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NEW DATA ON FUNERAL CUSTOMS AND BURIALS OF THE BRONZE AGE REZNES CEMETERY IN LATVIA

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The Bronze Age barrow cemetery in Reznes was located on the right bank of the River Daugava on a paleoisland. In total, eight barrows have been recorded in the cemetery. Archaeological excavations took place in the 1930s, led by E. Šturms, and in the 1950s and 1960s, led by J. Graudonis. Altogether, seven barrows have been excavated. Several barrows had secondary burials from the Late Iron Age and the historical period, thus complicating archaeological analysis of this already complex archaeological site. Both Šturms and Graudonis archaeologically dated the cemetery from 1200 to 600 BC. The inhumation layers at the base of the barrow were considered to be the oldest, chronologically followed by cremations. But the youngest were considered to be the burials in stone cists. However, ^{14}C dates show that the Reznes barrow cemetery was established earlier – in the middle of the 14th century BC – and was used until the 6th century BC. The chronological sequence of the burial types is revisited as well, as the ^{14}C dates show parallel use of all three types throughout the active use of the cemetery. The differing types of burials might have been determined by the social position of the deceased in society. The anthropological analysis of inhumations was limited due to the very poor preservation of the bones. Only occasionally was it possible to distinguish between adults and sub-adults, but more detailed analysis was impossible. Cremation skeletal material, on the other hand, shows that individuals belonging to all age groups were cremated – adults, juveniles and children. Some cremation pits consist of more than one individual, and in one case – at least 16 different individuals. In addition to the ^{14}C dating, carbon and nitrogen stable isotope analysis of collagen were carried out, when possible. Based on previously published isotopic data, different food groups and their contribution to Reznes humans' diets are discussed, arriving to a conclusion that contrary to general suggestions of millet consumption during the Bronze Age, Reznes humans' isotopic data does not confirm that. Distinction between terrestrial and aquatic protein sources is complicated by the highly variable Daugava River isotopic ecology, nonetheless, some dietary trends can be distinguished that slightly correlate with ^{14}C dates. However, aquatic reservoir effects in human collagen ^{14}C dates is still an open question and exceeds the limits of this study.

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Introduction: Research history and findings

There are representative examples when archaeological monuments have been thoroughly studied several decades ago and often referenced in publications so that the conclusions drawn from them have acquired a status of a paradigm, and the monument itself has become a sort of a classic case study in the archaeological literature. This is also true for the widely researched Bronze Age barrow cemetery in Reznes. Archaeological excavations in Reznes took place in the 1930s, 1950s and 1960s. The results and findings of those excavations have been reflected and referenced since the 1930s both in publications dedicated to the Bronze Age and in wider summarizing works on Latvian archaeology and prehistory (Šturms 1936; Balodis 1938, 57, 60 ff., 64; Moora 1952, 46 ff.; Graudonis 1961; 1967, 34 ff.; 1970; 2001, 150 ff.; Ozols 1969, 4 ff.; LA 1974, 63 ff.; Okulicz 1976, 123; Bader et al. 1987, 120 f.; Lang 2007, 163). However, with developments and innovations regarding research methods, there is still space for raising new, previously unaddressed questions, as well as revisiting the previous conclusions.

Reznes cemetery was located on the right bank of the River Daugava in Salaspils parish. A smaller River Jurupīte flowing into the Daugava separated a peninsula from the mainland about 2.5 km long and 0.4 km wide. In the middle of the peninsula rose a hill about 3 m high, 500 m long and 200 m wide. In prehistory, this elongated hill was an island. The barrows were confined on the south by the steep bank of the Daugava, on the west by a deep ravine, and on the north and north-east by a steep ancient bank. Eight barrows have been detected in the cemetery, but the actual number could had been larger, as some of the barrows might have been destroyed due to an intensive tillage during the historical period. The barrows were arranged in a row alongside the northern edge of the ancient shore (Fig. 1). They were 14–24 m in diameter, but their height was from 1,6–3 m. Nowadays, the whole area is located below the level of the Riga HES water reservoir.

Thorough excavations in the Reznes cemetery were carried out by Eduards Šturms in 1933 and 1935 (Šturms 1936), and in 1958 and 1969 by Jānis Graudonis (Graudonis 1961; LA 1974, 63 ff.). Before that, in 1900 one barrow (No. 3) was excavated by Anton Buchholz, but a report about the findings has not been preserved (LA 1974, 63). According to other reports, the same barrow was excavated by German soldiers in 1918 (Graudonis 1961, 26). In 1957, barrow 2 (partially excavated by Šturms) and barrow 7 were destroyed by earthworks. The fill of the

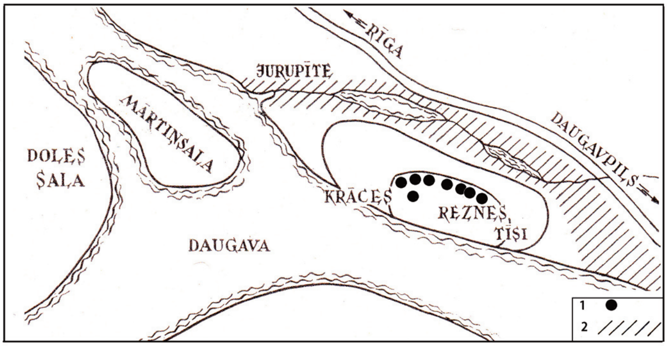

Fig. 1. Location of the Reznes barrow cemetery (LA 1974, fig. 18).

barrows consisted of light sandy soil with admixtures of fine coals, but in some cases pink clay sand was also used. Therefore, in total, archaeological information about seven barrows (1, 2, 4, 5, 6, 7, 8) has been preserved.

Several barrows contain secondary burials from the Late Iron Age and historical times, demonstrating that the significance of the site remained for later populations as well. This complicates sampling for ^{14}C dating. For example, within our study two samples that were previously considered to be from the Bronze Age, turned out to be much younger. Particularly surprising was the date of inhumation 3 in barrow 4, which was laid in a bent position on the left side. Although no grave goods were found near the burial, the bent position was viewed as reminiscent of the cultural tradition of the Corded Ware Culture and therefore this burial was considered to be one of the oldest in the whole Reznes cemetery (LA 1974, 66, fig. 21). However, ^{14}C date of the sample (Poz-101315) is 1033–1204 cal AD, hence the Late Iron Age. Examples of the Late Iron Age and medieval secondary burials in the Bronze Age/Pre-Roman Iron Age burial sites can be found elsewhere in Latvia (see Muižnieks 2015; Table 1), as well as in Estonia, for example, in the Kaseküla stone-cist grave (Laneman 2012). However, the Kaseküla site is unique with its secondary burials of infants – a phenomenon that has not been observed in Latvia so far.

Regarding burial traditions and chronology at Reznes, both Šturms and Graudonis considered the inhumations at the base of barrows to be the oldest. Above them followed a layer with cremation pits, which in turn was covered with a layer with cremations and inhumations in stone cists. The stratigraphy of the types of burials was therefore considered to coincide with the chronology. The finds of grave inventory in Reznes, similar to other Bronze Age burials in the Eastern Baltic, were scarce – only 44 items. Among them are some flint arrowheads and scrapers, a stone hole bore pin, a double-edged and simple work axe, a couple of bronze razor blades and tweezers, awls, a button, a spiral, an amber double button, a ring, some pendants, and pottery fragments (Graudonis 1961, table I). Reznes is considered to be the oldest site with domesticated horse bones in Latvia. A large number of horse teeth and even complete mandibles have been found in barrows' fill, and sometimes

Table 1. Radiocarbon dates and stable isotope measurements of the human bones, horse teeth and charcoals of barrow cemetery at Reznes. Calibration after OxCal v.4.3. (Bronk Ramsey 2009, Reimer et al. 2013)

