The LBK site of Vráble in Southwestern Slovakia: Selected results of the excavation season 2016[1]

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[1] The contribution was submitted at the end of 2017 and revised after review in September 2018. In the meantime, further papers and a monograph have been prepared or published, which build on the interpretations presented here and place them in a broader context. These are:
– N. Müller-Scheessel / J. Müller / I. Cheben / W. Mainusch / K. Rassmann / W. Rabbel / E. Corradini / M. Furholt, A new approach to the temporal significance of house orientations in European Early Neolithic settlements. PLOS ONE 15, 2020, e0226082. DOI: 10.1371/journal.pone.0226082.
– N. Müller-Scheessel / Z. Hukelová / J. Meadows / I. Cheben / J. Müller / M. Furholt, New burial rites at the end of the *Linearbandkeramik* in Southwest Slovakia. Antiquity (accepted).
– M. Furholt / N. Müller-Scheessel / I. Cheben / M. Wunderlich / J. Müller, Communality and Discord in an Early Neolithic settlement agglomeration: The LBK site of Vráble, SW Slovakia. Cambridge Archaeological Journal (accepted).
– M. Furholt / I. Cheben / J. Müller / A. Bistáková / M. Wunderlich / N. Müller-Scheessel (eds), The LBK and Želiezovce settlement site of Vráble. Arch. Žitava Valley 1 (Amsterdam in press).

[2] The contribution by I. Cheben is part of the VEGA-project no. 2/0107/17„Civilization development and settlement structure during the Linear Pottery culture in the lower Žitava basin".

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Introduction

The site of Vráble 'Veľke Lehemby' and 'Farské'[3] represents an unusual, albeit not singular, concentrated Early Neolithic habitation in Central Europe. With an area of 50 ha and 304 identified houses, it is among the largest known LBK settlements (see Petrasch 2012; Furholt et al. 2014). Such a large settlement raises interesting questions regarding the social and economic processes leading to and resulting from concentrated communal occupation. Since 2010, the settlement cluster of Vráble 'Veľke Lehemby' and 'Farské' has been the subject of a joint research project of the Archaeological Institute of the Slovakian Academy of Science and the Christian-Albrechts-University, Kiel. From the start, we have also closely collaborated with the Römisch-Germanische Kommission in Frankfurt, whose team excavates the nearby Bronze Age site of Vráble-Fidvár. Our main aim is to explore socio-economic transformations of the LBK community in this densely occupied settlement and its place in the socially interlinked network of settlements in the region.

Since 2016, the investigations at the site have been part of a larger project focusing on the transformation of social, economic, and socio-environmental relations[4]. More specifically, Vráble is used as a case study to explore the development of social integration, the role

[3] Actually, the settlement cluster extends over two adjacent areas, 'Veľke Lehemby' in the south and 'Farské' in the north and is composed of three distinct settlements (the northern, southwestern, and southeastern). The short name "Vráble 'Veľke Lehemby'" refers to all three settlements.

[4] https://www.sfb1266.uni-kiel.de/en?set_language=en.

of different social institutions, the organisation of subsistence, and the economic relations between individual households and household groups within the settlement cluster, as well as the integration of the settlement into the regional settlement system. In the final phase of research, Vráble will be put into perspective, especially in relation to contemporary sites in Hungary that yielded many relevant results with respect to the length of occupation of the houses and the formation of settlements (e. g. Jakucs et al. 2018; Oross et al. 2016).

From its beginning, archaeological understanding of the Neolithic period has been shaped by several assumptions about the social organisation that have long been uncritically accepted. One of these is the idea that closed, culturally and socially homogeneous communities lived in strictly defined geographic areas, and can thus be identified as "archaeological cultures" (Lüning 1972; Trigger 1978). This idea is not based on empirical observations or anthropological considerations but represents a widespread prejudice as to the social organisation of prehistoric communities. It is, as argued elsewhere (Kristiansen / Larsen 2005, 32; Furholt 2017), based on a romantic image of supposedly traditional, rural life, which is projected onto prehistory. The research at the settlement of Vráble 'Veľke Lehemby' and within the encompassing, regional settlement system of the upper Žitava valley explicitly questions the premise of homogeneous and closed settlement communities, and aims to explore the social structure of the Neolithic community and its regional context from a diachronic perspective.

In order to address the socio-economic transformation, set out as our main aim, we focus on several specific research questions:

– The extent to which the remarkable concentration of habitations at Vráble is connected to the process of social integration of previously more dispersed social units, that is, the fundamental social transformation of several smaller communities into fewer larger ones.
– Whether and in what way these social sub-units are detectable at Vráble; perhaps in the form of neighbourhoods or other forms of intra-site organisational segmentation.
– The degree to which subsistence and economic practices were affected by the increased settlement density, particularly with respect to whether they were organised at the level of the entire community, or at the level of the household, or a different segment of the community.

As the settlement cluster of Vráble has an occupation history of about 300 years, the questions of social integration and economic adaptation are explored from a diachronic perspective.

The excavation strategy in Vráble 'Veľke Lehemby' and 'Farské' has been to open several smaller trenches which sample individual houses or distinct house clusters in all sections of the settlement. With this strategy it is possible to assess both the relation between and within aggregations clearly visible in the magnetic plan. Furthermore, it not only provides materials for dating, but also bone and plant materials, as well as a sample of material culture such as pottery. Through the study of similarities and differences of practices regarding animal husbandry and plant management, production and discard of pottery and stone tools, and the access to and distribution of resources, we can approach questions of social integration and socio-spatial organisation.

In order to augment the site-level observations, we also consider Vráble in relation to the more general phenomenon of centralisation within a social environment. We address this aspect by exploring the site's regional context through survey and geophysical prospection at many, and excavations at some, of the contemporary settlements detected in the valley of the upper Žitava.

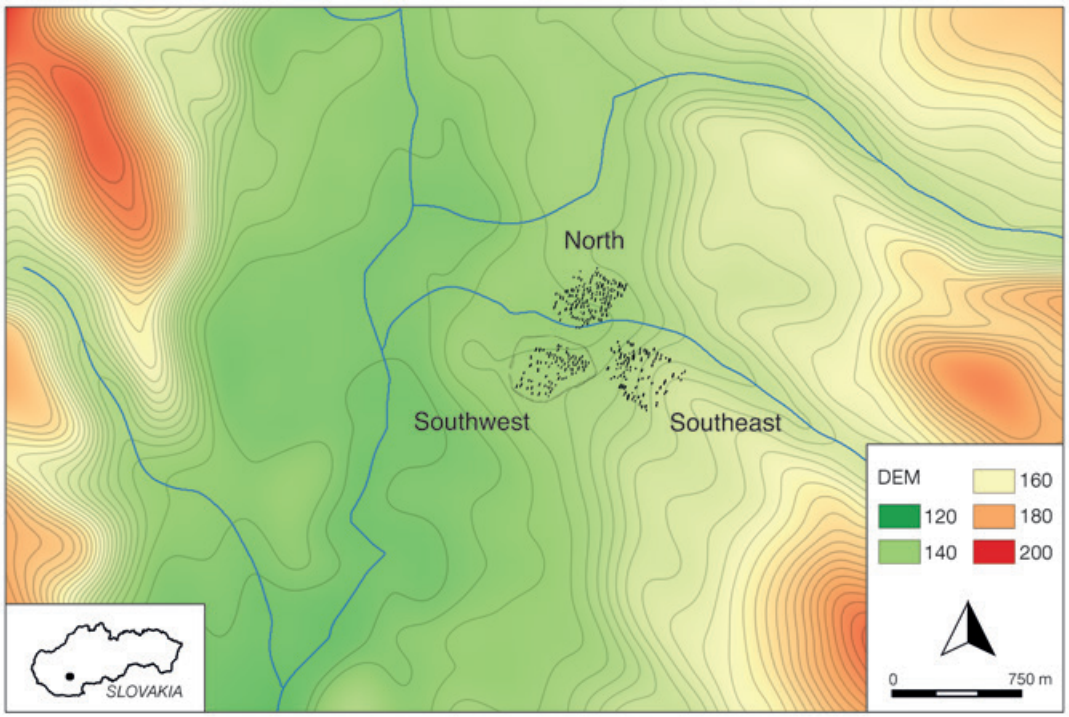

Fig. 1. Location of the settlements within the surrounding landscape. Black dots mark the location of the houses that were reconstructed based on the magnetic survey; the ditch system is visible around the southwest settlement. The north-south running river is the Žitava. The inset map shows the location of the site in Slovakia.

Method of excavation

The excavation area for 2016 was chosen based on the results of the magnetic surveys conducted in 2010–2012 and with the aim of covering several presumed houses that seemed to form a house cluster at the southwestern edge of the southeast settlement. Today, this area is situated on a gentle slope towards the west at a height of about 148 m above sea level (a. s. l.) *(fig. 1)*[5].

The excavation area covered 2283 m^2. It was divided into four sections (trenches), numbered consecutively 11 through 14 *(fig. 2)*. This numbering system was a continuation of that used during previous campaigns. The topsoil, which extended to the depth of 60 to 70 cm, was removed by heavy machinery (c. 1500 m^3 altogether); further excavation was carried out by hand (using shovels and trowels or finer tools, depending on the circumstances; a total of c. 75 m^3 of soil was removed). Between trench 11 on the one hand and trenches 12 and 13 on the other, a bulk of 2 m in width was left in place. The sections through this bulk provided important insights into stratigraphy of a number of long pits, from the bottom to today's surface.

Where possible, the excavation followed natural borders between different kinds of fills. Where, however, the natural borders were not visible, or fills exceeded a thickness of 10–15 cm, artificial layers 10–15 cm thick were excavated. The smallest unit of excavation was

[5] In an earlier publication (Furholt et al. 2014), the elevation is set at around 190 m a. s. l. This was due to a different height given to the reference points.

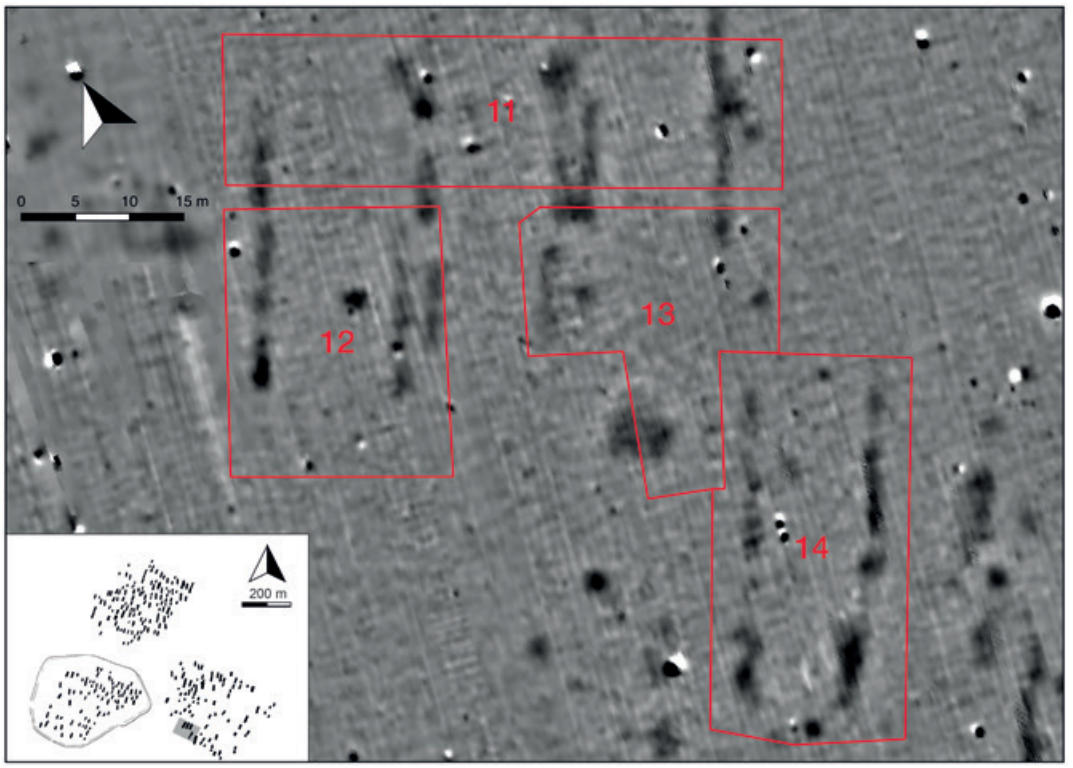

Fig. 2. The four trenches of the 2016 excavation area with the magnetic picture in the background. The inset map shows the reconstruction of houses based on the magnetic survey and of the ditch system around the southwest settlement; the grey box indicates the area represented in the large map.

termed context *("Befund")*. Contexts were identified based on the differences in colour and texture of the sediment, and / or by possible intrusions such as stones or burned daub, and the finds found within them were assigned to them. In recording, contexts were grouped into a larger entity, hereafter termed *"object"*, that could be any of the typical structural elements found in LBK settlements (postholes, long pits, other kinds of pits). *Objects* were then assigned to houses. Thus, it is possible to aggregate the finds at the level of contexts, *objects*, or houses.

The long pits, as well as most of the other large pits, were excavated using a grid system. This system accounts for the depth and often rather large areas over which the *objects* extend. By excavating alternating grid units (quadrants), we were able to obtain and document profiles along the entire length of the *objects* without necessarily having to fully excavate them. By combining the information about contexts and quadrants, every find can be located within an area of 2 × 2 metres, and often even more precisely. The location of the important finds – ornamented pottery, obsidian, flint tools, ground stone and larger bones potentially useful for ^{14}C-dating – was recorded three-dimensionally using a Leica total station with a minimum precision of 2 cm. Samples for geochemical, geoarchaeological and archaeobotanical analyses were regularly taken from the excavated deposits.

The identification of contexts in *planum* 1 (the level from which the excavation by hand started) was difficult due to the fact that the fills of the *objects*, especially of the long pits, consisted of dark brown soil whose horizontal extent appeared much greater than could be seen in the profiles (i. e. vertical sections).

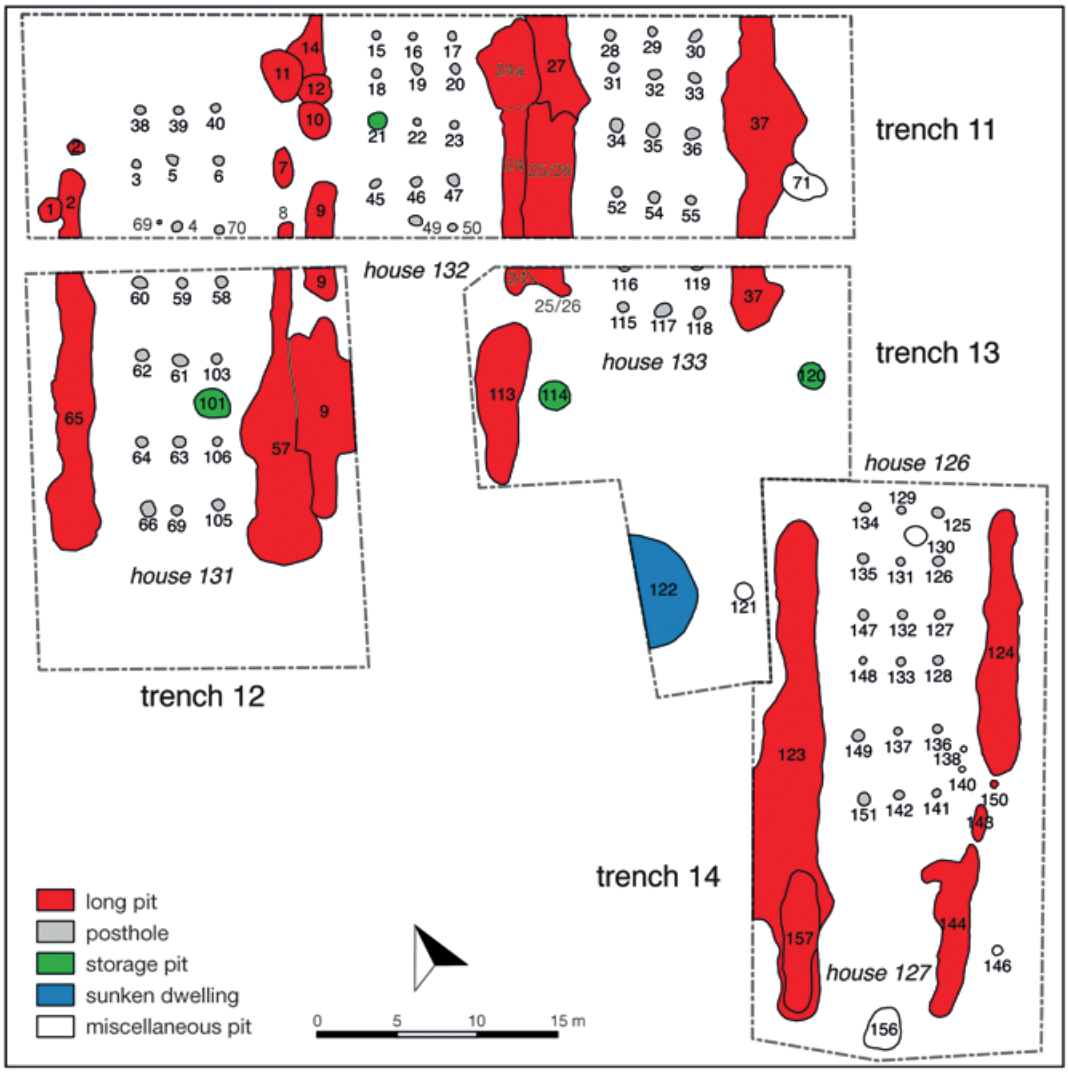

Fig. 3. Excavation area in 2016 with the numbers and types of the *objects*.

Generally, the results of the excavation are comparable to those reported for an earlier excavation campaign in the southwest settlement (see Furholt et al. 2014).

