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NEW RADIOCARBON DATES FOR TWO STONE-CIST GRAVES AT MUUKSI, NORTHERN ESTONIA

In the surroundings of Lake Kahala in northern Estonia, which is the richest area in Estonia in terms of Bronze Age stone graves, over twenty graves have been archaeologically excavated in different decades of the 20th century. Only five of them, however, have been excavated in their entirety with proper documentation. Human skeletal remains from two such stone-cist graves, Nos 5 and 70 at Sondlamägi, Muuksi, were recently radiocarbon-dated as part of a research programme for studying the chronology and mortuary practices of stone-cist graves. Altogether 13 AMS dates comprise most of the burials in the mentioned graves. The results reveal that the graves were built before 1100 and 800 BC, respectively, and are thus slightly older than previously thought, which necessitates the reconsideration of the dating of such graves. In both graves the inhumations outside of stone cists are of a Bronze Age date and are roughly contemporary with the inhumations inside the cists. This is notable since in some stone-cist grave burials of the outside inhumations are much later insertions to the grave. The burnt bones of grave 5, however, may date from the Roman Iron Age, and cremation(s) remains of an Iron Age date may also have been present in grave 70. The comparison of radiocarbon dates and artefact finds suggests that in the mid-Pre-Roman Iron Age grave 70 was used for some (ritual) practices in which burial was of secondary importance if practised at all. Along with these outlined topics, the article discusses a few details concerning the graves' structure, the burial practices (primary versus secondary) and the find assemblage.

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Introduction

In this article we publish and discuss AMS dates of the human bones from stone-cist graves 5 and 70 at Sondlamägi, Muuksi, Harjumaa. Radiocarbon dating of these bone assemblages, unearthed years ago, was part of the research programme briefly outlined in Laneman 2012, 92. Here it suffices to note the background of the research: a very small number of radiocarbon dates were available for stone-cist graves which contain human remains from different periods of time and for

which other methods of dating are limited. Out of several archaeologically excavated graves at Muuksi (see below), graves 5 and 70 were chosen for radiocarbon dating because they had been fully excavated with proper documentation. Graves 32 and 33 had to be rejected despite also being fully excavated with proper documentation because their osteological finds were not accessible at the time of sample collection (due to the problems in storing the bone assemblage at the Institute of History at Tallinn University); the rest of the excavated graves had either been excavated partially or with no documentation.

In the following we first provide an overview about the location and research history of the graves at Muuksi in general, with a separate section on previously offered dates for the graves. After that we will focus on graves 5 and 70, one at a time. The readers should note that along the way we sometimes deliberately deviate from the main course of introducing the radiocarbon results, in order to discuss important issues of grave construction or burial practices. Such a detailed approach is necessary to fill some gaps in previous treatments of the subject and, after all, a comprehensive understanding of the site is a prerequisite for understanding the radiocarbon dates.

Context of the graves

The graves discussed in this article are located about 35 km east of Tallinn in the surroundings of Lake Kahala, which accommodate approximately 200 stone graves within quite a limited area between the Loo and Puidisoo rivers (Fig. 1). The graves, most of which are probably stone-cist graves, cluster in groups of different sizes. The distribution density of the graves, extraordinarily high for Estonia, is typically explained with reference to the sacral significance of the lake which allegedly attracted the outlying population to bury their dead on the shores of the lake (e.g. Vedru 2002, 114; 2010, 60 f.; Lang 2007, 242). Only at Muuksi and Uuri, however, have the graves been subjected to archaeological excavation: at Muuksi around twenty stone-cist graves have been excavated (see below) and at Uuri an Early Pre-Roman Iron Age cairn grave (Vassar 1939) and a badly disturbed mound consisting of one or two stone-cist graves and a 3rd-century *tarand* grave (Moora 1977) have been excavated. More or less contemporary with the stone graves in the area are a few scattered cup-marked stones, two settlement sites and a promontory fort or hilltop settlement of ambiguous character (Vedru 1998a; 1999b; 2010; and references therein).

Around Muuksi are two separate grave groups with a distance of approximately one kilometre between them (Vedru 2010, 51). The smaller one is at Kabelimägi near the village centre where six graves have been preserved, one of which yielded four unusually arranged stone cists at excavations in 1921 (Spreckelsen 1926; see also Friedenthal 1932). The larger cluster, including the graves relevant to this study, are located to the south-west at the elevation called Sondlamägi where over 80 stone heaps, mostly 5–12 m in diameter and 0.4–1.5 m in height, have been registered (Fig. 2). Some of them, possibly around a dozen, in the eastern

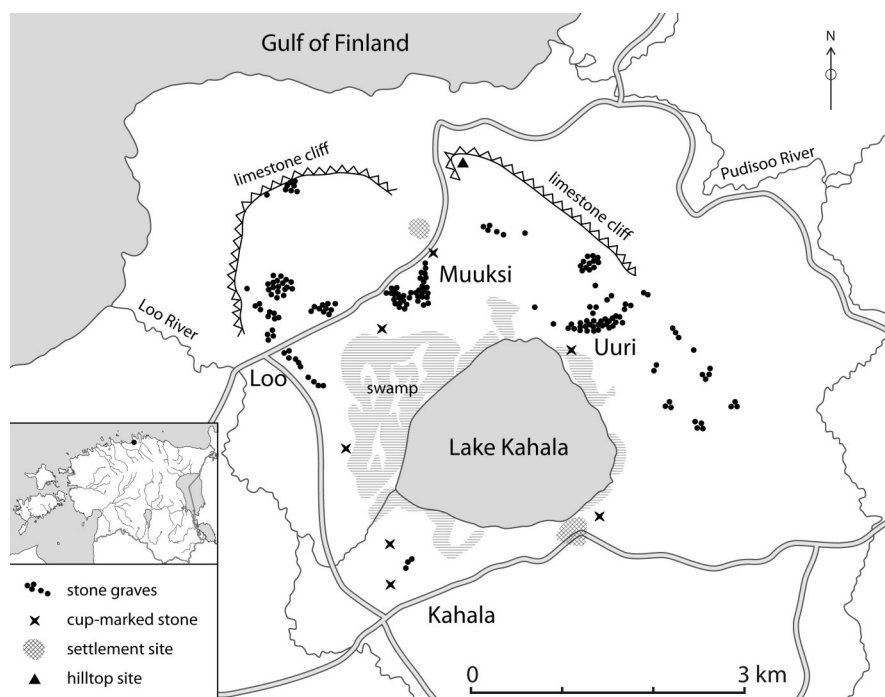


Fig. 1. Bronze Age and Pre-Roman Iron Age sites in the surroundings of Lake Kahala (Vassar 1938, fig. 1, updated according to the National Registry of Cultural Monuments and information from Gurly Vedru). Note that the plan is rather sketchy and in larger grave groups not all individual graves have been marked.

part of the group are not graves but small low clearance cairns from the end of the Iron Age or beginning of the medieval period (Vassar 1938, 305; Vedru 1996; 1998a, 31, 78 f.; 2010, 51, 56). It is also known that many stone heaps have been destroyed over the course of time (Vassar 1938, 305). The densest sub-group in the western part of the grave/cairn field, i.e. graves 1–35, has locally been called Hundikangrud [wolf cairns] (Parmas 1925, 17; Vassar 1938, 307; Lõugas & Selirand 1989, 157), although in recent archaeological literature the name has been extended to all graves at Sondlamägi (e.g. Vedru 1998a; 1999a; 1999b; 2010; Lang 2007, 148, 224, 242). In this article, however, we refer to the ‘graves at Sondlamägi’ because this designation unquestionably includes all the graves recorded here (see Vassar 1937, 1), distinguishes them from the Kabelimägi group, and is not as confusing as applying local farm names which has occasionally been used in literature to distinguish between graves.¹

¹ The majority of the graves at Sondlamägi, including grave 5, are located on the land of former Toomani farm while a few graves, including grave 70, are located on the land of Sepa farm; graves at Kabelimägi are also known as graves of Lõokese farm (see Vassar 1938, 305; Spreckelsen 1926).

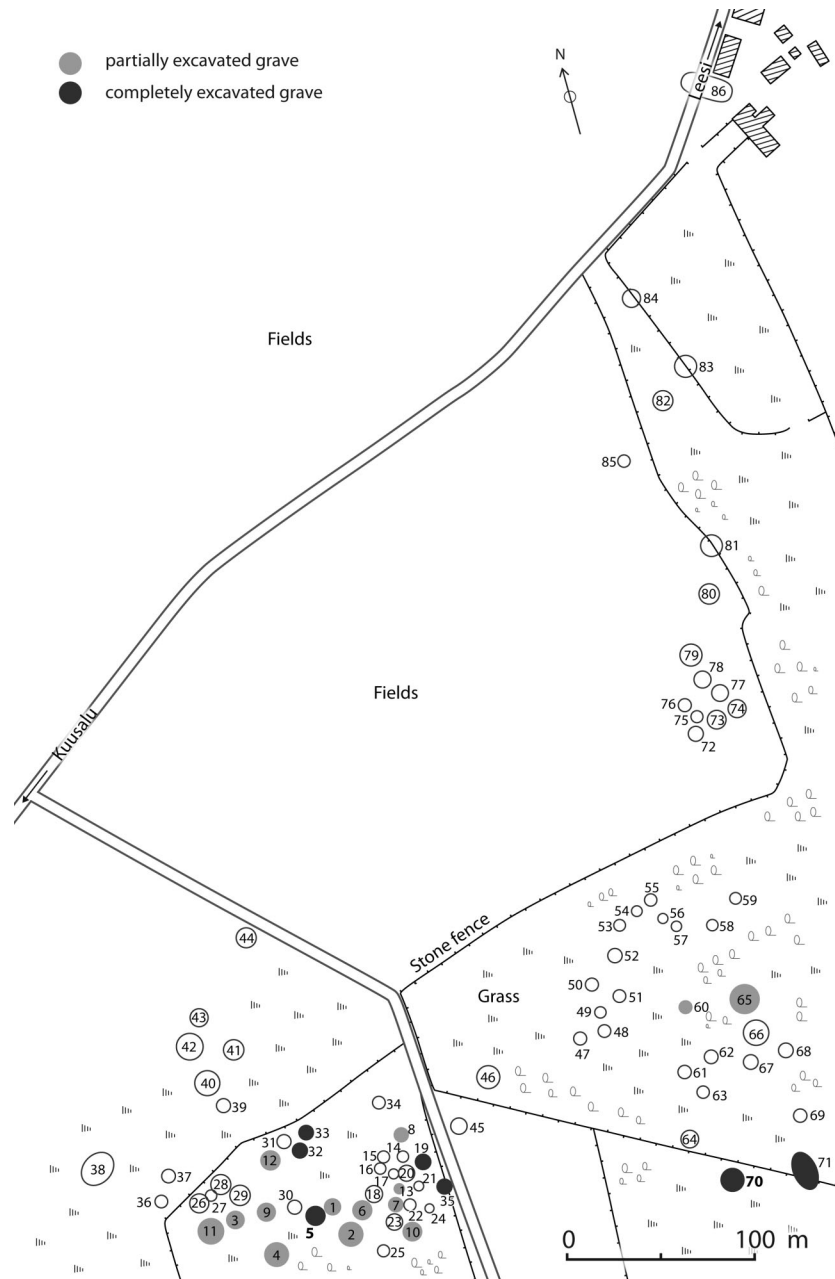


Fig. 2. Stone structures (graves and clearance cairns) at Sondlamägi, Muuksi (after Vassar 1938, fig. 2). Heaps 49 and 55 turned out to be clearance cairns at excavations, and it is likely that heaps 52–63 are also clearance cairns (Gurly Vedru, pers. comm. 22.04.2013).

