RESEARCH ARTICLE – VÝZKUMNÝ ČLÁNEK

Interconnection between house and fenced area: A case study of an LBK settlement in Hostivice-Sadová, Central Bohemia

Propojení mezi domem a ohrazením: Případová studie LnK sídliště v Hostivici-Sadové ve středních Čechách

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The article aims to examine the relationship between the use of longhouses and adjacent fenced areas at the Linear Pottery culture (LBK) settlement in Hostivice-Sadová. The analysis focuses on house no. 1 and 15 and the rectangular fenced areas defined mainly by single posts that were excavated next to their eastern walls. The study includes representative pottery assemblages from settlement features and construction pits dated to the two subsequent phases in the middle stage of LBK. Formation processes and the proportion of decoration style were analysed in combination with radiocarbon dating. The article also addresses whether fenced areas were later used as refuse disposal spaces. The results show that the fills of the features in the fenced areas were deposited later than the house unit assemblages were formed. In both cases, there is no significant evidence of using fenced areas later for waste disposal. Additionally, the social and economic aspects of these houses are discussed as the construction, length, fenced areas, and concentration of finds indicate their important social and economic role within the settlement.

Linear Pottery culture – Central Bohemia – formation processes – longhouse – fenced area

Cílem článku je prozkoumat vztah mezi využíváním dlouhých domů a přilehlých ohrazených ploch na sídlišti kultury s lineární keramikou (LnK) v Hostivici-Sadové. Analýza se zaměřuje na domy č. 1 a 15 a ohrazené plochy obdélníkového tvaru vymezené převážně jednotlivými kůly, které byly odkryty při jejich východních stěnách. Studie zahrnuje reprezentativní keramické soubory ze sídlištních objektů a stavebních jam ze dvou po sobě následujících fází středního stupně LnK. V kombinaci s radiokarbonovým datováním byly analyzovány procesy formování a podíl výzdobných stylů. Článek se rovněž zabývá otázkou, zda byly ohrazené plochy později využívány jako prostory pro odkládání odpadu. Výsledky ukazují, že výplně objektů v ohrazených plochách byly uloženy později, než se formovaly soubory stavebních komplexů. V obou případech neexistují žádné výraznější doklady o pozdějším využívání ohrazených ploch k ukládání odpadu. Dále jsou diskutovány sociální a ekonomické aspekty těchto domů, neboť konstrukce, délka, ohrazení a koncentrace nálezů naznačují jejich důležitou sociální a ekonomickou roli v rámci sídliště.

kultura s lineární keramikou – střední Čechy – formativní procesy – dlouhý dům – ohrazený prostor

Introduction

Longhouses of the Linear Pottery culture (LBK, 5500/5400–4900 BC) have been extensively studied over the past decades. Their ground plans typically had an approximately north-south orientation, were comprised of five rows of postholes, and sometimes the northern boundary of houses was defined by trenches. Regardless of how well preserved they are or how long they have existed, houses are the most common structures at many LBK

https://doi.org/10.35686/AR.2024.236

site	construction of fence	shape	fence area (m²)	chronology of LBK (stage)	reference
Zwenkau-Hart	single/double posts	oval shape	160	late	*Riedhammer 2003*
Bad Sassendorf	single postholes	polygonal shape	3600	LBK	*Baales et al. 2015*
Bad Sassendorf	single postholes	round-shape	1000	LBK	*Baales et al. 2015*
Harta-Gátőrház	single postholes	rectangular	max 770	middle/late	*Kustár et al. 2014*
Bylany near Kutná Hora (house 41)	single/ trenches	rectangular	600	middle/late	*Pavlů 2000*, 201
Bylany near Kutná Hora (house 912)	single/double postholes	rectangular	192	final	*Soudský 1966*
Vaux-et-Borset "La Chapelle Blanche"	trenches	connected houses/line	444	late	*Riedhammer 2003*
Düren-Arnoldsweiler	trenches	-	-	early	*Hausmann – Cziesla 2014*
Rötha	single/double postholes, trenches	rectangular	300; 600	younger	*Dalidowski et al. 2016*
Praha-Krč, Společenská zahrada	trenches	connected houses, oval shape	230	late	*Vondrovský 2021*, 34–36
Targowisko 12–13 (house 8/9)	postholes	connected houses/line	160/100	late	*Czerniak 2013*
Targowisko 12–13 (house 10)	postholes	rectangular	-	late	*Czerniak 2013*
Hostivice-Sadová D1	single/double postholes	rectangular	1807	LBK	
Hostivice-Sadová D15	single/double postholes	rectangular	813	LBK	

Tab. 1. An overview of the sites with houses and fenced areas and their basic characteristics.

settlements across Central Europe. Although hundreds of finds support the considerable uniformity of Early Neolithic architecture, certain houses built using traditional ground plan concepts have special adjacent structures, originally involving a wooden enclosure or fencing. These fenced areas varied in construction, size and form (*Riedhammer 2003*; *Husmann – Cziesla 2014*; *Kustár et al. 2014*; *Baales et al. 2015*; *Dalidowski et al. 2016*). The construction of fences could consist of single or double postholes, single trenches or combinations of trenches and postholes; the differences in structure can be seen for instance at the Rötha site in Saxony (*Dalidowski et al. 2016*, 72), where all three elements were employed for the fence construction. Fences defined only by postholes next to the house are not numerous within the LBK (*Tab. 1*). The shape of enclosures varies from rectangular to circular, as is documented at the Bad Sassendorf site in North Rhine-Westphalia (*Baales et al. 2015*). Houses mostly had a single fence on one side, but this was not an absolute rule. At the Rötha site in Saxony, two different-sized areas were defined on both sides of a single house (*Dalidowski et al. 2016*, 72). A noteworthy situation is a connection between two houses. At the site of Targowisko 12–13, the houses are connected by two fences, the first connecting to the central and the second to the northern extension of the houses (*Czerniak 2013*). Two ground plans of late LBK longhouses linked by trenches and interpreted as an enclosure were also at Praha-Krč – Společenská zahrada (*Vondrovský 2021*, 317–322). Evidence of single areas that stood separate from houses is also available (Harta-Gátőrház, Hungary: *Kustár et al. 2014*). Like most houses, those with fenced areas can be dated from the early stage (*Husmann – Cziesla 2014*) to the late stage of the

LBK culture (*Riedhammer 2003*, 485). However, they are known from the post-LBK period as well (*Riedhammer 2003*; *Končelová – Květina 2015*; 440).

The functional interpretation of fenced areas has been addressed and while we do not have reliable evidence of crop cultivation or animal husbandry inside these spaces, they are mostly considered gardens (*Baales et al. 2015*), pens for keeping a herd of cattle (*Soudský 1966*, 57–58; *Riedhammer 2003*) or, in specific cases of connected buildings, a meeting place (*Czerniak 2013*; *Vondrovský 2021*, 338). Regardless of the original purposes, fenced areas signify a different socio-economical status of the houses (*Pavlů 2000*, 277). However, to be a 'garden' or 'meeting/ritual point', the fenced area should not feature obstacles like pits. In some cases, such as Bad Sassendorf (*Baales et al. 2015*), Bylany (*Soudský 1966*) or Rötha (*Dalidowski et al. 2016*, 72), there were sunken features inside. It is not clear if and how features in fenced areas related to houses and if they were contemporaneous. How do these special houses fit together in the settlement development?

The main aim of this article is to examine the contemporaneousness of the loam and settlement pits in fenced areas in relation to house occupation. This should be achieved by an analysis of formation processes, relative chronology, and radiocarbon dating in the case study of Hostivice-Sadová (Prague-West distr.), where two houses with adjacent fenced areas were excavated. Based on the results, we discuss these special houses in the context of the settlement area of the Hostivice-Sadová site and their position in Early Neolithic society in general.

Material and methods

Hostivice-Sadová site

The Neolithic settlement of Hostivice-Sadová is part of an area stretching on both banks of the Litovický Stream, which flows through the northwest edge of Prague. The site is located on the right bank of the stream on the southeastern edge of the Hostivice municipality (Prague-West distr.) at an altitude of 341–352 metres above sea level. The rescue excavation performed in 2004 was carried out by I. Pleinerová and J. Klementová from the Central Bohemian Museum in Roztoky near Prague. It covered an area of 7 ha and revealed a multiple-period site (Early and Middle Eneolithic, Early Bronze Age, and late Hallstatt period), where over 100 Neolithic settlement features concentrated in the eastern part of the excavated area were excavated (*Fig. 1*). Certain features were excavated completely, but due to the rescue nature of the campaign other features could be examined only partly (e.g. pit no. 343, 415). The settlement comprised 20 LBK northwest-southeast-oriented longhouses preserved to a greater or lesser degree. In some cases (house no. 1, 3, 9, 15), the houses featured the typical architectural construction of northern trenches and large interior posts in the southern part (*Modderman 1986*; *Coudart 1998*; *Hofmann 2013*).

Two completely preserved houses (no. 1 and 15) were selected for the analysis, as both are adjacent to a rectangular fenced area with sunken features inside. The study thus assesses seven loam pits, 14 pits in the fenced areas, and two sunken features in one house interior (*Tab. 2*). The proximity to the house sets aside feature no. 45 (*Fig. 1*; *Fig. 3*), which was classified as a common settlement pit (*Pavlů 1977*, 21). We analysed the characteristics of pottery fragments in a chronological context divided into three artificial stages.

