Volume XI • Issue 2/2020 • Pages 149–176

INTERDISCIPLINARIA ARCHAEOLOGICA
NATURAL SCIENCES IN ARCHAEOLOGY
homepage: http://www.iansa.eu

Animal and Plant Remains from Two Kalenderberg Group (Hallstatt Culture) Cremation Graves in Devín-Záhrady, Slovakia

Zora Bielichová[a], Mária Hajnalová[b*], Petra Kmeťová[c], Peter Barta[d]

[a]*Institute of Archaeology, Slovak Academy of Sciences, Akademická 2, 94921 Nitra, Slovakia*
[b]*Department of Archaeology, Constantine the Philosopher University, Hodžova 1, 94974 Nitra, Slovakia*
[c]*The Monuments Board of the Slovak Republic, Cesta na Červený most 6, 81406 Bratislava, Slovakia*
[d]*Department of Archaeology, Comenius University in Bratislava, Gondova 2, 81102 Bratislava, Slovakia*

ARTICLE INFO

Article history:
Received: 16th June 2020
Accepted: 19th November 2020

DOI: http://dx.doi.org/10.24916/iansa.2020.2.2

Key words:
Early Iron Age
Eastern Hallstatt Culture
Kalenderberg Group
cremation graves
burial rituals
archaeozoology
archaeobotany
^{14}C
residuality
intrusion

ABSTRACT

The flotation of deposits from two recently excavated Kalenderberg Group cremation graves in Devín-Záhrady (SW Slovakia) yielded a plethora of archaeozoological and archaeobotanical remains, including small, otherwise overlooked, ecofacts. The results of our analysis in the context of contemporary data show that animals clearly constituted an unambiguous part of funerary ritual activities. Pig, fish, red deer, cattle and caprines were all exploited at Devín-Záhrady. These animals represented both food and symbolic offerings, with a preference for pig and fish. Cattle, red deer, pig and caprines astragali found in grave 2 were all associated with one of the urns. The age of perinatal piglets was used to indicate the season when the funerals took place. Plant macro-remains are much less common than bone remains and are not associated with the burial. The results of the analysis change what is known about the array, quantity and way animal and plant offerings from Kalenderberg Group cremation graves were prepared for the burial ritual. Their study also permitted residual and intrusive materials to be detected, allowed reconstruction of the deposit's formation processes and establishment of the connections (or absence of connections) between these ecofacts to the funeral and/or burial ritual.

1. Introduction

The Kalenderberg Group (for review see Nebelsick, 1997) was part of the Eastern Hallstatt Culture or Northeastern Alpine Hallstatt region. It formed in eastern Austria (Lower Austria, Burgenland), the westernmost part of western Hungary (Lake Neusiedl area), and the western part of southwestern Slovakia, developing out of the local Late Bronze Age Urnfield Culture. What is known at present about the graves and burial rituals of the Kalenderberg Group is mostly based on excavations of large barrows, the resting places of the elite (Nebelsick, 1997, pp.50–62; Pichlerová, 1969; Preinfalk, 2003; Rebay, 2002; Studeníková, 1994; 1996), while published information on more modest, so-called "simple" or "flat" graves, once perhaps associated with small mounds, is rare (*e.g.* Lochner, 1988; Rebay, 2006). Previous studies show that traditional cremation burial ritual predominated. The human cremation remains were placed in graves along with sets of pottery vessels, food, jewellery and components of clothing, tools, and occasionally also symbolic objects. Graves were frequently covered with burial mounds of various sizes. Large barrows, several meters in height, were constructed for individuals on the top of the social hierarchy. Rich grave goods suggest that offerings of meat (Müller-Scheeßel and Trebsche, 2007; Kmeťová, 2017a) and drinks stored mainly in ceramic vessels (*e.g.* Nebelsick, 2000) were commonly placed in graves. Detailed descriptions of meat offerings or animal remains reflecting other purposes in graves are discussed only sporadically in the literature. Very little is also known about plant remains from graves. What

*Corresponding author. E-mail: mhajnalova@ukf.sk

has been discovered are thought to represent food-offerings burned on the pyre (Hladíková and Kmeťová, 2019; *cf.* also Stadler, 2010, pp.81–82). The systematic sampling of deposits and flotation as a means of extracting organic remains (including seeds, charcoal, small vertebrate bones, fish remains, mollusc shells, insects *etc.*) still rarely takes place and/or the research results are not published.

The aim of this study is to present and interpret the animal and plant specimens retrieved by flotation of archaeological deposits from two "flat" graves unearthed in 2014/2015 in Bratislava-Devín, at the site of Záhrady (further referred to as Devín-Záhrady) and preserved in a charred (wood and seeds) as well as an uncharred state (mammalian and fish bones, mollusc shells, seeds and plant roots).

Following the cultural model of cremation of human bodies and their burial (*e.g.* Kuijt *et al.*, 2014), we assume that grave goods originate from two sets of ritual activities which might have been distinct in time and space and were either connected or not connected to the transformation through fire that accompanies cremation burial. In this paper, the detailed quantitative, spatial and taphonomic analysis of organic remains is presented, as well as a discussion of the identification of the origin of such ecofacts. As our intention was to improve understanding of the role and meaning of animals and plants in cremation burial rituals in this period and region, the results are presented against the backdrop of previous studies from the region of the Kalenderberg Group and Eastern Alpine Hallstatt Culture, the majority of which were written at a time when organic finds did not have a place at the centre of the excavator's attention.

2. Site and investigated archaeological contexts

Devín is a southwestern borough of Bratislava at the confluence of the Danube and Morava rivers. An important multiphase archaeological site, the Castle Hill of Devín (Figure 1), rises above the meeting point of the two rivers. The Castle Hill and adjacent area of the present-day borough have been inhabited since the Early Neolithic (Farkaš, 2012). During the Late Bronze and Early Iron Ages, Castle Hill seems to have been occupied continuously and the site has yielded strong evidence of flourishing long-distance contacts (Studeníková, 1993; pp.119–131; 2012, pp.137–138; Harmadyová, 2012a; 2012b; 2016; Kmeťová and Stegmann-Rajtár, 2014, pp.156–160).

Until recently, apart from sporadic stray finds associated with Late Bronze and Early Iron Age funeral activities (Harmadyová, 2006; 2012a; 2012b), two discoveries suggested the presence of one large or possibly a few small necropoli. The first is an Early Iron Age grave found on Kozičova Street (Novák *et al.*, 2008) and the second is an assemblage of finds thought to come from a grave dating to the turn of the Bronze and Iron Ages in the Lower Castle

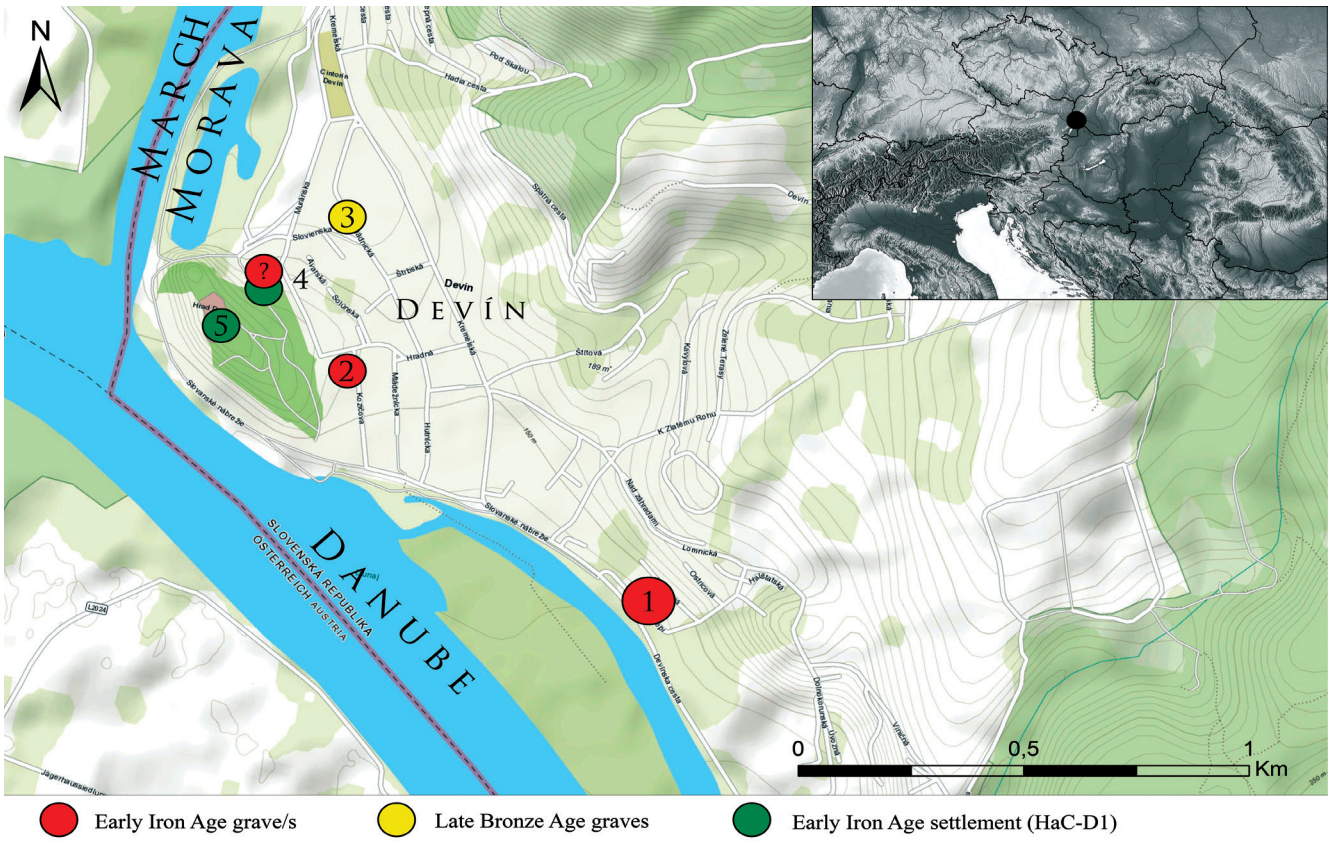

Figure 1. Bratislava-Devín. Location of sites dated to the Late Bronze Age and the Early Iron Age (HaC-D1). 1 – the site of Devín-Záhrady, two of the Early Iron Age graves presented here; 2 – the site on Kozičova St., an Early Iron Age grave; 3 – the site on Brigádnická St., Late Bronze Age graves; 4 – Devín-Lower Castle, an Early Iron Age grave (?) and settlement; 5 – Devín-Middle Castle, Early Iron Age hilltop settlement.

on Castle Hill (Kmeťová and Stegmann-Rajtár, 2014, pp.156–160). These two sites are located 800 and 600 m northwest of the Devín-Záhrady site that is the focus of this article (Figure 1).

The Devín-Záhrady site is located on the bank of the Danube, at the foot of the Devínska Kobyla massif, the southernmost promontory of the Little Carpathians and the westernmost part of the Carpathian mountain range. The settlement occupied a moderate terrace, rising 10 m above the river valley and 100 m from a present active meander of the Danube River. Sunken features as houses, storage pits, postholes, ditches and an oven recovered during rescue excavations attest to an occupation during the Late Hallstatt and Middle and Late La Tène periods (Chmelo *et al.*, 2015). The two Early Iron Age cremation graves belonging to the Kalenderberg Group (Eastern Hallstatt Culture) were situated near the edge of the terrace, approximately 8 m from each other.

Grave 1, feature no. 70, formed a semi-rectangular pit with rounded corners and dimensions of 2 m by 2.25 m (Figure 2:1). The southwest corner of the grave remains unexcavated. Direct evidence for the former presence of a burial mound was not detected. The bottom of the grave was at least 40 cm below the modern walking horizon. Four ceramic vessels were found in the centre of the floor (Figure 3:1): two large vessels (nos. 1 and 2) with conical necks, a deep bowl (no. 3),

Figure 2. Devín-Záhrady. Kalenderberg Group cremation graves; 1 – grave 1 (feature 70), 2 – grave 2 (feature 71). Photo: Archaeological Agency Bratislava.

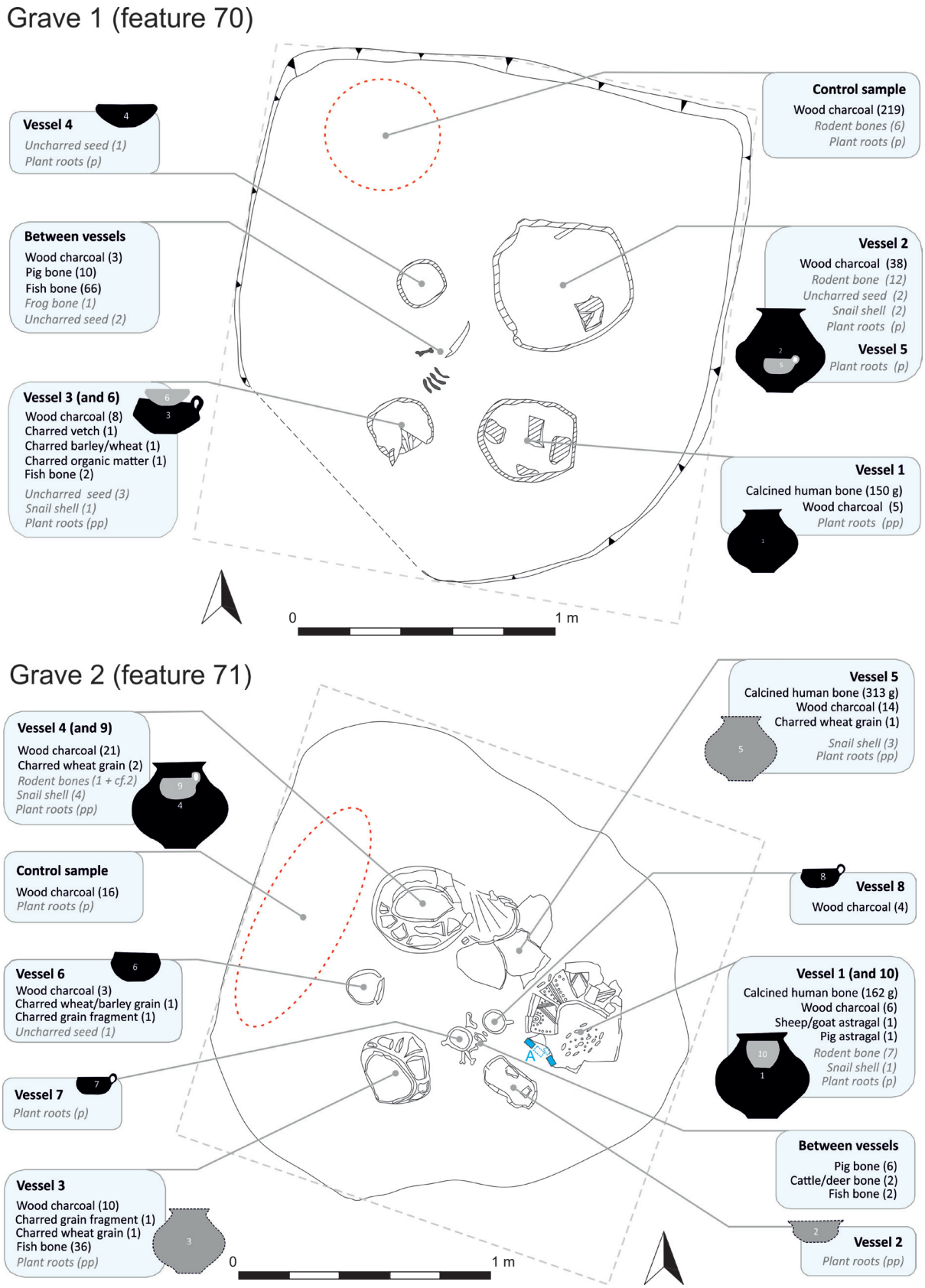

Figure 3. Devín-Záhrady. Kalenderberg Group cremation graves with schematic representation of organic finds/samples taken. 1 – Grave 1 (feature 70), 2 – Grave 2 (feature 71). Vessels in black can be fully reconstructed. Vessels in grey with solid outlines were not recognized during excavation. Vessels in grey and dashed outline were heavily damaged and reconstruction is only tentative. Black organic finds are from the Early Iron Age and those shown in grey are intrusive, residual or probably intrusive/residual. Location or tentative location (dashed outline) of astragali (blue colour) in grave 2 is indicated by letter A. Abbreviations: p – less than 10 ml; pp – more than 10 ml.

and shallower bowl (no. 4). A handled cup (no. 5) and a small bowl (no. 6) were later recovered from inside the large vessel no. 2 and the deep bowl no. 3 respectively. All the vessels were fragmented *in situ* due to post-depositional collapse. Among the vessels placed in the centre of the grave were animal bones and an iron knife. A darker "ashy" patch, 0.25 m × 0.6 m, spread over the earth between vessel no. 2 and the edge of the grave. Calcined bones recovered from vessel no. 1 (an urn) were perfectly burnt into a chalky form (indicating pyre temperatures between 550°–700°C). Those fragments of bone retaining diagnostic criteria came from one human individual, older than 7 years (Bodoriková *et al.*, 2019, pp.28–32).