Archaeological excavations have been performed at more than twenty graves at Sondlamägi, although in most cases the graves were not excavated in their entirety (Fig. 2). In 1924–26 graves 1–13, 60 and 65 were excavated under the guidance of Baltic-German amateur archaeologist Adolf Friedenthal whose main aim was to collect better preserved bones for an anthropological study (Friedenthal 1924; 1927; 1932; Friedenthal & Spreckelsen 1926; see also Vassar 1938, 308). His excavations were mostly limited to the central parts of the graves to find the cist(s). In 1936–37 Artur Vassar performed excavations at graves 32, 33 and 70, which were opened in their entirety to learn about the peripheral areas of a stone-cist grave (Vassar 1938). In late 1970s and early 1980s, under the leadership of Tanel Moora, graves 19, 35 and 71 were reportedly excavated but, regrettably, information on these digs is no more complete than that of the Baltic-German amateur excavations (no documentation has been submitted; about grave 71 see Yanits 1981; about graves 19 and 35 see Vedru 1998a, 40). Last but not least, the so-called revision excavation of grave 5, conducted by Gurly Vedru in 1996–97 as part of the extensive settlement archaeological research of the area, uncovered several cists that the partial excavation in 1925 had failed to spot (Vedru 1997; 1998a, 42 ff.; 1998b; 1998c; 1999a).

Although each grave is different in details, the excavated stone-cist graves at Sondlamägi can be divided into two groups which differ in terms of construction material and character of the find assemblage, and which are also separated spatially. It should be mentioned that graves 5 and 70, to be described in detail in the following sections, serve as excellent representatives of these two groups.

First, the excavated and probably also non-excavated graves under numbers 1–35/37 seem to have been predominately built of limestone while granite stones have been used occasionally and not in all graves. The entirely excavated graves were edged by a circular wall constructed of dry-laid horizontal limestone slabs. Walls of the cists, usually of adult human length, have a similar construction, but some such cists have large upright limestone slabs set against their inner sides, and some graves possibly contain cists constructed entirely of upright limestone slabs. The number of cists per grave varies between one and four, and graves with several parallel cists may even outnumber graves with a single cist. Artefact finds are rare in this grave group: cist of grave 1 yielded a pointed bone object and an artefact of local flint, supposedly an arrowhead (Friedenthal 1927, fig. 1); grave 10 yielded a few small potsherds (Friedenthal & Spreckelsen 1926; Vedru 1998a, 33 f.) and grave 33 three pieces of quartz and a red glass bead on an iron wire (Vassar 1938, 338).

Secondly, graves 70, 71 and perhaps also partially excavated 65 had many more granite stones used in their construction, and graves 70 and 71 were also noticeably abundant in artefact finds, though mainly in terms of ceramics outside of the cists. For grave 71 it must be noted here (grave 70 will be described below) that it was in fact a triple grave consisting of three stone-cist graves in a dense row. Each of the three had two concentric circles of granite stones serving as foundation for a limestone wall; centres of the graves contained a cist, which in the southernmost

grave had been built of horizontally laid limestone slabs and in the remaining two graves of large upright slabs (see the reconstruction of the main grave structures in Lang 2007, fig. 86). Grave 65 had only around one-fifth of its south-eastern part excavated and nothing is known about its possible stone surround and cist(s); only alternating layers of limestone and granite were observed at excavation, which also yielded abundant human bones and a single potsherd (Friedenthal & Spreckelsen 1926, 3).

Burial practices, however, seem to have been similar in both of the described grave categories. Most of the burials are inhumations, found both in and outside of cists. In two graves (3 and either 4 or 13), however, the cist contained nothing but cremated human bones, and some graves (e.g. 5, 8, 32, 65, 70) yielded cremations also outside of cists, although the number of such cremation deposits in a grave was rather small. The cists, in most cases, seem to enclose the remains of a single adult individual; less frequent are cists with two individuals and in most such cases it is a combination of an adult and a child (e.g. in graves 2, 5, 6, 33). Both females and males turn up in cists, although males are more than twice as frequent as females; sub-adults (under 15 years of age) seem to be rare in cists and they have never been found there on their own. Judging from the graves that have been excavated in their entirety, inhumations outside of cists are common and include male and female adults and children (in graves 5, 32, 33 and 70 the peripheral inhumations included at least five children, four adult males and two or three adult females). The age at death profile for the inhumations seems to be rather diverse, particularly for men (age at death between 20 and 80 years) while women appear to have died in generally younger ages.²

On previous dating of the graves

Friedenthal proposed different dates for the graves he excavated at Muuksi: initially around 1800 BC (Friedenthal 1924), then around 1500 BC (Friedenthal 1927), and finally around 1200 BC (Friedenthal 1932). In this he was undoubtedly influenced by the earlier Baltic German research tradition which had not long ago considered stone-cist graves a Stone Age phenomenon, although it should be pointed out that according to the chronology used in the early 20th century, the

² One must consider that age-at-death and sex data for the inhumations have been provided by different researchers of different schools: bones excavated in the 1920s were studied by Adolf Friedenthal, a medical doctor by profession (Friedenthal 1932); bones from the 1930s by Juhan Aul, a physical anthropologist (Vassar 1938); and bones from the 1990s by Jonathan Kalman, a forensic expert at the time (Kalman 1998). There is no reason to question the results of their work here, although it is likely that a re-examination of the bone assemblages would result in considerably different estimations, first and foremost perhaps in regard of the minimum number of buried individuals, particularly children (see e.g. Varul 2012). On these grounds detailed statistics and far-reaching conclusions should be avoided, the more so because osteological assemblages of graves 19, 35 and 71 have not been studied.

Stone Age lasted until the beginning of the Iron Age at the time of Christ's birth (Hausmann 1909, 7 ff.; 1910, 10 ff.). It did not take long, however, until the Bronze Age was firmly incorporated to the chronology, and stone-cist graves were ascribed to this period as well as to the early Iron Age (see below). At Muuksi, however, finds of flint and bone, probably combined with the psychological influence of previous research, encouraged Friedenthal to prefer a date closer to the Stone Age rather than to the Iron Age.

Friedenthal was well aware that despite repeated shifting of the date towards younger estimates (which can be viewed as a kind of compromise), his opinion remained in disagreement with the views of professional archaeologists (of native Estonian origin and with different research tradition) who in the second half of the 1920s arrived at the conclusion that stone-cist graves date from the end of the Late Bronze Age and, predominately, from the Pre-Roman Iron Age – a view that grew increasingly stronger and has largely been maintained until today. The statement was based on the fact that stone-cists (although merely secondary ones) at Jäbara in Virumaa had yielded early iron artefacts, which was coupled with a belief that stone-cist graves were 'genetic' predecessors of Roman Iron Age *tarand* graves and therefore cannot be much older than these (about the debate on the date of stone-cist graves during the 1920s refer to Moora 1929, 14; see also Friedenthal 1932, 1).

Consequently, Vassar (1938) dated graves 32 and 33 entirely to the Pre-Roman Iron Age, and grave 70 to the period from the end of the Pre-Roman Iron Age through the early Roman Iron Age. Such a date of stone-cist graves became more deep-rooted in the 1970s and 80s when Vello Lõugas, the main scholar engaged with the subject, dated the oldest stone-cist graves to period IV or V of the (Nordic) Bronze Age (which was around the 9th century BC then) but, however, assigned the great majority of the graves to a period of 200–250 years BC and some graves even beyond (Lõugas 1970; Jaanits et al. 1982). The graves at Muuksi belong to the group of late stone-cist graves in Lõugas's classification because they have mostly stacked limestone cists, contain cremations and are abundant in ceramics.

Valter Lang's studies in the 1990s, which rejected the Lõugas classification of stone-cist graves, resulted in a date that was a few hundred years earlier for the grave type (1100/1000–200 BC), but it was still maintained that most of the groups of stone-cist graves had been established not long before 600 BC and the majority of the graves had been built in the Early Pre-Roman Iron Age (Lang 1996, 292 ff., 311). The latter view was due to an Early Pre-Roman Iron Age date assigned to a pottery type that is present in many stone cists, and an assumption that stone-cist graves empty of artefacts are later in date than the rare stone-cist graves that contain well-datable bronze artefacts. The establishment of the graves at Muuksi was also dated to 'the final centuries of the Bronze Age or the beginning of the Pre-Roman Iron Age', i.e. after 800 BC (op. cit., 295). There were three main arguments for this: (1) two radiocarbon dates of human bones from one of the cists of grave 71 yielded a calibrated date range of approximately

760–400 BC (op. cit., 284; Fig. 4),³ (2) a pair of bronze temple ornaments found in the same cist (Vedru 1998a, pl. XVIII: 1–2) pointed to the earlier part of the above-mentioned date range; and (3) a bone pin with a spade-shaped head, found during the destruction of grave 85, suggested a date closer to the Pre-Roman Iron Age. The latter was also favoured by the Pre-Roman period artefacts outside of cists in graves 70 and 71. The dating conventions established by Lang are also followed in Gurly Vedru's works on the settlement history of the Kahala area (1998a; 1999a; 1999b; 2010).

In recent years indications have appeared that the pottery in stone cists and thus many of the bone pins dated on the basis of the pottery may be earlier in date than previously thought (see Lang 2007, 130, 162). This means that many stone-cist graves may be older than estimated, which on the one hand questions their temporal clustering around the Bronze Age–Iron Age border and on the other may shift the general date for the grave type. Evidence from the neighbouring countries also suggests that Early Bronze Age (i.e. Period III) stone-cist graves are anticipated to be found in Estonia (op. cit., 162 ff.).

Grave 5

Construction

Grave 5 (Fig. 3) was a predominately limestone heap with a height of up to 60–70 cm. One 4.4 m long stone cist in its centre had been opened by Adolf Friedenthal in 1925, while excavations by Gurly Vedru more than 70 years later uncovered an additional three shorter cists and a circular wall (Friedenthal 1927; Vedru 1997; 1998a–c; 1999a)⁴. The latter, approximately 9 m in diameter, was a dry wall of limestone slabs laid one upon other, but it had survived in fragments and to a height of only 10–20 cm. A similar low ring wall had been observed in graves 32 and 33 (Vassar 1938). The ring wall was surrounded on its outer side by a 2.5–3 m wide zone where the stones (mainly limestone, with occasional granites) were smaller than in the grave's interior; the stone layer became increasingly thinner towards the edges of the excavation.

The walls of the cists inside the ring wall had been laid of limestone slabs and preserved to a rather modest height: cist II had five or six and cists III and IV no more than three layers of limestone slabs left from their walls, whereas cist I with

³ It is relevant to note that the dates (2430 ± 50 and 2330 ± 55 BP; Tln-529 and -536), originating from the 1980s, were among the earliest radiocarbon dates ordered for prehistoric human bones in Estonia. Unfortunately, they were never published by the researchers who ordered the analysis (the data comes directly from a lab report archived in the Institute of History at Tallinn University) and it is not known whether they represent one individual or two different individuals. It is also uncertain whether the radiocarbon-dated bones belonged to the individual who wore the temple ornaments and was found in the same cist.

⁴ Besides the listed sources, part of the following information on the construction of the grave originates from personal communication with Gurly Vedru, because some relevant details have not been included in the records.