Results

Houses

The houses excavated in 2016 were numbered 131–133 and 126/127 according to the magnetic plan. These houses were recognized on the basis of the rows of postholes of each and the pits flanking their long sides *(fig. 3; tab. 1)*. In the geophysical survey, only the long pits were visible; generally, features identified by a magnetic anomaly were confirmed by the archaeological excavation (but see below on trench 14). While long pits were relatively easily discernible during the excavation, postholes turned out to be much harder to identify, especially in the eastern part of the excavation areas, where postholes are preserved to the

House	number of cross-rows of posts	long pits	length (from first to last cross-row of postholes)	width (average length of cross-row of postholes)
131	7, distances (from south to north): 4.4 m, 5.2 m, 4.8 m, 3.6 m, 4.1 m, 3.2 m (mean: 4.217 m)	„west: obj. 1, 2, 65; east: obj. 7, 8, 11, 57“	25.3 m (complete)	4.8 m (6 rows)
132	5, distances (from south to north): 2.5 m, 3.7 m, 3.4 m, 2.1 m (mean: 2.925 m)	„west: obj. 9, 10, 12; east: obj. 24, 113“	11.7 m (incomplete, perhaps 27.0 m)	4.7. m (3 rows)
133	6, distances (from south to north): 2.8 m, 4.3 m, 4.2 m, 3.5 m, 2.7 m (mean: 3.5 m)	„west: obj. 26; east: obj. 37“	17.5 m (probably incomplete)	5.0 m (6 rows)
126	6, distances (from south to north): 4.1 m, 4.4 m, 2.9 m, 3.4 m, 3.2 m (mean: 3.6)	„west: obj. 123, (157); east: obj. 124, (143, 144)“	18.0 m (perhaps complete)	4.6 m (6 rows)

Tab. 1. Basic information on the houses in the area excavated in 2016.

depth of only few decimetres at best (see below). It is possible that the ‘missing’ postholes were even shallower and therefore did not extend below the present plough layer, within which they are almost impossible to identify. Ditches or postholes for the presumed house walls, which are usual features elsewhere and were found in 2012 at Vráble (Furholt et al. 2014, 235 f.), could not be identified with certainty (during the excavation, it was proposed that *objects* 138–140 may be remains of wall posts, but only two of them could be verified in the profile).

In the area of trench 14, two houses (126, 127) were identified on the basis of the magnetic measurements. However, it turned out that the actual archaeological situation differed in some details from the magnetic picture. In particular, probably due to a measurement or interpolation error during the prospection, *objects* 143 and 144 were situated several metres to the east of the location suggested by the magnetic picture. It thus seemed possible that long pits 123 and 157 in the west of trench 14 and 124, 143 and 144 in the east belong to one house, rather than two houses. Yet, we did not observe a posthole between *objects* 157 and 144. It, therefore, remains unclear whether the south end of house 126 coincides with postholes 141, 142 and 151, and if long pits 157 and 143/144 belong to a different house. In the end, we decided to retain the differentiation between houses 126 and 127, even though we cannot assign any postholes to house 127.

The western-most house – house 131 – and perhaps also house 126 were uncovered almost entirely. Probably only the south part of house 132 and the north part of house 133 remained unexcavated.

The excavated features suggest that house 131 was erected using seven cross-rows of posts, while houses 133 and 126 contained at least six, if not more, rows of posts. In the case of house 132, it seems very probable that, in addition to the five uncovered rows of posts, at least two more remained unexcavated in its south part, which extends beyond our excavation trenches. Based on the rows of postholes, the length of house 131 can be reconstructed as roughly 27 m (25 m from the first to the last row of postholes and roughly one meter at each end for the wall). As houses 132 and 133 were not fully excavated, their measured lengths (11.7 m and 17.5 m respectively) are most likely not the total lengths.

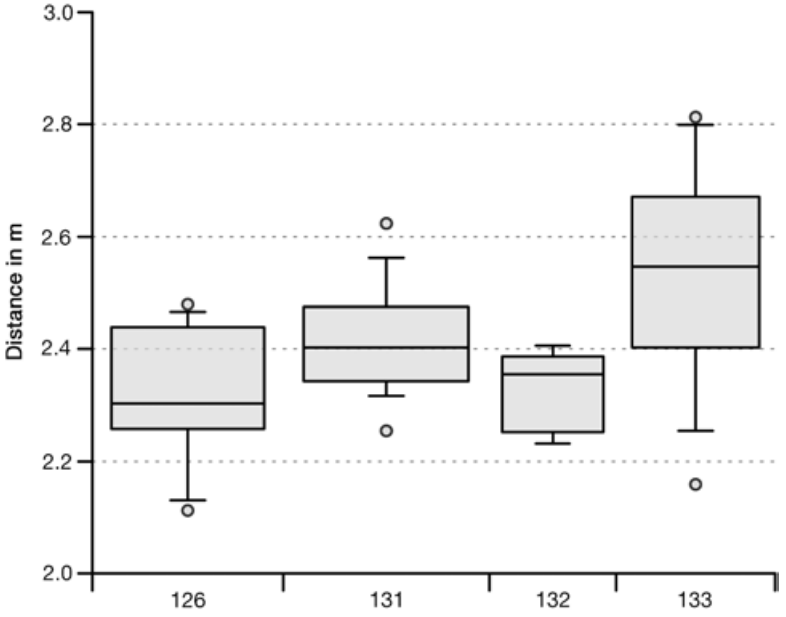

Fig. 4. Boxplot showing distances (in metres) between postholes within distinct rows of posts, grouped by house. The whisker represents the lower and upper end of the range (10 and 90 %), the width of the boxes corresponds to the number of postholes.

House 126 was not completely uncovered, but was most probably smaller than house 131, even if we add one row of postholes to make up for the incompletely excavated extent of the house (18 m + max. 5 m). Since the entire width of the houses was exposed in at least one excavation area, the measurements of widths as indicated by the outermost of the three rows of posts are more secure. House 126 seems to be one of the narrowest (4.6 m), while house 133 is the widest (5.0 m). House 131 (4.8 m) and 132 (4.7 m) are of medium width. This variation is, not surprisingly, reflected in the average distance between the postholes, which is, by far, the largest in house 133 and the smallest in houses 126 and 132 *(fig. 4)*. However, since most of the holes for wall posts are missing, it is possible that the 'original' widths were similar between the houses. In the case of the likely wall-posts *objects* 138 and 140, the distance between them and the next closest posts is about 1.5 m. Judging from this section of house 126, another three metres then have to be added to the width deduced from the location of the postholes in order to approximate the full width of the house. Together with the distance between the long pits, we can roughly estimate that the maximum wall-to-wall width was about 7–8 m, which is typical for LBK houses (Birkenhagen 2003, 61) and similar to the one house excavated in 2012 (Furholt et al. 2014, 235).

The average distances between the cross-rows of postholes (from south to north) are very similar in the case of houses 133 and 126 (3.5 m and 3.6 m, respectively), while house 131 shows considerably larger average distances (4.2 m) and house 132 remarkably smaller ones (2.9 m). Within individual houses, there is no real pattern discernible in the distances between the rows. Although there is an impression that smaller distances are more characteristic of the northern part of the houses and larger of the southern, this is not always the case.

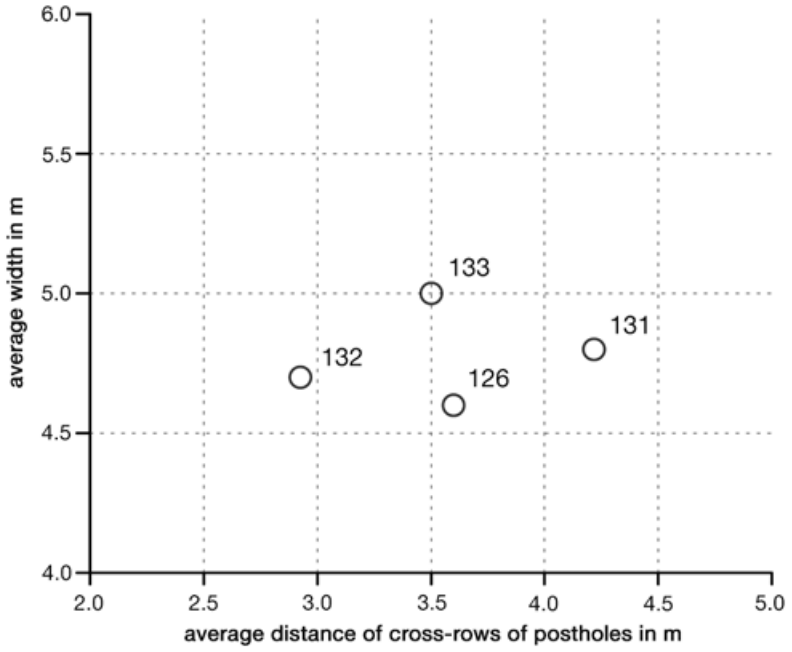

Fig. 5. Average distance between the rows of posts and average width (based on the location of postholes) of the houses.

If we combine the data on the average distance between the post rows and the total average house width *(fig. 5)*, we see that house 132 has the smallest indoor space available – it has the second smallest width, and the posts are set closest to one another. On the other hand, house 131 stands out as its posts are set the widest distance apart, and it is the second widest house. House 133 and 126 seem to represent a compromise between these two extremes.

The orientation of the houses follows the general pattern that is seen in all three settlements. That is, the houses are all orientated roughly towards north-northeast (26°), as is generally the case in eastern Central Europe (Vondrovský 2018 fig. 3).

Lateral long pits

The profiles showed that the lateral long pits consist of a row of several back-to-back pits of different depth, arranged like beads on a string *(fig. 6)*. As a rule, the fill of the pits is uniform and shows a twofold division. In most instances, the top layer of the fill contains large amounts of burned clay. This layer is rather shallow and less than 20 cm thick. Below this, there is a brownish, relatively homogeneous layer at the bottom of the pit. Despite its greater thickness, this layer generally contains significantly fewer finds than the top layer. In the case of house 132, the sequence of layers is reversed. There, the upper part of the fill of the long pits is homogeneous, while the daub-rich layer is found very close to the bottom. In a few cases, in addition to these two main layers, another layer was detected at the very bottom and had an almost chequered appearance. It is possible that this was due to higher rates of perturbation (but see below).

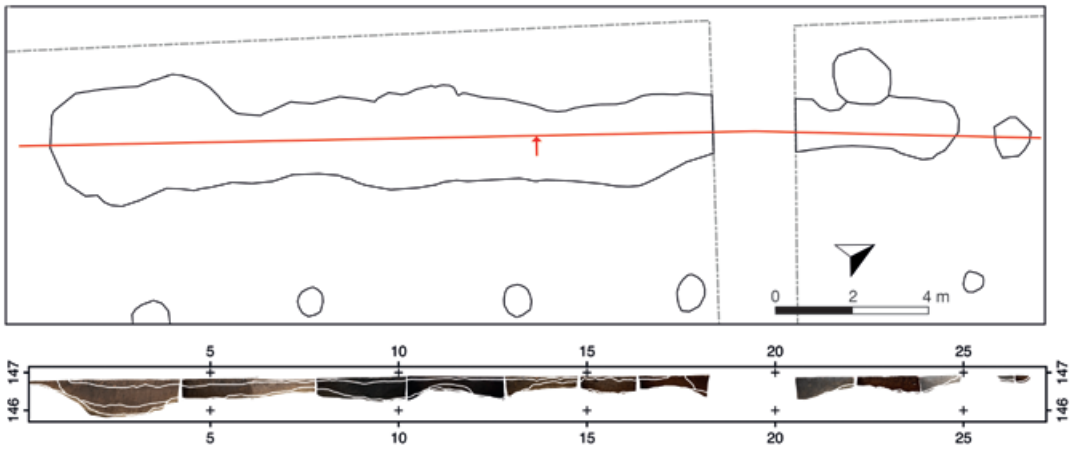

Fig. 6. Western long pit of house 131 (*object* 65). Below: view of south-north profile. Above: the exact location of the profile (red line) and the direction of view (red arrow).

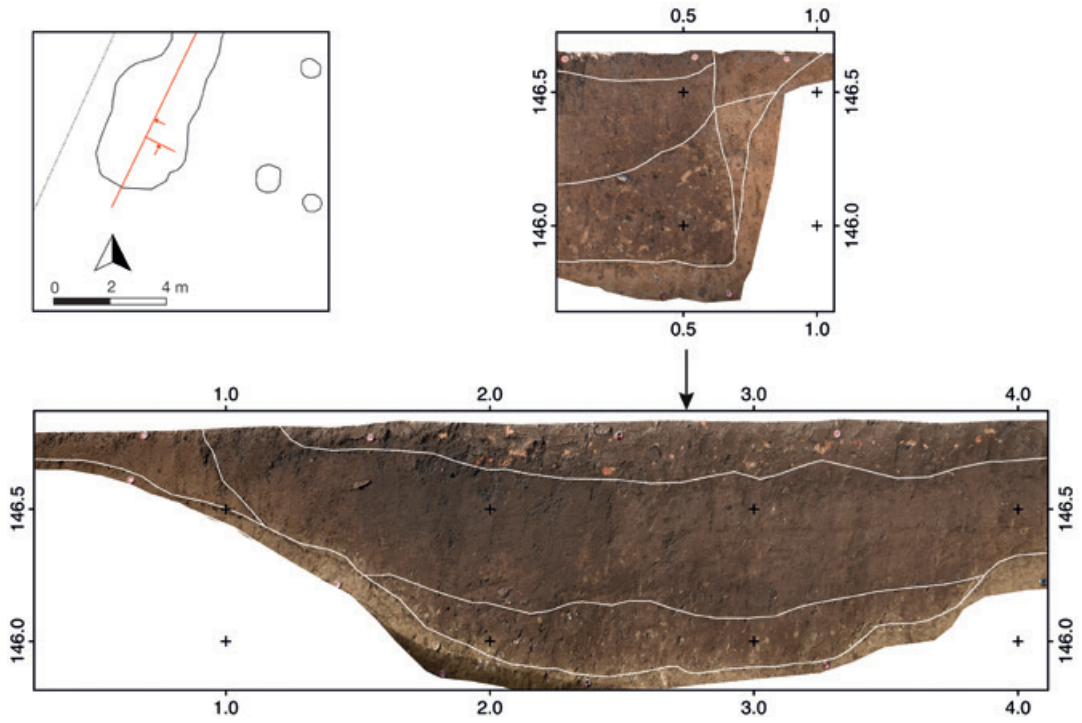

Fig. 7. South end of the western long pit (*object* 65) of house 131 which extends a further 20 m to the north (see *fig. 6*). Notice the daub layer at the top and the mixed layer at the bottom. The location of the profiles (red lines) and the direction of view (red arrows) are shown on the plan above left. The black arrow on the longitudinal profile below marks the position of the small profile above right.

The depth of long pits varies. For example, in the long pits of houses 131 and 133, one, if not *the* deepest point is at the south end. The depth of 1 m below *planum* 1, at 145.90 and 146.10 m a. s. l., was recorded in this part of *objects* 65 and 57, the western and eastern long

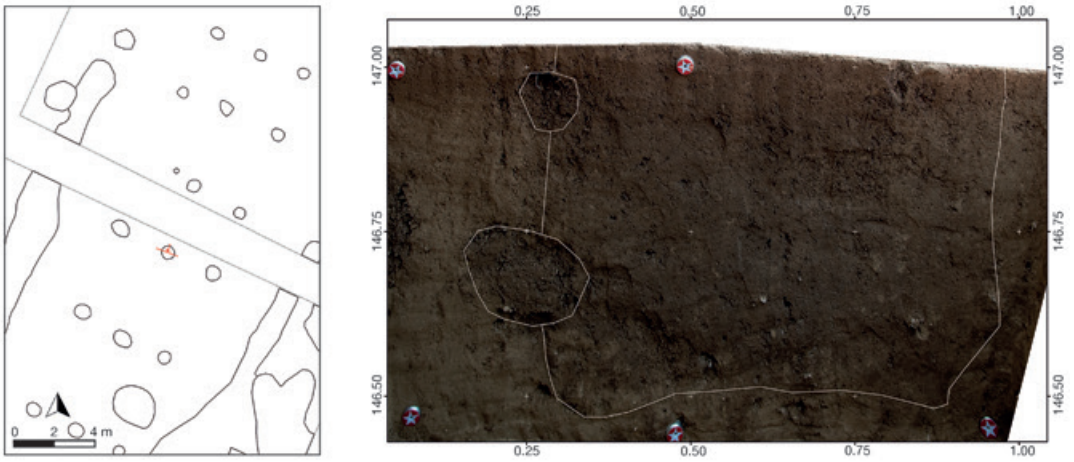

Fig. 8. Right: profile of the posthole *object* 59 associated with house 131. Left: plan showing the exact location of the profile (red line) and the direction of view (red arrow).

pits of house 131, respectively. In another part of these long pits, the bottom is located less than 20 cm below *planum* 1. The same is true for *object* 26, the western long pit of house 133. Its bottom is located 1.65 m below today's surface, which lies at 146.35 m a. s. l. It is in these deep sections of the pits that the fill deviates markedly from the general two-layer composition. In *objects* 65 and 57, the lowest layers appear heterogeneous, are brownish in colour and have loess intrusions *(fig. 7)*. That this appearance cannot be explained as the result of bioturbation is obvious from the cross section through the fill. The boundary between the bottom layer and the layer above is very sharp and its outline does not follow the outline of the bottom of the pit (*fig. 7* small profile). Therefore, the chequered fill can only be of anthropogenic origin, probably made by quickly refilling the pit with mixed material, and then later partially cutting into it. In the case of *object* 26, the lowest layer of the fill was dark brown and ashy in some parts.

Based on the different composition of the fill of the two long pits of house 131, as well as of the western pit of house 133, it can be hypothesised that specific human activities were taking place in the south section of these pits. They seem to have involved either intentional infilling and subsequent cutting though the fill (house 131) or an activity related to fire (house 133).

In order to further explore the function and the infilling of the long pits, two profiles underwent detailed examination and sampling for geochemical and geomorphological analyses. Supplementing the information obtained from the profiles, drilling was conducted nearby, in the bulk between trenches 11 and 12.

Postholes

Overall, postholes were very faint in the *plana* as well as in the profiles. At best, they were identified by their more intensive brownish colour than that of the surrounding loess. It was impossible to decide if this colour was the result of the *in situ* decay of the post, or if it was the colour of the material used to fill the hole after the post had been removed.

Object 59 in trench 12 is an example of a better-preserved posthole *(fig. 8)*. It measures roughly 0.70 m in diameter and is preserved down to 0.55 m depth below *planum* 1.

