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ORGANISATION OF ACTIVITIES IN SETTLEMENTS OF THE SOUTHEASTERN GROUP OF THE FUNNEL BEAKER CULTURE. PATTERNS OF USE AND DEPOSITION OF LITHIC ARTEFACTS FROM ZAWARŻA, SITE 2, PIŃCZÓW COMMUNE

ABSTRACT

Oberc T. 2024. Organisation of activities in settlements of the southeastern group of the Funnel Beaker Culture. Patterns of use and deposition of lithic artefacts from Zawarża, Site 2, Pińczów commune. *Sprawozdania Archeologiczne* 76/1, 445-468.

The aim of the study is to provide an insight in the possible modes of use of space and organization of work within the settlements of the south-eastern group of Funnel Beaker Culture (FBC SE) utilizing framework for integrating use-wear of lithic artefacts and intra-site analyses of their deposition patterns. Those analyses concerns Site 2 in Zawarża, Pińczów commune. Excavations on the site spanned from 1959 to 1963, culminating in the uncovering of 58 ares of the site, which equals approximately 60% of its supposed area. This fact along with already published set of data concerning archaeological remains, and short occupation period make it a nearly ideal candidate for testing new analytical approaches. This study utilizes traces of use recorded on 32 of the 119 flint artefacts, as well as the data on their deposition to identify possible functional areas of the site linked to butchering and related practices and other activities such as production or repairing of tools.

Keywords: Funnel Beaker Culture; Eneolithic; lithic analysis; lithic use-wear analysis; spatial analysis
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INTRODUCTION

The site in Zawarża is situated in the eastern part of the loess area of western Lesser Poland within the Nida catchment area. It was discovered in 1959 during a survey conducted in conjunction with research on the Stradów settlement at that time (Kulczycka-Leciejewiczowa 2002, 11). The subsequent excavations of the site spanned from 1959 to 1963, culminating in the uncovering of 58 ares of the site, which, according to A. Kulczycka-Leciejewiczowa, accounted for approximately 60% of the total settlement area. The comprehensive excavation effort led to the registration and examination of 77 archaeological features. Remarkably, only materials related to the South-Eastern group of the Funnel Beaker Culture (FBC SE) were discovered during these excavations. The site's finds inventories encompassed over 8,500 fragments of pottery, comprising complete or nearly complete vessels, more than 2,500 bone remains, 29 bone and antler products, 21 fragments of grinding stones and querns and 119 flint artefacts. Of significance to this study are the flint artefacts, which have been analysed in terms of typology and raw materials by Bogdan Balcer. These findings were incorporated as a dedicated chapter in a monographic publication of the site (Balcer 2002).

SPATIAL ARRANGEMENT OF THE SETTLEMENT

Although over half of the supposed settlement area in Zawarża has been excavated, we have only indirect evidence of its internal structure (Figs 1 and 2). This evidence comes in the form of clusters of archaeological features along with archaeological remains found within them. Based on this evidence, A. Kulczycka-Leciejewiczowa interpreted the site as a single-phase, small settlement characterized by 8-10 houses encircling a central plaza (Kulczycka-Leciejewiczowa 2002, 61, 62; fig. 52, insert). She estimated the locations of these houses by examining the placement of hearths and clusters of storage and waste pits. If this interpretation holds true, Zawarża would be one of the very few FBC sites where such a reconstruction is possible. Among known sites associated with this archaeological culture, those with internal structures that remained undisturbed by later occupation are not numerous. Moreover, the extent of the settlement is rarely known, due to limited scope of excavations. Both these factors contribute to the fact that settlement in Zawarża seems to be better suited to understand functioning of FBC SE communities than large, long-lasting settlements like Bronocice, Site 1, which show intensive occupation spanning over a thousand years, often obliterating earlier plans of arrangement.

Additionally, results of analyses conducted by A. Kulczycka-Leciejewiczowa suggested that the occupation of the site was relatively short, possibly consisting of only one occupational phase. This conclusion was drawn from the observed homogeneity of pottery, similarities in composition of clusters of features, and lack of stratigraphic relations between

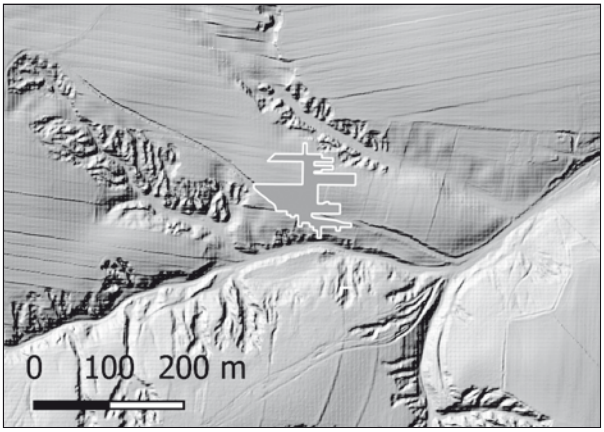

Fig. 1. Zawarża Site 2, Pińczów commune. Localisation of the site in the local topography

Fig. 2. Zawarża Site 2, Pińczów commune. Plan of excavated area; a – hearths, b – other features, numbers – features mentioned in Table 1. After Kulczycka-Leciejewiczowa 2002, with changes

them, suggesting that newer generations of features were dug during the time of use or, at least, with memories or traces of older ones. The author also suggested that at least some features were filled purposefully, supposing an organised emigration of settlers at the end of the functioning of the site. The precise duration of the site's use is uncertain, as no radiocarbon dating was available at the time of the study. The author estimated approximately 50 years as a probable time of use of the horizontal log constructions, which in her opinion were used for housing. Use of such constructions would explain lack of recorded postholes on the site. Estimated timespan of use of the settlement was also supported by general observations regarding the quantity of archaeological remains, such as pottery, bone fragments and lithics. Unfortunately, the actual timeframe of use of the settlement cannot be verified by radiocarbon dating at this point, as only one determination is available from the site, made on an animal bone from Feature 67 (ICA 15B/0615, 4730±40 BP, calibrated to around 3640-3370 BC; Kruk *et al.* 2018, 39, table 9; 40).

In terms of the spatial arrangement of the settlement, the author's view suggests the presence of several households, each marked by a cluster of features such as storage pits and hearths located inside or near the construction. These households were, therefore, interdependent units organized around the central plaza, with one feature interpreted as a water reservoir (Feature 65). This interpretation resembles the household-based settlement structures of earlier Neolithic societies, as discussed in literature (*e.g.*, Bogucki and Grygiel 2022). Planning at the higher level is also evident in these societies, particularly in the layouts of enclosed sites (*e.g.*, Lublin-Volhynian Culture phase in Bronocice; Kruk and Milisauskas 1985). However, the presence of a plaza in the middle of the settlement has not been confirmed in any of these examples. Planned settlement arrangements are strongly associated with so-called mega-sites of the Cucuteni-Trypillia Culture (*e.g.,* Gaydarska *et al.* 2020 and literature cited there), although the scale of these structures may be comparable only to the largest sites of the FBC SE, such as Bronocice 1, Miechów 3 or Mozgawa 1-3 (Nowak *et al.* 2022). For example, the estimated size of the settlement in Bronocice in phase Br II, which is stylistically analogous to the pottery of Zawarża, equates to 8 hectares with fewer than 200 people (Diachenko *et al.* 2016, 27, table 1), a multiple of the size of the settlement in Zawarża. The closest representation of the circular arrangement of settlements observed in Zawarża comes from the FBC sites in Garbia Basin, Central Poland, such as Andrzejów 2 (Pelisiak 2003, 65, 149-151). Unlike the situation in Zawarża, however, clear traces of hearths were localised in the vicinity of the central plaza, and not in the houses. The site in Andrzejów is also smaller than Zawarża. Altogether, while all elements of internal structure of the analysed site could be tracked back to either contemporary, or earlier ways of organisation of settlements, it is their combination made visible by extensive excavations, that makes Zawarża a unique test object.

