected on the basis of their scarcely recovered remains in the archaeological record of the Arpadian Period, are considerably larger than sheep. The two metapodia used for calculation provide withers height values of 71.9 cm and 78.9 cm respectively.

In the case of dogs, there are again two bones, one tibia and one femur, that are complete enough for withers height estimations. The calculated withers heights are 50.95 cm for one individual, and 62.8 cm for the other. Thus these bones come from animals of the size of a smaller modern German shepherd. However, a high variability is characteristic of dog populations so it is difficult to make general statements based on these two data. Dogs are relatively rare in refuse pit samples, since it was usually not consumed. Even though a high variability may be detected among the types kept by nobles, dogs from medieval villages usually fall into two groups: a larger type, probably used as shepherd dogs, and a somewhat smaller type,

[109] I use this word in quotation marks since there were no animal breeds in the Middle Ages in the modern sense of the word. Modern breeds usually have documented family trees and standard requirements in terms of size, stature and appearance, while in the Middle Ages only certain types can be distinguished within a taxon.

[110] S. Bökönyi, "Az állattartás történeti fejlődése Közép- és Kelet-Európában" (Historical development of Animal Breeding in Central- and Eastern Europe), *Agrártörténeti Szemle* 10 (1968): 297-298.

[111] I. Vörös, "Adatok a magyar szürkemarha és a rackajuh történetéhez,"*Az Alföld gazdálkodása* (Economy of the Great Hungarian Plain), ed. L. Novák (Nagykőrös: Arany János Múzeum, 2004),, 226; A. Paládi-Kovács, *A magyar állattartó kultúra korszakai* (Periods of the Hungarian Animal Keeping Culture) (Budapest: A Magyar Tudományos Akadémia Néprajzi Kutatóintézete, 1993), 111. (henceforth: Paládi-Kovács, *A magyar állattartó kultúra korszakai*)

[112] I. Vörös, "Adatok az Árpád-kori állattartás történetéhez" (Data for the History of Animal Keeping in the Arpadian Age), *A középkori magyar agrárium* (medieval Hungarian Agriculture), ed. L. Bende and G. Lőrinczy (Ópusztaszer: Ópusztaszeri Nemzeti Történeti Emlékpark Közhasznú Társaság, 2000), 90.

the so-called pariah dog, which is a result of animals breeding freely without any kind of human involvement or constraint.[113]

Cat was mainly kept in villages to keep rodents away from grain stores. Since these animals were not consumed in the Carpathian Basin, they only appear sporadically in archaeological assemblages.[114] In Muhi, a tibia, a humerus and a femur were well preserved, but two of these bones derive from young individuals, which means that the animal had not reached its maximum body size when it died. Seven of the eleven cat bones came to light in the same location, but they definitely do not derive from the same individual.

A humerus, a tibia and a tarsometatarsus were among the well preserved hen remains. Four individuals were identified as females and four as roosters; castrated specimens with "spurs" cut off were not found. The methods of castration of males is not fully known yet, since it is almost impossible to say on the basis of archaeological material whether the inner genital organs were actually removed, or only a part of the tarsometatarsal bone, the so-called "spur" was removed.[115]

Only fragmented bones of wild species were found at Muhi, none of which could be used for withers height estimation. A number of shed antler fragments show that antlers were collected in the environs of the village and used as raw material, without killing the buck or stag itself. The presence of antlers at the site signifies that people in Muhi had a precise knowledge about these animals' habitat area and the areas where they usually dropped their antlers.

[113] L. Bartosiewicz, *Régenvolt háziállatok* (Ancient Domestic Animals) (Budapest: L'Harmattan, 2006),, 120. (henceforth: Bartosiewicz, *Régenvolt háziállatok*)
[114]Daróczi-Szabó, *Állattartás középkori falvainkban*, 2-3.
[115] Bartosiewicz, *Régenvolt háziállatok*, 138-139.

4.3 Livestock health

Vertebrates are subject to a wide range of diseases; the majority of these affect soft tissues. However, some illnesses leave their mark on bones as well. Caution and some pessimism has been expressed by scholars regarding the possibilities of giving a precise diagnosis and interpretation of pathological remains from archaeological contexts since several different diseases may result in very similar symptoms on bones.[116] Radiographical analysis may help in establishing the diagnosis, but in our case there was no possibility for such an examination.

Pathological phenomena were present on eleven bones in Muhi. This is a very low number relative to the abundance of finds identified. As mentioned, however, not all diseases may be seen on the bone tissue. Also, old or sick animals were probably slaughtered before the symptoms could be manifested on the bones. All the pathological bones show traces of inflammatory disorders or bone discontinuities (fractures), using the classification of Jane Siegel,[117] and almost all skeletal parts are represented on the list.

For medical terms, see the glossary in the Appendix (9.2, Glossary).

Pathologies in cattle

New, small, spongy bone formations with irregular surfaces were observed on the medial condylus of a cattle humerus. It seems that originally a small fracture damaged the lateral condylus, which healed with callus, a new growth of osseous matter.

[116]As a summary of this problem, see Jane Siegel, "Animal Paleopathology: Possibilities and Problems," J*ournal of Archaeological Science* 3 (1976): 350-351. (hereafter: Siegel, Animal Paleopathology)
[117]Siegel, Animal Paleopathology, 352-353, Table 1.

Degenerative joint changes may be traced back to the stress of draught work.[118] These deformations usually appear on the lower extremities: the metapodia and phalanges.[119] Four bones reflect possible work overload. One proximal phalanx shows eburnation, an abnormal condition in which bone becomes hard and dense, almost like ivory, and the articulate facet becomes shiny through abrasion. Small exostoses grow around the articular facet. This deformation is usually very painful for the animal and mostly appears in hard-working, old individuals.

Another deformation that may be caused by hard work is the fusion of the centrotarsal bone and the metatarsus, found in another individual from Muhi. This disease, however, is usually not painful, at least not in the phase when the bones are already grown together,[120] so the animal was able to continue working. One metacarpal bone also displays a similar deformation in its first phase: the proximal articular facet is widened on the medial side.

On one vertebra lumbalis of cattle, both the right and left *processus articularis caudalis* are asymmetrical while on the right side the *facies articularis* is widened, developing a small, "hook-like" exostosis. The *processus spinosus* is missing but is seems from the remaining part that it was also asymmetrical. Similar pathologies were observed by a Slovakian scholar, Marian Fabis, who identified them as deformations that could easily develop from the draught use of the animal.[121] However, the aetiology of pathologies on the vertebral column is often multifactorial.

[118]Siegel, Animal Paleopathology, 374; M. Fabis, "Pathological Alteration of Cattle Skeletons – Evidence for the Draught Exploitation of Animals?," *Diet and Health in past Animal Populations*, ed. J.Davies, M.Fabis et al. (Oxford: Oxbow Books, 2005), 58-62 (hereafter: Fabis, Pathological Alterations); Y. Telldahl, "Can Paleopathology Be Used as Evidence for Draught Animals?," *Diet and Health in past Animal Populations*, ed. J.Davies, M.Fabis et al. (Oxford: Oxbow Books, 2005), 63-67.
[119]L. Bartosiewicz, W. Van der Neer and A. Lentacker, *Draught Cattle: Their Osteological Identification and History* (Annals of Scientific Zoology 281,. Belgium: Royal Museum of Central Africa, 1997)
[120] László Bartosiewicz, personal communication.
[121] Fabis, Pathological Alterations, 60.

Pathologies in horse

A partial, articulated skeleton of horse (right humerus, radius, metacarpal, phalanx proximalis, media et distalis, and a pelvis) was brought to light from stratigraphical unit nr. 2571 (settlement core). The pelvis is pathologically curved, probably due to of a fracture that healed with some dislocation. This animal could only have survived and be healed if the damage was recognised and the necessary conditions (rest, proper nutrition, no working) guaranteed. Horses were expensive and valuable animals so that it must have been worthwhile dealing with the break instead of slaughtering the injured individual.

The two other horse bones with some kind of deformation are not necessarily seriously pathological. On one phalanx proximalis posterior (both on the medial and lateral sides) and on one pelvis (ilium) the muscle attachment surfaces are stronger than usual. These features can appear in healthy specimens as well, particularly in heavy types of horses, but sometimes they may indicate hard work.

Pathologies in other species

The *processus spinosus* on a pig sacrum is a bit asymmetrical, but this does not necessarily represent serious damage.

An overgrowth on the lateral side of a right lower jaw of sheep indicates inflammation; the teeth, however, are intact. Abscesses on the mandible can occur directly as a result of infection.[122] Due to a lack of evidence, a non-specific infection can be identified as the reason for the lesion.

One rib of sheep or goat was fractured and healed. Rib fractures, although painful, do not hinder animals from feeding and moving, and if there is no infection,

[122]J.J. Davies, "Oral Pathology, Nutritional Deficiencies and Mineral Depletion in Domesticates," *Diet and Health in past Animal Populations*, ed. J.Davies, M.Fabis et al. (Oxford: Oxbow Books, 2005), 82.

the animal can survive without special treatment. (Such rib fractions can also be regarded as results of animal abuse by people.) The *processus spinosus* on a thoracic vertebra of sheep or goat appears slightly curved and asymmetrical. In the case of this taxon, one has to bear in mind that conditions on the Great Hungarian Plain were hardly ideal for sheep keeping, even though large numbers of sheep were kept in this area in the Late Middle Ages. Swampy areas with wet conditions and relatively cold weather are not the best habitats for sheep and goats, species that originated in the warm and dry areas of the Middle East. However, cultural behaviour patterns often "overwrite" biological facts.[123]

4.4 Mortality profiles

Accurate estimates of the age of an animal can be made only when the bone comes from a species whose age characteristics are well documented, when the animal's level of nutrition is known, when most of the skeletal elements are available, and when the individual is not fully adult.[124] These criteria are definitely not satisfied in the case of normal archaeological assemblages. Nevertheless, tooth eruption and phases of epiphyseal fusion help to estimate the age at death. Zooarchaeologists use the age categories of foetus, neonate, juvenile, subadult, adult and senile; the length of these life periods differ from species to species, and it is often difficult to distinguish between juvenile and subadult individuals. In horses, tooth eruption sometimes makes it possible to date the animal's death more precisely.[125]

[123]Examples for an unhealthy sheep population kept under hard, far from ideal conditions in the Great Hungarian Plain were observed as early as in the Early Neolithic (e.g. in the settlement of Ecsegfalva 23.(Dr Alice Choyke, personal communication)

[124]I.A. Silver, "The Ageing of Domestic Animals," *Science in Archaeology,* ed D. Brothwell and E. S. Higgs (2nd ed. New York: Basic Books, 1969), 283.

[125]In the case of horses, tooth wear data provided by Bodó and Hecker were used. (I. Bodó and W. Hecker ed, *Lótenyésztők kézikönyve* (Encyclopaedia of Horse Breeding) (Budapest: Mezőgazda, 1992), 79-81.)

At Muhi, the bones of cattle and sheep were difficult to age, since most of the material comprised small fragments of long bones on which the phase of epiphyseal fusion could not be observed. Most probably, the fragments that were unidentifiable to age, derive from adult individuals. It was easier to estimate the time of death for pigs and horses because the former was represented by bones from many young individuals, and for the latter a large number of teeth remains were available. The bones of dog and cat were not so heavily fragmented, since these were not affected by butchering and cooking activities. Thus, a good number of their bones could be identified to age.

In general, juvenile bones are less likely to survive since the proportion of organic to inorganic material in their bone tissues are different from that found in bones from adult individuals. These tissues contain smaller amounts of inorganic components, and are, consequently, not as dense and hard as bones from adults.[126] However, this taphonomic factor affects all domestic species, which means that a similar ratio of loss can be expected.

A high proportion of juvenile individuals can be observed among the pig remains (see *Table 4.2*) The precise age at slaughter was identifiable in 65 cases. A total of 22 individuals died at the age of 3-3.5 years, which can be regarded as the optimal age of slaughter. However, 17 animals were slaughtered before reaching the age of 1 year, and another 26 were killed before the end of their second year of life.

The number of young individuals amongst cattle seems a bit high at first sight, but it is important to remember that the fragments of indefinable age most probably derive from adult individuals. The precise age could be identified in 57 cases; most of these animals (34 individuals) were approximately 2-2.5 years old or somewhat younger; 13 cattle died at approximately three years of age. Four calves died or were

[126] Bartosiewicz, *Régenvolt háziállatok*, 71.

slaughtered at 12-18 months; one animal did not reach the end of its first year of life. However, the overwhelming majority of cattle died as adults.

The precise age could be identified for only 18 sheep. One bone came from a foetus that might have been miscarried or died when its mother was slaughtered (which is very improbable, since slaughtering pregnant females world represent an economic loss). The majority of the young animals were killed at the age of one or two years.

The ratio of juvenile horses in the faunal assemblage is low. The precise age of 17 horses could be determined. The youngest of them did not attain the age of 12 months when it died; one horse was 1.5 years old, three were approximately 3 years old. A four and a five years old individual were excavated as well; three other individuals died at the age of 4.5-5 years. Another specimen died at the age of 8 years, two horses died at the age of 9-10 years. There was one individual of 14 years and one of 15 years.

In the case of cats, three young individuals could be distinguished. One kitten was about 28-44 weeks old when it died; another died at the age of 18-24 months, while a third cat did not reach 18 months of age. Cats did not live as closely with humans as dogs (keeping cats as pets was extremely rare in the Middle Ages, partly due to their negative religious and superstitious connotations),[127] so kittens were not taken care of, contributing to their death at a young age.

species	foetus	neonatal	juvenile	subadult	adult	senile	unidentifiable
cattle NISP=*2810*		5	206	4	891	3	1701
horse NISP=*496*			13	2	263	1	217
sheep and	1	7	95		216	1	818

[127]Bartosiewicz, *Régenvolt háziállatok*, 126-128.

goat NISP=*1138*							
pig NISP=*1000*		7	193		284		512
dog NISP=*61*		1	4		38		18
cat NISP=*17*			3		11		3
hen NISP=*71*			9	5	27		30

Table 4.2. *Mortality profiles for the main domestic species.*

4.5 Forms of animal exploitation

Animals were kept primarily for their meat and draught power. This was mostly determined by the animal's biology and natural abilities; some animals were exploited only for their meat, some both for their meat and draught power, some also for secondary exploitation such as wool and milk production. All manure would have been gathered as both fertilizer and possible even for fuel. In this subchapter I will describe general aspects of medieval forms of animal exploitation in the Hungarian Kingdom and examine evidence for these things at Muhi. Since a whole chapter is dedicated to meat consumption, here I will only provide an overview of that topic and establish the context instead of going into details about Muhi.

Cattle

Cattle was exploited for its meat and milk but also as a draught animal. These forms of exploitation may even overlap in order to best exploit every aspect of their potential: the animals worked as long as they were fit and strong enough (cows might have been milked as well as used for draught), and were slaughtered at a relatively old age. This theory is supported by the fact that in Muhi the majority of cattle died when they were a mature age. Oxen (castrates) were considered especially valuable in the Middle Ages as animals for tillage work: these heavy, powerful animals required special training, which made them expensive. They were used for traction mainly on big estates; in settlements where inhabitants were not really wealthy, oxen bones occur relatively infrequently, which seems to be the case in Muhi, where only two bones of oxen were recovered. Cows also might have been used for traction on smaller pieces of land.

Beef is regarded as a cornerstone of medieval Hungarian meat consumption. Only in later texts, however, does written evidence exist to support this theory.[128] Traction work and beef production requires antagonistic anatomical features: carcasses of large, long-legged animals used in traction work contain a higher proportion of bone and muscle and less fat, which means that they are not suitable for primary beef production.[129] The conscious, large-scale production of beef for the market and specialization in cattle breeding only began in the fourteenth-fifteenth centuries in Hungary. In fact, the majority of the evidence comes from the sixteenth-seventeenth centuries. At that time, the number of bulls somewhat increases in the assemblages since bulls were no longer slaughtered at a young age.[130] Cows, however,

[128] In the Late Middle Ages and Early Modern period an exceptionally high proportion of beef was consumed: at the end of the sixteenth and the beginning of the seventeenth century, the annual Hungarian beef consumption was about 63 to 69 kg per head, compared with 47 kg in towns in South Germany and 26 kg in Southern France. (I.N.Kiss, "Agricultural and livestock production: wine and oxen. The case of Hungary," *East-Central Europe in Transition – From the Fourteenth to the Seventeenth Century*, ed. A. Maczak, H. Samsonowicz and P.Burke (Cambridge: Cambridge University Press, 1985), 88-90.) However, it is important to keep in mind that meat consumption would not have been the same in cities, towns and small villages. Vera Zimányi estimated the *per capita* beef consumption around 65-75 kg a year in the cities of Sopron and Kassa in the sixteenth century. (V. Zimányi, "Magyarország az európai gazdaságban, 1600-1650" (Hungary in the European economy between 1660-1650), (Értekezések a Történeti Tudományok Köréből 80, Budapest: Akadémiai Kiadó, , 1976), 133.)

[129] J.F.Kidwell and J.A. McCormick, "The influence of size and type on growth and development of cattle," *Journal of Animal Science* 15 (1956): 114.

[130]This is also the case in the later layers of Szentkirály village. É. Nyerges, *A szentkirályi kunok állattartása* (Cumanian Animal Husbandry) (MA Thesis. Eötvös Loránd University, Budapest, Department of medieval Archaeology, 2003), 52. (henceforth: Nyerges, *A szentkirályi kunok állattartása)*

still dominate the Late medieval meat market: in the inland trade, 75% of the slaughtered individuals were cows.[131]

The evidence we have on cattle kept for fattening and for traction is sometimes contradictory. The fourteenth-century Italian chronicler Matteo Villani mentions that oxen and cows were raised which were not used as draught animals,[132] while sixteenth-century documents reveal that old animals retired from traction work were still consumed at that time.[133] In my view, the two did not exclude each other, and the keeping of cattle solely for fattening depended on the financial position of a settlement or a family. Even though the large-scale Hungarian beef production and cattle trade was a later phenomenon, wealthier peasants in the thirteenth-fourteenth century may have kept a few cows and oxen only for their meat without using their draught power. In Muhi, the recovered bones derive from small, brachyceros-type individuals and the overwhelming majority of them died as adults indicating that they were kept not only for their meat but were exploited in other ways as well. It was not really worthwhile to slaughter young and healthy animals that could be used for milking and draught power.

Milking is a form of exploitation that leaves no manifestation on the bones (with a very few exceptions). Therefore, it is difficult to prove whether cows were milked or not on the basis of the bone material. Written evidence is also relatively scarce in Hungary concerning dairy products. The Cistercian monasteries were the

[131] I. N. Kiss, "A magyar marhatenyésztés jelentősége Magyarország és Közép-Európa számára a 16-18. században" (The Significance of Hungarian Cattle Breeding in Central Europe in the sixteenth-eighteenth century), *A Magyar Mezőgazdasági Múzeum Közleményei* (1981):169.

[132] A. Miskulin, *Magyar művelődéstörténeti mozzanatok Giovanni és Matteo Villani krónikáin alapján* (Movements in Hungarian Cultural History on the basis of Chronicles by Giovanni and Mateo Villani) (Budapest: Stephaneum 1905), 72-73. (hereafter: Miskulin, *Magyar művelődéstörténeti mozzanatok*) Matteo Villani reports that these animals were fattened on pastures, and after slaughter, their fat and skin was sold while the meat was salted and fried in large cauldrons together with the bones. Then the fried meat was dried and made into powder which could be stored for a long time without spoiling.

[133] L. Bartosiewicz, *Animals in the Urban Landscape in the Wake of the Middle Ages – A Case Study from Vác, Hungary* (Budapest: Archaeolingua, 1995), 40. (hereafter: Bartosiewicz, *Animals in the Urban Landscape*); T. Hoffmann, *A gabonaneműek nyomtatása a magyar parasztok gazdálkodásában* (Cereal cultivation in the economy of Hungarian peasants) (Budapest: Akadémiai Kiadó, 1963), 49)

first institutions where dairy products are documented: butter is mentioned in 1157; cheese was produced by almost all monastic communities.[134] Peasants also must have been involved in producing cheese, since this food is mentioned in 1358 as a usual "gift" that had to be given to the landlord (even though it is not known whether the milk of cow, sheep or goat was used for cheese production).[135] The fact that adult female cattle dominate the Muhi assemblage supports the assumption that cattle was also exploited this way. Among the pathological cattle bones from Muhi there are specimens with lesions that are probably related to hard work (*Fig. 9.26*); such pathologies easily develop on cows used both for traction and lactation. Another sign of heavy lactation is the tailing off of the compact bone, because the animals extract calcium from their skeletons to maintain the ideal chemical composition of milk;[136] such extreme cases, however, are not known from Muhi. Even though dairy products were certainly consumed in the Arpadian Age, the importance of milk and dairy farming increased significantly only in the sixteenth-seventeenth century, when cattle types able to produce a huge amount of milk appeared.[137]

[134] Paládi-Kovács, *A magyar állattartó kultúra korszakai*, 140.
[135] Gy. Székely, *Tanulmányok a parasztság történetéhez Magyarországon a 14. században* (Studies in the History of Peasantry in Fourteenth Century Hungary) (Budapest: Akadémiai Kiadó, 1953), 297. A. Paládi-Kovács adds that the ancient character of butter production in Hungary is supported by the fact that its terminology did not incorporate words from other languages. (Paládi-Kovács, *A magyar állattartó kultúra korszakai,* 142.)
[136]Nyerges, *A szentkirályi kunok állattartása,*. 33.
[137] Paládi-Kovács, *A magyar állattartó kultúra korszakai* , 225.

Horse

Horses were used for their draught power and riding in the first place, but there is still much debate on the issue of medieval horse meat consumption in Hungary. This custom was most certainly prevalent among the Ancient Hungarians in the time of the Hungarian Conquest,[138] but theoretically it was abandoned by the conversion to the Christian faith. The *Illuminated Chronicle* mentions that in 1046 the pagan leader Vata and his people consumed horse meat, as a crime against the Christian faith,[139] but it is not clear whether horse consumption refers to something that really happened in the Christian Kingdom of Hungary, or it is just a *topos* of paganism. It is certain, nevertheless, that eating horse was prohibited by the church already in the eighth century, and the taboo against eating horsemeat was observed in Christianized countries,[140] even though we do not know whether the church really punished this custom, and if it did, then how and to what extent.[141] However, it is certain that medieval people in some cases consumed the meat of horse, and exactly because of this ban and because of the different superstitions connected to this animal[142] can we expect that horse flesh was handled differently than the meat of other domestic species. Horse bones with butchering marks on them are known from several medieval assemblages. Eastern groups of peoples such as the Cumanians who came into the Carpathian Basin in the thirteenth century, ate horse meat, more or less,

[138] Paládi-Kovács, *A magyar állattartó kultúra korszakai*, 103.
[139] J. Matolcsi, *Állattartás őseink korában* (Animal Keeping in the Time of Our Ancestors) (Budapest: Gondolat, 1982), 252
[140] J. Langdon, *Horses, oxen and technological innovation* (Cambridge: Cambridge University Press, 1986), 261.
[141] Bartosiewicz, *Régenvolt háziállatok*, 112.
[142] It was a widespread custom to hang out horse skulls in order to keep evil forces at bay. Examples are known from the tenth-twelfth centuries (e.g. Tiszalök-Rázom, Tiszaeszlár-Bashalom or Csongrád-Felgyő) (Bartosiewicz, *Animals in the Urban Landscape*, 56. Sándor Bökönyi discovered Near Eastern analogies for this ancient Hungarian custom (S. Bökönyi, „Árpád-kori magyar szokás analógiája: kiaggatott lókoponyák közel-keleti falvakban” (Analogies for an Arpadian age Hungarian custom: displayed horse skulls in villages in the Near East), *Archaeologiai Értesítő* 105/1 (1978), 91-94.) Horse skulls are even hung up today in the Near East. (Dr. Alice Choyke, personal communication)

regularly.[143] The extent of this custom probably also depended on the ethnic dynamics of a settlement: while in the Cumanian village of Szentkirály there is evidence for horse meat consumption even in the fifteenth century,[144] there is no trace for such a behaviour in medieval Vác, a mixed Hungarian and German settlement.[145]

The milking of horses was a long-term tradition among the ancient Hungarians; it cannot be ruled out that in certain areas this tradition survived into the late Arpadian Period, but there is, unfortunately, no written evidence for this.[146] In the thirteenth-fourteenth century, however, its role was probably marginal (except among the Cumanian population).[147]

Horses were used as light draught animals for transporting less heavy loads at higher speeds; transportation with horses was much faster than with oxen. Castrates are more relaxed and endure draught exploitation somewhat better than do stallions or geldings. Indeed, the chronicler Matteo Villani mentions that in Hungary castrated horses were often used for light draught work.[148] For heavy tillage, however, oxen were preferred for their strength, even though their speed was more limited.

Swine

Swine is only exploited for its meat and fat although its hide may be used; it has no other exploitation purposes. There is an optimal age of slaughter when the animal reaches its maximum body weight and it was no longer worthwhile to feed it.

[143] Daróczi-Szabó, *Állattartás középkori falvainkban*, 3.
[144] I. Takács, "Szentkirály középkori falu zoológiai leletei" (Zoological finds from the medieval village of Szentkirály), *A Magyar Mezőgazdasági Múzeum Közleményei* (1988-1989): 103.
[145] Bartosiewicz, *Animals in the Urban Landscape* 55. The usually high (ca.10%) ratio of horse bones on Arpadian Age sites suggest that this custom was practiced indeed; there is, however, no systematic review of bone finds and written records yet which could confirm this assumption with absolute certainty. The problem of horse meat consumption in medieval Hungary, with its religious, superstitious and ethnical aspects would be a great research topic for further studies.
[146] Paládi-Kovács, *A magyar állattartó kultúra korszakai*, 104.
[147] Paládi-Kovács, *A magyar állattartó kultúra korszakai*, 143.
[148] Miskulin, *Magyar művelődéstörténeti mozzanatok*, 72.

Large numbers of young pigs are often found in medieval assemblages because of this kind of exploitation. Pigs efficiently transform nutrients into flesh[149] and can be foddered from forest products during the fall. In addition, pig is a multipara animal that can produce relatively many offspring each year. This makes its keeping easy and remunerative. medieval pigs were considerably smaller in size than modern breeds. In appearance they were similar to wild boar, partly due to crossbreeding which would have taken place when pigs were brought into the forest in the fall.[150] This kind of "half-pastoralist" form of animal keeping is known all over Europe, from Scandinavia and Scotland to the Iberian Peninsula.

Even though there are written reports for the fattening and trade of swine from the eleventh century onwards,[151] pigs were usually kept in individual households, only for local demand.[152] This was a main difference between the keeping of pigs and cattle or sheep: while the latter two were bred also for commercial purposes, there is no evidence for the large-scale trade of pigs. In medieval assemblages, sheep is usually greater in number than swine. In the Late Middle Ages, this ratio changes somewhat because after the Mongol invasion a large number of people of Western (mainly German) origin came to repopulate Hungary, bringing their own consumption traditions in which pork was much more emphasised.[153]

The large forests of the Bükk mountains in the vicinity of Muhi provided acorn for the fattening of swine. The fattening began in the fall and lasted until

[149]Bartosiewicz, *Régenvolt háziállatok*,: 108.

[150] Bökönyi, *History of Domestic Mammals*, 222, 224. A number of pictorial representations exist where domestic pigs are depicted looking much like wild boars, e.g. on the 1476 carving "The prodigious son" by Albrecht Dürer (*Fig. 9.31*).

[151]J. Szabadfalvi, "Az extenzív sertéstenyésztés emlékei Magyarországon" (Historical Traces of Extensive Swine Breeding in Hungary), *A Debreceni Déri Múzeum Évkönyve* 1969/70 (1970): 283-332.

[152] Belényessi, Az állattartás a XIV.században Magyarországon, 34, 37

[153] Daróczi-Szabó, *Állattartás középkori falvainkban,* 1-2.

Christmas.[154] The swampy character of the area around Muhi would have been suitable for pig keeping: this species needs more water than the other domestic taxa.[155] In North-Eastern Hungary, especially in Bihar county where forested and swampy areas were combined, pigs were kept in large numbers.[156] Pigs were not only fattened in the forest, but sometimes also in meadows; as Miklós Oláh reports in his description *Hungaria*, it was usual to feed swine (an omnivore) on the fish, eggs, worms and plants found on meadows and swamps.[157] This kind of extensive pig keeping resulted in a frequent crossbreeding with wild boar and the presence of primitive individuals in the population.[158]

A high proportion of juvenile individuals can be observed among the pig remains from Muhi:. This indicates that their owners did not necessarily wait for them to reach an ideal weight, but killed them earlier.[159] It was a common practice to kill juvenile swine, but there is also written evidence for the mandatory delivery of adult pigs to the landlord.[160]

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[154] Paládi-Kovács, *A magyar állattartó kultúra korszakai*, 108. There is written evidence for fattening of swine in the area of the Bükk mountains from 1471: Matthias Corvinus grants the Paulian order the right to fatten their pigs in the forests of the Diósgyőr possession. (J. Rupp, *Magyarország helyrajzi története* (The Topographical History of Hungary), Vol. II, Budapest, 1872: 59-60.) This also means that there was no free access to these forests, but a special permission was required to use them. There is, unfortunately, no evidence for the grazing-rights situation in the thirteenth century.

[155] Bartosiewicz, *Régenvolt háziállatok*, 106.

[156] Belényessi, Az állattartás a XIV.században Magyarországon, 53.

[157] Belényessi, Az állattartás a XIV.században Magyarországon, 28; Paládi-Kovács, *A magyar állattartó kultúra korszakai*, 105.

[158] It would be interesting to find written evidence on the influence of their roaming in the forest and their crossbreeding with wild boar on the behaviour of pigs. I have not found any descriptions of pigs being fierce or dangerous, but I am quite sure that a detailed examination of written documents would bring up some reports on this issue. In the 1603 English chronicle of John Stow, however, there is a description of pigfights; the animals were trained especially for this purpose. (Bökönyi, *History of Domestic Mammals*, 225.)

[159] Products that derive from animals killed before their optimal slaughter age can sometimes be regarded as more expensive, luxury foods, especially in the case of animals exploited in multiple ways (milk, wool, working power), since non-optimal slaughtering makes the product more expensive (see *Chapter 6*). Piglet bones, however, are frequently encountered, since this animal produces many offspring each year and thus, the loss is smaller than for animals that give birth to a single offspring every one or two years.

[160] In 1075 King Géza I donated the village of Ártánd to the Abbey of Garamszentbenedek, and prescribed that the village had to deliver twelve five-year-old pigs every year. (Bökönyi, *History of Domestic Mammals*, 225.)