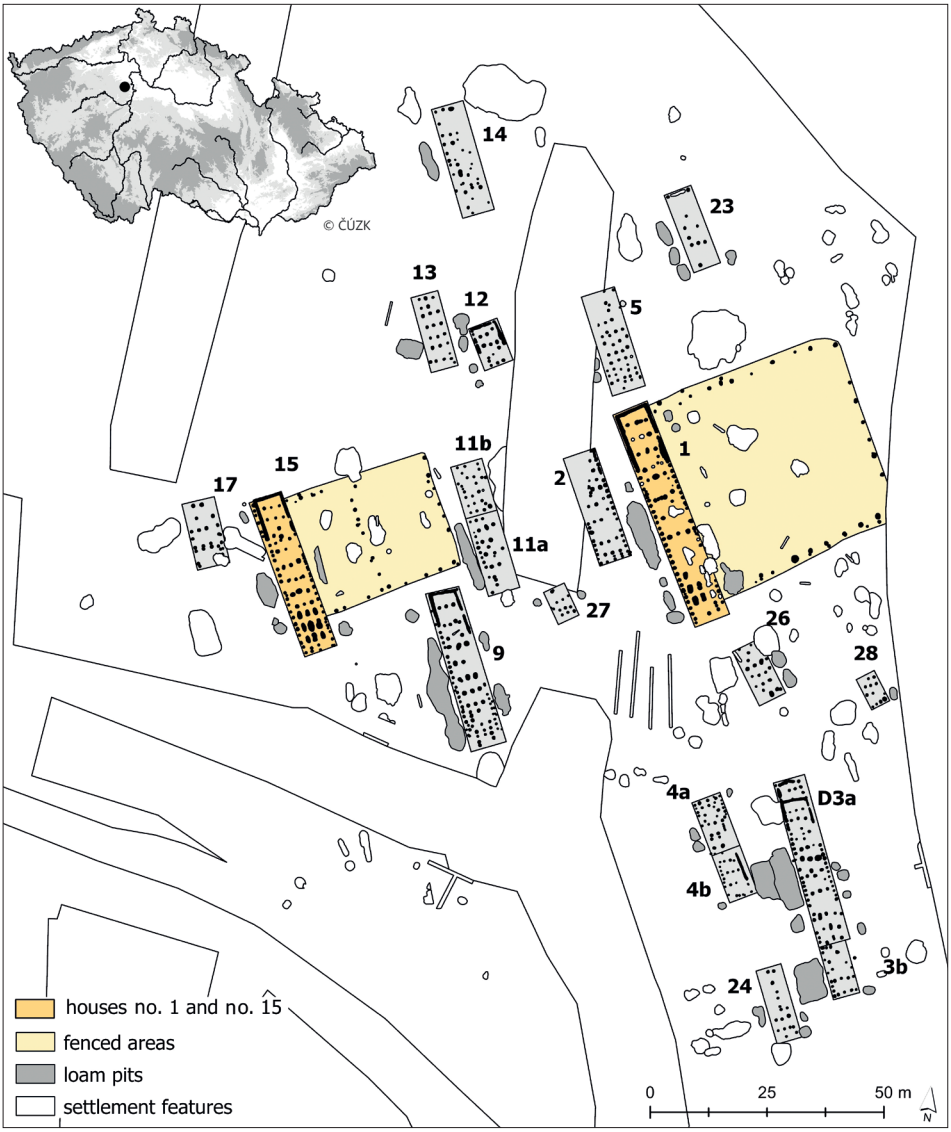

Fig. 1. Location of the Hostivice-Sadová site and overall plan of excavated Early Neolithic features. Analysed houses and fenced areas are in yellow.

This approach enables us to focus on the assemblages' characteristics and to identify potential differences. Feature no. 46 predates the house, as the eastern house wall line of posts intersects the feature. As such, the earliest stage is determined by the assemblage of feature no. 46 (*Tab. 3*; *Fig. 3*). The second stage is represented by individual loam pits adjacent to each house, which are most probably linked to the occupation of the houses (*Pavlů 1977*). It stems from the so-called house unit concept (see below). Here, the loam pits are determined by their functional relationship to longhouses and thus the assumption of a shorter

	feature charakteristics			pottery				chipped stone industry				polished and other industry			daub	animal bone
pit no.	interpretation	max depth [m]	volume [m²]	weight [kg]	individuals	fragments	average value of the morfometric characteristic	tools with gloss	blades	other retouched tools	flakes	polished tools	hand stones	grinding stone	weight [kg]	weight [kg]
36	feature	1.2	1.70	0.04	4	6	-0.4								0.1	
37	feature	0.7	10.50	1.47	53	65	0.6					1				0.29
39	feature	1.1	1.68	0.05	5	5	-1.1								6.5	
40	feature	0.8	8.04	1.33	54	67	0.5					2		1	0.0	1.17
41	feature	0.3	0.11	0.08	3	3	0.1								0.1	
45	feature	0.5	9.68	1.06	45	65	0.5					1				0.28
46	feature	0.4	3.25	3.87	142	176	0.3				6	1	1	1	3.0	0.31
50	loam pit	1.0	19.51	3.94	146	173	0.8				1	2	1		16.3	5.54
70	interior	0.7	3.78	4.96	184	223	1.2		3	1	4	2			0.8	1.33
72	loam pit	0.4	1.63	0.00	1	1	-1.0					1			0.5	
79	interior	0.7	3.50	0.03	3	3	-0.6									
84	loam pit	1.2	61.36	2.66	113	149	0.9					1		7	34.4	0.18
91	feature	0.5	2.70	0.28	11	12	2.0									
110	feature	1.1	1.43	0.08	3	3	-0.2									
118	loam pit	0.6	3.60	0.41	26	43	1.3	1		1					0.0	0.08
207	feature	0.5	2.60	0.30	12	12	0.2							1		0.66
339	feature	0.4	1.12	0.07	5	7	0.0									
343	feature	0.6	9.06	1.72	50	74	1.1	1		1				2	0.1	0.12
345	feature	0.5	2.08	0.12	5	5	0.0							2	0.0	0.03
346	loam pit	0.5	4.44	0.56	11	16	1.6			1				1		0.07
415	loam pit	0.8	4.59	0.50	18	22	1.6							1	0.2	
430	feature	0.8	4.37	0.47	18	25	1.4	1	1	3	1			1		0.11
438	loam pit	0.4	0.29	0.11	6	6	1.4									0.08

Tab. 2. The list of the basic information about the analysed features and their assemblages.

trajectory of formation arises at least in some cases (*Bickle 2020*, 183–189; *Pilař – Květina 2023*). The fence construction itself is dated by its connection to the building and should be contemporary with the lifetime of the house. However, as the area in one case was more or less empty (*Baales et al. 2015*), we assume, in the same vein as features inside rondels are considered, an asynchronous relationship between pits inside the fenced area and loam pits (*Řídký et al. 2019*, 43–67; *Blažková 2020*; *Vondrovský 2021*, 324–327). Fills of features in the fenced area thus represent the final stage of our artificial chronological framework (*Neustupný 1996*, 496; *Dalidowski et al. 2016*, 74). The pits situated within the longhouse interiors remained unclassified and aside from the chronological framework, as the chronological relationship between these pits and the construction of buildings is generally not clear (*Soudský 1969*; *Lička 2012*; *Bickle 2013*, 155; *Květina – Hrnčíř 2013*, 326).

Pottery assemblages

Pottery sherds are the key find category in our analysis, due to their quantity and mutual comparability (*Květina 2002*, 22). The many formation processes caused the degradation of pottery fragments, and these characteristics can be measured and observed on the level of individual sherds (*Wolfram 2013*; *Vondrovský 2021*; *Pilař – Květina 2023*). In general, these processes divided waste into several general categories: the material deposited directly at the site of activities (primary waste), the assemblages which were purposely moved (secondary waste) and finally, the sherds moved as part of the cultural layer (tertiary waste) by natural processes (*e.g. Schiffer 1972*, 162; *Řídký et al. 2012*; *Kuna 2015*).

The method and speed of filling are crucial for recognising differences (*Bickle 2020*, 186), in this case, between loam pits that flank the longer wall of houses and pits within the fenced area. Although the loam pit assemblages are traditionally considered to reflect house occupation regardless of the proportion of secondary waste and when it was deposited, they should be less influenced by formation processes than assemblages from sunken features opened for a long time (*Soudský 1966*; *Stäuble 1997*, 84; *Květina – Řídký 2017*; *Pilař – Květina 2023*). Of equal importance to the formation processes is the relative chronological development of settlements, analysed based on the occurrence and the ratio of decoration styles. The chronological classification of LBK pottery has been developed over decades (*Soudský 1966*; *Pavlů 1977*; *2000*) and the current perception of the chronology is based on an attempted critical evaluation with regard to the analysis of formation processes (*Květina – Končelová 2011a*; *Vondrovský 2021*, 260; *Pilař – Květina 2023*).

The analysed values of ceramic assemblages were determined from the quantitative and qualitative attributes of pottery fragments (*Wolfram 2013*; *Vondrovský 2021*; *Pilař – Květina 2023*). The fragments were assigned to individual vessels according to the similarity of decoration or pottery material characteristics (*Vondrovský 2021*, 69–82). The density of pottery finds (kg/m^3) was calculated for individual excavated feature parts (*Květina 2010*). These are parameters related to a particular sunken feature. In contrast, formal and metric characteristics were determined for each fragment separately (*Vondrovský 2021*, 69–82). The following categories were determined: weight; the size/wall index (maximum size of the fragment and average wall thickness) expressing susceptibility to breaking (*Květina 2005*; *Květina – Končelová 2011b*, 60–61); concavity; the degree of abrasion; and the shape of the fragment. Concavity represents only a supplementary variable because it was not determined for all fragments. Only fragments with a deflection higher than 5 mm were studied (*Pilař – Květina 2023*, 27). The overall shape of the fragment was classified in terms of polygonal, triangular, and amorphous shapes. Edge abrasions were separated into five categories: unworn edge, slightly worn edge, heavily worn edge, reutilised, and amorphous edge (*Květina 2005*; *Květina – Končelová 2011b*; *Řídký et al. 2012*; *Wolfram 2013*; *Vondrovský 2021*; *Pilař – Květina 2023*).

To address potential value bias arising from the limited dataset of sunken features related to selected longhouses (*Vondrovský 2021*, 77–82), a statistical evaluation of individual morphometric parameters was carried out on fragments from all Neolithic sunken features, comprising 5,179 pottery fragments from 3,988 vessels. As with the Neolithic settlement at Společenská zahrada in Praha-Krč, we reduced data to indexes allowing interoperability of formal and metric values. Nominal values are on a five-point scale. The zero values always represent the median. Higher and lower scores were assigned to the assemblage top

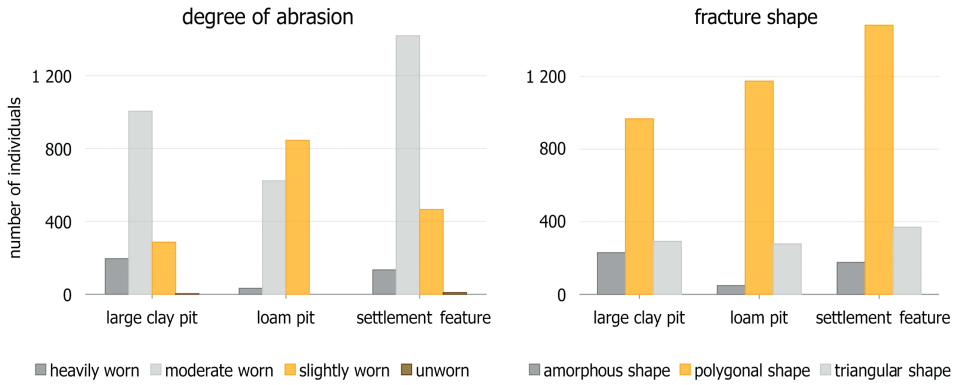

Fig. 2. Overall numbers of ceramic individuals in categories of edge abrasion and fragment shapes from Hostivice-Sadová site (degrees of abrasion: categories of unworn edge and reutilised fragments were not recorded).

and bottom decile (*Vondrovský 2021*, 77–82). For descriptive categories, the zero value determines the most frequently represented type (*Fig. 2*). However, the shape parameter requires reduction, as one category dominates all functionally defined pits (*Vondrovský 2021*, 80). The result is the sum of the individual index values determined for each pottery fragment. The resulting values are determined to be significantly positive (above the third quartile) or significantly negative (below the first quartile). Other values are classified as irrelevant.

