ARCHEOZOOLOGICAL DATA OF THE MOAT SYSTEM OF SULTAN SULEIMAN'S TÜRBE

ARCHEOZOOLÓGIAI ADATOK I. SZULEJMÁN SZULTÁN SZIGETVÁRI TÜRBÉJÉNEK ÁRKÁBÓL •

TUGYA, Beata [1,2]

[1]Thúry György Museum, H-8800 Nagykanizsa, Zrínyi Str. 62, Hungary

[2]University of Szeged, Department of Geology and Paleontology, H-6722 Szeged, Egyetem Str. 2-6, Hungary

E-mail: tbea82@gmail.com

Abstract

*At the end of the 16th century, a tomb (*türbe*) and a small Ottoman town were built at the site of the death of the Ottoman ruler, Sultan Suleiman I in Szigetvár – Turbék vineyard hill. A moat system bordered the memorial place from the northern direction. This moat was eventually filled in and disappeared by the end of the 17th century when land-use management changed, and the site was turned into an agricultural zone. The memorial place was found in 2014, while the moat surrounding the türbe next year in 2015, when archaeological excavations and geoarchaeological investigations started. Among others, animal remains turned up from the moat filling around the* türbe*. These archaeozoological finds derive from both hand-picking and wet sieving of samples collected during the excavation of the moat system. Due to this latter not only animal bones but also eggshell fragments were available for research. Bone material of a typical Turkish period site could have come from the Christian population of Hungary or non-Muslim Balkan elements. The particularity of the archaeozoological assemblage analysed in this study is that it can be considered kitchen waste left behind by the Halvetic dervishes living in the pilgrim town and the soldiers guarding the memorial place. These people must have been devout Muslims and abstained from eating pork. The study aims to investigate whether or not the animal bone remains support this hypothesis. In addition, it was important to reveal if our archaeozoological data differ from the bone material of other Ottoman period sites studied so far.*

Research and analysis of eggshells are not yet widespread in Hungary. Most of our knowledge is based on the analysis of eggshells from the Avar period, so it is important to study eggs from another period, too. Our research indicates that eggs were not only consumed but also used for breeding hens and hatching chicks in Szigetvár – Turbék vineyard hill.

Kivonat

*I. Szulejmán szultán halálának helyszínén, Szigetvár – Turbék szőlőhegyen, egy síremléket (*türbe*) állítottak fel, és egy oszmán kisváros épült a 16. század végén. A türbét északi irányból egy árok határolta. Az árok idővel feltöltődött, és el is tűnt a 17. század végén, amikor a földhasználat megváltozott és a terület mezőgazdasági művelés alá került. A türbét és a település maradványait csak 2014-ben találták meg, míg az azt övező árkot következő évben, 2015-ben, ezek után régészeti feltárás és régészeti geológiai vizsgálatok kezdődhettek. Ebből a feltöltődött árokból és a türbe területéről többek között állatmaradványok kerültek elő, melyek nem pusztán kézi gyűjtésből származnak, hanem földminták iszapolásából is. Utóbbinak köszönhetően nemcsak csontok, hanem tojáshéj töredékek is a kutatás rendelkezésére álltak. Egy átlagos török kori lelőhely csontanyaga akár a magyarországi keresztény lakosságtól vagy nem mohamedán vallású balkáni elemektől is származhatna. A tanulmányban elemzett csontegyüttes különlegességét az adja, hogy a zarándokhelyen élő halveti dervisek, illetve a zarándokvárost őrző katonák által hátrahagyott konyhahulladéknak tekinthető. Ezeknek az egykor élt embereknek hithű mohamedánnak kellett lenniük és tartózkodniuk a disznóhús fogyasztásától. A tanulmány célja azt vizsgálni, vajon az állatcsont maradványok ezt a feltevést alátámasztják-e vagy sem.*

Magyarországon a tojáshéjak kutatása, elemzése még nem elterjedt. Legtöbb ismeretünk avar kori tojáshéjak elemzésén alapszik, ezért fontos egy másik kor tojásainak vizsgálata, amelyből kiderült, nemcsak fogyasztották a tojást, hanem a területen tyúkok szaporítása, csibék keltetése zajlott.

• How to cite this paper: TUGYA, B. (2023): Archeozoological data of the moat system of Sultan Suleiman's türbe, *Archeometriai Műhely* **XX/3** 227–242.
doi: 10.55023/issn.1786-271X.2023-018

KEYWORDS: ARCHEOZOOLOGICAL ANALYSES, MEAT EATING HABITS, SHEEP/GOAT, CATTLE, HEN AND GOOSE BONES, EGG REMAINS

KULCSSZAVAK: ARCHEOZOOLÓGIAI ELEMZÉS, ÉTKEZÉSI SZOKÁSOK, JUH/KECSKE, SZARVASMARHA, TYÚK, LÚD CSONT, TOJÁSHÉJ MARADVÁNY

Introduction

In 1541, the Ottoman armies captured Buda, the capital of the Kingdom of Hungary, and in the following decades, Hungarian castles fell one after the other, Hungary shrank and the Ottoman Empire grew. In 1566, Suleiman I himself led the army that conquered the Southern Transdanubia. During the siege of Szigetvár, not only did the heroic castle defenders, led by Miklós Zrínyi, fall, but the aged Suleiman also died, albeit of natural causes (Pap et al. 2023). The Sultan's death was concealed from the Turkish army, lest it should have a negative effect on the besiegers' will to fight. The most famous Turkish sultan's internal organs were buried in Szigetvár, and only his embalmed body was repatriated. A tomb (*türbe*) was raised at the site of his death which became a pilgrimage place. This moat was eventually filled in by the end of the 17th century when the site was given over to tillage.

Hungarian archaeologists have been searching for decades for the location of the sultan's tomb until recent Hungarian and Turkish research has borne fruit in 2014 (Pap et al. 2023). The research was carried out on Szigetvár – Turbék vineyard hill in 2015 when archaeological excavations and geoarchaeological investigations started, led by Norbert Pap (University of Pécs), Pál Fodor (Eötvös Loránd Research Network) and Pál Sümegi (University of Szeged). The search has succeeded in identifying Suleiman's former tomb, as well as the remains of the mosque built by Mehmed Sokoldu in honour of Suleiman "the Magnificent" next to the turbe, and the northern wing of the Halveti Dervish Monastery, which encloses the mosque in a U-shape. They also excavated the palisade and the moat surrounding the *türbe* fortress from the north.

The importance of the site is shown by the fact that it became a place of pilgrimage during the more than 100 years of stay of the Turks. The highest Turkish dignitaries – as appropriate – visited the tomb of the Great Sultan. This gave rise to a small Ottoman-period town that name was *Türbe kasabası*.

The paper will present the results of the animal bone and eggshell fragment analysis recovered from the moat of Suleiman's memorial place. In addition to presenting archaeozoological data, we aimed to compare our results to the bone assemblage of other Ottoman period archaeological sites and to present the results of eggshell analyses, which have not been widely used in Hungary so far. Examining eggshells, we were looking for information about the species of egg, and whether they are eggs that have been consumed or eggs that are the remains of hatched eggs to get information about farming and eating habits.

