SPRAWOZDANIA ARCHEOLOGICZNE 77/2, 2025
PL ISSN 0081-3834
DOI: 10.23858/SA77.2025.2.3880

Agnieszka Czekaj-Zastawny[1]

IMPORTED ARTEFACTS FROM THE SITE BRZEZIE 17 (LESSER POLAND) IN THE LIGHT OF THE LINEAR POTTERY CULTURE EXCHANGE CONTACTS WITH THE EASTERN-LINEAR CIRCLE

ABSTRACT

Czekaj-Zastawny A. 2025. Imported artefacts from the site Brzezie 17 (Lesser Poland) in the light of the Linear Pottery Culture exchange contacts with the Eastern-Linear circle. *Sprawozdania Archeologiczne* 77/2, 195-215.

In the second half of the 6th millennium BC, two cultural circles developed on both sides of the Carpathians – the Linear Pottery Culture and the Eastern-Linear Culture. Contacts between these two units were based mainly on the long-distance exchange of richly decorated ceramics and stone raw materials. Very strong connections are visible primarily between the area of the upper Vistula river basin and eastern Slovakia. A very good example of these contacts are imported objects from the LBK settlement in Brzezie Site 17. As the analyses carried out have shown, they come from the territories of eastern Slovakia – the Šariš Basin and East Slovak Plain. As the LBK developed, the exchange of goods gradually flourished. The intensification of contacts with the south is legible at most of the settlements in south-eastern Poland, mostly starting from the decline of the LBK II phase. These contacts ceased suddenly as the Linear Pottery Culture and the Bükk Culture diminished.

Keywords: Eastern Linear circle ornamentation, Eastern Linear circle, ornamentation, obsidian, Linear Pottery Culture, Tiszadob-Kapušany group, Bükk Culture, ceramic imports

Received: 30.12.2024; Revised: 07.01.2025; Accepted: 15.05.2025

1 Institute of Archaeology and Ethnology, Polish Academy of Sciences, Sławkowska St. 17, 31-016 Kraków, Poland; a.czekaj-zastawny@iaepan.edu.pl; ORCID: 0000-0001-6171-9930

1. LOCATION OF THE SITE

Wide-area rescue excavations in Brzezie Site 17, Kłaj commune (AZP 104-59/36) on the line of the A4 Freeway under construction (Kraków-Tarnów section) started in 2000. The site is located in the so-called Wieliczka-Bochnia loess area, belonging to the Bochnia Foothills, the mesoregion of the Sandomierz Basin (Kondracki 1994). More precisely, it lies in the source area of the Tusznica River (the left-hand tributary of the Raba), on a small plateau bordered from the west by a steep slope cut by high escarpments. From the east is has a form of a promontory descending gradually towards the river valley. Towards the south, the raising ground merges with the slope water divider and on the north with a small elevation in the Vistula flood basin (Fig. 1). The site lies on loamy loess.

2. SETTLEMENT REMAINS

On Site 17 in Brzezie the were discovered and examined 2775 features. The largest number of pits was associated with the Linear Pottery Culture (1251 features), and significantly fewer with later units such as the Malice Culture, the Lengyel Culture, the Mierzanowice Culture, the Lusatian Culture, and the modern period (Czekaj-Zastawny 2014).

The most interesting result of the research was discovering the settlement of the Linear Pottery Culture (LBK), with traces of long houses of the post construction. These discoveries, combined with results of excavations on other sites of that type, throw new light on the question of the presence of long houses in the Lesser Polish LBK milieu, especially on the scale of that phenomenon.

In Brzezie the remains of 26 households of the Linear Pottery Culture were discovered. Each of them contained one long rectangular house of post construction, accompanied by constructional pits, all situated along (more or less) a N-S line. There were also other features, especially utility pits of medium size, most often to the north of the house.

A notable discovery was the excavation of four burials linked with LBK. They were situated on the western peripheries of the site, at the foot of the plateau with settlement features. Skeletal remains did not survive, but two of the burials were equipped with funerary goods. Another interesting feature of the site was a section of palisade by the group of houses and utility pits discovered in the eastern part of the site, in form of the foundation groove with remains of wooden posts within.

Stylistic analysis indicates that materials of the Liner Pottery Culture from Brzezie 17 come mainly from the LBK second (Music-Note) phase, from its early stage (NI) to the late stage (NIII), mainly with NII (classic). This is confirmed by ^{14}C dates: 5152±65 BC, 5129±62 BC (Poz-47716: 6200±40 BP, Poz-47715: 6170±40 BP; calibration afterCalPal, version March 2007; Weninger, Jöris 2004; Weninger *et al.* 2007; Czekaj-Zastawny 2014) which fall exactly into NI. In the absolute chronology of LBK in southeastern Poland, the II (Music-

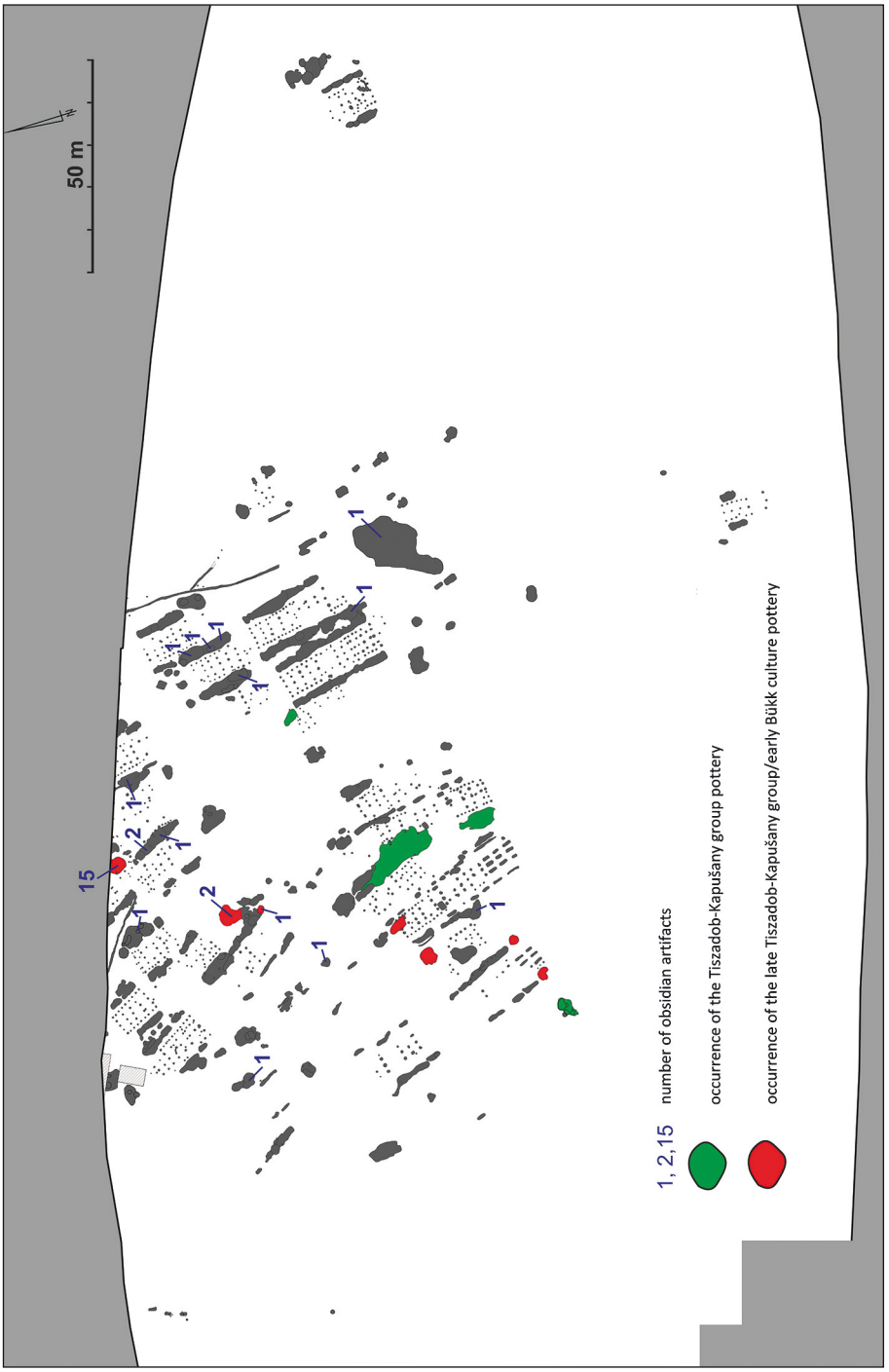

Fig. 1. Brzezie, Site 17, Kłaj commune. Distribution of imported Eastern-Linear pottery and obsidian artefacts in the LBK settlement. Drawn by K. Juszczyk

Note) phase was developing between *ca*. 5240/5219-5136/5084 BC (Oberc *et al*. 2022). Fragments of imported pottery from Brzezie come from the Eastern-Linear circle (ALPC) – the Tiszadob-Kapušany group and the Bükk Culture, Pre-Classic phase, contemporary with the LBK II (Music-Note) phase and the beginning of the III (Želiezovce phase; Hreha and Šiška 2015).