The analysed house units and pits in fenced areas comprise 1,161 fragments from 918 vessels. The data were statistically evaluated using the PAST software. The differences in ceramic density and refitting variability were tested using a non-parametric test (Kruskal-Wallis test with post-hoc). The values considered together were only for the analysis of variance due to the minimal frequency of features for the oldest and interior stages.

The relative chronological development was determined according to the style of linear ornamentation on pottery and the quantitative proportions of individual styles previously described for the LBK in Bohemia (*Soudský 1966*; *Pavlů 1977*; *Pavlů et al. 1987*; *Květina – Pavlů 2007*; *Pavlů – Zápotocká 2013*, Fig. 6). However, the most frequent style is a simple incised line (delta12), which is not chronologically significant. The main problem lies in its determination because the simple line could originally be part of another style, which remained unrecognised due to fragmentation. This uncertainty can distort chronological sequences (*Pilař – Květina 2023*). The relative chronology framework is based on balancing sequence accuracy (stage/phase) and formation processes (*Vondrovský 2021*, 260). The reliability factor played a pivotal role in the chronological assessment. This was achieved by implementing formation processes to eliminate fragments with a significantly negative score or featuring irrelevant decoration. Essentially, the morphometric parameters are used in this case study to determine the reliability of assemblages and eliminate those formed by long-term processes characterised by low values. Principally, the relative chronology is based only on significantly positive morphometric parameters. As decorated fragments do not occur frequently in all assemblages, the minimum number of individuals was limited to six.

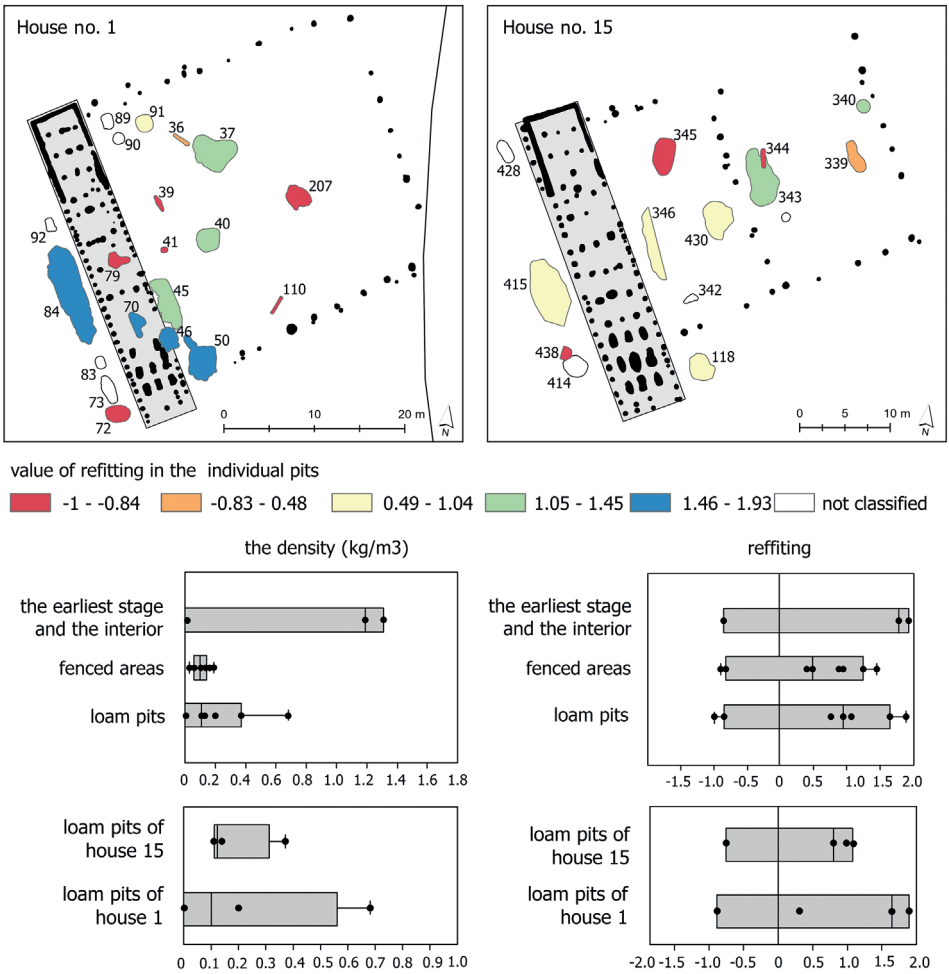

Fig. 3. The refitting value in the individual loam pits and features in the fenced areas of both houses. A box plot and jitter showing the refitting and density values and specific position of the ceramic assemblage at three defined artificial stages and houses.

The concept of the house unit referred to in this study assumes chronological homogeneity of individual loam pits distributed alongside the longhouses (*Soudský 1962*; *Pavlů 1977*; *Allard et al. 2013*). However, the differences in the formation processes of individual loam pits belonging to the same house unit (*Pilař – Květina 2023*) lead us to analyse the house units as individual loam pits and then evaluate their mutual chronological homogeneity. Variance of decorative styles in the multiple loam pits belonging to the same house unit should be further validated. Heterogeneity could be caused by the unrecognised overlapping of pits. Thus, the validation is based on field situations and the distance between houses along with the overall taphonomic trajectory of fills, an approach designed to achieve the highest accuracy. However, sometimes there are not enough significant finds in a single excavated pit to assess the situation reliably. In these cases, we retain the concept of

artificial stage	description	house 1	house 15
1st stage	the earliest feature	feature no. 46	-
2nd stage	house with loam pits and fence construction	loam pit no. 41, 50, 72, 73/74, 83, 84, 89, 90, 92	loam pit no. 118, 342, 346, 414, 415, 428, 438, 439
3rd stage	fenced area infills	feature no. 36, 37, 39, 40, 45, 91, 110, 207	feature no. 339, 343, 345, 430
unclassified stage	interior of the house	feature no. 70, 79	-

Tab. 3. Defined artificial stages and their settlement features.

the house unit as a supplementary approach, which makes it possible to analyse a greater number of house units, albeit with reduced accuracy.

Individual decoration styles and lines beneath the rim were determined. Vessel shapes and decoration motifs are not included in the analysis due to their low diversity and determination rate. The relative chronological development of selected assemblages was analysed using Correspondence Analysis (CA), which shows relationships between categories of variables.

The resulting relative chronology development was validated with radiocarbon dating of animal and human bones excavated in pit fills. The reliability of the features and the availability of osteological material affected the sampling strategy. Samples were obtained from the loam pits of house no. 1 and 15 and the grave situated in large clay pit 343 located in a fenced area next to house no. 15 and were assessed in the context of other radiocarbon dates from the site. The dates were calibrated and modelled using the OxCal 4.4 software (*Bronk Ramsey 2009*) and the IntCal20 calibration curve (*Reimer et al. 2020*).

Results

Formal and metric characteristics

The assemblages exhibit significant fragmentation rate, as nearly 84% of the individuals (reconstructed vessels) featured only a single fragment. In only one case, a refit was observed between pit no. 46 and 70. The refitting of ceramic vessels (H=2.093, p=0.3501) and density of ceramic (H=1.079; p=0.5791) show no significant differences between loam pits and sunken features in fenced areas. Thus, this is evidence of long-term processes that affected most of the pottery fragments. A high pottery density was recorded only in pit no. 70 located in the central part of house 1. In this case, it could be evidence of an intentional relocation of a larger amount of the assemblage. In addition, there are no significant differences between the loam pits of both houses (*Fig. 3*), neither in refitting (H=0.5, p=0.4795) nor in concentration (H=1.125; p=0.2845). The homogeneity could mean that more or less similar fill processes took place at both house units.

The values of descriptive characteristics are different. As a result of the long-term processes causing the shape reduction (*Vondrovský 2021*, 80), polygonal fragments dominate all of the features. The category of abrasion is more heterogeneous. Essentially, only one fragment from the fill of pit no. 46 of the earliest artificial stage represents the category of sherds with unworn edges. The vast majority were classified as moderately worn or slightly worn. Reutilised fragments are absent in the analysed assemblages, and amorphous ones

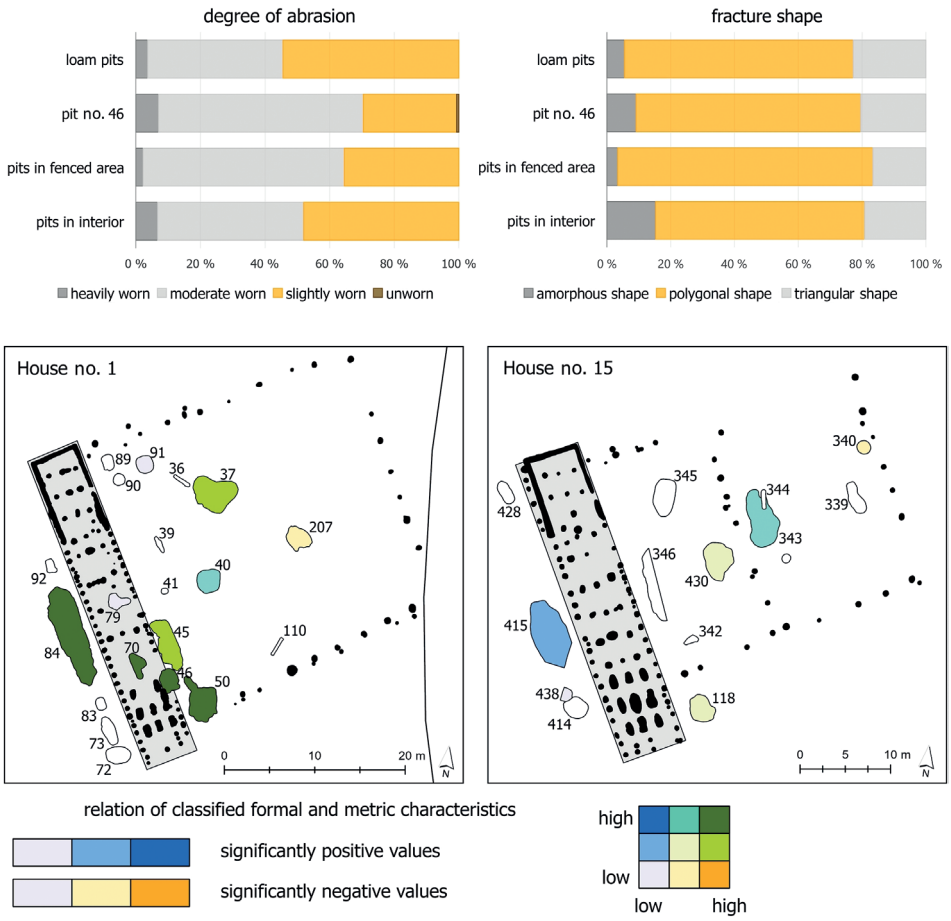

Fig. 4. The proportions of degree of abrasion and fracture shapes in the analysed features. Bivariate plot of significantly positive and negative values at individual features.

are less frequent. However, over half of the fragments from loam pits have slightly worn edges. In contrast, most fragments from the fenced area were characterised by completely worn edges (*Fig. 4*).

