

SPATIAL RECONSTRUCTION OF THE WORKSHOP FEATURE FROM BÁNOVCE NAD BEBRAVOU (WESTERN SLOVAKIA)¹

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The Early Iron Age site in Bánovce nad Bebravou, Biskupice-Keblov II (western Slovakia) was excavated by Archaeological Agency in 2014. During the excavation, there was found a feature connected with spinning and weaving – one of the important activities of Early Iron Age people, which penetrated to various spheres of life. This paper concerns short evaluation of the site with spatial analyses and reconstruction of the so-called workshop feature and its respective activities. The spatial analysis is evaluated by applying virtual space. The procedure is based on 3D reconstruction of individual features and creating of possible solutions in relation to original record. Part of this procedure was based on abstract visualization from archaeological record and second part used data from 3D photogrammetry. Results includes among visualization and space distribution of individual features, possible interior proportion and hut structure which could be used in this case.

INTRODUCTION

During spring and summer months (from March to July) of 2014, excavated Archaeological Agency area under upcoming construction site of the highway R2 Ruskovce-Pravotice (Žák-Matyasowszky *et al.* 2015). One of the discovered sites was Bánovce nad Bebravou, Biskupice-Keblov II. It is located in the western Slovakia, on the south-western edge of Bánovce nad Bebravou District. It is situated on the left bank of the Bebrava River, on the river terrace in altitude of 195–202 m a. s. l. (Fig. 1).

Total number of 67 features were discovered during its excavation. They belonged to two chronological horizons. Majority of features can be dated to the late neolithic stage Lengyel II. 4 features belonged with certainty to the Early Iron Age (features No. 3, 5, 9 and 35). Vertical stratigraphy also shows that Early Iron Age features concentrates in the NW part of the site (Fig. 2).

One of the most important finds from the site is feature No. 9. It has regular rectangular shape sunken house with rounded edges and flat bottom, which is visibly offset form walls. Dimensions are 331 × 320 cm (Fig. 3). Apart from pottery, the inventory of the feature consisted of more than 40 pieces of loom weights *in situ*. Whole filling and also large part of the feature inventory got in touch with fire and has visible burned parts. There was observed also large concentration of charcoal and burned wood. Strange circumstances of the feature destruction are indicated by the presence of very fine cereal awns, which support presence of either straw or whole cereal ears. This type of ecofacts is usually burned without residue already during lower temperatures (Hajnalová 2015, 3). This fact correlates with find context, which shows some artefacts with only partial local burns, that got in touch with fire only indirectly. There were no layers with traces of destruction of walls or roof. A small number of fragments of daub indicates only its partial usage on parts of the walls.

Ceramics from the feature has close relations to several settlements in Nitra region. Numerous analogies are observed on the site Hoste (Bujna/Romsauer 1984, 431–452). Very flat, sharp profilation of bowls,

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Fig. 1. Bánovce nad Bebravou, Biskupice-Keblov II. Localisation (Žák-Matyasowszky et al. 2015, 11, fig. 2).