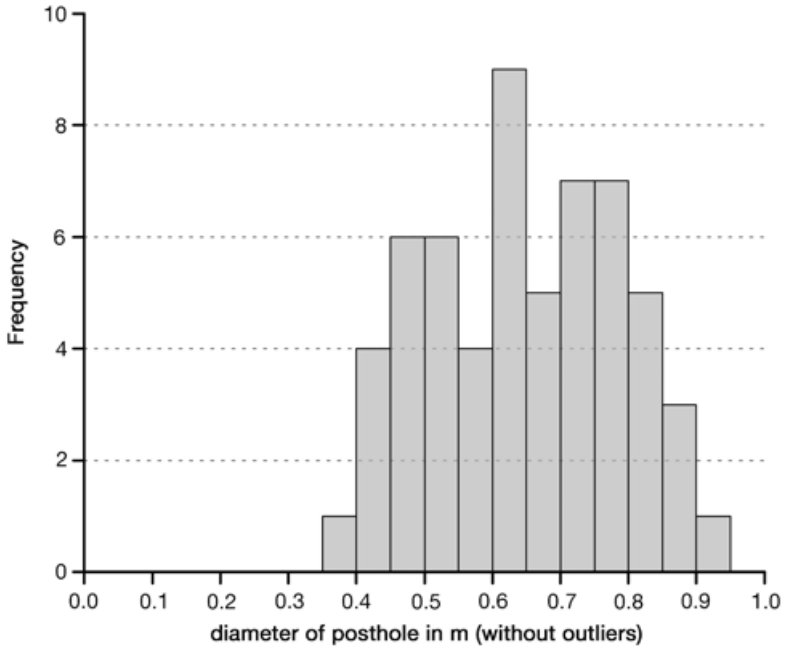

Fig. 9. Diameter of the postholes (in metres; outlier omitted).

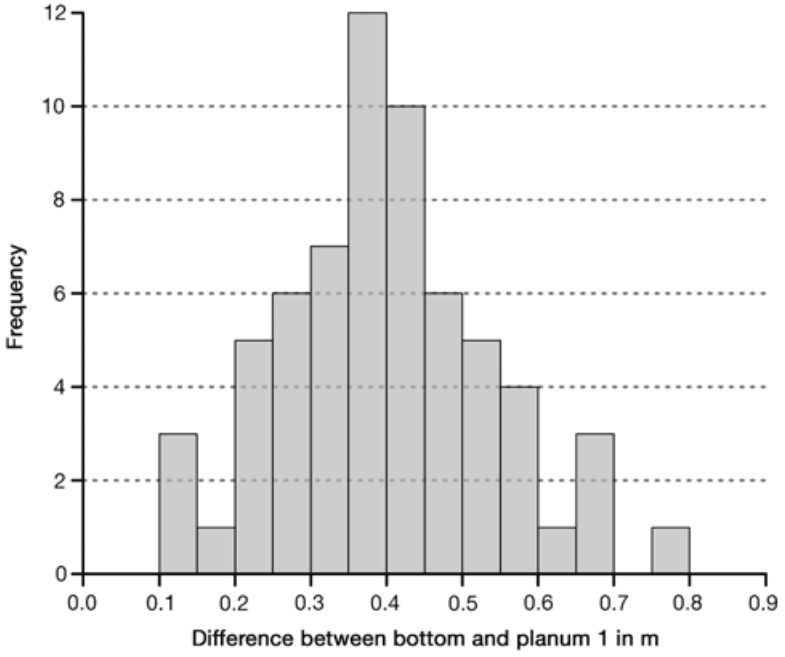

Fig. 10. Depth of the postholes (in metres) measured from *planum* 1.

Thanks to its dark brown colour, the posthole clearly stands out from the loess that surrounds it, though its borders are less clear. Still, it appears that the walls are more or less straight and the base is flat. Towards the lower part, the percentage of loess concretions

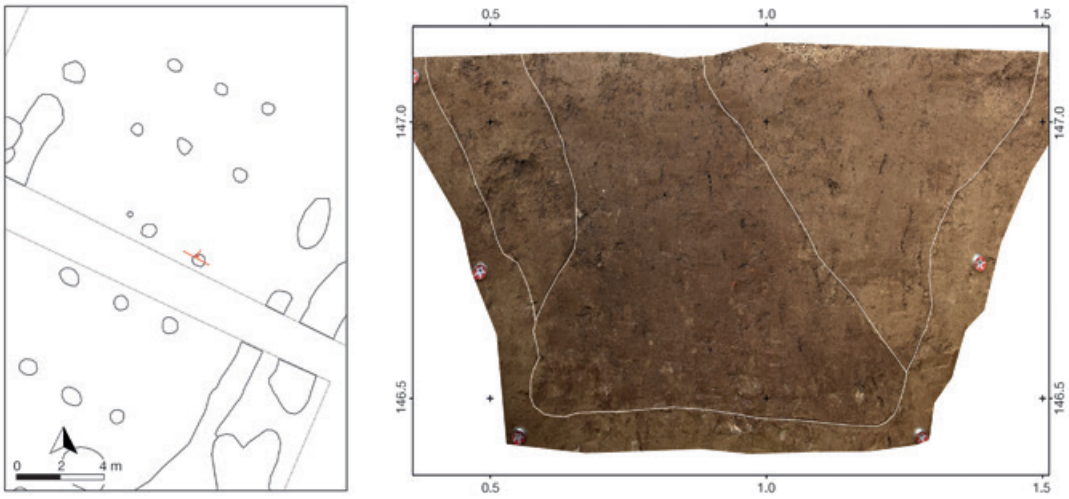

Fig. 11. Right: profile of the posthole *object* 70, attributed to house 131. Left: plan showing the exact location of the profile (red line) and the direction of view (red arrow).

increases and, at the bottom, there is an indistinct zone of dark and light brown stripes, probably resulting from bioturbation. A similar situation was observed in many other postholes.

The diameter of the postholes ranges between 0.4 and 0.9 m *(fig. 9)*. The very small diameter relates to the postholes that are preserved to the depth of only few decimetres, and it seems probable that, in these cases, only the very base of the posthole was recorded. All of the better-preserved postholes of, for example, house 131 have a diameter of at least 0.7 m (*object* 70: 1.00 m; *object* 59: 0.70 m; *object* 103: 0.75 m).

The preserved depth of the postholes follows a Gaussian curve *(fig. 10)*. Most of them were documented to a depth of around 40 cm. Postholes of more than 0.6 m in depth were rarely encountered. There is no functional explanation for the different posthole depths (e. g. in relation to the position of the posts within the house). In general, the preservation, i. e. erosion of the holes, largely determines their depths. The postholes in house 131 were much better preserved compared to those in other houses; their recorded depth was also the greatest.

The posthole / *object* 70 in trench 11 merits brief discussion *(fig. 11)*. Based on the colour, presence of concretions in the lower part, and the indistinct zone at the bottom, it generally resembles *object* 59 – as mentioned above, an example of a typical posthole. However, in *object* 70 it is possible to differentiate the pit fill itself, which measures about 1 m in diameter and 0.65 m in preserved depth, from the remains of the post, which was visible as a lining composed of dark brown soil. This darker soil had a diameter of about 0.35 m and, in profile, looked skewed to the east. The skew could have been a result of the effort to wiggle the post and pull it out (and probably reuse it elsewhere).

Beehive-shaped pits

In 2016, four beehive-shaped pits were excavated (*tab. 2*). One-half of *object* 21 was excavated, while *objects* 101, 114 and 120 were divided into four quadrants. In those excavated in quadrants, two complete profiles were obtained. The pits vary in size; their largest

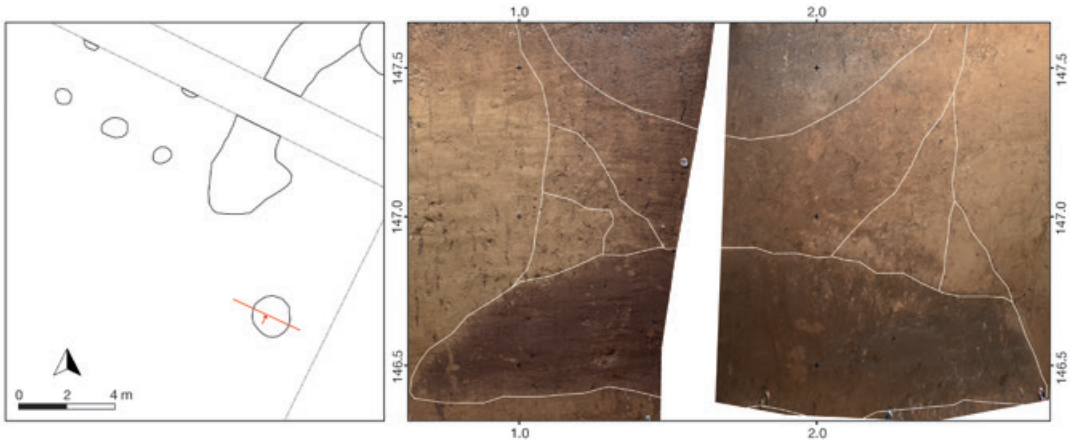

Fig. 12. Right: west-east profile of the beehive-shaped pit *object* 120, trench 13. Left: plan showing the exact location of the profile (red line) and the direction of view (red arrow).

diameter, invariably immediately above the bottom, is between 170 and 240 cm. However, all of them have similar layers of fill *(fig. 12)*: at the bottom, there is an accumulation of relatively dark soil. Above it, and along its edges, are fine layers of loess, alternating with layers of dark brown soil. In some instances, there are also big lumps of pure loess. The upper half of the pit fills is more homogeneous and consists of soil of different shades of brown colour. As was especially clear in *objects* 114 and 120, the opening is wider than the middle section of the pits so that, in cross-section, these pits are hourglass-shaped. This may be due to the erosion of the pit walls.

As with the postholes (see below), the level of the pit bottom varies according to the original terrain configuration. *Object* 101, located to the far west, had the greatest depth, while the bottom of *object* 120, far to the east, was located at the lowest height with respect to sea level. Interestingly, the height differences between the pit floor levels are not great (see below).

For *object* 114, two ^{14}C-dates were obtained on grains found in the botanical samples: Poz-90138 (from sample VEL16 S13 – *Probe* 060) comes from context 45, the topmost layer, and it gave a date of 6180 ± 40 BP; Poz-90137 (from sample VEL16 S13 – *Probe* 081) comes from context 28 (i. e. the layer immediately below context 45 that, nonetheless, belongs to one of the final infills) and dates to 6100 ± 40 BP. Even though there seems to be a chronological inversion, according to OxCal there is no reason to believe that the dates could not belong to the same phase of use of the pit (the agreement is 98.6 % and 94.7 %,

	bottom (m a.s.l.)	depth below modern surface	depth below planum 1	largest diameter	volume in m^3
Object 21	146.15	185 cm	120 cm	170 cm	1.8
Object 114	146.20	180 cm	125 cm	220 cm	3.5
Object 101	146.10	150 cm	95 cm	240 cm	2.8
Object 120	146.35	200 cm	140 cm	215 cm	2.8

Tab. 2. Basic information on the beehive-shaped pits in the area excavated in 2016.

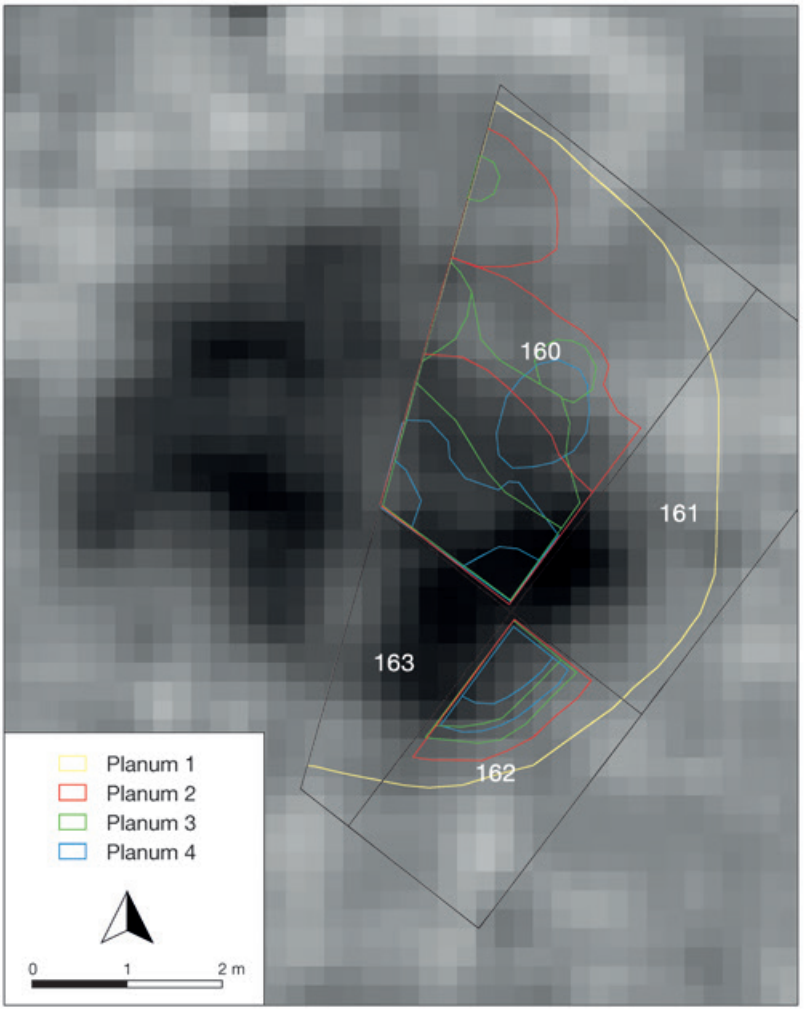

Fig. 13. Borders of the possible sunken-floor dwelling *object* 122 in *plana* 1–4 projected onto the magnetic plan (cf. *fig. 2*).

respectively). They place the final infilling of the pit in the period between roughly 5220 and 4950 cal BC (2 standard deviations), so it is impossible to decide whether the pit belonged to house 133 or 132 (if the LBK-inhabitants made such a differentiation at all).

In the pits, few finds were recovered; none can plausibly be linked to the primary function(s) of the pits. In order to obtain additional information about these pits, drilling was conducted in *object* 114 and, from the resulting cores, samples were taken at regular intervals for geochemical and geomorphological analyses.

Other pits

In trench 13, *object* 122 was recorded as a roundish pit with an impressive diameter of 7 m in *planum* 1. Only its eastern part was uncovered because the western part projected outside the excavation area of trench 13. At the lower levels, the pit appeared to be of rectangular shape *(fig. 13)*; the total depth below *planum* 1 of *object* 122 is 0.80 m. Its base, at

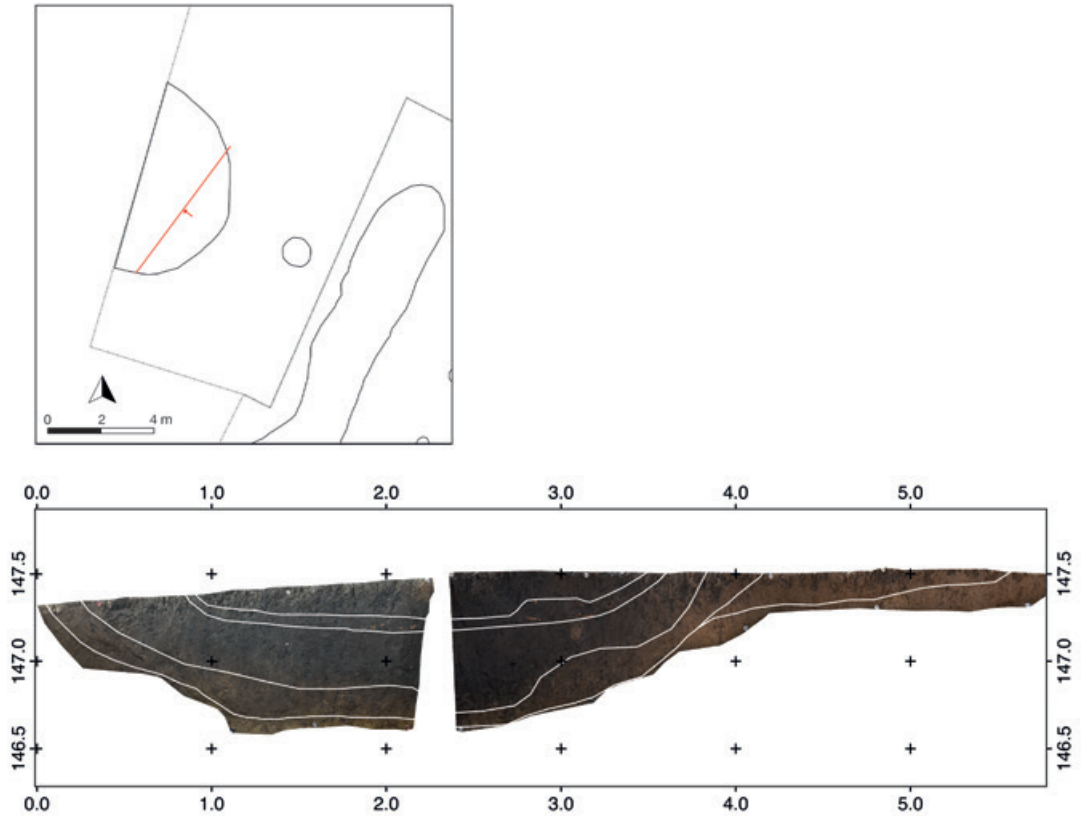

Fig. 14. Below: south-north profile of the possible sunken-floor dwelling *object* 122. Above: plan showing the exact location of the profile (red line) and the direction of view (red arrow).

146.65 m a. s. l. *(fig. 14)*, is more or less flat. Together, the magnetic picture and the excavated section of the pit suggest that its extension is 5.50 × 4.00 m. The pit would thus have covered an area of around 22 m^2. The northeastern part of the pit, defined in quadrant 160, seems to protrude further to the northeast. Since this protrusion could be followed through several *plana*, it could represent an entrance to the pit. The fill of *object* 122 was very similar to that of the long pits, as it mostly consisted of dark brown soil; only at the bottom did the fill show a lighter brown colour. This latter deposit had a thickness of 0.15 m and its distinct colour may be a result of bioturbation. About 0.50 m above the base there was a thin layer of scattered pieces of burnt clay.

