

The early days of Neolithic Alsónyék: the Starčevo occupation

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Southern Transdanubia on the eve of the Neolithic

The earliest Neolithic in the southern part of the Carpathian basin is represented by communities which share very similar material culture to those of the northern Balkans in the early sixth millennium cal BC.

Very limited evidence is available for the Mesolithic presence in Transdanubia, and until recently our knowledge was restricted to surface collections and stray finds (BÁNFFY et al. 2007, 56–57; EICHMANN et al. 2010, 215–223). The dataset has not allowed us to create adequate models of Mesolithic-Neolithic interactions on a regional scale, even when some of the assemblages, like that of the Kaposhomok site, have been re-evaluated (MARTON 2003). Various paleoenvironmental studies have indicated a pre-Neolithic anthropogenic impact on the environment and have served to refute former hypotheses that the Carpathian basin was abandoned in the Mesolithic, even in western Hungary (BÁNFFY 2004,

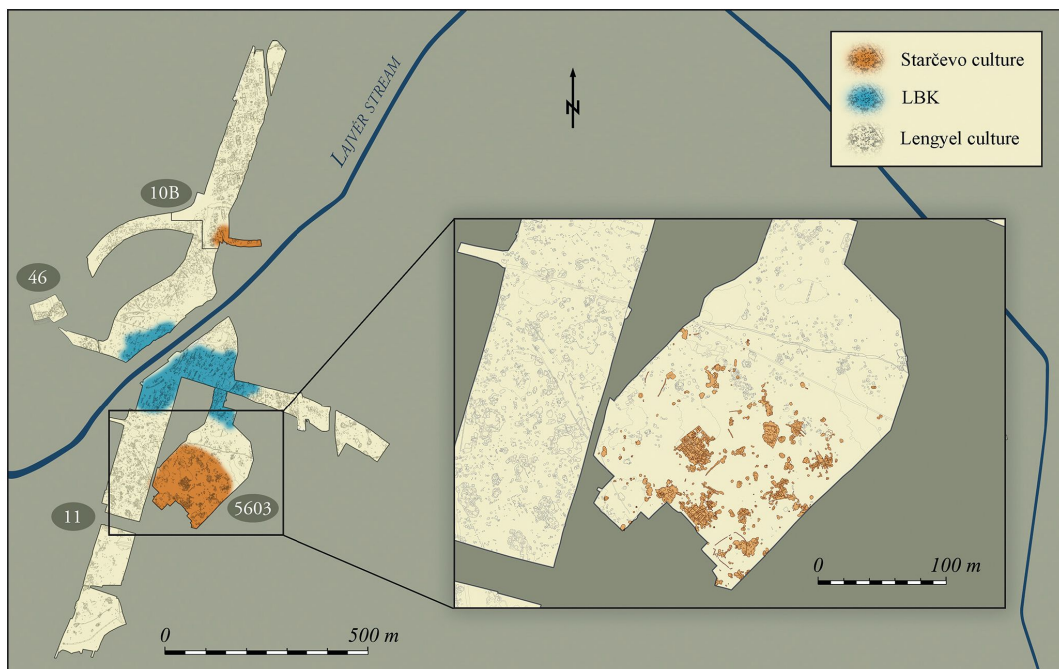


Fig. 1. Location of the Starčevo settlement within the Alsónyék complex.

354; BÁNFFY/SÜMEGI 2011; 2012). Intensive investigations during the last decade in the southern Transdanubian Kapos and Koppány valleys mark a new chapter in research on the Mesolithic in western Hungary, and the recently discovered site of Regöly 2 has been investigated by excavation as well (BÁNFFY et al. 2007, 57–59; EICHMANN et al. 2010, 223–227).

It has now been shown that the Hungarian territory that was to be populated by the Starčevo culture had been inhabited by hunter-gatherer groups in the Mesolithic, both in the inner area of southern Transdanubia and around Lake Balaton. Among the most important questions are the date of the appearance of the first food-producing communities and the pace of the spread of the Neolithic in the region.

The Starčevo occupation at Alsónyék

The Starčevo occupation uncovered at Alsónyék exemplifies the pace and scale of new Early Neolithic discoveries in south-east Transdanubia in the last decade or so. As noted by OSZTÁS et al. (this volume [a]), there are two apparently separate foci of Starčevo settlement, in subsites 10B and 5603, the larger of the two, in subsite 5603, being on a considerable scale (*fig. 1*). There, some 500 excavated features could be assigned to the Starčevo culture, with most of them being pits of various shapes and sizes. The smaller pits are usually 4–8 m long, and of round to oval shape. A recurrent feature are larger, intersecting pit complexes of irregular shape (perhaps used for multi-functional purposes, including clay extraction initially and for various depositions subsequently). Although some postholes were found, arranged in short lines, and a huge quantity of burnt daub recovered, definite house plans could not be securely identified. Parts of 20 possible, shallow bedding trenches were also found, of recurrent U-shaped cross-section and some with postholes, but these



Fig. 2. The radiocarbon-dated oven 1072 with grave 1061 discovered in the oven.

did not provide coherent house plans either. One further important group of features were the hearths. There were both hearths dug into the ground and oval clay ovens, the latter quite often with evidence of renewal or rebuilding. A different kind of oven with an elongated body was regularly placed into narrow, long pits. As their upper parts were never recovered, their complete form is uncertain (BÁNEFFY et al. 2010; 2014, 352–353, OSZTÁS et al. 2012, 378–379).

Overall, and using the evidence from subsite 5603 especially, the Starčevo occupation at Alsónyék represents a much larger and more intensively used Early Neolithic settlement than previously known in Transdanubia. One symptom of this is the exceptionally high number of Starčevo burials at Alsónyék, some 25 having been identified (KÖHLER 2015). There is some uncertainty in attribution, since with one exception, the Early Neolithic graves are unfurnished, and there are literally hundreds of Lengyel graves across subsite 5603 (OSZTÁS et al. this volume [b]). The predominant Starčevo body position was left-crouched, as in later phases too. The burials were often dug into pits or pit complexes. The skeletons are quite frequently associated with ovens (*fig. 2*), sometimes laid on the

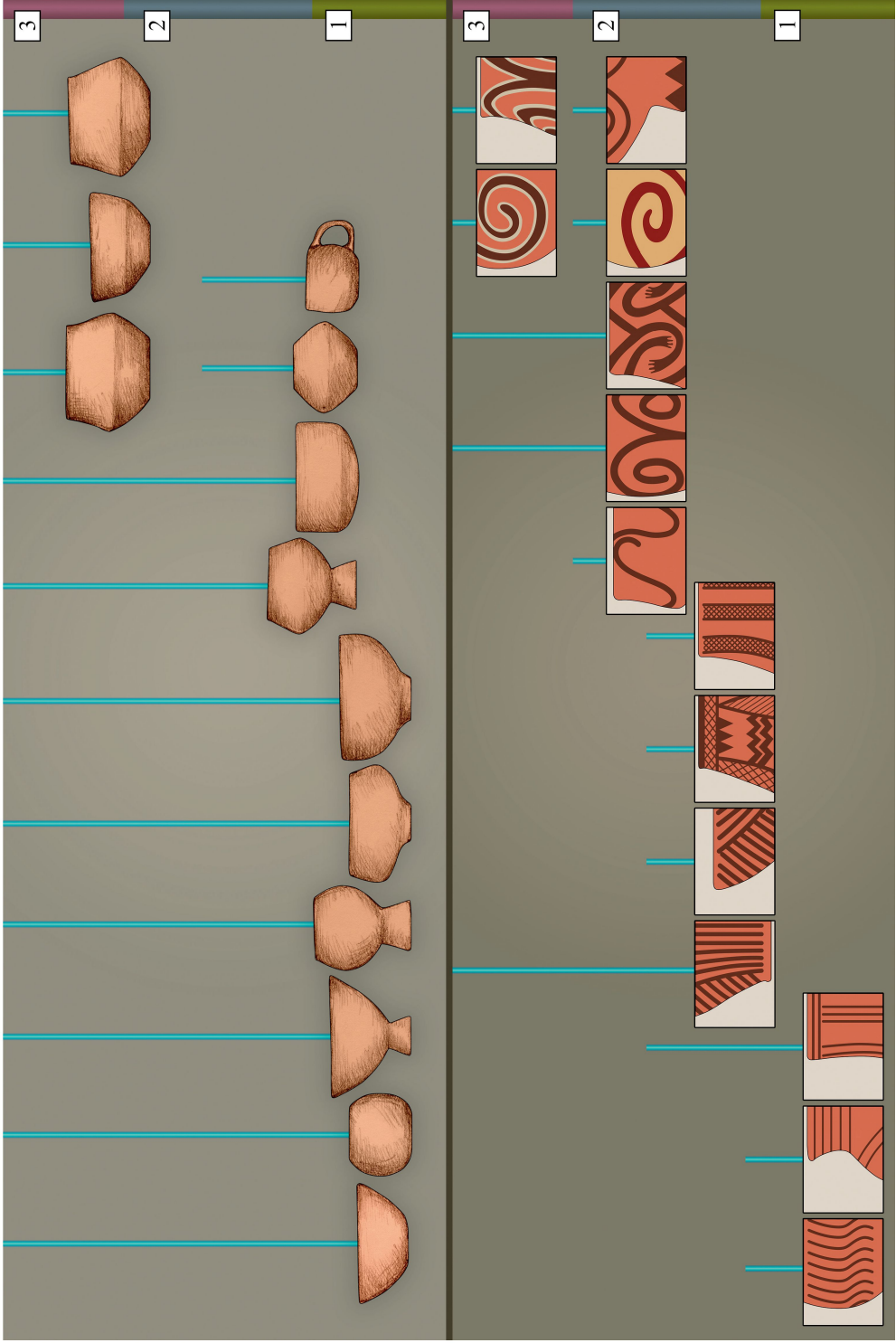


Fig. 3. Forms and painted pottery decorations of the three different style groups (1-3) of the Starčevo assemblage.

baking platform in a contracted position, but the human remains never show any traces of fire.

