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SUBSISTENCE, SETTLEMENT AND SOCIETY IN THE LATE BRONZE AGE OF SOUTHEAST HUNGARY: A CASE STUDY OF THE FORTIFIED SETTLEMENT AT CSANÁDPALOTA–FÖLDVÁR

ABSTRACT

Recent research has demonstrated that the southern part of the Great Pannonian Plain can be characterized by the emergence of a series of massive fortified settlements around 1300–1100 BC. This substantial change in settlement patterns indicates important social and economic transformations in the region, the nature of which, however, is still unknown. Furthermore, the function of these settlements is debated to some degree as they have not yet yielded substantial domestic remains (houses) so that their interpretations as refugia or ritual centres is also possible. We address this issue through the analysis of the remains of the subsistence economy from Csanádpalota-Földvár, Southeast Hungary. We present the preliminary results of the palaeobotanical and archaeozoological analyses, complemented with the study of agricultural macrolithic implements. The results are then compared to those from other contemporary sites in the Carpathian Basin and Southeast Europe. The exploitation of animals follows a general Bronze Age pattern in the region. Plant cultivation shows more diversity in the period. It seems that the practices at Csanádpalota follow wider European trends in some aspects, whereas they diverge considerably in others. Both types of remains as well as macrolithic tools confirm the presence of special depositions at the site that were probably the result of ritual activities.

INTRODUCTION

Around 1300 BC at the beginning of the middle phase of the Late Bronze Age according to Hungarian terminology (corresponding to BD-HA1), significant changes occurred throughout the Carpathian Basin, manifesting themselves in various forms: rich warrior tumulus graves such as in Čaka, Western Slovakia (Točík/ Paulík 1960), large cemeteries and ritual monuments such as in Lăpuş, Northwest Romania (Kacsó et al. 2011) or a series of fortified sites in various regions, e.g. in Transdanubia (e.g. Bándi 1982) or in the southern part of the Great Pannonian Plain (the area of modern Csongrád and Békés Counties in Hungary and Arad and Timiş Counties in Romania). These changes all indicate important political, social, economic and ideological transformations.

One of most visible pieces of evidence for the transformations occurring around 1300 BC is the appearance of a large number of fortified settlements within a fairly easily definable region: in the so-called Békés-Csanád loess plateau north of the Maros River in Southeast Hungary and the plain area of the Banat, between the Maros/Mureş, Tisza/Tisa and Timiş rivers in Southeast Hungary and Northwest Romania. In Hungary, some of them have been known for a long time and were even excavated some time ago (e.g. Orosháza–Nagytatársánc; Banner 1939). Nevertheless, a series of such sites has been identified recently in Békés County, mostly through aerial reconnaissance and field surveys, and in some cases through

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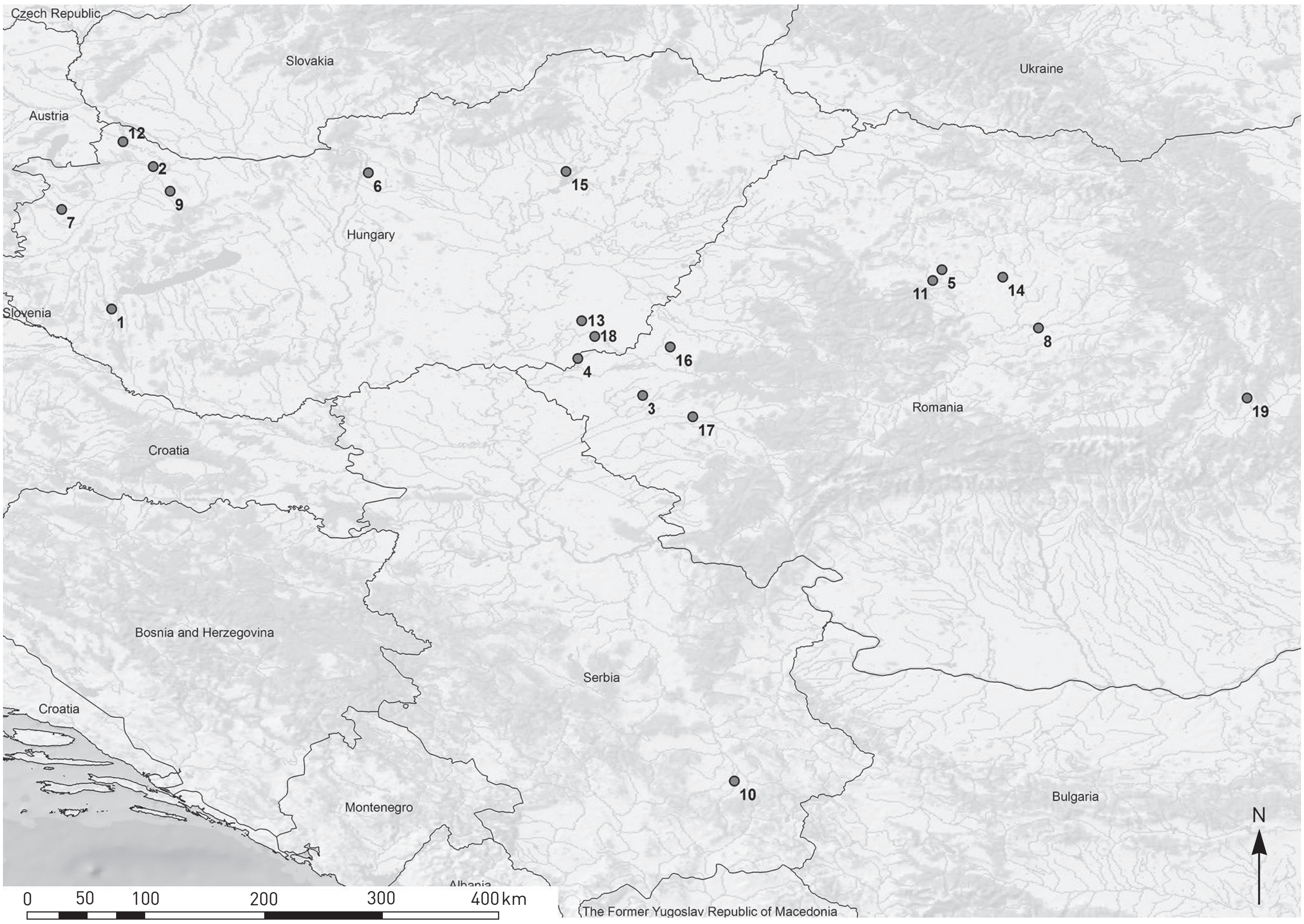

Fig. 1. Sites mentioned in the text: 1. Balatonmagyaród–Hídvégpuszta, 2. Börcs–Paphomok-dűlő, 3. Corneşti–Iarcuri, 4. Csanádpalota–Földvár, 5. Deuş, 6. Dunakeszi–Székes-dűlő, 7. Gór–Kápolnahalom, 8. Iernut–Sfântu Gheorghe–Monument, 9. Kajárpéc–Pokolfa-domb, 10. Leskovac–Hissar, 11. Mera, 12. Mosonmagyaróvár–Német-dűlő, 13. Orosháza–Nagytatársánc, 14. Pălatca–Togul lui Mândruşcă, 15. Poroszló–Aponhát, 16. Sântana–Cetatea Veche, 17. Topoloăţu Mare, 18. Végegyháza–Zsibrik-domb, 19. Zoltan.

smaller excavations (e.g. Végegyháza–Zsibrik-domb; Lichtenstein/Rósza 2007; Milo et al. 2009; Rósza 2010). In Romania, such sites have also been known for some time, although research has recently become more focused on sites such as Sântana–Cetatea Veche (Gogâltan/Sava 2010) and Corneşti–Iarcuri (Szentmiklosi et al. 2011) (**Fig. 1**).

The aim of our article is to examine the mentioned transformations and the nature of these sites through the preliminary investigation of the evidence for subsistence economy at one of these fortified settlements near Csanádpalota (Csongrád County, SE Hungary).

