

## The consumption of meat within late medieval castles: a case study of Pustý hrad Castle in Zvolen (central Slovakia)

Konzumácia mäsa na hradoch vo vrcholnom stredoveku:  
prípadová štúdia z Pustého hradu vo Zvolene

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*This contribution presents and interprets the results of the analysis of fauna relics from the Pustý hrad Castle in Zvolen in Central Slovakia. The analysed series comes from the Upper castle, from the half of the 13<sup>th</sup> to the 14<sup>th</sup> centuries. A total of 6082 bone fragments weighing about 28 kg were processed. In addition to standard quantification methods (MNI, NISP and weight), the age of the animals and the relative quality of the meat from the body parts represented were also analysed. At the same time, the analysis also considered individual buildings, their location and function, and thus the differences in the representation of species in individual units. Comparisons of results with analogous collections from the late medieval castles of the Hungarian and Czech Kingdoms were not left out either.*

central Slovakia – castle – zooarchaeology – the 13<sup>th</sup>–14<sup>th</sup> century AD

*Cieľom je predstaviť a interpretovať výsledky analýzy faunálnych pozostatkov z vrcholnostredovekého hradu Pustý hrad vo Zvolene na strednom Slovensku. Analyzovaný súbor pochádza z výskumu Horného hradu Pustého hradu, od polovice 13. až do 14. storočia. Celkovo bolo spracovaných 6082 fragmentov kostí o hmotnosti ca 28 kg. Popri štandardných kvantifikačných metódach (MNI, NISP a hmotnosť) bol sledovaný aj vek zvierat a relatívna kvalita mäsa zo zastúpených častí tiel. Zároveň sa v analýze prihliadalo aj na samostatné objekty, ich polohu a funkciu, a tým aj rozdielnosť v zastúpení druhov u jednotlivých súborov. Opomenuté neboli ani porovnania výsledkov s analogickými súbormi z vrcholnostredovekých hradov Uhorského i Českého kráľovstva.*

stredné Slovensko – hrad – archeozoológia – 13.–14. storočie

### 1. Introduction

The Pustý hrad Castle in Zvolen (fig. 1) is located in central Slovakia. It was one of the most important royal settlements of the last Arpád dynasty members and a famous royal hunting ground centre surrounded by forests (Maliniak 2009, 58–137). At the end of the 12<sup>th</sup> century, a massive stone castle was built on a hilltop plateau (571 m asl) by the Hungarian kings. At the time of its peak in the second half of the 13<sup>th</sup> century, the Upper Castle covered an area of 3.5 ha (Beljak et al. 2018, 19–28, 50–52). In the first half of the 13<sup>th</sup> century, the Lower Castle with an area of 0.7 ha was built on top of a lower-situated promontory (476 m asl; Beljak et al. 2014). In the 14<sup>th</sup> century, the massive settlement gradually lost its fortified function, which did not resume in the 15<sup>th</sup> century.

In 1992–2008, V. Hanuliak led the first systematic on-site archaeological research. Early castle restorations are also related to him (Beljak Pažinová – Beljak 2020). Since 2009, research and restoration is being coordinated under the leadership of J. Beljak.

Long-term goals are to regularly present the results of seasonal archaeological research (latest e.g. *Beljak Pažinová et al. 2021*; *Čierny et al. 2020*).

The goal of this paper is to present the osteological animal remains found in selected building interiors at the Upper Pustý hrad Castle in Zvolen (thereinafter Upper Castle). A complex analysis of this varied source offers an insight into the meat consumption habits of the castle dwellers, its preparation, and the settlement's varied natural vicinity. At the same time, the paper builds upon another faunal analysis found in the Lower Pustý hrad Castle (thereinafter Lower Castle) residential tower (*Šimunková et al. 2021*). The medieval culture layers found there can be dated into the 13<sup>th</sup>, up to the beginning of the 14<sup>th</sup> century (*Beljak et al. 2014*).

The number of published analyses of osteological material found at Slovak castles is fairly humble. These papers focus mainly on the diversity of species at individual locations and sometimes on meat production. The studies, however, vary in their quantifying method approach. Another long-term problem is the varied origin period of the material itself, which comes from a broad time range, ranging from the medieval up to the early modern period. When the vast territory of the Hungarian and Czech Kingdoms is taken into account, these comparable analyses are available from altogether twenty-three sites (*fig. 2*; *tab. 3*).

## 2. Pustý hrad Castle in Zvolen – Upper Castle

The castle served as the administrative centre of the vast Zvolen County. According to historical documents, the original residential tower (tower I) may have been built in the 12<sup>th</sup> century (*Beljak et al. 2014*, 36). Still, in the 13<sup>th</sup> century, more structures and tower additions were built (*fig. 3*). The tower I underwent serious reconstruction, in which it gained massive coating (the lower walls became thicker than 5 m). The massive coating suggests that the oldest residential tower was extended horizontally and likely vertically too. The curtain wall was finished in the first decades of the 13<sup>th</sup> century, it had rounded lines, no corners and formed the perimeter of a 3.5 ha area. The area itself varied in height and was predominantly sloping in character.

Another independent residential tower (tower II) expanded the castle's residential capacities in the middle of the 13<sup>th</sup> century. It was built in the centre of the fortified area. The tower was rectangular, 11.2 × 11 m, the original entrance was on the south-western side of the ground floor. At the turn of the 13<sup>th</sup> and 14<sup>th</sup> centuries, due to safety reasons, the entrance was moved into the upper floor, the original entrance was walled up, which "conserved" the original oldest castle inventory (*fig. 4: A*). In the second half of the 13<sup>th</sup> century, a rectangular flanking tower was built on the eastern side of the Upper Castle curtain wall, which guarded the connection ridge. Markings of alure beams are still visible there (*fig. 4: B*). The flanking tower has an irregular ground plan (11 × 7 m), the foundations are 1.9–2.6 m thick.

In the final decades of the 13<sup>th</sup> century, in the lowest-lying northern parts of the Upper Castle, a new rectangular area (the so-called Donč Castle) was defined. Its dimensions were ca. 50 × 50 m. A cross curtain wall, entrance gate, and a relatively shallow ditch separated it from the rest of the castle. The palace was the centre of this castle, its outer dimensions being 11.8 × 23.5 m and its interior area was 160 m<sup>2</sup> (20 × 8 m). It was built in the



Fig. 1. Pustý hrad Castle in Zvolen, Slovakia. Aerial view from the north of the castle hill. At the top right is the Upper Castle, at the bottom left is the Lower Castle. Photo by J. Beljak, 2014.

north-eastern corner of the area. Its basement may have been used for storage (*fig. 4: C*). Other residential buildings were made in the vicinity and the terrace courtyard received smaller agricultural buildings. One of them was an auxiliary pre-palace building (so-called “Stable”, as introduced by V. Hanuliak: however, it is unlikely that during the peak residential period a stable would be placed in the near vicinity of the palace) attached to the eastern curtain wall of the Donč Castle and the southern wall of the palace. Its interior dimensions were  $17 \times 7$  m (*fig. 4: D*). The Upper Castle ceased its function as the castle stopped being a royal residence in the second half of the 14<sup>th</sup> century.

The osteological material which is also the object of this paper was found at four castle buildings (*fig. 4*; residential tower II, flanking tower in the eastern perimeter wall, pre-palace building “the Stable”, the palace). The interiors were being researched by V. Hanuliak in 1993–2002 (*Hanuliak 1995; 1996; 1999; 2001; 2006; Hanuliak – Šimkovic 1997a; 1997b*). They were selected for analysis because of enclosed artefact assemblages from the late medieval period being present there.