Context	Material	Laboratory code	Date BP	Date Cal BC (95.4%), median Cal BC	$\delta^{13}C$ (‰)	$\delta^{15}N$ (‰)
Barrow 1 Cist, inhumation, depth 1.0 m	Bone	Poz-101317	2900 ± 40	1216–976, 1087	–21.7	10.7
Barrow 1	Charcoal	Poz-118495	3055 ± 35	1411–1223, 1319	–	–
Barrow 2 Central cist, inhumation, depth 2.8 m	Bone	Poz-101195	2535 ± 30	798–546, 675	–18.7	9.8
Barrow 2 Central cist, depth 2.8 m	Charcoal	Poz-118494	3085 ± 35	1430–1261, 1343	–	–
Barrow 2 Inhumation 19, depth 2.55 m	Horse tooth	Poz-111895	2935 ± 30	1225–1028, 1142	–22.3	4.9
Barrow 2 Inhumation 35, depth 2.73 m	Bone	Poz-101193	2555 ± 30	804–552, 767	–19.6	10.3
Barrow 2 Inhumation 47, depth 1.5 m	Bone	Poz-111831	2835 ± 35	1110–909, 991	–21.3	11.2
Barrow 2 Inhumation 54, depth 2.34 m	Teeth	Poz-101194	2885 ± 30	1193–946, 1065	–20.3	10.7
Barrow 2 Inhumation 55, depth 1.55 m	Bone	Poz-111833	2905 ± 35	1214–1001, 1093	–20.4	10.9
Barrow 2 Cremation 1, stone cist, depth 0.50 m	Partially calcined bone	Poz-111834	2935 ± 35	1257–1019, 1140	–21.9	10.8
Barrow 2 Cremation 1, stone cist, depth 0.50 m	Unburned horse tooth	Poz-111894	2920 ± 30	1211–1020, 1114	–22.8	5.0
Barrow 2 Creamation pit 3, depth 0.6 m	Unburned horse tooth	Poz-118254	2935 ± 30	1225–1028, 1142	–	–
Barrow 2 Cremation 5, stone cist, depth 0.42 m	Calcined bone	Poz-112721	2795 ± 30	1016–846, 948	–	–

Continued on the next page

Table 1. *Continued*

Context	Material	Laboratory code	Date BP	Date Cal BC (95.4%), median Cal BC	$\delta^{13}C$ (‰)	$\delta^{15}N$ (‰)
Barrow 2 Cremation pit 219, depth 0.75 m	Unburned horse tooth	Poz-118255	2850 ± 35	1117–918, 1012	–	–
Barrow 6 Large area of calcined bone (1)	Calcined bone	Hela-3555	2662 ± 31	894–795, 821	–	–
Barrow 6 Large area of calcined bone (2)	Calcined bone	Poz-123125	3010 ± 35	1388–1127, 1251	–	–
Barrow 6 Large area of calcined bone (3)	Calcined bone	Poz-123126	3080 ± 35	1427–1260, 1341	–	–
Barrow 6 Large area of calcined bone (4)	Calcined bone	Poz-123127	3105 ± 35	1442–1237, 1361	–	–

in specific grave contexts as well. In barrows 4, 5 and 6 they are found in 1–8 locations. Barrow 2 stands out with 136 locations of horse teeth in all layers of the fill (Šturms 1936, 82; Graudonis 1961, Appendix 2). An exception is the barrow 8, where a bull's tooth was found. Similar uses of horse teeth in a funerary ritual context are recorded in Later Bronze Age cemeteries: Ķivutkalns (Denisova et al. 1985, table 6), Kalnieši (Vankina 1962) and Vējstūri (Zariņa 1987). Noticeably, all are located by the River Daugava, but outside the lower reaches of the Daugava, this tradition has not been detected so far.

The archaeological dating of the finds covers a wide range: from the Neolithic to the end of the Bronze Age. The exception was some bronze objects within the IV–V periods (1100–600 BC). Therefore, the chronology of the cemetery, and especially that of the different burial types, was drawn from the typological-chronological evaluation that was based on the scarce finds, as well as on analogies of burial types in Northern Europe and south-east Baltic (former East Prussia). Both Šturms and Graudonis dated the cemetery from ca 1200 to 600 BC. Changes of burial traditions over time were described as purely linear: during the last quarter of the 2nd millennium BC – inhumations, but at the turn of the 2nd/1st millennium BC – a transition to cremations; in the second quarter of the 1st millennium BC, burials in stone cists began, first as cremations in continuity from the previous tradition, but later unburned dead were buried in the cists as well (Šturms 1936; Graudonis 1961; LA 1974, 67). These conclusions were mostly based on material from barrow 2, that was the largest of all, and barrow 6, while the others were less informative, as they reflected fragments of burial traditions observed in barrows 2 and 6.

In this paper, we present new ^{14}C dates and establish more precise absolute chronology of the site, and characterize its use and burial customs throughout time. We revisit previous claims about the burial types and their chronology and address bioarchaeology of the remains both by anthropological analysis of cremations and inhumations and by carbon and nitrogen stable isotope analyses of bone collagen. Reliability of the new ^{14}C dates in light of different possible reservoir effects is discussed as well.

Documentation, artefacts, skeletal remains and charcoal samples from archaeological excavations are stored mainly at the Department of Archaeology, National History Museum of Latvia, but part of the material is stored at the Repository of Bioarchaeological Material, Institute of Latvian History, University of Latvia. Unfortunately, there is a lack of reports from excavations, which makes it difficult to identify and use a wider range of source material. The information gaps can be partly filled by publications of Šturms (1936) and Graudonis (1961; 1970), that provide a summary of the excavations in the respective years. During the excavations, various samples were collected (cremated and unburnt burial bones, charcoal from and near the burials), that had not been studied so far. Unfortunately, from the excavations by Šturms in the 1930s, the bones from the cremations were only partially preserved. The sample availability is also limited by the fact that it is not always possible to identify the exact location in the barrows of the respective sample. However, despite the aforementioned limits, the previously unused samples are the main source for this study that enables us to obtain new information and re-evaluate the Reznes cemetery.

A total of 16 burial bones and two charcoal samples were analysed from the Reznes cemetery, 17 of them at the Poznań Radiocarbon Laboratory and one at the Chronology Laboratory of the University of Helsinki Museum of Natural History (Table 1). AMS dates were calibrated using programme OxCal v. 4.3.2 (Bronk Ramsey 2017), that utilizes IntCal 13 calibration curve (Reimer et al. 2013).

^{14}C dates and chronology

Barrow 1

Its diameter was 24 m, height 1.75 m. At a depth of 1 m, a 2.5 m long and 0.85 m wide central stone cist with inhumation was unearthed, oriented in the direction of WNW–ESE. ^{14}C date of the bone (Poz-101317) is 1216–976 cal BC (median 1087 cal BC[1]). A charcoal from the vicinity of the cist (Poz-118494) has been dated to 1411–1223 cal BC (median 1319 cal BC). In the case of barrow 1, skeletal material was very poorly preserved, therefore the anthropological analysis was not possible.

[1] Here and hereafter, median cal BC age is indicated for a clearer data comparison.

Barrow 2

The diameter of the barrow was 20 m, height 3 m (Fig. 2). Inhumation graves, cremation pits, as well as stone cists with cremations and inhumations were unearthed, in total 355 graves. The depth of the skeleton graves (95 in total) in the barrow was 0.85–2.90 m. All the more or less preserved inhumations were laid on their backs, in an outstretched position, hands placed along their sides. Orientation towards cardinal directions was variable, as the burials were mostly placed radially towards the centre of the barrow. Part of the burials in the peripheral zone of the barrow were laid concentrically. The inhumations were mostly without stone structures, although in several cases a row with two or three stones was found on one or both sides of the burial. Cremation pits (201 in total), as well as inhumations, were unearthed in different depths – from 0.18 to 2.90 m. Cremation pits were in a round or oval shape, 0.3–0.5 m in diameter, thickness of the burnt bone layer from 5–20 cm (Fig. 3). No stone structures were found around the cremations. Stone cists were discovered at a depth of 0.25–2.75 m, i.e., throughout all layers of the barrow. 59 partially-preserved cists made of granitoids and limestone were found in the barrow, but their number might had been higher, as the vast majority of them, especially those in the upper part of the barrow, had been destroyed. It seems that the stones of the ruined cists had been re-used in building new cists. The stone cists had an elongated rectangular shape, their length ranged from 0.75 to 2.40 m, and the width from 0.4 to 1.0 m. The depth of the cists did not exceed 0.3–0.4 m, but was usually shallower. In some cases, the cist's floor was paved with smaller stones. No stones from the cist's lids were

Fig. 2. Barrow 2. Photo by Eduards Šturms, 1933. (National History Museum of Latvia.)