The results show the heterogeneity of loam pit fills and sunken features in fenced areas. Moreover, differences in formation processes can be observed between both houses. Significantly negative values are present in the pits in the fenced area of house no. 1 (*Fig. 4*), although slightly worn pottery fragments were more commonly found in the loam pits along the house. As with house unit no. 1, pieces from the loam pits of house no. 15 were less affected by formation processes than the pottery within the fenced area. Several studies have shown that the fill of individual loam pits varies significantly, especially regarding the density of pottery fragments (*Pavlů 2010*, 53–54; *Květina – Končelová 2011a*, 64; *Pilař – Květina 2023*). In addition, the western loam pit of house no. 15 contained completely worn fragments, but their size and weight correspond to positive index values.

Pit no.		46	50	84	37	40	45	70	415	118	343	430
interpretation	The average index of formal characteristics	the earliest stage	house 1	house 1	house 1 – fenced area	house 1 – fenced area	house 1 – fenced area	house 1 – interior	house 15	house 15	house 15 – fenced area	house 15 – fenced area
alfa12	2.15	21.1	22.9	20.0	55.6	36.4	10.0	46.2	50.0	55.6	-	33.3
alfa13	8.10	-	-	-	-	-	-	3.8	-	-	16.7	-
delta12	0.82	73.7	57.1	52.0	22.2	54.5	60.0	40.4	33.3	44.4	33.3	55.6
epsilon0	0.51	-	5.7	8.0	-	-	-	-	-	-	16.7	-
epsilon10	2.75	5.3	14.3	16.0	11.1	9.1	20.0	7.7	-	-	-	11.1
epsilon20	8.43	-	-	-	-	-	-	-	16.7	-	33.3	-
theta	6.53	-	-	-	11.1	-	10.0	1.9	-	-	-	-
analysed LO	3.37	19	35	25	9	11	10	52	6	9	6	9
total LO	1.60	33	62	52	27	20	22	67	6	14	9	12
lines beneath the rim	-	10.5	8.6	12.0	22.2	27.2	-	13.5	-	-	16.6	11.1
hemispherical pots	-	17	14	11	6	5	2	33	2	4	26	6
deep bowls	-	-	-	-	-	-	-	-	-	-	-	-
others	-	4	5	1	1	-	1	2	1	-	-	-

Tab. 4. The average index of metrics and formal parameters of individual decoration styles in analysed features. The quantitative proportion of significantly positive decorated fragments and vessel shapes from the analysed loam pits and the features in fenced areas.

Relative chronology

Formation processes affect the variability of individual linear decoration styles in assemblages (*Květina 2010*, 20). Many analyses refer to a more intricate formation of pottery assemblages, as evidenced by their metric parameters (*Stäuble 1997*; *Květina 2010*; *Pilař – Květina 2023*). The combination of influences affecting the determinability of decoration styles and thus their reliability is demonstrated by the average index of formal attributes.

In any case, the most frequent decoration style was a simple line (delta12). However, as a low average value of the index of formal and metric characteristics shows, it was determined on one of the most fragmented pieces of pottery (*Tab. 4*). The highest values, which are linked with the filled-in band accompanied by musical notes (alfa13) and line with musical notes in closer intervals (epsilon20), are caused by low sherd representation (*Fig. 5*). On the other hand, the differences in the average value of formal and metric characteristics

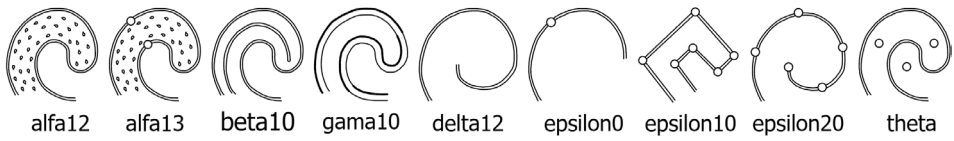

Fig. 5. An overview of the Bohemian LBK decoration styles that are mentioned in the text.

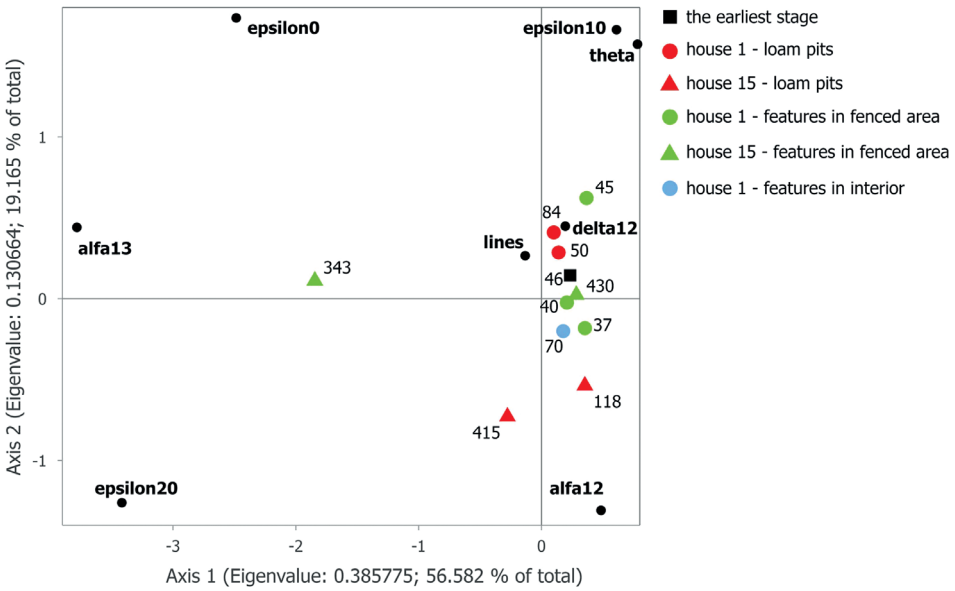

Fig. 6. Correspondence analysis of proportions of decoration styles in individual features in the fenced area and loam pits along house no. 1 and 15. Black – the earliest artificial stage; red – the second artificial stage; green – the third artificial stage; blue – the interior of the house).

are also evident for more frequent styles. As the results showed differences in the values of individual decoration styles, sherds with a long trajectory of formation processes should be eliminated to avoid distortion in the chronological assessment. After this step, only well-preserved sherds with unworn and slightly worn edges remain. Upon analysing the filtered results, it is evident that the decorated assemblages retrieved from the loam pits of house no. 15 were less impacted than those from house no. 1. The almost identical numbers substantiate this when compared to the original collection.

The correspondence analysis shows that the proportion of decoration styles in individual loam pits from both house units is more or less uniform (*Fig. 6*). As pit no. 415 was not excavated completely, we chose pit no. 118, which yielded the most decorated sherds. This makes the chronological framework more robust. In contrast to house units, the distribution of decorative styles among individual fenced area features shows a less uniform pattern. In the case of house no. 1, the fills of sunken features in the fenced area were formed significantly later than in the loam pits. This may be attributed to the high proportion of the filled-in band (alfa12) style in the assemblages from the fenced area (pit no. 37, 40) and the musical notes placed on ends of lines (epsilon10) in pit no. 45. Pottery in this pit corresponds more to the loam pits of house no. 15 than house no. 1., which displayed inconsistent differences from house no. 15 between features in the fenced area and loam pits. The assemblage from pit no. 430 contained a significantly lower portion of the filled-in band (alfa12) than the loam pits of house no. 15. In contrast, the assemblage from pit no. 343 featured fragments decorated by later styles, such as musical notes placed at closer intervals (epsilon20). However, the difference may be caused by a lower occurrence of decorated fragments.

Lab. No.	BP	pit no.	material	depth	interpretation
CRL_22_1782	**6078±30**	362	animal bone	20–40	house no. 13 – loam pit
CRL_22_1783	**6192±28**	353	animal bone	20–40	house no. 11 – loam pit
CRL_22_1784	**6355±38**	128	animal bone	40–60	house no. 3b/24 – loam pit
CRL_22_1786*	**6213±25**	118	animal bone	0–20	house no. 15 – loam pit
CRL_22_1787	**6166±27**	144	animal bone	0–20	house no. 4a – loam pit
CRL_22_2077	**6157±23**	33	animal bone	0–20	loam pit no. 23 – loam pit
CRL_22_2078	**6345±24**	29	animal bone	60–80	pit no. 29
CRL_22_2079*	**6365±46**	84	animal bone	0–20	house no. 1 – loam pit
CRL_22_2080	**6136±21**	150	animal bone	0–20	hit no. 150
CRL_22_2081	**5848±37**	273	animal bone	40–60	hit no. 273
CRL_22_2082*	**6084±20**	H20	human bone	burial at the bottom	grave H20 in pit no. 343
CRL_23_0177	**6210±27**	29	animal bone	0–20	pit no. 29
CRL_23_0178	**6223±28**	324	animal bone	0–dno	house no. 9 – loam pit
CRL_23_0469*	**6203±31**	50	animal bone – large mammal	40–60	house no. 1 – loam pit
CRL_23_0470*	**6287±35**	50	animal bone – large mammal	60–dno	house no. 1 – loam pit
CRL_23_1770	**6154±19**	273	human bone	burial	grave H18 in pit no. 273

Tab. 5. A summary of the radiocarbon samples taken at the Hostivice-Sadová site with details of find context (*samples belong to analysed houses and pits in a fenced area).

