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## FROM THE WEST TO THE EAST. ON THE TRANSCARPATHIAN CIRCULATION OF THE LITHIC RAW MATERIALS DURING THE LINEAR POTTERY CULTURE (LBK) DEVELOPMENT

### ABSTRACT

The article is devoted to the issue of far-reaching, Transcarpathian distribution and exchange of various flint raw materials and obsidian during the development of Linear Pottery Culture (LBK). The currently available source data suggest clear differences between the oldest (Pre-Music-Note) and the younger (Music-Note and Želiezovce) developmental phases of this culture in terms of directions and range, as well as the form and degree of distribution intensity of particular raw materials. This applies in equal measure to the raw materials of high technological importance – distributed in large quantities in the forms of concretions, pre-cores, or pre-

pared cores – and to blades, flakes or tools, constituting only a minor quantitative supplement to the mainstream Transcarpathian distribution of raw materials, much less important in this respect and represented within particular inventories by very few specimens. Particularly significant differences are visible at the younger developmental stage of the LBK. They are closely related to the much broader context of cultural phenomena and changes that took place in the areas on the northern side of the Carpathians at the turn of the 6<sup>th</sup> and 5<sup>th</sup> millennia BC as a direct reflection of the intensity of interregional contacts, both at the intra- and intercultural level.

**Keywords:** Linear Pottery Culture, flint raw materials, obsidian, distribution and exchange, Carpathians

### Introduction

The issue of the Transcarpathian distribution of obsidian and flint raw materials among the Linear Pottery Culture (*Linearbandkeramik*; hereafter as LBK) communities was the subject of consideration in many previous studies, focusing both on the period of this culture development,<sup>1</sup> as well as on the much broader chronological and cultural background, comprised of all the Danubian cultural units.<sup>2</sup> The attention of particular authors was drawn mainly to issues related to the character, intensity, extent, and directions of the territorial distribution of the Jurassic-Cracow and chocolate flint as well as obsidian. These raw materials were undoubtedly of greatest impor-

tance in areas located on both sides of the Carpathians, playing a key role in the overall system of distribution and exchange at the time when the communities of the Linear cultural circle were developing. Many studies emphasised that the territorial circulation of these products was of a complex, multi-stage, and far-reaching character, reflecting the intensive interregional contacts maintained by the LBK communities from southern Poland with other – sometimes very distant – settlement enclaves.<sup>3</sup> Attention was also paid to the non-industrial background of these phenomena, particularly clearly manifested in the case of the most distant and, at the same time, the least numerous finds.<sup>4</sup>

<sup>1</sup> E.g. Kozłowski 1970; 1985; Lech 1979; 1989; 1990; 2003; Caspar *et al.* 1989; Kaczanowska 2003; Mateiciucová 2008; Szeliga 2009; 2014; Szeliga, Zakościelna 2019.

<sup>2</sup> E.g. Kaczanowska 1971; 1976; 1985; Kaczanowska, Lech 1977; Lech 1987; Kaczanowska, Kozłowski 2005; Janák, Přichystal 2007; Szeliga 2007; Burgert 2018.

<sup>3</sup> E.g. Kozłowski 1958, 357; 1970, 74; Lech 1987, 241–243, fig. 28.1; 1989b, fig. 1; 2003, figs. 5–6; Kaczanowska, Kozłowski 2005, 79; Szeliga 2009, 298–299.

<sup>4</sup> E.g. Lech 1979, 131; 2003, 24–27; Małeck-Kukawka 1994, 40–43.

In the vast majority of previous studies, the research on the Transcarpathian distribution and raw material exchange concerned the whole period of the LBK development, without taking into account its particular developmental stages separately.<sup>5</sup> It was noted that these phenomena are documented for the entire period, since its earliest (Pre-Music-Note) phase, and that they intensified significantly in the younger (i.e. Music-Note) phase.<sup>6</sup> The current state of research indicates that very distinct differences existed between the earliest and the classical (Music-Note) as well as the late (Żeliezovce) developmental phases of this culture. These differences are manifested both at the level of a general range of material diversification as well as in the direction, intensity, and distribution patterns of particular flint varieties and obsidian. They correspond closely to phenomena and cultural changes that occurred north of the Carpathians at the turn of the 6<sup>th</sup> and 5<sup>th</sup> millennia BC. Those issues constitute the main subject addressed in the present study.

### The earliest horizon (Pre-Music-Note Phase)

The available source data related to the oldest phase of the LBK development indicate that the basic role in the Transcarpathian flint distribution system was played by the Jurassic-Cracow flint. This raw material was distributed across vast areas in relation to the region of its geological occurrence (Fig. 1), dominating the material inventories at archaeological sites located both to the north of the Carpathians<sup>7</sup> and in the Transcarpathian areas. However, in the latter region, its clear quantitative predominance was recorded only at certain Moravian sites (e.g. Kladníky-Záhumenky or Žopy I).<sup>8</sup> This flint variety flowed into the aforementioned areas mainly as pre-core forms and prepared cores, then elaborated locally, the products of which – i.e. semi-finished blanks and finished tools – were redistributed through the local circulation systems.<sup>9</sup>

There were also two other raw materials participating, although no doubt to a much lesser extent, in the