Materials and methods

Archaeozoological analysis

The moat bordering the memorial complex was revealed by a 4 meters long, 1.2 meters wide, and 2.5 meters deep excavation profile. Archaeo-zoological finds were handpicked by Pál Sümegi and his team. In addition, fourteen samples of 30 liters were taken at 10 cm intervals for archaeozoological analyses. Samples were dual-flotated according to Jacomet et al. (1999) and double-wet-sieved (800 and 63 μm) to retrieve organic remains suitable for dating and palaeoecological studies. Samples were then selected for identification. Despite the small size of the study area, a relatively large number of animal bones were found, a totally of 661 specimens, of which 198 originate from the wet-sieving of soil samples. These samples contained not only plant remains and animal bones, but also fish scales and eggshell fragments. The moat had a protective function; probably it was cleaned and maintained. The ditch may have been filled with rubbish when the castle was re-occupied in 1689. The finds therefore date from the second half of the 17th century and derive from the Ottoman period. The bones are definitely of a kitchen waste nature and no worked finds were recovered from the moat.

We followed the guidelines of Sisson (1914), Boessneck (1970), Schmid (1972) during the identification of bones and the work of Bartosiewicz (1995, 1996, 1999, 2020), Nyerges & Bartosiewicz (2006) and Tugya (Tugya 2009, 2016; Tugya et al. 2017, 2020) during the evaluation of the results. Bone measurement was carried out according to the work of von den Driesch (1976).

Eggshell remains

During embryonic development, the *allantois*, i.e. the fetal membrane of the developing chick, performs the metabolism of the developing embryo. Getting into contact with the interior side of the eggshell, the allantois resorbs, i.e. dissolves, and the calcareous material from the eggshell infiltrates the body and contributes to the bony frame of the chick. Traces of the resorption of the calcareous material can be observed under the microscope on

the internal – mammillary – layer of the calcareous shell. After hatching these mammillae transform into crater-like cavities. If an intact mammillary layer can be seen – the little calcareous supports (*mammillae*) are rounded off – it means that no resorption took place, and the egg was not hatched (Jakab 1980). In the case of hatched eggs, small craters can be seen, instead of rounded-off mammillae, as a result of the function of the allantois dissolving the calcareous material. Among them, resorption ditches and cavities may be visible too. This pattern can be seen everywhere on the internal surface of the calcareous eggshell of the hatched egg, except for the region forming the boundary of the air chamber, generally at the blunt end of the egg. In this section of the shell, the allantois does not get into contact with the eggshell, thus, it cannot resorb the calcareous material there. Therefore, the mammillae ends of the internal shell layer remain intact (Jakab 1978).

When determining the species, the thickness of the shell fragments and the number of mammillae going to 1 mm^2 are taken into consideration; they are the most general determining features. The characteristics of the most frequent eggs are: in the case of chicken *(Gallus domesticus L.)* eggs the shell is about 0.3–0.35 mm thick and the number of mammillae on 1 mm^2 can be put at 57–173. In the case of the domesticated duck *(Anas platyrhynchos domestica L.)*, the shell is 0.35–0.4 mm thick and the number of mammillae ranges from 28 to 173. The shell of the egg of the domestic goose *(Anser anser domestica L.)* is 0.5–0.6 mm thick and the number of mammillae on 1 mm^2 ranges from 28 to 57. The shell of the egg of the greylag goose *(Anser anser L.)* is 0.525–0.55 mm thick and the number of mammillae on 1 mm^2 ranges from 28 to 87 (Sidell 1993).

All the eggshell fragments were examined under a microscope, and images were taken of the inner sides of the most suitable ones for photography. Some fragments were in poor condition and not suitable for analysis. The selection was based on the need to select fragments with the least possible concavity of the inner surface. To obtain good quality, sharp microscopic images, a flat surface was required. This was true for all the samples from Szigetvár, as their size was very small. The microscopic images were taken at 31.5x magnification with a Nikon SMZ800 stereomicroscope at the Hungarian National Museum's Archaeological Archives.

Results

The identified taxa of the site are shown in **Table 1.**, while the anatomical distribution of bones by species is in **Table 2**.

Table 1.: Species list of the site

1. táblázat: A lelőhely fajlistája

Species	NISP (Number of Identified Specimen)	%	MNI (Minimum Number of Individual)
Cattle (*Bos taurus* L.)	185	37.4	3
Sheep (*Ovis aries* L.)	4	0.8	1
Goat (*Capra hircus* L.)	1	0.2	1
Sheep or goat (Caprinae G.)	221	44.7	3
Pig (*Sus domesticus* Erxl.)	4	0.8	2
Horse (*Equus caballus* L.)	4	0.8	1
Hen (*Gallus domesticus* L.)	11	2.2	2
Goose (*Answer domesticus* L.)	3	0.6	2
Dog (*Canis familiaris* L.)	37	7.5	1
Cat (*Felis catus* L.)	6	1.2	1
Rodent (Rodentia sp.)	4	0.8	1
Bird (Aves sp.)	5	1	1
Fish (Pisces sp.)	3	0.6	1
Frog (Anura sp.)	7	1.4	1
Identifiable bones	*495*	*100*	*21*
Non-identifiable bones	*166*	-	-
Total	**661**	**100**	**21**

The total number of animal bones was 661 specimens that weighed 4913 grams. The bones were intensely butchered; as a result, only 495 bones (75%) of the 661 specimens could be identified. The non-identifiable remains included bones of small and large ungulates and specimens that could only be identified as vertebrates. Their size is really small, often less than 1 cm, and most of them have turned up during double-wet-sieving. All remains that could not be identified to species level were shorted than 5 cm. Apart from some fish, bird, rodent, and frog/toad (*Anura*) bones, only the remains of domestic animals were found (**Table 1.**). The minimum number of individuals (MNI) was 21. This is only an informative value as it indicates the lowest possible number of animals (individuals) from which the remains came from.

The two most common species were sheep/goats and cattle, with a combined proportion of over 80%. The amount of bones of small ruminants is higher than that of cattle, but the difference is only 41 bones, 8.3%. Among the species involved in meat utilization, the consumption of poultry meat, including chicken and goose, is also observed.

HU ISSN 1786-271X; urn: nbn: hu-4106

Table 2.: Anatomical distribution of bones by species

2. táblázat: A csontok anatómiai megoszlása

Bones	Cattle	Sheep, goat	Sheep	Goat	Pig	Horse	Hen	Goose	Dog	Cat	Bird
Cornus	2	-	-	-	-	-	-	-	-	-	-
Skull	4	1	-	-	-	-	-	-	1	-	-
Nasale	1	-	-	-	-	-	-	-	-	-	-
Maxilla	2	2	-	-	1	-	-	-	-	-	-
Jaw	5	6	-	-	1	-	-	-	-	-	-
Tooth	13	3	-	-	2	1	-	-	2	-	-
Atlas	-	-	-	-	-	-	-	-	1	-	-
Axis	1	-	-	-	-	-	-	-	-	-	-
Cervical vertebrate	6	3	-	-	-	-	-	-	-	-	-
Thoracic vertebrate	2	10	-	-	-	-	-	-	4	-	-
Lumbar vertebrate	3	3	-	-	-	-	-	-	1	-	-
Vertebra	2	3	-	-	-	-	-	-	-	-	-
Sacrum	-	-	-	-	-	-	-	-	-	-	1
Ribs	55	67	-	-	-	-	-	-	10	-	-
Pelvic	5	6	-	-	-	-	-	-	1	-	-
Coracoid	-	-	-	-	-	-	1	-	-	-	-
Clavicle	-	-	-	-	-	-	-	-	-	-	1
Scapula	10	8	1	-	-	1	-	-	1	-	-
Humerus	5	14	2	-	-	-	2	-	1	1	1
Femur	7	6	-	-	-	-	2	1	-	1	-
Radius	7	18	-	-	-	-	-	-	3	-	-
Ulna	4	5	-	-	-	-	1	-	-	-	-
Tibia	-	20	-	-	-	1	1	1	1	-	-
Carpus	2	1	-	-	-	-	-	-	-	-	-
Astragalus	3	-	-	-	-	-	-	-	-	-	-

HU ISSN 1786-271X; urn: nbn: hu-4106

Table 2. cont.