3. IMPORTED POTTERY

The imported pottery is represented by 89 fragments of vessels coming from the Eastern-Linear circle, or more precisely pots of the Tiszadob-Kapušany group and early phase of the Bükk Culture (Czekaj-Zastawny 2014). They have been attributed to 21 forms – six spherical bowls, five amphorae and ten unknown vessels (Table 1).

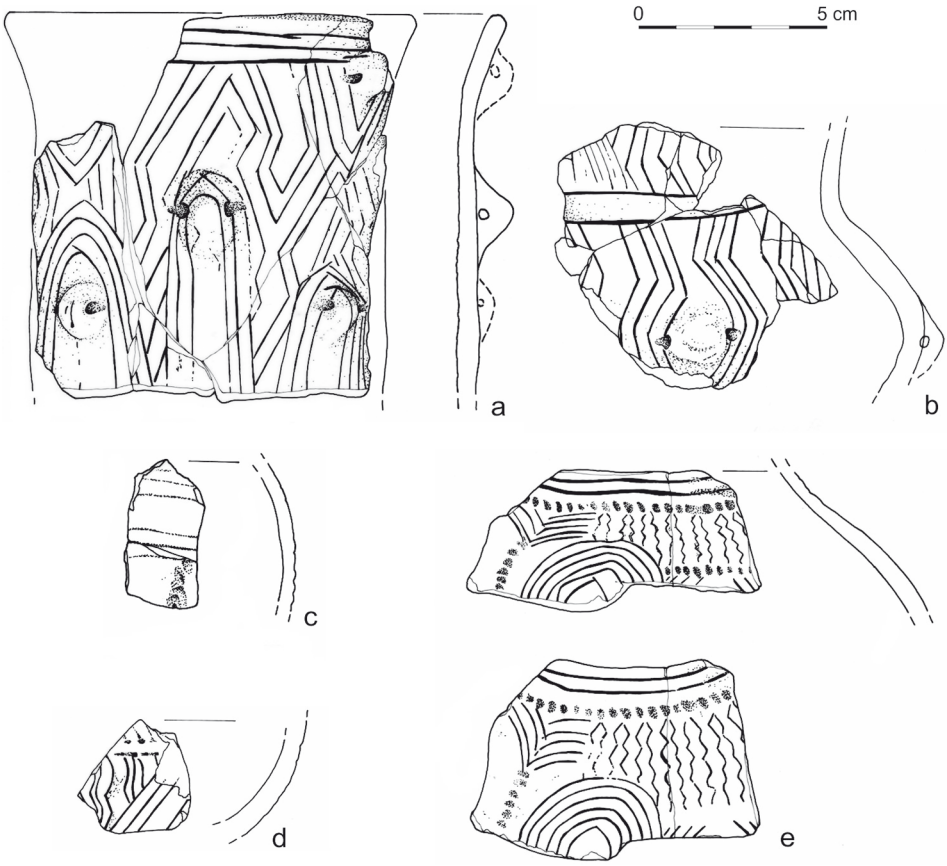

Fig. 2. Brzezie, Site 17, Kłaj commune. Imported Eastern-Linear pottery: a, b – House I (Feature 1); c, d – House II (Feature 762); e – House XII (Feature 400). Drawn by B. Grabowska and A. Krzywda

Table 1. Brzezie, Site 17, Kłaj commune. Fragments of vessels and obsidian artefacts imported from the Eastern-Linear circle

feature no./part/ depth	house no.	numbers of fragm/ number of forms	straight line and angular motifs	straight line and undulating motifs	arched and undulating motifs	chronology	number of obsidian artefacts	flakes	blades	chips	retouched tools
1/C2, F-G	I	19 fragments of rim and belly/ 1 amphora	1+ 4 round knobs horizontally perforated in the belly bilge	-	-	Tiszadob-Kapušany	-	-	-	-	-
1/C3,		8 rim and neck fragments/ 1 amphora	1+3 rows of round knobs horizontally perforated on the neck	-	-	Tiszadob-Kapušany	-	-	-	-	-
1/C3, D-E 1/D1, E-F		3 belly fragm./ 1 undeterm.	1	-	-	Tiszadob-Kapušany	-	-	-	-	-
762, C-D	II	3 belly fragments/ 2 undeterm.	1	1	-	Tiszadob-Kapušany	-	-	-	-	-
158	IV	-	-	-	-	-	1	1	-	-	-
238		-	-	-	-	-	2	1	1	-	-
245	V/VI	-	-	-	-	-	1	1	-	-	-
340	IX	-	-	-	-	-	1	1	-	-	-
376		-	-	-	-	-	1	-	1	-	-
377		-	-	-	-	-	1	1	-	-	-
450		-	-	-	-	-	1	1	-	-	-
400/B, F-G	XII	2 rim and belly fragments/ 1 spherical bowl	-	-	1	LateTiszadob-Kapušany	-	-	-	-	-
932		-	-	-	-	-	1	-	1	-	-

feature no./part/ depth	house no.	numbers of fragm/ number of forms	straight line and angular motifs	straight line and undulating motifs	arched and undulating motifs	chronology	number of obsidian artefacts	flakes	blades	chips	retouched tools
1167	XIII	-	-	-	-	-	1	-	1	-	-
709	XV	-	-	-	-	-	1	1	-	-	-
810/D, C-D		1 belly fragment/ 1 undeterm.	-	-	1	Bükk culture, Early Phase	-	-	-	-	-
857/B, J-K		1 neck fragment/ 1 amphora	-	-	-	Tiszadob-Kapušany/ Bükk culture	-	-	-	-	-
2393/C, C-D		8 belly fragment/ 1 amphora?	1+ indistinctive knobs on the bilge of the neck?	-	-	Bükk culture, Early Phase	-	-	-	-	-
2393/D, D-E		10 belly fragment/ 1 spherical bowl?, 2 undeterm.	1+ round handles vertically perforated on the belly bilge; 2	-	-	Bükk culture, Early Phase	-	-	-	-	-
996/A, D-E	XIX	9 rim and belly fragments/ 1 spherical bowl	-	-	1	Bükk culture, Early Phase	-	-	-	-	-
1287, F-G		2 belly fragments/ 1 spherical bowl?	-	1	-	Tiszadob-Kapušany	-	-	-	-	-
2229/C, C-D		2 belly and bottom fragments/ 1 spherical bowl?	1	1	-	Bükk culture, Early Phase	-	-	-	-	-
2330/C, I-J		6 rim and belly fragments/ 1 amphora	1	-	-	Bükk culture, Early Phase	-	-	-	-	-

2232/B2, E-F	XX	1 near-bottom fragment/ 1 undeterm.	1	-	-	Late Tiszadob-Kapušany/ Bükk culture, Early Phase	2	1	1	-	-
2446/A, D-E		1 belly fragment/ 1 undeterm.	1+ dense dots on ends if the line	1	-	Late Tiszadob-Kapušany/ Bükk culture, Early Phase	1	1	-	-	-
2749	XXI	-	-	-	-	-	1	1	-	-	-
216/A, F-G	unidentified house	10 rim and belly fragments / 1 spherical bowl	-	1	-	Bükk culture, Early Phase	15	12	2	-	1
216/B, K-L		1 belly fragment / 1 undeterm.	-	-	1	Bükk culture, Early Phase					
1127	separated pit	-	-	-	-	-	1	-	1	-	-
2269	seperated pit	-	-	-	-	-	1	-	1	-	-
2503	separated pit	-	-	-	-	-	1	-	1	-	-
Layer 314	cultural layer of LBK	-	-	-	-	-	1	1	-	-	-
846	secondary deposit	-	-	-	-	-	5	-	4	1	-
layer 1, A-B, 160/110	secondary deposit	1 belly fragment/ 1 undeterm.	-	-	-	Bükk culture, Early Phase	-	-	-	-	-
TOTAL		**89**					**39**				

SPHERICAL BOWLS. These are forms typical of the entire linear circle – in the shape of a segment of a sphere, with rims directed towards the interior of the vessel and a flat bottom, gently extending into the walls (Fig. 2: e; Fig. 4: c). It was possible to reconstruct one vessel in its entirety (from Feature 996), with a diameter of the mouth of 14 cm and a height of approximately 12 cm (4: a). The engraved ornamentation is very extensive, consisting of arrangements of densely spaced, multiple lines. Ornamental motifs fill entire zones on the surfaces of the vessels and, in the case of spherical bowls, these are rectilinear and wavy or arched and wavy motifs. One of the vessels was additionally equipped with round, nodular, vertically pierced lugs, placed on the bulge of the belly.