Transcarpathian contact network formed in the Pre-Music-Note Phase and closely related exchange of the Jurassic-Cracow flint. These additional materials were the Świeciechów and Chocolate flints, geologically related to the north-eastern Mesozoic margin of the Holy Cross Mountains. The analysis of the territorial dispersion of artefacts made with the use of these flint varieties indicates the existence of clear spatial separations between their basic distribution directions. The spread of Świeciechów flint aligns precisely with the south-western direction of distribution of the Jurassic-Cracow flint, towards the Vistula River, the Moravian Gate, and then to the more distant territories of Bohemia, Moravia, and Lower Austria (Fig. 1). The morphological diversity of the Transcarpathian finds witnesses an inflow of the Świeciechów flint to these territories only in the form of blades and prepared tools. Their spread took place within a multi-stage system of intergroup exchange, pronounced especially in the distribution of Jurassic-Cracow flint.<sup>10</sup> The character of the finds as well as – in each case – the minimum frequency of the Świeciechów flint (<1%) indicates the non-economic background of the phenomena related to its exchange.<sup>11</sup>

The characteristic feature of the chocolate flint distribution in the discussed period was its similarly modest scale but also its considerably greater territorial range, especially in the areas located northwards of its geological outcrops, mainly in Kuyavia (e.g. Brześć Kujawski 3, Grabie 4, or Smólsk 4)<sup>12</sup> and the Chełmno Land (e.g. Boguszewo 41 or Gruta 52).<sup>13</sup> The penetration of this raw material to the south of its deposits is documented very poorly, confirmed so far only for the basin of the Upper Vistula (Fig. 1). Up to date, the few finds of chocolate flint artefacts known from these areas, discovered in the context of the oldest LBK pottery, are represented only by a single flake from Samborzec I,<sup>14</sup> a distal part of a blade from Gwoździec 2,<sup>15</sup> and a modest – although unspecified in terms of quantity and typology – archaeological assemblage from Kazimierza Mała Site 1.<sup>16</sup> The potential inflow of this material to the Transcarpathian area during this period is not sufficiently documented in

<sup>5</sup> E.g. Kozłowski 1970; Kaczanowska, Lech 1977; Lech 1979; 1987; 2003; Kaczanowska 1985; Caspar *et al.* 1989.

<sup>6</sup> E.g. Lech 2008, 198; Mateiciucová 2008, 132.

<sup>7</sup> The predominance of Jurassic-Cracow flint in inventories attributed to the Pre-Music-Note Phase of the LBK was recorded both in the areas located in the Upper Vistula basin (e.g. Kaczanowska 1971, 10–11; Kukulka 2001, 37; Lech 2003, fig. 6; 2008, 157–160; Mateiciucová 2008, 125; Wilczyński, Kufel-Diakowska 2021, tab. 12) and in areas located at much greater distances from its geological deposits, i.e. in Kuyavia and the Chełmno Land (e.g. Czerniak 1994, 116, fig. 43; Małecka-

Kukawka 1992, 37, tab. 1; 2008, fig. 2; Grygiel 2004, 383; Domańska 2016, 32–33; Pyzel, Wąs, 2018, tab. 1).

<sup>8</sup> Mateiciucová 2000, tab. 2; Janák, Přichystal 2007, 7–10.

<sup>9</sup> Mateiciucová 2008, 126.

<sup>10</sup> E.g. Lech 1987, fig. 28.1; Přichystal 2007, 19; Mateiciucová 2008, 131–132.

<sup>11</sup> E.g. Lech 1979, 131.

<sup>12</sup> Kabaciński 2010, Fig. 12; Domańska 2016, tab. 8.

<sup>13</sup> Małecka-Kukawka 1992, tab. 1; 2008, figs. 1–2.

<sup>14</sup> Lech 2008, 198.

<sup>15</sup> Kukulka 2001, 37; Wilczyński, Kufel-Diakowska 2021, 169.

<sup>16</sup> Mateiciucová 2008, 133.





Fig. 1. General distribution directions of the most important flint raw materials from southern Poland on both sides of the Carpathians in the oldest (Pre-Music-Note) developmental phase of the LBK: A – Jurassic-Cracow flint outcrops; B – chocolate flint outcrops; C – Świeciechów flint (outcrop and mine in Świeciechów); D – distribution of prepared cores; E – distribution of blanks and retouched tool; F – frequencies of particular raw materials in inventories; G – selected LBK sites: 1 – Boguszewo 41; 2 – Grabie 4; 3 – Samborzec I; 4 – Kazimierza Mała 1; 5 – Gwoździec 2; 6 – Kladníky, “Záhumenky”; 7 – Žopy I; 8 – Mohelnice; 9 – Bylany 1; 10 – Vedrovice, “Široká u lesa” (settlement); 11 – Rosenberg I; 12 – Brunn am Gebirge IV; 13 – Neckenmarkt; 14 – Budapest-Aranyhegyi út (according to Kozłowski 1970; Czerniak 1990; Małecka-Kukawka 1992; Gronnenborn 1997; Biró 1998; Janák, Přichystal 2007; Lech 1989; 2008; Kaczanowska, Kozłowski 2005; Mateiciucová 2001a; 2008; Domańska 2016; Wilczyński, Kufel-Diakowska 2021. Compiled by M. Szeliga, based on data supplied by the NASA Shuttle Radar Topography Mission (SRTM)(2013). Shuttle Radar Topography Mission (SRTM) Global. Distributed by OpenTopography. <https://doi.org/10.5069/G9445JDF>. Accessed: 20th of February 2023; see also Farr, Kobrick 2000).