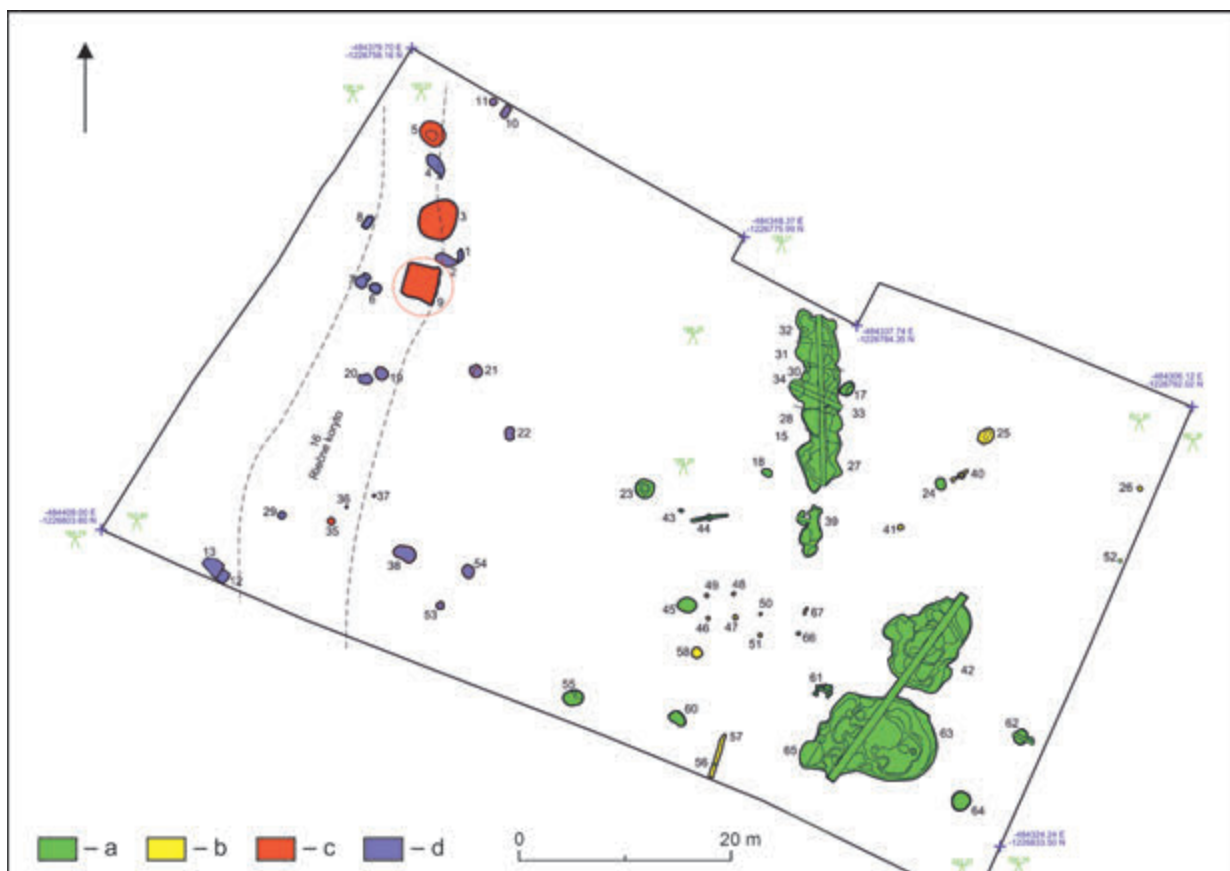


Fig. 2. Biskupice-Keblov II, Bánovce nad Bebravou. Horizontal stratigraphy of excavated features. Legend: a – Lengyel II; b – Lengyel II (?); c – Ha D2; d – Hallstatt period (?; Žák-Matyasowszky et al. 2015, 378, fig. 20).



Fig. 3. Biskupice-Keblov II, Bánovce nad Bebravou. Feature 9. Ground plan and photographic documentation of respective quadrants. Legend: 1 – looms weight; 2 – pottery; 3 – rock; 4 – daub (author L. Chmelo).

strip or ridge thickening and the plastic vertical ribs on vessels indicates Late Hallstatt period (HaD2) character of pottery, which is supported by the presence of graphite vessels and wheel-turned pottery. At the same time pottery don't reach character of the Final Hallstat period (HaD3) sites like Bratislava-Dúbravka (*Stegmann-Rajtár* 1996, 455–470) or Bučany (*Bujna/Romsauer* 1983, 277–304). Based on those characteristics' ceramics dates the site to HaD2. This dating is rare in this region of Slovakia and development of the Late Hallstatt period there is very much unclear.

METHOD OF DOCUMENTATION

First step towards creation of authentic reconstruction was the transfer of find situation to three-dimensional space. The drawn documentation of ground plan situation and four documented profiles of feature No. 9 served as a main material. Two-dimensional digital plan was converted to workspace of 3dsMAX program. The orientation of ground plan and planes of profiles was situated in a way so that

they could mutually reflect the space of observed features. The primary ground plan was made in scale 1 : 1 with dimensions of base 331 × 320 cm in axes CD × AB. To achieve the best accuracy, the application of photographic documentation of individual profiles has been used, so the minor deviation which occurred during terrain documentation could adjust. The modelling of surface of the feature No. 9 was based on previously mentioned ground plan. We were used working photos made during excavation for detailed situations. Thanks to this approach the reconstruction of find situation of negative of feature No. 9 could be obtained, as it was captured in terrain. To this situation were applied additional contexts such as individual layers and the findings themselves. In feature were captured loom weight, river stones, numerous ceramic sherds and pieces of daub. As a model for reconstruction of loom weights was used loom weight No. 7 (Fig. 4). Based on its drawing documentation the ideal model with exact scale could

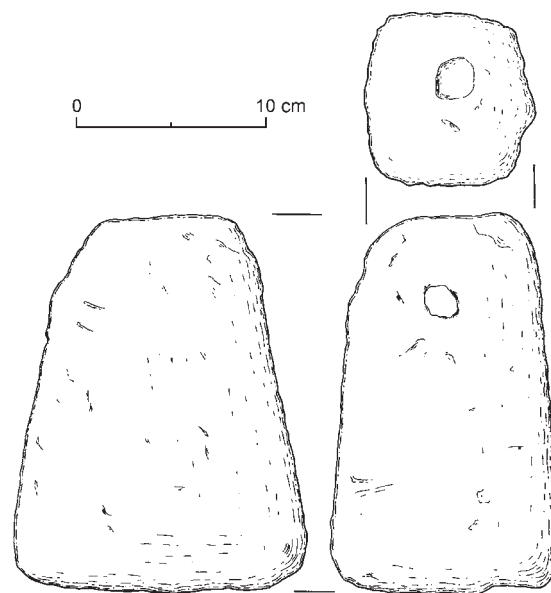


Fig. 4. Biskupice-Keblov II, Bánovce nad Bebravou. Feature 9, SE quadrant. Clay weight No. 77 (author L. Chmelo).