The aim of the study is to provide an insight into the possible modes of use of space and organization of work within FBC settlements. The specific question concerns the distinction between the tasks performed near individual households and in spaces that could be considered communal. The latter possibility was formulated by the original researcher of the site, basing on the observation of central plaza, an area almost free of archaeological features, and surrounded by clusters pits interpreted as remains of households. On the more detailed level, the study aims to create a robust framework for integrating use-wear and intra-site analyses in a way that would develop a better understanding of social and economic patterns of settlement activity in the FBC SE. Such analyses have been attempted for example for the Eastern group of the FBC (Małecka-Kukawka 2001; Pyżewicz 2015; Papiernik 2016; Kabaciński and Winiarska-Kabacińska 2018).

MATERIALS AND METHODS

Functional analysis was performed on the 80 of 119 flint artefacts described by B. Balcer (2002). The omitted specimens were not found in the preserved material. The typological designations by that author were employed during the study, with minor changes. Raw material designations were slightly expanded, particularly to better emphasize the presence of artefacts made from the so-called “type G” Jurassic flint, originating from the Central Kraków-Częstochowa Upland (Přichystal 2009, 93). Additionally, original drawings of the lithic items were used with slight modifications to mark the locations of use-wear traces. The artefacts were categorized into 7 dynamic classification categories, along with indications of the form of the blank or prefabricate used for their production. This step seems to be necessary for interpretation of observed traces, mostly because of specimens bearing multiple wear traces, or modifications (*e.g.*, splintered pieces). This approach is also aimed to provide information about the cycles of production and knapping activity present at the site, which could be compared with other Neolithic and Eneolithic site assemblages. The lithic artefacts had previously been documented and drawn by B. Balcer, and in only a few instances was more intensive cleaning necessary. In these cases, an ultrasonic bath was used. In most cases, rinsing with water to remove accumulated dust and wiping the surfaces with ethyl alcohol prior to observation sufficed. The artefacts have been observed with naked eye and using low magnifications first for marking of potentially used edges and surfaces. On this basis, a description of edge/area shapes, presence of working retouch, polishes and striations were made. For this purpose, a trinocular Nikon SMZ-745T has been used, with magnification range 6.3-50×, with additional use of a Dino-Lite AM4113ZTL digital microscope (20-90x). For the observation, description and documentation of the characteristics of polish and striations, a Nikon Eclipse LV100 metallographic microscope has been used, with magnification range 100-500×. Observed traces were recorded using a form based on characteristics described by Grzegorz Osipowicz (Osipowicz 2010). Observed traces were interpreted in accordance with established methodologies, drawing from the literature (van Gijn 1990; Korobkova 1999; Osipowicz 2010; Rots 2015) and comparisons with the writer’s own experimental collection. It should be noted

Table 1. Zawarża Site 2, Pińczów commune.
Artefacts with identified use wear

No.	Feature (depth)	Typological category	Raw material	Fragmentation	Contact material	Activity	Figure
1	36 (100-120 cm)	splintered piece	Jurassic (Kraków)	whole	hide	contact	
2	Loose	ret. flake	Volhynian	whole	hide	cutting	
3	65 (20-40 cm)	cont. ret. blade	Volhynian	apex	hide	cutting	3
4	70 (40-60 cm)	cont. ret. blade	Jurassic (G)	distal part	hide	cutting/ scraping	
5	Loose	ret. blade	Volhynian	whole	hide/meat	cutting	
6	5 (40-60 cm)	ret. blade	Jurassic	whole	hide/meat	butchering	8
7	15 (80-100 cm)	blade	Volhynian	whole	hide/meat	cutting	
8	65 (40-60 cm)	cont. ret. blade	Volhynian	whole	hide/meat	cutting	4
9	41 (60-80 cm)	flake	Jurassic	brekage: apex	meat	cutting	
10	76 (120-140 cm)	backed blade	Jurassic (Kraków)	whole	meat	cutting	
11	76 (140-160 cm)	splintered piece	Jurassic	whole	meat	cutting/ butchering	
12	75 (120-140 cm)	end scraper (double)	Volhynian	whole	bone	drilling	5
13	25 (30-50 cm)	splintered piece	Świeciechów	whole	bone/wood	cutting	
14	70 (20-40 cm)	ret. blade	Świeciechów	mesial part	bone/wood	engraving	9
15	37 (20-40 cm)	flake	Jurassic	whole	plants	cutting	
16	76 (80-100 cm)	flake	Volhynian	whole	plants	cutting	
17	16 (100-120 cm)	ret. blade	Volhynian	distal & mesial part	plants	cutting	
18	5 (80-100 cm)	end scraper	Volhynian	whole	silicous plants	cutting	
19	38 (20-40 cm)	end scraper	Volhynian	brekage: apex	silicous plants	cutting	6
20	38 (80-100? cm)	cont. ret. blade	Volhynian	brekage: apex	silicous plants	cutting	
21	37 (60-80 cm)	axe head	Świeciechów	whole	wood	cutting	9

No.	Feature (depth)	Typological category	Raw material	Fragmentation	Contact material	Activity	Figure
22	16	splintered piece	Volhynian	whole	wood	cutting/ sawing	
23	76 (80-100 cm)	splintered piece	Jurassic (Kraków)	whole	wood	splitting	8
24	39 (40-60 cm)	flake	Jurassic (Kraków)	whole	wood?	contact	
25	61 (20-40 cm)	splintered flake	Volhynian	apex	wood?	cutting/ splitting?	9
26	29 (140-160 cm)	splintered piece	Volhynian	whole	mineral	hitting (strike-a-light)	7
27	17 (40-60 cm)	splintered piece	Jurassic	whole	hard material	cutting?	
28	45 (40-60 cm)	ret. flake	Jurassic (G)	whole	hard material	cutting	
29	5 (40-60 cm)	flake	Jurassic (K)	whole	hard material	cutting?	
30	42	flake	Jurassic (G)	proximal & mesial part	unknown	cutting	
31	31 (40 cm)	flake	Jurassic	whole	unknown	cutting	
32	19 (40-60 cm)	ret. blade	Volhynian	mesial part	unknown	scraping?	

here that the collection comes from the "first-generation" experiments (*sensu* Marreiros *et al.* 2020), with no controlled and serial experiments conducted specially for this study. Therefore, the results of the use-wear analysis are limited at this point to the description of contact materials and performed activities. Interpretation was possible for 32 out of the initial 80 artefacts (Table 1). In the case of the remaining specimens, traces of use were either not present or impossible to interpret due to thermal breakage, mechanical damage, patination, very weak appearance or a mixture of these factors. For 3 of 32 artefacts, only supposed motion could be inferred, with unknown worked material. Furthermore, localisation of Find 2 is unknown. As a result, only slightly more than 1/5 of the whole assemblage (27 out of 119 of lithic artefacts) that could be used in spatial analysis.