The Starčevo pottery assemblage appears typical. Sherds are organic-tempered, and red, light brown or greyish, with the signs of typical Early Neolithic low-temperature firing in their cross-sections. Forms and decoration are characteristic of the entire ceramic sequence of the Starčevo culture in Hungary previously recorded (KALICZ 1990, 49–77). Decoration includes painting, also previously recognised on Starčevo pottery in Hungary (KALICZ 1983 Abb. 7,1–4; 1990 Taf. 13; 26,2.4–5.8–10; KALICZ 2011 Abb. 2; 10,1a–b; KALICZ et al. 2007a fig. 4).

Three different pottery style groups were distinguished (*fig. 3*). Their separation is based on the typo-chronological sequence that was created through the analyses of Croatian Starčevo assemblages and reflects substantial stylistic changes in pottery painting (DIMITRIJEVIĆ 1969a; 1969b; 1974; MINICHREITER 1992, 41–49). Nevertheless, the frequency of certain shapes in fine-ware pottery appeared to be characteristic as well.

According to widely accepted opinion, the appearance of some of the characteristics described below is chronologically significant. It must be noted, however, that a substantial part of the ceramic assemblage was uncovered in pit complexes that appear to represent multi-event scenarios and multiple fillings (BÁNYFY et al. 2010, 40 fig. 3). Thus the differences between the recorded combinations of forms and decoration do not always reflect temporal changes in pottery style.

Conical and globular vessels are the most common shapes in Style group 1. Pinched decoration and an incised net pattern are particularly frequent decorations on the coarse ware, with linear painting present on fine ceramics (*fig. 4,2–5*).

Substantial changes can be seen in Style group 2, when channelled barbotine decoration appears in great quantity. Deep bowls with cylindrical upper and conical lower body and low pedestalled vessels are characteristic shapes. Single-handled cups and vessels standing on feet are also found. Besides simple linear painting, painted net patterns in stripes also occur (*fig. 4,1*). There are painted 'S' motifs and spirals, as well as black spirals on plain or red surfaces (*fig. 4,6–13*), and the so-called 'red on cream' painting was found on one single sherd.

Large numbers of biconical vessels with a sharp carination can be noted in Style group 3. The surfaces of the biconical pots are often highly polished. The main distinctive element of the decoration of Style group 3 is the polychrome painting. Black and brown spirals are sometimes framed by beige or whitish edges (*fig. 4,14–15*).

Four-legged, rectangular altars, often decorated with incised lines (BÁNYFY et al. 2010, 48–49) are characteristic for all three different pottery style groups of the assemblage. Similar zoomorphic figurines are present in the material as well. The anthropomorphic figurines are usually 8–15 cm high, rod-headed, steatopygous idols, which were composed from two symmetrical parts. There are some unique pieces as well, like the fragment of a more realistically depicted body with red slip and a fragment of a much larger figurine.

There are many grinding stones and a limited number of stone axes among the stone artefacts. The chipped stone artefacts are mostly truncated blades, scrapers and trapezes. The raw material is predominantly radiolarite from the nearby Mecsek Mountains, but there are some pieces made from Bakony radiolarite and a few pieces of obsidian could also be observed. Among the bone tools, the typical shouldered spoons of the Early Neolithic assemblages must be noted (BÁNYFY et al. 2010, 49).

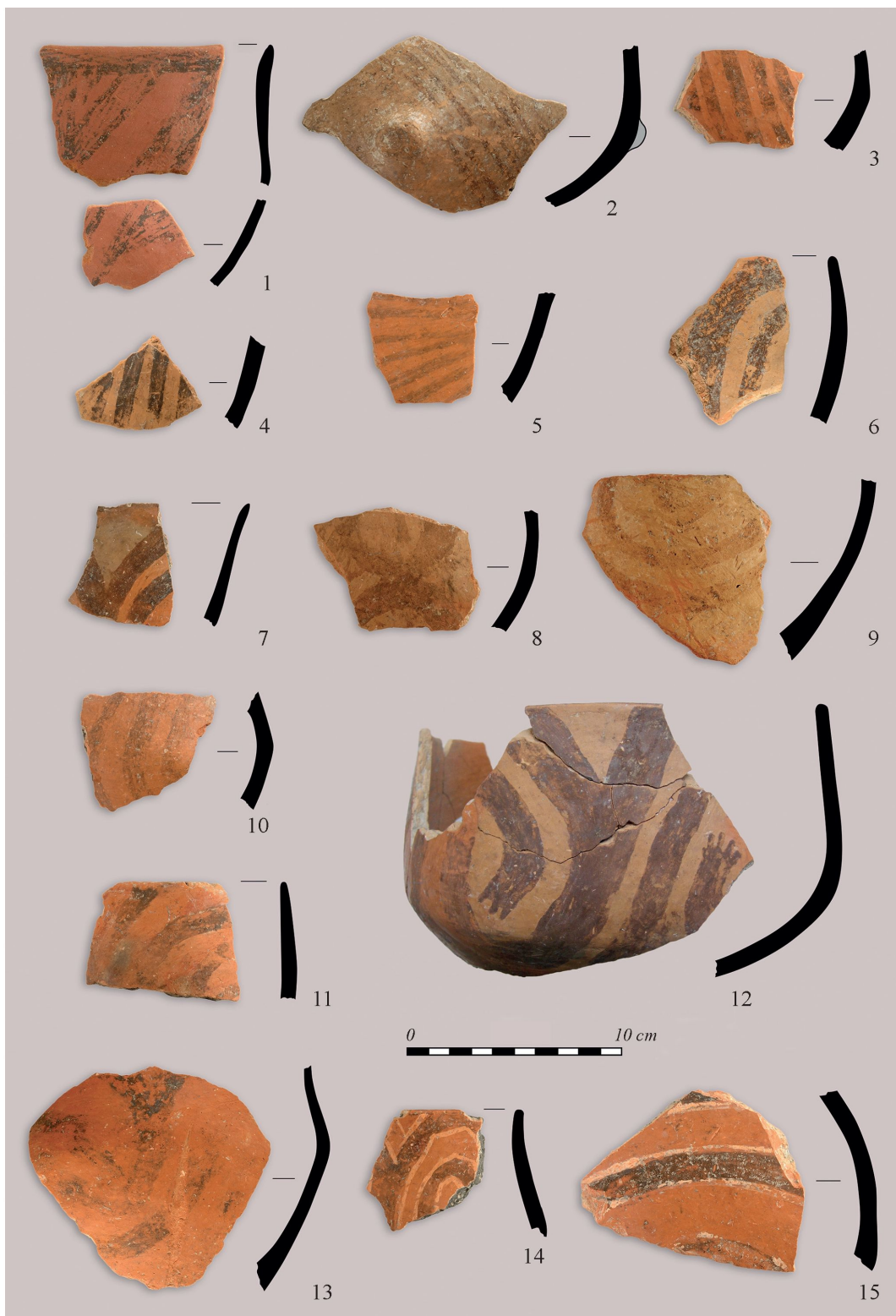


Fig. 4. Painted ceramic material from Starčevo features: 1 net pattern in stripes, 2–5 linear motifs, 6–13 spiral motifs, 14–15 spiral motifs in polychrome style.

The wider Starčevo culture context

In the early years of research, the Early Neolithic of Transdanubia was poorly investigated compared to the Great Hungarian Plain. There, to the east, the first sites of the Körös culture had already been discovered by the late nineteenth century (PULSZKY 1882; MILLER 1893), even though their correct place in the Neolithic sequence was only recognised in the late 1930s (TOMPA 1937; KUTZIÁN 1944; 1947). Any similar material culture was totally unknown from the western part of Hungary, where the LBK represented the earliest known Neolithic settlement right up to the 1970s (KALICZ / MAKKAY 1972a; 1972b). Nándor Kalicz and János Makkay recognised some assemblages with a typologically transitional character, and tried to introduce the so-called 'Medina type', based on a mixed assemblage, as a connecting link to the Early Neolithic of the northern Balkans. When the first Transdanubian Starčevo sites, Lánycsók-Bácsfapuszta (KALICZ 1977) and Becsehely-Bükkaljai-dűlő (KALICZ 1980a) were discovered in the 1970s, it became clear that the LBK had a definite predecessor in the region south of Lake Balaton.