The relative chronological assessment reveals that the assemblage from pit no. 70 inside house no. 1 indicates a closer association with house no. 15 than with its original dwelling due to the proportion of the filled-in band (alfa12) and the more significant presence of lines under the rim than in the assemblages of house no. 1. However, both areas and houses could be related to the middle LBK tradition with different proportions of filled-in band (*Pavlů – Zápotocká 1979*; *Trampota – Květina 2020*).

Absolute chronology

Currently, 16 radiocarbon dates are available for the Hostivicie-Sadová site. Samples were retrieved from various contexts comprising nine loam pits related to longhouses (10 samples), three pits (4 samples), and two graves (*Tab. 5*; *Fig. 7*; *Fig. 8*). Focusing on the two analysed houses and their fenced areas, five radiocarbon dates are available (*Fig. 7*). Samples were taken from the bone remains of larger ruminants, except for grave H20, situated in feature no. 343 and buried in pit no. 273. Since there is a chance of being affected by formation processes, only the larger pieces of animal bones were selected. The human remains have been selected as the most reliable. As the human remains in grave H24 situated near the northwest corner of house no. 15 turned out to be very fragmented and with insufficient collagen yield, we could not date them.

Eastern pit no. 50 and western loam pit no. 84 met the general criteria for radiocarbon dating. In eastern pit no. 50, bones from the lower layers (40–60 cm and 60 cm – bottom) were sampled for radiocarbon dating. Western loam pit no. 84 contained animal bone only at the upper layer 0–20 cm. The minimal occurrence of animal bones in individual pits affected the sampling of house no. 15. Thus, we selected loam pit no. 118, as its animal bone

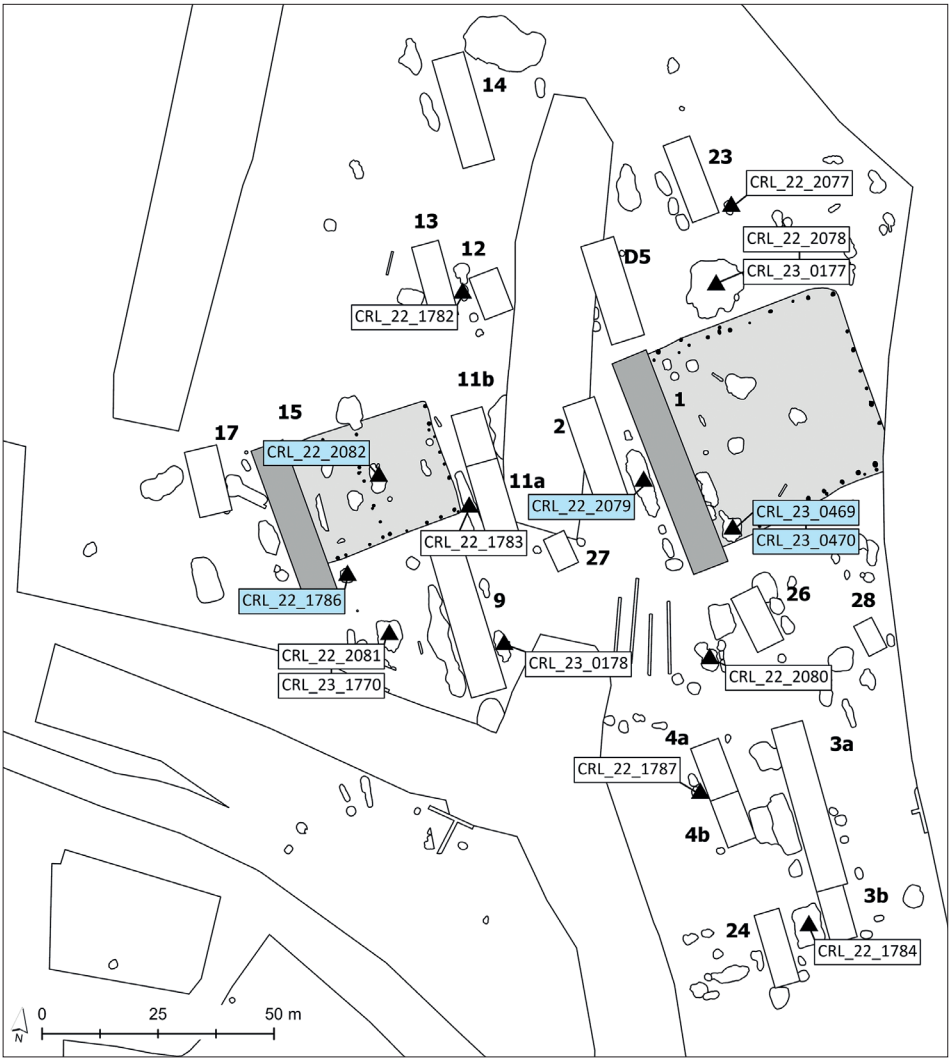

Fig. 7. The distribution of radiocarbon dates at the Hostivice-Sadová site.

assemblage was sufficient for sampling. As the features in fenced areas seem to be more significantly affected by formation processes, we selected pit no. 343 with grave H20 at the bottom layer.

The results of the consistency test, involving two samples from the eastern loam pit of house no. 1, confirmed the statistical consistency of samples (χ^2 test: df=1, T=3.2, T(5%)=3.8). The variability of the formation processes was evident in the western loam pit (χ^2 test: df=2, T=9.1, T(5%)=6.0). As the radiocarbon dating results from both pits are statistically inconsistent at the 5% significance level, sample CRL_22_2079 from the western loam pit is more likely associated with natural processes such as erosion or layer redeposition. Dates from eastern loam pit no. 50 (CRL_23_0469, CRL_23_0470) are statistically con-

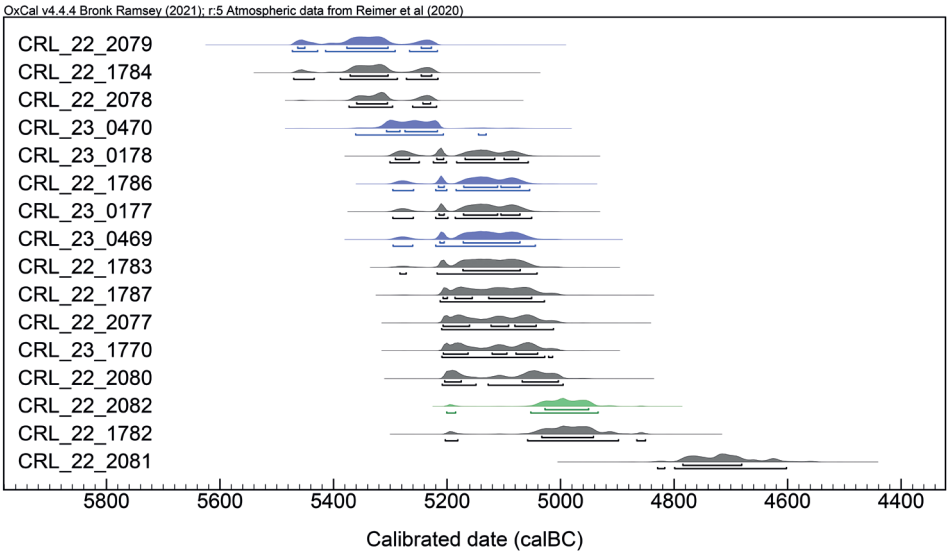

Fig. 8. Calibrated radiocarbon dates from the Hostivice-Sadová site. Blue – samples from loam pits; green – samples from the fenced area; grey – other samples from Early Neolithic contexts.

sistent; therefore, it is possible to date the start of the filling of loam pits around house no. 1 to 5305–5071 cal BC (95.4% probability) or 5300–5128 cal BC (68.3% probability).

At the 95.4% probability level, we can date the loam pit of house no. 15 (CRL_22_1786) to 5296–5055 cal BC, and with a 68.3% probability to 5216–5072 cal BC. The comparison of the dates related to the house no. 15 (CRL_22_1786) and the fenced area (CRL_22_2082) shows that they are statistically inconsistent (χ^2 test: df=1 T=16.291, T(5%)=3.8). Grave H20, situated in large clay pit no. 343, was dated to the interval 5201–4935 cal BC at a 95.4% level of probability, and with a 68.3% probability to 5028–4951 cal BC.

Overall, the radiocarbon dating results suggest continuity of the settlement. (*Fig. 8*). The entire radiocarbon sequence is in the range of 5473–4603 cal BC at a 95.4% level of probability, but the lower boundary spans within the post-LBK development in Bohemia (5000/4900–4400 BC). This is caused by the sample (CRL_22_2081), which came from animal bone from pit no. 273 and its resulting range is consistent with the late stage of Stroked Pottery culture (*Řídký et al. 2019*, Fig. 9.2). However, the second sample from sunken feature no. 273 (CRL_23_1771) associated with grave H18 yielded radiocarbon ranges that are widely apart and statistically inconsistent (χ^2 test: df=1 T=52.918, T(5%)=3.8). The pottery assemblage of feature no. 273 contained only the Early Neolithic fragments without any indication of disturbance; therefore, the risk of contamination was not expected. As the radiocarbon sample from human bone is in agreement with the current Early Neolithic chronology (*Pavlů – Zápotocká 2013*, Fig. 5) and given the taphonomic context of the samples (deliberately deposited burial, disarticulated animal bone), we consider CRL_23_1771 to reflect the pit chronology and CRL_22_2081 to be an intrusion. In view of the above, we assume that the sequence of results from the Hostivice-Sadová site is in the range of 5473–4851 cal BC at a 95.4% probability level.

Discussion

Formation processes in Neolithic houses and fenced areas

As some of the individual parameters (refitting, density of ceramics) do not show any significant differences between loam pits related to selected houses and sunken features in a fenced area, it is essential to compare them with remaining Neolithic assemblages from Hostivice-Sadová to understand the formation processes of four artificial stages better. Overall, the minimal number of reconstructable vessels suggests a lower proportion of secondary waste in all features and in the loam pits of both houses (*Schiffer 1972*, 161). As in previous studies (*Pilař – Květina 2023*), the fills of loam pits seem to be more transformed because the primary deposition of waste likely took place outside the excavation area (*Květina – Hrnčíř 2013*).

Transformation processes at the level of artificial stages were analysed through principal component analysis (PCA). In the scatterplot, three groups of assemblages are apparent (*Fig. 9*). The first group (pit no. 46 and 70) suggests a short-term filling with admixture of secondary waste. The percentages of positively classified fragments remain low, while refitting and density values demonstrate comparatively higher levels. The second group (pit no. 37, 40, 45, 91, 207, 343, 430 and loam pit no. 50, 84, 118) corresponds to the majority of Neolithic sunken features from the settlement. The third group (loam pit 346, 415) is characterised by low-influenced but less-numerous sherds. However, compared to others, the assemblages from the feature inside the building (pit no. 70) and the earliest stage (pit no. 46) were formed by a different mechanism. Although neither complete vessels nor their larger parts were found, the high refitting and density of ceramic fragments could mean that the assemblage was intentionally moved from its original deposition (*Pilař – Květina 2023*). At least in the case of the earliest stage (pit no. 46), the intentional translocation of slightly transformed fragments could have been motivated by the effort to eliminate obstacles near house no. 1 (*Stäuble 1997*). In pit no. 70, the distribution of a decoration style differs significantly from that of the earliest stage, especially by the presence of the filled-in band (alfa12), which suggests the later deposition of the assemblage (*Fig. 6*).

