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THE LATE BRONZE AGE POTTERY IN THE SOUTH-EASTERN CARPATHIAN BASIN

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After the abandonment of some of the Middle Bronze Age tell settlements, a series of developments and transformations lead to the construction of mega-forts in the Lower Mureș Region during the 15th c. BC, followed by their subsequent destruction/demise during the 13th c. BC. While most investigations in the aforementioned region have focused on the evolution of the most representative sites, a large number of artefacts, especially the pottery assemblage, have not yet been analysed in detail. The current paper aims to fill this gap by presenting a detailed analysis combining the available radiocarbon dates, the contexts from where these samples were taken, and the associated pottery finds. In this way we could establish time intervals expressed in absolute dates that frame the evolution of certain pottery shapes, decoration techniques and ornamental motifs. As a result of this analysis, it became clear that certain characteristics of the Middle Bronze Age pottery have been perpetuated during the Late Bronze Age. Another important observation was the widespread use of channelled pottery as early as the 16th c. BC within some communities from this region. On the other hand, other communities in the area make extensive use of incised decoration until the 14th c. BC. As a result, two different stylistic areas could be observed in the Lower Mureș Region. The results obtained in this paper underline the drawbacks of traditional relative chronologies based on the evolution of certain artefact types. Therefore, a chronological scheme based on major events taking place in the Lower Mureș Region, established following the analysis of a series of radiocarbon dates, is put forward in this paper.

Keywords: Late Bronze Age, Romania, Hungary, Lower Mureș, pottery, style, absolute chronology.

INTRODUCTION

Various chronological systems have been developed throughout time, systems that had to be subsequently refined as more absolute dates became available. Nowadays, our capacity to make chronological associations between artefacts, contexts, sites and events is strongly influenced by the number of existent radiocarbon dates. The aim of this paper is to establish absolute ranges for the Late Bronze Age pottery in a micro-region belonging to the broader inner Carpathian area: the Lower Mureș. This region lies in a contact area between the Romanian Western Carpathians and the Tisza floodplain, on the lower course of the Mureș River (Fig. 1). Major chronological markers in the region are the development of tell settlements throughout the Middle Bronze Age (MBA; ca. 2000–1600/1500 BC), sites that due to reasons still under debate were abandoned throughout the 16th c. BC, followed by the establishment, at the beginning of the Late Bronze Age (LBA; during the 15th c.), of mega-forts that extend over areas ranging from tens to hundreds and thousands of hectares.[1] Throughout the 13th c., the most representative mega-forts reached the end of their existence (*Gogâltan 2017*; *Gogâltan/Sava 2019*; *Krause et al. 2019*; *Molloy et al. 2020*; *Sava/Gogâltan/Krause 2019*; *Szeverényi et al. 2017*).

The importance of this micro-region is highlighted by the development during the last two decades of several research projects targeted at the investigation of MBA tells (such as Pecica-Șanțul Mare) and LBA mega-forts (Sântana-Cetatea Veche, Cornești-Iarcuri, Gradište Iđoš and Csánadpalota-Földvár). Although certain aspects of the MBA and LBA, such as the internal trajectory of sites, their character and function, have been studied, there are few studies dealing with one of the most essential aspects of this period, namely the absolute dating of the pottery. The lack of a reliable chronology, especially for the LBA, has led to numerous confusions among specialists, while correlating the traditional relative chronologies to the newly available dates is becoming an increasingly difficult, if not impossible, task.

In order to overcome these shortcomings and provide explanations for the profound transformations taking place within Bronze Age society, a new model based on the correlation of absolute dates, the contexts from which they were taken, associated pottery and major events that can be identified in the archaeological record was developed. For the Lower Mureș Basin a database has been compiled that up to the present moment contains over 150 radiocarbon dates, most of them coming from newly

[1] For MBA and LBA, I have used Florin Gogâltan's relative chronological system summarized in *Gogâltan 1999*, 71–78; *2001*; *2015*; *2019*.

