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Where styles collide: the Western Carpathians in the Early Iron Age in the light of pottery analysis

ABSTRACT

In the Early Iron Age, the Western Carpathians constituted a contact zone of various cultural traditions, which contributed to the complex, syncretic stylistic character of this region. At the same time, due to the scarcity of archaeological data, consisting mostly of relatively poor pottery assemblages from settlements, these mountainous areas escape unambiguous cultural classifications. Leaving aside the problems of taxonomy, this paper is an attempt to define the past processes that resulted in the observed diversity. Analyses were performed based on the most numerous sources available, which are ceramic vessels. Instead of being assigned to specific cultural units, individual pottery assemblages from the Western Carpathians were described in terms of stylistic diversity. This approach made it possible to analyse the available sources using quantitative methods, e.g. network analysis. The obtained results were treated as the starting point for a broader discussion on the processes of cultural development in prehistory. The problem of the possibility of reconstructing past social relations based on the pottery was addressed. Furthermore, a detailed study of three Western Carpathian regions provided a framework for considering the branching and blending models of cultural development in the context of local geographical conditions. It was demonstrated that very different processes may occur in neighbouring regions at the same time, resulting in various patterns of pottery styles distribution.

KEYWORDS

branching/blending hypotheses, Early Iron Age, network analysis, pottery style, Western Carpathians

I. INTRODUCTION

It is generally acknowledged that in prehistory, mountains often played a key role in economy and communication. The cultural position of these areas was also unique – mountain ranges could constitute intercultural borders, be a meeting point of different traditions and the cradle of individual cultural units. To understand the past processes that shaped the social and settlement development in these areas, a wide scope of sophisticated methods is applied in contemporary research, based, among others, on paleoclimatic, palaeobotanical and palaeozoological sources (*cf.* papers in this volume). Nevertheless, in many cases, archaeological traces of human activity remain the primary, sometimes the only available, subject of analysis. Therefore, it seems always worthwhile to re-examine artefacts – the basic archaeological data – using different methods to shed new light on phenomena that have not been fully explained.

The Western Carpathians are a particularly favourable region to conduct this kind of research. It is widely recognised that they constituted a cultural contact zone in many periods of prehistory (*cf.* e.g. Madyda-Legutko 1996; Czopek 2005; Przybyła 2009). The intermediate cultural position of these mountains manifested distinctly in the Early Iron Age. From the end of the Late Bronze Age, the Western Carpathians were on the borderline of drastically different phenomena: the continuing Lusatian model of Urnfield culture in the north and local manifestations of Eastern European steppe and forest-steppe cultural traditions in the south, enriched by surviving elements of fluted pottery cultural circle and influences of the Eastern Hallstatt culture. At the beginning of the La Tène period, the dichotomy was established by the expansion of the Pomeranian culture on the one hand and the La Tène culture on the other.

In terms of cultural identity, the inner, mountainous part of the Western Carpathians of that time is hard to define. This problem results mainly from the character of the archaeological source base. Above all, the scarcity of cemeteries should be emphasized. Aside from a few sites in the Dunajec and San River valleys (Bachórz-Chodorówka, Chełmiec, Gwoździec, Janowice 44, Sanok-Olchowce – Gedl 1994; Abłamowicz, Abłamowicz 1989; Szpunar, Szpunar 2003; Korczyńska 2021; Zielińska 2005), the sepulchral sites appear only in northwestern Slovakia, mainly in the Orava River valley (*cf.* Čaplovič 1987). Therefore, the archaeological landscape is composed principally of settlement sites, most of which provided scarce and poorly preserved pottery materials. It

should be also noted that, compared with the lowlands, the number of known, excavated and published settlements is very modest. At the same time, the available sources usually demonstrate local specificity in terms of settlement patterns and material culture as well as stylistic syncretism, resulting from the reception of multidirectional cultural influences. For this reason, these areas escape unambiguous cultural classifications and prompt researchers to distinguish several local taxonomic units. Apart from the Slovakian groups of the Lusatian circle, which are well established in the sources (the Orava and Zvolen groups – Bátora 1979; Čaplovič 1987; *cf.* Benediková 2006), several units should be mentioned here: the Somotor type (also known as Gáva III or pre-Kushtanovica horizon) in eastern Slovakia (Budinský-Krička 1976; Chochorowski 1989; Popovič 2002; Miroššayová 2017); the Zabrzeż-Podegrodzie horizon in the western part of the Polish Carpathians (Madyda-Legutko 1995; 1996); and the Siedliska and Niepla types in the eastern part of the Polish Carpathians (Czopek, Poradyło 2008; Czopek 2009; Trybała-Zawiślak 2019).

Taxonomic divisions provide a framework for the archaeological description of past cultural reality and are a convenient tool for organising phenomena in time and space. However, their suitability in examining and explaining the processes of cultural change is limited. Therefore, leaving aside the issues of taxonomy and nomenclature, I decided to investigate the situation in the Western Carpathians in the Early Iron Age, using the most numerous sources available, which are ceramic vessels. Rather than trying to assign it to specific units, I have characterised the stylistic diversity in this area, in order to create a groundwork for further analyses of the cultural and social phenomena occurring at that time.

Pottery analysis as a tool for the study of past social relations has a long story in archaeological literature, being the central premise of so-called ceramic sociology, popular mainly in the USA from the 1960s to the 1980s. The works representing this research trend, which applied a simplistic translation of the stylistic diversity of vessels into complex inter- and intra-group relations, have been strongly criticised on the grounds of methodological problems (Kobylińska 1980: 195–196; Rice 2005: 252–255). It was emphasized that different kinds of social interaction may result in various stylistic phenomena occurring in specific categories of material culture. Therefore, style analysis oriented not to the manifestations of style as such, but also the social reality behind them, should include more than one – or preferably all – of the categories of artefacts (Rice 2005: 254; *cf.* e.g. Kobylińska 1981). Thus, the study presented here, concerning solely pottery, is primarily an attempt to reconstruct

the formation processes of the stylistic diversity of ceramics in the Western Carpathians in the Early Iron Age. Due to the interpretation problems discussed in the research literature, the actual relationship between this category of source and the broader social phenomena is difficult to assess (*cf.* overview of the issue: Rice 2005: 270–272). However, I shall try to demonstrate that pottery style analysis may provide some proxies of more general cultural processes, which have been conditioned by geographical factors.

II. MATERIALS AND INITIAL PREMISES

As already mentioned, the archaeological source base of the Early Iron Age in the Western Carpathians is relatively poor and consists mostly of pottery materials from small settlement sites. This is due to several factors. Undoubtedly, the mountainous terrain contributes to increased erosion of archaeological sites. At the same time, we can observe that in subsequent periods, settlements were established on the same landforms in mountain valleys; therefore, in the case of multicultural sites, prehistoric layers were already destroyed later in the Iron Age or the Middle Ages. This situation is well documented in the Dunajec River valley (*cf.* e.g. Poleski 2004) and in the Spiš region (*cf.* e.g. Soják, Fecko 2015). Lastly, most known settlements, mainly hillforts, were excavated around the middle of the 20th century, and information on the context of the artefacts stored in the archives has been irretrievably lost (*cf.* e.g. Benediková 2004; Jędrysik *et al.* 2021).

Given the above problems, for the analysis, I chose sites from the mountainous areas, that provided relatively rich pottery assemblages from well-defined contexts. As points of reference, I also selected settlements and cemeteries from the neighbouring regions, well-dated and representative of different cultural traditions from the timespan from the end of the Bronze Age (HaB; 11th–9th centuries BC) to the beginning of the La Tène period (LtA/LtB1; 5th–4th centuries BC). A key condition for including a site in the analysis was the state of publication of these materials, featuring photographs or drawings of the pottery, which allowed an insight into the full spectrum of vessel shapes and decoration typical of a specified phase of settlement or cemetery use. The resulting collection of approximately 100 ceramic assemblages from individual sites or their phases served as the basis for describing the stylistic variation of pottery within the defined chronological and spatial framework (Fig. 1). Given the form of this paper, I am unable to include a full description of these

sources here, along with references – this information has been published elsewhere (Markiewicz 2024). It should only be noted that the assemblages differ significantly in terms of the number of diagnostic vessel fragments due to the nature of the sites – large cemeteries on the one hand and small settlements on the other. However, this problem has been partly mitigated by statistical tools (*cf.* below).