Csanádpalota–Földvár (also called Csanádpalota–Juhász T. tanya) fits well into the series of these sites. Its central part was originally discovered in 2005 during surveys (Szalontai 2012), and other areas were excavated between 2011 and 2013 as part of the preventive excavations preceding the construction of the M43 highway between Makó (Csongrád County, SE Hungary) and the Hungarian-Romanian border (Priskin et al. 2013; Szeverényi et al. 2014). The excavations revealed the existence of an extensive set of ditches that enclose an approximately 400 ha large area (**Fig. 2**). The excavated ditches were usually ca. 1.5–2 m deep and 4–7 m wide (**Fig. 3**). They were, however, part of a much larger system of ditches and ramparts that are clearly visible from the air, on Google Earth images or aerial photos (**Fig. 4**). From these images, it is possible to reconstruct the original form of the enclosures. There is an oval central area surrounded by a double ditch and a rampart. It is enclosed to the south by two concentric semi-oval ditches that run into the close by stream. These are, in turn, enclosed by

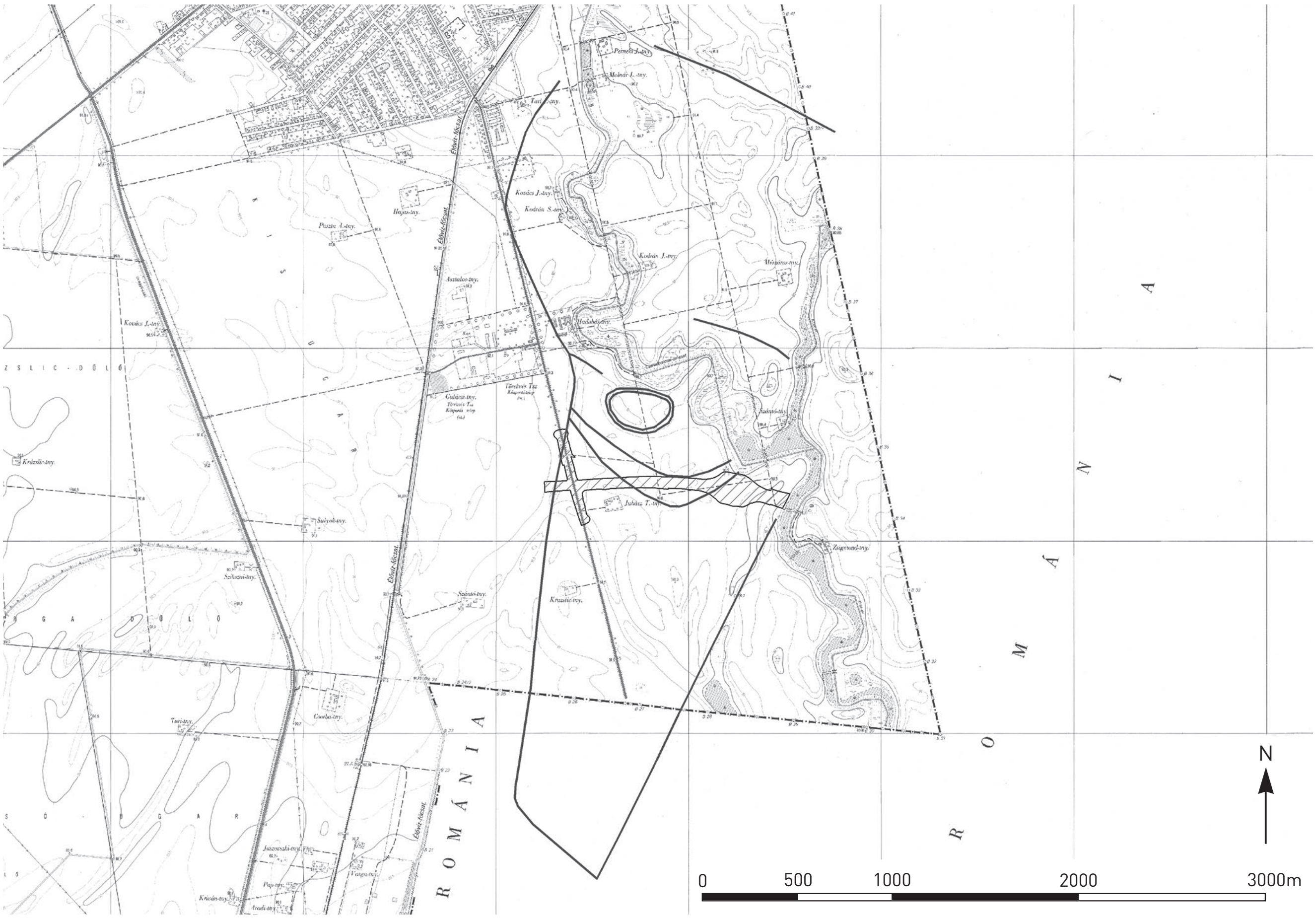

Fig. 2. The line of fortifications at Csanádpalota–Földvár (black line) and the excavated area (hatched area).

a long linear ditch that runs between the modern villages of Csanádpalota and Nagylak: it starts south of the former, runs to the south for ca. 2.5 km and then turns back in an angle to run into the above mentioned Krakk Creek (Fig. 2). The site yielded characteristic Late Bronze Age material of the so-called Pre-Gáva period (Trogmayer 1963; 1992; V. Szabó 1996; 2004a), with close affinities to Cruceni-Belegiš II material (Gumă 1997, 61–74, 133–144; Szentmiklosi 2009). Radiocarbon dates place the occupation of the settlement to ca. 1380–1120 BC.

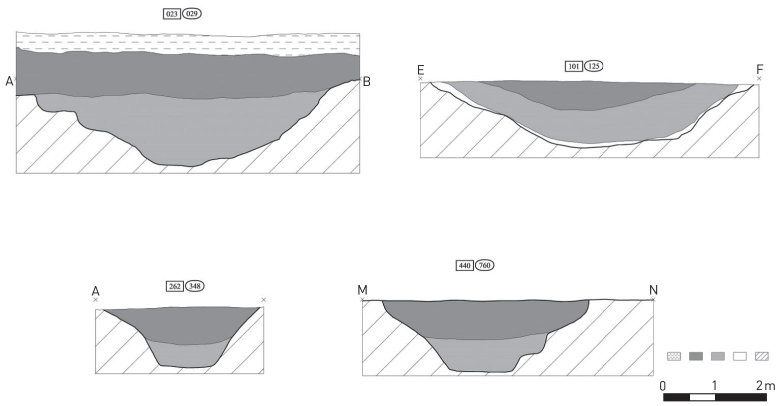

Fig. 3. Section of the LBA ditches 23, 101, 262 and 440 at Csanádpalota–Földvár.

THE CHARACTER OF THE OCCUPATION

Despite the increasing amount of available data from these sites, their function and the character of the occupation remain uncertain. There is obviously considerable variation among them regarding their size and the structure of the ditches and ramparts, and possibly regarding function as well. At one end of the spectrum, smaller sites, such as Végegyháza–Zsibrik-domb, have an area of ca. 1 ha and a

Fig. 4. Ditch 23 and its continuation outside the excavated area from the air.

Fig. 5. Sântana–Cetatea Veche (jud. Arad, Romania), LBA fortified settlement (satellite image from Google Earth).

simple oval ditch surrounding them. At the other extreme, large sites, such as Csanádpalota (ca. 400 ha), Sântana (217 ha) (**Fig. 5**) and Corneşti (1722 ha) (**Fig. 6**), have complex, multiple ditches and ramparts. At first glance, the system of large fortifications indicates a defensive function: the ditches are large enough and have a V or U section with ramparts – in case they are observable at all – on the inside (Fig. 3; for Sântana and Corneşti see Gogâltan/Sava 2010, 37 figs. 33–34 and Szentmiklosi et al. 2011, 823 fig. 4). These are the basic criteria for the identification of ditches and ramparts as fortifications with a defensive purpose (Keeley et al. 2007, 58–62). However, other interpretations are possible as well and in many cases such a function has recently been questioned for good reason (e.g. Hill 1995; Szeverényi/Kulcsár 2012, 291–292). It seems that all cases have to be evaluated individually (Harding 2006; Harding et al. 2006).

In the case of the large settlements, the length of the external ditches is so long, e.g. ca. 4 km N–S length at Csanádpalota or almost 18 km perimeter at Corneşti, that they are practically indefensible. A defensive function is conceivable only with regard to the innermost ditches and ramparts at all of these sites. On the other hand, the external ditches are often monumental, thus they are much larger than needed for pens or drainage systems.

To this we can add the issue of the lack of houses and built structures. No houses suitable for dwelling have been identified at any of these sites. Geophysical surveys at Corneşti (Szentmiklosi et al. 2011, 827–832 figs. 11–14) and at Csanádpalota do indicate the presence of Late Bronze Age features, but mostly pits. None of the magnetic anomalies can be identified as a house. At Csanádpalota, 96 Late Bronze Age features were unearthed between 2011 and 2013, including 29 ditches, 64 pits and three undetermined contexts. While these yielded abundant archaeological material, it remains unclear whether these are simple domestic features or something else. Many of the pits seem to contain special material, which might be interpreted as structured depositions (Richards/Thomas 1984; Garrow 2012). This material cannot be understood as simple domestic refuse, but was rather the result of deliberate deposition and may have been connected to various ritual activities and feasting.

One of the best examples is Pit 474, which was round, slightly irregular, about 3 m in diameter and 1.5 m deep (**Fig. 7**). It contained a large amount of finds that were deposited in layers. These could be identified and documented during the excavation and the finds of the layers and the soil samples from them were kept separately. The lowest layer included remains of burning and a large ashy patch that contained large amounts of botanical remains. It contained more than 400 sherds that belonged to at least 34 different vessels, most of which belonged to the category of fine ware, although coarse ware containers were also represented. The pit yielded bones of cattle, sheep or goat, an almost complete skeleton of a young sheep not in anatomical order from one of the layers, and the bones of pigs, dogs, and hare. Based on the calculated minimum number of individuals, the amount of meat represented by the deposited bones is almost 600 kg. With regard to botanical remains, this was the pit that contained the highest amount of common wheat, 745 seeds, accompanied by some compact wheat and einkorn. This may indicate that the pit contained a series of special depositions, the remains of recurring depositional practices, separated by some time.