2. táblázat folyt.

Bones	Cattle	Sheep, goat	Sheep	Goat	Pig	Horse	Hen	Goose	Dog	Cat	Bird
Calcaneus	**3**	**2**	-	-	-	-	-	-	-	**1**	-
Tarsale	**2**	-	-	-	-	-	-	-	-	-	-
Metacarpus	**3**	**6**	**1**	**1**	-	-	**1**	-	**2**	-	-
Metatarsus	**4**	**11**	-	-	-	-	-	-	**5**	**3**	-
Metacarpus/Metatarsus	-	**1**	-	-	-	**1**	-	-	**2**	-	-
Tarsometatarsus	-	-	-	-	-	-	**3**	**1**	-	-	-
Phalanges I.	**6**	**3**	-	-	-	-	-	-	**1**	-	-
Phalanges II.	**3**	**2**	-	-	-	-	-	-	**1**	-	-
Phalanges III.	**1**	-	-	-	-	-	-	-	-	-	-
Sesamoideum	**1**	-	-	-	-	-	-	-	-	-	-
Long bones	**17**	**19**	-	-	-	-	-	-	-	-	**2**
Flat bones	**6**	**1**	-	-	-	-	-	-	-	-	-
TOTAL	**185**	**221**	**4**	**1**	**4**	**4**	**11**	**3**	**37**	**6**	**5**

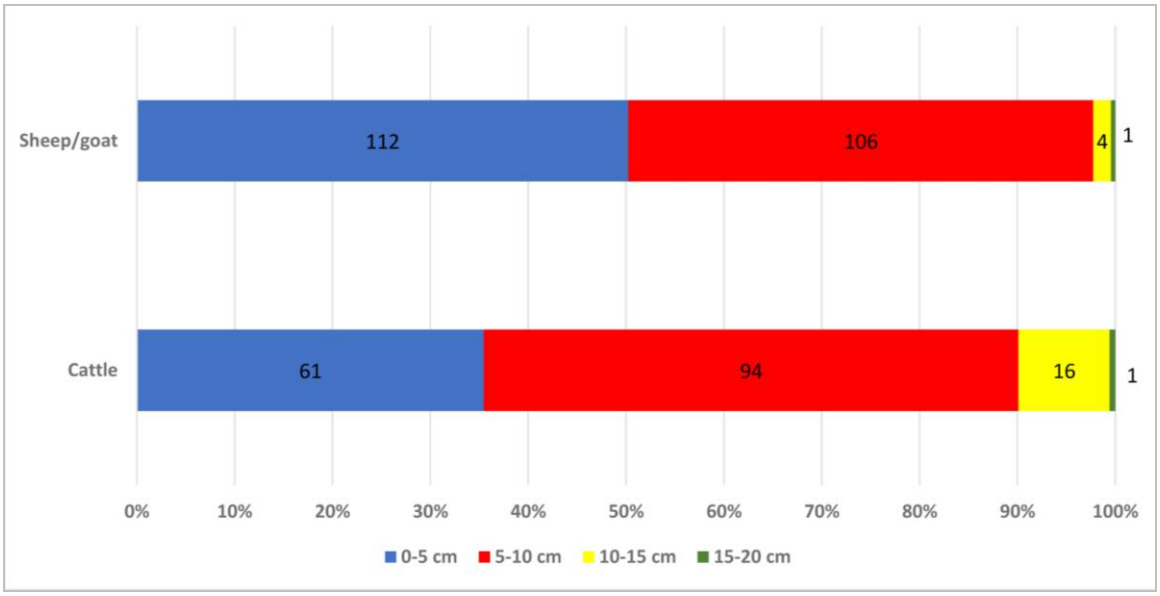


Fig. 1.: Distribution of cattle and small ruminant bones by physical length

1. ábra: Szarvasmarha és kiskérődzők csontjainak fizikai hosszúság szerinti megoszlása

HU ISSN 1786-271X; urn: nbn: hu-4106

Pig bones are rare, and the number of horse bones is also low. Dog and cat bones confirm that other species were also kept in the area.

Cattle (*Bos taurus* Linné, 1758)

A total of 185 pieces of bones (that is 37.4% of the remains) were identified as cattle and they belong to three individuals (MNI). It is very rare that the number of cattle bones is not the highest at non-Ottoman period settlements in Hungary. In addition to the true abundance of the species, this is due to the fragmentation of larger cattle bones that are more intensive and more exposed to taphonomic effects than the bones of smaller animals. Furthermore, it is necessary to cut them into smaller pieces during grilling and cooking to fit them into dishes or ovens. Adult specimens can have intact long bones up to 40 cm with meat, as an addition. This size - unless the animal is roasted *en gros* on an open fire - is particularly unprocessable in the kitchen. The ideal size of cuts would have about 5–10 cm long bones attached. This is confirmed by the fact that 50% of the cattle find fall into the 5–10 cm length category, although fragments between 0–5 cm in length were also found in significant numbers (33%) (**Fig. 1.**). These data show that the meat-bearing bones of cattle were intensively cut. There were only 16 specimens (9%) in the 10–15 cm category and only one bone (1%) was longer than 15 cm.

This shows that cattle bones were butchered intensively. There were also traces of cuts or hacking on ten bones, including the meat-rich cervical vertebrae, ribs, and shoulder. There are several cut marks on the medial surface of a rib (**Fig. 2.**). Near the wide, lower distal end, several deeper axe marks are visible, probably made by a non-butcher, when the bone was cut up. In the middle part of the bone, there are fainter incision marks, and in the upper, dorsal half there are two short, relatively deep cut marks. Cutting a bone on its greasy, slippery surface containing meat is not an easy task, traces of repeated attempts can be seen here probably made by a person who was not a specialist butcher.

A wide, moderately hacking mark is visible near the medial, distal edge of the glenoid surface on a scapula. It may have been inflicted when the head of the arm bone was detached from the scapula (**Fig. 3.**).

Whole metacarpus and metatarsus bones would be suitable for withers height calculations. However, these bones have been heavily damaged by thorough butchering. A diaphysis fragment of a metacarpus also shows several parallel or nearly parallel cut marks (**Fig. 4.**).