the sources. It is possible, however, that this situation reflects the current state of the research rather than the past reality. The presence of the chocolate flint in Moravia and western Slovakia is documented both in the inventories from the younger LBK developmental phases<sup>17</sup> as well as in older, Mesolithic materials (e.g. Smolín, Příbice, Dolní Věstonice, or Mostová).<sup>18</sup> Perhaps, some of the specimens from Mohelnice, which were made of this material,<sup>19</sup> as well as a single questionable artefact from Neckenmarkt, should be linked with the early Linear horizon.<sup>20</sup>

### The younger horizon (Music-Note and Želiezovce phases)

Starting from the LBK Music-Note Phase, the raw material distribution system developed further intensively, extending far and wide on both sides of the Carpathians. At the same time, the inter-group exchange would also grow, including a much wider spectrum of raw materials (Fig. 2).

In this period, the most important position in the distribution and exchange system was still occupied by the Jurassic-Cracow flint.<sup>21</sup> Its prevalence was recorded in numerous inventories located on both sides of the Carpathians, from Lower Silesia (e.g. Niemcza)<sup>22</sup> and Bohemia (e.g. Bylany)<sup>23</sup> in the west, through Moravia (Přáslavice-Kocourovce and Žopy II)<sup>24</sup> and Lesser Poland (e.g. Kraków-Olszanica 4, Bolechowice-Zielona 9, or Podlesie 6),<sup>25</sup> to Subcarpathia (e.g. Rzeszów 3)<sup>26</sup> and Spiš (e.g. Poprad-Matejovce or Strané pod Tatrami)<sup>27</sup> in the east. Similarly, to the previous period, this raw material penetrated the aforementioned areas primarily in the form of concretions, pre-core forms, or prepared blade cores,<sup>28</sup> reworked there into blanks and tools and then redistributed to much more distant areas (Fig. 2).<sup>29</sup> In the

discussed period, the distribution of Jurassic flint to the north was significantly reduced. This is clearly marked – despite the dominant frequency of this raw material in the inventory from Trzebieśławice Site 1<sup>30</sup> – even within the Sandomierz Upland (Fig. 2), especially its northern part (e.g. Samborzec I, Sandomierz-Kruków 20, or Tominy 6),<sup>31</sup> but it is most visible in Kuyavia and the Chełmno Land.<sup>32</sup>

In the discussed period, somewhat significant differences are apparent in the distribution of the raw materials from the Holy Cross Mountains across the Transcarpathian territories. Their inflow continued to cover the areas of Bohemia, Moravia, Lower Austria, and western Slovakia as a direct continuation of the processes initiated in the Pre-Music-Note Phase. Local discoveries are also characterised by small quantities and considerable territorial dispersion of the finds. However unlike in the oldest phase, the inflow of chocolate flint seemed to be definitely 'dominant'. So far it has been recorded at no less than seven sites (Figs. 2, 3) associated with the younger developmental stages of the discussed culture, especially its Music-Note Phase.<sup>33</sup> The distribution of Świeciechów flint in these areas became less intense in the discussed period, as indicated by its occurrence only in Asparn an der Zaya-Schletz in Lower Austria.<sup>34</sup> According to Inna Mateiciucová, some specimens made of this material and discovered at the Mohelnice site may be attributed to the late horizon of the LBK development.<sup>35</sup>

Regardless of the situation recorded in the Bohemian-Moravian clusters of the LBK settlement, the dispersion analysis of all the discovered artefacts made of the Świeciechów flint in the Transcarpathian area indicates a clear eastwards expansion of the far-reaching zone of their distribution, starting in the Music-Note Phase.<sup>36</sup> This is illustrated well by the substantial concentration

<sup>17</sup> Kaczanowska 1985, 61; Mateiciucová 2001b, 216, map 3.

<sup>18</sup> Mateiciucová 2001a, 285–287, tabs. I–III.

<sup>19</sup> Mateiciucová 2008, 133.

<sup>20</sup> Gronenborn 1997, 20; Mateiciucová 2008, 133.

<sup>21</sup> For example, Kaczanowska, Lech 1977, 8–9; Lech 1979, 130–131; 2003, figs. 5–6; Balcer 1983, 57.

<sup>22</sup> Lech 1981b, 39.

<sup>23</sup> Lech 1989, tab. 1.

<sup>24</sup> Mateiciucová 1997, 99; 2008, 126.

<sup>25</sup> Milisauskas 1986, 83; Breitenfellner, Rook 1991; Przeździecki *et al.* 2020, fig. 2.

<sup>26</sup> Kadrow 1997, fig. 18.

<sup>27</sup> Novotný 1982, 185, 191; Soják 1999, 96–97, tab. 1.

<sup>28</sup> Lech, 1981a, 218; Mateiciucová, 2008, 126.

<sup>29</sup> The analysis of finds from the area of western Slovakia (e.g. Borovce) indicates the possibility that the Jurassic-Cracow flint reached this territory also in the form of blanks of blades (Kaczanowska, 1985, 55). Most likely, this material also spread

to much more distant areas of the Transcarpathian zone primarily in this form (possibly also as flakes or tools), which is quite clearly documented by a few finds from Lower Austria (Asparn an der Zaya-Schletz, see Mateiciucová 2008, 127), as well as discoveries in the Transdanubia (e.g. Budapest-Aranyhegyi) and the north-eastern part of the Great Hungarian Plain (e.g. Balsa-Feckepart, see Biró 1998, 38, 46).

