Rows with the neighbours: the short lives of longhouses at the Neolithic site of Versend-Gilencsa, Hungary

János Jakucs[1], Krisztián Oross[1], Eszter Bánffy[1,2], Vanda Voicsek[3], Elaine Dunbar[4], Paula Reimer[5], Alex Bayliss[6,7], Peter Marshall[6] & Alasdair Whittle[8*]

[1] Institute of Archaeology, Research Centre for the Humanities, Hungarian Academy of Sciences, Tóth Kálmán utca 4, 1097 Budapest, Hungary

[2] Römisch-Germanische Kommission, DAI, Palmengartenstraße 10–12, 60325 Frankfurt, Germany

[3] Barátúr utca 9, 7625 Pécs, Hungary

[4] SUERC Radiocarbon Dating Laboratory, Scottish Enterprise Technology Park, Rankine Avenue, East Kilbride G75 0QF, UK

[5] ^{14}CHRONO Centre, Queen's University Belfast, 42 Fitzwilliam Street, Belfast BT9 6AX, UK

[6] Historic England, Fourth Floor, Cannon Bridge House, 25 Dowgate Hill, London EC4R 2YA, UK

[7] Biological and Environmental Sciences, University of Stirling, Stirling FK9 4LA, UK

[8] Department of Archaeology and Conservation, Cardiff University, John Percival Building, Colum Drive, Cardiff CF10 3EU, UK

** Author for correspondence (Email: whittle@cardiff.ac.uk)*

Received: 11 November 2016; Accepted: 13 February 2017; Revised: 26 April 2017

<LOCATION MAP 6.5cm colour, place to left of abstract and wrap text around>

*Longhouses culture are a key feature of Neolithic Linearbandkeramik (LBK) settlements in central Europe, but debate persists concerning their usage, longevity, and social significance. Excavations at Versend-Gilencsa in southwest Hungary (*c. *5200 cal BC) revealed clear rows of longhouses. New radiocarbon dates suggest that these houses experienced short lifespans. This paper produces a model for the chronology of Versend and considers the implications of these new dates for a fuller understanding of the layout and duration of LBK longhouse settlements.*

Keywords: Hungary; Versend-Gilencsa; Neolithic; LBK; longhouses; Bayesian chronological modelling

Introduction

Great timber longhouses are a defining feature of the first Neolithic communities in central and western Europe, belonging to the *Linearbandkeramik* (LBK) culture of the later sixth millennium cal BC (Coudart 1998). Even in the first recorded phase of longhouse construction (belonging to the LBK 'formative' phase), many elements of this architecture, such as longpits, side ditches and internal post rows, were already present (Bánffy 2013). During the succeeding (or earliest) LBK, buildings could be substantial, up to 20m long or so by 6m wide (Stäuble 2005). From the later LBK onwards, in the Flomborn, Ačkovy, Notenkopf and Keszthely phases, which began *c*. 5300 cal BC, some longhouses reach over 30m in length and become more elaborate internally, the typical internal cross-rows of three posts changing to any number of combinations and layouts (Modderman 1970; Coudart 1998). Many settlements have been found, each characterised by larger and smaller groupings of long houses.

Despite their high archaeological visibility, wide distribution, and thousands of excavated examples, many questions remain about these iconic structures. Where did this architecture first emerge? In the virtual absence of preserved floors, what can be said about the use of the interiors? How long did these buildings last, given the substantial oak posts with which the majority of them were framed? How did houses relate to their neighbours? What did variation in house size mean in terms of household composition? Should each house be considered an independent unit, or was household membership distributed across more than one building?

Consideration of such questions was long framed by the *Hofplatzmodell*, or independent homestead model. This model emerged from pioneering, large-scale rescue excavations on the Aldenhovener Platte in north-western Germany (Boelicke *et al*. 1988), and is based on a complex set of arguments built upon a combination of site layouts, horizontal stratigraphy, ceramic sequence constructed through correspondence analysis of decorative motifs on fineware pottery, and an inferred house duration of some 25–30 years (summarised in Zimmermann 2012). The model posits that each longhouse existed in its own space—or yard in Dutch terminology (van de Velde 1979)—and is separated from irregularly spaced neighbours by a wider area that includes an activity zone spanning approximately 25m (in the case of Langweiler 8: Boelicke *et al*. 1988). With each succeeding generation, these loose house clusters shifted slightly. Community thus comprised a combination of independent households, or groupings of such households, as seen at Vaihingen, south-western Germany, or Cuiry-lès-Chaudardes, northern France (Bogaard *et al*. 2011; Hachem 2011); wards are a useful term in this context (van de Velde 1979).

More recently, the *Hofplatzmodell* has been strongly criticised (Rück 2009, 2012). In its place, and principally on the basis of visual inspection of settlement plans, settlement layout based on rows of closely spaced longhouses aligned long side to long side has been proposed. Concurrently, differing hypothetical house durations up to and exceeding 75 years have been suggested (Schmidt *et al*. 2005: 162; Rück 2009). A wide range of candidates for row layout was suggested, essentially covering the LBK areas in central and western Europe. Other studies, particularly in the eastern part of this distribution, support the revision of the independent homestead model, without accepting all elements of the row model or necessarily following the proposed alternative estimated house duration (Lenneis 2012; Marton & Oross 2012). Other variations, such as linked house pairs and other close-set clusters, have also been proposed (Czerniak 2016).

The chronology of neither the *Hofplatzmodell* nor its alternatives, however, has been formally modelled (although note Lenneis 2012). The site of Versend-Gilencsa in south-western Hungary forms the focus of this paper. It provides an opportunity to jointly examine issues of layout and chronology, as it shows clear row layout and produced large assemblages of faunal remains suitable for radiocarbon dating.

Longhouse architecture and settlement layout in western Hungary

Archaeological research on LBK sites in western Hungary has intensified over the past two decades. By 2010 more than 300 houses from 50 sites were known (Oross 2013: 151–77, tab. 5.1, fig. 5.10, 401–402). The real number of excavated house plans is, however, much higher, as numerous discoveries remain unpublished. Their architecture is generally similar to contemporary houses in other regions of central Europe.

The excavated house plans from later sixth millennium cal BC settlements in western Hungary form clusters arranged into rows that are usually roughly parallel to each other. Each row consists of two to six houses with their long axes perpendicular to the row. Very similar settlement layout can be observed on large LBK sites of the region, with some rows located close to each other, as at Tolna-Mözs (Marton & Oross 2012: 225–33, fig. 3). Elsewhere, as at Balatonszárszó-Kis-erdei-dűlő, there were some open spaces between the house rows (Oross 2013: 320–45). The nearby Szederkény-Kukorica-dűlő settlement shares the same layout, although the house units were principally associated with early Vinča and Ražište style pottery (Jakucs *et al.* 2016).

Versend-Gilencsa

The large archaeological rescue excavation at Versend-Gilencsa (Figure 1) was carried out in 2006–2007 by archaeologists from the Janus Pannonius Museum, Pécs. The site lies in the area of the southern Baranya hills of Transdanubia, south of the village of Versend, and less than 3km to the east of Szederkény-Kukorica-dűlő (Jakucs *et al*. 2016). A 1.2km long strip, totalling over 6.5ha, was excavated. The Neolithic settlement extends over low, gently sloping ridges (Figure 2), on both sides of the Versend stream.