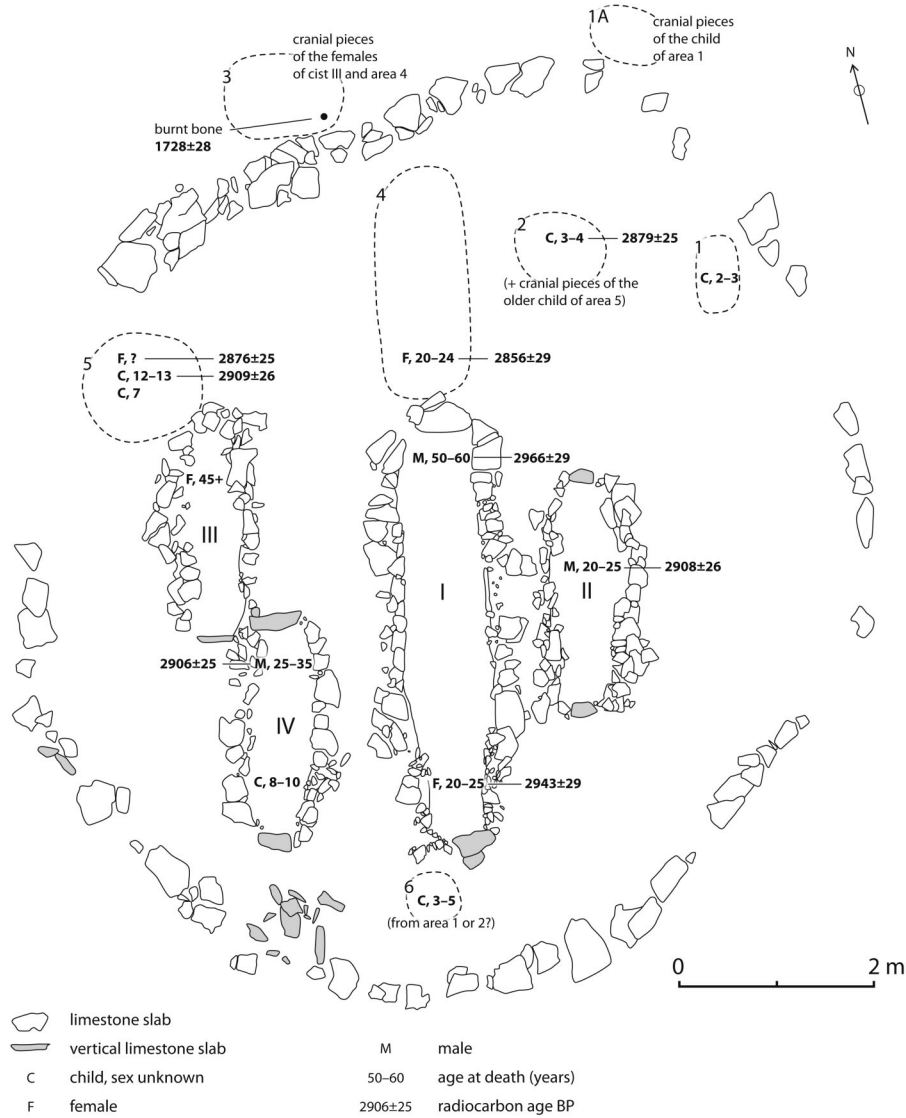


Fig. 3. Plan of grave 5 at Sondlamägi, Muuksi, showing location and age and sex data of the buried individuals, along with AMS dates if available (adapted from Vedru 1998b, fig. 2). Numeration of burial areas is according to the original source.

its 30 cm high walls displayed a better state of preservation. Most of the cist ends had a large vertical limestone slab, 20–45 cm in height and 2–4 cm in thickness, placed against the inner side of a cist’s wall.⁵ The lower ends of the slabs rested

⁵ Note that Figure 3 may leave one with a wrong impression as if the cist ends had been formed barely of upright slabs. Behind each vertical slab there was in fact a wall similar to that on the longitudinal sides of the cists.

on the cists' bottoms. The upper ends of the slabs, though in most cases apparently shattered by the time of excavation, may have been visible from the grave surface and functioned as grave markers, at least in the opinion of the excavator. Cover plates of the cists had not survived, at least not in their original position. Any floor plates that may have once been present would have splintered and mingled with natural limestone grit.

The number of cists in grave 5 is remarkably high. Apart from this grave, only one grave with four cists is known in Estonia, located also in Muuksi, though at Kabelimägi and with three of the cists built crosswise over the fourth (Spreckelsen 1926). The excavator of grave 5 proposed that in this grave the four cists were built all at once, with cist I originally twice as long as other cists (Vedru 1998b, 65; 1998c, 1). This interpretation is indeed suggested by the similar construction of the cists, by the positioning of the cist bottoms at the same vertical level and by the layout of the cists within the ring wall. Despite this, however, it seems more likely that the grave was originally built with a regular two metres long cist (i.e. the northern half of cist I), because the ring wall seems to have been built with regard to such a cist in its centre (although not as an ideal circle around the cist). At some later point, the cist was either elongated southwards or a separate cist was attached to its southern end. In the latter case the partition would have been missed by the excavators of 1925 which, however, is doubtful in view of their previous experience – if, of course, the supposed partition was a solid limestone wall and not a simple upright slab more amenable to destruction over time. The inference that there was a 'normal-sized' original cist is also encouraged by the facts that the skeletons in cist I were not lying side by side but in different halves of the cist (Friedenthal 1927, 48), and the northern part of the cist appeared to have been bounded by an oval-shaped surround of large granite stones, while the southern half of the cist seemed to lack such a feature. The respective stones measured 20–30 cm and above and they were positioned at a distance of 0.5–1 m from the cist, with bottoms situated relatively high above the limestone bedrock and surfaces probably even with the upper edge of the cist. Some stones, however, had been removed from their original positions by the time of excavation and therefore the character of the feature remains somewhat obscure; for instance its relation to the female skeleton found not far from the northern end of cist I (see below) is unclear. A similar feature of granite stones around the cist was also observed in grave 12 (Friedenthal & Spreckelsen 1926, 2; Friedenthal 1932, fig. 1).

It is not possible to firmly establish from the construction details alone in which order the other cists were built. One may, however, hypothesise that cist II was built when cist I was present in its full length, as the former seems to have knowingly been fitted next to the middle of the latter, involving perhaps an aesthetic consideration. If this was the case, it must have been calculated from the very beginning of its construction that no cists would be added south of cist II. The ends of cists III and IV met but, unfortunately, it seems that excavators did not observe in which order the cists had been built (or whether such details were

detectable at all). Based on the example of cist I one may speculate that cist III was built before cist IV, perhaps even before cist I was elongated. In the latter case the grave builders might not have foreseen the need or desire to add one more cist to the south, and when the need emerged it became evident that there was not enough room and, as a consequence, the new cist IV was not attached to cist III (in a fashion similar to cist I) but was instead positioned slightly closer to the grave's centre. Of course, other interpretations are possible. In any case, however, it is likely that the cists were added to the grave at relatively short intervals.

Human remains

Long bones and skulls from cist I have been examined by Adolf Friedenthal (1932), the rest of the osteological assemblage by Jonathan Kalman (1998). According to their work, the grave contained inhumed remains of at least 11 individuals, including three adult females, three adult males and five children aged from 2 to 13 years. The locations of sexed and aged individuals within the grave are shown in Figure 3. Different sections of the grave also yielded altogether 40 grams of slightly burnt bone fragments, ca 75 per cent of them skull fragments; sex and age determination from the bones was, however, impossible. Apart from a canine incisor in cist II, the grave contained nothing that could be considered a grave good or an offering; even animal bones were almost completely absent.

Inhumations in the cists were lying with their heads to the north. As already indicated, in cist I the male was in the northern and the female in the southern half of the cist and, judging from their skulls and long bones, were probably quite well preserved (Friedenthal 1927, 48; 1932). The male skeleton in cist II was relatively complete, according to Kalman, and, judging from the excavation records, found in a more or less correct anatomical position. However, the skeletons in cists III and IV showed much worse preservation: all the main parts of the male skeleton were present but highly fragmented, while skeletons of the female and the child were clearly incomplete, with a proportion of bones missing. Some bones of the male in cist IV, particularly the majority of his skull, were found in cist III, and two cranial pieces from the left orbit of the female in cist III were north of the grave on the exterior side of the ring wall (area 3 in Fig. 3). It is also possible that parts of the postcranial skeleton of the latter woman were located outside of cist in area 5. The osteologist's report, however, suggests caution with the latter conclusion: the mentioned area unquestionably yielded bones of an adult female, including bones that were absent in cist III, but the bones did not allow an age-at-death estimation (it was only possible to definitively say that they had belonged to a female who had given birth).

Skeletal remains outside of cists were situated between grave stones, usually slightly above the natural ground level and with no traces of specific burial

structures – a situation commonly interpreted as burial in the hollows recessed into the grave's stone body. The female skeleton north of cist I was found in a rather disturbed condition but with all of its main parts present; she had apparently been interred with her head to the north. The bones of a 2–3-year-old child to the east (area 1) revealed a similar alignment, while the head of a 3–4-year-old child (area 2) apparently pointed to a more easterly direction. The bones of the three individuals found near the corner of cist III (area 5), however, were highly mingled and fragmented, therefore the position and orientation of particular individuals was impossible to ascertain.

Similarly to the cist burials, inhumations outside of cists revealed that the bones of an individual may be found at a considerable distance in different parts of the grave. Therefore, some cranial fragments of the 12–13-year-old sub-adult of area 5 were found three metres away from the otherwise rather complete skeleton (including the skull), near the bones of the child in area 2; cranial pieces of the female in area 4 were found behind the ring wall in area 3, where also cranial pieces of the female from cist III had been found; and behind the ring wall were also some bones of the young children from the north-eastern part of the grave (cranial pieces of the 2–3-year-old in area 1A; bones of the 3–4-year-old, particularly the upper limbs, were slightly south of the latter⁶). The child bones near the southern end of cist I may have belonged to either of the children in the north-eastern part of the grave.

Kalman (1998) argues that disarticulate, mingled and incomplete skeletons and the location of an individual's bones in different parts of the grave are a result of secondary burial practice, i.e. clean bones that had undergone a defleshing process elsewhere were later placed in the grave. He suggested the place of the initial decomposition to have been directly behind the grave's ring wall and the single bones found there to be the leftovers from removing the skeletons for reburial within the encircled area. This view was, without much contemplation, accepted and repeated in literature (Vedru 1998b, 65; 1999a). An in-depth reading of Kalman's report, however, reveals that no solid arguments are presented as why the space behind the ring wall should be considered the initial burial ground and what excludes the possibility that the movement of the bones (ritual-related or not) was in the reverse order, from within the grave to the exterior area. One might also ask how likely it is that skull pieces were overlooked during reburial or that the skulls were already shattered by the time of reburial. When we also consider that some inhumations in the discussed grave almost certainly represent the primary burial practice (also in Kalman's opinion) and that the proposed secondary burials were found in human-sized hollows, it appears that there are no

⁶ This fact is presented only in Kalman's unpublished report while it has, for an unknown reason, been neglected in other relevant accounts and figures by Vedru. Therefore, the burial area could not have been located in Figure 3 either. It is perhaps relevant to note that there are some other minor discrepancies between Kalman's report and the quotations of his results in the works of Vedru. The current article, however, follows the original report.

grounds whatsoever to prefer the inference of secondary burials over that of primary burials. Furthermore, Kalman completely overlooks natural factors such as climate, small animals, plants (particularly junipers which are common at the site), and possible human intrusion such as by treasure hunters, stone robbers, etc., which would have had an effect on the preservation and situation of the bones. For instance, in area 5 in north-western part of the discussed grave there is a strong likelihood that at least some of the listed factors had an important part to play, since even the ring wall had been destroyed there.

The point here is not to prove that secondary inhumation or re-interment of clean bones was not practised in stone-cist graves but to draw attention to the fact that the argument is insufficient and other possible interpretations have been overlooked. This is also applicable to other osteologically analysed stone-cist graves. Particular criteria are used to differentiate between secondary and primary burials (e.g. Nilsson Stutz 2003, 208 ff.) and we encourage bioarchaeologists and osteologists to explore and discuss these more systematically than has previously been done, as complicated as it may be in case of above-ground mortuary monuments with protracted use-life, such as stone-cist graves. This highly complex subject also includes defining the 'proper' burial (in sense of Nilsson Stutz 2003, 322; i.e. defining the norm and variations from it) and research on rituals involving human bones – an area where so far only the surface has been scratched.