Recently, it has been argued that similar features in the LBK-settlements in Lesser Poland should be regarded as sunken-floor dwellings (Połczyński / Michalak 2016). The following characteristics were stated as the evidence supporting such interpretation: 1) large size, 2) regular shape, 3) flat floor, 4) straight, vertical walls, 5) traces of construction (e. g. postholes), and 6) traces of an oven or hearth (ibid. 372 f., partly following Wüstehube 1993). *Object* 122 fulfils at least four of the criteria (large size, regular shape, flat floor, entrance-like depression in the northeast = traces of construction). The absence of an oven / hearth could be easily explained as due to this feature perhaps being located in one of the unexcavated parts of the structure. Połczyński and Michalak would, therefore, undoubtedly classify *object* 122 as a sunken-floor dwelling. However, the lack of fine layering

deriving from multiple floors, which would be expected in a dwelling, seems peculiar. Furthermore, the size of *object* 122 (22 m^2) far exceeds that of the structures identified as sunken dwellings in Lesser Poland (whose maximum area is 7.3 m^2). For the moment, therefore, we do not want to exclude the possibility that *object* 122 was a sunken-floor building, but we are not fully convinced by the evidence. Further scientific analyses are planned in order to shed more light on this issue.

Object 121 (pit) in trench 13 is of an intermediate size and measures about 1 m in diameter. In profile, it had more or less steep walls; the depth was only about 0.55 m. For comparative purposes, coring samples from this pit were taken for geochemical and geomorphological analyses. Another pit, *object* 130 in trench 14, was initially thought to be a beehive-shaped pit because it measured 1.25 m in diameter in *Planum* 1, but it turned out to extend to the depth of only 0.30 m. The fill contained large lumps of burnt clay, demonstrating its anthropogenic origin. Because, in the case of both pits, the amount of finds was very limited, nothing can yet be said about their possible function. *Object* 156, in trench 14, was also of an unusual type. In *planum* 1, it appeared as a large roundish feature 2.5 m in diameter that contained a lot of burnt clay. However, it extended to the depth of only 0.10 m.

Stratigraphic relationships

In most cases, there is no physical overlap between the features that would enable us to assess stratigraphic relationships between the houses and the nearby pits. A likely exception is *object* 21, because its position is in the location where a posthole of house 132 would be expected. As there was no evidence of the posthole, it follows that *object* 21 was dug after the demolition of house 132; during this process, the posthole of house 132 seems to have been completely destroyed. Unfortunately, we have neither archaeological (ceramics) nor organic (e. g. bones, seeds) datable material, so it is not possible to test this hypothesis.

More significant is the stratigraphic relationship between *objects* 24 and 26, the long pits that belonged to houses 132 and 133, respectively. They could be traced in trench 11 and in a small, adjacent part of trench 13. In both trenches, the pits were hard to differentiate and, therefore, it is impossible to say if they were contemporary or if one of them was older[6]. The composition of their fills is so similar that only in the north profile of quadrants 145–147 in trench 13 was it possible to clearly separate the structures *(fig. 15)*.

In this profile, *object* 24 (of house 132) is located to the west and is less deep than *object* 26 (of house 133). The base of the latter is located at 1.65 m below the present surface (at 146.36 m a. s. l.); the former is 1.15 m in depth (its base lies at 146.86 m a. s. l.).

Object 24 appears very homogeneous: at the bottom of the pit, there is a series of beige-brownish layers (contexts 996, 997, 103) 10–20 cm thick; their boundaries are unclear due to bioturbation and, to the east, they seem to have been cut. The layer above context 103 (context 102) is of darker brownish colour and there is no change in it towards the top soil. The homogeneity also applies to the area to the east, where *object* 26 is located. From

[6] Initially, between *objects* 24 and 26 a further *object* 25 was defined in trench 11 (see *fig. 3*). However, it turned out that this corresponded to the overlapping zone of *objects* 24 and 26, and at deeper levels it could not be verified. Because of the stratigraphic relationship, it is now clear that *object* 24 has to be attributed to house 133. In trench 13, it was not even possible to differentiate between *objects* 24 and 26 in *planum* 1. Therefore, the whole context was labelled *object* 26 at this level (but differentiated further during the excavation).

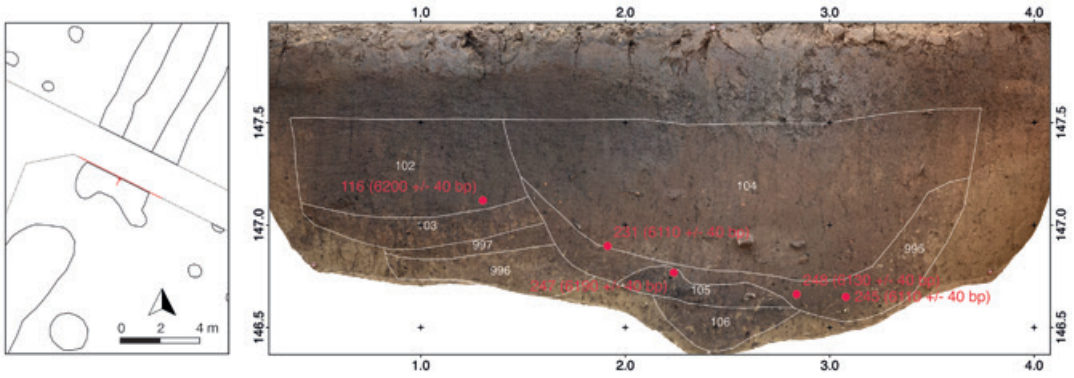

Fig. 15. Right: trench 13, *object* 24/26, quad. 145–147; view of north profile. Left: plan showing the exact location of the profile (red line) and the direction of view (red arrow).

object 24 derive only a few finds, mostly from context 102; some of the sparse bones were ^{14}C-dated (see below).

The fill of *object* 26 is heterogeneous. At its bottom, there is a narrow pit, only 50 cm wide and up to 30 cm thick (context 106). Despite the fact that this layer was obscured by bioturbation, it was clearly visible thanks to its very dark colour. The dark colour of the soil is due to the inclusion of ash and char in some parts of the layer. The deposit yielded a relatively large number finds, especially organic, including a bone needle.

In contrast, layer 105 and 995, above layer 106, were brownish (i. e. of lighter colour) as they lacked the ashy component. The uppermost, layer 104 contained many ceramic sherds, several stones and burned daub. It was sealed by brown sediment without significant inclusions. As already remarked above, this layer blended into layer 102 associated with *object* 24 without a visible break between the two deposits.

The area 1.6 m from the western edge of the profile is critical for establishing the relationship between *object* 24 and *object* 26. There, lower layers of the fill of *object* 24 (contexts 996, 997, 103) seem to be interrupted, while layer 995 (in *object* 26) appears intact. It follows that *object* 24 is older than *object* 26. This is confirmed by the ^{14}C-dates *(fig. 16; tab. 3)*. The earlier dates (no. 116) relate to *object* 24, while the dates for *object* 26 – even though they were obtained on the material from a lower level – are definitely later. Therefore, it is safe to say that house 132 predates house 133.

The situation is broadly similar to that encountered along the west side of house 132, where *object* 9 (associated with house 132) appeared to intersect with *object* 57 (attributed to house 131). At *planum* 1, the features seem to merge. Both pits were examined in several cross sections. However, in none of these could the relationship between the pits be securely determined because, as the profiles revealed, there is actually no connection between them, at least not below *planum* 1. Therefore, based on archaeological observations, it is not possible to establish a chronological relationship between *objects* 9 and 57 and thus houses 131 and 132, and we have to rely on the ^{14}C-dates (see below).

Reconstruction of the terrain

As mentioned in the introduction, the excavation area is today located on a slight westward slope. It seems that the configuration was similar in the Neolithic: the postholes with the

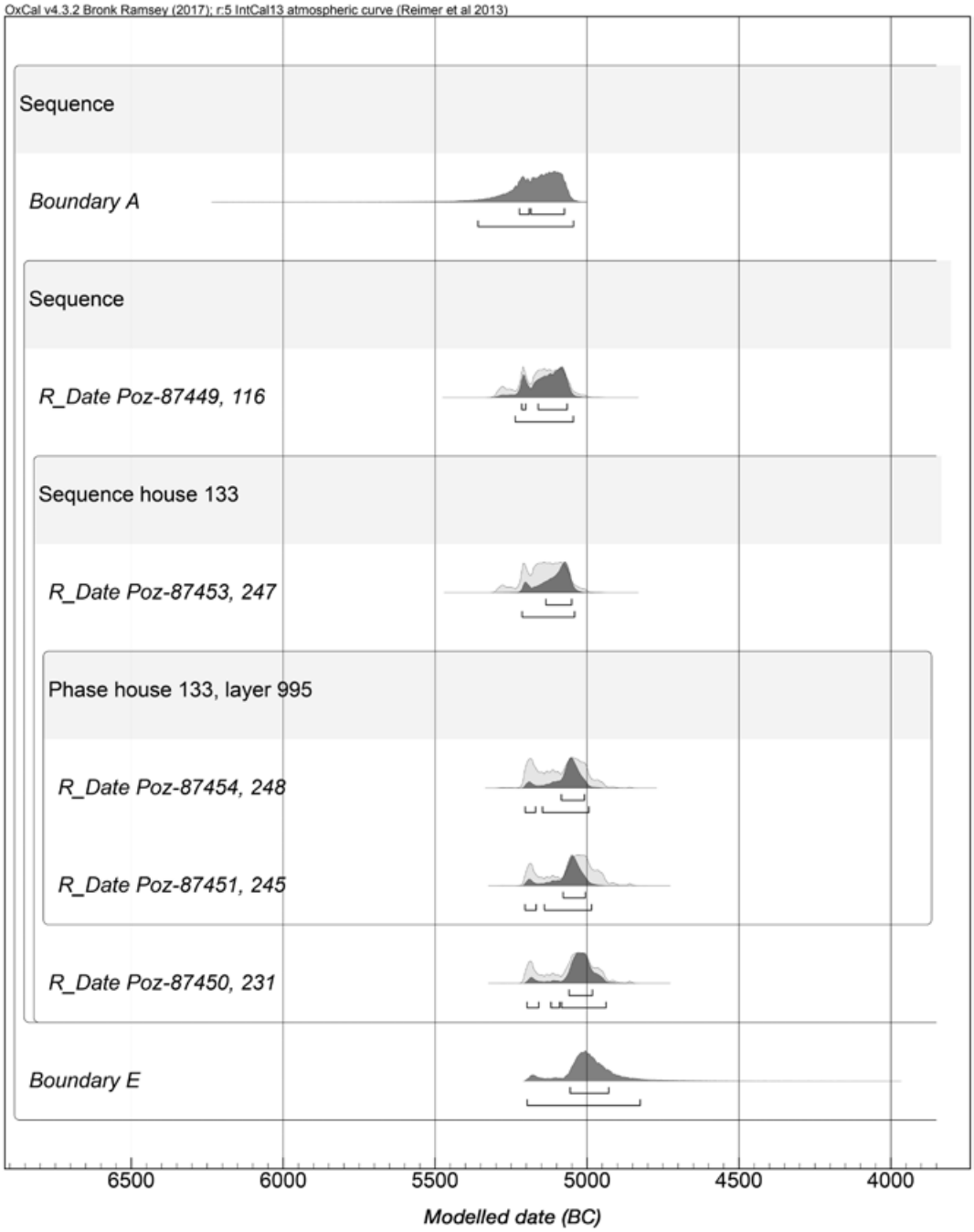

Fig. 16. Bayesian model of the ^{14}C-dates shown in *figure 15*.

greatest depths are found within house 131 in the west, where they extend to the absolute height of 146.3 m a. s. l. *(fig. 17)*. The shallowest postholes are those of house 133; their base is located at a level of up to 147.7 m a. s. l. This means that, across the east-west horizontal distance of 40 m, there was a height difference of up to 1.4 m in Neolithic times (= 3.5 %).

Name	Unmodelled (BC/AD) from	to	%	Modelled (BC/AD) from	to	%	Median	A-index
Sequence								
Boundary A				-5359	-5045	95.4	-5160	
Sequence								
R_Date Poz-87449, 116, house 132	-5295	-5045	95.4	-5237	-5046	95.4	-5127	109.3
Sequence house 133								
R_Date Poz-87453, 247	-5291 -5231	-5246 -5026	5.3 90.1	-5214	-5042	95.4	-5096	107.3
Phase house 133, layer 995								
R_Date Poz-87454, 248	-5211	-4962	95.4	-5204 -5147	-5170 -4995	7.2 88.2	-5057	114.7
R_Date Poz-87451, 245	-5208	-4942	95.4	-5205 -5141	-5168 -4986	7.7 87.7	-5052	112.1
R_Date Poz-87450, 231	-5208	-4942	95.4	-5198 -5119 -5085	-5160 -5091 -4938	5.6 2.5 87.3	-5023	120.1
Boundary E				-5198	-4826	95.4	-4998	

Tab. 3. Output of OxCal 4.3.2 for the Bayesian model of *figure 15*. A_{model}-index = 135.4; $A_{overall}$-index = 130.4.

The postholes of house 131 in the west are preserved to the greatest depth of 0.4–0.8 m. In house 126 the postholes are only 0.1–0.5 m deep, in house 132 0.1–0.6 m, and in house 133 only 0.1–0.4 m. Therefore, in comparison with house 131, either the postholes in other houses were dug to smaller depths or, in our view more likely, a thicker layer (by 20–30 cm) of the soil covering the remains of other houses was eroded. This would, in turn, imply that the slope from east to west was even more pronounced (c. 4.1 %) during the Neolithic.

A similar difference in the absolute heights of the bases of the postholes can be observed along the north-south axis. For example, in house 131, where almost all postholes could be identified, the differences between the elevation of the base of the postholes in the far northern row and that of the postholes in the row far to the south of the house is roughly 30 centimetres (146.6 vs. 146.3–146.4 m a. s. l.). The same applies to house 133 (147.5–147.7 vs. 147.2–147.3 m a. s. l.) and house 126 (147.4–147.5 vs. 147.1–147.3 m a. s. l.). Only in the case of the excavated postholes of house 132 is the depth of the holes roughly the same (the base lies at 147.1 ± 0.1 m a. s. l.).

This difference is mostly attributable to the fact that the houses were built with their long side neither perpendicular nor parallel to the westward slope. Thus, the height / depth divergence between the northernmost and southernmost postholes of houses 126 and 133 is almost negligible. Still, it seems probable that the house floors were slightly slanted, by about 30 cm (1 %), or that the southern end of the houses was raised above the ground.

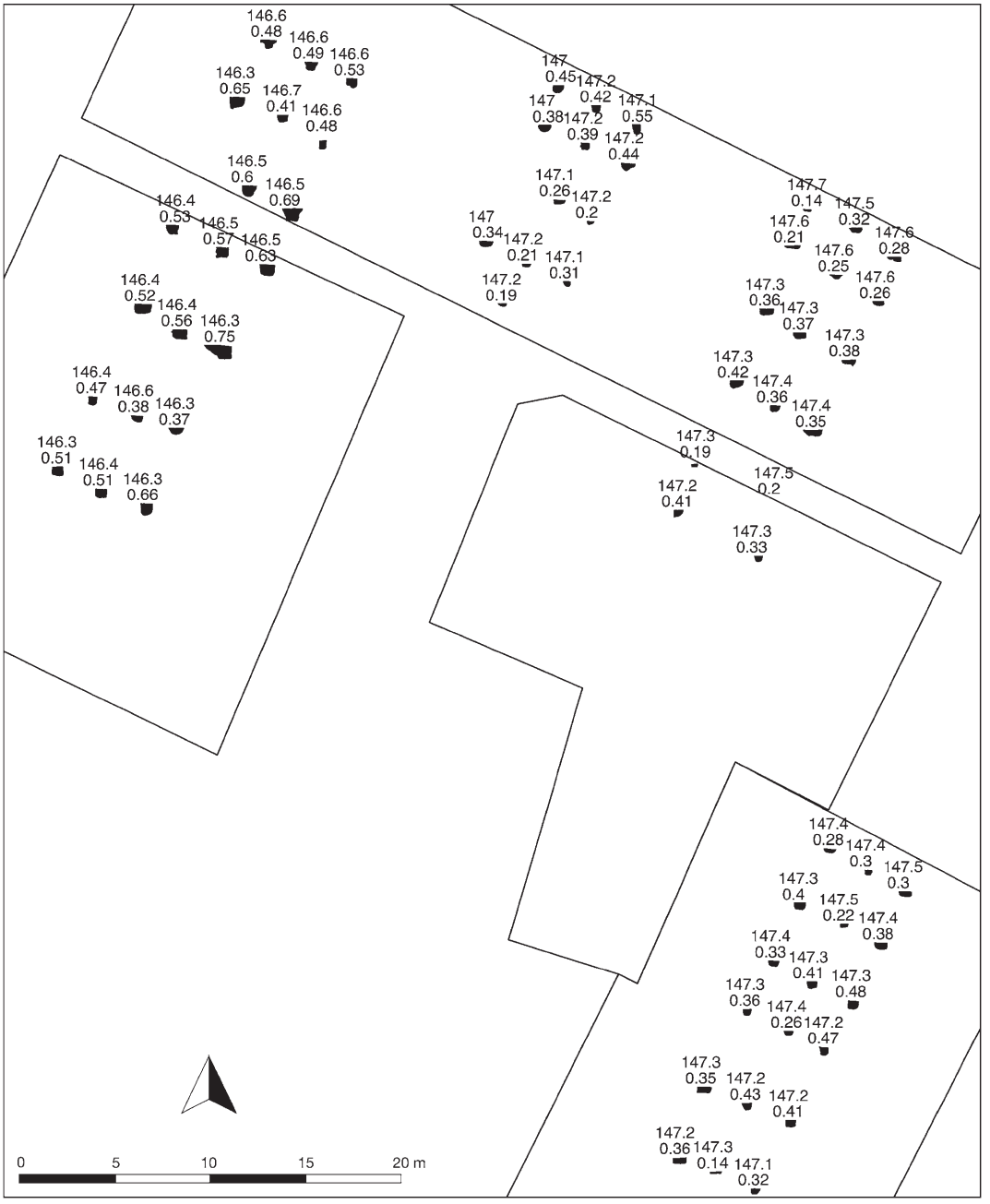

Fig. 17. Absolute height (a. s. l.) at the bottom and relative depth of the postholes (in metres).