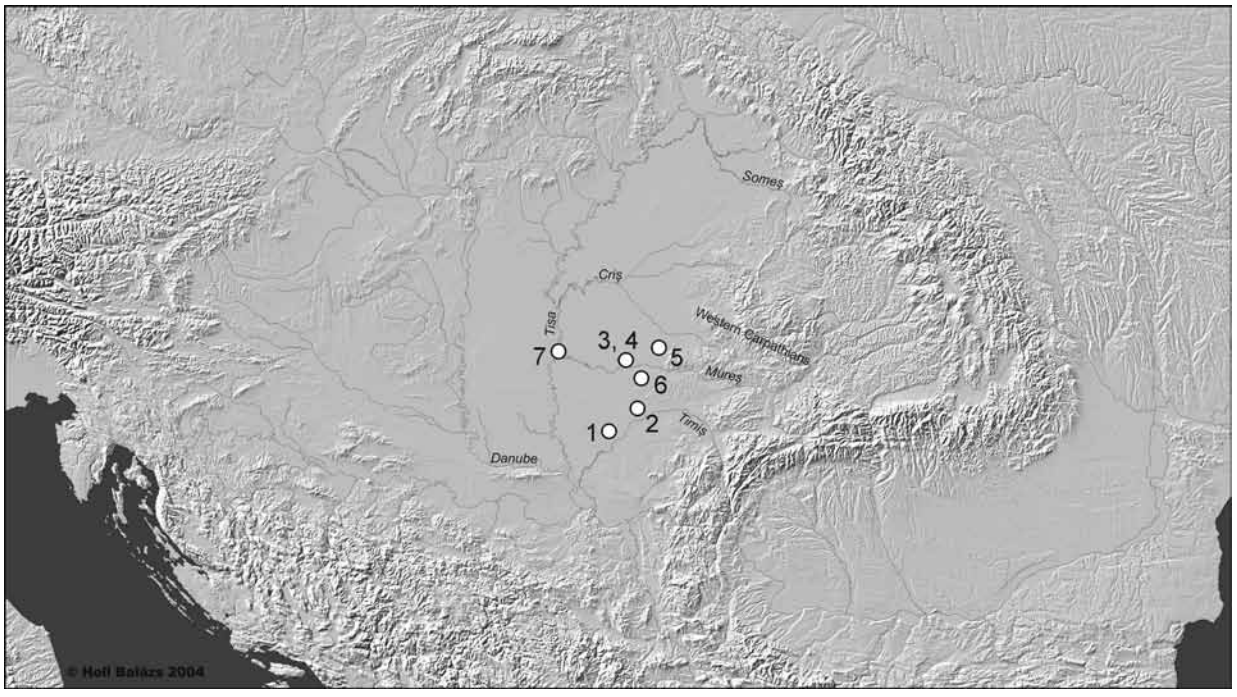

Fig. 1. Map of the Intra-Carpathian region with the sites where the analysed contexts were found. 1 – Foeni-Gomila Lupului; 2 – Giroc-Mescal; 3 – Pecica-Est; 4 – Pecica-Site 14; 5 – Sântana-Cetatea Veche; 6 – Șagu-Site A1_1; 7 – Tápé. The map of the Intra-Carpathian region was realised by H. Balász (http://www.ace.hu/igcp442/maps.html).

excavated LBA sites. However, as most of these sites are still under investigation, or the publication of the results is still in progress, only 39 dates come from published or known contexts with associated artefacts. Only 33 of these 39 contexts (coming from seven sites) have clear correlations between the radiocarbon dates, their contexts and the associated pottery. Most of these dates fall within an interval ranging from the 16th c. to the first half of 13th c. BC, which corresponds with the abandonment of the tell sites, the construction of mega-forts and the end of some of these latter sites.

As is the case with every archaeological phenomenon, the events that took place during the LBA in the Lower Mureș and their material expressions cannot be studied in a coherent manner in the absence of an overview of the main pottery styles distributed in the inner Carpathian region and surrounding areas. The next step is a discussion of the sites and contexts from which the AMS radiocarbon dates have been taken. The results obtained from the association of contexts, pottery and their respective dates will be individually discussed and illustrated. For the first time in the region under study, the typo-chronological analysis of the pottery will be combined with the study of the features where the pottery was uncovered and the absolute dating of each feature. The approach and interpretation of the data suggested here diverge from previous views regarding LBA chronology, allowing at the same time for new answers to be given to a complex issue. The analysis also results in an unambiguous chronological scheme regarding the pottery evolution in this region, despite the considerable variety in pottery form and decoration between contemporary sites located in relative geographic proximity.

SETTING AND BACKGROUND

Late Bronze Age in the Lower Mureș

The gradual abandonment of tell settlements after ca. 1600 BC coincides with the appearance of new settlements and cemeteries that are assigned to the LBA (*Gogâltan 2015*, 72, 73; *Sava/Gogâltan 2019*). As proven by recent radiocarbon dates collected from some tells located in the Lower Körös Basin (*Duffy et al. 2019*, tab. 3; fig. 4), as well as from MBA cemeteries in the Lower Mureș Basin such as Ostojićevo-Stari Vinogradi (*O'Shea et al. 2019*, fig. 3), the evolution of certain MBA sites continues long after the majority of tells have been abandoned. At the same time, there are proofs that during 1550–1450 BC the European continent experienced a substantial population increase (*Capuzzo et al. 2018*) that most likely had a significant impact on the Lower Mureș. Based on the available evidence, it can be stated that the

abandonment of tell settlements and the emergence of new settlements should be seen as a continuation of certain MBA traditions mixed with a series of Central-European influences on the material culture of the region, as well as on the local burial customs (*Sava/Gogâltan 2019*; *Sava/Ignat 2016*, 195, 196). This evidence also points towards an internal evolution of local communities that integrate and internalize a series of transformations occurring at a macro-regional level. A similar phenomenon, internal evolution towards a higher socio-political complexity, has also been recently demonstrated to have taken place in other European regions (*Cavazzuti et al. 2019*). During this chronological phase – LBA I (ca. 1600/1550–1450 BC) we are witnessing a reorientation of the settlement network towards the foothills of the Apuseni Mountains, possibly due to the flow of raw materials from the mountain region to the low flatlands. Even though some settlements from this phase are fairly large, reaching up to 40 ha in size (for example, Pâncota-Site 16), there are no fortified settlements at this stage. It seems that in some settlements, such as Șagu-Site A1_1, intense metallurgical and agricultural activities were being conducted (*Sava/Hurezan/Mărginean 2011*, 50–55, 74; *2012*). Although during this period bronze artefacts are widespread, finds from the biritual cemetery in Pecica-Site 14 stand as proof that large numbers of bronze artefacts were being accumulated in only a few graves (*Ignat/Sava 2019*, 14, 15, fig. 11). Furthermore, the process of increasing social stratification that had its modest debut during the MBA becomes more salient during this period, as evidenced by marked differences in grave offerings, with hereditary social inequality being attested in the cemetery from Pecica-Site 14 (*Sava/Andreica 2013*, 65). It appears that in the region here under study there are two main types of cemeteries: on the one hand, in the lowlands of the Banat plain we have cremation cemeteries typical for the Cruceni-Belegiš area such as the ones at Livezile (*Gogâltan 1998*) and Cruceni (*Radu 1971*; *1973*), on the other hand, in the Mureș Valley biritual cemeteries are the norm, such as the ones at Pecica-Site 14 (*Ignat/Sava 2019*) and Tápé-Széntéglaégető (*Trogmayer 1975*), where inhumation graves are predominant. Although the LBA I society continues certain MBA traditions, we can't help but notice that the new communities adapt to the new norms of the period. This entails the adoption of a new type of weapon, the sword, along with all the associated social connotations, such as the construction of a warrior identity (*Sava/Ignat 2014*, 18–29). The new social transformations taking place after the abandonment of the tell settlements, such as the widespread distribution of new occupations (warriors, metalworkers, etc.), heightened social stratification, population increase, greater uniformity in material culture over large areas and possibly an increase in long-distance trade and exchange with ever more distant regions gradually led to the emergence of one of the most impressive societies in the prehistory of the Carpathian Basin: that of the mega-forts.