Radiocarbon dates

Bone samples for radiocarbon dating were collected in 2012 in cooperation with bioarchaeologist Martin Malve, who matched the bones with skeletal characteristics provided by Friedenthal and Kalman (see above); re-examination of the bone assemblage was not undertaken. Sample fragments were removed sparingly so as not to inhibit metric and other analyses potentially needed in future osteological studies. Altogether nine samples were collected: from all of the adults present in the grave (if female bones in cist III and area 5 belonged to the same individual), two (out of the total of five or six) sub-adults and one from a burnt bone. The latter was chosen rather fortuitously, since we were unable to find the above-mentioned burnt cranial bones. Each sampled individual is represented by only one sample. The radiocarbon analysis was accomplished by SUERC laboratory in Glasgow, Scotland, and the respective results along with detailed sample information⁷ are presented in Table 1 and Figures 3 and 4.

⁷ Note that bones collected in the 1920s (i.e. long bones and skulls) belong to the Estonian History Museum (AM) but are currently kept at the Institute of History at Tallinn University (AI), with no respective registry number whatsoever. The Estonian History Museum has been unaware of the fate of the bones since at least the 1950s and has written the bones out of their collections (Krista Sarv, pers. comm. 05.02.2013). The bones are, however, marked and contextually identifiable with the aid of Friedenthal's 1932 article.

Table 1. Radiocarbon dates and stable isotope measurements of the human bones of grave 5 at Sondlamägi, Muuksi. Calibration after OxCal v4.1.7 (Bronk Ramsey 2009; Reimer et al. 2009)

Context	Sex/ Age	Bone / Register No.	Lab. No.	Date BP	Date cal (95.4%)	$\delta^{13}\text{C}$ (‰)	$\delta^{15}\text{N}$ (‰)
Cist I	Male 50–60	Left radius AM 365: T4	SUERC- 44064	2966 ± 29	1300–1060 BC	–21.2	10.3
	Female 20–25	Left humerus AM 365: T5	SUERC- 44065	2943 ± 29	1260–1050 BC	–21.1	10.2
Cist II	Male 20–25	Right tibia AI 6320: 135	SUERC- 44069	2908 ± 26	1210–1010 BC	–21.1	9.7
Cist IV	Male 25–35	Frontal bone AI 6320: 176	SUERC- 44070	2906 ± 25	1210–1010 BC	–21.3	10.4
Area 5 outside of cists	Female ?	Left humerus AI 6320: 171	SUERC- 44071	2876 ± 25	1130–940 BC	–21.4	9.7
Area 4 outside of cists	Female 20–24	Left tibia AI 6320: 146	SUERC- 44072	2856 ± 29	1120–930 BC	–21.2	9.6
Area 5 outside of cists	? 12–13	Cranium AI 6320: 192	SUERC- 44073	2909 ± 26	1210–1010 BC	–21.2	10.0
Area 2 outside of cists	? 3–4	Cranium AI 6320: 79	SUERC- 44074	2879 ± 25	1190–940 BC	–21.1	11.2
Area 3 (cremation)	? (adult)	A long bone AI 6320: 151	SUERC- 44075	1728 ± 28	AD 240–390	–13.2	–

The first thing to note about the obtained radiocarbon dates is that the grave is older than most researchers have hitherto assumed (see the discussion on the dating of the graves above). The dates (of the inhumations) span roughly from 1300 to 900 BC; the actual burial period was certainly shorter but in any case it is likely that the grave was present prior to 1100 BC and most if not all of the inhumations were deposited before 1000 BC. Such dates for stone-cist graves in Estonia are, however, not extraordinary, since the earliest graves at Jõelähtme, Harjumaa, which for a long time kept the title of Estonia's oldest stone graves, were also established at some point between 1200–1000 BC, as evidenced by both the artefactual record (Lang 1996, 295; 2007, 158 f.) and recent radiocarbon dates (with the oldest date so far in 2924 ± 32 BP, Hela-2365; authors' unpublished data). Stone-cist grave IIA at Tõugu, Virumaa was recently radiocarbon-dated to the same period (2931 ± 29 BP, SUERC-44079; authors' unpublished data). The dates for grave 5 may appear a bit surprising only because the dating of those stone-cist graves without artefacts has so far been based on a vague assumption that they are younger than the earliest graves with well-datable bronze items and slightly older than graves with Pre-Roman Iron Age items (Lang 1996; but see

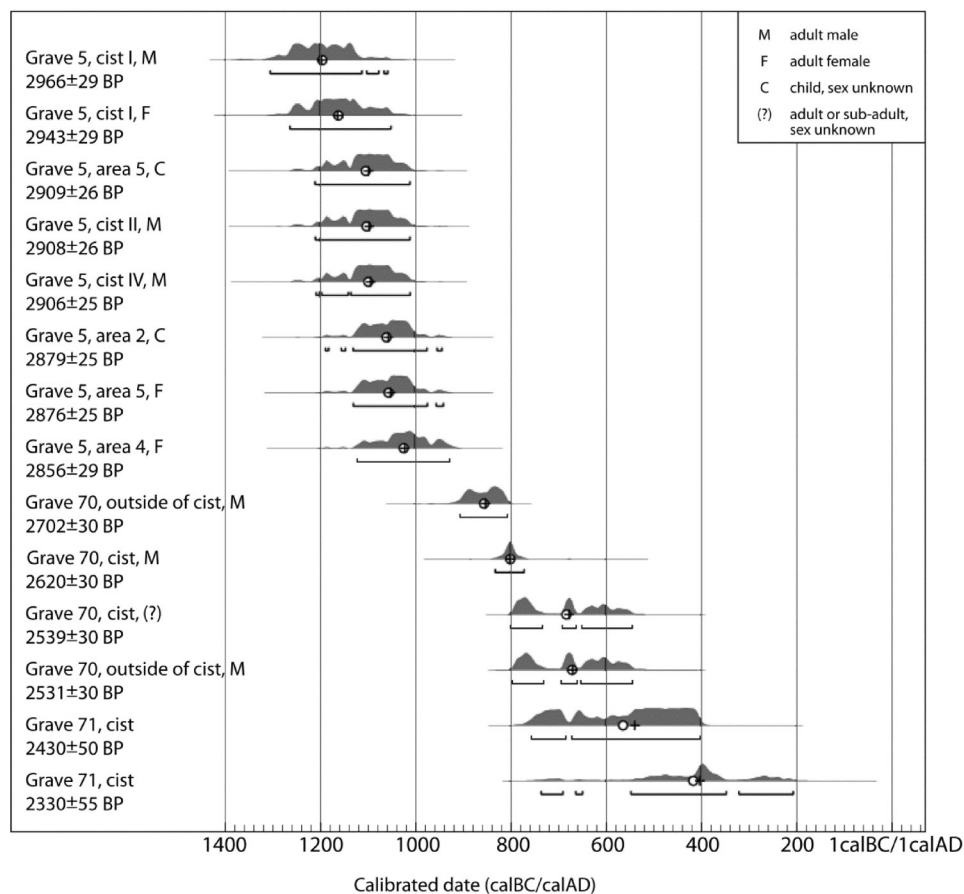


Fig. 4. Radiocarbon dates of the human bones from stone-cist graves 5, 70 and 71 at Sondlamägi, Muuksi as corrected to calendar ages, using OxCal v4.1.7 (Bronk Ramsey 2009) and the IntCal09 calibration data (Reimer et al. 2009). The figure shows calibration ranges of 95.4% probability, the mean and the mode. Note that the figure does not include the AMS date for the burnt bone from grave 5 (dated to AD 240–390; see Table 1). Two lowermost dates for grave 71 were obtained in the 1980s and are conventional (TIn-529 and -536); the rest are recent AMS dates.

also Lang 2007, 163). The dates from Muuksi challenge this view, which in its turn questions the deep-rooted understanding that the majority of stone-cist graves temporally cluster around the transition from the Bronze to the Iron Age. One should also consider that there is no particular reason to regard grave 5 as the oldest of the Hundikangrud group, which further supports the thought that stone-cist graves were introduced in Estonia as early as in the Early Bronze Age (in terms of the current chronology). It can be added that pollen data from Lake Kahala also confirm the inference of the appearance of graves in the area in the mid-Bronze Age around 1300 BC at the earliest (Vedru 1999b, 412; 2002, 108 f.; and references therein).

Another remarkable fact is the uniformity in the dates (of the inhumations), which implies relatively short intervals between the burials. This is an anticipated finding for the cist burials, since the details of cists' construction also suggested that the cists were not inserted all at once but still at short intervals. Radiocarbon dates do not contribute significantly to what was said above about the order of construction of the cists, but they seem to encourage rather than contradict the interpretation. A more noteworthy finding is the approximate contemporaneousness of the burials inside and outside of cists. For instance at Kaseküla, Läänemaa, the inhumations outside the cist were considerably later insertions to the Bronze Age grave, some of a Pre-Roman and some of a Late Iron Age date (Laneman 2012). The case at Muuksi is obviously different, although one may want to consider the possibility that the inhumations north of the cists were interred when all cists were already present and 'full'. This hypothesis is, however, challenged by the fact that the individuals outside of cists are mostly sub-adults while in the cists there are predominately adults – or to put it straightforwardly, it is not likely that first only adults and then almost exclusively children died. If there still is a slight temporal distance between the burials in and out of the cists then the burials into the peripheral areas of grave 5 must have been placed at the same time as burials in a new grave – which is not unlikely either.

In any case the temporal differences between the cist burials and exterior burials are minor, which leads to the question as to why some individuals were accorded a burial in a cist and other were not – given that, as it is currently believed, they were all members of the same kin group or household. The grave under review tempts one to conclude that first and foremost children were buried outside of cists, but evidence from other graves in the closest vicinity disprove the inference, as it is adults – particularly males – who are found outside of cists, whereas children turn up rarely (though at this point one may question the accuracy of past osteological studies). The observed discrimination in terms of burial location was therefore not based on straightforward age or sex characteristics. The question is further complicated by the view that only selected members of a community were interred in a stone-cist grave (Lang 1996, 354 f.). True, for the Kahala area or at least for Muuksi a deviation from this pattern has been suggested, as the average number of burials per grave (i.e. 6–7 individuals) is higher than usual (Vedru 1998a, 68, 71, 73; cf. Vedru 2010, 57; see also Lang 2007, 153). The radiocarbon results, a propos, indirectly support this opinion as far as they prove that inhumations outside cists can be counted as part of the community that built the graves. The issues of the elite background and internal hierarchy of stone-cist grave burials are, however, highly complex and require a more comprehensive treatment than is possible herein. Hence the inference at this point must be confined to the conclusion that the individuals interred inside and outside the cists were more or less contemporaries and belonged to the same community group – a fact that had up to now been only an assumption.

The bone fragment radiocarbon-dated to the 3rd or 4th century AD might be part of a dispersed cremation deposit, although it is not necessarily the case that

all remains of the cremated individual were brought to the grave or that the other burnt bones in the grave belonged to the same individual or to the same period. In any case, however, we are possibly observing the phenomenon of episodic re-use of old monuments. By the time the cremated bone arrived in grave 5, the grave group was probably well over one thousand years old and there is no reason to think that burial had been continuous through all the time; insertion of new graves to the group and probably also burials had ended after about 500 years, more likely even earlier. The presence of occasional burials or offerings of the same kind and date cannot be ruled out in other nearby graves, although none of them have yielded artefacts that can firmly be dated to the Roman Iron Age. How the remains of the rest of the population of the area were treated is not known, because Roman Iron Age sites are rare in the area. The closest and so far the only known mortuary site, a badly disturbed *tarand* grave with burnt and non-burnt bones and 3rd-century jewellery, was located at Uuri on the eastern shore of the lake (Moora 1977). It is however possible that *tarand* graves can also be found among the unexcavated graves at Muuksi (Vedru 1999b, 409). Only one settlement site with a probable Roman-period habitation is known, located at Kalamäe on the southern shore of the lake (Vedru 1998a, 52; 2010, 54).