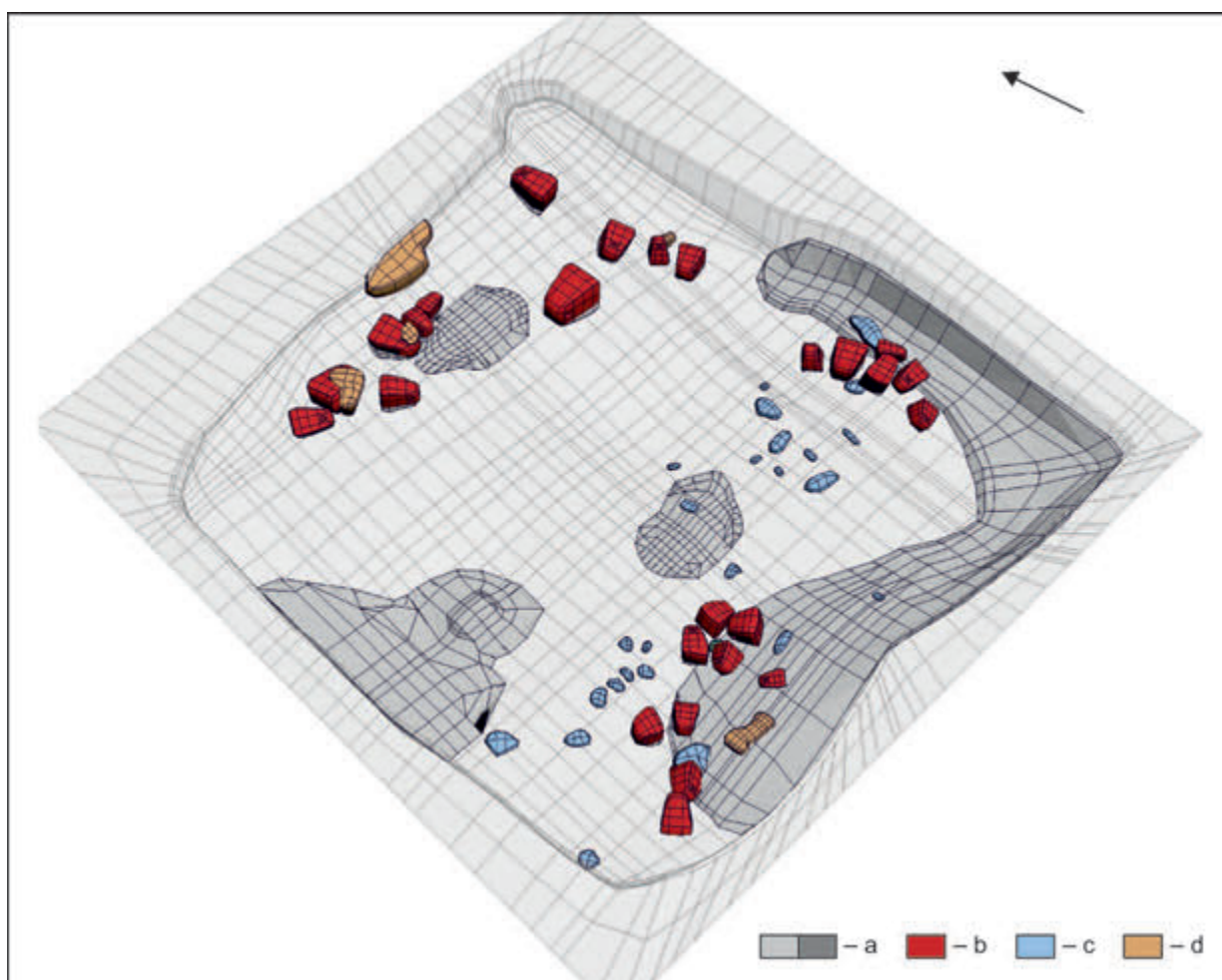


Fig. 5. Biskupice-Keblov II, Bánovce nad Bebravou. Feature 9. Fully reconstructed find situation in 3D space. Legend: a – layers; b – loom weight; c – rock; d – daub (author M. Styk).

Tab. 1. Hypothetical and expected weight of documented loom weights according sector differentiation (author L. Chmelo).

Nr.	Weight [g]	Sector	Base [cm]	Hypothetical weight reconstruction	Expected loom weight type [g]
41	1800	NE	–	5000–6000	5000–6000
43	5500	NE	18 × 15	–	5000–6000
46	1683	NE	10,5 × 11	1600–1800	1600–1800
47	1248	NE	8,5 × 11	1600–1800	1600–1800
48	2785	NE	–	not feasible	5000–6000
57	917	NW	–	not feasible	?
59	1059	NW	–	not feasible	?
64	3068	NW	10 × 21	5000–6000	5000–6000
65	3178	NW	10 × 21	5000–6000	5000–6000
74	1133	SE	–	not feasible	1600–1800
75	1865	SE	12 × 10	–	1600–1800
76	1721	SE	10 × 10	–	1600–1800
77	1727	SE	12 × 8,5	–	1600–1800
78	1176	SE	–	1600–1800	1600–1800
79	1839	SE	12 × 9,5	–	1600–1800
90	1627	SW	10 × 10	–	1600–1800
91	1625	SW	12 × 10	–	1600–1800
92	1139	SW	12 × 7	1600–1800	1600–1800
93	1152	SW	12,5 × 6,5	1600–1800	1600–1800
94	1250	SW	11,5 × 9,5	1600–1800	1600–1800
96	1766	SW	13 × Y	–	?
98	1052	SW	–	not feasible	1600–1800

be created. At the same time, this loom weight was documented via 3D photogrammetry in Agisoft program. The goal was not only to create universal model, which was subsequently altered for all 26 documented findings, but also to create detailed template for computing capacity and ideal mass of all supposed pieces. During these steps, attention was focused on creation of most similar copies with most accurate dimensions corresponding with reality. Created copies were transferred to space of feature, so that they could reflect the documented position *in situ* (Fig. 5).