In establishing the northern periphery of the Starčevo distribution within southern Transdanubia, 13 sites were listed in the first volume devoted to the culture's presence in western Hungary (KALICZ 1990, 32–37); 11 of them still are regarded as Starčevo culture sites today (KALICZ et al. 2012, 98 footnote 74). In the early 1990s new sites such as Vörs-Máriaasszonysziget (ARADI 1992; KALICZ et al. 1998; 2002) and Gellénháza-Városrét (SIMON 1994; 1996) were discovered to the south and west of Lake Balaton. Additionally, the Tihany-Apáti site was discovered on the northern shore of Lake Balaton (REGENYE 2007a; 2010; 2011a). Integrating the results of subsequent research, Kalicz and his colleagues later listed 26 sites from Transdanubia (KALICZ et al. 2007a fig. 1; 2012, 98 fig. 2.1; KALICZ 2011 fig. 1.1). After intensive research in south-east Transdanubia over the last decade, the concentration of Early Neolithic sites in the region has become even more obvious (BÁNYFY 2013a, 12), although it is hard to put a precise number on investigated sites due to numerous unpublished assemblages.

No definite house plans have been identified so far on Hungarian Starčevo sites. Some evidence, such as daub and other burnt material, certainly implies the presence of above-ground structures. Remains of buildings from about a dozen sites are well known in the contemporary Körös culture context (SELMECZI 1969; RACZKY 1976; 2012; HORVÁTH / SIMON 2004). On the other hand, it is worth noting that for the Slavonian distribution of the Starčevo culture, in northern Croatia, a series of irregular sunken features have consistently been interpreted as houses (MINICHREITER 1992, 70–71 figs 5–6; 9; 12–15; 2001; 2007, 37–59). Before the recent rescue excavations in south-east Transdanubia, only five human bodies of the Starčevo culture were known: a double burial from Lánycsók-Bácsfapuszta (KALICZ 1977, 137), two from Vörs-Máriaasszonysziget (ARADI 1992, 27; KALICZ et al. 2002, 17–19 figs 3–5), and one further burial from Siklós (KALICZ et al. 2007a, 28). Kalicz has emphasised substantial differences between the Transdanubian distribution of the Starčevo culture and the Körös culture in eastern Hungary, in terms of the size, location and density of settlements (KALICZ 1990, 83–88; 2000; KALICZ et al. 2012, 98).

Two different typo-chronological phases for the Starčevo culture in Transdanubia have been proposed (KALICZ 1990) on the basis of analysis of the pottery assemblages: the earlier one broadly equivalent to the Starčevo Linear B phase of Stojan Dimitrijević, and the later one regarded as identical with the Spiraloid B phase of the Slavonian pottery sequence (DIMITRIJEVIĆ 1969a; 1969b; 1974). The earlier phase is represented by only a few sites such as Lánycsók-Bácsfapuszta and Barcs-Dolec (KALICZ 1990, 33–34; 53–71 Taf. 11; 12,2.4–6.8–11; 13–30; KALICZ 2011, 111–113 Abb. 2–3; KALICZ et al. 2007a, 29–30;

32; 36 figs 3–6) while most of the sites like Becsehely-Bükkaljai-dűlő and Babarc revealed typical late Starčevo materials (BÁNFFY 2001; KALICZ 1990, 34–35; 73–77; 92; 2011, 114–117 Abb. 4–10; KALICZ et al. 2012, 87; 99–104 figs 3–7). Possible regional characteristics of the Transdanubian Starčevo culture within the Starčevo-Körös-Criş complex were also an issue in several discussions. Following a quite uniform material culture in the first stages of the Early Neolithic development of the northern Balkans and the southern Pannonian basin, Kalicz saw considerable regional differences in the Linear B phase and later (KALICZ 1983; KALICZ et al. 2012, 91). As the earliest stages of the Croatian and Serbian Starčevo development have not been recorded in Transdanubia, one possible explanation has been the deficiency of research in that field. The other reason, in our view more plausible, for the phenomenon is a temporal shift in the Neolithisation process towards the north. Concerning the Transdanubian Starčevo and Körös assemblages, various differences in the material culture were also highlighted in an effort to emphasise their diverging development (KALICZ 2000), as a reaction to Makkay's claim that it is impossible to separate the two cultural units from each other (MAKKAY 1982a, 20–25; 1996, 35–36).

Aims of the dating programme

At the time of the first summary of the Transdanubian Starčevo culture one single radiocarbon result was available from Becsehely (6425 ± 60 BP, without laboratory code), dated by the Berlin laboratory (KALICZ 1990, 92). We have knowledge of two further AMS dates from Becsehely measured by the VERA laboratory, but no detailed information was published except for their 1-sigma calibrated intervals: 5710–5635 cal BC and 5660–5555 cal BC (KALICZ 2011, 121). Another human sample was dated from Vörs-Máriaasszonyisziget (Deb-8167, 6510 ± 60 BP, 5615–5585 cal BC [4% probability] or 5570–5355 cal BC [91% probability]) from the northernmost fringes of the Hungarian distribution of the culture (KALICZ et al. 2002, 26 fig. 6). In the course of the aDNA project on the Neolithic and Chalcolithic populations of the Carpathian basin led by Kurt Alt and Eszter Bánffy (*Bevölkerungsgeschichte des Karpatenbeckens in der Jungsteinzeit und ihr Einfluss auf die Besiedlung Mitteleuropas* [Al 287/10-1]), 15 human samples from Alsónyék were measured in the Mannheim laboratory, and one further Starčevo culture sample (MAMS-14130, 6712 ± 25 BP, 5675–5610 cal BC [83% probability] or 5595–5560 cal BC [12% probability]) from Lánycsók-Csata-alja (SZÉCSÉNYI-NAGY et al. 2014; 2015, Supplementum 2). The main purpose of the dating project presented in the current paper is to present the first radiocarbon series for a Starčevo occupation in Transdanubia and to establish a robust Bayesian chronology that allows further conclusions about the development of the Early Neolithic at a regional level. One further important task is to explore whether the three style groups of pottery can be regarded as three successive phases, using a method independent of typo-chronological analysis.

Sampling strategy

The 15 graves that were dated to secure the chronological context of aDNA samples represented different parts of the Starčevo occupation and provided the basis for selecting further samples. In the current dating project, primarily animal bone samples were selected from features that were associated with already existing results on human burials. Attention was paid to features that provided diagnostic ceramic material to reinforce or refute earlier beliefs about the typo-chronology of the Starčevo culture. Careful attention was also given

to ensure that the sampling covered, as much as possible, the possible spatial extent of the Starčevo site.

Samples and the structure of the model

A total of 34 radiocarbon results are available from 33 samples of human and animal bone submitted to four radiocarbon laboratories (Oxford, Mannheim, SUERC and Poznań). The pretreatment and measurement methods are given in BAYLISS et al. (this volume). As already mentioned, the material dated in Mannheim (MAMS) was selected as part of the aDNA project, so that an additional 18 samples were submitted as part of this work to produce a robust chronological model for the Starčevo period of occupation (fig. 5).

There was an attempt to replicate approximately one in seven samples, but due to failures only one sample of the total submitted and successfully dated was replicated. A total of 12 settlement pits and pit complexes, one oven and 17 human burials were dated.

The chronological model was constructed as described by BAYLISS et al. (this volume), using OxCal v.4.2 and IntCal13 (fig. 6).

A sample of articulating *Ovis aries* / *Capra hircus* femur was dated (SUERC-51458) from Pit 1526, which is cut by Burial 1525, a left-crouched, 25–30-year-old male, who was dated (MAMS-11936) by a left femur.

Pit 1501 was dated (SUERC-51454) by a sample from an *Ovis aries* / *Capra hircus* metapodial with refitting unfused epiphysis. The pit was overlain by Burial 1372, a right-crouched, 35–45-year-old male, from which there is a result (MAMS-11932) on a left femur.

An *Ovis aries* / *Capra hircus* radius, which probably lay in the ground with a refitting unfused epiphysis (although this was lost on excavation), was dated (Poz-67494) from Oven 1072, which is cut by Burial 1061, a presumably left-crouched, 40–50-year-old male, from which a tibia (SUERC-57542) was dated. Oven 1072 was probably dug into one part of Pit Complex 687.

A sample of *Bos taurus* cervical vertebra with a refitting unfused epiphysis was dated (SUERC-51450) from Pit Complex 687, which is probably cut by Burial 688, a possibly right-crouched, 23–27-year-old female, that produced a result (MAMS-11926) from a right humerus. The exact relationship between their contexts could not be established unequivocally.

Burial 1533, a left-crouched, 35–45-year-old male was also dated (MAMS-11940) by a left femur. This was probably cut by Burial 1532, a presumably right-crouched, 20–30-year-old adult from which there is a result (MAMS-11939) on the right ulna.