The minimum number of individuals was three, their age distribution was mixed. Bones of young

Fig. 2.: Butchered cattle rib
2. ábra: Darabolt szarvasmarha borda

Fig. 3.: Cattle scapula with cut marks at the arm bone joint
3. ábra: Szarvasmarha lapockája vágásnyomokkal a karcsont ízületénél

Fig. 4.: Cattle metacarpus specimen with cut marks
4. ábra: Szarvasmarha kézközépcsont vágásnyomokkal

(juvenile, <3-years-old), almost adult (subadultus, between 3- and 4-years-old), and adult, possibly old animals occurred as well. In the case of the young individual, meat utilization dominated, while in the case of the older cattle, the milk production by cows may also have been important. Cattle bones represent all parts of the skeleton and every body region, including the toe bones left in the skin, which indicates that these animals may have been slaughtered at the site, or the entire animal was transported to the memorial place or the small town. Most bones belonging to the trunk region, which includes vertebrae, ribs and pelvic bones, are the ribs with 55 fragmented specimens. Bones of the meaty limb region (meat-bearing limb region) also represent a higher ratio (**Table 2.**).

HU ISSN 1786-271X; urn: nbn: hu-4106 © by the author(s)

Fig. 5.: Juvenile sheep/goat jaw
5. ábra: Fiatal juh/kecske állkapocs

Fig. 6.: Split sheep/goat neck vertebrae
6. ábra: Darabolt juh/kecske nyakcsigolya

Sheep (*Ovis aries* Linné, 1758) *and goat* (*Capra hircus* Linné, 1758) *remains*

Sheep and goat (small bovids in the Caprinae Gray, 1821 subfamily) are the most commonly encountered animal species at the site, with a combined proportion of 45.7%. Due to the high degree of similarity between the bones of these two species, it was not possible to determine whether the bones were derived from sheep or goat. The total number of these small ruminant bones was 226 specimens, of which sheep bones were certainly four specimens (sheep bones: 1 scapula, 2 humerus, 1 metacarpus, goat bone: 1 metacarpus), while there was one specimen that could be identified as goat. The MNI was five, of which two individuals were adults (of which one was the goat) and three were juvenile.

One of the juvenile animals was less than 1-year-old (**Fig. 5.**) based on its milk-tooth (m1, m2, m3), and another was less than 1.5 years old; their slaughter illustrates meat consumption. Complete long bones of small ruminants were not found either, and despite their smaller size, they were butchered very intensively, too (**Fig. 6.**). Bones shorter than 5 cm and in the 5–10 cm size category were the most common (49.6% and 46.9%), so the number of remains of other sizes was negligible (1–4 specimens, 0.4–1.8%). In the case of small ruminants - in the same way as cattle bones of the body region were the most common. Also, the number of ribs is the highest, which may be due to high fragmentation. The bone remains of the meat-bearing, proximal limb regions were the second most commonly represented except for femur fragments. Several vertebrae, cervical and dorsal vertebrae were cut along the median plane. Such traces of cutting occur when the spine is opened up longitudinally, cut in the middle of the vertebrae, and then divided into smaller pieces by perpendicular cuts. This is the same method as the one used in late medieval slaughterhouses (Benda 2016). **Fig. 6.** shows sheep/goat cervical vertebrae split in two along the median plane.

Pig (Sus domesticus Erxl., 1777)

Pork consumption is prohibited by Islam, and the number of pig bones in the Ottoman site of Szigetvár – Turbék vineyard hill site is indeed very low. Altogether four specimens came to light in different parts of the fieldwork. Two bones are most likely to belong together, these are small fragments of the mandibula and maxilla of a young individual. The other two fragments originate from two different canine teeth, females, around 3 years old.

Horse (*Equus caballus* Linné 1758)

The horse has been the most valuable domesticated animal in most cultures, so its bones were rarely found in the late medieval and early modern age food refuse. It could be used both as a mount and a beast of burden. Before mechanization, it was essential in transport and tillage as well as in times of war. The four horse bones found in the archaeozoological material represent 0.8% of the identifiable specimens from at least one adult animal.

The find includes a tooth fragment and a larger scapula fragment (15 cm), as well as a long bone (tibia) diaphysis fragment and a metapodium fragment. Due to poor preservation, measurements could not be recorded.

Domestic hen (*Gallus domesticus* Linné, 1758), *goose (Anser sp.) and bird*

Following small ruminants, the third largest number of bones of animals whose meat was consumed came from a hen. The ratio of hen bones was only 2.2% (11 specimens) and at least two individuals could be identified, one of them was a young chicken, and the other one was an adult hen (**Fig. 7.**). The number of goose bones was smaller than that of hen bones, but the three specimens originate from two individuals, a young and an adult bird. There are several streams and watercourses around Szigetvár in which wild geese may have lived. The bone of the young animal is more indicative of a domestic goose. At most archaeological sites, the number of goose bones is smaller than those of hen bones, hens were apparently slaughtered more often (Bökönyi 1974).

In addition to the poultry remains, five fragments of non-identifiable bird bones have also been found; each of them was small, their lengths varying between 2 and 5 cm. One of these finds, however, came from a goose-sized bird. One *clavicula*, one *humerus*, one *sacrum*, and two long bone (*os longum*) fragments turned up.

Dog (Canis familiaris Linné, 1758)

Dog bones were also identified, 37 specimens and all of them derived from the same old animal. The withers height of this individual can be estimated from one of the undamaged forearm bones (radius) as 61.5 cm (Koudelka 1885). Its size is at the upper withers height value of the present-day Hungarian pointer breed and also reaches the lower size of the female greyhound. The skull was broken, so it was not measurable.

The animal's two metatarsals on the left side were ossified (**Fig. 8.**), metatarsal II and III, and metatarsal IV and V, possibly as part of a Soudek syndrome according to László Bartosiewicz. This chronic inflammation that led to bone coalescence made walking difficult for the animal. Symptoms of diseases are relatively rare on bones since bones show only prolonged chronic conditions, which damage the skeleton (Siegel 1976; Bartosiewicz 2009).

Dog gnawing can be seen on only one cattle bone, the proximal epiphysis of a femur.

Six cat bones were found originating from one adult individual.

Other archaeozoological remains

A vertebra, a fin ray, and a fragment of a non-identifiable fishbone (*Pisces*) came to light from the sediments of the moat, indicating that fish was occasionally consumed at the site. Fish scales were also found in the soil samples. Seven frog or toad (*Anura*) bones were found in the double-wet-sieved material, from more than 2 m depth. These bones may have been associated with the drainage-wet phase of the moat during the 17th century.

Fig. 7.: Hen tarsometatarsus

7. ábra: Tojó tarsometatarsus

Fig. 8.: Ossified, pathological dog metatarsal (dorsal side)

8. ábra: Összenőtt, patológiás kutya lábközépcsont

Eggshell remains

All of the fourteen samples between 250 and 100 cm contained eggshell fragments. Most of them with at least 10 fragments, but there were also samples with only 8 fragments and samples with 20 fragments. Eggshells are extremely fragile and are difficult to detect without wet-sieving. The eggs were not thrown into the moat whole, but broken up or crushed, in addition, they were fragmented in the moat even further so samples were rarely larger than 0.5 cm^2. The fragments have an average shell thickness of 0.3 mm and an average number of mammilliae per 1 mm^2 was approximately 100, suggesting that the majority of the fragments originate from hen eggs (**Table 3.**). The analysis of the eggshells shows that the remains of both hatched and unhatched, but consumed eggs (**Fig. 9.**), based on the termination of the mammillae, are presented in the archaeozoological record. The species was bred locally and some of the eggs were consumed for food. To the best of our knowledge, the eggshells from Szigetvár are the