Material culture

The types of finds recorded in the campaign in 2016 are those typical for LBK settlements, and include burned daub, ceramics, artefacts made of chipped stone, ground stone objects and bones, that is building material, food waste and tools. Overall, during the 2016 excavation, 6295 ceramic sherds weighing 55.2 kg, 5 ceramic objects (loom weights, figurines?)

	ceramics (count)	ceramics (in g)	non-vessel ceramics (count)	non-vessel ceramics (in g)	chipped stone (count)	chipped stone (in g)	ground (count)	ground stone (in g)	bone (count)	bone (in g)	mollusc (count)	mollusc (in g)	daub weight (in kg)
lateral pit	6037	51735	5	287	251	656.65	26	5944	2222	6609	9	8	151.1
sunken dwelling	160	2391			3	19.4	1	198	1				6.4
storage pit	19	203			1	2.1			6	18			3.2
posthole	1	96			4	49.5			9	21			1.8
miscellaneous	78	798			10	21.6			5	19			3.4

Tab. 4. Absolute numbers of different find categories per type of *object*.

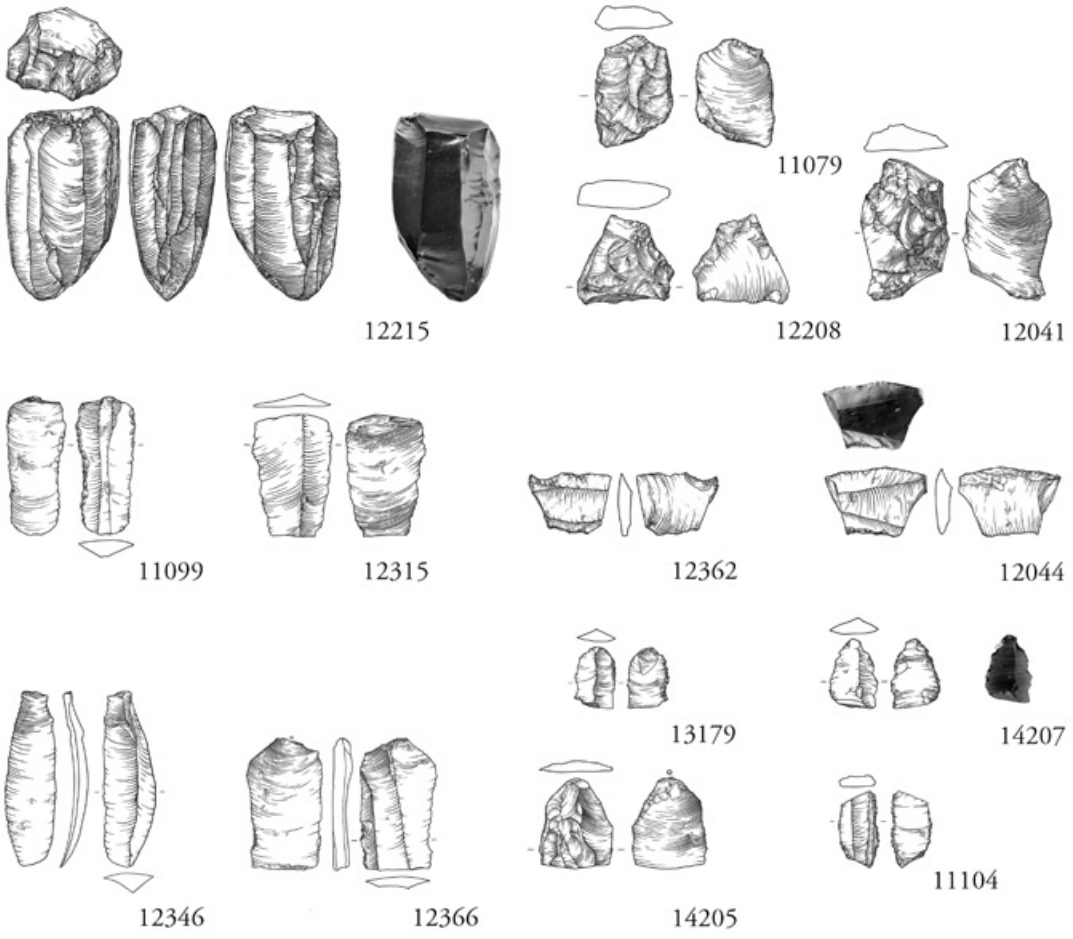

Fig. 18. Selected obsidian artefacts. – Scale 1 : 2 (drawings: K. Winter; photos: S. Jagiolla).

weighing 269 g, 269 chipped stone artefacts with a weight of 749.3 g, 27 ground stone artefacts 6.1 kg in weight, 2243 bone fragments weighing altogether 6.7 kg, 9 mollusc shells weighing 8 g, and 166 kg of daub were recovered. One extraordinary find was a small bead (see below).

Table 4 gives an overview of the numbers of artefacts found in each type of *object*. Most finds derive from long pits; of the other features, only *object* 122, the possible sunken-floor dwelling, yielded a considerable quantity of finds. Storage pits contained only few finds, and postholes virtually none. An interesting and exceptional find is an obsidian core No. 12215 *(fig. 18.12215)* found in the otherwise unremarkable posthole *object* 106 in trench 12 belonging to house 131. The extraordinary character of the obsidian core hints at its intentional deposition (for similar phenomena in somewhat later periods see Trebsche 2005), either before the start of the building process, or during the demolition of the house following the possible retrieval of the post. Another exception is *object* 103, also in trench 12 and belonging to house 131, which contained a large bone (submitted for ^{14}C-dating but which, unfortunately, did not contain enough collagen).

	ceramics (count)	ceramics (weight in g)	chipped stone (count)	chipped stone (weight in g)	daub (weight in g)
House 126	493	4721	15	78.1	13420
House 127	721	6309	7	20.6	21856
House 131	2038	14048	110	151.4	61079
House 132	1133	12391	29	183.0	45218
House 133	1652	14266	90	223.55	9536
Object 21	5	60			
Object 101					3168
Object 114	13	127			86
Object 120	1	16	1	2.1	
Object 122	160	2391	3	19.4	6403

Tab. 5. Absolute numbers of different find categories per house.

Quantitative patterns in the distribution of artefacts

Several patterns are visible in relation to the artefact yield. Weights of the two quantitatively largest find categories – ceramics and daub – are highly correlated ($r = 0.614$, $p = 0.004$). In most cases, *objects* connected to the same house yielded a similar number of finds. This justifies the pooling together of the *objects* into the higher-level class, i. e. the house, for the purpose of discussion.

Of the houses, 131 yielded the highest counts of ceramic sherds, chipped stones and daub *(tab. 5)*. However, as excavated soil volumes differed greatly between the houses, the comparison of the absolute number of artefacts of different types found inside them may be misleading. *Figure 19* shows the relative amount of ceramic sherds, daub and chipped stone artefacts in relation to the excavated volume of soil, after standardisation (division by average mean). The fundamental difference between storage pits and other pits mentioned above is quite evident. Only *object* 101 yielded an above-average number of finds in a single category, in this case daub. The high number of daub pieces could be due to the fact that *object* 101 is situated within house 131, where a large amount of daub was found. This could suggest that the infilling of *object* 101 and the collapse of the house were contemporaneous. The generally very low number of finds in beehive-shaped pits, especially in comparison to long pits, is in need of explanation given that they are not located much farther from the houses than the long pits.

The marked differences in the number of finds between different types of pits are even more surprising when *object* 122, the supposed sunken-floor dwelling, is taken into account. Although it yielded very low numbers of chipped stone artefacts, in all other respects it did not differ markedly from the long pits. Only small areas of houses 126 and 127 were excavated, so they are difficult to compare to the others. In contrast, significant portions of houses 131, 132 and 133 were uncovered, so the amounts of different artefact types should be representative. Houses 131 and 132 contained a relatively high abundance of chipped stone artefacts, as did house 133, which also had the highest relative number of ceramic sherds: all three houses contained little daub. The long pits of houses 131 and 132 contained very similar quantities of daub and ceramics.

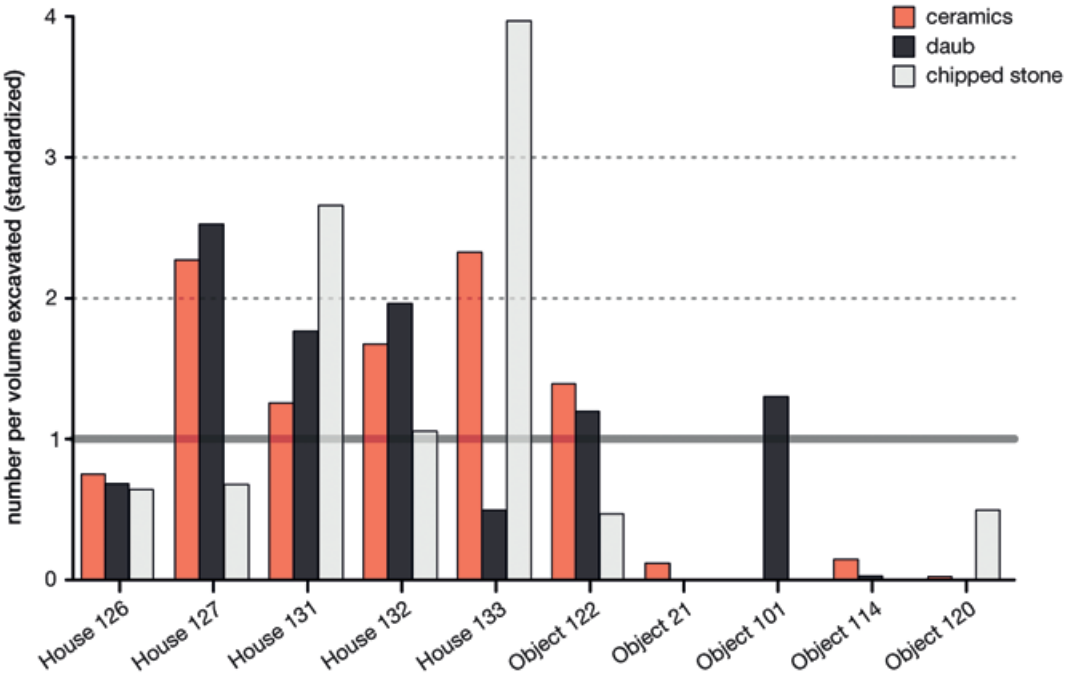

Fig. 19. Number of ceramic sherds, daub, and chipped stone artefacts in relation to the volume of soil removed from the *objects*; values after standardisation (division by average mean).

While in this form the results are difficult to interpret, the differences and similarities in the types and amounts of artefacts found within various types of *objects* seem significant, and suggest that taphonomic processes at this LBK settlement are less random than is usually suspected.

Ceramics

The range of ceramic types is generally similar to that expected for a Late LBK, Želiezovce Period settlement. A more detailed presentation of the ceramics by I. Cheben is under preparation. It is, however, worth mentioning the two sherds of the Bükk culture style, which were found in *object* 9 associated with house 132.

A correspondence analysis of the ornamental motives, aggregated per *object*, shows no gradient that could be interpreted as time *(fig. 20)*. However, it is of significance that in the ordination diagram *objects* of one and the same house are grouped together. This is especially the case for house 131, but also for houses 126 and 127. The *objects* of house 133 are widely distributed, but still located far from *objects* of other houses. The only exception is house 132: its *objects* 9 and 24 are located at opposite ends of the second axis. This grouping of *objects* according to house affiliation can be taken as an indication that the ceramic material in the respective long pits truly belongs to one house and is not (significantly) mixed. The fact that, despite the different dating of the houses as evidenced by the radiocarbon dates (see above and below), the seriation shows no chronological order should be interpreted as a hint towards the existence of house-specific traditions of ceramic ornamentation. Diachronologically shared or transmitted traditions might be hypothesised in the case of houses 126, 127 and 132.

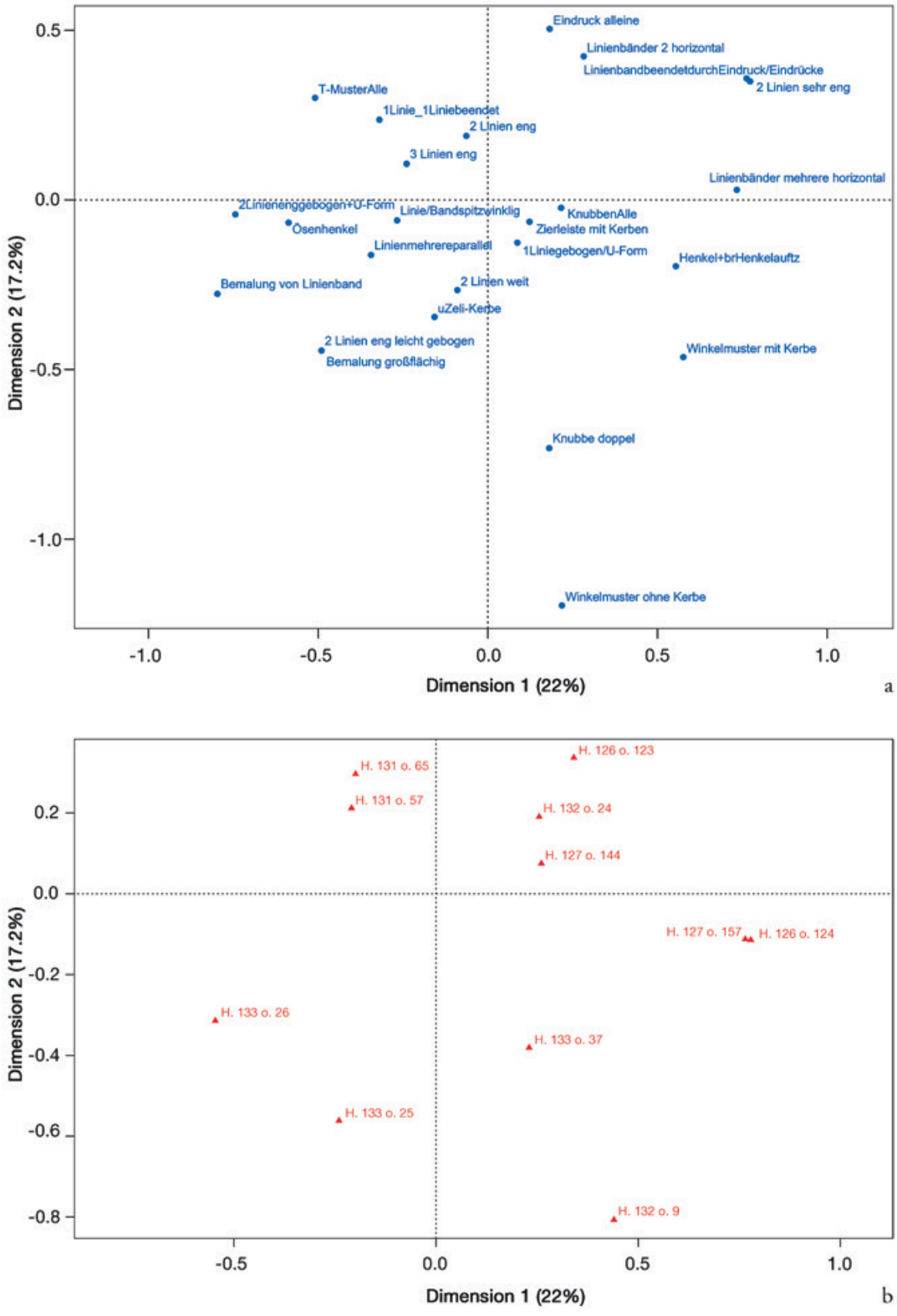

Fig. 20. Ordination diagrams of a correspondence analysis of motifs aggregated per *object* (only motifs and *objects* with more than three entries shown). a motifs; b *objects*.

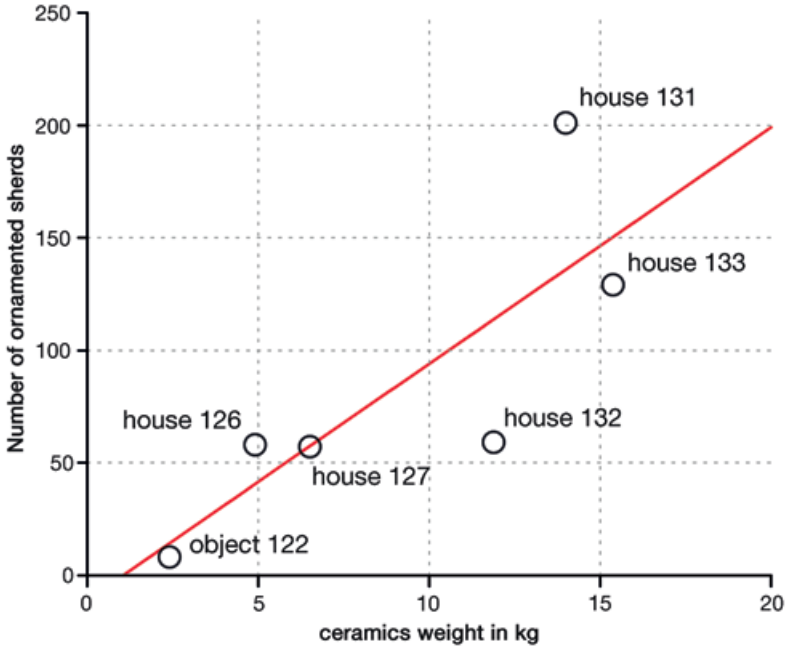

Fig. 21. Number of decorated sherds in relation to the amount of ceramics per house.

The results of the correspondence analysis of the material of all campaigns, which indicate a time-dependent change in ornamentation techniques, will be published in detail elsewhere (Cheben et al. in prep.).

In terms of the ornamentation of the ceramics, there is a clear correlation between the volume of ceramic sherds (expressed in weight in g) and the number of ornamented sherds *(fig. 21)*. Here, it is interesting to note that house 132 yielded a below-average number of ornamented sherds and in house 131 the number is above average. While an average of 9.3 ornamented sherds are found per kilogram of ceramics, in house 131 this value is as high as 14.4 ornamented fragments per kilogram of sherds, and in house 132 as low as 5. House 133 has an intermediate value of 8.4.

Chipped stone

In 2016, a total of 265 pieces of chipped stone, weighing 727.1 g, was recovered. The average weight per piece is 2.7 g. The median of 1.2 g, however, is considerably lower and points at a heavily skewed distribution.

The analysis of raw materials used for production of chipped stone tools is under way. The preliminary screening identified the use of well-known raw materials such as obsidian, radiolarite and limnoquartzite. Obsidian is, by far, the most frequent material – more than 100 pieces belong to this category *(fig. 22)*. In terms of the total weight, however, obsidian is not as common as limnoquartzite. Based on the relationship between the weight and frequency, it could be argued that obsidian was worked on-site, producing many very small pieces. The only other material with a comparable, i. e. low, ratio of weight to frequency is radiolarite.