A sample of a *Bos taurus* ulna, which probably lay in the ground with a refitting unfused epiphysis (although this was lost on excavation), from Pit complex 1383 was dated (SUERC-51453). An oven was cut into the wall of the pit complex, where the disturbed Burial 1398 was uncovered. The deceased is an approximately 1-year-old child, from which there are two results (OxA-30353–4) on an os parietalis from the skull. These are statistically consistent ($T' = 1.6$; $T'(5\%) = 3.8$; $v = 1$; WARD / WILSON 1978) and have been combined prior to calibration to form mean Burial 1398 (6710 ± 24 BP).

Pit complex 708/720, with a north–south extension of about 21.5 m and an east–west extension of about 12 m, was dated by a *Bos primigenius* tibia with refitting unfused epiphysis (SUERC-51451), a *Bos taurus* tibia with refitting unfused epiphysis (Poz-67492), an articulating *Sus scrofa* ulna and radius (SUERC-57540) and a *Bos taurus* radius with refitting unfused epiphysis (OxA-X-2586-27). The pit complex, close to its eastern edge, was

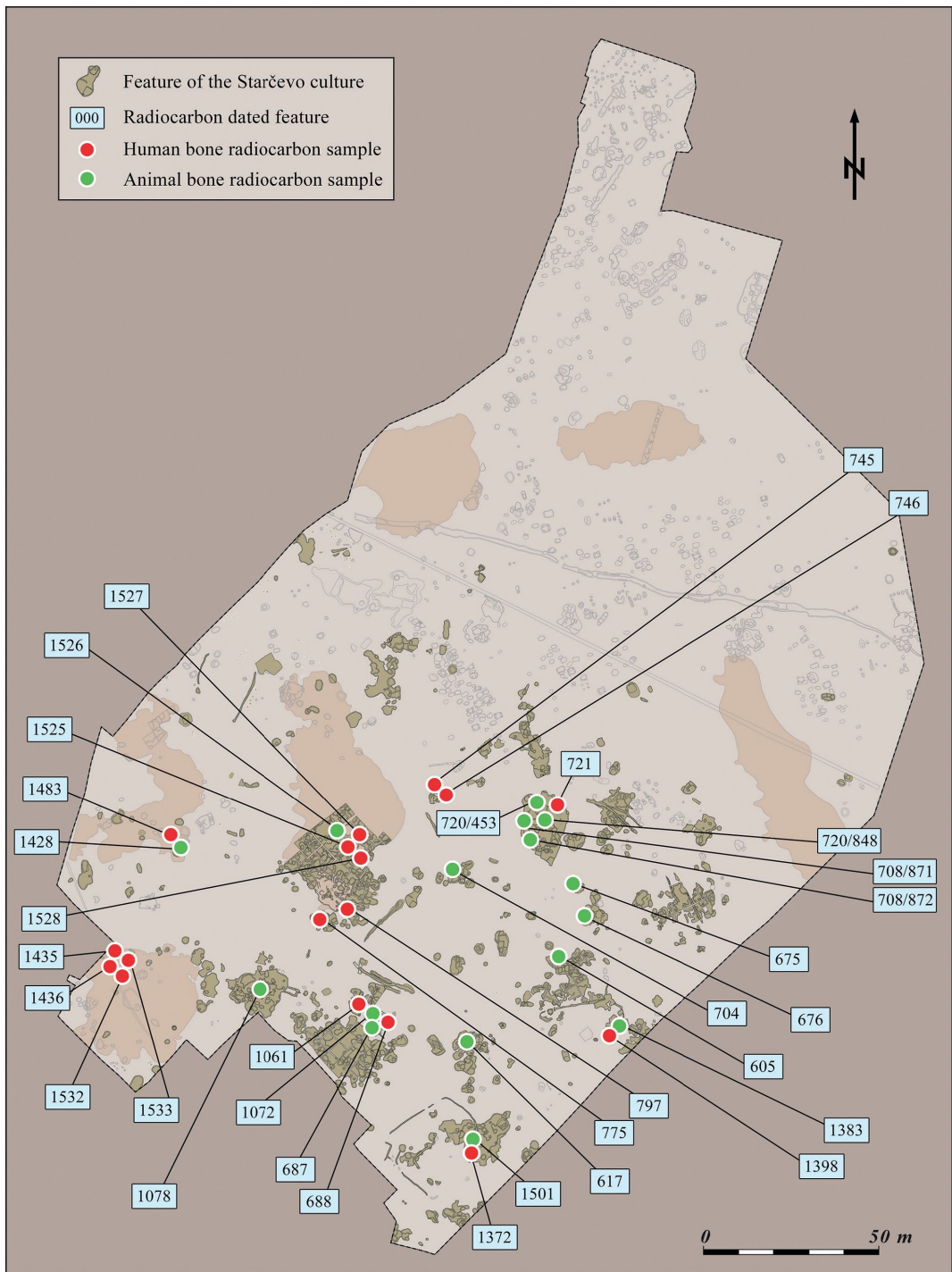


Fig. 5. Plan of the Starčevo settlement with radiocarbon samples and dated features.

cut by Burial 721, a presumably left-crouched, 30–40-year-old female, from whom the right femur was dated (MAMS-11927). Because of the size and the complexity of feature 708/720, the relationship of the dates from the pit complex and that from the burial cannot be established beyond doubt.

A further seven settlement pits were dated by an individual sample in each. From Pit 605 there is one result (OxA-30230) on an *Ovis aries*/*Capra hircus* femur with refitting unfused epiphysis. SUERC-51449 is from an articulating *Sus scrofa* radius and ulna in Pit complex 617. From Pit 675 an articulating group of *Ovis aries*/*Capra hircus* tarsals were dated (OxA-30481). An articulating *Ovis aries*/*Capra hircus* radius and ulna in Pit complex 676 was dated (OxA-30231). The result (SUERC-57541) from Pit complex 704 is from a *Bos taurus* humerus with refitting unfused epiphysis. There is a single result (SUERC-51452) from an *Ovis aries*/*Capra hircus* tibia with refitting unfused epiphysis in Pit 1078. Finally, a sample of a *Sus scrofa* femur with refitting unfused epiphysis present in the ground, but lost on excavation, was dated from Pit 1428 (OxA-X-2583-19).

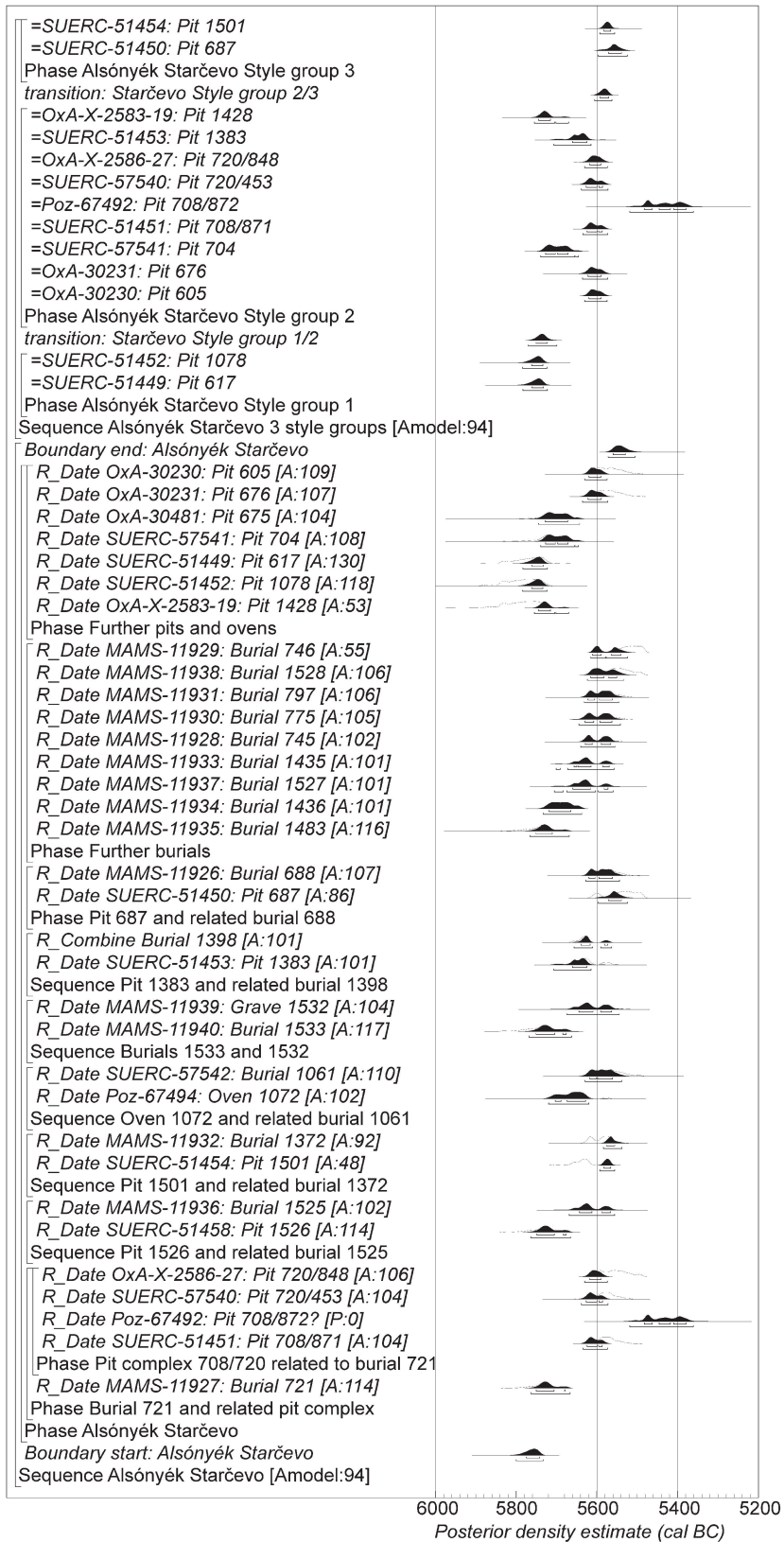
Nine additional burials were dated at MAMS. These are all stratigraphically isolated and include burials: 745, a presumably left-crouched, 35–45-year-old adult dated (MAMS-11928) by a left femur; 746, a left-crouched, 9–11-year-old child dated (MAMS-11929) by a left femur; 775, a possibly supine, 8–10-year-old child dated (MAMS-11930) by a right humerus; 797, probably in a prone position, a 35–45-year-old female dated (MAMS-11931) by a right femur; 1435, a right-crouched, 8–9-year-old child dated (MAMS-11933) by a left femur; 1436, a 25–35-year-old female dated (MAMS-11934) by a right femur; 1483, a left-crouched, 7–8-year-old child dated (MAMS-11935) by a left femur; 1527, a left-crouched, 40–50-year-old female dated (MAMS-11937) by a left femur; and 1528, a right-crouched, 45–55-year-old female, from which there is a result (MAMS-11938) on a left femur.