HU ISSN 1786-271X; urn: nbn: hu-4106 © by the author(s)

Table 3.: Summary of the most important features of egg samples

3. táblázat: A tojáshéj maradványok legfontosabb jellemzői

Samples	Depth (cm)	Number of fragments (pieces)	Size of fragments (cm^2)	Eggshell thickness (mm)	Average number of mammillae ($pieces/mm^2$)	Mammillae end
-1.	240-250	12	<1/2	0.27	66–100	Non-hatched egg
1.	230-240	10	<1/2	0.29	100-120	Non-hatched egg
2.	220-230	15	<1/2	0.29	127-130	Non-hatched egg
3.	210-220	20	Majority <1/2	0.36-0.38	100-110	Non-hatched egg
4.	200-210	8	Majority <1/2	0.3	100-120	Non-hatched egg
5.	190-200	10	Majority <1/2	0.34	70-80	Hatched egg
6.	180-190	15	Majority <1/2	0.36	>60	Hatched egg
7.	170-180	11	Majority <1/2	0.3	>70	Hatched egg
8.	160-170	9	Majority <1/2	0.3	80-100	Hatched egg
9.	150-160	16	Majority <1/2	0.31	107-110	Non-hatched egg
10.	140-150	10	<1/2 and ½	0.35	87-100	Non-hatched egg
11.	130-140	17	Majority <1/2	0.31-0.39	115-120	Non-hatched egg
12.	120-130	6	Majority <1/2	0.35	104-110	Non-hatched egg
13.	110-120	16	Majority <1/2	0.32	96-100	Non-hatched egg

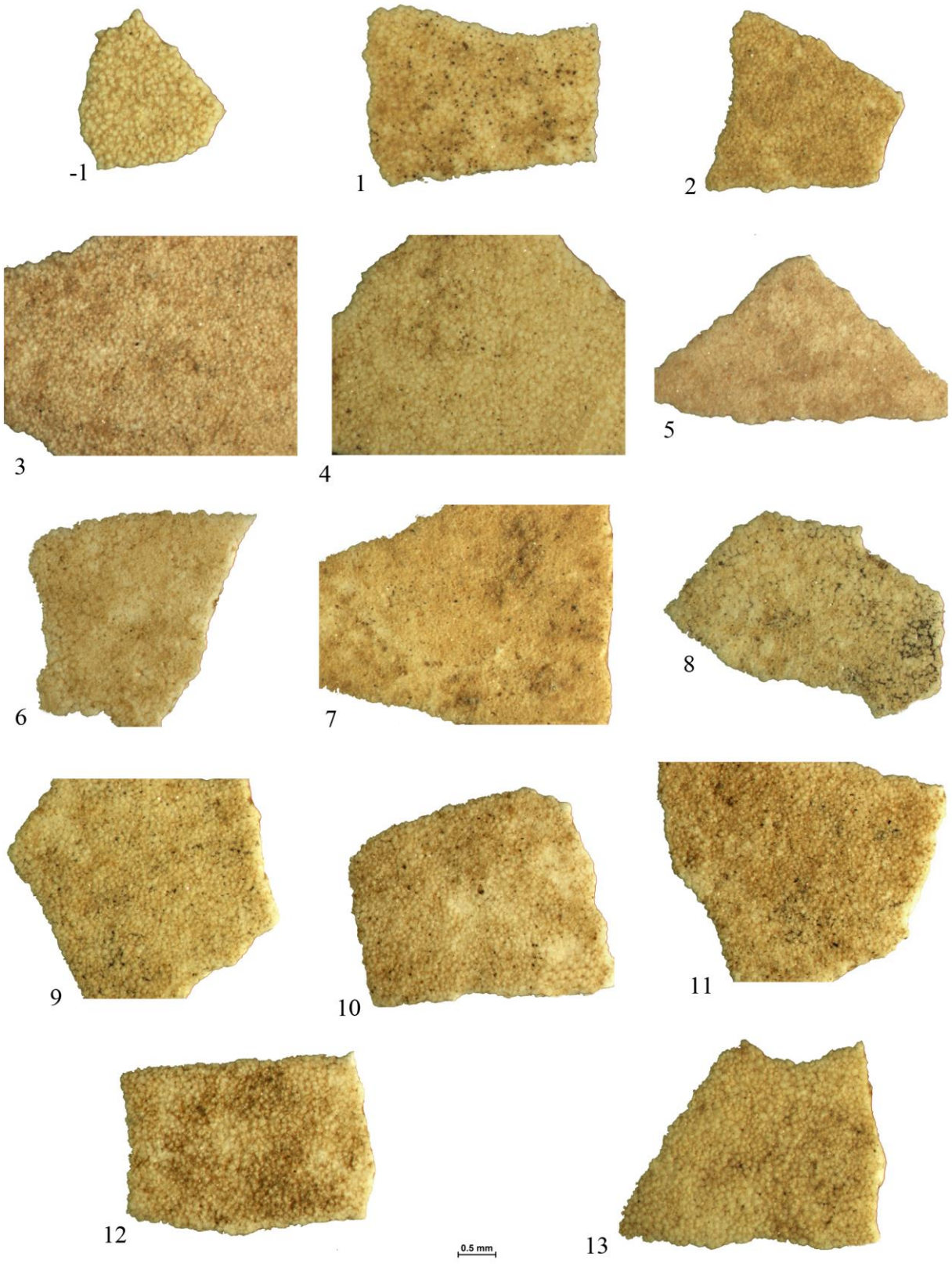


Fig. 9.: Microscopic images of hen egg samples at 31.5x magnification (sample No. -1–13, properties in Table 3)

9. ábra: Tojáshéj felvételek mikroszkópi képe 31,5-szeres nagyítással (-1–13: mintaszám, a minták tulajdonságai a 3. táblázatban láthatóak)

first Turkish period eggs examined in the Carpathian Basin, and these results are therefore of great importance.

Discussion – Other Ottoman period archaeozoological assemblages

The finds under discussion here are unique. Part of the bone waste may be associated with meat consumption by the soldiers guarding Sultan Suleiman's tomb or Halveti dervishes who resided at the Szigetvár – Turbék vineyard hill settlement. The Halveti order flourished in Ottoman Turkey during the 16th century. Its members practiced Sufi rituals. Members of the upper class, military, and high-ranking civil servants were all involved with the order.

There are only a few dated archaeozoological assemblages from the second half of the 17th century. In addition, it is also known who inhabited the settlement under discussion here.

The frequency and proportion of species differ somewhat from the Turkish sites of the Carpathian Basin, where cattle and sheep/goats are the most common species. In many cases, the ratio of domestic pigs is not low, often preceding the ratio of small ruminants, suggesting that these bones were probably left behind by non-Muslim individuals or communities. In a classical site inhabited by genuine Turks, or at least by people of the Muslim religion, pig bones have no place. However, such sites are quite rare; several pig bones occur in most cases. It is unlikely that the Muslims themselves consumed pork, rather the Balkan elements, not necessarily of the Muslim religion, who arrived with the Turks, or the local Christian population. The quantity of pig bones in Szigetvár is only four specimens (0.8%), the same as horse bones. The soldiers guarding Sultan Suleiman's *türbe* were probably Muslims, but the Halveti Dervishes (*zaviye*) of the *türbe* must have been devout Muslims, according to the evidence of the bones as well.