Based on our preliminary analysis, we suggest that these depositions, and some of the depositions in other pits and ditches, were the remains of special activities: rituals or feasts. This leads us to the hypothesis that many of the features and finds excavated at the site may not be the remains of everyday domestic activities. As a consequence, the site may not have been a simple, continuously occupied domestic site, as also indicated by the lack of houses, but may perhaps be interpreted as a fortified ritual centre, where a larger community gathered from time to time to carry out various rituals.

If this is indeed the case, we may expect that the analysis of evidence indicating subsistence economy – in our case flora, fauna and macrolithic tools – would show if these, in one way or another, diverge from the usual patterns observed in the Late Bronze Age of the Carpathian Basin.

ARCHAEOZOOLOGICAL ANALYSIS

The Late Bronze Age features of Csanádpalota–Földvár yielded numerous faunal remains, primarily animal bones, which allow the reconstruction of the exploitation of animals at the site.

Fig. 6. Corneşti–Iarcuri (jud. Timiş, Romania), LBA fortified settlement (satellite image from Google Earth).

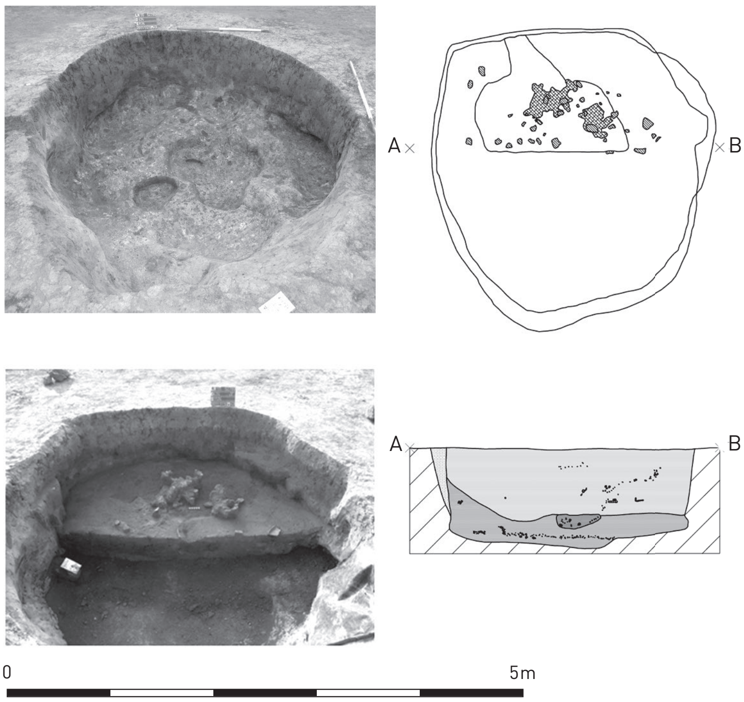

Fig. 7. Layers of depositions in Pit 474.

Methods

The primary aim of the archaeozoological analysis of the Bronze Age faunal remains is to reconstruct the modes of animal exploitation at the site, while the remains of wild animals, rodents, birds, molluscs and fish help to reconstruct the environment. In order to achieve this, we need to describe the remains found at the site (species, body parts, side, measurability, biometric description – e.g. withers height, anthropogenic and environmental impact, pathological changes, and age) in detail and analyze them with various methods. The statistical evaluation of the wild and domestic skeletal remains was based partly on M. Kretzoi's categorization of natural anatomical regions, partly on H.-P. Uerpermann's categories of meat quality, complemented with the estimated minimum meat values based on I. Vörös' publications (Vörös 2005; 2007).

According to Kretzoi's method, the lack or dominance of certain bones and the separation of animals represented by all body parts from those represented incompletely provide important information on the mode of the exploitation of the animals. The division of animal bones according to body parts and the evaluation of the quantity of bones representing certain body parts show if the animal was carried into the settlement as a whole or just in parts. An even distribution of body parts indicates local slaughtering; incomplete skeletons indicate that an animal was brought to the settlement in parts. The lack of terminal bones also indicates the transport of animal parts from outside, while their dominance suggests that their skin was carried into the settlement (Kretzoi 1968; Vörös 2007).

Based on Uerpermann's analysis, it is possible to differentiate between three categories of meat quality, taking into account that the quantity and quality of meat on various parts of the animals is very different (Kretzoi 1968; Uerpermann 1974, 310). As a result of this examination, we can draw conclusions about the eating habits and meat consumption of the given population, bearing in mind that the high, middle or low "nourishment value" of the given part of an animal is culturally specific and changes considerably over space and time. Nevertheless, the combination of the two methods is an important part of complex zooarchaeological analysis (Vörös 2007).

According to the animal remains amassed through human activity, we may calculate the Minimum Number of Individuals (MNI), which provides information on animal husbandry practices and the minimal number of specimens in the given species. The calculation of the MNI, however, is speculative and always has a margin of error due to taphonomy and subjectivity. Consequently, it has to be handled with caution (Bartosiewicz 2006, 158–159).

The results of osteometric and biometric investigations yield information on the stature and sex of a given specimen. Pathological deformities indicate forms of exploitation (traction), environmental impact and the characteristic diseases of the species. Anthropogenic and environmental impacts may indicate the forms of animal exploitation (nourishment, tool making, etc.) and the cause of death of the specimen.

Results

Most of the animal bones recovered from Late Bronze Age features belong to domestic species, complemented by a small amount of bones of three hunted species, and bone fragments of birds and rodents (**Fig. 8**): horse (*Equus caballus*, Linné 1758), cattle (*Bos taurus*, Linné 1758), pig (*Sus domesticus,* Linné 1758), sheep/goat (*Ovis aries/Capra hircus*, Linné 1758), dog (*Canis l. familiaris,* Linné 1758), deer (*Cervidae sp. indet*), roe deer (*Capreolus capreolus,* Linné 1758), European hare (*Lepus europaeus*, Pallas 1778), Aves sp. indet. and Rodentia sp. indet. (Tóth 2013).

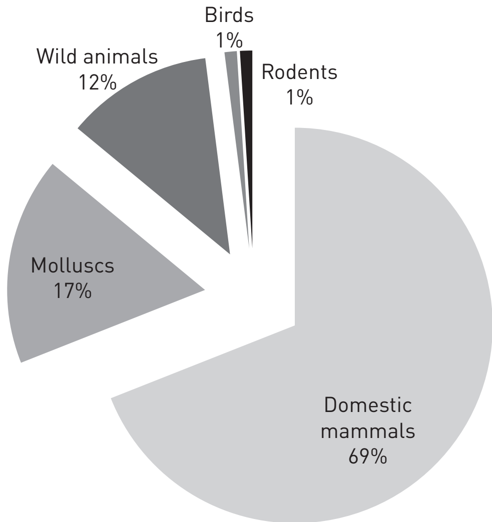

Fig. 8. Distribution of faunal remains from LBA features at Csanádpalota–Földvár.

The distribution of the remains of economically exploited animals found in pits and ditches is very similar despite the fact that 64 % of the faunal remains came from ditches. The largest amount of bones belongs to cattle and sheep/goat, followed by pigs. Horse and dog are represented in smaller numbers. Based on the Minimum Number of Individuals (MNI), however, their order is different: cattle, horse, pig, sheep/goat and dog. Mature, adult, subadult and juvenile individuals were all present, indicating multiple ways of exploitation. The minimum amount of meat from domestic animals is 2302 kg. This does not contain the amount of horse meat that may have been consumed as well (Tóth 2013).

More than 50 % of the domestic animal remains belong to Uerpermann's low meat quality category; the rest belongs to high and medium quality categories. The same is true if we use Kretzoi's 59 % belong to the head and terminal bones and 41 % to the meat rich trunk, meat rich and "dry" limb regions. Terminal bones are comprised of phalanges and sesamoid bones, and their presence indicates local processing, just like the presence of the bones of the head region, e.g. broken skulls and a large amount of teeth (Tóth 2013; Vörös 2007).