The material that was recovered from some of the pits, namely the Starčevo pottery, allows for some of the features to be grouped according to the three ceramic style groups. While the main model that contains all of the dated activity has been constructed using boundaries in OxCal that impose a uniform prior distribution to the dates, these nine dates are cross-referenced at the time of modelling so that the relative ordering of pottery Style groups 1–3 is taken into account. This also allows for the estimation of the date of transition between the different phases. Starčevo Style group 1 includes the following radiocarbon dates: SUERC-51449 (Pit 617) and SUERC-51452 (Pit 1078). Style group 2 includes the following dates: OxA-30230 (Pit 605), OxA-30231 (Pit 676), SUERC-57541 (Pit 704), SUERC-51451 (Pit 708/871), Poz-67492 (Pit 708/872), SUERC-57540 (Pit 720/453), OxA-X-2586-27 (Pit 720/848), SUERC-51453 (Pit 1383) and OxA-X-2583-19 (Pit 1428). Style group 3 includes the following dates: SUERC-51450 (Pit 687) and SUERC-51454 (Pit 1501).

Results

The model (*fig. 6*) shows good agreement between the stratigraphical and other archaeological information included in the model and the radiocarbon dates ($A_{\text{model}} = 94$).

The model estimates that the dated Starčevo activity began in 5800–5730 cal BC (95% probability; *fig. 8*; start: *Alsónyék Starčevo*), and probably in 5775–5740 cal BC (68% probability). The dated Starčevo occupation lasted for 170–280 years (95% probability; *fig. 7*; span: *Alsónyék Starčevo*), and probably for 190–245 years (68% probability). The Starčevo



activity ended in 5575–5505 cal BC (95% probability; fig. 8; end: *Alsónyék Starčevo*), and probably in 5560–5525 cal BC (68% probability).

The transition from Starčevo Style group 1 to Style group 2 occurred in 5770–5695 cal BC (95% probability; fig. 8; transition: *Starčevo Style group 1/2*), and probably in 5760–5730 cal BC (68% probability). The transition from Starčevo Style group 2 to Style group 3 occurred in 5610–5560 cal BC (95% probability; fig. 8; transition: *Starčevo Style group 2/3*), and probably in 5595–5570 cal BC (68% probability).

Highest Posterior Density intervals (at 95% probability) for the modelled dates of individual human burials are provided in *table 1*.

Sensitivity analysis

The prior information on the sequence of pottery styles was removed and the model was rerun, to test whether it would provide similar results and agreement between the recorded stratigraphy and the radiocarbon dates. This model had the same overall structure as the primary model, without the constraining pottery sequence. The sensitivity analysis also had good agreement between the radiocarbon dates and prior archaeological beliefs, which in this case were based on stratigraphy only (Amodel = 119). Since results show no appreciable difference for the start and end dates of the Starčevo activity, as well for the span of the dated Starčevo occupation, the primary model that enables the estimation of the dating of the various pottery styles is maintained as the preferred choice.

Discussion

The dating programme reported here has established that the Starčevo occupation at Alsónyék probably began in the *mid 58th century cal BC* (68% probability) and probably lasted for 190–245 years (68% probability) – some eight to ten generations – before it was abandoned during the *mid 56th century cal BC* (68% probability). The occupation is assumed to be continuous – a single phase of activity – in the model presented. In four cases, where a burial was dug into or sealed a pit or pit complex, and both animal bone samples from the pit and the human remains were sampled, the dates conformed to their stratigraphic sequence. In one case, where one burial was probably cut into another, the stratigraphical observation was reinforced by the dates (Burials 1532–3). In three cases (Pit complex 708/720: Burial 721; Pit complex 687: Oven 1072; Pit complex 687: Burial 688), however, the radiocarbon dates did not support the recorded stratigraphic sequence. The features in question were cut into one part of huge pit complexes that represent multi-event scenarios and therefore it was sometimes very hard to draw any reliable conclusion concerning their stratigraphy.



Fig. 6. Probability distributions of radiocarbon dates from the Starčevo settlement at Alsónyék. Each distribution represents the relative probability that an event occurs at a particular time. For each of the dates two distributions have been plotted: one in outline, which is the result of simple radiocarbon calibration, and a solid one, based on the chronological model used. Distributions other than those relating to particular samples correspond to aspects of the model. For example, the distribution ‘*start: Alsónyék Starčevo*’ is the estimated date when Starčevo activity on the site began. The large square brackets down the left-hand side along with the OxCal keywords define the overall model exactly.

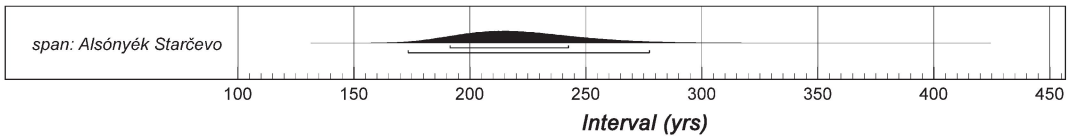


Fig. 7. Probability distributions for the number of years during which the Starčevo settlement at Alsónyék was used, derived from the model defined in *fig. 6*.

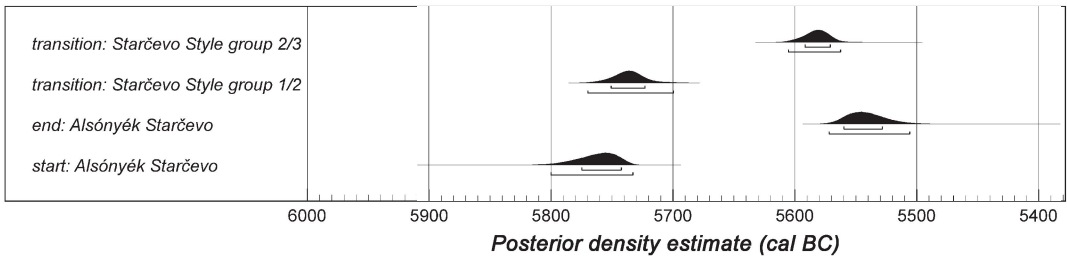


Fig. 8. Key parameters for the start and end of the Starčevo settlement and burial activity and for the transitions of pottery style groups at Alsónyék, derived from the model defined in *fig. 6*.

The validity of three distinct but successive ceramic style groups was supported by the modelling. The use of new decoration attributed to Style group 2 most probably started shortly after the beginning of the site in the *mid 58th century cal BC (68% probability)*, while the shapes and decoration present in Style group 3, and regarded as pronouncedly late in the Starčevo culture, appeared most probably in the *early 56th century cal BC (68% probability)*.

The further evaluation of the ceramic assemblage will surely highlight many additional contradictions between stratigraphy, absolute chronology and the traditional typo-chronological sequence of the Starčevo culture. Nonetheless, the programme has also shown that many important cornerstones of the sequence created decades ago have a real chronological relevance.

Few radiocarbon dates had been obtained for the Starčevo culture in Hungary before now. Those that are available appear to represent the later part of the conventionally accepted span (ca. 6200/6100–5500 cal BC) for the Starčevo-Körös-Criş complex (WHITTLE et al. 2002, 93; OROSS / SIKLÓSI 2012, 148–154). The sites of Vörs-Máriaasszonyisziget and Becsehely-Bükkaljai-dűlő, with conventional dates falling in the latest part of the span (KALICZ 1990, 92; KALICZ et al. 2002, 19; 26 *fig. 6*), are located near the northern edge of the Starčevo distribution. One possible explanation is that those sites represent a quite late, gradual spread towards the north.