Table 1. Devín-Záhrady. Information on contexts sampled for flotation and the results of sorting of the flot and heavy residue fractions. Quantity: + – less than 10, ++ – more than 10.

	Context	Volume (l)	Fraction	Fraction volume (ml)	Charcoal	Charred seeds	Uncharred seeds	Animal bones	Calcined bones	Pottery	Organic matter	Snail shells	Roots
Grave 1	Vessel 1	7	flot	20	5	–	–	–	+	–	–	–	++
			residue	430	–	–	–	–	++	+	–	–	–
	Vessel 2 (+5)	17.5	flot	70	38	–	2	–	–	–	–	+	+
			residue	470	–	–	–	++	–	+	–	–	–
	Vessel 3 (+6)	6	flot	25	8	2	3	–	–	–	+	+	++
			residue	185	–	–	–	+	–	+	–	–	–
	Vessel 4	2	flot	6	–	–	1	–	–	–	–	–	+
			residue	90	–	–	–	–	–	+	–	–	–
	Vessel 5	0.4	flot	11	–	–	–	–	–	+	–	–	+
	Between vessels	2	flot+residue	106	3	–	2	++	–	–	–	+	–
	Control	4	flot	55	219	–	–	+	–	–	–	–	+
			residue	115	–	–	–	+	–	–	–	–	–
Grave 2	Vessel 1 (+10)	5	flot	11	6	–	–	+	+	–	–	+	+
			residue	600	–	–	–	+	++	–	–	+	–
	Vessel 2	2	flot	6	–	–	–	–	–	–	–	–	++
			residue	65	–	–	–	–	–	+	–	–	–
	Vessel 3	8	flot	11	10	2	–	–	–	–	–	–	++
			residue	460	–	–	–	++	–	+	–	–	–
	Vessel 4 (+9)	11	flot	31	21	2	–	+	–	–	–	+	++
			residue	330	–	–	–	+	–	+	–	+	–
	Vessel 5	8	flot	8	14	1	–	–	+	–	–	+	++
			residue	860	–	–	–	–	++	+	–	–	–
	Vessel 6	1.5	flot	1	3	2	1	–	+	–	–	–	–
			residue	20	–	–	–	–	–	+	–	–	–
	Vessel 7	0.25	flot	4	–	–	–	–	–	–	–	–	+
			residue	23	–	–	–	–	–	+	–	–	–
	Vessel 8	0.25	flot	1	4	–	–	–	–	+	–	–	–
			residue	21	–	–	–	–	–	+	–	–	–
	Between vessels	1	flot	2	–	–	–	+	–	–	–	–	–
			residue	530	–	–	–	++	–	–	–	–	–
	Control	4	flot	11	16	–	–	–	–	–	–	–	+
			residue	75	–	–	–	–	–	–	–	–	–

Grave 2, feature no. 71, was a pit with unclear outlines measuring 1.75 by 1.8 m, that originally probably formed a rectangle (Figure 2:2). Remains of a burial mound were not detected, although two post-holes were found close to the grave (features 72 and 73) and might represent remains of an aboveground structure. The bottom of grave 2 was at least 50 cm below the modern surface. Eight ceramic vessels were found in the central part of the grave's floor (Figure 3:2): one large vessel with a conical neck (no. 1), three large vessels, possibly with conical necks (nos. 3, 4, 5), a bowl (no. 2), a deep bowl (no. 6) and two handled cups (nos. 7 and 8). A handled cup (no. 9) and probably a (cooking) pot (no. 10) were found when separating the soil for flotation from the remains of large vessels no. 4 and 1 respectively. Most of the vessels were fragmented *in situ* due to post-depositional collapse. Animal bones and an iron knife were found among the vessels in the centre of the grave. Calcined human bones were discovered in vessels (urns) no. 1 and 5 and were burned into perfect, or almost perfectly into, chalk (indicating temperatures of 550–700°C in the pyre). Among the identifiable bones found in vessel no. 1 were small tooth sockets, most probably of the deciduous teeth of a child as well as a fragment of the *processus spinosus* from the cervical vertebra of another human individual who was at least 15–20 years old. In vessel no. 5, the calcined bones included an incomplete, most likely deciduous, human tooth. If it is a canine tooth then it comes from a 3 to 7-year-old child (Bodoriková *et al.*, 2019, pp.28–32).

3. Methods

The excavations of both graves were carried out under time stress in severe weather conditions in late November and December 2014 (Chmelo *et al.* 2015). Sampling for animal and plant remains started only after the ceramic vessels became visible. The sampling targeted the recovery of all possible faunal and floral remains. Samples from both graves were collected from the fill of each ceramic vessel recognized during excavation, from the area with animal bones and an iron knife, and from an area without visible artefacts (the control sample). The sample volume varied between 0.25 and 17.5 litres (Table 1) in dependence of the context. The upper layers of the grave fill were not sampled.

All ecofacts, including human cremation remains, as well as some of the pottery fragments were extracted from deposits using water flotation. The lighter, floating finds (the flot fraction), were retrieved by a combination of flotation in a tank and manual wash-over methods; heavy finds (the heavy fraction) were retrieved by wet-sieving applied to the mineral fraction (residue). The sieve mesh sizes used were 0.25 mm for flotation and wash-over and 1 mm for wet-sieving (individual methods follows Hajnalová and Hajnalová, 1998).

The dried heavy fraction was sorted by naked eye, while the dried flot fraction was investigated under a stereo microscope for seeds, charcoal, calcined human bones, unburned bones of animals (mammals, fish, rodents and amphibians) and mollusc shells. The presence of charred organic matter of unknown origin (pastry/flesh/resin?) and roots was also recorded.

The analysis of animal remains consisted of anatomic and taxonomic macroscopic identification of individual specimens, sex and age-at-death assessment, osteometric data, and recording of bone modifications (*e.g.* Bartosiewicz and Gál, 2013; von den Driesch, 1976; Lyman, 1994; Reitz and Wing, 1999; Schmid, 1972). The age at death has been estimated by a combination of traits, such as: state of the bone surface porosity, size/length of specimens, and long bone epiphyseal fusion (Habermehl, 1975; Silver, 1969). The quantitative and qualitative evaluation of the "offered meat" followed the classification of skeletal elements suggested by Uerpmann (1973). The bone specimens were evaluated and interpreted on the basis of three methods: the number of identified specimens (NISP), weight of identified specimens (WISP), and minimum number of individuals (MNI). The assessment of MNI accounted for the age and size of individuals, separately for each grave. All specimens were weighted with the Kern laboratory scale to an accuracy of 0.1 g.

Plant seeds were studied under a stereomicroscope Zeiss SteREO Discovery V8 at maximum magnification of 40×. For charcoal, refractive surfaces of fragments larger than 2 mm were analysed under a microscope employing a reflected light source (Olympus BX 51 at max 200×). Plant taxa identification was based on the available literature and direct comparison with modern and archaeological seed and wood charcoal reference collections.

Table 2. Devín-Záhrady. Information on archaeological context and specimens selected for ^{14}C dating and stable isotopes analyses from graves 1 and 2 .

Lab code	Analytical Lab. No.	Grave No.	Context	Species	Anatomy	Weight (g)
DeA-24112	I/2344/1	2	fill of the urn – vessel no. 1 (+10)	*Arvicola*	*costae, tibia*	0.979
DeA-24113	I/2344/3	1	meat portion between vessels	*Sus*	*costae*	4.544
DeA-24114	I/2344/4	2	meat portion between vessels	*Sus*	*costa*	0.252
DeA-24115	I/2344/2	2	at the base of the urn – vessel no. 1	*Cervus*	*talus*	0.253
DeA-18106	I/1956/2	1	fill of vessel no. 3	*Hordeum / Triticum*	grain	single grain
DeA-18160	I/1956/3	2	fill of vessel no. 4	*Triticum aestivum*	grain	single grain
DeA-18161	I/1956/4	2	fill of vessel no. 5	*Triticum aestivum*	grain	single grain

Samples selected for stable isotopic and ^{14}C measurements (Table 2) were pre-treated and measured in the Debrecen radiocarbon laboratory (Molnár *et al.*, 2013, Major *et al.*, 2019). Radiocarbon determinations were calibrated by OxCal v.4.4.2 (Bronk Ramsey 2009), working with the IntCal13 dataset (Reimer *et al.*, 2013).

The contexts and the artefacts from both graves have not yet been published in full, while the majority of ceramic vessels have not been reconstructed. Typological and chronological analysis of the artefacts presented here is therefore only preliminary, based on data from the excavation report (Chmelo *et al.*, 2015).

4. Results

4.1 Animal bones

A total of 282 bone specimens weighing a total of 296.8 g were recovered from 11 flotation samples. Taxonomic and anatomic identification was possible for only half the specimens due to poor preservation and generally small size of the bone fragments. Complete elements represented 15% of the total. The average weight of the analysed specimens was 1.1 gram. In grave 1, altogether 158 archaeozoological specimens from at least six individuals were found while in grave 2, 124 specimens from at least nine individuals could be identified (Table 3).

4.1.1 Identified taxa

Five mammalian, one fish and one amphibian species were present in the assemblage. Among the domestic animals, cattle (*Bos taurus*), pig (*Sus* cf. *domesticus*) and caprines (*Ovis/Capra*) could be confidently identified. Distinction between sheep and goat bones was not possible. Since the pig bones came from immature individuals it did not prove possible to determine whether they represent domestic or wild pig (thus, we used the Latin name *Sus* cf. *domesticus*). The bones of young and very young (foetal) individuals suggest that these bones more likely came from the domestic form of the pig.

Plausibly identified wild species included red deer (*Cervus elaphus*), water vole *(Arvicola* cf. *amphibius*), common spadefoot (*Pelobates* cf. *fuscus*) and common chub *(Squalius cephalus*). Fragmentation and paucity of diagnostic elements

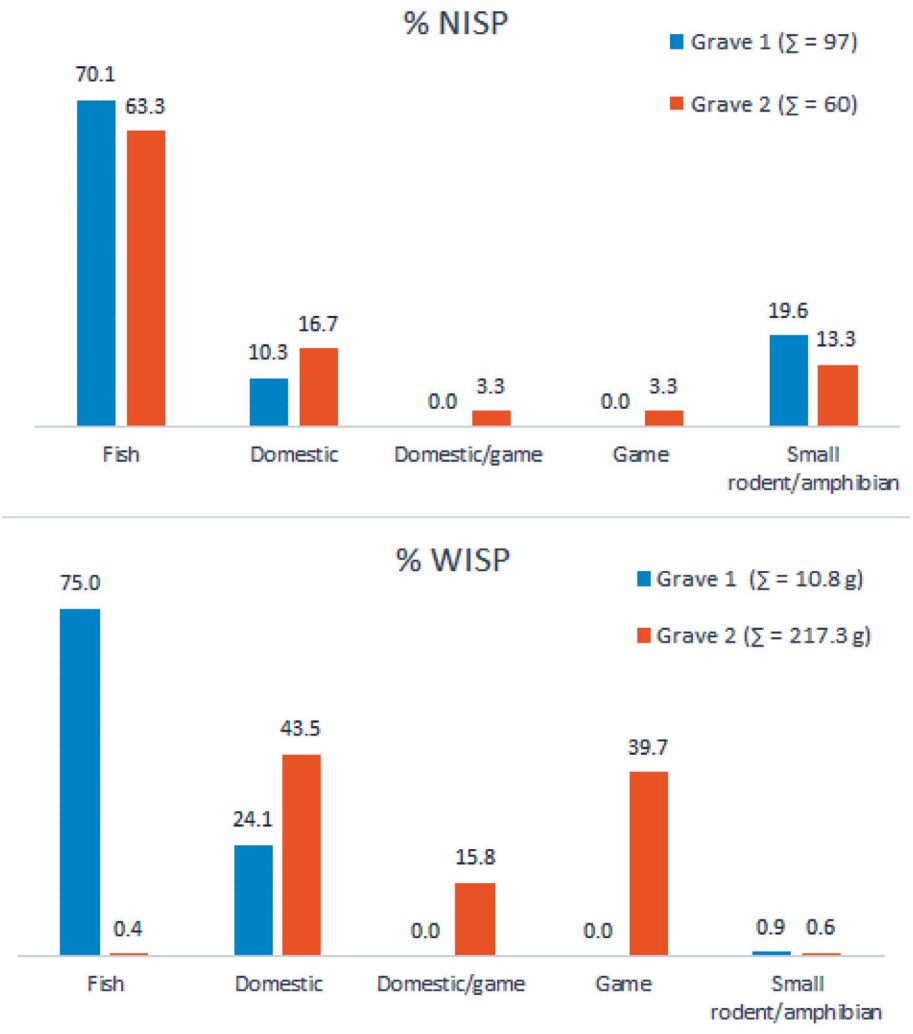

Figure 4. Devín-Záhrady. Representation of wild and domestic animals in two cremation graves.

Table 3. Devín-Záhrady. Animal species, their preservation and age assessment. Quantified by number (NISP) and weight (WISP) of identified specimens, and the calculated minimum number of individuals (MNI).

				Fragmentation status									Age category						Total per context		
	Context	Species	Element	whole bone	whole bone (disrupted)	whole bone (without epiphyses)	more than half (3/4)	half	less than half (1/4)	fragment	small fragment	very small fragment	foetus (shortly before birth)	neonatus (shortly after birth)	juvenile/subadult	subadult/adult	adult	not juvenile	NISP	WISP	MNI
Grave 1	Vessel 1	Unidentified bone (calcined)	*indet.*	–	–	–	–	–	–	10	–	51	–	–	–	–	–	–	61	31.6	–
	Vessel 2 (+5)	Unidentified small rodent	*humerus*	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	12	0.1	1
			ulna	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–			
			vertebrae	–	10	–	–	–	–	–	–	–	–	–	–	–	–	–			
	Vessel 3 (+6)	Unidentified fish (Pisces)	*cranium*	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	2	0.6	1
		Common chub (*Squalius cephalus*)	*os pharyngeum*	–	1	–	–	–	–	–	–	–	–	–	–	–	p	–			
	Between vessels	Pig (*Sus* cf. *domesticus*)	*humerus*	–	–	1	–	–	–	–	–	–	–	p	–	–	–	–	77	10.1	3
			costae	–	–	–	–	9	–	–	–	–	–	p	–	–	–	–			
		Common spadefoot (*Pelobatus* cf. *fuscus*)	*tibiofibula*	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–			
		Unidentified fish (Pisces)	*cleithrum*	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–			
			cranium	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–			
			operculum	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–			
			cranium	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–			
			vertebrae	–	9	–	–	–	–	–	–	–	–	–	–	–	–	–			
			costae	–	–	–	22	–	–	–	–	–	–	–	–	–	–	–			
			indet.	–	4	–	7	1	–	–	–	20	–	–	–	–	–	–			
	Control	Unidentified small rodent (Rodentia)	*humerus*	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	6	0	1
			incisivus inferior	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–			
			indet.	–	–	–	–	–	–	–	–	3	–	–	–	–	–	–			
	Sub-total			**2**	**25**	**1**	**30**	**14**	**2**	**10**	**–**	**74**	**–**	**p**	**–**	**–**	**p**	**–**	**158**	**42.4**	**6**

Table 3. Devín-Záhrady. Animal species, their preservation and age assessment. Quantified by number (NISP) and weight (WISP) of identified specimens, and the calculated minimum number of individuals (MNI). (*Continuation*)

