Coalescent community at Alsónyék:
the timings and duration of Lengyel burials
and settlement

By Anett Osztás, István Zalai-Gaál, Eszter Bánffy, Tibor Marton, Éva Ágnes Nyerges,
Kitti Köhler, Krisztina Somogyi, Zsolt Gallina, Christopher Bronk Ramsey,
Elaine Dunbar, Bernd Kromer, Alex Bayliss, Derek Hamilton, Peter Marshall
and Alasdair Whittle

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Alsónyék and the Lengyel culture in central Europe

The Lengyel culture was very widely distributed in central Europe in the first half of the fifth millennium cal BC. At its greatest extent, its settlements are found in western and north-east Hungary, south-west Slovakia, eastern Austria and the Czech Republic. Its distribution even reached Slovenia and Croatia in the south, and Poland in the north.

The Lengyel settlement at Alsónyék lies within a part of south-east Transdanubia where a series of Lengyel sites were already known, including settlements, concentrations of burials and enclosures – the product of research going right back to the late nineteenth century. The discovery of Alsónyék so close to other substantial Lengyel sites and the realisation of its great size have been major surprises.

The Lengyel occupation at Alsónyék

Nearly 9000 of the almost 15,000 features excavated at Alsónyék can be assigned to the Lengyel phase, including approximately 2300 burials, numerous pits and pit complexes, and 122 post-framed houses. It has been estimated that the entire site could have covered as many as 80 ha. The traces of Lengyel occupation can be seen over the entire excavated area. For the purposes of analysis here the relevant parts are subsites 5603, 11 and 10B *(fig. 1)*. When the *The Times of Their Lives* collaboration at Alsónyék began, the post-excavation analysis of subsite 46 was not advanced enough for inclusion in the dating programme. Since the area contained only two houses and 55 graves (MAJERIK et al. 2010), its exclusion was not seen as problematic.

Lengyel features are completely absent in subsite 5603/2 (the area of Sopot occupation; OSZTÁS et al. this volume [a], fig. 6), and largely absent in the southern portion of subsite 5603, where there is the intense Starčevo occupation, and in the centre of the site. Although it is possible that the Lajvér stream in this area eroded Lengyel occupation levels down to the LBK archaeology, the minimal visible traces of Lengyel activity suggest that this area was avoided in this period. Ditch sections were observed and investigated at the outer limits of subsites 10B, 11, and 5603, to the north, south and east, respectively. With the rising ground of the Szekszárd hills only about 65 m to the west of the centre of the site, it is our view that these could form the limits of a coherent, bounded settlement.

Subsite 5603

Subsite 5603 forms the eastern axis of the site (area 6). A total of 2911 features were excavated in this area. From the Lengyel phase, nearly 2000 features including postholes associated with 26 houses and 625 burials were recorded (Grave Groups 42–59 plus scattered graves), covering an area of over 6.3 ha. The area can be divided into two parts: a long, thin eastern arm and a more rectangular southern portion that runs close to subsite 11
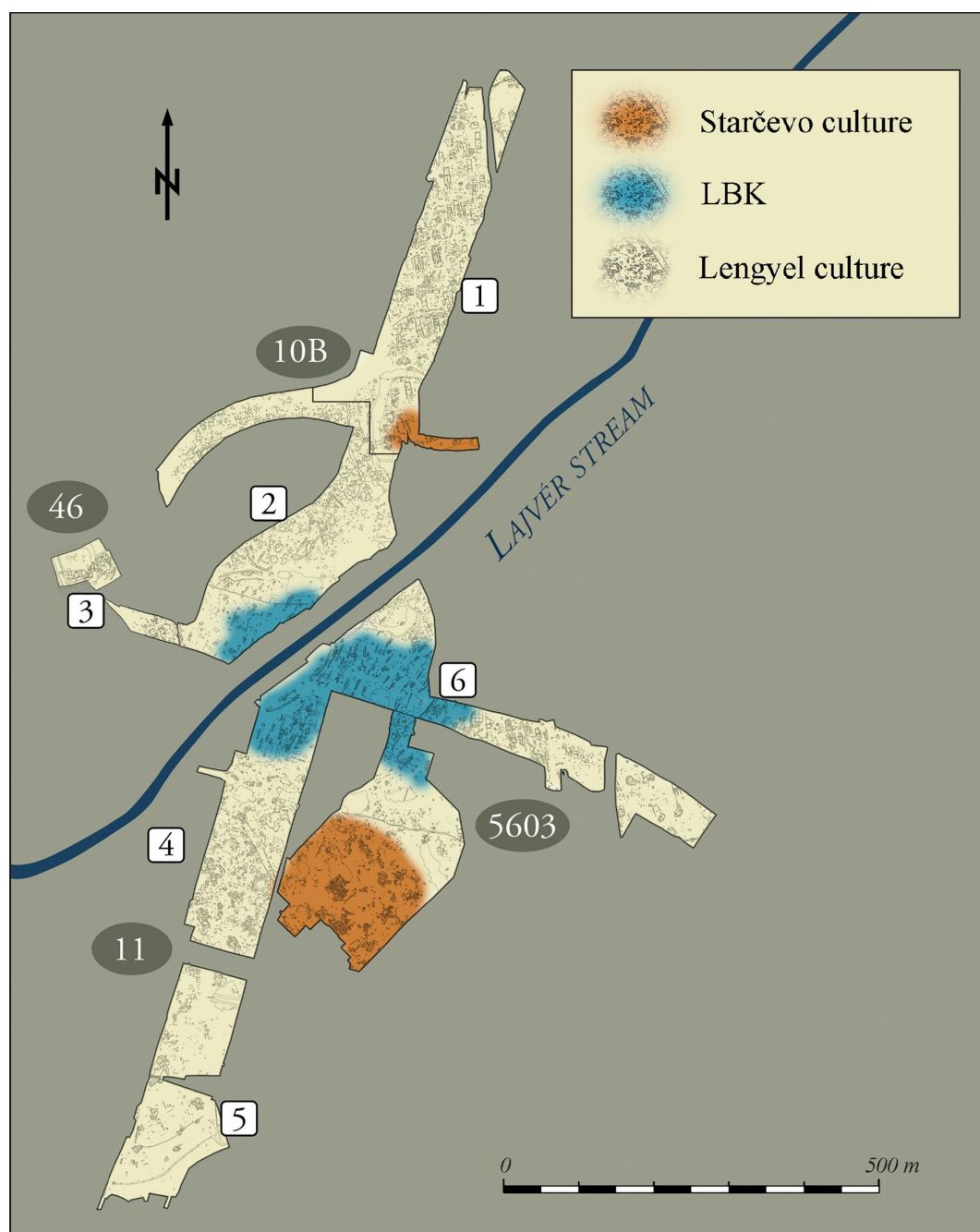
Fig. 1. Spatial distribution of cultural groups on the different subsites and areas at Alsónyék.

(fig. 1). The eastern section was the most densely occupied in the Lengyel phase and, with the exception of a few LBK settlement pits in its western end, only Lengyel features were observed here. The northern half of the southern portion of the area had traces of LBK settlement, but was otherwise densely covered with Lengyel features, whereas further south the area was densely covered with Starčevo features.

Subsite 11

Subsite 11 forms the southern axis of the site (areas 4 and 5), south of the bed of the Lajvér stream *(fig. 1)*. Nearly 3700 features were excavated, covering 8.3 ha. About 1500 recorded features could be assigned to the Lengyel period, among them 23 houses with postholes and 735 burials (Grave Groups 60–92 plus scattered graves). In the northernmost part of the area there were LBK occupation deposits, while the more southerly portion was relatively densely settled in the Lengyel period. At the southernmost part of subsite 11, a considerable number of features from the Late Iron Age and Early Roman periods came to light. Although a large number of excavated Lengyel burials were found in subsite 11, there were fewer buildings here than in 10B, though this might be due to circumstances of detection and survival. On subsite 11 the most common features are the extremely large pits or pit complexes, which are found across the whole site, except at its northernmost end. They are thought to have been used as clay extraction pits, although some may have had a natural origin. Several were investigated by test trenches, although due to the high groundwater level their full depth has not been established. Similar large features were excavated in the southern part of subsite 5603, containing mixed finds of different periods.

Subsite 10B

Subsite 10B is the northern axis, with a western arm, north of the bed of the Lajvér stream. A total of 7780 features were excavated from all periods *(fig. 1)*. From the Lengyel phase, nearly 6000 features including postholes associated with 71 houses and 862 burials (Grave Groups 1–41 plus scattered graves) were recorded, covering about 9 ha. This is the most densely filled portion of the site, in particular in the northernmost sections where the houses form rows and, in some cases, intercut one another, showing signs of both refurbishment and reconstruction. The western arm of subsite 10B also appears to have dense Lengyel occupation (Gallina et al. 2010 figs 6–7).

The visibility and excavation of features in the southern part of 10B (area 2) became increasingly problematic, largely due to high groundwater levels. Considerable numbers of features were excavated but many of these have simply been classified as indeterminate prehistoric, pending further evaluation of the ceramics. Many fewer traces of Lengyel occupation were found in the southernmost portion of 10B, compared to its northern part.

Burials and burial groups

There were substantial changes in mortuary practices in the Late Neolithic period. In the Early Neolithic in the Carpathian basin complete skeletons or skeletal remains were interspersed amongst settlement features or buried in pits, usually without the concentration of graves in formal groups (Bánffy et al. 2010; Minichreiter / Botič 2010; Paluch 2004; 2007). By the time of the central European LBK, there are numerous cemeteries (Bickle / Whittle 2013a, 17), but in Hungary these are essentially missing from the LBK of both Transdanubia and the Alföld (Oross / Marton 2012; Whittle et al. 2013). The much lower number of burials in earlier periods compared to the Lengyel period is also striking.

Approximately 2300 Lengyel burials were uncovered at Alsónyék, distributed over nearly the entire excavated area. By comparison, the next largest Lengyel cemetery so far known is Zengővárkony-Igaz-dűlő (21 km west of Alsónyék), with 368 graves (Dombay 1960).

Fig. 2. A selection of Lengyel culture grave groups. Clockwise from bottom: Grave Groups 14, 68, 52 and 76.

Other larger and smaller Lengyel burial grounds are known within the Lengyel culture (Antoni 1982; Kalicz 1985; Němejcová-Pavúková 1986; Zalai-Gaál 2010), although this phenomenon is characteristic of only its eastern area of distribution (Kalicz 1985, 21; Zalai-Gaál 1988, 56; 2010, 10). In the western area of Lengyel occupation, these regular forms of burial are not present at all. With the exception of a small grave group at Friebritz-Süd (Neugebauer-Maresch et al. 2002; Neugebauer-Maresch / Teschler-Nicola 2006), only solitary burials often deposited in settlement pits or special forms of mortuary treatment *(Sonderbestattungen)* have come to light in this area (Urban 1979; Barna 1996; Neugebauer-Maresch 1995, 93–99; Neugebauer / Neugebauer-Maresch 2003; Neugebauer / Trnka 2005, 223; Podborský 2004, 279–280; Čižmář et al. 2008, 83–87). The crouched inhumation rite dominates; cremations exist but were rare (Kalicz 1985, 33–35; Zalai-Gaál 1988, 70–71; 2010, 16–19; Zalai-Gaál / Ódor 2008; Neugebauer-Maresch 1995, 98–99; Ruttkay / Teschler-Nicola 1983; Ruttkay 1985; Zápotoczká 1998, 116; 127; Čižmář et al. 2008, 83–87; Bistáková / Pažinová 2010).

In southern Transdanubia an E–W orientation of the corpse (head facing east, body lying on its left side) is most common (Zalai-Gaál 2010, 62–70), in contrast to the more varied orientations found further north in the Transdanubian Lengyel. Although there are a few exceptions (e. g. Group 1 and 15), E–W is also the most typical orientation in the burial groups of Alsónyék.

Within the study of the Lengyel culture, it has often been claimed that settlements and burial grounds were separate and, at least within the eastern distribution of the culture, that graves fall into definable burial groups (Wosinsky 1889, 331; Dombay 1960, 193–195; Kalicz 1985, 21; Zalai-Gaál 1988, 71; Němejcová-Pavúková 1986, 143). A large proportion of the Lengyel burials at Alsónyék were found in what appear to be spatially discrete groups, though it must be remembered that these are often somewhat artificial constructs. In some cases these groups are both compact and clearly separated from other groups, but in others they are rather diffuse and spatially overlap or merge. It should be noted that burials occurred at different depths, and those found higher up, often without detectable grave cuts or pits, were only recovered because of careful, deliberate search. In many cases the high groundwater level made not just full excavation but also basic observation of graves impossible. In other cases graves were not visible at all because the colour of their fills was exactly the same as the topsoil, and only skeletal remains or grave goods turned over by the machine indicated the position of a burial.

A total of 92 grave groups have been identified. In practical terms, such classification is essential for handling the large number of graves and for easy identification of their location *(fig. 2)*. On average there were 25–40 burials in a group (for example, Grave Group 13), with some as large as 100 burials (for example, Grave Group 59). The overall extent was variable, but on average the groups are 15–40 m in diameter. In a few instances many of the burials within a group even appeared to form rows (for example, in Grave Group 61). Some of the grave groups (for example, Grave Group 56) were near a house and in seeming alignment with its long axis.

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Fig. 3. A selection of different grave pit forms from all subsites. Clockwise from bottom left: burial 769 (subsite 10B), 4004 (subsite 10B), burials 3377 and 3378 (subsite 10B), burial 95 (subsite 10B), burial 3371 (subsite 10B), burial 6378 (subsite 10B), burials 211, 227 and 226 (subsite 11), burial 1918 (subsite 11).
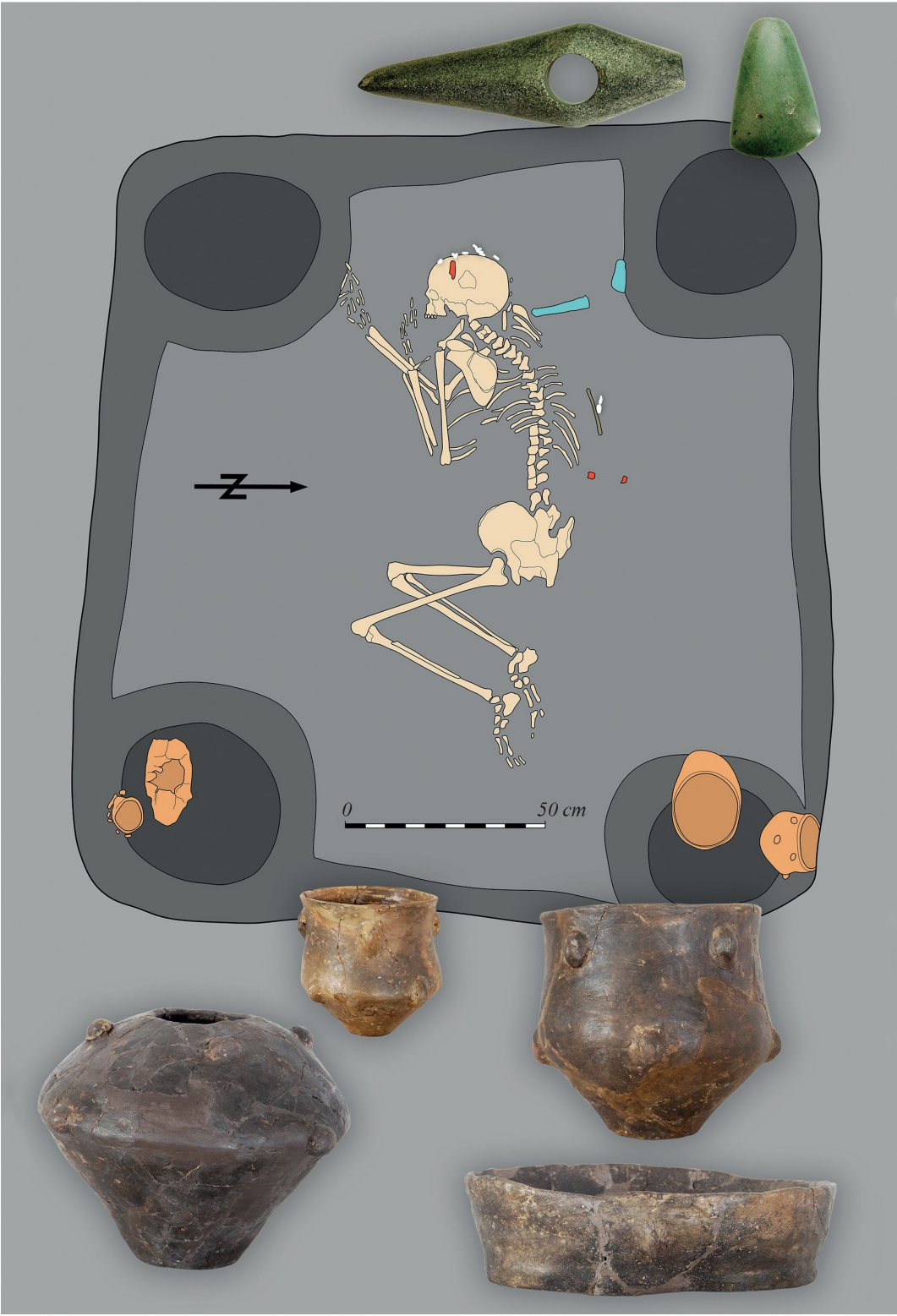
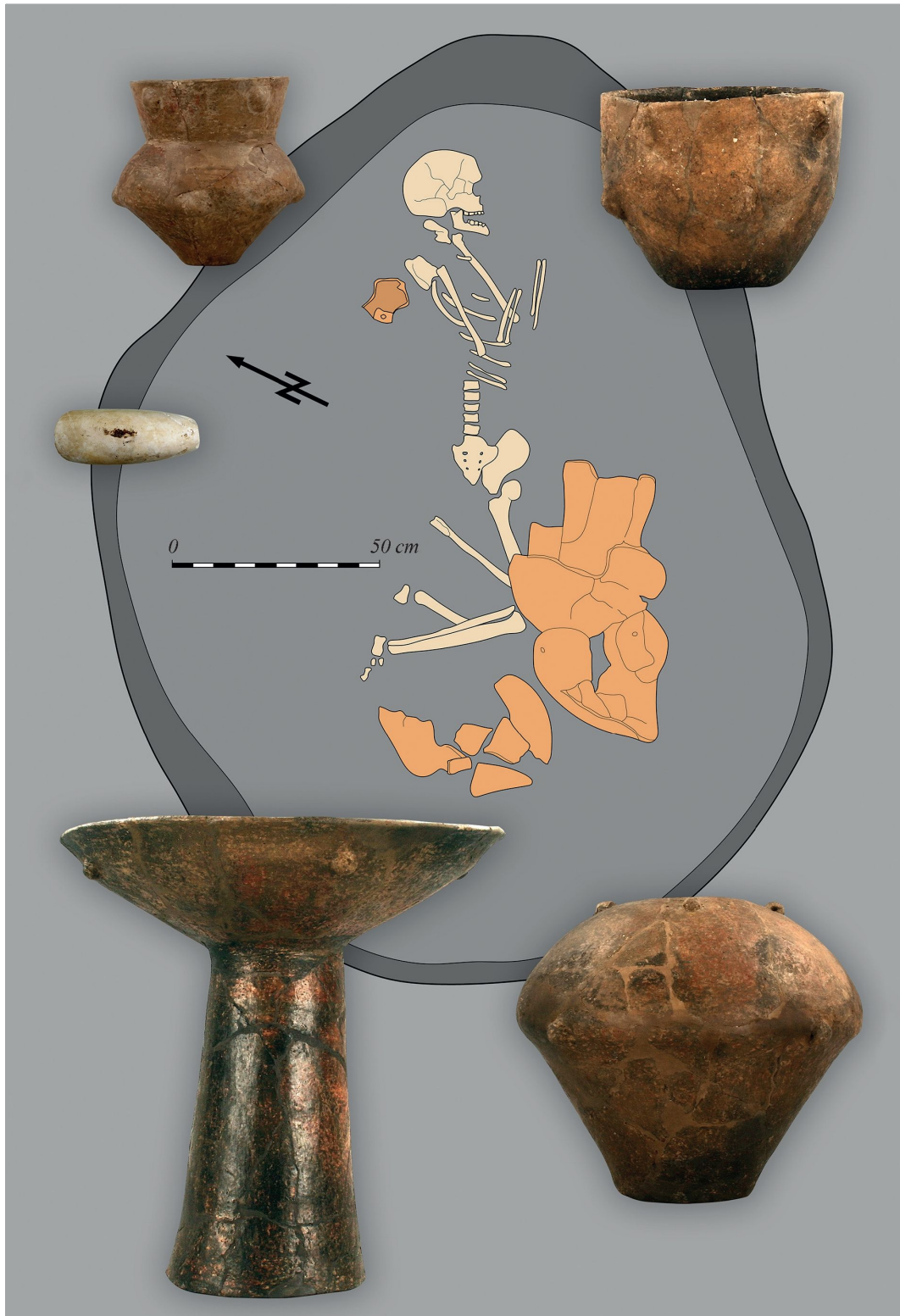Fig. 4. Burial 792 from subsite 10B.

Fig. 5. Burial 1235 from subsite 11.

Not all graves were part of groups. A number of graves were scattered across the site. Additionally, many of these graves were cut or placed into the fills of pits that contained occupation debris from the settlement. Many of these, as observed in subsites 5603 and 10B, lacked grave goods and were placed with their faces pointing in a direction other than south.

The burials followed a more or less strict burial rite. Although slight differences were often noted in burial orientations, an overall coherence can be observed. With the exception of a few grave groups (for example, Grave Groups 1 and 15), the orientation of the burials was E–W, with the head to the east, but with faces to the south (at least in subsite 10B and 5603). The dead were laid to rest in a contracted position on their left side. Some of the burials were found in higher soil layers without any detectable grave cut. The forms of the graves varied considerably *(figs 3–5)*. The most common were oval-shaped pits; there were some rounded rectangular pits. A rectangular pit with postholes in the four corners is a new type of construction within the Lengyel period first discovered at Alsónyék *(fig. 4)*. The difference between these two types of grave is reflected in the richness of the grave assemblages rather than in any chronological distinction, with the post-framed ones often being better furnished (ZALAI-GAÁL 2008; ZALAI-GAÁL et al. 2012b). The four-post graves in subsite 11 are less numerous, as well as less well furnished, than those in the northern part of subsite 10B (GALLINA et al. 2010 tabs 29–32).

The overall level of furnishing of the graves is also highly variable. While graves with four-post constructions contained grave goods that are both greater in quantity and perceived value, within the oval-shaped graves there is a large range, from completely unfurnished burials to those that approach the scale of furnishing of the graves with four-post constructions. A typical grave assemblage comprised 1–4 pots and perhaps a stone or bone tool. The pottery types are fairly varied in shape and size, and do not differ markedly from the ceramic material of other south-east Transdanubian Lengyel burials. The most characteristic types are the bowls and their variants (hollow-pedestalled bowls), cups, biconical vessels, tripartite vessels and Butmir-type pots *(figs 4–5)*. Some vases or amphorae, as well as anthropomorphic and zoomorphic representations (SOMOGYI / GALLINA 2013), are also found.

Among the more lavishly furnished burials, the artefacts include not only more pots, but often also polished and chipped stone tools (such as axes, adzes and flint blades), copper ornaments and imported shell beads (*Spondylus* and *Dentalium*). At Alsónyék, the most typical types of *Spondylus* ornaments are arm rings and belts; there are also *Spondylus* pendants and diadem-like forms. *Dentalium* shells often occurred in combination with copper beads, as necklaces or bracelets. Copper was used only for ornamentation in this period, mainly as arm rings, finger rings and necklaces combined with *Dentalium* beads *(fig. 6)*.

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Fig. 6. A selection of grave goods. Clockwise from left bottom: necklace of copper/malachite beads with *Spondylus* from burial 4032 (subsite 10B), *Spondylus* arm rings from burial 4087 (subsite 10B), belt from *Spondylus* beads from burial 6666 (subsite 10B), copper arm ring from burial 2222 (subsite 5603), polished stone axe from burial 792 (subsite 10B), small clay altar from burial 3368 (subsite 10B), chipped stone tools from burial 4071 (subsite 10B), copper finger rings with *Spondylus* beads from burial 3742 (subsite 10B).

Demography

From the c. 2300 excavated Lengyel burials, 862 from subsite 10B have so far been studied in detail (Köhler 2012; 2013). The evaluation of material from other subsites is ongoing, and that analysis will inevitably refine the view presented here. Nonetheless, although anthropological investigations of the numerous other excavated cemeteries of the Lengyel culture have been presented in detail (Zoffmann 1968; 1969–1970; 2004; 2014), the Alsónyék burials have already significantly changed our understanding of Lengyel practices. Although the condition of the skeletal material is moderately poor, with many fragmentary and incomplete bones, the exceptional volume of excavated burials has opened up new bioarchaeological and social-archaeological perspectives.

The demographic analysis of 862 skeletons suggests that the mortuary profile of the Alsónyék community is unrealistic *(tab. 1)*. Compared to normal expectations of pre-industrial societies, the proportion of neonates (<1 year) is far too low (1%), and consequently the life expectancy at birth is rather high (32.6 years). The proportion of Infant I (1–7-year-old) and Infant II (7–14-year-old) individuals is also low (9.1% and 8.0%). The low proportions of neonates and children in the cemeteries of Lengyel (and other prehistoric) communities are usual, however, and the data from Alsónyék are not exceptional. This phenomenon could be explained by the poorer preservation of their smaller bones or by the use of shallow graves for child burials, which were then destroyed by erosion, agricultural work or by the circumstances of rescue excavation.

Moreover, contrary to the expected values, the numbers of adult and mature individuals are almost equal (36.7% and 36.8% respectively), while very old individuals are practically missing from the cemetery (0.2%). The general or expected age distribution in prehistoric populations is that the proportion of children is close to 40%, while among the adults there are more younger adult (20–39 years) individuals, and fewer mature adults (40–59 years). The ratio of males and females is uneven, both at Alsónyék and in any other known Lengyel cemetery, almost all being characterised by a higher proportion of women *(tab. 1)*. This could be the result of selective mortuary practices, polygamy, and the death of males far from the community (or to flaws in the traditional methods of sex determination).

Researchers have often assumed that the characteristic Lengyel pattern of smaller or larger grave groups in some way reflects kinship links between the deceased (Kalicz 1985, 22; Němejcová-Pavúková 1986, 145; Zalai-Gaál 1988, 31; 77–80; 2010, 246–247). The analysis of the so-called hereditary anatomical variations in skeletal remains suggests relationships in a few cases (in some burial groups), but the demographic structure observed within several grave groups does not support this interpretation, because of the low ratio of children and the unequal sex and age proportions of the buried individuals found close together. In part due to the differing excavation methods and soil conditions, the verification of possible kinship links within a probably incomplete grave group is not easy. Further progress in this issue can be expected from aDNA testing on a large sample of the skeletal material.

Detailed palaeopathological analysis shows a relatively low incidence of trauma, non-specific inflammations and degenerative articular diseases. As for haematological disorders, *Cribra orbitalia* occurred with a high incidence among children, which probably reflects iron deficiency in the diet. Among the adults, the most frequent alterations were enthesopathic deformities, primarily on the calcaneum and on the patella, which are generally considered to be markers of more active lifestyle. Some rare and significant diseases occurred too. These include cases of benign tumour and of so-called pathological birth. Two cases of deformities affecting the frontal ligaments of the spinal column suggest DISH (diffuse idio-

Fig. 7. The classic deformation caused by tuberculosis on the vertebrae of burial 4027 from subsite 10B.

pathic skeletal hyperostosis); diabetes, obesity, a protein-rich diet and physical strain are among the possible causes of this condition (ORTNER 2003).

Beside these cases, the most important malady is the occurrence of the infectious disease tuberculosis (TB). The classic deformations were found on an adult male skeleton buried in grave 4027 (Grave Group 13). The most characteristic alteration was observable between the 4th lumbar and 10th thoracic vertebrae, where the vertebral bodies collapsed and fused *(fig. 7)* (KÖHLER et al. 2013; 2014).

TB is caused by bacterial species belonging to the *Mycobacterium tuberculosis* complex. Ancient DNA analysis to diagnose TB DNA in the skeletal material was performed on the skeleton and on other individuals buried in this grave group (PÓSA et al. 2015). This investigation confirmed the occurrence of TB in the case of three further individuals. Moreover, during the ongoing anthropological examination we found more cases (without the so-called typical symptoms) relating to TB, such as traces of periostitis on the inner surface of the ribs, multiple cavities on the vertebral bodies, and characteristic lesions on the inner surface of the skulls, which suggest that the disease can be seen as endemic in the Alsónyék community. The significance of these results is that this is one of the earliest representations of this infection in the Carpathian basin, and in Europe as a whole (KÖHLER 2012; MASSON et al. 2014). In the future, with the help of morphological and aDNA investigations, which can specify which member of the *Mycobacterium tuberculosis* complex caused the spread of the disease, we may be able to answer more of a list of still open questions (for example, whether human or animal bacterium infected the community, and how the disease can be connected to Neolithic lifeways, stock farming and the consumption of meat and milk).

Oral pathological examinations revealed a generally low frequency of carious lesions, alveolar abscesses and cysts, which suggests adequate dental hygiene. However, the frequent appearance of dental hypoplasia suggests an unpredictable food supply in early childhood.

There had previously been no isotopic investigations of the diet of Lengyel populations, and this is the first time that a large body of such evidence can be discussed (see BAYLISS et al. this volume, 40–48).

Settlement and subsistence

Previous knowledge of Lengyel architecture was very patchy. In Austria and elsewhere, traces of post-built houses have been found, but various sunken structures or pits cannot be interpreted any longer as residential buildings (Kalicz 2003, 8; Raczky 2005, 24; Pavúk 2003, 464). The above-ground, timber-framed buildings at Zengővárkony, uncovered in the 1940s, were for a long time the only known examples in Hungary (Dombay 1960, 57–65 Abb. 17). A part of a building with bedding trench and an apsidal end excavated at Veszprém-Felszabadulás út, and dated to Lengyel III (Raczky 1974), remains without parallel in Hungary.

Large-scale excavations in Hungary from the 1990s onwards opened up entirely new perspectives on above-ground timber-framed buildings, though their distribution in time and space remains uneven, and their dating is often uncertain. The rescue excavation in 2003 at Veszprém-Jutasi út (part of the same site as Veszprém-Felszabadulás út) yielded foundations of nine surface-level, timber-framed houses (Regenye 2004; 2007b). In Somogy County a number of Lengyel sites with traces of post-framed buildings have recently been found (Osztás et al. 2004; Krisztina Somogyi and Gábor Kocsis-Buruzs, pers. comm.). In Zala County, during the excavations preceding the construction of the M7 motorway, remains of post-framed buildings attributed to the Sopot culture as well as to the early Lengyel culture have been uncovered at Sormás-Török-földek (Barna 2011b). Also connected to the rescue excavations in Győr-Moson-Sopron County and Vas County, the remains of a few buildings with bedding trenches have been interpreted as belonging to the late Lengyel (III) period (Virág / Figler 2007, 360; Ilon / Farkas 2001).

It is Alsónyék above all which has provided exceptional new evidence (Osztás et al. 2012). The remains of 122 above-ground, timber-framed buildings were uncovered, and other buildings are known (based on the evidences of the geophysical survey) to lie in the unexplored areas (Rassmann et al. 2015). The majority of the house plans were incomplete, but well enough preserved for confident reconstruction *(figs 8–9)*. Structural elements and foundations could be seen clearly in 34 houses, mainly in the northern part of the investigated area, in subsite 10B, where 49 house plans were observed. Here we found closely spaced buildings, most forming rows, many of which had been repeatedly renewed.

The houses at Alsónyék were all large, post-framed buildings with one or two internal partition walls (thus very different from the LBK tradition) and often an open porch on the southern side. The houses all had a uniform north-north-west to south-south-east alignment, with slight variations across the entire settlement. The length of the buildings, including the porch, generally ranged between 14 m and 22 m, although a few were longer. Their width varied between 6 m and 8 m and they had rectangular or slightly trapezoidal ground plans *(fig. 8)*. House renewal on the same spot was recorded in some cases in subsite 10B (area 1). The more sturdy construction of some partition walls and northern walls can probably be explained by the enlargement of buildings. In terms of their structure, the new buildings did not differ from the earlier ones, save in their dimensions *(fig. 9)*.