While a reduction of database is not limited to this case, quantitative comparisons of this aspect between sites are not easy. Two simple measures were introduced to illustrate this problem: identification ratio (IR) and representativeness of the sample (RS). The former is the number of cases with identified traces (in this case: worked material and motion) per studied specimens, showing how often identifiable traces can be found in given assemblage or collection. The latter is the number of studied lithic items divided by the number of lithics in the whole site/phase assemblage (*nota bene*, lithics and other materials discovered during excavations are also samples of statistical populations of unknown size). As an example, out of 213 analysed lithic artefacts from Kopydłowo Site 6, use wear has been observed in 32 cases (Pyżewicz 2015, 193). Since the whole lithic material has been analysed, IR would equal about 15% and RS would be 100%. In the case of Sandomierz-Wzgórze Zawichojskie, from 102 analysed lithics found in features, use wear was observed on 65 specimens, but identification of the worked material was possible in the case of 48 of them (Winiarska-Kabacińska 2017, CD, tab. 1). Therefore, IR is about 47%. The RS is, however, much lower, as it consists of less than 4% of the 2701 lithic materials found in the archaeological features (Zakościelna 2017, CD, table 1). The RS is higher, about 32%, in the case of Wilkostowo Site 23/24 (Winiarska-Kabacińska 2015, 323, table 28). However, in this case the RS equals about 31% (103 identified for 330 analysed lithics). In her analyses of the Neolithic site inventories from Chełmno Land, J. Małecka-Kukawka set a typical frequency of "functional tools" in a range oscillating from a dozen to about 40% of lithics (Małecka-Kukawka 2001, 30-50, 84-100; 2012, 146). As can be seen, the value of IR varies, but only in some cases does it exceed 40-50%. A sharp decline in values of RS can be seen in collections and assemblages that are too numerous to analyse. In such cases applied sampling strategies strongly influence the possibility of comparison (*e.g.*, Małecka-Kukawka, Werra 2011; Pyżewicz 2021; Kruk *et al.* 2023, 64). The problem is still more complex if traces of multiple activities are considered. In the classic study of lithic artefact of Beek-Molenseeg by A. van Gijn, about 47% of the selected tools had identified use-wear (van Gijn 1990, 94). However, this study would show that out of 619 PUAs ("potentially used area" marked on artefact) there were only 149 AUAs ("actually used area"), including 32 with unknown worked material (van Gijn 1990, 93, Table 26). The ratio of about 19% of identifiable used areas should be therefore considered as a more representative value for the identification ratio. The materials from Site 2 in Zawarża do not therefore stand out from this background, with an IR value of c. 36% and a RS of c. 67%. The presented examples show that in most cases, the numbers of functional tool may be enough to represent the scope, but not necessarily represent intensity of different activities in the site.

The analysed artefacts were plotted on a plan of the investigated settlement area to visualize the possible locations of different activities. However, no circumstances allowing the use of the so-called 'Pompeian premise' have been discovered during excavations. Therefore, a displacement of materials from the place of its last use need to be taken into account. The model of disposal described by M. Kuna (2015) was used to conceptualise this problem. The data, however, allowed limited insight into deposition processes. Therefore, the utilised model was simplified. Primary and secondary refuse were treated as a uniform category characterised by short circulation in the space of the site, associated with direct and indirect deposition in time close to the last use of features, so at the beginning of formation of fills. Artefacts included in the tertiary refuse are associated with longer circulation around the site and indirect deposition from another cache. In the case of

Zawarża, no external residues (*sensu* Kuna 2015) are recoded under the hypostatised single-phase occupation of the settlement. Therefore, in archaeological features with layered fills, a stratigraphic position in the lowest layers (identified as a fill cones) should be in the closest association with the time of last usage of features. Archaeological material deposited in these layers would therefore be considered as sealed by superimposed layers, and therefore, removed from further circulation (= "short circulation"). In contrast, materials from the upper layers had a greater chance to be exposed to the longer period of circulation between last use and final deposition (= "long circulation"). Materials from features with uniform fills need to be considered as single strata that are equally distant chronologically from the last use of the feature, so they are treated as subjected to a long circulation process.

Used lithics were then assigned to the area of site, according to classification described above. For representation of short circulation deposition area, the outline of the features has been used without additional buffer. For the other materials Thiessen polygons were created around features' centroids to represent possible areas of discard of artefacts before their final deposition in the features fills. Polygons were created in the "Voronoi (Thyssen) polygons" algorithm with 10% buffer in QGIS 3 software. Data on use of lithics was appended to both the layers, and then they were combined. In cases of multiple traces on the artefacts, it was assumed that deposition followed the last recognisable use. Therefore, only these last stages were included in the spatial analysis. Additionally, Voronoi polygons were used to visualise spread of other lithics and pottery fragments.

RECORDED TRACES OF USE

Soft animal tissues

Traces of work on soft animal materials were observed in 11 cases. Those associated with cutting hide were found on two of them (Table 1, 2-3; Fig. 3), with possible another three used either for hide or meat and a fragment of continually retouched blade used for cutting or scraping hide (respectively nos 5, 7, 8 and No. 4; Fig. 4). Traces of cutting meat were found on two artefacts (No. 9-10), a flake and a backed blade. Lastly, two specimens have traces suggesting use in butchering (No. 6 and 11; Fig. 8) and one has unidentified contact with hide (No. 1). In general, mostly blades and blade tools have been used for this purpose, with "raw" or retouched thin edges, although not always straight. Traces of use are sometimes spread along edges and on nearby areas, but in some cases areas of greater intensity are observed, especially on the specimens interpreted as knives and scrapers for hide. The specimens identified as butchering tools had additional "bone-like" traces, occurring in the used areas (Fig. 8) and less localized traces characteristic for meat knives. In addition, traces of contact with soft animal tissues have been recorded on several occasions. In the case of some splintered pieces, these are interpreted as remnants of the arte-