				Fragmentation status									Age category						Total per context		
	Context	Species	Element	whole bone	whole bone (disrupted)	whole bone (without epiphyses)	more than half (3/4)	half	less than half (1/4)	fragment	small fragment	very small fragment	foetus (shortly before birth)	neonatus (shortly after birth)	juvenile/subadult	subadult/adult	adult	not juvenile	NISP	WISP	MNI
	Vessel 1 (+10)	Water vole *(Arvicola* cf. a*mphibius)*	*atlas*	–	1	–	–	–	–	–	–	–	–	–	–	p	–	–	56	21.4	1
			maxilla et dentes	–	–	–	–	–	1	–	–	–	–	–	–	p	–	–			
			humerus	1	–	–	–	–	–	–	–	–	–	–	–	p	–	–			
			ulna	–	1	–	–	–	–	–	–	–	–	–	–	p	–	–			
			pelvis	–	1	–	–	–	–	–	–	–	–	–	–	p	–	–			
			tibia	–	1	–	–	–	–	–	–	–	–	–	–	p	–	–			
			indet.	1	–	–	–	–	–	–	–	–	–	–	–	p	–	–			
		Unidentified bone (calcined)	*cranium*	–	–	–	–	–	–	–	12	–	–	–	–	–	–	–			
			indet.	–	–	–	–	–	–	–	24	13	–	–	–	–	–	–			
Grave 2	Next to vessel 1	Cattle *(Bos taurus)*	*talus*	–	1	–	–	–	–	–	–	–	–	–	–	–	–	p	6	167.5	3
		Red deer (*Cervus elaphus*)	*talus*	–	2	–	–	–	–	–	–	–	–	–	–	–	–	p			
		Pig (*Sus* cf. *domesticus*)	*talus*	–	1	–	–	–	–	–	–	–	–	–	p?	–	–	–			
	Vessel 1(+10)	Caprines *(Ovis/Capra)*	*talus*	–	1	–	–	–	–	–	–	–	–	–	–	–	p?	–	–	–	1
		Pig (*Sus* cf. *domesticus*)	*talus*	–	1	–	–	–	–	–	–	–	–	–	p?	–	–	–			
	Vessel 3	Unidentified fish (Pisces)	*costae*	–	–	–	–	–	–	–	3	28	–	–	–	–	–	–	36	0.8	1
			indet.	–	–	–	–	–	–	3	–	–	–	–	–	–	–	–			
			vertebrae indet.	–	1	–	–	1	–	–	–	–	–	–	–	–	–	–			
	Vessel 4 (+9)	Unidentified small rodent (Rodentia)	*vertebrae thoracales*	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	0.1	1
		Unidentified bone	*indet.*	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–			
	Vessel 5	Unidentified bone (calcined)	*cranium*	–	–	–	–	–	–	4	–	–	–	–	–	–	–	–	13	16.9	–
			indet.	–	–	–	–	–	–	9	–	–	–	–	–	–	–	–			

Table 3. Devín-Záhrady. Animal species, their preservation and age assessment. Quantified by number (NISP) and weight (WISP) of identified specimens, and the calculated minimum number of individuals (MNI). (*Continuation*)

				Fragmentation status									Age category						Total per context		
	Context	Species	Element	whole bone	whole bone (disrupted)	whole bone (without epiphyses)	more than half (3/4)	half	less than half (1/4)	fragment	small fragment	very small fragment	foetus (shortly before birth)	neonatus (shortly after birth)	juvenile/subadult	subadult/adult	adult	not juvenile	NISP	WISP	MNI
Grave 2	Between vessels	Cattle/Red deer (*Bos/Cervus*)	*ischium*	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	10	47.7	2
			patella	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–			
		Pig? (cf. *Sus domesticus*)	*costae*	–	–	–	–	–	2	–	–	–	–	–	p?	–	–	–			
		Pig (*Sus* cf. *domesticus*)	*femur*	–	–	–	1	–	–	–	–	–	p?	–	–	–	–	–			
			fibula	–	–	–	1	–	–	–	–	–	p?	–	–	–	–	–			
			humerus	–	–	–	1	–	–	–	–	–	p?	–	–	–	–	–			
			tibia	–	–	–	1	–	–	–	–	–	p?	–	–	–	–	–			
		Unidentified fish (Pisces)	*costae*	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–			
		Sub-total		**3**	**11**	**–**	**5**	**1**	**3**	**19**	**39**	**43**	**p?**	**–**	**p?**	**p**	**p?**	**p**	**124**	**254.4**	**9**
		Total		**5**	**36**	**1**	**35**	**15**	**5**	**29**	**39**	**117**	**p?**	**p**	**p?**	**p**	**p?**	**p**	**282**	**296.8**	**15**

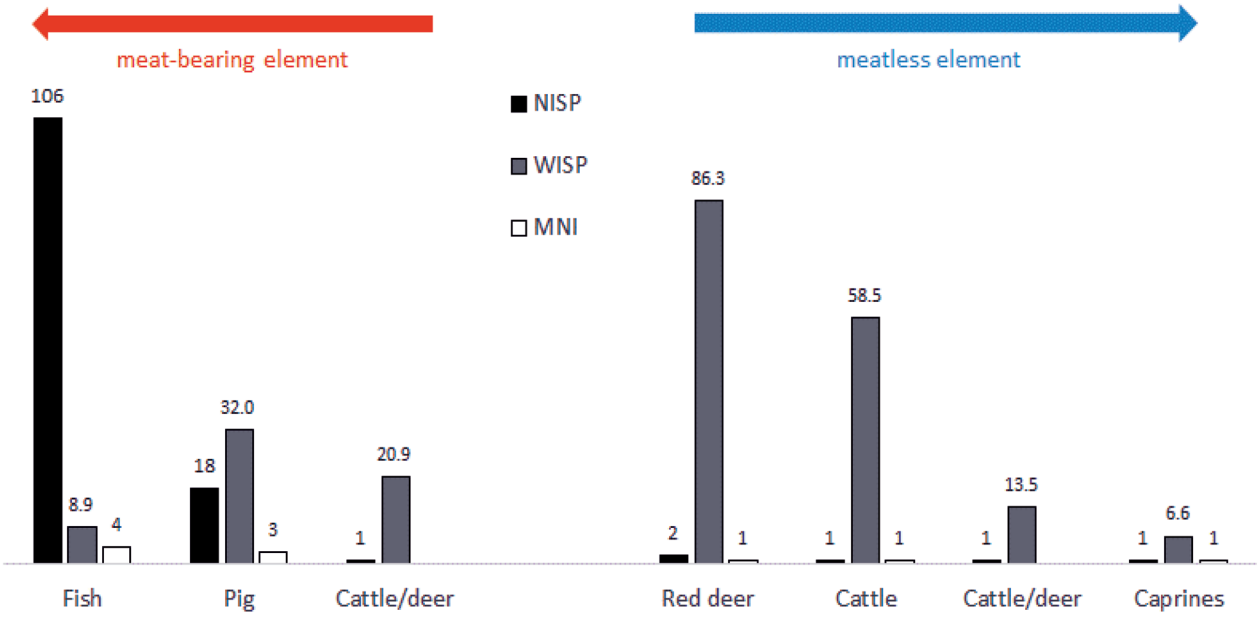

Figure 5. Devín-Záhrady. Animal species representation in food and symbolic grave-goods from grave 1 and 2. Quantified using NISP, WISP and MNI.

prevented closer determination of fish and rodent bones, although the majority of fish elements suggest they derive from members of the carp family (Cyprinidae?).

The European common chub *(Squalius cephalus*), was determined on the basis of a partly preserved *os pharyngeum superior* from grave 1, in vessel 3. It is a freshwater stocky fish of the carp family that occupies slow to moderately flowing rivers, canals and other still waters (Oliva *et al.*, 1968). Its long and cylindrical body, with reddish fins, usually reaches 30 cm (max. 60 cm) in length and 300–500 grams (max. 8 kg) in weight.

The European water vole, identified on the basis of the maxilla, teeth and some postcranial elements of a single individual in grave 2, in vessel 1, is an herbivorous, semi-aquatic rodent that resembles a rat. With the strong body of a good swimmer and climber, this animal can reach 14–22 cm in length (excluding the long tail) and 60–200 grams in weight. The animal lives in burrows, usually excavated down to 5 to 55 cm from the soil surface. The water vole remains active throughout the year (Krištofík *et al.*, 2012, pp.91–96).

A fibular bone of the European common spadefoot (syn. garlic toad) was found between the vessels in grave 1 at a depth of 5 cm from the excavated surface (and ca 70 cm from the contemporary surface). This toad lives in up to 1 m deep burrows dug into alluvial deposits of larger rivers such as the Danube (Oliva *et al.*, 1968, pp.272–275).

4.1.2 Representation of taxa and skeletal elements

Altogether 157 bone specimens have been taxonomically identified. By NISP numbers (Figure 4:1), wild animals predominate in both graves. By weight (Figure 4:2), the representation of wild and domestic species is more balanced in grave 2.

In grave 1, wild animals (excluding possibly intrusive rodents and amphibians, see Discussion) are represented by fish bones comprising 70% of total NISP or 75% of total WISP. Domestic taxa here represent 10.3% of NISP or 24.1% of WISP. In grave 2, wild taxa (excluding rodents/amphibians) represented by fish and deer bones make up 66.6% of NISP or 40% of WISP. Domestic taxa represent 16.7% of NISP, but 43.5% of WISP (Figure 4). The MNI ratio of wild and domestic animals suggests a balanced representation. In grave 1, one pig to at least one fish individual was identified (Table 3). In grave 2, four domestic (at least two pigs, one cattle, one sheep/goat) and three wild individuals (at least two fish and one red deer) were present.

Different quantification methods favour different species. In both graves, the share of fish remains is relatively high by NISP (67.5%) and partly by MNI (20%), but negligible when considering WISP (3.9%). In contrast, the share of game (red deer) remains is emphasized only when the WISP method (37.8%) is employed, while it appears low using either NISP (1.3%) or MNI (6.7%). Pigs are the second most represented species by MNI (20%), but lie in third place if the NISP (11.5%) or WISP (14.1%) is considered. In conclusion, fish dominate the assemblages using NISP, fish and pig appear to dominate when specimens are counted using the MNI method and red deer stands out when the WISP is examined.

The general representation of meat-bearing and meatless skeletal elements from specimens identified to species, excluding possibly intrusive small rodents/amphibians, is shown in Figure 5. The category of meat-bearing elements includes bones from the appendicular skeleton and meatless elements include astragali and a single patella recovered from grave 2.

Among meat-bearing elements, NISP values overestimate fish and pigs, while WISP emphasizes the mammalian share.

If the pelvis fragment found in grave 2 came from cattle, the WISP would cause domestic animals to appear to dominate in both graves: pig in grave 1 and cattle and pig in grave 2; if the pelvis fragment comes from red deer, game would appear to prevail in grave 2.

Cranial elements and vertebrae of mammals were absent (Table 3). Fish cranial and postcranial elements were present. Fin bones or fish scales were not identified although the soil conditions were suitable for their preservation and the extraction method (flotation) for their recovery (Bielichová, in press).

4.1.3 Age at death

Due to absence of cranial bones and teeth in the assemblage, the age at death of mammals was estimated through the state of epiphyseal fusion, relative bone size, and bone surface development. The remains of a water vole most probably belonged to a single subadult or adult individual. The pig bones from grave 1 included the left scapula with an open epiphysis and nine rib fragments (Figure 6:1) from one individual. The scapula was 45 mm long, suggesting (after Habermehl, 1975, p.140, Tab. 14) that the animal died during the perinatal period, perhaps at birth or few days after.

There were badly eroded pig humerus, fibula, tibia and femur (Figure 6:2) in grave 2. Their size and robusticity suggests that they came from an unborn pig foetus. Further, two chopped pig ribs (Figure 6:3) suggest the presence of another older, perhaps juvenile or subadult, pig. Astragali came from a subadult or adult caprines (Figure 7:1), juvenile or subadult pigs (Figure 7:2, 3), subadult or adult red deer (Figure 7:4, 5) and subadult or adult cattle (Figure 7:6). The age of the single cattle/red deer patella could not be determined, but it probably also belonged to a subadult/adult animal (Figure 7:7).

Figure 6. Devín-Záhrady. Pig remains. 1 – completely preserved humerus (without epiphyses) and rib fragments of a perinatal individual from grave 1; 2 – eroded bone shafts (diaphyses) of humerus, fibula, tibia and femur from a foetal/neonatal individual from grave 2; 3 – rib fragments from a subadult(?) individual from grave 2. Dashed lines indicating chopped-through areas.

Figure 7. Devín-Záhrady. Astragali and patella from grave 2. All specimens shown from two sides – dorsal and plantar. Finds found inside vessel 1 (grouped by dotted line): 1 – sheep/goat right astragalus; 2 – pig left astragalus. Finds lining the outside of the base of the vessel 1: 3 – pig right astragalus; 4 – red deer left astragalus; 5 – red deer right astragalus; 6 – cattle left astragalus. Find associated with the meaty portions from the centre of the grave: 7 – cattle/red deer patella.

4.1.4 Bone modifications

Cutting and chopping marks suggesting butchery and carcass/meat processing were scarce. They were recorded on two pig ribs, perhaps belonging to a single juvenile/subadult individual and resulted from secondary/tertiary portioning, *i.e.* portioning of larger carcass/meat chops into smaller parts (see Figure 6: 3).

Dark grey/black colouring was recorded on some parts of the bone surface on the pig rib chops, pig astragali and cattle/deer patella from grave 2. However, due to the poor bone surface preservation (partly covered with a solid calcittic coating) and missing information on the colouring of the surrounding deposit, it could not be ascertained whether the bones had been burned.

4.2 Plant macro-remains

Together 81.9 litres (70.9 l from vessels and 11 from other contexts) of deposit were processed by flotation. Nine cereal grains and one seed of a wild legume, representing the entire charred seeds assemblage, were recovered exclusively from

Table 4. Devín-Záhrady. Seed and charcoal fragments from cremation graves. Numbers of charcoal and seeds (n) and weight (w) of charcoal in milligrams are given.

Plant remains		Volume (l)	Uncharred seeds	Charred seeds				Charcoal				
				Triticum aestivum s.l.	*Triticum/Hordeum*	Cerealia indet.	Viciaceae	*Quercus* sp.		*Fagus sylvatica*		Indet.
		l	n	n				n	w	n	w	w
Grave 1	Vessel 1	7	–	–	–	–	–	5	61,3	–	–	–
	Vessel 2 (+ 5)	17.5	2	–	–	–	–	38	204.4	–	–	2.2
	Vessel 3 (+ 6)	6	3	–	1	–	1	7	69.7	1	25.9	–
	Vessel 4	2	1	–	–	–	–	–	–	–	–	–
	Between vessels	2	2	–	–	–	–	3	5.9	–	–	–
	Control	4	–	–	–	–	–	50	852.6	–	–	1497
Grave 2	Vessel 1 (+ 10)	5	–	–	–	–	–	6	19.2	–	–	–
	Vessel 3	8	–	cf. 1	–	1	–	10	62.5	–	–	1.9
	Vessel 4 (+ 9)	11	–	2	–	–	–	21	123.2	–	–	11.3
	Vessel 5	8	–	1	–	–	–	14	68	–	–	6.2
	Vessel 6	1.5	1	–	1	1	–	3	15.6	–	–	–
	Vessel 8	8	–	–	–	–	–	4	7.9	–	–	–
	Control	0.25	–	–	–	–	–	16	104.2	–	–	–

the fill of the vessels (Table 4). The seeds were damaged and/or fragmented. Three grains were from naked wheat (*T. aestivum/turgidum/durum*), one was probably from barley (cf. *Hordeum vulgare*), and one seed was identified as wheat/barley (*Triticum*/*Hordeum*). The remaining four damaged grains could not be taxonomically identified (Cerealia). The small seed of wild legume was from *Vicia* spp. or *Lathyrus* spp. (Viciaceae). Charcoal fragments (Table 4) were small (all less than 5 mm) and scattered in the fill. No accumulation or scatter of larger charcoal fragments was recorded during excavation. The 156 (16.204 g) identified and 160 (15.187 g) unidentified fragments were recovered from a majority of the vessels, from the area with animal bones in grave 1, and the control samples from both graves. In grave 1, the majority of charcoal came from the control sample and the smallest number from an area with animal bones. In grave 2, the charcoal fragments were even less numerous. Charcoal came exclusively from oak (*Quercus* sp.) in all but one sample from grave 1. Vessel no. 3 also contained one fragment from beech (*Fagus sylvatica*).

4.3 Ceramics and iron knives

In chronological terms, most of the vessel types recovered from cremation graves in Devín-Záhrady (Figure 8) could have been in use any time over a longer period of time. In grave 1, the most chronologically significant is vessel no. 2 (a large vessel with a conical neck, called in Early Iron Age research by the German term *Kegelhalsgefäß*) with incised decoration on its slim neck (Figure 8:1; Godiš and Kmeťová, forthcoming). Bunches of incised lines forming "standing angles" or inverted "Vs" (*stehende Winkel*) most frequently occurred in the HaC1 stage (Nebelsick, 1997, pp.69–77; Stegmann-Rajtár, 1992, pp.73, 76, 82, pp.168–169, Figure 21:10; 23:2, 27:10; Godiš and Kmeťová forthcoming). The HaC stage is currently dated between 800 and 625/600 BC and the HaC1 stage between 800 – early 7th century BC (Pare, 1998, pp.299, 388–400; Hennig, 2001, Table 1; Nebelsick, 1997, pp.68–80; Hellerschmid, 2006, pp.282–283). Similar decoration was also applied on a deep handled bowl (Figure 8:4; *cf.* Klemm, 1992, Tafle 66). Bowls with diagonally grooved surfaces (Figure 8:5, 6) were common, especially in the early HaC (Parzinger and Stegmann-Rajtár, 1988, p.168; Stegmann-Rajtár, 1992, p.162; Klemm, 1992, pp.176, 184). Undecorated hemispherical handled cups (Figure 8:2) were widely used forms in Kalenderberg ware (Klemm, 1992, pp.68–69).