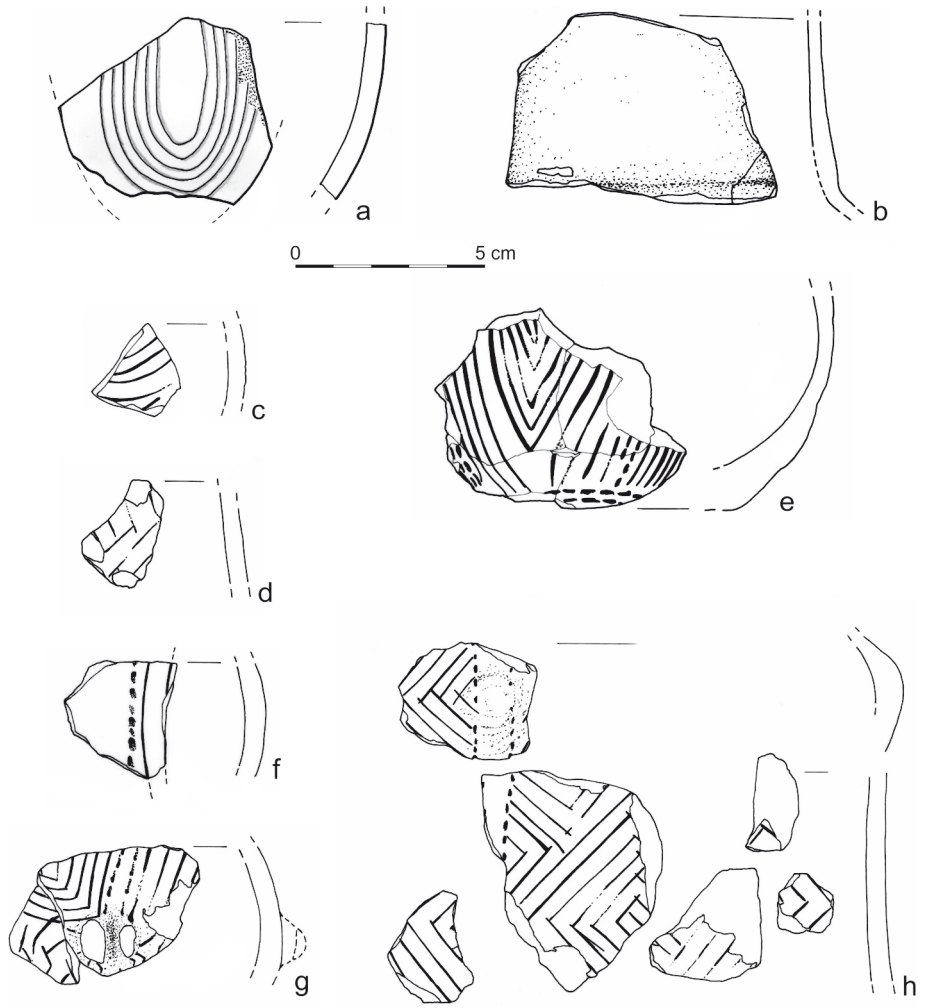

Fig. 3. Brzezie, Site 17, Kłaj commune. Imported Eastern-Linear pottery from House XV: a – Feature 810, b – Feature 857, c-h – Feature 2393. Drawn by B. Grabowska and A. Krzywda

AMPHORAE. They belong to the category of vessels with a neck. These are forms with squat, strongly swollen bellies, sometimes with a slightly visible bend, and necks that are lower (4-5 cm), slightly flared, or high (over 10 cm), cylindrical (Fig. 3: b, h; Fig. 4: e). Lugs in the form of round, pierced nodules or outwardly pushed nodules are located on the bulge of the belly and/or on the necks of these vessels. One of the neck fragments is undecorated,

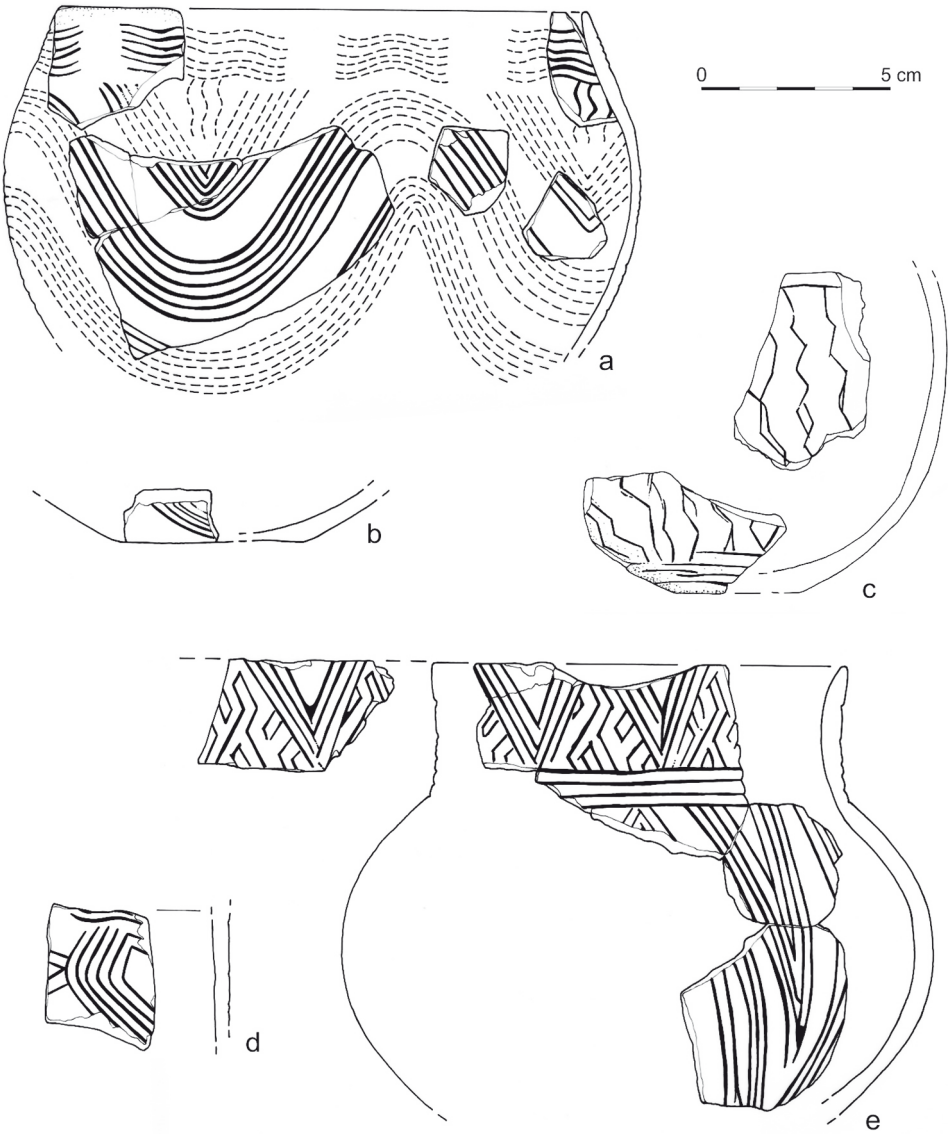

Fig. 4. Brzezie, Site 17, Kłaj commune. Imported Eastern-Linear pottery from House XIX: a – Feature 996, b, d – Feature 2229, c – Feature 1287, e – Feature 2330. Drawn by B. Grabowska and A. Krzywda