Based on the above materials, I distinguished 75 types of vessels with characteristic features of shape or decoration, which can be considered typical of specific stylistic trends; then, I assigned these types to 15 pottery styles (Fig. 2). The criteria and reasoning behind this procedure and the full description of the types and styles are presented in detail elsewhere (Markiewicz 2024). In this paper, a brief explanation of the concept of style is required. In the research literature, there is no single universally accepted definition of style – its communicative role is usually emphasised, and in some approaches, it is placed in opposition to function (*cf.* e.g. Sackett 1977; Dunnell 1978). Styles are open systems of expression, being subject to modification, manifesting themselves in varying ranges and internal combinations, and co-occurring in the same contexts (Rice 2005: 245). In the presented analysis, style is understood as a certain tradition of pottery production, comprising a repetitive set of vessel shapes as well as techniques and motifs in decoration, independent of cultural divisions (which are also based on other elements of material culture, such as funerary rites, settlement patterns or metallurgy). Thus, a style may have a wider territorial range and last longer than the cultural unit from which it originated. It should also be noted that this classification was made strictly for the Western Carpathian zone and, being incomplete or too general from an "external" point of view, cannot be applied to materials from adjacent regions.

Using data from the analysed sites, such as radiocarbon dates or diagnostic metal artefacts, I have determined the approximate chronological framework for each style. Based on such a timeline, several stages of stylistic development in the Western Carpathians from the late Bronze Age to the early La Tène period can be distinguished, characterised by varying diversity and changing dominance of cultural trends (Fig. 3; Markiewicz 2024).

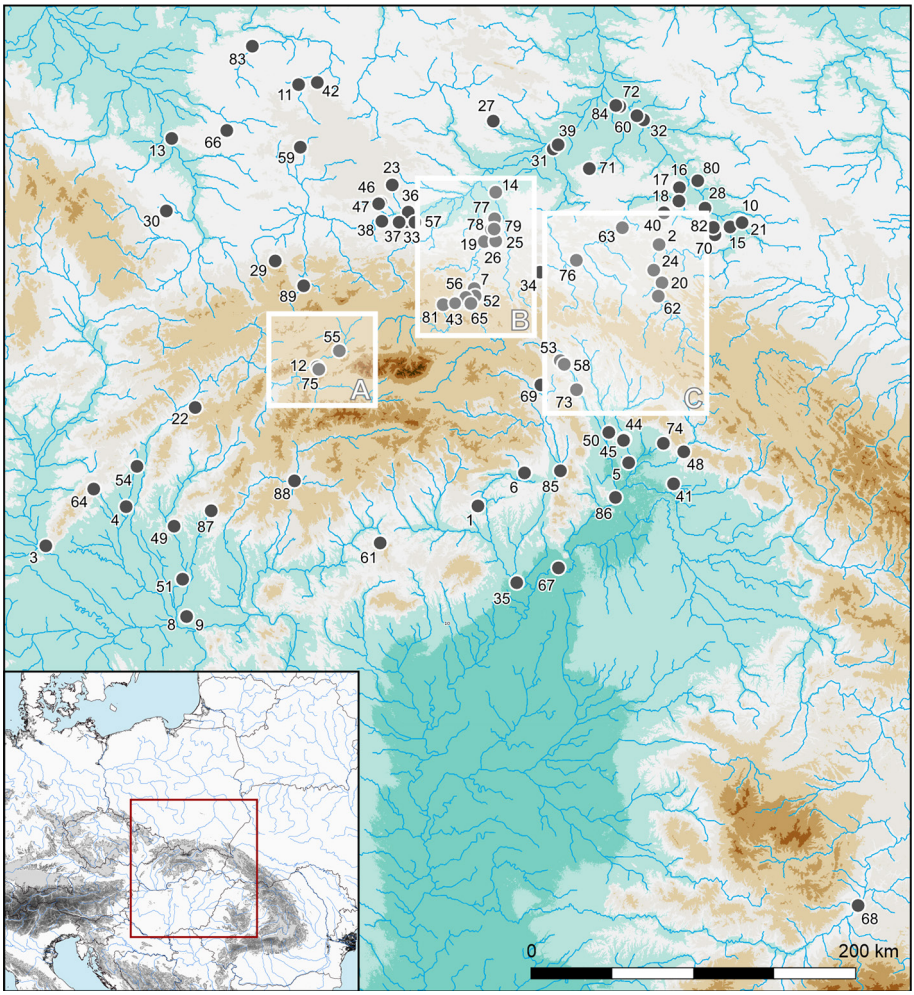

FIG. 1. Location of sites included in the analysis of the Early Iron Age pottery and the extent of the test areas. A – Orava River valley, B – Dunajec River valley, C – the eastern part of the Western Carpathians with the adjacent part of the Eastern Carpathians.

1 – Alsótelekes-Dolinka; 2 – Bachórz-Chodorówka; 3 – Bratislava-Dúbravka; 4 – Bučany; 5 – Budkovce, Červenica-Hora; 6 – Čečejovce; 7 – Chełmiec; 8 – Chotín I; 9 – Chotín II; 10 – Chotyniec; 11 – Częstochowa-Raków; 12 – Dolný Kubín II; 13 – Gogolin-Strzebniów; 14 – Gorzyce; 15 – Grabowiec; 16 – Grodzisko Dolne 1; 17 – Grodzisko Dolne 22; 18 – Grzęska; 19 – Gwoździec; 20 – Hłomcza; 21 – Hruszowice; 22 – Ilava, Porubská dolina; 23 – Iwanowice-Klin; 24 – Jabłonica Ruska (Lusatian phase, Vekerzug feature); 25 – Janowice 6; 26 – Janowice 44; 27 – Janowice Poduszowskie-Antoniów; 28 – Jarosław (Lusatian phase, Pomeranian phase); 29 – Jaworze, Młyńska Kępa; 30 – Kietrz (phases IV, V, VI); 31 – Kliszów; 32 – Kłyżów; 33 – Kokotów; 34 – Korczyna; 35 – Köröm; 36 – Kraków-Pleszów; 37 – Kraków-Prokocim; 38 – Kraków-Skotniki; 39 – Krzemienica; 40 – Lipnik; 41 – Malì Geïvcì; 42 – Małusy Wielkie; 43 – Maszkowice, Góra Zyndrama; 44 – Michalovce, Pod Hrádkom; 45 – Michalovce, Seregmeš; 46 – Modlnica (settlement, cemetery); 47 – Modlniczka; 48 – Nevic'ke; →