<sup>30</sup> Kaczanowska 1985, fig. 22.

<sup>31</sup> Michalak-Ścibior, Taras 1995, tab. V; Lech 2008, 198; Szeliga 2018a, fig. 2.

<sup>32</sup> Małecka-Kukawka, 1992, tab. 1, fig. 122; Kabaciński 2010, 90–94; Pyzel, Wąs, 2018, tab. 1.

<sup>33</sup> Lech 1989, tab. 1; 2003, fig. 6; Mateiciucová 2001b, 216, map 3.

<sup>34</sup> Kaczanowska, Kozłowski 2005, 79.

<sup>35</sup> Mateiciucová 2008, 132.

<sup>36</sup> Szeliga 2014, figs. 6, 8.



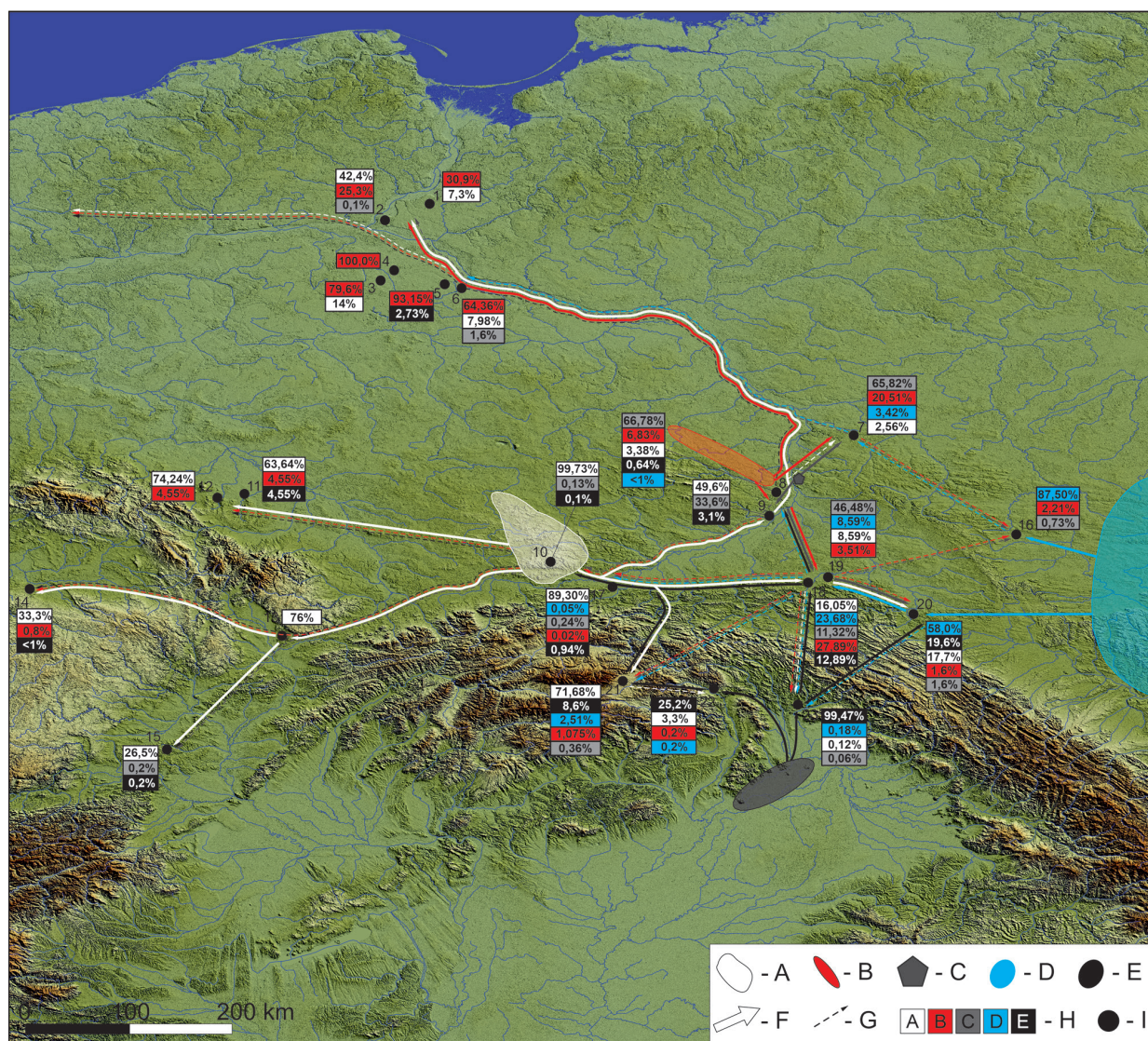


Fig. 2. General distribution directions of the most important flint varieties and obsidian on both sides of the Carpathians in the classical and late developmental stages of the LBK: A–C – see Figure 1; D – Volhynian flint outcrops; E – obsidian outcrops; F – distribution of concretions, pre-cores, or prepared cores; G – distribution of blanks and retouched tools; H – frequencies of particular raw materials in inventories; I – selected LBK sites: 1 – Lisewo 31; 2 – Nowy Dwór 9; 3 – Bożejewice 22/23; 4 – Łojewo 1; 5 – Zagajewice 1; 6 – Brześć Kujawski 4; 7 – Bogucin 6; 8 – Tominy 6; 9 – Trzebieszewice 1; 10 – Bolechowice-Zielona 9; 11 – Strzelin 19; 12 – Niemcza 4; 13 – Páslavice-Kocourovce; 14 – Byłany 1 (Phase IIa of the LBK); 15 – Asparn an der Zaya-Schletz (end of Phase II and Phase III of the LBK); 16 – Tarnoszyn 1; 17 – Brzezine 17; 18 – Zwięzycza 3; 19 – Łańcut 3; 20 – Kormanice 1; 21 – Strané pod Tatrami; 22 – Šarišské Michal’any; 23 – Humenné, “Pod Sokolom” (according to Kozłowski 1970; Kulczycka-Leciejewiczowa 1979; Lech 1981b; 1989; Zakościelna 1981; Breitenfellner, Rook 1991; Gruszczynska 1992; Małeczka-Kukawka 1992; 2008; Kaczanowska *et al.* 1993; Mateiciucová 1997; 2008; Soják 1999; Wojciechowski, Cholewa 2000; Kaczanowska, Kozłowski 2002; Grygiel 2004; Janák, Přichystal 2007; Kabaciński 2010; Pelisiak 2014; Wilczyński 2014; Burgert *et al.* 2016; Furmanek, Masojć 2016; Szeliga 2018; 2023. Compiled by M. Szeliga, based on data supplied by the NASA Shuttle Radar Topography Mission (SRTM)(2013). Shuttle Radar Topography Mission (SRTM) Global. Distributed by OpenTopography <https://doi.org/10.5069/G9445JDF>. Accessed: 20th of February 2023; see also Farr, Kobrick 2000).