Fig. 3. Barrow 2. The central stone cist. Photo by Eduards Šturms, 1935. (National History Museum of Latvia.)

found. The stone cists mostly contained cremations, however, in 5–6 cases no signs of cremated bones were found in the cists, so the deceased were most likely buried unburned. In these cases, the cists were the same size as a human body.

As mentioned above, both Šturms and Graudonis believed that the inhumations at the base of the barrow were the oldest, later overlaid with newer layers of cremation pits, but the newest burials were in the upper layer with cremations and separate inhumations in stone cists. However, given the depths of the burials, such temporal sequence of the burial types has been questioned. To resolve this debate, 11 samples in total have been radiocarbon dated from inhumations (6), cremation pits (2) and burials in stone cists (3).

Inhumation in the central cist

In the central part of the barrow, at the very bottom, 2.73–2.83 m from the top of the barrow, there was a NNE–SSW oriented 3.68 m long, 1.96 m wide and 0.60 m high cist, built of granitoids and some limestone (Fig. 4). An inhumation was found in the cist, which, according to Šturms, "was a very tall dead man, whose bones were severely rotten and who, unfortunately, did not have any grave goods" (Šturms 1936). Šturms, and later Graudonis, considered this burial to be the oldest of the barrow 2, and attributed it to the 12th or even 13th century BC. The age of the charcoal found in the stone cist (Poz-118494) is indeed 1430–1261 cal BC (median 1343 cal BC). However, the age of the bones (Poz-101195) is only 798–546 cal BC (median 675 cal BC), therefore contradicting the previous hypothesis. Šturm's description of the layer says that there were no other burials in the vicinity of the cist or above it. Such archaeological context and the new radiocarbon date thus mean that this grave was one of the most recent burials, and due to being laid in the

Fig. 4. Barrow 2. Cremation pit, cremation 32. Photo by Eduards Šturms, 1935. (National History Museum of Latvia.)

barrow much later, could have been the reason for the destruction of older burials. The much older charcoal sample most likely entered the cist from a much older structure that was destroyed while digging through the fill of the barrow. For example, it might had been originally from the time of establishing the barrow through a ritual burning of the base.

Inhumation 19 was unearthed at a depth of 2.30–2.50 m, oriented in a cardinal direction ESE–WNW. A horse tooth from the burial context (Poz-111895) is dated to 1225–1028 cal BC (median 1142 cal BC).

Inhumation 35 was discovered 2.73 m deep. A 30–40 years old adult individual was oriented towards NE–SW. Radiocarbon date of the skeletal bone (Poz-101193) is 804–552 cal BC (median 767 cal BC). Given the depth and date of the burial, it was most likely later dug into the barrow's fill.

Inhumation 47. An 8–10 years old child was laid at a depth of 1.50 m, bone sample date: 1110–909 cal BC, median 991 cal BC (Poz-111831).

Inhumation 54. An adult, 25–35 years old, was oriented in a N–S direction, buried 2.39 m deep. Bone sample date: 1193–946 cal BC, median 1065 cal BC (Poz-101194).

Inhumation 55. A 20–25 years old individual, placed in the WSW–ENE direction, was revealed at a depth of 1.52–1.65 m. A horse tooth found in the grave was radiocarbon dated to 1214–1001 cal BC, median 1093 cal BC (Poz-111833).

Cremation 1, a 1.5 x 0.5 m large stone cist built of limestone with small stone flooring was oriented NE–SW. Burnt bones (7–10 years old child) were scattered above the floor. Among them, 6 fragments of a clay vessel were found. The depth of the cist in the barrow was 0.50 m. The radiocarbon age of a cremated bone (Poz-111834) is 1257–1019 cal BC, median 1140 cal BC, the age of an unburned horse tooth (Poz-111894) from the burial context – 1211–1020 cal BC, median 1114 cal BC.

Cremation 3 was a 0.3 x 0.4 m round pit of burnt bones at a depth of 0.6 m. Burial bones represent at least 1 adult, 1 juvenile (?) and 1 child (infant I or II?). A horse tooth from the grave context (Poz-118254) is dated to 1225–1028 cal BC, median 1142 cal BC.

Cremation 5. Approximately 1 m long, destroyed cist was placed in the E–W direction and was revealed at a depth of 0.40 m. The cremated bones (adult) is radiocarbon dated (Poz-112721) to 1016–846 cal BC, median 948 cal BC.

Cremation 219 was a 0.15 x 0.15 m round cremation pit at a depth of 0.75 m. The radiocarbon age (Poz-118255) of the unburned horse tooth found next to the grave is 1117–918 cal BC, median 1012 cal BC.

Judging by the dates of the burials and their depth, barrow 2 reached its height (3 m) during the 13th–9th centuries BC. Later, the dead were buried by digging in the barrow fill (central cist, inhumation 35).

Barrow 6

The diameter of the barrow was 20 m, height 1.6–1.9 m. It was established on a charcoal layer (up to 1.5 cm thick) left from a burning ritual. Just above this layer, at a depth of about 1.3 m an area of 5 m^2 with up to 2 m thick layer of cremated human bones was unearthed (cremation "field"). A conical bronze button was found in this layer. Anthropological analyses of the bone fragments show that at least 16 individuals had been buried in this common grave. On top of this area, a 2.60 m long and 1.70 m wide stone cist was laid with flat limestone and densely stacked covering. No remains of the burial were found in the cist. In a slightly higher level, 21 inhumations, 13 cremation pits and 14 stone cists with cremations and inhumations were discovered. These burials were mostly located radially towards the centre of the barrow.

Four burned bone samples from the cremation "field" were selected for ^{14}C dating. The initial sample (1) was selected as a general calcined bone fragment. The additional three were selected to represent different individuals. In all three cases, petrous bone (ear pyramid) was chosen. The first sample (1) is 894–795 cal BC, median date 821cal BC (Hela-3555), second (2) 1388–1127cal BC, median date 1251 cal BC (Poz-123125), third (3) 1427–1260 cal BC, median date 1341 cal BC (Poz-123126), and fourth (4) 1442–1237 cal BC, median date 1361 cal BC (Poz-123127). As one can see, the dates of the second, third and fourth samples date back to the 14th and 13th centuries BC within about 100 years. In contrast, the first sample is about 500 years younger. Although the cremation "field" seemed to be compact and created within a short period of time, apparently in the 9th century BC another cremation was buried in the fill of the barrow 6, thus supplementing this much older collective grave.

^{14}C dates show that burials in Reznes cemetery took place from ca 1360 BC to ca 670 BC (Fig. 5). The previous interpretation that the depth of the burials reflect the chronological order has been proven false by the new ^{14}C dates. Thus, all three types of burials were actually used synchronously. For example, burial in a stone cist, as shown by the case of barrow 1, already occurred in the 12th–11th centuries BC and, as shown by the burial dates of barrow 2, has also been practiced in the 8th–6th centuries BC. Similarly, the inhumation graves are typical of both the oldest period of the barrow (inhumation 19) and later as well (inhumation 35). The same goes for the custom of cremating the dead. According to the ^{14}C dates from the cremation "field" of barrow 6, the oldest cremations took place in the 14th to 13th centuries BC, but the latest – in 9th century BC. The choice of the type of burial was apparently determined not chronologically, but by other reasons, for example, the social position and status of the deceased.