The best parallels to the houses uncovered at Alsónyék come from nearby Zengővárkony and the buildings excavated at Veszprém. They also share numerous similarities with Pavúk's Type 3a and 3b, even though the latter are usually larger and have a rectangular

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Fig. 8. Foundations of post-framed buildings uncovered on subsite 10B. Top: aerial photo from the northern part of 10B, bottom, from the left: drawings and photos of House 11 and 13.
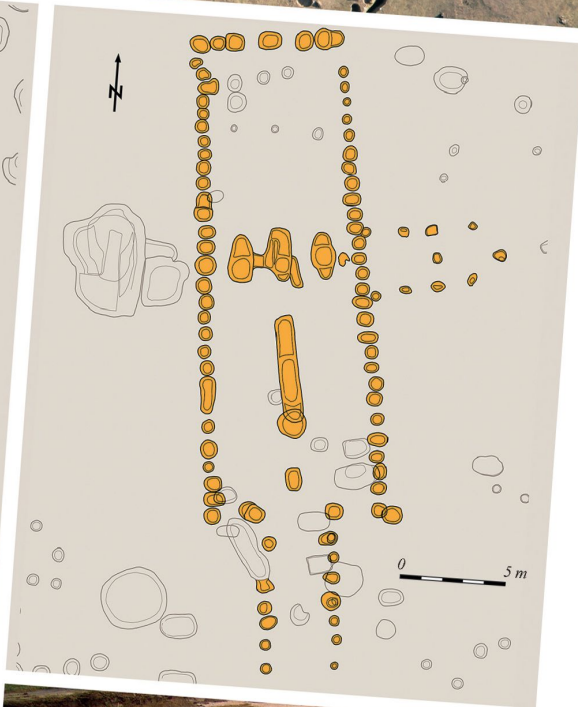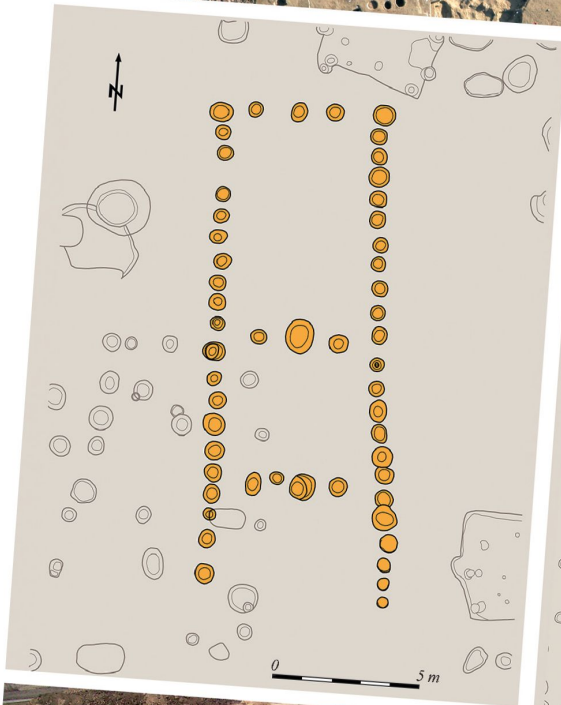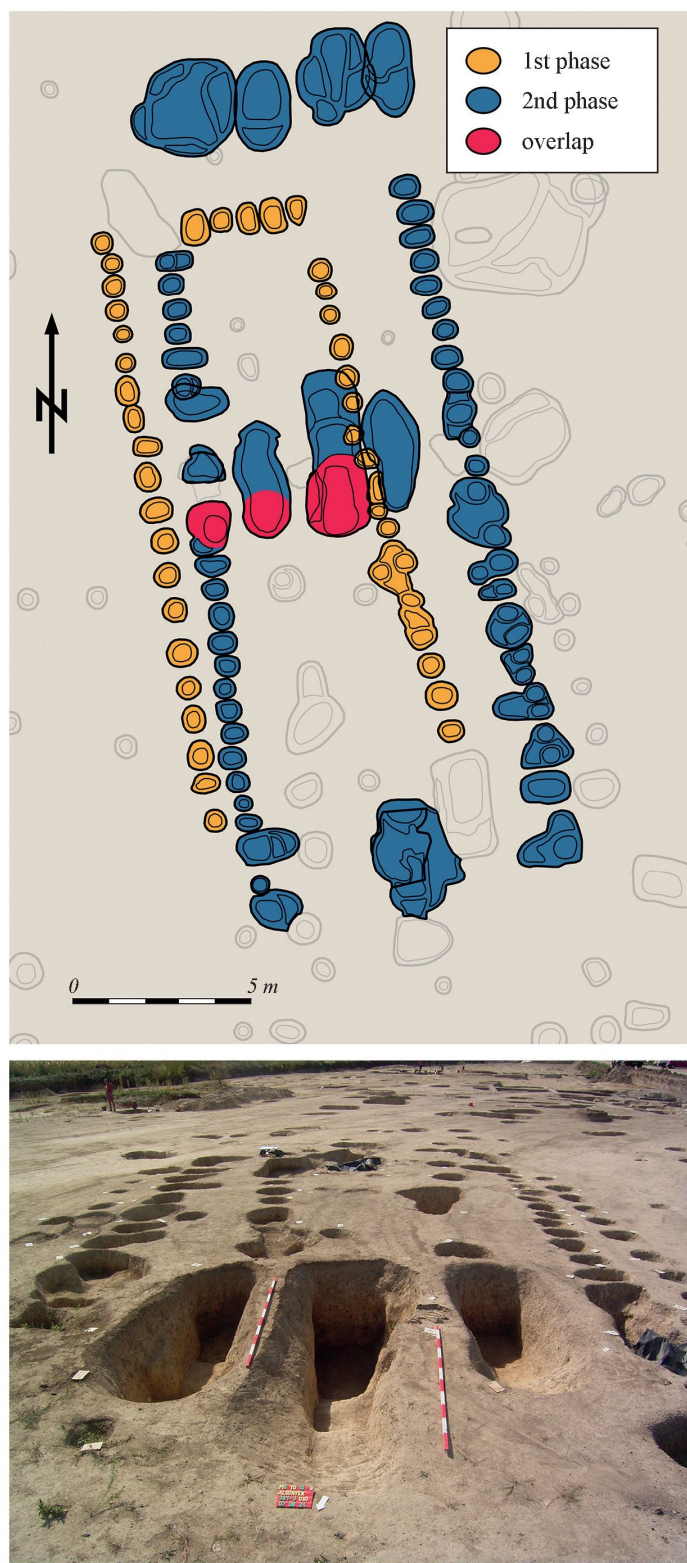
Fig. 9. Example of a house replacement on subsite 10B (House 26 and 27).
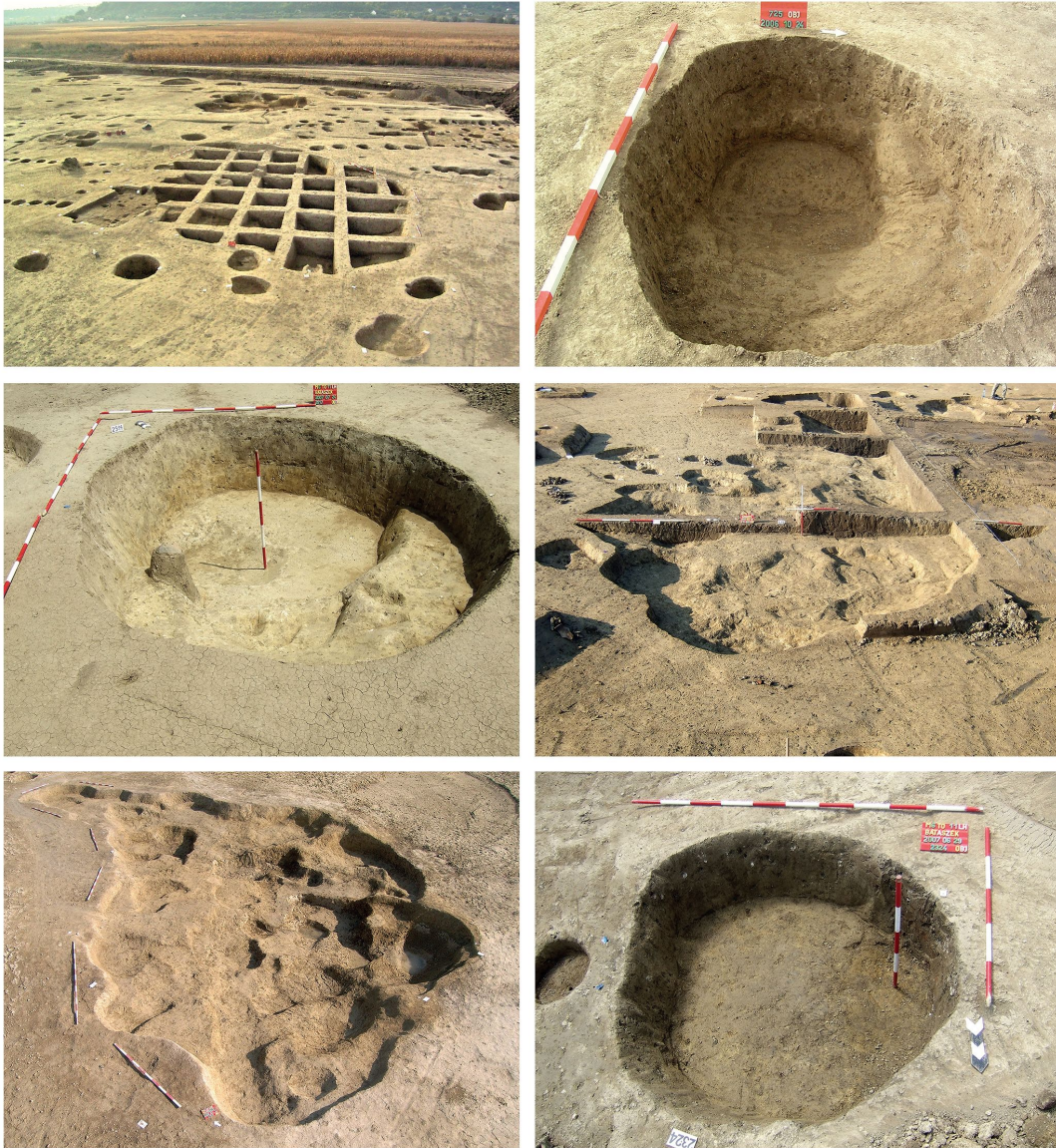
Fig. 10. A selection of Lengyel pits of different sizes and shapes. Clockwise from left bottom: Pit 2255 (subsite 5603), Pit 2514 (subsite 11), Pit 49 (subsite 10B), Pit 725 (subsite 10B), Pit 695 (subsite 11), Pit 2324 (subsite 11).

ground plan, while the Alsónyék buildings are smaller and slightly trapezoidal (DOMBAY 1960 57 Abb. 17; REGENYE 2004; PAVÚK 2003, 461 Abb. 8–9). The preliminary architectural assessment of the buildings uncovered at Alsónyék suggests that there were no major changes in architectural practices during the settlement's occupation. The house plans at the site and their architecture appear to reflect a fairly uniform and consistent practice.

Associated with the 122 excavated Lengyel houses at Alsónyék was a range of pit features containing occupation debris. These ranged from small individual pits (about 3 m in diameter) to massive, poly-lobulated multi-use pit complexes (up to 25 m across) *(fig. 10)*. In general, the fills of the pits contained a large quantity of broken pottery, stone and bone

tools, grinding stones, and both articulated and disarticulated animal bones. Burnt daub fragments regularly occurred in the fill of the large refuse pits, providing additional proof that some structures had been destroyed by fire and, also, that the rubble had been cleared away and that the occupants had kept the house areas clean.

The nature of the deposits in the pits and their proximity to timber buildings suggest that the material is directly related to Lengyel settlement on the site. Although it is hard to associate specific pits with particular houses, in some cases there do appear to be strong spatial associations (these are indicated in the text where the pit has been dated). The huge amount of ceramic material from the settlement pits is still being studied. Pottery analysis carried out so far shows no major differences in quality, technology, decoration and types between subsites 10B and 11. There is no information yet about the settlement pottery of subsite 5603. Pots from non-grave contexts appear to be more diverse in their types and sizes.

Great quantities of animal bones have been unearthed. Their analysis is also ongoing; 19,124 animal remains from 198 features from subsite 10B, area 1, have been studied so far (NYERGES 2013). The zoological finds were not heavily fragmented (88% of fragment lengths exceeded 5 cm), but only 62% of the bones were identifiable to species (NISP = 11,785). The proportions of domestic and wild species is balanced; 53.8% originated from domestic and 46.2 % from wild animals. Beef (*Bos taurus*: 42%) seems to have dominated in the meat diet of the settlement. Sheep and goat *(Ovis aries/Capra hircus)* together make up only 4%, while pig remains *(Sus domesticus)* are only slightly more numerous (6%). The bones of dog *(Canis familiaris)* from settlement pits represent 1%, but dogs must have had a significant role within the community as seen in the complete dog skeletons or skulls discovered beside the deceased (ZALAI-GAÁL et al. 2011a). In addition to remains of aurochs, mainly their horns, the jaws and tusks of wild boar, as well as tools made from deer, sometimes occurred as grave goods (ZALAI-GAÁL et al. 2012a, 70–75).

Most of the wild animal remains consist of aurochs (*Bos primigenius*: 21%) and red deer bones (*Cervus elaphus*: 17% skeletal bone and 1% antler). Together they are roughly equal in proportion to beef, which underlines the dominance of the consumption of large ruminants in the diet. Wild boar hunting (*Sus scrofa*: 6 %) was relatively common, but the remains of roe deer *(Capreolus capreolus)* are not significant (0.7% skeletal bone and 0.07% antler). The presence of fur-bearing mammals – bear *(Ursus arctos)*, wolf *(Canis lupus)*, hare *(Lepus europaeus)*, beaver *(Castor fiber)* and other species – on the other hand, is minimal.

Molluscs were also found, but in markedly lower quantities than in the early Neolithic Starčevo settlement features. Remains of catfish *(Silurus glanis)*, pike *(Esox lucius)* and the carp family (Cyprinidae) were also recovered.

All these archaeozoological data indicate a gallery forest with marshy areas rich in game, but which was also ideal for extensive livestock husbandry. Although such an environment was certainly home to numerous bird species, only a few fragmented bones of geese (Anserinae) or ducks (Anatinae) have been found. On archaeozoological grounds, meat consumption probably played a major role in the diet of the Lengyel people.

Although such a quantity of archaeozoological material is exceptional in Lengyel research, there are important, although smaller, comparative faunal assemblages from Zengővárkony, Pécsvárad-Aranyhegy and Villánykövesd (BÖKÖNYI 1959, 57–59; 1960; 1961; 1962). Bone tools have only been investigated in detail at Aszód (TÓTH 2013).

The wider Lengyel culture context

Previously, the span of the Lengyel culture in Hungary was conventionally estimated as covering 4900–4300 cal BC (e. g. KALICZ 2001, 9). Radiocarbon dates on seven human samples from Esztergályhorváti suggest that the beginnings of Lengyel culture can be dated to about 4990–4710 cal BC (BRONK RAMSEY et al. 1999, 202; BARNA 2007, 366–367). The mass grave of Esztergályhorváti represents the oldest, so-called formative phase of the culture both in terms of relative and absolute chronology (BARNA 1996). The end of the Lengyel development can be connected to only a few radiocarbon dates on animal bones from Zalaszentbalázs-Szőlőhegyi mező; this was assigned to the latest Lengyel (III) on the basis of the pottery assemblage (BÁNFFY 1995a; 1995b; HERTELENDI 1995, 105–107). Two radiocarbon dates on short-life samples might suggest a date of c. 4450–4370 cal BC for the decline of Lengyel culture in Hungary (OROSS et al. 2010, 397 Tab. 2). There are only a handful of other radiocarbon measurements from Lengyel deposits in Hungary, all on unidentified charcoal (QUITTA / KOHL 1969; 1970; KALICZ / RACZKY 1987, 29). Usually there are only one or two measurements per site (FIGLER et al. 1997; ILON 2004, 27 fig. 26) and often the context of samples is unclear (OROSS et al. 2010, 397).

Over the wider distribution of the Lengyel complex, typo-chronological schemes continue to be refined. These are essentially based on traditional typological archaeological analysis of pottery, especially of changes in shape and decoration. There is much debate about these schemes, but the picture can be outlined roughly as follows. Hungarian research basically distinguishes three main periods (I, II and III) in Lengyel culture periodisation, mainly based on Pavúk's classification (PAVÚK 2007). The Lengyel culture emerged in its primary territory on the basis of the late LBK groups and the Sopot culture (issues of the chronology of the transition between the Sopot and Lengyel cultures are discussed in detail in OROSS et al. (this volume [c], 167–168). For the time being, based mainly on typochronological observations, it is very difficult to compare the varying Lengyel material culture of different regions as far afield as Moravia and beyond (KALICZ 1974; ZALAI-GAÁL 2001b; 2002; ZALAI-GAÁL et al. 2014a; 2014b; SIKLÓSI 2010; VIRÁG / FIGLER 2007; PAVÚK 2007; DEMJÁN 2012; BARTA et al. 2013; STADLER / RUTTKAY 2007; KUČA et al. 2009; KALÁBEK et al. 2010). Only for the Moravian-Eastern-Austrian group (MOG) is the typo-chronology combined with series of radiocarbon dates (STADLER / RUTTKAY 2007). Carefully selected radiocarbon samples on short-lived material in closed contexts with diagnostic associations will be essential to unravel further cultural and chronological issues in the Lengyel culture. For Transdanubia at least, a programme is underway within the *The Times of Their Lives* project to meet this goal.

Altogether over 300 Lengyel sites are known in Hungary, about half of which can be found in southern Transdanubia (ZALAI-GAÁL 2008, 243 Abb. 2). According to the traditional classification, south-east Transdanubia (Baranya and Tolna Counties) belongs to the eastern distribution of the culture (KALICZ 1985, 12), and Alsónyék is in this region. This is one of the most intensively researched areas, beginning with the excavations on the eponymous site of Lengyel (Tolna County) (WOSINSKY 1891). Although numerous burials were unearthed here, neither the detailed archaeological record, nor most of the grave goods, nor the human remains have survived. From the 1930s a series of excavations on Lengyel sites, especially in Baranya County, began under the leadership of János Dombay. He investigated several important sites such as Pécsvárad-Aranyhegy (DOMBAY 1958), Villány-kövesd-Jakabfalusi út mente (DOMBAY 1959) and Zengővárkony-Igaz-dűlő (DOMBAY 1939; 1960). Lengyel burial grounds were found at almost all these excavations, among which Zengővárkony with its 368 graves is exceptional (DOMBAY 1960). In Tolna County both

extended field surveys (ZALAI-GAÁL 1982) and important excavations have yielded significant results. Notable are Szekszárd-Ágostonpuszta (ZALAI-GAÁL 1982, 7–9) and Pári-Altacker (TORMA 1969; ZALAI-GAÁL 1999), which also had burial grounds. The site of Györe is exceptional because of the presence of cremation burials (ZALAI-GAÁL 2000; ZALAI-GAÁL / ÓDOR 2008). In the 1970s, systematic excavations began at Mórágy-Tűzkődomb, 6 km west of Alsónyék (ZALAI-GAÁL 2001a; 2002). The finds from Mórágy created the basis for the wider analysis of over 600 burials found in south-east Transdanubia before the discovery of Alsónyék (ZALAI-GAÁL 2001b; 2010). According to this analysis, Lengyel burial started here in the Lengyel I period, but increased in scale during the Lengyel II period.

Apart from Lengyel, Zengővárkony and Mórágy, other excavations have opened only relatively small areas with test trenches (some 100–1500 m²), in which eight to 28 burials have been unearthed. Even smaller rescue investigations have produced one or two burials, such as Lánycsók in Baranya County (KALICZ 1977) and Kölesd-Lencsepuszta in Tolna County (ZALAI-GAÁL 1982, 11).

Following research by ZALAI-GAÁL (1990), intensive survey and mapping of Lengyel enclosures in Baranya County has been initiated. The remains of almost 20 Lengyel enclosures have been investigated in Baranya County, mostly using non-destructive survey techniques (BERTÓK / GÁTI 2011; 2014). Two of them (Szemely-Hegyes I and II) were investigated by test trenches and, based on the pottery, Szemely-Hegyes I can probably be dated to Lengyel II (BERTÓK et al. 2008; BERTÓK / GÁTI 2011, 12; 2014, 63).

Despite field surveys in the neighbouring Somogy County (ZALAI-GAÁL 1982), there have been only a few large-scale excavations. Two enclosures (OSZTÁS et al. 2004; SOMOGYI 2007) and traces of a few post-framed buildings have recently been uncovered (OSZTÁS et al. 2004; Krisztina Somogyi, pers. comm.; Gábor Kocsis-Boruzs, pers. comm.). Generally we can say that sites which can be dated to the Lengyel II period predominate in Somogy County, but there are so far hardly any detailed analyses of pottery assemblages (for example, for Kaposvár–Gyertyános: REGENYE 2011b).

Although as a byproduct of these excavations several settlements have come to light, we have no relevant information about settlement layouts, partly because of the small areas excavated. Settlement material has barely been evaluated, let alone analysed in detail. For a meaningful history of the region during the earlier fifth millennium cal BC, we need far more information on architecture, settlement material and mortuary practice.

On the basis of current knowledge, Zengővárkony is the only site which may have had a similar importance in the settlement network to that of Alsónyék. Its size is estimated at 40 ha. Except for a few burials from Zengővárkony and Györe, most of the burials investigated in southern Transdanubia appear to belong to the Lengyel II period. Alsónyék squarely fits the regional trend. The Lengyel burial grounds so characteristic for the eastern distribution of the culture are in sharp contrast with the western Lengyel area, thus cemeteries or even smaller grave groups were found neither in Vas and Zala Counties (see BARNA et al. 2015) nor on the Small Hungarian Plain (Győr-Moson-Sopron Counties).

Aims of the Alsónyék Lengyel dating programme

The aims of the dating programme are tied directly to a better understanding of Alsónyék, and its Lengyel occupation, as a Lengyel site of this scale was hitherto completely unknown. This is also the first time that Lengyel settlement and burial can be considered together. The scale and importance of the site lead to many research questions, some very specific and others more general. These include:

– What is the timing and tempo of settlement across the site? Was there a single florishing of activity, or did the site gradually grow? If the site grew over time, is it possible to determine those areas that were in use at the same time?

– Is there contemporaneity between the burial activity and settlement activity in areas across the site?

– What is the longevity of a single grave group? Were these groups used over a short period of time, potentially by extended family units?

– How did TB-affected burials relate to each other?

In order to investigate and answer these questions, it was necessary to develop a chronological framework focusing on the site at multiple levels. In doing so, it is possible to develop estimates for the start and end of activity associated with a single grave group, as well as an entire area, and finally the site as a whole.

Sampling strategy

Prior to beginning the radiocarbon dating programme, 'perfect pairs' of contemporary samples of human and terrestrial mammal bone from three burials (10B-3060, 10B-3472, and 5603-1821) were radiocarbon dated to check against the possibility of a freshwater reservoir offset. The statistical consistency of these results (Bayliss et al. this volume, tab. 1) suggests that the consumption of freshwater resources has not led to a wide-scale freshwater reservoir effect in human bone samples from the site. Some particular individuals may have consumed a larger proportion of such resources, however, and thus exhibit a measurable freshwater reservoir effect. The stable isotopic analyses for each individual, which were used to estimate the percentage of fish in their diet (see Bayliss et al. this volume, 41–45), attempted to identify and account for such individuals in the calibration process (see below).

As described by Bayliss et al. (this volume, 51–55), we adopted a sequential sampling approach for the Lengyel activity at Alsónyék. Our initial intention was to achieve a generational chronology for the furnished burials on the site, using the relative sequence provided by a site-based seriation of the types of pottery in the grave assemblages as prior information for the model. Unfortunately, at the time of sampling the construction of this seriation was only just beginning, using a sample of grave-assemblages from subsite 10B, although during the course of the sampling programme it was extended to include a sample of grave assemblages from subsite 11.

The first series of samples comprised approximately 20 burials from each of the three subsites, and was targeted at investigating questions relating to the overall use of the site and the potential for its growth and spatial development over time. This initial series not only attempted to cover the whole spatial area of Lengyel burials relatively evenly, but also targeted graves that were likely, on the basis of the preliminary analysis of the grave goods in advance of more detailed seriation work, to cover the whole temporal range of the graves. In addition a selection of graves was sampled where the skeletal remains showed signs of pathology, or the burial rite was outside of the norm, or the grave assemblage was sufficiently diagnostic that it was likely to fit into the site seriation as this was constructed.

After receiving the first-round results, preliminary modelling and simulation suggested that some grave groups might have been in use for only a few generations and that it might be possible to address questions relating to the timing or temporality of each group or a specific artefact type. Overall, however, burial in subsites 11 and 5603 did seem to persist

for some centuries. The ceramic-based seriation had, however, still to be successfully constructed, although an additional seriation on stone axe-heads was now also under construction (ZALAI-GAÁL et al. 2014a). A limited number of grave groups were targeted, in each case sampling being concentrated on burials with stratigraphic relationships or with diagnostic grave assemblages that were likely to fit in either the ceramic-based or the axe-based seriations. These were:
– Group 14, in subsite 10B, because it had graves that contained diagnostic stone axeheads;
– Group 13, in subsite 10B, because it was the only group investigated with definitive cases of tuberculosis;
– Group 61, in subsite 11, because it was one of the largest and best furnished groups within the subsite;
– Group 68, in subsite 11, because the initial results suggested that burial in the area might have endured for longer than elsewhere;
– Groups 56, 57 and 59, in subsite 5603, again because burial in these areas also appeared to be longer-lived than elsewhere on the site.

In the new belief that burial at Alsónyék may have persisted in some areas, graves were selected that contained copper artefacts, especially heavy arm rings and multi-row necklaces, which are different from the more common necklaces made of shell and copper/malachite beads, and so were thought to be in later use.

As described in BAYLISS et al. (this volume, 52–53), the second round of sampling of the Lengyel site at Alsónyék was not optimal, as it was based on the results of preliminary models that were subsequently found to be erroneous (following the discovery of the technical problem at Queen's University, Belfast). In particular, if the brevity of burial in subsite 10B (and to a lesser extent subsite 11) had been apparent at the time the second round of samples was submitted, the concentrated sampling of particular burial groups would probably not have been undertaken. It may also have been apparent that the search for chronological progression in a seriation where the vast majority of the graves were buried within a few generations around 4700 cal BC (see BÁNFFY et al. this volume, fig. 8) was doomed to failure.

Sampling of burials in the third round of submission was therefore targeted on managing the effect of the withdrawal of the initial series of dates from Belfast. The main focus of this submission, however, was the dating of the Lengyel settlement. A series of samples from settlement pits were submitted, in an attempt to discern whether there was any chronological difference in the use of the three subsites for settlement and burial, while also adding to the overall dataset to develop the chronological framework for the site. The most important element of the sample selection process was to ensure that the dated sample actually dates to the time of its deposition, and to do this meant that only bone that was articulated in the field or found to be articulating in post-excavation analysis could be considered. Armed with a pool of potential samples, it was then possible to select samples from pits that were spread across the site, had close associations with individual houses, and had stratigraphic relationships with other pits or human burials.

The samples and the structure of the models

The preferred models for the Lengyel occupation in each subsite at Alsónyék are defined in *figures 12–13; 15–16; 18–19*. Each model estimates the chronologies of the burial and settlement activities in a subsite, using uniform prior distributions for the spread of each

Fig. 11. Plan of subsite 5603 with the dated features.
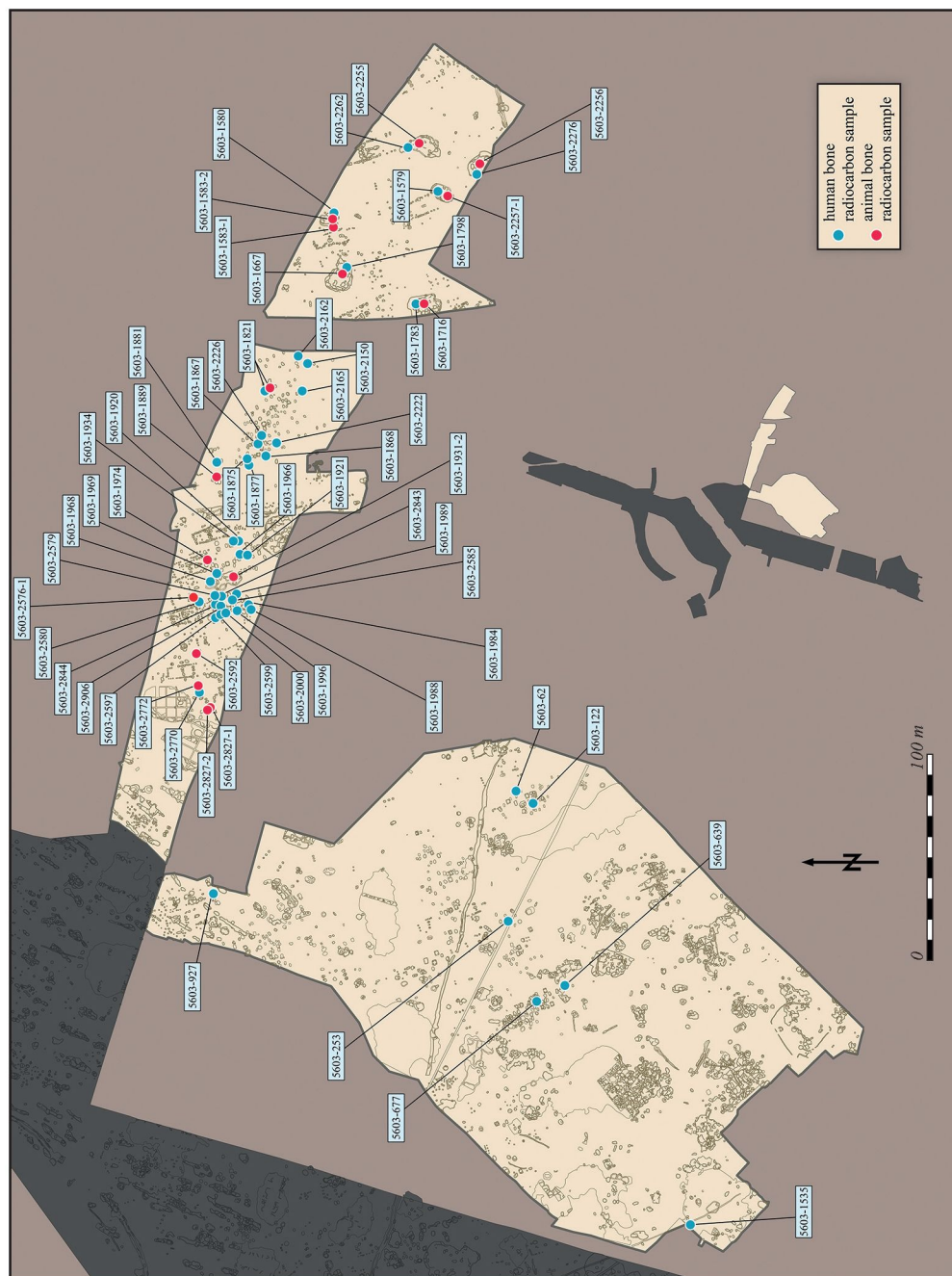
activity on each subsite (BUCK et al. 1992; BRONK RAMSEY 1995). As described above, more intensive dating was undertaken on a few grave groups and, to overcome the possibility of bias related to oversampling, groups with six or more dated burials were constrained within their own uniform prior distributions, which were then nested within the overall uniform phase of activity for the relevant burial phase. The effect of this approach is to reduce these larger sets of dates that may relate to an extremely short period of calendrical time to two effective parameters within the overall model.

Where a burial cuts into the top of a settlement pit, it has been included as providing a *terminus ante quem* for the date of the pit (so that it only provides a constraint on the date estimates for settlement activity), but it has been included fully in the model for the burial activity.

For each sub-site a general outlier model (BRONK RAMSEY 2009b, 1025–1028) has been employed, which weights each radiocarbon date in accordance with its probability of being an outlier. Each radiocarbon date has been given a prior probability of 5% of being an outlier; the posterior probability calculated by the model of its being an outlier is shown on the relevant figure. So, for example, *OxA-27472: 11-679* has a prior outlier probability of 5% but a posterior outlier probability of 28% *(fig. 15)* and so has been downweighted in the model accordingly. The choice of this approach is discussed further below.

Subsite 5603

A total of 65 radiocarbon results are available from subsite 5603 *(fig. 11; tab. 2; 5)*. These come from 60 submitted samples, comprising 44 samples of human bone and 16 samples of animal bone. The human bone was from inhumations spread across eight grave groups (42, 52–54 and 56–59), with a further nine burials being ungrouped. The animal bone was from a total of 13 settlement pits and one tool made from red deer antler (Burial 5603-1821). Further details of the dated human skeletons and graves from each of the subsites are given in *table 5*. The chronological model for burial and settlement in subsite 5603 is shown in *figures 12* and *13*.

5603: southern. Six inhumations were dated from four grave groups (Groups 42 and 52–54) in the southern excavation of subsite 5603 (burials 62, 122, 253, 639, 677 and 927). All these samples were selected because they added to the overall spatial coverage of dating at the site and they also had axes that were initially in a seriation. Additionally, burials 62, 122 and 639 all contained copper beads.

5603: main. Four grave groups (56–59) are represented, and they have one (Group 58), five (Group 57), ten (Group 59) and 13 (Group 56) burials dated respectively. The groups are discussed below in numerical order starting with Group 56.

Group 56. The 13 burials dated from Group 56 are relatively evenly spread across the approximately 35 burials that form the group. Of the 13, seven are not related stratigraphi-

▶

Fig. 12. General outlier model for the Lengyel burial activity on subsite 5603. Each distribution represents the relative probability that an event occurred at some particular time. For each of the radiocarbon measurements two distributions have been plotted: one in outline which is the result of simple radiocarbon calibration, and a solid one which is based on the chronological model use. The other distributions correspond to aspects of the model. For example, '*start: 5603 – Cemetery*' is the estimated date that the burial began on this subsite in the Lengyel period. The large square brackets down the left-hand side of *figs 12–13* along with the OxCal keywords define the overall model exactly.