SPATIAL RECONSTRUCTION

Based on the spatial analyses in correlation with knowledge about spinning and weaving (f.e. *Belanová et al. 2007; Grömer 2005; Mårtensson 2007; Mårtensson et al. 2009; Štolcová/Zajonc 2014*), we came to understanding, that feature No. 9 contained destruction of three looms *in situ*. Suggested spatial distribution of loom weights of two weight categories in respective quadrants, which resulted to above interpretation, is supported by its correlation with engraved signs, that were observed on loom weights (Tab. 1). All of them were observed on their top flat area. All preserved loom weights from SE quadrant contained a sign, while in SW quadrant there is absence of any signs. Less clear find situation in the NE and NW quadrants shows presence of the one signed exemplar in each of them. Engraved signs (or their absence) are unique for respective quadrants or concentrations of loom weights, and they do not appear in others. This observation can support fact, that loom weights

in those concentrations comes from different series marked by unique signs. Analogical situation from surrounding area was observed on chronologically younger Cífer-Pác site (*Štolcová/Kolník 2010, 467–487*). The interpretation of the looms is derived from a comprehensive analysis that takes into account the correlation observed between the archaeological context of the findings and the mathematical relationship linking the width of the loom weight base within linear concentrations, the overall width of the concentration, and the weight of the loom weights. Moreover, the presence of engraved signs further supports this interpretation. A detailed investigation focusing on this specific topic will be presented in the forthcoming contribution and it is a part of the author's dissertation.

In SW quadrant near the southern wall and in SE quadrant near the eastern wall were positioned looms No. 1 and 2, which were identical. They probably consisted of double row of six loom weights, what according to base width (from 10 to 12 cm) forms looms 60 to 72 cm wide (Tab. 1; Fig. 6). With weight of the loom weights 1600–1800 g the bearing needs for a weaver were 9.6 to 10.8 kg. On the border of NW and NE quadrant, there was leaned loom No. 3, that consisted of extremely heavy loom weights of 5000–6000 g. There probably were four of them in two rows with 18 cm wide base. Their final width was therefore same as in case of looms No. 1 and 2. Weaved thread was probably very thick on loom No. 3. All three looms belong to the first group of the Early Iron Age looms according to the classification of K. Grömer, with width 60 – 90 cm. Those can be observed for example in Stillfried (*Grömer 2016, 114–117*). In NE part of the feature had weavers pre-prepared loom weights that can be connected to any

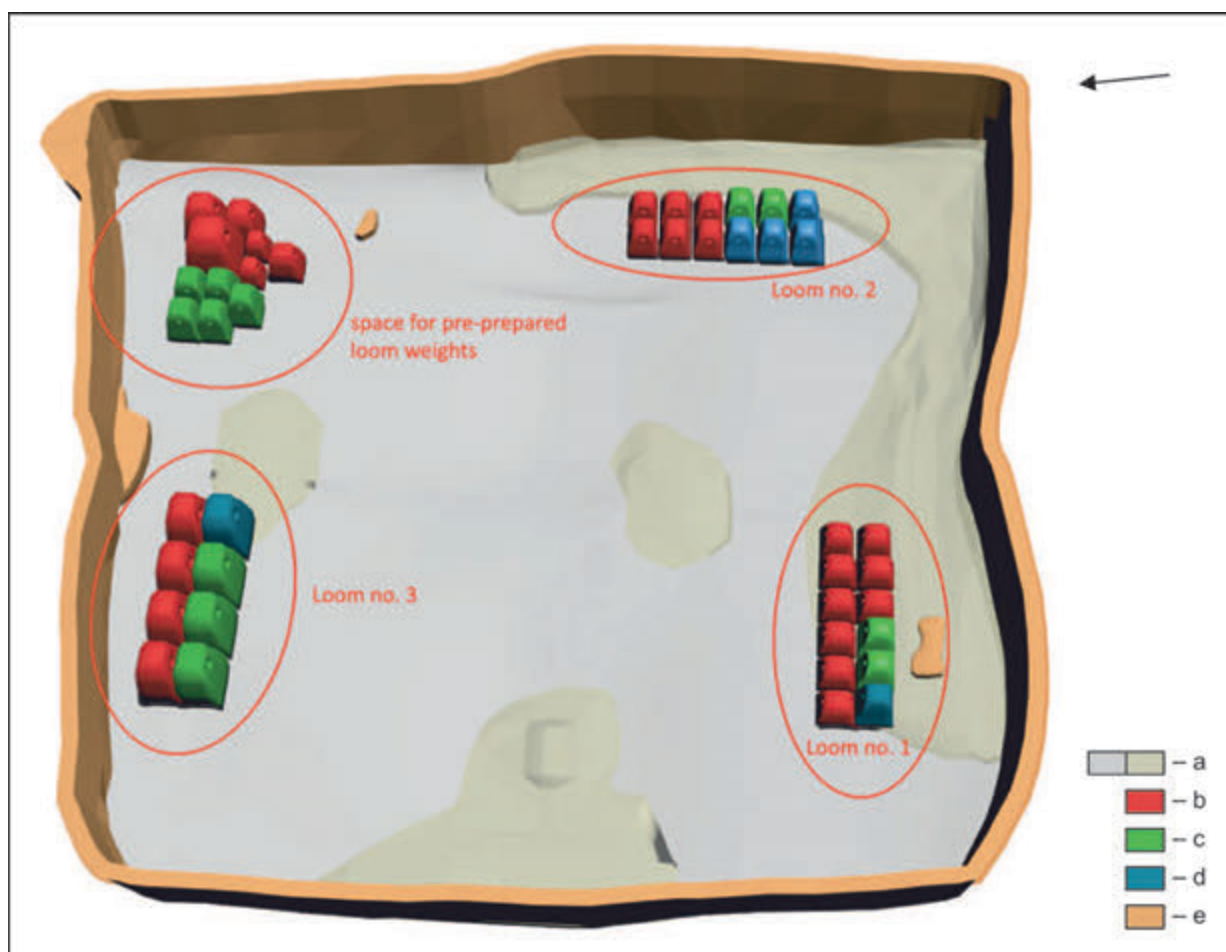


Fig. 6. Biskupice-Keblov II, Bánovce nad Bebravou. Spatial configuration of loom weights and interpretation of possible situation. Legend: a – layers; b – documented loom weight; c – known loom weight; d – expected loom weight; e – daub (author M. Styk).