In grave 1, one of the two large vessels with a conical neck (no. 1) was used as an urn. Vessels of this type were used in daily life most likely for storing foodstuffs and in cooking. Thus, if not serving as burial urns, they might have held raw foodstuffs, cooked meals or a liquid (*e.g.* an alcoholic drink – Dietler, 2006), the interpretations most likely for

Figure 8. Devín-Záhrady. Selected finds, partly reconstructed, from graves 1 and 2. 1–6 – grave 1: 1 – neck of large *Kegelhalsgefäß* (vessel no. 2); 2 – handled cup (vessel no. 5); 3 – iron knife; 4 – deep bowl (vessel no. 3); 5 – bowl (vessel no. 6); 6 – bowl (vessel no. 4); 7–10 – grave 2: 7 – parts of large *Kegelhalsgefäß* (vessel no. 1); 8 – deep bowl (vessel no. 6); 9 – handled cup (vessel no. 9); 10 – handled cup (vessel no. 8); 11 – iron blade fragment from a knife (Chmelo *et al*., 2015, Figures 570, 571, 575, 577, 580, 592, 596, 598, 607; Frančíková, 2015, restoration protocol no. 6 and 7).

vessel no. 2. Handled cup no. 5 (Figure 8:2), placed inside this vessel, might have been used as a ladle. Bowls no. 4 and 6 with inverted rims (Figure 8:5, 6) and deep bowl no. 3 (Figure 8:4) might have been used on a day to day level as platters or bowls (*cf.* Rebay, 2002, pp.78–81; Müller, 2012, pp.174–178).

There were two vessels of dating value in grave 2. Of special importance, in this regard, was the motif of red stripes on the outer surface of the hemispherical one-handled cup no. 8 (Figure 8:10). Although red slip was frequently applied on the surface of Kalenderberg ware (mostly funeral pottery), no ornaments were slip painted. Horizontal and diagonal stripes on handled cups were usually painted using graphite or a graphite-like substance (Klemm, 1992, p.142; Rebay, 2002, Text, pp.52–54). It seems that the red traces on cup no. 8 are remains of graphite painting after secondary firing (Peter Romsauer, 2020; pers. comm.), possibly on a funeral pyre. Graphite-like painting already occurred in the Kalenderberg region in Austria north of the Danube at the end of the Urnfield period (HaB3) and south of the river only at the beginning of the HaC1 stage (Hellerschmid, 2006, pp.258–259). Similar finds of handled cups with graphite stripes in this region date to HaC1–HaC2 stages (Rebay, 2002, 109, Plate 17:68; Studeníková, 1994, Figure 10:7; Eibner-Persy, 1980, pp.81, 83, Tafeln 11:1; 12:4; 14:1; 36:1; 43:4; 46:8; 59:5–6; 86:2). The second decorative element placing this grave chronologically is the richly-decorated pattern on the large vessel with a conical neck (*Kegelhalsgefäß*). An incised pattern on the belly exhibits bunches of incised lines forming an "X" shape with concentric circles (the so-called "sun" motif) between the metopes, separated by vertical bunches of grooves bordered by lines of incised dots, and also by hatched triangles around the base of the neck (Figure 8:7; Godiš and Kmeťová; forthcoming). It resembles the decoration on two vessels from barrow 4 at the site of Dunajská Lužná-Nové Košariská, dated to middle part of the HaC2 (Pichlerová, 1969, Table 21:3, 4; Parzinger and Stegmann-Rajtár, 1988, p.168; Stegmann-Rajtár, 1992, pp.108, 164, 169). Similar patterns of lines forming an "X" in metopes ("*Kreuzfeld*") were widespread decorative motifs used by Hallstatt Culture groups living in settlements along the Danube during the HaC1, HaC2 and also HaD1 stages; in the Kalenderberg region this design was predominantly executed with graphite-paint (Brosseder, 2004, pp.195–198, Figure 129; Preinfalk, 2003, pp.93–94, Figures 10:9; 13:6a; 26:22; 28:10, 14). A simple version of this motif and an especially archaic ornament comprising bunches of grooves bordered by lines of incised dots seems to have been mainly popular in the final phase of the Bronze Age and the early phase of the Early Iron Ages (Hellerschmid, 2006, pp.249–250; *cf.* also Kmeťová and Stegmann-Rajtár, 2014, p.160, Figure 7:1). All these dated ceramic vessels and decoration motifs suggest the grave should be dated to HaC, possibly to its earlier phase.

Two large vessels with conical necks, no. 1 and no. 5, in grave 2 were used as burial urns. The original position and function of vessel no. 10, typologically a cooking pot, found within urn no. 1 are unclear. It has not yet been established whether this smaller vessel was originally placed inside the urn or whether it sat atop a lid made of perishable material. Similar pots were used for ordinary activities such as cooking and serving food. Two other large vessels, numbers 3 and 4, might have been placed in the grave to hold now undetectable, perishable material. Several fish bones in vessel no. 3 might indicate it was used to hold a meal (soup?) where fish was one ingredient. Handled cup no. 9 (Figure 8:9), found within vessel number 4, may have served as a ladle. Bowls numbers 2 and 6 (Figure 8:8) could have served as platters, plates or bowls. Two handled cups, numbers 7 and 8 (Figure 8:10), placed next to animal bones may have served to hold or serve perishable food.

The set of ceramic vessels from the grave 1 seems to be aimed at a single individual, while those from the grave 2 were most likely deposited for two individuals, a conclusion

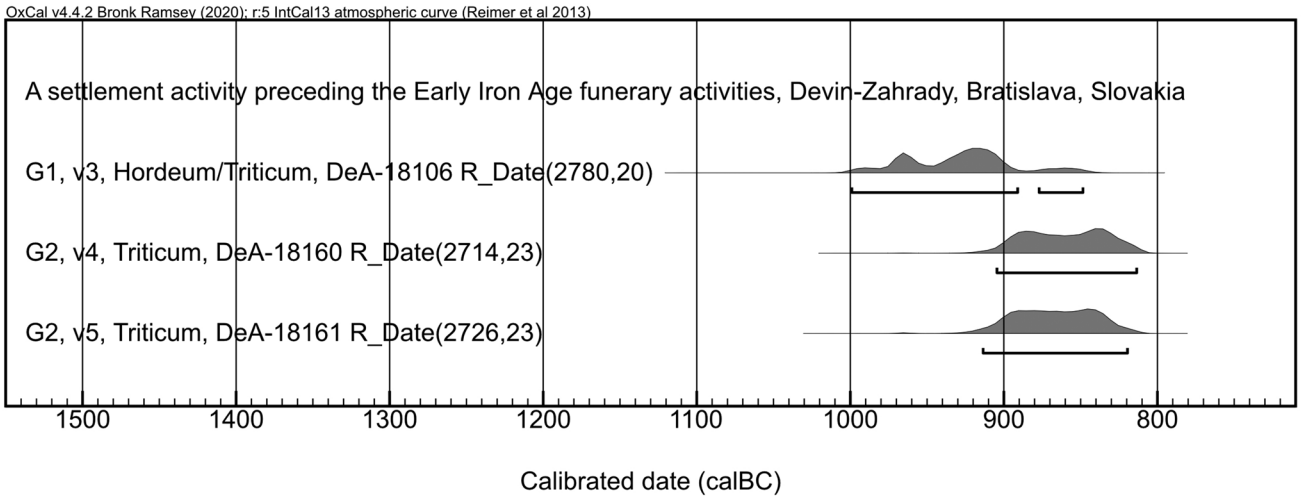

Figure 9. Devín-Záhrady. Radiocarbon dates of three single cereal grains. Charred grains of wheat/barley and wheat were extracted by flotation from the infill of vessel 3 (v3) in grave 1 (G1) and the infill of vessels 4 (v4) and 5 (v5) from grave 2 (G2). Calibrated dates strongly suggest that the three single-season samples predate Early Iron Age funerary activities (95.4% probability shown).

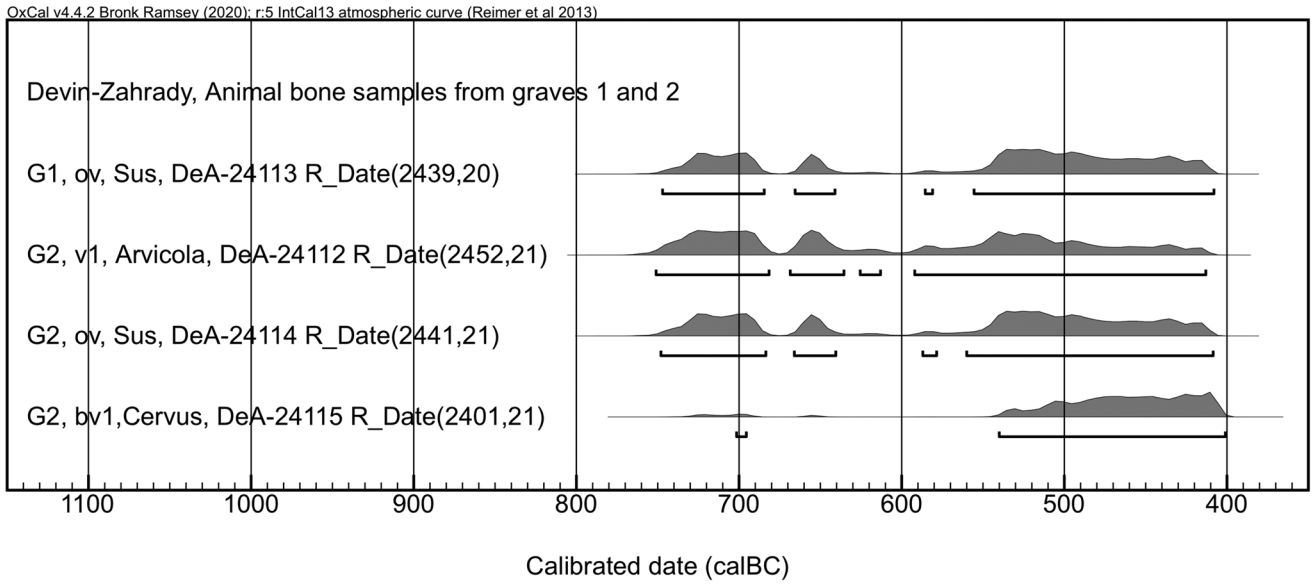

Figure 10. Devín-Záhrady. Radiocarbon dates on collagen extracted from animal bones in graves 1 and 2. From grave 1, a piglet rib (ov) outside vessels was analysed. Three samples from grave 2 were dated: a red deer astragalus from the outside of the bottom of vessel 1 (bv1), tibia and ribs of water vole from the fill of vessel 1 (v1), and a pig rib placed outside the vessels (ov). The pig bones represent 'meaty portions' and the red deer astragalus represents a non-food related grave-offering. The atmospheric production of ^{14}C does not permit to decide whether the water vole was buried as a part of the funerary ritual or, more likely, was intrusive to the burial (95.4% probability shown).

that is also in line with the physical anthropological analyses (Bodoriková *et al.,* 2019) of the calcined human bones.

Iron knives from both graves (Figures 8:3, 11) are not of great dating value; typologically, the tanged knife with a bent blade from grave 1 is the Early Iron Age successor of bronze knives of the Hadersdorf-type dating to the final stages of the Bronze Age (*cf.* Říhovský, 1972, pp.61–64).

4.4 Radiocarbon dating

Three charred cereal grains, two pig ribs, one red deer patella and one rodent bone were radiocarbon dated. Apart from obtaining absolute dates for the two burials, these specimens were selected to ascertain whether different types of finds were contemporary with each other and could be directly connected to burial ritual. Information on dated specimens, the anatomical distribution, number and original position in the graves, are provided in Table 2, results of the AMS and IRMS analyses are displayed in Table 5. The charred cereal grains dated to the Late Bronze Age (after calibration between 1002–815 cal BC; Figure 9) pre-date the burial itself. The pig, red deer and rodent bones all fall to dates within the Early Iron Age (after calibration between 752–402 cal BC; Figure 10). The association of the faunal remains to the burials is discussed below.

Table 5. Devín-Záhrady. Results of ^{14}C dating and stable isotopes analyses on animal and plant remains from graves 1 and 2.

Lab code	Grave No.	Species	^{14}C Age (BP) (±1σ)	cal BC (2σ unified range)	$\delta^{13}C$ (‰)	C content (%)	$\delta^{15}N$ (‰)	N content (%)	C:N
DeA-24112	2	*Arvicola*	2452±21	752–414	–21	40.6	2.9	14.3	3.3
DeA–24113	1	*Sus*	2439±20	748–408	–21	42	2.8	14.8	3.3
DeA-24114	2	*Sus*	2441±21	748–409	–20	35.4	7	12.2	3.4
DeA-24115	2	*Cervus*	2401±21	702–402	–20	33.3	3.9	11.9	3.3
DeA-18106	1	*Hordeum/Triticum*	2780±29	1002–845	–24	58.9	small sample	–	–
DeA-18160	2	*Triticum aestivum*	2714±23	905–815	–25	52.4	small sample	–	–
DeA-18161	2	*Triticum aestivum*	2726±23	914–820	–24	57.4	small sample	–	–

5. Discussion

The radiocarbon dating shows that not all recovered archaeological finds from the Kalenderberg cremation graves in Devín-Záhrady originated from the funeral and/or burial ritual activities. In addition, only some of the finds connected with ritual activities were cremated or otherwise transformed through fire. We believe that these two discoveries are important for understanding the burial rituals of simple graves from the Kalenderberg Group. We will therefore address and discuss them individually and in the broader contextual milieus of the Kalenderberg Group and Eastern Alpine culture.

5.1 Burned on the pyre

Direct connections between burning on funeral pyres and placement of the cremated remains in graves during funerals has been drawn for cremated human remains, secondarily-burned pottery, and bronze artefacts, but also for calcined animal bones, wood charcoal and charred seeds (*e.g.* Egg and Kramer, 2013, pp.379–380).

When the presence of cremation remains in simple graves or graves under barrows is mentioned, it is often not specified whether these finds represent pure calcined bones, pure wood charcoal or a mixture of the two (and/or also other types of finds). In Kalenderberg Group cremation graves, charcoal-free calcined human bones have been found on the floors of the graves or the grave chambers (Pichlerová, 1969, pp.52, 68), as well as on top of the charcoal scatters or charcoal layers (Klemm, 1992, pp.313–451; Szombathy, 1924; Pichlerová, 1969, pp.51, 58). It has been hypothesized that some of the charcoal-free calcined bones were originally placed in cases made of some perishable textile, leather or wood (as suggested by the fragments of bronze fittings; Preinfalk, 2003, p.47). Calcined bones have also been found mixed with wood charcoal and scattered in the grave (Kaus, 1973, p.31; Pichlerová, 1969, pp.32–34, 45, 90). As a rule, if a thick layer of charcoal is reported in the grave, the presence of calcined bones is usually also noted, but there are cases when pure charcoal has been found to form a layer while calcined bones were stored in a vessel (Rebay, 2006, Catalogue, pp.100, 150). Cremation remains in ceramic vessels can also consist of charcoal-free calcined bones (Adler *et al.*, 1971, p.40; Walter, 2010, p.30), or bones mixed with only a few pieces (Rebay, 2002, p.97) or larger amounts of wood charcoal (Kaus, 1973, p.180; Rebay, 2006, Catalogue, p.159). Due to the lack of systematic recording of this phenomenon, it is not possible to ascertain its contextual, regional and temporal variation.

In Devín-Záhrady, charcoal-free calcined human bones were only found in vessels. Their small volume and weight (Bodoriková *et al.*, 2019, pp.31–32) suggests that only a part of the cremated bodies was collected from the pyre, transported and subsequently buried. This practice is known as a part substituting for the whole – *pars pro toto* – practiced in a number of aspects of the Early Iron Age Hallstatt Culture burial practices (*e.g.* Rebay-Salisbury, 2016, Chapter 4.5; Klemm, 1992, pp.313–451; Pichlerová, 1969, pp.45–46, 51–52, 59, 68–69; Studeníková, 1996, pp.498, 500, 504). This notion was also applied to articles of daily use, status symbols (Pare, 1992; Augstein, 2019), and probably also to food offerings.