Boundary end: 5603 - Cemetery
=SUERC-52854: 5603-2276
=SUERC-53381: 5603-2770
=MAMS-20665: 5603-2262
=SUERC-52844: 5603-1968
=MAMS-20661: 5603-1798
=SUERC-52842: 5603-1783
=SUERC-52835: 5603-1580
=SUERC-52834: 5603-1579
R_Date MAMS-11941: 5603-1535
Phase ungrouped burials
Boundary end: Grave Group 59
R_Date SUERC-53350: 5603-2226 [O:4/5]
R_Date OxA-28938: 5603-2222 [O:4/5]
R_Date OxA-28943: 5603-2165 [O:6/5]
R_Combine 5603-2162 [O:6/5]
R_Date OxA-28247: 5603-2150 [O:4/5]
R_Date OxA-27453: 5603-1875 [O:4/5]
R_Date OxA-27457: 5603-1877 [O:4/5]
Sequence 5603-1877 & 5603-1875
R_Date SUERC-53341: 5603-1868 [O:4/5]
R_Combine 5603-1867 [O:7/5]
R_Date OxA-26699: 5603-1821h [O:4/5]
R_Date OxA-26698: 5603-1821a [O:4/5]
Combine 5603-1821
Phase Group 59
Boundary start: Grave Group 59
Sequence Group 59
R_Date SUERC-53342: 5603-1881 [O:4/5]
Phase Group 58
R_Date OxA-27454: 5603-1969 [O:4/5]
R_Date SUERC-53343: 5603-1966 [O:5/5]
R_Date OxA-28939: 5603-1921 [O:4/5]
R_Date OxA-28944: 5603-1934 [O:4/5]
R_Date OxA-27450: 5603-1920 [O:4/5]
Phase Double burial
Phase Group 57
Boundary end: Grave Group 56
R_Date SUERC-53354: 5603-2844 [O:4/5]
R_Date SUERC-53355: 5603-2906 [O:4/5]
Sequence 5603-2906 & 5603-2844
R_Date OxA-27456: 5603-2843 [O:4/5]
R_Date SUERC-53353: 5603-2599 [O:4/5]
R_Date OxA-27452: 5603-2597 [O:5/5]
R_Date SUERC-53351: 5603-2580 [O:3/5]
R_Date OxA-27459: 5603-2579 [O:5/5]
R_Date SUERC-53346: 5603-2000 [O:4/5]
R_Date OxA-27451: 5603-1996 [O:4/5]
R_Date SUERC-53352: 5603-2585 [O:3/5]
R_Combine 5603-1989 [O:3/5]
Sequence 5603-1989 & 5603-2585
R_Date SUERC-53345: 5603-1988 [O:4/5]
R_Date SUERC-53344: 5603-1984 [O:4/5]
Sequence 5603-1984 & 5603-1988
Phase Group 56
Boundary start: Grave Group 56
Sequence 5603: Main
R_Date SUERC-53315: 5603-122 [O:4/5]
R_Date OxA-27637: 5603-62 [O:4/5]
Phase Group 54
R_Date OxA-27478: 5603-253 [O:4/5]
Phase Group 53
R_Date SUERC-53320: 5603-677 [O:4/5]
R_Date SUERC-53316: 5603-639 [O:4/5]
Phase Group 52
R_Date OxA-27479: 5603-927 [O:4/5]
Phase Group 42
Phase SE Group
Phase 5603
Boundary start: 5603 - Cemetery
Sequence 5603 - Cemetery
Phase 5603 - Cemetery and Settlement [Outlier_Model("General",T(5),U(0,4),"t")]

5000 4900 4800 4700 4600 4500 4400 4300

Posterior density estimate (cal BC)

Fig. 13. General outlier model for the Lengyel settlement activity on subsite 5603. The format is as described in *fig. 12*. The large square brackets down the left-hand side of *figs 12–13* along with the OxCal keywords define the overall model exactly.

cally to other dated features and the remaining six form separate sequences. Of the seven burials that are not stratigraphically related to other dated features (1996, 2000, 2579, 2580, 2597, 2599 and 2843), only 2580 and 2597 were in graves lacking four-post constructions. Burials 2599 and 2843 were relatively well furnished, with *Spondylus* and *Dentalium* shell ornaments. Burial 2580 was initially not placed into this group, as it is approximately 3.75 m north of the nearest burial, but it is in line with the easternmost row of burials and so has been included.

The first sequence has burial 1984 cut by burial 1988. The lower grave was well furnished and included *Spondylus* shell, a cattle (wild or domesticated) shoulder and the tusk of a wild boar, while the upper grave had a polished stone axe and an adze. The second sequence has burial 1989 cut by burial 2585. There are two measurements from burial 1989. The results are statistically consistent (T′ = 0.2; T′(5%) = 3.8; ν = 1; WARD / WILSON 1978) and have been combined prior to calibration to form mean 5603-1989 (5865 ± 25 BP). The third sequence has burial 2906 cut by burial 2844. Burial 2906 was in a grave with a four-post construction.

Group 57. Group 57 lies a little over 10 m to the east of Group 56. Of the approximately 40 burials, five were dated; with one exception these are concentrated in the middle of the group. There are no stratigraphic relationships between the dated burials. Burials 1921 and 1969 contained copper rings and beads, while 1920 and 1934 were interesting as these formed a potential double burial, since no relationship was observed that would indicate two separate grave cuts. Burial 1966 was of the four-post type, and contained six pots.

Group 58. Group 58 comprises six burials. It lies just over 6 m north of Group 59, and it is therefore feasible that these burials are associated with that activity. However, for the purposes of the modelling the one dated burial from Group 58, burial 1881, has been kept separate.

Group 59. Group 59 is one of the largest and most spatially spread, and contains approximately 100 burials. Of these, ten have been dated that have a relatively even spread across the group. There is one sequence of burials, with burial 1877 being cut by 1875. All other dated burials are not stratigraphically related to other dated features.

There are two radiocarbon measurements on paired human and terrestrial mammal bones from burial 1821. These two results are statistically consistent (T′ = 1.7; T′(5%) = 3.8; ν = 1). Since the measurements are not from the same organism, they have been combined using the Combine function in OxCal. There are also two measurements from the skeleton in grave 1867, which are statistically consistent (T′ = 0.0; T′(5%) = 3.8; ν = 1) and have been combined prior to calibration to form mean 5603-1867 (5869 ± 25 BP).

Of the remaining six burials that do not have stratigraphic relationships with other features, only burial 1868 was in a grave of four-post construction. It also contained an anthropomorphic-faced pot (SOMOGYI / GALLINA 2013). Burials 2150, 2162 and 2222 all had copper arm rings, with the arm rings of the former two being quite substantial in size and weight. There are two results from burial 2162 that are statistically consistent (T′ = 2.0; T′(5%) = 3.8; ν = 1) and have been combined prior to calibration to form mean 5603-2162 (5705 ± 26 BP). The final two burials, 2165 and 2226, were accompanied by an axe and one pottery vessel, and three pots respectively.

Ungrouped burials. Nine further burials were dated across subsite 5603 and these all remain ungrouped. With the exception of burial 1535, all were dug into the settlement pits (noted below).

Settlement pits. Thirteen settlement pits spread across subsite 5603 were dated. These ranged in size from approximately 1 m to over 15 m in diameter. Seventeen radiocarbon dates are available from articulated or articulating animal bone in pits that are related to the settlement activity, with additional dates (noted above) coming from graves that cut the pits.

Eight dated settlement pits have observed stratigraphic relationships with dated burial pits. In five cases, the dated burials (2276, 1579, 1783, 1968 and 2770) are comfortably later than the pits into which they are cut (2256, 2257, 1716, 1931 and 2772 respectively).

Pit 2256 is a large settlement pit (c. 14 m long) that was not excavated completely. There are two results from a cattle metapodium, which are statistically consistent (T′ = 0.1; T′(5%) = 3.8; ν = 1) and have been combined prior to calibration to form mean 5603-2256 (5693 ± 20 BP). Burial 2276 was one of two graves cut into the top of the pit.

Pit 2257 is slightly smaller than pit 2256 and situated c. 12 m further north-west. It has a stratigraphic relationship with only one burial which is dated, unfurnished grave 1579.

Pit 1716 is a large settlement pit (c. 15 m long) that was cut by unfurnished burial 1783. The grave was cut into the upper layer of the pit, near the middle of its excavated portion. Four other, undated, graves were cut into the top of this pit.

Pit 1931 has an elongated oval shape (c. 18 m long) and is situated between Groups 56 and 57. Burial 1968 was dug into the upper layer of the northern part of this pit, and contained two copper finger-rings and copper and *Dentalium* beads.

Pit 2772 is a small oval-shaped settlement pit (3 m in diameter). There are two results from a red deer carpal bone. The measurements are not statistically consistent at 95% confidence (T′ = 4.2; T′(5%) = 3.8; ν = 1). They are consistent at 99% confidence, however, and have been combined prior to calibration to form mean 5603-2772 (5740 ± 17 BP). The pit is intrinsically interesting because it contained a large antler tine, fragments from an altarpiece and traces of fire. Also, it is cut by burial 2770, which is a double burial of two children (the older one of whom was dated).

In the remaining three cases where burials were recorded as cutting settlement pits, the dated burial appears to be anomalously old in relation to the date from the underlying settlement pit. Given the size of many of the settlement pits, and that some of them were clearly dug and redug over time, it is not completely unexpected that in at least a few cases the burials dug into the top of part of a large pit might predate material in a pit if the two sampled contexts are not located near one another.

Pit 2255 is the easternmost large pit from subsite 5603 and has an irregular oval shape (c. 18 m long; *fig. 11*). It has stratigraphic relationships with eight burials of which burial 2262 is dated. It was dug into the northern edge of the pit and contained only one pot, and appears to have been buried before the part of the pit which produced the pig tibia dated by SUERC-52846 was infilled.

The radiocarbon date (SUERC-52837) from large settlement pit 1667 (c. 15.5 m long and 13 m wide) is about 300 years younger than the date from burial 1798 (MAMS-20661), which was dug into its upper layer. In this case, again, it appears that the juvenile wild boar femur is from a part of the pit complex that was filled considerably later than the part that was cut by grave 1798.

Pit 1583 is an irregularly shaped pit (c. 8.5 m in diameter). There are six graves that intercut with the pit, and unfurnished burial 1580 was chosen for dating. However, upon more detailed consideration of the archaeological record (site plans and photographs), it became clear that the edge of the burial was actually cut by the pit rather than *vice versa*. The radiocarbon result from the skeleton is earlier than the two results from different samples of articulating animal bone in the pit, which are statistically consistent (T′ = 0.0; T′(5%) = 3.8; ν = 1), and so this relative order is preferred and used in the model.

Five pits (1889, 1974, 2576, 2592 and 2827) have no stratigraphic relationships with other dated features. The result on an articulating dog humerus from pit 2576 dates from the last third of the sixth millennium cal BC (SUERC-52848), despite the fact that the pit contains Lengyel pottery. This may be the result of poor excavation whereby two intercutting pits were not identified separately. Whatever the reason, the result does not relate to Lengyel activity and has been excluded from any modelling. The two results from articulating cattle and boar bones in pit 2827 are not statistically consistent (T′ = 7.0; T′(5%) = 3.8; ν = 1), and lend further support to the notion that many of the larger pits were probably used over a protracted period of time.

Only one radiocarbon date from subsite 5603 (*SUERC-52837:5603-1667*; O: 19/5; *fig. 13*) has a posterior outlier probability of more than 10%. This is no more than would be expected in a dataset of this size, where all the data are compatible with the model presented.

Subsite 11

A total of 69 radiocarbon results are available from subsite 11 (*fig. 14; tabs 3; 5*). These come from 62 submitted samples, comprising 45 samples of human bone and 17 samples of animal bone. The human bone was from inhumations spread across ten burial groups (60, 61, 66, 68, 71, 73, 76, 79, 83 and 88), with a further four burials being ungrouped. The animal bone was from a total of 16 settlement pits.

The demarcation of burial groups in subsite 11 is more tentative than in the other sub-sites. While there are clear cases of groups being tightly defined spatially, some even with identifiable rows of graves (such as Group 61), many are more ambiguous, as will be noted below. The larger grave groups were found at the edge of the excavated area, and were not fully defined.

Group 60. Group 60, in the southern part of subsite 11 and close to Grave Group 61, is well defined spatially, with graves that sometimes form rows. There are approximately 30 graves in the group, of which two were dated (190 and 333). There are two measurements from burial 333 that are statistically consistent ($T' = 0.0$; $T'(5\%) = 3.8$; $v = 1$) and have been combined prior to calibration to form mean 11-333 (5805 ± 23 BP). The grave is of possible four-post construction, and stands out as having copper rings and beads, as well as a polished stone axe, a belt of *Spondylus* shell and ten pots (GALLINA et al. 2010 tab. 37,2).

Group 61. Group 61 comprises Group 61A and Group 61B, with 61A being fairly well defined spatially with an indication of some rows of graves. The two groups are presented here together, but are modelled separately. In total there are approximately 80 graves across the group.

Within Group 61A there is one dated grave sequence, with burial 293 cutting burial 228. There are another six graves (263, 264, 272, 295, 319 and 337) which form an arc across the north of the group and down its eastern side. In the burials of this grave group there were more than the average number of vessels, and 319 and 272 in particular (GALLINA et al. 2010 tab. 37,1) have large numbers of pots (nine and eleven vessels, respectively). Grave 337 has a four-post construction, and burial 319 may also have a structure of the same type.

Within Group 61B there are two dated burials (145 and 324). Both burials contain copper artefacts, with 145 having two copper arm rings.

Group 66B. One unfurnished burial (1850) has been dated from this grave group, as it cut settlement pit 1800 (see below).

Group 68. There are approximately 45 burials in Group 68, of which 19 burials have been dated. This group is less well defined than Group 61, on the western limit of the excavated area, becoming more diffuse at the edges and with little suggestion of internal structuring (that is, without discernible rows). The dated burials are spread relatively evenly across the group, with eight burials intercutting to form four sequences. The remaining burials do not have stratigraphic relationships to any other dated features.

Burial 679 is a child with no grave goods which was recorded as being cut by burial 724, which contained a jar and three other pots, and had only the mandible remaining. The result from burial 679 is too recent given the stratigraphic position of the body, and upon re-examination of the archaeological record the relationship is unclear. The stratigraphic ordering has therefore been removed from the model.

Burial 1191 is cut by burial 1192, which contains a *Taschengefäss* (ZALAI-GAÁL et al. in press). Burial 1793 contained a macehead, and is cut by burial 1860. Burial 1848 is cut by burial 1822. With the exceptions noted, these graves are all very poorly furnished.
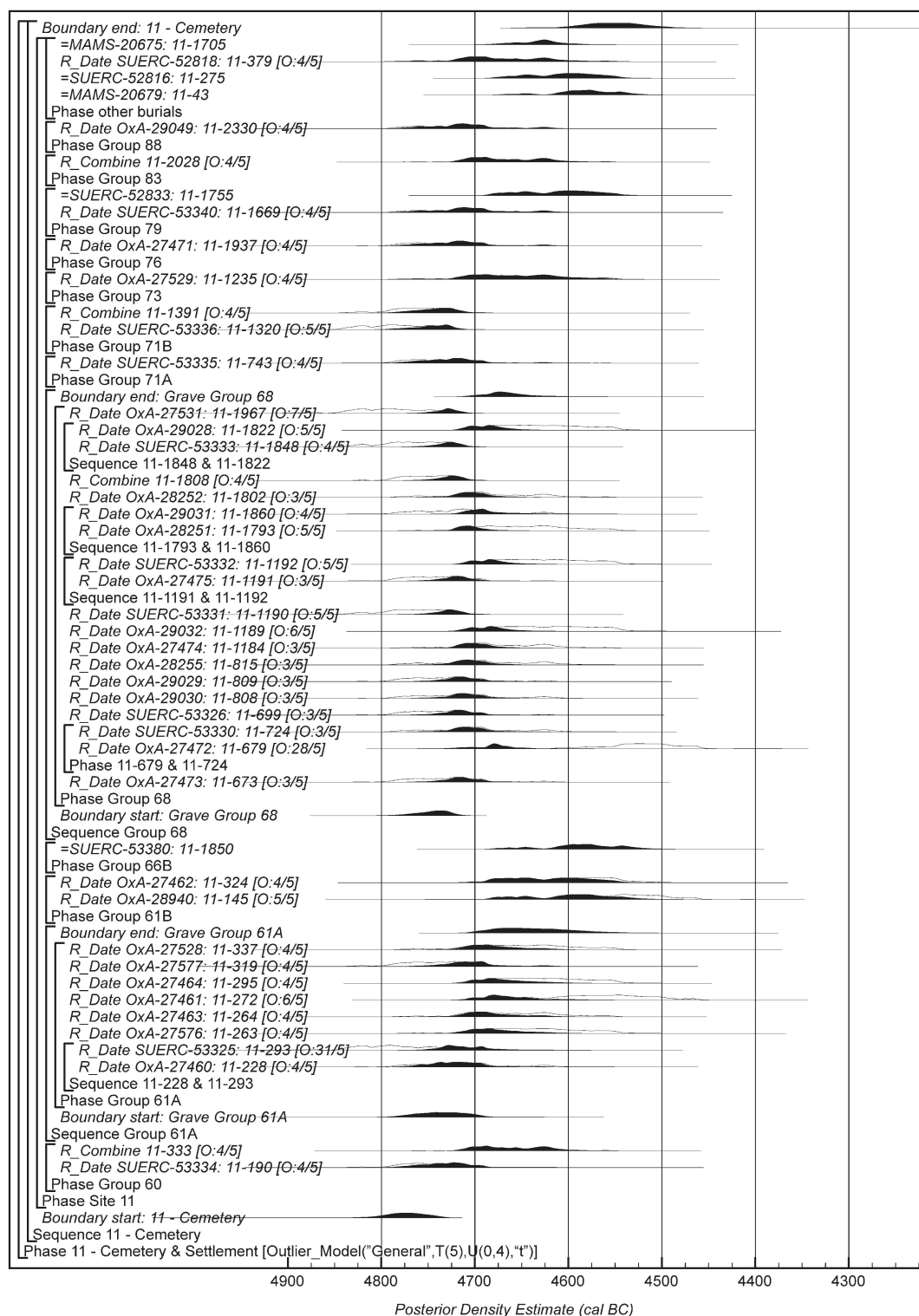
Fig. 14. Plan of subsite 11 with the dated features.

Fig. 15. General outlier model for the Lengyel burial activity on subsite 11. The format is as described in *fig. 12*. The large square brackets down the left-hand side of *figs 15–16* along with the OxCal keywords define the overall model exactly.
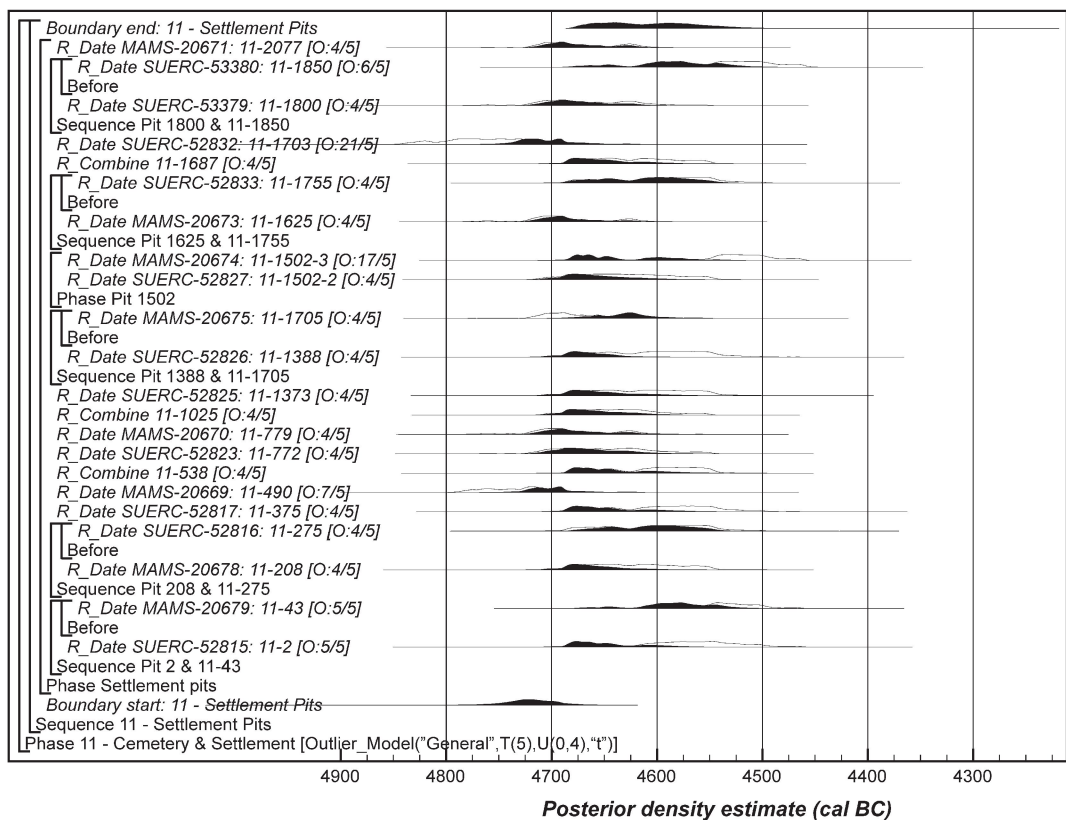
Fig. 16. General outlier model for the Lengyel settlement activity on subsite 11. The format is as described in *fig. 12*. The large square brackets down the left-hand side of *figs 15–16* along with the OxCal keywords define the overall model exactly.

The remaining 11 dated burials are not inter-stratified with any other dated features. Burials 699 and 1967 (GALLINA et al. 2010 tab. 32,4) are in graves of four-post construction and contain bone tools and flint in addition to pots. Burial 1184 contains a pot, a *Spondylus* pendant and a polished stone axe. The remaining graves (673, 808, 809, 815, 1189, 1190, 1802, 1808, 1822 and 1848) are all poorly furnished. There are two measurements from burial 1808 that are statistically consistent (T′ = 0.1; T′(5%) = 3.8; ν = 1), and have been combined prior to calibration to form mean 11-1808 (5878 ± 24 BP).

Group 71. Group 71, along the eastern side of the excavated area, has approximately 50 graves, of which three have been dated. The group is similar to 61 insofar as there is a main area of the group, 71B, which has internal spatial structuring which suggests rows, or at least an even separation of the graves. However, the much smaller 71A has only five graves with no discernible patterning.

The dated grave in 71A (burial 743) is a possible four-post construction grave, with a polished stone axe, a flint blade and six pots. The two graves from 71B (1320 and 1391) are less than 3 m from one another in the southern part of the group. Burial 1320 is of the four-post grave type and contains seven pots, copper beads and a copper finger-ring (GALLI-NA et al. 2010 tab. 30). There are two measurements from burial 1391 that are statistically consistent (T′ = 0.0; T′(5%) = 3.8; ν = 1), and have been combined prior to calibration to form mean 11-1391 (5887 ± 28 BP).

Groups 73, 76, 79, 83 and 88. These groups lie to the north of those discussed so far. Burial 1235 *(fig. 5)* is one of nine graves in Group 73. In addition to six pots and a polished stone adze, this burial also contained a grinding stone. Burial 1937 is one of the graves in Group 76, which is a relatively large group of approximately 55 graves. This particular burial was selected for dating because one of its well preserved pots was of a distinctive shape and had painted decoration that could possibly be included in the seriation, in addition to containing an axe. Burial 1669 is one of about a dozen that were grouped into the amorphous-shaped Group 79, and it contained seven pots. Also in this group was burial 1755, which was dated as it cut settlement pit 1625 (see below). Burial 2028 was one of two graves in Group 83. There are two statistically consistent measurements on the burial ($T' = 0.3$; $T'(5\%) = 3.8$; $v = 1$), which have been combined prior to calibration to form mean 11-2028 (5811 ± 26 BP). Burial 2330 was placed in Group 88, which contained four other graves.

Burials not within groups. Burials 43, 275 and 1705 are cut into settlement pits and are discussed below. Burial 379, with three pots, an axe, a bone tool and a flint blade, was submitted because it was thought to cut pit 538, although reassessment of the site archive suggests that this relationship is insecure, so it has not been included in the model.

Settlement pits. A total of 16 settlement pits were dated from subsite 11, and five of these pits (2, 208, 1388, 1625 and 1800) contained a sequence that ends with an inhumation cut into the top of the pit fills. The pits are relatively evenly scattered across the area where Lengyel deposits were excavated.

Pit 2 is one of the largest settlement pit complexes (minimum diameter of 13 m) in the subsite, and was not excavated fully because it extended beyond the western edge of the excavation limits. It was cut by two burials of which unfurnished burial 43 is dated.

Pit 208 is also a very large pit complex, which is situated at the southern part of the subsite, c. 17 m to the east of Group 61. Its total diameter is c. 15 m and it includes some other smaller pits. The northern part of the pit is cut by burial 275.

Pit 1388 is an approximately 25 m-long, irregularly shaped portion of a large pit that extended beyond the western edge of the excavation limits. It is cut by burial 1705.

Pit 1625, within the area of Grave Group 79, is a smaller settlement feature of oval shape (2.7 m in diameter). It is cut by Burial 1755, which contained two pots, a bone tool, a flint blade and an adze.

Pit 1800 is a small, oval-shaped pit (4 m long). It is cut by burial 1850, which has been assigned to Group 66B.

Eleven other settlement pits have radiocarbon dates, but are not stratigraphically related to other dated features.

Pit 1687 is the smallest dated pit (3 m long) and has two statistically consistent measurements ($T' = 0.1$; $T'(5\%) = 3.8$; $v = 1$), which have been combined prior to calibration to form mean 11-1687 (5769 ± 19 BP). Pits 2077, 1703, 1373, and 490 (4.5–6.8 m in diameter) each produced a single measurement on an animal bone sample. Pit 1502 is an oval-shaped pit (6 m long), with five graves situated to its southern side (Group 77). The two results from different groups of articulating animal bone in the pit are not statistically consistent ($T' = 4.3$; $T'(5\%) = 3.8$; $v = 1$), and probably suggest some longevity to the deposit.

Pit 375 is approximately 5 m along its long axis, and part of a larger pit complex that includes Pit 538 and Pit 772 (c. 6 m in diameter). These are situated between grave Groups 69 and 71. Pits 375 and 772 each produced a single result on articulating animal bone. Pit 779, which is an extremely large pit complex and includes other smaller pits, similarly produced a single measurement on a group of articulating animal bone.

Pit 538 is a large pit (c. 9.5 m in diameter) with two statistically consistent results on an articulating group of cattle bones (T′ = 0.3; T′(5%) = 3.8; ν = 1). A weighted mean has been taken before inclusion in the model, mean 11-538 (5753 ± 20 BP).

Pit 1025, situated a few metres north of grave Group 68, is irregularly shaped and nearly 9 m long. It has two statistically consistent measurements (T′ = 0.0; T′(5%) = 3.8; ν = 1) on an articulating group of aurochs tarsals, which have been combined prior to calibration to form mean 11-1025 (5784 ± 20 BP).

Four radiocarbon dates from subsite 11 have posterior outlier probabilities of more than 10%: two burials (*OxA-27472: 11-679*, O: 28/5 and *SUERC-53325: 11-293*, O: 31/5) and two samples from settlement pits (*MAMS-20674: 11-1502-3*, O: 17/5 and *SUERC-52832: 11-1703*, O: 21/5). This is no more than would be expected in a dataset of this size, where all the data are compatible with the model presented.

Subsite 10B

A total of 83 radiocarbon results are available from subsite 10B *(fig. 17; tabs 4; 5)*. These come from 74 submitted samples, comprising 54 samples of human bone and 20 samples of animal bone. The human bone was from inhumations spread across 13 burial groups (1, 2, 5, 7, 8, 12–15, 18, 22, 23 and 26), with a further ten burials being ungrouped. The animal bone was from a total of 14 settlement pits or intercutting pit groups.

There are three non-Lengyel dates from subsite 10B. There is an Iron Age date from Pit 820 (OxA-27489), which cut Burial 819 and two Bronze Age results obtained from burials 10B-3461 and 10B-3463 (OxA-29026 and OxA-29027). These results have been excluded from the modelling (see Bayliss et al. this volume, tab. 9).

Group 1. In Group 1 there are radiocarbon dates on four burials (4307, 7655, 7756 and 7753). Burials 7756 and 7655 are the two of the four not to contain copper artefacts, though the latter does contain an axe. There is a sequence of intercutting burials in this group, with burial 7753 being later than 7756. The two measurements from burial 7753 are statistically consistent (T′ = 0.0; T′(5%) = 3.8; ν = 1) and have been combined prior to calibration to form mean 10B-7753 (5751 ± 25 BP).

Groups 2, 5, 7, 8 and 12. The groups are dispersed across the northern portion of the subsite and so also enhance the overall spatial coverage of the radiocarbon dating.

Burial 7562 is from Group 2, and the grave contained an axe amongst its grave goods. Burial 6337 is from Group 5. It is a sparsely furnished grave that was selected because it cut burial 6338, for which no result was obtained. It produced two statistically consistent results (T′ = 0.0; T′(5%) = 3.8; ν = 1), which have been combined prior to calibration to form mean 10B-6337 (5727 ± 23 BP). Burial 497 from Group 7 contained copper and *Dentalium* beads and the skeleton had signs of an infectious disease (perhaps tuberculosis). Burial 552 is from Group 8. The skeletal remains exhibited some kind of, not precisely definable, metabolic disease. Burial 362 is from Group 12, and the grave contained three pots, an axe and a flint blade. It has two statistically consistent results (T′ = 0.0; T′(5%) = 3.8; ν = 1), which have been combined prior to calibration to form mean 10B-362 (5854 ± 25 BP).

Group 13. A total of 15 burials out of 38 graves were dated from this group. Of the 15 dated burials, four form two sequences, with the remaining ones not stratified in relation to other dated features. This group formed part of an investigation into the prevalence of tuberculosis. The classic skeletal pathologies were found on an adult male skeleton's spine buried in grave 4027 (Köhler et al. 2013; 2014). Seventeen other individuals displayed severe atypical morphological lesions, of which six burials were dated (256, 398, 783, 813,
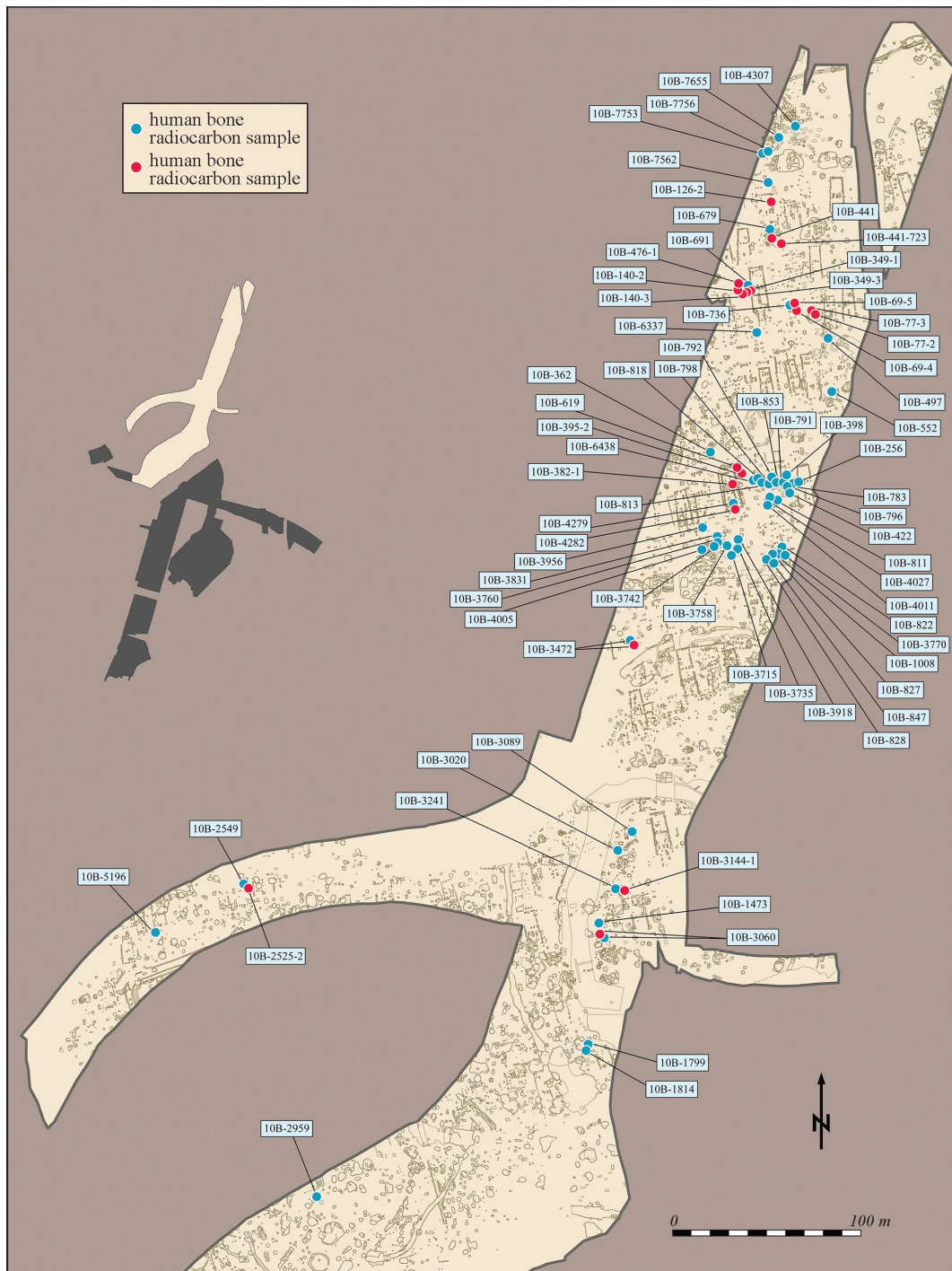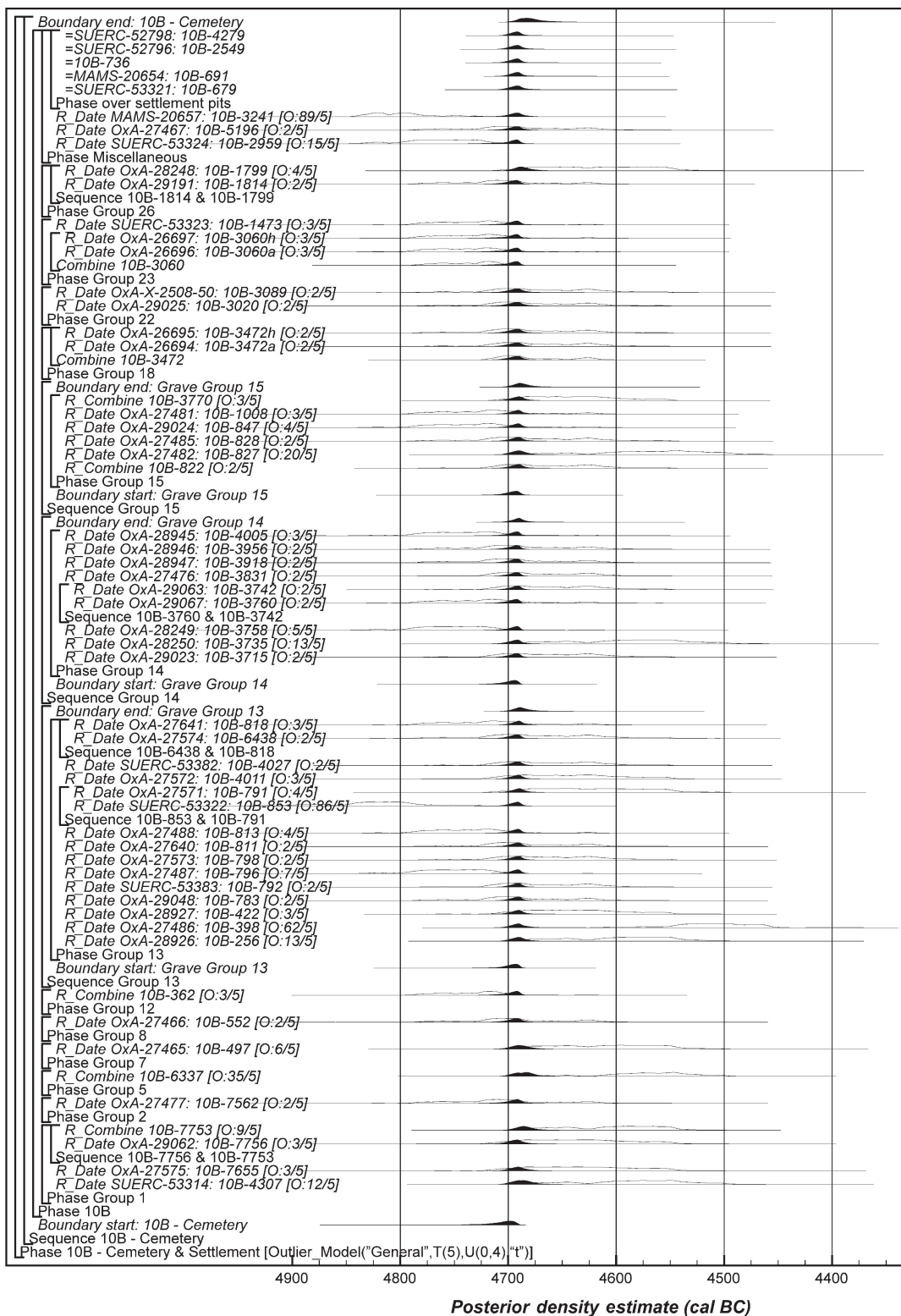
Fig. 17. Plan of subsite 10B with the dated features.