Sheep and goat

The proportion of sheep to goats in medieval flocks is an issue that is difficult to resolve on the basis of the bone finds since there are scarcely any differences between the skeletal elements of these two species and thus their ratio can only be evaluated from a few skeletal elements. The ratio of goat in Central Europe seems to have been much lower in all historical periods: the proportion of goat to sheep is usually around 15% on the basis of bone finds and tax records.[161] Ethnographic analogies in herding practices suggest that goats were used as leaders of the sheep flock (together with donkey) and were also kept for their milk.[162] Goat produces a large amount of milk in relation to its body size so it can be kept as a cheap milking animal in the household instead of cattle[163] (in Hungarian, goats are also called *szegényember tehene,* "the cow of the poor", even today). Goat keeping is economical and relatively easy, since they survive even in extreme circumstances, so it is possible that in some areas goats were kept in larger quantities than sheep. However, it is very difficult to establish their exact ratio in the zooarchaeological material since their bones are very similar to those of sheep, and identification is even more difficult when the bones are fragmented. (A good starting point for further investigation would be the chemical examination of ceramics; lipids, also the remains of milk, are sometimes preserved on the sides and in the fabric of pots so that the analysis of the types of fatty acids present may provide a more precise picture of the ratio of sheep and goat, or cattle and small ruminants exploited for milk by the human population.)[164]

[161] Nyerges, *A szentkirályi kunok állattartása*, 54., 62; L. Bartosiewicz, "The Role of Sheep Versus Goat in meat Consumption at Archaeological Sites," in *Transhumant Pastorialism in Southern Europe*, ed. L. Bartosiewicz and H. Greenfield, (Budapest: Archaeolingua, Series Minor 11, 1999): 56, Table 1.
[162] Bökönyi, *History of Domestic Mammals*, 197-198.
[163] Bartosiewicz, *Régenvolt háziállatok*, 99.
[164] The practice of dairying in early European farming communities was proved by Oliver Craig *et al* in 2005 through the analysis of milk fats on vessel fragments. (O. Craig, J. Chapman, C, Heron. L.H. Willis, L. Bartosiewicz, G. Taylor, A. Whittle and M. Collins, "Did the first farmers of central and

Only a little is known about the sheep keeping of Hungarian peasants in the Arpadian Period. In the Late Middle Ages, farms specialized in sheep keeping appeared on the Great Hungarian Plain,[165] but there is no trace of anything similar in the thirteenth-fourteenth century. Their wool was certainly used. Wool production is again a phenomenon that cannot be demonstrated from the archaeological material alone, although there are some written sources that mention the shearing of sheep in Cistercian monasteries.[166]

On medieval sites, most of the sheep finds usually derive from adult individuals because of their secondary exploitation; this is also the case in Muhi. The proportion of lipids in the milk of sheep is higher than in that of cow, and in consequence, sheep milk is an ideal material for making dairy products.[167] The significance of sheep milk, however, only increased during the Vlach colonisation in the fourteenth-fifteenth century; this people brought a highly developed dairy farming into the country.[168]

Dogs

Even though there is only few pieces of osteological evidence for dog keeping, representations and contemporary descriptions suggest that new types of dogs appeared in the Middle Ages; greyhounds (*agár*), beagles or hounds (*kopó*) are

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eastern Europe produce dairy foods?," *Antiquity* 79/306 (2005), 882-894. A similar project was carried out and published on British prehistoric vessels as well. (M.S. Copley, R.Berstan, S.N. Dudd, S. Aillaud, A.J. Mukherjee, V. Straker, S. paye and R.P. Evershed, „Processing of milk products in pottery vessels through British prehistory," *Antiquity* 79/306 (2005), 895-908. In more recent studies still unpublished, some pessimism has been expressed concerning this issue since it seems that the milk of different species was sometimes blended and stored together, and thus, one vessel fragment can contain lipids from different taxa, making their identification difficult. (László Bartosiewicz, personal communication)

[165] In 1526, 70,000 sheep were stolen by the Turkish Ottoman army in the area of the town of Szeged. (Paládi-Kovács, *A magyar állattartó kultúra korszakai*, 112.)

[166] E. Kalász, *A szentgotthárdi apátság birtokviszonyai és ciszterci gazdálkodás a középkorban* (Land Properties of the Szentgotthárd Abbey and Cistercian economy in the Middle Ages) (Budapest: Published by the author, 1932): 83, quoted by Paládi-Kovács, *A magyar állattartó kultúra korszakai,* 112.

[167] Bartosiewicz, *Régenvolt háziállatok*, 97.

[168] Paládi-Kovács, *A magyar állattartó kultúra korszakai*, 142.

mentioned in twelfth-thirteenth-century documents,[169] as well as the Hungarian 'vizsla' types (pointers).[170] A place called "Pescheer (Pecér) völgy" in 1343 (Pecér-valley; the Hungarian word *pecér* means the person who takes care of hunting dogs)[171] indicate the presence of such dog types in the possession of the royal family in Diósgyőr. These animals, however, were kept by the nobility and not by peasants. Descriptions or mentions of shepherd dogs and watchdogs do not occur in documents since they had no economic importance in the same way as cattle, sheep or horses. Neither were taxes paid for dog breeding in the same way as tithes were paid after the number of lambs born.

In the Muhi sample, adult individuals, four juveniles and a neonatal puppy of the, more or less, homogenous pariah-dog (mixed breed dogs) type were found. One cervical vertebra is of special interest because it had been chopped with an axe, perhaps to remove the head of the animal. This may imply occasional consumption of dogs – the fact that selling dog meat was legally prohibited in medieval Buda shows that this custom must sometimes have been practised.[172] It is, however, a very rare phenomenon; and it may be hypothesized that except in extreme years of famine, dog meat was not consumed in medieval Hungary.[173] Cutmarks on dog bones are rather connected to superstitions, pagan rituals[174] or simply to skinning. In Muhi, however,

[169] Bökönyi, *History of Domestic Mammals*, 327.
[170] Paládi-Kovács, *A magyar állattartó kultúra korszakai*, 120.
[171] J.Sz.Várnai, "Ómagyar kori helynevek Diósgyőr határában," (Ancient Hungarian Place Names in the Region of Diósgyőr). *A Debreceni Egyetem Magyar Nyelvtudományi Tanszékének Évkönyve* 38 (2000), 451-456; accessed on the internet at 2008.05.08, http://mnytud.arts.klte.hu/mnyj/38/51varnai.doc.
[172] Dogs were consumed even in the Early Modern and Modern Ages in Bavaria, Switzerland, Austria, or Silesia. In Munich, the last slaughterhouse was closed in 1965. (Bartosiewicz, *Régenvolt háziállatok*, 121.
[173] Bartosiewicz, *Animals in the Urban Landscape*, 59.
[174] Remains of dogs were recovered from under a number of buildings in the Arpadian Age village of Kána. (Márta Daróczi-Szabó, personal communication; see also *Chapter 7*) Dog bones sometimes occur in extreme contexts: István Vörös mentions a tenth-eleventh-century burial from Visegrád, where dogs were throw into the grave of an executed woman (I. Vörös, "Kutyaáldozatok és kutyatemetkezések a középkori Magyarországon II. (Dog sacrifices and dog burials in medieval Hungary Pt. II.), *Folia Archaeologica* 42 (1991): 184.) It is still unclear whether dog burials signify surviving pagan traditions or symbolize excommunication.

there was no trace of the practice of any kind of pagan rituals, which makes it difficult to put this find into a clear cultural context.

Domestic birds

Hens were the most significant of the domestic birds. Their remains are found on practically all Arpadian Age sites, and hens, as well as geese and eggs, are often mentioned in *urbaria* as small "gifts" given to the landlord.[175] They were widely kept in the Middle Ages for their meat and eggs and were especially important in urban areas. This species, together with swine, is typical for household animal keeping in villages; they could be kept in backyards and fed on grass, worms and kitchen refuse. Both the bones and eggshells brought to light from medieval contexts suggest that these animals were small, primitive individuals of ca. 1 kg, approximately half the size of modern birds.[176]

In the Muhi assemblage, the majority of hens were slaughtered at a mature age, even though a few subadult and juvenile individuals, i.e. chickens also were recovered. The dominance of adult hen indicates the importance of egg production; the animals were probably kept alive as long as they could lay eggs.

4.6 Conclusions

The overwhelming majority of the Muhi assemblage derives from domestic species; wild animals forming only a small part of the diet. The environment, however, was exploited in the form of antler gathering which provided raw material for tool manufacture. Hare, wild boar and deer was consumed occasionally; the legal

[175] Paládi-Kovács, *A magyar állattartó kultúra korszakai*, 116-117.
[176] Matolcsi, *A háziállatok eredete*, 207.

regulations for hunting in this time, however, are unclear. Wild animals consumed in Muhi were probably killed in the nearby meadows or in the forested areas of the Bükk mountains.

Half of the bone finds were identified as cattle. The dominance of this species is not surprising; it may, however, be somewhat overrepresented due to heavy fragmentation. The small, brachyceros cattle was exploited both for its meat, hide, bones and draught power as well as for its milk. Manure was also surely used as a fertilizer or fuel although this would leave little trace in the archaeological record. The majority of the cattle remains that could be sexed derive from cows. This also supports the theory that milking was an everyday activity, even for individuals that were also used in traction. There is no evidence for cattle kept and fattened only for its meat; it is more likely that animals retired from draught work were slaughtered and consumed so that they were usually killed at an adult age. Bone pathologies which can be traced back to work overload were discovered in some cases; this also demonstrates the preference in Muhi for slaughtering older animals. Calves were sometimes killed but certainly not on a regular basis. All this reflects an economical form of animal exploitation; the inhabitants of the village probably could not afford to keep and feed cattle only for beef production. Thus, even though remains of animals imported and animals raised in the settlement cannot be distinguished on the basis of osteoarchaeology, it is presumed that the majority of the animals slaughtered and consumed were raised in Muhi and not imported from other regional markets.

The recovered horse bones are few in number, and they are less fragmented than those of other species. This lack of fragmentations suggests that they were probably not consumed. This is also supported by the fact that all age classes are present in the assemblage. By the comparison with another coeval village, Kána (see

Chapter 7), however, some doubts emerge.[177] Horse must have been a valuable animal, and in some cases even injured specimens were kept alive and healed. There was no pathological bone which may be traced back to work overload, something that may support the theory that these animals were cared for more conscientiously than draught cattle.

The meat of small ruminants and pigs played a similar role in the diet. Sheep, however, was also kept for its wool (and perhaps for its milk), so sheep were kept alive longer, while pigs were rather slaughtered at a young age. The occasional slaughter of lamb was also an option.

The economical character of pig keeping in households may be the reason for the relatively high number of pigs in the assemblage; their proportion is higher than would be expected in this period. There is no reason related to special food traditions why pig was preferred, thus, together with the slaughter of old draught cattle, the high ratio of pigs may reflect the less wealthy position of the inhabitants of the village. Pigs were certainly kept by households. They were fattened on the meadows in herds and, presumably, on acorn in the forests of the Bükk mountains.

Dog keeping is difficult to reconstruct on the basis of these few bone finds. It is possible that dogs played a certain role in superstitious beliefs; even though only a single vertebra was found which may indicate their role in some kind of ritual behaviour. In the Arpadian Age village of Kána and elsewhere a number of young dog remains were recovered which reflect the continuation of such pagan beliefs in this period from earlier, pre-Christian times (see Chapter 7).

[177] In Kána, horse bones with clear hacking marks were found, indicating the occasional consumption of horse meat. The ratio of horse bones is almost the same on the two sites, as well as the mortality profile; it can be hypothesized that horse meat was now and then consumed in Muhi as well, but there is no clear archaeological evidence for this.

Only a few domestic hen seem to have been kept in the village. In this period, their meat and eggs only complemented the diet of the villagers but were not consumed in large quantities.

Chapter Five: ANIMALS AS RAW MATERIAL

Animal exploitation not only included use of their meat and working power, but also their skins and various skeletal elements which were used in tool manufacturing. The processing and use of animal skins is usually not directly perceptible in the archaeological record since skins only survive under special conditions. Bone tools, however, are found in relatively consistent numbers in excavations. In this chapter I will examine the bone tool material recovered from the thirteenth-century layers of the site of Muhi.

The osseous tissues of animals served as raw material for many types of tools. They were available everywhere, they were cheap, relatively easy to shape, and had no other uses beyond, except glue-making. Altogether 55 pieces were identified as tools or as debris from bone manufacturing in the thirteenth century Muhi sample. A large part of these (20 pieces) were sledge runners although gaming pieces, handles and other objects of less certain function were also found. The presence of debris and of unfinished, discarded and re-worked pieces demonstrate the local character of their production (something that also continues in the later layers).

All the worked osseous objects were made from the bones of domestic animals except for some antler debris. Two belt ornaments, somewhat more elaborated pieces, have been put to an exhibition in the Herman Ottó Museum in Miskolc and therefore they were not available for detailed study – I could only take a look at their photographs. Since I did not have them in my hands a close examination was not feasible, but in all probability, being more elaborated belt buckles, they are made of antler.[178] All other pieces were found in the general faunal material and were recovered in refuse pits.

I refer to the individual pieces by a reference number I have given them based on the location where they were found (see *Table 5.1*). I have also included objects which show traces of use or manufacturing wear but are too damaged to identify to type in this analysis.

5.1 Skates and sledge runners

Skates and sledge runners may be found in archaeological contexts from the Iron Age onwards,[179] often with practically the same form. They may be found in rural as well as in urban assemblages. These objects are usually made of long bones of horse and occasionally cattle, preferably from metapodia and radii, and sometimes even from the mandibles. Some have clearly recognisable fixing holes at the two ends of the caudal surface of the long bone diaphysis and some of them do not, but in most cases, microscopic wear patterns reveal their function clearly. The surface contacting the ice becomes polished and worn, and a strong, criss-crossing striations of varying thicknesses along the vertical axis is visible under the microscope, with a few random

[178] In most cases, such pieces are made of antler. The two belt ornaments were, in all probability, imported. Semi-circular buckles, however, can be made from bone and are usually home productions. (Dr. Alice Choyke, personal communication.)

[179] Similar objects have been discovered in earlier layers as well. There is, however, an ardent scholarly debate on the function and dating of Bronze Age "skates". The early manifestation of these objects is followed by a total obscurity in the archaeological record for two millennia. This topic is, however, outside the scope of my thesis. (For this topic see H.Ch. Küchelmann and P. Zidarov, "Let's skate together! Skating on bones in the past and today," *From Hooves to Horns, From Molluscs to Mammoth – manufacture and Use of Bone Artefacts from Prehistoric Times to the Present, Proceedings of the Fourth Meeting of the ICAZ Worked Bone Group at Tallin, 26th-31st of August, 2003* ed. H. Luik, A.M. Choyke, C.E.Batey and L.Lougas (Muinasaja teadus 15, Tallin: Cultural Endowment of Estonia, 2005); accessed on the internet at 16.04.2008:
http://www.knochenarbeit.de/eigene_arbeiten/skating_on_bones.pdf (hereafter: Küchelmann-Zidarov, Let's skate together); A.M. Choyke – L. Bartosiewicz, "Skating with Horses: continuity and parallelism in prehistoric Hungary," *Revue de Paléobiologie* 10 (December 2005): 317-326.

scratches appearing in all directions.[180] The characteristic shape and position of fixing holes make the fragments easy to recognize, even if only a small piece survived (as in case of 588 and 187, *Figs. 9.34 and 9.36* in the Appendix).

The difference between skates and sledge runners is rooted in their use. Skates may have two or more horizontal holes in order to fix them on the feet by a thong of some sort; the skater pushed himself forward with an iron-shod pole (see *Figs. 9.36-9.37*).[181] In some cases, skates have no holes at all, and the skater fixed the skate with his own body weight; these may be single skates used much like a skate board.[182] Pieces that have vertical holes extending into the medullary cavity at the two ends of the diaphysis above the epiphyses and on the caudal surface are interpreted here as sledge runners. The vertical holes were carved in order to fix the body of the sledge with pegs onto the runner (*Fig.9.38*). Two, or sometimes three bones could be used as runners on one sledge.[183] The pegs or nails were probably wooden or metal.[184] More elaborate pieces are pointed, rounded and/or carved to sweep up at the end(s) in order to ease the movement. Even though only the runners of such sledges have survived, ethnographic examples from the nineteenth and early twentieth century provide strong analogies to support the theory of such a use. Quite recent historical evidence and

[180] A. MacGregor, "Problems in the interpretation of microscopic wear patterns: the evidence from bone skates," *Journal of Archaeological Science* 2/4 (1975): 387-389, Figs. 2 and 3. (hereafter: MacGregor, Problems)

[181] A. MacGregor, *Bone, Antler, Ivory and Horn: Technology of Skeletal Materials Since the Roman Period* (London: Croom Helm, 1985), 142 (hereafter: MacGregor, *Bone, Antler, Ivory and Horn*). After the first attempts to use such objects as bone skates, some doubts emerged that these objects were rather used as textile smoothers. (A. M. Choyke, "Bone skates: raw material, manufacturing and use," *Antaeus* 24 (1997-1998): 153 (henceforth: Choyke, Bone skates). In the 1970s, Arthur MacGregor carried out a study on this topic, and demonstrated by his own experiments that these were indeed used as skates. (MacGregor, Problems, 387)

[182] Using bone skates without fixing it to the shoe is also mentioned by Ottó Herman in his ethnographic studies (O. Herman, "Ironga, szánkó, kecze" (Skate, sledge, fish-net weights), *Természettudományi Közlöny* 34 (1902),: 12 (henceforth: Herman, Ironga, szánkó, kecze). This kind of use was successfully demonstrated again recently by the experiments of Hans-Christian Küchelmann and Petar Zidarov. (Küchelmann-Zidarov, Let's skate together, 17.)

[183] O. Herman, "A csontos-szánkó" (The bone sledge), In O. Herman, *Halászélet, pásztorkodás* (Fishery and Pastorialism) (Budapest: Gondolat, 1980), 48-50, Figs. 16-19. (henceforth: Herman, A csontos-szánkó)

[184] Küchelmann-Zidarov, Let's skate together, 4.

ethnographic observations make it clear that almost any small boy would have been self-sufficient in this respect and make skates and runners for himself.[185] It may also be added that runners and skates could not only be used on ice but also on earth surfaces or grass; ethnographic analogies from Switzerland reveal that bone runners were sometimes used for transporting hay.[186]

Metapodia of horses were often used for this purpose; ca. 60% of the bone skates or runners were made from horse bones.[187] Horse was rarely eaten in medieval times, so these bones usually did not go through the processes of butchering and cooking. The quantity of marrow available inside them is small anyway, so even if horse meat was sometimes consumed, these bones survived intact due to their the low nutritional value. In addition the hides of animals were often removed with the metapodia and foot bones intact for ease of handling when the skins were initially scraped. Thus, combined with the differences in primary butchering, intact bones from horse seem to have been available in larger numbers than those of cattle or red deer.[188] In addition, the natural, symmetrically tubular shape of horse metapodia are easy to turn into skates or runners, and their thick walls can resist extremely high pressure without splitting. Evidently, fully developed bones of adult individuals would best serve such a purpose. The other type of sledge runner made from mandibles of horse and cattle (with the lower margins touching the ground or ice) is

[185] A. MacGregor – A. Mainman, "The bone and antler industry in Anglo-Scandinavian York: the evidence from Coppergate," *Crafting Bone: Skeletal Technologies through Time and Space*, ed. A.M. Choyke and L. Bartosiewicz (BAR International Series 937, Budapest: Archaeolingua, 2001), 346.
[186] A.T, Clason, "Voorwerpen uit been en gewei" (Artefacts made of bone and antler), *Spiegel Historiael,* 78 (1978), 294-297, cited by Choyke, Bone skates, 153.
[187] Küchelmann-Zidarov, Let's skate together Fig. 1.
[188] Choyke, Bone skates, 149

also known from medieval contexts from a few sites in Europe,[189] but has not been recovered in Hungary.

The sledge runners found in Muhi were made from radius, metacarpus or metatarsus of adult horses, and all have holes on the caudal side. The cranial/dorsal side of the bone, which served as the gliding surface was heavily worn by use in most cases; in the last stage, the medullar cavity was exposed and the runner usually split (e.g. in case of 2315 and, presumably, 186/4, see *Fig. 9.39*). The proximal and/or distal end was sometimes chopped and rounded; the ulna and the second and fourth metapodia were always cut off from the diaphysis. The gliding surface was sometimes also chopped to flatten it and even it out. Usually, this is impossible to demonstrate since use wear eliminate these chopping marks although in some cases the small chop marks visible next to the gliding surface can be interpreted as traces of such shaping.[190]

In the case of broken and discarded pieces, the stage of manufacturing the failure occurred is sometimes recognizable. On object 1452/2, the ends of the bone were already rounded, but the fixing holes had not yet been carved when the piece was discarded (probably because the diaphysis cracked even though no trace of splitting is recognizable on the surviving fragment). Object 1452/3 represents the next stage, when the ends were rounded and the manufacturer had begun to carve the fixing holes for the sledge. However, the runner split into two during this process and so, again, this was discarded. Object 562/1 (*Fig.9.41*) was once reworked (traces of an unfinished second hole are clearly visible on the proximal end) and then used again for some time. However, when the bone split on the caudal side it was thrown away.

[189] This type of sledge is very rarely recovered from medieval samples. Ottó Herman mentions such pieces but not from Hungarian context (Herman, A csontos-szánkó, 53; Herman, Ironga, szánkó, kecze, 19). Some iconographic evidence is also known from the Middle Ages: on Pieter Bruegel the Elder's copper engraving "Winter scene before the Antwerp city gate of St George" (1558) a child is using a sledge made of horse (?) mandible. (Bartosiewicz, *Régenvolt háziállatok,* 183, Fig. 153)
[190] Küchelmann-Zidarov, Let's skate together, 3.

Such reworked and reused runners are significant since they provide strong evidence for local production.

Object 186/1 has rough transverse chopping marks on the caudal side of the bone; these were deliberately made, probably in order to create friction to improve the foothold.[191] This object may have been used as a single skate without any kind of fixing, keeping the skate under the foot only by the body weight of the skater, as is known from the ethnographic record.[192]

Skates and runners are usually regarded as children's playthings, but some examples are known from the ethnographic record when these were used in hunting for wildfowl: with the help of sledges or skates, the hunter was able to approach the prey on the frozen surface of the lake, by manoeuvring with a pair of spiked sticks.[193] Skating was, however, primarily a popular free time amusement and sporting activity of children in the Middle Ages. As Fitz-Stephen wrote in his *Description of London* in 1180:

> " When the great marsh that laps up against the northern walls of the city is frozen, large numbers of the younger crowd go there to play about on the ice. Some, after building up speed with a run, facing sideways and their feet placed apart, slide along for a long distance. Others make seats for themselves out of ice-slabs almost as large as millstones, and are dragged along by several others who hold their hands and run in front. Moving so quickly, the feet of some slip out from under them and inevitably they fall down flat. Others are more skilled at frolicking on the ice: they equip each of their feet with an animal's shin-bone, attaching it to the underside of their footwear; using hand-held poles reinforced with metal tips, which they periodically thrust against the ice, they propel themselves along as swiftly as a bird in flight or a bolt shot from a crossbow. But sometimes two, by accord, beginning far apart, charge each other from opposite directions and, raising their poles, strike each other with them. One or both are knocked down, not without injury, since after falling their impetus carries them off some distance and any part of their head that touches the ice is badly scratched and scraped. Often someone breaks a leg or an arm, if he falls onto it. But youth are driven to show

[191] Choyke, Bone skates, 149.
[192] MacGregor, *Bone, Antler, Ivory and Horn*, 142
[193] MacGregor, *Bone, Antler, Ivory and Horn*, 145

off and demonstrate their superiority, so they are inclined to these mock battles, to steel themselves for real combat."[194]

The widespread use of sledge runners and bone skates survived even to the nineteenth-twentieth century, and is known from the ethnographical record not only in the Carpathian Basin but in other regions of Europe as well. Olaus Magnus, the sixteenth-century archbishop of Uppsala, also noted in 1555 how handy these objects were and recorded the practice of applying grease to the skates in order to reach the maximum speed.[195] Ottó Herman, the Hungarian ethnographer found analogies in Hungary[196] as well as in Germany.[197]

5.2 Gaming pieces

A number of gaming pieces came to light in Muhi; four of them come from a thirteenth-century layer (161, 279, 562/3 and 1452/6; *Fig. 9.43*). Three (279, 562/3 and 1452/6) are very similar: they are made of the first phalanx of cattle with one or

[194] William Fitz-Stephen, *A Description of London*, chapter 22. The English translation was made available by the Florilegium Urbanum – medieval English Urban History webpage: http://www.trytel.com/~tristan/towns/florilegium/introduction/intro01.html , accessed at 06.05.2008

[195] Olaus Magnus wrote in his *Description of the Northern Peoples* (chapter 25): "The other kind of men are those who attach to the soles of their feet a piece of flat, polished iron, a foot long, or the flat bones of deer and oxen, the shin bones, that is. These are slippery by nature because they have an inherent greasiness and achieve a very great speed, though only on smooth ice, and continue shooting forward without pause as long as the ice remains level. Among this sort too there are found everywhere men who take pleasure in racing for a prize. (...) The rest are outrun by those competitors in the race who attach to the soles of their feet the shin-bones of deer thoroughly smoothed and greased with pork fat, since, when the cold drops of water rise as it were through the pores of the ice during fierce cold, the bones smeared in this way cannot be hampered or kept in check, as iron can however much it is polished or greased. For no greasing suits iron as much as it does the shin-bones of deer and bullocks, which have an innate slipperiness of their own." (Olaus Magnus, *Description of the Northern Peoples*, Vol. 1, Translated by Peter Fisher and Humphrey Higgens, ed. By Peter Foote, with annotations by John Granlund (London: Hakluyt Society, 1996), 58.) It is surprising that Olaus Magnus mentions only deer and cattle bones, but no those of horses. Ottó Herman refers to Olaus Magnus' *Description* one time and states that the archbishop mentions bones of sheep as skates as well, but it is probably a misunderstanding (O. Herman, "Ironga, szánkó, kecze", 8); I did not find such a statement in the text. Besides, the metapodia of sheep are simply too small to be used this way; small children may be an exception.

[196] O. Herman, "A beszélő szerszám" (The talking tool), in O. Herman, , *Halászélet, pásztorkodás* (Fishery and Pastorialism), 25-40, Budapest: Gondolat, 1980: 35.

[197] Herman, A csontos-szánkó, 43.

two holes, one on the proximal and, in case of nr. 279, another one on its distal end. The fourth piece is a die made of sheep or goat astragalus (161).

Gaming pieces made from phalanges are often found, even though the precise way they were used is not known. The holes carved into them might indicate the value of a piece in a game. Such holes cannot be traced back to the methods of skinning and are certainly deliberate, so it can be ruled out that the accumulation of such phalanges is the result of some other, different practice. It is assumed that they offered an alternative to astragali, their natural shape allowing them to be stood on end easily,[198] and to be used as figures in some game similar to chess. Another possibility is that they were used as objects placed in rows on the ground, hit with a throwing stick.[199] Examples are known when the phalanges were filled with lead in order to produce heavier pieces that were easier to throw; such toys were found e.g. in Estonia and thirteenth century Gotland.[200] The pieces found in Muhi represent a simple type, where almost nothing was modified of the natural shape of the bone and only a hole was carved into the proximal articular surface. Such gaming pieces may be considered as cheap parallels to the more elaborate ivory toys of the aristocracy.

An interesting ethnographic analogy might shed light on another possible function of these gaming pieces. "Lancer horses" made from ceramics have a very similar hole on their front, which serves as a fixing hole for the "lance", represented by a small stick of wood.[201] Even though this toy type is only known in a ceramic form, it is possible that these bone pieces were not used as tokens but as similar

[198] MacGregor, *Bone, Antler, Ivory and Horn,* 134
[199] MacGregor, *Bone, Antler, Ivory and Horn,* 135.
[200] L. Maldre, "Bone and antler artefacts from Otepää Hill-Fort," *Crafting Bone: Skeletal Technologies through Time and Space*, ed. A. Choyke and L. Bartosiewicz (Budapest: Archaeolingua, 2001); 20, Dr. Alice Choyke, personal communication.
[201] S. Petényi, "Középkori és koraújkori játékok" (Toys from the middle and early modern ages), *Játszani jó! Történelmi barangolás a játékok birodalmában* (It's Good to Play! An Historical Journey in the Realms of Toys), ed. E. Matuz and A. Ridovics, (Budapest: Magyar Nemzeti Múzeum – Móra Ferenc Múzeum, 2004), 65.

"lancer horses." It is also known from the ethnographic record that a particular skeletal element can represent the animal itself, as in the case of the so-called "bone foal" (*csontcsikó*), a Hungarian toy that survived into the twentieth century. This consists of two first horse phalanges, "harnessed" and "hitched" to a wooden "wagon."[202] In our case, however, it would not have been horse phalanges that were used for the most part but the phalanges of cattle that might have represented the living animal.

Playing with bone dice or "knucklebones" has been a continuous tradition since prehistoric times.[203] The astragalus of sheep and goat has a rectangular, die-like shape and can be used as a gaming piece without modification; the anatomical differences between its sides make the carving that found on traditional dice unnecessary, since the natural features of the bone served as identifiers for each side. These could be, however, sometimes decorated with patterned incisions or otherwise modified.[204] The practice of dicing present throughout the Middle Ages, even though it was often labelled a moral deviation. In the twelfth century, ten different types of dice games were known according to Strutt.[205] The die found in Muhi (obj. 161) was made from the left astragalus of a sheep or goat. There are small modifications on the bone: the lateral and medial sides were carved in order to create a, more or less, even surface although no other carvings or incisions are visible. The whole surface of the

[202] I. Bárkányi, "Paraszti játékszerek Csongrád megyében" (Peasant toys in Csongrád county, Hungary), *Játszani jó! Történelmi barangolás a játékok birodalmában* (It's Good to Play! An Historical Journey the Realms of Toys), ed. E. Matuz and A. Ridovics (Budapest: Magyar Nemzeti Múzeum – Móra Ferenc Múzeum, 2004), 117.

[203] L. Bartosiewicz, "A systematic review of astragalus finds from archaeological sites," *Antaeus* 24 (1999): 37. (hereafter: Bartosiewicz, A systematic review) These games have a possible Eastern origin; ethnographic analogies and written sources reveal that astragalus games were widespread in Mongolia and Kazakstan where they are played even today. Such finds were discovered in great numbers in some excavation sites; in Majs-Udvari Rétek, 58 sheep astragali were recovered from a child's grave, These objects are usually considered to be children's toys, but they sometimes might have been used for fortunetelling as well. (Gy.Kovács, "Juh astragalos-játékkockák a szolnoki vár terletéről" (Gaming pieces made of sheep astragali from the Castle of Szolnok), *Archaeológiai Értesítő* 116/1-2 (1989): 103-110.)