loom. It is not excluded, that those loom weights were also produced directly in the feature No. 9. The interpretation of Feature No. 9 from Bánovce nad Bebravou, Biskupice-Keblov II as a weaving workshop is supported by the presence of three looms and a selected concentration of diverse production-ready and pre-produced loom weights and spindle whorls.

3D RECONSTRUCTION

Besides the ground plan of the feature No. 9, the documented layers and pieces of daub, the inclination of surrounding area was also captured. The moderate inclination of terrain towards the west side of the feature was documented, which is connected to waning slope towards a riverbank. Considering the character of excavation certain inaccuracies in feature shape are to be expected, which during confrontation with controlled profiles represents about 20–30 cm of missing height of the feature. After the adjustment of these terrain connections, the difference between the lowest and the highest part of feature is 64 cm, while average depth of feature varies around 40 cm. Into the resulting reconstruction there was applied natural slope of terrain.

Loom weight

After the transfer of the find situation into 3D space, the space context relationships of the feature inventory were evaluated. In the first step, the cluster of weights was observed in space of feature.

Considering the well-known layout of weights in looms lead to an observation of significant lines which documented the position of these constructions in situ. The weight of individual loom weights has been taken in regard, since those reflect different loom construction and final weaved thread (Štolcová/Zajonc 2014, 61). The absolute weight of the preserved loom weights was captured. In feature were also found few loom weights, which were not successfully spatially captured and quickly succumbed to destruction. The position of these weights is known within individual quadrants of the feature. Density of ceramic mass was calculated based on measured weight and volume of 3D model of sample loom weight No. 7 (Fig. 4). Based on this observation were calculated reference weights for undocumented loom weights. At the same time, these weights were placed in corresponding quadrants, in a way they could supplement captured cluster. Based on measured values, it was possible to single out 4 spatial clusters of loom weights with different weight values (Fig. 6). While in SE and SW quadrant were found clusters of weights with same weight values 13.6–14.4 kg, in NW quadrant the weight value was little bit higher 16.1–17.1 kg. The most discrepant weight value of the loom weight was found in NE quadrant with estimated weight value of 22.1–23.4 kg. Based on these results (also more importantly based on concentrations of the loom weights of two weight categories in respective quadrants) there were later interpreted two variants of looms and at the same time their position in spatial feature (Fig. 6) was set.

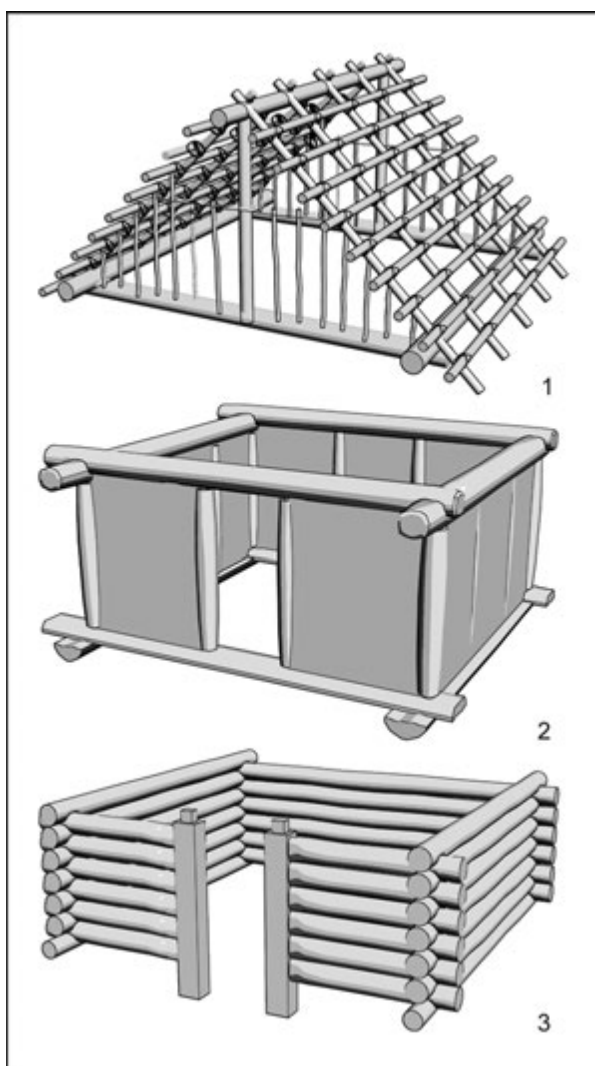


Fig. 7. Hypothetical reconstructions. 1 – simplified model of roof construction; 2 – variant with load-bearing walls; 3 – variant of cabin log structure (author M. Styk).