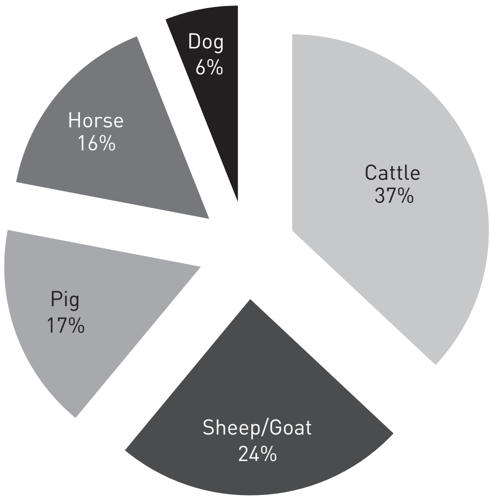

Fig. 9. Distribution of domestic mammals from LBA features at Csanádpalota–Földvár**.**

Cattle (*Bos taurus*, Linné 1758) remains comprise 37 % of domestic animal remains (**Fig. 9**). The area of the Late Bronze Age fortified settlement yielded adult, subadult and juvenile exemplars as well. Most of the remains were found in the ditches. Terminal bones are also represented, indicating that processing was carried out at least partly on the site. The remains of young cattle indicate summer and autumn mortality. Signs of processing are observable on a few bones (e.g. metatarsus split into two to remove marrow). With the help of bones suitable for estimating withers height, specimens of small to medium stature (1000.5–1165.3 mm) can be identified. Smaller size is at least partly the consequence of juvenile age (Matolcsi 1970; Tóth 2013, Vörös 2007).

A large number of horse (*Equus caballus*, Linné 1758)) remains have been identified from the site. They are represented by both juvenile and mature exemplars and comprise 15 % of domestic species (Fig. 9). Traces of cutting on the bones, indicating consumption and skinning, have not been observed. Complete skeletons, however, are missing and the dominance of bones with quality meat in the features does imply that horse meat was consumed. Horse bones were not suitable for the estimation of withers height (Tóth 2013, Vörös 2007).

The number of the remains of sheep and goat (*Ovis aries/Capra hircus*, Linné 1758), exploited for multiple purposes (wool, meat, milk), exceeds that of pigs (24 %) (Fig. 9). In terms of MNI, however, they lag behind pigs. The excavated bones belong to Uerpermann's low and medium-high categories in the same ratio. Young sheep/goat about half a year old indicate end of summer or autumn mortality. With the help of bones suitable for estimating withers height, specimens of small to medium stature (587.4–681.7 mm) can be identified (Teichert 1975; Tóth 2013, Vörös 2007).

The number of pig remains (*Sus domesticus*, Linné 1758), exploited for meat and usually slaughtered at a young age, barely exceeds that of horses (17 %) (Fig. 9). The number of finds from low meat quality areas or the head region is high. The amount is roughly the same as that of bones from high to medium meat quality regions. Based on the estimated MNI it is second after cattle among the domestic animal species at the site. Some of the bones were suitable to estimate withers height: they indicate large specimens (675.5–750.5/825.4 mm) (Teichert 1969; Tóth 2013, Vörös 2007).

The number of dog (*Canis l. familiaris*, Linné 1758) remains is low (5 %) (Fig. 9). The remains were unsuitable to calculate withers height.

Among wild animals, red deer, roe deer and hare were hunted. Red deer remains were found in the largest numbers, but its high value is caused by the large extent of antler fragmentation. Based on the MNI analysis and age distribution, adult and juvenile red deer (1-1), an adult roe deer, and an adult European hare were identified. They yielded a minimum amount of 388 kg meat. Red deer processing was probably carried out within the settlement as well, since the bones of all body regions were found scattered in the features. Obviously, the remains of the same specimen could have been deposed in multiple features (Tóth 2013, Vörös 2007).

94 % of the bones of hunted animals belong to red deer (*Cervus elaphus,* Linné 1758), complemented by a small amount of roe deer (*Capreolus capreolus*, Linné 1758). Both even-toed ungulates prefer recovering areas (after woodcutting or forest fires), forest steppe, and smaller forests rich in nourishment. The most suitable environments were floodplains, close to water courses. The analysis of meat quality shows the presence of large amounts of low meat quality regions, indicating processing within the settlement (Tóth 2013, Vörös 2007).

The number of European hare (*Lepus europaeus*, Pallas 1778) bones is small. Their presence indicates hunting and consumption. Their usual habitat of European hare is arable land and gardens neighbouring fields and forests.

Based on the investigation of environment sensitive molluscs (mussels and snails), we can establish that a large amount of snail shells has been found, among which *Fruticicola fruticum* (Müller 1774) lives on the banks of smaller water courses and deciduous forests, and climbs up on plants, just like the thermophilic *Cepaea vindobonensis* (Férussac 1821) and *Helix pomatia* (Linné 1758).

The reconstruction of the hydrology of the environment is possible through the shells of four freshwater mussel species: painter's mussel (*Unio pictorum*, Linné 1758), swollen river mussel (*Unio tumidus*, Linné 1758), thick shelled river mussel (*Unio crassus*, Philipson 1788) and an Anodonta species (*Anodonta* sp. indet, Lamarck 1799). They indicate primarily slow running water courses or still water with periodic flooding and stronger currents. Their nutritional value is not very high, but may have served as a complimentary food source. Since the settlement was surrounded by a system of ditches, it is possible that the mussels indicate that the ditches were filled with water for defensive purposes. This may contribute to the scattering of freshwater species. Fish bones were not found in the material, but the wet sieved samples have not yet been analyzed from an archaeozoological point of view.

In light of the whole faunal material, burning can be identified as an environmental impact and traces of bone tool manufacture and food processing as an anthropogenic impact. Rudimentarily worked bones were unearthed primarily from pits. Traces of cutting and working support the interpretation of the remains as kitchen waste.

The use life of the features can be placed to the summer and autumn, based on the half-a-year-old sheep/goat. The killing of pig (from 6-month-old to 3.5-year-old) and cattle (about 1-year-old to 3.5-year-old) must have been continuous. Thus, although the number of juvenile and subadult specimens is large, we cannot draw any unequivocal conclusions regarding mortality (Vörös 2007).

ARCHAEOBOTANICAL ANALYSIS

Despite the character of the preventive excavation at Csanádpalota–Juhász T. tanya (Földvár), a systematic sampling of soil was carried out in order to enable archaeobotanical analysis. Consequently, altogether 184 samples were collected from 118 contexts. It was important to examine all the features of various types (functions): pits, ditches, ovens and their surroundings and wells.

Methods

The samples were weighed before wet sieving. The average weight was 10–15 kg; the largest sample was 38 kg, the smallest (from a vessel) was 68 g, while the smallest individually collected charcoal was 4 g. The soil samples were wet sieved in a flotation basin. The "light fraction" floating on the water was collected in a sieve with a 0.4 mm mesh, while a net in the basin collected the "heavy fraction" material. After careful drying, both fractions were weighed and selected under a binocular-stereomicroscope. Zoological remains (snails, small bone fragments) that made up the majority of the material were separated for further analysis.

Charcoal and charred food remains were similarly set aside for later examination.

During the analysis, non-charred plant remains were also recovered, including: A*juga chamaepitys, Amaranthus sp., Capsella bursa-pastoris, Carduus acanthoides, Chenopodium album, Ch. hybridum, Conium maculatum, Convolvulus arvensis, Datura stramonium, Galium aparine, Glaucium corniculatum, Heliotropium europeum, Hibiscus trionum, Hyoscyamus niger, Leunurus marrubiastrum, Melampyrum album, Morus sp., Papaver rhoeas, Polygonum convolvulus, Sambucus ebulus, Sambucus nigra, Setaria viridis, Setaria glauca, Sorghum halpense, Stachys annua,* and *Urtica dioica*. Such non-charred, sub-fossil plant remains are usually found in wet-logged contexts (wells, ditches), where the water cover preserves the organic material. At Csanádpalota-Juhász T. tanya, however, this was not the case. Furthermore, the vegetation period of the non-charred plant species coincided mostly with the timespan of the excavation. Consequently, these plant remains cannot be considered to have been contemporaneous with the charred remains of the Bronze Age fortified settlement, and should be regarded as modern intrusions.

The summary of the biological remains can be seen in **figure 10**. 34 % of the samples contained only faunal remains. Another 15 samples (8 %) also contained charcoal, 7 samples (4 %) contained charcoal and food remains. 54 % (100 samples) yielded seeds and fruits. Ignoring non-charred remains and those not identifiable to a taxon, charred fragments and identifiable carpological remains occurred in only 37 % of the samples.

Results

The archaeobotanical analysis is based on 69 samples with charred plant macro-remains (seeds and fruits). A general characteristic of the material is that the seeds and grains were very badly preserved and porous. In many cases, the species or even the genus could not be determined. During the analysis, 32 species or taxons could be identified with 2063 specimens. The distribution of plant species is shown in **figures 11–12**.