<FIGURE 1>

<FIGURE 2>

In the eastern part of the Neolithic settlement, close to the stream, there were numerous traces of longhouses, oriented north–south. Although the postholes of these structures were poorly preserved, house plans could be identified from the characteristic longpits flanking the buildings. In this part of the site, at least 21 Neolithic house plans were identified, clearly arranged in at least four rows, nearly perpendicular to the streamline (Figure 2). Only one Neolithic burial was found here.

The western part of the site is more densely packed with features of different archaeological periods. Some were identified as potential Neolithic longpits due to their form. The locations of the suspected Neolithic houses are yet to be detected, due to later disturbance. This part of the settlement, however, yielded 24 burials which were mainly cut into larger pit complexes and appeared to form small clusters. Most of the burials were in a crouched position, but none had associated grave goods.

Material culture

A varied range of pottery styles was found at Versend, including Vinča, Ražište, early LBK and Starčevo (Figure 3). Starčevo was the first Neolithic cultural grouping in Transdanubia, dating to the first half of the sixth millennium cal BC. New evidence from Versend and other south-eastern Transdanubian sites has shown that inherited elements of the Starčevo pottery style could have been preserved to a greater extent than previously presumed (Marton & Oross 2012). Vinča is the major post-Starčevo cultural grouping to the south of the LBK, the earliest manifestations of which date to the late fifty-fourth century cal BC (Whittle *et al.* 2016: fig. 25). The Ražište style, an early variant of the north-eastern Croatian Sopot culture (on the fringes of the early Vinča culture), may have resulted from interaction between the Vinča and LBK spheres (Marković 2012; Jakucs & Voicsek 2015). Additionally, decorative elements of the Malo Korenovo type (a regional variant of the LBK in northern Croatia and south-western Hungary; Težak-Gregl 1993) also occur.

<FIGURE 3>

Early Vinča-style ceramics, figurines and bone tools are the dominant artefacts found in the buildings of the northern house row of the eastern settlement area, especially in houses H15 and H17 (Figure 4). In most houses, however, early Vinča-style vessel forms and technological markers occur together with early LBK-style ceramics (and in the cases of H3, H5, H7 and H15, with figurines as well), and also in some cases with material that appears to hark back to the Starčevo tradition (H10, H11 and H12). Analyses to date suggest relatively strong Vinča influences in the material culture of some houses in the eastern area of Versend, whereas other houses in the eastern area show stronger affiliations to the rest of Transdanubia (Figures 3–4). Ongoing post-excavation analysis has provided a different picture for the western side of the settlement. Although distinctive early Vinča elements, such as black burnishing, black-topped vessels and red slipping are numerous, there were significant differences in vessel forms and decorative techniques. The vessel forms and applied decorative patterns are most analogous to the Sopot-Ražište style ceramics of eastern Slavonia. Additionally, decorative elements of the Malo Korenovo pottery style are more frequent in this part of the site.

<FIGURE 4>

Radiocarbon dating

The radiocarbon dating programme for Versend was designed using Bayesian chronological modelling (Buck *et al*. 1996), incorporating the four radiocarbon dates on human skeletons that had been obtained previously (MAMS-; Table 1). The sampling strategy aimed to date the occurrence of longhouses and Vinča ceramics on the same site, to explore the layout of the eastern part of the settlement, and to determine whether occupation at Versend was contemporary with that at nearby Szederkény-Kukorica-dűlő.

<TABLE 1>

Sampling was concentrated on the eastern part of the settlement where the layout of the buildings could be reconstructed. A small number of samples were dated from the western area to check that both areas were occupied simultaneously. The entire faunal assemblage from the eastern part of the site was assessed for groups of articulating bones and bones with re-fitting unfused epiphyses (cf. Bayliss *et al.* 2016: fig. 7). This material must have been rapidly deposited after death for the elements to remain articulated. Strictly, such samples provide a *terminus ante quem* for the construction of each longhouse. It is likely, however, that the chronological difference between the deposition of the dated animal bones and house construction is relatively small as none of the recovered material came from the upper parts of features (the top 0.4m was mechanically removed prior to excavation).

Sixty-eight radiocarbon measurements are available from Versend, all on samples of articulating animal or human bone (Table 1). Technical details of the results and the methods used to produce them are provided in the online Supplementary Material.

Modelling the chronology of the Neolithic settlement at Versend-Gilencsa

Chronological modelling was undertaken using OxCal v4.2 (Bronk Ramsey 2009a; Bronk Ramsey & Lee 2013) and the calibration dataset of Reimer *et al*. (2013) (the model algorithms are defined exactly by the OxCal CQL2 code provided in online supplementary materials). The structure of the preferred model (Model 4) is illustrated by the brackets and OxCal keywords on the left-hand side of Figures 5 and 6 (http://c14.arch.ox.ac.uk/). The outputs from the models, the posterior density estimates, are shown in black, and the unconstrained calibrated radiocarbon dates are shown in outline. The other distributions correspond to aspects of the model. For example, the distribution *start Versend settlement* (Figure 5) is the posterior density estimate for the time when the settlement at Versend was established. In the text and tables, the Highest Posterior Density intervals of the posterior density estimates are given *in italics*.

<FIGURE 5>

<FIGURE 6>

A number of alternative models for understanding the chronology of Versend have been constructed. They all include the limited number of stratigraphic relationships between dated features (Grave 415 is earlier than Pit 414 of H18, Pit 1123 is earlier than Graves 1121 and 1124, and Pit 1387 is earlier than Grave 1394). Replicate radiocarbon measurements are combined by taking a weighted mean (Ward & Wilson 1978) before calibration and inclusion in the models, and the three measurements on intrusive samples of post-Neolithic date are excluded.

Model 1 (Versend_Model_1.oxcal) includes all of the settlement features and burials in a single, continuous uniform phase of activity (Buck *et al*. 1992). It has poor overall agreement (Amodel: 46; Bronk Ramsey 2009a, 356–7), with burials 1049 (*SUERC-67305*) and 1078 (*SUERC-67306*) clearly continuing later than the dated settlement. Model 2 (Versend_Model_2.oxcal), therefore, places the settlement features and the burials in separate, potentially overlapping, continuous uniform phases of activity (cf. the model structures illustrated in Figures 5 and 6). This model has poor overall agreement (Amodel: 56) and poor overall convergence (C: 85), with three samples having poor individual agreement (Bronk Ramsey 1995, 429; *UBA-22596*, A: 42; *UBA-22602*, A: 46, and *SUERC-58578*, A: 1). A variant of this, Model 3 (Versend_Model_3.oxcal), which splits the settlement into its eastern and western parts, has good overall agreement (Amodel: 63) but poor overall convergence (C: 83), with the same three measurements having poor individual agreement (A: 44; A: 47, and A: 4 respectively). SUERC-58578 is statistically significantly earlier than the other measurements on similar samples from the longpits of H15 ((T′=20.4; T′(5%)=11.1; ν=1; Ward & Wilson 1978)), and indeed is clearly earlier than all the other dated samples from the site (see Figure S1). Given its articulation, it appears unlikely to be residual from an earlier feature and so is likely to be a laboratory outlier.