Building structure

The hypothetical construction of the sunken feature itself, was evaluated as overlapped log structure without presence of supporting column. Based on the find situation, the presence of self-supporting roof covered probably with reeds is expected. The construction of saddle roof is based on the existing templates which respects technical abilities of observed period (Bláhová-Sklenářová 2012, 60, 61), for example results of experimental archaeology in Asparn an der Zaya in Lower Austria (Lauermann/Pacher 2013). In this case, supporting beams are not following to the floor of the log cabin, but they are anchored to transverse rafter, which are placed on log itself (Fig. 7: 1). Two different alternatives of construction were created based on the absence of evidence of used wood. Log cabin and House with load-bearing walls as variants with no direct evidence of foundation structure. Reconstruction of surrounding environment during the Early Iron Age suggests that it was situated in ecotone of floodplain forest and meadows. Timber for the construction could offer a species composition of floodplain forests from the immediate vicinity. Two species are considered – oak and spruce. House with load-bearing walls could use mainly hardwoods joined by tenoning in longitudinal sill beams. There are four supporting posts in the corners of the building and pairs of columns in the walls (Fig. 7: 2). The second type was represented by usage of roughly worked wood in a form of beams, which were embedded in the corners (Fig. 7: 3). It was based on analogy of log cabin reconstructed in Asparn, which created



Fig. 8. Biskupice-Keblov II, Bánovce nad Bebravou. Ideal reconstruction of the workshop, interior view (author M. Styk).

version made of soft (most likely spruce) wood in a form of transversely laid round log. Both structures were created with diameters 350×380 cm, in a way that it could exceed the dimension of recessed pit. By building outer construction around sunken part of the feature, step-shapes space was arisen, which had practical use in day-to-day activities. According to archaeobotanical finds (Hajnalová 2015), whole southern part of the feature was covered by hay.

Scene visualization

The entrance to the feature was established based on absence of loom weights and the terrain slope. It could have probably been in the middle section of the western wall, and it was oriented to river Bebrava River. Usage of daub in the feature is presumed in two cases, based on its only occasional appearance in the archaeological record. In the first case, it was probably part of wall erasure of House with load-bearing walls. Secondly, space between separate wooden bars was filled with moss or straw covered by daub. Sunken parts of pit walls should have been reinforced probably with wicker.

The construction of the structure allowed looms to be easily leaned against the walls, in a way they could form an angle of 80° and set the height to approximately 185 cm (see Štolcová/Zajonc 2014). Therefore, the structure (without roof) in the east side of the feature disposed with height less than 120 cm (Fig. 8). Nearly 8 m^2 of free space remained after the placement of all three assumed looms to the interior (Fig. 9).



Fig. 9. Biskupice-Keblov II, Bánovce nad Bebravou. Ideal reconstruction of the workshop, diagonal cut (author M. Styk).

Reference model from 3D photogrammetry was used for the final visualization of individual loom weights. Fragment of seven bowls were captured in feature, which consisted of four tubby vessels, one amphora and four cups. Complete containers were reconstructed based on profiles of well-known analogies and the texture of containers was made directly out of documented fragments. Their distribution in feature was based on the amount of representation of pottery fragments in individual quadrants. In final reconstruction, they were placed to space between construction and recessed part of pit-house. In Mudobox program were created textures for the resulting model reflecting ideal reconstruction of manufacturing feature. The whole scenery was created in 3dsMAX program with real sunlight, rendered with Mental Ray emulator.

DISCUSSION

Prehistoric structures reconstructions rely on groundplans and hypothesis based on appropriate analogies. In contrary to ancient architecture, there is a high risk of inequality in the architectural statement of the depicted object. For well reconstructed geometry is common the monochromatic visualization as appropriate interpretation method (*Lengyel/Toulouse 2021, 620*). On the other hand, when are used materials much more accurate than overall construction is monochromatic depiction misleading. In such a case, the whole reconstruction becomes vague, and the question is to what extent it can be used and presented. Therefore, we decided to display the space with a minimum of abstraction. Vivid reconstruction (Fig. 8; 9) is supported by perspective projection rather than groundplan axonometry. We are aware that realistic images may mute critical reflection which are necessary and abstract images of architectural objects would open a wider discussion (cf. *Lengyel/Toulouse 2021, 619*). This raises the question of the type of load-bearing structure roof construction and roofing. Main question is how to deal with situation when doesn't exist any feature that we can connect with remains of roof load-bearing structure in groundplan. Then, it is possible to proceed from the statements (based on: *Sklenářová 2003, 18*):

- a) load-bearing structures existed, but traces of them disappeared during the transformation processes,
- b) there was a structure that transferred the load of the roof to the ground, but were sunk shallow and did not leave any archaeological evidence,
- c) the building had a truss carrying the load into the walls.

In our case we decided to reconstruct structure which used walls for transferring load. In specific area it was log-house as most probable solution. Such evidence is known from alpine region (*Speck 1981*), for example reconstruction in Asparn (*Lauermann/Pacher 2013, fig. 20*). Because of mountain environment wooden roof was created, this is not necessary in Keblov case.

Another hypothesis relies on light post hole construction which does not leave any traces at all. Important argument stands on looms work management which depends on suitable light conditions. Due to this reason, we can assume shed roof or simple gable roof. Reconstruction of workshop building structures are solid in general (f.e. *Almássy/Pop 2014; Barth/Lobisser 2002; Čambal/Gregor 2005, 36–41*). From this point of view is important amount of soil levelling before the main excavation which was around 30 cm. Together with a strong agricultural activity may been destroyed evidence of small post-holes.