In the Lower Mureș, after the abandonment of tell settlements, around 1450 BC, complex fortification systems that in some instances enclose areas of hundreds or thousands of hectares were being built. These fortifications span the entire LBA II (ca. 1450–1250 BC). Some of the most representative mega-forts are Cornești-Iarcuri (whose fortifications enclose an area of 1765 ha; *Krause et al. 2019*) and Sântana-Cetatea Veche, a site that stands out due to its rich assemblage, even if the fortified area covers only 130 ha (*Gogâltan/Sava 2010*; *Gogâltan/Sava/Krause 2019*). A main feature of these mega-forts is the presence of multiple defensive elements consisting of impressive earthen ramparts, palisades or even walls constructed on top of the earthen ramparts and one or two ditches up to 10 m wide and almost 3 m deep. Besides the two aforementioned mega-forts, the fortifications in Gradište Iđoš (*Molloy et al. 2020*) and Csánadpalota-Földvár (*Szeverényi et al. 2017*) should also be mentioned. The last two sites have a rather small central enclosure (up to 7 ha) surrounded by a network of ditches that enclose an area of up to 400 ha in size. Although less numerous than the MBA tells, mega-forts are also constructed in the floodplains, sometimes in the proximity of former tells (for example Sântana, Munar, Cornești). Even though archaeological excavations at these immense sites have mostly focused on their fortification systems, the application of non-invasive investigations such as geophysical surveys and LIDAR scanning coupled with test trenches have allowed for the reconstruction of the settlement structure and inner layout of these mega-forts. By far the most impressive results have been obtained at Sântana-Cetatea Veche, where 29 buildings ranging in size from 50 to 1700 m^2 have been identified so far (*Gogâltan/Sava/Krause 2019*, 199, 200, fig. 7–10). Furthermore, gold, bronze, faience and glass artefacts uncovered at Sântana are indicative of intense craft activities being conducted at the site, doubled by the engagement of the mega-fort in long-distance trade and exchange networks. Dense networks of unfortified sites, some of them dating back to the LBA I, surround these mega-forts (*Sava/Ignat 2016*, fig. 16). While most settlements are scattered over areas ranging from 7/8 to 25 ha, there are also much smaller settlements such as the one from Șagu-Site 2 that covers an area of only 2,1 ha. Archaeological excavations undertaken in the region have revealed that on some of these settlements, such

as the one from Șagu-Site A1_1 intense craft activity (especially metalworking and pottery manufacture) were undertaken besides agriculture (*Sava/Hurezan/Mărginean 2011*, 50–63). A further example is the Szőreg C settlement that has yielded clear evidence of intense metalworking (*Fischl 2000*, fig. 20; 21; *Mozsolics 1985*, 196, 197, tab. 273; 274). Long and medium-distance trade and exchange coupled with a rich metallurgical and agricultural production have led to an unprecedented accumulation of wealth during the LBA II that finds its material expressions in the numerous gold and bronze hoards and single finds of the period (*Boroffka/Luca 1995*, 225, 226, fig. 1: 15; *Dömötör 1897*, 264; *Dörner 1970*, 460, fig. 14: 4; *Gogâltan/Sava 2014*; *Kacsó 1993*; *2015*, 30, 31, fig. 4: 6–9; *Kemenczei 1991*; *Mureșan/Caba 2007*; *Petrescu-Dîmbovița 1977*, 64, 102, 107, 119, 157, pl. 55: 1–11; 186: 17, 18; 187; 277: 14–16; 374: 8–10; *Soroceanu 2012*, 122, 123, note 46, taf. 45: 2; 46: 6, 8; 47: 2, 6). The funerary finds of this interval are represented by the second phase of the cemeteries from Pecica-Site 14 and Tápé (*Trogmayer 1975*),[2] alongside some isolated finds and smaller burial grounds (*Foltiny 1957*; *Ignat/Sava 2019*, 8; *Nagy 2005*). The burial mounds from Susani were probably erected around 1400 BC (*Diaconescu et al. 2018b*, 27), while pottery depositions of the type encountered at the mound from Susani-Grămurada lui Ticu (*Stratan/Vulpe 1977*, 46–53) are generally later than the actual period of use of these mounds as burial grounds.

The constant flow of copper and tin led to a widespread distribution and availability of bronze artefacts during LBA II. This is why the control of trade routes and the defence of redistribution centres were the main priorities of the period (*Kristiansen/Suchowska-Ducke 2015*, 369–373). In the context of a growing need of defending these immense mega-forts, protecting the trade routes or maintaining the status quo within society, the prestige and importance of professional warriors grew (*Krause 2019a*). This is expressed in the material record by a marked increase in the number of weapons (*Gogâltan/Sava 2018*; *Sava/Ignat 2014*). Archaeological investigations of the fortification system from Sântana have brought to light evidence suggesting the existence of multiple violent conflicts culminating in a final siege that ultimately led to the destruction of the fortifications towards the end of the 14th c. or the beginning of the 13th c. BC (*Gogâltan/Sava/Krause 2019*, 209, fig. 22–24; *Sava/Gogâltan/Krause 2019*, 170–174). A rather similar situation is encountered at Cornești, where a succession of violent events could be documented beginning with the 15th c. BC that continue throughout the 14th c. BC and ultimately lead to the abandonment of the first two fortification rings in the first half of the 13th c. BC (*Lehmphul et al. 2019*, 273–275, tab. 8).