[204] Bartosiewicz, A systematic review, 39.

[205] Quoted by MacGregor, *Bone, Antler, Ivory and Horn,* 132.

object is worn and shiny, which indicates either long-time use or deliberate polishing (in case of a simple, not at all elaborate bone throwing piece the former sounds more reasonable).

5.3 Handle

Object 754, presumably the remains of a knife handle (*Fig. 9.42*), was made from a horse or cattle long bone; since only the compact tissue was used, it is impossible to identify the species. Only a 4 cm long fragment of the end survived; it is decorated with regular incisions. A small hole, which probably served as a fixing point, was carved into the object; the rest of the handle broke off due to a crack starting out from the hole. The outer surface of the handle is worn and shiny. Since the production of such an object requires a simthy (which was probably not present in Muhi), the piece may be interpreted as an import.

5.4 Unidentified objects

There are some bone objects in the assemblage which seem to have been modified by humans but cannot be identified precisely due to fragmentation or damage. Some are worked but the function is not known. I included eight pieces in this category; there are signs of polishing and wear on all of them.

In the case of objects 186/2, 186/3, 194 and 2709 there are unambiguous traces of manufacturing on their surfaces: one side of these large mammal diaphysis fragments was heavily polished. Objects 186/2, 186/3 and 194 are presumably fragments of handles. Object 2709 is a peculiar piece: this fragment of a cattle ulna was made into an enigmatic 5 cm long rectangular object with a hole on one end.

Objects 200, 619 and 2087 are either ad hoc objects or they were polished by taphonomic factors. There are irregular wear patterns on their surface which may indicate that they were used in leather-working, but this cannot be demonstrated, since only damaged, 5-6 cm fragments survived. Object 335/1 is another rather mysterious piece: it is a roe deer mandible fragment where the *foramen mentale* was artificially widened by cutting with a knife, perhaps in order to hang the object, however, no other traces of manufacturing are visible. Probably this piece is not a real tool but the hole was rather widened in order to hang the meat for smoking, as is known for scapulae. I could not, however, find any analogies for such a smoking method. Moreover, the piece derives from roe deer, a relatively rare species in rural contexts.

5.5 Workshop debris

Interestingly, almost all the pieces of workshop refuse derive from antlers (19 pieces) although no antler objects were found among the bone tool assemblage. Antlers of both roe and red deer are found in the faunal assemblage since both species formed a permanent element in the fauna. It appears that the majority of antler pieces derive from shed antlers. Only one unshed (and unprocessed) roe deer antler was found together with a fragment of the animal's skull *(Fig. 9.44)*. In three cases it was obvious that the antlers were shed since the rose survived; where there were only small fragments, it was impossible to say whether the antlers were collected as shed pieces or taken from the head of killed game. Antlers are grown normally by male red and roe deer and are shed from the late fall, winter and early spring. The timing of antler growth varies from one region to the other.[206] In the Carpathian Basin red deer stags usually shed their antlers between February and April (first the old males, finally the youngsters);[207] roe deer stags drop their antlers in November and December.[208] It was usual to collect shed antlers (most importantly red deer antler) in the woods; a huge amount of raw material could be gathered this way. Individual deer tend to shed their antlers on the same spot each year; village people were probably aware of the movement of deer populations and the spots where antlers could be picked up. Antler collecting must have been an organised and intensive action in order to gain material of good quality, since deer themselves gnaw their shed antlers and rodents like mice and rats also can cause damage to the raw material if it is not collected in time.[209] The legal regulations for Hungarian antler collecting are, however, not known. Olaus Magnus mentions that deer may only be hunted by the nobility while shed antlers were the property of the person who found them,[210] but no such evidence survives from the Carpathian Basin.

The methods of processing bones and antlers are well known.[211] A preparatory softening was necessary in order to make antler easier to carve. Soaking antler in cold or briefly in boiling water or in some kind of very mild acidic liquid (such as a low solution of water and vinegar) would have been common practice, something also supported by ethnographic evidence.[212] The unused parts, such as smaller antler tines or the articular ends of long bones were cut off. Usually, the long bone diaphysis and

[206] Reitz and Wing, *Zooarchaeology*, 83.
[207] S. Faragó, *Vadászati állattan* (Zoology of Wild Animals) (Budapest: Mezőgazda, 2002), 406. (hereafter: Faragó, *Vadászati állattan*)
[208] Faragó, *Vadászati állattan*, 419.
[209] MacGregor, *Bone, Antler, Ivory and Horn,* 36.
[210] MacGregor, *Bone, Antler, Ivory and Horn,* 32.
[211] It is likely that antlers were treated this way very often, but bones were not. (Dr. Alice Choyke, personal communication.)
[212] MacGregor, *Bone, Antler, Ivory and Horn*, 63-64.

the main beam of the antler rack represented the best quality raw material and were used for manufacturing.

The antler pieces found in Muhi are mostly cut or sawed, and all parts of the antler rack are present. Objects 1195 and 2230 are crowns where the main beam was sawn off. The majority of the pieces represent fragments of the main beam. There are three tine fragments. In some cases, it is not clear whether the piece was discarded because it could not be used or whether it came to the refuse accidentally: there are pieces which would seem to be completely usable for further processing. Object 2791 seems unfinished: the tines are cut off, and the end is carved into a round, sphere-like shape. It may have been intended as a kind of knob or handle but was discarded before completion.

Pieces of flat bones, presumably from horse/cattle size scapulae or mandibles, discarded during bone manufacturing (190/1, 2 and 3), were also found at the site. Object 641 is made from the distal fragment of a sheep or goat metacarpus; the diaphysis was cut off and used in manufacturing while the distal end was discarded. Such sawn-off articular ends of cattle and sheep/goat are common workshop refuse from medieval sites in Hungary (for example Buda Castle) as well as elsewhere in Europe, e.g. Southampton, Münster or Dorestad in the Netherlands.[213] Their presence, however, cannot be connected to one particular type of manufactured object, but can rather be regarded as remains from the first phase of processing the raw material.

[213] MacGregor, *Bone, Antler, Ivory and Horn*, 46

5.6 Conclusions

The bone tools found in Muhi are typical products of local, household production. The majority of the finds are skates and sledge runners, which are regarded as toys, even though the sledge runners in particular were used primarily for hunting on ice or hauling hay or manure. Even though some workshop debris was recovered, there is no trace for centralized, large-scale production of bone tools; Muhi seems to be a self-sufficient settlement also from this aspect. The raw material was provided by animals kept in the village and antlers collected in the forest. In most cases, bones of horses were used for bone tool production. These were not damaged by butchering and had no other use. Besides, most of the tools are skates and runners which are best made with horse metapodia. Horse metapodia were chosen as the tradional and best raw material. The discovered pieces are all simple tools that might have been produced without special skills, although since people produced them since childhood a certain degree of know-how was required.[214]

Table 5.1 *Bone tools and workshop debris found in thirteenth century contexts at Muhi. (The reference number, mostly identical with the number of the stratigraphical unit where the piece was found, serves only to identify the pieces.)*

Ref.nr.	Location of discovery (stratigraphical unit)	Tool type	Bone
153/1	153	Debris	Red deer antler
153/2	153	Debris	Red deer antler
161	161	Die	Sheep or goat astragalus
186/1	186	Sledge runner	Horse metatarsus
186/2	186	Unidentified	Long bone of large mammal
186/3	186	Unidentified	Long bone of large mammal
186/4	186	Skate (fragment)	Horse metacarpus
186/5	186	Debris	Roe deer antler
187	187	Sledge runner	Horse metacarpus
190/1	190	Debris	Flat bone of large mammal
190/2	190	Debris	Flat bone of large mammal
190/3	190	Debris	Flat bone of large mammal

[214] Dr Alice Choyke, personal communication.

194	194	Unidentified	Cattle radius
200	200	Unidentified	Cattle metacarpus
279	279	Gaming piece	Proximal phalanx of cattle
335/1	335	Sledge runner	Horse radius
335/2	335	Unidentified	Roe deer mandible
552	552	Sledge runner	Horse radius
562/1	562	Sledge runner	Horse radius
562/2	562	Sledge runner	Horse metatarsus
562/3	562	Gaming piece	Cattle phalanx
588	588	Sledge runner (fragment)	Horse radius
619	619	Unidentified	Cattle metacarpus
641	641	Debris	Sheep or goat metacarpus
754	754	Handle	Long bone of large mammal
1149/1	1149	Debris	Red deer antler
1149/2	1149	Debris	Red deer antler
1195	1195	Debris	Red deer antler
1251	1251	Sledge runner	Horse radius
1258	1258	Sledge runner	Horse metatarsus
1297	1297	Debris	Red deer antler
1452/1	1452	Sledge runner (broken)	Horse metacarpus
1452/2	1452	Sledge runner (unfinished)	Horse metatarsus
1452/3	1452	Sledge runner (broken and unfinished)	Horse metatarsus
1452/4	1452	Debris	Roe deer antler
1452/5	1452	Debris	Red deer antler
1452/6	1452	Gaming piece	Cattle phalanx
2087	2087	Unidentified (used in leather working?)	Cattle tibia
2181	2181	Debris	Roe deer antler
2200	2200	Debris	Red deer antler
2201	2201	Debris	Roe deer antler
2230	2230	Debris	Roe deer antler
2315	2315	Sledge runner	Horse radius
2320	2320	Sledge runner	Horse metacarpus
2337/1	2337	Sledge runner	Horse metatarsus
2337/2	2337	Sledge runner	Horse metatarsus
2337/3	2337	Debris	Red deer antler
2337/4	2337	Debris	Red deer antler
2337/5	2337	Debris	Red deer antler
2709/1	2709	Unidentified	Cattle ulna
2709/2	2709	Debris	Roe deer antler
2745	2745	Sledge runner	Horse metacarpus
2791	2791	Debris	Roe deer antler
2870	2870	Sledge runner	Horse radius
3110	3110	Sledge runner	Horse metatarsus

Chapter Six: MEAT CONSUMPTION AND SOCIAL STATUS. ANALYSIS OF THE EXCAVATED AREAS

In complex societies, individuals from various social economic, gender, or age groups often have different consumption customs related to economic, political and cultural factors. The problem of food consumption not only involves what is actually consumed but also includes the labour and technology that goes into the production and preparation of food, as well as the distribution of nutriments and discarded leftovers. Food systems of complex societies are thus interwoven with social differentiation and may contribute to defining and maintaining social hierarchies.[215]

Animal remains from excavation sites can sometimes be used as indicators of social status; indeed, this is one of the newest and most dynamically developing branches of archaeozoology. Nevertheless, the vast majority of bone materials used to approach these theoretical questions tend to come from urban, elite contexts. As we shall see, the models of status and food consumption patters generated from such faunal assemblages may not always be completely appropriate for measuring social differentiation in faunal materials in a rural village setting. In this chapter, I will separately analyse bone assemblages from the excavation areas at Muhi in order to identify similarities and differences which may reflect the relative social status of the inhabitants in the different parts of the thirteenth century village. A considerable difference was expected between the diet of people living in the settlement core and that of inhabitants living on the settlement's edges.[216]

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[215] G. Gumerman, "Food and complex societies," *Journal of Archaeological Method and Theory* 4/ 2 (1997), 105-139.

[216] For this issue, although based on human bone material, but connected to consumption trends, see Katherine Kondor's study: K. Kondor, *Diet and social stratification in Árpád period Hungary: a paleostomatological analysis* (Budapest : CEU, Budapest College, 2006)

6.1 Introduction: Kitchen refuse as indicator of social status

Some scholars argue that before the fifteenth-sixteenth century the emphasis was more on the quantity rather than on the quality of food, and it was only the increased availability of food for the masses that led to the demand for more sophisticated cooking.[217] However, in strongly hierarchical societies, day-to-day consumption is characterised by differences between households, groups of households and types of settlement.[218] Since these social differences were reflected in everyday practices, the analysis of archaeological kitchen refuse (together with other archaeological features as hearths, grindstones, cooking pots etc.) can provide useful data to study this problem.

The consumption behaviour of nobility can best be investigated on the basis of consumption refuse excavated from their castles. However, luxury and poverty are relative, culturally specific concepts. To assess food as being of low value or a luxury item is, therefore, always a complex issue. The perception of basic needs has changed through time, and affluence and luxury are often difficult to separate in archaeological contexts. Brian Hayden identifies as luxury or feast foods as those that are the rarest, the most difficult to produce and the most labour-intensive to prepare.[219] Anton Ervynck *et al*. recently initiated a more concrete notion of luxury: in their 2003 article they describe luxury as "something more than affluence, a state in which one can enjoy consumption of special food products, accessible only to a very small part of

[217] M. van der Veen, "When is food a luxury?," *World Archaeology* 34/3 (2003), 412. (henceforth: van der Veen, When is food a luxury?)

[218] van der Veen, When is food a luxury?, 415.

[219] B. Hayden, "Feasting in prehistoric and traditional societies," *Food and the Status Quest: An Interdisciplinary Perspective,* ed. P. Wiessner and W. Schiefenhövel (Providence: Berghahn, 1996), 137.

society."[220] The prominence of animal protein as preferred food is highlighted in most cultures.[221] As Jelliffe explained:

> "All cultures have prestige foods, which are mainly reserved for important occasions or, even more, for the illustrious of the community. (...) Examination suggests that, even in vegetarian societies, these are usually protein, frequently of animal origin. They are usually difficult to obtain, so that they are expensive and relatively rare. In the western world they may have been hunted wild, as opposed to domesticated, or imported from distant regions."[222]

Kitchen refuse found on excavated settlements, especially the quantity and quality of meat that bones carry, has been used by archaeozoologist to evaluate the social status of inhabitants since the 1980s. In medieval Europe wealthy classes often distinguished themselves from the less affluent by the sheer quantity and quality of the food they ate.[223] Such an estimation is usually easier to make in case of rural settlements and castles than in urban contexts, since urban samples probably contain debris from dozens of individual houses and shops, thus blurring the differences between the wealth and status of individual households.[224] In those fortunate cases when the examination of individual houses and their associated refuse pits is possible, it may result in a more precise picture.

It was Miklós Kretzoi who first created a system of meat values, originally for the neolithic;[225] most scholars, however, follow the somewhat simpler categorization of by Hans-Peter Uerpmann, who divided animal bones into three categories:[226]

A: muscular parts of the body represent high value meat (the vertebral column (excluding the tail), upper leg bones, and bones of the shoulder and pelvic girdle belong here).

[220] A. Ervynck et al., "Beyond affluence: the zooarchaeology of luxury," *World Archaeology* 34/3 (2003), 429. (henceforth: Ervynck et al,, Beyond affluence)
[221] van der Veen, When is food a luxury?, 411.
[222] Quoted by M. van der Veen, "When is food a luxury?," *World Archaeology* 34/3 (2003), 411.
[223] van der Veen, When is food a luxury?, 412.
[224] O'Connor, *The Archaeology of Animal Bones*, 167.
[225] Bartosiewicz, *Régenvolt háziállatok*, 153
[226] Uerpmann, Animal bone finds and economic archaeology, 316-317.

B: medium value meat is carried by the lower leg bones and skull (with brain and jaw musculature) and mandible (jaw musculature and tongue), ribs and sternum.

C: lowest value meat is represented by face bones, tail and feet, including ankle joints.

Accumulation of bones that indicate high quality meat or bones of minimal value which were probably discarded during butchering can provide a basis for the interpretation of the inhabitants' diet. This, of course, is much easier if we can connect these areas with an accumulation of certain types of bones to other, well-defined archaeological features, preferably buildings.

Much debate is focussed on this theory. Uerpmann's categorisation, despite being a convenient tool, may be criticised for not taking the varied gastronomic customs of ethnic groups into account.[227] The categorisation of body parts on the basis of nutritional value is an objective evaluation, however, consumption is usually influenced by customs, biases and traditions, and a great difference is possible between the objective value and the real value of meat in a cultural context.[228] Furthermore, plant food consumption is rarely figured into the equation so that the relative amounts of energy coming from meat protein, usually indicative of wealth and status in complex societies becomes that much more difficult to assess. Therefore, Uerpmann's concept must be handled with care, but is a good starting point for further study.

Without disregarding the influence of traditions, some recurring observations seem to be valid for most societies. In bone assemblages, rare species are often

[227] E.g. in Hungary we have a national dish that mainly consists of the lower extremities of pig – body parts which are usually regarded as valueless. As an interesting archaeological case, I can mention the large number of facial skull fragments of horse found in the kitchen refuse in the Early Bronze Age settlement of Albertfalva (excavated by Anna Endrődi, archaeologist of the Aquincum Museum; animal remains were analysed by the author; the results are not yet published).

[228] Bartosiewicz, *Régenvolt háziállatok*, 156-157.

regarded as luxury foods, simply because they are expensive. Exotic food is perhaps the most easily identifiable category of luxury food. However, it is important to bear in mind that the notion of rarity always depends on the particular geographical area. Even if a certain animal product is abundant on the spot of its production, it can have a high value where it is consumed.[229]

Products derived from animals killed before their optimal slaughter age can also be regarded as luxury food, especially in the case of animals with a secondary exploitation (milk, wool, working power), since a non-optimal time of slaughter makes the product more expensive. Animals that are slaughtered when young have not reached their optimal weight as regards the amount of food they consume.[230] Piglet bones, however, are frequently found since this animal produces many offspring a year and thus the economic loss is smaller than for animals that only produce their young every one or two years.

Wild animals, especially wild boar, roe deer, red deer, fallow deer and hare are relatively numerous on elite sites from the Middle Ages, also as a consequence of the hunting privileges of the nobility. These species were usually kept on estates as animals to be hunted for the amusement of the nobles (it was a male sport so we can guess that hunting these species also was a way of demonstrating male prowess and strengthening social relations between adult men of a certain class).[231] The meat of large game, hunting being a status-dependent, gendered social activity, was associated

[229] E.g., the appearance of turkey (*Melleagris gallopavo*) on Late medieval European sites is a good example for such rarities. Ervynck et al,, Beyond affluence, 431.

[230] Andrew Reid mentioned analogies from South African complex societies for the slaughter of large quantities of young animals, as a sign that the élite had a special need for representation. The slaughter of young bulls, however, is constrained, not only by socio-political preferences but also by physical practicalities. To maximize growth in the herd, cows must be allowed to live until the end of their reproductive life, but to ensure that they bore offspring every season, only a few bulls are needed. (A. Reid, „Cattle herds and the redistribution of cattle resources," *World Archaeology* 28/1 (1996), 43-57.)

[231] In medieval England, hares were kept on estates under quite controlled conditions, and were hunted as an alternative to deer. This form of management can be observed throughout Northern Europe, and result in the low number of rabbit bones in medieval samples, for example in York. (O'Connor, *The Archaeology of Animal Bones*, 168-169.)

with a number of ideological factors. Naomi Sykes has described a situation where people involved with the royal forest territories had access to certain body parts of the game while the nobility received other parts. After the hunt, the meat was distributed on the basis of rank: while the lords consumed the prized portions, such as the liver and testicles (portions that would not show up in the archaeozoological record), park keepers received the shoulders while persons of lower standing were offered the remaining parts. This selectivity is reflected in the bone assemblages as well.[232] Even though no written evidence has been recovered yet, the situation was probably also more complex than the historical *topos* concerning hunting practices in Hungary suggests.

Religious perceptions can influence both species and body part preference; e.g. a Jewish population is relatively easily recognised by an absence of pig remains. By analysing animal remains from the seventeenth-eighteenth-century Waterlooplein site in Amsterdam, Ijzereef observed that deposits without pig bones (most probably refuse pits of the resident Portuguese Jews) were also characterised by the absence of hind legs of cattle and sheep, since this joint is not kosher unless the sciatic nerve is removed. Calves were also absent in these deposits but contained a high abundance of chicken and, surprisingly, the non-kosher eel.[233] Simon Davis argues that not only body parts, but the side from which a piece of meat is derived was a significant factor of preference.[234] Indeed, a distinction is made between the parts of the body and its sides in the biblical command (*Exodus 29*). An ethnic distinction was visible in the bone material from a well in fourteenth-century Buda as well, where the period of Jewish inhabitation was clearly demonstrated by the absence of pig bones or fish with

[232] N.J. Sykes, "The impact of the Normans on hunting practices in England', *Food in medieval England: History and Archaeology*, ed. C. Woolgar, D. Serjeantson and T. Waldron (Oxford: Oxford University Press, 2005), 175-176.
[233] O'Connor, *The Archaeology of Animal Bones*, 168.
[234] S.J.M. Davis, "Thou shalt take of the ram... the right thigh for it is a ram of consecration. Some zoo-archaeological examples of body-part preferences," unpublished.

visible scales.[235] Such phenomena, however, might have occurred in Christian contexts as well, since in time of fasting only certain types of food were allowed.

Animal remains may play a crucial role in identifying ethnicity and social status of a population, settlement or household. This recently emerged branch of archaeozoology is, however, too complex to have established many general rules. Abundance of high quality meat and exotic taxa is usually considered a sign of high social rank, but it is important to bear in mind that social structure, animal exploitation and distribution of animal protein in a society as well as religious beliefs connected to animals vary from culture to culture, sometimes from region to region. Therefore, presenting a precise picture of social status on the basis of animal remains is only possible if the cultural and archaeological context can be identified.

6.2 Meat consumption at Muhi village

Butchering

Butchering marks serve as an indicator of the way the carcass of an animal was partitioned during primary and secondary butchering as well as meat distribution. Patterned butchering marks and the presence of standardised and selected meat parts have been interpreted as an evidence for wholesale meat supply.[236] Where the meat supply was centralised, butchers slaughtered the animals and carried out the primary butchering, which produces primary butchering waste (i.e. parts of the body which represent no meat or very low quality meat, such as horn cores and lower extremities; a part of these found its way to the workshops where it was processed). The meat was then sold and transported to households where the domestic food processing took

[235] L. Daróczi-Szabó, "Animal bones as indicators of kosher food refuse from 14th c. AD Buda, Hungary," *Behaviour behind bones*, ed. O'Day, S. J. et al. (Oxford: Oxbow Books, 2003), 252-261.
[236] Bartosiewicz, *Animals in the Urban Landscape*, 35.

place resulting in kitchen waste. István Vörös argues that medieval cattle carcasses were not deboned after slaughtering, but sold with the bones left within the meat, and thus the secondary butchering and defleshing took place at households even in larger urban centres.[237] In my view, this is a far too general statement; I would rather say that secondary butchering took place in the shop or household (depending on the structure of meat supply), where the sections of carcass were cut into segments to fit the cooking vessels and conform to traditional meat recipes. In cases where slaughter and the whole butchering process took place in households, all skeletal elements will be found in the refuse associated with one household.

I investigated the cut marks on cattle remains since bones of this species were recovered in the highest number in Muhi. Hacking marks appear on a number of spots, mostly at the joints, but also on diaphyseal fragments. István Vörös pointed out that the basic processes of primary butchering are defined by anatomical structures.[238] Therefore, butchering marks often appear at joints where the carcass was easier to cut into two pieces. This method was followed by professional butchers as well with specialized tools. It is, however, important to bear in mind that the method of butchering is also a cultural choice depending on the desired outcome, even if anatomical structures define the most practical, 'efficient' way of partitioning the carcass seen through modern eyes. As Gifford-González has written:

> "How an animal is disjointed and filleted depends on whether a butcher aims to produce joints of meat to roast on a fire, segments of bones and flesh to boil in a pot, boneless cuts to be sliced and dried as jerky, or manageable and quickly frozen segments for winter storage."[239]

[237] I. Vörös, "Egy 15. századi budavári ház állatcsontleletei. A budavári piacok húsellátása a csontleletek alapján. – Tierknochen aus einem Haus (15. Jh.) im Burgviertel von Buda. Fleischversorgung der mittelalterlichen Märkte in Burgviertel von Buda," *Communicationes Archaeologicae Hungariae* (1992), 227-239: 232. (hereafter: Vörös, Egy 15. századi budavári ház állatcsontleletei)

[238] Vörös, Egy 15. századi budavári ház állatcsontleletei, 232.

[239] D. Gifford-González, "Gaps in zooarchaeological analyses of butchery: is gender an issue?," *From Bones to Behaviour: Ethnoarchaeological and Experimental Contributions to the Interpretation of*

To this list body parts to be smoked or soaked in brine for long-term preservation might be added.

The first step in the "standardised" butchering practiced in medieval Hungary was to cut the spine into two along the longitudinal axis, the ribs were cut off; the foreleg was cut into two pieces at the elbow joint, the hind leg at the ankle joint. Thus, larger carcass parts were transported to the market.[240] In Muhi, however, butchering patterns do not seem to be standardised. Cut marks appear practically anywhere on the skeleton (see *Fig. 7.1* and *Table 7.1*) without a strong preference for any particular body areas. Even though the number of cut marks on the distal end of cattle humeri are a bit higher than at other spots, this can also be explained by the fact that the solid compact tissues of this bone part have a better chance to survive. The number of cut marks on the whole skeleton, nevertheless, is unusually low: they were found only on 234 pieces, which represent only 8.2% of all cattle remains. A possible explanation is that bones were often not hacked but broken up, also in order to extract the bone marrow. A relatively high number of cuts on the lower extremities would indicate that feet were removed together with the hide, however, there are no traces of anything similar here. Vertebrae split into two "standard halves" may be an indicator that professional butchering tools like cleavers were used; in Muhi's case, animals carcasses were not split longitudinally. Only the vertebral processes were sometimes cut or chopped off.[241]

A skull fragment of a sheep was recovered from stratigraphical unit 335. The facial part of the skull was hacked off in order to extract the brain; this is the only find

Faunal Remains, ed. J. Hudson (Carbondale: Southern Illinois University, 1993), 185; quoted by S.M. Subías, "Cooking in zooarchaeology: Is this issue still raw?," *Consuming Passions and Patterns of Consumption*, ed. P. Miracle and N. Milner (Cambridge: MacDonald Institute for Archaeological Research, 2002), 10.

[240] Vörös., Egy 15. századi budavári ház állatcsontleletei, 232.

[241] Bartosiewicz, *Animals in the Urban Landscape*, 37.

where this kind of partitioning is visible. Interestingly, there are no cut marks on the horn cores showing that the horns were processed to produce tools or ornaments.

It was possible to identify hack marks probably made by an axe or cleaver and the small fine cut marks left by knives, presumably made during cooking or when the meat was eaten. At Muhi, the latter were typically found on ribs, while hacking marks were common on cattle pelvis, mandible, humerus and astragalus as well as at spots where the main parts of the body were dismembered.

There is no trace of standardised butchering or centralised meat distribution in this village. It is much more likely that animals were slaughtered in households, and families killed their own animals instead of buying meat at the market. This result corresponds to the general assumption that standardised butchering, and the appearance of professional butchers is one of the indicators of a settlement's urbanisation. In thirteenth-century Muhi, as it is expected, there is no trace for such a practice. This, however, can best be demonstrated by looking at the bone refuse from the three excavated areas (see the second part of the chapter).

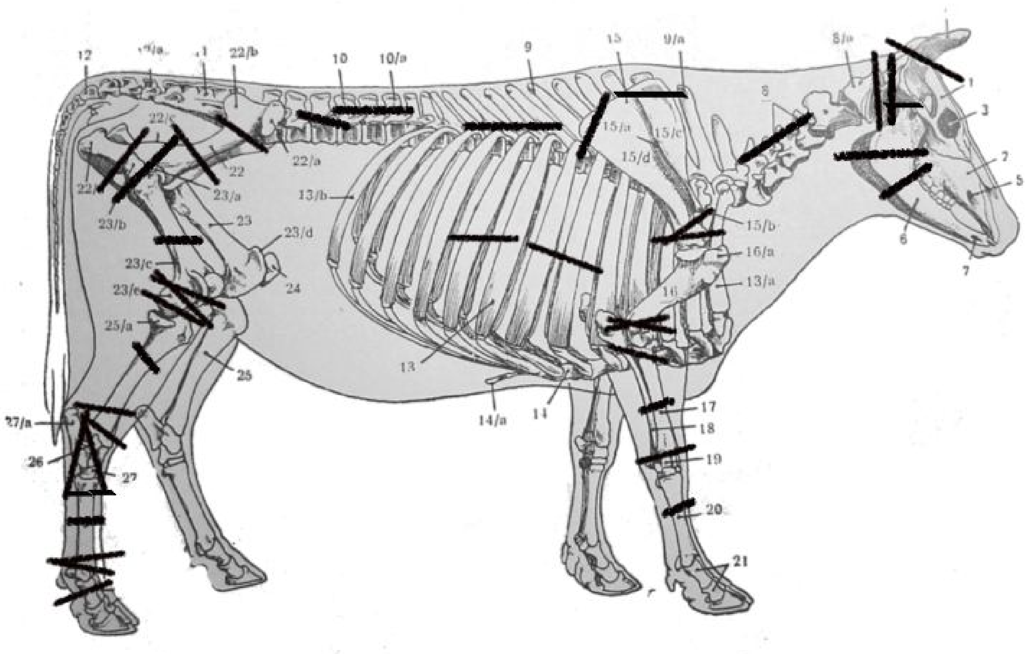


Fig. 6.1 *The places where butchering marks were found on cattle remains from Muhi. (The image of the skeleton was taken from Gy. Kovács, Háziállatok anatómiájának atlasza (The Atlas of the Anatomy of Domestic Animals), Budapest: Mezőgazdasági Kiadó, 1967, 18)*

There is an interesting contradiction here between butchering patterns and species diversity. Melinda Zeder has made the argument that centralised distribution of meat usually leads to the low number of species being present at a site since the butchers' interest in efficiency will favour species which provide the most meat. Besides, if meat supply is centralised, the availability of supplementary meat will be limited, or, at least, their acquisition discouraged.[242] It seems, however, that even though meat supply was not centralised in this thirteenth-century settlement, other factors influenced the diversity of the species. These factors seem to be rooted in cooking traditions and hunting prohibitions. The amount of data available for Arpadian Period villages are, however, too few to permit general statements to be made on this topic; in addition, cooking traditions may vary from one region to the other.

	varia		**proximal end**		**diaphysis**		**distal end**	
	cut	**hacked**	**cut**	**hacked**	**cut**	**hacked**	**cut**	**hacked**
horn core	1	1						
facial skull fragment	2							
basal skull fragment	1	1						
corpus mandibulae	4	11						
ramus mandibulae	8	6						
vertebrae cervicales		1						
vertebrae lumbales		3						
vertebrae thoracales	2	4						
facies articularis scapulae	1	5						
margo dorsalis scapulae	3	4						
corpus scapulae		4						
humerus			1	4	1	3		17
radius and ulna			1	8	2	4	1	3

[242] M. Zeder, *Feeding Cities: Specialized Animal Economy in the Ancient Near East*, Washington: Smithonian Institution Press, 1991: 38-39.

metacarpus			2	1		1	2	3
acetabulum	2	7						
ilium	2	10						
ischium		2						
femur				1	1	5		2
tibia						4	2	7
astragalus		12						
calcaneus	1	8						
tarsal bone		3						
metatarsus			1	3	1	6	4	2
phalanx proximalis	1	3						
rib	26	2						

Table 6.1 *The distribution of knife cuts and hack marks on cattle bones.*

It is, unfortunately, problematic to calculate the amount of available meat on the basis of bone fragments. Using MNI (minimum number of individuals, see Chapter 2) is an option, but this method is strongly biased by the size of the sample and its degree of fragmentation. The Muhi assemblage is highly fragmented. Another possibility is to weigh all the bones and assume that bone weight amounts to between 7 and 7.7% of the weight of the living animal; the latter method is not influenced by fragmentation.[243] However, the calculation of meat weight from bone weight assumes a linear relationship between these two, which is not necessarily the case.[244] Lyman proposed the use of butchering units in communities with secondary distribution of meat, where the consumption of entire carcasses is not likely and only meat portions purchased at the market were consumed.[245] In the case of Muhi, however, where the practice of household slaughter is presumed and thus all skeletal parts are present, this method is not of much use. Therefore, I have not calculated the amount of meat

[243] Uerpmann, Animal bone finds and economic archaeology:, 310-311
[244] R.L. Lyman, "Available Meat from Faunal Remains: A Consideration of Techniques," *American Antiquity* 44/3 (1979): 538. (hereafter: Lyman, Available Meat from Faunal Remains)
[245] Lyman, Available Meat from Faunal Remains, 540-544.

consumed, but only investigated whether there is any kind of concentration of body parts representing high quality meat parts on the carcass.