Model 4 (Versend_Model_4.oxcal), therefore, implements outlier analysis to identify and proportionally weight any statistical outliers arising from unquantified laboratory error in the data ((Outlier_Model("SSimple",N(0,2),0,"s"); Christen 1994; Bronk Ramsey 2009b). This model is identical in form to Model 2, but implements s-type outlier analysis in OxCal, with each radiocarbon measurement being given a prior outlier probability of 5%. Only *SUERC-58578* (83%) and *UBA-22602* (11%) have posterior outlier probabilities of more than 10%, and it is again clear that *SUERC-58578* is a significant outlier from the main body of data from the settlement (the outlier analysis downweights this date proportionately). Model 4 is defined by the CQL2 code provided as supplementary information (Versend_Model_4.oxcal), although its overall form is illustrated in Figures 5 and 6. The first and last dated events have been calculated for each longhouse that has yielded more than two radiocarbon dates. The difference between them provides an estimate for the duration of use of each building, bearing in mind that the upper longpit fills are probably missing. These key parameters are illustrated in Figures 7 and 8, and their Highest Posterior Density intervals are given in Table 2.

<FIGURE 7>

<FIGURE 8>

<TABLE 2>

Obtaining a statistically plausible and stable model for the chronology of Versend has been challenging, due to the shape of the radiocarbon calibration curve between *c*. 5300 and *c*.

5000 BC (Figure S1). This consists of two small plateaux separated by a pronounced wiggle, which leads to strongly bi-modal posterior distributions. Consequently, the models are extremely slow to converge or are unable to achieve adequate convergence at all (Bronk Ramsey 1995, 429). The highest peaks of probability in all of our variant models, however, suggest a short-lived settlement occupied for a few decades around 5200 cal BC. As this coincides with a steep part of the calibration curve separating two small plateaux, we were concerned that our results could be an artefact of the shape of the curve. For this reason, we ran 14 simulation models identical in form to Model 1, each spanning 30 years and starting from 5270 BC to 5130 BC. The posterior distributions produced by these simulations included the actual dates in accordance with statistical expectation (Table S1), and so we feel that the model outputs presented should be accurate to within the quoted uncertainty.

The model shown in Figure 5 suggests that the Versend settlement was established in *5305–5280 cal BC* (*2% probability*; *start Versend settlement*; Figure 5) or *5255–5210 cal BC* (*93% probability*), probably in *5235–5215 cal BC* (*68% probability*), and was abandoned in *5220–5180 cal BC* (*93% probability*; *end Versend settlement*; Figure 5) or *5150–5115 cal BC* (*2% probability*), probably in *5210–5195 cal BC* (*68% probability*). It was in use for *1–70 years* (*93% probability*; *use Versend settlement*; Figure 8) or *135–185 years* (*2% probability*), probably for *10–35 years* (*68% probability*). Given the short overall duration of the settlement, most houses were probably in use for no more than a decade or two (Figure 8). Burial occurred for longer on the site, beginning in *5395–5225 cal BC* (*95% probability*; *start Versend burials*; Figure 6), probably in *5330–5240 cal BC* (*68% probability*) and ending in *5040–4815 cal BC* (*95% probability*; *end Versend burials;* Figure 6), probably in *4995–4905 cal BC* (*68% probability*). It continued for a period of *215–540 years* (*95% probability*; *use Versend burials*; distribution not shown), probably for a period for *275–415 years* (*68% probability*). This persistence in burial is in stark contrast to the brevity of settlement on the site.

Discussion

Model 4 suggests not only short durations for individual longhouses in Versend-Gilencsa (median values not exceeding 20 years; Figure 8), but also, in complementary fashion, a short life for the settlement as a whole, in the late fifty-third century cal BC. Although fewer in number, dates from the western part indicate a similar period of use to the eastern part. The longer duration for burial on the site, although unusual in this type of context, does not conflict with the modelled brevity of settlement. In assessing the implications of these formally modelled estimates, we must restate the nature of our dated samples. Our short-life samples came principally from pits flanking the longhouses in the eastern part of the settlement, and it is believed that those features were truncated. Furthermore, it is not entirely clear how the filling of these pits relates to the lifespan of individual buildings. Did these features fill up quickly? Were the finds in them foundation deposits? Were they recut periodically? These are questions that apply across the whole LBK distribution (cf. Stäuble 1997), and are therefore open to testing in other cases. Our proxy, however, is the best available for Versend-Gilencsa, and is likely to be the kind of proxy found in many other LBK contexts.

The estimated short house durations, therefore, have not only local significance (discussed below), but also potential wider implications for the debate concerning the forms and timings of LBK settlements. The eastern part of Versend-Gilencsa is unequivocally arranged in rows, as is probably the western part. This example, and plenty of others in Transdanubia and east-central Europe, therefore confirm the spatial dimension of the row model (Rück 2009, 2012). Our date estimates for house longevity, however, conform well to the estimates produced by the *Hofplatzmodell* (Zimmermann 2012), and are considerably shorter than those proposed as a corollary of the row model. It remains to be seen, of course, whether similar results can be produced by formal modelling of other LBK longhouse settlements. The few other formally modelled estimates for house duration in other Neolithic contexts available generally support shorter rather than longer house lives. In the tell settlements of Vinča-Belo Brdo, Serbia, and Uivar, Romania, for example, median house durations range from 4–55 years and from 11–82 years respectively (Tasić *et al.* 2016: fig. 10; n=10; Draşovean *et al*. 2017: fig. 7; n=8); many houses appear to have lasted from one to two human generations. All such estimates have to be contextualised.

We have suggested that some houses in the early stages of tell development could have been deliberately abandoned to create memory and renown (Draşovean *et al*. 2017), and that house life in the late stages of Vinča-Belo Brdo tell could have been shortened by circumstances of very unsettled times (Tasić *et al.* 2015). Precise dendrochronological dating suggests that short house lives (<20 years) were also the norm in the Alpine foreland (Hofmann *et al*. 2016). Although variation is possible, it appears probable that Neolithic housing was rarely long-lived, even when solidly constructed. If such estimates are robust, we need to consider the reasons why. That involves thinking not only about the individual house and household but also the nature of communities and the specific circumstances in which they found themselves.

There seems no reason why, with adequate maintenance (especially of the roof), LBK longhouses could not have been long-lasting. Their shorter lives, if that is what they normally had, must therefore be due to the social context in which they were built and used. People may have relocated buildings (and indeed whole settlements) for a number of practical reasons, including escape from infestation and unsanitary conditions (Whittle 1997). There are also well documented ethnographic cases where the death of household heads, and the associated pollution, are sufficient motive to abandon particular buildings. A well-known counter-example is the Zafamaniry house in Madagascar, which can endure in parallel with long-lasting marriage (Bloch 1995).

There is no specific evidence from individual houses at Versend-Gilencsa, and rarely elsewhere, that enables us to identify such influences. We must, however, consider flexibility and fluidity in household composition and durability, the wider context of groups of houses, and the circumstances in which they were built and used. The closely set rows at Versend-Gilencsa surely project a strong sense of community. Evidence suggests that the rows were relatively fully populated at the same time; only a few relationships (for example, H19 and 20; H14 and 16; Figure 2) suggest successive building. Setting out rows of houses in the manner seen at Versend-Gilencsa—facing each other across narrow lanes and with their long sides very close to neighbours—was surely a deliberate act of community construction. Earlier settlement history in the region lends further support to this claim, when many occupations of both the Starčevo and Körös cultures might have had a less concentrated character (Bánffy *et al*. 2010). By analogy, whatever the situation may be with individual houses and households, it is likely that community was often fragile and divided; in settling in the same place, people probably had to work hard to stay together (Cohen 1985; Canuto & Yaeger 2000; Amit 2002; Birch 2013: 8). In the American Southwest, early Mesa Verde villages have been called 'social tinderboxes', which rarely lasted beyond 30–70 years (Wilshusen & Potter 2010: 178).