As a result of the destruction of the mega-forts from Sântana and Cornești and the abandonment of LBA I and II settlements, the Late Bronze Age society of the Lower Mureș underwent major transformations. So far, there are only isolated instances where continuity in settlement from the preceding phase could be documented. This is the case for example at Cornești-Iarcuri, where there are some indications that the area of the fortification was used until the Early Iron Age (EIA); however, the intensity of use decreased dramatically compared to earlier periods, and there are breaks in the occupation of the site (*Lehmphul et al. 2019*, 275, 276, tab. 9); at Gradište Iđoš, following an intense use-period of the site during the LBA, the settlement was re-settled during the EIA after a break of almost two centuries (*Molloy et al. 2020*, 15–17, tab. 3). At the same time, during LBA III there is a significant decrease in the number of settlements and bronze hoards. This phase is insufficiently documented in the Lower Mureș especially due to the dearth of archaeological finds that could be assigned to this interval. However, beginning with the end of the 12th c. BC, new power centres emerge in Transylvania (*Bălan 2013*; *Hansen 2019a*; *Uhnér et al. 2019*; *Vasiliev/Aldea/Ciugudean 1991*).

Pottery styles of the Late Bronze Age

The relative chronology of the LBA in the inner Carpathian area has been divided into three or four distinct phases, depending on the scholars who devised the respective schemes (*Ciugudean 2010*, fig. 4; *Gogâltan 2001*, 196–199; *2019*, 49–57; *Kacsó 1990*; *Kemenczei 1984*, 87–96; *Marta 2009*, 104; *Popa/Totoianu 2010*, 240–250, tab. 1; *Przybyła 2009*, 54–58; *Sava/Gogâltan 2019*; *Sava/Ignat 2016*, 192–196). Recent studies have tried to incorporate, more or less successfully, the new radiocarbon dates into the existing relative chronologies (*Ciugudean/Quinn 2015*; *Ciugudean et al. 2019*; *Gogâltan 2019*; *Harding/Kavruk 2013*). The newly available radiocarbon dates have also led to substantial revisions of the chronological framework of the LBA, resulting in some instances to the traditional chronology being pushed back up to 300 years (Fig. 2).

The gradual social and economic transformations that occurred after ca. 1600 BC, such as the end of tell settlements in western Romania (*Gogâltan 2017*, 36, 37), the development of new settlements and cemeteries, the gradual change of burial customs

[2] Another cemetery with a similar evolution to those from Tápé and Pecica-Site 14 is located in Velebit, in the immediate vicinity of our study region (*Kapuran 2019*).