It is worth comparing the results of the Szigetvár archaeozoological finds to those from other 15th–17th-century Ottoman period sites in Hungary. **Fig. 10.** shows the results of ten Ottoman period archaeological sites in addition to the Szigetvár archaeozoological assemblage.

It can be seen that the size of the bone assemblages is not uniform, with wide variations ranging from just over 400 to over 9800 specimens. Nevertheless, it is hoped that the comparison will help to establish some sort of trend or pattern in the consumption of meat in the late medieval Ottoman period. It is also important to investigate which sites have a similar composition of bone material to that of Szigetvár since it shows the meat consumption habits of the people living there, which may even allow us to infer religion.

Bajcsa's short-lived fortress hosted German and Croatian soldiers, as can be seen from the composition of the bone material: almost 75% of the finds come from cattle. The proportion of pig bones is also around 15%, while that of small ruminants is very low, only 4.76%. Smaller quantities of poultry bones and remains of hunted animals, and even fish bones, could be found (Gál 2012).

Erika Gál and László Bartosiewicz identified 9837 animal bones from the area of the Barcs palisade site: more than 98% of the bones came from domestic animals. Based on the number of finds, the most frequently slaughtered species was cattle, followed by chickens and then sheep and goats. Pig bones were found in very small quantities, with 55 bones representing only 0.55% (Gál & Bartosiewicz 2016).

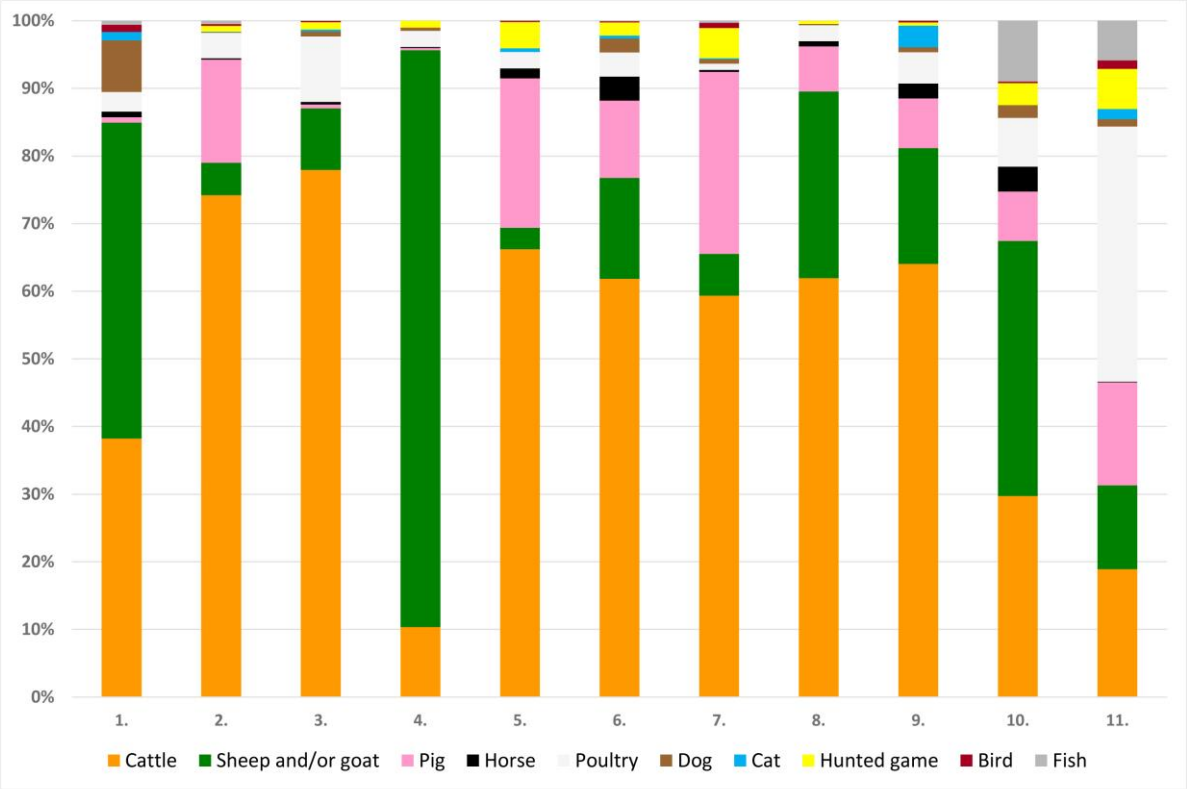
The composition of the 1460 animal bones known from Buda Castle, Pasa's Palace site is very different from the other sites in the comparison: sheep/goat bones were found in the largest number (1245 specimens; 85%), cattle was 10%, and some bones of poultry and hunted species were also found (Bökönyi 1974). Five pig bones were found representing only 0.3% of the bone assemblage.

The most common species in the Ottoman material from Fonyód was cattle, followed by pigs and then sheep/goats. Poultry remains were also found here, and some finds also attest to hunting (Bökönyi 1974).

The majority of the bone material (2049 specimens) recovered from the castle of Nagykanizsa belonged to cattle (61.8%). Compared to the 1267 cattle bones, the number of sheep/goats (305) and pigs (234) represent a more modest proportion. Poultry includes not only hens and geese but also ducks. There is also evidence of hunting, in addition, two fish bones were found (Bökönyi 1974).

Cattle bones accounted for 58% of the 653 specimens of the 16th century finds recovered from the Nagykanizsa-Miklósfa-Romlottvár site. The ratio of domestic pig bones was 26%, while the proportion of sheep/goat bones (40 pieces) was much lower, only 6%. Among poultry, geese were more common, hens less frequent. Some bones also indicate hunting. One of the two fish bones came from great sturgeon (Tugya 2017).

The Ottoman archaeozoological material (1058 specimens) of Segesd in Somogy county indicates, that the most common species was cattle, followed by sheep and goats, then domestic pigs. The bone material of the site was processed from the 14th century to the Ottoman period and shows that the quantity of pig bones increased significant-



1. Szigetvár-Turbék (484 ps)
2. Bajcsa (4059 ps)
3. Barcs palisaded fort (9837 ps)
4. Budai castle, Pasa palace (1460 ps)
5. Fonyód (539 ps)
6. Nagykanizsa castle (2048 ps)
7. Nagykanizsa-Miklósfa, Romlottvár (647 ps)
8. Segesd (1051 ps)
9. Szécsény-Gyalogkapu (409 ps)
10. Szekszárd-Palánk (6189 ps)
11. Visegrád-Palace (1195 ps)

Fig. 10.: Comparison of archaeozoological assemblages from 15-17th century sites

10. ábra: A 15-17. századi lelőhelyekről származó archeozoológiai leletegyüttesek összehasonlítása

ly compared to the Medieval period. This may be because the consumption of pork among the Hungarian population of Segesd increased since the Islamic ban on eating pork meant that the species was of no value to the occupying Ottoman tax authorities (Bartosiewicz 1996).

In the 17th century finds of Szécsény-Gyalogkapu site in Nógrád county, most of the bones originate from cattle, followed by pigs and then small ruminants. However, the minimum number of individuals shows that pigs were mostly slaughtered, many of them at a young age (Tugya 2012). Probably – similarly to Segesd – pork consumption was prominent here because Ottoman authorities did not tax pig farming.