Roman Iron Age burials or at least offerings or some other related practices at stone-cist graves were not restricted to the Kahala area, as can be seen from Roman-period artefacts from a number of farther stone-cist graves (e.g. at Lagedi, Proosa, Vão, perhaps also Rebala). The phenomenon has not been specifically studied, but it seems that in comparison with the Roman-period *tarand* graves, stone-cist graves contain artefacts that are rather modest in both quantitative and qualitative terms. Human remains have so far been radiocarbon dated only in one such grave group, at Rebala, but no Roman Iron Age dates were obtained (unpublished data; of course, not all the burials were subjected to individual dating).

Grave 70

Construction

Grave 70, excavated in 1937 by Artur Vassar (1937; 1938), was one of the first stone-cist graves in Estonia excavated in its entirety (Fig. 5). A flat cairn survived to a height of 80 cm in the middle and slightly less at the edges; its lower part consisted predominately of granite stones and its upper part predominately of limestone. The centre of the grave enclosed a limestone cist built above the underlying limestone; its walls, initially a minimum of 25 cm in height, had collapsed by the time of excavation, and its cover plate, broken into halves, had survived only above its southern end. The cist was surrounded by a compact stone pile about 4 m across in which the lower layer was predominately granite stones, the middle sections were mostly limestone and the upper layer was granite stones mixed with limestone shingle. The structure was defined by a limestone wall above

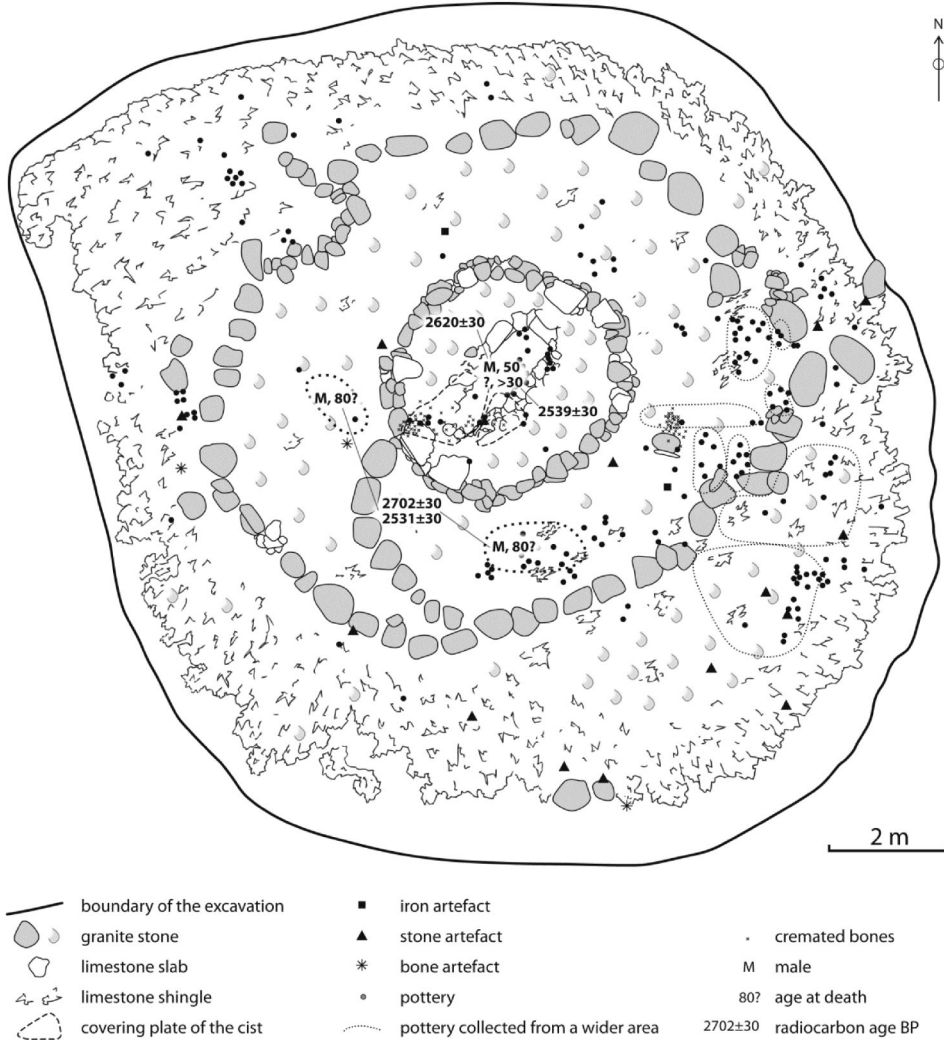


Fig. 5. Plan of grave 70 at Sondlamägi, Muuksi, showing the location of artefact finds and burials, including sex and age data and AMS dates for the buried individuals if available (adapted from Vassar 1938). Note that a single sign for pottery may stand for a single potsherd as well as tens of potsherds, and some pottery locations have not been mapped by the excavator.

a foundation of granite stones. The limestone wall had been built of remarkably thick slabs placed one upon the other with their straight edges turned outwards; a maximum of four such layers had survived. Unlike the limestone wall, its granite foundation was much less pronounced, since the stones were of the same size as the rest of the surrounding stones and not much effort had been made to form a straight exterior side for the structure. It therefore seems that the lower part of the

circular structure had not been meant for display and only its upper limestone part may have been exposed.

The space around this structure was filled with a dense packing of granite stones which in places was three or four layers thick and which was overlain by a relatively thick layer of smaller limestone slabs and shingles, without any orderliness in their position. This zone was, in its turn, edged by a lopsided roundish structure of large granite stones, which in the opinion of the excavator may have been purposefully formed in a hexagonal shape. The stones of this feature were much larger than in the interior of the grave, approximately half a metre or more in diameter, particularly in the northern and eastern parts of the grave where the natural ground level declined towards the north-east. The stones were situated with small spaces between and, although Vassar does not mention it, they may have been topped with a limestone wall. The north-western part of the circle revealed a gap, possibly a result of destruction.⁸ In the south-western part of the grave a curved row of larger stones seemed to have connected the large stone circle with the centre of the grave (in the vein of a spiral, as Vassar puts it). The bottoms of the stones, however, were situated at different heights and therefore the function and intentionality of the feature remained undecided.

The margin of the excavated area consisted mainly of limestone shingles, except for its south-eastern part where a 2 m wide stretch packed with granite stones was observed against the exterior side of the stone circle. The limestone layer was thickest by the circle stones, over a half-metre thick, but became increasingly thinner towards the exterior. A similar layer of limestone shingles was present all over the grave surface, including the central cist, which led Vassar to suggest that the limestone coating had been purposefully superimposed in the final stages of the grave's usage to conceal the inner structures. This interpretation is difficult to assess in hindsight; it is, however, possible that the upper part of the grave may have been formed from limestone from the very beginning and part of the stones may originate from field cultivation, as old field remains lay not far from the grave (Vassar 1937, 1; Vedru 1996). It is nevertheless likely that originally both the inner and the outer stone circle were visible from the grave's surface, although the former only with its topmost part; both circles were probably built at the same time and it was the external one that served as a real border.

In terms of construction the grave resembles the nearby triple grave 71 where cists were surrounded by double two-layer (i.e. limestone above granite) stone circles, although the circles of these graves were located closer to each other than in grave 70. As to the inner limestone wall, it resembles the granite stone structure around cist I in grave 5, which differed from the surrounding stone material and bordered the cist on the surface level of the grave.

⁸ In the original plan of the grave (in this paper adapted as Figure 5) the gap shows, for an unexplained reason, a fill of smaller stones, although the texts by Vassar clearly state that the circle stones were absent at this spot.

Human remains

Four inhumations and two cremations were encountered in the grave. Sex and age estimations on the inhumations were carried out by physical anthropologist Juhan Aul (there is no detailed report but the results are quoted in Vassar 1937 and 1938). The locations of the burials within the grave, along with sex and age-at-death data are shown in Figure 5.

The two skeletons inside the cist, probably supine and with heads to the north, were intermingled and damaged by the stones fallen into the cist. The bones of the male who had died around the age of 50 had been preserved remarkably better than the bones of the younger individual of indeterminable sex. According to Aul, the latter had been a young adult whose age at death was not determinable more precisely than less than 30 years; however, according to Martin Malve's preliminary estimation, it was a sub-adult less than 15 years of age.

Outside the cist were the remains of males who had died at a remarkably old age (according to Aul/Vassar perhaps around 80 years of age, though Malve's preliminary estimation was 50 and beyond). Their bones were found above the layer of granite stones and covered in limestone, with no recognizable traces of cist-like structures. The western inhumation was lying at a depth of ca 30–35 cm from the grave's surface and may have had a south-east–north-west orientation, with head to the south-east. The southern inhumation was lying slightly deeper and appeared to have been oriented west–east, head to the west. The skeletons were very incomplete – both had its lower parts (pelvic girdle and lower limbs) almost completely missing. The western skeleton was slightly better preserved than the southern one, except for the skull. In the archaeology of the 1930s, the possibility of secondary burial practices was not considered, but undoubtedly the skeletons under review may warrant this consideration today.

One of the deposits of cremated bone was found around the southern end of the cist; it had most likely been dispersed above the cist's cover plate. The cremation in the eastern part of the grave, however, was a compact assemblage of bones situated at a considerable depth near the underlying limestone bedrock, with large limestone slabs underneath and on top of it and two larger granite stones on two sides. Next to the southern granite stone stood an upright half-metre tall limestone slab with a triangular upper end which may have functioned as a grave marker (cf. cist ends in grave 5). The dimensions of the whole structure (except for the presumed grave marker) were 60–70 × 40 × 25 cm but it cannot be regarded as a proper cist; it was also filled with smaller limestone and granite rocks. Both of the bone assemblages were described as thoroughly cremated and cleaned before interment. Occasional burnt bone fragments were also found in other parts of the grave.

Vassar argued that the first occupant of the cist was the younger individual, because its bones were less well-preserved than the bones of the older man. The eastern cremation and southern inhumation were assumed to have been roughly contemporaneous with the first burial in the cist, since they were found lying at

considerable depths, while the western inhumation with its slightly higher position was considered somewhat later in date. The latest burial, or at least later in date than the inhumations within the cist, was the scattered cremation in the centre of the grave, according to Vassar. Based on artefact finds, Vassar dated the burials to around the turn of the era.

Finds

The find assemblage of grave 70 is remarkably abundant for a stone-cist grave, but the finds are mostly stone or bone items or potsherds which are difficult to date. None of the finds can be firmly associated with particular burials and many of them are located in the margins of the excavated area which is, strictly speaking, outside the grave (Fig. 5). The distribution and character of the finds has led several researchers to assume that the finds originate from a nearby settlement site, but test pitting to locate the site has yielded no results (see Vedru 1998a, 52). Therefore Vassar may have been correct when he suggested that the finds constituted a variety of offerings placed during grave construction, funerary and memorial rituals and also partly during rituals performed at the site at a considerably later time (Vassar 1938, 333; Vedru 1998a, 52).