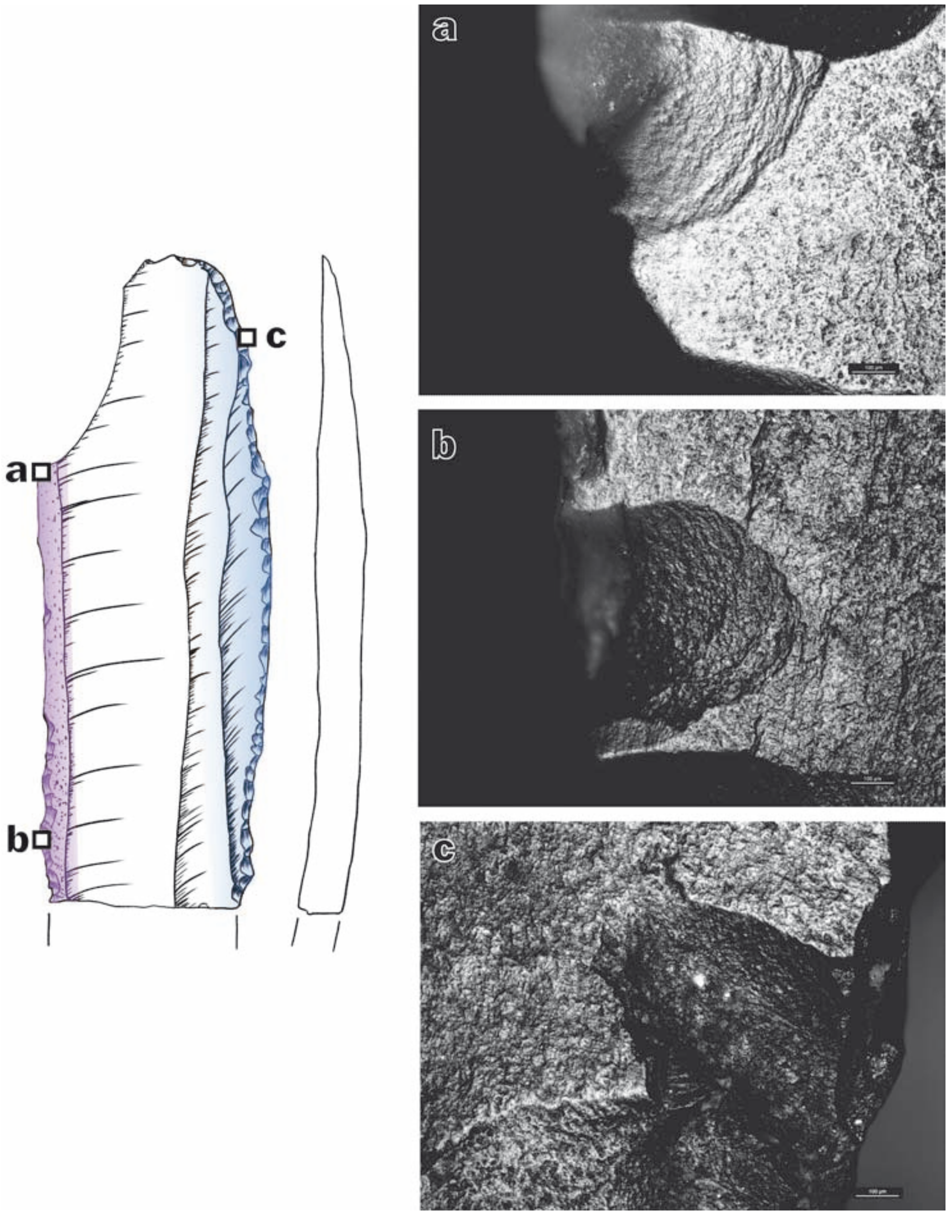

Fig. 3. A distal part of the continuously retouched blade (No. 3, Feature 65); a, b, c – traces of contact with hide; violet area – cutting, blue area – unknown contact. Original drawing after Balcer 2002 with modifications. Original magnification: a, b, c – 100x, objective 10x, scale bar: 100 µm

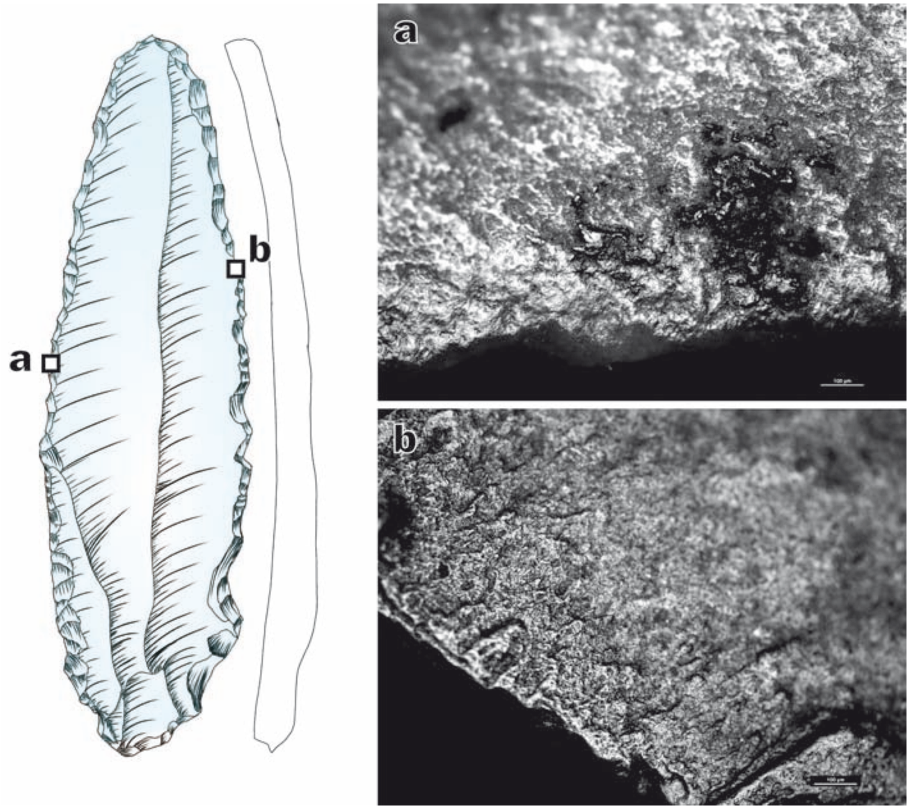

Fig. 4. The continuously retouched blade (No. 8, Feature 65); a, b – traces of cutting meat or hide. Original drawing after Balcer 2002 with modifications. Original magnification: a, b – 100x, objective 10x, scale bar: 100 μm

fact's previous function, as it was in the case of a splintered end scraper, which was subsequently repurposed as a strike-a-light (No. 26, Fig. 7: a). Traces found on its lateral edges may be associated with prehension, but also on the distal end of the specimen there are remnants suggesting some work in hide before the edge was obliterated by bipolar strikes. Traces of both scraping motion and contact with hide are present on the proximal end of a sickle insert, and on its right lateral edge (although, with ambiguous motion indicators; No. 19, Fig. 6: b, c). The specimen was however described by B. Balcer as an end scraper/perforator with broken apex (and this diagnosis seems plausible). Therefore, it is possible that the tool has been worked with in multiple ways during its life history, leaving complicated pattern of use wear. Similarly, there are also traces of directional, scraping-like activity, accompanied by polish, suggesting contact with soft animal tissues on the distal part of a double end scraper (described by B. Balcer as an end scraper/blunt perforator; No. 12, Fig. 5: a). In this case, the piece also shows multiple different stages of uses.

Hard animal tissues

The specimen described above shows traces of movement with the proximal end against organic material, possibly softened bone or antler (Fig. 5: c). This movement was multidirectional, possibly rotary or semi-rotary at approximately right angle to the material contacted. This was apparently the last of the functions of the specimen before it was discarded. The hide-scraping end mentioned above might have been used in a separate stage, preceding the "blunt drill" function, but it should be argued, that considerable pressure was probably applied at this edge, leaving some marks on it. It is also probable that retouched notches on the lateral edges of the specimen – made after it was used as a sickle insert – are associated with this activity. In case of another two specimens possibly used for bone/antler, one is splintered piece with edge marked by traces of perpendicular movement with weak traces of cutting hard material, probably bone or hard wood (No. 13). Another one is a mesial portion of a retouched blade, with traces of grooving on the edge

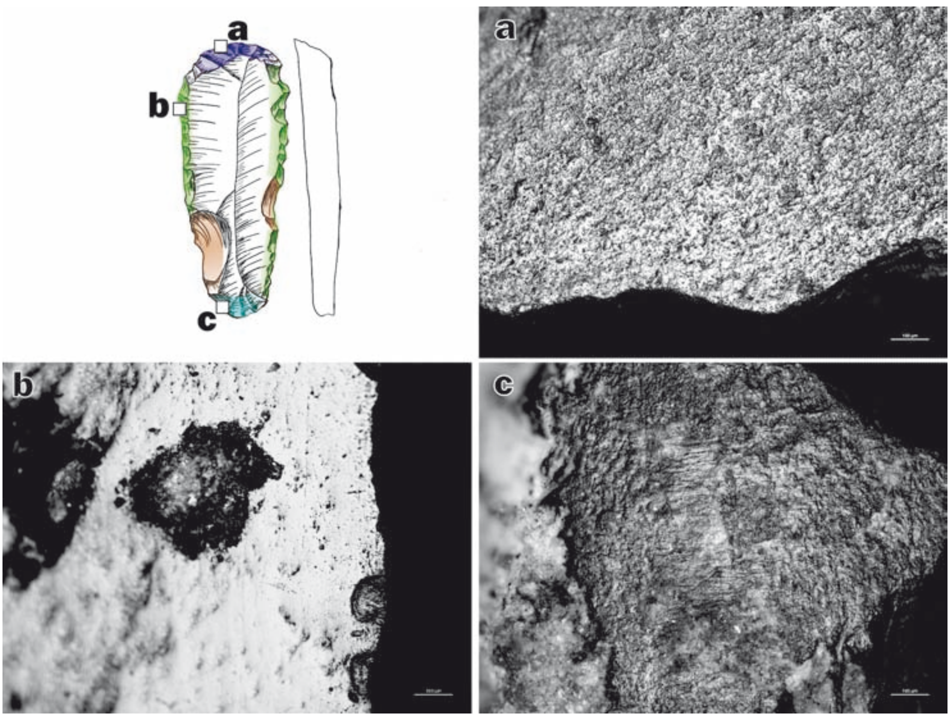

Fig. 5. The two-sided end scraper (No. 12, Feature 75); a – traces of hide scraping (violet), b – traces of cereals cutting (green), c – traces of bone/antler drilling (cyan), brown – negatives free of distinguishable use wear. Original drawing after Balcer 2002 with modifications. Original magnification: a, b, c – 100x, objective 10x, scale bar: 100 μm

broken in a burin-like fashion (No. 14, Fig. 9: c). Three other artefacts have damages on the working edges characteristic of the cutting or splintering of hard material (No. 27-29). The contact material, however, could not be identified.