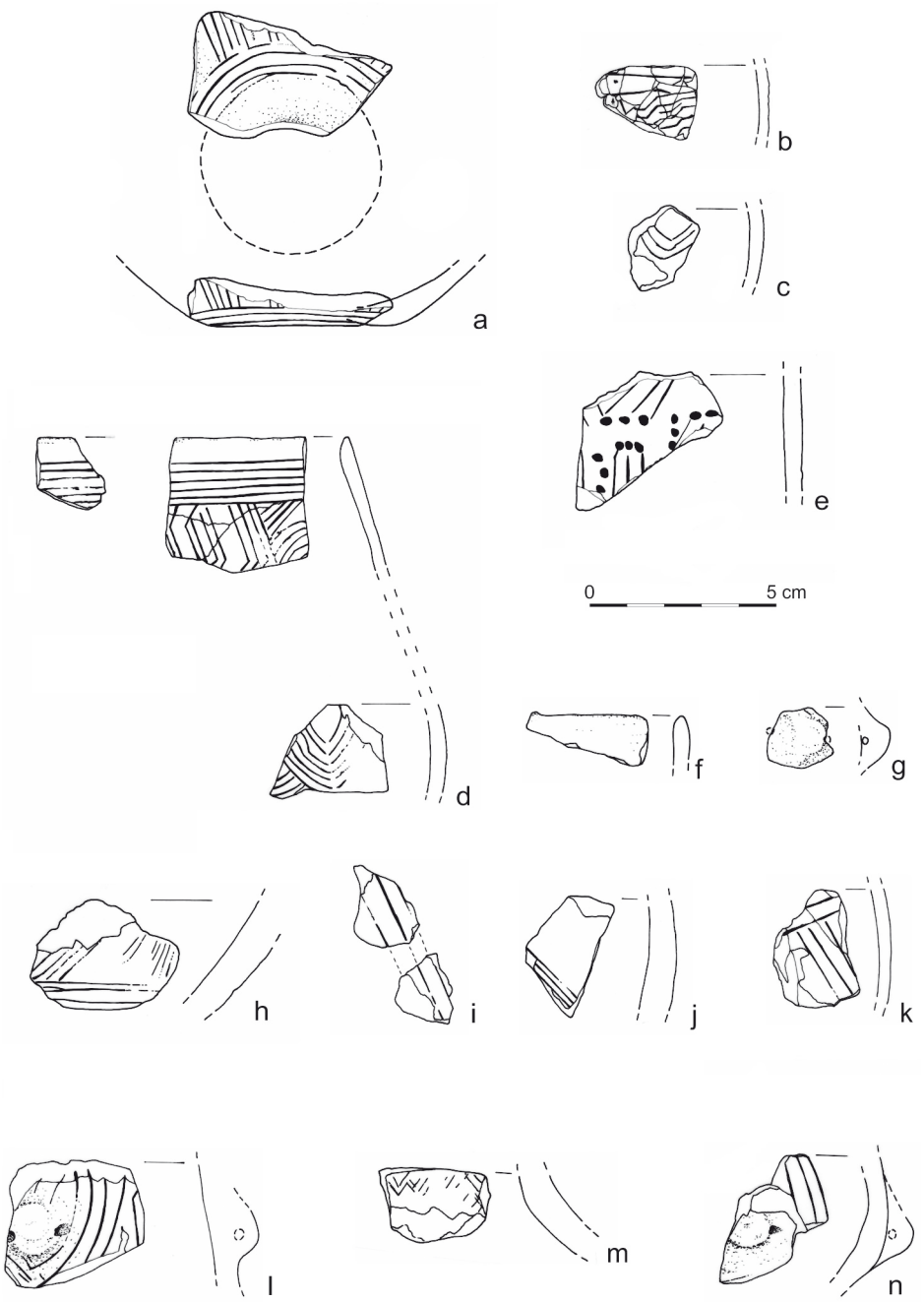

Fig. 5. Brzezie, Site 17, Kłaj commune. Imported Eastern-Linear pottery: a, b – House XX (Feature 2232, Feature 2446, c, d – Feature 216, e-n – secondary position. Drawn by B. Grabowska and A. Krzywda

the remaining amphorae, like the spherical bowls, are densely covered with an ornament of multiple engraved lines building angular motifs. Unlike the spherical bowls, there are no arched or wavy motifs. An amphora from which a high, cylindrical neck has been preserved (Fig. 2: a) was a particularly attractive vessel. Even in the Eastern-Linear circle these vessels were not common. An analogous form comes from Hungary, from the Öcsöd-Kováshalom site (Raczky 1999/2000).

The remaining small fragments of unidentified forms are decorated in the same style – densely spaced engraved, angular, arched or wavy lines (Fig. 3: c, d, f, g; Fig. 5: a-n).

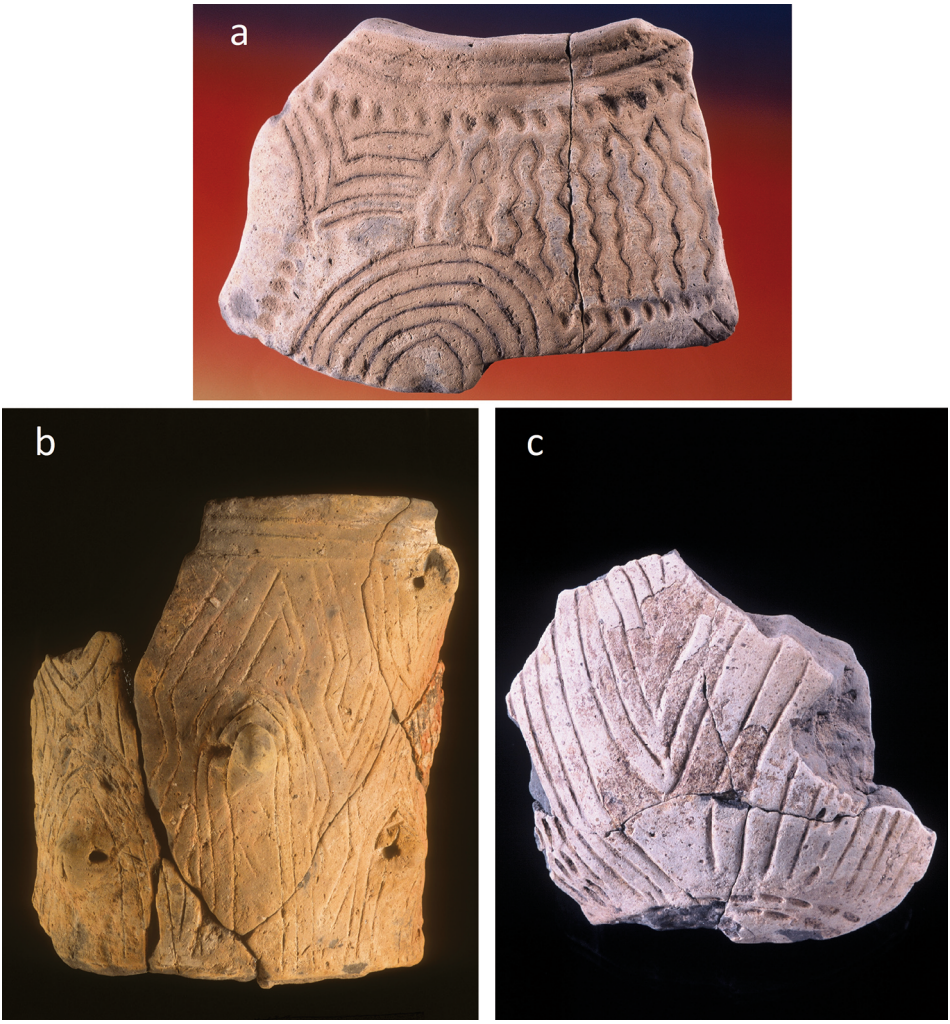

Fig. 6. Brzezie, Site 17, Kłaj commune. Examples of imported Eastern-Linear pottery from Features 400 (a), 1 (b) and 2392 (c). Photo R. Słaboński