Thus, based on the new ^{14}C dates, the custom of cremating the dead in the area of the lower reaches of the Daugava, including at the Reznes, could have been practised as early as the 14th–12th centuries BC. (Reliability of these dates in context of old wood effect is discussed below.) In SW Latvia this custom appears even earlier – in the 17th–16th centuries BC at the Pukuļi barrow cemetery (Ciglis & Vasks 2017; Legzdiņa et al. in press). To the same or even earlier time is attributed a cremation in a ceramic urn at the Kretuonas 1 B settlement in eastern Lithuania, however, it has not been radiocarbon dated yet (Girininkas 2013, 147 ff.). The transition to cremating the dead in Northern Europe is associated with period III of

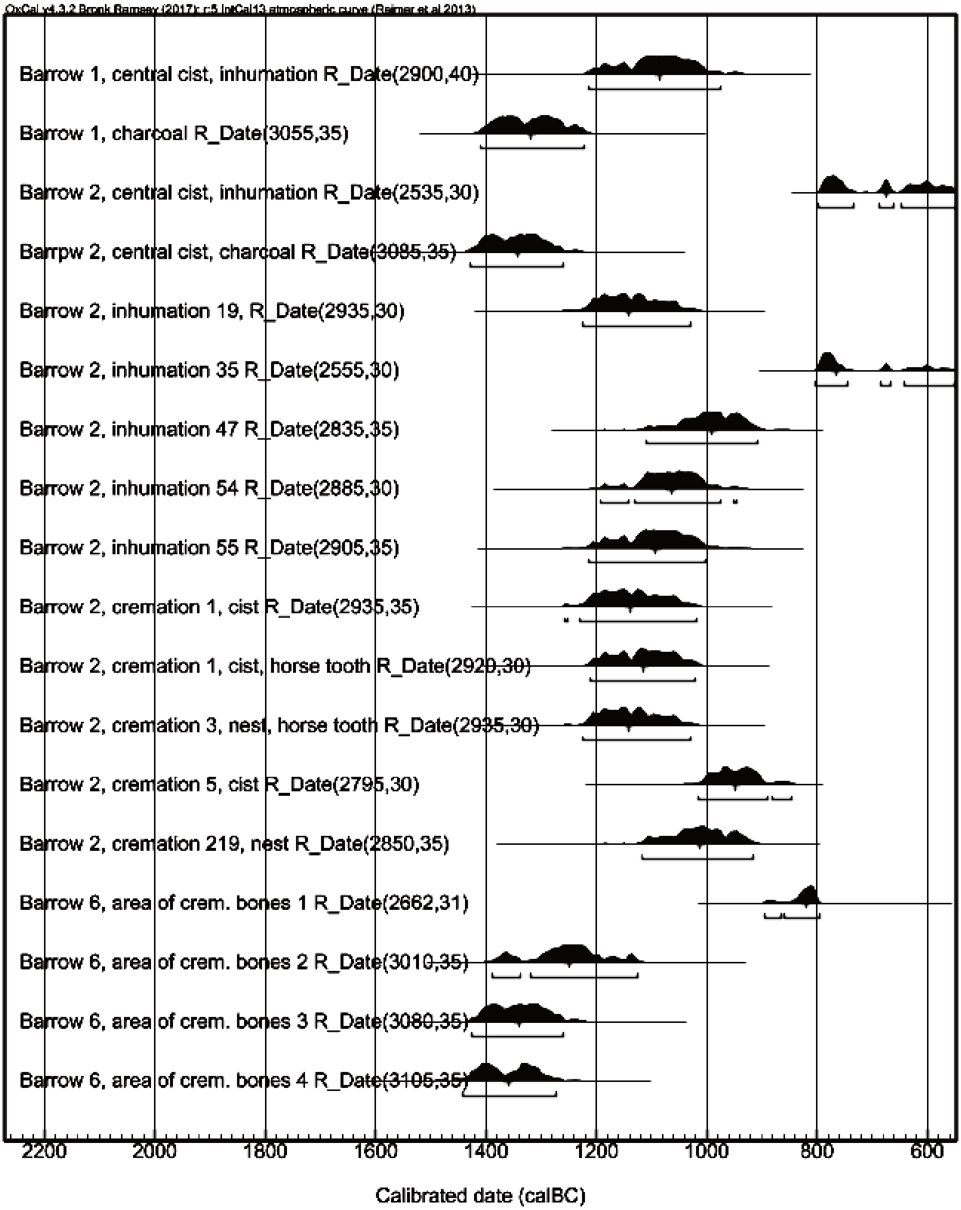

Fig. 5. Radiocarbon dates from Reznes barrow cemetery, calibrated by OxCal v.4.3.2 (Bronk Ramsey 2017) using the IntCal 13 (Reimer et al. 2013) calibration curve.

the Bronze Age (1300–1100 BC) (Fokkens & Harding 2013, 104). Even earlier – during the period I and II (1800–1500–1300 BC) cremation graves appeared in Central Europe: in Hungary (Kovács 1977, 53 f.), Slovakia (Harding 2000, 111 f.) and Poland (Hensel 1978, 175 f.). Apparently, this burial tradition reached south-western Latvia already during the period I and II, and spread further north at the end of the period II and in the period III. Significantly, this spread of cremations is connected to waterways (the coast of the Baltic Sea, River Daugava). For example, in the lower reaches of the Daugava is another burial site Vējstūri barrow (not far from Reznes cemetery), the ^{14}C date of cremation is 1372–1112 cal BC. Further up the Daugava is the barrow I of Kalnieši cemetery, the ^{14}C date of the cremation 15 is 1210–1000 cal BC. Further along the Daugava is the Raganukalns flat cemetery, ^{14}C date of the cremation pit is 1258–1049 cal BC. In sites located more inland, cremations seem to appear later. For example, in the Vidzeme Upland, a cremation of Puntūzis cemetery barrow 10 dates back to 820–590 cal BC. In northern Vidzeme, four cremations have been dated from the Buļļumuiža barrow cemetery near Limbaži, the ^{14}C dates fall in range 968–400 cal BC (Ciglis & Vasks 2017, table 1; Legzdiņa et al. in press, table 1, fig. 1).

Physical anthropology of the remains

In a mythological world view, cremation of the deceased is often perceived as a complete separation of the spirit from the physical body through fire as a purification. The ritual of cremation can therefore be interpreted as a transition to the after-world, that would detain the deceased from returning to the world of living.

In prehistory, cremation of a human body was a rather complicated process. It required serious planning and a noticeable dedication of time, effort and resources. From a technical point of view, three major factors had to be taken into account: time, temperature and flow of oxygen. Given the technological limits at the time, achieving the right conditions could not always be ensured. In such cases, cremation would happen only partially.

For a fully completed cremation, a temperature of 760–1150 °C have to be kept for approximately two hours. After the process, some fragmented skeletal remains can still be identified. If during the cremation bones have completely lost all organic components, their colour turns white. For example, 10th–13th century cremations from Salaspils Laukskola cemetery show such an example, therefore it can be concluded that the cremation was done in at least 700–800 °C temperature (Zariņa 2005, 208).

Cremated bone fragments from Reznes barrows 2 and 6, on the other hand, are mostly brown or dark brown, it indicates that cremations were done unsteadily and in a lower 500–600 °C temperature. That is almost the lowest temperature threshold for cremating a human body. In higher and more steadily kept temperatures – 600–680 °C – bone fragments turn light grey, but in even higher temperatures – white (Golubovich 1991).

In this study, our main focus of the anthropological analysis of cremations is the age groups, and the question if individuals of all age groups had been buried in this cemetery – adults, juveniles and children. Of course, the much smaller children bones might be less preserved and therefore could be absent from the statistical analysis. In some cases, however, skeletal elements of children can be identified by teeth, petrous bones and skull fragments.

As a comparison, demographic analysis of the 10th–13th century Salaspils Laukskola cemetery show that only 2 out of 111 cremations were of children, while of all inhumations children substituted 40%. It has been found, that in Scandinavian prehistoric material child cremations are rather rare as well. From the researched material in Norway only 6% of cremations were of children, and in Denmark – 7,6%. Similar proportions have been found elsewhere in Northern Europe (Holck 1997, 119). Higher proportions of children have been found in west Estonia Iron Age cemeteries. For example, in Maidla I (4th–5th c. AD), 35.3% of all cremations were children. In contrast, in the Late Iron Age Maidla II cemetery child cremations were extremely rare, leading to a suggestion that crushing of children and infant bones before the burial could had been a custom (Allmäe 2013).

Data on male and female proportions in cremations in Norway, Denmark and Sweden are highly variable and based on small proportion of the identified individuals. In some cases, higher proportions of female cremations have been observed (Rheinberg 900–600 BC, Bargstedt 800 BC – 100 AD, Soderstorf 550–300 BC.) It has been speculated that in such cases males were not buried due to dying far away from the community, or for other reasons. In contrast, several Late Iron Age cemeteries in Northern Europe have similar male – female burial proportions: North Spanga 500 BC – 1050 AD, Vallhagar 100–600 AD, Illington 400–700 AD (Holck 1997, 56 ff.). In Salaspils Laukskola, amount of male cremations is twice as that of female cremations (Zariņa 2005, 207).

The cremated bone fragments from Reznes are rather large. Such skeletal elements as petrous bones, skull fragments, maxillae, long bone fragments could be identified (Fig. 6). The preservation therefore allows (to a limit) to determine the minimum number of individuals buried in the same cremation pit and in some cases the age at death. Mostly, a distinction between three groups could be made: child or adolescent, juvenile and adult. The anatomical evaluation could be made based on the following skeletal elements: petrous bone, frontal bone and other skull bone elements, long bone epiphysis, vertebra, maxilla and mandible fragments. Determination of age at death was done, following the standard methodology (Buikstra & Ubelaker 1994).