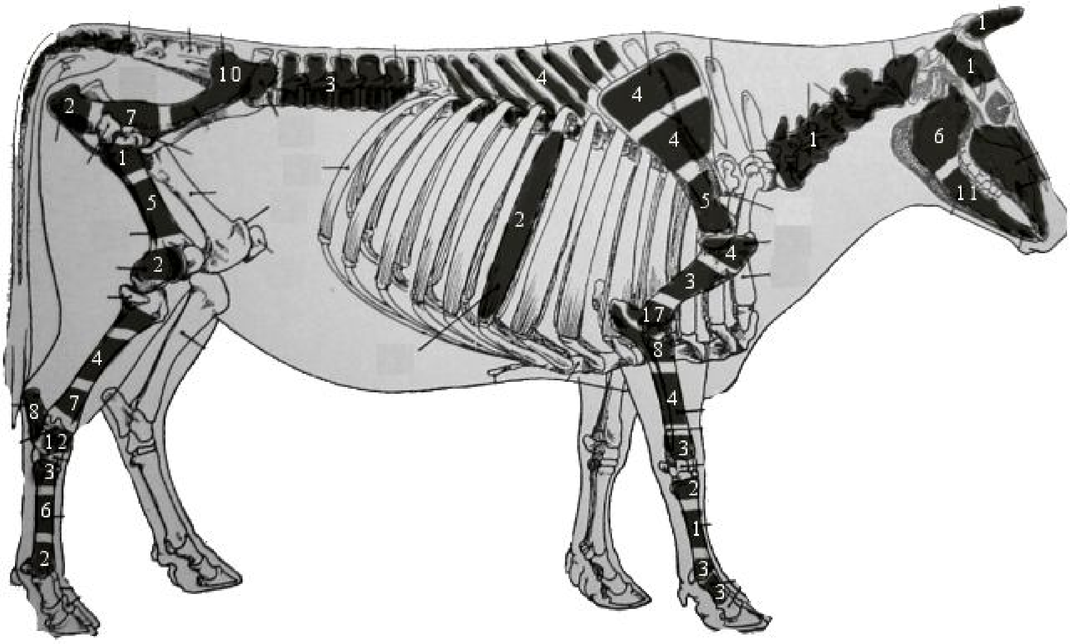


Fig. 6.2. *The number of hacking marks from Muhi on different parts of a cattle skeleton. (The image of the skeleton was taken from Gy. Kovács, Háziállatok anatómiájának atlasza (The Atlas of the Anatomy of Domestic Animals), Budapest: Mezőgazdasági Kiadó, 1967, 18)*

Fig. 6.3 Hacking marks on a cattle metatarsal bone.

The settlement core and the outskirts of the settlement

Differences between the refuse of households in the settlement core and houses in the outskirts area have the potential to shed light on the degree of social differentiation within the village; the hypothesis here is that wealthier inhabitants lived in the settlement core while poorer houses were situated towards the edges of the village.

The ratio of species, in fact, is different in the refuse bone samples coming from the main street and from the outskirts of the settlement (*Fig.6.4*). It seems that the inhabitants of Muhi mainly consumed beef in both areas, even though the proportion of cattle is higher in the settlement core, while the bones of small ruminants and pigs are more prominently represented on the outskirts of Muhi.

On the main street, the proportion of cattle comes to 51.6%, horse to 10.6%, caprinae to 16.9% and pigs to 16.3%; On the outskirts of Muhi, the species ratios are 40.8% for cattle, 26.7% for caprinae and 22.4% for pigs respectively. It is striking that the numbers of horse remains is almost twice as high in the bone refuse coming from the main street area. The differences between the number of bone fragments of the four main domestic species (cattle, horse, caprinae and pig) are statistically significant in both areas ($\chi^2_{\text{main street}} = 632.05$; $\chi^2_{\text{outskirts}} = 609.29$; both values are higher than the critical value of $\chi^2_{\text{critical}} = 11.345$[246], which means that the differences are statistically significant). Therefore, the difference requires explanation. It may be argued that cattle must be somewhat overrepresented due to fragmentation, but in my view, cattle bones would be even more subject to fragmentation in the densely inhabited centre,

246 Where the degrees of freedom: f=3.

and since the fragment size is actually larger here than on the outskirts, the fragmentation is more or less the same in the two areas. Therefore it does not influence the picture to a large extent.

It might be assumed that wealthier inhabitants of the settlement core could afford to consume larger amounts of beef as well as keeping horses, while somewhat less advantaged people living on the outskirts consumed more pork and caprinae – animals whose keeping is economically more favourable. This kind of social distinction is, however, at first sight not supported by the somewhat puzzling mortality profiles (*Fig. 6.5*). Even though it is expected from the ratio of species that wealthier inhabitants of the settlement core could afford consumption of larger amounts of meat derived from young individuals, the mortality profiles seem to be almost the same; in fact, more calves and piglets were found in the outskirts area than in the settlement core, while the proportion of juveniles to adults is very similar in case of swine and caprinae. This, however, may also be explained by functional differences between the two parts of the village. If people living on the outskirts were more involved in herding (as it is suggested by the species ratios and the presence of the circular ditch nr. 16 in the agricultural area, identified as a sheepfold), this should result in a higher cull of young individuals related to natural mortality. Thus, the relatively high number of juveniles does not necessarily reflect the better financial position of people living away from the village core but only their more direct participation in tending swine and sheep-goat herds. It would have been easier to keep sheep and goats on the outskirts since these animals were usually kept in larger groups and thus would require larger open areas for stalling, while one or two cows or horses could easily be kept in small stables behind houses. Since pigs were fed on plants, worms and acorn provided by the environment, swine kept in large numbers also required open space. This functional difference between animal keeping in the settlement core and on the outskirts would explain the difference in the ratio of species: while inhabitants of the main street could afford keeping cattle and horse in stables in their backyards, the less advantaged people on the outskirts of Muhi village mainly kept sheep and swine, and did not have the same access to beef products.

All skeletal elements are found in equal proportions in both areas, supporting the notion that animals were slaughtered in the households also in the settlement core. Thus, all body parts entered the food chain and ended up in the kitchen refuse. The average size of fragments is 6.1 cm in the outskirts area and 6.8 cm in this area, so the 6-7 cm "pot-compatible" size is a standard. It also shows that taphomomic factors such as trampling did not effect fragment size or distort species ratios. The places where the carcasses were partitioned seem, more or less, to be the same, without any trace of a standardised butchering method. There are, however, differences in the number of butchered bones: hacked bones are much more common in the settlement core (95 pieces) than in the outskirts area (32 fragments). In the outskirts area, the number of knife cuts is almost twice as high as the number of hacking marks. This may indicate the presence of proper (and expensive) tools in the households of the main street, while in the outskirts only the primary carcass partitioning (which is impossible to do with a simple knife) was carried out with a proper axe. In both cases, however, the majority of bones are simply broken up by percussion (producing spiral fractures) in order to extract the marrow.

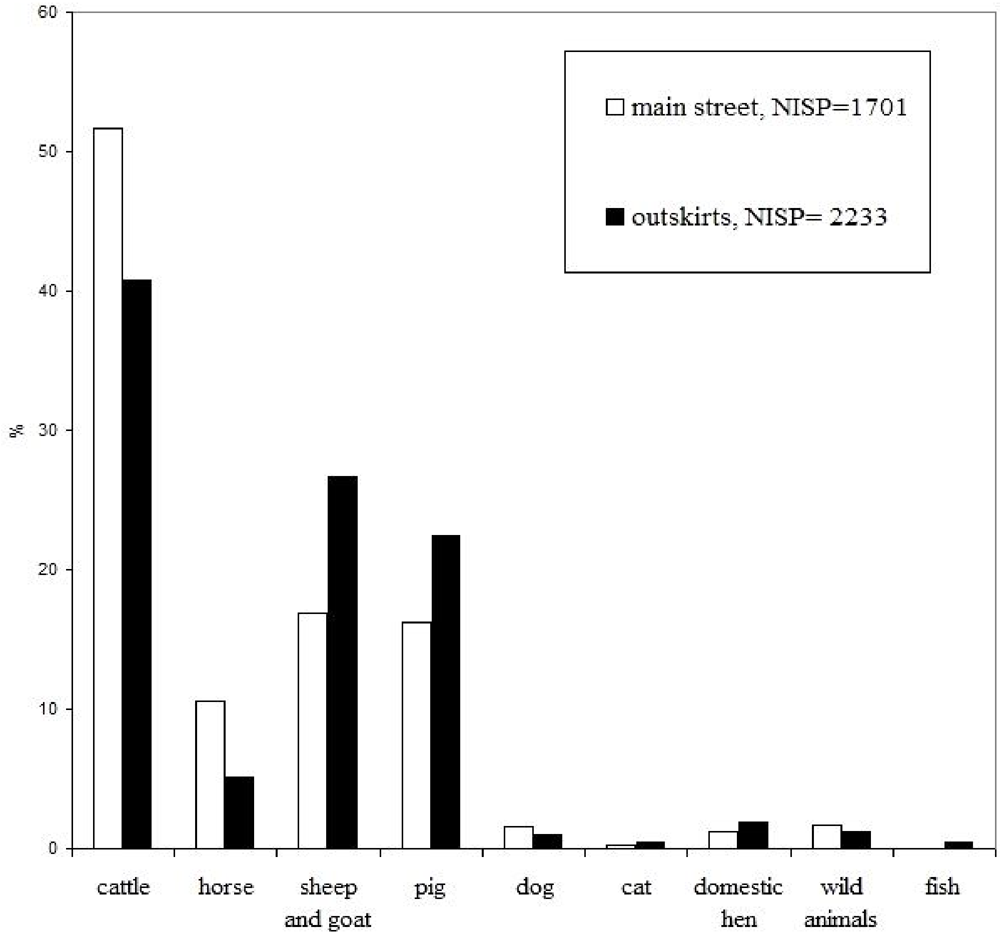


Fig. 6.4 *The ratio of species in the main street and the outskirts of Muhi village*

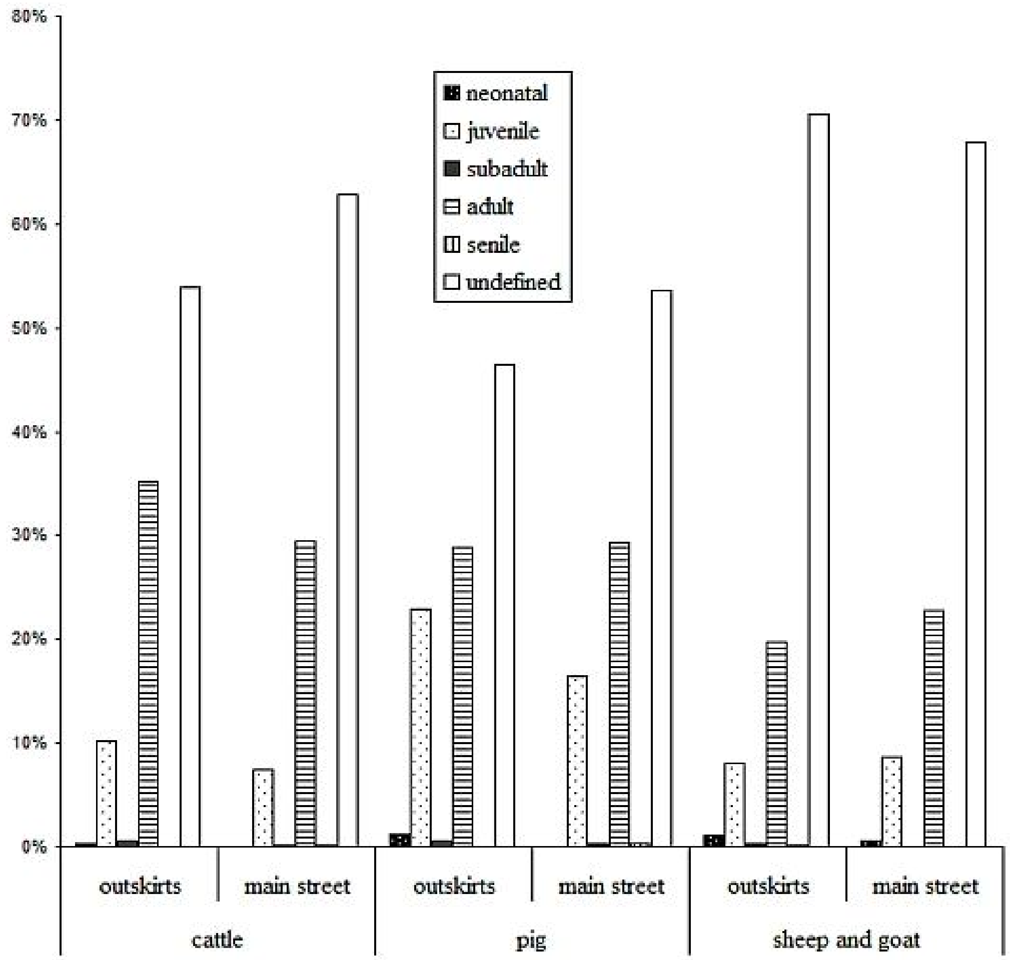


Fig. 6.5 *Mortality profile of the main domestic species*

The number of cattle metapodia fragments is quite high in both areas. This may be explained by the fact that metapodia have a better chance to survive in the soil and they are easy to identify. Otherwise, there is no sign of any preference for certain body parts. Meat quality evaluation results in a homogenous picture (*Fig. 6.6*): medium quality meat provides the bulk of the meat protein in both areas. The ratio of low quality meat is, indeed, a bit higher in the outskirts area, as a consequence of the high number of metapodial fragments. (This may be traced back to skin processing being more common in peripheral areas of the village due to larger free space.) There is, however, no difference between the two parts of the village in terms of body parts representing high quality meat.

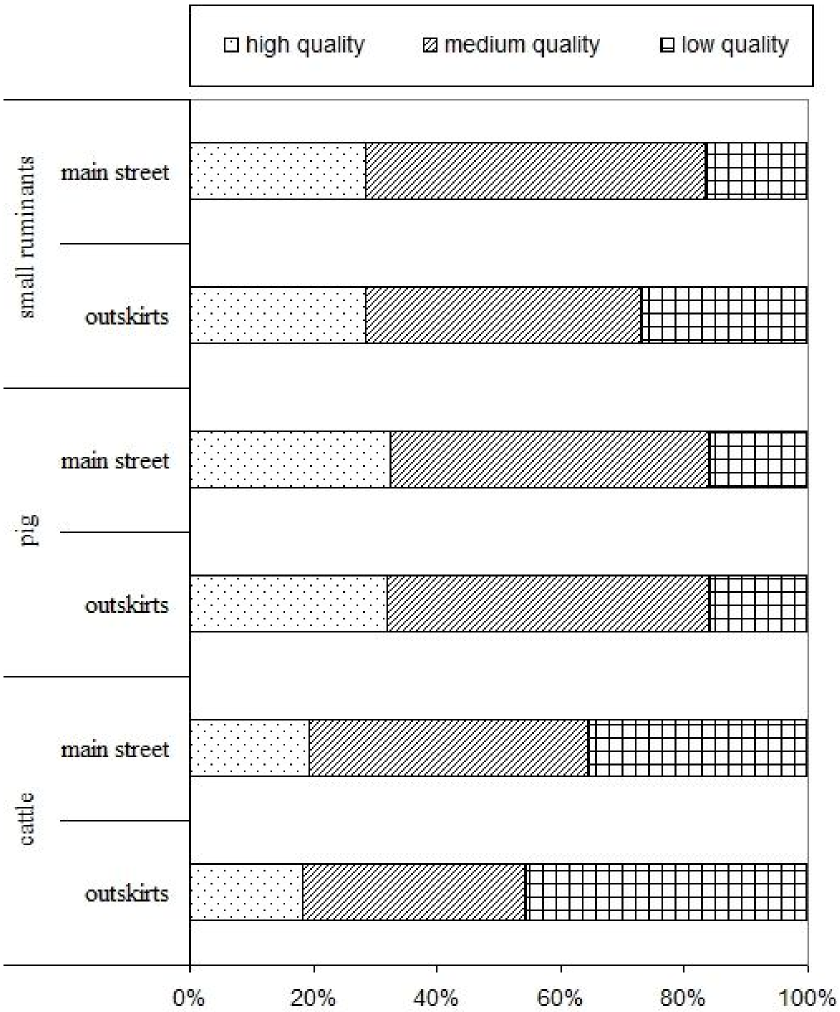


Fig. 6.6 *Meat quality*

Cattle bones with pathologies related to hard traction work were found in both areas; it can be assumed that it was mostly old working animals that were slaughtered in all households.

The number of wild animals is higher on the main street, although antlers as well as other body parts are present in both areas. The majority of antler finds, however, derive from the settlement core.

The similarity of the areas is also reflected in the distribution of bone tools. Nine sledge runners were recovered in the main street and six in the outer areas; there was no difference in their manufacturing, indicating they were produced using the same kinds of tools and the same manufacturing techniques.

The wells and the agricultural area

Wells in the main street were common property, used by everyone, so the material found in them cannot be directly connected to households, even though inhabitants of the nearby houses probably used the wells more often. Wells nr. 2006 and 2007 provided a large number of animal bones (169 and 203 fragments respectively); only a few fragments were recovered from the remainder of the wells.. These wells served as refuse pits after they dried out and functioned as natural traps as well.

All bone finds from the wells derive from cattle, horse, pig and caprinae; only one tusk of wild boar was recovered from well nr. 1298. Four horn cores of goat were thrown into well nr. 2007. Otherwise, the wells contain scattered kitchen refuse - characteristic of the whole site -, reflecting the dominance of cattle. There are hacking marks on some of the finds. The average size of these fragments is somewhat larger than those recovered from other areas of the site (7.6 cm respectively), and whole long bones were also discovered in the wells. This may indicate that it was mainly discarded pieces from primary butchering that were thrown into the dried-up wells, while the bone fragments from secondary butchering were cooked with the meat and thus were more likely to end up in refuse pits in the backyards.

Finds from the agricultural area are not really suitable for statistical evaluation. Only 35 bone specimens were collected here; this signifies that the gardens were being continuously cleaned. All fragments derive from domestic species, the majority from cattle.

6.3 Conclusions

It has been hypothesised in the secondary literature that Muhi had already emerged as a centre for regional trade at the end of the thirteenth and beginning of the fourteenth century (see Chapter 1). Therefore, it was expected that a relatively clear social differentiation should be observable in the kitchen refuse of the settlement core compared to the outskirts of the village. In particular, it was hypothesised that bone fragments of body parts representing better quality protein would be more likely found in the centre of the settlement. Such a clear differentiation in the quality of meat would therefore reflect the presence of a kind of *élite* in the village, a group of people who, as a consequence of their trading activities, provided the financial and economic basis for the further development of the settlement. The faunal material, however, displays a more complex picture.

Even though the results are somewhat ambiguous, it is important to remember that the *topoi* we have on social status and meat consumption in medieval Hungary, i.e. our models of identifying status from kitchen refuse, are mainly based on assemblages of élite sites and urban contexts. I am not convinced that these are completely valid for medieval rural society as well.[247] The social differentiation,

[247] The amount of meat consumed by peasants in the Middle Ages is not really known. Even in England, where the number of surviving written documents is much higher than in Hungary, certain contradictions are evident. Their concept of meat quantities, "much" and "little" meat, must have been quite different from ours. Attempts were made to prevent the sale of bad meat and fish, but despite the effort, extreme cases happened here and there. P.W.Hammond quotes an interesting story from medieval London: a man found a dead pig in the city of London, and sold its meat, both cooked and raw. He was punished, but it is strange that if the meat was as bad as was said, how anyone could have bought it. (P.W.Hammond, *Food and Feast in medieval England* (Phoenix Mill: Alan Sutton Publishing, 1995), 87-88. (henceforth: Hammond, *Food and Feast*) Poverty among peasants also has various interpretations. For the poor people described by William Langland, even bread seemed to be a

reflected in the kitchen garbage, is therefore not revealed in a spectacular but rather in a subtle way in this case.

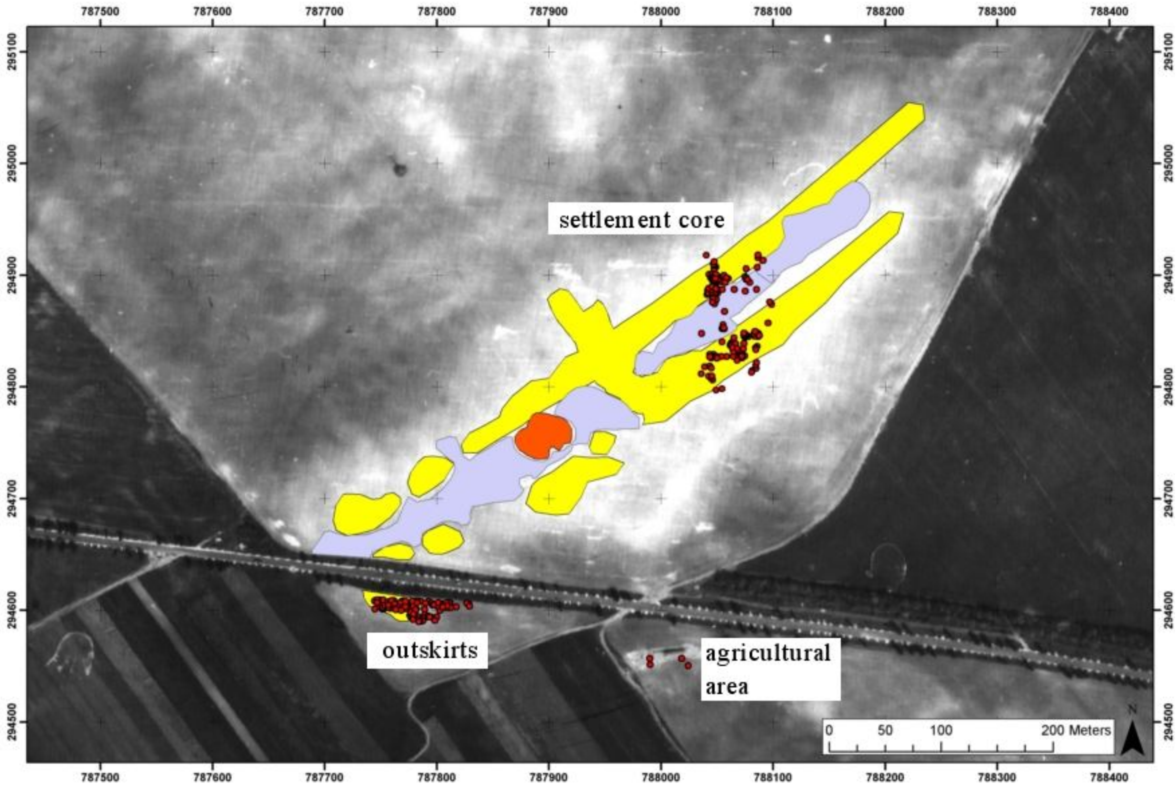


Fig. 6.7 *The three excavation areas in the air photograph.*

It is important to remember that the amount of meat represented by single cattle is much more than the meat of a single sheep or pig. This means that according to the species ratios, the core area had access to increased quantities of meat protein even if quality was not a factor. This signifies a not well expressed but still noticeable differentiation. In this early stage of development, the emphasis was rather on the quantity and not on the quality of meat protein, something which is supported by the

luxury in winter, and cold meat and fish was almost unkown to them. In Chaucer's Nun Priest's Tale, however, the diet of the poor widow and her daughters included milk, bacon and occasionally an egg, and they owned three pigs, three cows and a sheep, and, presumably, hens as well. (Hammond, *Food and Feast*, 29-30.) The concept of meat quality is further complicated by the fact that – depending on the cooking traditions – practically every piece of meat was edible: a stew could be made from the feet, head or liver; the marrow was picked out of the bones, which were then simmered in water to make a rich broth that was used as a base for other dishes. (B.A. Henisch, *Fast and Feast: Food in medieval Society* (University park, Pennsylvania: The Pennsylvania State University Press, 1976), 128.) The situation is even more complicated in medieval Hungary, since there are scarcely any reliable records on the quantities of meat available to peasants peasants or their concepts of poverty and meat quality.

general hypothesis expressed in the secondary literature about medieval evaluation of food.[248] There is, however, a paucity of good data from contemporary Hungarian villages and the problems inherent in applying models derived from urban and élite contexts to a small rural village have still not been resolved. A more precise picture might be achieved by analysing individual households, but this was, unfortunately, not feasible in Muhi's case.

It is also important to remember that archaeological assemblages do not reliably reflect all aspects of trading activities. Financial and social differentiation, which is the consequence of capital influx, will, at least in my view, be reflected in consumption patterns, food being a primary indicator of wealth. In thirteenth-century Muhi wealth was probably associated with the varying amounts of meat available to individual households. Nevertheless, the basis for social differentiation is not known, and it is important to remember that certain aspects of nutrition are not reflected in the archaeological record; if e.g. wealth would have been expressed in eating sheep entrails daily, it would never be detected using archaeological methods. Statistically, higher numbers of cattle and high prestige animals such as horse does seem to be a reflection of some sort of social differentiation in the village, but we do not know the source of that differentiation from the animals bones themselves. It is worthwhile to mention, however, that – in addition to the building structures, ceramics and kitchen waste – some smaller but interesting details also support the theory that people living in the settlement core were in a better financial situation. The horse which was injured and healed, presumably by a long and expensive time of treatment, was found in this area, as well as the decorated belt ornaments made of antler.

Households slaughters and the maximum exploitation of the animals' potentials are, however, characteristic of the whole settlement. The picture is probably

[248] van der Veen, When is food a luxury?, 412

influenced by the period of revival after the Mongol invasion, when the settlement must have been in a difficult economic situation due to the devastation wrought by the Mongols. It seems that the rapid economic growth of the village (and more pronounced financial differentiation) only began later, presumably as a result of better organised weekly markets, held from 1343 on. Since written evidence is lacking, it is hard to draw conclusions on the financial sources of the village's development, but it cannot be ruled out that the development of the village did not derive from purely internal factors in this first period. As a royal possession, Muhi was a good candidate for support from outside powers. The growth of the settlement indeed turned out to be remunerative for the royal family since later the Muhi fairs and toll would come to yield huge amounts of income.[249]

These results correspond to the historical fact that the differentiation between rich peasants, inhabitants of the oppidi, and poor peasants, characteristics of the fourteenth-fifteenth century, was not yet prevalent in the thirteenth century. There were, of course, social differences, but these were not necessarily observed within one settlement. People of different legal status usually lived in different types of settlements, or, if they shared one, their inhabitation areas were clearly separated.[250] Such differentiation was not yet striking in thirteenth-century Muhi.

Chapter Seven: ANIMALS IN MUHI COMPARED TO OTHER COEVAL SETTLEMENTS

[249] Gyulai, Termelés és kereskedelem, 323. In 1563, the annual income of the Muhi toll was ca. 500 forints, which meant a considerable sum.

[250] J. Laszlovszky, "Social Stratification and Material Culture in Tenth-Fourteenth Century Hungary," *Alltag und materielle Kultur im mittelalterlichen Ungarn,* hrsg. A. Kubinyi and J. Laszlovszky (*Medieum Aevum Quotidianum* 22. Krems, 1991), 32-68.

It is a scientific commonplace, but in case of faunal analyses it must be emphasised, that there is a strong need for more research. The data from Muhi stands virtually alone in terms of detailed faunal reports on villages from this period. Even though the material of some other Arpadian Age villages have been published,[251] these investigations are mostly old fashioned with poor documentation and poor grasp of sampling (and taphonomic issues). In addition, most reports were only based on insufficient numbers of bone fragments, undermining the reliability of these samples. Lately, however, some large-scale excavation works have been carried out where the faunal assemblages have been identified and analyzed. In this chapter, I will compare the Muhi thirteenth century faunal assemblage to the faunal material from Kána, another Hungarian Arpadian Age. The idea is to establish the main differences between them, and to demonstrate what features either made Muhi special or typical as far as meat consumption and animal keeping practices are concerned. The bone material from Kána is still unpublished; it has been analysed by Márta Daróczi-Szabó, a PhD student in archaeology at Eötvös Loránd University in Budapest. She has kindly agreed to share some results of work with me. Her analysis, however, is still in progress; a topographical analysis of the Kána finds has not yet been completed at this phase in the research. (The data and interpretation I use here are based on personal communication between the two of us.) Kána is an outstanding site in terms of size and the number of finds; this is the main reason why I chose this settlement for comparison.

The Arpadian Age village of Kána was situated in a hilly area within the territory of Budapest, ca. 180 km from Muhi. During the large-scale excavations, ca.

[251] I used the data of the following excavated villages in addition to Muhi and Kána: Szarvas-Rózsás, Kardoskút-Hatablak and Tiszalök-Rázom.

190 houses and a cemetery were recovered.[252] On the basis of written documents and the archaeological research, the settlement of Kána and a nearby monastery were founded in the twelfth century. The life of the village was relatively short: Kána was ultimately abandoned in the fourteenth century.[253] Only a few finds were dated to this last period; the majority of the available material dates to the twelfth and thirteenth centuries.[254] Thus, the medieval village of Kána can be considered contemporary with Muhi.