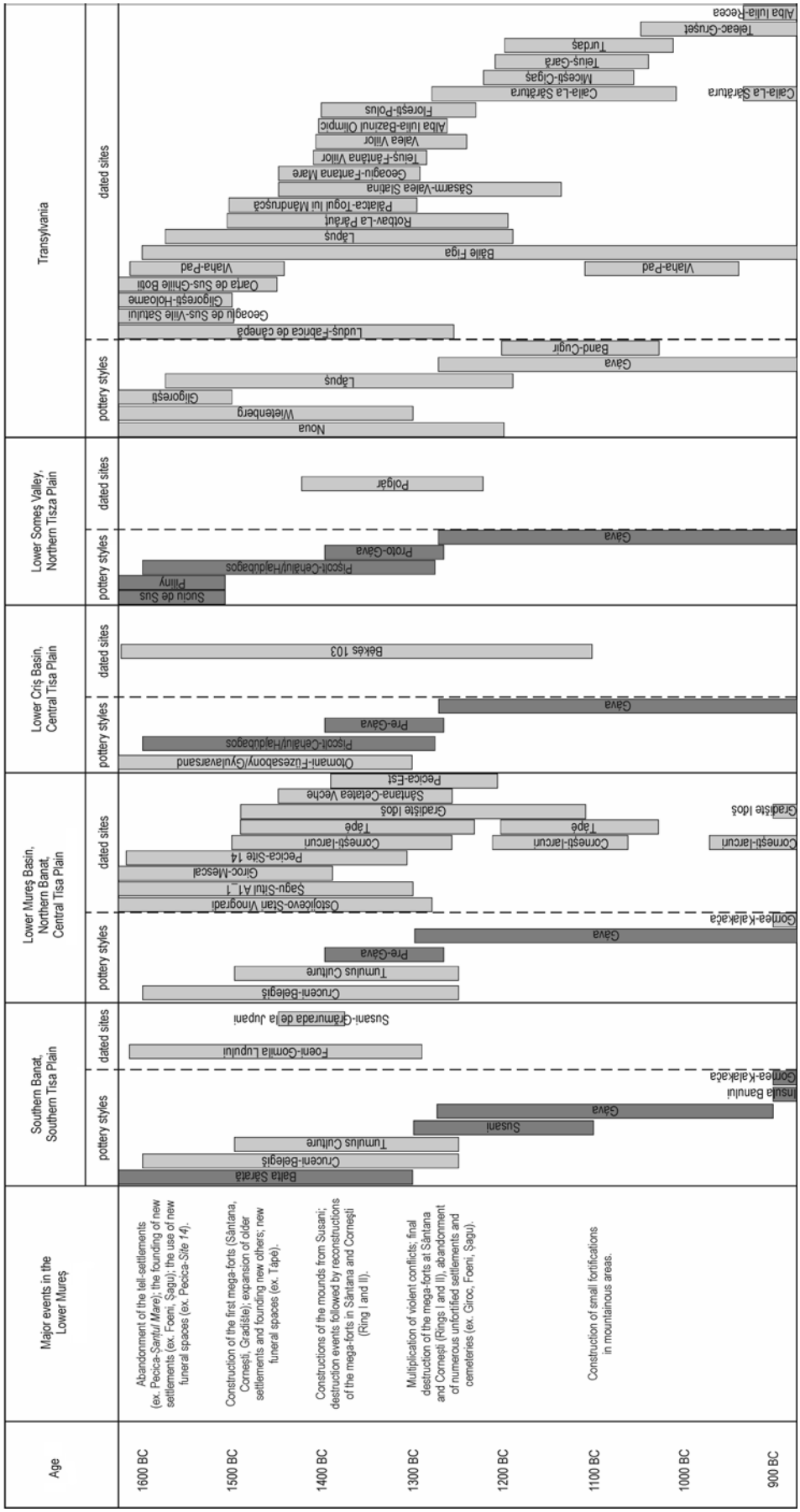

Fig. 2. Chronological scheme of the LBA from the Intra-Carpathian region and surrounding areas. In light grey – pottery styles and sites with absolute dates; in gray – pottery styles for which no (or only a few) absolute dates are available. Graphic by the author. The radiocarbon dates used for drawing this table were taken from the works referenced throughout this paper; additionally, the dates from the salt works at Băile Figa, Săsarm-Valea Slatina and Caila-La Sărătura published in *Harding/Kavruk 2013* were also used. The ranges illustrated represent the calibrated values (2σ) of the radiocarbon data, or as the case may be their sums.

(*Motzoi-Chicideanu 2011*, 561–672), the unprecedented developments in metallurgy (*Petrescu-Dîmbovița 1977*), and considerable innovations in agriculture (*Filipović et al. 2020*; *Stika/Heiss 2013*), are also reflected in the appearance of new pottery styles. The Cruceni-Belegiš I[3] pottery style, which in certain aspects represents a continuation of some MBA pottery traditions, develops in Banat between 1600 and 1400 BC. Characteristic shapes are biconical pots, dishes and cups with high handles rising above the rim. The typical ornamental motifs consist of incised arches and garlands, displayed horizontally or in zigzagged lines, as well as horizontal and vertical rows of pseudo-cord decoration (*Gumă 1993*, 150–153; *1997*, 55–57). Parallel to the evolution of Cruceni-Belegiš (or possibly slightly earlier) is the development of the so-called Balta Sărată pottery style, spreading from the piedmont of Banat all the way to Transylvania. Despite the fact that the complete pottery assemblage characteristic for the first phases of this style is hard to define, it seems that pots and certain types of dishes were among the typical pottery shapes, while the diagnostic decoration is represented by successive stitches and triangular impressions, and, more seldom, channelling – a decoration technique that becomes more frequent during the later phases (*Gumă 1997*, 49, 50). In north-west Romania (Crișana, the Someș plain and Sătmar lowlands), Slovakia and north-east Hungary, the Suciu de Sus, Pișcolt-Cehăluț/Hajdúbagos and Piliny pottery styles that continue MBA ceramic traditions are encountered at this stage, with channelled decoration being frequently employed in all these groups (*Furmánek 1977*, 299–314; *Furmánek/Veliačik/Vladár 1991*, 138–145; *Kacsó 1990*; *Kemenczei 1984*, 16–19; *Marta 2009*, 87–93; *Marta et al. 2010*, 65–69; *Németi 2009*, 212, 213; *Pop 2009*, 14–24). In the central and southern Tisza Plain there are western influences from the Tumulus Culture circle (*Sánta 2011*, 521–523; *2017*, 102, 103; *Trogmayer 1975*). In Transylvania the MBA pottery of Wietenberg type continues to be in use until ca. 1300 BC, even if after 1600 BC the Noua pottery style spreads in eastern Transylvania, in the foothills of the south-eastern Carpathians, in central and northern Moldavia as well as in the northern Moldavian Republic (*Bălan/Quinn/Hodgins 2016*, 86, 87; *Boroffka 1994*, 289, 290; *Ciugudean/Quinn 2015*; *Quinn et al. 2020*; *Sava E. 2002*, 216, 218–220). The cultural synthesis between late Wietenberg and Noua is known as "Gligorești" in the academic literature (*Gogâltan/Popa 2016*, 197, 198).

The rise of mega-forts in the Lower Mureș during the 15th c. (*Gogâltan/Sava 2010*; *Gogâltan/Sava/Krause 2019*; *Krause et al. 2019*; *Lehmphul et al. 2019*; *Molloy et al. 2017*; *Sava/Gogâltan/Krause 2019*; *Szeverényi et al. 2017*) is relatively parallel to the evolution of the Cruceni-Belegiš II phase. This pottery style is characterized by the continued use of the main pottery shapes of the previous phase, with a marked increase in the use of horizontal and vertical channellings or channellings displayed in a garland pattern. In Crișana and south-western Transylvania we encounter the Igrița pottery style (*Andrițoiu 1992*, 69–72; *Chidioşan/Emődi 1982*; *1983*). In the foothills of the Banat region, the final phases of the Balta Sărată group are encountered at this time, characterized by the adoption of new shapes such as biconical vessels, biconical dishes, and cups with high arched handles; although incised and stitched ornaments are still encountered, channelled decoration becomes more widespread (*Gumă 1993*, 163–166; *1997*, 64). In the Sătmar and Carei plains (north-western Romania), the Suciu de Sus and Pișcolt-Cehăluț/Hajdúbagos pottery styles continue their evolution, making extensive use of channelled decoration (*Marta 2009*, 38, 39; *Németi 2009*, pl. 1; 2). Parallel to the rise of mega-forts on the Lower Mureș, the Lăpuș pottery style makes its appearance in the mountainous regions of north-western Romania (*Kacsó 2001*; *2011*; *Metzner-Nebelsick/Kacsó/Nebelsick 2010*, 225). Where the Mureș flows into the Tisza and in the southern Tisza Plain the influence of the Tumulus Culture continues until probably the end of the 14th c. BC, or even the first part of the 13th c. BC, through the Tápé cemetery.[4] At the same time, the pottery known as Pre-Gáva starts to spread in the central Tisza Plain and the Lower Körös Basin, while in the north-eastern Tisza Plain the Proto-Gáva group is encountered (*Szabó 2017*). Between 1300–1200 BC the first elements of the Gáva or Gáva-Holihrady pottery style make their appearance in northern Romania, north-eastern Hungary, northern Moldavia and the Lower Mureș Basin (*László 2019*; *Metzner-Nebelsick 2012*, 67; *Metzner-Nebelsick/Kacsó/Nebelsick 2010*, 223). The defining characteristics