It was possible to determine that in the Reznes barrow 2, out of 11 cremations seven contain a single individual: three of them adults, three – children or adolescents and one juvenile. More than one individual have been buried in 4 cremations – mostly an adult together with one or more subadults (Table 2).

Results of the Reznes barrow 6 are rather similar. 14 cremation pits were analysed. In 11 cases cremations most likely consist of one individual. Of those six are adults, three are children 2–10 years old, and two juveniles. Three cremation pits definitely consist of more than one individual. The common graves are as

Fig. 6. Barrow 6. Skeletal material of the cremation "field". Photo by Gunita Zariņa, 2019.

follows: cremation pit 6 – one adult (possibly a young woman) and an adolescent; cremation pit 8 – juvenile, adolescent and a child; cremation pit 11 – one adult, one or two adolescents and an infant (Table 3). In total, the proportion of children among the cremated is ~42%. It is a high proportion, however, it corresponds with the child mortality in prehistory.

Table 2. Reznes barrow 2 – determined age at death of the cremated and inhumated individuals

Archaeological object	Age		
	Adult (20–70 yr)	Juvenile (15–19 yr)	Child, adolescent (0–14 yr)
Cremations			
Cremation pit 1			1
Cremation pit 2	1		
Cremation pit 3	1	1	1?
Cremation pit 4			1
Cremation pit 5	1		
Cremation pit 6	1		1?
Cremation pit 7			1
Cremation pit 8	1		1
Cremation pit 9		1	
Cremation pit 10	1–2		2
Cremation pit 13	1		
Inhumations			
Cist burial 7	1 (20–25)		
Burial 33	1 (50–60)		
Burial 34	1 (20–25)		1 (7–9)
Burial 35	1 (30–40)		
Burial 37		1 (18–22)	
Burial 42	1 (30–50)		
Burial 43		1 (18–22)	
Burial 44	1 (30–50)		
Burial 46	1 (20–25)		
Burial 47			1 (8–10)
Burial 49	1 (30–50)		
Burial 50		1 (18–22)	
Burial 53	1		
Burial 54	1 (25–35)		
Burial 55	1 (20–25)		
Burial 57	1 (50–60)		
Burial 58	1 (20–25)		

Analysis of Reznes barrows 6 and 2 cremations show that individuals of all age groups were cremated in a single cremation: children (even an infant in barrow 6, cremation pit 11), juveniles and adults. Some cremations contain remains of more than one individual. In such cases, the pattern is an adult together with at least one child. However, a question remains, if the common graves were created by burning the individuals simultaneously, or if an already existing cremation pit could had been sometimes appended with an additional cremation.

Table 3. Reznes barrow 6 – determined age at death of the cremated and inhumated individuals

Archaeological object	Age		
	Adult (20–70 yr)	Juvenile (15–19 yr)	Child, adolescent (0–14 yr)
Cremations			
Cremation "field"	8–10	1–2	7–8
Cremation pit I		1	
Cremation pit III			1
Cremation pit IV			1
Cremation pit 2		1	
Cremation pit 3	1		
Cremation pit 4	1		
Cremation pit 5	1		
Cremation pit 6	1		1
Cremation pit 7			1
Cremation pit 8		1	2
Cremation pit 9	1		
Cremation pit 10	1		
Cremation pit 11	1		2–3
Cremation pit 13	1–2		
Inhumations			
Cist burial 1	1		
Cist burial 8	1 (50–70)		
Burial 4		1	
Burial 7		1	
Burial 8		1	
Burial 9	1		
Burial 10			1 (6–8)
Burial 15	1 (25–35)		
Burial 16	1 (20–25)		
Burial 17	1		
Burial 18			1 (9–12)
Burial 19			1 (2–3)
Burial 20	1 (25–35)		
Burial 27		1	
Burial 28			1 (4–6)
Burial 31		1	
Burial 32			1 (4–6)
Burial 34	1 (25–35)		

From an anthropological point of view, a rather unique object is the cremation "field" in barrow 6 – a large cremation pit. Analysis of the bone fragments suggest the minimal number of individuals to be 16. Of them 8–10 adults, 1–2 juveniles, 6 children and 1–2 infants (Table 3). As discussed before, ^{14}C dates show that they were not cremated simultaneously. One of the samples come from a much later added cremation. The other three fall in a ~100 years long period from 1360–1250 cal BC. It is possible that this cremation "field" was formed by storing the cremated remains elsewhere before the final burial in the barrow.

As mentioned before, the skeletal material of inhumations has been very poorly preserved, especially from barrow 1. In some cases, from barrows 2 and 6 age determination was possible based on teeth and mandible fragments (Tables 2 and 3). The limited material was sufficient for determining that in most cases inhumations consist of one individual, belonging to different age groups – children, juveniles and adults. Similar findings have been reported regarding the stone-cist graves at Muuksi (Laneman & Lang 2013) and at Väo (Laneman et al. 2015) from northern Estonia. More detailed demographic analysis, such as proportions of different age groups, would not be justified in case of Reznes, given that age determination was based on teeth, where older individuals could be under-represented due to the enamel being too worn for tooth preservation.

Stable isotope analysis and palaeodiet

In addition to the ^{14}C dating, carbon and nitrogen stable isotope (SI) analysis were carried out, when possible. The laboratory protocols and IRMS technical specifications can be found at the homepage of the Poznan Radiocarbon Laboratory. Results are displayed in Table 1. The analysis was done, using the same bone collagen extracted for the ^{14}C dating purposes, therefore the skeletal elements sampled are variable and are not consistent. Altogether, 7 human bone and 2 horse teeth samples produced enough collagen for the SI analysis. We recognize the shortcomings of such sampling strategy and realize that a more robust population-oriented palaeodietary analysis would call for a systematic sampling strategy and a much larger sample size. However, for the purposes of this study, even the limited data can provide a valuable insight in different aspects of the research topic.

Both horse teeth samples have very similar δ values: only 0.5‰ difference for $\delta^{13}C$ and 0.1‰ difference for $\delta^{15}N$. Thus, a question arises, is there a possibility for them to be from the same animal? The ^{14}C dates are very close as well, but the archaeological context – different burials, very different depth of the finds – hint towards them being from different animals, although the character of the archaeological object (barrow with numerous re-diggings and additional burials over time) does not permit to exclude this possibility. Both δ values are on the low end: –22.8‰ to –23.3‰ $\delta^{13}C$ and 4.9‰ – 5‰ $\delta^{15}N$. Depleted $\delta^{13}C$ values in the east Baltic region is by now a well-established fact (Eriksson et al. 2003). Consequently, it can be observed in all trophic levels, including the human stable isotope data. The low $\delta^{15}N$ values, on the other hand, are not surprising as the horse is a terrestrial herbivore. Animal stable isotope baseline for the lower Daugava River region for the time being is not well-established. Some data are available from previous research. For example, there are three unspecified animal data from the Late Bronze Age hillfort Ķivutkalns. As the sampled material are finely worked bone artefacts, the species are impossible to determine. However, the C and N δ values place them on the terrestrial herbivore/omnivore area as well (Oinonen et al. 2013). Geographically close, but chronologically more distant are the Late Iron Age domesticated animals from Daugmale (two domesticated pigs) and Aizkraukle (horse, cattle, chicken, goose) hillforts. The horse sample from Aizkraukle: 5.6–22.73, i.e. very close to the Reznes horses. The other domesticates from that research can provide a baseline distribution for the domesticated animal data (Gunnarssone et al. 2020).

The same paper by Gunnarssone et al. (2020) provides a large data set (n = 19) of the Late Iron Age Daugava fish from the Daugmale hillfort. Species cover wide trophic levels and natural habitats: pike, zander, perch, bream, salmon, Atlantic cod, etc. The results demonstrate the serious issues one faces when researching river delta and brackish water regions, as the variability in $\delta^{13}C$ values is enormous due to having in one habitat both freshwater and marine/migratory fish. Even if excluding the Atlantic cod as the less likely inhabitant in Daugava River, the data distribution is still too wide to provide any meaningful determination of the fish intake in human diet, if looking only at the C isotopes. The N isotopes, on the other hand, are more helpful in this matter. The Daugava fish have rather low $\delta^{15}N$ values, given that the aquatic trophic chain is usually much longer than the terrestrial. In this case, such bottom feeders as vimba or bream skew the aquatic lower margin down to that of terrestrial herbivores. And if excluded, carnivores such as pikes and zanders cluster around 9‰ $\delta^{15}N$, which is still on the low end for an aquatic isotopic ecology.