7.1 Muhi and Kána – differences and similarities

The ratio of species

A huge number of animal bones came to light during the excavations at Kána. Almost 20,000 pieces have been analysed by Márta Daróczi-Szabó. Of these, 11,428 bones have been exactly identified to species and skeletal element. The species present in this material are nearly identical to those found at Muhi; in addition to the species found at Muhi, remains of a fox were identified in Kána, while wolf is missing from the Kána material. Donkey remains, quite rare on sites of this period, [255] have also been recovered at Kana. In my view, however, this reflects the scarcity of

[252] Gy. Terei, "Kána. Egy középkori falu Budapest határában" (Kána, a medieval village within the confines of Budapest), *Magyar Múzeumok* 3 (2004),:23. (hereafter: Terei, Kána)
[253] Gy. Terei, "Kőérberek-Tóváros Lakópark" (Kőérberek-Tóváros housing estate), *Kincsek a város alatt – Treasures Under the City*, ed. Paula Zsidi, (Budapest: Budapesti Történeti Múzeum, 2005), 89.
[254] Terei, Kána, 24.
[255] Bökönyi regarded donkey bones from medieval Hungarian sites as special rarities. (S.Bökönyi, "Die Haustiere in Ungarn im Mittelalter auf Grund der Knochenfunde", *Viehzucht und Hirtenleben in Ostmitteleuropa*, ed. László Földes (Budapest: Akadémiai Kiadó, 1961). Zooarchaeologists often have to pose the question whether the absence of a taxon is the consequence of the taxon never having been present at the site, or is rather a result of inadequate sampling. This problem is especially complex if the species in question is rare and has a patchy distribution. On the problem of negative evidence and the absence of species, see R. Lyman, „Determining when rare (zoo-) archaeological phenomena are truly absent," *Journal of Archaeological Method and Theory* 2/4 (1995), 369-424.

thoroughly analysed assemblages rather than a special feature of these two settlements.

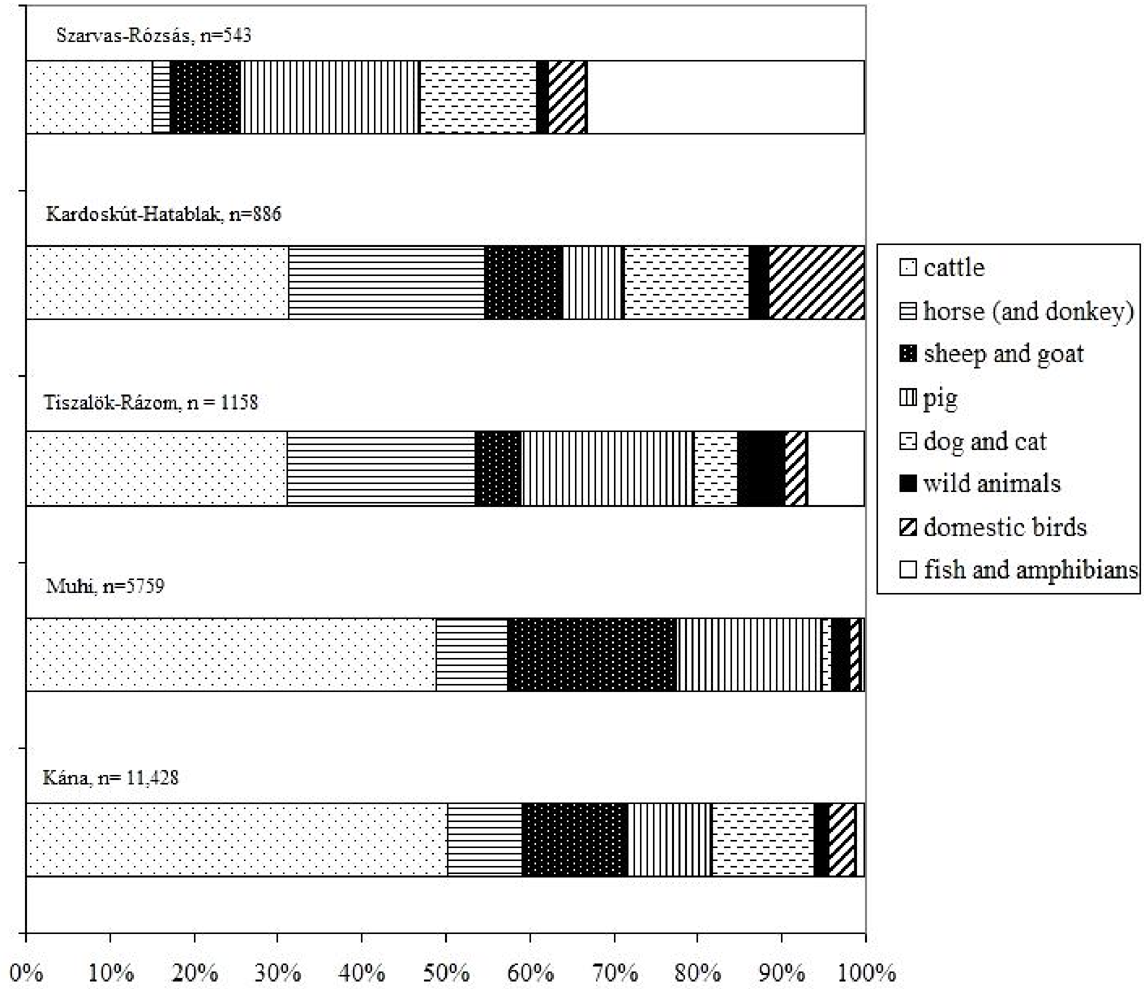


Fig. 7.1 *The ratio of species at several Arpadian Age villages. (Szarvas-Rózsás, Kardoskút-Hatablak and Tiszalök-Rázom were published by Sándor Bökönyi.)*[256]

The ratio of taxa shows similarities with the Muhi material. The absolute dominance of domestic species is a common feature of both assemblages. Low species diversity and an overwhelming reliance on domesticated sources of meat, especially cattle, appear to be the characteristics of these Arpadian Age settlements.

256 Bökönyi, *History of Domestic Mammals*, 373, 400, 412. I only included village assemblages where the number of identified finds came to more than 500 specimens. Materials containing a lower number of finds cannot be considered representative. It is striking that as the number of identified finds grow, the ratio of cattle remains increases; it means that cattle was probably underrepresented in the previous assemblages analysed by Bökönyi.

The small ratio of wild animals may be traced back to the same causes in Kána as in Muhi, i.e. the limited availability of hunting areas, even though legal regulations of hunting and its regional aspects are still unknown. The wild species, however, are the same as in Muhi: wild boar, roe and red deer and hare; one fragment from Kána can be interpreted as aurochs. Nevertheless, the problem that this taxon might have been practically extinct by this period arises here, just as at Muhi (see Chapter 4). An interesting difference is that while at Muhi people complemented their diet with red deer as well as roe deer, in Kána only antler fragments of the latter were found, but no other body parts.

Just as in Muhi, the dominance of cattle is clear in the Kána assemblage (50.19%). Small ruminants represent 12.47% of the material, while pig bones sum up to 9.98%. Horse remains represent 8.94%. Even though the proportion of pigs to small ruminants is very similar on the two sites, the ratio of these species in Kána is lower than in Muhi, while domestic bird and dog remains were found in much higher numbers in Kana village. The picture is quite similar in the two Arpadian Age villages; the same species are found, and meat consumption relied mainly on beef. These two settlements, however, stand apart from the picture at other analysed Arpadian settlements (see *Fig*. 7.1): the dominance of cattle at Kána and Muhi is much more evident, while the number of fish and domestic bird remains at these two sites is much lower than in Szarvas-Rózsás or Tiszalök-Rázom. This, nevertheless, is a consequence of the poor sampling typical of older excavations rather than regional differences, at least in my view.

The difference in the number of dog remains, however, requires explanation. A relatively high number of apparently ritual phenomena connected to dogs in Kána (see later in the chapter) may explain the significance of this animal in the popular belief system but not its overrepresentation in the refuse bone. In Muhi, on the other hand, dogs represent a very small part of the whole assemblage compared to any of the other sites. This difference may be rooted in the character of the excavated refuse material: the number of dog bones is expected to be higher in mixed refuse pits which not only contain kitchen refuse but also bodies of unconsumed animals. Another explanation would be that dog meat was occasionally consumed in Kána, however, this is not supported by any kind of cut marks on the bones.

Livestock character and animal exploitation

The horses from Kána were somewhat larger than those from Muhi although they still fall within the same size category.[257] There are no traces of the heavier ”cold-blood” horses which were described by Sándor Bökönyi as a new type appearing in the period of the Árpád Dynasty.[258] Their mortality profile is also similar: four infantile and 94 juvenile individuals were identified in Kána. The question of horse meat consumption, however, can also be posed here: in Kána, the ratio of horse bones is almost the same as that of pig and small ruminant bones. In Kána's case, it is certain that horse was sometimes consumed, since hacking marks and cutmarks were found on a few fragments, on bones which are associated with good quality meat. This sheds a new light on the Muhi horse remains. The ratio of horse bones is almost the same at the two sites, as is the mortality profile; it can be assumed that even

[257] The average withers height calculation for horses in the Kána assemblage may actually be more precise than that in Muhi sample due to the larger number of whole horse long bones in Kána on which the calculations were based. It is worth to mention, however, that the region of Kána was an area famous of its cattle and horses sold on the fairs in Pest. Larger size and variability may thus indicate the presence of a demand on the market.

[258] S. Bökönyi, "The beginnings of conscious animal breeding in Hungary: the biological, written and artistic evidence", *L'homme, l'anmimal domestique et l'environnement du Moyen Age au XVIIIe siècle*, ed. R. Durand, (Enquêtes et Documents n° 19, Nantes: Ouest Editions, 1993), 104.

though no direct evidence is available at the moment horse meat was now and then consumed in Muhi as well.[259]

Some bone tools made of horse metapodia and radii were interpreted as skates or sledge runners in Kána, just as in Muhi. The methods of tool manufacture seems to be the same: the ends were sometimes carved, and in some cases there are holes carved into the skate in order to fasten the skate to the foot or runner to the sledge.

Consumption of beef in large amounts was characteristic at both villages. Pathologies on cattle bones at Kána, similarly to those found in Muhi, were observed (mostly small exostoses on the lower extremities). These may indicate that the same strategy was practiced here as in Muhi: old animals retired from work were slaughtered and consumed. Bones of calves, however, are relatively many in Kána, which may signify that there were individuals kept only for their meat and not used for traction. The dominance of cows suggests the cows were milked, similarly to the situation at Muhi. Since healed fractures were only observed on ribs, it is likely that in Kána injured animals were slaughtered.[260]

Cattle recovered in Muhi tend to be larger at the withers (see *Fig. 7.2*), but comparison of the metacarpals from the two sites (*Fig. 7.3*) shows that the two populations more or less overlap in terms of variability. The measurements form a continuous plot and the three groups on the diagram can rather be identified as sexes rather than cattle types.[261] Measurements of the basal circumference of the horn cores also suggest a similarity between the kinds of cattle present at the two settlements (in

[259] In Tiszalök-Rázom and Kardoskút-Hatablak the ratio of horses is higher, but their archaeological context is not clear, and butchering marks were not documented. Butchered horse bones have come to light from Early Arpad Age settlements in today's Slovakia as well. (László Bartosiewicz, personal communication)

[260] Rib fractures, even though they can be painful, do not really influence the animal's ability to work as opposed to the leg bone fractures.

[261] When the proximal depth of the metacarpal is plotted against the proximal breadth, measurement groups suggesting sexual dimporphism are expected to emerge. It may be, however, difficult to recognize clear distinctions due to the presence of castrates.

Muhi, the average circumference is 13.5 cm, min. 9.5, max. 18; in Kána, the average circumference is 13.6 cm, min. 8.5, max. 17.8 cm). Brachyceros individuals with small horn cores were found at both sites.

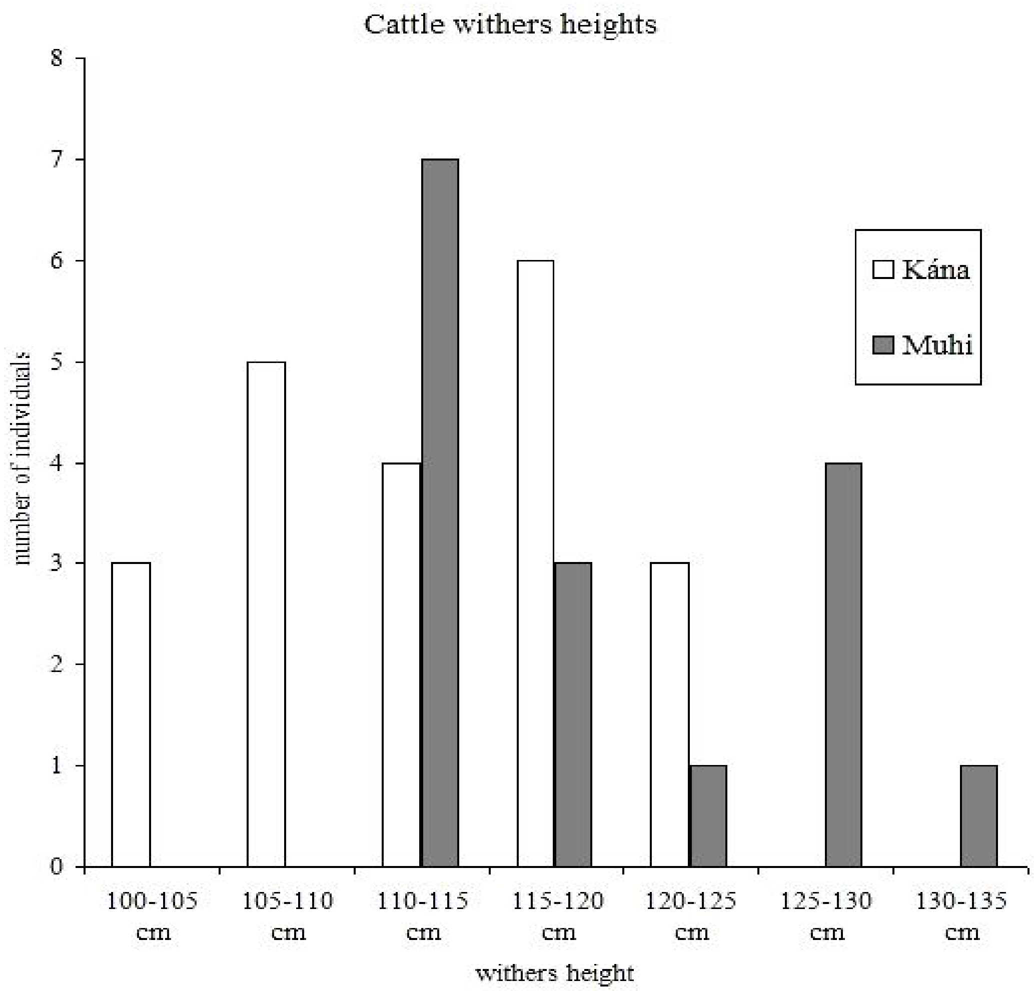


Fig. 7.2 *Withers height calculations for cattle in the two samples.*

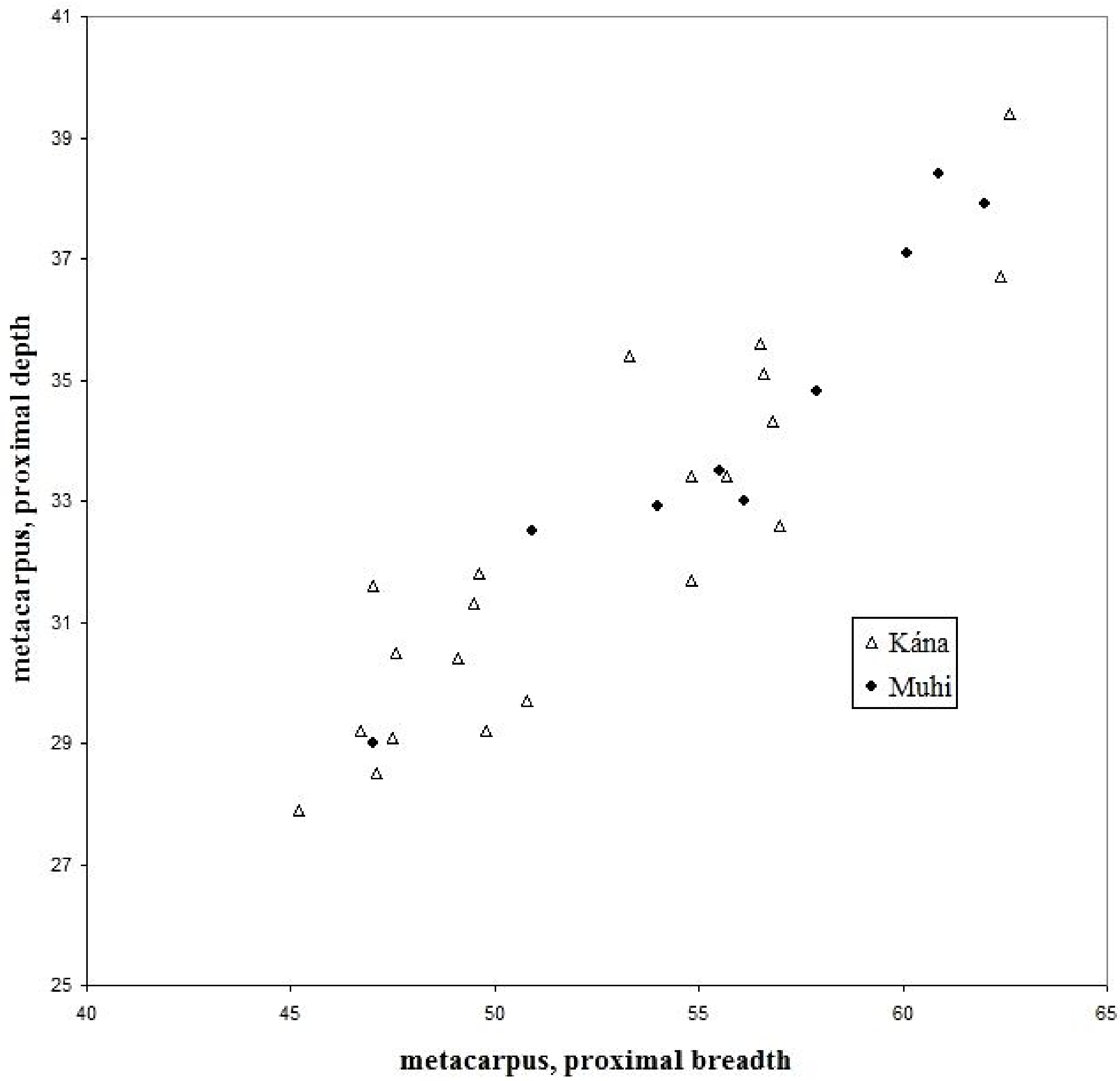


Fig. 7.3 *Cattle metacarpus measurements from Kána and Muhi. The high variability indicates the presence of all sorts of "medium-size" cattle on both sites.*

Only pig bone was suitable for withers height estimation in Kána and that was similar in size to the pigs recovered in Muhi. Pig bones at Muhi, however, were very fragmented and thus measurements could hardly be taken. There were more young individuals of pig found at Kána compared to the situation at Muhi. The size of sheep and goat at Kána also resembles those found at Muhi, even though only one or two bones were suitable for withers height calculations. Measurable sheep horn cores were recovered in larger numbers at Kána; hornless individuals are missing from this sample although individuals with somewhat twisted horns occur. There is, however, no striking difference between the two samples.

A strikingly high number of pathological dog bones (88 cases) were recovered in Kána and the majority of the individuals died at a mature age. The high number of pathologies may be related to the fact that dogs can easily survive smaller injuries and can run quite well even on three legs. They were certainly not slaughtered when they were injured as opposed to the situation with cattle, sheep or pig, so diseases could develop in the phase when they manifested on the bones This kind of pathology is totally missing from the Muhi sample.

Butchering

As in Muhi, all skeletal elements of the main domestic species are present in Kána without strong concentrations of particular element. Mandibles, ribs, scapulae, metapodia and phalanges were recovered in especially high numbers for cattle.

The number of hacking marks is low in Kána as well, which indicates the absence of professional butcher's tools. The number of hacked bones is low as well on the unidentifiable remains of large mammals. Thus, butchered bones have not been identified as a consequence of heavy fragmentation. Thus, just as in Muhi, hacking was practiced in the primary carcass partitioning, but the bones were probably broken up in the later phases of processing. Cut marks were observed in more than 350 cases on cattle, horse, small ruminant and pig bones, practically anywhere on the skeleton. This again corresponds to the assumption that neither Kána nor Muhi was in that stage of development when professional butchers usually appear.

Skinning marks were observed at Kána as well. Most of them were visible on the lower extremities of cattle and sheep although horse bones and a pig calcaneus also had skinning marks. At Muhi skinning marks were discovered on the lower extremities of horse, cattle and red deer, and, surprisingly, on a ground squirrel mandible.

Ritual phenomena

In Kána, a large number of ritual animal burials came to light. A number of pots, buried upside down, were excavated from under houses, from pits and ditches. Almost half contained animal remains of various species, often neonatal individuals. These are, in all probability, building sacrifices. A similar context can be reconstructed for dog skulls which were recovered from under buildings.

It is striking that as opposed to the abundance of such phenomena at the Kána site, nothing similar was recovered from Muhi, except for the one dog vertebra with cut marks on it. In my opinion, if such ritual activities had been practiced in this part of medieval Hungary, at least some traces would have been found during the excavations, even though only certain parts of medieval Muhi were excavated, not the whole settlement. There is no evidence for differences in the ethnic dynamics of the two settlements, which means that the discrepancies may be rooted in variations in regional traditions. Similar phenomena, however, were also discovered in the twelfth-thirteenth century village of Fancsika, not so far from Muhi (Hajdú-Bihar county, Northeastern Hungary, not far from the town of Debrecen); here dog skulls were deposited in pots. Some written evidence is available for this practice from the sixteenth century Kolozsvár (Cluj Napoca) as well.[262] The appearance of similar rituals here and there over Hungary signifies that this was a widespread practice, even

[262] I. Vörös, Kutyaáldozatok és kutyatemetkezések a közékori Magyarországon I. (Dog sacrifices and dog burials in medieval Hungary Pt. I.), *Folia Archaeologica* 41 (1990): 119-145: 119-128. (hereafter: Vörös, Kutyaáldozatok I.)

though the data available on this topic are still too few for more general conclusions to be drawn yet.

Two partial dogs skeletons were found in Muhi: in stratigraphical unit 2360 (adult individual), and in unit 2210 (neonatal individual). For the latter, an interesting analogy is known from medieval Kolozsvár:

> „egi leanka az hwl Mutatta az kert mellet meg astak es egi fazekat talaltak, kyt hogy ky weottek volt az feoldbeol, felywl feold volt, Borbel Ianos Ely tazitotta az fazakat, Es hogi ely Romlot az feold keozet egi Eb Keolyek feienek chiontaiik latta keozte".[263]

Cut-off heads of dogs, or deliberately deposited dog remains inside buildings or in pots from other Arpadian Age settlements[264] were not documented in Muhi. (Two dog skulls were recovered, but the stratigraphical units (512 and 518) they come from, were impossible to date.) This negative evidence, however, does not prove that such practices were unknown.

Separate horse skulls were recovered from Kána. This may reflect the practice of hanging out skulls on buildings in order to keep evil forces away. Even though nothing similar was observed in Muhi, this may also have taphonomic reasons: skulls have less of a chance to survive than long bones, and it is possible that very fragmented and damaged horse skulls not recognized.[265]

[263] "A girl had shown the spot beside the garden, and when they started to dig, they found an old pot, which they picked up from the ground; on the top there was soil in it, so János Borbély threw it to the ground, and as the soil fell out, he saw the bones of the head of a young dog in it." T. Szabó,. *Erdélyi magyar szótörténeti tár II. kötet, Cs-Elsz* (Dictionary for Hungarian Dialects Spoken in Transylvania, Vol.2: Letters Cs-Elsz) (Bucharest: Kriterion, 1978), 540.

[264] István Vörös put a list of such finds together. Dog remains – skulls or skeletons – were put into ovens in seven cases (Esztergom, Sály, Fenékpuszta, Csátalja, Bóly, Szarvas and Tiszalök); dog skulls in pots were only recovered in Fancsika, and, recently, in Kána. Dog remains are recovered from pits practically everywhere. (Vörös, Kutyaáldozatok I., 136.)

[265] The presence of such ritual phenomena at Kána and their absence at Muhi may also be explained by the differences between the two excavations. In Kána, there were scarcely any superpositions, which made it easier to excavate and recognise ritual contexts. In Muhi, on the other hand, many features were destroyed by later buildings and pits.

7.2 Conclusions

The similarity of these two settlements in terms of animal remains is striking, especially compared to other village assemblages analysed and published in the past. The same taxa are present (the donkey, which was considered unimportant domestic species was found on both sites) and in similar proportions even though in Kána the number of dog remains is much higher, probably as a consequence of pagan rituals and beliefs connected to this animal. Arpadian Age village assemblages published so far display great variability, and the similarity between these two, geographically distant settlements in terms of animal types, size, ratio and butchering, draws the attention to the imperfection of past studies. It may also suggest that cultural imperatives were more important than potentials of the natural environment.

It is clear from Kána's history that this settlement did not develop into a larger economic or trading centre, but remained a small village throughout its short time of existence. The similarity between Muhi and Kána signifies that in the thirteenth century, in the first phase of its development, Muhi was nothing more than a village. It is important to note that trading activities, including animal trade, cannot be demonstrated from animal remains alone since it is impossible to distinguish between the bones of animals raised in the settlement and bones of those bought on the market. The mortality profiles of domestic taxa, however, supports the idea that most of the animals slaughtered were first used as traction and transport animals (cattle and horse) and exploited for their secondary products (sheep and cattle) in both Kána and Muhi. The presence of calves in a higher number in Kána may be interpreted as a sign of some level of wealth, since it is always an economic loss if animals that might have been exploited for their secondary potentials are killed. The ratio of calves is much lower in Muhi. The same is true for lambs which appear in higher ratios in Kána compared to Muhi. The higher proportion of juvenile cattle and sheep at Kána suggest that Kána was indeed a wealthier village in general. Even though some research is still needed to make overall statements, it seems that Muhi's emergence as a place of regional importance began at the end of the thirteenth century at the earliest. However, in the thirteenth century there is not yet any trace of some kind of large economic surplus as far as animal husbandry is concerned.

Chapter Eight: CONCLUSIONS

The analysis of archaeological animal remains yields a good deal of valuable information on the animal husbandry and nutrition of thirteenth-century Muhi. These results were only available through a detailed osteoarchaeological analysis given the almost total absence of relevant textual data.

The three excavation areas provided an excellent opportunity to gain insight into the settlement's life. It has been presumed on the basis of the ecavated buildings that the area excavated in the settlement core and the outskirts of the village represent different layers of society and the various architectural structures associated with them. It was, therefore, hypothetised that the composition of kitchen refuse will differ in these areas in terms of species ratios, mortality profiles, meat quality, butchering methods and preferred body parts, in accordance with the social status of the inhabitants.

It has already been emphasised in the secondary literature that Muhi had emerged as a centre for regional trade at the end of the thirteenth and beginning of the fourteenth century, which would mean that a group of élite inhabitants must have been existed, who, presumably due to their participation in regional trade, provided the financial basis for the settlement's development. Thus, it was expected that a relatively clear differentiation should be observable in the kitchen refuse of the buildings on the main street compared to that recovered on the outskirts of the village. In particular, I hypothesized that bone fragments of body parts representing better quality protein would be found in the centre of the settlement in greater numbers.

The faunal material, however, reveals a more complex and subtle picture, which not only sheds light on the early stages of the village's development, but also demonstrates the potentials of bone material investigation, as well as the gaps in the available data and proper methodology for certain aspects of zooarchaeological studies in Hungary.

The composition of the faunal assemblage, on the one hand, reflects the proportion of domestic to wild taxa usually observed at the few excavated and published Arpadian Age villages, but on the other hand, displays a somewhat different ratio within the domestic species. The overwhelming majority of the Muhi sample derives from domesticates, such as cattle, caprinae, swine and horse; wild animals contributed very little to the nutrition. It is certain, however, that the meat of hare, wild boar, roe and red deer was also consumed occasionally; legal regulations for hunting in this period, however, are obscure. Wild animals consumed in Muhi were probably killed in the environs. The nearby environment was also exploited in the form of antler gathering, an activity which required precise knowledge on male deer Spring territories to ensure raw material for tool manufacture.

Approximately half of the remains were identified as cattle. The dominance of this taxon was expected based on results from previous excavations, the proportion of cattle to other species, however, is much higher here than in other village faunal assemblages. These small-size, brachyceros type cattle were exploited for their meat, hide, bones, manure and draught power as well as for their milk. Manure was probably also gathered and used. The majority of the cattle remains where the sex could be identified derive from cows, supporting the idea that milking was an everyday activity, even for draught animals. Even though written sources reveal that this practice of cattle being kept and fattened only for its meat was present in wealthier settlements, there is no osteological evidence for this tradition in the thirteenth century. It is more likely that animals retired from draught work were slaughtered and consumed, meaning that they were usually killed as adults..

Pathologies which can be traced back to work overload were discovered in some cases both in the settlement core and on the outskirts; this also suggests that the preference of slaughtering older animals was prevalent over the whole settlement. Calves were sometimes killed but certainly not on a regular basis. All this reflects an economical form of animal exploitation; probably none of the thirteenth century inhabitants of the village could afford to keep and feed cattle only for beef production, not even those living in the settlement core. Even though remains of animals imported and animals raised in the settlement cannot be distinguished using osteoarchaeological criteria, it is very likely that the majority of the animals slaughtered and consumed were raised in Muhi and not imported from other regional markets.

The discovered horse bones are few in number. They are less fragmented than those of other species. This lack of fragmentation suggests that these horses were probably not consumed. The fact that all age classes were present in the assemblage also suggests that horse was not eaten, at least not regularly. In the comparison with another coeval village, Kána, however, some doubts arose. The ratio of horse bones is namely almost the same on the two sites, as are the mortality profiles. On this basis it can be suggested that horse meat was also, in all probability, consumed in Muhi now and then, although there is no clear archaeological evidence for this. Horse must have been a valuable animal, and in some cases even injured specimens were kept alive until their injuries healed, especially in somewhat wealthier households. None of the horse bones displayed pathologies that can be traced back to work overload, something that may also support the supposition that horse was better cared for than draught cattle.

The meat of small ruminants and pigs played a similar role in the diet in general, although there were differences between inhabitants of the settlement core and people living on the outskirts. Sheep was also kept for its wool (and perhaps for its milk), so sheep were usually kept alive longer, while pigs were more likely to be slaughtered at a young age. The occasional slaughter of lamb was also an option but the mortality profile for sheep more closely reflects natural herd mortality..