### 3. Osteological material and processing methods

The faunal remains used in osteological analysis came from the interiors of four selected buildings located within the Upper Castle of the Pustý hrad Castle in Zvolen (*fig. 4*). The osteological material can be dated into the middle of the 13<sup>th</sup> century and up to the 14<sup>th</sup> century. The hand gathering methods used were dry-screening, dry-sieving, the sedi-

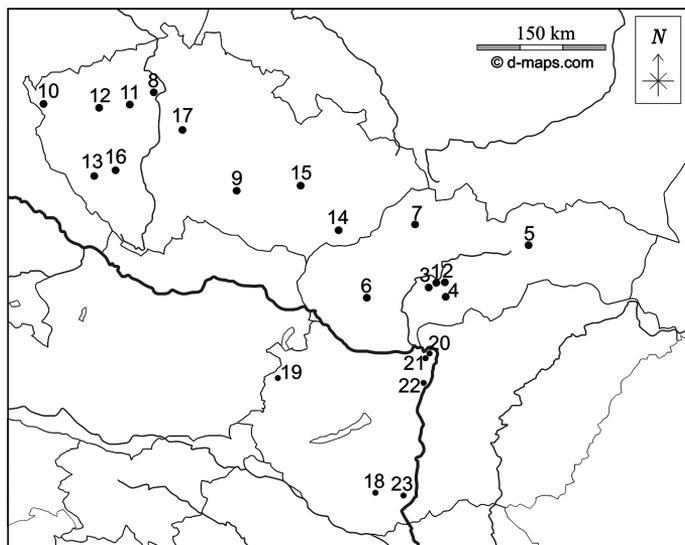
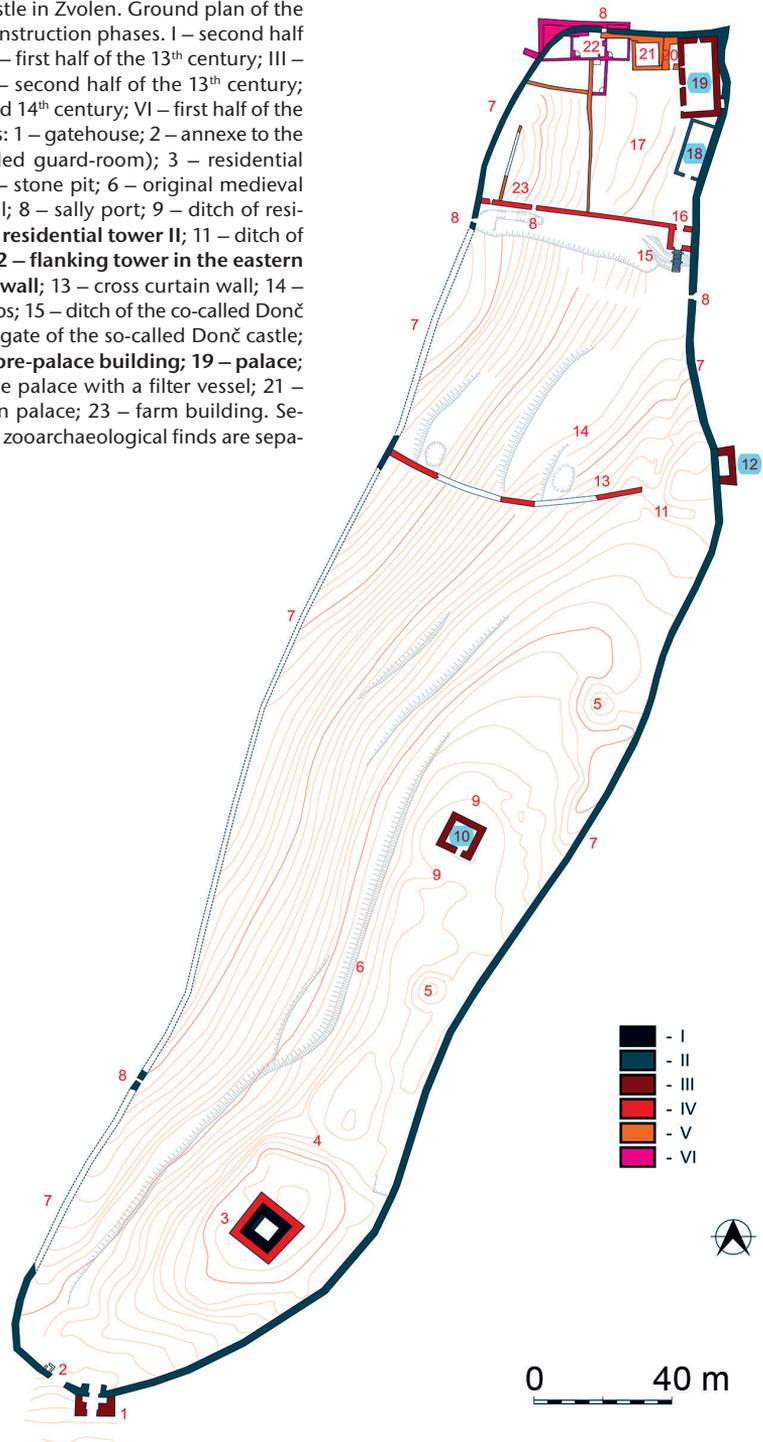


Fig. 2. The geographical distribution of sites mentioned in the study: 1 Zvolen – Pustý hrad Castle, Upper Castle, 2 Zvolen – Pustý hrad Castle, Lower Castle, 3 Peťuša Castle, 4 Dobrá Niva Castle – outer bailey, 5 Markušovce – manor-house, 6 Appony Castle, 7 Lietava Castle, 8 Praha Castle – western outer bailey, northern promontory, 9 Rokštejn Castle, 10 Cheb Castle, 11 Tetín Castle, 12 Krašov Castle, 13 Osvračín Castle, 14 Veselí nad Moravou Castle, 15 Lelekovice Castle, 16 Skála Castle, 17 Zlenice Castle, 18 Váralja-Várfő, 19 Köszeg Castle, 20 Visegrad Castle – Salamon Tower, 21 Visegrad Castle – Royal Palace, 22 Buda – Royal Palace, 23 Öcsény-Oltovány.

ment was not water-sieved. In total, 6,082 bone fragments were analysed, totalling ca. 28 kg in weight. Out of that number, 226 bone fragments, weighing 680.96 g in total were unidentified (unidentifiable, small, medium, large mammal). To better describe the unidentified bone fragmentation, here are the average fragment values: small mammal 1.01 g, mid-sized (medium) mammal 3.65 g, large mammal 9.35 g, unidentifiable bones 1.16 g.

Basic anatomical and taxonomic analysis were based on available publications in veterinary science, anatomy, and zooarchaeology (Adams – Crabtree 2008; Bocheňski – Tomek 2009a; 2009b; France 2009; Kolda 1951; Popesko 2007; Schmid 1972) and using the researchers' own comparative sample collection. Fragments, in which the exact species could not have been determined, were assigned into auxiliary categories commonly used in zooarchaeological publications based on their size, weight, and fragment structure: large mammal (the size of a horse, domestic cattle, deer), mid-sized mammal (the size of a caprine, pig, roe deer, large dog, etc.), and small mammal (the size of rodents). The small ruminants group *Ovis/Capra* (caprines) includes both species of the *Caprinae* subfamily – the domestic sheep and the domestic goat. Whenever the differentiation markings were available, these related species were differentiated using the papers of J. Boessneck (1969), B. J. Adams and P. J. Crabtree (2008), P. Halstead and P. Collins (1995), P. Halstead et al. (2002) and S. Payne (1973). According to animal part determination, the quality of the meat was defined as well. The highest quality meat was included in the quality category of meat A, which includes the muscles of the thigh, back, shoulders and neck; meat quality B contains the muscles of the chest, forearms and knees and quality C represents the

Fig. 3. Pustý hrad Castle in Zvolen. Ground plan of the Upper Castle with construction phases. I – second half of the 12<sup>th</sup> century; II – first half of the 13<sup>th</sup> century; III – mid-13<sup>th</sup> century; IV – second half of the 13<sup>th</sup> century; V – turn of the 13<sup>th</sup> and 14<sup>th</sup> century; VI – first half of the 14<sup>th</sup> century. Captions: 1 – gatehouse; 2 – annexe to the fortified wall (so-called guard-room); 3 – residential tower I; 4 – ditch; 5 – stone pit; 6 – original medieval road; 7 – curtain wall; 8 – sally port; 9 – ditch of residential tower II; 10 – residential tower II; 11 – ditch of the flanking tower; 12 – flanking tower in the eastern perimeter (curtain) wall; 13 – cross curtain wall; 14 – terrace with workshops; 15 – ditch of the co-called Donč castle; 16 – entrance gate of the so-called Donč castle; 17 – courtyard; 18 – pre-palace building; 19 – palace; 20 – an annexe of the palace with a filter vessel; 21 – cistern; 22 – northern palace; 23 – farm building. Selected buildings with zooarchaeological finds are separately marked.