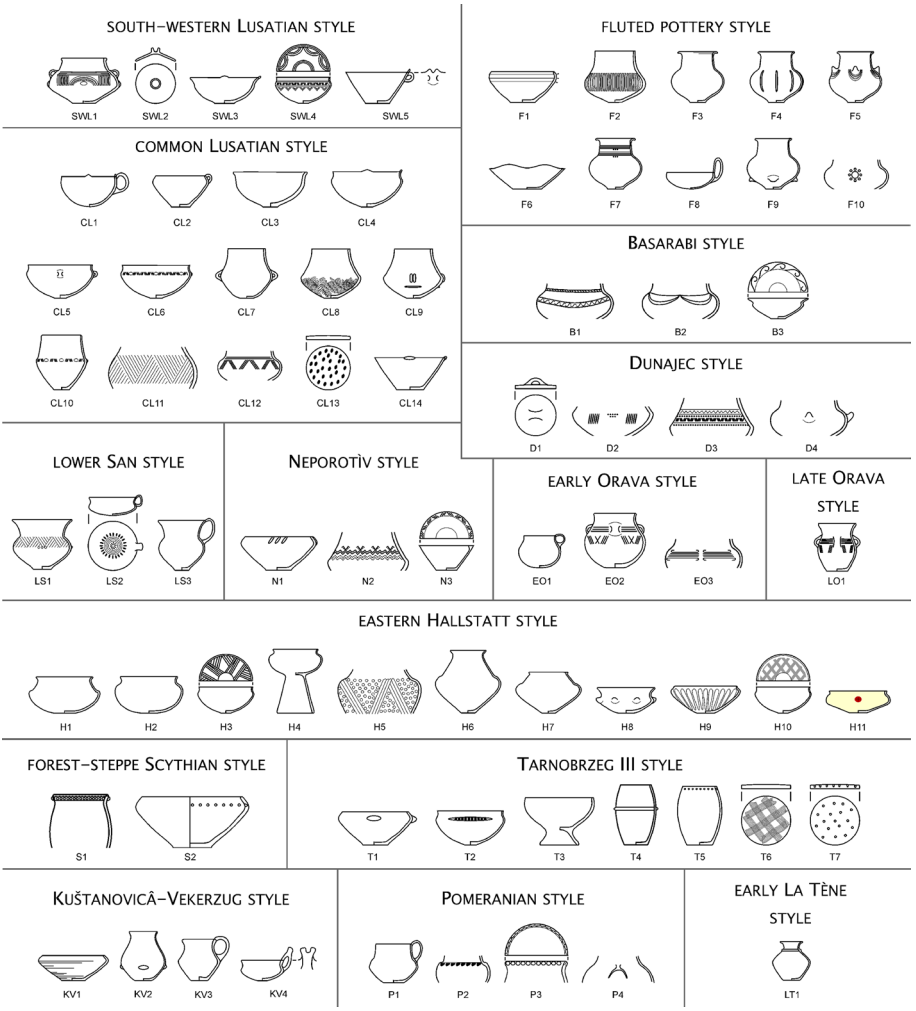

FIG. 2. The stylistic classification of the Early Iron Age pottery from the Western Carpathians (drawn by the author)

← 49 – Nitra-Chrenová; 50 – Nižný Hrušov; 51 – Nové Zámky; 52 – Nowy Sącz-Biegonice; 53 – Oľšavce; 54 – Pobedim, Hradištia; 55 – Podbiel I; 56 – Podegrodzie; 57 – Podłęże (Lusatian phase, Pomeranian phase); 58 – Porúbka; 59 – Przeczyce; 60 – Pysznica; 61 – Radzovce (settlement, cemetery); 62 – Sanok-Olchowce (settlement, cemetery); 63 – Siedliska; 64 – Smolenice-Molpír; 65 – Stary Sącz-Lipie; 66 – Świbie; 67 – Taktabáj; 68 – Teleac; 69 – Terňa, Lysá stráž; 70 – Trójczyce; 71 – Trzęsówka; 72 – Turbia; 73 – Vlača, Záhumenky; 74 – Vojnatina; 75 – Vyšný Kubín, Tupá skala; 76 – Warzyce; 77 – Wierzchosławice; 78 – Wojnicz 18; 79 – Wojnicz 48; 80 – Wylewa; 81 – Zabrzeż, Babia Góra; 82 – Zamiechów; 83 – Zbrojewsko; 84 – Zbydniów; 85 – Ždaňa, Doboky; 86 – Zemplín (older graves, younger graves); 87 – Žitavany-Kňažice; 88 – Zvolen-Balkán; 89 – Żywiec, Grojec (drawn by the author)

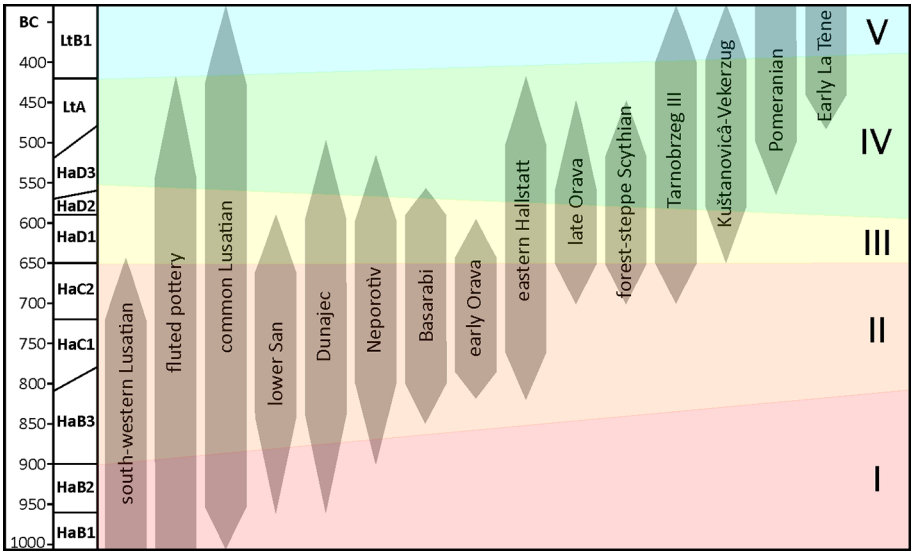

FIG. 3. Chronology of the pottery styles in the Western Carpathians divided into developmental stages (drawn by the author)

III. ANALYSIS

Network analysis

Using the above classification of pottery types and styles, I have described each ceramics assemblage from the selected sites, determining the share of individual styles among the diagnostic fragments of vessels (Fig. 4). Preliminary observation allows us to conclude that the mountains are a place of mixing of different stylistic traditions. Importantly, it is evident that differentiation can be found here both in the chronological and regional dimensions. The dynamics of these changes are therefore conditioned on the one hand by geographical factors, and on the other, by the expansiveness of individual stylistic traditions from neighbouring regions.

This has important implications for quantitative methods of analysis. Since the diversity is of both chronological and spatial character, the usefulness of the classic statistical tools (e.g. seriation, correspondence analysis) is rather limited. Therefore, to capture the potential relationships and trends in the dynamics of stylistic changes in the Western Carpathians, the network

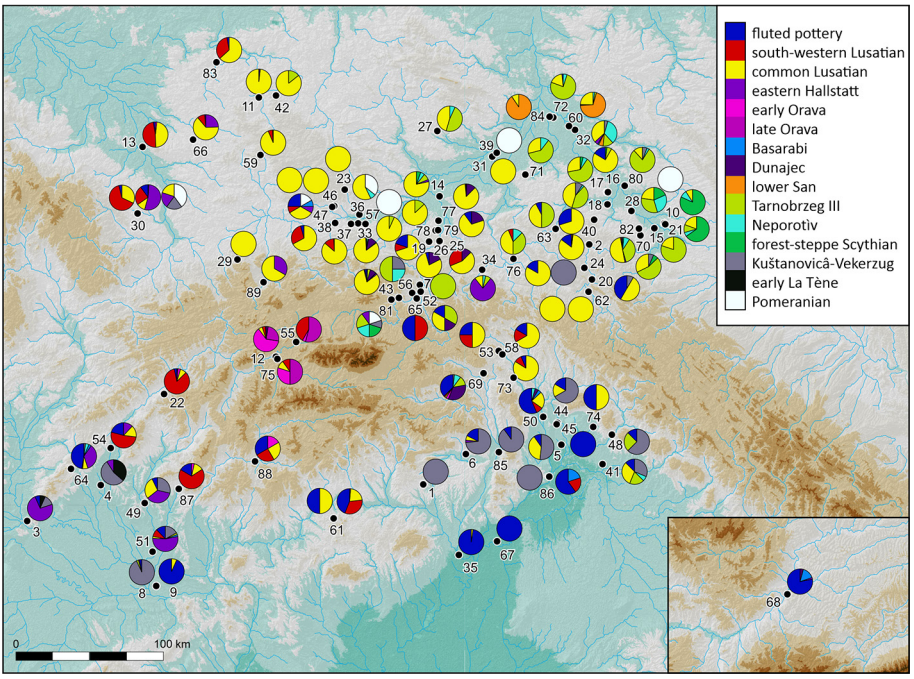

FIG. 4. The proportion of the individual pottery styles in the assemblages from the Early Iron Age sites included in the analysis. For the numbering of the sites see Fig. 1 (drawn by the author)

analysis proved to be suitable. This method, derived from social sciences, is widely applied in archaeology. Its main advantage is the possibility of examining various cultural phenomena in the context of relations between specific units, occurring in both spatial (physical and social) and temporal dimensions (Brughmans 2013).