The bone assemblage of the Ottoman site of Szekszárd-Palánk is about ten times larger than that of Szigetvár. In addition to domestic animals, the remains of several hunted species and fish remains have been found. Similarly to the Szigetvár site, ruminants were the most common in Szekszárd as well, with more sheep/goat bones and slightly fewer cattle bones: the total number of sheep and goat remains was 2333, and 1841 cattle bones. Bones of other species are much lower. 452 pig bones and almost 400 poultry bones indicate that these species were frequently consumed. The castle was defended by Bosnian and Serbian marauders who were exempted from eating pork. Taking advantage of the relative proximity of the Danube, numerous pike, carp, and catfish bones, and even sturgeon remains have been found in the castle area of

Szekszárd (Bartosiewicz 1995). Of all the rivers in Hungary, the Dráva is the closest to Szigetvár, but the distance between the castle and the river is several times greater than the distance between Szekszárd and the Danube. It is therefore understandable that the number of fish bones is much less in the ditch of the *türbe* in Szigetvár. There are also smaller watercourses in Szigetvár and its surroundings (e.g. Almás-patak), in which small fish also lived, but due to their size they are generally less likely to occur.

The Visegrád-Palace site from the 16th and 17th centuries indicates only a small difference in the archaeozoological assemblage (1195 specimens) regarding cattle (226 specimens), sheep/goat (149 specimens), and pig (182 specimens). Hen bones occurred in the largest number with 414 specimens. The site is located along the Danube River, and fish remains (70–71 specimens) were found in the same quantity as hunted species (Bökönyi 1974).

Domestic cat remains are known from the Roman period in the Carpathian Basin. Their role may have been rodent control, but they may also have been kept as pets. Cats were also found in the Arpadian period, but their frequency always lags behind that of the dog, which played an important role in human life as a territorial guardian, watchdog, herding animal, herdsman, and hunting companion. There are 28 sites from the Arpadian period where dog bones were found, and cat bones were found in only seven sites (Vörös 2000). And there is only one site where cat bones were found, and dog bones did not turn up: the Murga-Schanz site of the 13th century (Gál 2004). The situation is different for sites of the 13th and 17th centuries, although there are also castles among them. Here, 9 of the 12 sites containing dog bones also contained cat remains (Bökönyi 1974; Tugya 2017).

Cat bones were not considered special in the Ottoman layers, as members of the Muslim population may have preferred cats to dogs (Bartosiewicz & Gál 2003), probably because they were a favourite animal of the Prophet Muhammad. In Christian culture, cats were often associated with witches (Bartosiewicz & Gál 2003).

The ossified dog metatarsals found in Szigetvár appeared to be part of Sudeck's syndrome according to László Bartosiewicz. This disease is a type of chronic pain that usually develops after an injury, in humans after surgery. The pain is usually disproportionate to the severity of the original injury. Sudeck's syndrome (also known as complex regional syndrome, CRPS) is not a common condition. Treatment is most effective when it is started as early as possible, in which case lasting pain relief and even pain-free conditions are possible. In the late stages of the disease, irreversible damage can occur to the bones and surrounding soft tissues (see http links in the References).

Summary

Altogether 14 sediment samples (30 liters per sample) were taken for archaeozoological analysis and 661 animal bone specimens (weighing 4913 g) were found. Apart from some fish, birds, rodents and *Anura* bones, only the remains of domestic animals have been found (**Table 1**). The most common species were sheep/goat and cattle. They account for more than 80% of the vertebrate archaeozoological finds. The consumption of poultry meat, including hen and goose can also be observed. In addition, the remains of dogs, cats, and horses have also been identified. Surprisingly, a few pig bones and teeth were also found at the site, raising the question of whether Christians lived in the town of Türbe kasabası or near the site.

However, such sites are quite rare in Ottoman period Hungary, pig bones often occur in smaller or larger numbers. It is unlikely that Muslims themselves consumed pork, rather than the ethnic groups that came together with the Ottoman people, who were not necessarily Muslims, or the local Christian population. In Szigetvár, the ratio of pig bones is only 0.8% (4 specimens), which is the same proportion as that of rarely occurring horse bones. The soldiers guarding the memorial of Sultan Suleiman must have been faithful Muslims. If the pig bones are contemporaneous with the existence of the tomb, Christians may also have been present in the town.

The archaeozoological results of 10 other sites from the period between the 15th and 17th centuries were compared with the bone material of the Szigetvár – Turbék site. Several of them contain data before the Ottoman conquest, which is also important since we could compare meat consumption habits before and after the Ottoman period. Only two sites had only a few pig bones (Buda Castle - Pasa Palace site, Barcs Palisaded Fort) in addition to the material from Szigetvár. At the other sites, pig bones were found in appreciable quantities and at several sites – e.g. Bajcsa, Fonyód, Visegrád-Palota – in a higher proportion than the number of bones of small ruminants in the Ottoman period. The consumption of pork among the Christian population taxed by the Ottoman authorities increased, which may have been a reasonable, viable response at the time. The pig was a well-known species by this time, and today it is the most popular in Hungarian cuisine, along with poultry. The widespread consumption of pork is partly due to the Ottoman period when pig farming was not taxed so people could keep and breed them without consequences. A further advantage and reason for its success are that it is much less demanding than cattle and sheep, and

after a short gestation period, it gives birth to several offspring at a time, which can be up to twice a year. Thus, Muslim dervishes and soldiers were likely to consume sheep, goats, and beef, as well as poultry meat and fish. The Hungarian or non-Muslim ethnic groups consumed pork as well, which has become increasingly popular. The analysis of the eggshells indicates that both hatched and unhatched, but consumed eggs turned up in Szigetvár. According to our data, the species was bred locally and some of the eggs were consumed. These are the first eggshell analysis data in the Carpathian Basin from the Ottoman period.

Contribution of authors

Tugya Beáta Writing – Original draft.

Acknowledgement

This research has been supported by the Hungarian Ministry of Human Capacities grant 20391-3/2018/FEKUSTRAT and the European Regional Development Fund grant GINOP-2.3.2-15-2016-00009 'ICER'.

References

BARTOSIEWICZ, L. (1995): Camel remains from Hungary. In: BUITENHUIS, H. & UERPMANN, H.-P. eds., *Archaeozoology of the Near East II*. Backhuys Publishers, Leiden, 119–125.

BARTOSIEWICZ, L. (1996): Közép- és török kori állatmaradványok Segesdről. Mittelalterliche und Türkenzeitliche Tierreste aus Segesd. *Somogyi Múzeumok Közleményei* **11** 183–222.

BARTOSIEWICZ, L. (1999): Turkish Period bone finds and cattle trade in south-western Hungary. In: BECKER, C., MANHART, H., PETERS, J., & SCHIBLER, J. eds., *Historia animalum ex ossibus*. Rahden/Westfalen, 47–56.

BARTOSIEWICZ, L. (2009): Állatbetegségek régészeti kutatása. Anatómiai és paleopatológiai vizsgálatok háziállatok csontozatán. *Természet Világa* 2009. november, 524–525.

BARTOSIEWICZ, L. (2020): Az archeozoológia és a környezettörténeti kutatások viszonya a régészetben. In: TÖRŐCSIK, T., GULYÁS, S., MOLNÁR, D. & NÁFRÁDI, K. eds., *Környezettörténet. Tanulmányok Sümegi Pál professzor 60 éves születésnapi köszöntésére.* Geolitera, Szeged, 147–152.