PLANT-BASED MATERIALS

Activities involving the cutting of soft plant tissues were identified on three artefacts (Table 1, 15-17). They consist of two flakes and a fragment of retouched blade. On the flakes traces are faint and spatially limited. They probably had been used as *ad hoc* tools. The retouched blade has a fairly well developed polish visible on the preserved part of its left lateral edge, more pronounced in the supposed central part of the specimen, in the region of local bend of the original blade. These characteristics are sometimes observed on the tools for splitting fibres. In this case, polish is brighter on the ventral side of the artefact,

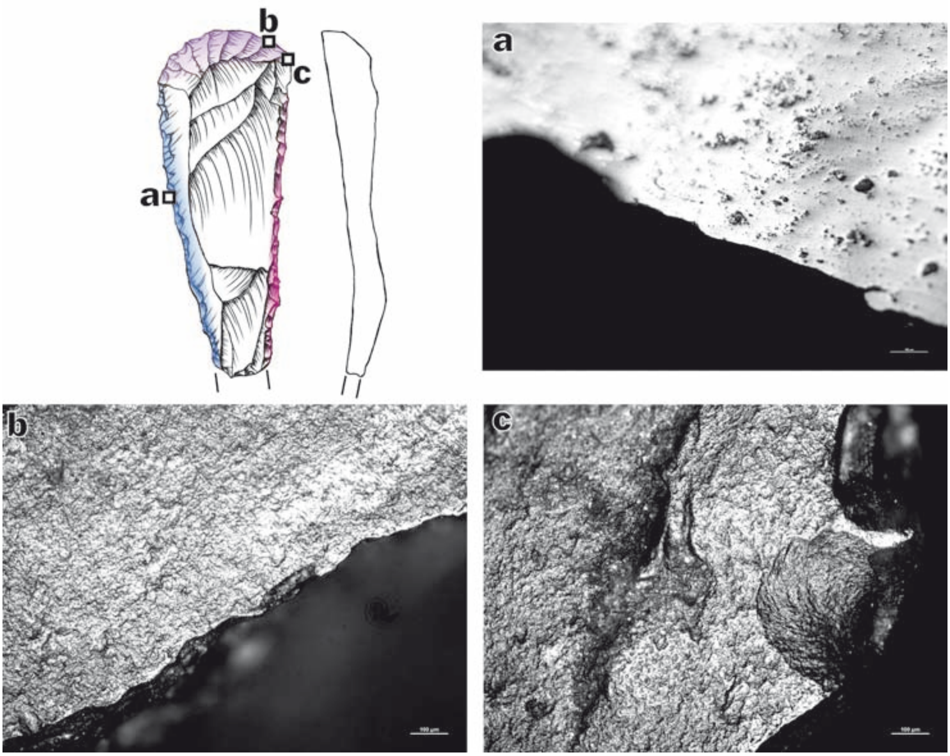

Fig. 6. End scraper (No. 19, Feature 38); a – traces of cereals cutting (blue), b – traces of hide working (violet), c – traces of contact with hide (fuschia). Original drawing after Balcer 2002 with modifications. Original magnification: a, b, c – 100x, objective 10x, scale bar: 100 µm

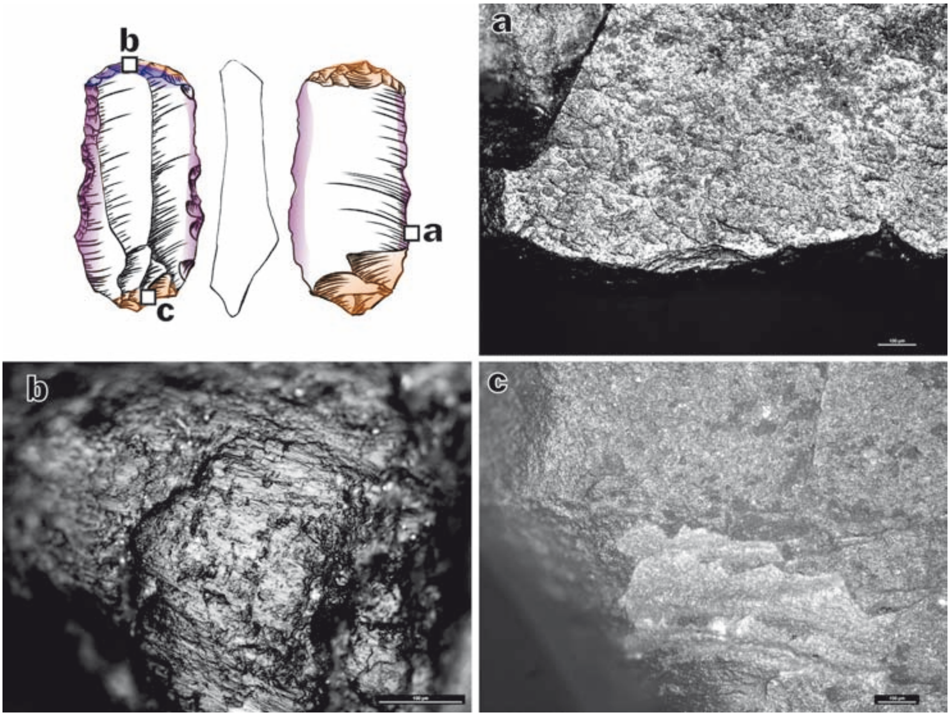

Fig. 7. Splintered piece made on end scraper (No. 26, Feature 29); a – traces of intensive contact with hide (pink), b – traces of striking a spark with mineral material (violet), c – technological traces associated with bipolar technique? (orange). Original drawing after Balcer 2002 with modifications. Original magnification: a, c – 100x, objective 10x, b – 200x, objective 20x, scale bar: 100 μm

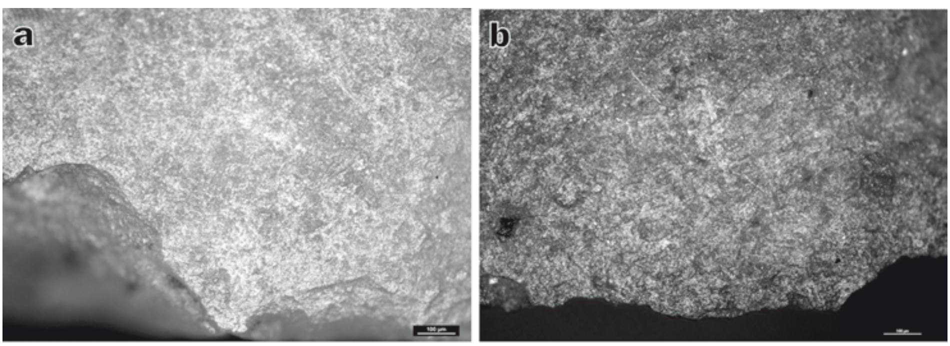

Fig. 8. Traces associated with wood working (a; splintered piece, No. 23, Feature 76) and butchering (b; retouched blade, No. 6, Feature 5).
Original magnification: a, b – 100x, objective 10x, scale bar: 100 μm

although the direction of striations suggest movement diagonal and parallel to the edge instead of perpendicularly, needed for such an activity.