The majority of the botanical finds is represented by the diaspores of domestic plants. The remains of almost all cereals known from the period have been found (**Fig. 13**), although only in a small quantity compared to the number of the samples (**Fig. 14**). The most frequent

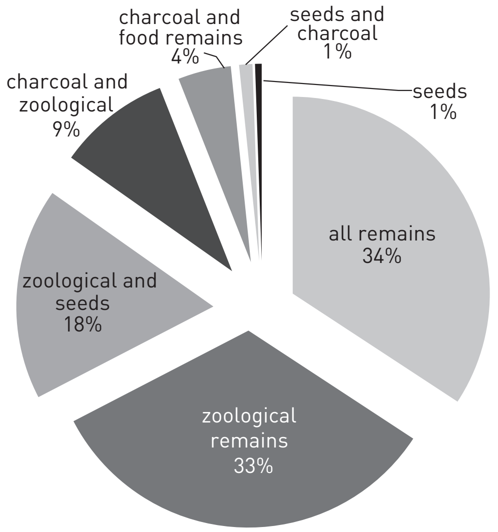

Fig. 10. Distribution of organic remains in flotation samples from LBA features at Csanádpalota–Földvár.

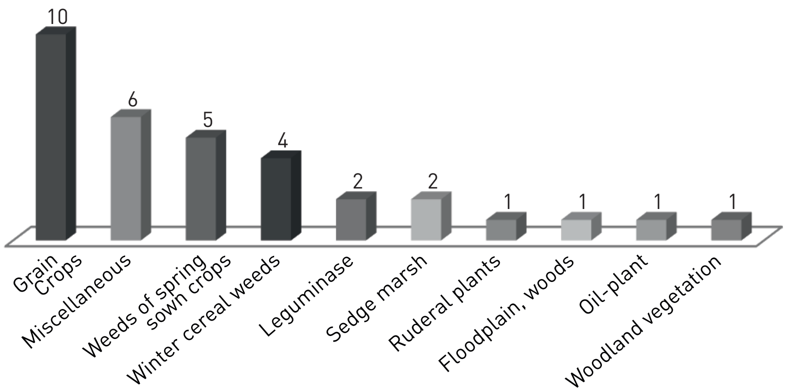

Fig. 11. Number of plant species from LBA features at Csanádpalota–Földvár.

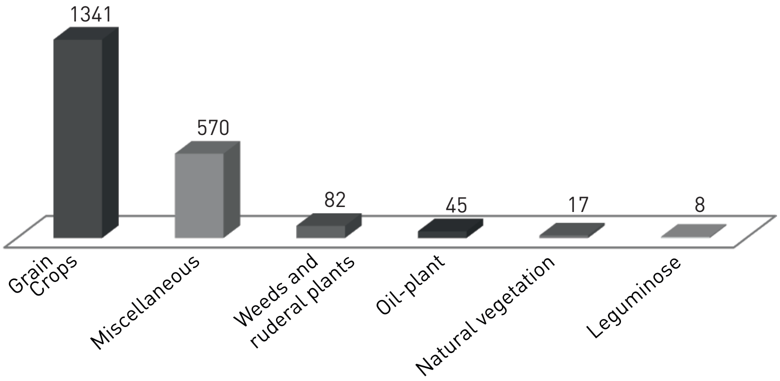

Fig. 12. Number of plant remains from LBA features at Csanádpalota–Földvár.

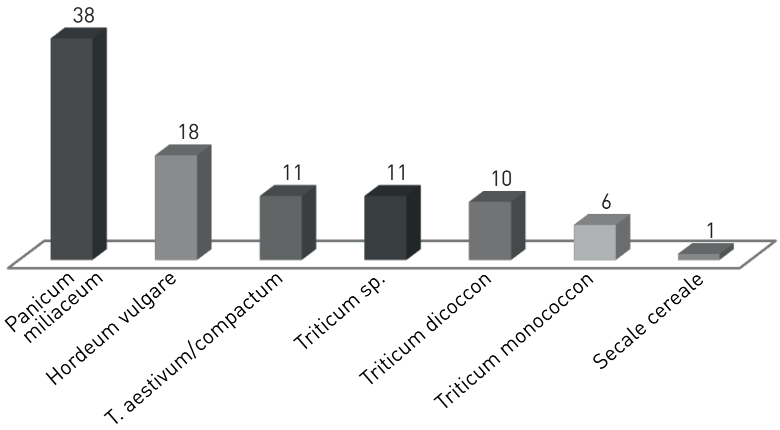

Fig. 13. Number of LBA features containing cereal remains at Csanádpalota–Földvár.

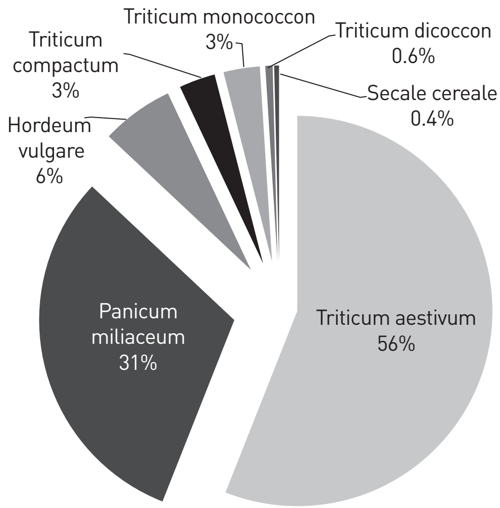

Fig. 14. Distribution of cereal remains from LBA features at Csanádpalota–Földvár.

Fig. 15. *Panicum miliaceum* from an LBA feature at Csanádpalota–Földvár.

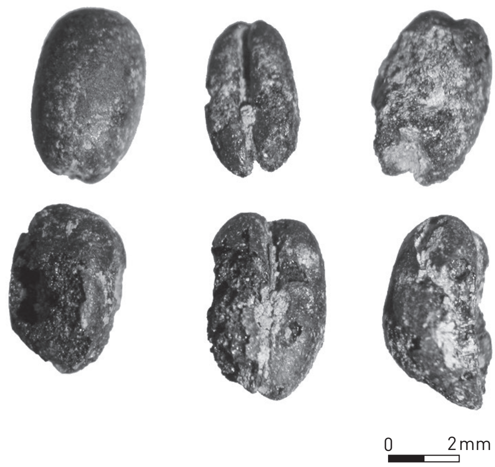

Fig. 16. *Triticum aestivum* from an LBA feature at Csanádpalota–Földvár.

finds were the grains of millet (*Panicum miliaceum*) (**Fig. 15**). Although it is not the largest group in terms of the number of specimens (367 pcs), it was present in 55 % of the samples. In all cases the "naked" grain was found and for the greater part even the sprout had fallen out. This indicates that they come from a cleaned yield. Millet is followed by barley (*Hordeum vulgare*) in 18 samples (25 % of the examined samples). The diaspores of both six-row and hulless barley were attested.

Among wheat, common or bread wheat (*Triticum aestivum*) occurred in unusually large quantities (**Fig. 16**). It was found in only nine samples, but in one of them an extremely large number, 745 pieces, were identified (sample 111, feature 474). Many grains are strongly deformed and sometimes the burnt remains of the spikelets were visible on the tip. It may be suggested that in order to avoid grain loss, the wheat had been harvested before it was fully ripe, thus the grain could have deformed more easily. The similarly hulless compact wheat (*T. aestivum* subsp. *compactum*) is represented in two samples.

Emmer (*Triticum dicoccon*), a hulled wheat most characteristic for the period, occurred in 10 samples with 11 specimens, whereas einkorn (*Triticum monococcum*) was present in six samples with 38 specimens. Another 11 samples yielded wheat grains not identifiable to the species (*Triticum* sp.).

Rye (*Secale cereale*) appeared in one sample (Sample 111, Feature 474) in insignificant numbers and is associated with bread wheat. It is surprising that wheat grains were accompanied by cleaning waste (*Triticum monococcum rachis*) in only a single sample (Sample 108/1, Feature 451/1169).

The presence of the remains of lentil (*Lens culinaris*) and pea (*Pisum sativum*) indicates some form of horticulture, but they also appear only in small numbers. Lentil was found in five samples (6 pieces), pea in two (2 pieces).

The remains of black mustard (*Brassica nigra*) found in a pit (Sample 109/3, Feature 474/834) indicate the cultivation and consumption of oil-bearing plants (**Fig. 17**). It is represented by a fairly high number of specimens among the botanical remains (45 pieces). Aside from oil extraction, mustard may have been used as a spice as well.

Some of the weeds present in the botanical material are characteristic for arable land and hoe-farming. Based on the character of the weeds, we may expect at least two annual harvests. The weeds of autumn cereals (wheat, rye, maybe autumn barley) (*Secalietea*) could be identified in only three samples. Sample 111 (Feature 474/1232) contained the remains of *Galium spurium* (3 pieces) and *Dasypyrum villosa* (23 pieces), associated with *Triticum aestivum*. In Sample 90 (Feature 426/579), one *Polygonum convulvus* diaspore could be found in addition to *Bromus secalinus* (4 pieces) and *Bromus arvensis* (5 pieces). *Polygonum convulvus* also appeared in association with rye in one more sample (Sample 76, Feature 343/523).

The species of hoe weed alliances (*Polygono-Chenopodietalia*) were identified in 15 samples, in similar amounts as wheat weeds: *Chenopodium album* (38 pieces), *Chenopodium hybridum* (3 pieces), *Lolium temulentum* (1 piece) and *Malva neglecta* (1 piece). *Chenopodium album,* found in 12 samples, yielded the largest number of specimens and is the most frequent among ruderal species.