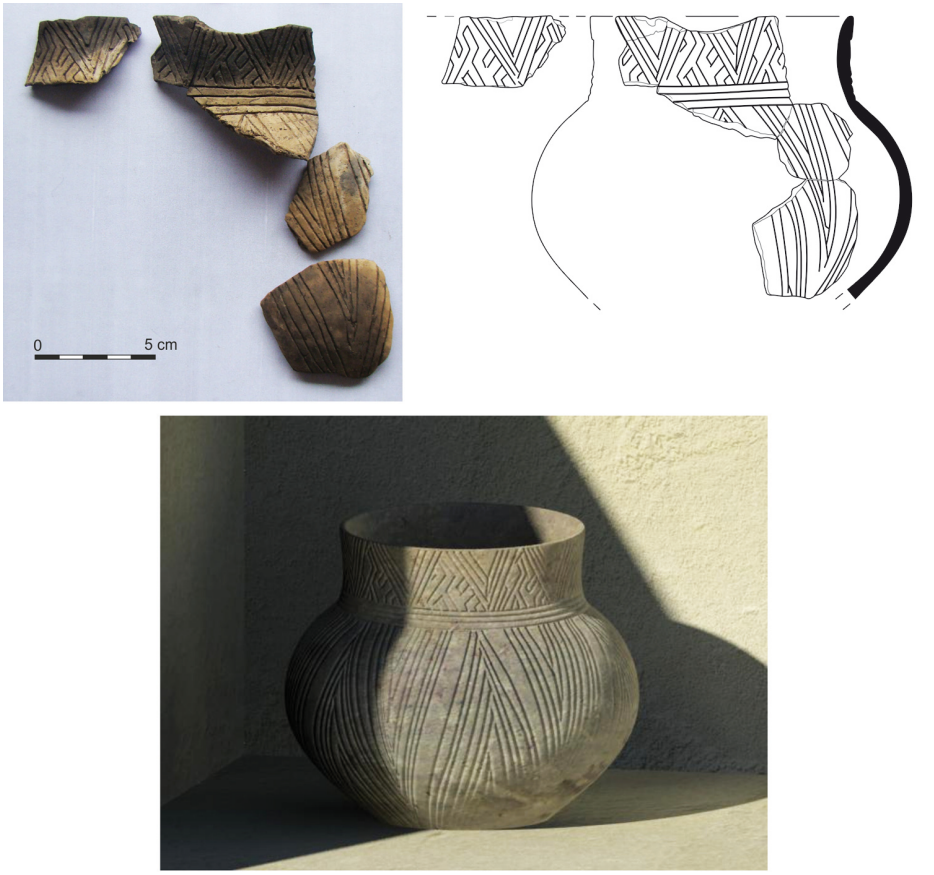

Fig. 7. Brzezie, Site 17, Kłaj commune. Imported Eastern-Linear pottery from Feature 2330. Drawn by J. Ożóg, reconstructed by K. Juszczyk

All fragments of the imported vessels represent small thin-wall forms with rich engraved ornamentation (Fig. 6; Fig. 7). Technologically, it was high quality pottery with smooth (matt or glossy) walls of thickness varying from 3 to 8 mm (most frequently 4-5 mm). The pottery fabric use for their production was very well made, homogenous, with very small amount of fine temper. Microscopic observations of 11 samples (Rauba-Bukowska 2014) resulted in distinguishing two basic types of them: (a) with small amount of fine sand and mica, vessels with soft 'floury' surface; (b) with very fine grain and high amount of mica, vessels with smooth 'hard' surface. Material of the first type was used in nine vessels, and of the second type in 12 vessels. It appears that pottery forms and their chronology were not related to any specific pottery fabric, neither in vessels of the Tiszadob-Kapušany group nor of the early Bükk Culture. Nonetheless, the imported forms are technologically distinctive from locally produced LBK vessels (Czekaj-Zastawny and Rauba-Bukowska 2014).

Decoration on seven vessels (wavy and angular motifs and meanders; *e.g.*, from Features 1, 400, 762, 2446) is typical for the Eastern-Linear Tiszadob-Kapušany group in northeaster Hungary and eastern Slovakia, contemporary with the II phase of LBK (Tompa 1929; Šiška 1979; 1995; Kozłowski 1998; Kaczanowska and Godłowska 2009; Hreha and Šiška 2015). Eight other vessels (*e.g.*, from Features 216, 810, 996, 2229, 2393) can be related to the early Bükk Culture (Šiška 1979), contemporary with the III phase of LBK. Inferring from decorative motifs (multiple arched and wavy lines) the finds from Brzezie are linked with the early phase of this unit.

As already mentioned, two main groups of pottery fabric were recognized in pottery from Brzezie: (a) with small amount of fine sand and mica; (b) with very fine sand and high amount of mica. According to Slovak archeologists, in the Eastern-Linear circle, vessels with 'soft' floury surface with negligible mica admixture (like fabric a) are typical mainly for sites in the Šariš Basin (*e.g.*, Prešov or Šarišské Michaľany), while pottery with high amount of mica (like fabric b) appears almost exclusively in the Zemplín region (Hreha and Šiška 2015). Relations with latter area are confirmed also by the presence in Brzezie of obsidian artefacts (this raw material was exploited by people of the Eastern-Linear circle in the Zemplín Mts. (Kozłowski 1997; Kalicki *et al.* 2007; Werra *et al.* 2021; 2024a; 2024b; Kozłowski *et al.* 2014; Wilczyński 2016; Czekaj-Zastawny *et al.* 2017; Szeliga 2022; Szeliga *et al.* 2021). Concluding, the imported pottery was brought to the Brzezie site from territories of eastern Slovakia – the Šariš Basin and East Slovak Plain.

4. IMPORTED OBSIDIAN ARTEFACTS

In the collection of 40 obsidian artefacts from Brzezie (Fig. 8; Fig. 9) there are 24 flakes, 14 blades, one chip, one retouched blade (Wilczyński 2014). They were found in eighteen features, mainly as single appearances (*cf.*, Table 1). However in Feature 216 there were fifteen of them, in Feature 846 of the Malice Culture in the secondary position – five, and in Features 238 and 2232 – two artefacts in each feature. It seems that the appearance of obsidian artefacts – in contrast to imported pottery – was not related to the house type (from pits of one-part House IX there are four artefacts, and from pits related to Houses IV and XX – three artefacts respectively). Therefore, it is not a very large inventory (such as the one discovered in the settlement in Olszanica; Milisauskas 1986). In any case, in Brzezie obsidian was only a secondary raw material, testifying to the contacts that the inha-bitants of the site maintained with the Eastern-Linear cultural circle (Wilczyński 2014).