Harvesting tools have been identified in three cases as a final activity (Table 1, 18-20) and on several occasions as a previous stage of use. Two of them are typologically an end scraper and end scraper/perforator with broken apex (No. 19, Fig. 6). The third one is a blade with continuous retouch with broken-off apex. In case of specimen No. 19, it is unknown, as is mentioned before, whether the cutting of cereals was the final stage of use, or if it was later used for hide scraping, since it would seem that larger blades, usually used as sickle inserts were often refurbished for other purposes. Specimen No. 20 was used as double sided insert, with observable "fresh" retouch over part of one edge. Another example, already mentioned, is specimen No. 12, with both retouched lateral edges covered with harvesting polish, and later used as a drill for antler of bone, with possible intermediate stage of scraping hide.

Tools associated with wood working can be divided in two main groups: specialized, planned tools represented by an axe head of Świeciechów flint (No. 21, Fig. 9: a), and tools that require less expertise to produce, such as splintered pieces or just flakes. While traces

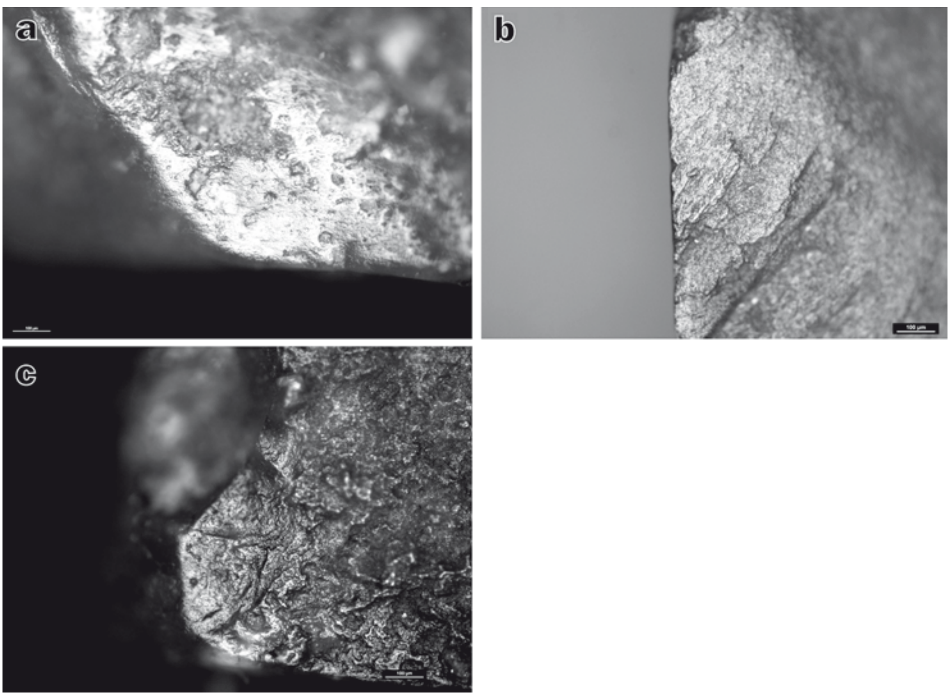

Fig. 9. Traces associated with wood working (a, b; axe head, No. 21, Feature 37 and flake from splintered piece, No. 25, Feature 61) and grooving antler/bone (c; fragmentary retouched blade, No. 14, Feature 70). Original magnification: a, b – 100x, objective 10x, scale bar: 100 µm

on the axe head are well developed in the working and handling area, the other tools were seemingly used in more expedient way. One of the splintered pieces, with traces of a sawing motion, has been made on the retouched blade (No. 22). It is therefore uncertain if the traces belong to the final stage of use. Specimen No. 23 has been used as a wedge in wood, or in similar matter (Fig. 8: a). It is possible, that specimen No. 25 also have been formed in a similar process. The use wear on the latter is, however, less developed (Fig. 9: b).

MINERAL MATERIALS

The only artefact with identified contact with mineral material of a character other than a technological one is the splintered piece strike-a-light mentioned above (No. 27, Fig. 7). Three other artefacts, with unidentified material contact, have wear traces suggesting cutting or scraping motion, usually not observed on the hard, mineral materials.

Deposition patterns

Out of 32 analysed artefacts, only five can be associated with a short circulation process (Table 2). Interestingly, most of them are splintered pieces. These include two specimens made on cortical flakes, one on a negative flake, and last one on an end scraper turned strike-a-light. Above that, only two flakes (one retouched) could be associated with early deposition, while all the typological tools circulated longer before final deposition. A similar

Table 2. Zawarża Site 2, Pińczów commune. Number of artefacts in category (broken down into prefabricate categories) in short and long circulation contexts

Artifact category	**Circulation**		**Sum**
Prefabricate category	Short	Long	
Blade		**1**	**1**
Blade production		1	1
Flake	**1**	**6**	**7**
Preparations	1	3	4
Bipolar technique		2	2
Repairs		1	1
Splintered pieces	**3**	**5**	**8**
Preparations	1	2	3
Flake production	1	1	2
Bipolar technique		1	1
Tools	1	1	2
Tools	**1**	**15**	**16**
Preparations		1	1
Blade production		13	13
Flake production	1	1	2
Sum	**5**	**27**	**32**

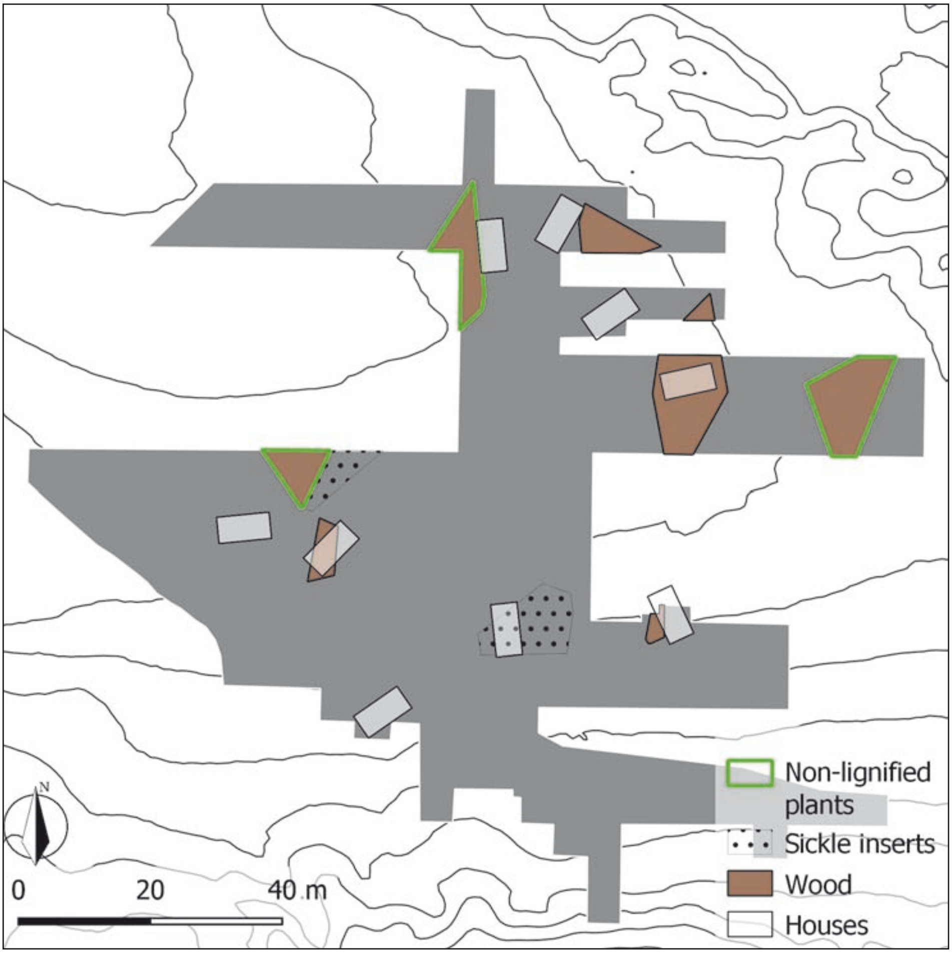

Fig. 10. Zawarża Site 2, Pińczów commune. Thiessen polygons representing deposition areas of tools used for processing plant-derived materials with localisation of supposed housing structures marked