Unfortunately, there are no isotopic data available for different plants, which complicates addressing the issue of possible manuring of domesticated plants, crops, etc. However, the impact of plant isotopes on the bone collagen is less prominent due to carbon and nitrogen coming mostly from protein sources (100% for N and ~74% for C), whereas in plants protein is in much smaller amounts than carbohydrates (Fernandes et al. 2012). Ongoing discussion is that of C_4 vs. C_3 plants in the Bronze Age palaeodiets (Oinonen et al. 2013; Vasks & Zariņa 2014). As Latvian territory is located in Northern Europe, there are actually no indigenous C_4 plants, as they require more warm and arid climates. Same goes for imported domesticate crops. One such exception is millet which has actually been recorded in Latvian archaeological material (LA 1974, 88). Millet as C_4 plants, have much higher $\delta^{13}C$ values. If an individual consumes large amounts of millet for a prolonged period of time, it should be recorded in their isotopic data as elevated $\delta^{13}C$, while depleted $\delta^{15}N$ value. Geographically closest millet isotopic data is from Lithuania: –9.1 $\delta^{13}C$ and 6.4 $\delta^{15}N$ (Antanaitis & Ogrinc 2000). Further, we adopt this data when consumption of millet is discussed. In the case of bone collagen, it is estimated that ~20% of dietary protein (not to be mistaken with the overall calorie intake) must come from a non-C_3 source in order for it to be distinguishable isotopically (Hedges 2003). In literature, a cautious application of a $\delta^{13}C$ cut-off usually use value of −18‰ or greater, combined with relatively low $\delta^{15}N$ values as an indication of C_4 consumption (Pearson et al. 2007). From the analysed Reznes humans, none have $\delta^{13}C$ values higher than −18‰. Two of them have somewhat elevated $\delta^{13}C$: –18.7‰ and –19–6‰; however, they both still have somewhat high $\delta^{15}N$ values: 9.8‰ and 10.3‰, respectively (Fig. 7). When applying the Bayesian statistical probability programme FRUITS (Fernandes et al. 2014), it becomes clear

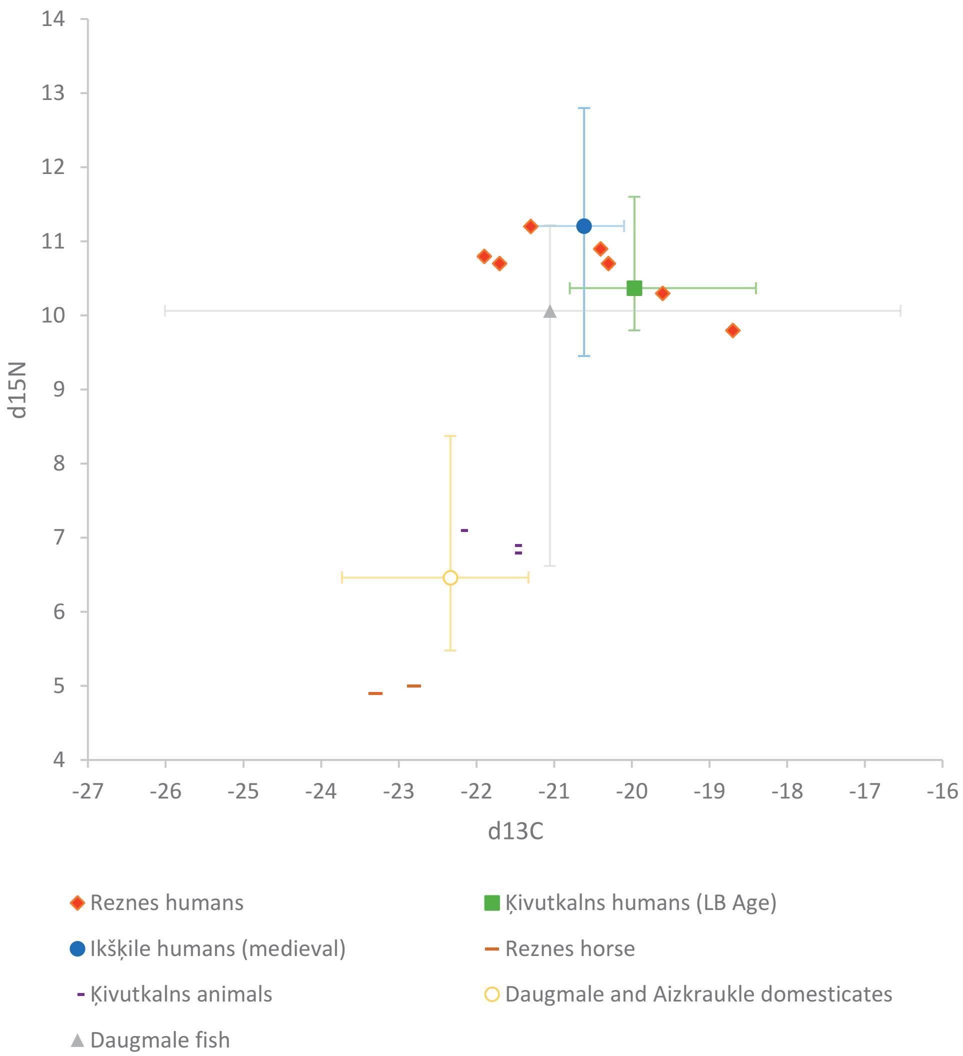

Fig. 7. Human and animal carbon and nitrogen stable isotope data plot. Reznes data: this study; Ķivutkalns data: Oinonen et al. 2013; Ikšķile data: Zariņa 2015; Daugmale and Aizkraukle data: Gunnarssonne et al. 2020.

that the millet consumption could be low to non-existent to all Reznes individuals, including the ones with higher $\delta^{13}C$ values (Fig. 8).

The statistical analysis with FRUITS is less clear when it comes to distinguishing between terrestrial (animal) and aquatic (fish) isotopic contribution. One has to keep in mind that such statistical analysis can only be as precise as the given data. In our case, the most statistical confusion comes from the aquatic baseline, as the isotopic variation is so high. It is illustrated by the large probability distributions and error margins of all the individual analysis. However, the trend seems to be that the individuals with lower $\delta^{13}C$ values were more likely consuming larger amounts of fish in comparison with others (Fig. 9). Therefore, another way to look at the data is to see if there is any correlation between the $\delta^{13}C$ values and the cal BC dates. Interestingly, there indeed seems to be some correlation, as the five older dates (~1200–900 cal BC) all have lower $\delta^{13}C$, while the two youngest – 804–552 cal BC and 798–546 cal BC – fall more closely not with other Reznes individuals, but with the Late Bronze Age Ķivutkalns individuals: both regarding the $\delta^{13}C$ and the ^{14}C dates, and even regarding the $\delta^{15}N$ values (Figs 7 and 9). Although the sample size is still too small for a more certain interpretation, this seems to indicate a slight dietary shift from the Early to the Late Bronze Age. Several possibilities should be considered regarding the shift in $\delta^{13}C$ values. Could it be ecological? Not likely, quite a prominent ecological change should take place to cause such a noticeable shift. As we know from previous palaeogeographical research, nothing like that takes place, so we can disregard that possibility. Another possibility would be changing subsistence strategies. For example, could it be a rise in niche fishing, i.e., targeting only the marine/migratory fish? But that would, on the other hand, increase $\delta^{15}N$ values, which we do not see in neither Reznes, nor Ķivutkalns humans. For a comparison, another population example from the region is the medieval Ikšķiles humans that show untypically high $\delta^{15}N$ most likely due to larger proportion of the diet consisting of the fish (Fig. 7). However, the Reznes humans $\delta^{15}N$ values do not vary significantly, meaning that the trophic level does not seem to change, i.e. the proportion between animal based and plant based diet. Likely, the interpretation of

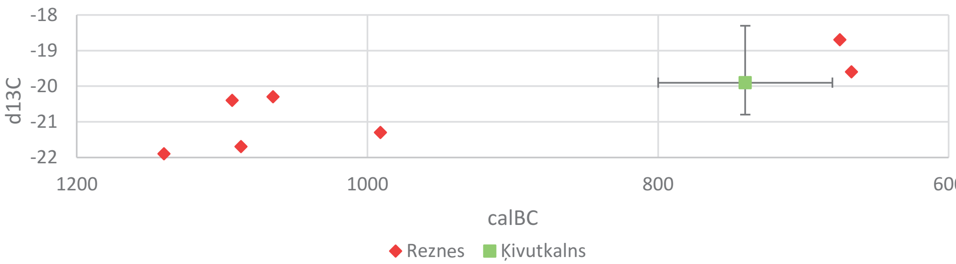

Fig. 8. Reznes and Ķivutkalns inhumation ^{14}C and $\delta^{13}C$ data plot. Reznes ^{14}C data points represented by calibrated median age. Ķivutkalns data points represented by the average and total distribution (n = 14). Reznes data: this study; Ķivutkalns data: Oinonen et al. 2013.