In this paper we review the find assemblage cursorily but, admittedly, a more thorough investigation (of use-wear traces, comparisons with other find contexts) might potentially yield interesting results. This would, however, require a separate research project, because such unspectacular stone and bone objects as those in grave 70 have not been subjected to specific investigation and are often neglected in publication. In regard to such finds, we have not much to add to Vassar's 1938 treatment; as to the ceramics, however, there has been more progress and this find type will be discussed more thoroughly. Detailed descriptions of all non-ceramic finds together with photographs for the majority of them can be found in Vassar 1938 (figs 21–23); in the interest of better readability we do not refer to the latter figures in the following text, as these can easily be found in Vassar's work.

There were two **metal objects** in the grave: iron awls or other similar pointed items between the two stone circles in the northern and eastern part of the grave (see Fig. 5). Both were lying between the lowermost granite stones, but they had probably dropped from above, as there was very little earth between the upper stones (Vassar 1937, 20). The items can be dated to the Pre-Roman Iron Age, while a date in the final Bronze Age is not entirely impossible, though rather unlikely (Lang 1996, 47 f.; 2007, 121, 139). Iron and bronze awls have been encountered in a number of stone-cist, cairn and *tarand* graves (ibid.), which indicates that these objects were intentionally placed in graves.

Of **bone objects**, there were two simple pointed awl-like items, one on the western exterior side of the outer stone circle, positioned clearly higher above the original ground level, and the other on the southern margin of the excavated area just above the underlying limestone. A similar object was in the cist of grave 1 together with an object of flint (Friedenthal 1927, fig. 1). The bone objects of

grave 70 perhaps reached the site after the marginal zone of limestone shingles had already been formed, either intentionally or as a result of natural dispersal of grave stones over time. Besides the mentioned objects there were a few fragments of animal bone with traces of working, for instance a split long bone at a depth of 30 cm near the western inhumation.

The most numerous **stone objects** were the fragments of possible whetstones, five in number, including three thick specimens from sandstone and two thinner ones from metamorphic rocks. All of the finds were made outside the encircled area at different margins of the grave, mostly higher above the ground level between grave stones. They probably date from the Iron Age, but a more precise estimation is not possible (Andres Tvauri, pers. comm. 09.06.2013). Four handy cobblestones were found at the southern margin of the excavated area, one directly against the stone circle, others farther at the margin. At least two of them had been used as grinding tools and one as a stone hammer. Except for the latter which was uncovered directly beneath the turf, the stones were lying near the original ground surface. At least one similar stone was also found in grave 71 and, notably, two stray cobblestones with traces of grinding or polishing have been found thereabouts not far from the graves (Vedru 1998a, 54). Similarly to whetstones, such stone artefacts are present in contexts of different character and date (Vassar 1943, 234 f.; see also Laneman 2012, 101 and references therein); a thorough examination of the presence of such artefacts in graves is worth a separate study. A date in the Late Bronze or Early Iron Age is not unlikely for this find category. Besides the cobblestones, the grave contained a larger flat fragment of sandstone with traces of grinding, which was located between the stone circles in the south-eastern part of the grave at a depth that suggested that the item must have reached the grave at the time of its construction.

In the south-eastern margin, 1.3 m from the stone circle and relatively high between the stones (i.e. 15 cm from the grave surface) was a fire-striking stone, not a classic example of an oval fire-stone but nevertheless quite similar and hence perhaps of a similar date. Oval fire-striking stones are dated to the early Roman Iron Age through the Pre-Viking Age and usually occur as stray finds; in stone-cist graves they are rare but a few are known from cremation barrows and *tarand* graves (Vassar 1943, 225; Tvauri 2012, 88 ff.). Further, the grave contained a small flint scraper in its western part at a depth of only 12 cm, and two quartz objects that had also been used as scrapers. One of them is a small bipolar flake, precise location unknown, and the other is a larger platform flake found right on the western boundary of the excavation (the quartz and flint artefacts were classified by Aivar Kriiska). Also, a fossil with a hole in the centre was collected from the eastern margin of the grave.

The grave contained approximately 2000 **potsherds**. Based on differences in rim, shoulder and also some bottom and side fragments, a minimum of 22 clay vessels were distinguished, but the actual number of vessels was undoubtedly higher (cf. Vassar 1938, 350). The full shape of the vessel was possible to reconstruct in only a few cases (Fig. 6). The great majority of the vessels, 13 or 14

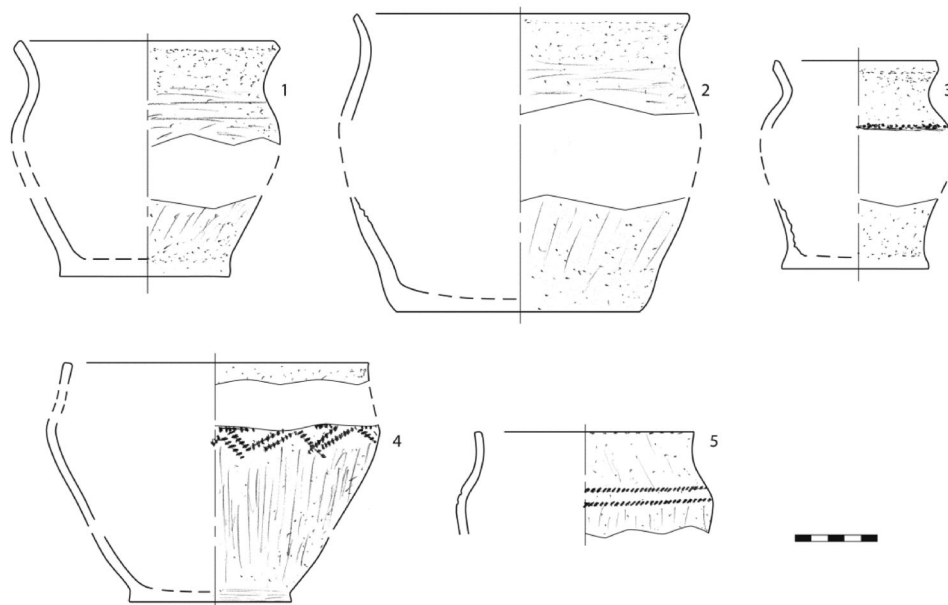


Fig. 6. Reconstructions of some clay vessels from grave 70 at Sondlamägi, Muuksi (drawn by Valter Lang). 1–4 Ilmandu-style pottery, 5 Cord-Imprinted Pottery.

in number, was found in the eastern half of the grave between the stone circles, particularly near the cremation burial where a cluster of at least ten vessels was located. A minimum of two vessels were in the vicinity of the cist and additional five or six were outside the encircled space (it is perhaps relevant to note that the total number of sherds outside the circle was relatively small, a few dozen over 300). Sherds, including the sherds from one and the same vessel, were lying between stones at different heights, which suggests that the vessels had once been placed or, perhaps more likely, thrown upon the grave stones. Potsherds were also found inside the cist, but those had most probably dropped from above when the covering plate of the cist collapsed. The pottery assemblage comprises several ceramics styles and chronological layers.

In the eastern part of the grave, on both the inner and outer side of the stone circle, scattered sherds of an Asva-style coarse ware clay vessel were found. It had been a relatively large undecorated pot with roughly smoothed surfaces and a slightly incurved upper part (rim profile in Vassar 1938, fig. 14: 5). Such pots turn up mostly in settlement sites, including fortified settlements, while they are rare in stone(-cist) graves; they have been dated to the Late Bronze Age, although a slightly later date cannot be excluded (Lang 1996, 46; 2007, 127 ff.; see also Laneman 2012, 100). Not far from this vessel in the eastern part of the grave was another similar pot (though with strong horizontal striation on the surfaces), but it is uncertain whether it belongs to the same style group.

At least six vessels in different parts of the grave can be classified as Ilmandu-style ceramics. Three of them were found in the eastern part of the grave on the inner side of the stone circle (Fig. 6: 1 and Vassar 1938, fig. 19: 1; Fig. 6: 2 and Vassar 1938, figs 16: 7, 17: 3; Fig. 6: 4 and Vassar 1938, fig. 18: 3); one was partly inside the cist (Vassar 1938, fig. 17: 2); one in the north-eastern part of the grave scattered between the stone circles (Fig. 6: 3; Vassar 1938, figs 16: 5, 18: 1); and one scattered over the north-western periphery of the site. The exteriors of the vessels had been either striated or smoothed and decoration was observed in three vessels: the north-easternmost vessel had a row of stick impressions on its shoulder (Fig. 6: 3); the vessel in the vicinity of the cist had deep oblique cuts on top of its rim and imprints of a thin object reminiscent of the end of a wooden chip on its shoulder; and the shoulder area of one of the eastern vessels displayed impressions made by a 20–25 mm long stick that had a cord twisted around it (Fig. 6: 4). The latter vessel has similar counterparts in the stone-cist grave at Loona, Saaremaa (AI 4210: 44/53), the *tarand* grave at Liiva-Putla, Saaremaa (AI 4339: 80), *tarand* grave I at Poanse, Läänemaa (Mandel 1978, pl. VIII: 3), the cist of stone-cist grave II at Lagedi, Harjumaa (Spreckelsen 1927, pl. III: 81) and the settlement site at Rannamõisa, Harjumaa (Lang 1996, fig. 13: 1). Ilmandu-style pottery is also present in other settlement sites (including fortified and hilltop settlements) and *tarand* and cairn graves, while it is uncommon in stone-cist graves. Recent (and so far unpublished) AMS dates from *tarand* grave III at Ilmandu, Harjumaa, which apply to inhumations that had been accompanied by Ilmandu-style pots as grave goods, fell within the 5th century BC,⁹ but this pottery type was probably used even later in the Pre-Roman Iron Age and it may have appeared as early as at the end of the Bronze Age (Lang 2007, 130 ff.).

Scattered sherds of a vessel that had two parallel horizontal rows of cord impressions on its shoulder were found on the western exterior side of the outer stone circle (Vassar 1938, fig. 18: 2). Another vessel with a presumably similar decoration was in the vicinity of the northern end of the cist and partly within the cist (Fig. 6: 5; Vassar 1938, fig. 17: 4–5), although in this case there is a slight possibility that the impressions originate from a cord twisted around a stick or from other similar stamp (cf. Vassar 1938, 353). The top of the rim of this vessel bears notches or shallow indentations. A vessel with similar two cord impressions on the shoulder is also known from a grave at Uuri in the Kahala area, as well as from graves in the areas surrounding Tallinn such as Lehmja-Loo II, Kurna IIB, Lagedi I and Rannamõisa II (AI 4887: 54; 4444: 249; AM A30: 35; 13: 4; 264: 265). The majority of the rest of the Cord-Impressed Pottery, distributed mainly in the western mainland Estonia and the islands, displays more elaborate decoration, e.g. zigzag and wavy impressions. Cord-Impressed Pottery dates predominately from the second half of the Pre-Roman period (Lang 2007, 132 f.).

Five sherds from a carinated vessel with a pinched decoration (Vassar 1938, fig. 20: 6) were scattered both within and outside the stone circle in the south-

⁹ 2361 ± 29; 2354 ± 29; 2413 ± 29 BP (SUERC-44060...44062).

western periphery of the grave, with distances of several metres between the sherds. Pottery with a pinched decoration, as a southern Baltic influence, is mainly distributed in southern Estonian Middle Iron Age sites (Tvauri 2012, 80 f.). However, the sherds in grave 70 may be earlier in date, since they resemble for instance pinched carinate vessels from fortified settlements in Lithuania, which are locally classified among the striated ceramics (e.g. Danilaitė 1968, fig. 3; Grigalavičienė 1995, fig. 129: 1–3). Carinated vessels appeared in the fortified settlements of Lithuania in the Late Pre-Roman Iron Age (Grigalavičienė 1986, fig. 38) and the vessel from Muuksi cannot therefore be of a much earlier date. Dating it to the later Pre-Roman period would correspond to the date of the Cord-Imprinted Pottery (cf. Vassar 1938, 358), although a date in the later periods of the Iron Age cannot be ruled out (since the grave also contained other later finds). The vessel was probably an imported item.