The differences between the two house units are apparent and also the results vary even in individual loam pits. Overall, loam pit no. 50 and 84 related to house no. 1 correspond to the predominant part of the ceramic assemblage, which includes all sunken features from the Early Neolithic settlement. Therefore, they can be related to a longer trajectory of formation processes (*Wolfram 2013*; *Pilař – Květina 2023*), which can also be inferred from inconsistent radiocarbon dating results from both loam pits. At least some components of the fill of loam pit no. 84 could have come from the redeposition of earlier cultural layers or natural processes such as erosion. However, pit no. 50 on the eastern side reveals consistent and more reliable results perhaps formed by a lower proportion of secondary waste. In contrast, the assemblages from the loam pits of house no. 15 had a shorter formation trajectory of fills and probably contained a higher proportion of secondary waste, as reflected by larger, slightly worn pottery fragments distributed with a lower density.

The assessment of the sunken feature fills within the fenced areas, the processes that formed them, and the chronology of those processes is crucial. The analysis of formation processes indicates that the assemblages deposited inside the fenced area were more heavily affected by formation processes than the assemblages of loam pits; they contained tiny,

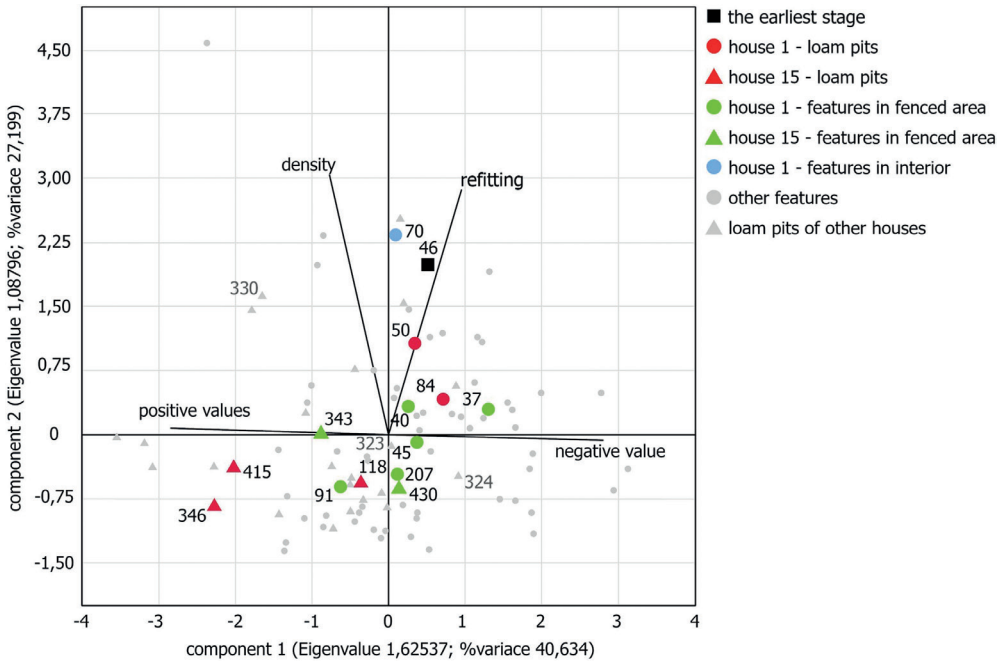

Fig. 9. Principal correspondence analysis (PCA) of the refitting, density, and formal and metric characteristics of ceramic assemblages from pits with more than five individuals from the settlement of Hostivice-Sadová. Black – earliest artificial stage; red – second artificial stage; green – third artificial stage; blue – interior of the house; light grey – other pits; dark grey numbers – individual pits of house no. 9.

moderate or heavily worn sherds indicating longer processes associated with the tertiary waste (*Kuna 2015*). Although the processes appeared similar to those of house no. 1, the chronology assessment suggests they differed. Besides the processes that seem important for the development framework, the typochronological changes play the same role. Previous results showed that the decoration styles found in pit no. 46, 50, and 84 were almost identical in proportion (*Fig. 6*), even though they were influenced by different processes affecting the morphometry of sherds but not the approximate proportion of styles. Even if we eliminate almost half of the assemblages that appear to be affected by a longer formation trajectory, the similarity in proportion of the decoration styles remains. Essentially, we may associate these three assemblages from different artificial stages with one waste area used before the construction of house no. 1 and perhaps after that.

The same principles could be applied to features inside fenced areas and the loam pits. Nevertheless, if the assemblages from loam pits and fenced areas are from one waste area, they should correspond more closely to each other in proportions of decoration styles regardless of influences; likewise, the earliest stage (pit no. 46) and loam pits (no. 50 and 84) of house no. 1 (*Rulf 1997*; *Last 1998*; *Allard et al. 2013*; *Květina – Hrnčíř 2013*). However, more frequent occurrences of the filled-in band (alfa12) can be associated with later deposition, at least in the case of pit no. 37 and 40 inside the fenced area of house no. 1 (*Pavlů 1977*), especially when its occurrence was higher even in the cultural layer that likely formed most of the fills deposited within the fenced area.

In the second case, the later fill of pit no. 343 in the fenced area of house no. 15 is indicated by a few sherds decorated with musical notes at closer intervals (epsilon20) associated with later development of decoration style. In addition, it is supported by radiocarbon dating of the burial deposited at the bottom of the feature. To ensure reliable results, we eliminate insufficient parts (fragments with indexes below the third quartile) of assemblages and discuss the remaining assemblages from the fenced areas (pit no. 45 and 430). In both cases, the proportion of the filled-in band (alfa12) from the loam pits varied. The styles such as musical notes placed aside lines (theta) are present in pit no. 45, suggesting earlier deposition than in the loam pits of house no. 1 (*Pavlů 1977*, 45). In the second case, the difference in proportion of the filled-in band (alfa12) is not significant but essentially indicates earlier or later deposition than in loam pits around house no. 15.

In summary, the chronology and formation process assessment confirms that the fills of features in the fenced area formed later than loam pits. Therefore, it can be considered that the area was without any pits during the period of house occupation.

Assessing LBK settlement phases and decorative traditions

During the middle stage of LBK development in central Bohemia, the proportion of the filled-in band (alfa12) increased and then decreased. The maximum proportion is observed at phase 2B, although it also remained significant in later phase 2D. The musical notes along the line were set closer to each other, replacing the variants with sparser notes (*Pavlů 1977*; *Pavlů – Zápotocká 1979*; *Pavlů – Zápotocká 2013*, 34).

The development of the analysed LBK houses from the settlement at Hostivice-Sadová consists of at least two phases of the middle LBK (*Fig. 6*). This allowed us to validate the relative chronology sequence in the wider context of the settlement development and search for chronological connection between other houses and those with fenced areas. All houses from the Hostivice-Sadová site have a proportion of decoration styles comparable to those from LBK sites in Prague-Liboc (Libocká Street 10 site: *Olmerová – Pavlů 1991*, Šestákův statek site: *Schindlerová 2019*), Roztoky (*Rulf 1991*), Dolní Břežany (*Čtverák – Rulf 1984*), and Praha-Krč (*Vondrovský 2021*) situated in the Prague area close to the Vltava River or in the vicinity of its tributaries. Libocká Street 10 and Šestákův statek located in the Litovický Stream basin are the closest sites to Hostivice-Sadová (*Olmerová – Pavlů 1991*; *Schindlerová 2019*). The settlement from Libocká Street 10 offers only a few sunken features for comparison, so a more significant assessment is given with Šestákův statek (*Schindlerová 2019*, 97). However, the chronological development of Šestákův statek has to be revised, since the local chronological framework was based on a scheme of simplified decoration styles (*Schindlerová 2019*, 93–105), meaning that the earlier style of notes set aside lines (theta) was analysed as a single group along with the later musical note styles (epsilon 0, epsilon 10). Therefore, the results of the correspondence analysis, which includes assemblages with short trajectories of formation processes and where the individual styles were analysed, can vary.

The same characteristics as those of the previous chronological analysis of house units and fenced areas were chosen for evaluation of a wider context. In this case, however, it was necessary to also include vessel shapes in the analysis. It made it possible to compare the Hostivice-Sadová site with the settlement, where deep bowls were notably represented as older vessel shapes (*Pavlů et al. 1987*).

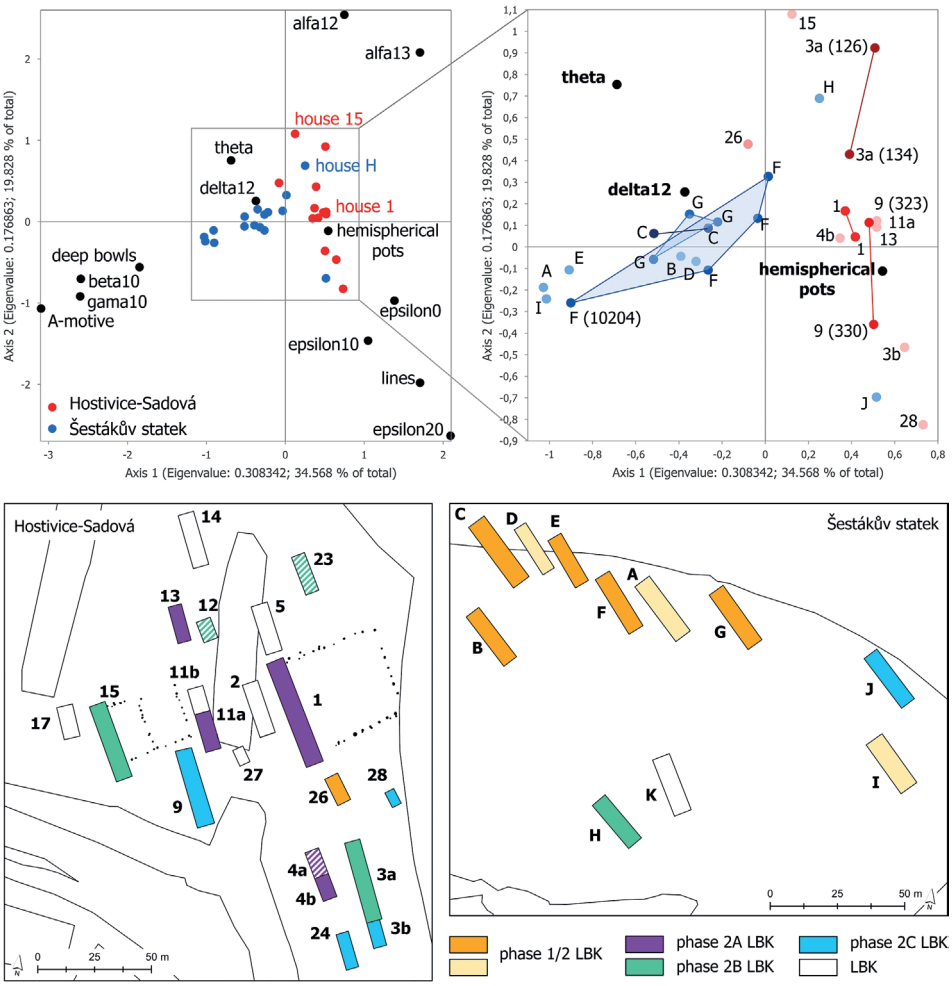

Fig. 10. Correspondence analysis (CA) of individual decorative styles and shapes of vessels from assemblages of settlements at Hostivice-Sadová and Praha-Liboc, Šestákův statek. Development of individual settlements in the Litovický Stream basin microregion (hatched fillings show individual houses dated with lower accuracy).