[3] For a short research history regarding the Cruceni-Belegiš style see *Gumă 1993*, 150–157 and *Stavilă 2012*, 32, 33. The pottery here defined as Cruceni-Belegiš is known in Serbia as Belegiš, while its later phase is termed Belegiš-Gáva (see *Tasić 1984*; *2001*), or just Gáva (*Bukvić 2000*).

[4] Among the AMS radiocarbon dates published in *O'Shea et al. 2019* there is also the sample UGAMS-30830 taken from the cremation grave 188 that offers a very late date 1209–1038 cal BC (2σ) – therefore the possibility that this cemetery was in use also during the 12th–11th centuries, even if most burials are dated to the 15th–14th centuries BC. A similar situation is encountered at Békés-Site 103 in the Lower Körös Basin, where the cemetery was in use for a long period of time, until the 11th c. BC (*Duffy et al. 2019*, fig. 4).

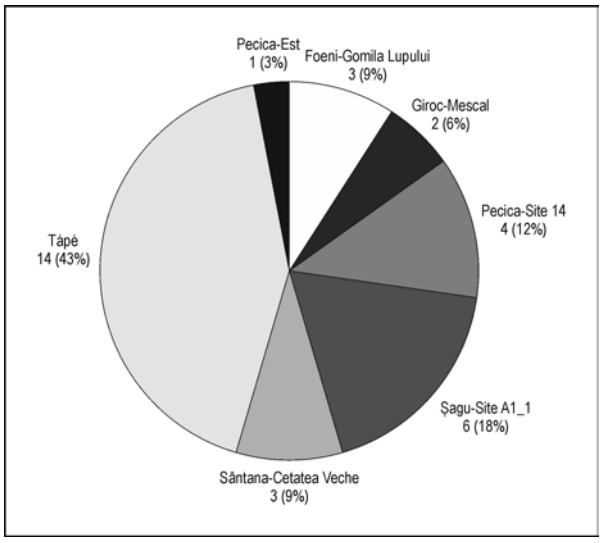

Fig. 3. Distribution of the number of contexts by site. Graphic by the author.

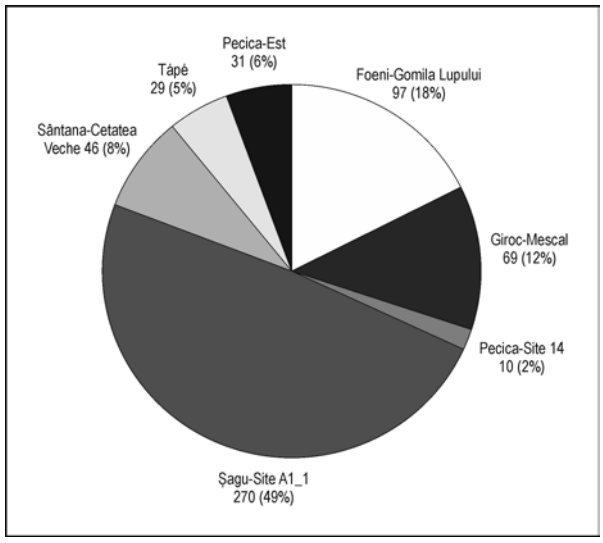

Fig. 4. Distribution of the number of pottery sherds by site. Graphic by the author.

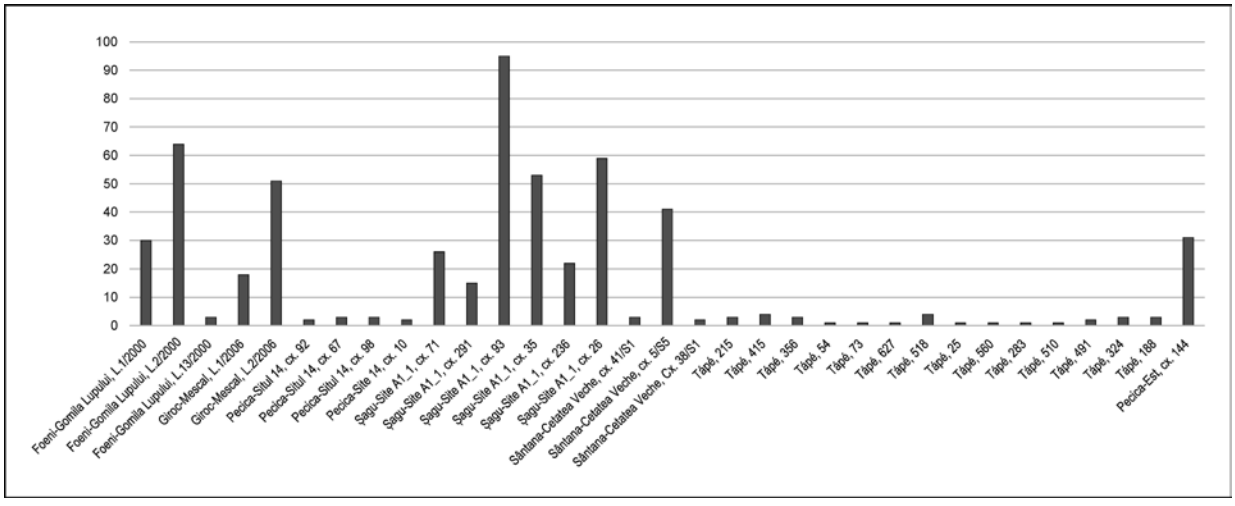

Fig. 5. Distribution of the number of pottery sherds by context and site. Graphic by the author.