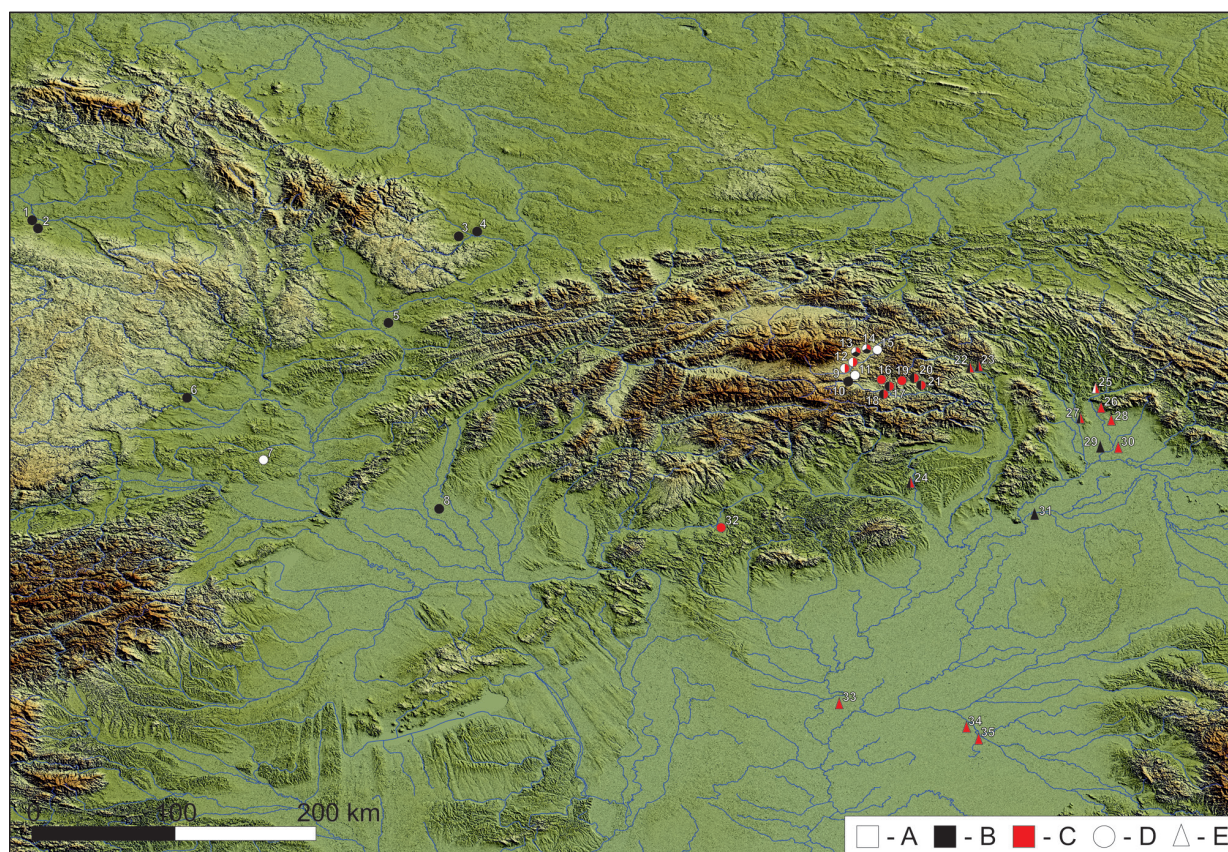


Fig. 3. Distribution of artefacts made of the Świeciechów flint (A), chocolate flint (B), and Volhynian flint (C) in inventories of the classical and late developmental stages of the LBK (D) as well as in materials of the Eastern-Linear cultural groups (E): 1 – Kolín X; 2 – Bylany 1; 3 – Otice; 4 – Bolatice; 5 – Prusinovice; 6 – Bojanovice; 7 – Asparn an der Zaya-Schletz; 8 – Vel'ký Grob; 9 – Poprad-Matejovce, Nad kopčekom I; 10 – Spišský Štiavnik, Sedliská I; 11 – Spišský Štiavnik, Nad Rybníkom; 12 – Vel'ká Lomnica, Na kopci (Šibeničná hora); 13 – Strané pod Tatrami, Pod Kamenným vrchom I; 14 – Rakúsy/Spišská Belá, Kahlenberg (Stirn); 15 – Krížová Ves, Družstevné lúky; 16 – Iľiašovce, Za hostincom; 17 – Spišská Nová Ves/ Smižany, Smižianska roveň; 18 – Spišská Nová Ves, Rittenberg; 19 – Spišský Hrhov-Kaštieľ; 20 – Jablonov, Rybník; 21 – Žehra, Hlinky I; 22 – Ražňany, Feature 1/12; 23 – Šarišské Michalany; 24 – Borsod (Edelen); 25 – Humenné, "Pod Sokolom"; 26 – Zbudza; 27 – Moravany; 28 – Zalužice; 29 – Malé Raškovce; 30 – Čierne Pole; 31 – Balsa-Fecskepart; 32 – Szécsény-Últetes; 33 – Tiszaföldvár-Téglagyár; 34 – Mezőberény-Bódishát; 35 – Gerla-Kázmán (according to Kozłowski 1958; 1970; Novotný 1982; 1983; Kaczanowska 1985; Lech 1989b, 2003; Soják 1999; 2000; 2002; Kaczanowska *et al.* 1993; Biró 1998; Javorský, Soják 1999; Mateciucová 2001b; 2008; Kaczanowska, Kozłowski 1997; 2002; 2005; Nowak *et al.* 2010; Burgert 2018; Karabinoš *et al.* 2018. Compiled by M. Szeliga, based on data supplied by NASA Shuttle Radar Topography Mission (SRTM)(2013). Shuttle Radar Topography Mission (SRTM) Global. Distributed by OpenTopography <https://doi.org/10.5069/G9445JDF>. Accessed: 20th of February 2023; see also Farr, Kobrick 2000).

of finds in north-eastern and eastern Slovakia and, to a lesser extent, also in northern Hungary (Fig. 3), both in the area inhabited by the LBK community (Spiš) and the areas occupied by the Eastern-Linear communities (East Slovak Lowland).

The territorial expansion of the materials from the Holy Cross Mountains across the Transcarpathian areas and a clear intensification of this distribution were not accompanied by a change in its form. Still, only single products reached the most distant settlements, constituting