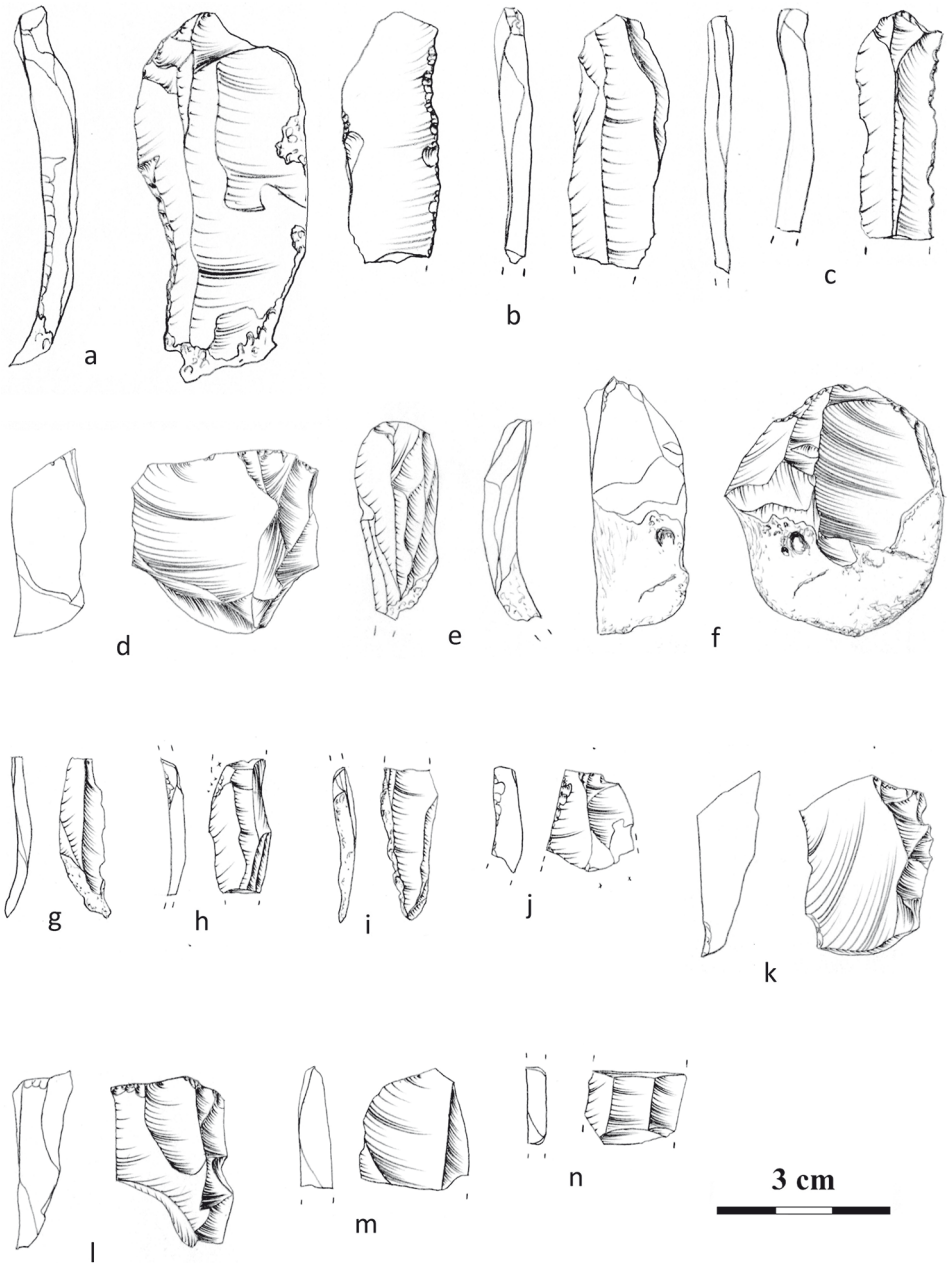

Fig. 8. Brzezie, Site 17, Kłaj commune. Obsidian artefacts from the LBK settlement:
a – retouched blade, b, c, e, g-j, m, n – blades, d, f, k, l – flakes; a, b, d, k, l – Feature 216, c – Feature 376, e – Feature 1127, f, n – Feature 2232, g – Feature 846, h – Feature 1215, i – Feature 846, j – Feature 2503.
Drawn by J. Wilczyński

Fig. 9. Brzezie, Site 17, Kłaj commune. Example of obsidian artefact.
Photo R. Słaboński

5. DISTRIBUTION OF IMPORTED ITEMS WITHIN THE SETTLEMENT

Almost all potsherds were found in fills of LBK features related with three-part houses (of Type 1 according to Modderman 1986). Thus, from Feature 2393 (at House XV) there are fragments of four vessels, from Feature 1 (near House I) – of three vessels, from Feature 762 (at House II) – of two vessels. Fragments of two imported forms were also found in Feature 216 (of a workshop character). The other fragments appeared as individual finds (*cf.*, Fig. 1, Table 1)

In Brzezie, in the subsequent development phases, there was always a tripartite building distinguished by its structure and length. These were Houses II, XII, XV, XVII, XIX (Czekaj-Zastawny 2014). This is a regularity observed in almost every LBK settlement (Czekaj-Zastawny 2008; 2009; 2013a; 2013b; 2017). These houses are also distinguished by other features, such as the nature of the inventories of their household. This is where imported ceramics are concentrated (Houses XII, XV, XIX), as well as unique objects, the only ones at the site, such as a graphite pendant (near House III), a clay bracelet and a miniature bowl with holes in the bottom (near House XV), and a vessel with a hole (House XIX). Moreover, the household features are characterised by the greatest variety of artefacts (*e.g.*, House XV – a bracelet, a bowl with holes in the bottom, imports, spindle whorls,

a shoe-last tool, a quernstone, pottery, flint products; House XVII – spindle whorls, shoe-last tool, pottery, including a miniature bowl, flint products; House XIX – vessel with a hole, imports, shoe-last tool, quernstone, pottery, including a miniature bowl and spherical bowl, flint products; House XX - imports, spindle whorls, shoe-last tools, quernstone, pottery, flint products).

Similar wealth of inventory is only present in Feature 216 – it is not known, however, whether it is connected with a particular house or relates to the settlement as a whole. It is unique in many ways. In addition to numerous fragments of vessels, including imported ones, and a cache of ochre, it contained six hundred flint artefacts and 14 items made of obsidian (mainly flakes). It can be assumed that there was a specialized workshop here that dealt with the processing of the above-mentioned raw materials. It appears, moreover, that, unlike imported pottery, the occurrence of obsidian was not related to house type. Apart from Feature 216, the majority of artefacts (four pieces) come from the pits of single-part House IX, followed by three each from the pits of Houses IV and XX.

6. EXCHANGE CONTACTS – DISCUSSION

In the second half of the 6th millennium BC, the cultural entities of the Eastern-Linear Pottery circle maintained regular contacts with the LBK for few hundred years. They had strongest links with the areas of the upper Vistula river basin. It is believed that their primary purpose was the exchange of goods, made perhaps during hiking through the Carpathian passes (Pelisiak 2018) or during summer grazing of cattle in the area (Valde-Nowak and Kienlin 2002-2004). High quality raw materials used for tool production – Jurassic flint from Lesser Poland exchanged for obsidian from the areas beyond the Carpathians – formed the core of this exchange. Additionally, this was accompanied by an inflow of pottery from the Eastern-Linear Pottery Culture. These contacts were certainly accompanied by the exchange of information, ideas and new technologies (Czekaj-Zastawny *et al.* 2017; Rauba-Bukowska and Czekaj-Zastawny 2020). The neighbouring areas on both sides of the Carpathians were rich in important natural resources. This applies especially to the area of the upper Vistula river basin, where perceptible are the two main areas where the sites were clustered, a bigger group on the left bank of the upper Vistula river, and a smaller one, on its right bank (Czekaj-Zastawny 2008; 2009; 2013a; 2013b; 2017). From the standpoint of current data, it can be stated that particular natural conditions were the cause of the emergence of these clusters as they affected the dynamic development of settlement, contacts, and exchange. Soil types favourable for the development of agriculture, as well as the climate of the time, and the region's well-developed river network (Czekaj-Zastawny 2008; 2009; 2013a; 2013b; 2017) should be mentioned among the factors, but, above all, natural resources (*e.g.*, flint deposits, salt springs), and location relatively near the area where the Eastern-Linear Pottery circle developed were crucial in

this respect. Generally, sites from the upper Vistula basin are distinguished by the presence of artefacts (Eastern-Linear ceramics, obsidian, amphibolite, graphite, Świeciechów flint, chocolate flint, Volhynian flint) indicating multidirectional expeditions (Czekaj-Zastawny 2014; 2017).

Based on research on the ceramics, among other things from the site in Brzezie Site 17, it is now possible to determine more precisely the regions from which imports came. Here, we should mention the areas of the Šariš Basin and the Eastern Slovak Lowland, from where almost from the beginning of the Music-Note phase of the LBK, vessels characteristic of the Tiszadob-Kapušany group arrived in the area, and towards the end of the II phase and in the III phase of the LBK, vessels of the Bükk Culture, as well as obsidian. Most probably that obsidian was obtained, like the imported pottery, from the Šariš Basin and the Zemplín region. The increased presence of obsidian in the II/III phase of LBK corresponds with the inflow of the imported pottery of the late phase of the Tiszadob-Kapušany group/Early Bükk Culture on LBK sites in Lesser Poland (Godłowska 1976, 89-92; 1982; Kaczanowska and Godłowska 2009; Hreha and Šiška 2015; Kozłowski *et al.* 2014; Czekaj-Zastawny 2017; Szeliga *et al.* 2021). This is also confirmed by the latest research on the deposits of this raw material. Based on the geochemical analyses performed until now, we can conclude that obsidian of the Carpathian 1 variant was most commonly utilised. The investigations conducted for obsidian materials from eight Early Neolithic sites in Slovakia (the Alföld Linear Pottery Culture, and the Bükk Culture) revealed that all of the artefacts were made of obsidian of the Carpathian 1 type, and that this raw material was recorded in all morphological groups. Analogical analysis performed for the Neolithic sites in Poland also revealed a predominant role of the Slovakian obsidian. Artefacts made of obsidian from Hungarian outcrops are recorded only sporadically. Noteworthy is the variability in the occurrence of this raw material in particular morphological groups (Szeliga 2009; Szeliga *et al.* 2021; Werra *et al.* 2021).