The economical character of pig keeping in households may be the reason for the relatively high ratio of swine in the assemblage; their proportion is higher than it might be expected in this period. Their importance is especially emphasised on the outskirts. There was not any tradition documented that would explain a preference for pig, thus, together with the slaughter of old draught cattle, the high ratio of pigs may reflect the less wealthy position of the inhabitants of the village, especially those living in the southern area. Pigs were certainly kept by households and probably roamed through the village eating human offal of various kinds, especially during the winter. Howver in other seasons they may have been fattened on the meadows in herds and, probably, on acorn in the forests of the Bükk mountains in the fall and early winter. The legal regulation of this practice, nevertheless, is unknown.

Dog keeping is difficult to reconstruct on the basis of the few recovered few bone finds. It is possible that dogs played a certain role in superstitious beliefs; even though only a single vertebra was found at Muhi which may indicate their role in some kind of popular ritual behavior beyond formal church rites. A number of dog remains were recovered in the Arpadian Age village of Kána and elsewhere in Hungary, suggesting the continuation of certain, not well understood pagan beliefs from pre-Christian times. The fact that such phenomena appear in different geographical areas mean that such beliefs were widespread; therefore it is presumed that they were also known and maybe practiced in Muhi, even though no unambiguous archaeological evidence has been discovered.

Only a few domestic birds seem to have been kept in the village. The meat and eggs of domestic hen only complemented the diet of the villagers but were apparently not consumed in large quantities.

The bone tools recovered from Muhi are typical products of local, household production; except for two decorated belt ornaments and one knife handle, they were certainly not imported; they can rather be regarded as simple tools produced without special skills but with long background practice. The majority of the tools comprise skates and sledge runners, which have usually been regarded as toys, even though they were important in hunting and hauling purposes. Although some workshop debris was found, there is no trace of centralised, large-scale production of bone tools; Muhi seems to be self-sufficient from this aspect. In most cases, horse bones were used for skate and sledge runner production, since they were usually not damaged by butchering but save as they represent a long manufacturing traditon and are, in fact, the ideal bone to make such objects.

The separate analysis of the excavated areas makes it clear that the ratio of species is indeed different in the settlement core and on the outskirts of the village, large domesticates being more prevalent in the settlement core and caprinae and swine occuring in larger proportions on the outskirts. This supports the hypothesis on social differentiation. The mortality profiles, however, seemed to contradict the idea that slightly more upper cass people dwelled in the core. Young animals were found in a relatively large number also on the outskirts, something that might be a consequence of the natural mortality of animal herds. Strikingly enough, there was no significant difference between the quality of meat consumed in the two areas in terms of preferences for body parts representing better quality meat. In accordance with a more recent theory on medieval meat consumption and social status, it seems that in Muhi the amount of meat available was the real measure of status, while meat quality was only of secondary significance. The amount of meat represented by a single cattle is much more than the meat from a single sheep or even swine, which means that based on the species ratios, inhabitants living in the core area had access to larger quantities of meat. This signifies the presence of a not striking but still noticeable social differentiation. There is, however, lack of supporting faunal data from contemporary Hungarian villages. Meat consumption customs of peasants in this period are still obscure, and the problems of applying models derived from élite contexts to rural ones are still waiting for a solution. A more precise picture could have been achieved at Muhi by analysing plant and faunal data from individual households. Even though this was not feasible in Muhi's case, further studies may yet provide a deeper insight into this problem.

The results are thus somewhat ambiguous; the picture emerging from the finds does not exactly correspond to the expected results since more clear social differention expressed in a variety of meat consumption behaviors was expected.. The social differentiation is present but in a much subtle form. Households slaughters and the maximum exploitation of the animals' potentials suggest that the picture was probably influenced by events in the period of revival following the Mongol invasion, when Muhi must have been in a difficult economic situation. It seems that the rapid economic growth of the village (and a more predominant financial differentiation) only began later. The similarity between Muhi and Kána also signifies that in the thirteenth century, i.e. in the first phase of its development, Muhi was nothing more than a small village. Nevertheless, the *topoi* and models we have on meat consumption in medieval Hungary are mainly based on on faunal assemblages from castles, urban contexts and élite sites. It seems that in this rural settlement there was a different, more subtle kind of distinction was characteristic between groups of people, with the focus being on the quantity of protein available. This statement may seem somewhat exaggerated, and it is true that it is impossible to draw general conclusions on the basis of a single village material, but this study at least attracts our attention to this scarcely researched topic.

It is again a commonplace, but by the end of this analysis it has become evident that more research is needed on the animal husbandry of Arpadian Age villages. Newly excavated and assessed materials such as Kána and Muhi provide a picture quite different from the one constructed on the basis of previous studies. The problem of horse meat consumption and the role of dogs in superstition provide fascinating research topics for further studies, as well as the connections between settlement type and social differentiation as reflected in the kitchen garbage. Other aspects, such as connections between ethnic dynamics, trade dynamics, animal husbandry and meat consumption and its regional differences, are still somewhat unclear due to the lack of properly excavated and analysed assemblages.

In terms of Muhi, the analysis of later layers as well as the investigation of remains from individual households (tasks that I deal with in my PhD dissertation at Eötvös Lorand University in Budapest) will contribute to our deeper understanding of the settlement's history and development. The first results show the increasing importance of cattle, in accordance with the theory that Muhi participated in the cattle trade and thus its inhabitants would have had easier access to beef. All these data, however, can only be properly interpreted if they are embedded in an archaeological, cultural as well as historical context. The study of social status on the basis of kitchen garbage is a dynamically developing branch within zooarchaeology, which will, in my hope, provide increasingly precise methods and models for the incredibly complex task of evaluating bone samples. At the end, let me quote the words of Nicky Milner and Preston Miracle, a few sentences I cannot agree more with:

> „The subtlety and complexity of food symbolism and its manipulation in and contribution to social strategies makes these challenging topics for analysis in the present day, let alone in the past. We are not content, however, with just highlighting the social embeddedness of food in the past. We need to develop rigorous methods for addressing and evaluating socially-informed interpretations of food use and symbolism. Fortunately in the case of food waste, we have hard-won taphonomic information for looking at the consumption side of production and procurement. Thus, despite difficulties, only through archaeological studies of food can we understand long-term patterns of stability and change in food choices."[266]

[266] N. Milner and P. Miracle, „Introduction: Patterning Data and Consuming Theory", *Consuming Passions and Patterns of Consumption*, ed. By P. Miracle and N. Milner, 1-6, (Oxford: McDonald Institute for Archaeological Research, 2002), 5-6.

APPENDIX

9.1 Animal anatomy

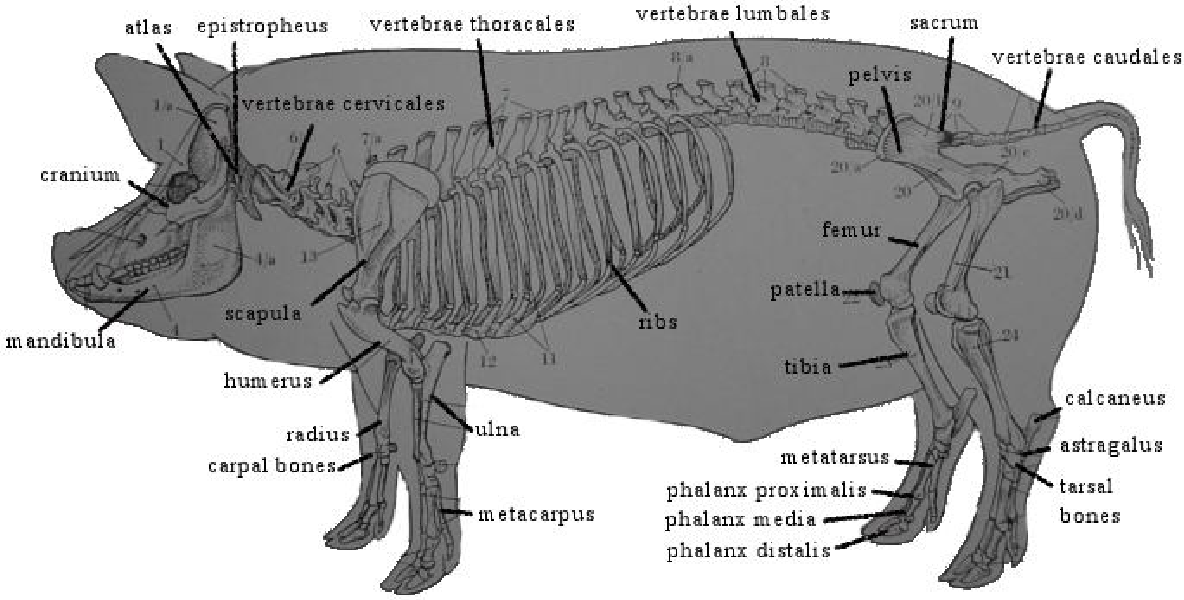


Fig. 9.1 *Skeletal elements of pig. Other domestic mammals have the same skeletal elements, with the same names.*

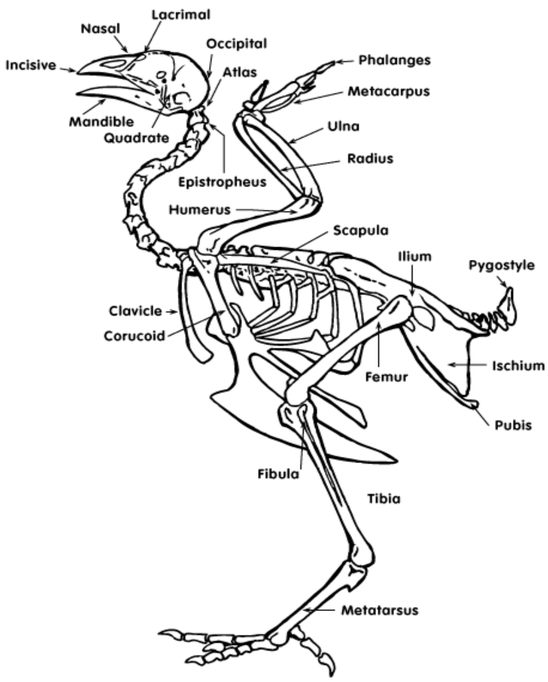


Fig. 9.2 *The skeleton of hen.*

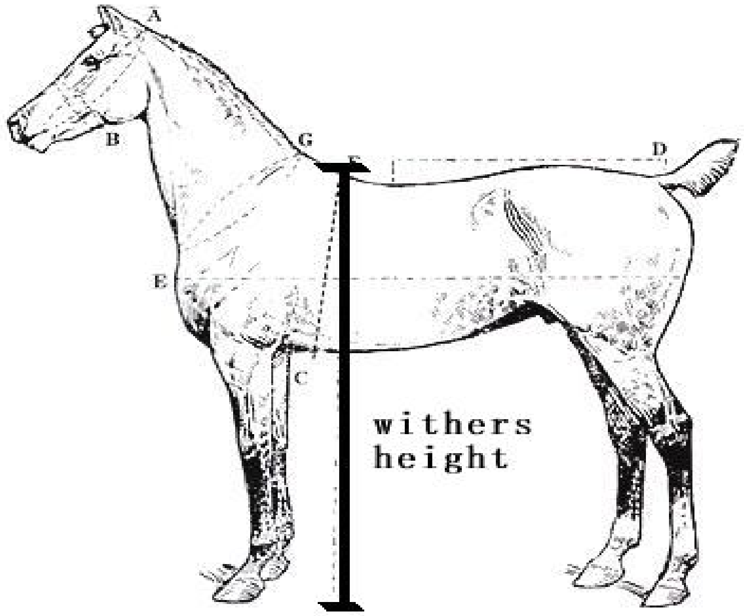


Fig. 9.3 *Measuring the withers height. This value is measured at the same spot in all mammals.*

9.2 Glossary

abscess: An abscess is a collection of pus that has accumulated in a cavity formed by the tissue on the basis of an infectious process or other foreign materials (e.g. splinters or bullet wounds). It is a defensive reaction of the tissue to prevent the spread of infectious materials to other parts of the body.

aurochs: The aurochs or urus (*Bos primigenius*) is an extinct, very large type of wild cattle, which was originally prevalent in European forests.

compact bone*:* The hard outer layer of bones is composed of compact bone tissue, due to its minimal gaps and spaces. This tissue gives bones their smooth, white, and solid appearance, and accounts for 80% of the total bone mass of an adult skeleton. Compact bone may also be referred to as dense bone or cortical bone.

crossbreeding: crossbreeding occurs when two distinctly different breeds of animals mate, just as in the case of horse and donkey (which together produce mule), dog and wolf, or swine and wild boar.

exostosis: An exostosis (plural: exostoses) is the formation of new bone on the surface of a bone. Exostosis can cause chronic pain ranging from mild to debilitatingly severe, depending on where they are located and what shape they are.

medial condylus*:* The medial condyle is one of the two projections on a long bone. To counter the clumsiness of usage of "left" and "right", the directional terms lateral (*lateralis*; "to the side") and medial (*medius*; "middle") are used. *Medial* is the adjective describing structures near the midline of an animal.

processus spinosus*:* The processus spinosus or spinous process is a part of a vertebra, which serves for the attachment of muscles and ligaments. In animals, the process points upward and may slant forward or backward.

trabecular or spongy bone: Filling the interior of the organ is the trabecular bone tissue (an open cell porous network, also called cancellous or spongy bone) composed of a network of rod- and plate-like elements that make the overall organ lighter and allowing room for blood vessels and marrow. Trabecular bone accounts for the remaining 20% of total bone mass, but has nearly ten times the surface area of compact bone.

withers height: The withers is the highest point on the back of a non-upright animal, on the ridge between its shoulder blades. The height of the withers is used as a characteristic feature of the animal; in modern breeds it is used as a standard feature.

9.3 Additional illustrations

Illustrations for Chapter 3

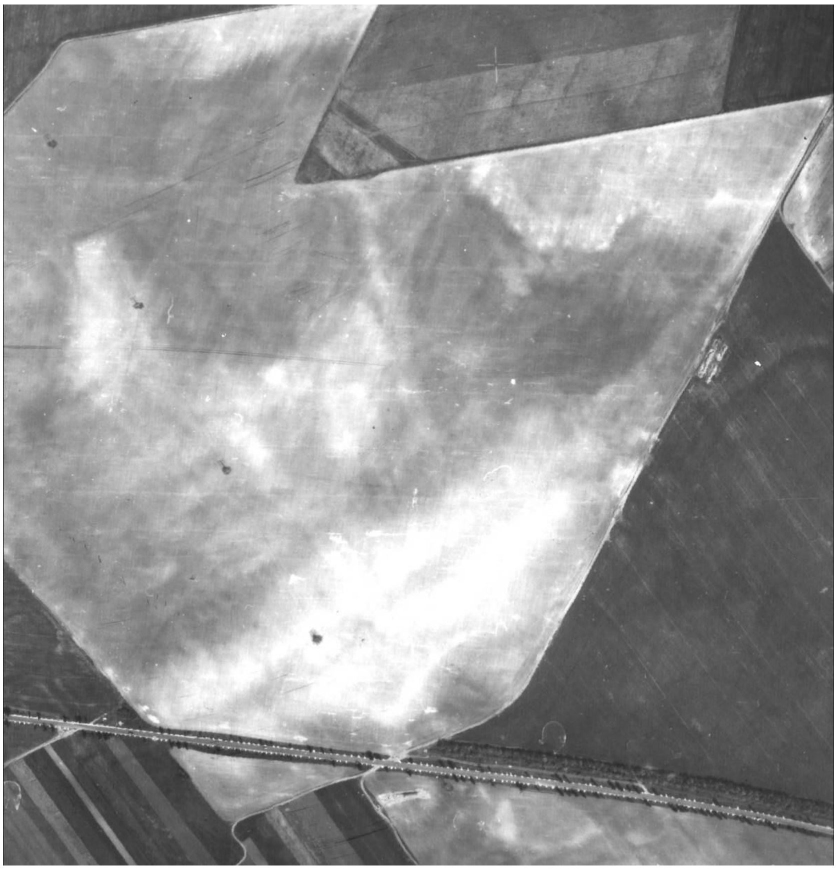


Fig. 9.4. *Aerial photo taken in 1972*

Fig.9 5. *Aerial photo taken in 1995*

Fig.9.6. *Muhi's main street with the traces of medieval carts, as it is today (excavation photo)*

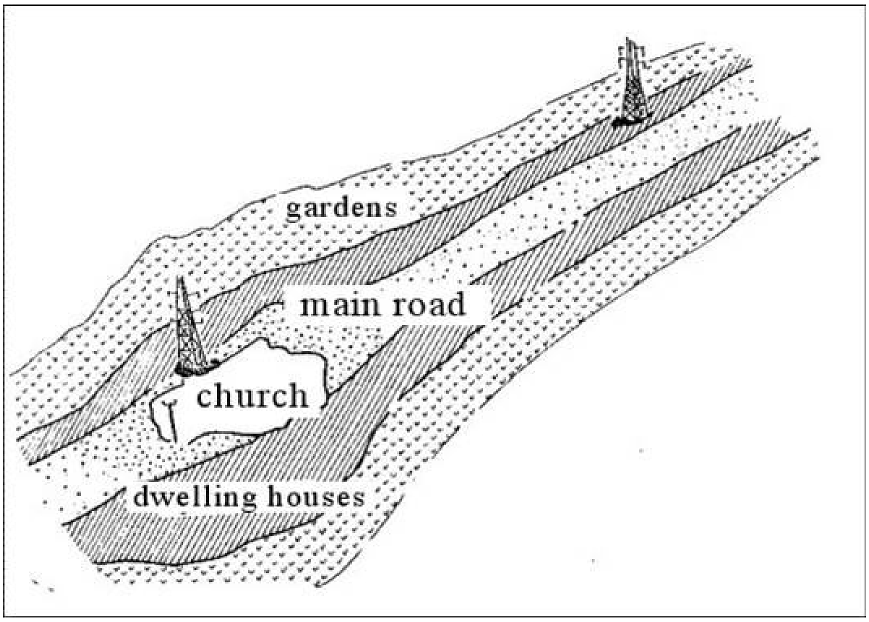


Fig. 9.7. *The interpretation of the aerial photos*

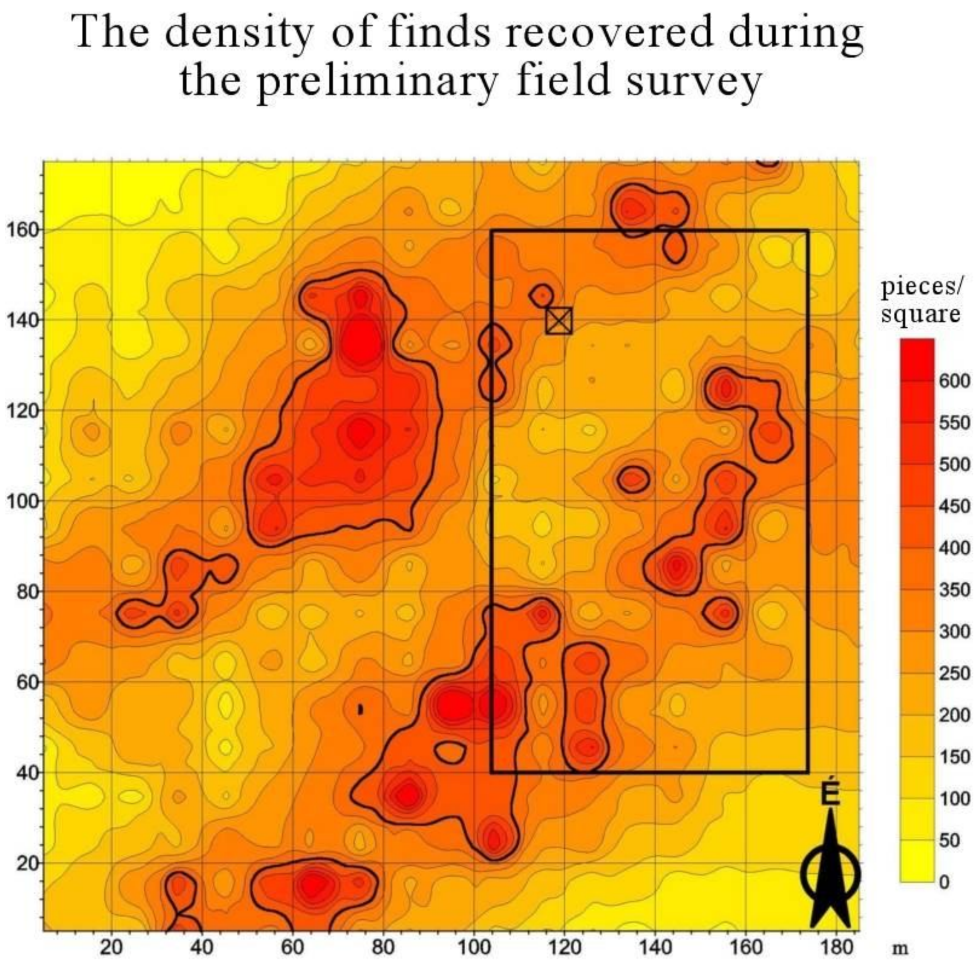


Fig. 9.8 *Field walk and surface collection: the density of finds (diagram nr. 1). The X indicates the location of the electronic pole. (from the Muhi project website: http://www.szakmai.hermuz.hu/kutat.htm, accessed 02.04.2008)*

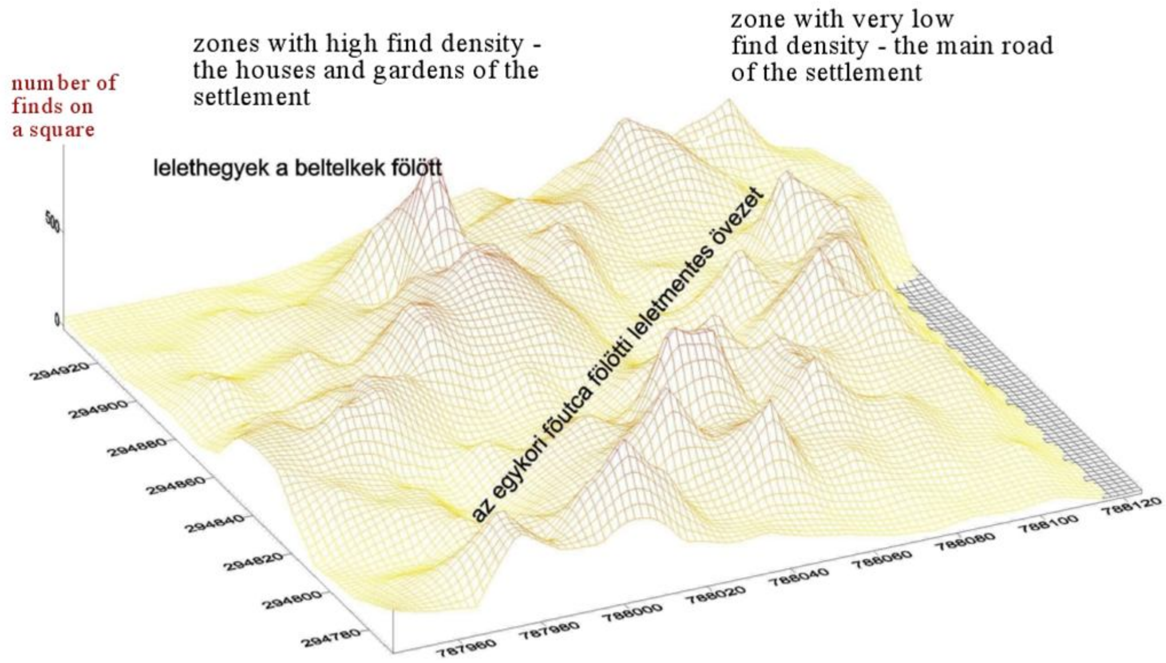


Fig. 9.9. *Field walk and surface collection: the density of finds (diagram nr. 2)*
(from the Muhi project website: http://www.szakmai.hermuz.hu/kutat.htm, accessed 02.04.2008)

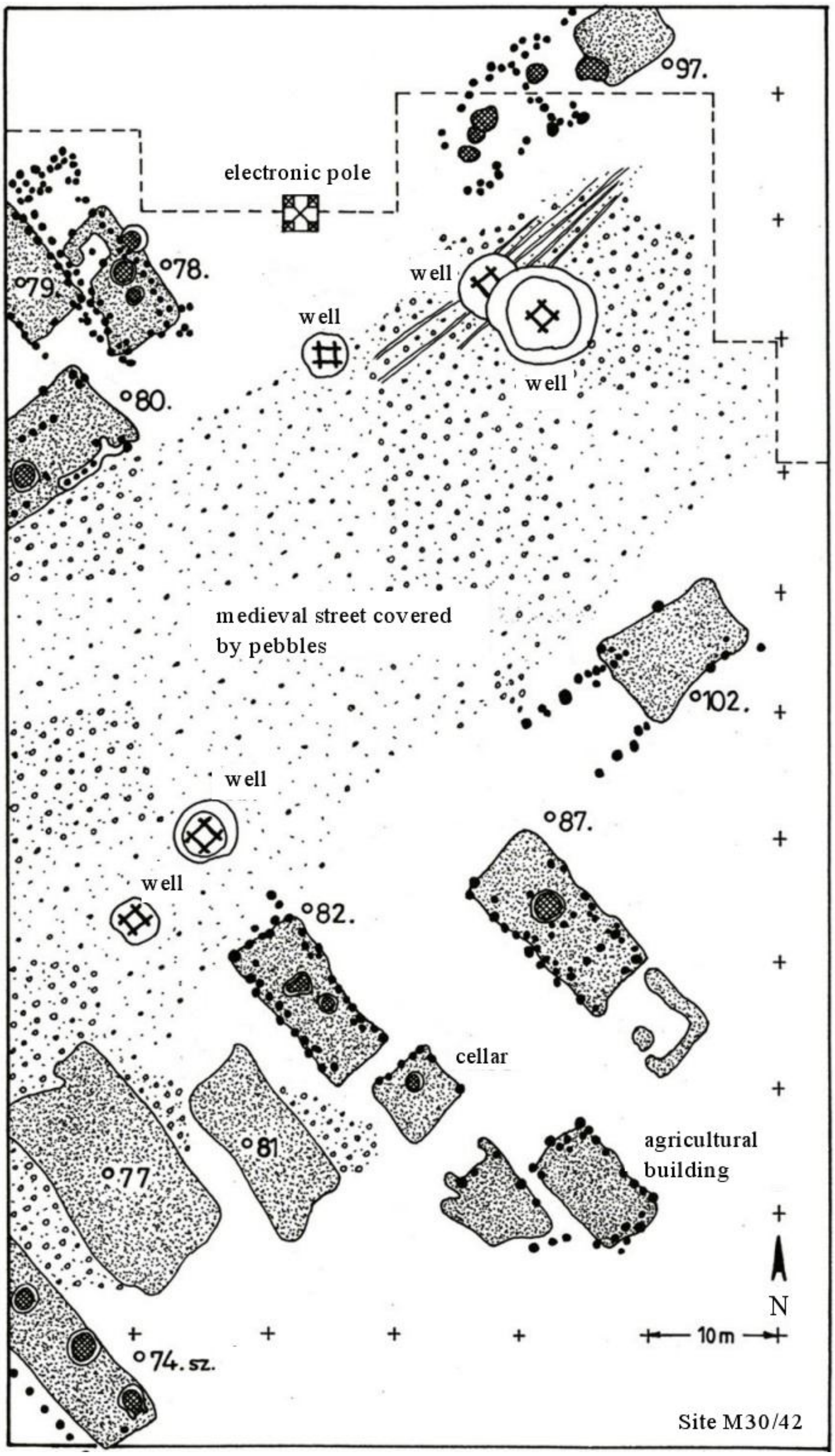
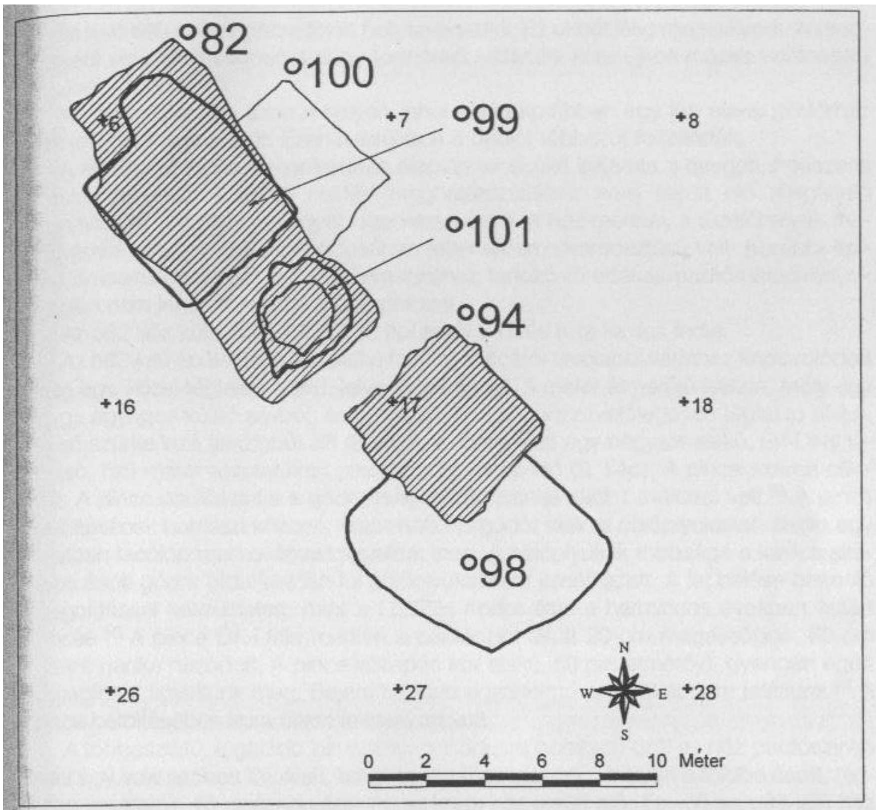


Fig. 9.10. *The excavated area of the main road. The buildings shown on this map did not exist at the same time. (from Pusztai, A középkori Mohi mezőváros építészeti emlékei)*



The position of building remains excavated under and behind house nr. 82

Fig. 9.11. *House nr. 82 and the related features (from Pusztai, A középkori Mohi mezőváros építészeti emlékei)*