of this style are an exponential increase in the use of channelled or fluted decoration and a new technique of firing pottery that leads to the vessels having shining black outer surfaces and red or brick-red inner surfaces. After 1100 BC this pottery style also spreads to Transylvania. East of the Carpathians this group is sometimes being referred to as the Chișinău-Corlăteni pottery style (*Bader 2012*; *Ciugudean 2012*; *Kósa 2018*; *László 1994*; *Leviţki 1994*; *Metzner-Nebelsick 2012*; *Pankau 2004*; *Szabó 2017*). These are the dominating pottery styles in the aforementioned regions until 900–800 BC. It should be mentioned that during the time period between 1300 and 1100 BC, the Bobda-Susani pottery style is encountered in Banat (*Diaconescu et al. 2018a*, 131, 132; *2018b*, 29, 30; *Gumă 1993*, 168–180; *Stratan/Vulpe 1977*, 46–53), which for a while has a parallel evolution to the early Gáva pottery in the Lower Mureș and northern Tisza Plain. In Transylvania, during 1200–1050 BC we encounter the Cugir-Band group characterized by an increased use of combed decoration, Kammstrich (*Ciugudean et al. 2019*).

METHODS

In establishing an absolute chronology of the Lower Mureș micro-region, data coming from the radiocarbon dating of 33 features originating from seven sites has been compiled; in total, these features entailed 552 complete vessels and pottery sherds (Fig. 3–5). These finds were then organized

Tab. 1. List of the LBA radiocarbon dates from the Lower Mureș Basin.