While individual house lives in tell settlements may have often been relatively short, occupation of place was maintained for centuries (Tasić *et al*. 2015, 2016; Draşovean *et al*. 2017). There is good reason to assume that many 'flat' settlements, including plenty of LBK examples, lasted for considerable periods of time. Formal modelling suggests, for example, that the occupation of nearby Szederkény-Kukorica-dűlő lasted from the late fifty-fourth to the early fifty-second centuries cal BC (Jakucs *et al*. 2016); Tolna-Mözs, approximately 50km to the north along the Danube (Marton & Oross 2012), provides another useful comparison. Szederkény, which combines the characteristically LBK longhouses with early Vinča style pottery, was probably founded soon after the initial LBK 'diaspora' across central Europe and beyond (Jakucs *et al*. 2016: fig. 24), and in circumstances of considerable social, cultural and demographic flux. This situation seems to have continued into the fifty-third century cal BC, considering the range of ceramic styles seen at Versend-Gilencsa.

We must allow for the possibility that some villages ended much more quickly than others. In some cases, this may have been due to internal tensions, shifting alliances or external aggression. To date, there is no direct evidence from Versend-Gilencsa that allows us to identify specific factors, although the ceramic variability at the site could suggest the co-presence of social groups with diverse cultural backgrounds and allegiances; this mix might have produced difficulties in maintaining community. In assessing the relevance of the modelled estimates presented here for longhouses and site duration, the possibilities of premature ending or social failure, in contingent circumstances, must be kept in mind. It remains to be seen whether other row settlements will yield similar results. If rows at one level were all about communal solidarity, it could be that households within them were also more prone to tension and fission, and therefore had shorter lives than the more independent and autonomous social units implied in the *Hofplatzmodell*.

Acknowledgements

Thanks to Boldizsár Csornay and Erzsébet Nagy for supporting our work in the Janus Pannonius Museum of Pécs; the Deutsche Forschungsgemeinschaft for funding the *Bevölkerungsgeschichte des Karpatenbeckens in der Jungsteinzeit und ihr Einfluss auf die Besiedlung Mitteleuropas* project, led by Kurt W. Alt and Eszter Bánffy; Kitti Köhler for her help with human bone identification; Éva Ágnes Nyerges and Hayley Foster for animal bone identification; and Zsolt Réti and Kirsty Harding for help with the figures. Dating and modelling were supported by an Advanced Investigator Grant (295412) of the European Research Council, for *The Times of Their Lives* (www.totl.eu), led by Alasdair Whittle and Alex Bayliss.

Supplementary material

To view supplementary material for this article, please visit XXXX

References

AMIT, V. 2002. Reconceptualizing community, in V. Amit (ed.), *Realizing community: concepts, social relationships and sentiments*: 1–20. London: Routledge.

BÁNFFY, E. 2013. Tracing the beginning of sedentary life in the Carpathian basin, in D. Hofmann & J. Smyth (ed.), *Tracking the Neolithic house in Europe: sedentism, architecture, and practice*: 117–49. New York: Springer.

BÁNFFY, E., MARTON, T. & OSZTÁS, A. 2010. Early Neolithic settlement and burials at Alsónyék–Bátaszék, in J.K. Kozłowski & P. Raczky (ed.), *Neolithization of the Carpathian Basin: northernmost distribution of the Starčevo/Körös culture*: 37–51. Kraków and Budapest: Polish Academy of Arts and Sciences, and Institute of Archaeological Sciences of the Eötvös Loránd University.

BAYLISS, A., BEAVAN, N., HAMILTON, D., KÖHLER, K., NYERGES, É.Á., BRONK RAMSEY, C., DUNBAR, E., FECHER, M., GOSLAR, T., KROMER, B., REIMER, P., BÁNFFY, E., MARTON, T., OROSS, K., OSZTÁS, A., ZALAI-GAÁL, I. & WHITTLE, A. 2016. Peopling the past: creating a site biography in the Hungarian Neolithic. *Bericht der Römisch-Germanischen Kommission* 94: 23–91.

BIRCH, J. 2013. Between villages and cities: settlement aggregation in cross-cultural perspective, in J. Birch (ed.), *From prehistoric villages to cities: settlement aggregation and community transformation*: 1–22. New York: Routledge.

BLOCH, M. 1995. The resurrection of the house amongst the Zafamaniry of Madagascar. In J. Carsten & S. Hugh-Jones (ed.), *About the house: Lévi-Strauss and beyond*: 69–83. Cambridge: Cambridge University Press.

BOELICKE, U., VON BRANDT, D., LÜNING, J., STEHLI, P. & ZIMMERMANN, A. 1988. *Der bandkeramische Siedlungsplatz Langweiler 8. Gemeinde Aldenhoven, Kreis Düren*. Köln: Rheinland-Verlag GmbH.

BOGAARD, A., KRAUSE, R. & STRIEN, H.-C. 2011. Towards a social geography of cultivation and plant use in an early farming community: Vaihingen an der Enz, south-west Germany. *Antiquity* 85: 395–416.

BRONK RAMSEY, C. 1995. Radiocarbon calibration and analysis of stratigraphy. *Radiocarbon* 36: 425–30.

– 2009a. Bayesian analysis of radiocarbon dates. *Radiocarbon* 51: 337–60.

– 2009b. Dealing with outliers and offsets in radiocarbon dating. *Radiocarbon* 51: 1023–45.

BRONK RAMSEY, C. & LEE, S. 2013. Recent and planned developments of the program OxCal. *Radiocarbon* 55: 720–30.

BUCK, C.E., LITTON, C.D. & SMITH, A.F.M. 1992. Calibration of radiocarbon results pertaining to related archaeological events. *Journal of Archaeological Science* 19: 497–512.

BUCK, C.E., CAVANAGH, W.G. & LITTON, C.D. 1996. *Bayesian approach to interpreting archaeological data*. Chichester: John Wiley and Sons.
CANUTO M.-A. & YAEGER J. (ed.) 2000. *The archaeology of communities: a New World perspective*. London: Routledge.
CHRISTEN, J.A. 1994. Summarizing a set of radiocarbon determinations: a robust approach. *Applied Statistics* 43: 489–503.
COHEN, A.P. 1985. *The symbolic construction of community*. Chichester: Ellis Horwood.
COUDART, A. 1998. *Architecture et société néolithique. L'unité et la variance de la maison danubienne*. Paris: Maison des Sciences de l'Homme.
CZERNIAK, L. 2016. House and household in the LBK, in L. Amkreutz, F. Haack, D. Hofmann & I. van Wijk (ed.), *Something out of the ordinary: interpreting diversity in the Early Neolithic Linearbandkeramik and beyond*: 33–64. Newcastle upon Tyne: Cambridge Scholars Publishing.
DRAŞOVEAN, F., SCHIER, W., BAYLISS, A., GAYDARSKA, B. & WHITTLE, A. 2017. The lives of houses: duration, context and history at Neolithic Uivar. *European Journal of Archaeology*. http://dx.doi.org/10.1017/eaa.2017.37
HACHEM, L. 2011. *Le site néolithique de Cuiry-lès-Chaudardes, 1. De l'analyse de la faune à la structuration sociale*. Rahden: Marie Leidorf.
HOFMANN, D., EBERSBACH, R., DOPPLER, T. & WHITTLE, A. 2016. The life and times of the house: multi-scalar perspectives on settlement from the Neolithic of the northern Alpine foreland. *European Journal of Archaeology* 19, 596–630.
JAKUCS, J., BÁNFFY, E., OROSS, K., VOICSEK, V., BRONK RAMSEY, C., DUNBAR, E., KROMER, B., BAYLISS, A., HOFMANN, D., MARSHALL, P. & WHITTLE, A. 2016. Between the Vinča and Linearbandkeramik worlds: the diversity of practices and identities in the 54th–53rd centuries cal BC in south-west Hungary and beyond. *Journal of World Prehistory* 29: 267–336.
LENNEIS, E. 2012. Zur Anwendbarkeit des rheinischen Hofplatzmodells im östlichen Mitteleuropa, in F. Kreienbrink, M. Cladders, H. Stäuble, T. Tischendorf, & S. Wolfram (ed.), *Siedlungsstruktur und Kulturwandel in der Bandkeramik*, 47–52. Dresden: Landesamt für Archäologie, Freistaat Sachsen.
MARKOVIĆ, Z. 2012. Novija razmatranja o nekim aspektima sopotske kulture u sjevernoj Hrvatskoj — Neuere Betrachtungen über bestimmte Aspekte der Sopot-Kultur in Nordkroatien. *Priloži Instituta za Arheologija u Zagrebu* 29: 57–70.
MARTON, T. & OROSS, K. 2012. Siedlungsforschung in linienbandkeramischen Fundorten in Zentral- und Südtransdanubien — Wiege, Peripherie oder beides? in F. Kreienbrink, M.