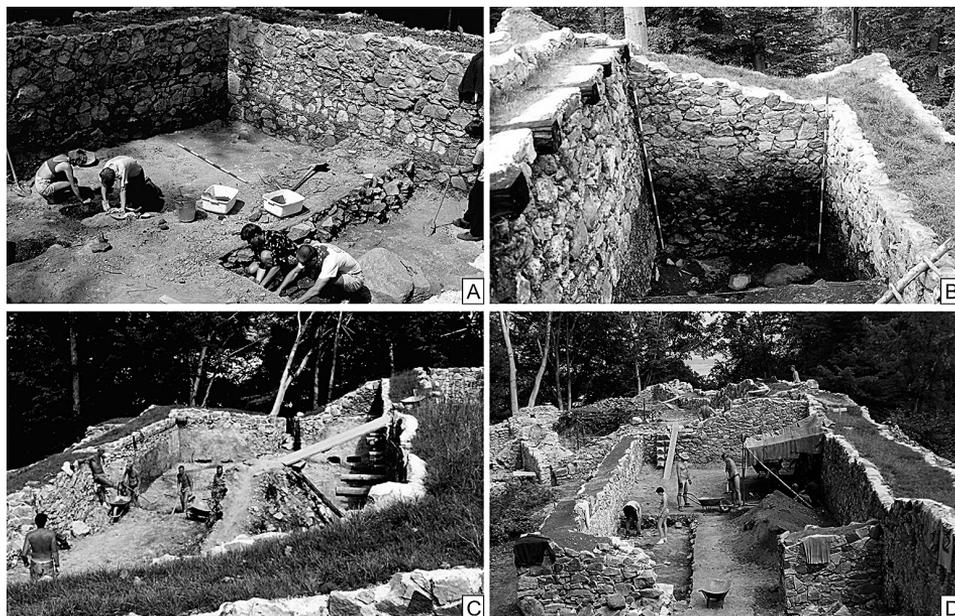


Fig. 4. Pustý hrad Castle – Upper Castle in Zvolen. Interiors of selected buildings with faunal remains. A: Residential Tower II, B: Flanking Tower in the eastern perimeter (curtain) wall, C: Palace, D: Pre-palace building. Photo by V. Hanuliak.

distal parts of the limbs (autopod bones as phalanges or metapodia) and the skull, which contains the least muscles (Páral *et al.* 1995; Páral – Pyszko 2011). In this work we will not deal with the weight determination of meat quality, because we are aware of the problems of this method and at the same time for comparison of castles from other research these data are not published.

The osteometric data of bones and fragments was measured according to *von den Driesch* (1976). The individual withers heights were then determined based on said data (e.g. Vitt 1952; Fock 1966, ref. *von den Driesch – Boessneck* 1974; 1974; Teichert 1969; Harcourt 1974). The approximate age of each animal was determined using both methods: the epiphyseal fusion method (Reitz – Wing 2008; Zoetis *et al.* 2003), and the tooth eruption and wear method (Grant 1982; Hillson 2005; Payne 1973; 1987).

Basic observed signs included cultural taphonomic and pathological bone lesions (e.g. sawing, chopping, bone deformation, etc.), bone tissue preservation according to A. K. Behres-meyer (1978) and signs of heat affection (Shipman *et al.* 1984; Thurzo – Beňuš 2005).

Basic quantifying methods – NISP, MNI, and bone weight – were used in evaluating the material. These methods were based on standard methods (Klein – Cruz-Uribe 1984; Kyselý 2004b; Reitz – Wing 2008).

In the case of NISP (number of identified bone specimens), every bone or bone fragment was considered a single unit/specimen, despite some fragments likely forming a single bone (i.e. an epiphysis without fusion, with certainty belonging to a specific diaphysis, still marked as a separate unit). An upper or a lower jawbone was considered a single unit, together with its teeth.

	Species	Species (Latin name)	NISP	MNI	weight (g)
Domestic animals	Cattle	<i>Bos taurus</i>	296	6	13285.87
	Goat	<i>Capra hircus</i>	5	1	29.3
	Horse	<i>Equus caballus</i>	3	1	63.14
	Sheep	<i>Ovis aries</i>	79	6	1047.06
	Sheep or goat	<i>Ovis/Capra</i>	324	12	2314.79
	Pig	<i>Sus domesticus</i>	588	25	6221.06
	Dog	<i>Canis familiaris</i>	2	1	45.94
	Cat	<i>Felis domesticus</i>	1	1	2.34
Domestic birds	Duck (?)	<i>Anas platyrhynchos?</i>	2	1	7.13
	Goose ?	<i>Anser domesticus?</i>	5	1	8.58
	Hen	<i>Gallus domesticus</i>	156	17	205.06
	Peafowl?	<i>Pavo domesticus?</i>	2	1	04.7
Wild mammals	Red deer	<i>Cervus elaphus</i>	101*		3046.71
	Roe deer	<i>Capreolus capreolus</i>	3	1	79.02
	Brown bear	<i>Ursus arctos</i>	3	1	21.91
	Red squirrel	<i>Sciurus vulgaris</i>	4	1	2.76
	Wild boar	<i>Sus scrofa</i>	18	1	871.06
Rodents	Rodents sp.	<i>Rodentia sp.</i>	5	1	4.27
	Rat	<i>Rattus rattus</i>	7	1	0.6
	Voles	<i>Microtus sp.</i>	2	1	0.06
Wild birds	Wood pigeon	<i>Columba sp.</i>	1	1	1.18
	Western capercaillie	<i>Tetrao urogallus</i>	2	1	1.88
	Grey partridge	<i>Perdix perdix</i>	3	1	2.22
	Common quail	<i>Coturnix coturnix</i>	5	1	0.46
	Galliforms	<i>Galliformes sp.</i>	6	2	5.67
	Birds	<i>Aves sp.</i>	221**	2	16.36
Fish		<i>Pisces sp.</i>	3979***	2	37.27
Frogs		<i>Ecuadata sp.</i>	25	1	1.91
Molluscs		<i>Bivalvia sp.</i>	2	1	0.28
Snails		<i>Gastropoda sp.</i>	10	1	0.32
	Indet.		99		115.04
	small mammal		26		26.34
	medium mammal		70		259.07
	large mammal		30		280.51
<b>Total</b>			<b>6085</b>	<b>93</b>	<b>28009.1</b>

\* of which 80 antler fragments

\*\* of which 187 fragments of eggshells

\*\*\* of which 3887 fish scales

Tab. 1. Pustý hrad Castle – Upper Castle in Zvolen, Slovakia. Characteristic of zooarchaeological material according to quantification methods

MNI (minimum number of individuals) values were based on the total number of a single anatomical element, taking into consideration the side, fragmentation and age determination of individual species. Fragments belonging together were considered a single individual.

## 4. Results

### 4.1. Animal species

Within the Upper Castle the following animal species were identified: domestic cattle, domestic pig, domestic sheep, domestic goat, domestic dog, cat?, horse, small ruminants

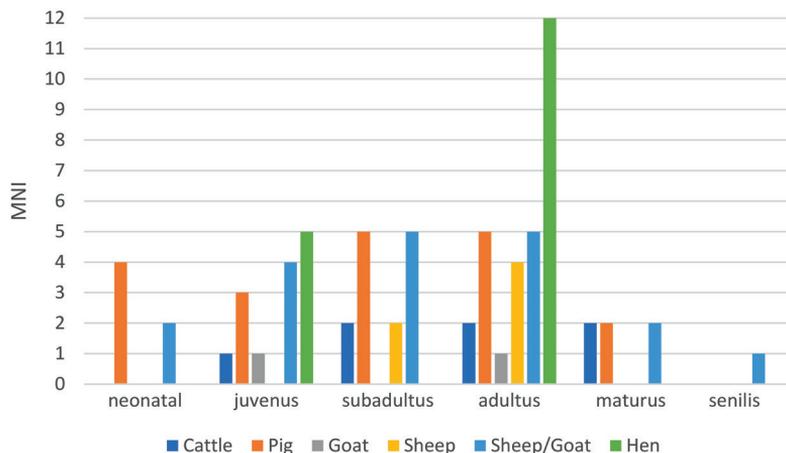


Fig. 5. Pustý hrad Castle – Upper Castle in Zvolen. The proportions between ageable remains among meat purpose of individual animal species.

group of sheep/goat (caprines), poultry: hen, domestic goose?, domestic duck?, peafowl?. Other species include: roe deer, red deer, wild boar, red squirrel?, brown bear. Bird bones were identified as well: pigeon, common quail, grey partridge, western capercaillie, game-fowl/galliforms, and other unidentified bird species. The osteologic material included unidentified snails, molluscs, and frogs. Some bone fragments were identified as rodents, specifically voles and common rats. Numerous fish scales were found as well, but these were not closely examined. Some may have belonged to fish the size of carps or catfish (*tab. 1*).

#### 4.2. Osteometry

If the state of the bone allowed it, measurements were taken and withers heights were determined. The approximate **domestic cattle** withers height, based on two radial bones (*radius*) was 123–127 cm. Several **domestic sheep** withers heights were determined, based on heel bones (*calcaneus*), metacarpal bones (*metacarpus*), metatarsal bones (*metatarsus*), a thigh bone (*femur*), radial bones (*radius*), and ulnae (*ulna*). The approximate height was 53–73 cm, but if only the withers heights based on thigh bones, radial bones, and ulnae are taken into account, the approximate height was 53–58 cm. **Domestic pig** withers heights were also determinable. They were based on the total lengths of heel bones, metacarpal bones, metatarsal bones, a radial bone and an ulna. The approximate withers heights ranged between 68 cm and 100 cm. However, if we again take into consideration the longer bones only (radial bone and ulna), the withers height remains stable between 68 and 69 cm.