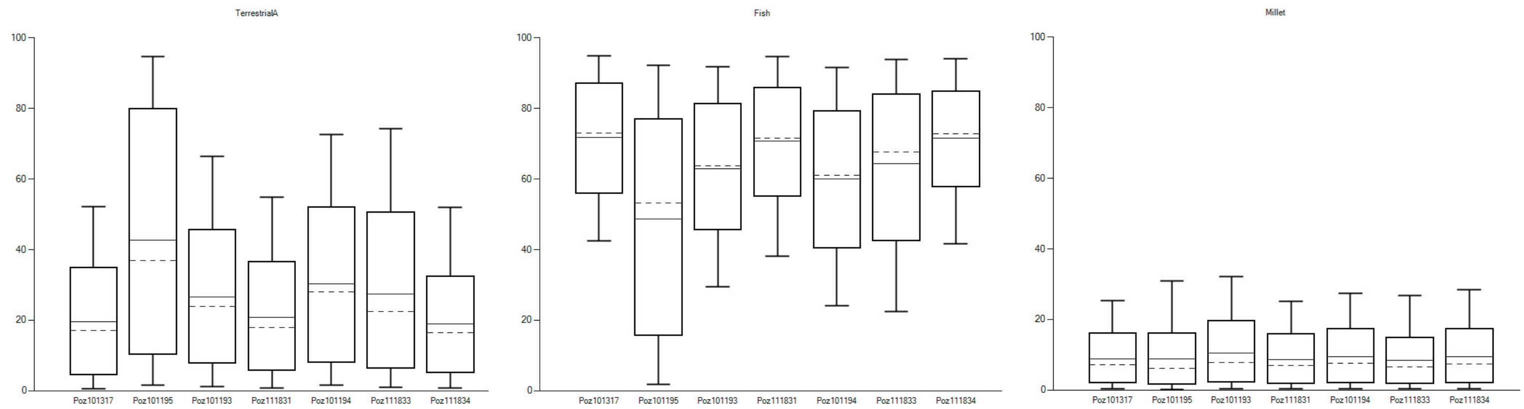

Fig. 9. Bayesian statistical model (FRUITS: Fernandes et al. 2014) – contributions of food groups to the Reznes individuals' isotopic composition. Values used in the analysis: terrestrial animals – $\delta^{13}C = -22 \pm 1‰$, $\delta^{15}N = 7 \pm 2‰$ (approximations based on data from: this study, Oinonen et al. 2013; Gunnarssone et al. 2020); fish – $\delta^{13}C = -21 \pm 4‰$, $\delta^{15}N = 9 \pm 2‰$ (approximations based on data from: Gunnarssone et al. 2020); millet – $\delta^{13}C = -9 \pm 2‰$, $\delta^{15}N = 6.5 \pm 2‰$ (data from: Antanaitis & Ogrinc 2000); trophic offsets – $\delta^{13}C = 4.8 \pm 0.5‰$, $\delta^{15}N = 5.5 \pm 1‰$ (approximations based on: Fernandes et al. 2012).

the elevated $\delta^{13}C$ solely due to millet consumption does not stand a critique, as that would deplete $\delta^{15}N$ more significantly. On the other hand, if manuring was used in millet and other crop production, that would compensate the expected drop in $\delta^{15}N$. For targeting the possible manuring, a much larger domesticated animal and preferably crop stable isotope analysis would have to be carried out. But from the possible explanations discussed above, the most likely would be as follows: Early Bronze Age – early farmers' society with a high proportion of animal protein, including significant amount of fish; the Late Bronze Age – larger proportion of crops (including some millet?) that could be manured, but still some consumption of fish. Of course, given both the small sample size and the lack of well-established isotopic baselines for different food groups, this is a highly speculative interpretation, widely open for corrections when additional data is obtained.

Issues with ^{14}C precision: aquatic reservoir effects and old wood effect

As the consumption of fish within the Early Bronze Age population may have been significant, a question arises of the possible aquatic reservoir effects and their influence on the bone collagen ^{14}C dates. Due to the Reznes site being so close to the river delta, it is an even more complicated question. Two types of aquatic reservoir effects should be considered: marine (MRE) from the migratory fish and freshwater (FRE) from the local freshwater fish. In Baltic region, sometimes the average MRE of the Baltic Sea is used in considerations (Pesonen et al. 2012; Oinonen et al. 2013). However, studies with higher resolution demonstrate that the Baltic Sea MRE has a high local variability, and there are regions where average estimates would generate false data (Lougheed et al. 2013; Piličiauskas & Heron 2015). The Riga Bay of the Baltic Sea is under-researched regarding this question. However, as mentioned earlier – if a niche fishing took place that targeted the migratory fish with the marine isotopic signals, that would be reflected in higher $\delta^{15}N$ values, which is not the case. We therefore cautiously decide to consider the possible MRE as insignificant. FRE, on the other hand, if present during the Bronze Age, should be considered for those individuals with the lower $\delta^{13}C$ and higher $\delta^{15}N$, as is indicated by the FRUITS statistical analysis. A modern catfish, caught in 2019, have been radiocarbon dated to 1085 ± 30 BP (Poz-118263, 894–1016 AD, 95.4%), demonstrating that the FRE have to be considered when dealing with ^{14}C dates from the Daugava River region. However, for the time being data is still too limited to thoroughly address the FRE, which is a much needed research for future investigation. When it comes to Reznes site and its chronology, the questionable bone collagen ^{14}C dates are a minority and therefore do not noticeably skew the overall ^{14}C dates of the site.

Additional consideration regarding ^{14}C dates and their precision arises when regarding the dates of cremated bones. Calcined bones can produce an older date due to the old wood effect, i.e. if a firewood much older than the burial had been used for the cremation. Controlled experiments have shown that the calcined apatite of the cremated bone, depending on calcination stage, has its carbon derived from the oxidized fire fuel (wood) by 67 ± 3% to 91 ± 8%. Therefore, if old wood was used in cremation, the "old carbon" would be infused in the bone carbonate, thus changing the ^{14}C count (Zazzo et al. 2012). On the other hand, studies have shown that other sources of carbon, such as the bone collagen, might be contributing as well (Snoeck et al. 2015). Such cases are occasionally detected if the ^{14}C date is a notable outlier.

Unlike aquatic reservoir effects that appear due to a systemic process such as the diet, old wood effect is accidental. For example, if a hundreds of years old tree is for some reason chosen to be cut down and used for the cremation, or an old building is torn down and the timber is used as the firewood. Therefore, it is very unlikely that all or most cremations of one site could be systematically affected by the old wood effect. In this study, none of the calcined bone samples produced suspicious dates, i.e. none of them are notably older than the oldest non-burial related dates, and none of them is a clear outlier in comparison with other burials. Additionally, one cremation has a paired date with an unburned horse tooth (Reznes barrow 2, cremation 1; Poz-111834, Poz-111894), and the ^{14}C offset is 15 ± 5 BP. Although this indicates that a minor presence of a reservoir effect could had taken place, the dates are still contemporary and the offset is not alarming. Another aspect that speaks in favour of the cremation ^{14}C dates being accurate, is the previously discussed fact that the bones had been cremated in rather low temperatures and the calcination is not complete. Meaning that the contribution of the carbon from oxidized fire fuel would be on the lower end.