Cladders, H. Stäuble, T. Tischendorf & S. Wolfram (ed.), *Siedlungsstruktur und Kulturwandel in der Bandkeramik*: 220–39. Dresden: Landesamt für Archäologie, Freistaat Sachsen.

MODDERMAN, P.J.R. 1970. *Linearbandkeramik aus Elsloo und Stein.* Analecta Praehistorica Leidensia 3.

OROSS, K. 2013. *Balatonszárszó–Kis-erdei-dűlő lelőhely középső neolit településszerkezete és közép-európai párhuzamai. (The Middle Neolithic settlement structure of the site at Balatonszárszó-Kis-erdei-dűlő in a Central European context)*. Budapest: PhD dissertation, Eötvös Loránd University.

REIMER, P.J., BARD, E., BAYLISS, A., BECK, J.W., BLACKWELL, P., BRONK RAMSEY, C., BUCK, C.E., CHENG, H., EDWARDS, R.L., FRIEDRICH, M., GROOTES, P.M., GUILDERSON, T.P., HAFLIDASON, H., HAJDAS, I., HATTÉ, C., HEATON, T.J., HOFFMANN, D.L., HOGG, A.G., HUGHEN, K.A., KAISER, K.F., KROMER, B., MANNING, S.W., NIU, M., REIMER, R.W., RICHARDS, D.A., SCOTT, E.M., SOUTHON, J.R., STAFF, R.A., TURNEY, C.S.M. & VAN DER PLICHT, J. 2013. IntCal13 and Marine13 radiocarbon age calibration curves 0–50,000 years cal BP. *Radiocarbon* 55: 1869–87.

RÜCK, O. 2009. New aspects and models for Bandkeramik settlement research, in D. Hofmann and P. Bickle (ed.), *Creating communities: new advances in Central European Neolithic research*: 159–85. Oxford: Oxbow Books.

– 2012. Vom Hofplatz zur Häuserzeile. Das bandkeramische Dorf – Zeilenstrukturen und befundfreie Bereiche offenbaren ein neues Bild der Siedlungsstrukturen, in F. Kreienbrink, M. Cladders, H. Stäuble, T. Tischendorf & S. Wolfram (ed.), *Siedlungsstruktur und Kulturwandel in der Bandkeramik*: 20–42. Dresden: Landesamt für Archäologie, Freistaat Sachsen.

SCHMIDT, B., GRUHLE, W., RÜCK, O. & FRECKMANN, K. 2005. Zur Dauerhaftigkeit bandkeramischer Häuser im Rheinland (5300–4950 v. Chr.) — eine Interpretation dendrochronologischer und bauhistorischer Befunde, in D. Gronenborn (ed.), *Klimaveränderung und Kulturwandel in neolithischen Gesellschaften Mitteleuropas, 6700–2200 v. Chr.*: 151–70. Mainz: Römisch-Germanisches Zentralmuseum.

STÄUBLE, H. 1997. Häuser, Gruben und Fundverteilung, in J. Lüning (ed.), *Ein Siedlungsplatz der Ältesten Bandkeramik in Bruchenbrücken, Stadt Friedberg/Hessen*: 17–150. Bonn: Habelt.

– 2005. *Häuser und absolute Datierung der Ältesten Bandkeramik*. Bonn: Habelt.

TASIĆ, N., MARIĆ, M., FILIPOVIĆ, D., PENEZIĆ, K., DUNBAR, E., REIMER, P., BARCLAY, A., BAYLISS, A., GAYDARSKA, B. & WHITTLE, A. 2016. Interwoven strands for refining the chronology of the Neolithic tell of Vinča-Belo Brdo, Serbia. *Radiocarbon* 58(4). Doi: 10.1017/RDC.2016.56, Published online: 30 August 2016

TASIĆ, N., MARIĆ, M., PENEZIĆ, K., FILIPOVIĆ, D., BOROJEVIĆ, K., BORIĆ, D., REIMER, P., RUSSELL, N., BAYLISS, A., BARCLAY, A., GAYDARSKA, B. & WHITTLE, A. 2015. The end of the affair: formal chronological modelling for the top of the Neolithic tell of Vinča-Belo Brdo. *Antiquity* 89: 1064–82.

TEŽAK-GREGL, T. 1993. *Kultúra linernotrakaste keramike u sredisnjoj Hrvatskoj. Korenovska kultúra (The Linear Pottery culture in central Croatia. The Korenovo culture)*. Zagreb: Dissertationes et Monographia 2.

VAN DE VELDE, P. 1979. On Bandkeramik social structure. *Analecta Praehistorica Leidensia* 12: 1–242.

WARD, G.K. & WILSON, S.R. 1978. Procedures for comparing and combining radiocarbon age determinations: a critique. *Archaeometry* 20: 19–31.

WHITTLE, A. 1997. Moving on and moving around: modelling Neolithic settlement mobility. In P. Topping (ed.), *Neolithic landscapes*: 15–22. Oxford: Oxbow Books.

WHITTLE, A., BAYLISS, A., BARCLAY, A., GAYDARSKA, B., BÁNFFY, E., BORIĆ, D., DRAŞOVEAN, F., JAKUCS, J., MARIĆ, M., ORTON, D., TASIĆ, N., SCHIER, W. & VANDER LINDEN, M. 2016. A Vinča potscape: formal chronological models for Neolithic cultural development in south-east Europe. *Documenta Praehistorica* 43, 1–60.

WILSHUSEN, R.H. & POTTER, J.M. 2010. The emergence of villages in the American Southwest: cultural issues and historical perspectives, in M.S. Bandy & J.R. Fox (ed.), *Becoming villagers: comparing early village societies*: 165–83. Tucson: University of Arizona Press.

ZIMMERMANN, A. 2012. Das Hofplatzmodell — Entwicklung, Probleme, Perspektiven, in F. Kreienbrink, M. Cladders, H. Stäuble, T. Tischendorf & S. Wolfram (ed.), *Siedlungsstruktur und Kulturwandel in der Bandkeramik*: 11–19. Dresden: Landesamt für Archäologie, Freistaat Sachsen.

Figure captions

Figure 1. Map showing the location of principal sites mentioned in the text.

Figure 2. Layout of the eastern part of the Versend settlement, with at least four rows of longhouses clearly visible.