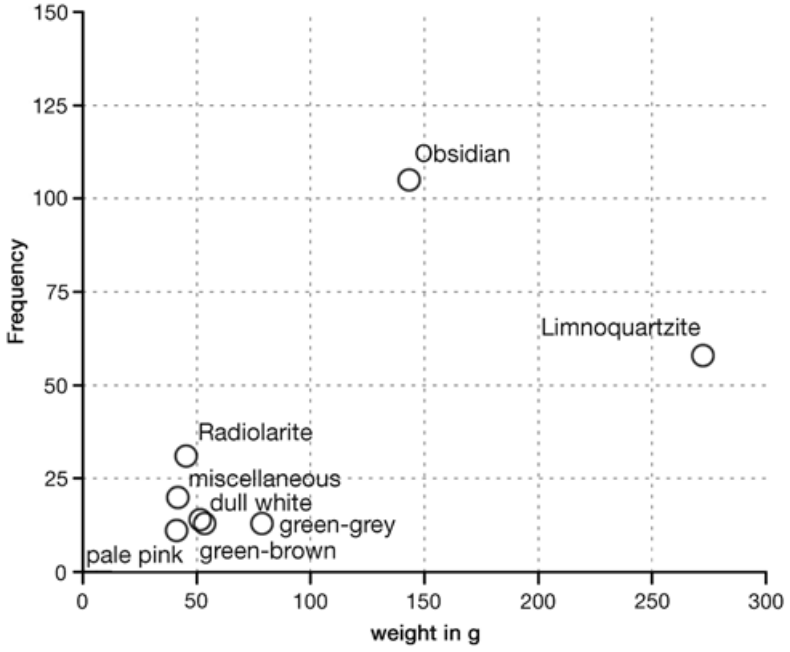

Fig. 22. Weight of chipped stone artefacts in relation to the quantity of the raw material.

That production was done on-site is also indicated by the fact that many flakes (n = 54), bladelets (n = 31) and general debris (n = 74) were found *(tab. 6)*. In total, 92 pieces were classified as blades. Additionally, three cores and five core discs were uncovered, of which only one core is not obsidian. Since the debris and flakes of all other raw materials were also found, it seems that they were worked on-site as well.

In some parts of the excavation area, the relative abundance of obsidian was much higher than in the others *(fig. 23)*. While this is difficult to determine for houses 126 and 127 due to the overall very low numbers, the difference in size of the assemblages from

	blade	bladelet	flake	nucleus	nucleus disc	debris	undefined	sum
Obsidian	51	17	9	2	5	20	1	105
Limnoquartzite	12	3	17	1		22	3	58
Radiolarite	6	8	5			9	3	31
green-grey	5	2	4			2		13
green-brown	6		6			2		14
dull white	1	1	7			4		13
pale pink	6					5		11
miscellaneous	5		5			9	1	20
sum	92	31	53	3	5	73	8	265

Tab. 6. Relationship between different types of chipped stone artefacts and the raw materials.

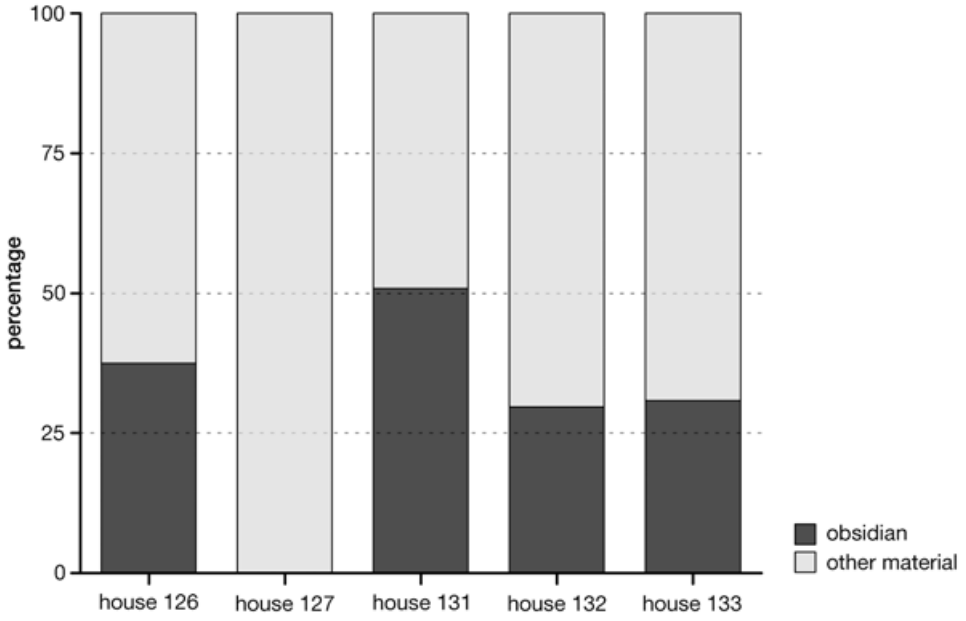

Fig. 23. Percentage of artefacts made of obsidian, per house.

house 131 on the one hand, and from houses 132 and 133 on the other is striking. In the former, well over 50 % of all chipped stone artefacts were made of obsidian, while in the latter, less than 30 % were made of this material. According to XRF-analyses[7], the obsidian can, without doubt, be identifed as coming from the Carpathian sources in eastern Slovakia *(fig. 24)*.

In the functional analysis, the following categories were differentiated (in some cases, finer-grained categories are amalgamated because the number of items is too small):

– blades without visible modifications
– drilling instruments (points, borers)
– scrapers
– pieces with 'sickle gloss' on damaged edges
– pieces with 'sickle gloss' on undamaged edges
– artefacts with other traces of use (such as re-touching, splintering, rounding, truncation).

The general understanding of sickle gloss on blades is that it derived from the use of the blades as elements of composite harvesting sickles (Semenov 1964; Meeks et al. 1982). However, this can only apply to the blades with worn edges. Gloss on the blades with slightly rounded edges, but with no sign of damage, can hardly be associated with the cutting of quite hard, siliceous grass stems. These blades must have been used for something else, perhaps for cutting leather or some other comparably soft material. At Vráble, blades

[7] The analyses were conducted with the pXRF-device Niton XL3t900 Goldd+. We are thankful to T. Schreiber for producing the measurements.

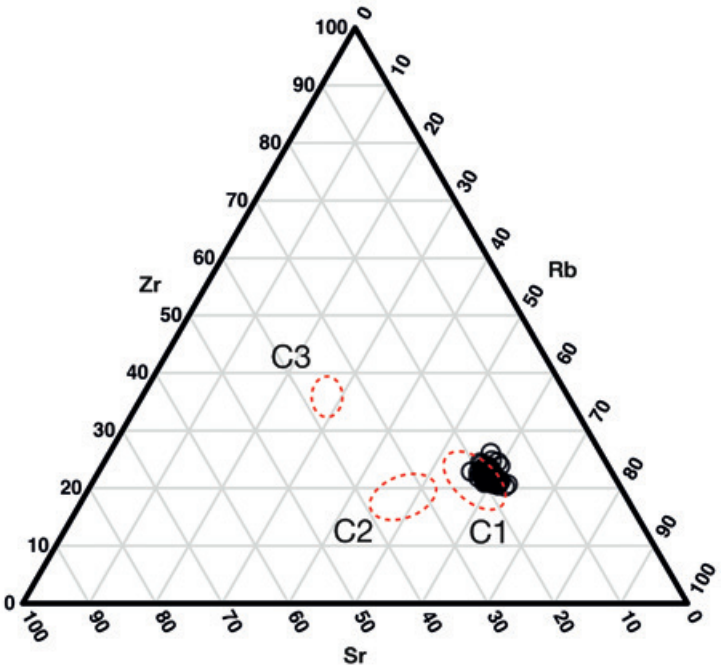

Fig. 24. Measurements obtained by pXRF of Rb, Sr, and Zr of obsidian artefacts. The dashed ellipses refer to the main obsidian sources in the Carpathians: C1 – East Slovakia; C2 – Hungary; C3 – Ukraine (ellipses after Bonsall et al. 2017, 4 fig. 4; measurements obtained by T. Schreiber).

with gloss but no damaged edges are more numerous than those with damaged edges. Finally, it must be noted that on obsidian pieces gloss is hardly identifiable because of the translucent and shiny character of the raw material.

At least one obsidian artefact (find no. 44, from trench 12, *object* 57 – east long pit of house 131) could be regarded as a trapezoid arrowhead (*fig. 18.12044*; perhaps also *fig. 18.12362*).

It has been mentioned above that houses 131 and 133 are the 'richest' in terms of chipped stone artefacts; in other houses, the numbers are too low to allow any conclusive observations. Concentrating, thus, on houses 131 and 133, the differentiation in terms of the types of tools shows a surprising result: while the overall numbers of chipped stone artefacts are comparable, the pits attributed to house 131 contain a much greater quantity of specialised tools. More blades were found there (ten vs. four blades in house 133 [without traces of wear]), more drilling instruments (four vs. one), and many more artefacts with sickle gloss (nine vs. one). The only type that makes house 133 stand out is scrapers (two in house 131 vs. six in house 133).

Ground stone tools

Ground stone tools such as grindstones, polishing stones and adzes were rare. One completely preserved miniature adze stemmed from the eastern long pit of house 131 *(fig. 25.1)*. With a weight of 22 g it measures only 5.9 cm in length and 1.4 cm in width and depth.

Fig. 25. Selected artefacts. 1 miniature adze (VEL16 S12 – Einzelfund 295); 2 stone bead (VEL16 S12 – Einzelfund 358); 3 bone artefact (VEL16 S13 – Einzelfund 127).

Ceramic objects

The ceramic (i. e. clay) object assemblage consists of three fragments of loom-weights and two elongated objects. The latter could represent legs of figurines, but the pieces are too small to be determined. All five finds come from long pits.

Bead

A small bead (VEL16 S12 – EF 358) was recovered from the bottom of long pit 9 associated with house 132. Its weight is only 0.3 g; it measures 7.3 mm in diameter and 3 mm in height *(fig. 25.2)*. The hole, of 3.5 mm in diameter, was drilled obliquely and right through the centre. The drilling was obviously done from both ends as a small ridge remained in the middle.

Bone and molluscs

The analysis of mollusc remains and animal bones is ongoing. Preliminary screening revealed some bones with distinct traces of wear *(fig. 25.3)*.

Human remains

Description

In trench 14, at the border of the long pit *object* 144, a human skeleton was discovered; parts of the skull were already visible in *planum* 1. Further excavation revealed that the burial was disturbed: the skeleton lay on its back, with the axis of the spine oriented east-

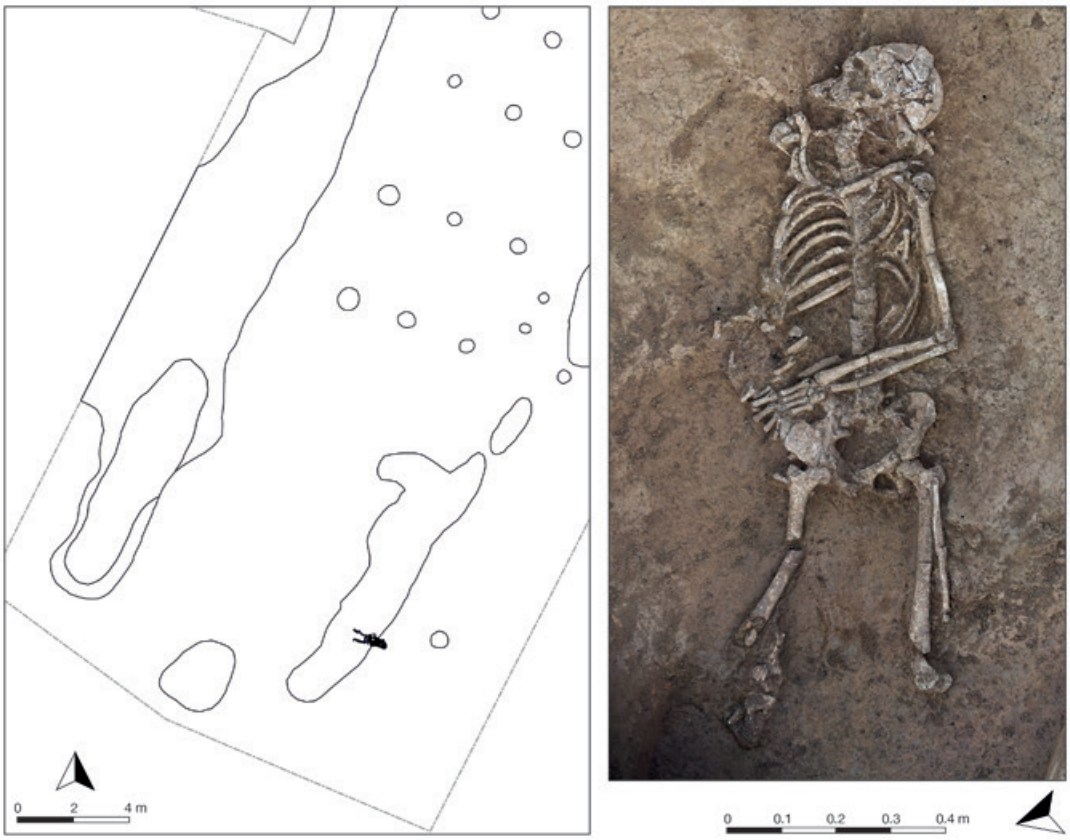

Fig. 26. Human skeleton in *object* 144, trench 14.

southeast–west-northwest, with the head to the east *(fig. 26)*. The head was bent heavily backwards, while the right arm lay beneath the upper body, with the right hand placed close to the right pelvic bone. The position of the right arm was very unusual and seems possible only after the ligaments had at least partly decomposed.

The left hand was well preserved. The phalanges pointed inwards, which gave the impression that the hand was formed into a fist, but this could also be due to the decomposition process. The right hand was heavily disturbed. Phalanges belonging to it were also found in the chest and even inside the skull. This suggests that an animal burrowed through the part of the burial where the upper body lay.

Both legs were destroyed from the knee downwards. The condyle of the left femur was broken and turned upside down; the tibia and patella had been displaced and were lying on the right side of the skeleton; the right tibia was incomplete. The fact that the left fibula was found immediately to the left of the left femur, lying parallel to it, is intriguing. The absence of foot bones implies that the fibula was placed there after the destruction of the lower legs. This would have been possible only when the femur was still exposed and after the soft tissue on the lower leg had already largely decomposed. When the rest of the pit fill was excavated, more human foot bones, probably from the same individual, were found.

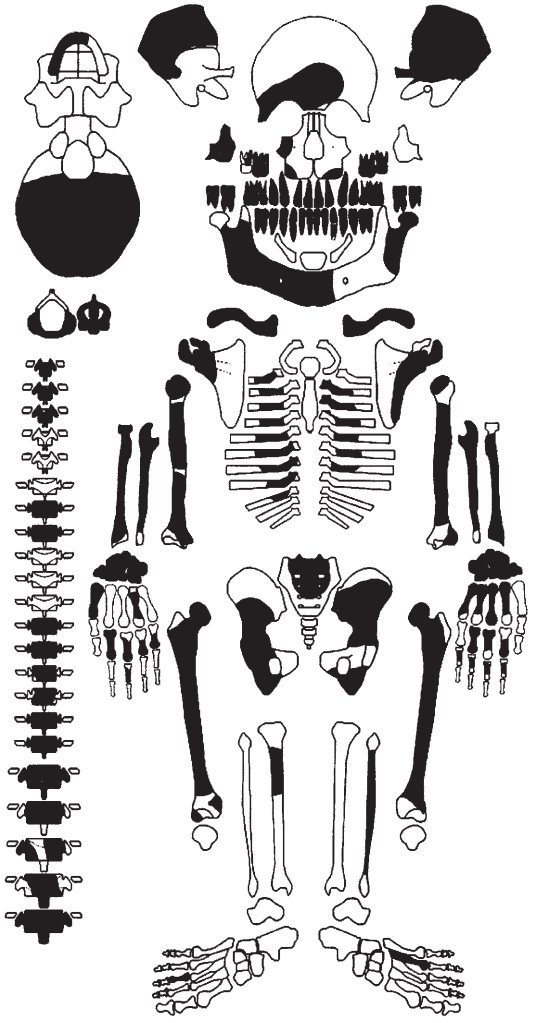

Fig. 27. State of preservation of the human skeleton in *object* 144, trench 14 (preserved parts are shown in black).

Physical anthropology

A preliminary anthropological analysis was conducted by Zuzana Hukeľová. According to the results, c. 75 % of the skeleton was preserved *(fig. 27)*, but the macroscopic analysis was complicated by the high rate of post-mortem fractures.

Several sex indicators on the skull (mental eminence, supraorbital ridges, orbital margins) and the pelvis (greater ischiatic notch, the absence of preauricular sulcus) point to a male individual, and the abrasion of teeth indicate an age of 20–35 years. The skeleton had a healed trauma at the back of the skull – on the parietal bones, perpendicular to the sagittal suture (approximately 6 cm long); besides that, Schmorl nodes were visible on the second and third cervical vertebrae. Additional pathological changes were not observed because of the high rate of fragmentation.

^{14}C-dating of the human skeleton

In addition to the ^{14}C-date from the fill of the pit, two ^{14}C-dates on human bones were commissioned – one on a right rib and one on a fragment of parietal bone. Because these bones are formed and transformed at different times during the life of an individual, slight differences in ^{14}C-age can be expected. This allows for a refinement of the calibration process for these dates through wiggle-matching. This approach is a variant of the HBCO-correction (Barta / Štolc 2007). As the individual was above 19 years of age, differences in the dates of 10 to 20 years seem likely (Tütken 2010, 35 fig. 2). Calibrated individually with OxCal 4.3, the dates range between 5053 and 4848 cal BC (R_Date Poz-87474, VEL16 S14 – sample 141, skull fragment) and 4941 and 4729 cal BC (R_Date Poz-87473, VEL16 S14 – sample 134, rib fragment), respectively (2-sigma). The command 'Combine'[8] gives a relatively low A_{comb}-value of 60.1 % (threshold-value 50 %; individual agreement of the dates between 69 and 70.4 %), but the chi-square-test is not significant (T = 3.144; 5 %-level 3.841). Therefore, the combination of the two dates is possible. The combined age falls between 4987 and 4841 cal BC (2-sigma).