trend can be seen also in the whole set of lithics: less than a quarter of 80 artefacts can be associated with short circulation patterns, in which also splintered pieces and flakes dominate. Moreover, tools in this subset consists of two retouched flakes, fragment of a retouched blade and a flint grinder. This picture would suggest that the users of flint tools executed most of the activities outside of the pits, and that more elaborated tools, and perhaps raw material itself, were not disposed of lightly.

The overall distribution of used lithic materials within the settlement does not exhibit any clear clustering. As depicted in Figures 10 and 11, tools associated with work involving processing animal and plant materials form distinct clusters in the central and western

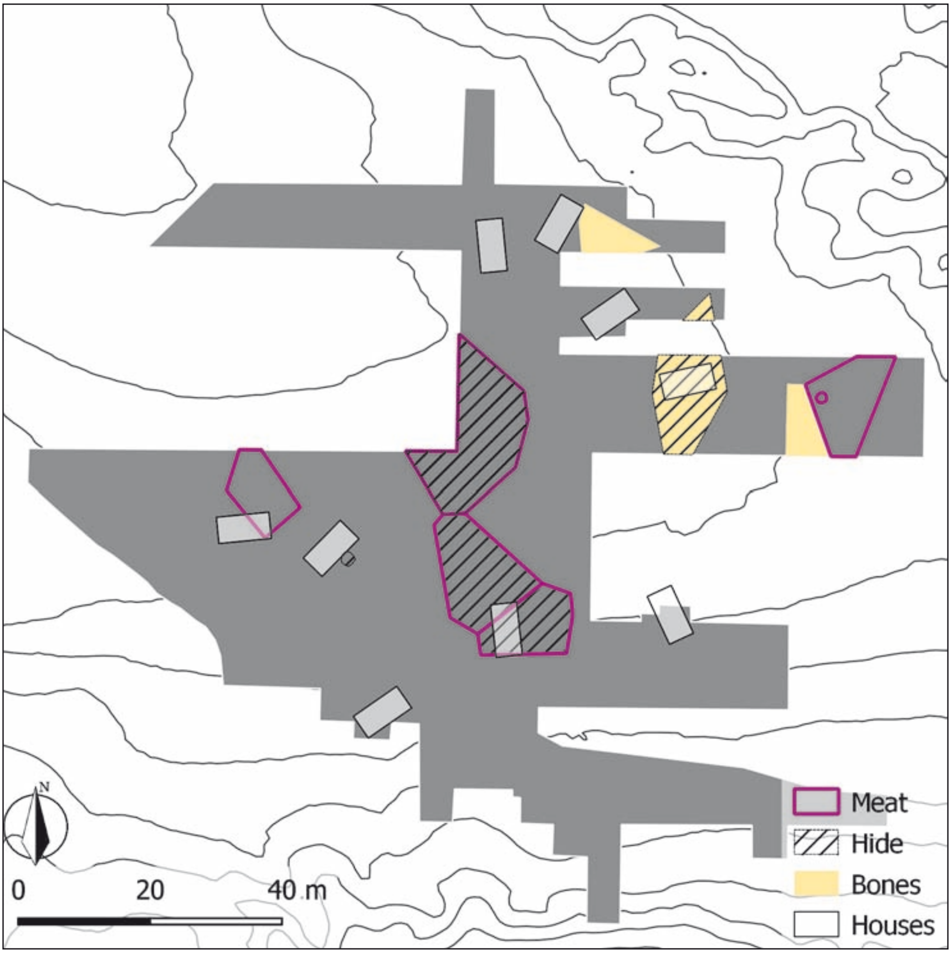

Fig. 11. Zawarża Site 2, Pińczów commune. Thiessen polygons representing deposition areas of tools used for processing animal-derived materials with localisation of supposed housing structures marked

portions of the settlement. However, in the eastern part, these clusters overlap. If the assumed location and concurrent usage of housing structures proposed by A. Kulczycka-Leciejewiczowa are accurate, one might expect household specialization in production within the settlement.

The concentration of pits in the eastern side of the settlement can be interpreted in multiple ways. It could potentially represent a common production area associated with processing animal-based material or a site for waste storage. Supporting the former function is the presence of a hearth (Feature 76) in that vicinity, as well as the presence of tools associated with bone or antler working. Notably, while both animal remains and items

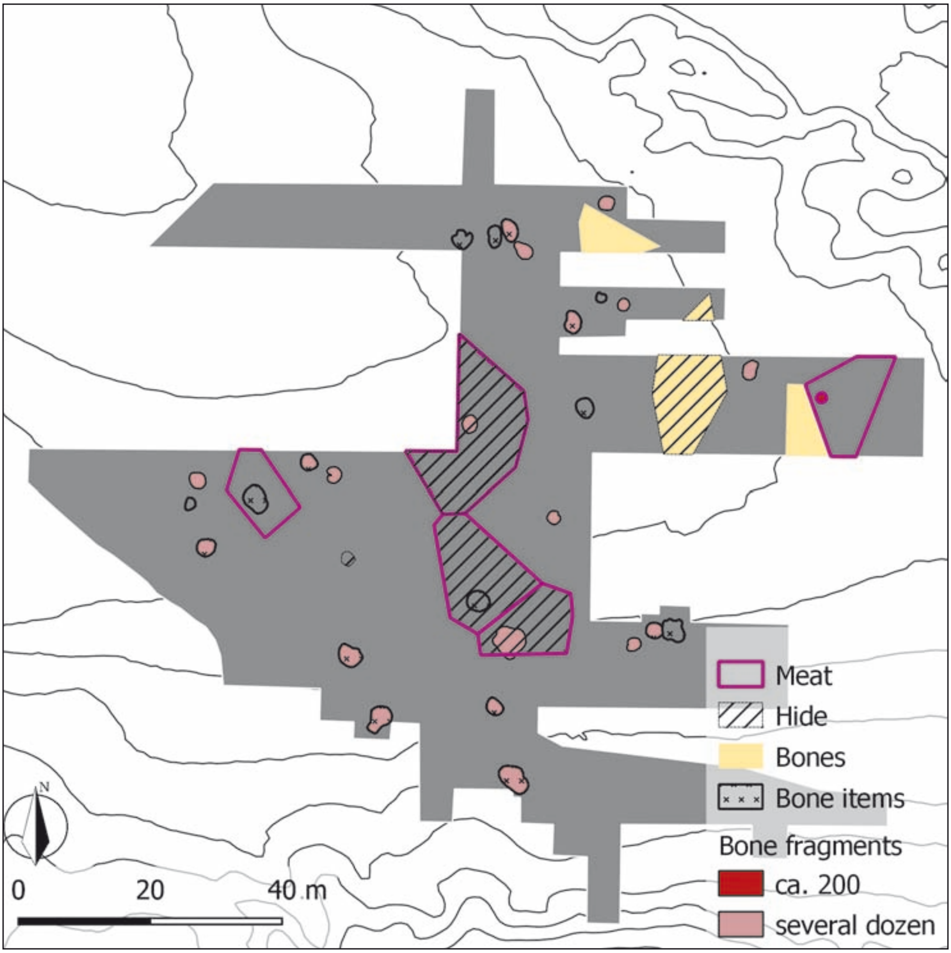

Fig. 12. Zawarża Site 2, Pińczów commune. Thiessen polygons representing deposition areas of tools used for processing animal-derived materials with localisation of features containing animal bones and bone/ antler items marked

made of bone and antler are evenly distributed throughout the site, the highest density of bone deposits has been discovered in Feature 76 (Fig. 12). On the other hand, the downslope location of this area, on the opposite side of the ridge and near a small valley, made it ideal for deposition of cumbersome waste. Both of these factors, along with presence of tools used on soft animal tissues suggest that this area might have been used for activities like butchering. Conversely, the western part of the plaza appears to have been associated with "cleaner" activities. While lithics with traces of working on wood and softer plant materials have been uncovered there, two sickle blades were also found. These items were