The network analysis was performed using the Pajek programme (de Nooy, Mrvar, Batagelj 2005). The starting point in the calculations was the share of each vessel type from the stylistic classification in the collection of diagnostic pottery fragments. A certain flaw of the database prepared in this way, resulting from the different sizes of the analysed sets and the varying degrees of recognition of individual types in the fragmented ceramic material, were the drastic disproportions between assemblages and differences between extreme values within them. For this reason, I decided to use the geometric interval classification. For each case (assemblage), depending on the number

of different values within it, two to five value intervals describing the frequency of variables (types) were distinguished, which were then assigned point values (from 0 to 5). This procedure made it possible to prepare a standardised database, from which Pearson's correlation coefficient was calculated for each pair of cases and the network analysis was carried out (Fig. 5).

The results of the network analysis seem to be generally consistent with intuitive predictions; however, a few observations are worth noting. The layout of the diagram is determined by the geographical conditions only to a certain extent – that is, the position of a given site in the centre or periphery of the analysed area does not always correspond to the position of the assemblage in the centre or periphery of the network. The distribution in the diagram essentially reflects two main factors. The first is the cultural divisions and influences. The sites representing the same, homogeneous cultural phenomena are grouped in distinct clusters (e.g. Gáva culture: Taktabáj, Köröm, Teleac; Orava group: Podbiel, Vyšný Kubín, Dolný Kubín; Upper Silesia-Little Poland group: Gogolin-Strzebniów, Zbrojewsko, Przeczyce, Kraków-Prokocim, Kraków-Skotniki; Pomeranian culture: Podłęże, Jarosław, Krzemienica). In between them, there are the assemblages of mixed cultural character (e.g. Podegrodzie: between the sites from the northern part of the Western Carpathians and the Vekerzug culture; Nižný Hrušov: between the sites of the Gáva culture and the Tarnobrzeg group). The second factor determining the network layout is chronology – in general, older sites are located on the left and the younger ones are on the right side of the diagram, although some deviations are worth pointing out, manifested in local "branches" and the proximity of sites of different chronology, resulting from independent stylistic development in a given region (e.g. the already mentioned sites of the Orava group, which is further discussed below).

Case studies

In order to examine in detail the process dynamics of stylistic changes in the Western Carpathians in the Early Iron Age, I have selected three test areas – regions that differ geographically and culturally: the Orava and Dunajec River valleys and the most eastern part of the Western Carpathians with the adjacent part of the Eastern Carpathians (Fig. 1).

The first area – the Orava River valley – is in the centre of the Western Carpathians. It is a relatively narrow valley, surrounded by mountain ranges of the Orava Magura in the northwest and the Tatra Foothills in the

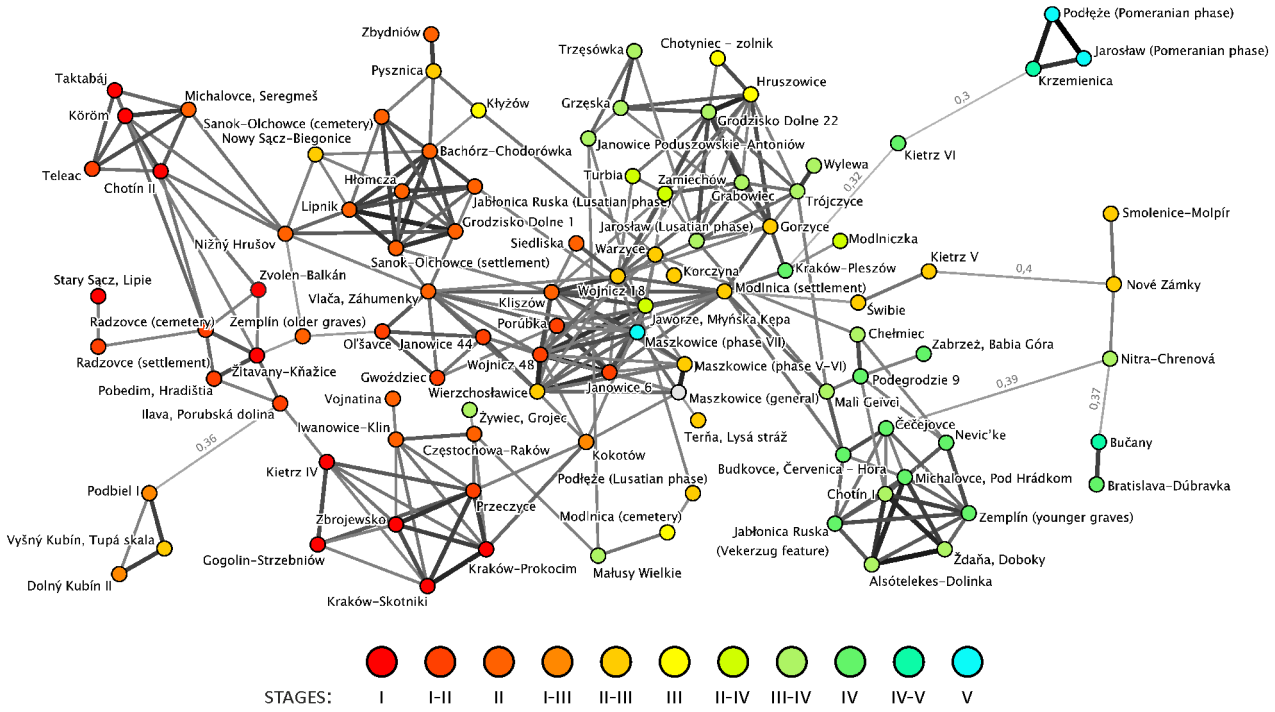

FIG. 5. Results of the network analysis of 100 pottery assemblages (distribution based on the Kamada Kawai algorithm). The links representing Pearson's correlation coefficient r≥0.5 are marked (the significance threshold at p=0.05 is 0.194). For assemblages lacking links to the main part of the network with r≥0.5, the single links with the highest value (indicated above the lines) are marked. Thicker and darker lines indicate a higher correlation coefficient. Colours indicate the chronology of assemblages based on the assignment to the stages of stylistic development (cf. Fig. 3; drawn by the author)

southwest. In the northeast, the valley opens into the lowland area of Orava-Nowy Targ Basin (Balon, Jodłowski 2014). The latter seems to constitute a natural communication route to the northern part of the Western Carpathians; however, traces of Early Iron Age settlement – as well as sites with pottery from other periods of prehistory – are absent in the whole region. The Orava River valley formed a northern extension of the settlement network functioning in the south-western part of the Western Carpathians (*cf.* Benediková 2006).

In the cultural sense, this region is the place of origin of a taxonomic unit called the Orava group (Čaplovič 1987; Veliačik 1988; Benediková 2006). Three sites representing this unit were included in the analysis: cemeteries Podbiel I and Dolný Kubín II and the hillfort Tupá skala at Vyšný Kubín. They all functioned for a relatively long period, from the end of the Bronze Age to the Hallstatt Period, although the exact moment of their abandonment is a matter of debate (*cf.* Čaplovič 1977; 1987; Cheben 1981; Benediková 2006). The common cultural background of these sites is closely reflected in the charts showing the share of the defined styles in the pottery assemblages (Fig. 7a). They are generally not very diversified and are dominated by the types representative of the local Early and Late Orava styles. The south-western Lusatian style is also present, associated with the oldest phases of the sites. Three other styles (Fig. 7b) are an occasional admixture in the local ceramics.

This stylistic uniformity is also visible in the network analysis (Fig. 6). Despite their central geographical location in the Western Carpathians, the sites from the Orava River valley are grouped in one cluster on the periphery of the diagram and show weak links with other regions. It is worth noting that they are connected with the sites from the settlement ecumene on the south-western outskirts of the Western Carpathians, although they are clearly separated from them.