BARTOSIEWICZ, L. & GÁL, E. (2003): Animal Exploitation in Hungary during the Ottoman Era. In: GERELYES, I. & KOVÁCS, GY. eds., *Archaeology of the Ottoman Period in Hungary*. Papers of the conference held at the Hungarian National Museum, Budapest, 24-26 May 2000. Hungarian National Museum, Budapest, 365–376.

BENDA, J. (2016): Marhakereskedelem és mészárszékek a késő-középkori Budán, Pesten, Óbudán. *Tanulmányok Budapest múltjából* **41** 7–40.

BOESSNECK, J. (1970): Osteological Differences between Sheep (Ovis aries Linne) and Goats (Capra hircus Linne). In: BROTHWELL, D. & HIGGS, E. eds., *Science in Archaeology*, Praeger, New York, 331–358.

BÖKÖNYI S. (1974): *History of Domestic Mammals in Central and Eastern Europe.* Akadémiai Kiadó, Budapest, pp. 597.

GÁL, E. (2004): Murga-Schanz 13. századi földvár állatcsontleletei. In: GAÁL, A. ed., *A Wosinsky Mór Múzeum Évkönyve* Szekszárd, **26** 245–258.

GÁL, E. (2012): Possible evidence for hawking from a 16th century Styrian Castle (Bajcsa, Hungary). In: RAEMAEKERS, D.C.M., ESSER, E., LAUWEIER, R.C.G.M.& ZEILER, J.T. eds., *A bouqet of archaeozoological studies.* Essays in honour of Wietske Prummel. Barkhuis & University of Groningen Library, Groningen, 171–178.

GÁL, E. & BARTOSIEWICZ, L. (2016): Animal remains from the Ottoman-Turkish palisaded fort at Barcs, Southwest Hungary. In: KOVÁCS, Gy. & ZATYKÓ, Cs. eds., *"Per sylvam et per lacusnimios"...* The Medieval and Ottoman Period in Southern Transdanubia, Southwest Hungary: the Contribution of the Natural Sciences. Institute of Archaeology Research Centre for the Humanities Hungarian Academy of Sciences, Budapest, 181–252.

https://www.hirslanden.ch/fr/corporate/description-pathologies/maladie-sudeck.html

https://www.webbeteg.hu/cikkek/fajdalom/24022/sudeck-szindroma

JACOMET, S., KREUZ. A. & RÖSCH, M. (1999): *Archäobotanik. Aufgaben, Methoden und Ergebnisse vegetations- und agrargeschichtlic Forschung.* Verlag Eugen Ulmer, Stuttgart. pp. 368.

JAKAB, B. (1978): Fossilis avar- és középkori tojáshéjleletek összehasonlító vizsgálata. *Móra Ferenc Múzeum Évkönyve* **1976-77/1** 41–48.

JAKAB, B. (1980): Újabb tojáshéjlelet-vizsgálatok eredményei (Longobard és avar kori leletanyag vizsgálata). *Móra Ferenc Múzeum Évkönyve* **1978-79/1** 311–322.

KOUDELKA, F. (1885): Das Verhältniss der Ossa longa zur Skeletthöhe bei den Säugetieren. *Extrait de Verhandlungen der Naturforschung in Brünn* **24** 127–153.

NYERGES, É. & BARTOSIEWICZ, L. (2006): Animal keeping at Szentkirály in light of

archaeozoological data from the Middle Ages. *Studia Caroleinsia* **3-4** 331–351.

PAP, N., FODOR, P., KITANICS, M., GYENIZSE, P. & HANCZ, E. (2023): Introduction. Historical and archaeological data for integrated multiproxy environmental historical analyses on the moat profile of the türbe complex of Sultan Suleiman I at Szigetvár – Turbék vineyard hill site (Hungary). *Archeometriai Műhely* **XX/3** 195–200.
https://doi.org/10.55023/issn.1786-271X.2023-016

SCHMID, E. (1972): *Atlas of Animal Bones For Prehistorians, Archaeologists and Quaternary Geologists. Knochenatlas Für Prähistoriker, Archäologen und Quartärgeologen.* Elsevier, Amsterdam, London, New York, pp. 159.

SIDELL, E.J. (1993): A methodology for the identification of archaeological eggshell. *MASCA (Museum Applied Science Center for Archaeology) Research Papers in Science and Archaeology* **10** (Supplement), University of Pennsylvania, University Museum, Philadelphia, pp. 45.

SIEGEL, J. (1976): Animal palaeopathology: possibilities and problems. *Journal of Archaeological Sciences* **3/4** 349–384.

SISSON, S. (1914): *The Anatomy of the Domestic Animals.* Philadelphia and London, W.B. Saunders Company. pp. 930.

TUGYA, B. (2009): Animal remains from an Árpádian Age oven. In: KVASSAY, J. & SCHILLING, L. eds., Settlement and cemetery excavations at the borders of Dunaszentgyörgy. *VIA Kulturális Örökségvédelmi Kismonográfiák* **I** Budapest, 282–286.

TUGYA B. (2012): *Jelentés Szécsény-Gyalogkapu lelőhely állatcsontleleteinek vizsgálatáról.* Kubinyi Ferenc Múzeum régészeti adattár, Szécsény, pp. 11.

TUGYA, B, (2016): Eggshell Remains in an Avar Age Grave in Nădlac. *Archaeologica Bulgarica* **20/1** 93–97.

TUGYA, B. (2017): Nagykanizsa–Miklósfa-Romlottvár (Botszentgyörgy vára) 16. századi állatcsont leletei. *Zalai Múzeum* **23** 185–200.

TUGYA, B., P. BARNA, J. & LICHTENSTEIN, L. (2017): Animal bone finds from Sormás- Mántai-dűlő. Animal bone finds from Sormás-Török-földek. Antler and bone tools at Sormás-Török-földek. In: P. BARNA, J. ed., *The Formation of the Lengyel Culture in South-Western Transdanubia*. Archaeolingua Press, Budapest, 385–398.

TUGYA, B., NÁFRÁDI, K., TÖRŐCSIK, T., SÜMEGI, B.P., GULYÁS, S., POMÁZI, P. & SÜMEGI, P., (2020): Environmental historical analysis of the Sarmatian and Gepids settlement of Rákóczifalva. *Acta Archaeologica Academiae Scientiarum Hungaricae* **71** 101–156.
https://doi.org/10.1556/072 .2020.00005

VON DEN DRIESCH, A. (1976): *A Guide to the Measurement of Animal Bones from Archaeological Sites as developed by the Institut für Palaeoanatomie, Domestikationsforschung und Geschichte der Tiermedizin of the University of Munich.* Peabody Museum Bulletin 1., Peabody Museum of Archaeology und Ethnology Harvard University. pp. 136.

VÖRÖS, I. (2000): Adatok az Árpád-kori állattartás történetéhez. In: BENDE, L. & LŐRINCZY, G. eds., *A középkori magyar agrárium.* Tudományos ülésszak Ópusztaszeren. Csongrád Megyei Múzeumok Igazgatósága, Ópusztaszer, 71–119.

HU ISSN 1786-271X; urn: nbn: hu-4106