Three bottom pieces found in the eastern pottery-rich part of the grave bear textile impressions (Vassar 1938, fig. 20: 7–8) which, according to Silvia Laul (1966), originate from a plant fibre fabric woven using the rep technique. She claims that vessels with analogous textile impressions can be found in the Bronze Age fortified settlement at Asva and Roman Iron Age *tarand* graves in south-eastern Estonia.

The eastern part of the grave, both within and outside the encircled area, also yielded a number of highly dispersed wall fragments from one or perhaps even more vessels that had sand in the modelling paste and carefully smoothed surfaces. The sherds are clearly different from the rest of the grave's pottery and date from later periods, the Middle or Late Iron Age. The remaining nine vessels that were distinguishable (one in the northernmost periphery, one in the closest vicinity of the southern inhumation, and the rest in the eastern part of the grave) had deteriorated to the extent that neither type nor date could be determined. It is nevertheless likely that the vessels pre-date the end of the Roman Iron Age, whereas the most likely date is in the Pre-Roman Iron Age.

Animal bones were scattered all over the grave, most abundantly in the peripheral areas and rather the upper than lower layers of the grave; they were particularly numerous at the north-western margin together with potsherds (Vassar 1938, 332). Sheep or goat, cattle and horse were present in all quarters of the grave; the south-eastern quarter also contained pig bones, the north-western quarter seal bones, and bones of a wolf-sized dog were uncovered at the northern (NNW) border of the excavation. Other species present (various wild birds, hare, toad, marten) need not have been associated with human activities.

Summing up the review of the finds, the first thing to note is that according to the artefacts the most clearly and firmly represented period in grave 70 is the Pre-Roman Iron Age – the great majority of the ceramics and the iron objects most probably come from this period. Ilmandu-style pottery and Cord-Imprinted Pottery are usually dated, respectively, to the first and second halves of the Pre-Roman Iron Age, but chronological overlapping around the middle of the period is entirely possible. There are also other sites that comprise both of the mentioned ceramics

styles (*tarand* graves at Poanse and Liiva-Putla, the settlement site at Rannamõisa). Further, a later part (or parts) of the Iron Age is (are) represented – by a few potsherds and probably also a fire-striking stone. One or two Asva-style coarse ware vessels may indicate an earlier, i.e. Bronze Age temporal layer at the site, but on the other hand the contemporaneity of these pots with the Pre-Roman-period pottery cannot be ruled out. Stone and bone objects cannot be dated but it seems that at least most of them could also be dated to the Iron Age rather than the Bronze Age.

It may also be worthwhile to have a quick look at the artefact finds of the neighbouring triple grave 71, although the absence of excavation records does not allow a detailed account thereof. The cist of the middle grave contained a pair of bronze temple ornaments (Vedru 1998a, pl. XVIII: 1–2) which unquestionably date from the Bronze Age. At the well-datable stone-cist grave field at Jõelähtme such spiral temple ornaments date from Period IV or, at the latest and less likely, the beginning of Period V of the (Nordic) Bronze Age (see Lang 1996, 283 f.; this date is confirmed by AMS dates of the skeletal remains, hitherto unpublished). A tiny tube of sheet bronze, ca 22 mm in length and 3 mm in diameter, which was found outside the cist of the middle grave (AI 4980: 900), is probably of the same date, since an analogous find was made in the cist of grave 3 at Jõelähtme. The find assemblage apparently also includes a small amount of Asva-style fine ware pottery (AI 4980: 699) and Lügänuuse-style pottery (AI 4980: 58, 667, 847/849), which may also date from the Bronze Age (Lang 2007, 128 ff.). The majority of the grave's approximately thousand potsherds, however, come from Ilmandu-style and Cord-Impressed potteries and date from the Pre-Roman Iron Age. The amount of Ilmandu-style ceramics is, however, smaller than in grave 70. A date in the Pre-Roman period has also been attributed to the spindle whorl of sandstone (Lang 2007, 138). A scythe, a polychromic glass bead, a horse hoof ice spike and perhaps also some pottery originate from the later periods of the Iron Age (Vedru 1998a, pl. XVIII: 9, 15). These finds have counterparts for instance in the stone grave-field at Proosa and the hill fort at Iru not far from Tallinn, and they might therefore date from the late Viking Age or the early Final Iron Age (e.g. Lang 1996, 99, 101, 199, 202; Vedru 1998a, 41 f.). Besides the mentioned items, the find assemblage also includes a cobblestone, a lump of quartz, bone fragments with cut-marks and an abundance of slags.

Radiocarbon dates

Samples for radiocarbon dating were collected in 2010, in the same way as described above with grave 5, and were processed in the dating laboratory of the Finnish Museum of Natural History (Table 2; Figs 4 and 5). All four inhumations were sampled. The cremations could not be dated, because at excavation 'cremated bone crumbs were not quite collected' (Vassar 1937, 22). The existing bone assemblage was in a quite unfortunate condition and seemed to have been repeatedly re-arranged. Therefore, the bones recorded under numbers 19 and 20,

Table 2. Radiocarbon dates and stable isotope measurements (by IRMS method) of the human bones of grave 70 at Muuksi. Calibration after OxCal v4.1.7 (Bronk Ramsey 2009; Reimer et al. 2009). The uncertainty in the stable isotope measurements is $\pm 0.1\%$

Context	Sex/ Age	Bone / Register No.	Lab. No.	Date BP	Date cal (95.4%)	$\delta^{13}\text{C}$ (‰)	$\delta^{15}\text{N}$ (‰)
Outside of cist	Male ~80?	Occipital bone AI 3583: 19–20	Hela-2409	2531 \pm 30	800–540 BC	–20.2	10.5
Outside of cist	Male ~80?	Occipital bone AI 3583: 19–20	Hela-2410	2702 \pm 30	910–810 BC	–20.7	N/A
Cist	Male ~50	Left femur AI 3585: 21a	Hela-2411	2620 \pm 30	830–770 BC	–20.7	10.1
Cist	? >30	Right femur AI 3585: 21a	Hela-2412	2539 \pm 30	800–545 BC	–20.6	10.2

which represent the male inhumations outside the cist, had been mixed and can no longer be distinguished, given that the bones belonged to individuals of the same sex and age at death. This unfortunately means that we do not know which of the radiocarbon results Hela-2409 and -2410 belongs to which of the two inhumations outside the cist. However, it is important to emphasise that these two dates definitely apply to these peripheral inhumations.

The results suggest that the grave was built between 900–800 BC, more likely perhaps towards the end of the period – which is nevertheless slightly earlier than previously thought (see the discussion on previous dating above). There is a possibility that, a little unexpectedly, the oldest burial of the grave is one outside the cist (due to the problems indicated above it cannot be ascertained which of the two inhumations; based on Vassar's suggestion, though not particularly well-grounded, the southern one is more likely). If this was the case, it probably implies that the grave (or graves in general) had not been erected after a particular death case (cf. Vassar 1938, 334) and there were quite strict rules to decide who is to be interred inside and who outside the cist (which by the way applies even if the eastern cremation was the oldest burial). It is also possible (though cannot apparently be verified) that the inhumation under review was a secondary burial thrown out of the cist or brought to the grave from elsewhere. By all this guesswork, however, one should not forget that the inhumation under review may also be slightly later in date than the man of about 50 in the cist. As for the latter, it should be remarked that, contrary to what Vassar proposed, this individual is more likely than the younger individual to be the earlier occupant of the cist; Vassar was however right when he argued that at least one burial inside and one outside the cist were more or less contemporary.

Two skeletons, one inside and other outside of cist, were radiocarbon-dated to quite a long stretch of time between 800 and 500 BC, and it is advisable to attempt to estimate whether they originate from either the earlier or later part of the period. A date at the beginning of the period is suggested by the fact that the

other two skeletons date from around 800 BC; also, evidence from the nearby grave 5 suggests that a grave was probably used for burial for a relatively short time, as opposed to a period of several centuries. On the other hand, the date of the abundant Ilmandu-style pottery around 500 BC is not entirely impossible and thus the later part of the discussed period should be considered. It was, however, shown above that the association between the pottery and the burials was obscure; also, the Ilmandu pottery accompanied by the Cord-Imprinted Pottery dates from rather the Pre-Roman Iron Age than the Bronze Age, and is thus indicative of an activity that is chronologically later than the inhumations. All things considered, it seems more likely that all the inhumations of grave 70 originate from a relatively short period of time and inhumations outside and inside the cist are roughly contemporaneous. In any case all the inhumations are of a Bronze Age date.

The date of the cremations is difficult to estimate without radiocarbon dating because, similarly to peripheral inhumations in stone-cist graves, peripheral cremations may be roughly contemporaneous with or much later than cist burials. Vassar may well have been right when he proposed that the eastern cremation burial is among the earliest in the grave. That cremation was practised in the Bronze Age is evidenced for instance by cremated human bones in two cists hereabout at Sondlamägi, Muuksi. The eastern cremation in grave 70, however, was not situated in a proper cist, but it nevertheless resembles cremations in Bronze Age ship graves which were placed in small box-like stone structures (Jaanits et al. 1982, 150 f.; Lang 2007, 164 ff.). Grave 18 at Iru, Harjumaa has even provided evidence that a cremation with no cist whatsoever in the periphery of a stone-cist grave may be of a Bronze Age date (unpublished data of authors). Despite all this, an Iron Age date for the discussed burial in grave 70 cannot be ruled out. The only relevant conclusion that can be drawn from the artefactual record is that the discussed cremation is more or less contemporary with or earlier than the Pre-Roman Iron Age pottery above it; a later date is nevertheless unlikely.

The cremation in the centre of the grave must be later than the inhumations within the cist, but a more precise estimation is hardly possible. Similar cremations in upper layers outside of cists were encountered in graves 8 and 32, but no artefacts to enable dating were present. As seen above, the nearby grave 5 contained burnt bones of a Roman Iron Age date. It is possible that the cremation under review is somehow associated with the ceramic finds and dates from the Pre-Roman period – the surroundings of the cist indeed yielded at least one Ilmandu-style vessel and one presumably of Cord-Imprinted style. On the other hand, however, similar vessels were found in other parts of the grave with no cremated bones nearby. At Rebala, Harjumaa, for instance, such cremations from the grave's upper layers were recently radiocarbon-dated to most likely the Early Pre-Roman Iron Age, although a Bronze Age date is also possible (unpublished data of authors).

As for the abundant artefact finds, only one or two Asva-style clay vessels may possibly fit the obtained radiocarbon dates, while the other ceramics are probably from the Pre-Roman Iron Age and are perhaps, but not necessarily, associated with the cremation burial(s). The association of finds and human bones in any case

provides no grounds for re-dating the ceramics to an earlier period or doubting the credibility of the absolute dates. Hence, the most likely interpretation currently appears to be that the pottery originates from an activity performed at the grave a number of centuries after its construction and the interment of inhumations; this activity may, though not necessarily, have involved placing cremation burials. The vessels overwhelmingly outnumber the cremation deposits (even if there were actually more cremations than the excavator succeeded to trace), which suggests that burial, if it had been practised, was not the most important element in the Pre-Roman Iron Age use of the grave, and the majority, if not all of the clay vessels had not been involved in funerals but rather in offering-like practices, memorial meals, or the like. Here a reference can be made to Vassar (1938, 358), who suggested from the thick layer of a charred porous substance that was observed on the interiors of a few vessels that the latter were used to bring embers (the grave itself embraced no traces of fire), or birch tar used as medicine, to the grave. There also seems to be a clear association between ceramics and faunal remains, since the latter were also distributed predominately in the upper strata of the grave, and the nearby graves that lacked artefacts also lacked animal bones. The Pre-Roman-period practices, the precise content of which remains unknown, may also have involved other artefacts that were present in the grave but are not firmly datable to confirm the hypothesis.