Calcined bones of "small" unidentifiable animals, mixed with wood charcoal and human calcined remains, have been reported from one barrow in Nová Dedinka, as well as two barrows from the site of Janíky (Studeníková, 1994, p.34). Burned horse (?) skull fragments and lower limb bone fragments have also been identified in Bad Fischau, Lower Austria (Klemm, 1992, pp.372–393, 411–417). In Burgenland, burned bones from caprines and cattle have been found in one of the graves at the site of Donnerskirchen (Rebay, 2005, pp.174–175) and burned limb bones of caprines reported in one barrow from Zagersdorf, placed beside other unburned animal remains (Rebay, 2002, p.98). These rare records of calcined animal bones in Kalenderberg Group cremation graves may be the result of taphonomical or methodological bias. The cremation of whole animals and fresh animal bones exhibit similar patterns of colour change, fracturing and warping, to those resulting from experiments involving human bones (Whyte, 2001, p.440). If the cremated remains underwent intentional fragmentation, then distinguishing animal and human is likely to prove rather challenging and without the preservation of diagnostic bone fragment(s), virtually impossible. Visual determination of very small fragments of undetermined calcined bones from Devín-Záhrady neither ruled out nor attested to the presence of animal remains. Nevertheless, the absence of single animal skeletal element suggests that humans were the only mammals likely to have been cremated and buried.

Information on wood charcoal from Kalenderberg burials comes mostly from large "princely" barrows (for Slovakia, see Hajnalová, 1981; Hajnalová and Mihályiová, 1998; Pichlerová, 1969, pp.21, 45–46, 58–59, 78–79; Studeníková, 1994, pp.30, 46; Studeníková, 1996, pp.503–504; for Austria and Hungary, see Kaus, 1973, p.180; Klemm, 1992, pp.24, 313, 317, 325, 334, 345, 360, 366, 369, 372, 394, 399, 411, 443–451; Preinfalk, 2003, pp.16, 18–27; Szombathy, 1924; *cf.* Eibner-Persy, 1980). They have been found in thick charred layers, smaller charcoal concentrations, or as individual fragments scattered in the fill. Some earlier sources interpret all charcoal (or "cremations") as the remains of pyres burned *in situ* (*cf.* Pichlerová 1960; 1962; 1969). More recent works distinguish between pyres burned *in situ* and later covered by a burial mound (*cf.* Vadász, 1986, pp.253–256) – and remains originally cremated elsewhere and then transported to the grave/mound (*cf.* Studeníková, 1996, pp.498, 500; Rebay, 2002, p.97). The most systematic analyses of charcoal from Kalenderberg Group cremation graves have been carried out by E. Krippel and E. Hajnalová (Table 6). E. Krippel's results are available only as presence-absence data and can only be evaluated in terms of ubiquity of individual species. The most common plant species present is oak (*Quercus*), an excellent wood fuel. Relatively common tree species also include: poplar (*Populus*), beech

Table 6. Charcoal from Slovakian Kalenderberg Group cremation graves. Hand-collected fragments from barrows at Dolné Janíky II, III, Nová Dedinka I, Nové Košariská I, II, III, IV and VI (Pichlerová, 1969; Krippel, unpublished data), Dolné Janíky IV (Hajnalová and Mihályiová, 1998), Špačince 'flat' graves (Krippel in Pichlerová, 1963); extracted by flotation from barrows II, IV and IV at Reca (Hajnalová, 1981); retrieved by flotation at Devín-Záhrady – this paper. Judgement sampling applied at all sites except Devín; ni – no information.

Recovery method	**Hand-retrieved**				**Flotation**			
Type of grave	**Barrow**		**Flat grave**		**Barrow**		**Devín-Záhrady**	
Context	**fill**	**vessel**	**fill**	**vessel**	**fill**	**vessel**	**fill**	**vessel**
Total no. of samples	15	9	3	0	3	17	4	13
Quercus	11	3	3	–	3	10	3	9
Populus	7	2	–	–	–	–	–	–
Fagus	2	6	–	–	–	–	–	1
cf. *Prunus*	2	–	–	–	–	–	–	–
Alnus	2	–	–	–	–	–	–	–
Ulmus	2	–	–	–	3	1	–	–
Carpinus betulus	–	–	–	–	2	–	–	–
Fraxinus	–	–	–	–	1	–	–	–
Acer	–	–	–	–	1	1	–	–
Corylus avellana	–	–	–	–	1	–	–	–
Pomoidae	–	–	–	–	–	1	–	–
without charcoal	ni	ni	ni	ni	0	6	1	4

(*Fagus*) and elm (*Ulmus*). Prune (*Prunus*), alder (*Alnus*), hornbeam (*Carpinus*), maple (*Acer*), ash (*Fraxinus*), hazel (*Corylus*) and pomaceous fruitwood (Pomoidae) are only rarely encountered. Some of the taxa may have been selected for cultural or economic reasons or both. For example, woods unsuitable for fuel, such as poplar, alder and hazel, might originate from wooden objects burned on the pyre (*e.g.* wooden containers). However, without proper contextual and quantitative information, any reasoning on the origin of the wood charcoal remains speculative. Among a layer of charcoal scattered between vessels, oak (*Quercus*) was the only taxa detected among the hand-retrieved fragments (Pichlerová, 1963, pp.104–125) in three simple graves from a "flat" cemetery at the site of Špačince. In the two graves in Devín-Záhrady, charcoal was rare, not concentrated but scattered as individual fragments in some vessels (9 out of 13 samples) and parts of the fill (3 out of 4 samples). As the fragments derive from oak and beech, both woods with excellent thermal properties, it is tempting to see their origin in the fuel used for the cremation pyre. If this is the case, then the very low number, density and weight of charcoal and its spatial distribution in the grave suggest that an effort was made to separate calcined bones from wood ashes prior to the burial; or they represent the scattering of only a (symbolic?) handful of ashes over the open grave. As these charcoal fragments are very small in size and from old wood of unknown age, the true association of this charcoal with the funeral ritual could not be ascertained despite the coeval AMS dating. Due to their small size, and co-occurrence with finds such as uncharred seeds, a higher volume of roots of present vegetation and rodent bones (see Figure 3), it cannot be dismissed that these objects may be intrusive in character.

Information on plant seeds from Kalenderberg cremation graves is rare and, except for Devín-Záhrady, derives exclusively from (large) barrows. Millet (*Panicum miliaceum*) seeds from mound I at Dunajská Lužná-Nové Košariská (Pichlerová, 1969, p.21) are the only evidence existing from the territory of Slovakia. In Austria, charred seeds have been found at two sites. "Quite large numbers" of millet grains were mixed with scattered "ashes" in mound 3 at Donnerskirchen (Netolitzky, 1914, p.748), while an unspecified "grain" in mound 6 and a hazelnut (*Corylus avellana*) were recovered in mound 5 at Bad Fischau, (Klemm, 1992, pp.345–356; Szombathy, 1924, pp.177, 181, note 1). None of the finds have been radiocarbon dated. The rare records of charred seeds in large barrows (lately *cf.* Hladíková and Kmeťová, 2019) might be the result of inadequate excavation sampling methodology, though it is likely that bulk finds of seeds would have been recorded if present. If an association of charred seeds with the burials could be established, their scarcity suggests that only a small number of seeds were burned on the pyres (no data for pyres/ustrina exist) or only some of the burned plant foods/ offerings were placed into the grave(s). The situation is very different in the large mounds of the southern Eastern Alpine Hallstatt Culture, where a much wider spectrum of plants and numerous charred finds have come to light (for review, see Hladíková and Kmeťová, 2019). In Devín-Záhrady, the scarce finds of charred seeds often occur with wood charcoal and calcined human bones, so it is tempting to seek their origin as being in the remains from the funerary pyres. However, the AMS dating rules this possibility out for three (out of nine) cereal grains. Dated seeds of free-threshing wheat and wheat/barley precede the burial by at least

70 years (Table 5, Figure 9) and so are not directly connected to the actual burial ritual.

5.2 Not cremated organic remains

Animal bones, mollusc shells, and mineralized and uncharred seeds that have not been transformed through fire occur in cremation graves throughout the area of the Eastern Alpine Hallstatt Culture, including the Kalenderberg Group. A connection with the funeral and subsequent burial has been ascertained for the (majority of) animal bones and for (only some of) the mineralized seeds.

Subfossil uncharred and/or mineralized seeds are known from two Kalenderberg Group cremation graves. In Rabensburg, unspecified numbers of mineralized millet grains and probably wheat was recorded (Netolitzky, 1914, p.747; Werneck, 1949, p.76), while three uncharred pips of *Vitis vinifera* (Rebay, 2002, p.99) were present in mound 1 at the site of Zagersdorf. The mode of preservation (fossilization) and therefore also dating of the Zagersdorf grape pips to the Early Iron Age is uncertain (Rebay-Salisbury, 2018; pers. comm., Hladíková and Kmeťová, 2019, p.272).

The sub-fossilization of uncharred seeds through mineralization, facilitated by the salts and metallic compounds in the soil, only occurs in deposits (or seeds) rich in phosphates and carbonates, or in the vicinity of metal objects (Murphy, 2014; Körber-Grohne, 1991, pp.11–12). Their scarcity or absence in graves is therefore not surprising. The rare occurrence of fossilized uncharred seeds and deposition of vessels in functional positions in (but not only) cremation graves suggest that they were originally filled with plant products like dry or cooked cereal/pulse grain or plant-based liquids like alcoholic beverages or stews. Such plant offerings might have also originally filled seemingly empty ceramic vessels, three from grave 1 and six from grave 2, at Devín-Záhrady. The occurrence of seeds-eating rodents and possible "ladles" in some of the vessels can also be seen as indirect evidence for the presence of consumable grain. Unfossilised (modern) uncharred seeds, recovered from Devín-Záhrady graves, are discussed below.

Uncremated animal bones occur frequently in the Kalenderberg Group cremation graves of social elites lying beneath large barrows (Ambros, 1975; Preinfalk, 2003; Pucher, 2003; Rebay, 2002, p.98; Studeníková, 1996, p.504; Kmeťová, 2017a, pp.72–73; Kmeťová, 2017b), but also in cremation graves under small mounds and simple graves in "flat" cemeteries (*e.g.* Adler *et al.,* 1971; Pichlerová, 1960; Gattringer, 1971a; 1971b; Lochner, 1988; Rebay, 2006). They usually represent only part of an animal carcass which was originally either rich in meat (femur, humerus, scapula, pelvis, and parts of the vertebral column), with less flesh (ribs, radius, ulna, tibia, fibula, cranium, tail), or without flesh (metapodials, carpal and tarsal bones, and phalanges). Bones from meat-bearing parts often represent specific cuts, or chops, and are referred here as meat portions. The portions preserved as an accumulation of sometimes articulated bones are often found on the floor of the grave surrounded by ceramic vessels and sometimes associated with a knife, or in ceramic vessels, especially bowls. The remains of meat portions in cremation graves are usually considered to originate from (symbolic) food offerings – dishes given for the journey to the underworld and/or to deities. Solitary or multiple finds of meatless elements such as astragali or phalanges are sometimes thought to have been added *pars pro toto* and/or clean bones functioning as amulets.

5.2.1 Meat offerings

The skeletal element representation (Table 3), anthropogenic modifications (chops), and arrangement of unburned bones, show that the food offerings in the Devín-Záhrady cremation graves consisted of fish, pig and cattle/red deer meat (Figure 11). Missing multiple chopping/cutting and/or filleting marks indicate that meat was still attached to the bone when prepared and placed in the graves. In grave 1, meat offerings placed in between the vessels consisted of a dish from a single pork cut (shoulder bone and nine ribs of probably new-born piglet) and a single, more or less complete, chub (*Squalius cephalus*; several fish cranial bones and ribs in articulated position). The dishes in grave 2 included at least five portions of meat – two pork cuts (shoulder and ham probably from a foetal piglet), small cuts of pork spare rib (two rib fragments), a beef/game rump (pelvic fragment from cattle/red deer) and a small cut

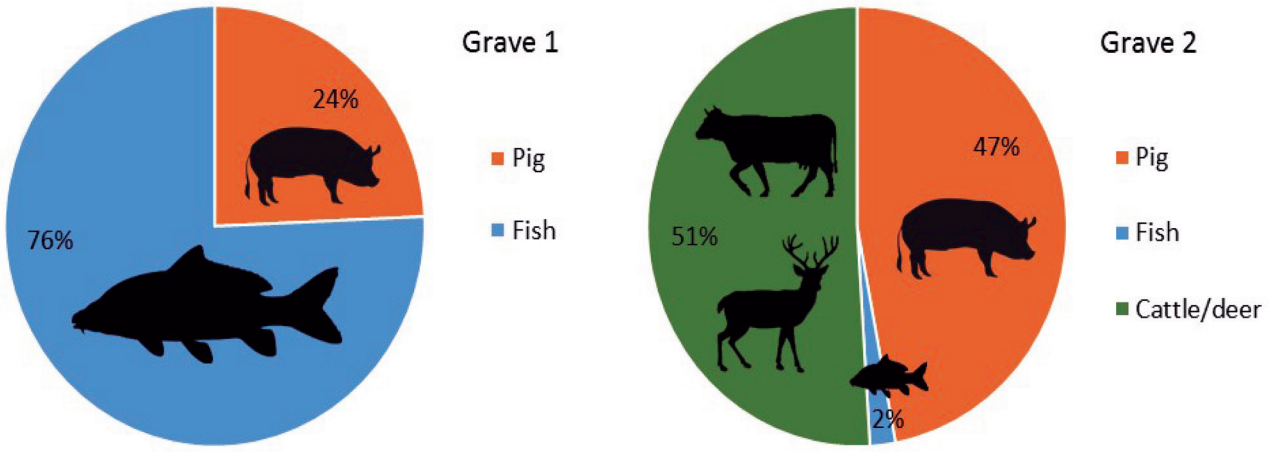

Figure 11. Devín-Záhrady. Meat contribution of animal taxa in graves 1 and 2. Quantified using WISP.

from the body of a fish (two ribs of unidentified large-sized fish species). Use of animals of less than 1 year of age for funerary purposes, common in the East Hallstatt cultural sphere, may reflect a demand for valuable and tasty tender meat (Müller-Scheeßel and Trebsche, 2007, p.76, Figure 7; Kmeťová, 2017a, p.72) or have a symbolic value.

As parts of foetal piglets were used as offerings in both graves, we argue that in Devín-Záhrady they are an (inherent) part of the local burial rite and not a consequence of random death of a pregnant sow. In the case that the main intention behind the killing of a sow was the sole extraction of the foetuses' delicate meat, it would be a very (!) expensive dish indeed. Whereas the killing of a sow to secure a large amount of pork alongside some delicate portions for the burial banquet, and then using only a small part of the most luxurious item as a grave offering, would be a more economic behaviour. Either practice could be driven by other cultural, religious or symbolic reasons, but the killing of a pregnant sow would always mean an economic loss.

At other Kalenderberg Group sites, offerings (of often meatless skeletal elements) of caprine are most often found in simple "flat" graves (Rebay, 2005, pp.173–175; 2006, Text, 189; *cf.* also Pichlerová, 1960), whereas cattle are more characteristic of elite burials (Kmeťová, 2017a, pp.69–70, Kyselý, 2018). In this regard, our burials stand out with their exceptionally high proportion of fish remains (Figure 5). Fish was previously known only from two barrows, numbers 3 and 4 from the site of Dunajská Lužná-Nové Košariská, where some of the finds were identified as the cranial and trunk elements of pike (*Esox lucius*; Ambros, 1975, pp.218–219, 225; Kmeťová, 2017b, pp.141, 152, Table 1). Elsewhere in the Hallstatt Culture region, fish remains are also rare and have only been recovered from meticulously excavated cremation graves (Stadler, 2010, p.49; Kmeťová, 2017a, p.71; *cf.* also Trebsche, 2013, p.223, Table 1). For example, a solitary bone from common chub was reported from one of the Early Iron Age graves at the site of Dietfurt a. d. Altmühl in Germany (Röhring in Hansen, 2013, p. 241).