Alsónyék lies some 100–150 km to the south-east of those sites. The Tolna Sárköz now appears to represent the heartland of the Hungarian Starčevo distribution, much closer to the numerous sites in Slavonia and the Vojvodina region of northern Serbia. It seems now that there were Early Neolithic communities in south-east Transdanubia from at least the first half of the 58th century cal BC. The apparent broad pattern of a subsequent shift northwards seems to match suggestions for the Körös culture in eastern Hungary (WHITTLE et al. 2002, 88; DOMBORÓCZKI 2010a, 156–159 *fig. 11*), at least when the Lake Balaton area and the Tolna Sárköz are compared. On the other hand, WHITTLE et al. (2002, 89) emphasised that radiocarbon dates do not fit the ‘wave of advance model’ of AMMERMAN

and CAVALLI-SFORZA (1984), and that the process was probably more complex, including pioneer colonisation and differences determined by landscape variations. Subsequent research on the absolute chronology of the Körös culture could reinforce this suggestion (OROSS / SIKLÓSI 2012, 153).

The first settlements of the Körös culture appeared around 6000 cal BC in a tight area at the Tisza-Maros confluence, approximately 100 years or about three human generations after the appearance of Early Neolithic sites in the Vojvodina and in southern Transylvania (WHITTLE et al. 2002, 88–89; OROSS / SIKLÓSI 2012, 148–153 tab. 3 figs 9–10). In contrast, there is no evidence for Neolithic settlements in Transdanubia from the period before 5800 cal BC, although it must be noted that not a single radiocarbon result has been published from the southernmost part of western Hungary. Might an earlier horizon be detected south of the Mecsek hills (in the area to the south of Pécs)? If not, some of the sites in the Tolna Sárköz could really represent the transition to the Neolithic in southern Transdanubia. Over 700 sites of the Körös culture (SIKLÓSI 2012) can be contrasted with the three dozen or so Starčevo sites in Transdanubia. Perhaps this is not only a consequence of different settlement strategies and environmental conditions, but also a reflection of the different time spans over which Early Neolithic communities existed in the two regions.

Looking more to the south, it is difficult to draw any further conclusion based on the radiocarbon dates of the adjacent Slavonian region of northern Croatia. The sites of Slavonski Brod-Galovo and Zadubravlje were dated, the first with nine, the latter with five measurements. Both series consist of conventional radiometric dates on charcoal samples that date the sites to time spans that exceed 1000 years (MINICHREITER / KRAJCAR BRONIĆ 2006). Three AMS dates on animal tooth samples date the Starčevo occupation from Vinokovci-Sopot, the eponymous tell settlement of the Sopot culture (KRZNARIĆ ŠKRIVANKO 2011 tabs 2–3; SRAKA 2012, 362–363 fig. 6).

It became obvious very shortly after the discovery of the Early Neolithic site at Alsónyék that former notions of exclusively small, scattered sites in the Transdanubian Starčevo distribution must be revised. Past opinions were further reinforced by more recent large-scale excavations such as those at Becsehely-Bükkaljai-dűlő (KALICZ et al. 2012, 98 fig. 7.1). The small scale of the sites was repeatedly explained by the idea of a short duration of use and of their transitional character in the Neolithisation process. The Early Neolithic site at Alsónyék has revealed clear evidence that Starčevo settlements could exist for a longer time as well. All the consequences of this fact must be taken into account when discussing the settlement structures, dynamics, subsistence strategies, social organisation and demography of the communities concerned.

The dating programme presented here will undoubtedly become a benchmark for the absolute chronology of the Early Neolithic in western Hungary. Nevertheless, more dates are now needed from sites in south-east and south-west Transdanubia as well as from the Lake Balaton area, to elaborate a more sophisticated chronological framework for the spread of the Neolithic in the region as a whole.

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Summary · Zusammenfassung · Résumé

SUMMARY The excavations at Alsónyék revealed numerous Starčevo features, over 50 in the southern part of subsite 10B and some 500 in subsite 5603. The overwhelming majority of the features uncovered were individual pits and pit complexes. Traces of houses or above-ground structures were recorded, but no certain house plans could be identified; numerous hearths and ovens were found. 25 Starčevo burials have been identified, with some in disused pits and ovens. The occupation excavated in subsite 5603 was substantial, the largest yet discovered in Transdanubia.

The north-west distribution of the Early Neolithic cultural complex of the northern Balkans – the Starčevo, Körös and Criş cultures – represents the first food-producing communities in many parts of the Carpathian basin. Starčevo sites are now known in the southern part of western Hungary up to Lake Balaton, but there are many unresolved questions about the precise chronology of the Early Neolithic in Transdanubia and beyond, in the Starčevo-Körös-Criş complex as a whole, and about the character and identity of the first farmers of the region.

This paper presents 34 radiocarbon dates from 33 samples, interpreted within a Bayesian framework, for the dating of the Starčevo occupation at Alsónyék. 18 samples of human and animal bone were selected as part of the OTKA-funded project *Alsónyék: from the beginnings of food production to the end of the Neolithic* in collaboration with the ERC-funded *The Times of Their Lives* project, in conjunction with 15 existing dates from human burials. The programme aimed to date Starčevo occupation and burials at Alsónyék, and in so doing to contribute to further understanding of the character and pace of the spread of the Neolithic way of life in the region. The Bayesian model presented estimates that Starčevo activity probably began in 5775–5740 cal BC (68% probability), probably lasted for 190–245 years (68% probability), and probably ended in 5560–5525 cal BC (68% probability). The transition from pottery Style group 1 to 2 probably occurred in 5760–5730 cal BC (68% probability), with the transition from pottery Style group 2 to 3 probably in 5595–5570 cal BC (68% probability).

The implications of these estimates for the character of the Starčevo occupation at Alsónyék are discussed, as well as for the wider development of the Starčevo culture and of the Early Neolithic in the region as a whole. The current picture suggests the densest Starčevo presence in south-east Transdanubia within the Hungarian distribution of the culture, with a gradual spread to the north later on. The results also demonstrate that Early Neolithic settlements in western Hungary lasted for a substantial period of time, across several human generations.

ZUSAMMENFASSUNG Zahlreiche Starčevo-Befunde wurden in Alsónyék ausgegraben; davon über 50 im südlichen Bereich der Fläche 10B und über 500 in Fläche 5603. Hauptsächlich handelt es sich dabei um Einzelgruben und Grubenkomplexe. Spuren von Häusern oder oberirdischen Strukturen wurden zwar aufgezeichnet, allerdings konnten keine sicheren Hausgrundrisse identifiziert werden. Viele Feuerstellen und Öfen wurden gefunden. Insgesamt wurden 25 Starčevo-Gräber entdeckt, einige davon in aufgelassenen Gruben und Öfen. Die in Fläche 5603 dokumentierte Starčevo-zeitliche Belegung ist bisher die größte in Transdanubien.

Die nordwestliche Ausdehnung des altneolithischen Kulturkomplexes des nördlichen Balkans – die Starčevo-, Körös- und Criş-Kulturen – repräsentiert die ersten Nahrungsmittel produzierenden Gemeinschaften in vielen Regionen des Karpatenbeckens. Fundstellen der Starčevo-Kultur sind im südlichen Bereich Westungarns bis zum Balaton bekannt. Aller-

dings gibt es viele unbeantwortete Fragen hinsichtlich einer genauen Chronologie des Altneolithikums in Transdanubien und darüber hinaus sowie zum Starčevo-Körös-Criş-Komplex insgesamt und zur Lebensart und -weise bzw. zur Identität der ersten Bauern der Region.

Es werden 34 Radiokarbonaten aus 33 Proben vorgestellt, die im Rahmen eines Bayes'schen Ansatzes interpretiert werden, um die Starčevo-Belegung von Alsónyék zu datieren. 18 Proben aus menschlichem und tierischem Knochenmaterial in Verbindung mit 15 bereits existierenden Daten aus Gräbern wurden in einer Zusammenarbeit der Projekte *Alsónyék: from the beginnings of food production to the end of the Neolithic*, das vom OTKA unterstützt wird, und *Times of Their Lives*, das vom ERC finanziert wird, ausgewertet. Dabei sollte die Datierung der Starčevo-Besiedlung und der Gräber in Alsónyék vorangetrieben werden, um letztendlich ein besseres Verständnis für den Charakter und die Ausbreitungsgeschwindigkeit der neolithischen Lebensweise in der Region zu erreichen. Mit Hilfe des Bayes'schen Modells wurde berechnet, dass die Starčevo-Kultur um 5775–5740 cal BC (68% Wahrscheinlichkeit) begann, für etwa 190–245 Jahre (68% Wahrscheinlichkeit) andauerte und wohl um 5560–5525 cal BC (68% Wahrscheinlichkeit) endete. Der Übergang von der keramischen Stilgruppe 1 zu Stilgruppe 2 fand um 5760–5730 cal BC (68% Wahrscheinlichkeit) statt, der Übergang der keramischen Stilgruppe 2 zu Stilgruppe 3 wahrscheinlich um 5595–5570 cal BC (68% Wahrscheinlichkeit).