The general assumption is the dominance of pit-house in the Hallstatt period, mainly because are difficult to prove post-built structures especially with load-bearing walls. In west hallstatt region they are interpreted as sunken-floored ancillary structures. Because of wetter and colder climatic conditions they could be suitable for weaving activities (*Audouze/Buchsenschutz 1992, 134*). In many cases are pit-houses divided by truss location to full (truss is at ground) and half type (truss is bearing by wooden walls). After all, some half pit-houses could be a basement part of larger buildings (*Bláhová-Sklenářová 2012, 116*) or cellars related to storage (*Audouze/Buchsenschutz 1992, 135*). Post holes occurs in the centre of shorter walls, in corners and variously around the perimeter and area, often in larger numbers. Walls and roof reconstruction are always hypothetical as single-aisled house with ridge beam supported on an axial row of load-bearing uprights (cf. *Audouze/Buchsenschutz 1992, 58*). Access is reconstructed by stairs modelled in the terrain, wooden or ladder. Absence of hearth is usually explained by existence of pyraunos.

Altitude of the region around 200 m above sea level suggests the prevailing flora could have been represented by the mixture of genus *Salix* and *Populus* of soft riparian forests with proximity of meadows. In case of site Keblov II it is most probably the ecotone (*Forman/Gordon 1993*) of those two mentioned

biocenoses. Already from the Bronze Age are technological steps of wood crafting well known (*Audouze/Buchsenschutz* 1992, 47–55). In archaeology are lot of indirect (ground plans, woodcraft tools, plastics) and some direct (preserved wood structures) evidence. Due to these reasons, we assume mortice-and-tenon joint, slot mortice and halved joint for timber joining techniques. In case of Blockbau structure is probably use of sill-beams.

In the Danube region during the Hallstat period we observe two different types of features with loom weights. Pit-houses had regular shape with destructions of looms displayed by linear loom weights concentrations in functional position generally alongside the walls of the feature. Settlement pits had oval, elliptical or irregular shape. Loom weights were either scattered across the whole extent of the feature or piled up in one stack.

According to analyses of K. Grömer (2016, 114–117), the width of the looms in the Early Iron Age was standardized. She observed 3 different groups:

1. Narrow looms with width 60–90 cm used for production of narrow cloth (f.e. Stillfried, Biskupice)
2. 120 to 160 cm wide looms, which are the most frequent in the Early Iron Age. Minimum of two workers were needed to operate them during weaving (Smolenice, Nové Košariská, Győr-Menfőcsanak)
3. Very large looms with width larger than 3 m. Those finds are rare and are concentrated in the area of Austria.

Find from Biskupice-Keblov II supports the relevance of the results of her analyses and the first group, as all three looms independently on the size of loom weights had approximately same length. However, the rarity of the context like in Biskupice-Keblov II in the wider Central European area requests further research to support those hypotheses.

CONCLUSION

Site Biskupice-Keblov II site is located in the western Slovakia, on the south-western edge of Bánovce nad Bebravou District. Major part of the site represents settlement pits dated to the Late Neolithic stage Lengyel II. Only 4 features (features no. 3, 5, 9 and 35) belonged with certainty to the Early Iron Age. The focus of this study was feature No. 9 connected with spinning and weaving. The evaluated context consisted of more than 40 pieces of loom weights *in situ*.

Feature No. 9 from Bánovce nad Bebravou, Biskupice-Keblov II can be interpreted as weaving workshop. The structure contained destruction of three looms *in situ* differentiated by spatial concentrations, engraved signs and weight categories. Looms consist of two rows of 4 to 6 loom weights. All three looms independently of the size of loom weights had approximately the same length 60–72 cm. They leaned on separate walls of the structure placed against each other and workshop entry. In NE part of the feature had weavers pre-prepared loom weights that can be connected to any loom.

Because of dominance of sunken house in the Hallstatt period and absence of post holes in the studied context were used structure with walls for transferring load. Due to climatic conditions, two different alternatives to log construction were created. The final structure has diameters of 350 × 380 cm which bounded the dimension of recessed pit. We expect self-supporting construction, probably a saddle roof covered with reeds.

As a result, the use of 3D reconstruction turned out to be particularly useful in solving the spatial relations of the looms and the interior workshop arrangement. The importance of digital reconstruction as a crossroad between research and practical use is well known (f.e. *Münster et al.* 2015, 209). From our point of view, it is also crucial for the reconstruction of the find situation itself and archaeological reasoning. For the interpretation and presentation of the results, we use the so-called historical imagination method (*Markiewicz* 2018, 395–396), which without proper commentary has several pitfalls. The 3D reconstruction itself offers several possibilities for creating archaeological hypotheses and reversible tools for re-evaluating results. Together, it represents an important tool not only for solving architecture, but also spatial relationships within archaeological features.

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Priestorová rekonštrukcia tkáčskej dielne z Bánoviec nad Bebravou (západné Slovensko)

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Súhrn

Počas výskumu v roku 2014 v Bánovciach nad Bebravou bola objavená lokalita v polohe Biskupice-Keblov II (obr. 1). Väčšiu časť lokality reprezentovali sídliskové objekty datované do neskorého neolitu, stupňa Lengyel II. Iba štyri objekty (3, 5, 9, 35) boli s určitou istotou datované do doby halštatskej (obr. 2). Uvedená štúdia sa venuje objektu 9, v ktorom boli objavené doklady spojené s pradením a tkaním. Hodnotený kontext pozostával z viac než 40 kusov tkáčskych závaží *in situ* (obr. 3; 4). V príspevku je objekt vyhodnotený v rámci formálnej a priestorovej úrovni a rekonštrukcia pravekej dielne s jej prislúchajúcimi aktivitami. Priestorová analýza je hodnotená pomocou virtuálneho priestoru, v ktorom sa vychádza z 3D rekonštrukcie jednotlivých prvkov a z vytvorenia možných riešení vo vzťahu k pôvodnej situácii (obr. 5). Časť tohto postupu bola založená na abstraktnej vizualizácii z dvojrozmernej dokumentácie a druhá časť vychádzala z obrazovej korelácie. Vo výsledkoch je vizualizované priestorové rozloženie jednotlivých prvkov, možné vnútorné proporcie a štruktúra objektu, ktoré odpovedajú stanoveným hypotézam.