Posterior density estimate (cal BC)

818 and 4011). Ancient DNA analysis to diagnose TB DNA in the skeletal material was performed on all individuals buried in this grave group, which confirmed the occurrence of TB in the case of four individuals (Pósa et al. 2015). All these have been dated (422, 791, 811 and 4027).

Burial 4027 was of the four-post construction type and contained six pots, a polished stone adze and a flint blade, whereas burials 256, 422 and 783 were poorly furnished.

Both burials 792 *(fig. 4)* and 813 are of the four-post construction type and relatively abundantly furnished with five vessels, polished stone tools, shell ornaments and flint blades. This stands in contrast to burials 796 and 798, which were poorly furnished.

Burials 811 and 4011 were not in graves of the four-post type, but were also fairly well furnished, and between them contained a stone macehead, an altarpiece, a polished stone adze and flint blades.

The two sequences of burials show similar differences in grave type and assemblages. The lower graves in both cases are of four-post construction and are more abundantly furnished than those that cut them. Burial 853 is cut by burial 791, and burial 6438 is cut by burial 818.

Burial 398 was the only one dated that contained copper artefacts. In addition to copper beads, the grave also had a pot with a spiral decoration that is considered a late chronological marker (Zalai-Gaál 2007, 106–107). The grave is situated at the very edge of the group and at a higher level than most of the other graves.

Group 14. Group 14 contained approximately 70 burials, of which nine have been dated, including a sequence of two intercutting graves. There is a dense cluster of graves in the south-west portion of the group with many intercutting, and there is also the suggestion of one row of graves.

Many of the dated graves are relatively well furnished compared to other graves in this group because the sampling strategy focused on graves with axes, which are generally accompanied by a range of other grave goods. Four of the graves (3715, 3735, 3742 and 3831) contained copper artefacts, including copper beads and finger rings, while a complement of bone and stone tools (including axes) could be found with burials 3715, 3735, 3831, 3918, 3956 and 4005. Burials 3758 and 3760 were poorly furnished. The one dated sequence in the group is burial 3742, a grave of four-post construction type, which cut burial 3760. There was also intercutting between burials 3760 and 3831, but the relationship was unclear in the field.

Group 15. Six burials were dated from the approximately 40 that make up the group, which is fairly compact. The dated burials are concentrated in its centre. Groups 14 and 15 are approximately 7 m from one another, but the orientations of the burials in each cluster was completely different, with the heads pointing east in the former group and west in the latter. There are no stratigraphic relationships between the dated burials (822, 827, 828, 847, 1008 and 3770). Burial 847 is in a grave of four-post construction and has a pot with an anthropomorphic decoration, while burial 827 has *Dentalium* beads and burial 3770 has copper beads. The remaining graves are relatively poorly furnished. There are two statistically consistent results from burial 3770 ($T' = 0.0$; $T'(5\%) = 3.8$; $v = 1$), which have been combined prior to calibration to form mean 10B-3770 (5785 ± 24 BP). Similarly,

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Fig. 18. General outlier model for the Lengyel burial activity on subsite 10B. The format is as described in *fig. 12*. The large square brackets down the left-hand side of *figs 18–19* along with the OxCal keywords define the overall model exactly.
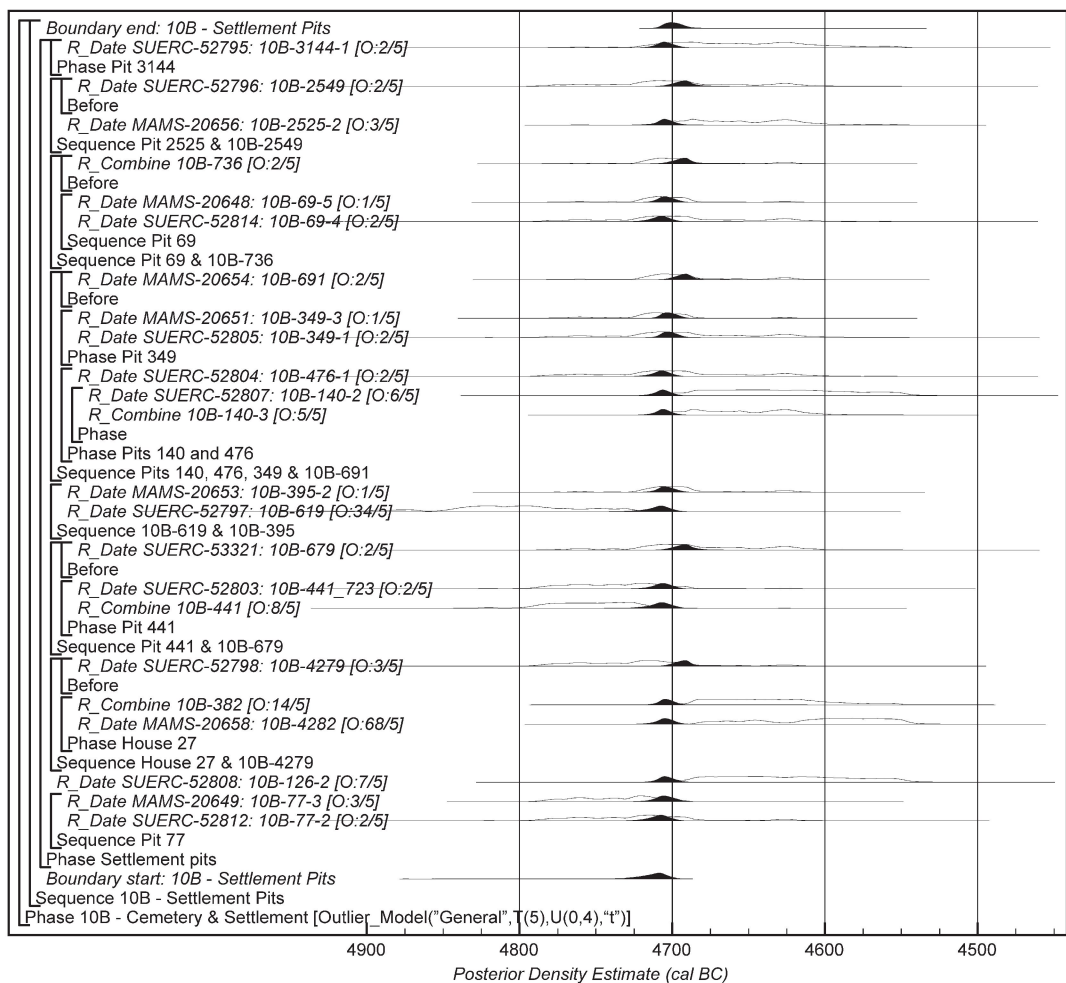
Fig. 19. General outlier model for the Lengyel settlement activity on subsite 10B. The format is as described in *fig. 12*. The large square brackets down the left-hand side of *figs 18–19* along with the OxCal keywords define the overall model exactly.

two statistically consistent results from burial 822 (T′ = 0.0; T′(5%) = 3.8; ν = 1), have also been combined prior to calibration to form mean 10B-822 (5807 ± 27 BP).

Group 18. One grave from Group 18, also in the northern part of 10B, was dated as part of the pilot study to investigate the potential for a freshwater reservoir offset (10B-3472). The two results from the human skeleton and a wild boar mandible are statistically consistent (T′ = 0.0; T′(5%) = 3.8; ν = 1). Since the measurements are not from the same organism, they have been combined after calibration using the Combine function in OxCal.

Groups 22, 23 and 26. Two burials were dated in Group 22. Burial 3089 was in a grave of four-post construction with a food offering, five pots and *Spondylus* shell ornaments. Burial 3020 had a possible food offering and seven pots.

Two very abundantly furnished burials were dated from Group 23. The graves contained a man (3060) and a woman (1473). 3060 *(fig. 20)* is the burial of a right-crouched adult male (aged 40–49 years) in a four-post grave pit. It contained six vessels, three differ-

Fig. 20. Burial 3060 in subsite 10B.

ent types of polished stone axe, a polished macehead and flint blades. In addition it also included a necklace composed of *Dentalium* and copper beads, a very rich assemblage of *Spondylus* ornaments and four animal remains (a large aurochs trophy, the proximal fragment of an aurochs scapula, a polished red deer antler and a fragment of carpometacarpus from a griffon vulture). This burial is considered the richest male burial from this time period in eastern-central Europe (ZALAI-GAÁL et al. 2011b).

The two results from the human skeleton and the aurochs skull with horncores in burial 3060 are statistically consistent ($T' = 0.0$; $T'(5\%) = 3.8$; $v = 1$). Since the measurements are not from the same sample, they have been combined after calibration using the Combine function in OxCal.

Burial 1473 *(fig. 21)* is the grave of a right-crouched adult female (aged 40–59 years), also laid in a pit with a four-post construction. Seven vessels, copper items, a very rich assemblage of shell ornaments (over 1000 shell items are present), animal bone, flint tools, a fragment of a clay altar and a piece of red ochre were placed next to the deceased as grave goods.

Two burials were also dated from Group 26. These form an intercutting sequence with burial 1814 cut by burial 1799, which contained a copper arm ring.

Ungrouped graves. Ten burials were dated that did not belong to any grave grouping. Of these, two burials (3461 and 3463) had Bronze Age results and have been excluded from the modelling. Another five burials (679, 691, 736, 2549, and 4279) that intercut with settlement pits were dated, which are described below.

Fig. 21. Burial 1473 in subsite 10B.

Burial 2959 was in the southern part of subsite 10B, while burial 5196 was in its western arm. Both were selected because the skeletal remains exhibited signs of Diffuse Idiopathic Skeletal Hyperostosis (DISH), which is relatively common in modern populations, and is linked to age, diet, sedentary lifestyle and reduced physical activity. Grave 3241 was thought to cut settlement pit 3144 at the time of submission, but further examination of the excavation records suggests that this relationship is not clear and so this stratigraphic sequence is not included in the model.

Settlement pits. The dated settlement features in subsite 10B are concentrated in its northern part, with the exception of Pit 2525, which is in the western arm. A total of 13 pits were dated within this series, and five of them had a burial that cut the top of the excavated fills.

Pit 77 is of medium size (8.5 m in diameter) and lies in the middle of the northern part of subsite 10B. From this pit there are results from two different layers, with 77-2 from the bottom of the pit being earlier than 77-3 which comes from the upper layer of the pit.

Pit 126 is relatively small (c. 3.5 m in diameter) and circular in shape. The pit fills contained an abundance of pottery, and produced a single result on an articulating animal bone group (SUERC-52808).

House 27 is a rebuild of House 26 *(fig. 9)*, located in the middle of the northern part of subsite 10B, near Grave Group 13. There are two dated features from it. Feature 4282 is a very large posthole in the southern end of the house that contained the articulating remains of a dog cranium. Feature 382 is the middle posthole of the central dividing wall, from

which there are two statistically consistent results ($T' = 0.8$; $T'(5\%) = 3.8$; $\nu = 1$) on a pig humerus with refitting unfused epiphysis, which have been combined prior to calibration to form mean 10B-382 (5781 ± 17 BP). There was a human burial (4279) that cuts post-hole 4282. This burial must be later than both samples associated with House 27.

Settlement pit 441 is a relatively large, irregularly shaped pit with a length of 9 m. It forms part of a complex of pits and includes pit 723 in the very northern section of subsite 10B. There are three results on two samples from different areas of the pit. The single result from 441/723 is on a complete dog skeleton, while the two results from 441 are on a refitting unfused dog cranium from the second layer of the pit. The two results are statistically consistent ($T' = 1.6$; $T'(5\%) = 3.8$; $\nu = 1$) and have been combined prior to calibration to form mean 10B-441 (5882 ± 24 BP). Burial 679 cuts the pit to the north, and the burial contained an axe, an adze, a copper finger-ring and beads.

A sample from a complete dog skeleton in pit 619 was dated. This pit was cut by pit 395 from which a sample from a pig left tibia with refitting unfused epiphysis was dated. The two features lie in the middle of the northern part of the subsite, near Houses 26 and 27.

Three intercutting pits and a burial were dated from the north-western part of the sub-site, to the west of House 13 *(fig. 8)*. The earlier pit (140) has three measurements on two samples. Two statistically consistent results ($T' = 0.1$; $T'(5\%) = 3.8$; $\nu = 1$) from an articulated wild boar metatarsal (140-3) have been combined prior to calibration to form mean 10B-140-3 (5798 ± 16 BP). There is also a single result from an articulating wild boar radius and ulna (140-2). Pit 140 was initially thought to have been cut by pit 476 from which an articulating red deer ulna was dated. However, further examination of the field records (plans and photographs) has raised some doubts as to the validity of this interpretation, and so no relationship has been modelled. Pit 349 definitely cuts both pits 140 and 476. There are two results from samples of articulating red deer and cattle bone. Pit 349 was cut by burial 691, which was poorly furnished.

There is another sequence of a burial (736) cutting a settlement pit (69). Pit 69 is relatively small with an approximate diameter of 5 m, and the dated animal bone comes from two successive layers of fill. Burial 736 lies to the northern edge of the pit and is unfurnished. Two statistically consistent results from the burial ($T' = 3.4$; $T'(5\%) = 3.8$; $\nu = 1$) have been combined prior to calibration to form mean 10B-736 (5829 ± 17 BP).

Pit 2525 is small (2.5 m in diameter) and lies in the western arm of 10B. It was cut to the north by burial 2549, which was sparsely furnished.

Pit 3144 is relatively small (5 m in diameter) and lies in the southern part of subsite 10B. From it, a cattle ulna which was found to articulate with the radius was dated.

A total of twelve radiocarbon dates from subsite 10B have posterior outlier probabilities of more than 10%: nine burials and three samples from settlement features. This is more than would be expected in a dataset of this size where all the data are compatible with the model presented.

In order to interpret the results from the chronological model for activity in subsite 10B *(figs 18; 19)*, we need to examine each radiocarbon date that has been identified as an out-lier in an attempt to judge why it may be so (i. e. whether it is a misfit, an outlier, or an offset; BAYLISS et al. this volume, 56).

Considering first the graves *(fig. 18)*, five burials have posterior outlier probabilities between 20% and 60% (*SUERC-53314: 10B-4307,* O: 12/5; *OxA-28926: 10B-256,* O: 13/5; *OxA-28250: 10B-3735,* O: 13/5; *OxA-27482: 10B-827,* O: 20/5; and *SUERC-53324: 10B-2959,* O: 15/5). These probably represent statistical outliers that accurately date bur-ials that actually fall into the concentrated horizon of burial in subsite 10B suggested by

the modelling. Three burials have posterior outlier probabilities greater than 60% (*MAMS-20657: 10B-3241*, O: 89/5; *SUERC-53322: 10B-853*, O: 86/5; and *OxA-27486: 10B-398*, O: 62/5), however, and clearly represent misfits. Burials 3241 and 853 are clearly much earlier, dating to the generations around 4800 cal BC rather than those around 4700 cal BC. Grave 853 was richly furnished *(tab. 5)* and had a four-post structure which may still have been visible when Grave Group 13 formed in this area a century or so later. Burial 398 seems to have been a later interment in the space previously occupied by Grave Group 13, as suggested by the recovery of this burial at a higher level than most of the other graves, its different orientation (head facing east) and the presence of a pot with a spiral decoration thought to be late (ZALAI-GAÁL 2007, 106–107). The final outlier (10B-6337, O: 35/5) is marginal, and may either be a burial that is later than the main concentrated phase of burial in this area, or an extreme statistical outlier.

This interpretation of the outliers is important since it suggests that perhaps 49 of the 53 dated burials in our sample (92%) do actually fall in the very concentrated period of burial suggested by our modelling. There are, however, two outliers that clearly represent earlier burials in this area (4%), and perhaps two more that represent much later burials (4%).

Considering next the settlement *(fig. 19)*, three dated samples have posterior outlier probabilities greater than 10% (*MAMS-20658: 10B-4282*, O: 68/5, *10B-382*, O:14/5, and *SUERC-52797: 10B-619*, O: 34/5). Two of these derive from House 27, the outlier probabilities arising from the relative dating of these samples with burial 4279 suggested by stratigraphy. This stratigraphic relationship has been reviewed and appears to be secure. The isotopic values of burial 4279 do not suggest that this individual consumed an unusual amount of fish and so has a detectable freshwater reservoir effect (BAYLISS et al. this volume, tab. 5). Consequently, it seems that MAMS-20658 must be an extreme statistical outlier and the dating suggested by the model must stand. This leaves 10B-619 (SUERC-52797), which is again marginal, and could suggest an element of earlier occupation in this area, but it may simply be a statistical outlier.

A narrative of Lengyel settlement and burial

Subsite 5603

The overall burial activity dated in subsite 5603 began in *4815–4725 cal BC (95% probability; fig. 12; start: 5603 – Cemetery)*, probably in *4790–4740 cal BC (68% probability)*.

Burial in Grave Group 56 began in *4780–4710 cal BC (95% probability; fig. 12; start: Grave Group 56)*, and probably in *4750–4715 cal BC (68% probability)*. This activity ended in *4725–4665 cal BC (95% probability; fig. 12; end: Grave Group 56)*, probably in *4720–4685 cal BC (68% probability)*. This burial activity spanned *1–95 years (95% probability; fig. 22; Span Grave Group 56)*, probably *1–60 years (68% probability)*.

Burial in Grave Group 59 began in *4795–4670 cal BC (95% probability; fig. 12; start: Grave Group 59)*, probably in *4760–4710 cal BC (68% probability)*. This activity ended in *4665–4490 cal BC (95% probability; fig. 12; end: Grave Group 59)*, probably in *4600–4510 cal BC (68% probability)*. This burial activity spanned *35–275 years (95% probability; fig. 22; Span Grave Group 59)*, probably *120–240 years (68% probability)*.

The overall burial activity dated in subsite 5603 ended in *4530–4440 cal BC (95% probability; fig. 12; end: 5603 – Cemetery)*, probably in *4515–4465 cal BC (68% probability)*. The dated burial activity spans *215–355 years (95% probability; fig. 22; Span 5603 – Cemetery)*, probably *240–315 years (68% probability)*.

Fig. 22. Probability distributions for the number of years during which burial activity and deposition in settlement pits occurred on subsite 5603 at Alsónyék, derived from the model defined in *figs 12–13*.

Fig. 23. Probability distributions for the number of years during which burial activity and deposition in settlement pits occurred on subsite 11 at Alsónyék, derived from the model defined in *figs 15–16*.

The settlement in subsite 5603, as dated through a selection of settlement pits, began in *4805–4625 cal BC (95% probability; fig. 13; start: 5603 – Settlement Pits)*, probably in *4745–4665 cal BC (68% probability)*. The dated settlement activity ended in *4520–4475 (3% probability; fig. 13; end: 5603 – Settlement Pits)* or *4450–4185 cal BC (92% probability)*, probably in *4345–4245 cal BC (68% probability)*. This settlement activity spanned *175–580 years (95% probability; fig. 22; Span 5603 – Settlement Pits)*, probably *335–490 years (68% probability)*.

Subsite 11

The overall burial activity dated in subsite 11 began in *4820–4730 cal BC (95% probability; fig. 15; start: 11 – Cemetery)*, probably in *4795–4745 cal BC (68% probability)*.

Burial in Grave Group 61A began in *4800–4675 cal BC (95% probability; fig. 15; start: Grave Group 61A)*, probably in *4765–4700 cal BC (68% probability)*. This activity ended in *4705–4555 cal BC (95% probability; fig. 15; end: Grave Group 61A)*, probably in *4685–4605 cal BC (68% probability)*. This burial activity spanned *1–205 years (95% probability; fig. 23; Span Grave Group 61A)*, probably *1–10 years (4% probability)* or *30–145 years (64% probability)*.

Burial in Grave Group 68 began in *4785–4710 cal BC (95% probability; fig. 15; start: Grave Group 68)*, probably in *4760–4720 cal BC (68% probability)*. This activity ended in *4715–4605 cal BC (95% probability; fig. 15; end: Grave Group 68)*, probably in *4695–4645 cal BC (68% probability)*. This burial activity spanned *1–165 years (95% probability; fig. 23; Span Grave Group 68)*, probably *35–115 years (68% probability)*.

The overall burial activity dated in subsite 11 ended in *4635–4480 cal BC (95% probability; fig. 15; end: 11 – Cemetery)*, probably in *4585–4515 cal BC (68% probability)*. The dated burial activity spans *120–325 years (95% probability; fig. 23; Span 11 – Cemetery)*, probably *175–270 years (68% probability)*.
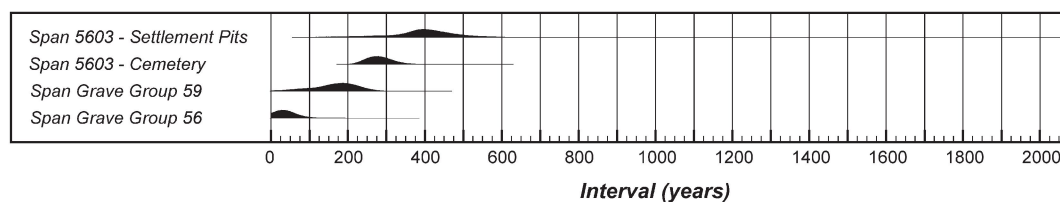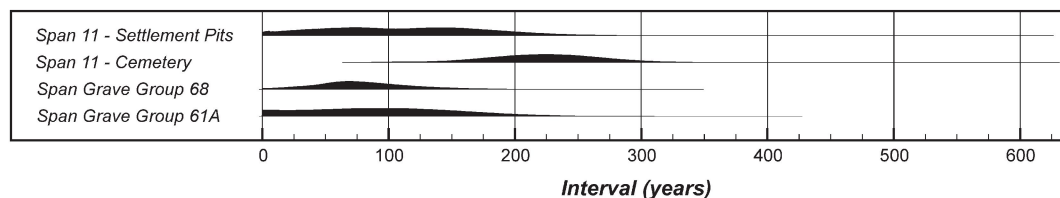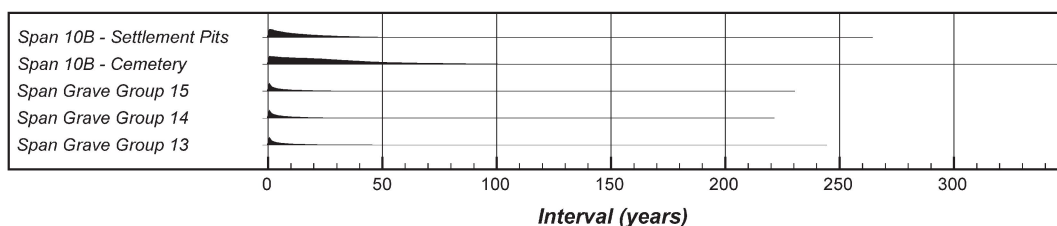
Fig. 24. Probability distributions for the number of years during which burial activity and deposition in settlement pits occurred on subsite 10B at Alsónyék, derived from the model defined in *figs 18–19*.

The settlement in subsite 11, as dated through a selection of settlement pits, began in *4780–4660 cal BC (95% probability; fig. 16; start: 11 – Settlement Pits)*, probably in *4745–4690 cal BC (68% probability)*. The dated settlement activity ended in *4680–4525 cal BC (95% probability; fig. 16; end: 11 – Settlement Pits)*, probably either in *4670–4620 cal BC (37% probability)* or *4610–4565 cal BC (31% probability)*. The dated settlement activity spans *1–225 years (95% probability; fig. 23; Span 11 – Settlement Pits)*, probably *35–175 years (68% probability)*.

Subsite 10B

The concentrated period of burial activity dated in subsite 10B began in *4740–4685 cal BC (95% probability; fig. 18; start: 10B – Cemetery)*, probably in *4715–4690 cal BC (68% probability)*.

Burial in Grave Group 13 began in *4730–4685 cal BC (95% probability; fig. 18; start: Grave Group 13)*, probably in *4705–4685 cal BC (68% probability)*. This activity ended in *4705–4660 cal BC (95% probability; fig. 18; end: Grave Group 13)*, probably in *4700–4680 cal BC (68% probability)*. This burial activity spanned *1–60 years (95% probability; fig. 24; Span Grave Group 13)*, probably *1–20 years (68% probability)*.

Burial in Grave Group 14 began in *4725–4685 cal BC (95% probability; fig. 18; start: Grave Group 14)*, probably in *4705–4685 cal BC (68% probability)*. This activity ended in *4710–4670 cal BC (95% probability; fig. 18; end: Grave Group 14)*, probably in *4700–4680 cal BC (68% probability)*. This burial activity spanned *1–45 years (95% probability; fig. 24; Span Grave Group 14)*, probably *1–15 years (68% probability)*.

Burial in Grave Group 15 began in *4725–4680 cal BC (95% probability; fig. 18; start: Grave Group 15)*, probably in *4705–4685 cal BC (68% probability)*. This activity ended in *4705–4660 cal BC (95% probability; fig. 18; end: Grave Group 15)*, probably in *4700–4675 cal BC (68% probability)*. This burial activity spanned *1–50 years (95% probability; fig. 24; Span Grave Group 15)*, probably *1–15 years (68% probability)*.

The concentrated period of burial activity dated in subsite 10B ended in *4705–4640 cal BC (95% probability; fig. 18; end: 10B – Cemetery)*, probably in *4695–4670 cal BC (68% probability)*. The concentrated period of dated burial activity spans *1–95 years (95% probability; fig. 24; Span 10B – Cemetery)*, probably *1–40 years (68% probability)*. As described above, 92% of burials in this subsite date to this very short period.

The settlement in subsite 10B, as dated through a selection of settlement pits, began in *4735–4695 cal BC (95% probability; fig. 19; start: 10B – Settlement Pits)*, probably in *4720–4700 cal BC (68% probability)*. The dated settlement activity ended in *4715–4680 cal BC (95% probability; fig. 19; end: 10B – Settlement Pits)*, probably in *4710–4690 cal BC*
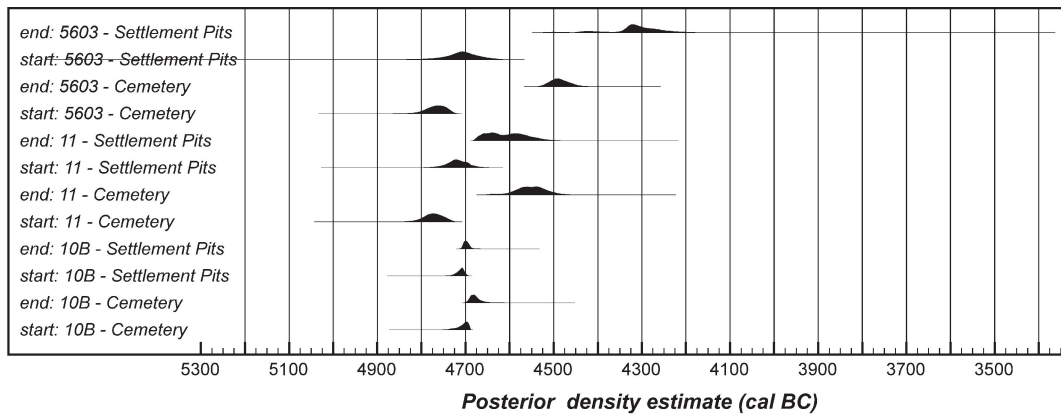
Fig. 25. Summary of the posterior density estimates for the 'start' and 'end' of activity associated with burials and settlement in each of the three subsites. The probabilities have been derived from the models shown in *figs 12–13; 15–16; 18–19*.

(68% probability). This settlement activity spanned *1–45 years (95% probability; fig. 24; Span 10B – Settlement Pits)*, probably *1–20 years (68% probability)*.

The spatio-temporal development of the Lengyel settlement and burial at Alsónyék

The dates when Lengyel burial and settlement began and ended on the three subsites at Alsónyék are summarised in *figure 25* and *table 6*. By comparing the posterior density estimates, it is possible to calculate the probable order of pairs of different events *(tab. 7)*. For example, it is *99.2% probable* that the concentrated phase of burial on subsite 10B *(start: 10B – Cemetery)* began after burial on subsite 11 *(start: 11 – Cemetery)*. It is also possible to calculate joint probabilities. For example, the probability that burial on subsite 10B *(start: 10B – Cemetery)* began after burial on both subsite 11 *(start: 11 – Cemetery)* and on subsite 5603 *(start: 5603 – Cemetery)* is 99.2% × 98.8% = 98.0%. It is not possible to determine whether burial on the site began first on subsite 11 or first on subsite 5603 *(58.6% probable versus 41.4% probable)*, but the first burials probably appeared in the southern part of the Lengyel site in the first half of the 48th century cal BC with burial intensifying across the northern part of the site two or three generations later *(fig. 25)*.

In contrast Lengyel settlement appears to have appeared everywhere across the site in the decades around 4700 cal BC *(fig. 25)*. It is not possible to determine the relative order of its beginning on the different subsites *(tab. 7)*. The medians of the posterior density estimates for the start of settlement on the different subsites vary by less than a decade.

Overall it is *97.5% probable* that Lengyel burial began on the site before the settlement was established. The concentration and expansion of burial into the northern area appear to be contemporary with the foundation of the settlement across the whole 80 ha area of the Lengyel site *(fig. 25)*. The medians of the posterior density estimates for the start of settlement on the different subsites vary from the start of the concentrated horizon of burial on subsite 10B by less than 15 years.

Lengyel burial ended at different times across the site *(fig. 25; tab. 6)*. First, in the early 47th century cal BC, the concentrated horizon of burial ended on subsite 10B. Then, sometime in the 46th century cal BC, burial ended on subsite 11. It persisted longest on
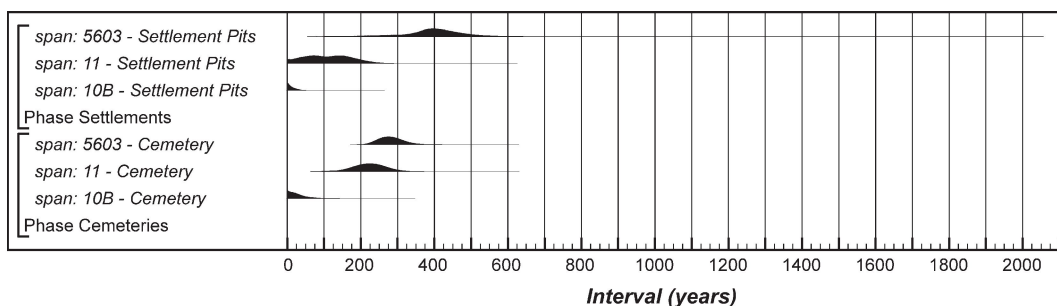
Fig. 26. Summary of the number of years during which burial activity and deposition in settlement pits occurred in each of the three subsites. The probabilities have been derived from the modelling shown in *figs 12–13; 15–16; 18–19.*

subsite 5603, where it probably ended in the first half of the 45th century cal BC. This order of endings in the different areas is *94.9% probable.*

Lengyel settlement also ended at different times across the site *(fig. 25; tab. 6)*, following the same sequence *(99.8% probable)*. First, in the decades around 4700 cal BC, came the end of the brief episode of settlement on subsite 10B. Then, at a time that is imprecisely known somewhere within the later 47th or earlier 46th century cal BC, settlement ended on subsite 11. It endured on subsite 5603, where it probably ended in the later 44th century cal BC.