The second case study comprises the middle and lower Dunajec River valley, which has its source in the interior of the Western Carpathians and reaches the northern foothills. It encompasses diverse landscape forms – from the steep slopes of the Beskid Sądecki, Gorce and Beskid Wyspowy Mountains, through the Łącko and Sącz Basins, to the gentle hills of the Rożnów Foothills and lowland of the Sandomierz Basin (Balon, Jodłowski 2014). In prehistory, the Dunajec River valley constituted an important communication route on the north-south axis, being a kind of link connecting settlement networks from both sides of the Western Carpathians (*cf.* Markiewicz 2020).

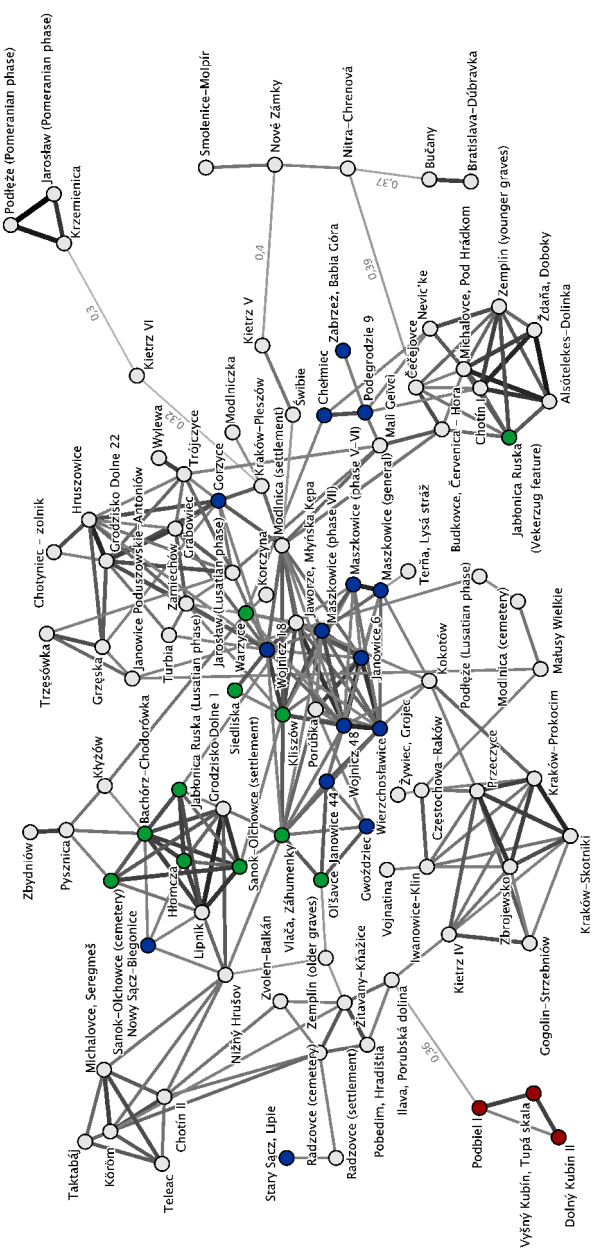

FIG. 6. Position of the sites from the test areas in the network analysis diagram. A – Orava River valley, B – Dunajec River valley, C – the eastern part of the Western Carpathians with the adjacent part of the Eastern Carpathians (drawn by the author)

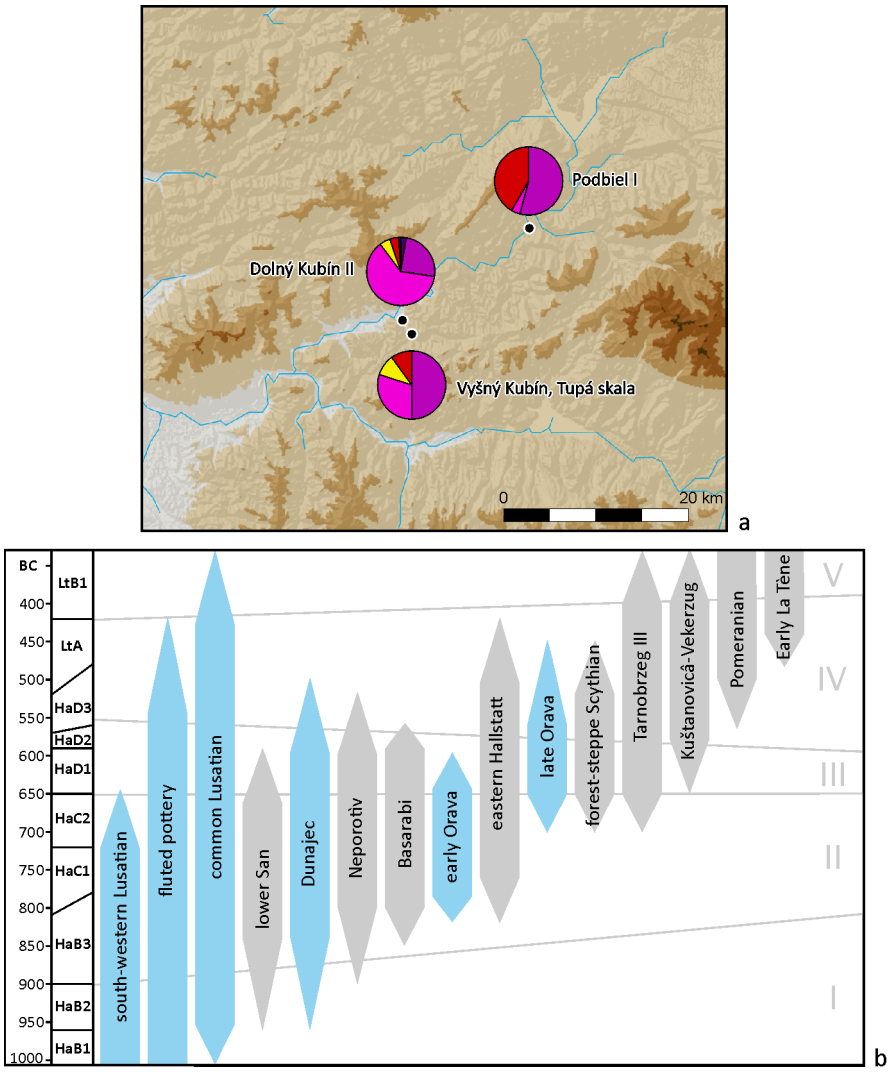

FIG. 7. Orava River valley: a – the proportion of the individual pottery styles in the assemblages from the sites included in the analysis (colors correspond to Fig. 4); b – chronology of the styles present in the assemblages (marked in blue; drawn by the author)

In the Early Iron Age, this opening in both directions contributed to the reception of diversified cultural influences. Almost all of the 15 styles defined for the Western Carpathian region are represented in the pottery assemblages from the 12 sites included in the analysis (Fig. 8; Chełmiec – Abłamowicz,

Abłamowicz 1989; Gorzyce – Szpunar, Szpunar, Kuś 2009; Gwoździec – Szpunar, Szpunar 2003; Janowice 6 – Kienlin *et al*. 2010; Janowice 44 – Korczyńska 2014; 2021; Maszkowice – Markiewicz 2024; Nowy Sącz-Biegonice – Cabalska, Madyda-Legutko, Tunia 1990; Podegrodzie 9 – Madyda-Legutko 1995; Stary Sącz-Lipie – Przybyła 2009; Wierzchosławice – Oleszczak, Miraś 2012; Miraś, Oleszczak 2014; Wojnicz 18 – Dzięgielewski 2010a; Wojnicz 48 – Dzięgielewski 2010b; Zabrzeż – Jędrysik *et al*. 2021). However, they are not equally represented in the inventories; on the contrary, there are drastic qualitative and quantitative differences between the sites in terms of the presence of individual styles, especially in the southern, mid-mountainous part of the valley. Importantly, these variations seem to go beyond chronological differences. The variable share of the common Lusatian style, long-lasting and predominant on the northern side of the Western Carpathians, is especially noteworthy – from prevailing (e.g. Wojnicz, Janowice 44), through moderate (e.g. Gorzyce, Nowy Sącz-Biegonice) to zero (Chełmiec, Gwoździec, Podegrodzie, Stary Sącz, Zabrzeż). Also striking is the proximity of sites in which the main role in the ceramic assemblages is played by "eastern" (Tarnobrzeg III, forest-steppe Scythian, Neporotìv styles) or "south-western" influences (fluted pottery, south-western Lusatian style, e.g. Gorzyce and Wojnicz 18 in contrast to Gwoździec and Janowice 44, Stary Sącz in contrast to Chełmiec).