Aus diesen Kalkulationen ergeben sich Schlussfolgerungen hinsichtlich des Charakters der Starčevo-Belegung in Alsónyék sowie der gesamten Entwicklung der Starčevo-Kultur und des Altneolithikums in der Region, die hier diskutiert werden. Der gegenwärtige Forschungsstand lässt vermuten, dass die dichteste Verbreitung der Starčevo-Kultur innerhalb Ungarns in Südosttransdanubien zu finden ist, mit einem Ausläufer nach Norden im späteren zeitlichen Verlauf. Die Ergebnisse zeigen außerdem, dass altneolithische Siedlungen in Westungarn eine beträchtliche Zeitspanne über mehrere Generationen bestanden. (M.E.)

RÉSUMÉ Les fouilles d'Alsónyék ont révélé de nombreuses structures Starčevo, dont plus de 50 dans la partie sud du sous-site 10B et quelques 500 autres sur le sous-site 5603. La grande majorité des structures mises au jour comprend des fosses épars ou regroupées. On a constaté des traces de maisons ou de structures au-dessus du sol, sans identifier avec certitude des plans de maisons. De nombreux foyers et fours ont néanmoins été découverts. De plus, 25 sépultures Starčevo ont été identifiées dont certaines dans des fosses et des fours abandonnés. L'occupation fouillée dans le sous-site 5603 est la plus vaste jamais découverte en Transdanubie. L'expansion nord-ouest du complexe culturel du Néolithique ancien du nord des Balkans représenté par les cultures de Starčevo, Körös et Criş livre les premières communautés productrices d'aliments en de nombreux endroits du bassin des Carpates. Les sites connus de Starčevo s'étendent actuellement du sud de la Hongrie occidentale jusqu'au lac Balaton. Mais il reste encore de nombreuses questions non résolues concernant la chronologie précise du Néolithique ancien en Transdanubie et au-delà, notamment le complexe Starčevo-Körös-Criş en général, ainsi que la nature et l'identité des premiers paysans de cette région.

La présente contribution met en avant 34 datations radiocarbone, prélevées sur 33 échantillons, et interprétées dans un cadre bayésien pour dater l'occupation Starčevo à Alsónyék. Dix-huit échantillons d'os humains et d'animaux furent sélectionnés pour être intégrés au projet financé par l'OTKA *Alsónyék: des débuts de la production alimentaire à la fin du Néolithique* en collaboration avec le projet *The Times of Their Lives* financé par l'ERC, qui complètent 15 datations dors et déjà existantes provenant de sépultures. Le programme avait pour objectif de dater l'occupation et les sépultures Starčevo d'Alsónyék et ainsi de

contribuer à la compréhension accrue du caractère et de la rapidité de diffusion du mode de vie néolithique dans la région. Selon le modèle bayésien présenté, l'activité Starčevo aurait commencé vers 5775–5740 cal BC (68 % de probabilité) et se serait achevée vers 5560–5525 cal BC (68 % de probabilité), comprenant une durée d'environ 190–245 ans (68 % de probabilité). La transition du groupe céramique de style 1 au groupe 2 a probablement eu lieu vers 5760–5730 cal BC (68 % de probabilité), et celle du groupe stylistique 2 au groupe 3 probablement vers 5595–5570 cal BC (68 % de probabilité).

Les implications de ces estimations sur la nature de l'occupation Starčevo à Alsónyék, ainsi que sur les perceptions à l'égard de l'évolution de la culture de Starčevo et du Néolithique ancien à l'échelle régionale sont finalement discutées. Selon les résultats, une présence Starčevo particulièrement dense en Transdanubie sud-orientale, suivie d'une diffusion progressive vers le nord sont actuellement envisagées pour la Hongrie. De plus, les résultats révèlent que les habitats du Néolithique ancien en Hongrie occidentale furent occupés pendant une longue période, couvrant plusieurs générations. (Y.G. / E.P.)

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Lab ID	Context no.	Context description [Sample ID]	Material	$\delta^{13}\text{C}_{\text{AMS}}$ (‰)	$\delta^{13}\text{C}_{\text{RIMS}}$ (‰)	$\delta^{15}\text{N}$ (‰)	C:N	Radiocarbon age (BP)	Modelled date (95% probability)
OxA-30230	605/179	Irregular shaped settlement pit. Pottery: globular forms, channelled barbotine decoration, painted spiral motifs. [5603-605/179]	Animal bone: subadult sheep / goat; right femur; refitting unfused distal epiphysis		-20.7 ± 0.2	5.6 ± 0.3	3.3	6639 ± 35	
SUERC-51449	617/222	Settlement pit complex in the southern part of subsite 5603. Pottery: globular forms, pinched decoration; narrow linear painted motifs. [5603-617/222]	Animal bone: subadult wild boar; left radius; articulating with ulna		-19.5 ± 0.2	6.9 ± 0.3	3.2	6886 ± 31	
OxA-30481	675/346	Oval shaped settlement pit. Pottery: globular forms, incised net pattern. Zoomorphic figurine. [5603-675/346]	Animal bone: juvenile sheep / goat; left centrotarsal; articulating with next tarsal and metatarsal		-20.9 ± 0.2	7.8 ± 0.3	3.1	6822 ± 36	

Tab. 1. Radiocarbon and stable isotopic results from Starčevo culture features at Alsónyék. The results are presented in ascending order by context number. All results are from subsite 5603.

Lab ID	Context no.	Context description [Sample ID]	Material	$\delta^{13}\text{C}_{\text{AMS}}$ (‰)	$\delta^{13}\text{C}_{\text{RIMS}}$ (‰)	$\delta^{15}\text{N}$ (‰)	C:N	Radiocarbon age (BP)	Modelled date (95% probability)
OxA-30231	676/410	Settlement pit complex. Pottery: globular and slightly biconical forms, painted net patterns in stripes. Anthropomorphic figurine. [5603-676/410]	Animal bone: juvenile sheep / goat; right radius; articulating with ulna		-21.1 ± 0.2	6.2 ± 0.3	3.4	6647 ± 37	
SUERC-51450	687/1248	Settlement pit complex in the southern part of subsite 5603. It is probably cut by Burial 688, Burial 1061, and Oven 1072. Pottery: biconical forms, black burnished surface, incised linear motifs, short incisions, painted spirals, polychrome painted motifs. [5603-687/1248]	Animal bone: juvenile cattle; unfused cervical vertebra; refitting unfused epiphyses		-20.7 ± 0.2	7.4 ± 0.3	3.2	6590 ± 32	
MAMS-11926	688	Burial of possibly right-crouched, 23–27-year-old female. It was probably dug into Pit complex 687. [5603-688]	Human bone: right humerus	-21.9	-20.5 ± 0.2	9.1 ± 0.1		6649 ± 29	5630–5540 cal BC

Lab ID	Context no.	Context description [Sample ID]	Material	$\delta^{13}\text{C}_{\text{AMS}}$ (‰)	$\delta^{13}\text{C}_{\text{IRMS}}$ (‰)	$\delta^{15}\text{N}$ (‰)	C:N	Radiocarbon age (BP)	Modelled date (95% probability)
SUERC-57541	704/358	Settlement pit complex in the central part of subsite 5603. Pottery: slightly biconical forms, footed vessels, channelled barbotine decoration, painted 'S' motifs and spirals. [5603-704/358]	Animal bone: juvenile cattle; left humerus; refitting unfused distal epiphysis		-20.9 ± 0.2	7.3 ± 0.3	3.4	6830 ± 35	
SUERC-51451	708/871	Extended settlement pit complex in the central part of subsite 5603 (708 = 720). Pottery: globular forms, single-handed cups, pinched decoration, incised net pattern, painted 'S' motifs and spirals. [5603-708/871]	Animal bone: subadult aurochs; left tibia; refitting unfused proximal epiphysis		-21.3 ± 0.2	5.6 ± 0.3	3.2	6656 ± 32	
Poz-67492	708/872	Extended settlement pit complex in the central part of subsite 5603 (708 = 720). Pottery: globular forms, single-handed	Animal bone: subadult cattle; right tibia; refitting unfused proximal epiphysis		-20.9 ± 0.33	5.0 ± 0.43	3.3	6480 ± 40	

Tab. 1. (continued)

Lab ID	Context no.	Context description [Sample ID]	Material	$\delta^{13}\text{C}_{\text{AMS}}$ (‰)	$\delta^{13}\text{C}_{\text{RIMS}}$ (‰)	$\delta^{15}\text{N}$ (‰)	C:N	Radiocarbon age (BP)	Modelled date (95% probability)
SUERC-57540	720/453	cups, pinched decoration, incised net pattern, painted 'S' motifs and spirals. [5603-708/872] Extended settlement pit complex in the central part of subsite 5603 (708 = 720). Pottery: globular forms, single-handed cups, pinched decoration, incised net pattern, painted 'S' motifs and spirals. [5603-720/453]	Animal bone: subadult wild boar; right ulna; articulating with radius		-20.6 ± 0.2	7.8 ± 0.3	3.3	6660 ± 34	
OxA-X-2586-27	720/848	Extended settlement pit complex in the central part of subsite 5603 (708 = 720). Pottery: globular forms, single-handed cups, pinched decoration, incised net pattern, painted 'S' motifs and spirals. [5603-720/848]	Animal bone: infant cattle; left radius; articulating with ulna		-21.2 ± 0.2	6.1 ± 0.3	3.3	6625 ± 40	