On subsite 10B it is *94.5% probable* that the settlement activity ended before the concentrated horizon of burial and, similarly, on subsite 11 the settlement appears to have been abandoned before burial ended *(82.7% probable)*. On subsite 10B the intense period of burial outlasted the settlement by a couple of decades or so, but on subsite 11 burial endured for a few generations. On subsite 5603, however, the settlement clearly outlasted burial *(100% probable)*, for a period of –25–305 years *(95% probability*; distribution not shown; difference *end: 5603 – Cemetery / end: 5603 – Settlement Pits)*, probably for a period of *125–250 years (68% probable)*.

These varied beginnings and endings mean that the durations of Lengyel burial and settlement in different areas of the site also vary *(fig. 26; tab. 8)*. The occupation on subsite 10B was intense, but brief, with neither settlement nor the intense period of burial enduring for more than a decade or two. The duration of the settlement on subsite 11 is imprecisely known, but probably endured for several generations, but burial in this area clearly continued for a couple of centuries. Activity endured longest on subsite 5603, where burial continued for approaching 300 years and the settlement was occupied for around four centuries.

Grave groups

It is currently difficult to make any precise distinctions between the groups based on the grave goods, because many of the finds are under restoration and so cannot yet be fully studied. Nonetheless two main categories of grave group can be defined on the basis of size; smaller grave groups (25–40 burials) and larger ones (c. 100 burials) are both spread across the whole site. Further distinctions in their use should be possible after a full evaluation of the finds. But it already seems clear that the four-post graves in subsite 11 are less numerous as well as less well furnished than those in the northern part of subsite 10B. This
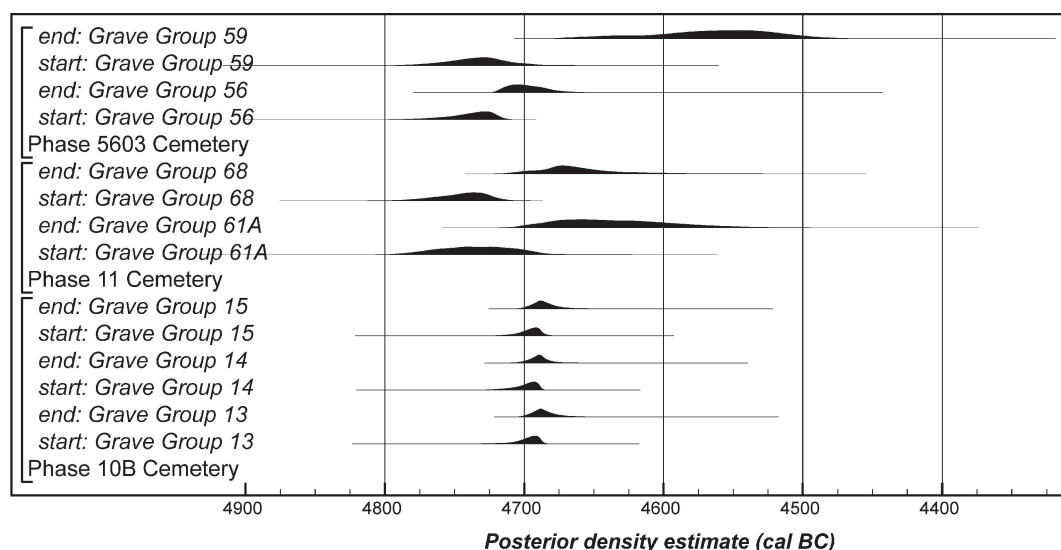
Fig. 27. Summary of the posterior density estimates for the 'start' and 'end' of burial in grave groups that have more than six dated burials. The probabilities have been derived from the models shown in *figs 12–13; 15–16; 18–19*.

means fewer copper (such as arm rings) and shell artefacts (*Spondylus* and *Dentalium*), and no lavish individuals (such as burial 3060 and 1473).

A total of seven grave groups across the three subsites were so intensively dated that it was necessary to apply a uniform prior probability to their distribution, thus reducing the weight of this very localised activity on the overall model results. In practice, the 8–19 individual parameters that make up each of these grave groups are reduced to two, which represent the 'start' and 'end' date of the burial activity within the group *(fig. 27)*. One benefit is that the probabilities derived from the dating allow us to explore intra-site variability in burial over time with specific reference to coherent spatial groupings.

In subsite 5603, Grave Groups 56 and 59 were intensively dated. Group 56 is a compact group with what appear to be rows of graves. The group is sited immediately south of House 100, apparently closely conforming to the width of the short end of the structure. The modelling suggests that the formal organisation of this group was intentional, estimating that burials in Grave Group 56 occurred over a period of *1–95 years (95% probability; fig. 28; span: Grave Group 56)*, probably *1–60 years (68% probability)*. Grave Group 56 was in use during the second half of the 48th century cal BC *(fig. 27)*. Group 59, in the middle of the eastern arm of subsite 5603, is a very large grave group with 100 burials. The north-western part is considerably more compact, with burials becoming more dispersed moving toward the south-east. While in some instances a handful of graves may form rows, the overall impression in this group is that the inhumations occurred over a period of time. Group 59 formed between the later 48th century cal BC and the 46th century cal BC *(fig. 27)*. It formed over the longest timespan of all the dated groups of burials, over a protracted period of *35–275 years (95% probability; fig. 28; span: Grave Group 59)*, probably *120–240 years (68% probability)*. This is consistent with it being one of the largest grave groups.

Grave Groups 61A and 68 were dated in subsite 11. Both are situated in the extreme southern portion of the subsite (and probably continue beyond it). The two groups begin
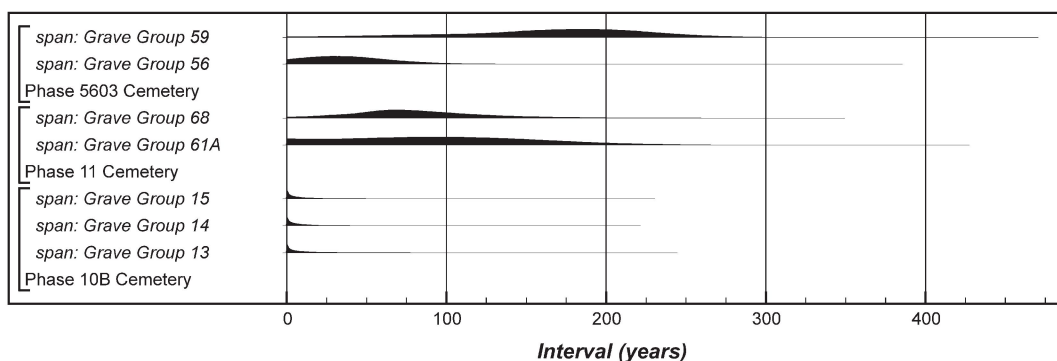
Fig. 28. Summary of the number of years during which the grave groups that have more than six dated burials were in use. The probabilities have been derived from the models shown in *figs 12–13; 15–16; 18–19.*

being used at about the same time and contain c. 80 and 45 inhumations respectively. Graves in Group 61 appeared to form rows, and the 61A part shows a high density where the grave pits touch each other. Group 68 has a much looser structure, and covers roughly the same area as Group 61, but has only half as many burials. Both groups appear to have been used for two or three generations between the mid-to-late 48th century cal BC and the early-to-mid 47th century cal BC *(figs 27; 28)*.

Within subsite 10B, the three well dated grave groups (13, 14 and 15) have very similar chronologies, due in large part to the very short period of intensive activity that occurred here, with each group used for little more than a decade *(fig. 28)*. While the three groups are located in close proximity to one another, it is potentially highly significant that they do not display the same characteristics. Groups 13 and 15 have a similar character in terms of size and number of burials included. Group 14 is twice as large and contained c. 70 burials. Individuals buried in Group 13 and 15 were placed with their heads facing west and those in Group 14, starting c. 4.5 m to the west, were placed with their heads facing east.

At least 18 of the 38 burials in Grave Group 13 showed evidence of tuberculosis (Pósa et al. 2015). This outbreak has now been dated to between *4730–4685 cal BC (95% probability; fig. 27; start: Grave Group 13)*, probably *4705–4685 cal BC (68% probability)*, and *4705–4660 cal BC (95% probability; fig. 27; end: Grave Group 13)*, probably *4700–4680 cal BC (68% probability)*. One other dated skeleton shows signs of disease, burial 10B-497, which dates to *4710–4655 cal BC (95% probability; fig. 18; OxA-27465: 10B-497)*, probably to *4700–4675 cal BC (68% probability)*.

This dating is compatible with there having been an epidemic of tuberculosis in the settlement when it was at its largest extent. Potentially this could be a reason why the occupation of subsite 10B was so brief and the settlement contracted so quickly, though it will be important in due course to check for the presence of the disease in other grave groups.

Copper arm rings

One of the initial predictions was that there might be some chronological sensitivity to the burial of individuals with heavy copper arm rings. These were encountered much less frequently than ornaments made of copper beads and shell. The modelled probability densities were extracted from the three subsite models and are given in *figure 29*. While the sample is relatively small (six graves with arm rings), neither the very earliest nor the very
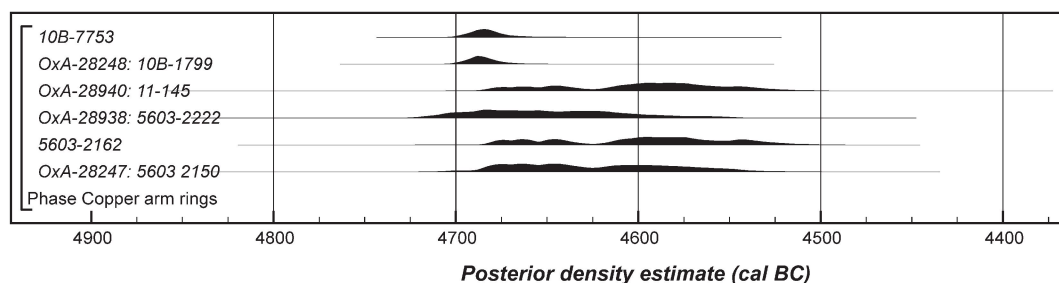
Fig. 29. Posterior density estimates for burials containing copper arm rings. The probabilities have been derived from the models shown in *figs 12–13; 15–16; 18–19*.

latest burials at Alsónyék are represented. Heavy copper arm rings are certainly present, however, from the first quarter of the 47th century cal BC.

Axes

One aim of the radiocarbon dating programme was to provide a chronology for a nascent seriation of stone axeheads recovered from graves. Although the seriation was never completed, a formal typology consisting of six types was produced (Zalai-Gaál et al. 2014a). Twenty-two dated graves contain stone axeheads that have been assigned to one of these types *(fig. 30)*. These come from subsites 5603 and 10B and derive from ten different grave groups. No grave group contains more than two dated graves with classified axeheads, except for grave group 14 on subsite 10B which contains six such graves (containing axeheads of types B, D, E, and F). Another 12 graves contain axeheads that have yet to be classified. All the axehead types appear to have been in use during the time when the site was used most intensively, in the generations around 4700 cal BC. No clear chronological trends are apparent but, on the basis of the samples of graves currently dated, not all axehead types may have been in use before 4700 cal BC (e. g. A–D) and not all necessarily continued in use beyond 4600 cal BC (e. g. A and F). These apparent trends may be an artefact of the available sample, and further dated examples are required to confirm these suggestions.

Chronological summary

It is clear that Alsónyék presents an unrivalled opportunity to examine burial and settlement together in a Lengyel context. There is a wealth of new insights about both dimensions of the site. It is apparent that Alsónyék did not belong to an early phase of Lengyel culture development. Our modelling has established the timings, durations and relationships between burial and settlement activity in the three Alsónyék subsites investigated *(figs 25–26)*. The first burials appear to have begun in the earlier 48th century cal BC in subsites 5603 and 11. The end of burial activity in these areas was to fall at the very start of the 45th century cal BC and during the 46th century cal BC respectively. Burial in subsite 10B, however, appears to have been concentrated in the decades around 4700 cal BC, probably over the span of a single generation. The settlement appears to have been established swiftly on all subsites at the time when the concentrated period of burial in subsite 10B began. Settlement activity ended before burial on both subsites 10B and 11, but appears to have continued for much longer in subsite 5603, until the end of the 44th
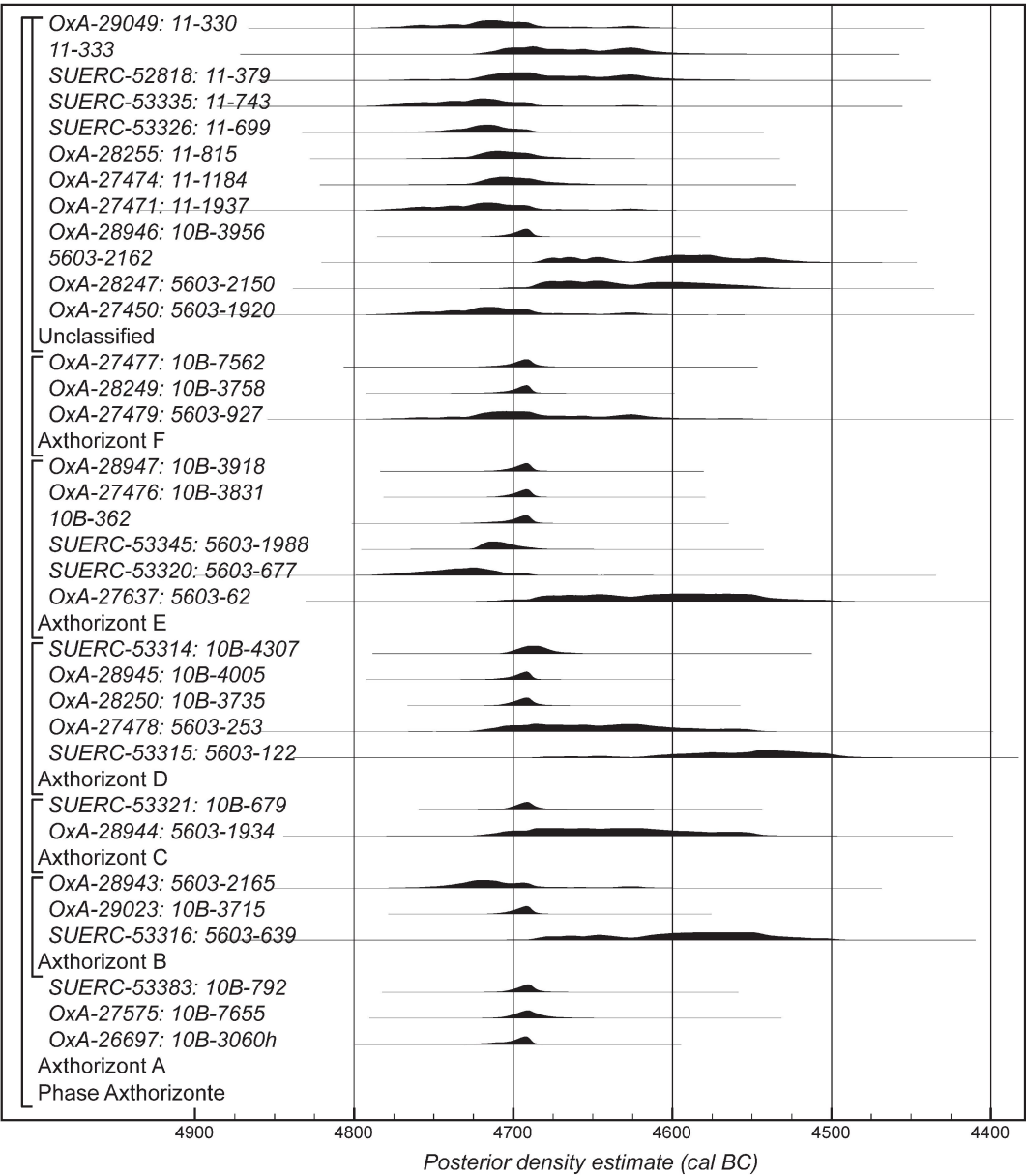
Fig. 30. Posterior density estimates for burials containing stone axeheads. The probabilities have been derived from the models shown in *figs 12–13; 15–16; 18–19.*

century cal BC. The peak of both burial and settlement activity probably lay either side of 4700 cal BC.

Examining the reliability of the Lengyel chronology

Three alternative models were constructed for Lengyel activity on each of the subsites at Alsónyék. Key parameters for the start and end of burial and settlement on each subsite from each of the models are shown on *figure 31.*
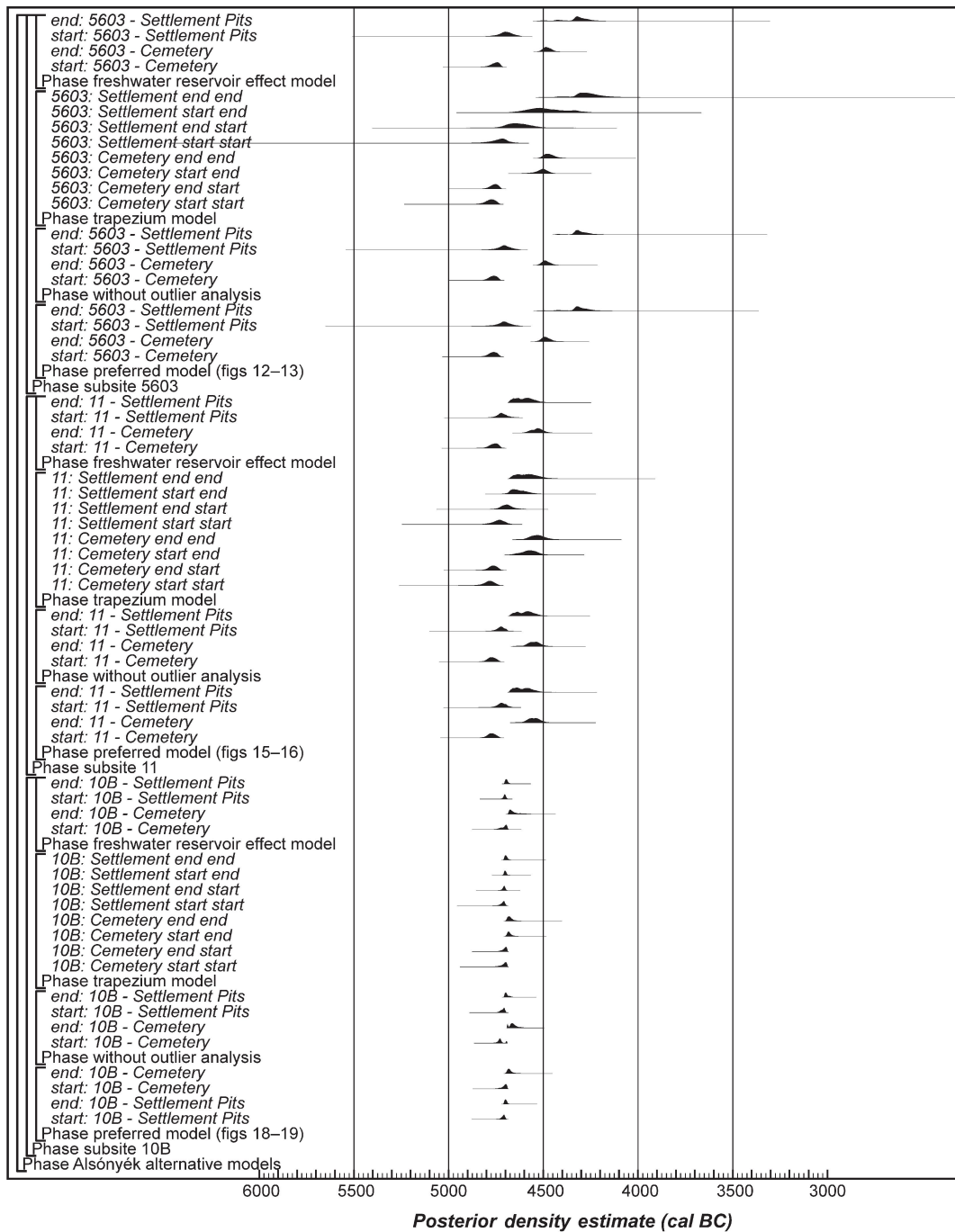
Fig. 31. Summary of alternative models for the chronology of Lengyel burial and settlement at Alsónyék: for each subsite the models shown are, from the bottom, a) preferred model (general outlier model with uniform phase; see *figs 12–13, 15–16 and 18–19*), b) uniform phase model without outlier analysis, c) general outlier model with trapezium phase, and d) general outlier model with mixed source calibration to account for freshwater reservoir effects.

First, the model for each subsite was run without the general outlier analysis. The model for subsite 5603 has good overall agreement (Amodel: 71) and produces date estimates for the start and end of burial and settlement in this area that are almost identical to those provided by the preferred model shown in *figures 12* and *13* (the medians of the equivalent parameters vary by a maximum of three years). The model for subsite 11 also has good overall agreement (Amodel: 73) and again produces date estimates for the start and end of burial and settlement in this area that are almost identical to those provided by the preferred model shown in *figures 15* and *16* (the medians of the equivalent parameters vary by a maximum of 12 years). We have excluded the earliest and latest graves from this model of subsite 10B, since the preferred model has shown these burials to be clear outliers from the main period of burial in this area (SUERC-53322 and mean of results from 10B-398), but the model for subsite 10B has poor overall agreement nonetheless (Amodel: 47). The date estimates for the settlement activity in this area are almost identical to those provided by the preferred model shown in *figure 19* (the medians of the equivalent parameters vary by a maximum of four years), but the date estimates for the use of the cemetery differ appreciably, with the start being about a generation earlier than in the preferred model and the end about a generation later (the medians of the equivalent parameters vary by 26 and 19 years respectively). These differences again appear to arise from the presence of a small number of graves in this area which pre-date and post-date its main period of concentrated use. All five burials with individual indices of agreement below 25 in this model were also identified as outliers by the previous analysis (see above, MAMS-20657, A: 16; the mean of results from 10B-6337, A: 22; OxA-27482, A: 23, OxA-28250, A: 24; and OxA-28926, A: 29).

Second, the general outlier models were run using trapezium boundaries (KARLSBERG 2006; LEE / BRONK RAMSEY 2012) for the cemetery and settlement models for each subsite, allowing for a more gradual introduction and exit of the dated cultural phase. For example the period of introduction of burial on subsite 5603 is estimated to have first begun in *4845–4730 cal BC (95% probability; 5603: Cemetery start start; fig. 31)*, probably in *4805–4745 cal BC (68% probability)*, and its introduction is estimated to have been complete by *4810–4720 cal BC (95% probability; 5603: Cemetery end start; fig. 31)*, probably by *4780–4735 cal BC (68% probability)*, taking *1–70 years (95% probability; distribution not shown)*, probably *1–25 years (68% probability)*. Although the two models do not produce directly equivalent parameters, it is clear that the introduction of burial in this area was swift (and so the point estimate for the introduction of burial on subsite 5603 provided by the preferred model is not importantly wrong) and that both models estimate this to have occurred in the first half of the 48th century cal BC. Similarly, the end burial in subsite 5603 seems to have been swift and both models agree in placing this ending in the first decades of the 45th century cal BC. The introduction and demise of settlement in subsite 5603 appears to have been much slower, with the decline of the settlement in particular probably occurring over a century or two *(fig. 31)*. The preferred and trapezium models agree, however, in placing the start of the settlement c. 4700 cal BC and final ending at the start of the 43rd century cal BC. On subsite 11 the phase of burial began and ended swiftly, and again the preferred and trapezium models agree in the dating of these boundaries. The phase of settlement also began and ended swiftly; the two models produce very similar date estimates *(fig. 31)*. On subsite 10B both burial and settlements also began and ended very swiftly, and the preferred and trapezium models provide date estimates that are almost identical.

Third, the general outlier models were run using mixed-source calibration for samples from human and dog skeletons in order to explore the effect of any potential freshwater

reservoir offset (see BAYLISS et al. this volume, 45). The model for subsite 5603 produces date estimates for the start and end of burial and settlement in this area that are very similar to those provided by the preferred model shown in *figures 12* and *13* (the medians of the equivalent parameters vary by a maximum of 14 years). The freshwater reservoir effect model for settlement on subsite 11 produces date estimates that are very similar to those provided by the preferred model shown in *figures 15* and *16* (the medians of the equivalent parameters vary by a maximum of five years). The date estimates for the use of the cemetery on subsite 11, however, fall a decade or so later in this reading (the medians of these parameters vary by up to 18 years). This reflects the possibility that a small amount of freshwater fish was consumed by some of the dated individuals. The freshwater reservoir model for subsite 10B produces date estimates for the start of burial and for settlement in this area that are very similar to those provided by the preferred model shown in *figures 18* and *19* (the medians of the equivalent parameters vary by a maximum of seven years). The date estimate for the end of the cemetery, however, is a decade or two later in this reading (the medians of these parameters vary by 17 years). This again reflects the possibility that a small amount of freshwater fish was consumed by some of the dated individuals.

The alternative models constructed for the Lengyel occupation at Alsónyék generally produced results that are remarkably similar to those presented in the preferred models *(fig. 31)*. Date estimates for burial on subsite 10B are most sensitive. It is clear that a small number of burials were placed in this area both before and after the concentrated phase of burial here in the generations around 4700 cal BC. It is also possible, however, that this concentrated phase of burial continued for a decade or two later than suggested by the preferred model. The trapezium models confirm that the appearance and demise of burial and settlement in different areas of the site were swift, with the exception of settlement on subsite 5603, which appears to have declined gradually over the course of several centuries. The consumption of freshwater resources by the inhabitants of Alsónyék was very slight, leading to a reservoir age of a decade or two at most.

Initial discussion

In the final paper that follows, *The Alsónyék story: towards the history of a persistent place*, the many wider implications of the trajectory presented above are followed in much more detail, and in conjunction with the earlier phases of the site. Big issues of village development, persistent place, sense of place and imagined community, aggregation and coalescence, population density and internal difference will all be discussed there. Here it is sufficient first to underline the very distinctive history of the Lengyel occupation of Alsónyék, and secondly to draw initial attention to some of the specific questions which it immediately raises.

Two features are of particular interest, both in themselves and in relation to the local and regional context within south-east Transdanubia: the appearance at Alsónyék of burials before settlement activity, and then the surge in settlement activity accompanying a further intensification of burial, in a short period of time either side of 4700 cal BC. This invites comparison with other Lengyel sites locally and regionally, but exposes the limitations of current knowledge. Is Alsónyék the exception, not just in terms of its maximum size, but also in its combination of intense burial activity and settlement? There are several uncertainties to take into account. Alsónyék has been excavated on a far greater scale than most other comparable sites in south-east Transdanubia and beyond. Whether it is really larger

than its not distant neighbours such as Mórágy-Tűzkődomb, about 6 km away, and Zen-
gővárkony and the site of Lengyel itself, both not much more than 20 km afield, is perhaps
an open question, though the extensive trial trenching at Zengővárkony (DOMBAY 1960)
may suggest a size of 40 ha, thus of a significantly lesser order of magnitude to Alsónyék.
Nor is it yet certain whether these are directly contemporary or at least partially overlap in
time within the Lengyel culture of the region (ZALAI-GAÁL et al. 2014a; 2014b). It is a
further aim of the *The Times of Their Lives* project to provide formal date estimates for the
phases of the Lengyel culture in Transdanubia and beyond with greater precision, exploit-
ing the seriated ceramic sequence (ZALAI-GAÁL et al. 2014b Abb. 43), and that work is in
progress. Some traces of settlement are known from Zengővárkony (DOMBAY 1960), but
few seem apparent from the more recent excavations at Mórágy-Tűzkődomb (ZALAI-GAÁL
2001a; 2002). It becomes a pressing question for future research whether on the one hand
all three sites followed roughly the same kind of sequence, but with our knowledge of the
settlement dimension at Zengővárkony and Mórágy reduced because of the circumstances
of the investigations, or on the other hand if it was at Alsónyék alone that, if only for a
brief initial phase, houses were built in numbers. If the latter, Alsónyék then stands out
doubly, for the great numbers of burials and the vast extent of houses and pits. The follow-
ing paper looks at the possible scenarios which might have produced such a concentration
of people and activity.

   In the resulting aggregation, there are already some signs of potentially significant varia-
tion and differentiation, though there is much more post-excavation work still to be done
to evaluate all the finds and contexts, and any interpretation is unavoidably provisional at
this stage. Finds with four-post construction graves in the northern part of subsite 10B are
more abundant compared to subsite 11; there are subtle variations in Grave Groups 61
and 61A, with rows beginning to form in some places but not others; and there were
varying durations among Grave Groups 56–59 and 61–68 *(fig. 28)*. The two most richly
furnished graves both come from Grave Group 23 on subsite 10B. These graves contained
a man (3060: *fig. 20*; ZALAI-GAÁL et al. 2011b) and a woman (1473: *fig. 21*; ZALAI-GAÁL
et al. 2010, 314–315; 319 Abb. 12a–b). The body in the male grave was accompanied by
a large aurochs trophy, a large set of polished stone axes, the largest stone knife ever found
in the Carpathian basin, *Spondylus* and *Dentalium* ornaments, and copper beads. The wo-
man in grave 1473 has comparably abundant grave goods, especially of *Spondylus* and *Den-
talium*. These individuals were probably buried in the early decades of the 47th century cal
BC, as were the people buried in the adjacent Grave Groups 13, 14 and 15 on subsite
10B. These are not identical in terms of the grave orientations and body position, and so
this diversity is surely significant amongst a group of people who would have known each
other. Though the sample is tiny, the apparent concentration of dated stone axes around
4700 cal BC *(fig. 30)* could also speak to the importance of display among peer groups at
the peak of the occupation aggregation. Directly contemporary groups were signalling dif-
ference in mortuary practice, and while there is again much more work to be done, this
may encourage the view that such a rapid and large concentration of people would only
have been possible if previously separate communities had been brought together, for any
number of possible reasons. On this basis, the paper that follows explores the potentially
significant theme of coalescence.

   Anticipating the discussion that follows in the next paper, we know on comparative
grounds that many early villages of any size were, other things being equal, socially fragile,
and subject to any number of internal tensions, which regularly led to their fairly rapid
demise. This might apply also in the case of Alsónyék, but the strikingly rapid surge and
very brief flourishing of the peak of simultaneous burial and settlement activity can also

suggest very specific causes, rather than simply the operation of recurrent processes in similar conditions. This applies to both the coming together and the breaking up of the major aggregation across Alsónyék. Disease has been mooted as a factor in the abandonment of subsite 10B, and it might also perhaps be appropriate to consider its role in encouraging people to come together, escaping bad conditions elsewhere. But the fact that burial preceded settlement at Alsónyék may rather suggest that in some way it was either the renown of the place that drew people in numbers around 4700 cal BC or that bad conditions in the region drove people to seek a prominent place as a resort in times of trouble. The following paper looks at a range of conditions, including the threat of conflict and violence, which elsewhere push people together.

The modelled estimates given above also make it clear that the Alsónyék story did not have a quick ending. Whatever caused the peak of aggregation to pass did not lead to the abandonment of the site as a whole, and what remained was probably still of considerable size. The place may now have had dual significance, first for continuing burial, which outlasted settlement on subsites 10B and 11, but also for residence, that continuing longest on subsite 5603. It will again be for further evaluation to tease out potential differences in the character of later burial and settlement, compared to both the phase of maximum aggregation around 4700 cal BC and in the beginnings of burial activity in the 48th century cal BC, and for future regional research to compare late Alsónyék with other contemporary sites.

Acknowledgments

Summary · Zusammenfassung · Résumé

SUMMARY   The Neolithic settlement of Alsónyék reached its greatest extent during the
Late Neolithic Lengyel period. Nearly 9000 features, including postholes associated with
122 houses, pits and pit complexes, and c. 2300 burials, could be assigned to it. The traces
of Lengyel settlement and burials were found over the entire excavated area, with an esti-
mated extent of some 80 ha.

The burials uncovered mostly form part of groups of graves, actually being small ceme-
teries within the various parts of the settlement. Apart from the grave groups, several solitary
or scattered graves were also found. Other large Lengyel burial grounds or large Lengyel
settlements with numerous burials are known in Transdanubia, but the enormous number
of graves at Alsónyék is unprecedented within the Lengyel cultural complex as a whole, and
provides exciting opportunities for varied archaeological and bioarchaeological investigations.

The discovery of 122 surface-level, timber-framed houses at a single site is also unique
for the area and the Lengyel period as a whole. These buildings help to build a better
understanding of the architecture and lifestyle of the Lengyel population, which is a fairly
new strand in the settlement archaeology of the Lengyel culture in Hungary and beyond.
This and the sheer size of the site make Alsónyék exceptionally significant.

Altogether 217 radiocarbon results are presented for the Lengyel phase. For the purpose of
analysis subsites 5603, 11 and 10B have been modelled separately. The modelled estimates
are precise enough that it is possible to estimate robustly the timing of activity across the site.
The modelling suggests that burial activity in subsite 5603 probably began in *4790–4740 cal
BC (68% probability)* and that it began at a similar time, *4795–4745 cal BC (68% prob-
ability)*, in subsite 11. An intensive period of burial began slightly later, in *4715–4690 cal
BC (68% probability)*, on subsite 10B. At this time settlement was established across a wide
area, in subsite 11 from *4745–4690 cal BC (68% probability)*, on subsite 5603 from
4745–4665 cal BC (68% probability), and on subsite 10B from *4720–4700 cal BC (68%
probability)*.