The network analysis shows that the sites from the Dunajec River valley are considerably scattered throughout the chart; several clusters can be distinguished, which are not connected by any direct links of a high degree of correlation (Fig. 6). As discussed before, the pottery assemblages on the diagram are grouped according to the criteria of cultural and chronological similarity. The visible dispersion of the analysed sites from the region is therefore a manifestation of both cultural and chronological differences.

The third study area encompasses the easternmost part of the Western Carpathians with the adjacent part of the Eastern Carpathians, namely the upper San River valley. This region, compared with the other two, is characterised by the gentlest relief of the terrain; the foothills dominate here (the Strzyżów, Dynów and Przemyśl Foothills in the north and the Ondava and Laborec Foothills in the south), divided by the Jasło-Sanok Depression and the Beskid Niski Mountains (Balon, Jodłowski 2014). Only the upper San River valley has a typically mountainous character, with steep slopes surrounding a narrow valley bottom. The whole zone is crossed by numerous rivers, connecting uplands with inhabited areas in the foothills and lowlands. It is therefore the most open region, offering several crossings along the north-south axis.

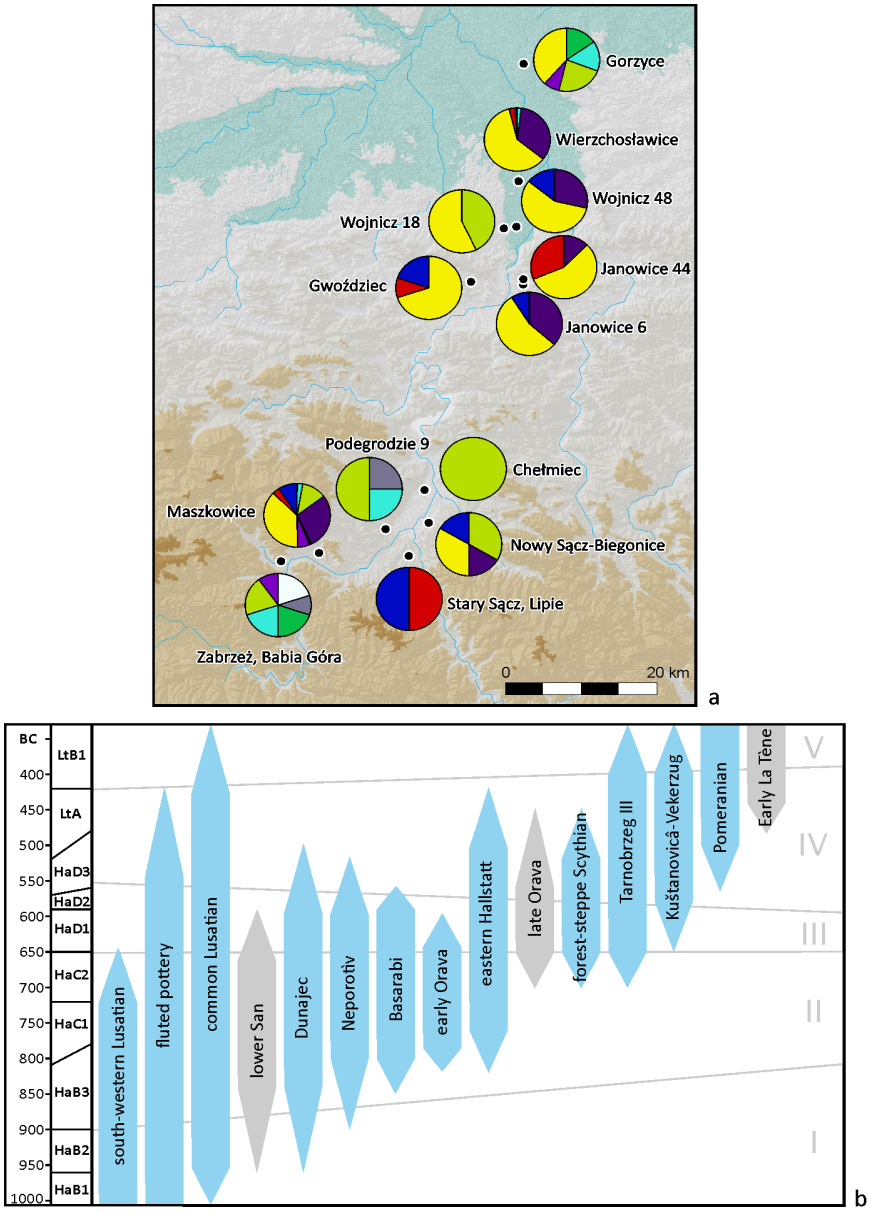

FIG. 8. Dunajec River valley: a – the proportion of the individual pottery styles in the assemblages from the sites included in the analysis (for purposes of clarity, type CL13 was excluded from the totals of vessel fragments representing the common Lusatian style – cf. Markiewicz 2023; colors correspond to Fig. 4); b – chronology of the styles present in the assemblages (marked in blue; drawn by the author)

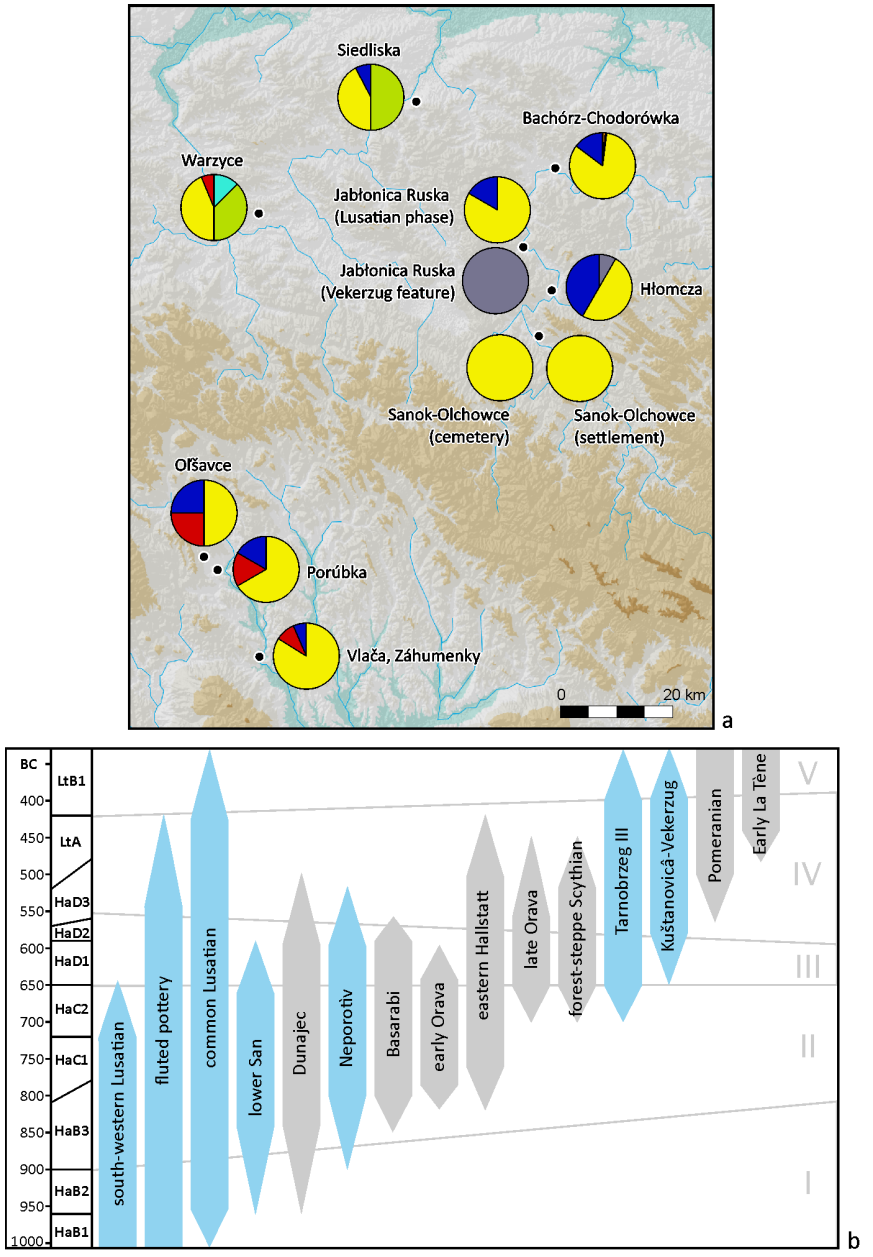

FIG. 9. The eastern part of the Western Carpathians with the adjacent part of the Eastern Carpathians: a – the proportion of the individual pottery styles in the assemblages from the sites included in the analysis (colors correspond to Fig. 4); b – chronology of the styles present in the assemblages (marked in blue; drawn by the author)