Na základe archeologickej analýzy interpretujeme objekt 9 ako tkáčsku dielňu. Boli v nej objavené zvyšky troch tkáčskych krosien *in situ* odlišné na základe priestorovej koncentrácie závaží (obr. 6), ich značiek a váhových kategórií (tabuľka 1). Krosná pozostávali z dvoch radov štyroch až šiestich závaží. Všetky tri krosná, nezávisle na veľkosti závaží, mali približne rovnakú dĺžku v rozmedzí 60–72 cm. Opierali sa samostatne o steny objektu tak, aby boli umiestnené oproti sebe navzájom a oproti predpokladanému vstupu. V severovýchodnej časti objektu sa nachádzala koncentrácia nedokončených/predpripravených závaží, ktorá nie je spájaná s rekonštruovanými krosnami.

Pre rekonštrukciu nadzemnej časti objektu bola zvolená samonosná konštrukcia zrubovej alebo „štenýrovej“ konštrukcie, ktorá odpovedá prevahe zahĺbených objektov v dobe halštatskej a absencii stĺpových a kolových jám (obr. 7: 2, 3). Odlišné varianty boli hodnotené aj z pohľadu klimatických podmienok. Výsledná konštrukcia mala pôdorys v rozmedzí 350 × 380 cm, ktorý ohraničoval zahĺbenú časť objektu (obr. 8). V súvislosti s ňou predpokladáme samonosnú verziu sedlovej strechy (s využitím polo-sochy), ktorá mohla byť krytá slamenými trsmi (obr. 7: 3; 9).

V dôsledku toho sa využitie 3D rekonštrukcie ukázalo ako užitočné najmä pri riešení priestorových vzťahov krosien a vnútorného usporiadania dielne. Význam digitálnej rekonštrukcie ako priesečníku medzi výskumom a praktickým využitím je dobre známy (napr. Münster *et al.* 2015, 209). Z nášho pohľadu je kľúčový aj pre rekonštrukciu samotnej nálezovej situácie a archeologickej analýzy. Na interpretáciu a prezentáciu výsledkov využívame takzvanú metódu historickej imaginácie (Markiewicz 2018, 395, 396), ktorá má bez náležitého komentára viacero úskalí. Samotná 3D rekonštrukcia ponúka viacero možností vytvárania archeologických hypotéz a reverzibilných nástrojov na prehodnocovanie výsledkov. Spolu predstavuje dôležitý nástroj nielen na riešenie architektúry, ale aj priestorových vzťahov v rámci archeologických prvkov.

Obr. 1. Bánovce nad Bebravou, Biskupice-Keblov II. Lokalizácia (Žák-Matyasowszky *et al.* 2015, 11, fig. 2).

Obr. 2. Bánovce nad Bebravou, Biskupice-Keblov II. Horizontálna stratigrafia skúmaných objektov. Legenda: a – Lengyel II; b – Lengyel II (?); c – Ha D2; d – doba halštatská (?; Žák-Matyasowszky *et al.* 2015, 378, fig. 20).

Obr. 3. Bánovce nad Bebravou, Biskupice-Keblov II. Objekt 9. Pôdorys a fotografická dokumentácia jednotlivých sektorov. Legenda: 1 – závažia; 2 – keramika; 3 – kamene; 4 – mazanica (autor L. Chmelo).

Obr. 4. Bánovce nad Bebravou, Biskupice-Keblov II. Objekt 9, JV sektor. Hlinené závažie č. 77 (autor L. Chmelo).

Obr. 5. Bánovce nad Bebravou, Biskupice-Keblov II. Objekt 9. Rekonštrukcia nálezovej situácie premietnutá v 3D priestore. Legenda: a – vrstvy výplne; b – závažia; c – kamene; d – mazanica (autor M. Styk).

Obr. 6. Bánovce nad Bebravou, Biskupice-Keblov II. Priestorové rozloženie závaží a interpretácia skúmanej situácie. Legenda: a – vrstvy výplne; b – dokumentovaná váha závaží; c – známe váhy závaží; e – očakávané váhy závaží; e – mazanica (autor M. Styk).

Obr. 7. Hmotová rekonštrukcia. 1 – zjednodušený model strešnej konštrukcie; 2 – variant hrazdenej konštrukcie; 3 – variant zrubovej konštrukcie (autor M. Styk).

Obr. 8. Bánovce nad Bebravou, Biskupice-Keblov II. Ideálna rekonštrukcia tkáčskej dielne, vnútorný pohľad (autor M. Styk).

Obr. 9. Bánovce nad Bebravou, Biskupice-Keblov II. Ideálna rekonštrukcia tkáčskej dielne, diagonálny rez (autor M. Styk).

Tabuľka 1. Hypotetické a očakávané hmotnosti dokumentovaných tkáčskych závaží na základe rozdelených sektorov (autor L. Chmelo).

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