The LBK and ALPC communities maintained permanent contacts for a few centuries, and they kept the strongest relationships with the territories of the Upper Vistula basin (Kozłowski *et al.* 2014; Czekaj-Zastawny 2017). The contacts with the Eastern-Linear circle also reached the regions of Silesia (Kurgan-Przybylska 2013), Kuyavia, Pomerania, and the Chełmno Land (Kirkowski 1994). These contacts were based on the exchange of high-quality raw materials for tool production – Jurassic flint from Lesser Poland was traded for obsidian from beyond the Carpathians, which was associated with the inflow of Eastern-Linear pottery. Until the present there have been identified a few dozen sites where imported artefacts have been encountered (Kaczanowska and Godłowska 2009; Czekaj-Zastawny 2017, 52-55; Szeliga and Zakościelna 2019). In the oldest phase, these contacts seem to have been rather occasional, since in the territory of Poland there are no finds of pottery representing the early phases of the Eastern-Linear circle. On the other side of the Carpathians there are only few sites where artefacts made of Jurassic, chocolate, Świeciechów or Volhynian flints have been reported (Kaczanowska *et al.* 2001; Mateiciucová

2002; Szeliga 2014; 2022). As the LBK developed, the exchange of goods between the two linear circles gradually flourished. Sites dated to the II or III phases of LBK are much more numerous (Kaczanowska and Godłowska 2009; Czekaj-Zastawny 2017). The intensification of contacts with the south is legible at most of the settlements in south-eastern Poland, mostly starting from the decline of the II phase of LBK. This fact is observed mainly based on the increase in the amount of imported obsidian (up to 20% of utilised lithic materials in the Želiezovce phase at the Rzeszów-Piastów site; Godłowska 1976, 89-92; 1982; Kaczanowska and Godłowska 2009; Kadrow 1990). These contacts ceased rapidly as the Linear Pottery Culture and the Bükk Culture diminished. In the next period a gap in settlement on both sides of the Carpathians was recorded, and the issue of disappearance of the two cultural units in question is currently a subject of debate (Kaczanowska 1990; Kamieńska and Kozłowski 1990, 14-16; Kadrow and Zakościelna 2000, 187-255; Kulczycka-Leciejewiczowa 2002; Kozłowski 2004).

References

Czekaj-Zastawny A. 2008. *Osadnictwo społeczności kultury ceramiki wstęgowej rytej w dorzeczu górnej Wisły*. Kraków: IAE PAN.

Czekaj-Zastawny A. 2009. *Settlement of the Linear Pottery Culture in Southeastern Poland* (= *BAR* S2049). Oxford: Archaeopress.

Czekaj-Zastawny A. 2013a. The Structure of Linear Pottery Culture Settlement in South-Eastern Poland. In S. Kadrow and P. Włodarczak (eds), *Environment and subsistence – forty years after Janusz Kruk's 'Settlement studies…'* (= *Studien zur Archäologie in Ostmitteleuropa / Studia nad Pradziejami Europy Środkowej* 11). Rzeszów, Bonn: Mitel & Verlag Dr. Rudolf Habelt GmbH, 69-84.

Czekaj-Zastawny A. 2013b. Linear pottery culture in the upper Vistula River basin - settlement patterns. In C. Hamon, P. Allard and M. Ilett (eds), *The domestic space in LBK settlements* (= *Internationale Archäologie – Arbeitsgemeinschaft, Symposium, Tagung, Kongress* 17). Rahden/ Westf: VML Verlag Marie Leidorf GmbH., 169-182.

Czekaj-Zastawny A. 2014. *Brzezie 17. Osada kultury ceramiki wstęgowej rytej* (= *Via Archaeologica. Źródła z badań wykopaliskowych na trasie autostrady A4 w Małopolsce*). Kraków: Krakowski Zespół do Badań Autostrad.

Czekaj-Zastawny A. 2017. The first farmers from the South – Linear Pottery culture. In P. Włodarczak (ed.), *5500-2000 BC* (= *The Past Societies. Polish lands from the first evidence of human presence to the Early Middle Ages* 2). Warszawa: IAE PAN, 21-62.

Czekaj-Zastawny A., Kadrow S. and Rauba-Bukowska A. 2017. Ceramic raw material acquisition and transfer of technological ideas among the Early Neolithic communities in the environs of the Western Carpathians. In L. Burnez-Lanotte (ed.), *Matières à Penser: Raw materials acquisition and processing in Early Neolithic pottery productions Matières à penser: sélection et traitement*

des matières premières dans les productions potières du Néolithique ancient. Proceedings of the Workshop of Namur (Belgium) Actes de la table ronde de Namur (Belgique) 29 et 30 mai 2015 – 29 and 30 May 2015) (= *Séances de la Société préhistorique française* 11). Paris: Société préhistorique française, 81-91.

Czekaj-Zastawny A. and Rauba-Bukowska A. 2014. Technology of the earliest vessels in the upper Vistula River basin – imports against local pottery. In T. L. Kienlin, P. Valde-Nowak, M. Korczyńska, K. Cappenberg and J. Ociepka (eds), *Settlement, Communication and Exchange around the Western Carpathians. International Workshop held at the Institute of Archaeology, Jagiellonian University, Kraków, October 27-28, 2012*. Oxford: Archaeopress Archaeology, 95-107.

Godłowska M. 1976. Próba rekonstrukcji rozwoju osadnictwa neolitycznego w rejonie Nowej Huty. *Materiały Archeologiczne Nowej Huty* 5, 7-180.

Hreha R. and Šiška S. 2015. *Bukovohorská Kultúra na Slovensku vo svetle výskumov v Šarišských Michaľanoch and Zemplínskych Kopčanoch*. Nitra: AUSAV.

Kaczanowska M. and Godłowska M. 2009. Contacts between the Eastern and Western Linear Cultures in South-Eastern Poland. In J. K. Kozłowski (ed.), *Interactions between different models of Neolithization North of the Central European Agro-Ecological Barrier*. Kraków: PAU, 137-150.

Kaczanowska M., Kaminská L., Kozłowski J. K., Nowak M. and Vizdal M. 2001. Slovensko-polský výskum neolitického sidliska v Moravanoch. *Archeologické výskumy a nálezy na Slovensku* 2001, 97-100.

Kadrow S. 1990. Osada neolityczna na stan. nr 16 w Rzeszowie na Osiedlu Piastów. *Sprawozdania Archeologiczne* 41, 9-76.

Kadrow S. and Zakościelna A. 2000. An outline of the evolution of Danubian cultures in Małopolska and Western Ukraine. In A. Kośko (ed.), *The western border area of the Tripolye culture*. *Baltic-Pontic Studies* 9, 187-255.

Kalicki T., Nowak M., Vizdal M. and Litvinyuk G. I. 2007. Early Neolithic Settlement Pattern and its Influence on Morphology in Eastern Slovakian Lowland. In T. Kalicki and B. Szmoniewski (eds), *Settlement and Morphology*. Warszawa: Institute of Archaeology and Ethnology, Polish Academy of Sciences.

Kamieńska J. and Kozłowski J.K. 1990. *Entwicklung und Gliederung der Lengyel- und Polgar-Kulturgruppen in Polen* (= *Zeszyty Naukowe UJ, Prace Archeologiczne* 46). Warszawa, Kraków: Wydawnictwo UJ.

Kienlin T. L. and Valde-Nowak P. 2002-2004. Neolithic Transhumance in the Black Forest Mountains, SW Germany. *Journal of Field Archaeology* 29, 29-44.

Kirkowski R. 1994. Kultura ceramiki wstęgowej rytej na ziemi chełmińskiej. In L. Czerniak (ed.), *Neolit i początki brązu na ziemi chełmińskiej*. Grudziądz: Muzeum w Grudziądzu, 57-99.