#### 4.3. Animal age

In general, most of the animals were slaughtered in their adult and subadult age. Curiously, neonate and juvenile domestic pigs and caprines were also found within the castle. This can suggest the consumption of very young pigs and lambs/kids. Mainly adult chickens

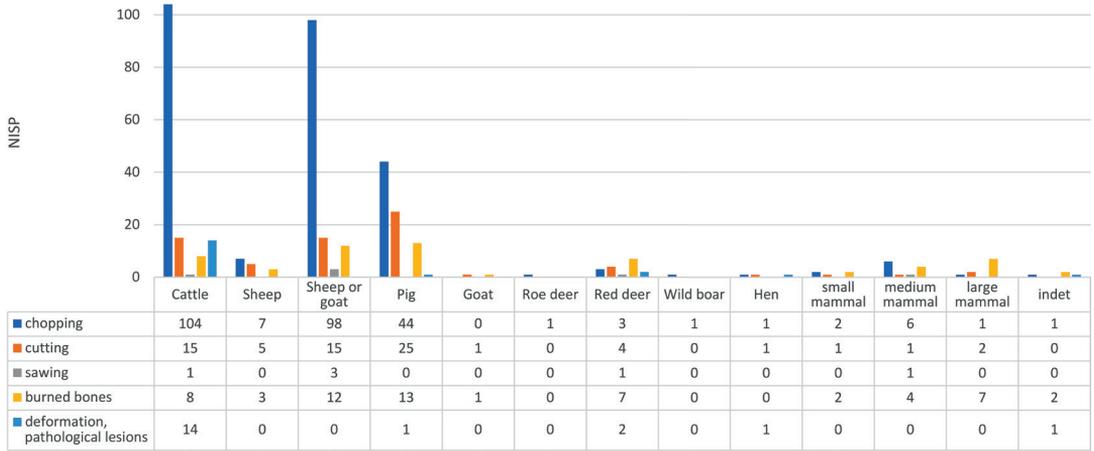


Fig. 6. Pustý hrad Castle – Upper Castle in Zvolen. Marks indicative of defleshing or food preparation and deformities on the bones of individual species.

were found within the case, but scarce instances of chicks were present as well. Domestic cattle was present both as young calves and as adult specimens (*fig. 5*).

## 5. Pathologies and taphonomic modifications

Signs of various intentional damage were found during the analysis, such as chopping, cutting, sawing, as well as bone pathologies and deformations (*fig. 6*).

Pathologies mainly include deformations and pathological signs. These were present on 16 bone fragments belonging to two animal species, namely domestic cattle and chicken. In the case of the chicken, it was specifically a healed tarsometatarsus fracture. Other deformed bones belonged to cattle and one fragment could not have been identified in detail. The cattle deformations were specifically deformed bony projections at the thoracic and cervical vertebrae and deformation and bony projections (osteophytes) on the proximal and distal phalange, as well as on the knee bone.

To the taphonomic modifications belong intentional modifications such as chopping, cutting, etc., but also gnawing by predators or rodents. Chopping, cutting, sawing, or grinding marks were present on 412 bone fragments (0.67 %). However, 76 of those fragments were red deer and roe deer antlers. They were manufacturing products, not kitchen waste. Nine other bone fragments had manufacturing signs. These were defined either as manufacturing goods or items: crossbow parts, a crossbow nut made of cattle bones (*basis metatarsalis*), a piece of a whistle (probably) made of unidentified mammal bone, two pieces of manufacturing goods to make arrowheads made of an unidentified large mammal bone.

Hence, only 327 bone fragments can be considered kitchen waste. Domestic cattle bones had the most cutting, chopping, and sawing marks, 114 bone fragments in total. These modifications were present on long bones and vertebrae, but some were found on a lower jawbone, sternum bone, pelvis, proximal phalanges, shorter bones (ankle bone, heel bone), and on shoulder blades. Caprines were the second most numerous group with the most

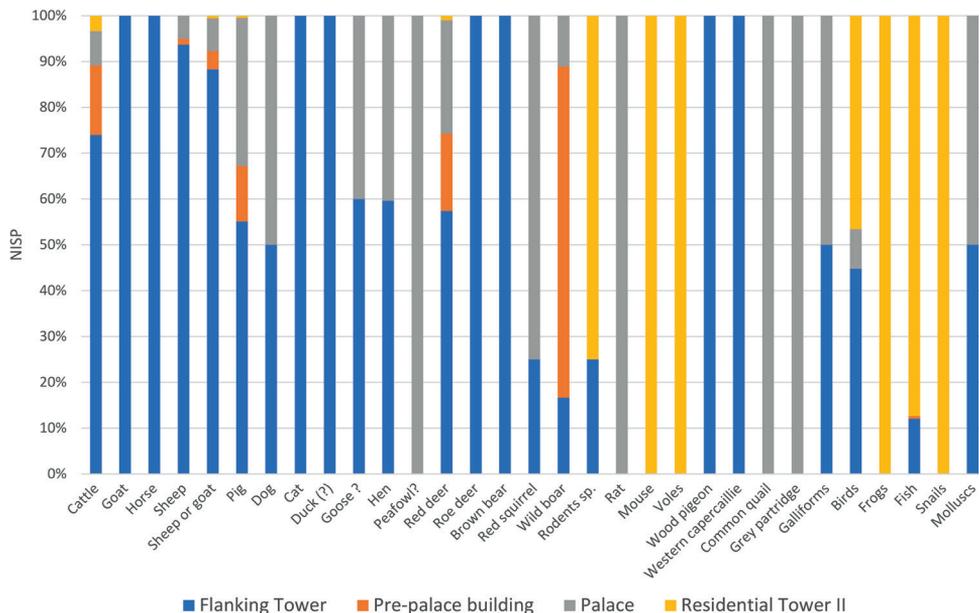


Fig. 7. Pustý hrad Castle – Upper Castle in Zvolen. Representation of individual species within the selected buildings.

cooking and butchering modifications. In this case, the spine was often severed, hence chopping markings are mainly on thoracic and lumbar vertebrae, but they are present on ribs as well. Domestic pig bone fragments also had butchering and cooking modifications, namely on thoracic and lumbar vertebrae, shoulder blades, long bones, metatarsal bones (*metatarsus*), skull parts (upper jawbone, parietal bone, occipital bone).

Other analysed markings included sings or burns found on 61 bone fragments. Mainly long bones, ribs and vertebrae were singed or burned. Curiously, 6 red deer antler fragments were singed. The bone tissue changed its colour ranging from brownish-black to greyish white. Two fish vertebrae were found as well, singed black.

Bite marks were also present on some bone fragments. These were left by carnivores (likely dogs) and rodents. Carnivores were interested mainly in long bone epiphyses, originating from cattle, sheep, caprines, domestic pigs, chickens, bears, and red deer. Rodent bite marks were also left on long bones, but also on phalanges and a single deer antler.

## 6. Spatial analysis of bone fragments found within the castle

Since the material originated in four various castle buildings (*fig. 4*) with various functions, a spatial evaluation of animal remains was conducted as well, focusing on species, age profiles and meat quality (*tab. 2; fig. 7*). The highest number of species (23) was identified within the flanking tower by the eastern curtain wall. The lowest number of species (7) was found within the auxiliary pre-palace building. However, we reiterate here that this is closely related to the number of fragments (NISPs) found in individual buildings. From