The development of Hostivice-Sadová features 10 house units analysed at the level of individual loam pits and three based on the house unit concept with lower accuracy. These three houses (house no. 4a, 12, and 23) were not included in the correspondence analysis and were compared separately based on the similarity of style occurrences with more precisely dated houses. The assemblage from Šestákův statek consists of 10 houses, which were analysed on the level of individual loam pits (*Tab. 6*). The correspondence analysis shows (*Fig. 10*) the consistency of individual loam pits of almost every house unit (house no. 1 and 15 from Hostivice-Sadová, houses C and G from Šestákův statek), with the exception of house no. 9 and no. 3a from Hostivice-Sadová and house F from Šestákův statek, which varied in the decoration style of individual assemblages. As loam pit 10204 of

	House no.	loam pit no.	alfa 12	alfa 13	alfa 30	beta 10	delta 12	epsilon 0	epsilon 10	epsilon 20	gama 10	theta	total LO	A-motiv	lines beneath the rim	deep bowls	hemispherical pots	total vessels
Hostivice-Sadová site	1	50	22.9	-	-	-	57.1	-	14.3	-	-	-	35	-	8.6	-	73.7	19
	1	84	20.0	-	-	-	52.0	-	16.0	-	-	4.0	25	-	12.0	-	91.7	12
	3	126	55.6	11.1	-	-	33.3	-	-	-	-	-	9	-	-	-	100.0	7
	3	134	33.3	-	-	-	41.7	-	16.7	-	-	-	12	-	-	-	87.5	8
	3b/24	128	4.3	2.9	-	-	55.7	2.9	22.9	2.9	-	-	70	-	38.6	-	92.9	70
	4a*	131, 144, 239	33.3	-	-	-	66.7	-	-	-	-	-	3	-	33.3	-	100.0	2
	4b	125	21.4	-	3.6	-	71.4	-	3.6	-	-	-	28	-	25.0	4.8	95.2	21
	9	323	25.0	-	-	-	50.0	12.5	12.5	-	-	-	8	-	12.5	-	100.0	3
	9	330	-	-	-	-	58.8	-	35.3	-	-	-	17	-	17.6	-	96.0	25
	11a	353	7.7	15.4	-	-	53.8	-	7.7	-	-	-	13	-	7.7	-	100.0	6
	12*	361, 362	57.1	-	-	-	42.9	-	-	-	-	-	7	-	14.3	-	100.0	3
	13	364	30.0	-	-	-	43.3	-	26.7	-	-	-	30	-	13.3	-	89.5	19
	15	118	55.6	-	-	-	44.4	-	-	-	-	-	9	-	-	33.3	66.7	4
	15	415	50.0	-	-	-	33.3	16.7	-	16.7	-	-	6	-	-	-	66.7	3
	23*	33, 101, 102	83.3	-	-	-	-	-	16.7	-	-	-	6	-	33.3	-	100.0	5
	26	116	25.0	-	-	-	75.0	-	-	-	-	-	8	-	-	25.0	75.0	4
	28	231	-	-	-	-	50.0	-	50.0	-	-	-	6	-	50.0	-	100.0	3
	-	29	3.8	-	-	0.6	53.1	10.0	20.6	7.5	-	3.1	160	-	17.5	1.3	90.1	151
	-	150	24.0	-	-	-	60.0	-	8.0	-	-	-	25	-	-	-	86.4	22
	-	273	42.9	4.8	-	-	33.3	4.8	4.8	-	-	9.5	21	-	-	-	85.7	14
Praha-Liboc, Šestákův statek site	A	10199	-	-	-	12.5	87.5	-	-	-	-	-	8	12.5	-	62.5	25.0	8
	B	10235	-	-	-	11.8	82.4	-	5.9	-	-	-	17	-	-	22.2	66.7	9
	C	10182	-	-	-	-	88.9	-	3.7	-	-	3.7	27	-	-	25.0	50.0	8
	C	10218	-	-	-	10.0	90.0	-	-	-	-	-	10	-	-	33.3	-	3
	D	10154	-	-	-	-	85.7	-	9.5	-	-	-	21	-	-	44.4	33.3	9
	E	10177	8.3	-	-	33.3	58.3	-	-	-	-	-	12	8.3	-	44.4	55.6	9
	F	10204	-	-	-	10.0	80.0	-	10.0	-	-	-	10	10.0	-	63.6	27.3	11
	F	10205	-	-	-	-	83.3	-	16.7	-	-	-	6	-	-	33.3	33.3	3
	F	10211	11.1	-	-	-	77.8	-	11.1	-	-	-	9	-	-	20.0	80.0	5
	F	10267	30.0	-	-	-	55.0	-	10.0	-	-	5.0	20	-	5.0	30.8	61.5	13
	G	20508	4.8	-	-	-	90.5	-	-	-	-	4.8	21	-	4.8	23.1	53.8	13
	G	20514	16.7	-	-	-	50.0	-	16.7	-	-	16.7	6	-	-	66.7	33.3	3
	G	20586	7.1	-	-	14.3	60.7	-	7.1	-	7.1	3.6	28	-	-	31.8	59.1	22
	I	20550	-	-	-	19.0	71.4	-	-	-	9.5	-	21	-	-	63.0	33.3	27
	J	20535	-	-	-	-	16.7	-	66.7	-	-	-	6	-	33.3	18.2	72.7	11
	H*	41224, 41226	55.6	-	-	-	44.4	-	-	-	-	-	9	-	-	-	100.0	5

Tab. 6. The overall proportions of individual decoration styles and vessel shapes from three selected large clay pits from Hosivice-Sadová and individual loam pits of houses from Hostivice-Sadová and Šestákův statek (*houses with lower accuracy, the proportions of which are based on house units; the remaining proportions of vessels belongs to other shapes).

house F from Šestákův statek contains grave H2, and other loam pits are either overlapped by others or close to a house, we prioritise pit 10204 in the chronological framework. Moreover, the assemblage from this loam pit is the most representative. Essentially, individual loam pit no. 126 and 134 of house no. 3a from Hostivice-Sadová were relatively homogenous, although pit no. 134 could have been overlapped by the loam pit of house no. 4b, as the houses are spatially close together. On the other hand, they differ in proportion of decoration styles, which indicates lesser alteration. Thus, the chronology of house no. 3a seems to be better represented by loam pit no. 126. The last evaluation is based on the trajectory of formation processes. In the case of house unit no. 9, we chose the reliable assemblage of feature no. 330, which was least influenced by formation processes, and that is why positive values are present more than in the other loam pits of the house unit (*Fig. 9*).

The development of the filled-in band (alfa12) from Hostivice-Sadová is almost identical to the development in the Šestáků statek assemblages. Differences occur in the proportion of specific decoration styles, such as the 'A style' (beta10), which is missing at Hostivice-Sadová. Musical notes placed at the ends of lines (epsilon10) are, on the other hand, more frequent at Hostivice-Sadová than at Šestákův statek. The start of the development at Hostivice-Sadová is represented by house no. 26 featuring a low proportion of filled-in bands (alfa12) and deep bowls (*Pavlů 1981*). Therefore, house no. 1, 4b, and 11a from Hostivice-Sadová might belong to phase 2A rather than to phase 1/2 of the Bohemian LBK, as the deep bowls and older styles (gama10, beta) are missing here in contrast to Šestákův statek (*Fig. 10*). Notably, a higher proportion of the filled-in band (alfa12) was also observed at Libocká 10 (*Olmerová – Pavlů 1991*, 50). Although the low presentation of decorated fragments could affect the proportion of the filled-in band (alfa12) from house unit no. 15, the assemblages of house no. 15 and probably house no. 3a correspond to phase 2B of the LBK culture in Bohemia, with the maximum occurrence of filled-in band (*Pavlů 1977*; *Pavlů et al. 1987*; *Pavlů – Zápotocká 2013*). Similar values apply to Dolní Břežany III (*Čtverák – Rulf 1984*), the house unit with pit 287 from Roztoky (*Čtverák – Rulf 1984*; *Rulf 1991*, 90), and the Libocká 10 assemblage from pit 1/79 (*Havel – Rulf 1988*).

The high proportions of the significant decoration style (alfa12) were in features within the fenced area of house no. 1, in pit no. 37 and 40 (*Tab. 4*). Therefore, the pit assemblages within the fenced area can reflect phase 2B of the LBK. On the contrary, pit no. 45 may have been later or may have been admixed by material from the nearby pit.

The occurrence of pottery decorated with musical notes placed at the ends of lines (epsilon10) is significant at house no. 9 and 28, and probably two houses (no. 24 and 3b) with a shared loam pit 128 (*Kretchmer et al. 2016*; *Lenneis 2012*). Based on assemblages from Černý Vůl (pit no. 33 and 42; *Řídký et al. 2009*, 187) and Společenská zahrada (pit no. 364; *Vondrovský 2021*, 267), where the occurrence of musical notes placed at the ends of lines (epsilon10) is almost identical, the end of the development of Hostivice-Sadová and Šestákův statek could be dated to phase 2C of the LBK culture in Bohemia. Compared to the loam pit, assemblages of the fenced area associated with house no. 15 were more consistent with phase 2C of the LBK. According to the comparison, the entire development of the Hostivice-Sadová site took place during the middle LBK.