Stylistically, this zone is more homogeneous than the Dunajec River valley (Fig. 9). Seven out of 15 styles are represented in the 10 analysed sites: 8 settlements (Hłomcza – Muzyczuk, Pohorska-Kleja 1994; Jabłonica Ruska – Drewniak, Mazurek 2022; Oľšavce – Jarosz, Tunia 2008; Porúbka – Mačalová, Mačala 2008; Sanok-Olchowce – Zielińska 2005; Siedliska – Skowron 2015; Vlača – Kotorová-Jenčová 2018; Warzyce – Czopek, Poradyło 2008) and 2 cemeteries (Bachórz-Chodorówka – Gedl 1994; Sanok-Olchowce – Zielińska 2005). The variation within individual assemblages is limited; they encompass 1–3 styles (only the pottery collection from Warzyce comprises 4 stylistic components). The differences between them result partly from chronological factors (the south-western Lusatian style being the oldest and the Tarnobrzeg III and the Kuštanovicâ-Vekerzug styles – the youngest). However, looking from a broader perspective (*cf.* Fig. 4), the stylistic differentiation takes the form of a gradient distribution: the sites in the northern part of the region show more similarities to the areas north of the Western Carpathians (high share of the common Lusatian and Tarnobrzeg III styles), and the further south, the more the composition of the assemblages comes closer to the characteristics of the Slovak territories (higher share of the fluted pottery and the south-western Lusatian styles).

In the diagram of network analysis, the sites from the eastern zone are not grouped as evidently as those in the Orava River valley, but they are also not as dispersed as those in the Dunajec River valley (Fig. 6). Generally, as noticed above, they occupy an intermediate position between the clusters of sites in the southern and northern forelands of the Western Carpathians. Only one assemblage (from the Vekerzug feature at Jabłonica Ruska), which represents the youngest settlement episode in this region, is distinctly separated.

IV. DISCUSSION

In the field of comparative anthropology, Galton's problem is sometimes discussed; this concerns the situation when the same cultural trait is observed in different populations, but the independence of the sampled communities cannot be proven. Traditionally, two opposite interpretations of such a phenomenon are put forward: either the populations share a common "cultural ancestor" or the trait in question is connected to some functional conditions. The possibility of cultural interaction between the groups is also suggested (Mesoudi 2011: 94–99; Przybyła 2014: 280). The pottery style, as understood

in this paper, is generally regarded as a feature lacking the functional dimension; hence, it can be ruled out that the appearance of the same elements in two different societies results from independent reactions to some other factor, for example, economic or political. Therefore, in this study, analysing the stylistic similarities, I consider two possibilities: a common origin or mutual influences.

These two hypotheses, known as the "branching" and "blending" models, have been discussed in the literature on cultural development processes since at least the middle of the last century (*cf.* Kroeber 1948: 260; overview of the discussion: e.g. Shennan 2002: 83–91; Przybyła 2014: 279–288). The premise of the branching hypothesis is the dominant role of the "vertical" cultural transmission: the similarities and differences among societies result mainly from combined processes of within-group transmission and population fission. This model is therefore illustrated by a phylogenetic tree used in biology to represent relationships of species; the cultural diversity is strongly associated with biological and linguistic patterns (Collard, Shennan, Tehrani 2006: 170; Mendoza Straffon 2019: 153; *cf.* e.g. O'Brien, Darwent, Lyman 2001; Mace, Holden 2005). In contrast, the blending hypothesis emphasizes "horizontal" transmission: the continuous flow of ideas, innovations, goods and cultural practices between populations, the intensity of which is usually conditioned by geographical factors. It is depicted as "a braided stream, with different channels flowing into one another, then splitting again" (Collard, Shennan, Tehrani 2006: 171 – further literature there). Because of these two models, we can expect that vertically transmitted features will appear in a restricted region over a long period, while horizontal transmission will result in a wide geographical distribution of a given trait within a short time horizon (Przybyła 2014: 288).

Numerous studies in the field of archaeology and anthropology have proved that none of the above models is universally applicable and their relevance should be ascertained individually in every case (Collard, Shennan, Tehrani 2006: 180). This approach is well justified by large-scale observations. An analysis of Bronze Age and Early Iron Age cemeteries from the Rhine and Danube River basins showed that – in contrast to the conservative and vertically transmitted funeral rites – the pottery style was easily subject to horizontal cultural transmission and blends into local traditions (Przybyła 2014: 292–294). However, at the level of smaller regions and shorter periods, processes of spreading of pottery styles are not that unambiguous. In the case of pottery production, various studies indicate the vertical transmission of

skills in pre-modern societies, which is associated with the essential role of a long-term relationship between the teacher and learner (*cf.* review in e.g. Shennan 2002: 40, 49–50; Przybyła 2014: 280–281). Hence, it is pointed out that the intergroup transmission of pottery style must rely on a long-term change of residence of the potters; blending can occur by mixing people from different cultural backgrounds in one community (*cf.* Neiman 1995).

Another factor that must be considered in the case of stylistic traits – which are assumed to be adaptively neutral, i.e. lacking the practical function – is so-called cultural drift. This involves a random spreading and fading of cultural features due to independent factors, which, combined with copying errors, can produce a branching effect of cultural traditions. This process is a direct result of vertical cultural transmission; however, it can be affected by horizontal transmission as well: at the level of an individual population, it can manifest through the adoption of "foreign" stylistic traits, which then co-exist with "native" elements. On an intergroup scale, the drift leads to a rapid increase in diversity, which can be inhibited by horizontal transmission, bringing the evolution of culture closer to the blending model (Shennan 2002: 51; Mesoudi 2011: 103–104; Przybyła 2014: 283–284). Therefore, cultural drift intensifies in conditions of limited contact between groups; hence the reduction of diversity in traits that are not clearly functional in nature is most probably connected to the isolation of the population (Przybyła 2014: 287).

An exemplary study concerning this phenomenon is the case of the Woodland period pottery from North America (Neiman 1995). The comparison of archaeological data with a mathematical drift model demonstrated that an intensive intergroup transmission results in a significant stylistic diversity within pottery assemblages and at the same time minor differences between them, while in periods of limited contacts, an internal stylistic impoverishment of local production and deepening of intergroup differences is observed. However, a counterexample should also be mentioned, which concerns Neolithic pottery from a settlement complex in western Germany (Shennan, Wilkinson 2001). The authors of the study demonstrated that the results of the stylistic analysis do not align with the neutral drift model; apparently, the stylistic differentiation must have been influenced by a selection made by anti-conformist potters, who intentionally chose new or rare decoration motifs.

Apart from the above-described mechanisms, the stylistic diversity of pottery in each region can be hypothetically affected by long-distance exchange (*cf.* Kobylińska, Kobyliński 1981: 46–48; Rice 2005: 191–200). However, it is generally accepted that a long-distance (i.e. more than a day's journey)

distribution can only be considered in the case of particularly valuable vessels that played the role of prestige goods. The clay vessels produced on an ad hoc basis for household needs usually did not leave the "native" village. Hence, isolated "foreign" elements occurring in pottery assemblages are not necessarily imports, but rather local products made in a non-local style, which may be associated with the migration of individuals, e.g. as part of marriage exchange (*cf.* Przybyła 2009: 29–31).