Lab ID	Context no.	Context description [Sample ID]	Material	$\delta^{13}\text{C}_{\text{AMS}}$ (‰)	$\delta^{13}\text{C}_{\text{FRMS}}$ (‰)	$\delta^{15}\text{N}$ (‰)	C:N	Radiocarbon age (BP)	Modelled date (95% probability)
MAMS-11927	721	Burial of presumably left-crouched, 30–40-year-old female. It cuts the eastern part of Settlement pit complex 708 = 720. [5603-721]	Human bone: right femur	-19.7	-20.9 ± 0.2	9.9 ± 0.1		6852 ± 31	5765–5665 cal BC
MAMS-11928	745	Burial of left-crouched, 35–45-year-old adult [5603-745]	Human bone: left femur	-18.0	-20.6 ± 0.2	10.6 ± 0.1		6677 ± 27	5645–5550 cal BC
MAMS-11929	746	Burial of left-crouched, 9–11-year-old child [5603-746]	Human bone: left femur	-24.2	-20.5 ± 0.2	8.5 ± 0.1		6571 ± 34	5620–5520 cal BC
MAMS-11930	775	Burial of possibly supine, 8–10-year-old child [5603-775]	Human bone: right humerus	-26.7	-21.1 ± 0.2	10.1 ± 0.1		6672 ± 35	5645–5540 cal BC
MAMS-11931	797	Burial of probably prone, 35–45-year-old female [5603-797]	Human bone: right femur	-26.1	-20.8 ± 0.2	9.8 ± 0.1		6657 ± 30	5635–5545 cal BC
SUERC-57542	1061	Burial of presumably left-crouched, 40–50-year-old male. It was probably dug into Pit complex 687. [5603-1061]	Human bone: tibia		-20.5 ± 0.2	9.5 ± 0.3	3.3	6644 ± 36	5630–5535 cal BC

Tab. 1. (continued)

Lab ID	Context no.	Context description [Sample ID]	Material	$\delta^{13}\text{C}_{\text{AMS}}$ (‰)	$\delta^{13}\text{C}_{\text{RIMS}}$ (‰)	$\delta^{15}\text{N}$ (‰)	C:N	Radiocarbon age (BP)	Modelled date (95% probability)
Poz-67494	1072/1296	Oven. It was probably dug into Pit complex 687. Pottery: limited number of sherds, red slip. [5603-1072/1296]	Animal bone: juvenile / sub-adult sheep / goat; left radius; refitting unfused epiphysis (lost on excavation)		-20.4 ± 0.33	4.8 ± 0.43	3.5	6750 ± 40	
SUERC-51452	1078/5112	Extended settlement pit complex in the southern part of sub-site 5603. Pottery: pinched decoration, incised net pattern, narrow linear painted motifs. Anthropomorphic figurine. [5603-1078/5112]	Animal bone: juvenile sheep / goat; left tibia; refitting unfused distal epiphysis		-21.8 ± 0.2	7.8 ± 0.3	3.2	6903 ± 35	
MAMS-11932	1372	Burial of right-crouched, 35–45-year-old male. It was probably dug into Settlement pit 1501. [5603-1372]	Human bone: left femur	-13.1	-20.9 ± 0.2	11.0 ± 0.1		6661 ± 25	5585–5535 cal BC
SUERC-51453	1383/1930	Settlement pit complex. Pottery: channelled barbotine dec-	Animal bone: juvenile cattle; left ulna; refit-		-21.4 ± 0.2	4.4 ± 0.3	3.2	6708 ± 33	

Lab ID	Context no.	Context description [Sample ID]	Material	$\delta^{13}\text{C}_{\text{AMS}}$ (‰)	$\delta^{13}\text{C}_{\text{IRMS}}$ (‰)	$\delta^{15}\text{N}$ (‰)	C:N	Radiocarbon age (BP)	Modelled date (95% probability)
		oration, painted spiral motifs. [5603-1383/1930]	ting unfused epiphysis (lost on excavation)						
OxA-30353	1398	Burial of approximately 1-year-old child [5603-1398]	Human bone: skull, os parietalis		-19.7 ± 0.2	13.1 ± 0.3	3.3	6738 ± 33	
OxA-30354	1398	Replicate of OxA-30353 [5603-1398]	Human bone: skull, os parietalis		-19.7 ± 0.2	12.8 ± 0.3	3.3	6679 ± 34	
Burial 1398		^{14}C age: $T' = 1.6$, $v = 1$, $T'(5\%) = 3.8$, 6710 ± 24 BP; $\delta^{13}\text{C}$: $T' = 0.0$, $T'(5\%) = 3.8$, $v = 1$, -19.7 ± 0.15 ‰; $\delta^{15}\text{N}$: $T' = 0.5$, $T'(5\%) = 3.8$, $v = 1$, 13.0 ± 0.22 ‰							5660–5610 cal BC (72%) or 5595–5560 cal BC (23%)
OxA-X-2583-19	1428/4865	Irregular shaped settlement pit. Pottery: channelled barbotine decoration, painted spiral motifs [5603-1428/4865]	Animal bone: subadult wild boar; right femur; refitting unfused epiphysis (lost on excavation: articulating)		-21.3 ± 0.2	7.9 ± 0.3	3.3	6906 ± 34	

Tab. 1. (continued)

Lab ID	Context no.	Context description [Sample ID]	Material	$\delta^{13}\text{C}_{\text{AMS}}$ (‰)	$\delta^{13}\text{C}_{\text{RIMS}}$ (‰)	$\delta^{15}\text{N}$ (‰)	C:N	Radiocarbon age (BP)	Modelled date (95% probability)
MAMS-11933	1435	Burial of right-crouched, 8–9-year-old child [5603-1435]	Human bone: left femur	-31.7	-21.0 ± 0.2	7.5 ± 0.1		6704 ± 34	5705–5690 cal BC (1%) or 5675–5555 cal BC (94%)
MAMS-11934	1436	Burial of 25–35-year-old female [5603-1436]	Human bone: right femur	-23.4	-20.9 ± 0.2	9.5 ± 0.1		6800 ± 35	5735–5635 cal BC
MAMS-11935	1483	Burial of left-crouched, 7–8-year-old child [5603-1483]	Human bones: left femur	-17.8	-20.9 ± 0.2	9.4 ± 0.1		6857 ± 31	5770–5665 cal BC
SUERC-51454	1501/2248	Oval shaped settlement pit. It is probably cut by Burial 1372. Pottery: biconical forms, incised linear motifs, painted spirals, polychrome painted motifs. Anthropomorphic figurine. [5603-1501/2248]	Animal bone: juvenile sheep / goat; metapodial; refitting unfused epiphysis (lost on excavation: articulating)		-19.8 ± 0.2	6.9 ± 0.3	3.3	6713 ± 33	
MAMS-11936	1525	Burial of left-crouched, 25–30-year-old male. It cuts Pit 1526. [5603-1525]	Human bone: left femur	-21.8	-20.2 ± 0.2	9.4 ± 0.1		6698 ± 34	5670–5555 cal BC

Lab ID	Context no.	Context description [Sample ID]	Material	$\delta^{13}\text{C}_{\text{AMS}}$ (‰)	$\delta^{13}\text{C}_{\text{RIMS}}$ (‰)	$\delta^{15}\text{N}$ (‰)	C:N	Radiocarbon age (BP)	Modelled date (95% probability)
SUERC-51458	1526/2717	Settlement pit. It is cut by Burial 1525. Pottery: limited number of sherds, channelled barbotine decoration. [5603-1526/2717]	Animal bone: subadult sheep / goat; left femur; refitting unfused epiphysis (lost on excavation: articulating)	-20.7 ± 0.2	-20.7 ± 0.2	5.3 ± 0.3	3.3	6850 ± 33	
MAMS-11937	1527	Burial of left-crouched, 40–50-year-old female [5603-1527]	Human bone: left femur	-20.2	-20.7 ± 0.2	10.4 ± 0.1		6709 ± 34	5710–5680 cal BC (4%) or 5675–5555 cal BC (91%)
MAMS-11938	1528	Burial of right-crouched, 45–55-year-old female [5603-1528]	Human bone: left femur	-28.9	-20.9 ± 0.2	10.6 ± 0.1		6617 ± 38	5625–5530 cal BC
MAMS-11939	1532	Burial of presumably right-crouched, 20–30-year-old adult. It probably cuts Burial 1533 [5603-1532]	Human bone: right ulna	-31.6	-20.6 ± 0.2	10.0 ± 0.1		6695 ± 40	5675–5540 cal BC
MAMS-11940	1533	Burial of left-crouched, 35–45-year-old male. It probably is cut by Burial 1532 [5603-1533]	Human bone: left femur	-26.0	-20.3 ± 0.2	9.8 ± 0.1		6853 ± 38	5770–5660 cal BC

Tab. 1. (continued)