After a brief episode of intense occupation, lasting at most a few decades, settlement and
then burial ended on the northernmost subsite 10B, in the *4700s or 4690s cal BC (68%
probability)* and *4695–4670 cal BC (68% probability)* respectively. Settlement also ended
before burial on subsite 11, but endured for much longer. The settlement here ended in
4670–4620 cal BC (37% probability) or *4610–4565 cal BC (31% probability)* and burial in
4585–4515 cal BC (68% probability). Both settlement and burial endured longest on sub-
site 5603, although here the end of burial preceded the end of settlement by well over a
century. Burial ended here in *4515–4465 cal BC (68% probability)*, and settlement ended
in *4345–4245 cal BC (68% probability)*.

ZUSAMMENFASSUNG   Die größte Ausdehnung erreicht die neolithische Besiedlung
von Alsónyék während der spätneolithischen Lengyel Kultur. Annähernd 9000 Befunde,
darunter Pfostengruben von 122 Häusern, Gruben und Grubenkomplexe sowie rund 2300
Bestattungen sind der Lengyel Kultur zuzuweisen. Die Befunde erstrecken sich über die
gesamte Grabungsfläche und umfassen ein Areal von über 80 ha.

Die meisten Bestattungen bilden Gräbergruppen, die an unterschiedlichen Stellen der
Siedlung kleine Friedhöfe bilden; Einzelgräber streuen ebenfalls über die Fläche. Es sind
zwar weitere große Gräberfelder und große Siedlungen mit Bestattungen der Lengyel Kul-
tur in Transdanubien bekannt, allerdings ist die enorme Zahl an Gräbern in Alsónyék bei-
spiellos innerhalb des gesamten Lengyel-Komplexes. Diese Tatsache eröffnet Möglichkeiten
für unterschiedlichste archäologische und bioarchäologische Untersuchungen.

Die Entdeckung von 122 Pfostenbauten auf einer einzigen Fundstelle ist einzigartig für die Lengyel Kultur. Diese Bauten eröffnen ein besseres Verständnis für die Architektur und den Lebensstil der Lengyel-zeitlichen Bevölkerung, was eine vollkommen neue Situation für die Archäologie der Lengyel Kultur in Ungarn und darüber hinaus bedeutet. Dieser Umstand und die enorme Größe machen Alsónyék so bedeutend.

Insgesamt können 217 Radiocarbondaten der Lengyel Kultur ausgewertet werden, wobei die Flächen 5603, 11 und 10B separat untersucht wurden. Die Kalkulationen sind genau genug, um eine robuste zeitliche Abfolge der Aktivitäten auf der Fundstelle zu ermitteln. Das Modell zeigt an, dass die Bestattungen auf Fläche 5603 vermutlich um *4790–4740 cal BC (68% Wahrscheinlichkeit)* einsetzen und auf Fläche 11 etwa zur gleichen Zeit, nämlich um *4795–4745 cal BC (68% Wahrscheinlichkeit)*. Wenig später, um *4715–4690 cal BC (68% Wahrscheinlichkeit)*, beginnt in Fläche 10B eine intensive Bestattungsphase. Zu dieser Zeit ist bereits eine weitläufige Besiedlung festzustellen – in Fläche 11 von *4745–4690 cal BC (68% Wahrscheinlichkeit)*, in Fläche 5603 von *4745–4665 cal BC (68% Wahrschein-lichkeit)* und in Fläche 10B von *4720–4700 cal BC (68% Wahrscheinlichkeit)*.

Nach einer kurzen, aber intensiven Belegungszeit, die nur wenige Jahrzehnte andauerte, endet die Besiedlung und danach die Bestattungstätigkeit in der nördlichsten Fläche, 10B, in den *4700er oder 4690er Jahren cal BC (68% Wahrscheinlichkeit)* bzw. um *4695–4670 cal BC (68% Wahrscheinlichkeit)*. Die Besiedlung von Fläche 11 endet ebenfalls vor der Aufgabe der Bestattungsaktivität, jedoch dauerte sie insgesamt länger. Die Siedlung wird aufgelassen um *4670–4620 cal BC (37% Wahrscheinlichkeit)* oder *4610–4565 cal BC (31% Wahrscheinlichkeit)*, die Begräbnisse enden um *4585–4515 cal BC (68% Wahrscheinlich-keit)*. Am längsten halten sich die Siedlung und die Bestattungstätigkeit in Fläche 5603, obwohl das Ende der Bestattungen etwa 100 Jahre vor dem Ende der Siedlung anzusetzen ist. Die Gräber enden um *4515–4465 cal BC (68% Wahrscheinlichkeit)*, die Siedlung um *4345–4245 cal BC (68% Wahrscheinlichkeit)*.

RÉSUMÉ   L'habitat néolithique d'Alsónyék atteint sa plus grande extension durant la période du Lengyel récent. Près de 9000 structures ont pu lui être attribuées, dont des trous de poteaux associés à 122 maisons, des fosses ou complexes de fosses, ainsi qu'environ 2300 sépultures. Les traces de l'habitat et des sépultures de cette époque furent retrouvées sur l'ensemble de l'aire fouillée, de 80 ha environ. Les sépultures découvertes sont généralement regroupées en petites nécropoles à différents endroits de l'habitat. Quelques tombes isolées ou épars furent également observées. D'autres vastes nécropoles ou habitats du complexe culturel de Lengyel sont connues en Transdanubie. Cependant, le site d'Alsónyék demeure sans précédent de par l'énorme quantité de tombes aptes à servir à diverses études archéologiques et bioarchéologiques.

La découverte en surface de 122 maisons à pans de bois réunies sur un seul site représente aussi un cas unique dans la région pour cette période Lengyel. Ces bâtiments contribuent à mieux comprendre l'architecture et le mode de vie de la population Lengyel – un élément tout à fait nouveau dans l'archéologie de l'habitat de la culture de Lengyel en Hongrie et au-delà. Cet aspect ainsi que la taille même du site font d'Alsónyék un cas exceptionnel.

Un total de 217 datations radiocarbone sont présentées pour la phase Lengyel. L'analyse a exigé une modélisation séparée des sous-sites 5603, 11 et 10B, dont les estimations sont suffisamment précises pour évaluer une chronologie robuste des activités à travers le site. Selon la modélisation, les premières sépultures du sous-site 5603 auraient été aménagées vers 4790–4740 cal BC (68 % de probabilité), soit en même temps que le sous-site 11,

entre 4795–4745 cal BC (68 % de probabilité). Une phase d'activité funéraire intense débuta peu après sur le sous-site 10B, entre 4715 – 4690 cal BC (68 % de probabilité). L'habitat couvrait alors une grande surface, sur le sous-site 11 de 4745–4690 cal BC (68 % de probabilité), sur le sous-site 5603 de 4745–4665 cal BC (68 % de probabilité), et sur le sous-site 10B de 4720 – 4700 cal BC (68 % de probabilité).

L'occupation du sous-site 10B situé le plus au nord cessa vers 4700 ou 4690 cal BC (68 % de probabilité). Après une une occupation intense, mais brève, tout au plus de quelques décennies, l'activité funéraire s'acheva un peu plus tard, vers 4695–4670 cal BC (68 % de probabilité). Sur le sous-site 11, l'habitat fut également abandonné avant la nécropole. Ce dernier cependant, perdura bien plus longtemps. En effet, l'occupation cessa vers 4670 – 4620 cal BC (37% de probabilité) ou 4610–4565 cal BC (31 % de probabilité) et l'activité funéraire vers 4585–4515 cal BC (68 % de probabilité). C'est sur le sous-site 5603 que l'habitat et la nécropole se maintinrent le plus longtemps. Ici, l'activité funéraire cessa près d'un siècle avant l'occupation – la nécropole fut finalement abandonnée vers 4515–4465 cal BC (68 % de probabilité) et l'habitat vers 4345–4245 cal BC (68 % de probabilité).   (Y.G. / E.P.)

Addresses of authors:
Anett Osztás
osztas.anett@btk.mta.hu
István Zalai-Gaál
gaal.istvan@btk.mta.hu
Tibor Marton
marton.tibor@btk.mta.hu
Éva Ágnes Nyerges
nyerges.eva@btk.mta.hu
Kitti Köhler
kohler.kitti@btk.mta.hu
Institute of Archaeology
Research Centre for the Humanities,
Hungarian Academy of Sciences
H-1014 Budapest
Országház u. 30, Hungary

Eszter Bánffy
eszter.banffy@dainst.de
Römisch-Germanische Kommission
des Deutschen Archäologischen Instituts
Palmengartenstr. 10-12
D-60325 Frankfurt/Main, Germany;
Institute of Archaeology
Research Centre for the Humanities,
Hungarian Academy of Sciences
H-1014 Budapest
Országház u. 30, Hungary

Krisztina Somogyi
lasinja@freemail.hu
Zsolt Gallina
gallina71@freemail.hu
ÁSATÁRS Cultural,
Archaeological Servicing and Commercial Ltd.,
H-6000 Kecskemét
Futár u. 12, Hungary

Christopher Bronk Ramsey
christopher.ramsey@arch.ox.ac.uk
Oxford Radiocarbon Accelerator Unit
Research Laboratory for Archaeology and the History of Art
Dyson Perrins Building, University of Oxford
Oxford OX1 3QY, United Kingdom

Elaine Dunbar
Elaine.Dunbar@glasgow.ac.uk
Derek Hamilton
Derek.Hamilton.2@glasgow.ac.uk
Scottish Universities Environmental Research Centre
Scottish Enterprise Technology Park
Rankine Avenue
East Kilbride G75 0QF, United Kingdom

Bernd Kromer
bernd.kromer@cez-archaeometrie.de
Klaus-Tschira-Archäometrie-Zentrum an der Universität Heidelberg
C5 Zeughaus
68159 Mannheim, Germany

Alex Bayliss
Alex.Bayliss@HistoricEngland.org.uk
Peter Marshall
Peter.Marshall@HistoricEngland.org.uk
Scientific Dating, Historic England
1 Waterhouse Square, 138–42 Holborn
London EC1N 2ST, United Kingdom

Alasdair Whittle
whittle@cardiff.ac.uk
Department of Archaeology and Conservation
Cardiff University
John Percival Building, Colum Drive
Cardiff CF10 3EU, United Kingdom

Age	Sex not determinable	Male	Female	Total	
Neonate (0–1 year)	9	0	0	9	(1.1%)
Infans I. (1–7 years)	69	0	0	69	(8.0%)
Infans II. (7–14 years)	69	0	0	69	(8.0%)
Juvenis (14–20 years)	41	9	15	65	(7.5%)
Adultus (20–40 years)	38	112	166	316	(36.7%)
Maturus (40–60 years)	37	126	154	317	(36.8%)
Senilis (60–80 years)	0	1	1	2	(0.2%)
Adultus–Senilis (20–80 years)	9	0	0	9	(1.0%)
Indeterminable (1–80 years)	6	0	0	6	(0.7%)
Total	**278**	**248**	**336**	**862**	(100.0%)

Tab. 1. Age and sex distribution of the 862 skeletons studied so far from subsite 10B.

Laboratory number	Context description [Sample ID]	Material	$\delta^{13}C_{AMS}$ (‰)	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	C:N	Radiocarbon age (BP)
OxA-27479	Burial 927, Grave Group 42 [5603-927]	Human bone: left femur		−19.3 ± 0.2	10.4 ± 0.3	3.2	5829 ± 34
SUERC-53316	Burial 639, Grave Group 52 [5603-639]	Human bone: left tibia		−20.1 ± 0.2	10.2 ± 0.3	3.2	5739 ± 31
SUERC-53320	Burial 677, Grave Group 52 [5603-677]	Human bone: right tibia		−19.5 ± 0.2	11.5 ± 0.3	3.2	5875 ± 31
OxA-27478	Burial 253, Grave Group 53 [5603-253]	Human bone: right femur		−19.9 ± 0.2	11.0 ± 0.3	3.2	5797 ± 33
OxA-27637	Burial 62, Grave Group 54 [5603-62]	Human bone: right tibia		−19.5 ± 0.2	10.7 ± 0.3	3.2	5753 ± 36
SUERC-53315	Burial 122, Grave Group 54 [5603-122]	Human bone: left tibia		−20.3 ± 0.2	10.2 ± 0.3	3.2	5712 ± 31
SUERC-53344	Burial 1984, Grave Group 56; cut by burial 1988 [5603-1984]	Human bone: left tibia		−19.9 ± 0.2	10.6 ± 0.3	3.2	5840 ± 33
SUERC-53345	Burial 1988, Grave Group 56; cuts burial 1984 [5603-1988]	Human bone: right femur		−20.3 ± 0.2	10.5 ± 0.3	3.2	5808 ± 31
OxA-27458	Burial 1989, Grave Group 56; cut by burial 2585 [5603-1989]	Human bone: left femur		−19.7 ± 0.2	10.4 ± 0.3	3.1	5834 ± 33
UBA-22534	Replicate of OxA-27458 [5603-1989]	Human bone: left femur		−19.9 ± 0.22	10.0 ± 0.15	3.2	5906 ± 38
Mean 5603-1989	T' = 0.2; T'(5%) = 3.8; ν = 1						5865 ± 25

Tab. 2. Radiocarbon and stable isotopic results from Lengyel culture burials and settlement activity in subsite 5603 at Alsónyék.

Laboratory number	Context description [Sample ID]	Material	$\delta^{13}C_{AMS}$ (‰)	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	C:N	Radiocarbon age (BP)
OxA-27451	Burial 1996, Grave Group 56 [5603-1996]	Human bone: right femur		−19.7 ± 0.2	10.1 ± 0.3	3.2	5901 ± 34
SUERC-53346	Burial 2000, Grave Group 56 [5603-2000]	Human bone: right femur		−20.1 ± 0.2	9.9 ± 0.3	3.2	5837 ± 31
OxA-27459	Burial 2579, Grave Group 56 [5603-2579]	Human bone: left femur		−19.7 ± 0.2	9.9 ± 0.3	3.1	5910 ± 33
SUERC-53351	Burial 2580, Grave Group 56 [5603-2580]	Human bone: right femur		−20.3 ± 0.2	9.4 ± 0.3	3.2	5857 ± 31
SUERC-53352	Burial 2585, Grave Group 56; cuts burial 1989 [5603-2585]	Human bone: right femur		−20.3 ± 0.2	9.8 ± 0.3	3.2	5829 ± 31
OxA-27452	Burial 2597, Grave Group 56 [5603-2597]	Human bone: left femur		−19.5 ± 0.2	10.9 ± 0.3	3.2	5800 ± 36
SUERC-53353	Burial 2599, Grave Group 56 [5603-2599]	Human bone: right femur		−20.2 ± 0.2	9.9 ± 0.3	3.3	5829 ± 31
OxA-27456	Burial 2843, Grave Group 56 [5603-2843]	Human bone: right tibia		−19.8 ± 0.2	9.9 ± 0.3	3.2	5866 ± 35
SUERC-53354	Burial 2844, Grave Group 56; cuts burial 2906 [5603-2844]	Human bone: right femur		−20.2 ± 0.2	10.6 ± 0.3	3.2	5874 ± 31
SUERC-53355	Burial 2906, Grave Group 56; cut by burial 2844 [5603-2906]	Human bone: left femur		−19.7 ± 0.2	10.0 ± 0.3	3.2	5913 ± 31
OxA-27450	Burial 1920, Grave Group 57; double grave with burial 1934 [5603-1920]	Human bone: right tibia		−19.8 ± 0.2	10.1 ± 0.3	3.2	5849 ± 33

Laboratory number	Context description [Sample ID]	Material	$\delta^{13}C_{AMS}$ (‰)	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	C:N	Radiocarbon age (BP)
OxA-28939	Burial 1921, Grave Group 57 [5603-1921]	Human bone: rib		−19.9 ± 0.2	10.7 ± 0.3	3.3	5710 ± 34
OxA-28944	Burial 1934, Grave Group 57, double grave with burial 1920 [5603-1934]	Human bone: right tibia		−19.3 ± 0.2	10.5 ± 0.3	3.3	5787 ± 33
SUERC-53343	Burial 1966, Grave Group 57 [5603-1966]	Human bone: left femur		−20.1 ± 0.2	9.3 ± 0.3	3.2	5887 ± 36
OxA-27454	Burial 1969, Grave Group 57 [5603-1969]	Human bone: left tibia		−19.8 ± 0.2	10.5 ± 0.3	3.2	5752 ± 33
SUERC-53342	Burial 1881, Grave Group 58 [5603-1881]	Human bone: right femur		−20.3 ± 0.2	10.5 ± 0.3	3.3	5877 ± 37
OxA-26698	Burial 1821, Grave Group 59 [5603-1821a]	Red deer antler tool		−19.9 ± 0.2	6.1 ± 0.3	3.2	5742 ± 32
OxA-26699	Burial 1821, Grave Group 59 [5603-1821h]	Human bone: right femur		−19.5 ± 0.2	9.8 ± 0.3	3.2	5805 ± 31
OxA-27448	Burial 1867, Grave Group 59 [5603-1867]	Human bone: left ?tibia		−19.7 ± 0.2	9.8 ± 0.3	3.2	5866 ± 33
OxA-27449	Replicate of OxA-27448 [5603-1867]	Human bone: left ?tibia		−19.7 ± 0.2	9.5 ± 0.3	3.1	5872 ± 35
Mean 5603-1867	T′ = 0.0; T′(5%) = 3.8; v = 1						5869 ± 25
SUERC-53341	Burial 1868, Grave Group 59 [5603-1868]	Human bone: right femur		−20.2 ± 0.2	10.5 ± 0.3	3.2	5803 ± 31

Tab. 2. (continued)

Laboratory number	Context description [Sample ID]	Material	$\delta^{13}C_{AMS}$ (‰)	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	C:N	Radiocarbon age (BP)
OxA-27453	Burial 1875, Grave Group 59; cuts burial 1877 [5603-1875]	Human bone: left femur		−19.5 ± 0.2	10.6 ± 0.3	3.2	5737 ± 35
OxA-27457	Burial 1877, Grave Group 59; cut by burial 1875 [5603-1877]	Human bone: right femur		−19.8 ± 0.2	9.7 ± 0.3	3.2	5769 ± 35
OxA-28247	Burial 2150, Grave Group 59 [5603-2150]	Human bone: rib		−19.6 ± 0.2	10.1 ± 0.3	3.2	5743 ± 33
OxA-27455	Burial 2162, Grave Group 59 [5603-2162]	Human bone: right femur		−19.6 ± 0.2	9.9 ± 0.3	3.2	5674 ± 33
UBA-22531	Replicate of OxA-27455 [5603-2162]	Human bone: right femur		−19.8 ± 0.22	9.9 ± 0.15	3.2	5747 ± 39
Mean 5603-2162	T' = 2.0; T'(5%) = 3.8; ν = 1						5705 ± 26
OxA-28943	Burial 2165, Grave Group 59 [5603-2165]	Human bone: right femur		−17.9 ± 0.2	9.9 ± 0.3	3.3	5879 ± 35
OxA-28938	Burial 2222, Grave Group 59 [5603-2222]	Human bone: right tibia		−19.7 ± 0.2	9.2 ± 0.3	3.3	5793 ± 34
SUERC-53350	Burial 2226, Grave Group 59 [5603-2226]	Human bone: left femur		−20.2 ± 0.2	10.3 ± 0.3	3.2	5818 ± 31
MAMS-11941	Burial 1535, ungrouped [5603-1535]	Human bone: right femur	−21.1	−20.5 ± 0.2	10.2 ± 0.1		5790 ± 33
SUERC-52834	Burial 1579, ungrouped; dug into settlement pit 2257 [5603-1579]	Human bone: ?femur		−19.3 ± 0.2	9.9 ± 0.3	3.2	5709 ± 32

Laboratory number	Context description [Sample ID]	Material	$\delta^{13}C_{AMS}$ (‰)	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	C:N	Radiocarbon age (BP)
SUERC-52835	Burial 1580, ungrouped; dug into settlement pit 1583 [5603-1580]	Human bone: ?femur		−19.8 ± 0.2	10.7 ± 0.3	3.2	5801 ± 32
SUERC-52842	Burial 1783, ungrouped; dug into settlement pit 1716 [5603-1783]	Human bone: right femur		−20.1 ± 0.2	10.0 ± 0.3	3.2	5651 ± 30
MAMS-20661	Burial 1798, ungrouped; dug into settlement pit 1667 [5603-1798]	Human bone: left femur	−13.5	−19.4 ± 0.08	9.5 ± 0.09	3.1	5820 ± 17
SUERC-52844	Burial 1968, ungrouped; dug into settlement pit 1931 [5603-1968]	Human bone: left tibia		−20.2 ± 0.2	9.8 ± 0.3	3.2	5701 ± 31
MAMS-20665	Burial 2262, ungrouped; dug into settlement pit 2255 [5603-2262]	Human bone: left femur	−17.6	−19.2 ± 0.08	11.3 ± 0.09	3.1	5758 ± 23
SUERC-52854	Burial 2276, ungrouped; dug into settlement pit 2256 [5603-2276]	Human bone: right femur		−20.0 ± 0.2	9.1 ± 0.3	3.2	5722 ± 33
SUERC-53381	Double burial 2770 of two children, ungrouped; the sample comes from the elder one (subnumber 2/2); the grave was dug into settlement pit 2772 [5603-2770]	Human bone: ?femur		−20.3 ± 0.2	10.4 ± 0.3	3.2	5815 ± 31

Tab. 2. (continued)

Laboratory number	Context description [Sample ID]	Material	$\delta^{13}C_{AMS}$ (‰)	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	C:N	Radiocarbon age (BP)
SUERC-52836	Irregularly shaped settlement pit 1583 (c. 8.5 m in diameter); cuts burial 1580 [5603-1583-1]	Animal bone: adult cattle; right metatarsal articulating with tarsal		−19.9 ± 0.2	6.6 ± 0.3	3.2	5683 ± 32
MAMS-20659	Same context as SUERC-52836 [5603-1583-2]	Animal bone: subadult/adult pig; right tibia articulating with astragalus	−23.7	−20.7 ± 0.08	8.6 ± 0.09	3.3	5638 ± 24
SUERC-52837	Large settlement pit 1667 (c. 15.5 m long and 13 m wide); cut by burial 1798 [5603-1667]	Animal bone: subadult wild boar; right femur; with refitting unfused distal epiphysis		−20.5 ± 0.2	9.6 ± 0.3	3.4	5445 ± 32
SUERC-52838	Large settlement pit 1716 (c. 15 m long); cut by burial 1783 [5603-1716]	Animal bone: cattle/red deer; left carpal bone; articulating with next carpal		−21.0 ± 0.2	6.1 ± 0.3	3.2	5676 ± 30
SUERC-52843	Small irregular-shaped settlement pit 1889 (4.6 m long) [5603-1889]	Animal bone: juvenile cattle; left humerus; with refitting unfused distal epiphysis		−19.1 ± 0.2	6.8 ± 0.3	3.3	5775 ± 29
MAMS-20662	Settlement pit 1931 that has an elongated oval shape (c. 18 m long); cut by burial 1968 [5603-1931-2]	Animal bone: subadult wild boar; left ulna; articulating with radius	−21.8	−20.4 ± 0.08	5.9 ± 0.09	3.3	5735 ± 24
SUERC-52845	Small round settlement pit 1974 (0.95 m in diameter) [5603-1974]	Animal bone: juvenile cattle; left tibia; articulating with tarsal bones		−20.2 ± 0.2	6.9 ± 0.3	3.2	5545 ± 31

Laboratory number	Context description [Sample ID]	Material	$\delta^{13}C_{AMS}$ (‰)	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	C:N	Radiocarbon age (BP)
SUERC-52846	Settlement pit 2255 with an irregular oval shape (c. 18 m long); cut by burial 2262 [5603-2255]	Animal bone: juvenile pig; left tibia; with refitting unfused distal epiphysis		−20.0 ± 0.2	9.3 ± 0.3	3.2	5682 ± 30
MAMS-20663	Large settlement pit 2256 (c. 14 m long); cut by burial 2276 [5603-2256]	Animal bone: juvenile cattle; metapodial distal epiphysis; refitting unfused diaphysis (lost on excavation: articulating)	−21.1	−19.2 ± 0.08	5.5 ± 0.09	3.3	5698 ± 25
SUERC-52847	Replicate of MAMS-20663 [5603-2256]	Animal bone: juvenile cattle; metapodial distal epiphysis; refitting unfused diaphysis (lost on excavation: articulating)		−19.5 ± 0.2	5.7 ± 0.3	3.2	5686 ± 31
Mean 5603-2256	T' = 0.1; T'(5%) = 3.8; v = 1						5693 ± 20
MAMS-20664	Settlement pit 2257, which is c. 12 m south-west of pit 2256; cut by grave 1579 [5603-2257-1]	Animal bone: subadult sheep; right ulna; articulating with radius	−24.3	−20.2 ± 0.08	8.4 ± 0.09	3.4	5744 ± 24
SUERC-52848	Small oval settlement pit 2576 (2.1 m long) [5603-2576-1]	Animal bone: juvenile dog; left humerus; articulating with the next limb segment (zygopodium)		−19.7 ± 0.2	10.5 ± 0.3	3.2	6240 ± 30

Tab. 2. (continued)

Laboratory number	Context description [Sample ID]	Material	δ¹³C$_{AMS}$ (‰)	δ¹³C$_{IRMS}$ (‰)	δ¹⁵N (‰)	C:N	Radiocarbon age (BP)
MAMS-20666	Small sub-rectangular settlement pit 2592 (2.2 m long) [5603-2592]	Animal bone: subadult/adult red deer; right metatarsal; articulating with tarsal	−17.8	−20.2 ± 0.08	4.0 ± 0.09		5728 ± 23
SUERC-53036	Small oval settlement pit 2772 (3 m diameter); cut by double burial 2770 [5603-2772]	Animal bone: subadult/adult red deer; right carpal; articulating with next carpal and metacarpal		−20.9 ± 0.2	4.8 ± 0.3	3.2	5695 ± 27
MAMS-20667	Replicate of SUERC-53036 [5603-2772]	Animal bone: subadult/adult red deer; right carpal; articulating with next carpal and metacarpal	−28.9	−20.5 ± 0.08	4.7 ± 0.09	3.2	5764 ± 20
Mean 5603-2772	T' = 4.2; T'(5%) = 3.8; ν = 1						5740 ± 17
SUERC-52853	Small round settlement pit 2827 (3 m in diameter) [5603-2827-1]	Animal bone: subadult cattle; left ulna; articulating with radius		−19.3 ± 0.2	7.4 ± 0.3	3.2	5815 ± 28
MAMS-20668	Same context as SUERC-52853 [5603-2827-2]	Animal bone: subadult wild boar; thoracic vertebra; with refitting unfused caudal epiphysis	−31.8	−18.9 ± 0.08	7.2 ± 0.09	3.3	5727 ± 18

Tab. 2. (continued)

Laboratory number	Context description [Sample ID]	Material	$\delta^{13}C_{AMS}$ (‰)	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	C:N	Radiocarbon age (BP)
SUERC-53334	Burial 190, Grave Group 60 [11-190]	Human bone: right femur		−20.3 ± 0.2	10.6 ± 0.3	3.2	5865 ± 31
OxA-27468	Burial 333, Grave Group 60 [11-333]	Human bone: right femur		−19.6 ± 0.2	10.2 ± 0.3	3.2	5804 ± 32
OxA-27469	Replicate of OxA-27468 [11-333]	Human bone: right femur		−19.7 ± 0.2	10.3 ± 0.3	3.2	5806 ± 32
Mean 11-333	T' = 0.0; T'(5%) = 3.8; ν = 1						5805 ± 23
OxA-28940	Burial 145, Grave Group 61B [11-145]	Human bone: rib		−19.4 ± 0.2	10.8 ± 0.3	3.3	5710 ± 34
OxA-27460	Burial 228, Grave Group 61A; cut by burial 293 [11-228]	Human bone: right femur		−20.0 ± 0.2	10.2 ± 0.3	3.2	5843 ± 34
OxA-27576	Burial 263, Grave Group 61A [11-263]	Human bone: right femur		−18.8 ± 0.2	10.8 ± 0.3	3.1	5790 ± 40
OxA-27463	Burial 264, Grave Group 61A [11-264]	Human bone: right femur		−19.8 ± 0.2	11.2 ± 0.3	3.2	5811 ± 34
OxA-27461	Burial 272, Grave Group 61A [11-272]	Human bone: right femur		−19.5 ± 0.2	12.8 ± 0.3	3.2	5725 ± 40
SUERC-53325	Burial 293, Grave Group 61A; cuts burial 228 [11-293]	Human bone: left femur		−19.9 ± 0.2	11.3 ± 0.3	3.2	5920 ± 31
OxA-27464	Burial 295, Grave Group 61A [11-295]	Human bone: tibia, ?left		−19.9 ± 0.2	10.0 ± 0.3	3.2	5777 ± 32
OxA-27577	Burial 319, Grave Group 61A [11-319]	Human bone: left tibia		−18.7 ± 0.2	11.6 ± 0.3	3.2	5863 ± 38

Tab. 3. Radiocarbon and stable isotopic results from Lengyel culture burials and settlement activity in subsite 11 at Alsónyék.