It is notable that similar activities probably occurred 30 m away at grave 71, where the Pre-Roman Iron Age ceramics was complemented by a radiocarbon date calibrated between 400–200 BC (2240 ± 40 BP, Tln-513; Lang 1996, 289); the date was obtained from charcoal collected from beneath the peripheral stones outside the ring walls. Perhaps it is possible that in the Pre-Roman Iron Age, graves 70 and 71 formed a kind of joint ritual locale, which might also account for the dense clustering of the ceramics in the eastern part of grave 70. Unfortunately, information on the location of the human remains and artefact finds in grave 71 is insufficient.

A few artefacts in the grave represent an even later temporal layer (or layers) which, as was perhaps the case during the Pre-Roman Iron Age usage, most probably did not involve burials. These later components are more evident in grave 71 where they can be dated to the late Viking or beginning of the Final Iron Age, but in this case the finds of the two graves may not have any association whatsoever. It may be that the latest finds are in some way or another associated with the nearby field remains from the end of the Iron Age. Current knowledge is however insufficient to tell what these finds mean and what was the meaning of the graves at the time of their arrival at the site.

Conclusions

Radiocarbon dates revealed that grave 5 at Sondlamägi, Muuksi had been established prior to 1100 BC and grave 70 prior to 800 BC. Inhumations inside and outside of the stone cists do not show considerable differences in date. Although the discussed graves may leave one with an impression that in stone-cist graves

mainly children and elderly people were interred outside of cists, evidence from other graves at Muuksi and elsewhere do not confirm the inference. Burials (cremations rather than inhumations) and/or other ritual practices at the graves were carried out also in the Iron Age.

When viewing the obtained radiocarbon dates in the local context of Sondlamägi, it seems that the inventory-less limestone graves clustered in the western part of the grave field are older than the find-richer graves with more granite stones east and perhaps also west of them. True, the temple ornaments of grave 71 would allow dating the grave to approximately the same time as the inhumations of grave 5, but on the other hand it is entirely possible that such ornaments were also worn around the 8th century BC, which is also suggested by the radiocarbon dates from the same grave. In other words, the differences in the grave groups that we described in the beginning sections of the article were due to variations in the date of the graves and not, as suggested by previous studies (Vedru 1998a, 65 f.; 2002, 110 f.; 2010, 51), a result of contemporary graves being constructed by grave builders of different social backgrounds. Moreover, the 'rich' artefact assemblage of grave 70, or at least part of it, turned out to be considerably later in date than the burials. The observed development in the peculiarities in the graves' construction over time is, however, a local trend and is not valid in general.

In a broader perspective, the current study provides strong support to the thought that stone(-cist) graves were introduced to what now is Estonia at a slightly earlier date than previously held, i.e. in terms of the current chronology in the Early Bronze Age (note that *Herr* Friedenthal was right, after all). Of significance is also the conclusion that peripheral burials outside of cists not always are 'late' in date but may be contemporaneous to the cist burials, even when the artefact finds suggest inversely. Since in stone-cist graves either case can be encountered, it is evident that scientific dating of the osteological material is highly advisable. Information that was obtained on the post-Bronze Age use of the graves, however, cannot currently be used for drawing far-reaching generalisations, but if we aim at a better understanding of what the role of the Bronze Age monuments was in the landscapes and mindscapes of the following generations, then any bit of applicable information is important.

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Margot Laneman ja Valter Lang

UUED RADIOSÜSINIKUDATEERINGUD KAHEST MUUKSI KIVIKIRSTKALMEST

Resüme

Muuksis Kahala järve lähistel on 20. sajandi erinevatel kümnenditel kaevatud paarikümnet kivikirstkalmet (jn 1–2). Osana laiemast kivikirstkalmete dateerimist ja matmiskombeid hõlmavast uuringust lasime radiosüsiniku- (AMS-) meetodil dateerida kahe sealse kalme (nr 5 ning 70) inimluid. Ülejäänud Muuksis

uuritud kalmed on kas kaevatud üksnes osaliselt, kaevamiste kohta puudub aruandlus või polnud luud proovide võtmise ajal kättesaadavad, mistõttu neid uurin-gusse ei kaasatud.

Kalme nr 5 (jn 3) keskse kirstu avasid 1925. aastal baltisaksa harrastusarheo- loogid, ülejäänud kaevati läbi aastail 1996–1997 Gurly Vedru juhtimisel. See oli kuni 70 cm kõrguselt säilinud peamiselt paekividest koosnev kuhjatis, mille ümber oli 9-meetrise läbimõõduga ringmüür ja sees neli kivikirstu, üks neist ebatavaliselt pikk. Kalmes olid vähemalt üheteistkümne inimese põletamata jäänused, kusjuures umbes pool maetutest leiti kirstudest ja teine pool väljastpoolt kirste kalme põhja- osast. Mitme kirstuvälise laibamatuse puhul on arvatud, et nende algne matmispaik oli kalmest väljaspool ringmüüri ääres ja alles mõnevõrra hiljem maeti puhtad luud ümber ringmüüri piiratud alale, kuid vähemalt praeguse uurimisseisu juures ei saa seda arvamust piisavalt põhjendatuks lugeda. Kalmes oli ka vähesel hulgal ja laiali paiknevaid nõrga põletusega inimluid, eriti koljutükke. Muinasaegseid esemeleide ei olnud ja ka loomaluud peaaegu et puudusid.

Radiosüsinikuproovid võeti kaheksast põletamata luustikust ja ühest põletatud toruluukatkest (jn 3–4 ning tabel 1). Dateerimistulemused näitavad, et kalme on rajatud ajavahemikus 1300–1100 eKr ja hiljemalt 900. aastaks eKr oli mat- mine lõppenud. Kalme tegelik kasutamisaeg oli tõenäoliselt palju lühem, kui nimetatud piirdateerimised osutavad. Seejuures on tähelepanuväärne, et kirstuvälised luustikud on üldiselt samaaegsed kirstusisestega, mitte selgelt hilisemad nagu näi- teks Kasekülal. On siiski võimalik, et ka kõnealust kalmet on kasutatud kas mat- miseks või muudel rituaalsetel eesmärkidel pärast sajanditepikkust pausi rooma rauaajal, sest just selle ajaga dateeriti põletatud luu, mis võiks oletatavalt pärineda laiali puistatud põletusmatusest.

Kalme nr 70 (jn 5) kaevati 1937. aastal läbi Artur Vassar. See oli eelkirjeldat- tud 5. kalmest üsna pisut suurem rajatis, mille alumine osa koosnes raudkividest, pealmine valdavalt paest. Kalmel oli suurtest raudkividest 9–10-meetrise läbi- mõõduga ring, mille keskmel paistis olevat veel teine, väiksema läbimõõduga ring – paemüür raudkividest vundamendil, ümbritsemas kalme ainsat kirstu. Kirstus oli kaks luustikku, nagu ka väljaspool kirstu kalme lääne- ja lõunaosas. Oli ka kaks suuremat põletatud luude kogumit: üks neist puistatud kirstu kateplaadile ja teine kompaktselt vastu paepõhja kivide vahel kalme idaosas. Leide oli kivikirstkalme kohta arvukalt, ent neid ei saa kindlalt konkreetsete matustega seostada, samuti ei saa peamiselt kivi-, luu- ja keraamikaleidudest koosnevat ainet kuigi täpselt dateerida. Rohke keraamika (kindlasti üle kahekümne savinõu) osutab mitmele ajalisele kihistusele: üks või kaks nn Asva stiilis jämekeraamilist nõu võivad päri- neda juba pronksiajast, vähemalt kuus Ilmandu stiilis nõu (jn 6: 1–4), kaks nõor- ornamendiga (jn 6: 5) ja üks näppeornamendiga nõu on arvatavasti pärit eelrooma rauaajast (kõige tõenäolisemalt perioodi keskpaigast) ning üksikud ornamendita nõu(de) laiali paiknevad killud kuuluvad rauaaja kesk- või lõpuossa (seostuvad võib-olla selleaegsete põldudega lähikonnas).

Radiosüsinikuga dateeriti kõik neli põletamata luustikku (jn 4–5; tabel 2); põletatud luud kaevamistel kahjuks ei kogutud. Tulemuste põhjal võib kalme

rajamisaja paigutada vahemikku 900–800 eKr. Ka selle kalme puhul tundub, et kõik laibamatused on kalmesse jõudnud suhteliselt lühikese aja jooksul aasta 800 ümber eKr või kui ka mitte, siis vähemalt ei ole ükski neist pronksiajast hilisem. Seejuures ei ole alust arvata, et kirstusisesed luustikud on tingimata vanemad kui kirstuvälised. Kõnealusel kalmes pole välistatud ka vastupidine. Põletatud luid, nagu märgitud, dateerida ei saanud, aga on võimalik, et osa neist – eriti luud kirstu kohal – seostub mingil viisil keraamikaleidudega ja pärineb eelrooma rauaajast. Igatahes märgivad arvukad savinõud nii 70. kui ka 71. kalmes, et eelrooma rauaajal on nimetatud kalmeid mingil (rituaalsel?) otstarbel kasutatud, kusjuures matmine ei pruukinud seejuures peamine olla. Arvatavasti seostuvad selle kasutusperioodi ja tegevusega ka 70. kalme arvukad loomaluud (sest teistes tervenisti läbi kaevatud kalmetes, kus esemeleide praktiliselt polnud, puudusid ka loomaluud) ja võimalik, et ka ülejäänud leiuaines või osa sellest.

Seni on enamik uurijaid sedalaadi (leiutühjad või ilma pronksleidudeta ja võrdlemisi keraamikarohked) kalmed suhteliselt hiliste kivikirstkalmete hulka arvanud, eelistades tugevalt eelrooma rauaaja poole kalduvat dateeringut. Radiosüsiniku järgi on mõlemad kalmed seni arvatust märksa vanemad, kusjuures 5. kalme, mis rajati tõenäoliselt enne 1100. aastat eKr, kuulub praeguste teadmiste kohaselt Eesti kõige varasemate kivikalmete hulka. Enam-vähem sama vana on Jõelähtme kalmerühm ja arvatavasti ka Tõugu kivikirstkalme. Kuna kõnealune Muuksi kalme võib olla ka sajand või paar eelnimetatud daatumist varasem ja ei ole erilist põhjust arvata, et see on oma kalmerühmas vanim, siis on põhjust väita, et kivi(kirst)kalmeid hakati Eesti alal ehitama seni arvatust märksa varem, kehtiva kronoloogia kohaselt vanemal pronksiajal. See oleks igati ootuspärane ka naabermaade andmes-tikku arvestades.

Radiosüsinikudateeringud tõestasid ka, et kõnealustes kalmetes ei ole kirstusisestel ja -välistel matustel suurt ajalist vahet, mis tähendab, et ühe ning sama kogukonna liikmeid koheldi surmajärgselt erinevalt. Millest oli selline eristamine tingitud, on omaette kompleksne küsimus. Igatahes on selge, et see praktika oli kasutusel ja normikohane juba kõige varasemates kivikirstkalmetes. Kohalikul tasandil osutavad radiosüsinikudateeringud võimalusele, et algul, võib-olla enne 800. aastat eKr, ehitati Muuksis kalmeid peamiselt paest üksteise ligi kobarasse, hiljem aga ka raudkividest ja mitme kiviringiga. Selline areng on aga kindlasti lokaalne eripära ega kehti laiema trendina.