	Species	Species (Latin name)	Flanking Tower	Pre-palace building	Palace	Residential Tower II
Domestic animals	Cattle	<i>Bos taurus</i>	219	45	22	10
	Goat	<i>Capra hircus</i>	5	-	-	-
	Horse	<i>Equus caballus</i>	3	-	-	-
	Sheep	<i>Ovis aries</i>	74	1	4	-
	Sheep or goat	<i>Ovis/Capra</i>	286	13	23	2
	Pig	<i>Sus domesticus</i>	324	71	190	3
	Dog	<i>Canis familiaris</i>	1	-	1	-
	Cat	<i>Felis domesticus</i>	1	-	-	-
Domestic birds	Duck (?)	<i>Anas platyrhynchos?</i>	2	-	-	-
	Goose ?	<i>Anser domesticus?</i>	3	-	2	-
	Hen	<i>Gallus domesticus</i>	93	-	63	-
	Peafowl?	<i>Pavo domesticus?</i>	-	-	2	-
Wild mammals	Red deer	<i>Cervus elaphus</i>	58	17	25	1
	Roe deer	<i>Capreolus capreolus</i>	3	-	-	-
	Brown bear	<i>Ursus arctos</i>	3	-	-	-
	Red squirrel	<i>Sciurus vulgaris</i>	1	-	3	-
	Wild boar	<i>Sus scrofa</i>	3	13	2	-
Rodents	Rodents sp.	<i>Rodentia sp.</i>	1	-	-	4
	Rat	<i>Rattus rattus</i>	-	-	7	-
	Voles	<i>Microtus sp.</i>	-	-	-	2
Wild birds	Wood pigeon	<i>Columba sp.</i>	1	-	-	-
	Western capercaillie	<i>Tetrao urogallus</i>	2	-	-	-
	Common quail	<i>Coturnix coturnix</i>	-	-	5	-
	Grey partridge	<i>Perdix perdix</i>	-	-	3	-
	Galliforms	<i>Galliformes sp.</i>	3	-	3	-
	Birds	<i>Aves sp.</i>	99	-	19	103
	<b>Frogs</b>	<i>Ecuadata sp.</i>	-	-	-	25
	<b>Fish</b>	<i>Pisces sp.</i>	481	22	1	3475
	<b>Snails</b>	<i>Gastropoda sp.</i>	-	-	-	10
	<b>Molluscs</b>	<i>Bivalvia sp.</i>	1	-	1	-
	Indet.		21	8	24	46
	small mammal		14	-	12	-
	medium mammal		47	8	6	9
	large mammal		18	5	7	-
	<b>Total</b>		1767	203	425	3690

Tab. 2. Pustý hrad Castle – Upper Castle in Zvolen, Slovakia. Occurrence of individual species within the selected buildings.

the Flanking tower with the most numerous species identified, the most bone fragments were also found. So it is not surprising that it is in this building that most species have been identified. The palace, other than a few domestic agricultural animal bone fragments, contained species never found in any other castle building: common quail, grey partridge, rat, and two bones which most likely belonged to a peafowl (note: determined only according to a bird anatomy handbook). Surprisingly, several bone fragments belonging to the red squirrel were found within this building. Red squirrel bones were found in the flanking tower as well but in much lower numbers. The residential tower II contained only the domestic mouse, murids, frogs, and snails. Tower II had a higher concentration of fish scales, rodent remains, and unidentified bird remains too. The main agricultural animals (cattle, caprines, pigs) left only a handful of fragments.

It is vital to mention the red deer, remains of which were identified in every single researched building. From the total fragment number of 101, 80 were antler fragments.

Fig. 8. Pustý hrad Castle – Upper Castle in Zvolen. Comparison of quality of meat for cattle within the selected buildings.

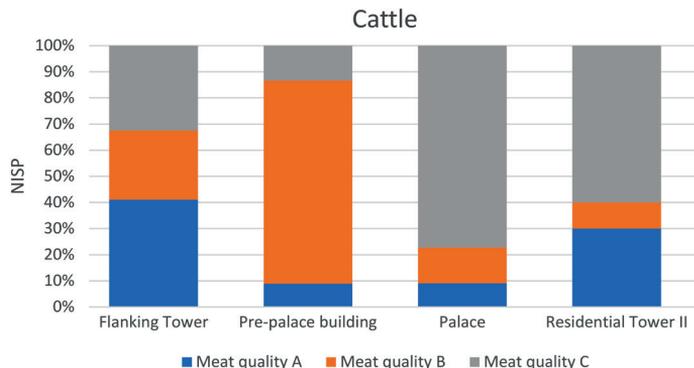
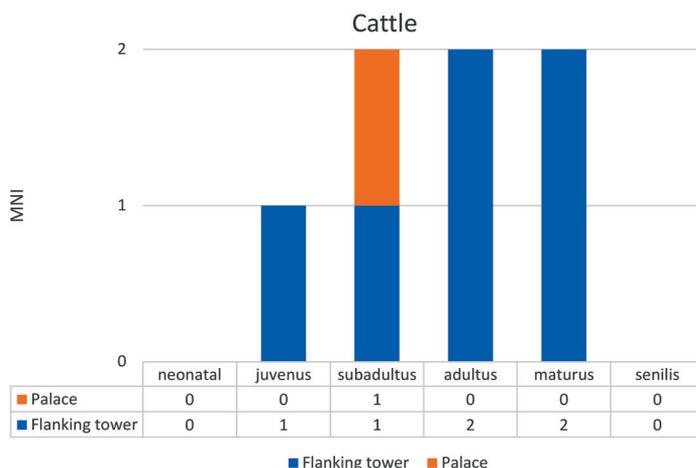


Fig. 9. Pustý hrad Castle – Upper Castle in Zvolen. The proportions between ageable cattle remains in the selected buildings.



Most of these antlers, either as manufacturing goods or as manufacturing waste, were present within the flanking tower (53 pieces).

Unidentified bird remains are interesting as well, most of them represented by eggshell fragments (flanking tower – 93 pieces, residential tower II – 96 pieces).

### 7. Meat quality within the buildings of the castle

Several critical moments came up when comparing the eating quality based on zooarchaeological material found within the individual castle buildings. The first problem was that not every building yielded sufficient numbers of bones for age determination of even the main livestock species. Another problem, as mentioned above, occurred when comparing material files that did not contain the same or even a similar number of bone fragments of a given species. Despite these difficulties, an attempt was made to evaluate eating quality within the individual castle buildings based on age profiles and meat quality representation for each agricultural species individually.

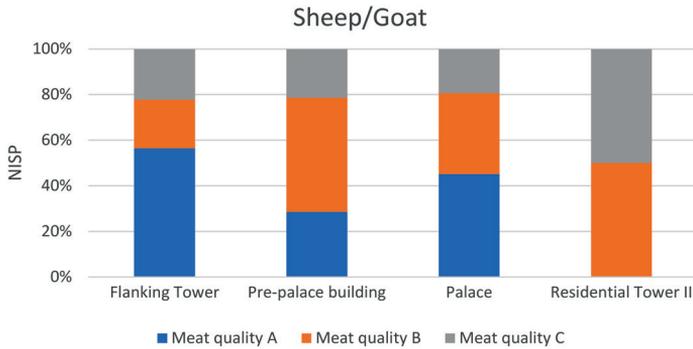


Fig. 10. Pustý hrad Castle – Upper Castle in Zvolen. Comparison of quality of meat for caprine within the selected buildings.

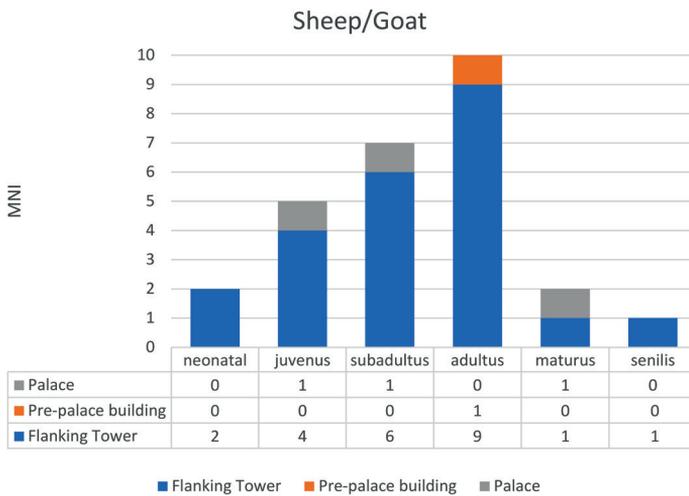


Fig. 11. Pustý hrad Castle – Upper Castle in Zvolen. The proportions between ageable caprine remains in the selected buildings.

Several curiosities came up when comparing the **domestic cattle** category according to anatomical elements (*fig. 8*). Meat quality A was scarce within the palace and the residential tower II. C quality meat was prevalent there, meaning the anatomical elements found bore minimal or no amount of meat. These were mainly phalanges, rarely teeth, and both jawbone variants. The auxiliary pre-palace building had a lot of B quality meat, C quality being scarce. Still talking about domestic cattle, the flanking tower had the most A quality meat pieces, the B and C quality categories had a roughly even distribution. It is crucial to mention that these outcomes may be affected by field collection methods and the number of fragments found and used for the analysis pertaining to these methods.

The domestic cattle age profiles within the individual buildings are again affected by the state of bone fragments found. The species' age categories could have only been determined within the flanking tower and the palace (*fig. 9*). The results: the flanking tower yielded the remains of juvenile and older individuals too, on the other hand, a single sub-adult specimen was determined within the palace, meaning higher meat quality.

In the case of the **domestic sheep and the domestic goat** category, the flanking tower and the palace contained the highest number of A quality meat pieces (*fig. 10*). On the

Fig. 12. Pustý hrad Castle – Upper Castle in Zvolen. Comparison of quality of meat for pig within the selected buildings.