Finally, as already indicated in the introduction, it should be emphasized that the distribution of style of material culture cannot be simplistically translated into social networks; the latter had to be more permanent, independent of the popularity of essentially transient styles. However, analyses of material culture can approximate the structure of this network, pointing to the main nodes and links; for this reason, the stylistic diversity is still considered the basis of studying the relationships between past societies (Przybyła 2016: 49).

In the light of the above observations, we can conclude that the presence of a "foreign" style in a region is evidence of intense social contacts, presumably related to the presence of people from a different cultural background, while the lack of obvious similarities between sites from the same period is most likely a manifestation of limited communication. In the latter case, the influence of archaeologically undetectable factors cannot also be excluded, such as intentional selection, functional issues or cultural taboo (*cf.* Rice 2005: 256). For this reason, as already mentioned, the pottery style analysis presented here should be perceived as a certain premise of the past social reality, but its complete reconstruction will require confrontation with other categories of sources.

As already mentioned, from the north, the mid-mountainous Orava River valley was adjacent to an uninhabited area of Orava-Nowy Targ Basin. Hence, it showed stronger connections with the south-western part of the Western Carpathians; in the Late Bronze Age, both regions represented the same cultural phenomenon. It was only in the Early Iron Age that two cultural provinces emerged and the Orava group developed, defined by a specific funeral rite and – which is important in the context of this research – an individual style of pottery production (Čaplovič 1987; Benediková 2006). The analysis discussed above showed that the pottery assemblages from the Orava River valley are characterised by a limited formal spectrum and high homogeneity, with a predominance of the local stylistic tradition. The origins of the Orava group are manifested in the high proportion of the south-western Lusatian style, while the "foreign" elements occur rarely, demonstrating

a loose relationship with the Upper Silesian-Little Poland group and the Eastern Hallstatt culture (*cf.* Benediková 2017: 338–343). Further evidence of interregional, sometimes long-distance contacts, are bronze and iron artefacts (ibid.: 343–351; Danielová 2018). However, it should be noted that, unlike pottery production, the distribution of this category of goods, which were often objects of exchange, did not require a long-term change of residence of craftsmen. It seems therefore, that the situation observed in the Orava River valley in the Early Iron Age fully corresponds to the classic branching model: the local population grew from the common south-western Lusatian "stem", then "fission" occurred, leading to the isolation and – in consequence – to the dominance of the vertical, within-group transmission and the inhibition of the horizontal one. Thus, the cultural drift resulted in the internal unification and stylistic impoverishment of pottery. It should be emphasized that the conservatism in terms of ceramic production does not indicate complete social isolation; however, the regional distinctiveness manifests itself also in the already mentioned funeral rites and the settlement structure, dominated by hillforts (Čaplovič 1987: 109–155; *cf.* Lofajová Danielová *et al*. 2021).

A distinctly different model of cultural development is demonstrated by the Dunajec River valley: relatively wide, offering favourable conditions for settlement, and – connecting the mid-mountain zone with lowlands – constituting one of the few convenient north-south passages in this part of the Western Carpathians. These environmental advantages are reflected in the settlement structure: the settlements were founded on the hills, providing the possibility of controlling the communication route and using diversified economic strategies, as well as on the fertile river terraces (*cf.* Kienlin *et al*. 2010; Przybyła, Skoneczna, Vitoš 2012; Kienlin, Korczyńska, Cappenberg 2014; Markiewicz 2020). In various periods of prehistory, this region saw the coexistence of different cultural traditions, which is visible mainly in the pottery materials (Przybyła 2009: 230–248; Markiewicz 2020; Korczyńska-Cappenberg, Przybyła 2024). In the Early Iron Age, the multidirectional contacts manifested also in numerous deposits of metal artefacts (Żurowski 1927; Przybyła, Korczyńska-Cappenberg, Dzięgielewski 2024). It is worth noting that this syncretism of material culture lies at the root of the postulated local cultural distinctiveness (*cf.* Madyda-Legutko 1995). The analysis performed above showed that considerable stylistic diversity occurs here both within the sites and, interestingly, between them. The network analysis indicated that there are no obvious chronological or cultural correlations between the groups of assemblages. Considering the significant communication role of the Dunajec

River valley, it seems reasonable to interpret these differences in terms of actual social dissimilarities, i.e. as different origins of individual population groups. The pattern of stylistic variety in this region is best explained by a model of a series of independent settlement episodes, which can be defined as "blended branches" or "branched blends": in subsequent periods, various population groups would arrive in the Dunajec River valley, constituting a specific cultural mix, would function here independently for some time, and then, perhaps, leave the area. Therefore, we would observe a lack of settlement stability and, at the same time, a constant influx of new stylistic elements. It should be emphasised here that, in theory, the "anti-drift" model cannot be excluded in this case either, i.e. the diversity resulting from a deliberate selection made by potters intending to distinguish themselves (*cf.* Shennan, Wilkinson 2001); then, settlement continuity would be accompanied by substantial local variety. However, the observations made on a microscale seem to support the model of shorter settlement episodes: at some long-used sites, series of several settlement phases are recognised, stylistically diverse and separated by hiatus periods (*cf.* e.g. Jędrysik *et al*. 2021; Markiewicz 2024).

The easternmost analysed area is characterised by different geographical qualities; the relatively gentle landscape with numerous potential north-south crossings offered favourable conditions for stable settlement. In prehistory, the Polish and Slovakian parts of this region were strongly connected by cultural links (*cf.* Czopek 2005; Przybyła 2009: 188–200), although, the Early Iron Age taxonomic divisions recorded in the research literature seem to coincide with the contemporary political borders (*cf.* Budinský-Krička 1976; Miroššayová 1987; Czopek, Poradyło 2008; Czopek 2009; Trybała-Zawiślak 2019). The analysed pottery assemblages show internal stylistic diversity; however – importantly – the differences between them are rather slight. It seems that a incremental differentiation is noticeable, extending on the north-south axis, linking the cultural zones from the opposite sites of the Western Carpathians and maintaining the chronological sequence. These observations align well with the predictions of the cultural drift model, including a high level of interpopulation transmission, i.e. with the blending hypothesis (*cf.* Neiman 1995). It is therefore difficult to explain the situation in the discussed region in the Early Iron Age differently than by the functioning of a relatively stable settlement network with intensive intergroup contacts, conditioned by geographical proximity and involving some form of continuous – possibly marital – population exchange.

V. CONCLUSIONS

Considering various methodological and theoretical issues, the primary archaeological source, which is pottery, can still provide a reliable basis for the study of past social processes. This statement is particularly meaningful in the face of limited data coming from the mountains. In the case of the Western Carpathians in the Early Iron Age, the analyses of pottery style, based mainly on poorly preserved settlement materials, made it possible to demonstrate the functioning of three different models of local cultural development. The classic branching model is reflected in the Orava River valley: mid-mountainous, narrow and separated in some way, it favoured continuous, independent evolution resulting in stylistic homogeneity. The opposite mechanism was dominant in the eastern part of the Western Carpathians, where the gentle, open landscape with numerous crossings offered conditions for establishing a stable settlement network, connecting different cultural traditions. In this region, the stylistic differentiation took the form of incremental distribution, corresponding to the predictions of the blending hypothesis. Finally, in the Dunajec River valley, defined by its particular importance for trans-Carpathian communication, a combined model is observable, comprising a series of relatively short-lived settlement centres representing various mixes of cultural traditions.

Therefore, the presented study provides another argument against the universality of either of the two hypotheses of cultural development. It is worth emphasizing that in the Western Carpathians, three different models coexisted, functioning in the regions only several dozen kilometres apart. However, a full understanding of the social mechanisms that resulted in the emergence of the observed archaeological picture will require a confrontation of the discussed pottery analysis with other categories of sources.

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