In summary, we approach some of the unburnt bone collagen ^{14}C dates with caution, as a significant consumption of fish cannot be ruled out. The modern fish ^{14}C demonstrated a present FRE in Daugava, however, more detailed research in this area is needed, based on paired datings and establishing more rigorous isotopic ecology of the micro region. Regarding the calcined bones and their ^{14}C dates, we are more confident to view them as accurate due to there being no obvious outliers, and considering the low temperatures the bones were cremated and the incomplete calcination of the bones.

Conclusions

^{14}C dates show that the barrow cemetery in Reznes was established in the middle of the 14th century BC and was in use until the 6th century BC. As a site at the bank of Daugava, Reznes falls into the pattern of cremation tradition first spreading through water-ways. The most important discovery is that contrary to previous interpretations the different types of burial – inhumations, cremations and burials in stone cists – are not chronologically consecutive, but were actually used parallel throughout the existence of the cemetery. The differing types of burials may have been determined by the social position of the deceased in society, or other cultural reasons. Another discovery is that secondary burials took place already during the Bronze Age, sometimes by digging rather deep graves in the barrow fill.

Skeletal material of inhumations is very poorly preserved, therefore anthropological analysis (age at death) is possible only occasionally. Consequently, a detailed demographic analysis is therefore inaccessible. However, it was possible to determine that members of all age groups were buried in individual inhumations. Cremations were done in low 500–600°C temperatures and the preserved bone fragments are therefore rather large. It was possible to determine that most of the cremations contained remains of a single individual, but the age at death was variable – adults, juveniles and children as well were cremated. In some cases, common cremation graves were detected, most commonly – an adult together with one or more children or juveniles. Subadults substitute 42% of all cremations. Significant is the cremation "field" from barrow 6 where the minimum number of individuals is 16 (adults, juveniles and children). ^{14}C dates show that the deceased were not cremated all at once, thus it is possible that the cremated bones were stored elsewhere for some time before the final burial in this large common grave.

Carbon and nitrogen stable isotope analyses were carried out, utilizing collagen extracted for radiocarbon dating purposes. Therefore, the skeletal elements sampled are variable and not consistent, thus limiting analysis to more individualistic approach (seven humans in total), rather than addressing population-oriented palaeodietary questions. However, for the purposes of this study, even the limited data provides a valuable insight. For example, none of the seven Reznes humans had significant millet contribution to their diet, although, based on archaeological finds, millet consumption during the Bronze Age has been a rather well argued point in Latvian archaeological literature. Distinction between terrestrial and aquatic protein sources is complicated due to the isotopic ecology in River Daugava. As a region where Daugava flows into the Baltic Sea, three groups of fish can be encountered in the river – freshwater, marine and migratory. Consequently, there is a high variability in fish isotopic values. This is reflected by the high uncertainty in FRUITS statistical modelling. However, there seems to be a trend for the individuals with lower $\delta^{13}C$ to having consumed more fish. Interestingly, the two individuals with the more recent ^{14}C dates had diets more similar to the Late Bronze Age Ķivutkalns humans, than to the other five Reznes humans, thus indicating a slight shift towards more terrestrial food sources from the Early to the Late Bronze Age. Due to the possible fish consumption, freshwater reservoir effect needs to be addressed in future research. However, when it comes to Reznes site and its chronology, the questionable bone collagen ^{14}C dates are a minority (n = 5) and therefore does not noticeably skew the overall ^{14}C dates of the site. Regarding the old wood effect, no obvious cases were detected. The systemic dating of the cremations leads to the presumption that the dates are accurate.

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Andrejs Vasks, Gunita Zariņa, Dardega Legzdiņa ja Eduards Plankājs

UUSI ANDMEID REZNESI PRONKSIAEGSETE KALMETE MATUSTE JA MATMISVIISI KOHTA LÄTIS

Resümee

Reznesi pronksiaegsete kalmete rühm paiknes Väina (Daugava) kõrgel paremkaldal, muistsel saarel. Kokku avastati siin kaheksa kääbast (jn 1). Arheoloogilisi kaevamisi viidi läbi 1930. aastatel E. Šturmsi ja 1950. ning 1960. aastatel J. Graudonise juhtimisel. Kaevati seitset kalmet. Mitmes kalmes tuvastati matuseid ka hilisrauaajast ja ajaloolisest ajast, mis muutis niigi komplitseeritud muistise analüüsi veelgi keerulisemaks. Šturms ja Graudonis dateerisid kalmerühma sealt leitud arheoloogiliste leidude põhjal ajavahemikuga 1200–600 eKr. Arvati, et laibamatuste kiht kalmekuhjatiste põhjal on kõige varasem ja põletusmatused nende peal on hilisemad. Kõige nooremateks hinnati matuseid kivikirstudes. Uued radiosüsinikudateeringud maetute luudest aga osutavad sellele, et kalmerühm rajati varem – juba 14. sajandi keskpaiku eKr – ja siia maeti kuni 6. sajandini eKr. Erinevate matmisviiside kronoloogilisse järjestusse tuli samuti korrektiive teha, kuna radiosüsinikudateeringute põhjal selgus, et kõik kolm matmisviisi olid kasutusel samaaegselt (tabel 1, jn 5). Erinevused matmisviisis võivad seetõttu tingitud olla hoopis surnute sotsiaalsest positsioonist ühiskonnas.

Laibamatuste osteoloogiline analüüs on piiratud põletamata luude väga halva säilivuse tõttu. Ainult kohati võis eristada täiskasvanute ja alaealiste luid, kuid detailsem analüüs ei olnud võimalik. Põletatud luude uurimisel tuvastati, et põletati kõikidesse vanuserühmadesse – täiskasvanud, noorukid ja lapsed – kuuluvaid isikuid (tabelid 2 ja 3). Põletati madalal temperatuuril, umbes 500–600 °C juures, mistõttu põletatud luude tükid on üsna suured. Mõni põletatud luude pesa sisaldas mitme indiviidi jäänuseid, kusjuures ühel juhul oli koos luid vähemalt 16 inimeselt (jn 6). Alaealiste matused moodustasid kõikidest matustest 42%.

Süsiniku ja lämmastiku isotoopanalüüs radiosüsinikudateeringuks võetud seitsme inimluu ning kahe hobusehamba kollageenist (tabel 1) andis väikesest valimist hoolimata muistse elanikkonna toitumuse kohta olulist teavet. Loomaluude stabiilsete isotoopide kohalik taustinfo Väina alamjooksu piirkonna kohta ei ole päris selge, kuid mõningaid andmeid on saadud varasemate uurimustega. Väina kalaluude stabiilsed isotoobid osutavad tõsisele väljakutsele jõesuudme mage- ja mere riimvee kokkupuuteala elustiku uurimisel, seda eriti $\delta^{13}C$ näitude suure varieeruvuse

tõttu (jn 7). Kuigi arheoloogiline aines kõneleb hirsi kasutamisest pronksiaegses Lätis, pole selle kohalikku isotoopsignaali näha ja lähimad vastavad andmed pärinevad Leedust. Bayesi statistilise tõenäosusprogrammi FRUITS järgi oli Reznesi elanikel hirsi kasutamine kas väga harv või lausa olematu. Sama statistiline analüüs ei andnud isotoopväärtuste suure kõikuvuse tõttu kuigi selget vastust küsimusele, millises vahekorras tarvitati maismaa ja merelise päritoluga toitu. Teatud korrelatsioon $\delta^{13}C$ väärtuste ja ^{14}C-dateeringute vahel siiski ilmnes: Reznesi kaks noorimat matust sarnanesid rohkem Ķivutkalnsi indiviididega (jn 9). Võimalikest tõlgendustest tundub olevat tõenäolisem, et kui vanemal pronksiajal oli tegemist varajaste maaharijate ühiskonnaga, kus suure osa toidusest moodustas loomne proteiin ja väga oluline oli ka kala, siis hilispronksiajal tarvitati toiduks rohkem teravilja (mis võis tulla sõnnikuga väetatavatelt põldudelt), aga endiselt samuti kala. Magevee reservuaariefekti osas tuleb Väina-äärsete alade uurimisel ettevaatlik olla. Praegu on vastavaid andmeid liiga vähe ja tulevikus peab teemat põhjalikumalt uurima. Reznesi dateeringutega seoses tuleb siiski märkida, et võimalike probleemsete dateeringute hulk on väike ja need ei muuda kogu muistise ajalist määrangut kuigivõrd.