Usually, more than one main domestic species occurs in graves and (not always) flesh-rich parts are mostly from cattle, caprines and pigs (Müller-Scheeßel and Trebsche, 2007; Stadler, 2010; Kmeťová, 2017a; Kyselý, 2018). Where identification is possible, sheep are common and goats are rare (Benecke, 1994, p.358, Table 32; Müller-Scheeßel and Trebsche, 2007, p.66; Kyselý, 2018, p.264; Klemm, 1992, pp.392–393; Studeníková, 1994, p.46). Further, a connection between the selection of domesticated species placed in graves as meat portions and the gender of the deceased has been attested. Lamb or mutton is more often found in the graves of women and beef, veal and pork in the graves of men (Müller-Scheeßel and Trebsche, 2007, p.80; Stadler, 2010, pp.64–67). As for game, hare and beaver meaty elements were only found in elite barrows from the site of Dunajská Lužná-Nové Košariská (Ambros, 1975). They are otherwise absent in all studied simple graves, including those from Devín-Záhrady where the single meaty pelvic fragment cannot be clearly identified as that of red deer or cattle (Figures 4 and 8). Thus, the unbalanced occurrence of game in meat offerings and the presence of hunting scenes on ceramic vessels from Kalenderberg graves (*e.g.* Trebsche, 2018; *cf.* also Kmeťová 2017a, p.70) is striking.

The arrangement of meat and fish portions on the grave floor suggests that they were originally placed in a bowl or on a platter made from some perishable material (Kmeťová, 2017b, p.152; *cf.* also Klemm, 1992, p.464, Figures 61:60a–60d; Pichlerová, 1969, Figures 12, 26, 38, 57). Iron knives are often found next to them (Gattringer, 1971a, p.41; 1971b, pp.49–50; 1972, pp.60, 62; Klemm, 1992, p.374; Lochner, 1988, p.101; Nebelsick, 1997, pp.97–98; Rebay, 2005, p.173; 2006, Text, p.163, Catalogue, pp.14, 19, 21, 27, 101, 144, 158, 159, 177; Studeníková, 1996, p.504). Their position suggests that they were originally placed with (or pierced in?) the meat.

As in grave 2 at Devín-Záhrady, small ceramic bowls, cups or similar size vessels have also been found at other sites next to bone accumulations (Pichlerová, 1969, Figures 12:20; 26:24, 27; 38:17, 24; 57:7, 7a, pp.11–13, 65, 66, 68, 69; Rebay, 2006, Catalogue, pp.151, 159; *cf.* also *e.g.* Adler *et al.*, 1971, p.39; Gattringer, 1971b, p.50). Most likely these bowls were associated with meaty foods and served in a symbolic way as tableware for serving, eating or drinking.

We do not know if the meat placed in the graves in Devín-Záhrady was first cooked or raw, since cooking is not detectable in bones without using special methods (*e.g.* Shipman *et al.*, 1984; Koon *et al.*, 2009). Two chopped pig ribs and the cattle/deer patella (from the central area of grave 2) and one pig astragalus placed in/next to vessel 1 in the same grave exhibited partial grey to black staining of the bone surface(s). Such colour modification could indicate direct contact of the meat with an open fire during roasting or grilling (with the meat still on the bone). However, the preservation of the specimens precludes distinguishing clear marks of carbonization or calcination (see Chapter 4.1.4). Both alternatives – meat processing and post-depositional staining of bones through some unknown means – are plausible. No charcoal remains, a possible source of black staining, were found near the affected bones. For the fish meat portions, the absence of scales and fin elements indicate that at least the cleaning, the initial stage of food preparation, had been carried out.

In contrast to the majority of analysed Kalenderberg burials from Slovakia (Pichlerová, 1960; Pichlerová, 1969, p.139), where animal food offerings were found outside ceramic vessels, at Devín-Záhrady, fish were also found inside vessels. Most of the vessels stood in functional positions, suggesting that they may have contained fish soup or some other liquid dish.

5.2.2 Other purposes of animal remains placed in cremation graves

In addition to, or instead of meat (food) offerings, the remains of animals in graves may also reflect religious beliefs or symbolic aspects. In connection with the piglet offerings from Devín-Záhrady, it is suggestive that in several ancient

religions associated with agrarian cults, pigs were connected to fertility as well as to death or rebirth (*e.g.* Baerlocher *et al.*, 2012, p.42; Burkert, 1983, pp.257–259; Cooper, 1986, pp.170–171; Spaeth, 1996, pp.34–35). For example, unborn baby animals were sacrificed in or for fertility rituals as *"an ambiguous being, living but not born, sacrificed but not capable of being a proper victim"* (Beard *et al.*, 1998, p.53). Further, the pigs, and piglets in particular, were a symbol of liminality, a component of the *rites of passage* (Spaeth, 1996, p.17; for rites of passage, see van Gennep, 1960; and Turner, 1969). In ancient Rome, foetal pigs were known as a delicacy, but also offered up on the occasion of cremation of the deceased (Baerlocher *et al.,* 2012, p.42). In conclusion, it cannot be excluded that bones of perinatal piglets in Devín-Záhrady originate from a sacrifice of a pregnant sow, consumed at the funeral feast, and/or that they might have symbolized a liminal part of some (burial) rites of passage, fertility or rebirth to the afterlife.

The role of meatless elements, represented in Devín-Záhrady by the patella of cattle/red deer found next to meat portions in grave 2, along with the astragali of deer, cattle, pig and sheep/goat (six in total) associated with urn 1 in the same grave (Figure 3:2 and 11), were also probably placed there as symbols.

In many societies around the world, astragali or phalanges from different animals, often decorated or worked, were (and still are) used in round or children games and in divination; they were also placed in graves as talismans (Bartosiewicz, 1999; Birtalan, 2003; Choyke, 2010, pp.200–201; Kyselý *et al.*, 2020, pp.28–29; Nývltová-Fišáková and Parma, 2014). Astragali from graves of the antecedent Urnfield culture are thought to represent *pars pro toto* for the possession of a certain number of livestock (Wiesner, 2013, pp.103–106).

The astragali from the Devín-Záhrady graves were of two sizes, large (of cattle and deer) and small (caprines and pig; Table 3). Cattle and deer astragali, and probably also the left astragalus of a pig, lined the outside edge of the urn base (Figure 12). The astragalus of sheep/goat and the right astragalus of pig might have been placed there together with calcined bones (vessel 1) or inside the associated pot (vessel 10). As they were not worked, perforated, hollowed or decorated, they might come from animals consumed during the funeral feast(s) and placed in the graves as a symbolic (*pars pro toto*) food or substitute for the deceased possessions. A connection to the personal possessions of the deceased is suggested by their position in the grave – inside the urn (two astragali from pig and caprines) and very close to the outer side of the urn (one smaller pig astragalus and three large-sized astragali from cattle and red deer). Similar positioning of astragali, sometimes arranged as a "necklace" around the vessel has been documented in several Urnfield culture graves in Lower Austria (Wiesner, 2013, Figure 3; Appendix). Whether the cattle/red deer patella associated with meaty portions had a similar symbolic function (Figure 12) remains unclear.

In general, graves containing astragali are rare in the Kalenderberg Group (*e.g.* Klemm, 1992, pp.394–395, Szombathy, 1924, p.191; Lochner, 1988, pp.97–99; Nebelsick, 1997, p.84; Rebay, 2006, Text, pp.184–185, Catalogue, p.95; Teržan, 1996, p.518). If present, there is usually more than one (5 to 28) astragalus coming from caprines, domestic cattle or red deer, but rarely from more than one species per grave. They are always placed with the remains of the deceased – in the case of cremation burials inside the urn with calcined human bones, and in inhumations next to the hand of the deceased, but never with other animal (food or offering) finds (Klemm, 1992, p.394; Lochner, 1988, p.97).

Astragali have been placed in a similar way in graves of the Urnfield culture (Wiesner, 2013) and in graves contemporary with the Kalenderberg Group over the wider

Figure 12. Devín-Záhrady. *In situ* position of cattle/red deer patella (black arrow) and astragali of red deer and cattle (white arrows) lining the bottom of vessel 1 in grave 2. Photo M. Vrablec.

territory of the Northeastern Alpine Hallstatt Culture. For example, astragali of sheep have been identified in Transdanubia in the large barrows of social elites (Vadász, 1983, p.31; 1986, p.255; Vörös, 1993, pp.36–37) and in some graves in "flat"cemeteries (Lengyel, 1959, p.159). In larger "flat" necropoli, astragali have been found in graves of individuals of higher social status (*cf.* Lengyel, 1959; Rebay, 2006, Text, p.184). The role of a marker for different gender, social groups or status has also been considered for numerous cases of unburned and unworked scapulae or phalanges/astragali, regularly present in Early Bronze Age, Únětice Culture graves (2200–1700 cal BC) (Kyselý *et al.,* 2020). Accordingly, the presence of astragali in grave 2 from Devín-Záhrady might indicate the different social rank or gender status of at least one of the deceased.

5.3 On the season of the Devín-Záhrady burials

Both graves in Devín-Záhrady yielded piglet bones of individuals aged from late pre-natal to early post-natal, although remains of piglets up to 8–10 weeks of age are rarely found elsewhere in Kalenderberg Group graves. Among finds from large barrows, they have only occurred in barrow 3 at the site of Dunajská Lužná-Nové Košariská (Ambros, 1975, p.221).

It is probable that the Early Iron Age sows were similar to European wild boar, or unimproved indigenous breeds used in extensive husbandry regimes, and usually gave birth once a year – in the spring (Rosell *et al.,* 2012; Egerszegi *et al.*, 2003). A second litter in late summer/ early autumn would have been possible but determined by food availability, habitat, weather conditions and human provision of supplementary food (Kozdrowski, 2004; Frémondeau *et al.,* 2015, p.223). Multiple farrowing in domestic pigs, mentioned in antique and historical sources (see *e.g.* Lauwerier, 1983), has rarely been attested in archaeological populations (Ervynck and Dobney, 2002; Frémondeau *et al.*, 2015; Wright *et al.*, 2014). Accordingly, given the Early Iron Age conditions of a continental climate with harsh winters, extensive pig rearing and a possibility of interbreeding with wild boar, the pig birth season was (only) in the spring. If so, and assuming that meat from recently slaughtered animals was used in the burial ritual, the two burials must have taken place between March and April (or between August and October, the latter being the season of a possible second litter). In addition, one may also speculate whether the killing/sacrifice of piglets represented the availability of multiple litters, a well-developed pig husbandry, and pragmatic behaviour.

5.4 The problem of residuals and intrusions

During the excavation in Devín-Záhrady, no human or animal related disturbances of the graves were visible. Radiocarbon measurements of selected samples, however, identified that some finds, and the activities which produced them, were not contemporary with the burial and some, even if probably contemporary, were not connected to the burial ritual itself.

As for the finds deriving from the burial ritual activities in Devín-Záhrady, two dates on piglet bones from graves 1 and 2 and one date on the red deer astragalus from grave 2, all fall in the expected time-window between 750–400 cal BC (Figure 10). Even if the bones of the water vole from vessel number 1 in grave 2 date to the same interval, the radiocarbon date (745–414 cal BC) does not unambiguously reflect the time it entered the archaeological burial context. The diet of the analysed animal (*cf.* Krištofík *et al.*, 2012) was most probably of C_3 terrestrial origin ($\delta^{13}C$ = –21.0 ‰, Table 5), so the date should not be obscured by any freshwater reservoir effect. Unfortunately, the chronological resolution of (any) individual ^{14}C dates in 750–400 cal BC is coarse because of atmospheric ^{14}C production. Accordingly, the artefact of the calibration curve ("Hallstatt plateau") is not distinguishable from the dating information of the sample, so it is not possible to decide if the water vole was used in the funerary ritual or represents an intrusion. Some other solitary bones and teeth of unidentifiable rodents and an amphibian (*Pelobates* cf. *fuscus*) may well represent even later intrusions in the graves.

Remains of small rodents, amphibians and land snails are common in Early Iron Age graves (*e.g.* Stadler, 2010, pp.50–52; Kyselý, 2018, p.257) and often found in pottery vessels (Stadler, 2010, Liste 2; Rebay, 2002, pp.99, 174). Rarely, in specific contexts, they are considered food (offerings) and connected to the burial ritual (Stadler, 2010, pp.50–52). At the site of Devín-Záhrady, the completeness of the water vole skeleton, the absence of anthropic modifications on its, and other rodent and frog, bones suggests the natural death of an animal in its burrow and indicates its intrusive origin. Moreover, the co-occurrence of rodent and amphibian remains with uncharred seeds, roots and land snails (Figure 3) that are probably modern supports this assumption.

The intrusive origin of uncharred (not mineralized) plant remains from Early Iron Age cremation graves has also been reported elsewhere. For instance, Šoštarić *et al.* (2007) recorded uncharred seeds in a vessel from a cremation grave under burial mound number 1 at the Kaptol-Gradci near Požega in Croatia. AMS dating showed their recent origin and the authors interpret them as the result of storage activity by ants. Similar concentrations of seeds of plants from hedges (*Rosa* sp., *Mercurialis* sp., *Ajuga* sp.) on the floor of a burial chamber in barrow II at the site of Dunajská Lužná-Nové Košariská was also interpreted as possibly the result of modern storage activity by European hamster (*Cricetus*; Pichlerová, 1969, pp.43–45).

Three charred cereal grains from vessel 3 in grave 1 and vessels 4 and 5 in grave 2 (Table 5) represent residue with an earlier date than the grave itself. They reflect evidence of the settlement or farming activity by the burial place in the 11th–9th century cal BC (Figure 9), *i.e.* in the Late Bronze Age. Originally, they might have been a part of the Iron Age topsoil horizon and might have entered the grave with deposits used for backfilling the grave-pit or through bioturbation undetected during excavation.

6. Conclusions

The two graves from Devín-Záhrady are the only cremation graves of the Kalenderberg Group where animal and plant remains have been recovered through flotation, studied simultaneously and interpreted together. Our findings show that the two graves are very similar in shape and orientation to the grave-pits, as well as in the composition and spatial distribution of both the organic and inorganic grave goods. The semi-rectangular (square) outline of the pits indicates the presence of a wooden chamber or lining of the walls. In the middle of the floor of the grave chamber, ceramic vessels of various sizes were arranged around the meat and fish offerings, accompanied by an iron knife. The majority of the vessels were placed in a functional position. Some of the bowls and cups were originally placed inside or on top of the larger vessels. Due to their small size they could not have served as lids. At least one vessel, a handled cup from grave 2, was burned secondarily. Cremated remains from one human individual were buried in grave 1, and possibly two human individuals were buried in grave 2. Calcined human bones were not mixed with wood charcoal and were placed exclusively in the large vessels with a conical neck (functioning as urns).

The typological-chronological analysis of the pottery places the graves to the Kalenderberg Group in its HaC stage, dated to 800–625/600 BC. This surpasses the chronological resolution of the measured ^{14}C dates on unburned animal bones (food offerings), which are locked in the time range of 750–400 cal BC.

Animals constitute an unambiguous part of the funerary ritual activities of the Kalenderberg Group and correspondingly cattle, caprines, pig, red deer and fish were placed in the graves from Devín-Záhrady. The partial carcasses of pig, red deer/cattle and common chub appear as meat offerings (as a portion). Cut and chop marks were observed on only one pig rib-portion. All archaeologically-detected meat portions were very small in size, represented by parts of piglets or pig foetuses, small parts of pig cutlet and cattle/red deer rump. The preference for fish and the tender meat of piglets/foetuses was attested using quantitative methods.

Combining the evidence on the presence of particular animal body parts, taxonomy, butchery marks, and placement of meaty elements together with vessels and iron knives, suggest a variety of meat and fish dishes were placed in these graves. It remains unclear if the meat and fish was raw, cooked, roasted, smoked, or in the form of a soup or broth. At least two animal-based dishes were detected in grave 1 and at least six in grave 2, where the composition of the ceramic vessels indicates a "dinner set for two". The food, of which only a part found its way into the graves, may have been destined for the deceased, the deities, and/or consumed at the funeral feasts. The reason for killing the piglets, or sow with foetuses, and placing them (as offerings) in the graves may also be symbolic or religious. The age of perinatal individuals indicates the likely season for both funerals as early spring (March–April). Due to the rare occurrence of piglets/foetuses in Kalenderberg Group necropolis, it seems that this custom must still have been alive in the local community and that the studied graves were close to each other in time. The grave goods of animal origin of an exclusively symbolic nature include the astragali of cattle, red deer, pig, caprines, as well as the patella of cattle/red deer. The astragali are all associated with one of the two urns in grave 2 and their possible roles include the amulet, *pars pro toto* (substitute for the whole animal), and some manifestation of the different social rank or identity of the cremated individual placed in the urn.

In this and other Kalenderberg Group cremation burial assemblages, the remains of plants are much less common than those of animals. This is due to the different ways floral and faunal remains are preserved on dry archaeological sites. In dry deposits, seeds, fruits and woody parts preserve only if charred (carbonized) or mineralized, while other plant parts decompose or do not survive taphonomic transformations.