Laboratory number	Context description [Sample ID]	Material	$\delta^{13}C_{AMS}$ (‰)	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	C:N	Radiocarbon age (BP)
OxA-27462	Burial 324, Grave Group 61B [11-324]	Human bone: left tibia		−19.4 ± 0.2	9.8 ± 0.3	3.2	5753 ± 33
OxA-27528	Burial 337, Grave Group 61A [11-337]	Human bone: right tibia		−19.2 ± 0.2	10.8 ± 0.3	3.2	5800 ± 40
SUERC-53380	Burial 1850, Grave Group 66B; cut into settlement pit 1800 [11-1850]	Human bone: left femur		−20.5 ± 0.2	10.6 ± 0.3	3.2	5695 ± 31
OxA-27473	Burial 673, Grave Group 68 [11-673]	Human bone: right tibia		−19.9 ± 0.2	9.4 ± 0.3	3.2	5856 ± 33
OxA-27472	Burial 679, Grave Group 68; cut by burial 724 [11-679]	Human bone: right humerus		−20.0 ± 0.2	9.6 ± 0.3	3.2	5693 ± 33
SUERC-53326	Burial 699, Grave Group 68 [11-699]	Human bone: left femur		−19.7 ± 0.2	11.0 ± 0.3	3.2	5860 ± 31
SUERC-53330	Burial 724, Grave Group 68; cuts burial 679 [11-724]	Human bone: right femur		−19.8 ± 0.2	9.9 ± 0.3	3.2	5835 ± 31
OxA-29030	Burial 808, Grave Group 68 [11-808]	Human bone: right femur		−19.8 ± 0.2	10.2 ± 0.3	3.2	5844 ± 34
OxA-29029	Burial 809, Grave Group 68 [11-809]	Human bone: left femur		−19.8 ± 0.2	10.7 ± 0.3	3.2	5857 ± 34
OxA-28255	Burial 815, Grave Group 68 [11-815]	Human bone: right femur		−19.5 ± 0.2	10.1 ± 0.3	3.3	5829 ± 35
OxA-27474	Burial 1184, Grave Group 68 [11-1184]	Human bone: left tibia		−19.3 ± 0.2	10.2 ± 0.3	3.2	5816 ± 32

Laboratory number	Context description [Sample ID]	Material	δ¹³C_AMS (‰)	δ¹³C_IRMS (‰)	δ¹⁵N (‰)	C:N	Radiocarbon age (BP)
OxA-29032	Burial 1189, Grave Group 68 [11-1189]	Human bone: left femur		−20.2 ± 0.2	9.7 ± 0.3	3.3	5767 ± 33
SUERC-53331	Burial 1190, Grave Group 68 [11-1190]	Human bone: right femur		−20.3 ± 0.2	10.9 ± 0.3	3.2	5896 ± 31
OxA-27475	Burial 1191, Grave Group 68; cut by burial 1192 [11-1191]	Human bone: right tibia		−19.8 ± 0.2	9.6 ± 0.3	3.2	5865 ± 32
SUERC-53332	Burial 1192, Grave Group 68; cuts burial 1191 [11-1192]	Human bone: left femur		−19.9 ± 0.2	10.4 ± 0.3	3.2	5774 ± 31
OxA-28251	Burial 1793, Grave Group 68; cut by burial 1860 [11-1793]	Human bone: right femur		−19.5 ± 0.2	10.4 ± 0.3	3.2	5795 ± 33
OxA-28252	Burial 1802, Grave Group 68 [11-1802]	Human bone: left femur		−19.5 ± 0.2	10.3 ± 0.3	3.3	5825 ± 33
OxA-28253	Burial 1808, Grave Group 68 [11-1808]	Human bone: right femur		−19.4 ± 0.2	9.7 ± 0.3	3.3	5883 ± 33
OxA-28254	Replicate of OxA-28253 [11-1808]	Human bone: right femur		−19.3 ± 0.2	9.9 ± 0.3	3.2	5872 ± 34
Mean 11-1808	T′ = 0.1; T′(5%) = 3.8; ν = 1						5878 ± 24
OxA-29028	Burial 1822, Grave Group 68; cuts burial 1848 [11-1822]	Human bone: left femur		−19.9 ± 0.2	8.6 ± 0.3	3.2	5777 ± 33
SUERC-53333	Burial 1848, Grave Group 68; cut by burial 1822 [11-1848]	Human bone: left femur		−19.6 ± 0.2	10.3 ± 0.3	3.2	5898 ± 31

Tab. 3. (continued)

Laboratory number	Context description [Sample ID]	Material	$\delta^{13}C_{AMS}$ (‰)	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	C:N	Radiocarbon age (BP)
OxA-29031	Burial 1860, Grave Group 68; cuts burial 1793 [11-1860]	Human bone: left femur		−19.8 ± 0.2	9.6 ± 0.3	3.3	5845 ± 34
OxA-27531	Burial 1967, Grave Group 68 [11-1967]	Human bone: right femur		−19.6 ± 0.2	10.1 ± 0.3	3.2	5921 ± 33
SUERC-53335	Burial 743, Grave Group 71A [11-743]	Human bone: left femur		−19.6 ± 0.2	11.0 ± 0.3	3.2	5858 ± 31
SUERC-53336	Burial 1320, Grave Group 71B [11-1320]	Human bone: right femur		−19.8 ± 0.2	10.2 ± 0.3	3.2	5914 ± 31
OxA-27470	Burial 1391, Grave Group 71B [11-1391]	Human bone: left tibia		−19.8 ± 0.2	10.8 ± 0.3	3.2	5883 ± 34
UBA-22529	Replicate of OxA-27470 [11-1391]	Human bone: left tibia		−20.0 ± 0.22	10.6 ± 0.15	3.2	5893 ± 46
Mean 11-1391	T' = 0.0; T'(5%) = 3.8; ν = 1						5887 ± 28
OxA-27529	Burial 1235, Grave Group 73 [11-1235]	Human bone: right tibia		−19.5 ± 0.2	11.2 ± 0.3	3.2	5806 ± 36
OxA-27471	Burial 1937, Grave Group 76 [11-1937]	Human bone: right femur		−19.8 ± 0.2	11.5 ± 0.3	3.2	5851 ± 32
SUERC-53340	Burial 1669, Grave Group 79 [11-1669]	Human bone: right tibia		−20.1 ± 0.2	10.9 ± 0.3	3.3	5840 ± 31
SUERC-52833	Burial 1755, Grave Group 79; cut into settlement pit 1625 [11-1755]	Human bone: right femur		−20.2 ± 0.2	10.4 ± 0.3	3.2	5746 ± 30
OxA-27530	Burial 2028, Grave Group 83 [11-2028]	Human bone: left fibula		−19.6 ± 0.2	9.8 ± 0.3	3.2	5801 ± 36

Laboratory number	Context description [Sample ID]	Material	δ¹³C_AMS (‰)	δ¹³C_IRMS (‰)	δ¹⁵N (‰)	C:N	Radiocarbon age (BP)
OxA-27580	Replicate of OxA-27530 [11-2028]	Human bone: left fibula		-19.7 ± 0.2	9.8 ± 0.3	3.2	5821 ± 37
Mean 11-2028	$T' = 0.2; T'(5\%) = 3.8; \nu = 1$						5811 ± 26
OxA-29049	Burial 2330, Grave Group 88 [11-2330]	Human bone: right tibia		-19.9 ± 0.2	10.7 ± 0.3	3.3	5845 ± 31
MAMS-20679	Burial 43, ungrouped; cut into settlement pit 2 [11-43]	Human bone: right femur	-17.8	-19.9 ± 0.08	10.9 ± 0.09		5712 ± 24
SUERC-52816	Burial 275, ungrouped; cut into settlement pit 208 [11-275]	Human bone: skull, calvaria		-20.3 ± 0.2	10.9 ± 0.3	3.2	5750 ± 30
SUERC-52818	Burial 379, ungrouped; cut into settlement pit 538 [11-379]	Human bone: right femur		-20.2 ± 0.2	10.3 ± 0.3	3.2	5817 ± 32
MAMS-20675	Burial 1705, ungrouped; cut into settlement pit 1388 [11-1705]	Human bone: right femur	-20.0	-19.7 ± 0.08	9.6 ± 0.09		5810 ± 25
SUERC-52815	Large settlement pit 2 (minimum diameter 13 m); cut by burial 43 [11-2]	Animal bone: juvenile pig; right tibia; refitting unfused distal epiphysis (lost on excavation: articulating)		-20.1 ± 0.2	8.9 ± 0.3	3.2	5729 ± 32
MAMS-20678	Large settlement pit 208 (c. 15 m diameter); cut by burial 275 [11-208]	Animal bone: subadult/adult cattle; left tibia; articulating with astragalus and calcaneus	-21.6	-20.0 ± 0.08	5.4 ± 0.09	3.1	5770 ± 26

Tab. 3. (continued)

Laboratory number	Context description [Sample ID]	Material	$\delta^{13}C_{AMS}$ (‰)	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	C:N	Radiocarbon age (BP)
SUERC-52817	Settlement pit 375 (c. 5 m long); part of larger pit complex with pits 538 and 772 [11-375]	Animal bone: subadult pig/wild boar; cranium; with refitting unfused elements		−20.4 ± 0.2	7.5 ± 0.3	3.2	5744 ± 32
MAMS-20669	Medium oval settlement pit 490 (6.8 m long) [11-490]	Animal bone: subadult red deer; left radius; articulating with ulna	−21.6	−19.7 ± 0.08	6.6 ± 0.09	3.1	5857 ± 24
MAMS-20677	Large settlement pit 538 (c. 9.5 m in diameter); cut by burial 379 [11-538]	Animal bone: juvenile/subadult cattle; right ulna, articulating with radius	−15.2	−19.2 ± 0.08	6.1 ± 0.09	3.2	5744 ± 25
SUERC-52822	Replicate of MAMS-20677 [11-538]	Animal bone: juvenile/subadult cattle; right ulna, articulating with radius		−19.7 ± 0.2	6.1 ± 0.3	3.2	5765 ± 30
Mean 11-538	T' = 0.3; T'(5%) = 3.8; v = 1						5753 ± 20 BP
MAMS-20670	Irregular-shaped large settlement pit 779 (30 m long) which extended beyond the excavation area [11-779]	Animal bone: subadult cattle; right radius; refitting unfused distal epiphysis (lost on excavation: articulating)	−19.1	−19.8 ± 0.08	5.8 ± 0.09	3.1	5820 ± 27
SUERC-52823	Medium-size settlement pit 772 (c. 6 m diameter) [11-772]	Animal bone: juvenile pig; tibia; refitting unfused distal epiphysis (lost on excavation: articulating)		−19.9 ± 0.2	10.5 ± 0.3	3.2	5798 ± 32

Laboratory number	Context description [Sample ID]	Material	$\delta^{13}C_{AMS}$ (‰)	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	C:N	Radiocarbon age (BP)
MAMS-20676	Irregular-shaped settlement pit 1025 (c. 9 m long) [11-1025]	Animal bone: subadult aurochs; right tarsal bone; articulating with centrotarsal	–15.5	–18.9 ± 0.08	7.9 ± 0.09	3.2	5787 ± 25
SUERC-52824	Replicate of MAMS-20676 [11-1025]	Animal bone: subadult aurochs; right tarsal bone; articulating with centrotarsal		–19.1 ± 0.2	7.8 ± 0.3	3.2	5778 ± 33
Mean 11-1025	T' = 0.0; T'(5%) = 3.8; v = 1						5784 ± 20
SUERC-52825	Medium oval settlement pit 1373 (5.7 m long) [11-1373]	Animal bone: adult/mature aurochs; left horn core		–19.8 ± 0.2	6.8 ± 0.3	3.2	5764 ± 32
SUERC-52826	Large irregular settlement pit 1388 (c. 25 m long); it is cut by Burial 1705 [11-1388]	Animal bone: juvenile cattle; right metacarpal; refitting unfused distal epiphysis (lost on excavation: articulating)		–20.9 ± 0.2	11.3 ± 0.3	3.2	5753 ± 33
SUERC-52827	Oval-shaped settlement pit 1502 (6 m long) [11-1502-2]	Animal bone: adult aurochs; left metacarpal; articulating with carpal		–19.3 ± 0.2	7.5 ± 0.3	3.2	5779 ± 32
MAMS-20674	Same context as SUERC-52827 [11-1502-3]	Animal bone: aurochs; right metatarsal; articulating with tarsal	–19.1	–20.2 ± 0.08	4.0 ± 0.09		5696 ± 24

Tab. 3. (continued)

Laboratory number	Context description [Sample ID]	Material	$\delta^{13}C_{AMS}$ (‰)	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	C:N	Radiocarbon age (BP)
MAMS-20673	Small oval settlement pit 1625 (2.7 m in diameter); cut by burial 1755 [11-1625]	Animal bone: subadult pig/wild boar; cranium; with refitting unfused elements	–19.2	–20.1 ± 0.08	9.2 ± 0.09		5824 ± 24
MAMS-20672	Small settlement pit 1687 (3 m long); immediately next to pit 1703 [11-1687]	Animal bone: subadult/ adult cattle; left metatarsal; articulating with two tarsals	–18.2	–18.0 ± 0.08	7.0 ± 0.09	3.2	5766 ± 23
SUERC-52828	Replicate of MAMS-20672 [11-1687]	Animal bone: subadult/ adult cattle; left metatarsal; articulating with two tarsals		–18.4 ± 0.2	7.0 ± 0.3	3.2	5775 ± 30
Mean 11-1687	T' = 0.1; T'(5%) = 3.8; v = 1						5769 ± 19
SUERC-52832	Medium-size settlement pit 1703 (5 m long); immediately next to pit 1687 [11-1703]	Animal bone: subadult aurochs; left tarsal bone; articulating with centrotarsal		–19.5 ± 0.2	8.1 ± 0.3	3.2	5902 ± 32
SUERC-53379	Small, oval settlement pit 1800 (4 m long); cut by burial 1850 [11-1800]	Animal bone: subadult small ungulate; lumbar vertebra; with refitting unfused caudal epiphysis		–21.2 ± 0.2	5.8 ± 0.3	3.2	5813 ± 31
MAMS-20671	Small oval settlement pit 2077 (4.5 m long) [11-2077]	Animal bone: subadult/ adult wild boar; right ulna; articulating with humerus	–21.9	–20.4 ± 0.08	4.4 ± 0.09	3.1	5815 ± 23

Tab. 3. (continued)

Laboratory number	Context description [Sample ID]	Material	$\delta^{13}C_{AMS}$ (‰)	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	C:N	Radiocarbon age (BP)
SUERC-53314	Burial 4307, Grave Group 1 [10B-4307]	Human bone: right femur		−19.6 ± 0.2	10.3 ± 0.3	3.2	5735 ± 31
OxA-27575	Burial 7655, Grave Group 1 [10B-7655]	Human bone: left femur		−18.4 ± 0.2	10.2 ± 0.3	3.1	5783 ± 38
OxA-28941	Burial 7753, Grave Group 1; cuts burial 7756 [10B-7753]	Human bone: left fibula		−19.1 ± 0.2	9.6 ± 0.3	3.3	5755 ± 35
OxA-28942	Replicate of OxA-28941 [10B-7753]	Human bone: left fibula		−18.4 ± 0.2	9.7 ± 0.3	3.2	5748 ± 34
Mean 10B-7753	T' = 0.0; T'(5%) = 3.8; v = 1						5751 ± 25
OxA-29062	Burial 7756, Grave Group 1; cut by burial 7753 [10B-7756]	Human bone: left tibia		−19.9 ± 0.2	10.3 ± 0.3	3.3	5786 ± 36
OxA-27477	Burial 7562, Grave Group 2 [10B-7562]	Human bone: right femur		−19.7 ± 0.2	10.3 ± 0.3	3.2	5839 ± 34
OxA-29060	Burial 6337, Grave Group 5 [10B-6337]	Human bone: right femur		−20.1 ± 0.2	9.4 ± 0.3	3.2	5733 ± 33
OxA-29061	Replicate of OxA-29060 [10B-6337]	Human bone: right femur		−19.9 ± 0.2	9.0 ± 0.3	3.2	5722 ± 31
Mean 10B-6337	T' = 0.1; T'(5%) = 3.8; v = 1						5727 ± 23
OxA-27465	Burial 497, Grave Group 7 [10B-497]	Human bone: left femur		−19.8 ± 0.2	9.8 ± 0.3	3.2	5756 ± 33
OxA-27466	Burial 552, Grave Group 8 [10B-552]	Human bone: left femur		−19.9 ± 0.2	10.5 ± 0.3	3.2	5829 ± 32

Tab. 4. Radiocarbon and stable isotopic results from Lengyel culture burials and settlement activity in subsite 10B at Alsónyék.

Laboratory number	Context description [Sample ID]	Material	δ^{13}C$_{AMS}$ (‰)	δ^{13}C$_{IRMS}$ (‰)	δ^{15}N (‰)	C:N	Radiocarbon age (BP)
OxA-27566	Burial 362, Grave Group 12 [10B-362]	Human bone: left femur		−19.6 ± 0.2	10.0 ± 0.3	3.2	5852 ± 38
OxA-27581	Replicate of OxA-27566 [10B-362]	Human bone: left femur		−19.8 ± 0.2	9.5 ± 0.3	3.1	5855 ± 31
Mean 10B-362	T' = 0.0; T'(5%) = 3.8; v = 1						5854 ± 25
OxA-28926	Burial 256, Grave Group 13 [10B-256]	Human bone: right femur		−20.2 ± 0.2	10.5 ± 0.3	3.2	5744 ± 29
OxA-27486	Burial 398, Grave Group 13 [10B-398]	Human bone: right femur		−18.4 ± 0.2	10.1 ± 0.3	3.2	5681 ± 34
OxA-28927	Burial 422, Grave Group 13 [10B-422]	Human bone: skull fragment		−20.1 ± 0.2	9.1 ± 0.3	3.2	5785 ± 29
OxA-29048	Burial 783, Grave Group 13 [10B-783]	Human bone: left humerus		−19.9 ± 0.2	10.3 ± 0.3	3.3	5826 ± 31
OxA-27571	Burial 791, Grave Group 13; cuts burial 853 [10B-791]	Human bone: left femur		−19.5 ± 0.2	10.6 ± 0.3	3.1	5769 ± 35
SUERC-53383	Burial 792, Grave Group 13 [10B-792]	Human bone: ?femur		−19.5 ± 0.2	11.1 ± 0.3	3.3	5812 ± 31
OxA-27487	Burial 796, Grave Group 13 [10B-796]	Human bone: right femur		−18.8 ± 0.2	10.0 ± 0.3	3.1	5875 ± 32
OxA-27573	Burial 798, Grave Group 13 [10B-798]	Human bone: left tibia		−19.0 ± 0.2	11.2 ± 0.3	3.1	5808 ± 34
OxA-27640	Burial 811, Grave Group 13 [10B-811]	Human bone: left femur		−19.6 ± 0.2	10.6 ± 0.3	3.2	5825 ± 31

Laboratory number	Context description [Sample ID]	Material	δ¹³C_AMS (‰)	δ¹³C_IRMS (‰)	δ¹⁵N (‰)	C:N	Radiocarbon age (BP)
OxA-27488	Burial 813, Grave Group 13 [10B-813]	Human bone: left femur		-19.1 ± 0.2	10.9 ± 0.3	3.2	5860 ± 32
OxA-27641	Burial 818, Grave Group 13; cuts burial 6438 [10B-818]	Human bone: right tibia		-19.7 ± 0.2	11.0 ± 0.3	3.2	5846 ± 35
SUERC-53322	Burial 853, Grave Group 13; cut by burial 791 [10B-853]	Human bone: ?tibia		-19.6 ± 0.2	10.5 ± 0.3	3.2	5946 ± 31
OxA-27572	Burial 4011, Grave Group 13 [10B-4011]	Human bone: right femur		-19.4 ± 0.2	10.6 ± 0.3	3.2	5794 ± 35
SUERC-53382	Burial 4027, Grave Group 13 [10B-4027]	Human bone: ?femur		-19.7 ± 0.2	11.0 ± 0.3	3.3	5808 ± 31
OxA-27574	Burial 6438, Grave Group 13; cut by burial 818 [10B-6438]	Human bone: left tibia		-18.3 ± 0.2	10.5 ± 0.3	3.1	5816 ± 39
OxA-29023	Burial 3715, Grave Group 14 [10B-3715]	Human bone: right femur		-20.0 ± 0.2	10.3 ± 0.3	3.2	5807 ± 34
OxA-28250	Burial 3735, Grave Group 14 [10B-3735]	Human bone: left femur		-19.2 ± 0.2	10.1 ± 0.3	3.2	5737 ± 34
OxA-29063	Burial 3742, Grave Group 14; cut by burial 3760 [10B-3742]	Human bone: left femur		-19.6 ± 0.2	10.3 ± 0.3	3.2	5806 ± 31
OxA-28249	Burial 3758, Grave Group 14 [10B-3758]	Human bone: right femur		-19.8 ± 0.2	9.2 ± 0.3	3.3	5876 ± 35
OxA-29067	Burial 3760, Grave Group 14; cuts burial 3742, and has an unclear stratigraphic relationship with burial 3831 [10B-3760]	Human bone: left ?femur		-19.9 ± 0.2	9.4 ± 0.3	3.2	5849 ± 35

Tab. 4. (continued)

Laboratory number	Context description [Sample ID]	Material	$\delta^{13}C_{AMS}$ (‰)	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	C:N	Radiocarbon age (BP)
OxA-27476	Burial 3831, Grave Group 14; has an unclear stratigraphic relationship with burial 3760 [10B-3831]	Human bone: right tibia		−19.7 ± 0.2	10.1 ± 0.3	3.2	5816 ± 32
OxA-28947	Burial 3918, Grave Group 14 [10B-3918]	Human bone: right femur		−22.6 ± 0.2	9.1 ± 0.3	3.3	5829 ± 34
OxA-28946	Burial 3956, Grave Group 14 [10B-3956]	Human bone: right femur		−22.5 ± 0.2	10.3 ± 0.3	3.3	5827 ± 33
OxA-28945	Burial 4005, Grave Group 14 [10B-4005]	Human bone: right femur		−19.0 ± 0.2	10.3 ± 0.3	3.3	5863 ± 33
OxA-27480	Burial 822, Grave Group 15; has no secure stratigraphic relationship with burial 1008 [10B-822]	Human bone: left femur		−19.2 ± 0.2	10.3 ± 0.3	3.2	5808 ± 35
UBA-22526	Replicate of OxA-27480 [10B-822]	Human bone: left femur		−19.9 ± 0.22	10.3 ± 0.15	3.2	5806 ± 41
Mean 10B-822	T' = 0.0; T'(5%) = 3.8; ν = 1						5807 ± 27
OxA-27482	Burial 827, Grave Group 15 [10B-827]	Human bone: left femur		−19.8 ± 0.2	9.0 ± 0.3	3.2	5721 ± 33
OxA-27485	Burial 828, Grave Group 15 [10B-828]	Human bone: left femur		−19.7 ± 0.2	10.1 ± 0.3	3.2	5820 ± 34
OxA-29024	Burial 847, Grave Group 15 [10B-847]	Human bone: left femur		−19.1 ± 0.2	10.7 ± 0.3	3.3	5858 ± 34
OxA-27481	Burial 1008, Grave Group 15; has no secure stratigraphic relationship with burial 822 [10B-1008]	Human bone: right femur		−19.4 ± 0.2	11.4 ± 0.3	3.2	5847 ± 33

Laboratory number	Context description [Sample ID]	Material	$\delta^{13}C_{AMS}$ (‰)	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	C:N	Radiocarbon age (BP)
OxA-27483	Burial 3770, Grave Group 15 [10B-3770]	Human bone: right femur		-19.2 ± 0.2	10.6 ± 0.3	3.2	5786 ± 33
OxA-27484	Replicate of OxA-27483 [10B-3770]	Human bone: right femur		-19.1 ± 0.2	10.6 ± 0.3	3.2	5784 ± 33
Mean 10B-3770	T' = 0.0; T'(5%) = 3.8; ν = 1						5785 ± 24
OxA-26694	Burial 3472, Grave Group 18 [10B-3472a]	Animal bone: adult/maturus wild boar; skull fragment		-20.5 ± 0.2	4.9 ± 0.3	3.2	5814 ± 31
OxA-26695	Burial 3472, Grave Group 18 [10B-3472h]	Human bone: right femur		-19.8 ± 0.2	11.1 ± 0.3	3.2	5820 ± 32
OxA-29025	Burial 3020, Grave Group 22 [10B-3020]	Human bone: left femur		-19.7 ± 0.2	9.7 ± 0.3	3.2	5818 ± 32
OxA-X-2508-50	Burial 3089, Grave Group 22 [10B-3089]	Human bone: right femur		-19.2 ± 0.2	11.3 ± 0.3	3.1	5815 ± 35
SUERC-53323	Burial 1473, Grave Group 23 [10B-1473]	Human bone: ?tibia		-19.7 ± 0.2	11.0 ± 0.3	3.2	5856 ± 31
OxA-26696	Burial 3060, Grave Group 23 [10B-3060a]	Animal bone: adult/maturus aurochs; skull fragment		-19.7 ± 0.2	6.8 ± 0.3	3.2	5860 ± 32
OxA-26697	Burial 3060, Grave Group 23 [10B-3060h]	Human bone: right femur		-19.5 ± 0.2	11.5 ± 0.3	3.2	5855 ± 32
OxA-28248	Burial 1799, Grave Group 26; cuts burial 1814 [10B-1799]	Human bone: left tibia		-19.5 ± 0.2	9.0 ± 0.3	3.2	5764 ± 33

Tab. 4. (continued)

Laboratory number	Context description [Sample ID]	Material	$\delta^{13}C_{AMS}$ (‰)	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	C:N	Radiocarbon age (BP)
OxA-29191	Burial 1814, Grave Group 26; cut by burial 1799 [10B-1814]	Human bone: left tibia		−22.2 ± 0.2	10.9 ± 0.3	3.2	5837 ± 32
SUERC-53321	Burial 679, ungrouped; cuts settlement pit 441 [10B-679]	Human bone: left femur		−19.9 ± 0.2	10.2 ± 0.3	3.2	5824 ± 31
MAMS-20654	Burial 691, ungrouped; cuts settlement pit 349 [10B-691]	Human bone: left tibia	−18.6	−19.8 ± 0.2	11.1 ± 0.25	3.2	5826 ± 19
MAMS-20655	Burial 736, ungrouped; cuts settlement pit 69 [10B-736]	Human bone: right femur	−15.8	−19.5 ± 0.2	10.3 ± 0.25	3.3	5811 ± 19
SUERC-52813	Replicate of MAMS-20655 [10B-736]	Human bone: right femur		−20.0 ± 0.2	10.2 ± 0.3	3.2	5879 ± 32
Mean 10B-736	T′ = 3.4; T′(5%) = 3.8; ν = 1						5829 ± 17
SUERC-52796	Burial 2549, ungrouped; cuts settlement pit 2525 [10B-2549]	Human bone: ?tibia		−19.9 ± 0.2	9.7 ± 0.3	3.2	5833 ± 32
SUERC-53324	Burial 2959, ungrouped [10B-2959]	Human bone: right femur		−19.9 ± 0.2	11.0 ± 0.3	3.2	5894 ± 31
MAMS-20657	Burial 3241, ungrouped; cuts settlement pit 3144 [10B-3241]	Human bone: left femur	−15.2	−18.7 ± 0.2	10.4 ± 0.25	3.3	5929 ± 18
SUERC-52798	Burial 4279, ungrouped; cuts house structure 4282 [10B-4279]	Human bone: right femur		−20.4 ± 0.2	10.1 ± 0.3	3.2	5849 ± 30
OxA-27467	Burial 5196, ungrouped [10B-5196]	Human bone: left femur		−20.0 ± 0.2	10.3 ± 0.3	3.2	5829 ± 36

Laboratory number	Context description [Sample ID]	Material	$\delta^{13}C_{AMS}$ (‰)	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	C:N	Radiocarbon age (BP)
SUERC-52814	Small settlement pit 69 (c. 5 m in diameter); cut by burial 736 [10B-69-4]	Animal bone: subadult sheep; right radius; articulating with ulna		–20.2 ± 0.2	7.7 ± 0.3	3.2	5832 ± 32
MAMS-20648	Same context as SUERC-52814 [10B-69-5]	Animal bone: subadult dog; cranium; with refitting unfused elements	–18.6	–19.2 ± 0.2	10.3 ± 0.25	3.2	5834 ± 18
SUERC-52812	Medium-size settlement pit 77 (8.5 m diameter) [10B-77-2]	Animal bone: adult red deer; antler		–19.9 ± 0.2	5.8 ± 0.3	3.2	5849 ± 31
MAMS-20649	Same context as SUERC-52812 [10B-77-3]	Animal bone: juvenile cattle; right metatarsal; refitting unfused distal epiphysis (lost on excavation: articulating)	–21.0	–20.2 ± 0.2	6.3 ± 0.25	3.2	5861 ± 18
SUERC-52808	Small settlement pit 126 (c. 3.5 m in diameter) containing an abundance of pottery [10B-126-2]	Animal bone: adult wild boar; left femur; articulating with pelvis		–21.1 ± 0.2	5.0 ± 0.3	3.2	5774 ± 29
SUERC-52807	Small oval settlement pit 140 (5.4 m long); cut by settlement pit 349 [10B-140-2]	Animal bone: subadult wild boar; right radius; articulating with ulna		–20.2 ± 0.2	5.8 ± 0.3	3.2	5778 ± 31
MAMS-20650	Same context as SUERC-52807 [10B-140-3]	Animal bone: subadult wild boar; left metatarsal; articulating with tarsal and astragalus	–23.2	–20.1 ± 0.2	6.1 ± 0.25	3.2	5801 ± 18

Tab. 4. (continued)

Laboratory number	Context description [Sample ID]	Material	$\delta^{13}C_{AMS}$ (‰)	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	C:N	Radiocarbon age (BP)
SUERC-52806	Replicate of MAMS-20650 [10B-140-3]	Animal bone: subadult wild boar; left metatarsal; articulating with tarsal and astragalus		−20.3 ± 0.2	6.8 ± 0.3	3.2	5790 ± 28
Mean 10B-140-3	T′ = 0.1; T′(5%) = 3.8; ν = 1						5798 ± 16
SUERC-52805	Small sub-rectangular settlement pit 349 (2.4 m long); cuts settlement pit 140 and settlement pit 476, and cut by burial 691 [10B-349-1]	Animal bone: cattle; phalanx I; articulating with phalanx II		−20.4 ± 0.2	6.6 ± 0.3	3.2	5829 ± 32
MAMS-20651	Same context as SUERC-52805 [10B-349-3]	Animal bone: juvenile red deer; phalanx I; articulating with phalanx II	−17.2	−20.7 ± 0.2	4.8 ± 0.25	3.3	5838 ± 19
MAMS-20652	Middle posthole 382 of the central dividing wall of House 27 [10B-382-1]	Animal bone: juvenile pig; right humerus; refitting unfused distal epiphysis (lost on excavation: articulating)	−20.4	−20.4 ± 0.2	8.8 ± 0.25	3.2	5790 ± 19
SUERC-52802	Replicate of MAMS-20652 [10B-382-1]	Animal bone: juvenile pig; right humerus; refitting unfused distal epiphysis (lost on excavation: articulating)		−20.5 ± 0.2	9.0 ± 0.3	3.2	5757 ± 32
Mean 382-1	T′ = 0.8; T′(5%) = 3.8; ν = 1						5781 ± 17
MAMS-20653	Small oval settlement pit 395 (c. 4.5 m long); cuts pit 619 [10B-395-2]	Animal bone: juvenile pig; left tibia; refitting unfused distal epiphysis (lost on excavation: articulating)	−13.9	−19.7 ± 0.2	9.0 ± 0.25	3.2	5828 ± 19

Laboratory number	Context description [Sample ID]	Material	$\delta^{13}C_{AMS}$ (‰)	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	C:N	Radiocarbon age (BP)
OxA-27567	Large settlement pit complex 441 (c. 9 m long); cut by burial 679 [10B-441]	Animal bone: subadult dog; cranium; refitting unfused elements		−19.3 ± 0.2	8.7 ± 0.3	3.2	5847 ± 36
OxA-27582	Replicate of OxA-27567 [10B-441]	Animal bone: subadult dog; cranium; refitting unfused elements		−19.5 ± 0.2	8.3 ± 0.3	3.2	5907 ± 31
Mean 10B-441	T' = 1.6; T'(5%) = 3.8; v = 1						5882 ± 24
SUERC-52803	Large settlement pit complex 441 (c. 9 m long) which contains pit 723; cut by burial 679 [10B-441_723]	Animal bone: subadult/adult dog; humerus; full articulated skeleton		−20.5 ± 0.2	9.0 ± 0.3	3.2	5860 ± 30
SUERC-52804	Small oval settlement pit 476 (5.4 m in length); cut by settlement pit 349 [10B-476-1]	Animal bone: juvenile red deer; right ulna; refitting unfused proximal epiphysis (lost on excavation: articulating)		−20.5 ± 0.2	6.8 ± 0.3	3.2	5833 ± 32
SUERC-52797	Pit 619; cut by settlement pit 395 [10B-619]	Animal bone: subadult dog; left radius; full articulated skeleton		−20.2 ± 0.2	8.1 ± 0.3	3.2	5931 ± 33
MAMS-20656	Small settlement pit 2525 (2.5 m in diameter); cut by burial 2549 [10B-2525-2]	Animal bone: juvenile red deer; left tibia proximal epiphysis; refitting unfused diaphysis (lost on excavation: articulating)	−17.3	−18.4 ± 0.2	8.4 ± 0.25	3.2	5800 ± 19

Tab. 4. (continued)

Laboratory number	Context description [Sample ID]	Material	$\delta^{13}C_{AMS}$ (‰)	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	C:N	Radiocarbon age (BP)
SUERC-52795	Small settlement pit 3144 (5 m in diameter); cut by burial 3241 [10B-3144-1]	Animal bone: subadult cattle; right ulna; articulating with radius		−19.1 ± 0.2	7.3 ± 0.3	3.3	5805 ± 33
MAMS-20658	Large post-hole 4282 at the southern end of House 27; cut by burial 4279 [10B-4282]	Animal bone: subadult dog; cranium; refitting unfused elements	−21.6	−19.6 ± 0.2	8.2 ± 0.25	3.2	5752 ± 18

Tab. 4. (continued)

Sample ID	Laboratory number	Grave Group	Description	Age	Sex	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	Highest Posterior Density interval (95% probability)
5603-62	OxA-27637	54	Left-crouched; one pot, a type E axe and a copper bead.	25–30	M	−19.5 ± 0.2	10.7 ± 0.3	4705–4520 cal BC
5603-122	SUERC-53315	54	Left-crouched; one pot, a type D axe, a pendant made from Spondylus, copper and Dentalium beads around its neck, an animal bone fragment on the skull (probably a wild boar tusk).	25–30	M	−20.3 ± 0.2	10.2 ± 0.3	4680–4635 (8%) or 4620–4485 (87%) cal BC
5603-253	OxA-27478	53	Left-crouched; a type D axe and a bone tool.	30–40	M	−19.9 ± 0.2	11.0 ± 0.3	4720–4550 cal BC
5603-639	SUERC-53316	52	Left-crouched; a type B axe, a flint blade, a Spondylus arm ring and copper beads around its neck.	25–30	?M	−20.1 ± 0.2	10.2 ± 0.3	4690–4505 cal BC

Sample ID	Laboratory number	Grave Group	Description	Age	Sex	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	Highest Posterior Density interval (95% probability)
5603-677	SUERC-53320	52	Left-crouched; four-post construction; five vessels, a type E axe, an adze, a flint blade, a *Spondylus* pendant, and a complete dog.	30–35	M	−19.5 ± 0.2	11.5 ± 0.3	4790–4680 cal BC
5603-927	OxA-27479	42	Left-crouched; four-post construction; a type F axe, an adze, bone tools and a unique and extensive assemblage of 34 flint blades (deposited as a set).	50–59	M	−19.3 ± 0.2	10.4 ± 0.3	4775–4580 cal BC
5603-1535	MAMS-11941		Probably right-crouched; no grave goods.	30–45	F	−20.5 ± 0.2	10.2 ± 0.1	4715–4545 cal BC
5603-1579	SUERC-52834		Right-crouched; no grave goods.	Adult	?	−19.3 ± 0.2	9.9 ± 0.3	4610–4480 cal BC
5603-1580	SUERC-52835		Right-crouched; no grave goods.	30–40	F	−19.8 ± 0.2	10.7 ± 0.3	4725–4555 cal BC
5603-1783	SUERC-52842		Left-crouched; no grave goods.	?Adult	?	−20.1 ± 0.2	10.0 ± 0.3	4545–4460 cal BC
5603-1798	MAMS-20661		Left-crouched; one fragmented pot.	?Adult	?	−19.4 ± 0.08	9.5 ± 0.09	4720–4605 cal BC
5603-1821	OxA-26699	59	Left-crouched; three pots, an adze, a flint blade, antler point and animal shoulder blade.	20–22	M	−19.5 ± 0.2	9.8 ± 0.3	4695–4555 cal BC
5603-1867	OxA-27448	59	Left-crouched; five vessels, *Spondylus* and copper beads.	14–15	Child	−19.7 ± 0.2	9.8 ± 0.3	4770–4655 (91%) or
	OxA-27449					−19.7 ± 0.2	9.5 ± 0.3	4640–4615 (4%) cal BC
5603-1868	SUERC-53341	59	Left-crouched; four-post construction; three pots (one bears anthropomorphic decoration), a gravel and a piece of red ochre.	30–40	F	−20.2 ± 0.2	10.5 ± 0.3	4725–4575 cal BC

Tab. 5. Descriptions of the radiocarbon-dated burials from all three subsites at Alsónyék. The *posterior density estimates* given are the *95% probability* range for the date of the burial derived from the modelling described in the text *(figs 12–13; 15–16; 18–19)*. Axe types are those defined by Zalai-Gaál et al. (2014a).