The botanical material from the Late Bronze Age settlement also contained the diaspores of plant species from the contemporaneous environment. The number of species and specimens does not allow a comprehensive reconstruction of thanatocoenosis, but they certainly give an indication of the natural flora. Based on the ecological and plant sociological characteristics of the species, we may assume the presence of a waterlogged, swampy area (*Carex vulpina*), a wet, woodless area or meadow (*Echinocloa grus-gali, Rumex crispus, Saponaria officinalis*) and a forest edge or forest steppe area (*Teucrium chamaedrys, Prunus sp.*) in the vicinity. We are probably not far away from the truth if we assume that the Bronze Age population created its arable land in areas close to rivers.

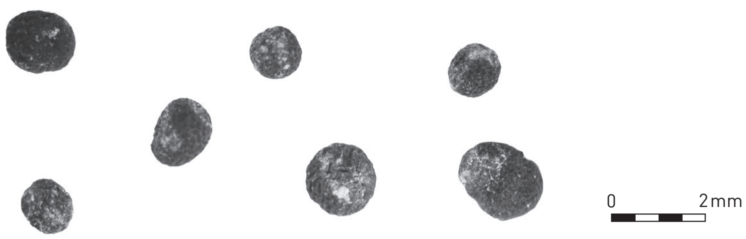

Fig. 17. *Brassica nigra* from an LBA feature at Csanádpalota–Földvár

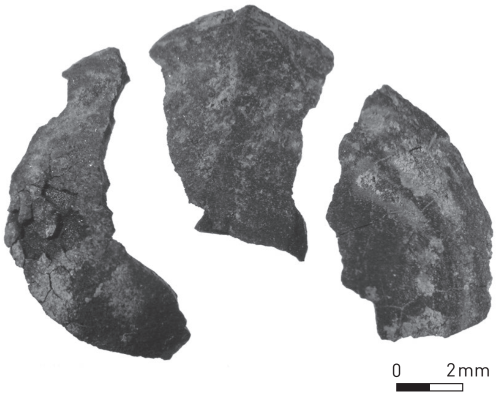

Fig. 18. Hard-shell remains of a *Prunus* from an LBA feature at Csanádpalota–Földvár.

The only fragmentary hard-shell remain from the site – based on its size and habitus – is most probably the fruit of *Prunus domestica* subsp. *insititia* (damson plum) or *Prunus cerasifera* (cherry plum) (**Fig. 18**). The hard shell of cherry plum and domestic plum (*Prunus domestica*) has already been attested in Late Neolithic and Copper Age Tiszapolgár and Lengyel contexts (Gyulai 2010, 81).

Although most samples were collected from the ditches, these did not yield most of the botanical material. Usually, only one or two species could be identified in these samples, represented by only a few specimens. In the samples collected from 17 ditches, 11 yielded *Panicum* remains, almost 65 %. Beside millet, almost all cereals were present, but pulses were missing and weeds were only represented by *Chenopodium album* in two samples. The botanical material of Sample 94 (Feature 439/1118) deserves to be mentioned: two samples were collected from this ditch segment, one from an ashy patch near a concentration of ceramic finds and one from the general fill. The latter yielded the single hard shell fruit remain of the site. Altogether 102 diaspores could be identified from this feature: beside the *Gramineae* fragments (56 pieces) that could not be identified to the species *Panicum, miliaceum* dominated here as well, associated with 3 seeds of *Hordeum vulgare* and one *Hordeum nudum*. Both hulled wheat (*Triticum monococcum* (1 piece) and *Triticum dicoccon* (1 piece)) and the free-threshing bread wheat (*Triticum aestivum* (4 pieces)) are present. The sample did not contain any weeds.

Soil samples were also collected from two deep pits interpreted as possible wells. Sample 63 (Feature 303/482) contained one millet (*Panicum miliaceum*), one barley (*Hordeum vulgare*) and three unidentifiable cereal fragments (*Gramineae*). In the other feature (153/207, Sample 30), samples were collected from three different layers. The uppermost layer yielded 2 specimens of unidentifiable wheat grain (*Triticum* sp.). From 1 m depth an einkorn (*Triticum dicoccon*) could be identified. No weeds were found here either.

Three samples were collected from the vicinity of hearths. Two samples (Samples 59/1-2) were collected from Feature 310/441, namely from its debris, the plastering and from the burnt area beside the hearth's plate. Both samples contained millet (*Panicum miliaceum*), altogether 153 pieces. In the debris of the hearth, beside a larger amount of millet, one *Chenopodium album* and one *Saponaria officinalis* seed were identified. In Feature 310/442 (Samples 60/1-2), the samples were taken from the plastering of the hearth and from an ashy area beside the hearth. Both yielded *Paniceum miliaceum* grains (51 pieces) and unidentifiable charred fragments (12 pieces). Sample 78 (Feature 390/681) came from the debris of the baking plate, and contained in addition to all the important cereals of the period (*Hordeum vulgare* (1 piece), *Panicum miliaceum* (1 piece), *Triticum monococcum* (1 piece), T*riticum dicoccon* (3 pieces), *Triticum aestivum* (2 pieces)), the seeds of pea (*Pisum sativum* (1 piece)) and white goosefoot (*Chenopodium album* (2 pieces)) as well. The number of unidentifiable cereal and other charred fragments is 153.

Most of the carpologically valuable samples came from pits (37 samples). In many cases, they contained only a single cereal grain. Some samples yielded a hoe cultivated plant with its weed, e.g. *Panicum miliaceum* and *Chenopodium album* or *Panicum, Hordeum* and *Chenopodium hybridum*, but represented only one specimen each. Most of the samples, however, contained a mixture of the diaspores of species belonging to various successions. The most frequently observed species in the botanical material of pits were also millet (177 pieces in 21 samples) and barley (77 pieces in 12 samples). The remains of pulses (*Lens culinaris* and *Psium sativum*) were found in these samples as well. Here, the material of two pits will be highlighted and compared. Sample 90 (from Feature 426/759) contained in addition to rye (*Secale cereale*) and compact wheat (*Triticum aestivum* subsp. *compactum*) all the above-mentioned cereal species as well as lentil (*Lens culinaris*) among pulses. The presence of weeds is quite conspicuous. The sample contains the grains of both autumn wheat weeds (*Bromus*) and spiky weeds (*Lolium temulentum, Chenopodium album*). Feature 474/1232 (Sample 111) yielded the largest number of remains at the site. Excepet for *Triticum dicoccon*, all the cereals are represented, bread wheat (*Triticum aestivum*) the most abundantly, and the grain of rye could be identified here for the first time. This composition of species is special as it is reminiscent of the cultivation pattern of later periods. Although the archaeological dating of the feature is unambiguous, the grains of *Triticum aestivum* have been selected for radiocarbon dating.

ANALYSIS OF STONE TOOLS FOR GRINDING

The analysis of stone tools for grinding, which were used in agriculture and food processing, can provide further information on subsistence economy at the Late Bronze Age site of Csanádpalota, complementing the information from archaeozoology and archeobotany.

Methods

So far, only a preliminary examination (primarily macroscopic analysis) of 196 pieces of stone implements from Late Bronze Age contexts has been carried out. This analysis included a categorization based on typology, the definition of function and an investigation of the relationship with botanical remains. There are very few typological studies of macrolithic tools in Hungary (e.g. Biró 1995; Horváth 2004). Consequently, typological systems elaborated in international research were used (Adams 2002; Risch 2002).

Results

45 of the Late Bronze Age features contained stone materials (macrolithic tools and raw materials of stone tools). With regard to chipped stone tools, it is a general observation that their number is low in Late Bronze Age Hungary (Horváth 2004). We found only a single core at the Csanádpalota site. On the other hand, the manufacture and use of macrolithic tools remained significant as they were often used in connection with a number of economic activities. These tools were abraders, smoothers and polishers, hammerstones and whetstones used in various craft activities, but mainly tools for grinding and pulverizing. Here, we present the preliminary results of the analysis of grinding stone tools, focusing on function and investigating the supposed connection between grinding tools and botanical remains.

Altogether 248 pieces of lithic implements were found in 45 Late Bronze Age features (ditches, pits and wells). There are 21 pieces of smoothers and abraders. Special finds include a fragment of a polished mace head and of a mould. 11 blocks of mica, probably used as tempering material during pottery manufacture, were also recovered. Furthermore, ten polishers and ten netherstones were found. 78 pieces of manufacturing waste of lithic raw materials are also among the stone finds. Most of the lithic finds, however, are grinding tools: 60 grinding slabs, 11 handstones and a pestle.