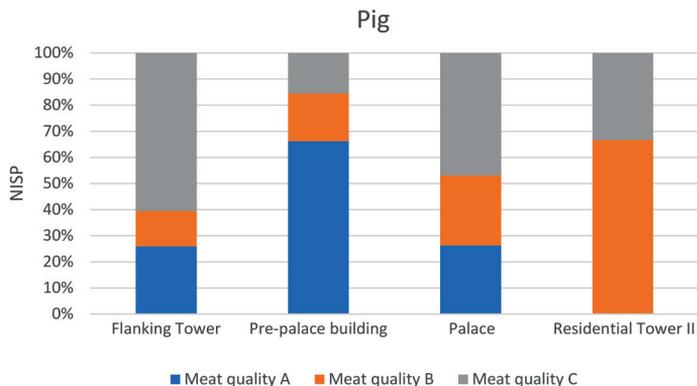
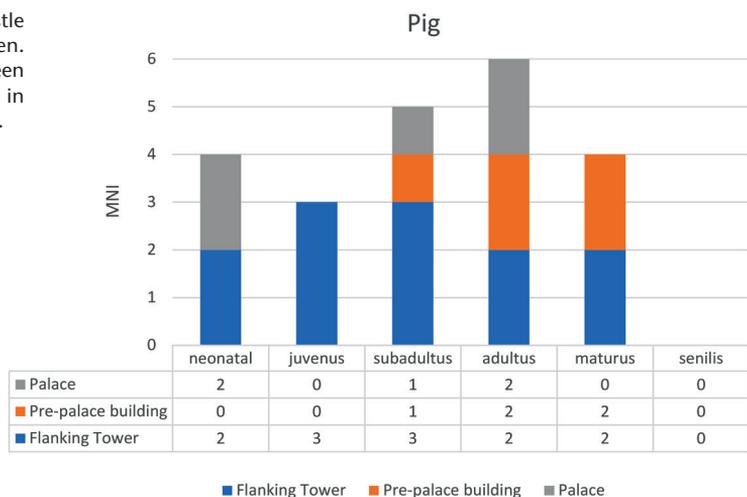


Fig. 13. Pustý hrad Castle – Upper Castle in Zvolen. The proportions between ageable pig remains in the selected buildings.



other hand, there were no A quality meat pieces of this small ruminant group within the residential tower II. It only contained B and C quality meat elements. The pre-palace building again featured a higher number of B quality pieces. The flanking tower featured every age category, including neonate and senile animals (*fig. 11*). The pre-palace building contained adult animals only, the palace featured the bones of juvenile, subadult, and older specimens.

The auxiliary pre-palace building again featured the highest number of **domestic pig** A quality meat pieces (*fig. 12*). This category was less prevalent in the flanking tower and the palace. The residential tower II featured a high B quality meat concentration; however, the data may be skewed due to only three bone fragments found within the interior. C quality meat was most prevalent within the flanking tower. The age profile is interesting as well (*fig. 13*). The flanking tower featured every domestic pig age category, ranging from neonate to older specimens. The palace contained neonate piglets, subadult and adult pigs, the pre-palace building featured subadult, adult, and older specimens.

## 8. Evaluation

According to the aforementioned data, the residential tower II featured only a small number of main domestic animal remains. Commensal animal remains such as mice were the most prevalent, as well as a lot of fish scales, frogs, clams, unidentified bird eggshells. The palace was the exclusive location of the common quail, grey partridge, and what was likely a peafowl. Considering the residential function of both buildings, only a small number of bone fragments was found within.

The auxiliary pre-palace building, however, sparks interest. From the point of meat quality of the main agricultural species, the A and B categories were prevalent, which may suggest that the building had an agricultural function, perhaps that of a kitchen, meat processing, or a meat storehouse. Its close connection to the palace may make this theory more credible.

When considering the age at slaughter, the palace featured mainly young animal remains (domestic pig and domestic cattle), the pre-palace building featured both young and older specimens, the flanking tower had mainly juvenile and adult specimens, with some neonate individuals (caprines and pigs).

To what extent the quality of meat in the Upper Castle is characteristic and representative we can determine on the basis of a comparison with other seats. However, only three sites with different social contexts passed the required prerequisites: the royal Lower Castle in Zvolen (Beljak *et al.* 2014; Šimunková – Beljak Pažinová – Beljak 2021, 178, fig. 7), the Peťuša Castle (Beljak Pažinová 2017; Beljak Pažinová – Ragač 2018; Šimunková – Beljak Pažinová 2018, 374, graf 3) – residence of the toll station garrison located within the Zvolen woodland hunting ground at a visual distance of 2 km from the Upper Pustý hrad Castle, and the Banská Štiavnica – Glanzenberg, a fortified rich mining town and castle (Bielichová – Labuda 2017, 37–39, fig. 4; Labuda 2016) less than 20 km southwest of the Upper Pustý hrad Castle as the crow flies. All three locations feature similar domestic cattle meat rates (fig. 14) and have similar meat quality dispositions for this species (Páral – Pyszko 2011, tab. 1). In the case of the domestic pig, more significant differences are apparent (fig. 15). C quality meat (slaughterhouse waste) was prevalent at the Upper Pustý hrad Castle and Peťuša Castle. On the other hand, C quality was less prevalent at the Lower Pustý hrad Castle and in Banská Štiavnica – Glanzenberg. This would suggest that the socially higher castles (the royal Pustý hrad Castle and a rich mining town and castle) also enjoyed higher quality meat. Another possible explanation for the prevalence of C quality meat at the Upper Castle is that most of it originated in younger specimens. They did not require being cut up into smaller portions, hence body parts with no meat were found as well. When comparing the meat quality of caprines (fig. 16), both the Upper and the Lower Castle shine into the foreground, as the A quality meat was significantly prevalent at both locations. It was followed by B quality meat. C quality meat rate is more than halved. Caprines were slightly more often consumed at Peťuša Castle, according to better-quality animal parts being present (a higher rate of B and C quality meat, a slightly lower rate of A quality meat). Banská Štiavnica – Glanzenberg follows a different trend. B quality meat is significantly dominant, C quality meat rate is less than a half. The data suggest that the royal Pustý hrad Castle received the highest quality caprine meat. It would also appear as a location of direct consumption. The fortified mining town and castle Glanzenberg was also a purely consumption location, this being backed up by the particularly

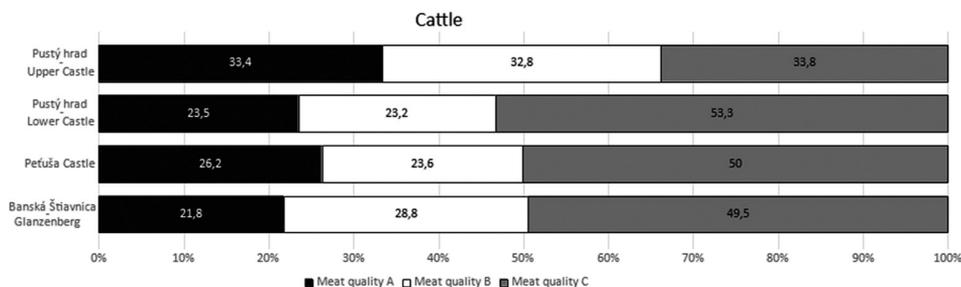


Fig. 14. Comparison of quality of meat for cattle from comparable sites.

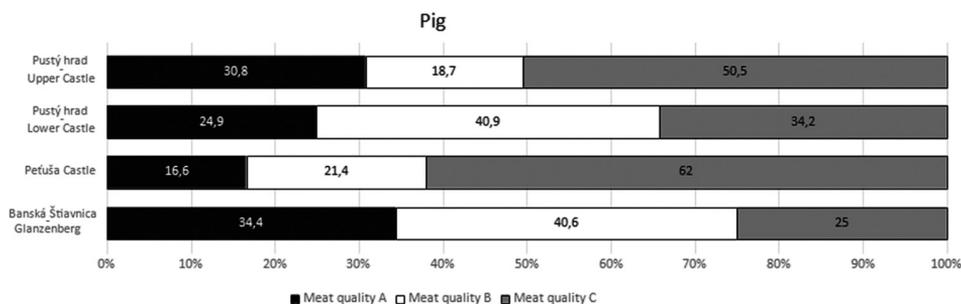


Fig. 15. Comparison of quality of meat for pig from comparable sites.