but a minimal share in the raw material structure of particular inventories (Fig. 2). It is visible in both the western and eastern distribution areas. In the first case, a good example is the settlement in Bylany, where the inflow of chocolate flint in the beginning of the second (IIa) and the third (III) settlement phases is documented by only a single artefact for each period, constituting 0.80% and 0.40%, respectively, of all flint materials chronologically associated with them<sup>37</sup>. A similar situation is also illustrated by the raw material structure of the LBK inventories

<sup>37</sup> Lech 1989, tab. I.



from the eastern part of the Transcarpathian zone (Fig. 3), revealing a somewhat higher, but still only incidental, content of the Holy Cross Mountains flints. In the case of the chocolate flint, it amounted to between 1.08% (Strané pod Tatrami, the site known as *Pod Kamenným vrchom* I) and 1.90% (Rakúsy/Spišská Belá, the site known as *Kahlenberg [Stirn]*), whereas the Świeciechów flint at the same sites constituted, respectively, 0.36% and 0.90%.<sup>38</sup> Slightly larger, although also minimal, frequency in these areas was enjoyed by the Volhynian flint, whose share in Strané pod Tatrami was estimated at 2.53%,<sup>39</sup> while in Rakúsy/Spišská Belá at 2.00%.<sup>40</sup> The Jurassic-Cracow flint – whose share sometimes exceeds 60.00% or even 70.00% – was of strategic significance in the lithic manufacturing of the Spiš cluster of the LBK settlement.<sup>41</sup>

A different situation can be observed in the neighbouring areas of the East Slovak Lowland and in the north-eastern part of the Great Hungarian Plain inhabited by the Eastern-Linear cultural groups. In these areas, local raw materials, in particular obsidian, as well as hornstones and radiolarites, were of vital importance.<sup>42</sup> The presence of particular products made of the flints from the Holy-Cross Mountains has been recorded so far only in a few inventories attributed to the Eastern-Linear Pottery Culture and the Bükk Culture (Fig. 3), and their share generally did not exceed 0.50% (e.g. Humenné, site *Pod sokolom*: Świeciechów flint – 0.06%; Šarišské Michaľany: Chocolate flint – 0.20%).<sup>43</sup> The inventory discovered in Feature 1/12 in Ražňany, and attributed to the Bükk-Mountain Culture, should be considered exceptional. It was estimated that the share of chocolate flint in this collection was 6.80%.<sup>44</sup> Currently, it is the highest share of this raw material recorded in the Eastern Linear context.