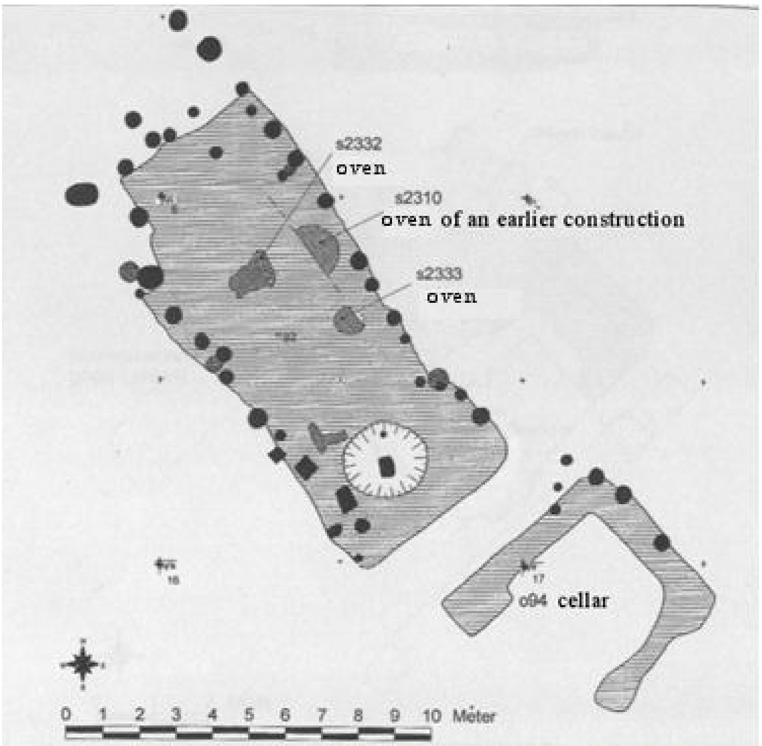


Fig.9.12. *House nr. 82 and the cellar (from Pusztai, A középkori Mohi mezőváros építészeti emlékei)*

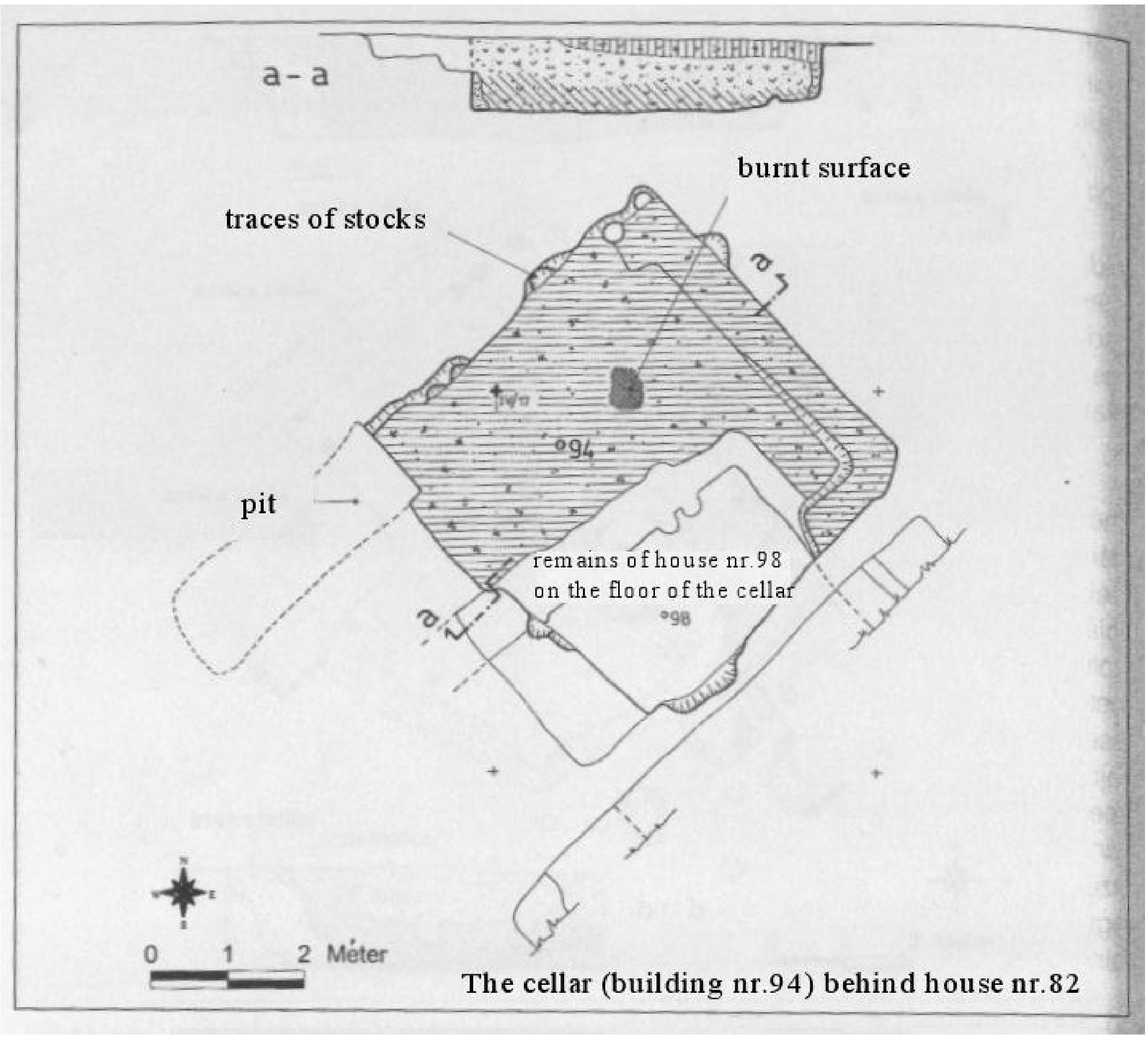


Fig.9.13. *The cellar behind house nr. 82 (from Pusztai, A középkori Mohi mezőváros építészeti emlékei)*

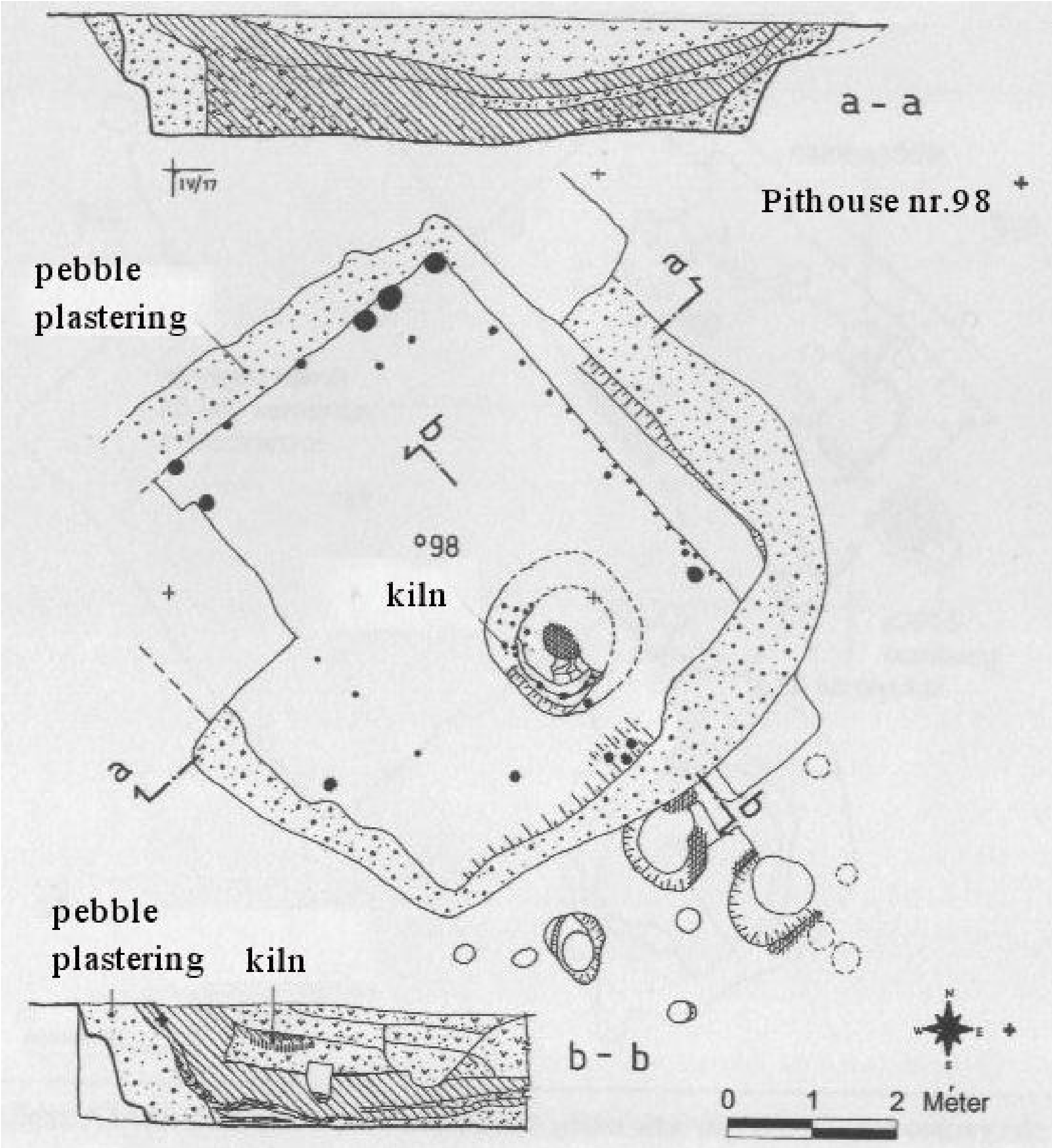


Fig.9. 14. *House nr. 98* ***(****from Pusztai, A középkori Mohi mezőváros építészeti emlékei)*

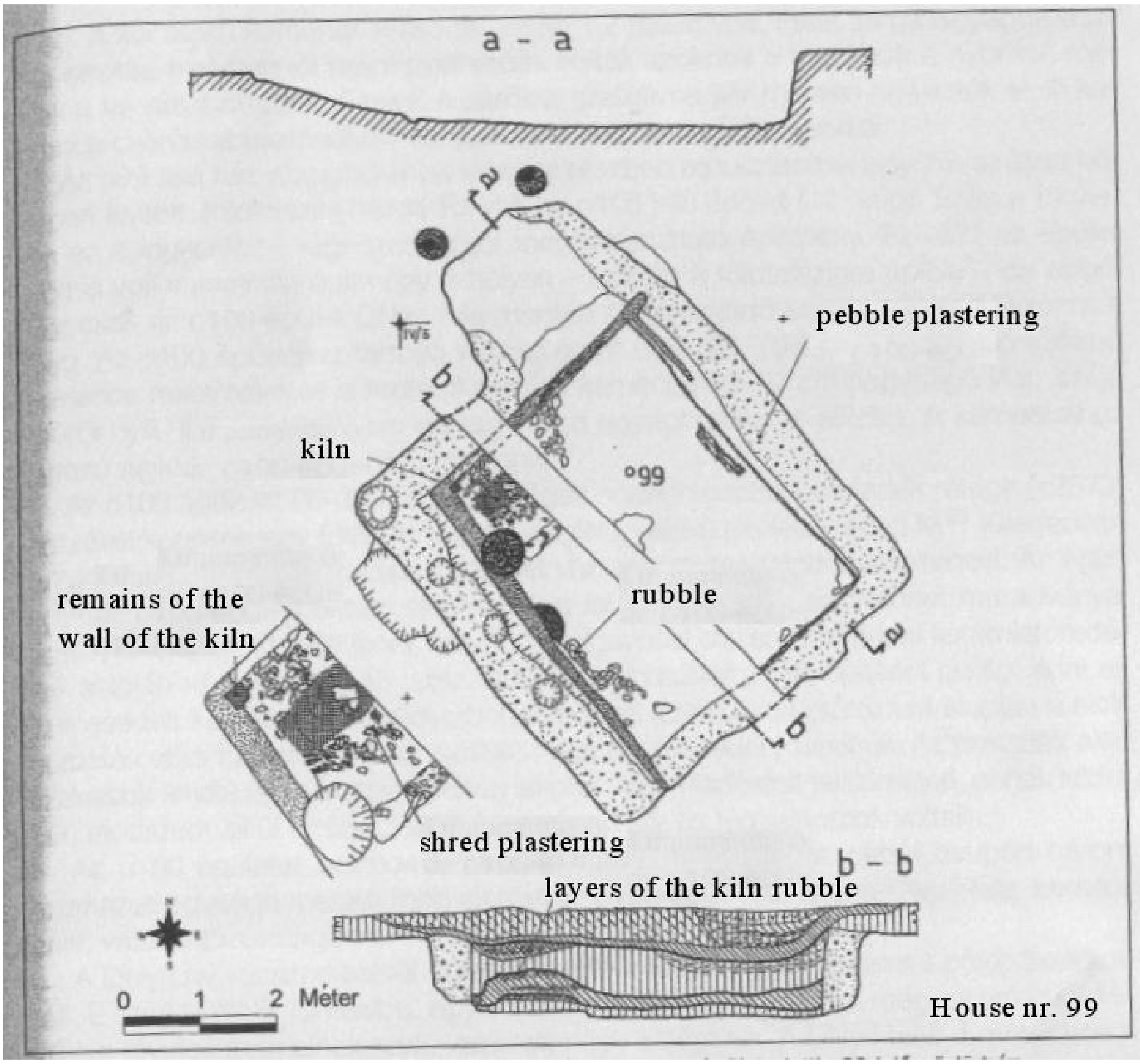


Fig. 9.15. House nr. 99 (from Pusztai, A középkori Mohi mezőváros építészeti emlékei)

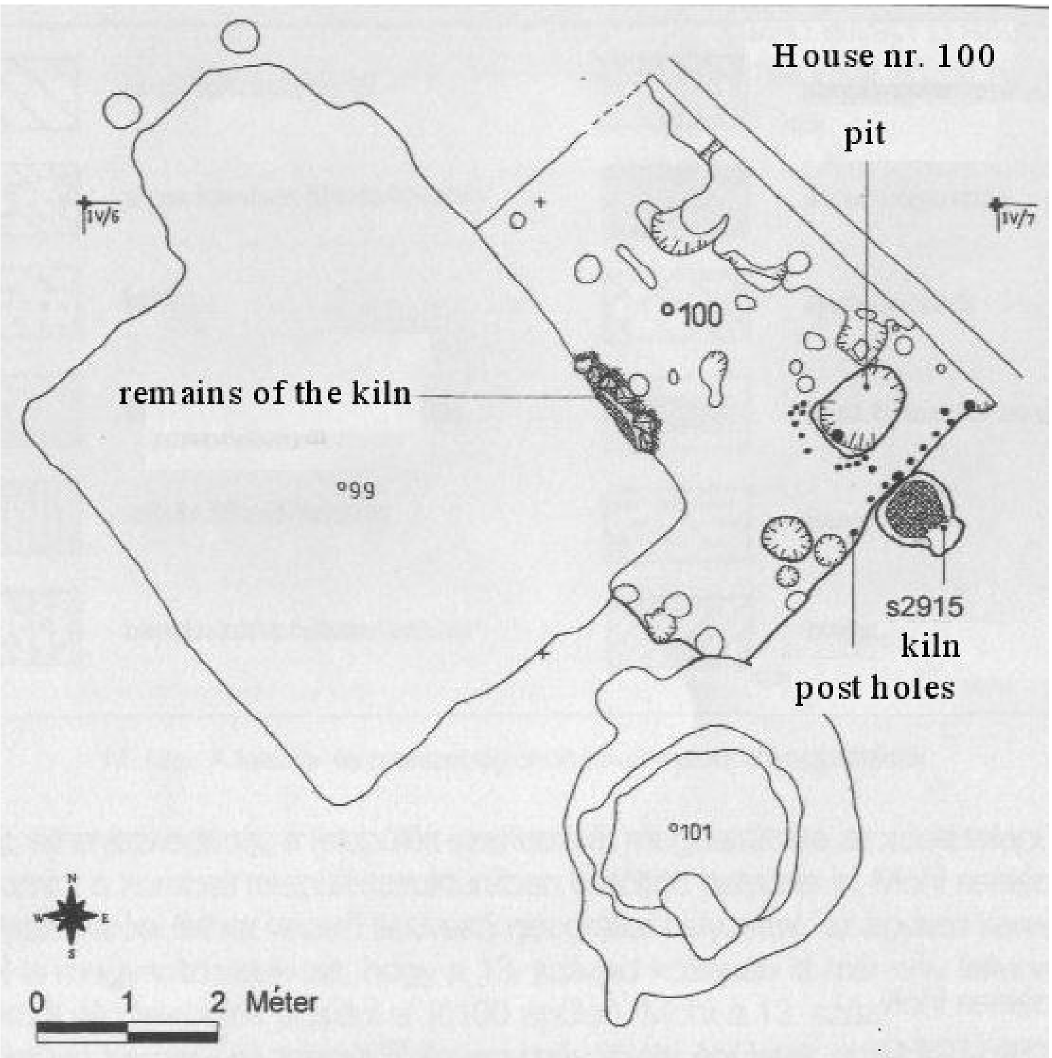


Fig.9.16. *House nr.100 (from Pusztai, A középkori Mohi mezőváros építészeti emlékei)*

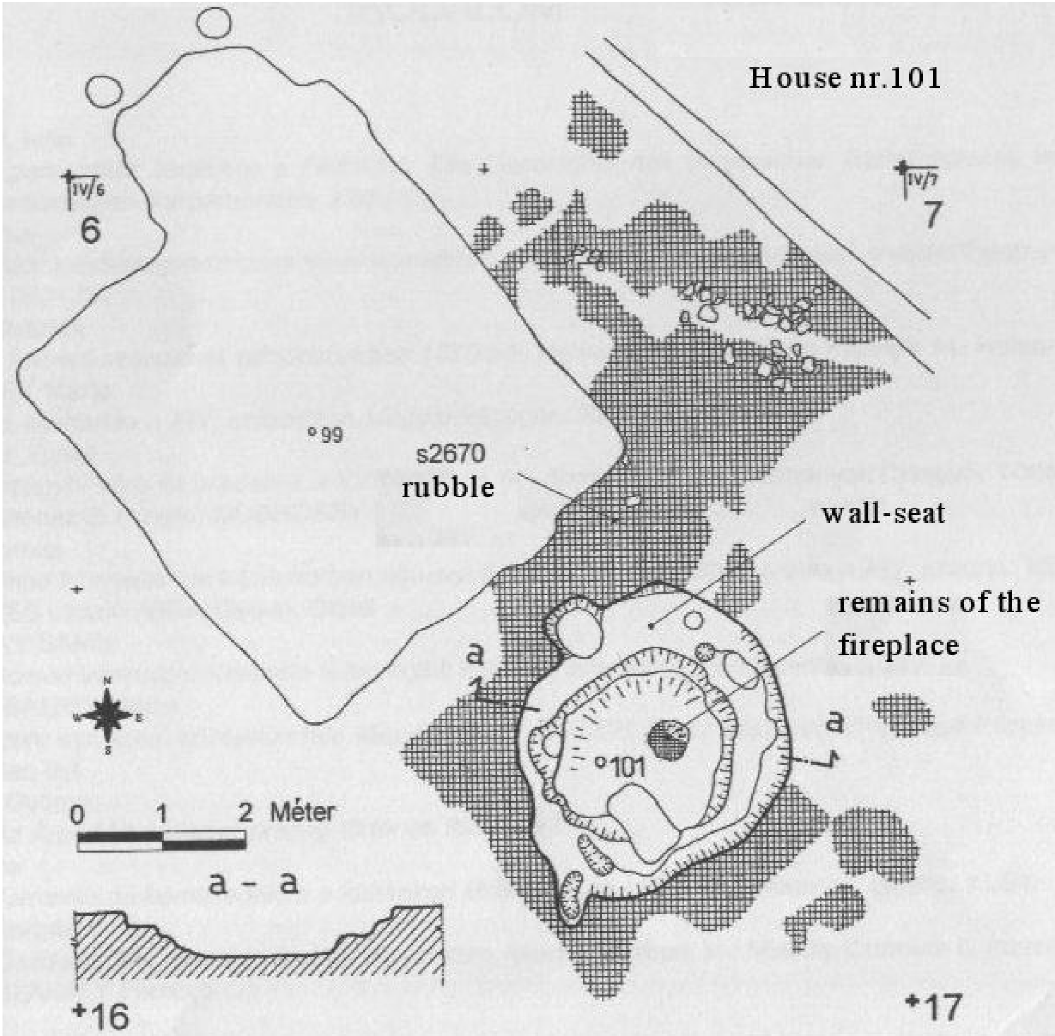


Fig. 9.17. House nr.101 ***(from*** *Pusztai, A középkori Mohi mezőváros építészeti emlékei)*

Fig. 9.18. *The wooden construction of a well in Muhi (from Zs. Visy et al. (eds), Magyar régészet az ezredfordulón (Hungarian Archaeology at the turn of the Millennium), Budapest: Nemzeti Kulturális Örökség Minisztériuma Műemléki Főosztálya, 2003)*

Fig.9. 19. *Medieval vessels and jugs in one of the wells in Muhi (from: Zs. Visy et al. (eds), Magyar régészet az ezredfordulón (Hungarian Archaeology at the turn of the Millennium), Budapest: Nemzeti Kulturális Örökség Minisztériuma Műemléki Főosztálya, 2003)*

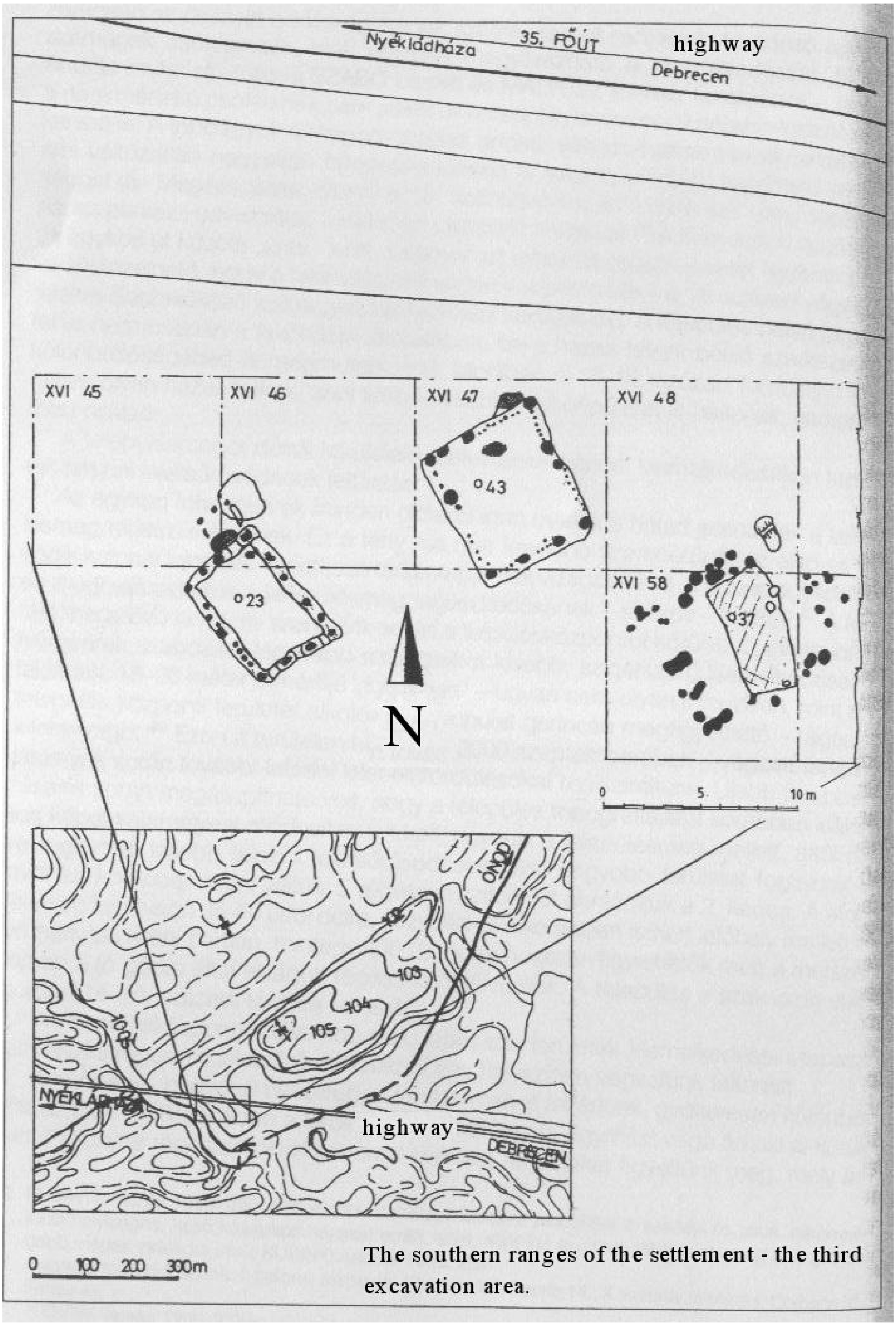


Fig. 9.20. The southern part of Muhi (from Pusztai, A középkori Mohi mezőváros építészeti emlékei)

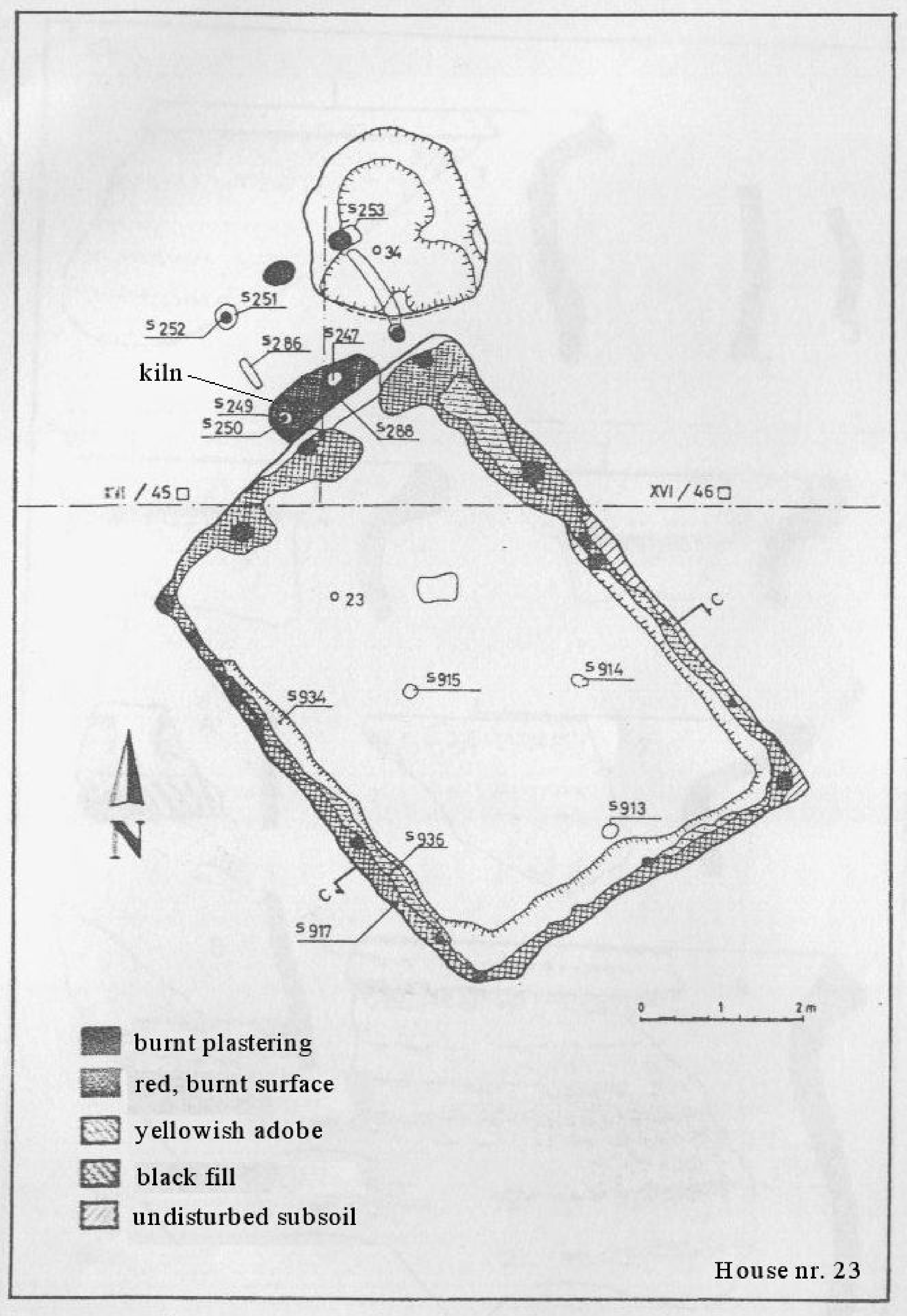


Fig. 9.21. *House nr. 23 (from Pusztai, A középkori Mohi mezőváros építészeti emlékei)*

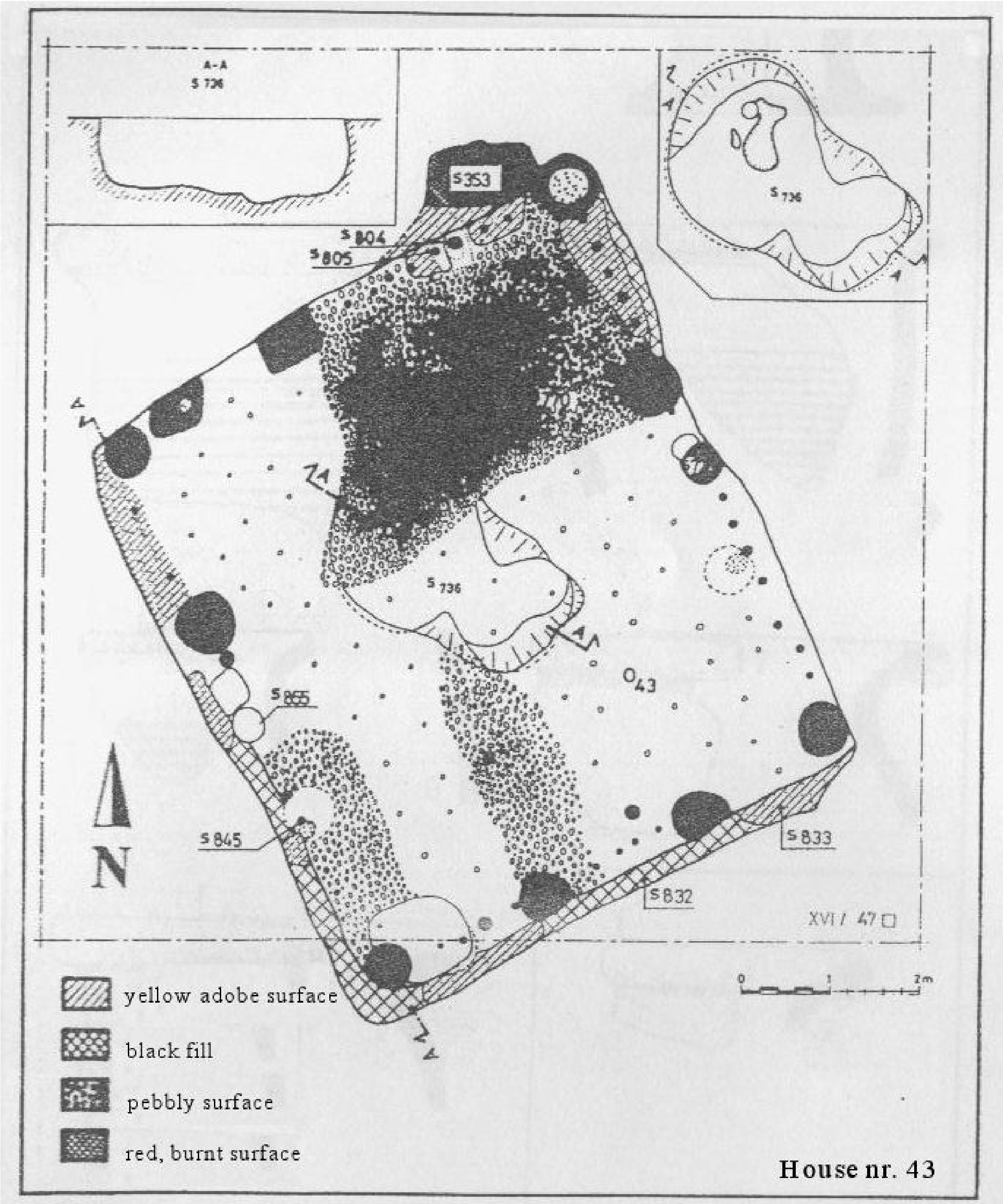


Fig. 9.22. *House nr. 42. (from Pusztai, A középkori Mohi mezőváros építészeti emlékei)*