If we assume an interval of 20 years between the formation of the two bone elements, the agreement increases significantly (83.9 and 87.9 % respectively) with an overall A_{comb}-value of 80.6. The individual dates now range from 4992 to 4843 cal BC and 4972 to 4823 cal BC respectively (2-sigma), and the combined date is 4972 to 4823 cal BC (2-sigma).

Interpretation

Because the axis of the body runs orthogonal to the axis of the long pit, a hypothesis was already formed during the excavation that the burial was intentionally deposited in this way, in connection with the long pit. The fact that the upper part of the body clearly lay outside the area of the long pit *object* 144 is puzzling. Despite all efforts, it was not possible to detect any traces of a burial pit filling. Thus, either the long pit extended further and enclosed the body, or the pit for the burial was dug into it. Either way, the filling must have been composed of loess, which could not be distinguished from the loess of the surrounding.

The distorted position of the cervical spine, as well as the position of the right arm lead to the assumption that the body was partly decomposed before it was buried, or that the body decomposed elsewhere before it was placed in the location of the discovery. It does seem that the individual died between roughly 4950 and 4800 cal BC (assuming that the formation of the bone collagen in the ribs predates the death by around 10 years [Tütken 2010, 35 fig. 2]). Thus, the deposition of the body marks one of the last events in the area of the excavated group of houses, and probably also in the entire southeast settlement at Vráble.

^{14}C-dates

Apart from two ^{14}C-dates from pit 114 (on cereal grains) and two from the human skeleton (see above), 25 samples from animal bones were submitted for ^{14}C-dating. They all derive

[8] We use 'Combine' (combining after calibration) instead of 'R_Combine' (combining before calibration) because we have to assume that the two samples do *not* belong to the same reservoir, given the relative age differences in forming of the respective bone. See the OxCal 4.3 Manual on this: https://c14.arch.ox.ac.uk/oxcalhelp/hlp_contents.html (access: 2018/06/28).

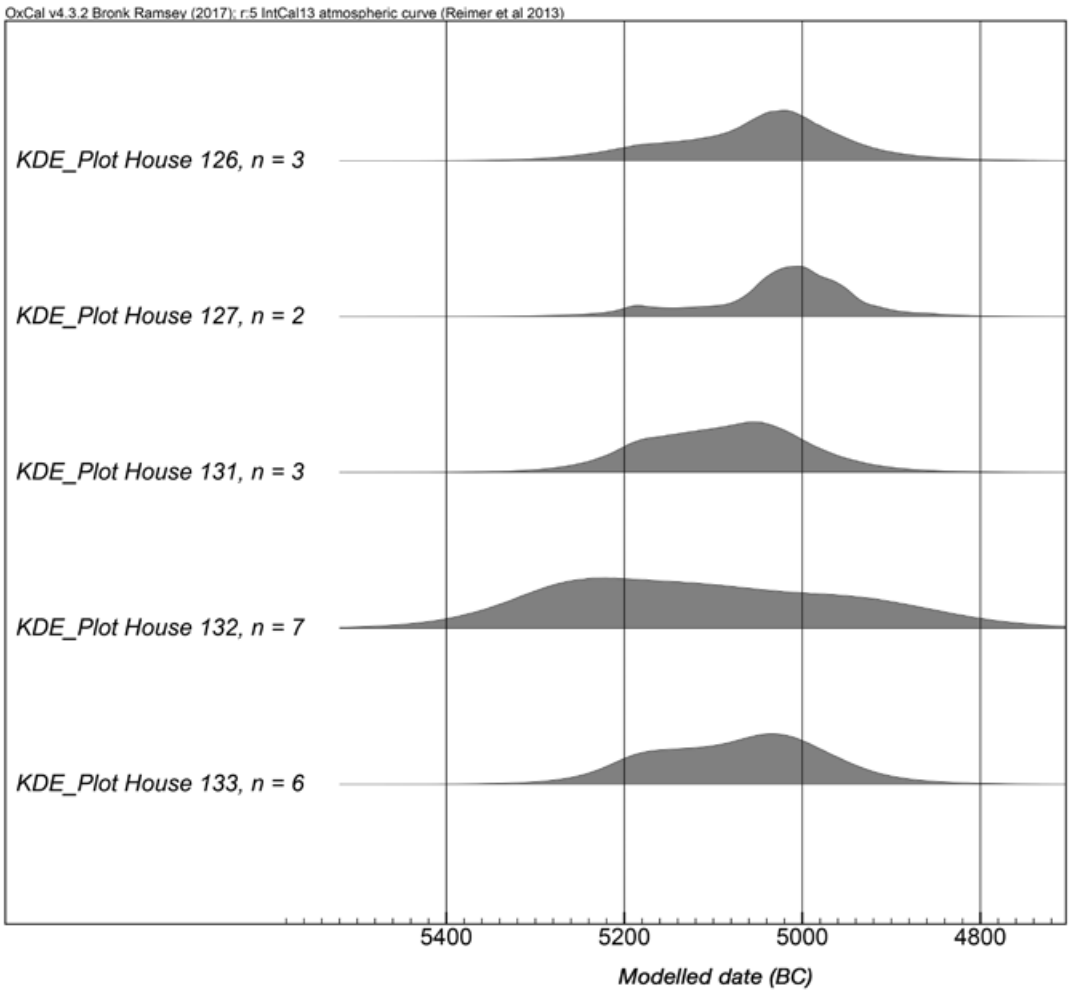

Fig. 28. KDE-plots (Bronk Ramsey 2017) of ^{14}C-dates of houses in the area excavated in 2016. For individual dates see *table 7*.

from long pits. In terms of sampling, it is preferable to obtain dates from articulated bones which can be taken as an indication that the bones were not disturbed after deposition (Bayliss et al. 2011, 38–42; Denaire et al. 2017). However, in general, bone preservation was very poor, and, except for the human skeleton (see above), a case for articulated deposition could not plausibly be made for any of the bones.

Four samples (Poz-87387, Poz-87444, Poz-87455, Poz-87470) yielded very poor collagen ratios. Therefore, the laboratory advised taking into account that the related dates might by too young. Indeed, these four dates are among the six youngest, and Poz-87387, Poz-87455, Poz-87470 are the youngest dates. Thus, we excluded from consideration the four dates on the bones with poor collagen.

KDE-plots of dates for all the houses *(fig. 28; tab. 7)* indicate two things. On the one hand, there is a clear temporal sequence of the excavated structures. The oldest dates, those from house 132, fall into the period well before 5200 cal BC, while the youngest houses, 126 and 127 (see discussion above on the spatial relationship of these two houses), were

Lab-code	trench	find	House	Object	^{14}C-age	material	collagen %
Poz-87387	13	224	132	24	5590 ± 120	animal bone	0.0
Poz-87436	11	147	132	24	6300 ± 50	animal bone	0.2
Poz-87437	11	166	132	9	6070 ± 40	animal bone	0.3
Poz-87438	11	177	132	24	6000 ± 35	animal bone	2.4
Poz-87439	11	216	133	37	6140 ± 40	animal bone	1.8
Poz-87440	11	231	133	37	6080 ± 40	animal bone	3.8
Poz-87441	11	279	132	24	6130 ± 40	animal bone	1.7
Poz-87443	12	150	131	65	6170 ± 35	animal bone	1.8
Poz-87444	12	328	132	9	6050 ± 50	animal bone	0.07
Poz-87445	12	342	131	57	6100 ± 35	animal bone	0.9
Poz-87446	12	654	132	9	6270 ± 40	animal bone	3.2
Poz-87447	12	663	131	57	6140 ± 35	animal bone	1.6
Poz-87448	12	698	132	9	6220 ± 40	animal bone	0.3
Poz-87449	13	116	132	24	6200 ± 40	animal bone	1.2
Poz-87450	13	231	133	26	6110 ± 40	animal bone	2.7
Poz-87451	13	245	133	26	6110 ± 40	animal bone	5.8
Poz-87453	13	247	133	26	6190 ± 40	animal bone	2.4
Poz-87454	13	248	133	26	6130 ± 40	animal bone	0.3
Poz-87455	14	66	126	124	5860 ± 40	animal bone	0.08
Poz-87456	14	75	126	124	6130 ± 40	animal bone	0.8
Poz-87470	14	76	127	157	5880 ± 40	animal bone	0.15
Poz-87472	14	100	127	144	6080 ± 35	animal bone	4.6
Poz-87473	14	134	127	145	5960 ± 40	human bone (phalanx)	0.9
Poz-87474	14	141	127	145	6060 ± 35	human bone (skull)	0.7
Poz-87475	14	153	126	123	6115 ± 35	animal bone	1.5
Poz-87476	14	156	126	123	6080 ± 40	animal bone	2
Poz-87477	14	189	127	144	6110 ± 40	animal bone	1.3
Poz-90137	13	81		114	6100 ± 40	charred grain	
Poz-90138	13	60		114	6180 ± 40	charred grain	

Tab. 7. List of ^{14}C-samples and dates.

perhaps still in use after 5000 cal BC. In this regard, the dates from the skeleton correspond well, since the burial in the east long pit of house 127 likely took place after 4950 cal BC (see above). Houses 131 and 133 could have been more or less contemporary and were erected after 5200 cal BC.

On the other hand, it is also obvious that the long pits, from which the dated samples derive, have a complex taphonomy. This is evident, for example, in the case of the dates from house 132, which span roughly 5300–4900 cal BC. It seems probable that either the long pits of house 132 were open / in use for a considerable period of time, or they were reopened after they went out of use and the fill was disturbed. The latter explanation seems very likely when the close spatial relationship of house 132 and houses 131 and 133 is taken into consideration. What remains puzzling, however, is the fact that the layer of scattered daub pieces that seals many of the long pits (see above) appears undisturbed. This layer should, therefore, be interpreted as a closing event.

A more detailed discussion and Bayesian modelling of the dates is provided elsewhere (Meadows et al. 2019).

Archaeobotanical analysis

Summary of the previous archaeobotanical work

Archaeobotanical samples at Vráble have been collected since 2012. First results of the archaeobotanical analysis relate to the excavations in 2012 (Furholt et al. 2014); they provided the first information on the preservation and density of charred plant remains and noted the presence of a number of crop and wild species. Overall, the assemblage was small and the density of charred macro remains low. Based on their number and the frequency of their occurrence, the analysis identified emmer and einkorn as the most important crops, and lentil and probably pea as less well represented cultivated species. Cereal (wheat) remains were mostly represented by grain, and only a few glume bases were discovered. Broomcorn millet grains were also encountered, in very small number, and their radiocarbon dates show that they are later intrusions. Remains of wild edible fruit were occasionally detected and included shell fragments of hazelnut and fruit stone fragments of Cornelian cherry. Seeds were registered of some other wild species that may have also been of use to the Neolithic inhabitants of Vráble – for instance dwarf elder, mallow, and goosefoot – or they could have arrived at the site as arable weeds and ruderal species together with other plants of this category that were present in the samples.

Field and laboratory methodology

The sampling strategy in 2012 was to target those contexts that looked most promising to contain charred material, as the aim of this first season was to assess the general potential of the site. The remains were recovered from 98 archaeobotanical samples (the additional 24 samples taken in 2012 did not contain charred plant material). Field processing of the samples included bucket flotation, drying, and quick scanning of the heavy residue. In 2013, a standard sampling procedure was introduced which has since been in place. Soil samples are taken from each excavated *object* and different parts of the *objects*, as well as from randomly selected individual layers, including arbitrary layers (spits). The desired volume for archaeobotanical samples is set at ten litres of soil (wherever possible). Field recovery consists of bucket flotation and the use of a 0.3 mm sieve for collecting the light fraction. The heavy fraction is rapidly scanned immediately after flotation and then discarded; so far, none of the heavy fractions has yielded remains of charred seed/fruit, while they occasionally contain few small wood charcoal fragments. Larger charcoal pieces noted during the excavation were sometimes collected by hand.

Light residue fractions are transported to the laboratory in Kiel where they are fully sorted for charred macros and wood. The seed / fruit / chaff remains are identified (using the in-house seed reference collection and seed atlases when necessary) and counted. The data are entered into *ArboDat* database (thus the species names follow the nomenclature used by the database).

The samples collected at Vráble in 2016

In the course of the 2016 excavation season, 93 flotation samples measuring altogether 907 litres were taken from the four trenches explored. Of these, two samples did not yield any

Fig. 29. Cereal grains from house 131: 1 Einkorn; 2 Emmer (photos: D. Filipović).

botanical remains, whereas nine samples produced only wood charcoal. Another 31 hand-collected botanical samples were also sorted; the majority of them yielded charcoal fragments, while two samples contained a few fragments of hazelnut shell. *Table 8* lists all the samples, the recorded taxa and their absolute quantities[9]. A total of 339 countable items were recorded; categories such as fragments of parenchyma tissue, indeterminate vegetable matter, indeterminate seed, pod, culm fragments, etc. (see *tab. 8*) were not included in the total. Hazelnut MNI (minimum number of individuals) was determined arbitrarily; where up to 20 nutshell fragments were found, a MNI of one was assigned. Only one sample yielded more fragments (41, sample 12360) and was, accordingly, converted to an MNI of two.

The average density of the 82 samples that produced seed/fruit remains is extremely low – 0.4 items per litre of soil. Only several (7 = 8 %) samples have a density of 1 or more; the maximum density is recorded in samples 13081 (3.3) and 13060 (4.9). These two samples yielded the highest number of cereal grains in the assemblage; they come from the fill of a pit for which a working hypothesis suggests that it served for (crop) storage. However, without the evidence of *in situ* burning in the pit, due to which the grain would have been charred, it remains unclear whether the charred grain represents traces of the 'original' content of the pit.

Cereals dominate the Vráble 2016 botanical assemblage, amounting to c. 84 % of the total remains found; this group is mostly composed of grain – few glume bases were encountered. A large number of cereal grains are fragmented and eroded beyond the possibility of more specific identification. Of the identifiable grain, the vast majority belongs to einkorn *(fig. 29.1)*. Other represented cereals include emmer *(fig. 29.2)*, barley and free-threshing wheat. The single grain of broomcorn millet is considered a later addition (intrusion) in the deposit, in line with the previous conclusions on the status of this taxon (see above). The remains of pulses are few and include badly preserved lentils and peas.

[9] *Table 8* is available online, doi: https://doi.org/10.11588/data/HF0LX9.

The botanical archive also includes some indicators of the gathering of wild edible fruit – namely shell fragments of hazelnut and seeds of wild strawberry *(Fragaria vesca)*, Chinese lantern *(Physalis alkekengi)*, dwarf elder *(Sambucus ebulus)*, and possibly some other taxa that remained unidentified. Within the small assemblage of taxa growing as arable weeds and / or ruderals of disturbed places (e. g. roadsides, waste areas, edges of crop fields / gardens, etc.), fat-hen *(Chenopodium album)* is somewhat more visible as it occurs in several samples, but is actually present in very low numbers per sample.

Silicified and desiccated cereal chaff (glumes) and impressions of rachis segments were noted in the matrix of burnt daub, testifying to the use of crop by-products to temper the building material.

The small number of remains largely precludes any further consideration based on their quantity that would, for instance, include mapping the distribution of different taxa across the excavated area or detecting differences in the representation of charred plant remains that would potentially point to activity areas. The uniformity in the low visibility of plant material across excavated areas and different contexts is perhaps due to the nature of the contexts as they, according to the archaeological interpretation, are likely to have a complex taphonomy.

Discussion

Summary of the excavation results

During the 2016 excavation, five houses consisting of an elongated pit at each lateral side and several rows of postholes were partly or completely excavated. There is a certain variability between the houses in the distance between the posts and the rows of posts, which could indicate chronological variation. Additionally, four beehive-shaped storage pits, several pits of less well-defined character, as well as a possible sunken-floor house were discovered. Based on the relative depth of the *objects*, sloping of the terrain of c. 4 % can be reconstructed, which is larger than the present day slope. An extraordinary finding is the human skeleton in a long pit from house 127. While the material culture conforms to the expected repertoire, the amount of flint recovered artefacts in general, and obsidian in particular, was much higher than in previous campaigns.

The area excavated in 2016 enabled us to explore in more detail patterns in the spatial and temporal relationships between houses within a house cluster. Both the stratigraphy (at the intersection of the lateral pits of neighbouring houses) and the ^{14}C-dating (Meadows et al. 2019) indicate the following chronological sequence. House 132 is the oldest building in this cluster, while houses 131 and 133, located to the west and east of 132, are younger – both probably erected after the abandonment of 132. Houses 126 and 127, which did not have any stratigraphic connection to the other houses, appear to have been slightly younger than houses 131 and 133.

The distribution of flint and obsidian tools in these houses is of particular interest. In house 132, 27 chipped stone artefacts were found, a third of which were made of obsidian. In addition, fragments of two Bükk culture style pots were found here. Their co-occurrence with obsidian is typical of the SW-Slovakian LBK, as reported by S. Šiška (1995). The Bükk pottery is most commonly found in eastern Slovakia and northeastern Hungary (ibid.), the regions in which the relevant obsidian sources are located. In the two successive houses, 131 and 133, the horizontal distribution and the distribution through the layers of both flint and obsidian tools were variable. In house 131, 112 chipped stone tools were found, half of which are obsidian, including an obsidian core and two core fragments. By

contrast, house 133 yielded 91 chipped stone tools, less than a third of which are obsidian. The density of this type of finds (number of items per litre of excavated soil) reveals significant differences between the houses.

Similarly striking are the differences in tool types. In house 131, more specialised tools for drilling and perhaps leather working (i. e. pieces with sickle gloss on undamaged edges) were found, while scrapers were abundant in house 133 and were potentially used in woodworking. It thus seems that there were differences in both the raw-material used and the production of chipped stone tools between the more or less contemporaneous houses 131 and 133.

As for the pottery, *figure 21* indicates that there is variation among the houses in the quantity of pottery deposited, and in the number of decorated vessels. House 131 yielded much less pottery than houses 132 and 133 *(fig. 19)*. Based on the quantity of sherds per litre of soil, house 133 yielded the highest density of material. On the other hand, in house 131 the ratio between decorated pottery fragments and the weight of sherds is the highest. Therefore, while the relative amount of pottery in house 131 was lower than that recovered from houses 132 and 133, there was more decorated pottery there. Furthermore, a correspondence analysis of the motives indicated house-specific ornamentation traditions.