The Jurassic-Cracow flint is also represented by modest shares and has been noted in particular inventories mainly in the form of single artefacts (only sometimes as groups of several items), represented mainly by tools (e.g. Borsod-Edeleny, Humenné, or Šarišské Michaľany).<sup>45</sup> Similarly, the Volhynian flint occurred only occasionally and was represented by very few or even single specimens of blanks or retouched tools (e.g. Zalužice – 2 pcs.; Borsod – 2 pcs.; Ražňany – 1 pcs.; Šarišské Michaľany – 1 pcs.),<sup>46</sup> recorded in just a few inventories of the Eastern-Linear cultural groups (Fig. 3). This situation indicates a completely non-economic reason behind the inflow of the Volhynian and southern-Polish flint materials into the Eastern-Linear communities.

Contrary to the previous period, the distribution of raw materials between the areas located on both sides of the Carpathians during the younger horizon of the LBK development was bilateral. On the one hand, it manifested itself by the inflow of various flint varieties into the Transcarpathian areas from southern and central Poland as well as Ukraine, whereas on the other by importation of obsidian – whose deposits are located in the Slanské Hills and Zemplén Mountains, on the border between Slovakia and Hungary – into the northern foreland of the Carpathians (Fig. 2).<sup>47</sup> Currently, several dozen sites of this culture – with artefacts made of this material – are known from Poland. They concentrate mainly in the loess upland areas of southern and south-eastern Poland and occur in several distinct clusters. Much less numerous findings are known from areas located to the north of the upland zone.<sup>48</sup>

The earliest known obsidian finds are associated with the Music-Note Phase of the LBK.<sup>49</sup> Despite its vast territorial distribution, the modest share of this raw material

<sup>38</sup> Soják 1999, 96–97, tab. 1; 2000, 211, Diagram 9.

<sup>39</sup> Soják, 1999, 96.

<sup>40</sup> Soják 2000, 211, Diagram 9.

<sup>41</sup> Novotný 1982, 191; Kaczanowska 1985, 64–65; Soják 1999, 96, tab. 1; 2004, 75.

<sup>42</sup> Šiška 1979, 266–267; Kaczanowska 1985, 47; Kozłowski 1989, 377, 384, 390–391, tabs 1, 5, 8; Kaczanowska, Kozłowski 1997, 178, 186–187, 192–193, 210–211.

<sup>43</sup> Kaczanowska *et al.* 1993, 41–42, tabs 8–9; Kaczanowska, Kozłowski 2002, 67, tab. 2.

<sup>44</sup> Karabinoš *et al.* 2018, 343.

<sup>45</sup> Kaczanowska 1985, 57, 59; 2003, 8; Kaczanowska *et al.* 1993, 60, tab. 17; Biró 1998, 49; Kaczanowska, Kozłowski 2002, 67, tab. 2.

<sup>46</sup> Kaczanowska 1985, 59, fig. 13; Kaczanowska *et al.* 1993, tab. 8–9; Kaczanowska, Kozłowski 1997, 211; Karabinoš *et al.* 2018, tab. 2.

<sup>47</sup> The newest discoveries of A. Přichystal and P. Škrdla allow for inferring the location of the main Carpathian obsidian prehistoric outcrop in the area between Brehov, Cejkov, and Zemplén

in south-eastern Slovakia (Přichystal, Škrdla, 2014, 224), related to the occurrence of the *Carpathian I* variety. The results of the latest geochemical analyses conducted for a series of Neolithic obsidian artefacts from Poland (Kabaciński *et al.*, 2015, 10–12; Szeliga *et al.* 2021, 35) and Bohemia (Burgert *et al.* 2016, 234) corroborate this interpretation.

<sup>48</sup> Szeliga, 2009, fig. 2, tab. I.

<sup>49</sup> This view remains predominant in the archaeological literature (e.g. Kaczanowska 1971, 12; 1976, 37–38; Godłowska 1982, 151; Kulczycka-Leciejewiczowa 1979, 85; Kadrow 1990a, fig. 26: c; Szeliga 2009, 299–301, fig. 3). The suggestion – presented in certain studies – that the beginning of the obsidian inflow to the areas located on the northern side of the Carpathians started as early as in the Pre-Music-Note Phase of the LBK (e.g. Mateiciucová 2008, 126) is still not sufficiently supported by the available source data. Despite sporadic discoveries of artefacts made of this raw material in inventories linked with Phase I of the LBK (Gwoździec 2, Feature 29), they are interpreted as later elements, associated with the Music-Note or Źeliezovce Phase of this culture (Wilczyński, Kufel-Diakowska 2021, 167).

among the Music-Note assemblages indicates a somewhat negligible scale of obsidian importation at that time. This observation does not apply to the Carpathian foothills – more precisely to the Rzeszów and Przemyśl settlement concentrations of the LBK – where the share of obsidian in some assemblages linked with this phase was several times greater than in other areas (Fig. 2). The increase in the inflow of obsidian took place in the Źeliezovce Phase of the LBK. In comparison to the earlier period, we can see that it was limited to two regions of concentration: Rzeszów and Cracow, with the Rzeszów cluster still maintaining its dominant position. The percentages presented for this region indicate significantly higher importance of obsidian in the local production – similar to the share of flint.<sup>50</sup> The present state of research allows us to suspect that obsidian was brought to the Rzeszów, Cracow, and Sandomierz settlement clusters of the LBK in the form of small natural concretions and possibly blade cores, which were considerably processed at particular sites.<sup>51</sup> The products of this procedure (blades, flakes and retouched tools) were distributed from these regions to much more distant areas, located mainly on the northern side of the Carpathians and the Sudetes,<sup>52</sup> as well as, probably, in Bohemia, Moravia, and Lower Austria (Fig. 2).<sup>53</sup>