At Devín-Záhrady only nine charred seeds**,** grains of wheat and wheat/barley and a pulse were recovered. Three of the grains were dated by AMS to the 11th–9th century cal BC. These grains are therefore not linked to the burial rituals, but represent residuals from earlier farming or settlement activities close to the burial area. Charred seeds from three other Kalenderberg Group necropoli represent single/isolated finds (mostly millet grains) not dated by radiocarbon methods. If their association with the burials could be established, their scarcity suggests that charred seeds were rarely deliberately placed in grave(s). The situation is different in the burial mounds from the southern Eastern Alpine Hallstatt Culture, where a much wider spectrum of plants and numerous charred finds have come to light. We argue that plant products such as cereal/pulse grain or plant-based liquids might have originally filled some of the "empty" ceramic vessels placed in the graves in functional positions. This methodological recovery issue should be addressed in future research through relevant (phytolith and chemical) analyses.

Wood charcoal in Devín-Záhrady graves was rare. Individual fragments, rarely larger than 2 mm, were randomly scattered in the fill. This differs from observations in other Kalenderberg Group cremation graves. In "flat" graves (studied only from the Špačince necropolis) charcoal fragments were scattered in thin layers below or between vessels. In large barrows, wood charcoal, pure or mixed with calcined bones, often formed thick layers or accumulations on the burial chamber floors, roofs, filled some of the vessels or the space between them. Due to the very small size of charcoal fragments in the graves from Devín-Záhrady, a possible "old wood" effect and an artefact of the calibration curve (Hallstatt plateau), a direct connection between the recovered fragments to the cremation and the funeral rite could not be established even through radiocarbon dating. The possible origin and function of the wood charcoal in a cremation funeral ritual is discussed here for the first time for the Kalenderberg Group. It is possible that if the

recovered wood charcoal originated from the funeral pyre, then an effort was made during the burial ritual to separate calcined bones from wood ashes before the actual burial and only a handful of wood ashes from the pyre were scattered over the grave. However, as the charcoal often occurred with residual charred grains, both may have the same origin.

In conclusion, this study shows that spatially-fixed sampling of archaeological deposits from cremation graves and their subsequent flotation represents an invaluable method for studying cremation burial rituals**.** It enables the collection of small, and otherwise overlooked, ecofacts. The results from their analysis will modify what is known about the assortment, quantity and form of preparation of animal and plant offerings from cremation graves. For example, the high proportion (preference) of fish found in the graves from Devín-Záhrady may be related to the site's proximity to the Danube, but in our opinion, it is much more likely that the absence of appropriate excavation and recovery methods (and published results) at other sites caused that fish bones were simply not recovered during excavation. Information on the distribution of modern vegetation remains (roots, uncharred seeds) in relation to other finds and radiocarbon (AMS) dating of carefully-selected, short-lived samples was also of key importance to the analysis of the burial ritual for the two graves. It permitted the detection of residuals (charred cereal grains) and intrusions (remains of rodents and amphibians), reconstruction of the deposit formation processes, and establishment of the connection of the ecofacts to the funeral and/or burial rite.

Dedication

We dedicate this work to Ing. Eva Hajnalová, DrSc., Research Professor of Archaeobotany, in celebration of her 80th birthday. Being a founder of Slovak archaeobotany, Eva has been the teacher and mentor to many, for us she is a strong inspiration both as scientist and as human. *Ad multos annos!*

Acknowledgements

This article was supported by VEGA project no. 1/0399/18, Slovak Research and Development Agency project no. APVV-14-0550 and CORWIN Inc. The authors would like to thank ARCHAEOLOGICAL AGENCY Ltd Bratislava for providing material and field documentation, René Kyselý from the Institute of Archaeology of the Czech Academy of Sciences in Prague for rodent bone analysis, the late Karol Hensel from the Comenius University for fish bone determination, Romana Kočárová (a free-lancer) for charcoal analysis, Matej Styk from the Constantine the Philosopher University in Nitra for drawing plans of the barrows and Alice Choyke from the Central European University in Vienna for English language revision.

References

ADLER, H., JUNGWIRTH, J., and WINDL, H., 1971. Fugging, Gem. Obritzberg-Rust, BH St. Pölten. *Fundberichte aus Österreich*, 10, 38–40.

AMBROS, C., 1975. Tierreste aus den früheneisenzeitlichen Hügelgräbern in Nové Košariská. *Slovenská archeológia,* 23, 217–226.

AUGSTEIN, M., 2019. "Sometimes they seem to be deliberately broken or rendered useless... "– Considerations on an Aspect of Early Iron Age Funerary Ritual. In: Ch. Bockisch-Bräuer, B. Mühldorfer, M. Schönfelder, eds. *Die Frühe Eisenzeit in Mitteleuropa. Internationale Tagung vom 20.–22. Juli 2017 in Nürnberg*. Beiträge zur Vorgeschichte Nordostbayerns, Band 9. Nürnberg: Naturhistorische Gesellschaft Nürnberg e.V., Abteilung für Vorgeschichte, pp. 39–56.

BAERLOCHER, J., AKERET, Ö., CUENI, A., DESCHLER-ERB, S., 2012. Prächtige Bestattung fern der Heimat – Interdisziplinäre Auswertung der frührömischen Gräber der Grabung Windisch-"Vision Mitte" 2006–2009. *Jahresbericht der Gesellschaft Pro Vindonissa*, 29–55.

BARTOSIEWICZ, L., 1999. A Systematic Review of Astragalus Finds from Archaeological Sites. In: A. Vaday, ed. *Pannonia and beyond. Studies in honour of László Barkoczi*. Anthaeus, 24, 1997–1998, p. 37.

BARTOSIEWICZ, L., GÁL, E., 2013. *Shuffling Nags, Lame Ducks. The Archaeology of Animal Disease.* Oxford: Oxbow Books.

BEARD, M., NORTH, J., PRICE, S., 1998. *Religions of Rome. Volume 1. A History*. Cambridge: Cambridge University Press.

BENECKE, N., 1994. *Archäozoologische Studien zur Entwicklung der Haustierhaltung in Mitteleuropa und Südskandinavien von den Anfängen bis zum ausgehenden Mittelalter.* Schriften zur Ur- und Frühgeschichte, 46. Berlin: Akademie Verlag.

BIELICHOVÁ, Z., in press. Archeozoologický výskum sídliska a pohrebiska z doby železnej v Devíne. In: *Archeologické výskumy a nálezy na Slovensku v roku 2015*. Nitra.

BIRTALAN, A., 2003. Ritualistic Use of Livestock Bones in the Mongolian Belief System and Customs. In: A. Sárkozi, A. Rákos, eds. *Altaica Budapestinensis MMII*. Proceedings of the 45th Permanent International Altaistic Conference (PIAC) held in Budapest, Hungary on 23rd–28th June 2002. Budapest: Research Group for Altaic Studies HAS – Department of Inner Asian Studies, Budapest: Eötvös Loránd University, pp. 34–62.

BODORIKOVÁ, S., ŽÁK MATYASOWSZKY, F., ŠEBESTA, B., ŠÚTOR, M., 2019. Žiarové hroby z lokality Bratislava-Devín, poloha Záhrady (Slovensko, 9. stor. p. n. l.). *Slovenská Antropológia*, 22(1), 26–32.

BRONK RAMSEY, B., 2009. Bayesian Analysis of Radiocarbon Dates., *Radiocarbon,* 51(1), 337–360.

BROSSEDER, U., 2004. *Studien zur Ornamentik hallstattzeitlicher Keramik zwischen Rhônetal und Karpatenbecken*. Universitätsforschungen zur Prähistorischen Archäologie, 106. Bonn: Verlag Dr. Rudolf Habelt GmbH.

BURKERT, W., 1983. *Homo necans: The Anthropology of Ancient Greek Sacrificial Ritual and Myth*. Translated by P. Bing. Berkeley – Los Angeles – London: University of California Press.

CHMELO, L., ŠEBESTA, B., ŠÚTOR, M., and ŽÁK MATYASOWSZKY, F., 2015. *P021 – Záhrady-Devín, Bratislava*. Unpublished excavation report. Nitra: ARCHAEOLOGICAL AGENCY, Ltd.

CHOYKE, A. M., 2010. The Bone is the Beast: Animal Amulets and Ornaments in Power and Magic. In: D. Campana, P. Crabtree, S.D. DeFrance, J. Lev-Tov and A. Choyke, eds. *Anthropological Approaches to Zooarchaeology: Colonialism, Complexity, and Animal Transformations*. Oxford: Oxbow Books, pp. 197–209.

COOPER, J. C., 1986. *Lexikon alter Symbole*. Translated by G. Middell, and M. Middel. Leipzig: VEB E.A. Seemann Verlag.

DIETLER, M., 2006: Alcohol: anthropological and archaeological perspective. *Annual Review of Anthropology*, 35, 229–249.

DRIESCH, A. von den, 1976. *A guide to the measurement of animal bones from archaeological sites.* Peabody Museum Bulletins, 1. Harvard: Peabody Museum of Archaeology and Ethnology, Harvard University.

EGERSZEGI, I., RÁTKY, J., SOLTI, L., BRÜSSOW, K.-P., 2003. Mangalica – an indigenous swine breed from Hungary (Review). *Archiv für Tierzucht*, 46(3), 245–256.

EGG, M. KRAMER, M., 2013. Verteilung der Funde in der Grabkammer und Rekonstruktion des Bestattungsrituals. In: M. Egg, D. Kramer, eds. *Die hallstattzeitlichen Fürstengräber von Kleinklein in der*

Steiermark: der Kröllkogel. Monographien des Römisch-Germanischen Zentralmuseums, 110. Mainz: Verlag des Römisch-Germanischen Zentralmuseums, pp. 379–388.

EIBNER-PERSY, A., 1980. *Hallstattzeitliche Grabhügel von Sopron (Ödenburg). Die Funde der Grabungen 1890–92 in der Prähistorischen Abteilung der Naturhistorischen Museums in Wien und im Burgenländischen Landesmuseum in Eisenstadt*. Wissenschaftliche Arbeiten aus dem Burgenland, 62. Eisenstadt: Burgenländisches Landesmuseum, Eisenstadt.

ERVYNCK, A., DOBNEY, K., 2002. A pig for all seasons? Approaches to the assessment of second farrowing in archaeological pig populations. *Archaeofauna,* 11, 7–22.

FARKAŠ, Z., 2012. Starý neolit na území Bratislavy (5600–5300/5200 pred n. l.). In: J. Šedivý, T. Štefanovičová, eds. *Dejiny Bratislavy 1. Brezalauspurc – na križovatke kultúr. Od počiatkov do prelomu 12. a 13. storočia*. Bratislava: Slovart, pp. 70–71.

FRANČÍKOVÁ, E., 2015. Reštaurovanie a konzervácia kovových archeologických nálezov. In: Chmelo *et al.*, In: L. Chmelo, B. Šebesta, M. Šútor, F. Žák Matyasowszky: *PO21 – Záhrady-Devín, Bratislava*. Unpublished excavation report. Nitra: ARCHEOLOGICAL AGENCY, Ltd., pp. 373–383.

FRÉMONDEAU, D., HORARD-HERBIN, M.-P., BUCHSENSCHUTZ, O., UGHETTO-MONFRIN, J., BALASSE, M., 2015. Standardized pork production at the Celtic village of Levroux Les Arènes (France, 2nd c. BC): Evidence from kill-off patterns and birth seasonality inferred from enamel δ18O analysis. *Journal of Archaeological Science: Reports,* 2, 215–226.

GATTRINGER, A., 1971a. Getzersdorf, Gem. Inzersdorf ob der Traisen, BH St. Pölten. *Fundberichte aus Österreich*, 10, 40–43.

GATTRINGER, A., 1971b. Wagram ob der Traisen, Gem. Traismauer, BH St. Pölten. *Fundberichte aus Österreich*, 10, 49–51.

van GENNEP, A., 1960. *The Rites of Passage*. Translated by M. B. Vizedom, and G. L. Caffee. Chicago: University of Chicago Press.

GODIŠ, J., KMEŤOVÁ, P., forthcoming. Osídlenie lokality v dobe halštatskej. Bratislava – Devín, poloha Záhrady. In: D. Repka, B. Šebesta, F. Žák Matyasowszky, eds. *Osídlenie Devína, poloha Záhrady v dobe železnej*. Nitra, forthcoming.

HABERMEHL, K.-H., 1975. *Altersbestimmung bei Haus- und Labortieren*. Berlin-Hamburg: Verlag Paul Parey.

HAJNALOVÁ E., 1981. Uhlíky z pohrebiska kalenderberskej kultúry v Reci. *AVANS*, 1980, AÚ SAV Nitra, 68–77.

HAJNALOVÁ, E., MIHÁLYIOVÁ, J. 1998. Archeobotanické nálezy v roku 1996. *AVANS*, 1996, AÚ SAV, Nitra, 61–67.

HAJNALOVÁ, M., HAJNALOVÁ, E., 1998. Preplavovanie – metóda získavania rastlinných makrozvyškov z archeologických objektov a vrstiev. *Informátor SAS pri SAV,* 8, 6–7.

HANSEN, L., 2013. Hunting in der Hallstatt period – The example of the Eberdingen-Hochdorf "princely grave". In: O. Grimm, U. Schmölcke, eds. *Hunting in Northern Europe until 1500 AD. Old traditions and regional developments, continental sources and continental influences*. Papers presented at a workshop organized by the Centre for Baltic and Scandinavien Archaeology (ZBSA), Schleswig, June 16th and 17th, 2011. Schriften des Archäologischen Landesmuseums, 7. Neumünster: Wachholtz Verlag, 239–258.

HARMADYOVÁ, K., 2006. Žiarové hroby z mladšej doby bronzovej v Bratislave-Devíne. *Zborník múzea mesta Bratislavy,* 18, 9–28.

HARMADYOVÁ, K., 2012a. Oblasť Devína v dobe halštatskej. In: J. Šedivý, T. Štefanovičová, eds. *Dejiny Bratislavy 1. Brezalauspurc – na križovatke kultúr. Od počiatkov do prelomu 12. a 13. storočia*. Bratislava: Slovart, pp. 156–159.

HARMADYOVÁ, K., 2012b. Územie Devína v dobe bronzovej. In: J. Šedivý, T. Štefanovičová, eds. *Dejiny Bratislavy 1. Brezalauspurc – na križovatke kultúr. Od počiatkov do prelomu 12. a 13. storočia*. Bratislava: Slovart, pp. 129–132.

HARMADYOVÁ, K., 2016. Dvojslučková oblúkovitá spona z Bratislavy-Devína. *Zborník Slovenského národného múzea*, 110*,* Archeológia*,* 26, 103–107.

HELLERSCHMID, I., 2006. *Die urnenfelder-/hallstattzeitliche Wallanlage von Stillfried an der March. Ergebnisse der Ausgrabungen 1969–1989 unter besonderer Berücksichtigung der Kulturwandels an der Epochengrenze Urnenfelder-/Hallstattkultur*. Mitteilungen der Prähistorischen Kommission, 63. Wien: Österreichische Akademie der Wissenschaften.

HENNIG, H., 2001. *Gräber der Hallstattzeit in Bayerisch-Schwaben.* Monographien der Archäologischen Staatssammlung München, 2. Stuttgart: Konrad Theiss Verlag.

HLADÍKOVÁ, K., KMEŤOVÁ, P., 2019. Porridge for the dead, and cereals for gods? Remains of plant food in graves of the Eastern Alpine Hallstatt region. In: R. Karl, J. Leskovar, eds. *Interpretierte Eisenzeiten. Fallstudien, Methoden, Theorie. Tagungsbeiträge der 8. Linzer Gespräche zur interpretativen Eisenzeitarchäologie*. Studien zur Kulturgeschichte von Oberösterreich, 49. Linz, pp. 267–278.

KAUS, K., 1973. *Chronologie und Bestattungssitten der Hallstattkultur in Niederösterreich und im Nordburgenland*. Unpublished Dissertation Thesis. Wien: Universität Wien.

KLEMM, S., 1992. *Die Malleiten bei Bad Fischau in Niederösterreich. Monographie zu den Grab- und Siedlungsfunden der urgeschichtlichen Höhensiedlung. Ein Beitrag zur Kenntnis der Keramik der Urnenfelder- und der Hallstattzeit im Ostalpenraum*. Unpublished thesis (PhD), Wien: Universität Wien.

KMEŤOVÁ, P., 2017a. Animals to honour the ancestors: on animal depositions in barrows of North-East Alpine Hallstatt region. In: R. Schumann, S. van der Vaart-Verschoof, eds. *Connecting Elites and Regions. Perspectives on contacts, relations and differentiation during the Early Iron Age Hallstatt C period in Northwest and Central Europe*. Hamburg; Leiden: Sidestone Press, pp. 67–84.