Finally, we will focus on the radiocarbon dating of samples taken from the Hostivice-Sadová site. The data can be assessed within the Bayesian model featuring the sequence

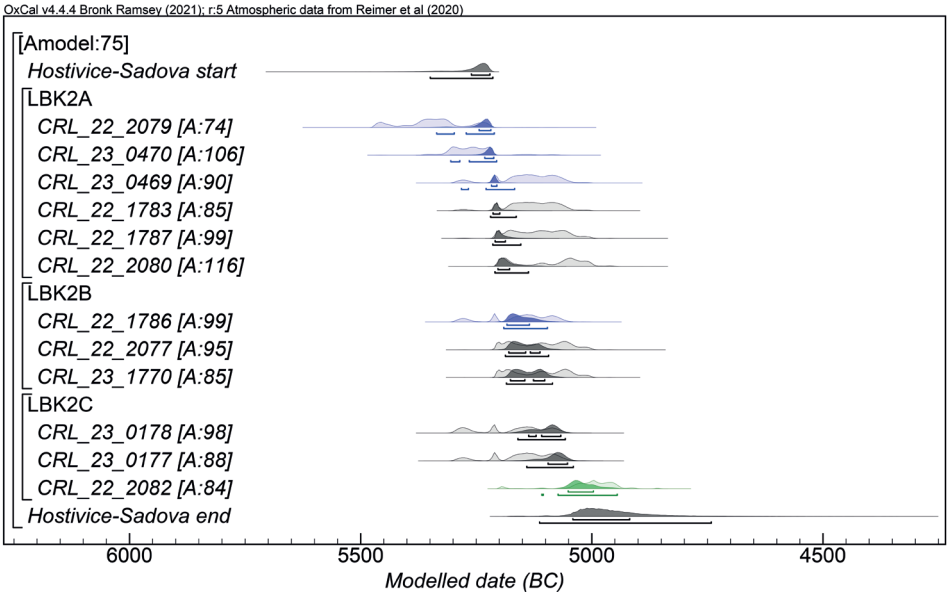

Fig. 11. Radiocarbon model of the Hostivice-Sadová development. Blue – samples from the loam pits of house no. 1 and 15; green – the sample from the pit in the fenced area.

established in combination with the relative chronological information[1] and overlapping ground plans of houses. Although the three large clay pits – no. 29, 150, and 273 – were not involved in the correspondence analysis of houses, they were included in the model because the occurrences of decoration styles were significant. Their relative chronological position in development corresponds to the proportions of decoration style (*Tab. 6*; pit no. 150 corresponded to phase 2A; pit no. 273 with phase 2B and pit no. 29 with phase 2C). The results of Bayesian modelling show sufficient agreement (*Fig. 11*) for the sequence model. Although the probability modelling was distorted by the calibration curve plateau, which occurs roughly between 5200 and 5000 BC, the modelled data supports the relative chronology framework. Moreover, no significantly low agreements were detected. This implies that both houses were used at different times and are non-contemporaneous. In accordance with the chronology framework, the differences between samples from fenced area pit no. 343 and the loam pit of house no. 15 are more apparent. This implies the maximum occurrence of filled-in bands in the Litovický Stream basin in *5191–5086 cal BC* (*95.4% probability*) and likely corresponded to the late stage of the LBK at Bylany (*Pavlů – Zápotocká 2013*, 27). Overall, as the later decoration style (epsilon20) is presented by a few sherds, and the radiocarbon dating of Hostivice-Sadová site shows long settlement continuity, it could suggest the longer duration of the filled-in band tradition (*Trampota – Květina 2020*) in the Litovický Stream basin.

[1] House no. 4a and 23 are based on sherds from a house unit comprising related loam pits. Proportion corresponds to phase 2A of the LBK culture in the case of house no. 4a and phase 2B of the LBK in the case of house no. 26. Due to the low presence of decorated sherds, they are not considered in the overall development scheme.

The role of fenced areas in Early Neolithic society

Generally, empty fenced areas during house occupation could be similar to the central areas of Neolithic rondels (*Stäuble 2013*; *Řídký et al. 2019*, 43–67; *Blažková 2020*, *Vondrovský 2021*, 324–327). Since we do not have any evidence of activities like crop growing or animal husbandry, we can only suggest how the first farmers used these enclosed areas. One possibility is a social or ritual zone, as is assumed in the case of connected houses (*Riedhammer 2003*, 483–485; *Czerniak 2013*). As these situations are not well preserved, we do not have any reliable evidence of entrances to fenced areas. However, the fenced area of house no. 15 from Hostivice-Sadová could be accessed from the northern part of the adjacent house, as postholes are missing here. On the other hand, the eastern part of the longhouse trenches from Hostivice-Sadová are interrupted, which could have been the entrance allowing access to the fenced area. This position suggests that the fenced areas were reserved for exclusive use by household members because the entrances are located in the northern part of the houses and go directly towards the fenced area (*Podborský 2011*).

Dividing the development of Hostivice-Sadová into four chronological phases, where two entail a house with a fenced area, suggests a potential social or hereditary relationship between these two specific households. Social relations might be indicated by motives in peripheral areas of the vessels. The variability determines the diversity of relation and *vice versa* (*Pechtl 2015*, 566; *Gronenborn et al. 2017*). However, the proportion of the classified secondary ornaments on individual ceramic fragments is not considerable for socio-cultural analysis. On the other hand, the possible inheritance relationship between the longhouses can be seen in their almost identical construction elements. Both houses consist of a ground plan with a tripartite division with double postholes at the southern ends, and the northern ends are defined by a trench with an entrance at the eastern part (the same as for house no. 3 and 9). Although both differ in their total lengths (house no. 1 is 48 m long and house no. 15 is 35 m long), they exceed the limit for extreme houses (*Pechtl 2009*, 188; *Podborský 2011*). It is also noteworthy that the other houses from Hostivice-Sadová dated to phase 2A consisted only of central parts, which supports the distinct perception of house no. 1 and its social or economic significance. The southern and northern section of three-part division of longhouses had their own informative values connected with social-economical differences in Early Neolithic society (*Pavlů 2013*; *Gomart et al. 2015*, 243–245), although the functional interpretation of individual parts is still discussed. Traditionally, a southern section with a greater density of postholes is interpreted as a raised floor or a storage area on the second floor (*Soudský 1966*, 29; *Pavúk 1986*; *Coudart 1998*; *Pavlů 2000*, 218).

Another point of view is a specific economic behaviour displayed in distinct finds accumulated near houses, especially in grinding-milling tools and faunal remains. The number of grinding-milling tool fragments from loam pit no. 84 in house no. 1 may indicate household specialisation in food storage or production (*Hachem – Hamon 2014*). However, the grinding-milling tools were used for a long time and deposited fragments of finds could be associated with the previous stage of settlement (*Květina – Řídký 2017*, 132). In addition, at the Hostivice-Sadová site as at most of other Early Neolithic sites, we do not have evidence of storage pits implying the accumulation of supplies in these unique houses (*Rocek 2020*). In addition to stone artefacts, animal remains play an important role in socio-economical differences. *Hachem* (*2000*) analysed the spatial distribution of wild and

domesticated animal remains to investigate the correlation between the archaeozoological assemblage and the dimensions of the domestic structure. As the faunal remains from the Hostivice-Sadová site were almost uniform and with a minimum of wild animals, there seem to be no significant differences in consumption (*Hachem 2000*; *Kovačiková et al. 2012*, 85). Only loam pit no. 50 is exceptional, as it contained a large amount of animal bones (*Tab. 2*). The weight of the archaeozoological assemblage implies that the animal remains could plausibly signify discarded remnants from food preparation at house no. 1. However, we currently lack evidence of specialisation among later households. On the other hand, certain houses with a low occurrence of decorated vessel fragments were not included in the relative chronological framework, but these houses lack evidence of archaeozoological remains or the density of finds were low.

The length of the houses, the construction of the southern ends, and even fenced areas lead to the conclusion that these two households represent the prestige of their inhabitants (*Pavúk 1986*, 373; *Pavlů 2000*, 269; *Pechtl 2009*, 194; *Květina – Řídký 2019*). The fenced areas could be associated with individuals possessing higher social status (*Pechtl 2009*) conferred due to their experience or organisational ability. On the other hand, regardless of the association between houses with fenced areas and particular persons, these special houses could be venues for short-term ritual activities like feasts, ceremonies or even meeting places (*Soudský 1966*, 57; *Květina – Řídký 2019*, 177). Furthermore, long-term site occupation featuring two distinguished houses, each representing a specific decorative style tradition, indicates continuity in traditions reflected by the duration of decoration style.

Conclusion

We aimed to combine the different approaches toward studies of pottery fragments to offer a possible new viewpoint of unusual Early Neolithic longhouses. We generated several results from analysing the sequence of development and the nature of ceramic waste in the case study of Hostivice-Sadová. While the formation processes are complicated, as previous studies have demonstrated, different trajectories can be reconstructed in this case through development based on a defined sequence of the use of the settlement area. The morphometric characteristics of pottery fragments demonstrate that pits in fenced areas were not used for refuse disposal and were filled in later than loam pits alongside the houses. As important records of other parts of the settlement area are missing, we cannot locate the areas of primary deposition. Thus, most of the pit fills have been formed by either intentional redeposition of already transformed waste, natural processes, or combinations of both. However, the earliest artificial stage appears to have been formed more intentionally than the others, which could be interpreted as deliberate filling of the pit before the house construction. As the morphometric characteristics were generally better preserved in the loam pits alongside the houses, these contexts were used as the basis for the relative chronology of the settlement in order to achieve a more accurate model. In both cases, the disproportion in the typochronology and morphometry of pottery, together with intervals of radiocarbon dates, implies that the fenced area was without pits while houses were occupied. Moreover, the ground plans of the houses, their lengths, and fences occurring in the two following LBK phases should be evidence of the extraordinary social status of these selected houses.

The settlement at Hostivice-Sadová is partly contemporaneous with the settlements at Šestákův statek in Praha-Liboc. The proportion of individual decoration styles combined with radiocarbon dating testify to the continuity of a residential area at Hostivice-Sadová during the middle stage of the LBK culture. The result shows a longer duration of a specific decoration style at the Litovický Stream basin, especially at the Hostivice-Sadová site, which could be associated with the social or economic position of houses with fenced areas. This suggests that this decorative style may have held greater significance in the region's cultural context.

This research was financially supported by the Charles University Grant Agency, project no. 202422 'Comparison of relative and absolute chronology of the first farmers settlement areas in Šárka-stream basin' implemented at the Faculty of Arts of Charles University.

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