## Conclusions

The distinct differences in the raw material distribution between the LBK Pre-Music-Note (Fig. 1), Music-Note, and Źeliezovce phases (Fig. 2) correspond to the much broader context of cultural phenomena and changes that took place in the Upper Vistula basin at the turn of the 6<sup>th</sup> and 5<sup>th</sup> millennia BC. These transformations consisted of a gradual weakening and, consequently, a complete disappearance of the influences from the previous cultural centre in south-western Slovakia (leading

to a gradual decline of the Linear stylistic development in these areas) along with the substantial increase in the influence of the Eastern-Linear circle.<sup>54</sup> One of the most important indications and consequences of these processes was the further and very intensive development of the Transcarpathian system of distribution of various flint varieties and obsidian, combined with shifting of its centre towards the east – to the settlement centres in south-eastern Poland as well as to northern and eastern Slovakia and north-eastern Hungary (Fig. 2). Among the areas located northwards of the Carpathians, the most important role in this system was played most likely by the Rzeszów settlement cluster. On the one hand, the available data from this region indicate a significant position of the Jurassic-Cracow flint in the local processing (although it was much less significant than in many other areas). On the other, it suggests a considerable – sometimes even strategic – economic importance of the flints from the Holly-Cross Mountains (especially Świeciechów flint) and obsidian.<sup>55</sup> This indicates that the local LBK communities were the most important receivers and users of these raw materials, controlling and intermediating in their further distribution to more distant areas. On the one hand, this fact pertains to the distribution of obsidian across territories located to the north of the Carpathians, but on the other, to the southward transportation of other flint goods,<sup>56</sup> mainly the chocolate and Świeciechów varieties but also – to a much lesser extent – the Jurassic-Cracow flint.<sup>57</sup> Presumably, this observation also applies to the redistribution of goods made of the Volhynian flint – although its distribution was much more modest – imported to the Rzeszów cluster most probably through the intermediation of communities settled by the upper San.<sup>58</sup> In this case, the possibility that this raw material arrived in the areas of eastern Slovakia and north-eastern Hungary directly from the Przemyśl cluster communities should be considered as highly probable.<sup>59</sup>

<sup>50</sup> Kozłowski 1970, tab. I; Kaczanowska 1985, fig. 22; Kadrow 1990a, fig. 24: a–i; 1990b, fig. 14: b; Szeliga 2009, 299; Pelisiak 2014, tab. 14.

<sup>51</sup> Kozłowski 1970, 89; Kaczanowska 1985, 14; Kulczycka-Leciejewiczowa 1979, 85; Michlak-Ścibior 1992, 44; Szeliga *et al* 2021, 35.

<sup>52</sup> Szeliga 2009, 299.

<sup>53</sup> So far, obsidian artefacts have been only sporadically discovered across these territories, recorded at the LBK sites in Asparn an der Zaya-Schletz, Buchlovice, Bylany, Dobřany, Količín, Mezice, and Ůhřetice, (Matejčicová 2008, 136–137, tab. 15; Burgert 2015, tab. 7; Burgert *et al.* 2016, tab. 1). It is highly probable that they were brought there through the Moravian Gate – with the participation of people inhabiting the LBK settlement clusters in western Lesser Poland – as an addition to the

main distribution of the Jurassic-Cracow flint (analogically to products made of the chocolate and Świeciechów flints).

<sup>54</sup> Kozłowski 1985, 69; Kadrow, Zakościelna 2002, 190–192, figs. 2–3.

<sup>55</sup> E.g., Kozłowski 1970, fig. 2, tab. I; Kaczanowska 1985, fig. 22; Caspar *et al.* 1989, 172; Kadrow 1990a, fig. 24: a–e; 1997, fig. 18; Gruszczyńska 1992, 123; Pelisiak 2014, 122, tab. 14.

<sup>56</sup> Szeliga 2014, 98, fig. 8.

<sup>57</sup> The redistribution of this raw material in eastern Slovakia seems to be related primarily to the Spiš cluster of the LBK settlement (Soják 2000, 218–219), due to its definitely larger frequencies in the particular inventories than in the Rzeszów region (Fig. 2).

<sup>58</sup> Lech 1987, fig. 28.1; 2003, fig. 6.

<sup>59</sup> Kozłowski 1974; 52–53; Kaczanowska 1985, 59; Kaczanowska *et al.* 1993, 44.



Each time, small – usually even minimal – frequencies of the Świeciechów, chocolate, and Volhynian flints in the Transcarpathian inventories (as well as the modest share of the Jurassic-Cracow flint at the Eastern-Linear sites) allow us to rule out the practical/economic reasons behind their importation to these areas. Products made of these raw materials could have served as symbolic and prestigious goods, whose possession guaranteed maintaining a high social status in the group. It is possible that their distribution and exchange took place only between the highest-ranked leaders or was meant for their exclusive use.<sup>60</sup> Apart from individual benefits, the circulation of goods undoubtedly had a major impact on maintaining and intensifying interregional contacts and strengthening intergroup ties. This observation is confirmed both

by the largest concentration of the ‘northern-Carpathian’ flint products only in eastern and north-eastern Slovakia and by shifting of the Świeciechów flint towards these areas of long-range distribution, due to the extremely strong cultural links with south-eastern Poland (including mainly the Rzeszów cluster) since the Music-Note Phase of the LBK.

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<sup>60</sup> Kruk, Milisauskas 1999, 57.

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