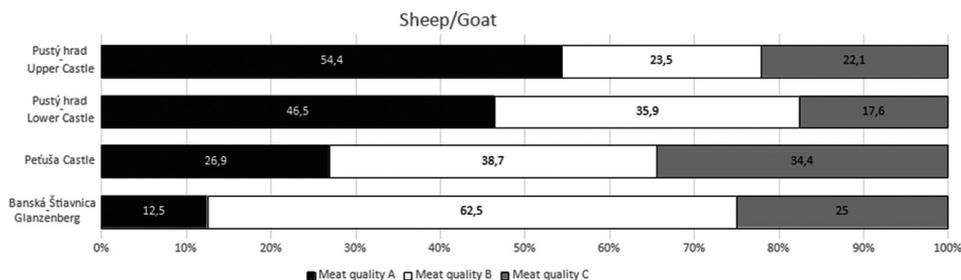


Fig. 16. Comparison of quality of meat for caprine from comparable sites.

low rate of caprine animal waste. In the case of Peťuša Castle, caprine meat was demonstrably prevalent and beef was fairly rare, including predominant slaughterhouse waste. This could have pertained to the castle garrison and its guard function.

## 9. Discussion

To be able to compare the analysed material found at the Upper Castle in Zvolen, other osteological analyses from Slovakia, the Czech Republic, and Hungary were selected (*tab. 3; fig. 2*). The goal was to explain the consumer behaviour of the castle inhabitants, as well as their eating preferences in light of the animals consumed.

	Site	Century	Number of specimens NISP (total/specified)	Cattle	Pig	Sheep/Goat	Hen	Wild animals	Source
Slovakia	1 Zvolen – Pustý hrad/Deserted Castle – Upper castle	13 <sup>th</sup> –14 <sup>th</sup>	6085/5860	5	10	6.9	2.7	72 (of it 3.9% birds, 65.4% fish)	
	2 Zvolen – Pustý hrad/Deserted Castle – Lower castle	13 <sup>th</sup>	3633/1289	28.1	15.2	25.8	9	13.2 (of it 6.2% birds)	Šimunková et al. 2021
	3 Peťaša Castle	14 <sup>th</sup> –15 <sup>th</sup>	9004/3774	15.3	20.7	24.5	4.5	18.7 (of it 2.5% birds)	Šimunková – Beljak Pažinová 2018
	4 Dobrá Niva Castle – outer bailey	15 <sup>th</sup> –17 <sup>th</sup>	1660/753	31.9	27.1	30.3	1.5	7.8	Šimunková – Beljak Pažinová 2017
	5 Markušovce – manor-house	13 <sup>th</sup> –20 <sup>th</sup>	52/35	40	25.7	22.9	2.9	2.9	Bielich et al. 2018
	6 Appony Castle	13 <sup>th</sup> –17 <sup>th</sup>	296/230	44.3	18.7	24.8	1.7	3.9	Repka et al. 2017
	7 Lietava Castle	15 <sup>th</sup> –17 <sup>th</sup>	?	10	10	29	17 (+30% goose)	3	Bielich 2015; Vozák 2014
Czechia	8 Prague Castle – western outer bailey, northern promontory	12 <sup>th</sup> –13 <sup>th</sup>	1624/455	20	31	9.6	7	3.7	Kovačíková et al. 2019, 536, Tab. 1
	9 Rokštejn Castle	end of the 13 <sup>th</sup>	5501/2915	35.8	25	8.2	5.8	22 (including fish and rodent)	Sacherová 2003
	10 Cheb Castle	13 <sup>th</sup> –14 <sup>th</sup>	1006/1006	34	31	10		12.5–14.5	Šamata et al. 2001
	11 Tetín Castle	13 <sup>th</sup> –14 <sup>th</sup>	4196/1398	22	28	6.9	27.4	10.7	Peške 1994
	12 Krasov Castle	12 <sup>th</sup> /13 <sup>th</sup> – 15 <sup>th</sup>	3382/595	28.7	10.3	7.7	27.4	13.9	Peške 1994
	13 Osvračín Castle	2 <sup>nd</sup> half of the 13 <sup>th</sup> – 1 <sup>st</sup> half of the 15 <sup>th</sup>	100/100	3	1	0	5	72 (birds)	Kyselý 2000
	14 Veselí nad Moravou Castle	13 <sup>th</sup>	9097/5407	36.8	37.2	7.6	3.8	8	Dejmal 2020; Sívová 2015
	15 Lelekovice Castle	14 <sup>th</sup>	7/954	44	32	7		8.1	Páral et al. 1994
	16 Skála Castle	end of the 14 <sup>th</sup> –15 <sup>th</sup>	?	71.75	18.8	3.3	0	3.6	Nývltová Fišáková 2010
	17 Zlénice Castle	half of the 15 <sup>th</sup>	179/73	46.6	26	6.8	1.4		Kyselý 2004a
	18 Váralja-Várfő Castle	13 <sup>th</sup>	7/1343	34	34.5	19.2	5.7	3.6	Bartosiewicz 1998
	19 Kőszeg Castle	13 <sup>th</sup> –14 <sup>th</sup>	7/239	36.4	34.3	13.8	2.5	12.5	Békányi 1974, 378
	20 Visehrad Castle – Salamon Tower	13 <sup>th</sup> –15 <sup>th</sup>	7/148	52	20.3	16.9	8.1	2	Békányi 1974, 429
21 Visehrad Castle – Royal Palace	14 <sup>th</sup> –15 <sup>th</sup>	7/3871	24.3	20.1	15.94	27.13	13.6	Békányi 1974, 426	
22 Buda – Royal Palace	14 <sup>th</sup> –15 <sup>th</sup>	4205/3548	50.4	20.1	11.9	5.9	9	Matolcsi 1977	
23 Öcsényi-Oltovány	13 <sup>th</sup> –15 <sup>th</sup>	2662/2370	33.1	34.9	22.2	0.3	8.9	Bartosiewicz 2016, Table 1	

Tab. 3. Comparison of late medieval castles in Slovakia, Czech Republic and Hungary. Proportions between the remains of the most important meat producing animals in the assemblages.

When considering the rate of the main agricultural animals, the remains of cattle are prevalent in Slovak medieval castles, representing 28–44 %. The Upper Castle is a clear exception. Here, domestic cattle represents only 5 % of all animal remains, placing itself third on the ladder. Lietava Castle is different as well, with domestic cattle placed second, representing 10 % of all animals found. In the case of Peťuša Castle, domestic cattle placed third, representing 15.3 % of all domestic species found. Another common feature of Slovak castles is that caprines usually represent the second most numerous animal group. The rate usually is between 22 % and 30 %. The Upper Castle is again an exception. Here, the group represented only 6.9 % of all animals found. When it comes to the domestic pig, the Slovak castle average is 15–27 %. Again, the exception is true in this case as well, the domestic pig represented only 10 % of all animals found within the Upper Castle. It would therefore seem that the Upper Castle inhabitants preferred pork as their meat of choice. Only the Lietava Castle represents a similarly low rate of domestic pig bone remains.

In the case of the chicken, important differences are presented (*tab. 3*). The Upper Castle in Zvolen, Oponice Castle, Dobrá Niva Castle outer bailey, and the noble estate in Markušovce, all featured a low rate of chicken remains found, namely under 3 %, in some cases under 2 %. The situation is somewhat better at the Peťuša Castle (4.5 %) and the Lower Castle in Zvolen (9 %). Higher values have been measured at Lietava Castle. Here, the chicken represented 17 % of all analysed remains. This high rate may be explained with chicken being the meat of choice for the Thurzó family (*Lengyelová 2012, 129–131*) – Lietava Castle owners.

When it comes to game as meat eaten within the analysed Slovak castles, as well as the noble estate, the rate averages between 2.9 % up to 7.8 %. The castles located within the Zvolen woodland hunting ground are a clear exception: Peťuša Castle (18.7 %, 2.5 % being wild birds), Lower Castle (13.2 %, 6.2 % being wild birds), Upper Castle (up to 72 %, 3.9 % being wild birds, 65.4 % fish remains). This large rate of wild animals likely pertains to the usage of these castles. The castles are located within royal hunting woodlands, famous in the medieval period (*Maliniak 2009, 180–182*). At the same time, Peťuša Castle likely served as the residence of the toll station garrison (*Beljak Pažinová – Ragač 2018*). But as mentioned above, the Upper Castle is characterized by a large number of fish remains. Apart from them and from wild birds, the Upper Castle is in the lower limit of game hunting (2.7 %). This enormous number of fish remains could be because fish was an important source of protein during fasting periods when meat and dairy products were not allowed. In addition to complete church fasts, there were also so-called fasts restrained (*ieiunium semiplenum, abstinentia*), and therefore slightly softer, when eggs and dairy products were allowed to be eaten. These more restrained fasts took place every Wednesday, Friday, and later Saturdays joined them and were observed by the rulers (*Hlaváčková 2015, 448*). However, explaining this number of fish in the Upper Castle would want further study from a historical point of view.