The distribution of grinding slabs in the Late Bronze features is as follows: 37 pieces were found in ditches, 22 pieces in pits and one piece in a deep pit interpreted as a well. Except for a single complete grinding slab from Feature 440 (**Fig. 19**), grinding slabs were usually found in smaller or larger fragments in the Bronze Age features. In most cases, the work surface of the grinding slabs was preserved, although sometimes only the ventral side or the distal/proximal edge remains. With regard to handstones, five pieces were found in ditches and six in pits. The pestle was found in a ditch.

Fig. 19. Grinding slab from Feature 440 at Csanádpalota–Földvár.

It was examined if there was a correlation between botanical remains and grinding stones in the Bronze Age features. There are 17 features that contained both. This would indicate that most of these tools might have been used to process grain or other foodstuffs. It seems that there are only few botanical remains from ditches, whereas the number of grinding stone tools is the highest in this type of feature (28 pieces). The number of ditches containing both botanical remains and grinding stones is rather low (**Table 1**). In four ditches (Features 101, 262, 348 and 440) 1, 13, 1 and 15 botanical remains were found, respectively, while Feature 101 contained 9 grinding stones, Feature 262 contained 8, Feature 348 contained two and Feature 440 contained 10 pieces as well. We have more abundant material from pits: 12 features contained both botanical remains and grinding stones (Table 1). Altogether there are 11 grinding slabs and five handstones from pits. The number of botanical remains is 85.

It is worth mentioning that some macrolithic tools and grinding stones have traces of burning on their surfaces (**Fig. 20**).

Table 1. Association of grinding stones and botanical remains in LBA features at Csanádpalota–Földvár.

Feature number	Feature type	Macrolithic tool type	Botanical remains
101/125	ditch	grinding slabs (9)	*Panicum miliaceum* L. (1)
262/348	ditch	grinding slabs (6), handstones (2)	*Panicum miliaceum* L. (11), *Graminae* fragments (2)
328/480	ditch	grinding slab (1)	*Hordeum vulgare* L. (1), *Triticum* sp. (2)
440/760	ditch	grinding slabs (8), handstone (1)	*Gramineae* fragments (7), *Panicum miliaceum* L. (1), *Hordeum vulgare* L. (1)
440/1167	ditch	grinding slab (1)	*Gramineae* fragments (3), *Triticum dicoccon* Schrank (2), *Triticum* sp. (1)
44/51	pit	grinding slab (1)	*Panicum miliaceum* L.(3) *Triticum* sp. (1)
153/207	pit	grinding slab (1)	*Triticum dicoccon* Schrank (1), *Triticum* sp. (1)
268/354	pit	handstone (1)	*Panicum miliaceum* (3), *Triticum aestivum* (1), *Triticum dicoccon* (1), *Triticum* sp. (4), *Graminae* fragments (32)
330/482	pit	grinding slab (1)	*Hordeum vulgare* (1), *Panicum miliaceum* (1), *Graminae* fragments (3)
348/531	pit	grinding slabs (2)	*Gramineae* fragments (6), *Hordeum vulgare* L. (1)
388/656	pit	handstone (1)	*Gramineae* fragments (9), *Panicum miliaceum* L. (2)
390/658	pit	grinding slab (1)	*Hordeum vulgare* L. (2), *Triticum* sp. (3)
407/685	pit	grinding slab (1)	*Triticum* sp. (1)
418/696	pit	handstone (1)	*Gramineae* fragments (2), *Hordeum vulgare* L. (1), *Triticum monococcum* L. (1)
421/699	pit	grinding slab (1), handstone (1)	*Triticum* sp. (1)
426/731	pit	grinding slabs (2)	*Gramineae* fragment (1), *Triticum aestivum* L. (1)
447/766	pit	handstone (1), grinding slab (1)	*Gramineae* fragments (2)

DISCUSSION

The results of the archaeozoological analysis show that animal exploitation at Csanádpalota followed a "classical" Bronze Age pattern in the Carpathian Basin: cattle dominate, followed by sheep/goat and pigs. Animals of all age groups are attested, which indicates the exploitation of secondary products as well. When compared to other, roughly contemporary sites, we cannot find significant deviations. **Figure 21** shows a comparison of nine Late Bronze Age sites in the Carpathian Basin. We have data mostly from the Transdanubian and Transylvanian sites: Kajárpéc–Pokolfa-domb, Börcs–Paphomok-dűlő and Mosonmagyaróvár–Német-dűlő (Choyke/ Bartosiewicz 1999) in Hungary and Iernut-Sfântu Gheorghe-Monument (Golgâltan 2009; Kelemen 2009), Pălatca (Rotea 1996–97; Bindea/ Kelemen 2008/09), Deuş (Kelemen 2009), Mera (Kelemen 2009) and Zoltan (El Susi 2002) in Transylvania (Fig. 1). The general tendencies seem to be the same: domestic mammals dominate and hunting appears to be insignificant (2–15 %). Among domestic mammals, cattle lead (30–60 %), followed by ovicaprids (15–30 %) and pigs (10–20 %), then by horses (1–13 %) and dogs (1–5 %). The remains from Iernut seem to differ from the rest regarding the smaller ratio of sheep/goat (10 %) and the larger ratio of pigs (40 %), but due to the very low number of remains (n=24, Kelemen 2009, 143) this is hardly a representative sample. Kajárpéc and Zoltan, however, have a much larger number of identified specimens, and still have a ratio of pigs at about 20 %. Ruminants seem to have been exploited for their secondary products (milk, wool, traction) as well, as indicated by the age distribution of the animals (El Susi 2002, 159; Kelemen 2009, 146; Tóth 2013). Horse bones appear everywhere except at Iernut and, in contrast to earlier suggestions (Choyke/ Bartosiewicz 1999, 245), they do seem to have been kept for their meat as well even in the Late Bronze Age. In general, the data suggest that the animal remains of Csanádpalota–Földvár are in conformity with general LBA patterns in the area and further to the east (Sava 2005), as well as with patterns of the preceding Middle Bronze Age (Bökönyi 1974, 32–34, 65–69; 1992; Choyke/ Bartosiewicz 1999). They do not seem to indicate special, selective depositional practices.

Fig. 20. Burnt macrolithic tools from Feature 451 at Csanádpalota–Földvár.

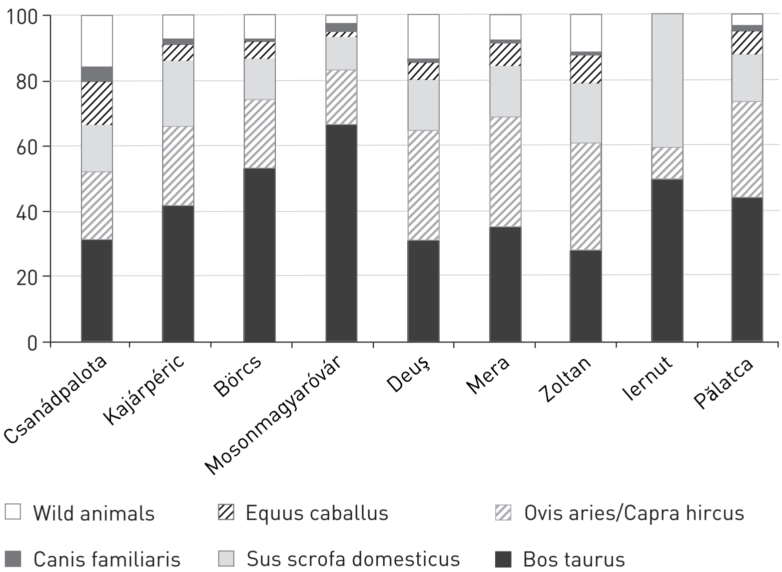

Fig. 21. Comparison of the ratio of faunal remains at various Late Bronze Age settlements.

Nevertheless, a few pits contained especially large amounts of animal bones that may indicate structured depositions and perhaps remains of feasting (Tóth 2013). Pits 44, 407, 439, 447 and 474 belong to this category. They contained large amounts of bones, some in anatomical order indicating the deposition of animals in whole or perhaps with some bones still in the skin (Pit 44). Pit 407 yielded a cattle skull, while in the case of Pit 474 the amount of meat calculated from the bones was almost 600 kg (Tóth 2013).