Figure 3. The range of pottery styles and other material recovered from the eastern part of Versend: A) Starčevo; B) early LBK; C) Vinča.

Figure 4. The proportions of different pottery styles by row and longhouse in the eastern part of Versend.

Figure 5. Probability distributions of dates from the settlement at Versend; each distribution represents the relative probability than an event occurs at a particular time. Posterior/prior outlier probabilities are shown in square brackets. The structure of the model is shown by the brackets and OxCal keywords down the left-hand side of Figures 5 and 6. The model is defined exactly by the OxCal code provided as supplementary information (Versend_Model_4.oxcal).

Figure 6. Probability distribution of dates from burials at Versend. Format as for Figure 5. The structure of the model is shown by the brackets and OxCal keywords down the left-hand side of Figures 5 and 6. The model is defined exactly by the OxCal code provided as supplementary information (Versend_Model_4.oxcal).

Figure 7. Key parameters for the first and last dated events for houses with more than one radiocarbon date and for the establishment and abandonment of the settlement, derived from Model 4 (Versend_Model_4.oxcal).

Figure 8. Key parameters for duration of houses with more than one radiocarbon date and the overall settlement, derived from Model 4 (Versend_Model_4.oxcal).

Table 1. Radiocarbon and stable isotopic measurements from Versend-Gilencsa. Replicate measurements have been tested for statistical consistency and combined by taking a weighted mean before calibration as described by Ward and Wilson (1978; T′(5%)=3.8, ν=1 for all).

Laboratory number	Material, context, and associations	$\delta^{13}C_{IRMS}$ (‰)	$\delta^{13}C_{AMS}$ (‰)	$\delta^{15}N$ (‰)	C/N ratio	Radiocarbon age (BP)
Eastern						
SUERC-67296	Pit 114 S1: articulating cattle left 1st and 2nd phalanges, from western longpit of H10, in the middle of row 3. With Starčevo-like decoration and shapes, early Vinča-type biconical bowls and red slipped pedestals, some typical early LBK-type vessels and incised decoration	−19.9±0.2		9.0±0.3	3.3	6258±32
SUERC-58556	Pit 114 S2: articulating cattle left proximal radius and ulna, from the same feature as SUERC-67296	−20.2±0.2		8.9±0.3	3.2	6267±34
UBA-22601	Pit 114 S2: replicate of SUERC-58556	−20.3±0.22		8.8±0.15	3.2	6276±42
^{14}C: 6271±27 BP, T′=0.0; δ^{13}C: −20.3±0.15‰, T′=0.1; δ^{15}N: 8.8±0.13‰, T′=0.1						
SUERC-58557	Pit 114 S3: cattle right distal humerus with refitting unfused epiphysis, from the same feature as SUERC-67296	−19.5±0.2		8.1±0.3	3.3	6185±34
UBA-22602	Pit 128 S1: articulating cattle right tibia and proximal astragalus, from eastern longpit of H9, in row 3. Some undiagnostic neolithic pottery fragments and chipped stone	−20.3±0.22		7.6±0.15	3.2	6109±44
SUERC-58558	Pit 128 S2: articulating cattle left distal humerus and proximal radius, from the same feature as UBA-22602	−19.8±0.2		5.7±0.3	3.2	6306±32
SUERC-67285	Pit 128 S3: articulating cattle left astragalus and navicular cuboid, from	−20.3±0.2		8.6±0.3	3.3	6171±30

	the same feature as UBA-22602					
SUERC-58559	Pit 148 S1: articulating cattle right 1st and 2nd phalanges, from western longpit of H11, in row 3. With Starčevo-like decoration and shapes, early Vinča-type biconical bowls, red slipped pedestals, and an early Vinča-type figurine, a few typical early LBK-type incised decoration	−20.6±0.2		7.8±0.3	3.2	6229±31
UBA-22603	Pit 148 S1: replicate of SUERC-58559	−20.8±0.22		8.7±0.15	3.2	6198±41
^{14}C: 6218±25 BP, T′=0.4; δ^{13}C: −20.7±0.15‰, T′=0.5; δ^{15}N: 8.5±0.13‰, T′=**7.2**						
SUERC-58560	Pit 163 S1: articulating cattle right 2nd and 3rd phalanges, from eastern longpit of H11, in row 3. With Starčevo-like decoration and shapes, early Vinča-type pedestalled vessels	−19.3±0.2		9.1±0.3	3.3	6257±33
UBA-22604	Pit 167 S1: articulating cattle right 1st and 2nd phalanges, from a late Copper Age feature cut into the western longpit of H11 that was not recognised on excavation	−20.5±0.22		8.0±0.15	3.2	5021±39
SUERC-67301	Pit 319 S1: sheep/goat left distal humerus with articulating proximal radius, from pit 319 which may have formed the eastern longpit of House H21. No diagnostic material associated	−19.9±0.2		7.2±0.3	3.3	6155±32
SUERC-58564	Pit 342 S1: articulating cattle right 1st and 2nd phalanges, from eastern longpit of H7, in row 2. Vessel fragments with typical early Vinča-type incised and dotted decoration; a red-slipped pedestal	−19.9±0.2		7.8±0.3	3.2	6270±32
UBA-22605	Pit 342 S1: replicate of SUERC-58564	−20.0±0.22		7.6±0.15	3.2	6253±58
^{14}C: 6266±29 BP, T′=0.1; δ^{13}C: −19.9±0.15‰, T′=0.1; δ^{15}N: 7.6±0.13‰, T′=0.4						
UBA-22606	Pit 346 S1: articulating cattle right 1st and 2nd phalanges, from western longpit of H7, in row 2. With early Vinča-type red-slipped pedestals, a	−19.9±0.22		9.4±0.15	3.2	6272±44

	few typical early LBK-type incised decoration					
SUERC-67286	Pit 345 S1: articulating cattle right 2nd and 3rd phalanges, from the shared longpit of Houses H12 and H13. With early LBK-type incised decoration	−19.5±0.2		9.3±0.3	3.4	6163±30
UBA-22607	Pit 362 S1: articulating cattle left distal tibia unfused epiphysis and proximal astragalus, from eastern longpit of H12, in row 3. Early Vinča-type figurine, biconical bowl and red slipped pedestalled vessels, vessel fragments with early LBK-like incised decoration and goat protome Starčevo-like low pedestal and barbotine decoration	−19.0±0.22		8.2±0.15	3.2	6251±43
SUERC-58565	Pit 362 S3: articulating cattle right 2nd and 3rd phalanges, from same feature as UBA-22607	−19.5±0.2		8.8±0.3	3.3	6168±32
SUERC-58566	Pit 395 S1; articulating cattle left 1st and 2nd phalanges, from eastern longpit of H19, in row 4, containing an assemblage of Neolithic pottery with a few diagnostic early Vinča sherds	−20.2±0.2		7.0±0.3	3.3	6250±33
UBA-22609	Pit 395 S1: replicate of SUERC-58566	−20.4±0.22		6.9±0.15	3.2	6348±45
^{14}C: 6285±27 BP, T′=3.1; δ^{13}C: −20.3±0.15‰, T′=0.5; δ^{15}N: 6.9±0.13‰, T′=0.1						
SUERC-67287	Pit 396 S1: articulating cattle atlas and axis, from a rounded pit, associated with House H18, dug next to the western wall of the house, and probably belonging to the longpit flanking the house. is With early Vinča-type vessel forms and an altar fragment	−20.7±0.2		8.3±0.3	3.4	6233±30
SUERC-67288	Pit 396 S2: articulating cattle left 1st and 2nd phalanges, from the same feature as SUERC-67287	−20.0±0.2		6.9±0.3	3.3	6227±30