Comparison of the assemblages from different excavation areas

When comparing the quantitative results of archaeobotanical analysis for the areas excavated in 2016 (*tab. 8*. See online supplementary material: https://doi.org/10.11588/data/HF0LX9) to the corresponding data from previous season, that is from other excavation trenches and thus other house clusters, we find clear differences. The emmer to einkorn ratio in the different areas is 3.6 : 1 for the 2012 area (southwest settlement; Furholt et al. 2014, 243 ff.), 1 : 1 for the areas excavated in 2013 (southeast settlement) and 2014 (north settlement; Furholt et al. in prep.) and 0.1 : 1 for the 2016 area (southeast settlement; see above). This may reflect chronological differences and/or variation in the plant management strategies between different house clusters. A similar differentiation is indicated by the comparison of chipped stone assemblages. Both flint and obsidian are much more frequent in the 2016 area than in all other excavation areas combined. Outside the house cluster investigated in 2016, obsidian is a rare occurrence; altogether only three artefacts were found in the campaigns 2012–2014 (Furholt et al 2014, 243; Furholt et al. in prep.). For the pottery, current data allow only a comparison of the results from seasons 2013 (Furholt et al. in prep.) and 2016. It is, however, striking that the area excavated in 2016 yielded much less pottery (in weight, per volume of soil) and a significantly lower ratio of decorated to non-decorated sherds, as is especially visible in house 102 *(fig. 30)*. Results of the analysis of animal bone (Eckelmann 2017) hint towards significant differences between house clusters in the species representation.

Although the data on the different assemblages are still incomplete, an initial observation is that the variation in the composition of materials is much greater between the house clusters than within the individual clusters. This may be due to differences in practices between groups of houses (e. g. use of raw materials, plant cultivation strategies, pottery ornamentation and discard); the differences between single houses are much less visible. The house cluster excavated in 2016 stands out by the quantity and distribution of chipped stone artefacts, tool types, and the amount of obsidian pieces.

The latter could be interpreted in two ways. One could assume unequal access to obsidian as a raw material. This would be an argument towards a restricted access to an exotic resource and the existence of household- or house group-based rights to resource exploita-

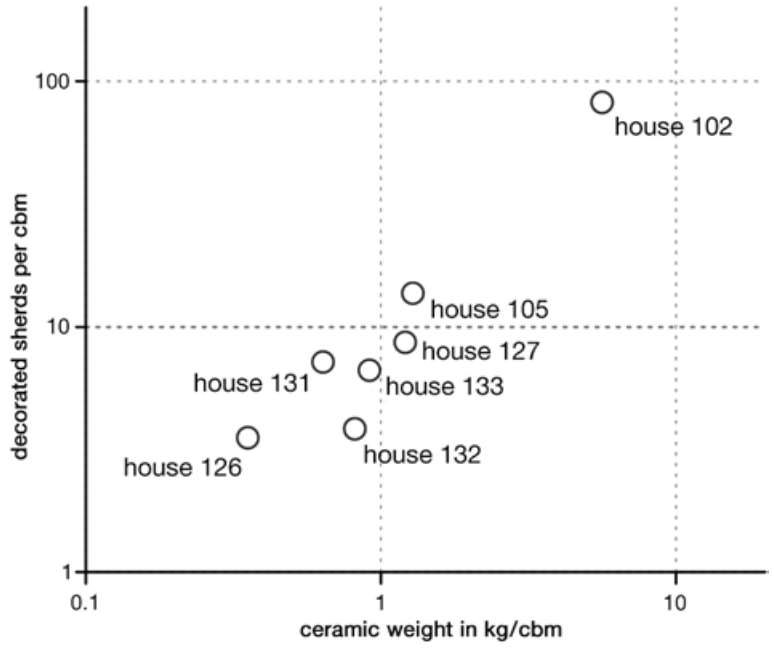

Fig. 30. Number of decorated sherds and weight of ceramics (in kilogrammes) in relation to the volume of excavated earth (in cubic metres). Note the logarithmic scale.

tion. However, since the large amount of obsidian in the houses excavated in 2016 matches the generally high numbers of chipped stone tools in these houses, this could (also) be interpreted as reflecting specialisation of activities at the level of houses / house groups. This is also implied by the distinctive tool sets found in houses 131 and 133. Perhaps the houses excavated in 2016 represented an integrated economic unit, rather than several independent households. The similarity in the amount of decorated pottery and types of ornaments (Wolthoff 2017) support this impression. Thus, our working hypothesis is that economic activities at Vráble were organised at the level of house clusters and not individual households, and that food and products such as worked hide or wood were shared between houses of the same cluster.

Conclusion: contemporary occupation of the sites

The newly available ^{14}C-dates, as well as those from 2012 (Furholt et al. 2014, 240 f.) hint at an at least partial, if not complete temporal overlap of the southwest and southeast settlements. As a substantial number of further dates show (Meadows et al. 2019), this is true for all three settlements: they were occupied concurrently for about 300 years from 5250 to 4950 cal BC. An obvious question to ask is then: what motivated the division into three distinct settlements? One could argue that the space available in one of the settlements became insufficient; the neighbouring elevation on the other side of the creek would then have offered a readily-available opportunity for an expansion or relocation.

However, several indicators suggest that there was more to this development than the need for additional (residential) space. The first is that all three sites in Vráble share a similar shape. In layout, they all have a near-trapezoid shape, the widest side of which is always

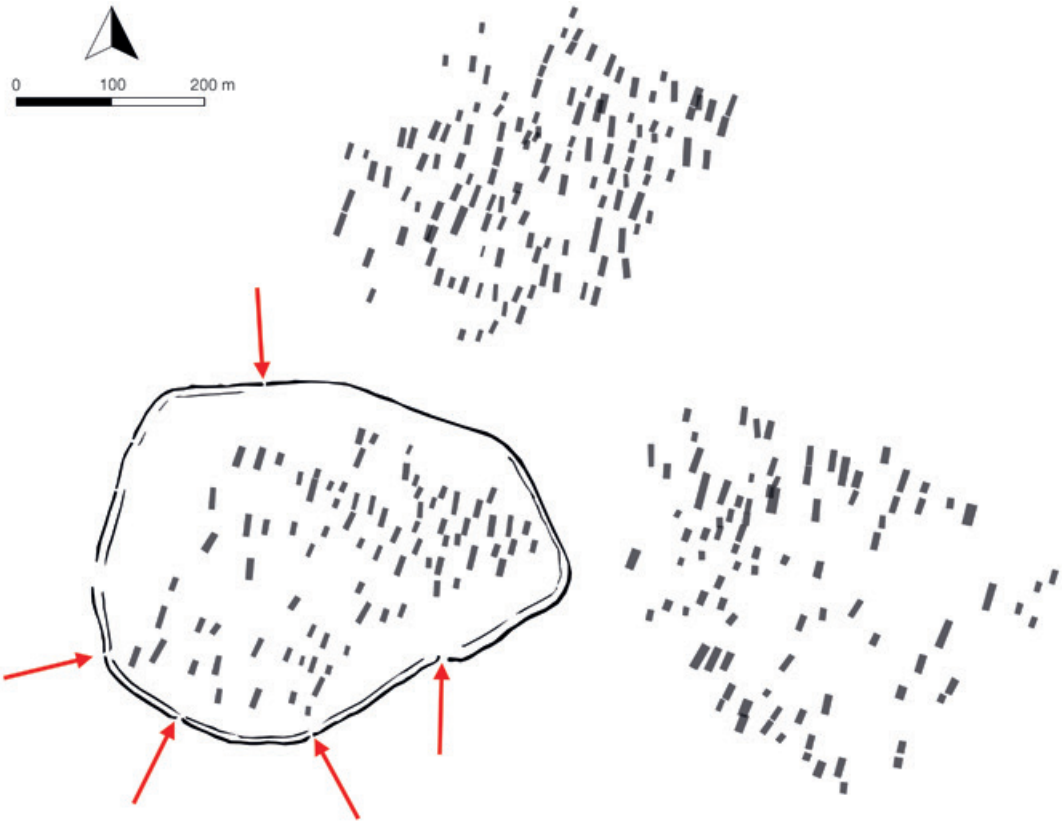

Fig. 31. Schematic plan of the three settlements. Entrances to the southwest settlement are marked by arrows.

in the north, and they have comparable sizes – around 13–14 ha[10]. There seems to have existed a shared idea as to settlement planning. This impression is supported by the fact that, although the arrangement of the houses of the southwest settlement, 10 ha in extent, does not follow the trapezoid outline, the 14 ha-large enclosed area is again trapezoid in plan, with the longest side of the trapezoid in the northeast; so even if the whole enclosed area is not filled with house plans, the common concept is reproduced and maintained. The decision to settle in one of the three locations seems to have been carefully planned, and it included the founding of an altogether new settlement; it most likely was not simply a consequence of the need for more space. Rather than enlarging one settlement to create additional space, two entirely new settlements were built. Furthermore, the boundary of the southwest settlement was demarcated by an elaborate double ditch and palisade system; this settlement was, thus, very clearly separated from the other two. Even more curious is the position of its entrances, clearly visible in the magnetic plan *(fig. 31)*. The entrances (five in total) were positioned to face in all directions, except in the direction of the two other settlements. The entrance closest to the southeast settlement is, moreover, constructed on a strange bend of the ditch, as if the intention was to place it far away from

[10] Note that the northern settlement, 'Farské', has been partly destroyed by modern construction of buildings in the northwest and thus appears slightly smaller than it probably was.

the southeast settlement. The ditch and the palisade appear to have served to isolate the southwest settlement from the neighbours and to form a physical barrier to the interaction between the groups living in immediate vicinity of each other.

In view of this obvious need for separation, the differences in material culture and subsistence outlined above gain in significance. However, it is important to stress that this common notion about the size and shape of the occupied area, the concept of the trapezoid outline of the village, is not in any way typical of an LBK settlement. On the contrary, shapes and sizes of LBK settlements are quite diverse. Therefore, the repetition of the same shape in Vráble is remarkable and has to be viewed as a shared cultural trait of the people who lived in the three settlements. This common cultural trait and the decision to live in such a close proximity point to some kind of collective social identity, even though there was a simultaneous drive or need to live in three separate settlements.

A viable model for the interpretation of this process would be the one of social fission and fusion (Goody 1969). In connection with the eastern Mediterranean Neolithic, Leppard (2014) has proposed social fission as a strategy aimed at resolving the economic tension between the need to store surplus grain and the moral imperative towards sharing food, that is the incentive to hoard and accumulate and the communal ethos of sharing. In an environment with no natural limits and with no scarcity of fertile soils, communities to which these contradicting tendencies are inherent are likely to remain in a constantly fragile state, in which social fission would be a viable and effective way of countering emerging inequalities in the access to food or resources. Leppard (ibid.) proposes social fragility as the main mechanism driving the Neolithic expansion into Europe; but, on a lower scale, it could also be seen as a model of the social development of LBK communities.

The data from the house cluster excavated at Vráble in 2016 shed at least some light on how this mechanism could potentially have been enacted. This cluster initially started out as a single building (house 132), which later expanded into a cluster of two or three houses. We would therefore argue that the decision to leave the old community and join the new one was made by a small group of people, maybe a single household, rather than by a large group. The subsequent split into two, or possibly three, houses could reflect household reproduction (e. g. from nuclear to extended family). Alternatively, the new settlement areas could have been founded by individuals or groups coming in from other places. One possible (and obvious) source of such a population influx could have been the neighbouring settlements, but inhabitants of the other settlements in the Žitava valley or of locations even farther away must also be considered.

The distinction between the potentially multiple origins of the residents of the three Vráble settlements is of key importance to the application of the fission-and-fusion model to Vráble. Furthermore, the processes of fission and fusion within a community may have taken the form of alternating phases in the settlement's history, and may have run in parallel with (successive) movements of people between the three Vráble settlements, and perhaps also with the influx of people from elsewhere. The finds of obsidian and Bükk style pottery indicate that there could have been new groups of people coming from outside the Vráble region and settling there. Our task is then to assess to what degree the newcomers could have contributed to the population of the site.

Another possible explanation for the development of settlement at Vráble could be the existence of a completely 'open' community, where some people left Vráble, while, at the same time, newcomers arrived (e. g. Hamnett 1985 – 'pre-contact movement'). The results of the excavations in 2017, which revealed a substantial number of individuals buried in and around the ditch system of the southwest settlement, may help us evaluate which of these three models best applies to Vráble.

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The LBK site of Vráble in Southwestern Slovakia: Selected results of the excavation season 2016

Summary · Zusammenfassung · Resumé

SUMMARY · This paper presents selected results of the excavation campaign 2016 in the southeastern of the three LBK settlements of Vráble/Slovakia. On a total area of 2283 m^2 five LBK longhouses with their characteristic cross-rows of three posts and long pits flanking the houses were completely or partially uncovered, in addition four storage pits and a possible sunken-floor building. Numerous ^{14}C dates as well as stratigraphic relations show that the excavated houses were not, as originally assumed, in use at the same time, but represent a time depth of up to 200 years. The spectrum of finds includes typical artefacts of the LBK such as pottery, chipped stone tools, ground stone tools and bone tools. However, the houses show subtle differences in their material culture, obsidian artefacts and some fragments of the so-called "Bükk pottery" refer to long-distance contacts in Eastern Slovakia. As an outstanding find, an obsidian core was recovered from one of the post holes. It must have been deliberately deposited in the post hole, either when the house was built or when it was dismantled. A fairly complete human skeleton was found in a long pit. The male individual aged 20–35 had been laying open for some time as dislocated bones show. The poorly preserved archaeobotanical remains are dominated by einkorn, emmer is much rarer. The paper concludes with reflections on the social relations between the inhabitants of the three largely simultaneous settlements of Vráble, which, in spite of all similarities, were obviously deliberately marking-off from each other. This is particularly evident in the enclosure around the southwestern settlement, which has no entrances to the other two settlements. This could be the reaction to "fission-and-fusion" processes in which social tensions are resolved or mitigated by the constant rearrangement of social relations.

ZUSAMMENFASSUNG · Der vorliegende Aufsatz präsentiert selektive Ergebnisse der Grabungskampagne 2016 in der südöstlichen der drei bandkeramischen Siedlungen von Vráble/Südwestslowakei. Auf einer Fläche von insgesamt 2283 m² wurden fünf bandkeramische Langhäuser mit ihren charakteristischen Pfostenreihen und hausbegleitenden Längsgruben ganz oder teilweise aufgedeckt, dazu vier Vorratsgruben und ein mögliches Grubenhaus. Zahlreiche ^{14}C-Daten sowie stratigraphische Überlagerungen zeigen, dass die ausgegrabenen Häuser nicht, wie ursprünglich vermutet, zeitgleich in Benutzung waren, sondern eine Zeittiefe von bis zu 200 Jahren repräsentieren. Das Fundspektrum umfasst typische Artefakte der Linearbandkeramik wie Keramik, geschlagene Steingeräte, Felsgesteingeräte und Knochengeräte, wobei zwischen den Häusern durchaus Unterschiede in der Fundzusammensetzung bestehen. Artefakte aus Obsidian sowie einige Scherben der sogenannten „Bükker Keramik" verweisen auf Fernkontakte in die Ostslowakei. Als herausragender Fund wurde aus einem der Pfostenlöcher ein Kern aus Obsidian geborgen, der dort bei Anlage oder Abbruch des Hauses deponiert worden sein muss. In einer Längsgrube fand sich ein weitgehend vollständiges menschliches Skelett. Das männliche, 20–35jährige Individuum lag offensichtlich längere Zeit offen, wie Dislokationen der Knochen zeigen. Die insgesamt schlecht erhaltenen archäobotanischen Überreste sind dominiert von Einkorn, Emmer kommt wesentlich seltener vor. Der Aufsatz schließt mit Überlegungen zu den sozialen Beziehungen zwischen den drei weitgehend gleichzeitigen Siedlungen von Vráble, die sich bei allen Ähnlichkeiten offenbar auch bewusst gegeneinander abgrenzten. Besonders deutlich wird dies am Grabenwerk um die südwestliche Siedlung, das zu den beiden anderen Siedlungen keine Eingänge aufweist. Dies könnte die

Reaktion auf „fission-and-fusion"-Prozesse sein, bei denen soziale Spannungen durch die konstante Neuarrangierung der sozialen Beziehungen aufgelöst oder abgemildert werden.

RESUMÉ · Cet article présente une sélection des résultats de la campagne de fouilles menée en 2016 dans celui des trois habitats rubanés de Vráble (Slovaquie sud-occidentale) qui se situe au sud-est. Une surface totale de 2283 m² a révélé, partiellement ou totalement, cinq maisons longues du Rubané avec leurs rangées de poteaux caractéristiques et les fosses allongées longeant les maisons, et encore quatre fosses à provisions et une maison probablement semi-enterrée. Toute une série de datations au radiocarbone, ainsi que des recoupements stratigraphiques, indiquent que les maisons mises au jour n'étaient pas contemporaines, comme on l'avait pensé au départ, mais qu'elles s'échelonnent sur une période atteignant 200 ans. L'éventail des trouvailles comprend des artefacts typiques du Rubané, tels que céramique, outils en pierre taillée, des outils sur roche, ainsi que des outils en os. Il faut cependant remarquer que l'éventail des objets varie entre les maisons. Des objets en obsidienne et quelques tessons de la « céramique de Bükk » révèlent des liens avec la Slovaquie orientale. Un trou de poteau a même livré une trouvaille exceptionnelle, un nucleus d'obsidienne vraisemblablement déposé là lors de la construction ou de la destruction de la maison. On a aussi trouvé un squelette humain complet dans une des fosses allongées. Cet individu, âgé de 20-35 ans, a du reposer un certain temps à l'air libre, comme l'indiquent les os disloqués. Les restes archéobotaniques généralement mal conservés comprennent surtout de l'engrain, l'amidonnier est bien plus rare. L'article s'achève par une réflexion sur les rapports sociaux entre les trois villages de Vráble, en grande partie contemporains, qui, malgré leurs similitudes, se distinguaient sciemment. L'habitat du sud-ouest le démontre particulièrement bien à travers ses fossés qui ne présentent aucun accès aux deux autres villages. Ceci pourrait être une réaction aux processus- « fission-and-fusion » qui permettent de résoudre ou d'adoucir les tensions sociales par un réajustement constant des relations sociales. (Y. G.)

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