Sample ID	Laboratory number	Grave Group	Description	Age	Sex	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	Highest Posterior Density interval (95% probability)
5603-1875	OxA-27453	59	Left-crouched; no grave goods.	24–27	?	−19.5 ± 0.2	10.6 ± 0.3	4685–4535 cal BC
5603-1877	OxA-27457	59	Left-crouched; six pots.	50–59	?F	−19.8 ± 0.2	9.7 ± 0.3	4715–4575 cal BC
5603-1881	SUERC-53342	58	Left-crouched; four-post construction; seven vessels, two flint blades and a bone tool.	35–45	F	−20.3 ± 0.2	10.5 ± 0.3	4795–4665 (93%) or 4640–4615 (2%) cal BC
5603-1920	OxA-27450	57	Left-crouched; formed a double burial with individual 1934; two vessels, an axe, an adze, two flint blades and a pendant made from *Spondylus*.	30–35	F	−19.8 ± 0.2	10.1 ± 0.3	4785–4610 cal BC
5603-1921	OxA-28939	57	Left-crouched; three vessels, a flint blade, necklace around its neck made from copper and *Dentalium* beads, a *Spondylus* arm ring and a stone.	27–30	F	−19.9 ± 0.2	10.7 ± 0.3	4685–4485 cal BC
5603-1934	OxA-28944	57	Left-crouched; formed double burial with individual 1920; one pot, a type C axe, a flint blade, a piece of wild boar tusk, a bone tool and an animal bone.	45–55	M	−19.3 ± 0.2	10.5 ± 0.3	4715–4545 cal BC
5603-1966	SUERC-53343	57	Left-crouched; four-post construction; six pots.	35–40	?F	−20.1 ± 0.2	9.3 ± 0.3	4795–4680 cal BC
5603-1968	SUERC-52844		Left-crouched; copper and *Dentalium* beads around its neck and three copper finger rings.	25–30	F	−20.2 ± 0.2	9.8 ± 0.3	4600–4475 cal BC
5603-1969	OxA-27454	57	Left-crouched; four vessels, a copper finger ring and copper beads.	30–40	F	−19.8 ± 0.2	10.5 ± 0.3	4695–4515 cal BC

Sample ID	Laboratory number	Grave Group	Description	Age	Sex	δ¹³C$_{IRMS}$ (‰)	δ¹⁵N (‰)	Highest Posterior Density interval (95% probability)
5603-1984	SUERC-53344	56	Left-crouched; three vessels, flint tools, Spondylus ornaments, a bone tool, the shoulder of a domestic cattle/aurochs and the tusk of a wild boar.	25–30	M	−19.9 ± 0.2	10.6 ± 0.3	4755–4690 cal BC
5603-1988	SUERC-53345	56	Left-crouched; a type E axe, an adze and a flint blade.	40–45	M	−20.3 ± 0.2	10.5 ± 0.3	4730–4680 cal BC
5603-1989	OxA-27458 / UBA-22534	56	Left-crouched; three vessels, a bone tool and flint blades.	18–20	Juvenile	−19.7 ± 0.2 / −19.9 ± 0.22	10.4 ± 0.3 / 10.0 ± 0.15	4760–4700 cal BC
5603-1996	OxA-27451	56	Left-crouched; four-post construction; seven vessels and a flint blade.	40–45	M	−19.7 ± 0.2	10.1 ± 0.3	4760–4700 cal BC
5603-2000	SUERC-53346	56	Left-crouched; four-post construction; three vessels, Spondylus beads, a flint blade, an obsidian core and a bone tool.	40–50	M	−20.1 ± 0.2	9.9 ± 0.3	4750–4685 cal BC
5603-2150	OxA-28247	59	Left-crouched; an axe, a flint blade, a heavy copper arm ring and Dentalium beads.	30–40	M	−19.6 ± 0.2	10.1 ± 0.3	4695–4540 cal BC
5603-2162	OxA-27455 / UBA-22531	59	Left-crouched; two vessels, a polished stone axe and an adze, a flint blade, two copper arm rings, copper beads, Spondylus and Dentalium beads.	?	Child	−19.6 ± 0.2 / −19.8 ± 0.22	9.9 ± 0.3 / 9.9 ± 0.15	4685–4515 cal BC

Tab. 5. (continued)

Sample ID	Laboratory number	Grave Group	Description	Age	Sex	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	Highest Posterior Density interval (95% probability)
5603-2165	OxA-28943	59	Left-crouched; a very fragmented vessel, a type B axe and a flint blade.	45–55	M	-17.9 ± 0.2	9.9 ± 0.3	4765–4650 (88%) or 4640–4615 (7%) cal BC
5603-2222	OxA-28938	59	Left-crouched; multiple copper arm rings, *Dentalium* and copper beads around its neck.	25–30	?	-19.7 ± 0.2	9.2 ± 0.3	4720–4565 cal BC
5603-2226	SUERC-53350	59	Left-crouched; three pots.	50–59	?	-20.2 ± 0.2	10.3 ± 0.3	4730–4585 cal BC
5603-2262	MAMS-20665		Left-crouched; one pot.	Adult	F	-19.2 ± 0.08	11.3 ± 0.09	4685–4540 cal BC
5603-2276	SUERC-52854		Right-crouched; a fragmented vessel.	18–20	?F	-20.0 ± 0.2	9.1 ± 0.3	4580–4470 cal BC
5603-2579	OxA-27459	56	Left-crouched; four-post construction; six pots.	45–59	F	-19.7 ± 0.2	9.9 ± 0.3	4760–4700 cal BC
5603-2580	SUERC-53351	56	Left-crouched; six pots.	Adult	?	-20.3 ± 0.2	9.4 ± 0.3	4755–4685 cal BC
5603-2585	SUERC-53352	56	Left-crouched; flint blades, a bone tool, a wild boar tusk and a *Spondylus* shell pendant.	Adult	?	-20.3 ± 0.2	9.8 ± 0.3	4735–4680 cal BC
5603-2597	OxA-27452	56	Left-crouched; three pots.	16–18	Juvenile	-19.5 ± 0.2	10.9 ± 0.3	4745–4675 cal BC
5603-2599	SUERC-53353	56	Left-crouched; four-post construction; four vessels, an adze, bone and flint tools, a rich ornament assemblage of *Spondylus* and *Dentalium* shells.	c. 14	Child	-20.2 ± 0.2	9.9 ± 0.3	4750–4680 cal BC
5603-2770	SUERC-53381		Double grave of two children in an irregular position; the sample come from the elder one (its subnumber is 2/2); no grave goods.	4–5	Child	-20.3 ± 0.2	10.4 ± 0.3	4670–4540 cal BC

Sample ID	Laboratory number	Grave Group	Description	Age	Sex	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	Highest Posterior Density interval (95% probability)
5603-2843	OxA-27456	56	Left-crouched; four-post construction; five vessels and *Spondylus* shell ornaments.	35–45	F	−19.8 ± 0.2	9.9 ± 0.3	4755–4690 cal BC
5603-2844	SUERC-53354	56	Left-crouched; probably one pot and a flint blade.	45–59	M	−20.2 ± 0.2	10.6 ± 0.3	4745–4690 cal BC
5603-2906	SUERC-53355	56	Left-crouched; four-post construction; four vessels and a fragmented pot, a bone tool.	23–29	M	−19.7 ± 0.2	10.0 ± 0.3	4765–4710 cal BC
11-43	MAMS-20679		Right-crouched; no grave goods.		Child	−19.9 ± 0.08	10.9 ± 0.09	4670–4510 cal BC
11-145	OxA-28940	61 B	Left-crouched; one fragmented vessel and two copper arm rings.	5–6	Child	−19.4 ± 0.2	10.8 ± 0.3	4690–4520 cal BC
11-190	SUERC-53334	60	Left-crouched; three vessels.	40–49	F	−20.3 ± 0.2	10.6 ± 0.3	4790–4675 (93%) or 4635–4615 (2%) cal BC
11-228	OxA-27460	61 A	Left-crouched; two pots.	2.5–3	Child	−20.0 ± 0.2	10.2 ± 0.3	4780–4660 cal BC
11-263	OxA-27576	61 A	Left-crouched; six vessels and animal teeth were collected from between the legs of the deceased.	30–50	?	−18.8 ± 0.2	10.8 ± 0.3	4725–4600 cal BC
11-264	OxA-27463	61 A	Unusual burial position: supine with legs crossed at the knees; one pot.	25–35	?F	−19.8 ± 0.2	11.2 ± 0.3	4730–4605 cal BC
11-272	OxA-27461	61 A	Left-crouched; 11 vessels, one wild boar tusk, a wild boar mandible and a *Dentalium* shell were retrieved near the head.	c. 3	Child	−19.5 ± 0.2	12.8 ± 0.3	4720–4585 cal BC

Tab. 5. (continued)

Sample ID	Laboratory number	Grave Group	Description	Age	Sex	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	Highest Posterior Density interval (95% probability)
11-275	SUERC-52816		Left-crouched; a bone tool.	?	Child	−20.3 ± 0.2	10.9 ± 0.3	4680–4540 cal BC
11-293	SUERC-53325	61 A	Left-crouched; two vessels and five flint blades.	35–45	M	−19.9 ± 0.2	11.3 ± 0.3	4760–4620 cal BC
11-295	OxA-27464	61 A	Left-crouched; one pot and sherds of further vessels.	30–40	F	−19.9 ± 0.2	10.0 ± 0.3	4720–4600 cal BC
11-319	OxA-27577	61 A	Left-crouched; possible four-post construction and nine pots.	35–45	F	−18.7 ± 0.2	11.6 ± 0.3	4765–4650 (91%) or 4640–4615 (4%) cal BC
11-324	OxA-27462	61 B	Left-crouched; one pot and 41 copper beads.	25–35?	?F	−19.4 ± 0.2	9.8 ± 0.3	4700–4540 cal BC
11-333	OxA-27468	60	Left-crouched; 10 vessels, possible four-post construction, an axe, a belt of *Spondylus* beads, a copper finger ring and copper beads forming a necklace (together with *Dentalium* shell beads).	20–30	F	−19.6 ± 0.2	10.2 ± 0.3	4725–4585 cal BC
	OxA-27469					−19.7 ± 0.2	10.3 ± 0.3	
11-337	OxA-27528	61 A	Left-crouched; four-post construction; six vessels.	25–35	M	−19.2 ± 0.2	10.8 ± 0.3	4730–4600 cal BC
11-379	SUERC-52818		Left-crouched; three pots, an axe, a flint blade and a bone tool.	Adult	?	−20.2 ± 0.2	10.3 ± 0.3	4770–4580 cal BC
11-673	OxA-27473	68	Right-crouched tightly; four vessels.	30–50	F	−19.9 ± 0.2	9.4 ± 0.3	4765–4675 cal BC
11-679	OxA-27472	68	Left-crouched; no grave goods.	c. 6	Child	−20.0 ± 0.2	9.6 ± 0.3	4740–4630 cal BC
11-699	SUERC-53326	68	Left-crouched; four-post construction, four vessels, an axe, two adzes and a flint blade.	35–45	M	−19.7 ± 0.2	11.0 ± 0.3	4765–4680 cal BC

Sample ID	Laboratory number	Grave Group	Description	Age	Sex	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	Highest Posterior Density interval (95% probability)
11-724	SUERC-53330	68	Left-crouched; four vessels.	20–25	M	−19.8 ± 0.2	9.9 ± 0.3	4760–4655 cal BC
11-743	SUERC-53335	71 A	Left-crouched; possible four-post construction, six vessels, an axe and a flint blade.	35–45	M	−19.6 ± 0.2	11.0 ± 0.3	4790–4655 (92%) or 4640–4615 (3%) cal BC
11-808	OxA-29030	68	Left-crouched; three vessels and a *Spondylus* bead.	?	F	−19.8 ± 0.2	10.2 ± 0.3	4765–4660 cal BC
11-809	OxA-29029	68	Left-crouched; two vessels.	c. 9–10	Child	−19.8 ± 0.2	10.7 ± 0.3	4770–4675 cal BC
11-815	OxA-28255	68	Left-crouched; an axe.	?	M	−19.5 ± 0.2	10.1 ± 0.3	4760–4650 cal BC
11-1184	OxA-27474	68	Left-crouched; one vessel, an axe and a large *Spondylus* pendant under the lower arm.	30–40	M	−19.3 ± 0.2	10.2 ± 0.3	4745–4640 cal BC
11-1189	OxA-29032	68	Left-crouched; two vessels.	18–20	F	−20.2 ± 0.2	9.7 ± 0.3	4725–4635 cal BC
11-1190	SUERC-53331	68	Left-crouched; four pots.	40–59	F	−20.3 ± 0.2	10.9 ± 0.3	4765–4690 cal BC
11-1191	OxA-27475	68	Left-crouched; four vessels and a bone tool.	30–40	F	−19.8 ± 0.2	9.6 ± 0.3	4765–4685 cal BC
11-1192	SUERC-53332	68	Left-crouched; two vessels.	25–45	?F	−19.9 ± 0.2	10.4 ± 0.3	4720–4635 cal BC
11-1235	OxA-27529	73	Left-crouched; six vessels, a polished stone adze and a grinding stone under the left lower leg.	40–50	M	−19.5 ± 0.2	11.2 ± 0.3	4745–4550 cal BC

Tab. 5. (continued)

Sample ID	Laboratory number	Grave Group	Description	Age	Sex	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	Highest Posterior Density interval (95% probability)
11-1320	SUERC-53336	71 B	Left-crouched; four-post construction; seven vessels, copper finger ring, copper and *Dentalium* beads.	35–45	F	−19.8 ± 0.2	10.2 ± 0.3	4800–4705 cal BC
11-1391	OxA-27470	71 B	Right-crouched; six vessels.	40–55	F	−19.8 ± 0.2	10.8 ± 0.3	4790–4695 cal BC
	UBA-22529					−20.0 ± 0.22	10.6 ± 0.15	
11-1669	SUERC-53340	79	Left-crouched; seven pots.	25–30	M	−20.1 ± 0.2	10.9 ± 0.3	4780–4610 cal BC
11-1705	MAMS-20675		Left-crouched; four pots and a grinding stone on the tibia.	Adult		−19.7 ± 0.08	9.6 ± 0.09	4690–4555 cal BC
11-1755	SUERC-52833	79	Left-crouched; two pots, an adze, a flint blade, a bone tool and animal bone.	Adult	?	−20.2 ± 0.2	10.4 ± 0.3	4685–4540 cal BC
11-1793	OxA-28251	68	Left-crouched; three fragmented vessels and a macehead.	?	M	−19.5 ± 0.2	10.4 ± 0.3	4760–4655 cal BC
11-1802	OxA-28252	68	Left-crouched; no grave goods.	?	F	−19.5 ± 0.2	10.3 ± 0.3	4760–4645 cal BC
11-1808	OxA-28253	68	Left-crouched; four vessels.	?	M	−19.4 ± 0.2	9.7 ± 0.3	4765–4690 cal BC
	OxA-28254					−19.3 ± 0.2	9.9 ± 0.3	
11-1822	OxA-29028	68	Left-crouched; one vessel.	?	F	−19.9 ± 0.2	8.6 ± 0.3	4725–4635 cal BC
11-1848	SUERC-53333	68	Left-crouched; two vessels.	?	F	−19.6 ± 0.2	10.3 ± 0.3	4770–4695 cal BC
11-1850	SUERC-53380	66 B	Left-crouched; no grave goods.	Adult	?	−20.5 ± 0.2	10.6 ± 0.3	4680–4510 cal BC
11-1860	OxA-29031	68	Left-crouched; a fragmented vessel and probably *Spondylus* beads.	30–35	?F	−19.8 ± 0.2	9.6 ± 0.3	4725–4620 cal BC

Sample ID	Laboratory number	Grave Group	Description	Age	Sex	δ¹³C$_{IRMS}$ (‰)	δ¹⁵N (‰)	Highest Posterior Density interval (95% probability)
11-1937	OxA-27471	76	Left-crouched; two vessels, an axe, a flint blade and two copper beads.	35–45	M	–19.8 ± 0.2	11.5 ± 0.3	4785–4650 (89%) or 4640–4615 (6%) cal BC
11-1967	OxA-27531	68	Left-crouched; four-post construction; seven vessels, a bone tool and probably a piece of red ochre.	40–59	F	–19.6 ± 0.2	10.1 ± 0.3	4770–4695 cal BC
11-2028	OxA-27530	83	Left-crouched; two vessels, a flint core and probably a flint blade.	20–30	F	–19.6 ± 0.2	9.8 ± 0.3	4730–4575 cal BC
	OxA-27580					–19.7 ± 0.2	9.8 ± 0.3	
11-2330	OxA-29049	88	Left-crouched; three vessels and an axe.	25–35	M	–19.9 ± 0.2	10.7 ± 0.3	4785–4610 cal BC
10B-256	OxA-28926	13	Right-crouched; likely tuberculosis; two flint blades.	6–7	Child	–20.2 ± 0.2	10.5 ± 0.3	4710–4670 cal BC
10B-362	OxA-27566	12	Left-crouched; three vessels, a type E axe and a flint blade.	35–44	M	–19.6 ± 0.2	10.0 ± 0.3	4725–4680 cal BC
	OxA-27581					–19.8 ± 0.2	9.5 ± 0.3	
10B-398	OxA-27486	13	Left-crouched; likely tuberculosis; three vessels, flint blades and copper beads.	30–39	M	–18.4 ± 0.2	10.1 ± 0.3	4710–4665 cal BC
10B-422	OxA-28927	13	Tuberculosis; no grave goods.	11–12	Child	–20.1 ± 0.2	9.1 ± 0.3	4710–4670 cal BC
10B-497	OxA-27465	7	Left-crouched; infectious disease; copper and Dentalium beads and animal bone.	40–59	F	–19.8 ± 0.2	9.8 ± 0.3	4710–4655 cal BC

Tab. 5. (continued)

Sample ID	Laboratory number	Grave Group	Description	Age	Sex	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	Highest Posterior Density interval (95% probability)
10B-552	OxA-27466	8	Left-crouched; metabolic disease; a single pot and fragments of vessels, a flint blade and a fragment of red ochre.	45–54	M	−19.9 ± 0.2	10.5 ± 0.3	4725–4670 cal BC
10B-679	SUERC-53321		Right-crouched; two vessels, a type C axe, an adze, a flint blade, a copper finger ring and copper beads.	21–24	M	−19.9 ± 0.2	10.2 ± 0.3	4710–4665 cal BC
10B-691	MAMS-20654		Right-crouched (but it rather lay on its chest); very fragmented grave goods, but it is not sure that they belonged to the grave or the pit (349) it cuts.	40–49	M	−19.8 ± 0.2	11.1 ± 0.25	4710–4670 cal BC
10B-736	SUERC-52813		Left-crouched; no grave goods.	19–23	?F	−20.0 ± 0.2	10.2 ± 0.3	4710–4675 cal BC
	MAMS-20655					−19.5 ± 0.2	10.3 ± 0.25	
10B-783	OxA-29048	13	Right-crouched; likely tuberculosis; three vessels.	40–59	M	−19.9 ± 0.2	10.3 ± 0.3	4715–4675 cal BC
10B-791	OxA-27571	13	Right-crouched; tuberculosis; three or four pots and a flint blade.	40–49	M	−19.5 ± 0.2	10.6 ± 0.3	4710–4670 cal BC
10B-792	SUERC-53383	13	Right-crouched; four-post construction; four vessels, a type A axe, an adze, flint blades, Spondylus beads and probably a bone tool.	50–59	M	−19.5 ± 0.2	11.1 ± 0.3	4715–4675 cal BC
10B-796	OxA-27487	13	Right-crouched; three pots, flint blades and a bone tool.	23–26	F	−18.8 ± 0.2	10.0 ± 0.3	4720–4680 cal BC
10B-798	OxA-27573	13	Right-crouched; two pots.	50–59	M	−19.0 ± 0.2	11.2 ± 0.3	4710–4675 cal BC

Sample ID	Laboratory number	Grave Group	Description	Age	Sex	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	Highest Posterior Density interval (95% probability)
10B-811	OxA-27640	13	Right-crouched; tuberculosis; three vessels, a stone macehead, a flint blade and a fragment of a clay object.	23–26	?	−19.6 ± 0.2	10.6 ± 0.3	4715–4675 cal BC
10B-813	OxA-27488	13	Right-crouched; likely tuberculosis; four-post construction; three vessels, a stone macehead, a polished stone tool, flint blades, *Dentalium* and *Spondylus* shells and animal bone.	25–34	M	−19.1 ± 0.2	10.9 ± 0.3	4715–4680 cal BC
10B-818	OxA-27641	13	Right-crouched; likely tuberculosis; two vessels, an animal bone tool and a piece of red ochre.	40–49	F	−19.7 ± 0.2	11.0 ± 0.3	4710–4675 cal BC
10B-822	OxA-27480	15	Right-crouched; two pots.	18–21	Juvenile	−19.2 ± 0.2	10.3 ± 0.3	4710–4670 cal BC
	UBA-22526					−19.9 ± 0.22	10.3 ± 0.15	
10B-827	OxA-27482	15	Right-crouched; *Dentalium* shell beads.	35–44	M	−19.8 ± 0.2	9.0 ± 0.3	4710–4670 cal BC
10B-828	OxA-27485	15	Right-crouched; three vessels.	30–39	?F	−19.7 ± 0.2	10.1 ± 0.3	4710–4670 cal BC
10B-847	OxA-29024	15	Right-crouched; four-post construction; four vessels (one bears anthropomorphic decoration); fill of grave contains a flint blade, freshwater shells and animal bones.	20–24	F	−19.1 ± 0.2	10.7 ± 0.3	4715–4675 cal BC
10B-853	SUERC-53322	13	Right-crouched; four-post construction; probably eight vessels and an animal bone.	40–49	F	−19.6 ± 0.2	10.5 ± 0.3	4725–4680 cal BC

Tab. 5. (continued)

Sample ID	Laboratory number	Grave Group	Description	Age	Sex	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	Highest Posterior Density interval (95% probability)
10B-1008	OxA-27481	15	Probably right-crouched; four vessels.	3–4	Child	−19.4 ± 0.2	11.4 ± 0.3	4715–4675 cal BC
10B-1473	SUERC-53323	23	Right-crouched; four-post construction; seven vessels, flint tools, copper items, a very rich assemblage of shell ornaments (over 1000 items), animal bone, a small clay altar and a piece of red ochre.	40–59	F	−19.7 ± 0.2	11.0 ± 0.3	4730–4675 cal BC
10B-1799	OxA-28248	26	Left-crouched; one vessel and a copper arm ring.	30–39	?F	−19.5 ± 0.2	9.0 ± 0.3	4710–4655 cal BC
10B-1814	OxA-29191	26	Left-crouched; four vessels.	25–29	F	−22.2 ± 0.2	10.9 ± 0.3	4725–4680 cal BC
10B-2549	SUERC-52796		Left-crouched; two vessels, a fragmented vessel, animal bone.	35–39	?F	−19.9 ± 0.2	9.7 ± 0.3	4710–4665 cal BC
10B-2959	SUERC-53324		Right-crouched; DISH; two vessels and a polished stone adze.	35–44	M	−19.9 ± 0.2	11.0 ± 0.3	4735–4680 cal BC
10B-3020	OxA-29025	22	Right-crouched; seven vessels, probably a bone tool and a possible food offering in the form of an animal bone.	30–39	?F	−19.7 ± 0.2	9.7 ± 0.3	4720–4665 cal BC
10B-3060	OxA-26697	23	Right-crouched; four-post construction; six vessels, three axes including one of type A, a macehead, flint blades, a necklace consisted of *Dentalium* and copper beads, a very rich assemblage of *Spondylus* ornaments, four animal bones. This is the richest male burial from this time period in eastern central Europe.	40–49	M	−19.5 ± 0.2	11.5 ± 0.3	4725–4680 cal BC

Sample ID	Laboratory number	Grave Group	Description	Age	Sex	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{15}N$ (‰)	Highest Posterior Density interval (95% probability)
10B-3089	OxA-X-2508-50	22	Right-crouched; four-post construction; five vessels, *Spondylus* beads, a piece of stone, a *Spondylus* bracelet and pendants made from *Spondylus* shell, and a possible food offering in the form of an animal bone.	40–59	F	−19.2 ± 0.2	11.3 ± 0.3	4720–4665 cal BC
10B-3241	MAMS-20657		Left-crouched; may have contained a flint blade and a piece of red ochre, but it is not clear whether they belonged to the grave or the pit (3144) which it cuts.	14–15	Juvenile	−18.7 ± 0.2	10.4 ± 0.25	4735–4670 cal BC
10B-3472	OxA-26695	18	Left-crouched; three pots, polished stone adze and a wild boar mandible.	23–25	M	−19.8 ± 0.2	11.1 ± 0.3	4720–4670 cal BC
10B-3715	OxA-29023	14	Left-crouched; five vessels, a type B axe, a flint blade, bone tools, copper and *Dentalium* beads around its neck and animal bone.	20–23	?M	−20.0 ± 0.2	10.3 ± 0.3	4715–4680 cal BC
10B-3735	OxA-28250	14	Left-crouched; a type D axe, a flint blade, a copper bead and probably a wild boar's tusk.	40–44	?M	−19.2 ± 0.2	10.1 ± 0.3	4715–4675 cal BC
10B-3742	OxA-29063	14	Left-crouched; four-post construction; five vessels, a copper finger ring with *Spondylus* beads and a bone tool.	40–59	?F	−19.6 ± 0.2	10.3 ± 0.3	4710–4680 cal BC
10B-3758	OxA-28249	14	Left-crouched; one vessel and a type F axe.	11–13	Child	−19.8 ± 0.2	9.2 ± 0.3	4715–4680 cal BC

Tab. 5. (continued)

Sample ID	Laboratory number	Grave Group	Description	Age	Sex	δ¹³C$_{IRMS}$ (‰)	δ¹⁵N (‰)	Highest Posterior Density interval (95% probability)
10B-3760	OxA-29067	14	Left-crouched; a fragmented vessel.	40–59	F	−19.9 ± 0.2	9.4 ± 0.3	4715–4685 cal BC
10B-3770	OxA-27483	15	Right-crouched; two vessels and copper beads.	35–44	F	−19.2 ± 0.2	10.6 ± 0.3	4710–4670 cal BC
	OxA-27484					−19.1 ± 0.2	10.6 ± 0.3	
10B-3831	OxA-27476	14	Left-crouched; three fragmented pots, a type E axe, an adze, a flint blade, a copper ring and copper beads.	30–40	M	−19.7 ± 0.2	10.1 ± 0.3	4715–4680 cal BC
10B-3918	OxA-28947	14	Left-crouched; four-post construction; four vessels, a type E axe, an adze, a bone tool, *Spondylus* pendants and flint blades.	30–34	M	−22.6 ± 0.2	9.1 ± 0.3	4715–4680 cal BC
10B-3956	OxA-28946	14	Left-crouched; one vessel, an axe, an adze, flint blades, bone tools and a wild boar's tusk.	50–59	M	−22.5 ± 0.2	10.3 ± 0.3	4715–4680 cal BC
10B-4005	OxA-28945	14	Left-crouched; a type D axe, three vessels, an adze and flint blades.	25–29	F	−19.0 ± 0.2	10.3 ± 0.3	4715–4680 cal BC
10B-4011	OxA-27572	13	Right-crouched; likely tuberculosis; three vessels, a polished stone adze and one flint blade.	25–28	M	−19.4 ± 0.2	10.6 ± 0.3	4710–4670 cal BC
10B-4027	SUERC-53382	13	Right-crouched; four-post construction; tuberculosis; six vessels, a polished stone adze and a flint blade.	30–35	M	−19.7 ± 0.2	11.0 ± 0.3	4710–4675 cal BC
10B-4279	SUERC-52798		Left-crouched; one or two vessels, two dog skulls, animal bone and a gravel.	25–34	F	−20.4 ± 0.2	10.1 ± 0.3	4710–4665 cal BC

Sample ID	Laboratory number	Grave Group	Description	Age	Sex	δ¹³C$_{CIRMS}$ (‰)	δ¹⁵N (‰)	Highest Posterior Density interval (95% probability)
10B-4307	SUERC-53314	1	Right-crouched; one pot, a type D axe, a flint blade, copper and *Dentalium* beads.	25–30	M	–19.6 ± 0.2	10.3 ± 0.3	4710–4655 cal BC
10B-5196	OxA-27467		Left-crouched; DISH; two pots.	40–49	?F	–20.0 ± 0.2	10.3 ± 0.3	4725–4670 cal BC
10B-6337	OxA-29060	5	Left-crouched; an adze.	17–20	?M	–20.1 ± 0.2	9.4 ± 0.3	4710–4655 cal BC
	OxA-29061					–19.9 ± 0.2	9.0 ± 0.3	
10B-6438	OxA-27574	13	Left-crouched; four-post construction; three vessels, a flint blade and a bone arm-ring.	25–29	M	–18.3 ± 0.2	10.5 ± 0.3	4715–4680 cal BC
10B-7562	OxA-27477	2	Right-crouched; one pot, a type F axe and a flint blade.	35–44	M	–19.7 ± 0.2	10.3 ± 0.3	4725–4670 cal BC
10B-7655	OxA-27575	1	Right-crouched; one vessel, two fragmented pots and a type A axe.	45–54	?M	–18.4 ± 0.2	10.2 ± 0.3	4715–4660 cal BC
10B-7753	OxA-28942	1	Right-crouched; fragments of vessels, a copper arm ring, *Spondylus* beads and copper and *Dentalium* beads around its neck.	30–34	F	–18.4 ± 0.2	9.7 ± 0.3	4710–4655 cal BC
	OxA-28941					–19.1 ± 0.2	9.6 ± 0.3	
10B-7756	OxA-29062	1	Right-crouched; no grave goods.	50–59	M	–19.9 ± 0.2	10.3 ± 0.3	4715–4670 cal BC

Tab. 5. (continued)

Parameter	Highest Posterior Density interval (95% probability)	Highest Posterior Density interval (68% probability)
start: 10B – Cemetery	4740–4685 cal BC	4715–4690 cal BC
end: 10B – Cemetery	4705–4640 cal BC	4695–4670 cal BC
start: 11 – Cemetery	4820–4730 cal BC	4795–4745 cal BC
end: 11 – Cemetery	4635–4480 cal BC	4585–4515 cal BC
start: 5603 – Cemetery	4815–4725 cal BC	4790–4740 cal BC
end: 5603 – Cemetery	4530–4440 cal BC	4515–4465 cal BC
start: 10B – Settlement Pits	4735–4695 cal BC	4720–4700 cal BC
end: 10B – Settlement Pits	4715–4680 cal BC	4710–4690 cal BC
start: 11 – Settlement Pits	4780–4660 cal BC	4745–4690 cal BC
end: 11 – Settlement Pits	4680–4525 cal BC	4670–4620 cal BC (37%) or 4610–4565 cal BC (31%)
start: 5603 – Settlement Pits	4805–4625 cal BC	4745–4665 cal BC
end: 5603 – Settlement Pits	4520–4475 cal BC (3%) or 4450–4185 cal BC (92%)	4345–4245 cal BC

Tab. 6. Highest Posterior Density intervals for the start and end of different areas and activities in the Lengyel settlement, from the models defined in *figs 12–13; 15–16; 18–19.*

	start: 10B – Cemetery	end: 10B – Cemetery	start: 10B – Settlement Pits	end: 10B – Settlement Pits	start: 11 – Cemetery	end: 11 – Cemetery	start: 11 – Settlement Pits	end: 11 – Settlement Pits	start: 5603 – Cemetery	end: 5603 – Cemetery	start: 5603 – Settlement Pits	end: 5603 – Settlement Pits
start: 10B – Cemetery		98.5%	32.6%	70.1%	0.8%	100.0%	33.8%	100.0%	1.2%	100.0%	49.0%	100.0%
end: 10B – Cemetery	1.5%		0.1%	5.6%	0.0%	99.7%	6.8%	95.7%	0.0%	100.0%	19.8%	100.0%
start: 10B – Settlement Pits	67.4%	99.9%		92.0%	0.4%	100.0%	40.6%	100.0%	0.5%	100.0%	55.4%	100.0%
end: 10B – Settlement Pits	29.9%	94.5%	8.0%		0.0%	100.0%	20.7%	99.9%	0.0%	100.0%	38.2%	100.0%
start: 11 – Cemetery	99.2%	100.0%	99.6%	100.0%		100.0%	94.7%	100.0%	58.6%	100.0%	91.1%	100.0%
end: 11 – Cemetery	0.0%	0.3%	0.0%	0.0%	0.0%		0.0%	17.3%	0.0%	95.2%	0.1%	99.7%
start: 11 – Settlement Pits	66.2%	93.2%	59.4%	79.3%	5.4%	100.0%		99.5%	7.3%	100.0%	59.2%	100.0%
end: 11 – Settlement Pits	0.0%	4.3%	0.0%	0.1%	0.0%	82.7%	0.5%		0.0%	99.2%	2.6%	99.9%
start: 5603 – Cemetery	98.8%	100.0%	99.5%	100.0%	41.4%	100.0%	92.7%	100.0%		100.0%	89.4%	100.0%
end: 5603 – Cemetery	0.0%	0.0%	0.0%	0.0%	0.0%	4.8%	0.0%	0.8%	0.0%		0.0%	96.9%
start: 5603 – Settlement Pits	51.1%	80.2%	44.6%	61.8%	8.9%	99.9%	40.8%	97.4%	10.6%	100.0%		100.0%
end: 5603 – Settlement Pits	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.1%	0.0%	3.1%	0.0%	

Tab. 7. Percentage probabilities of the relative order of the start and end of different areas and activities in the Lengyel settlement, from the models defined in *figs 12–13; 15–16; 18–19*. The cells show the probability of the distribution on the left-hand column being earlier than the distribution on the top row. For example, the probability that *start: 10B – Cemetery* is earlier than *start: 5603 – Cemetery* is *1.2%*.

Parameter	Highest Posterior Density interval (95% probability)	Highest Posterior Density interval (68% probability)
span: 10B – Cemetery	1–95 years	1–40 years
span: 10B – Settlement Pits	1–45 years	1–20 years
span: 11 – Cemetery	120–325 years	175–270 years
span: 11 – Settlement Pits	1–225 years	35–175 years
span: 5603 – Cemetery	215–355 years	240–315 years
span: 5603 – Settlement Pits	175–580 years	335–490 years

Tab. 8. Highest Posterior Density intervals for the durations of different areas and activities in the Lengyel settlement, from the models defined in *figs 12–13; 15–16; 18–19*.