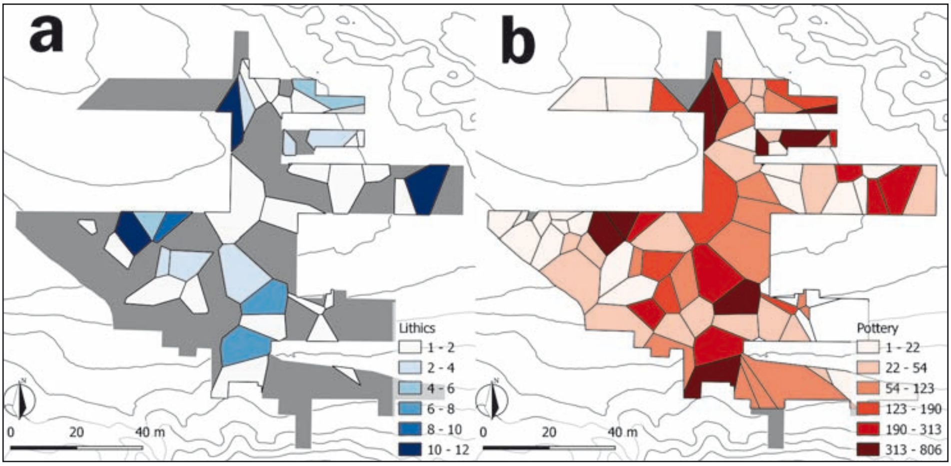

Fig. 13. Zawarża Site 2, Pińczów commune. Thiessen polygons representing deposition areas of lithic and pottery artefacts

likely not used in the centre of the settlement. According to experimental research, sickle blades tend to have a relatively long lifespan (*e.g.*, Osipowicz 2010, 86, 87). Examination of the sickle inserts from Zawarża did not reveal serious damage or blunting; instead, they appear to have undergone modifications aimed at extending their lifespan. Moreover, sickle inserts made from long blades could potentially be repurposed into other tools, as happened in the case of specimen No. 12 and in the case of tools from Bronocice (Kruk *et al.* 2023, 84). Thus, it is plausible that repairs, assemblage or reattachment of blades to handles were conducted in this location. In this area, a higher-than-average number of lithic artefacts have been found, including an axe head – a part of another specialized, composite tool that may have required repairs and maintenance, but serving a completely different function (Fig. 13: a). However, it is important to note that this area also yielded a high concentration of pottery fragments, the use and deposition processes of which are considered independent of the lithics (Fig. 13: b). Therefore, alternative explanations, such as the existence of a waste storage area or a natural catchment area for materials from the upslope region, should also be considered.

SUMMARY

In the lithic material from Zawarża, Site 2, there is an observable tendency to recycle tools. The whole preserved specimens made on larger blades are rare and show clear signs of long use. This applies also to the axe head, that has been used after at least one stage of repairs. On the other hand, flakes and splintered pieces were sometime discarded with no or only general traces of use, regardless of the used raw material. Also, while tools made on flints from the Kraków-Częstochowa Jurassic Upland are more numerous than from Volhynian and Świeciechów flint, the ratio of tools/artefacts is higher for the latter two (Balcer 2002, tab. 2, 119). This pattern shows that the economic effort was concentrated into obtaining and maintaining specialised tools. The frequency of observed modifications suggest, however, that also other forms were not fully expedient, possibly due to limited flint supplies. Similar tendencies have been observed on the other FBC and FBC-Baden sites in the western Lesser Poland (*e.g.*, Brzeska-Zastawna 2017-2018; Kruk *et al.* 2023, 84). In the general terms, these results support observation made by B. Balcer, that Zawarża was a settlement of flint users, and not producers (Balcer 2002, 127).

The problem of use of splintered pieces as a wood wedges is interesting from the use-wear perspective. While B. Balcer (1975, 130) indicated such possibility, it seems that the traces of such activities are rare – possibly due to the susceptibility of such tools for chipping. In this case study, both splintered pieces and splintered flakes had polish that could be associated with wood working. Although, in conducted experiment of such kind, the wedges (made of chocolate flint) had many more striations of "technological" type, that probably resulted of multiple chipping during the work. Experimental work by W. Migal on the topic suggests, that composition of hammer and anvil makes about as great a difference as flint variety used in the bipolar technique (Migal 1987). In accordance to the mentioned above picture of scarcity of material needed for production of specialised tools such as axe heads and ubiquitous presence of splintered pieces in FBC settlements, more experiments including these products should be conducted.

The results of the analysis of deposition of used artefacts shows that most of the tools can be treated as tertiary refuse (according to Kuna's system), and they were characterised by longer circulation before final deposition. An exception to this rule is, once again, splintered pieces and flakes. On the eastern side of the site, there is a probable area associated with processing animal-based materials. For the exact nature of it, an analysis of the cut marks on the bones discarded there should be included, but traces of work on hides, meat and bones combined suggest a butchering site. In the light of the above discussion, it seems possible that there was some kind of specialised area in the central part of the site, not associated with specific materials, but for example accommodating activities such as repairs of axes or sickles. It would be in accordance with the diversified toolset found in this area. Reconstruction of such workshop areas is a complex task, requiring analysis of multiple chains of processing. At last, it is hard to pinpoint activities related to the housing structures without clear traces of them. It seems that some diversified activities could have occurred in the central plaza of the site, although it clearly overlaps with the portion of the site that has not been excavated – and where other houses should have been to enclose the ring. This fact impedes also an interpretation of the high amount of other archaeological material in this area. On the other hand, in the proximity of some reconstructed houses similarly varied activities have been recorded – most notably in the southern part of the site (clusters with Features 5, 15 and 36, 39; Fig. 2). This fact would suggest a more household-based economy. Although, also in the model suggested by A. Kulczycka-Leciejewiczowa, such activities would be possible. It is likely that the distribution of pits, fireplaces and other remains, used by this researcher as a proxy, did not in every case relate to houses, but maybe to other structures of economic importance. Even if that is the case, collective processing would be expected in at least some areas of the site – most probably one associated with butchering. This fact does not, however, mean that animal-based economy was more important to the occupants of the settlement, even in combination with the high number of bones in archaeological features. An analysis of the economical profile of the site requires an adjustment for the loss of plant materials, which are preserved only exceptionally. As far as a comparison between number of tools used for processing materials of plant and animal origin can tell, both "branches" of the economy should be considered as having been of roughly equal value. In both groups, curated tools of imported lithic materials can be found as well. The most important thing that the deposition patterns of lithics in Zawarża shows is that the different materials were likely processed in neighbouring or even the same spots in various configurations, suggesting a complex and an intertwined character of the economy.

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