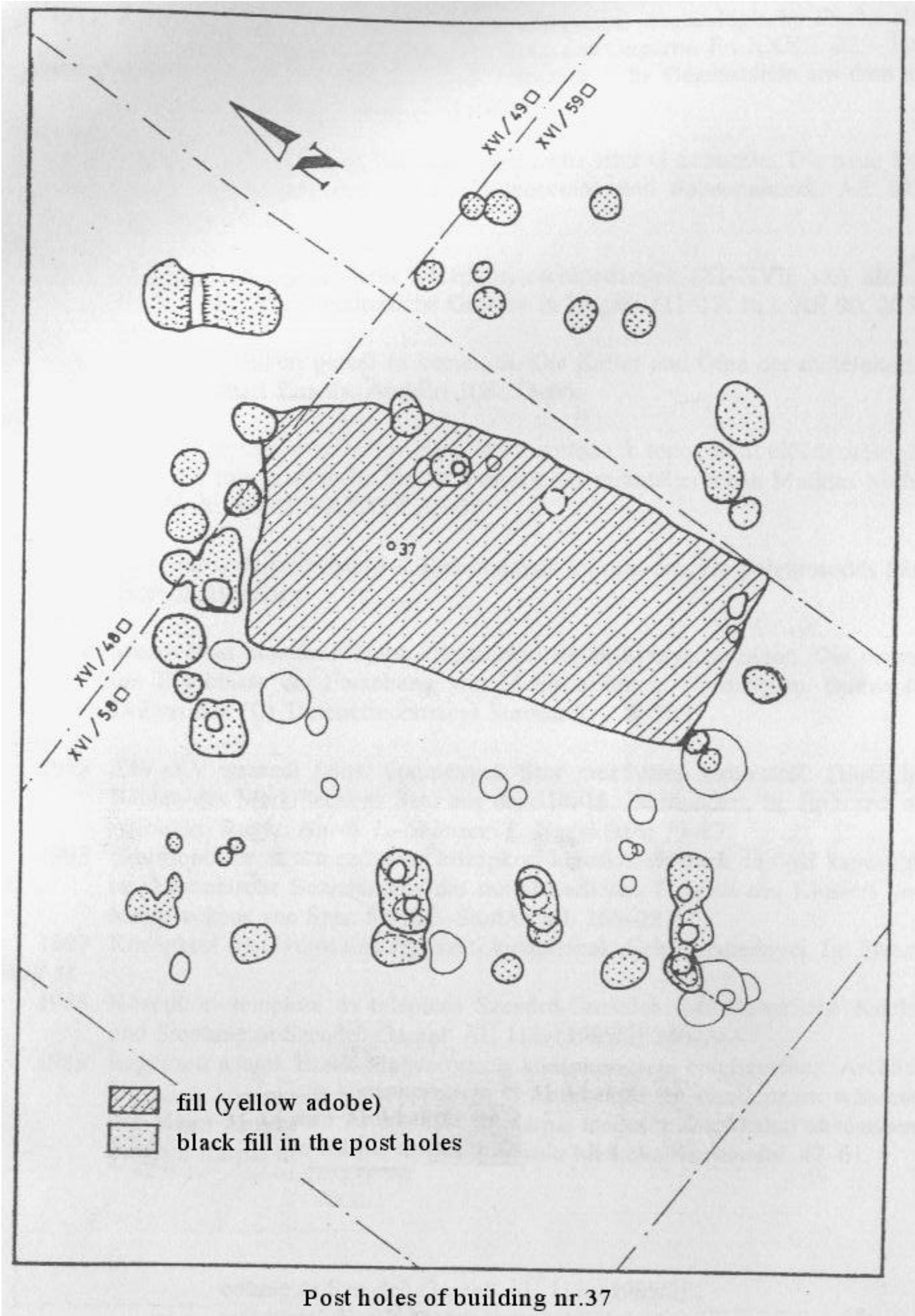


***Fig. 9.23**. Building nr. 37. (from Pusztai, A középkori Mohi mezőváros építészeti emlékei)*

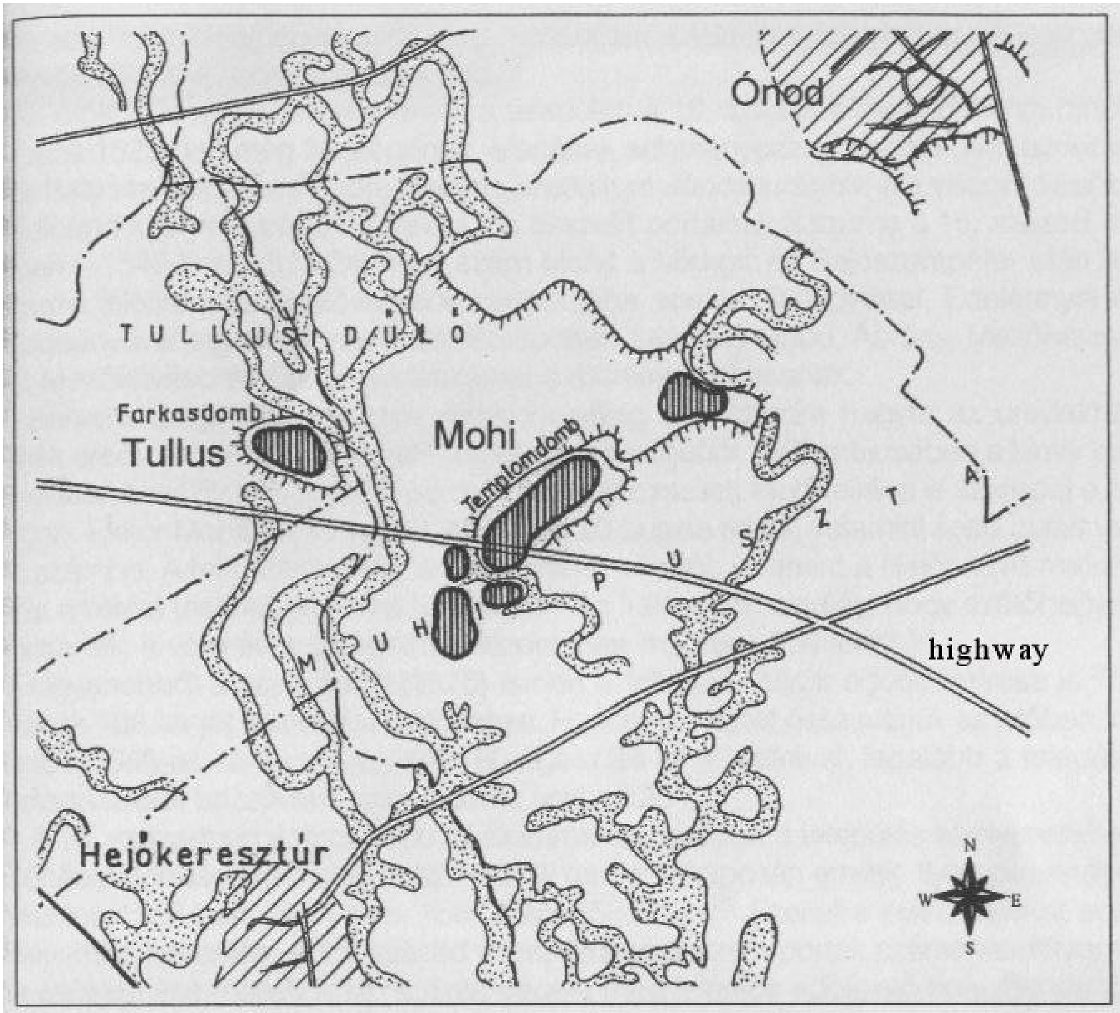


Fig. 9.24. *The watercourses south of Muhi (from Tomka, Közép- és kora újkori településrészlet)*

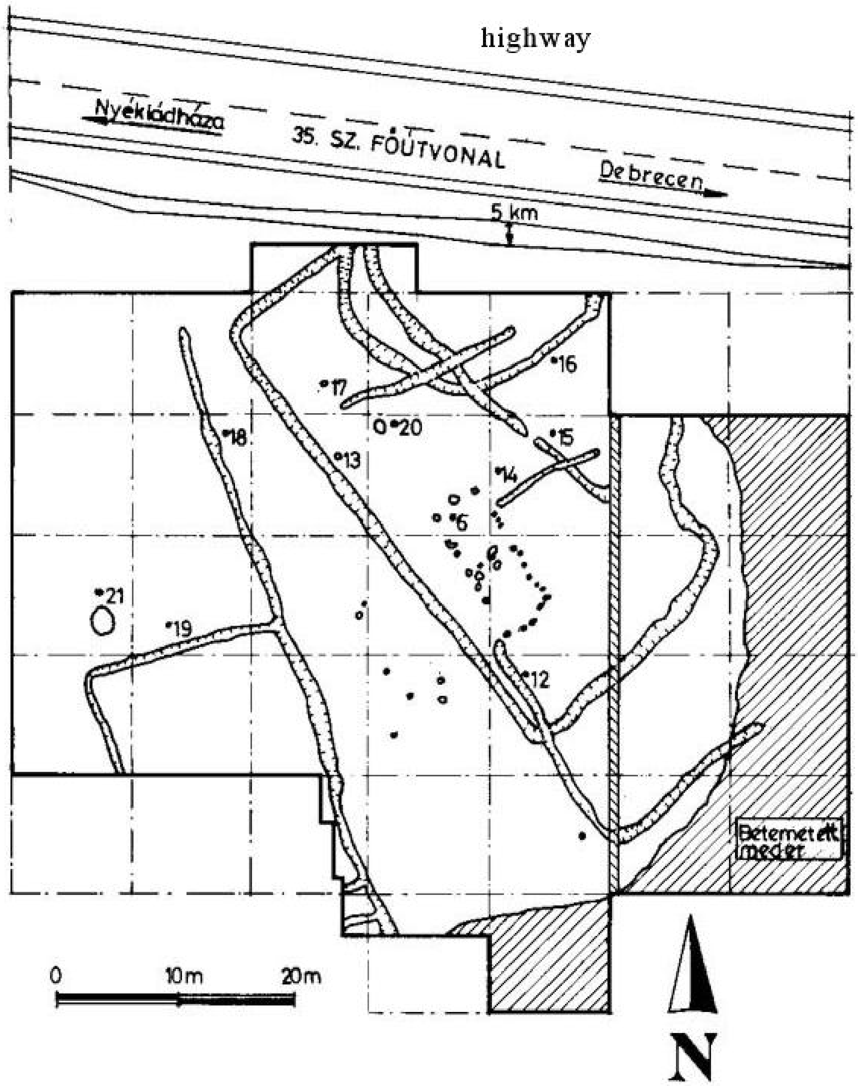


Fig. 9.25. *The third excavated area (from Tomka, Közép- és kora újkori településrészlet)*

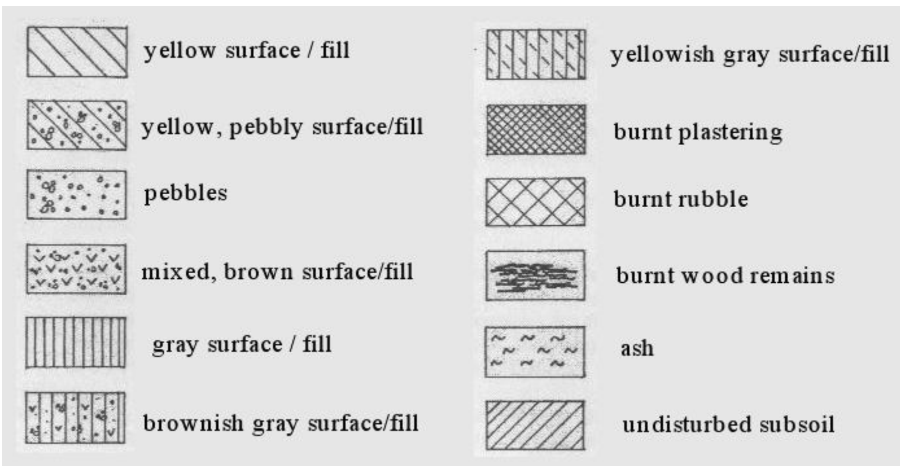


Fig. 9.26. *Additional legend for the excavation drawings from Pusztai, A középkori Mohi mezőváros építészeti emlékei*

Illustrations for Chapter 4

Fig. 9.27. *Horn core fragments of brachyceros cattle from Muhi.*

Fig. 9.28 *Pathological lesions on the proximal end of a cattle metacarpus from Muhi.*

Fig. 9.29 *Cattle metatarsus from Muhi.*

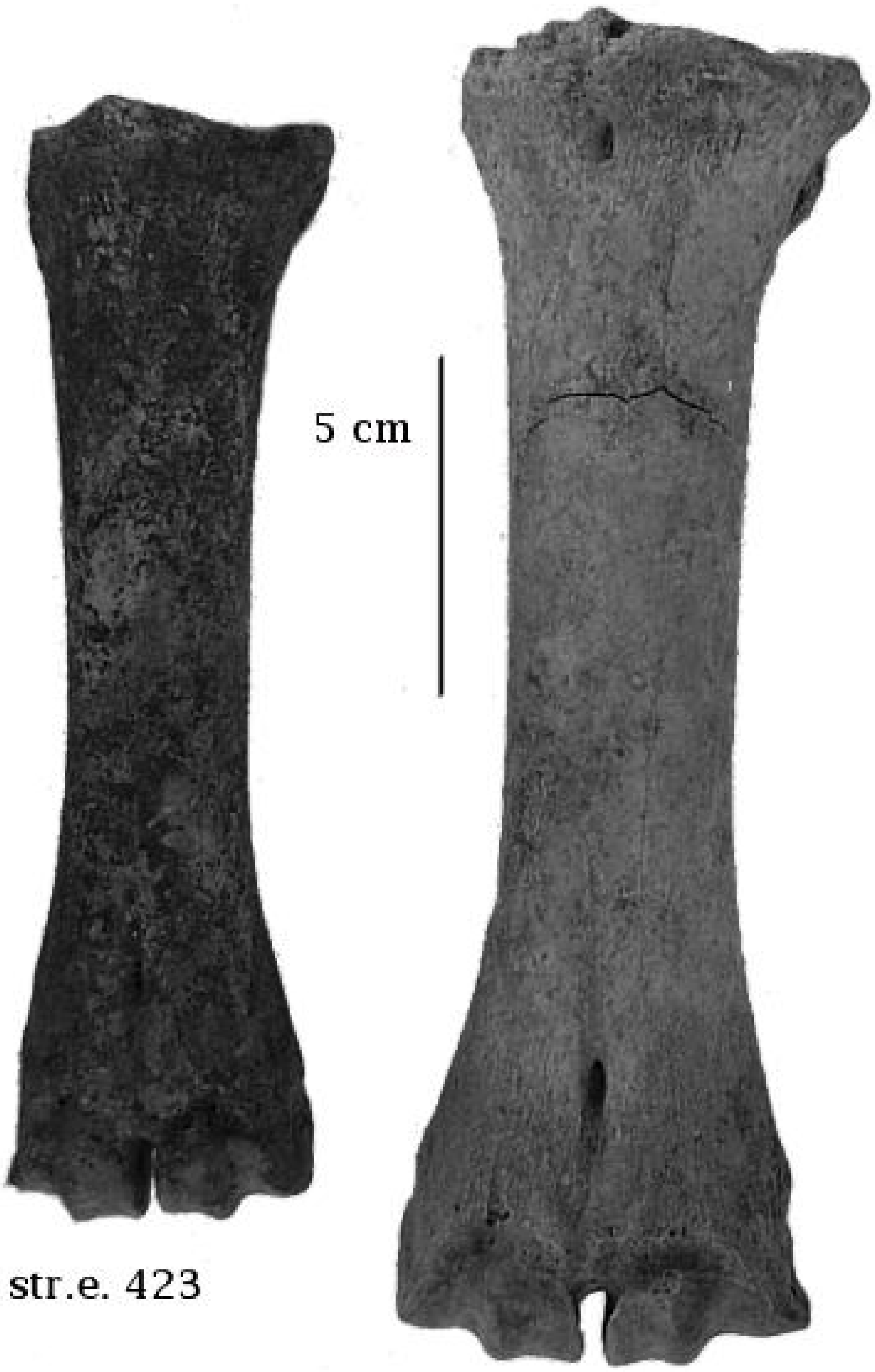


Fig. 9.30 *Size variability in cattle metacarpal bones from Muhi.*

Fig. 9.31 *Wild boar – like domestic pigs on the copper carving „The prodigious son" by Albrecht Dürer, ca. 1496 (from H. Lüdecke, Albrecht Dürer, Budapest: Corvina, 1978, Fig.70)*

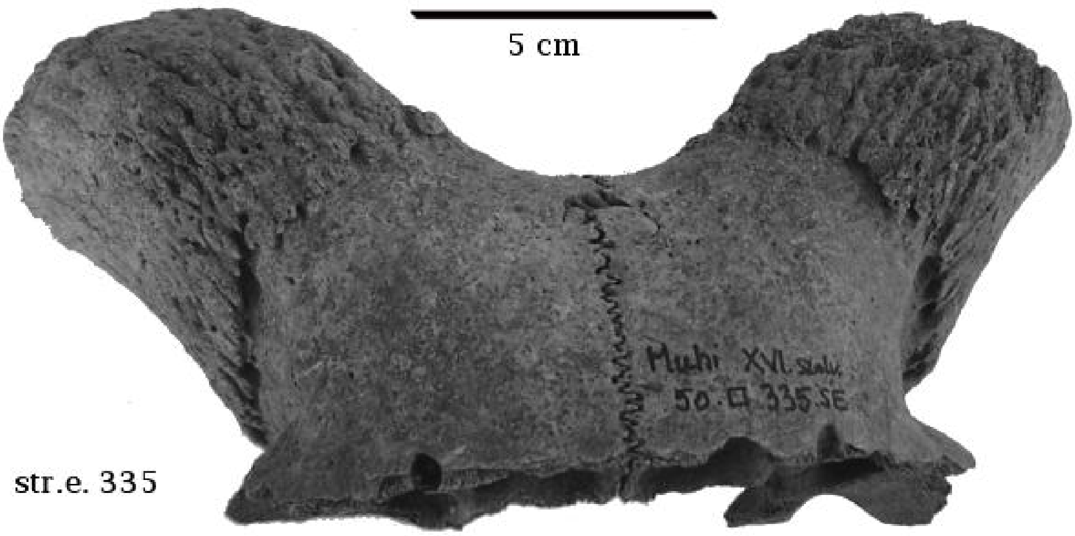


Fig. 9.32 *Horn cores of a sheep. The facial part of the skeleton was hacked off.*

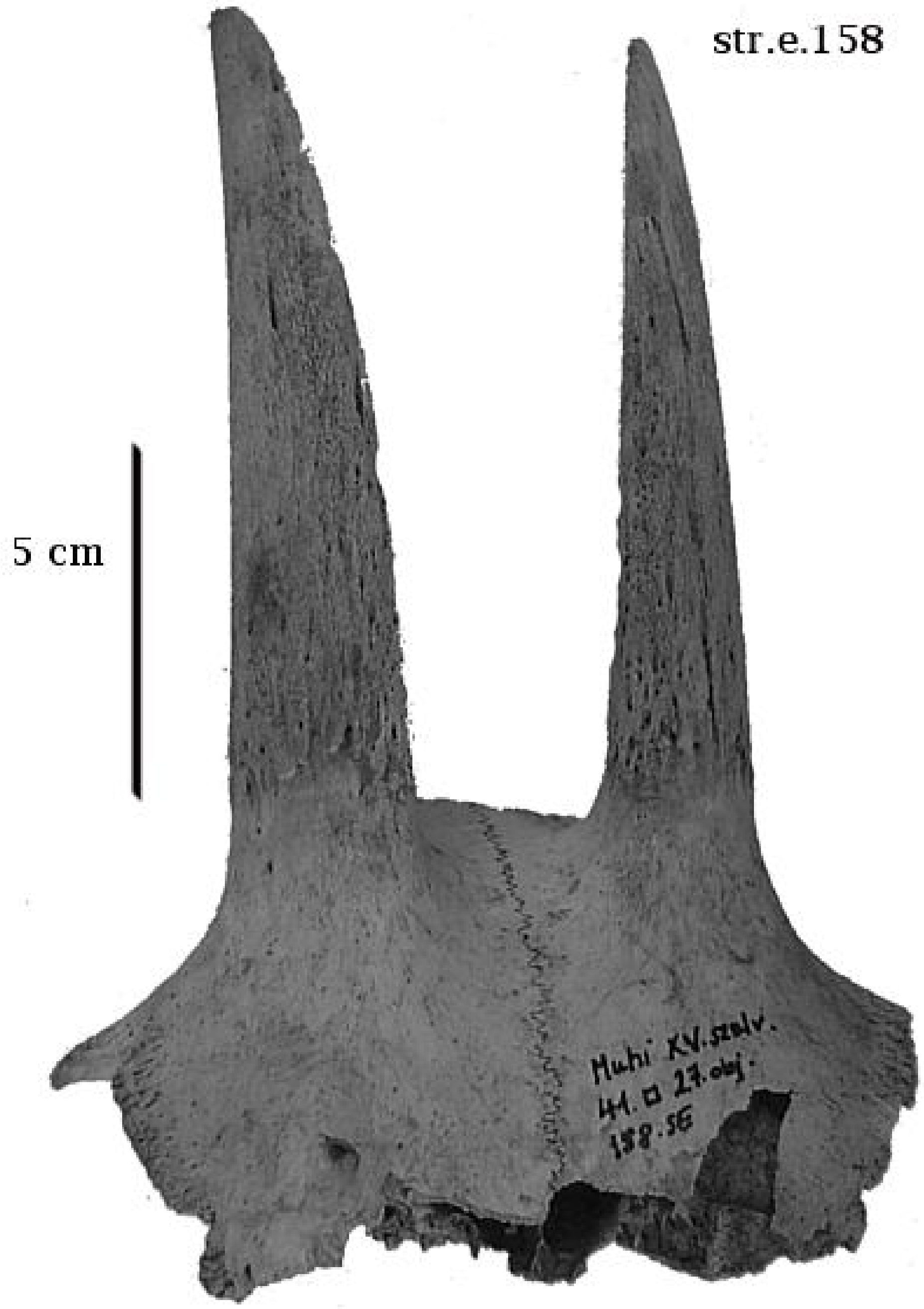


Fig. 9.33 *Horn cores of a goat from Muhi.*

Illustrations for Chapter 5

Fig. 9.34. *Sledge runner 588, made of horse radius**.** The shape of the fixing hole is clearly visible, even though the piece is broken.*

Fig.9.35 *Sledge runner 187, made of horse metacarpus**.** The piece is broken and burnt, but the flat surface which contacted with the ice is still visible.*

Fig.9.36. *The use of bone skates on ice (From Olaus Magnus' Historia, 1555; from Küchelmann-Zidarov, Let's skate together, 14, Fig. 10/a)*

Fig.9.37 *The use of bone skates as it is known from the ethnographical record: Hungarian youth on bone skates. In this case no fixing straps are used. (From O. Herman, "A beszélő szerszám" (The talking tool), In O. Herman, Halászélet, pásztorkodás (Fishery and pastorialism), 25-40, Budapest: Gondolat, 1980: 34, Fig.5)*

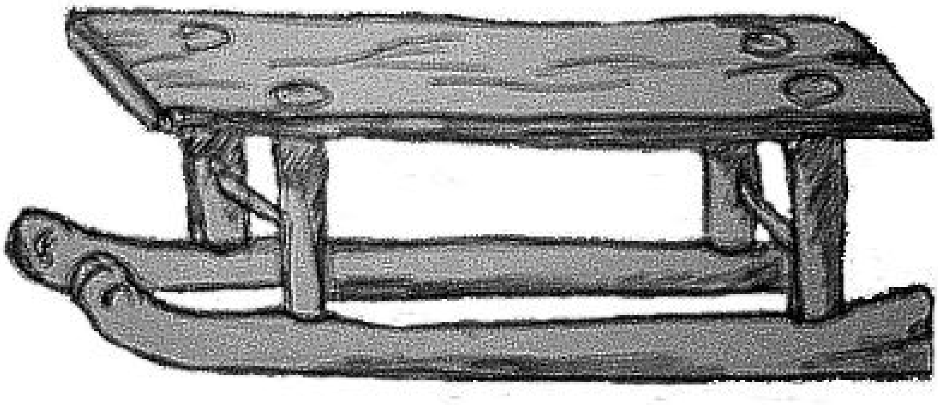


Fig. 9.38 The reconstruction of runners on the sledge, fixed by two holes on the palmar/caudal side of the bone. (Drawning by K. Lyublyanovics)

Fig.9.39. *Skate fragment 186/4, made of horse metacarpus*.

Fig.9.40. *Sledge runner 562/2, made of horse metatarsus*

Fig.9.41 *Sledge runner 562/1, made of horse radius. Traces of a former, unfinished hole are visible on the proximal end.*

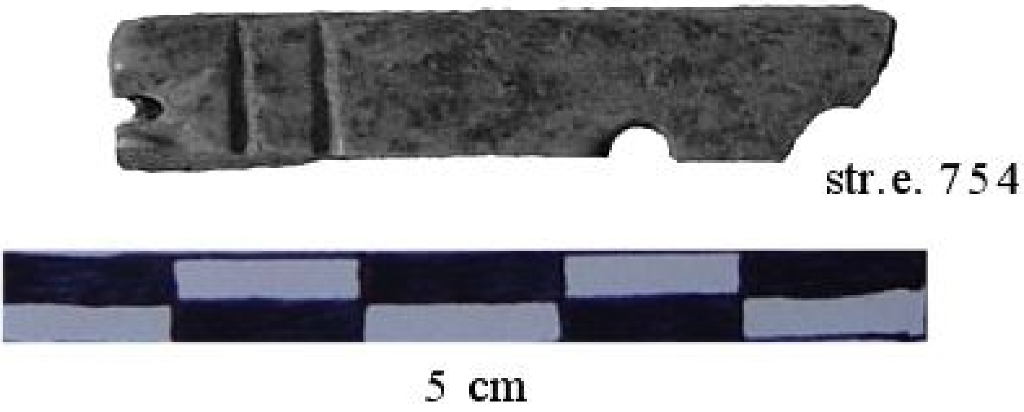


Fig. 9.42 *Fragment of a knife handle (754).*

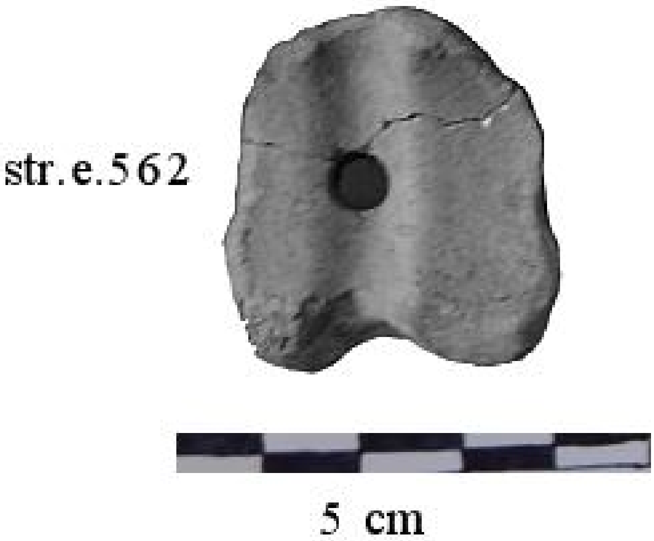


Fig. 9.43 *Gaming piece 562/3: hole on the proximal end of the phalanx proximalis of cattle.*

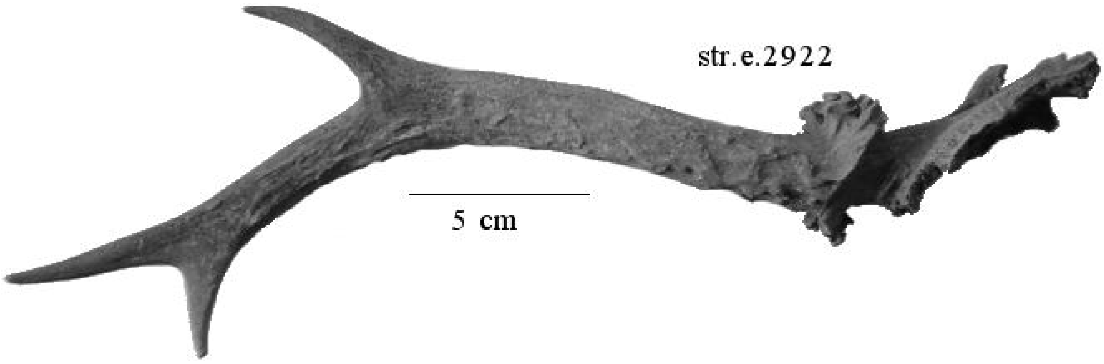


Fig. 9.44 *Roe deer antler, uncut and unprocessed***.**

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