When looking at the material found at Czech castles (*tab. 3; fig. 2*), it is evident that domestic cattle was usually very prevalent (rate between 22 % and 71.8 %). The exceptions were: Tetín Castle (domestic cattle in the third place), Veselí nad Moravou Water Castle (cattle in the second place), Prague Castle – western outer bailey, north promontory (cattle in the second place). The domestic pig was dominant in the two latter castles. Domestic cattle represented only 3 % of all animals found at the Osvračín Castle, for example. The second most numerous species was the domestic pig. Its rate averaged between 18 % and

32 %. Osvračín Castle was again an exception, only a single bone of this species was found there. Caprines (sheep/goats) placed third, their rate ranging from 6.8 % (Zlenice Castle) to 10 % (Cheb Castle). Once more, Osvračín Castle was an exception, featuring no remains of this animal group. Within the Skála Castle, caprines represented only 3.3 % of all animals remains. Overall, Osvračín Castle was specific with its massive prevalence of wild game – 72 %. It is important to note that the total number of analysed animals remains was low and all wild game remains were identified as bird remains.

The individual castles feature various rates of the wild game present. Usually, the rate averaged between 8 % (Veselí nad Moravou Castle) and 14.5 % (Cheb Castle). However, at Skála Castle, for example, the number of the wild game remains was low (3.6 %), a similar rate was present at Prague Castle – western outer bailey, north promontory (3.7 %). Zlenice Castle featured no wild game remains. On the other hand, a high rate of wild game was found at Rokštejn Castle (22 %) and Osvračín Castle (72 %, all wild birds).

The prevalence of chicken in Czech castles is interesting as well. The most common rate of chicken among other meat types was 7 %. Tetín Castle and Krašov Castle are exceptions, their rate of chicken remains found reached 27.4 % – meaning second place among all analysed species.

When it comes to Hungarian castles (*tab. 3; fig. 2*) domestic cattle was the dominant main domestic species (24 %–53.5 %). In general, the domestic pig was placed second (20 %–34.9 %) and caprines were placed third (11.9 %–22.2 %). The chicken rate was anywhere between 2 % and 8 %. The Öcsény-Oltovány Castle was an exception, with the chicken representing only a minimal part of all animals remains found (0.3 %). In contrast, the Royal Palace in Visegrád featured chicken remains as its most common animal remains found, namely 27.2 %. The rate of game remains found at individual locations varied. Generally, it did not reach higher than 14 %.

When comparing the overall domestic animal species situation within Hungarian and Czech castles of the late medieval period, it is apparent that according to the percentage contribution to the number of identifiable bones, cattle seems to have been the most important domestic animal in terms of fragment numbers, providing not only beef but also dairy products and draught power as well as bone and leather used in craft industries. Forms of secondary exploitation and industrial hide processing, however, were unlikely to have taken place at a large scale in the castles themselves. Pork seems to have dominated in terms of fragment numbers at settlements where less beef was consumed. The castles Tetín, Veselí nad Moravou, Prague Castle – western outer bailey, north promontory, Váralja-Várfő, Öcsény-Oltovány and Upper Castle in Zvolen are examples to this exception. Here, domestic pig bones dominate, being followed by cattle or caprines. However, it can also be misleading, as the data has shown from the Öcsény-Oltovány Castle and Upper Castle in Zvolen. In these castles, an attempt was made to analyse the bone weights as well. They suggest that over half of the meat consumed in the castles must have been beef. This means that while pig remains are dominant in the assemblages in terms of absolute fragment numbers, when bone weights are taken into consideration, it is evident that approximately twice as much beef was consumed at the sites as pork. Meat from caprines was far less significant, as shown by their small summarized weights.

Horse bones occur scarcely in the castle assemblages, clearly indicating that this species did not contribute to the meat supply of the castles. At late medieval sites, horse carcasses were processed for manufacturing purposes only: fine cut marks on the bones of the feet

often testify to the use of the hide. Horse metapodia were frequently carved due to their strength and straight shape (*Bartosiewicz 2016*, 159). In the absence of such activities, however, there was no reason to bring horse body parts into the castle area.

Dog and cat meat was not consumed either and, therefore, remains of these animals had a smaller chance of ending up in the archaeological material mainly consisting of kitchen refuse. Dog carcasses are thus likely to be discovered intact and in anatomical order. The very few dog and cat bones f.e. at the Upper Castle in Zvolen, however, were disarticulated and probably represent secondary deposition. By the late medieval period, luxury dogs became important symbols of social status across Europe (*Bartosiewicz 2011*), and therefore they must have been present at settlements, especially where hunting was pursued. As was undoubtedly the case at the Pustý hrad Castle in Zvolen (*Maliniak 2015*). This hypothesis is supported by some bones in the kitchen refuse gnawed on by dogs which must have scavenged for food remains within the castle area.

Game animals usually represent a fifth or a sixth of the analysed assemblage. However, the data is often skewed by antlers, which are common within all settlements and could have been collected freely. Not all pieces of game found must have also been consumed. Fish remains also help inflate the numbers, which is especially evident in the case of the Upper Castle. It is important to mention that oftentimes, the remains of furbearers were a common find at various castles, which could mean that these species were not hunted exclusively for meat, but mainly for their fur.

In conclusion, it should be pointed out that when comparing, we did not take into account the different social backgrounds of the dwellers at the selected castles. Nevertheless, the outcomes presented suggest meat being consumed in a hierarchical society. The differences are evident both in the quantity and the quality of the meat consumed. Higher social status is indicative of a better quality basic diet. It is also proven that a higher diversity of zooarchaeological species (especially game) is considered to be a sign of a higher social environment (*Ashby 2002*).

## 10. Conclusion

After processing the osteological animal material found in four selected building interiors in the Upper Castle of the Pustý hrad Castle in Zvolen (Slovakia), rich biodiversity of species has been identified. In total, 6,085 bone fragments were analysed, totalling ca. 28 kg in weight. The rate of identified domestic animals was 24 %. Disregarding the fact that 65 % of all animal fragments were fish bones and scales, the rate of bone fragments from domestic species was 69 %. The analysis pointed out the importance of pork in medieval castle cuisine. Small ruminants (sheep and goats/caprines) played a slightly smaller role. Placed third in the number of fragments found were the remains of domestic cattle. Domestic fowl species were present as well, especially the chicken. The rate of wild game remains found, large game especially was not negligible either.

According to the spatial analysis, which evaluated the age profiles, animal presence, and meat quality within the selected castle buildings (palace, auxiliary pre-palace building, flanking tower, residential tower II), the pre-palace building may have served as a kitchen or a storehouse. A and B quality meat was highly prevalent. Other residential areas, the palace and residential tower II, presented only a few bone fragments. This phenomenon

is understandable, considering waste must have been regularly and actively removed from these interiors. The palace featured rare animal species as well, namely common quail, and peafowl. This may suggest their particular popularity within the aristocracy.

The residential tower II interior was interesting as well, featuring a massive amount of fish remains. The flanking tower featured evidence of manufacturing – a fairly high rate of red deer antler waste and manufacturing goods. When it comes to the meat quality in the given building, A quality caprine meat was prevalent. All age categories were being consumed within this building – juveniles, older specimens, but mainly adults.

The analysis outcomes, age structure especially, suggest that slaughterhouse animals were not commonly kept within the castle. The residents surely largely relied on produce from a subject village (or villages), which was either bought or received as tax. However, the neonate piglets, lambs, and juvenile specimens found within the Pustý hrad Castle may suggest a level of agricultural independence and animal husbandry directly on site. In the case of adult cattle, the production of milk and draught function come into mind as well. Various reasons may have led to animals being kept within the castle and their remains being found within various castle buildings (milk production, wool production, source of drawing power). Faunal material was also highly fragmented, which may suggest a unified way of animal product processing (meat, fat, hide, bone, antler) directly on site.

When it comes to taphonomic characteristics, the Upper Castle in Zvolen presented traces of portioning and processing. These intentional modifications suggest that the bone assemblage originated in kitchens. Singing was fairly rare (1 %). It was usually present on domestic pig, caprine, domestic cattle, and red deer bones. Gnawing marks (0.6 %) were present as well, usually left by carnivores, sometimes rodents.

As per common knowledge, the Pustý hrad Castle in Zvolen was a famous royal hunting ground centre. Therefore, the indication of a woodland environment due to the presence of game (red deer, roe deer, bear, wild boar, red squirrel, capercaillie) is not surprising. Animals of this size need a good cover, and therefore they are indicative of forested areas in the relative proximity of the site. Water environment was identified as well (fish, duck, goose), secured by the near vicinity of the Hron River. Meadows and pastures were identified due to the presence of the partridge or the common quail, as well.

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