KMEŤOVÁ, P., 2017b. Guláš či stehienko? Zvieracie kostrové zvyšky z halštatských mohýl v Dunajskej Lužnej-Nových Košariskách ako doklad mäsitej stravy? In: *Sedem decénií Petra Romsauera. Studia Historica Nitriensia 2017/Supplementum – mimoriadne číslo časopisu venované životnému jubileu prof. Petra Romsauera*. Nitra: Univerzita Konštantína Filozofa v Nitre, pp. 137–154.

KMEŤOVÁ, P., and STEGMANN-RAJTÁR, S., 2014. Zur symbolischen Bestattung von Pferdeschädeln in Gräbern der späten Urnenfelder- und älteren Hallstattzeit. In: S. Tecco Hvala, ed. *Studia Praehistorica in Honorem Janez Dular*. Opera Instituti Archaeologici Sloveniae, 30. Ljubljana: ZRC SAZU, Inštitut za arheologijo, Založba ZRC, pp. 149–166.

KOON, H.E.C., O'CONNOR, T.P., and COLLINS, M.J., 2009. Sorting the butchered from boiled. *Journal of Archaeological Science,* 37, 62–69.

KOZDROWSKI, R., DUBIEL, A., 2004. Biologia rozrodu dzika. *Medycyna Wet.*, 60(12), 1251–1253.

KÖRBER-GROHNE, U. 1991. Identification methods. In: W. Van Zeist, K. Wasylikowa, K-E. Behre, eds. *Progress in the Old World Palaeoethnobotany*. Rotterdam, Brookfield: A.A. Balkema, pp. 3–24.

KRIŠTOFÍK, J, FENĎA, P., STANKO, M., HANZELOVÁ, V., ŠPAKULOVÁ, M., 2012. Hryzec vodný – *Arvicola amphibius*. In: J. Krištofík, Š. Danko, eds. *Cicavce Slovenska, rozšírenie, bionómia a ochrana*. Bratislava: Veda, pp. 91–97.

KUIJT, I., QUINN, C.P., COONEY, G., eds. 2014. *Transformation by Fire. The Archaeology of Cremation in Cultural Context.* Tucson: The University of Arizona Press.

KYSELÝ, R., 2018. Meat offerings in graves of the Hallstatt Period in Bohemia (Czech Republic): An archaeozoological comparison. *Ann. Naturhist. Mus. Wien*, Serie A, 120, 245–280.

KYSELÝ, R., LIMBURSKÝ, P., ŠUMBEROVÁ, R., LANGOVÁ, M., ERNÉE, M., 2020. Scapulae and the phalanges as grave goods: a mystery from the Early Bronze Age. *Archaeological and Anthropological Sciences*, 12(72). https://doi.org/10.1007/s12520-019-01004-1

LAUWERIER, R.C.G.M., 1983. Pigs, Piglets and Determining a Season of Slaughtering. *Journal of Archaeological Science*, 10, 483–488.

LOCHNER, M., 1988. Ein Flachgräberfeld der Hallstattkultur in Grafenwörth, pol. Bez. Tulln, Niederösterreich. *Archaeologia Austriaca*, 72, 91–142.

LENGYEL, I., 1959. A halimbai (Veszprém megye) koravaskori temető. *Archaeologiai Értesitő*, 86, 159–169.

LYMAN, R.L., 1994. *Vertebrate taphonomy*. Cambridge: Cambridge University Press.

MAJOR, I., DANI, J., KISS, V., MELIS, E., PATAY, R., SZABÓ, G., HUBAY, K., TÚRI, M., FUTÓ, I., HUSZANK, R., JULL, A.J., MOLNÁR, M., 2019. Adoption and evaluation of a sample pretreatment protocol for radiocarbon dating of cremated bones at HEKAL. *Radiocarbon*, 61. 159–171.

MOLNÁR, M., JANOVICS, R., MAJOR, I., ORSOVSZKI, J., GÖNCZI, R., VERES, M., LEONARD, A.G., CASTLE, S.M., LANGE, T.E., WACKER, L., HAJDAS, I., JULL, A.J.T., 2013. Status report of the new AMS 14C sample preparation lab of the Hertelendi Laboratory of Environmental Studies (Debrecen, Hungary). *Radiocarbon*, 55, 665–676.

MURPHY, CH., 2014. Mineralization of Macrobotanical Remains. In: C. Smith (eds), *Encyclopedia of Global Archaeology*. New York, NY: Springer, https://doi.org/10.1007/978-1-4419-0465-2_2256.

MÜLLER, S., 2012. *Smolenice-Molpír, Sereď und Ratkovce. Studien zu Siedlungen der frühen Eisenzeit in der Südwestslowakei*. Universitätsforschungen zur Prähistorischen Archäologie, 220. Bonn: Dr. Rudolf Habelt GmbH.

MÜLLER-SCHEEßEL, V. N., TREBSCHE, P., 2007. Das Schwein und andere Haustiere in Siedlungen und Gräbern der Hallstattzeit Mitteleuropas. *Germania*, 85, 61–94.

NEBELSICK, L. D., 1997. Die Kalenderberggruppe der Hallstattzeit am Nordostalpenrand. In: L.D. Nebelsick, A. Eibner, E. Lauermann, J.-W. Neugebauer, eds. *Hallstattkultur im Osten Österreichs*. St. Pölten: Niederösterreichisches Pressehaus, pp. 9–128.

NEBELSICK, L. D., 2000. Drinking against Death. Drinking Sets in Ostentatious Tombs in the Late Bronze and Early Iron Ages in the Western Carpathian Basin. *Altorientalische Forschungen*, 27, 211–241.

NETOLITZKY, F., 1914. Die Hirse aus antiken Funden. *Sitzungsberichte der Mathematisch-naturwissenschaftlichen Klasse der Kaiserlichen Akademie der Wissenschaften*, 123, 725–759.

NOVÁK, M., HULÍNEK, D., MINARČÁK, P., 2008. *Rodinný dom, Kozičova 21, Devín. Výskumná dokumentácia*. Unpublished excavation report. Bratislava: SAHI, o. z.

NÝVLTOVÁ-FIŠÁKOVÁ, M., PARMA, D., 2014. Hrátky s kostmi. Astragaly jako doklady her v mladším pravěku. *Studia Archaeologica Brunensia,* 19/1, 113–122.

OLIVA, O., HRABĚ, S., LÁC, J., 1968. *Stavovce Slovenska I. Ryby, obojživelníky a plazy*. Bratislava: Vydavateľstvo Slovenskej akadémie vied.

PARE, CH., 1998. Beiträge zum Übergang von der Bronze- zur Eisenzeit in Mitteleuropa. Teil I: Grundzüge der Chronologie im östlichen Mitteleuropa (11.–8. Jahrhundert v. Chr.). *Jahrbuch des Römisch-Germanischen Zentralmuseums Mainz*, 45, 293–433.

PARZINGER, H., and STEGMANN-RAJTÁR, S., 1988. Smolenice-Molpír und der Beginn skytischer Sachkultur in der Südwestslowakei. *Prähistorische Zeitschrift*, 63, 162–178.

PICHLEROVÁ, M., 1960. Mladohalštatské popolnicové pohrebisko vo Vrádišti. *Slovenská archeológia*, 8, 125–182.

PICHLEROVÁ, M., 1963. Špačince v praveku a ranej dobe dejinnej. *Sborník SNM*, 57, *História*, 3, 104–125.

PICHLEROVÁ, M., 1969. *Nové Košariská. Kniežacie mohyly zo staršej doby železnej*. Bratislava: Slovenské národné múzeum.

PREINFALK, F., 2003. *Die hallstattzeitlichen Hügelgräber von Langenlebarn, Niederösterreich*. Fundberichte aus Österreich Materialheft, A 12. Wien: Bundesdenkmalamt, Abteilung für Bodendenkmale.

PUCHER, E., 2003. Die Tierknochen. In: F. Preinfalk: *Die hallstattzeitlichen Hügelgräber von Langenlebarn, Niederösterreich*. Fundberichte aus Österreich Materialheft, A 12. Wien: Bundesdenkmalamt, Abteilung für Bodendenkmale.

REBAY, K. C., 2002. *Die hallstattzeitliche Grabhügelgruppe von Zagersdorf im Burgenland*. Wissenschaftliche Arbeiten aus dem Burgenland, 107. Eisenstadt: Amt der Burgenländischen Landesregierung.

REBAY, K. C., 2005. Hallstattzeitliche Grabfunde aus Donnerskirchen. *Burgenländische Heimatblätter*, 67(4), 165–210.

REBAY, K. C., 2006. *Das hallstattzeitliche Gräberfeld von Statzendorf in Niederösterreich. Möglichkeiten und Grenzen der Interpretation von Sozialindexberechnungen*. I, II. Universitätsforschungen zur Prähistorischen Archäologie, 135, Bonn: Verlag Dr. Rudolf Habelt GmbH.

REBAY-SALISBURY, K., 2016. *The Human Body in Early Iron Age Central Europe. Burial Practices and Images of the Hallstatt World.* Oxford – New York: Routledge.

REIMER, P.J., BARD, E., BAYLISS, A., BECK, J.W., BLACKWELL, P.G., BRONK RAMSEY CH., BUCK, C.E., CHENG, H., EDWARDS, R.E., FRIEDRICH, M., GROOTES, P.M., GUILDERSON, T.P., HAFLIDASON, H., HAJDAS, I., HATTÉ, CH., HEATON, T.J., HOFFMANN, D.L., HOGG, A.G., HUGHEN, K.A., KAISER, F.K., KROMER, B., MANNING, S.W., NIU, M., REIMER, R.W., RICHARDS, D.A., SCOTT, D.A., SOUTHON, J.R., STAFF, R.A., TURNEY, CH.S.M., VAN DER PLICHT, J., 2013. IntCal13 and Marine13 Radiocarbon Age Calibration Curves 0–50,000 Years cal BP. *Radiocarbon,* 55(4): 1869–1887.

REITZ, E.J., and WING, E.S., 1999. *Zooarchaeology*. Cambridge: Cambridge University Press.

ROSELL, C., NAVÀS, F., ROMERO, S., 2012. Reproduction of wild boar in a cropland and coastal wetland area: implications for management. *Animal Biodiversity and Conservation*, 35(2), 209–217.

ŘÍHOVSKÝ, J., 1972. *Die Messer in Mähren und dem Ostalpengebiet*. Prähistorische Bronzefunde, 7(1). München: C.H. Beck'sche Verlagsbuchhandlung.

SCHMID, E., 1972. *Atlas of animal bones.* Amsterdam – London – New York: Elsevier.

SCHMITZBERGER, M., 2006. Tierknochen aus dem hallstattzeitlichen Gräberfeld von Statzendorf, Nö. In: K.C. Rebay, ed. *Das hallstattzeitliche Gräberfeld von Statzendorf in Niederösterreich. Möglichkeiten und Grenzen der Interpretation von Sozialindexberechnungen*. I, II. Universitätsforschungen zur Prähistorischen Archäologie, 135, Bonn: Verlag Dr. Rudolf Habelt GmbH, pp. 329–336.

SILVER, I.A., 1969. The ageing of domestic animals. In: D.R. Brothwell, E.S. Higgs, eds. *Science in archaeology: a survey of progress and research*. London: Thames & Hudson, pp. 250–268.

SHIPMAN, P., FOSTER, G., SCHOENINGER, M., 1984. Burnt bones and Teeth: an Experimental Study of Color, Morphology, Crystal Structure and Shrinkage. *Journal of Archaeological Science,* 11, 307–325.

SPAETH, B. S., 1996. *The Roman Goddess Ceres*. Austin: University of Texas Press.

STADLER, J., 2010. *Nahrung für die Toten? Speisebeigaben in hallstattzeitlichen Gräbern und ihre kulturhistorische Deutung*. Universitätsforschungen zur prähistorischen Archäologie, 186. Bonn: Verlag Dr. Rudolf Habelt GmbH.

STEGMANN-RAJTÁR, S., 1992. Spätbronze- und früheisenzeitliche Fundgruppen des mittleren Donaugebiets. *Bericht der Römisch-Germanischen Kommission*, 73, 29–179.

STUDENÍKOVÁ, E., 1993. Druhá etapa výskumu mohyly v Janíkoch. In: *AVANS*, 1992, Nitra: AÚ SAV, p. 122.

STUDENÍKOVÁ, E., 1994. Záchranný výskum halštatskej mohyly v Novej Dedinke. *Zborník SNM*, 88, *Archeológia*, 4, 25–47.

STUDENÍKOVÁ, E., 1996. Neue Ausgrabungen hallstattzeitlicher Hügelgräber in der Südwestslowakei. In: E. Jerem, A. Lippert, eds. *Die Osthallstattkultur. Akten des Internationalen Symposiums, Sopron, 10.–14. Mai 1994*. Archaeolingua, 7. Budapest: ARCHAEOLINGUA Foundation, pp. 497–511.

STUDENÍKOVÁ, E., 2012. Staršia doba železná (800 až 500 pred n. l.). In: J. Šedivý, T. Štefanovičová, eds. *Dejiny Bratislavy 1. Brezalauspurc – na križovatke kultúr. Od počiatkov do prelomu 12. a 13. storočia*. Bratislava: Slovart, pp. 133–156.

SZOMBATHY, J., 1924. Die Tumuli im Feichtenboden bei Fischau am Steinfeld. *Mittheilungen der Prähistorischen Commission der Kais. Akademie der Wissenschaften Wien*, 54, 163–197.

ŠOSTARIĆ, R., POTREBICA, H., BRIGIĆ, A., 2007. Direct dating of botanical samples in an archaeological context – Plant remains from the prehistoric site of Kaptol-Gradec near Požega (Croatia). *Prilozi Instituta za arheologiju u Zagrebu,* 24, 79–88.

TERŽAN, B., 1996. Weben und Zeitmessen im südostalpinen und westpannonischen Gebiet. In: E. Jerem, A. Lippert, eds. *Die Osthallstattkultur. Akten des Internationalen Symposiums, Sopron, 10.–14. Mai 1994*. Archaeolingua, 7. Budapest: ARCHAEOLINGUA Foundation, 507–536.

TURNER, V., 1969. *The Ritual Process. Structure and Anti-Structure*. New York: Aldine de Gruyter.

TREBSCHE, P., 2018. Die hallstattzeitlichen Jagddarstellungen der Kalenderberggruppe – zu einem Altfund von Rauheneck bei Baden (Niederösterreich). *Annalen des Naturhistorischen Museums in Wien, Serie A*, 120, 221–244.

UERPMANN, H. P., 1973. Animal bone finds and economic archaeology: a critical study of "osteo-archaeological" method. *World Archaeology,* 4, 307–322.

VADÁSZ, É., 1983. Előzetes jelentés egy koravaskori halomsír feltárásáról Süttőn (Vorbericht über die Erschliessung eines früheisenzeitlichen Hügels in Süttő. Auszug). *Communicationes Archaeologicae Hungariae*, 1983, 19–54.

VADÁSZ, É., 1986. Das früheisenzeitliche Gräberfeld von Süttő. In: L. Török, ed. *Hallstatt Kolloquium Veszprém 1984*. Antaeus, 3. Budapest: Archäologisches Institut der UAW, pp. 251–257.

VÖRÖS, I., 1993. Temetési étel- és állatáldozat Százhalombatta 109. sz. halomsírjában. In: I. Poroszlai, ed. *4000 év a 100 halom városában. Százhalombatta: Fejezetek Százhalombatta történetéből*. pp. 35–40.

WERNECK, H. L., 1949. *Ur- und frühgeschichtliche Kultur- und Nutzpflanzen in den Ostalpen und am Ostrande des Böhmerwaldes*. Schriftreihe der O.-Ö. Landesbaudirektion, 6. Wels.

WIESNER, N., 2013. Astragali in Gräbern der mitteleuropäischen Urnenfelderkultur. *Germania*, 91, 89–113.

WHYTE, T. R., 2001. Distinguishing remains of Human Cremations from Burned Animal Bones. *Journal of Field Archaeology*, 28, 437–448.

WRIGHT, E., VINER-DANIELS, S., PARKER PEARSON, M., ALBARELLA, U., 2014. Age and season of pig slaughter at late Neolithic Durrington Walls (Wiltshire, UK) as detected through a new system for recording tooth wear. *Journal of Archaeological Science,* 52, 497–514.

Online sources:

https://www.fishworld.eu/sk/ryby/jalec-hlavaty

https://www.fishbase.in/Summary/SpeciesSummary.php?ID=4482&AT=chub

https://en.wikipedia.org/wiki/European_water_vole