With regard to botanical remains, the situation is more complex. It is difficult to compare the results with contemporary sites, since most-

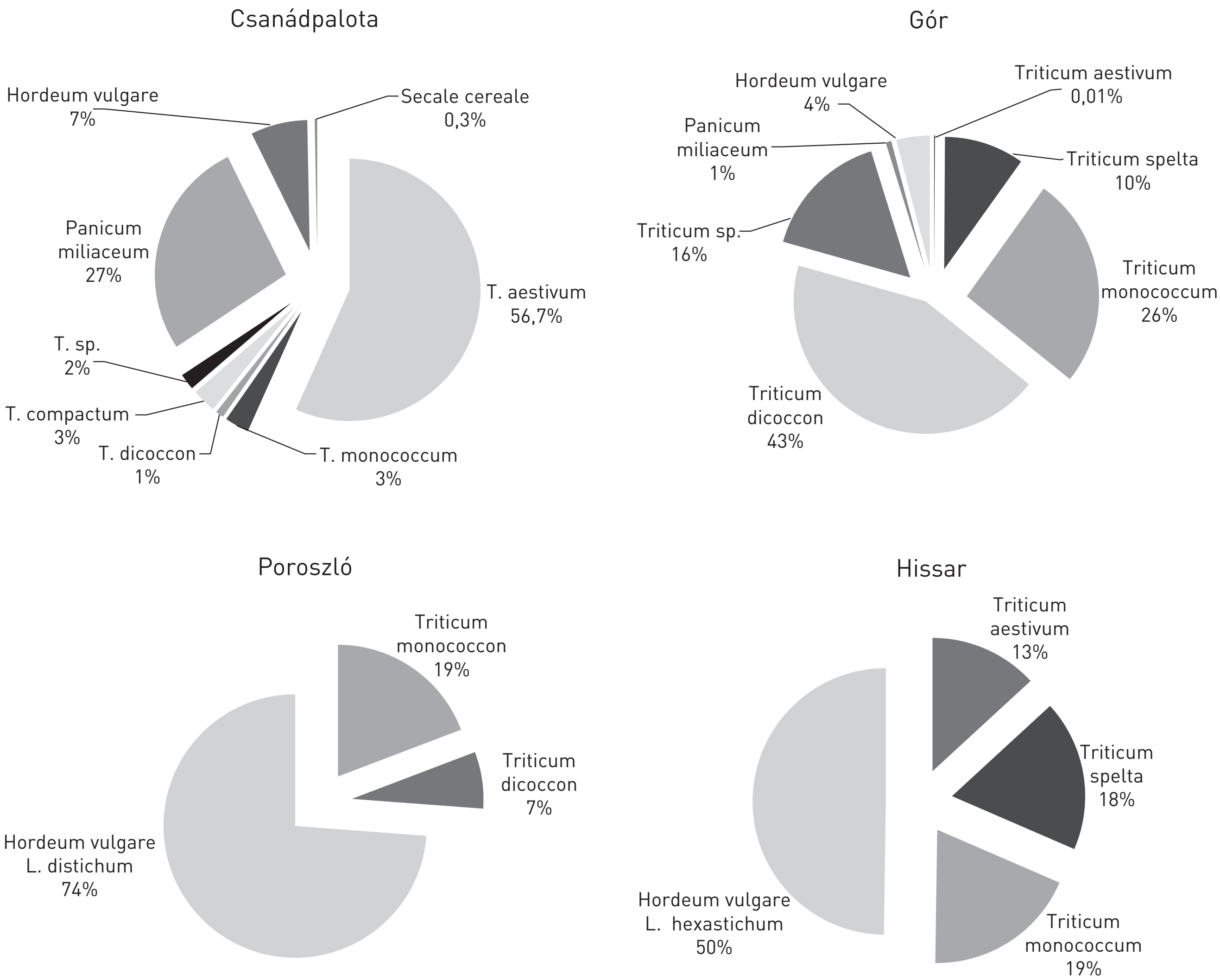

Fig. 22. Comparison of the ratio of cereal remains at various Late Bronze Age settlements.

ly only preliminary analyses are available that are not based on systematic sampling, but on the analysis of samples from arbitrarily chosen features. Such comparative material is available from Gór–Kápolnahalom (Ilon 2001; Gyulai/Torma 1996) and Balatonmagyaród–Hídvégpuszta (Horváth 1994; Gyulai 1996) in Western Hungary, from Dunakeszi (Szilas 2002; Gyulai 2002) in Central Hungary, and from Poroszló–Aponhát (V. Szabó 2004 b; Gyulai 2010) in Eastern Hungary. Botanical data from a roughly contemporary settlement are known from Hissar near Leskovac in Southern Serbia (Medović 2012) (**Fig. 22**).

In general, Csanádpalota stands out for two reasons with regard to botanical remains, especially cereals. The site yielded a large amount of common bread wheat (*Triticum aestivum*), which is unusual for prehistoric sites. This ratio is more characteristic for later periods. Nevertheless, radiocarbon dates measured from three seeds confirm that these are indeed Late Bronze Age specimens. This indicates perhaps innovative agricultural practices and choices of cereals. Only the site of Hissar near Leskovac in Serbia yielded comparable amounts of *Triticum aestivum*, but still not in such a dominant quantity as at Csanádpalota (Medović 2012). The other important characteristic is the importance of millet (*Panicum miliaceum*). This fits very well into a wider Late Bronze Age pattern. As pointed out by A. Harding, millet becomes widespread and increasingly important during the Late Bronze Age and the Iron Age in Europe, probably due to its ability to withstand unfavourable weather conditions (Harding 1989, 76). However, this trend is not unequivocal in the Hungarian material. Only at the site of Dunakeszi do we find large amounts of millet (89 % of domestic plant remains) (Gyulai 2002), but that material comes from a single special feature (a well) that yielded large quantities of botanical remains suitable for the reconstruction of prehistoric vegetation, but very few domestic plant remains. Thus, it is hardly representative. At Balatonmagyaród, millet is attested as well, but here also a single sample has been analyzed that contained only *Pisum sativum* beside weeds (Gyulai 1996), which is therefore clearly not representative.

If we compare the results of the archaeobotanical study of Csanádpalota with those of a contemporary Late Bronze Age hillfort at Gór-Kápolnadomb in Western Transdanubia, the so-called anthropogenic grouping of the botanical finds shows similar percentages (Gyulai/ Torma 1996). At both sites, domestic plants comprise the majority of the material. The ratio of cereals is 90 %. Among pulses, lentil and pea are included at both sites in similar proportions. Oil-bearing plants were also attested: *Brassica nigra* at Csanádpalota and *Camelina sativa* at Gór. These again seem to have generally gained importance in the Late Bronze Age in Europe (Harding 1989, 75–76). The ratio of the weeds of cereals and hoe-cultivated plants is also similar, and even the distribution of species is quite close, although ruderal species are missing from Csanádpalota. However, significant differences can be observed in connection with the composition of wheat species. At Gór, hulled cereals (*T. monococcum* and *T. dicoccon*) dominate, while at Csanádpalota an emphasis of free-threshing wheat (*T. aestivum*) is observed. Finally, the botanical material from the slightly later Poroszló seems to be rather different, with a domination of barley and hulled wheat species (emmer and einkorn) following in second and third place (Gyulai 2010).

To sum up, there does not seem to be a clear, unified pattern in Late Bronze Age plant cultivation, and local traditions might have varied significantly. The dominance of millet and the presence of oil-bearing plants at Csanádpalota fit into a wider European Late Bronze Age trend. The appearance of large quantities of common bread wheat is unusual, but so is its context: most of the remains came from a single pit, from Feature 474, that seems to be a special deposition for other reasons as well.

With regard to macrolithic tools, the current report presents only the first phase of an ongoing analysis. The many grinding stone fragments in the lithic material provide evidence for the subsistence economy. Although only a single intact grinding slab was found, the morphological characteristics of the working surfaces of fragmentary macrolithic tools also indicate that they were used for grinding.

The correlation between botanical remains and grinding stone tools is generally not very strong. Their connection within ditches is especially questionable, since the distance between the location of the soil samples and the tools can be up to 10 m. In those cases, however, where grinding stones and cereals appear together in pits, it may be safe to assume that the tools were used in grinding cereals.

A large amount of grinding stone tool fragments was found in ditches, which raises further questions. How and why had these fragments been deposited in the ditches? Were these the result of deliberate depositional practices or just discarded waste? The first view might be more convincing at this moment, since a fairly large amount of other objects – whole antlers, intact clay vessels, bronze pins, and large parts of animals – seem to have also been deposited intentionally at various points of the ditches.

As mentioned above, traces of burning can be seen on the surface of a number of macrolithic tools that were found in pits. Many came from features which were probably used as refuse pits. Some of them, however, were deposited in special pits that contained rich Late Bronze Age material, primarily pottery. Based on the finds, we assume that the function of these pits was different from everyday usage and the traces of burning on macrolithic tools may have been the result of ritual burning in the pits.

CONCLUSION

Based on the above information, we can conclude that our analyses have been partly successful and partly inconclusive. The botanical, zoological and lithic evidence provides important insight into the economic activities of a regionally significant Late Bronze Age community. The exploitation of animals follows a general Bronze Age pattern in the region. Plant cultivation, however, seems to be diverse in the period. The practices at Csanádpalota follow wider European trends in some aspects, while diverge considerably in others. Both types of remains as well as the study of macrolithic tools, however, confirm the presence of special depositions at the site that were probably the result of ritual activities. These, however, may not provide sufficient evidence to claim a purely ritual function for the whole settlement. Recent studies also suggest that ritual and everyday domestic activities do not contradict each other, and ritual was not a distinct sphere of activity in prehistory (Bradley 2005). Future work at Csanádpalota–Földvár will certainly shed more light on both everyday and ritual practices in the Late Bronze Age of the Carpathian Basin.

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