SUERC-58567	Pit 414 S1: articulating cattle right 1^{st} and 2^{nd} phalanges, from eastern longpit of H18, in row 4. Mainly early Vinča-type pottery and altar fragment; a few typical early LBK-like incised sherds	−20.6±0.2		7.8±0.3	3.3	6211±32
UBA-22610	Pit 414 S2: articulating cattle left 1^{st} and 2^{nd} phalanges, from the same feature as SUERC-58567	−20.7±0.22		8.1±0.15	3.2	6141±43
MAMS-14830	Grave 415: rib from adult female human skeleton, uncovered from a layer below Pit 414, which is the eastern longpit of H18, in row 4		−14.7		3.2	6321±28
SUERC-58568	Pit 420 S1: articulating cattle right 1^{st} and 2^{nd} phalanges, from western longpit of H17, in row 4. Mainly early Vinča-type pottery and bone spoon, a few early LBK type incised pottery fragment	−19.9±0.2		7.7±0.3	3.3	6235±31
UBA-22611	Pit 420 S1: replicate of SUERC-58568	−20.2±0.22		8.0±0.15	3.2	6201±49
^{14}C: 6225±27 BP, T′=0.3; δ^{13}C: −20.0±0.15‰, T′=1.0; δ^{15}N: 7.9±0.13‰, T′=0.8						
SUERC-67289	Pit 434 S1: articulating cattle right 2^{nd} and 3^{rd} phalanges, from western long-pit of H20. No diagnostic material associated	−20.4±0.2		8.6±0.3	3.3	6220±30
SUERC-58569	Pit 443 S1: articulating sheep/goat thoracic vertebrae, from southern part of the western longpit of H15, in row 3. With very typical early Vinča-type biconical bowls, red slipped pedestalled vessels and fragments of a figurine	−20.5±0.2		8.0±0.3	3.2	6247±33
UBA-22612	Pit 451 S1: articulating sheep/goat right proximal radius and ulna, from western longpit of H6, in the eastern part of row 3. Fragments of early Vinča-type (Vinča A) conical bowls and red-slipped pedestal; early LBK-style (and some Alföld LBK) vessels	−20.2±0.22		6.8±0.15	3.2	6165±40

SUERC-58570	Pit 451 S2: cattle left 1st phalanx with refitting unfused proximal epiphysis, from same feature as UBA-22612	−20.6±0.2		10.0±0.3	3.3	6299±32
UBA-22613	Pit 465 S1: articulating cattle right astragalus and navicular cuboid, from eastern longpit of H6, in the eastern part of row 3. No diagnostic material associated	−20.3±0.22		9.6±0.15	3.2	6257±41
SUERC-67299	Pit 476 S1: articulating sheep/goat atlas and axis, from eastern longpit of H4, in row 2. With a few diagnostic early Vinča and early LBK-type pottery	−20.7±0.2		7.1±0.3	3.4	6152±32
SUERC-58574	Pit 481 S1: articulating cattle left 2nd and 3rd phalanges, from eastern longpit of H5, in row 2. Fragments of early Vinča-type (Vinča A) conical bowls and a red-slipped pedestal	−20.1±0.2		8.5±0.3	3.3	6198±32
UBA-22614	Pit 481 S2: articulating sheep/goat left humerus and proximal radius (with refitting unfused epiphysis), from a later, Avar-period, feature cut into the eastern longpit of H5 that was not recognised on excavation	−19.9±0.22		11.9±0.15	3.2	1222±29
SUERC-67297	Pit 481 S3: sheep-size thoracic vertebra with refitting unfused epiphysis, from the same feature as UBA-22614	−19.8±0.2		10.1±0.3	3.3	1211±29
SUERC-67298	Pit 486 S1: articulating cattle right 1st and 2nd phalanges, from western longpit of H5, in row 2. Fragments of early Vinča-type (Vinča A) conical bowls; vessel fragments with incised and dotted decoration; a red-slipped pedestal, a few early LBK-type incised fragments	−20.5±0.2		6.4±0.3	3.3	6167±31
SUERC-58575	Pit 486 S3: articulating pig left distal tibia and astragalus, from the same feature as SUERC-67298	−20.6±0.2		10.3±0.3	3.3	6264±33

SUERC-58576	Pit 496 S1: cattle left 1st phalanx with refitting unfused epiphysis, from western longpit of H3, at the eastern end of row 3. With a few early LBK-like pottery fragments and incised altar fragment	−19.8±0.2		8.2±0.3	3.3	6180±32
SUERC-67290	Pit 496 S3: articulating cattle right 1st and 2nd phalanges, from same feature as SUERC-58576	−20.9±0.2		7.0±0.3	3.3	6198±29
SUERC-67291	Pit 497 S1: articulating cattle atlas and axis, from northern part of the western long-pit of House H3, at the eastern end of row 3. With a few early LBK-style incised pottery fragment and a polished stone adze	−20.2±0.2		6.3±0.3	3.3	4150±31
SUERC-67295	Pit 497 S2: cattle right metacarpal with refitting unfused epiphysis, form the same feature as SUERC-67291	−21.4±0.2		7.9±0.3	3.4	6257±32
UBA-22616	Pit 514 S1: articulating cattle right 1st and 2nd phalanges, from eastern longpit of H3, at the eastern end of row 3. No diagnostic pottery associated	−19.3±0.22		8.2±0.15	3.3	6172±38
SUERC-67279	Pit 522 S1: articulating cattle left 1st and 2nd phalanges, from northern part of the western longpit of H15, in row 3. With large amount of very typical early Vinča-type pottery and figurine; some fragments with typical early LBK-type incised decoration	−20.8±0.2		7.3±0.3	3.4	6247±29
SUERC-67280	Pit 522 S2: articulating cattle right astragalus and navicular cuboid, from same feature as SUERC-67279	−20.8±0.2		9.1±0.3	3.5	6260±29
SUERC-58578	Pit 522 S3: cattle left tibia with refitting unfused proximal epiphysis, from same feature as SUERC-67279	−19.3±0.2		6.6±0.3	3.3	6399±31
SUERC-58577	Pit 532 S1: articulating cattle left tibia and astragalus, from shared longpit between H1 and H2, in row 1. Fragments of early Vinča-like	−20.9±0.2		6.0±0.3	3.3	6226±32

	biconical bowls and pedestalled vessels, fragments of an incised altar					
UBA-22617	Pit 532 S2; cattle left metacarpal with refitting unfused distal epiphysis, from same feature as SUERC-58577	−18.1±0.22		7.7±0.15	3.2	6198±39
SUERC-67300	Pit 587 S1: sheep/goat right 1st phalanx with refitting unfused epiphysis, from northern part of the western longpit of H15, in row 3. Large amount of very typical early Vinča-type pottery; some Starčevo-like pottery form and decoration; a few typical LBK-type incised fragment	−18.9±0.2		9.0±0.3	3.2	6238±29
SUERC-58579	Pit 587 S2: articulating cattle left 2nd and 3rd phalanges, from the same feature as SUERC-67300	−20.0±0.2		6.5±0.3	3.3	6305±31
Western						
SUERC-58550	Pit 1048 S1: articulating cattle left humerus and radius, from pit 1048. Contained some typical early Sopot/Ražište-type pottery and some LBK-like (Malo Korenovo-style) pottery	−20.3±0.2		9.6±0.3	3.3	6266±31
SUERC-67281	Pit 1048 S2: articulating cattle right 2nd and 3rd phalanges, from same feature as SUERC-58550	−20.1±0.2		10.4±0.3	3.3	6162±29
UBA-22598	Pit 1048 S3: articulating cattle left tibia and astragalus, from same feature as SUERC-58550	−20.1±0.22		9.2±0.15	3.2	6166±50
SUERC-67305	Grave 1049 S1: rib from mature adult male crouched skeleton lying on its left side, which cuts pit-complex 1073.	−19.9±0.2		10.4±0.3	3.2	6059±29
SUERC-67306	Grave 1078 S1: rib from adult male crouched skeleton lying on its right side, which cuts pit complex 1113. Pit 1113 contained some typical Vinča-style red-slipped pedestal vessels.	−19.5±0.2		9.7±0.3	3.3	6047±29