Kondracki J. 1994. *Geografia Polski, mezoregiony fizycznogeograficzne*. Warszawa: Wydawnictwo Naukowe PWN.

Kozłowski J. K. (ed.). 1997. *The Early Linear Pottery Culture in Eastern Slovakia*. Kraków: Polska Akademia Umiejętności.

Kozłowski J. K. 1998. Rozprzestrzenianie się gospodarki wytwórczej z pierwotnych centrów neolityzacji obszaru Starego Świata i jej adaptacja do warunków środowiskowych umiarkowanej strefy Eurazji. In J. K. Kozłowski (ed.), *Encyklopedia Historyczna Świata* 1. *Prehistoria*. Kraków: FOGRA, 151-172.

Kozłowski J. K. 2004. Problem kontynuacji rozwoju pomiędzy wczesnym i Środkowym neolitem oraz genezy 'cyklu lendzielsko-polgarskiego' w basenie górnej Wisły. *Materiały Archeologiczne Nowej Huty* 24, 11-18.

Kozłowski J. K., Kaczanowska M., Czekaj-Zastawny A., Rauba-Bukowska A. and Bukowski K. 2014. Early/Middle Neolithic Western (LBK) vs Eastern (ALPC) Linear Pottery Cultures: ceramics and lithic raw materials circulation. *Acta Archaeologica Carpathica* 49, 37-76.

Kulczycka-Leciejewiczowa A. 2002. Some remarks on the Stroke-Ornamented Pottery Ware culture in Poland. *Archeologické rozhledy* 54, 179-190.

Kurgan-Przybylska M. 2013. Neolit. In *Archeologia. Górny Śląsk*. Katowice: MŚ, 47-78.

Mateiciucová I. 2002. Štipaná kamenná industrie z pohřebiště v 'Široké u lesa'. In V. Podborský (ed.), *Dvě pohřebiště neolitického lidu s lineární keramikou ve Vedrovicích na Moravě*. Brno: Filozofická fakulta Masarykovy univerzity, 217-234.

Milisauskas S. 1986. *Archeological investigations on the Linear Culture Village of Olszanica*. Wrocław, Warszawa, Kraków: Zakład Narodowy im. Ossolińskich Wydawnictwo Polskiej Akademii Nauk.

Modderman P. J. R. 1986. On the typology of the house plans and their European setting. *Památky archeologické* 77, 383-394.

Oberc T., Czekaj-Zastawny A. and Rauba-Bukowska A. 2022. Radiocarbon dating for the Linear Pottery Culture from the territory of Poland – research problems. In M. Grygiel and P. Obst (eds), *Walking Among Ancient Trees. Studies in Honour of Ryszard Grygiel and Peter Bogucki*. Łódź: Fundacja Badań Archeologicznych Imienia Profesora Konrada Jażdżewskiego, Muzeum Archeologiczne i Etnograficzne w Łodzi, 183-212.

Pelisiak A. 2018. *Centrum i peryferia osadnictwa w neolicie i wczesnej epoce brązu na wschodnim Podkarpaciu i we wschodniej części polskich Karpat*. Rzeszów: Uniwersytet Rzeszowski.

Raczky P. 1999/2000. A unique face pot from the Öcsöd-Kováshalom settlement of the Tisza Culture. *Acta Archaeologica Academiae Scientiarum Hungaricae* 51, 9-22.

Rauba-Bukowska A. 2014. Wyniki badań mineralogiczno-petrograficznych naczyń importowanych kręgu wschodniolinearnego, odkrytych na stanowisku Brzezie 17, gm. Kłaj. In A. Czekaj-Zastawny, *Brzezie 17. Osada kultury ceramiki wstęgowej rytej* (= *Via Archaeologica. Źródła z badań wykopaliskowych na trasie autostrady A-4 w Małopolsce*). Kraków: Krakowski Zespół do Badań Autostrad, 459-468.

Rauba-Bukowska A. and Czekaj-Zastawny A. 2020. Changes in the pottery production of the Linear Pottery Culture. Origins and directions of ideas. In M. Spataro and M. Furholt (eds), *Detecting and explaining. Technological innovation in prehistory*. Leiden: Sidestone Press, 73-83.

Šiška S. 1979. Die Bükker Kultur in der Ostslowakischen Tiefebene. *Slovenská Archeológia* 27, 245-290.

Šiška S. 1995. Zur Problematik des Unterganges der Bükker Kultur. *Slovenská Archeológia* 43, 5-26.

Szeliga M. 2009. Znaczenie obsydianu karpackiego w gospodarce surowcowej najstarszych społeczności rolniczych na ziemiach polskich. In J. Gancarski (ed.), *Surowce naturalne w Karpatach oraz ich wykorzystanie w pradziejach i wczesnym średniowieczu*. Krosno: Muzeum Podkarpackie w Krośnie, 287-324.

Szeliga M. 2014. The distribution and importance of Turonian flints from the north-eastern margin of the Holy Cross Mountains in the flint raw material economy of the earliest Danubian communities. *Acta Archaeologica Carpathica* 49, 77-112.

Szeliga M. 2022. From the west to the east. On the Transcarpathian circulation of the lithic raw materials during the Linear Pottery Culture (LBK) development. *Światowit* 61, 441-462.

Szeliga M., Kasztovszky Zs., Osipowicz G. and Szilágyi V. 2021. Obsidian in the Early Neolithic of the Upper Vistula basin: origin, processing, distribution and use – a case study from Tominy (southern Poland). *Praehistorische Zeitschrift* 2021, https://doi.org/10.1515/pz-2021-0014

Szeliga M. and Zakościena A. 2019. Transcarpathian intercultural relationships of the LBK communities from the Sandomierz settlement cluster in the light of new findings. *Sprawozdania Archeologiczne* 71, 167-195.

Tompa F. 1929. *Die Bandkeramik in Ungarn. Die Bükker- und Theiss-Kultur* (= *Archaeologia Hungarica* 5-6). Budapest: Franklin-Társulat nyomdája.

Weninger B. and Jöris O. 2004. Glacial Radiocarbon Calibration. The CalPal Program. In T. Higham, Ch. Bronk Ramsey and C. Owen (eds), *Radiocarbon and Archaeology. Fourth International Symposium* (= *Oxford University School of Archaeology, Monograph* 62). Oxford: Oxford University School of Archaeology, 9-15.

Weninger B., Jöris O. and Danzeglocke U. 2007. CalPal-2007. Cologne Calibration & Palaeoclimate Research Package, http://www.calpal.de/ (accessed March 2007).

Werra D. H., Hughes R. E., Nowak M., Vizdal M. and Gačková L. 2021. Obsidian Source Use within the Alföld Linear Pottery culture in Slovakia. *Sprawozdania Archeologiczne* 73/1, 331-369.

Werra D. H., Szeliga M. and Hughes R. E. 2024a. Technological Analysis and Geochemical Characterization of Obsidian Artifacts from the Middle Neolithic Site of Opatów, Southeast Poland. In L. R. M. Johnson, K. P. Freund and N. Tripcevich (eds), *Reflections on Volcanic Glass: Proceedings of the 2021 International Obsidian Conference. Regents of the University of California*. UC Berkeley: Archaeological Research Facility, 63-89.

Werra D. H., Szeliga M., Pyżewicz K. and Burgert P. 2024b. Value, significance and use of 'exotic' materials – in the light of the presence of obsidian at Neolithic sites in Poland. *Sprawozdania Archeologiczne* 76/1, 71-97.

Wilczyński J. 2014. Krzemienny oraz obsydianowy inwentarz kultury ceramiki wstęgowej rytej ze stanowiska Brzezie 17, gm. Kłaj. In A. Czekaj-Zastawny, *Brzezie 17. Osada kultury ceramiki wstęgowej rytej* (= *Via Archaeologica. Źródła z badań wykopaliskowych na trasie autostrady A-4 w Małopolsce*). Kraków: Krakowski Zespół do Badań Autostrad, 499-546.

Wilczyński J. 2016. Flint, Obsidian, and Radiolarite in Lithic Inventories of the LBK Culture in Lesser Poland. In L. Amkreutz, F. Haack, D. Hofmann and I. van Wijk (eds), *Something out of the Ordinary?: Interpreting Diversity in the Early Neolithic Linearbandkeramik and Beyond*. Newcastle upon Tyne: Cambridge Scholars Publishing, 123-139.