SUERC-67307	Grave 1121 S1: clavicle from sub-adult crouched skeleton lying on its right side, which cuts pit complex 1123. Pit 1123 contained large amount of very typical early Sopot/Ražište-type.	−19.5±0.2		9.7±0.3	3.3	6125±29
SUERC-58554	Pit 1123 S1: articulating cattle right tiba and astragalus, from pit complex 1123, in the western part of the excavated area. It contained a large amount of very typical early Sopot/Ražište-type pottery	−20.6±0.2		9.4±0.3	3.2	6229±34
UBA-22599	Pit 1123 S1: replicate of SUERC-58554	−20.5±0.22		9.2±0.15	3.2	6172±40
^{14}C: 6205±26 BP, T′=1.2; δ^{13}C: −20.6±0.15‰, T′=0.1; δ^{15}N: 9.2±0.13‰, T′=0.4						
UBA-22596	Grave 1124 S1: right femur from adult female crouched skeleton lying on its right side, which cuts the pit complex 1123. Pit 1123 contained large amount of very typical early Sopot/Ražište-type pottery	−20.3±0.22		9.8±0.15	3.3	6252±41
SUERC-58555	Pit 1387 S1: articulating cattle right 1st and 2nd phalanges, from pit 1387. Contained a large amount of very typical early Sopot/Ražište-type pottery and some LBK-like incised (Malo Korenovo-style) pottery fragment.	−20.0±0.2		9.1±0.3	3.3	6199±32
UBA-22600	Pit 1387 S2: articulating cattle left 1st and 2nd phalanges, from same feature as SUERC-58555	−18.7±0.22		9.4±0.15	3.2	6221±40
MAMS-14832	Grave 1394: tibia from mature adult female crouched skeleton lying on its left side, which cuts pit 1387, which contained a large amount of very typical early Sopot/Ražište-type pottery and some LBK-like incised (Malo Korenovo-style) pottery fragment.		−23.4		3.3	6226±30
UBA-22597	Grave 1561 S1: left femur from adult female crouched skeleton lying on its left side which cuts pit-complex 1570, located in the western part of	−20.5±0.22		10.2±0.15	3.3	6180±51

	the excavated area.					
SUERC-67308	Grave 1720 S1: scapula from sub-adult crouched skeleton, which cuts pit 1287.	−19.9±0.2		10.5±0.3	3.2	6166±29
SUERC-67309	Grave 1721 S1: femur from mature male crouched skeleton, which cuts pit 1287.	−18.6±0.2		9.4±0.3	3.3	6280±29
SUERC-67310	Grave 1995 S1: rib from adult female crouched skeleton lying on its left side which cuts pit 1767, located in the western part of the excavated area. It contained a large amount of typical early Sopot/Ražište-type and some LBK-like (Malo Korenovo-style) pottery	−19.9±0.2		9.6±0.3	3.3	6140±29
MAMS-14833	Grave 2030: cranium from adult female crouched skeleton lying on its left side, dug into pit 2034, which contained some typical early Sopot/Ražište-type pottery		−19.3		3.3	6186±29
MAMS-14831	Adult human cranium from unidentified skeleton. The bone material was mistakenly thought to belong to Grave 1163, a child grave which later proved to be of Avar age. The dated bone was probably from a Neolithic grave, destroyed by the Avar burial.		−26.8		3.3	6202±31

Table 2. Highest Posterior Density intervals for key parameters from Versend-Gilencsa, derived from Model 4 (Figures 4–5).

Parameter	Highest Posterior Density interval (95% probability)	Highest Posterior Density interval (68% probability)
start Versend burials	*5395–5225 cal BC*	*5330–5240 cal BC*
end Versend burials	*5040–4815 cal BC*	*4995–4905 cal BC*
use Versend burials	*215–540 years*	*275–415 years*
start Versend settlement	*5305–5280 cal BC* (*2%*) or *5255–5210 cal BC* (*93%*)	*5235–5215 cal BC*
end Versend settlement	*5220–5180 cal BC* (*93%*) or *5150–5115 cal BC* (*2%*)	*5210–5195 cal BC*
use Versend settlement	*1–70 years* (*93%*) or *135–185 years* (*2%*)	*10–35 years*
first H1 or H2	*5245–5200 cal BC*	*5225–5210 cal BC*
last H1 or H2	*5230–5185 cal BC*	*5215–5200 cal BC*
use H1 or H2	*1–40 years*	*1–15 years*
first H3	*5250–5205 cal BC*	*5230–5215 cal BC*
last H3	*5220–5185 cal BC* (*94%*) or *5170–5140 cal BC* (*1%*)	*5215–5200 cal BC*
use H3	*1–60 years* (*94%*) or *75–100 years* (*1%*)	*1–25 years*
first H5	*5250–5205 cal BC*	*5230–5210 cal BC*
last H5	*5225–5185 cal BC* (*94%*) or *5175–5155 cal BC* (*1%*)	*5215–5200 cal BC*

use H5	*1–65 years*	*1–20 years*
first H6	*5255–5210 cal BC*	*5230–5215 cal BC*
last H6	*5230–5180 cal BC*	*5220–5200 cal BC*
use H6	*1–70 years*	*1–25 years*
first H7	*5255–5205 cal BC*	*5230–5215 cal BC*
last H7	*5240–5200 cal BC*	*5225–5210 cal BC*
use H7	*1–25 years*	*1–10 years*
first H9	*5250–5205 cal BC*	*5230–5215 cal BC*
last H9	*5220–5170 cal BC*	*5215–5200 cal BC*
use H9	*1–80 years*	*5–25 years*
first H10	*5260–5210 cal BC*	*5230–5215 cal BC*
last H10	*5230–5185 cal BC*	*5220–5200 cal BC*
use H10	*1–70 years*	*1–20 years*
first H11	*5250–5205 cal BC*	*5230–5210 cal BC*
last H11	*5235–5195 cal BC*	*5220–5205 cal BC*
use H11	*1–35 years*	*1–15 years*
first H12	*5245–5200 cal BC*	*5225–5210 cal BC*
last H12	*5230–5170 cal BC*	*5215–5200 cal BC*
use H12	*1–50 years*	*1–15 years*
first H15	*5285–5265 cal BC* (*2%*) or *5255–5210 cal BC* (*93%*)	*5235–5215 cal BC*
last H15	*5230–5195 cal BC*	*5220–5205 cal BC*
use H15	*1–60 years*	*1–20 years*
first H18	*5245–5205 cal BC*	*5225–5210 cal BC*
last H18	*5220–5185 cal BC* (*94%*) or *5165–5135 cal BC* (*1%*)	*5215–5200 cal BC*
use H18	*1–70 years*	*1–20 years*