No.	Site	Feature no.	Site type	Context type	Lab no.	Age C^{14} [BP]	±	Calibration value 2σ	Mean	Material	References
1	Foeni-Gomila Lupului	L.13/2004	settlement	pit	Beta-256559	3300	40	cal BC 1684–1498	cal BC 1576	charcoal	*Szentmiklosi 2009*, 108, 222
2	Foeni-Gomila Lupului	L.2/2000	settlement	pit	Beta-256558	3170	50	cal BC 1533–1368	cal BC 1446	charcoal	*Szentmiklosi 2009*, 106, 107, 212
3	Foeni-Gomila Lupului	L.1/2000	settlement	pit	Beta-256557	3100	40	cal BC 1449–1260	cal BC 1354	charcoal	*Szentmiklosi 2009*, 106, 211
4	Giroc-Mescal	L.2/2006	settlement	pit	Beta-256562	3360	40	cal BC 1746–1531	cal BC 1653	charcoal	*Szentmiklosi 2009*, 109
5	Giroc-Mescal	L.1/2006	settlement	pit	Beta-256561	3180	40	cal BC 1530–1386	cal BC 1457	charcoal	*Szentmiklosi 2009*, 108, 109
6	Pecica-Est	cx. 144	settlement	pit	RoAMS 996.80	3038	28	cal BC 1396–1215	cal BC 1293	animal bone	unpublished
7	Pecica-Situl 14	cx. 92	cemetery	grave	DeA 5017	3279	38	cal BC 1642–1493	cal BC 1560	human bone	*Sava/Ignat 2016*, fig. 4; 6
8	Pecica-Situl 14	cx. 67	cemetery	grave	DeA 5019	3271	49	cal BC 1659–1439	cal BC 1553	human bone	*Sava/Ignat 2016*, fig. 4; 5
9	Pecica-Situl 14	cx. 98	cemetery	grave	DeA 5018	3185	38	cal BC 1531–1392	cal BC 1461	human bone	*Sava/Ignat 2016*, fig. 4; 6
10	Pecica-Situl 14	cx. 10	cemetery	grave	RoAMS 988.80	3104	28	cal BC 1431–1291	cal BC 1361	human bone	unpublished
11	Sântana-Cetatea Veche	cx. 38/S1	fortification	ditch	MAMS 33948	3131	23	cal BC1487–1306	cal BC 1411	animal bone	*Sava/Gogâltan/Krause 2019*, tab. 1; fig. 5
12	Sântana-Cetatea Veche	cx. 41/S1	cemetery	grave	MAMS 33945	3118	23	cal BC1438–1303	cal BC 1395	human bone	*Sava/Gogâltan/Krause 2019*, tab. 1; fig. 9
13	Sântana-Cetatea Veche	cx. 5/S5	fortification	palisade debris	MAMS 37712	3081	19	cal BC 1410–1286	cal BC 1343	charcoal	*Gogâltan/Sava/Krause 2019*, tab. 1
14	Sântana-Cetatea Veche	cx. 5/S5	fortification	palisade debris	MAMS 37711	3055	20	cal BC 1397–1236	cal BC 1324	charcoal	*Gogâltan/Sava/Krause 2019*, tab. 1
15	Șagu-Site A1_1	cx. 71	settlement	pit	RoAMS 992.80	3312	26	cal BC 1660–1517	cal BC 1581	animal bone	unpublished
16	Șagu-Site A1_1	cx. 291	settlement	pit	RoAMS 995.80	3275	30	cal BC 1626–1497	cal BC 1557	animal bone	unpublished
17	Șagu-Site A1_1	cx. 93	settlement	pit	RoAMS 993.80	3204	28	cal BC 1526–1422	cal BC 1472	animal bone	unpublished
18	Șagu-Site A1_1	cx. 35	settlement	pit	RoAMS 991.80	3185	33	cal BC 1521–1406	cal BC 1461	animal bone	unpublished
19	Șagu-Site A1_1	cx. 236	settlement	pit	RoAMS 994.80	3177	29	cal BC 1505–1408	cal BC 1454	animal bone	unpublished
20	Șagu-Site A1_1	cx. 26	settlement	pit	RoAMS 990.80	3079	29	cal BC 1416–1265	cal BC 1342	animal bone	unpublished
21	Tápé	215	cemetery	grave	UGAMS 30831	3170	25	cal BC 1500–1410	cal BC 1447	human bone	*O'Shea et al. 2019*, tab. 3
22	Tápé	415	cemetery	grave	UGAMS 30834	3160	20	cal BC 1497–1406	cal BC 1436	human bone	*O'Shea et al. 2019*, tab. 3
23	Tápé	356	cemetery	grave	UGAMS 30833	3140	20	cal BC 1455–1319	cal BC 1420	human bone	*O'Shea et al. 2019*, tab. 3
24	Tápé	54	cemetery	grave	UGAMS 30829	3130	20	cal BC 1447–1309	cal BC 1411	human bone	*O'Shea et al. 2019*, tab. 3
25	Tápé	73	cemetery	grave	UGAMS 23656	3128	24	cal BC 1451–1303	cal BC 1407	human bone	*O'Shea et al. 2019*, tab. 3
26	Tápé	627	cemetery	grave	UGAMS 30840	3120	20	cal BC 1437–1304	cal BC 1400	human bone	*O'Shea et al. 2019*, tab. 3
27	Tápé	25	cemetery	grave	UGAMS 2655	3117	24	cal BC 1440–1301	cal BC 1393	human bone	*O'Shea et al. 2019*, tab. 3
28	Tápé	518	cemetery	grave	UGAMS 23659	3115	25	cal BC 1438–1299	cal BC 1390	human bone	*O'Shea et al. 2019*, tab. 3
29	Tápé	560	cemetery	grave	UGAMS 30839	3110	25	cal BC 1435–1297	cal BC 1381	cremated human bone	*O'Shea et al. 2019*, tab. 3
30	Tápé	283	cemetery	grave	UGAMS 30832	3090	20	cal BC 1416–1291	cal BC 1345	human bone	*O'Shea et al. 2019*, tab. 3
31	Tápé	510	cemetery	grave	UGAMS 30838	3070	20	cal BC 1407–1276	cal BC 1341	human bone	*O'Shea et al. 2019*, tab. 3
32	Tápé	491	cemetery	grave	UGAMS 30836	3060	20	cal BC 1402–1262	cal BC 1337	human bone	*O'Shea et al. 2019*, tab. 3
33	Tápé	324	cemetery	grave	UGAMS 23657	3055	24	cal BC 1403–1258	cal BC 1322	human bone	*O'Shea et al. 2019*, tab. 3
34	Tápé	188	cemetery	grave	UGAMS 30830	2920	20	cal BC 1209–1038	cal BC 1113	cremated human bone	*O'Shea et al. 2019*, tab. 3

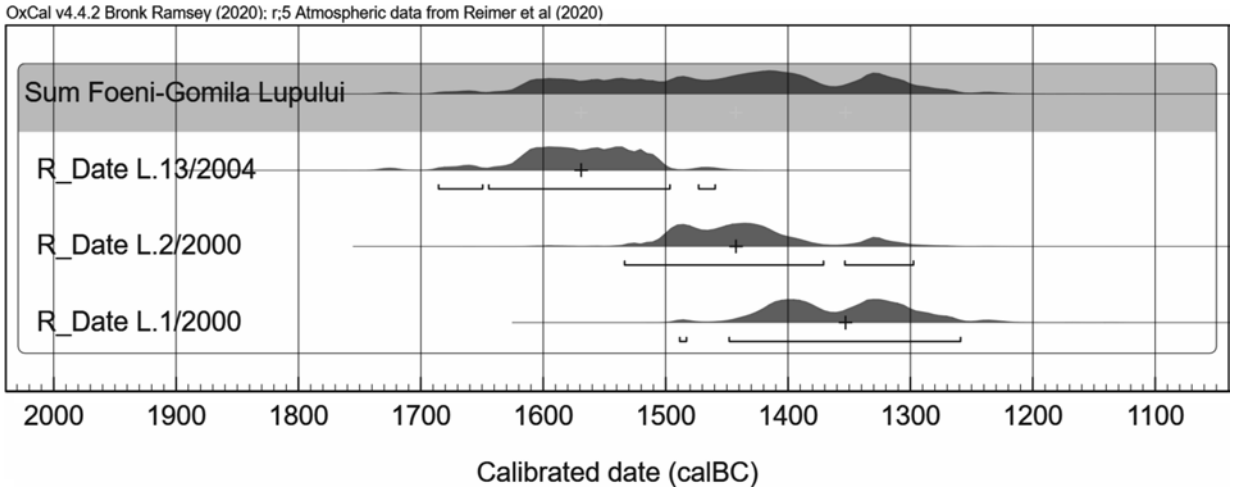

Fig. 6. The calibrated AMS dates from Foeni-Gomila Lupului. Graphic by the author.

in a database that contains fields for recording all the main morphological features of the pottery (shape and decoration) alongside technological properties (decoration techniques). This allowed for the construction of seven query criteria: 1. shapes; 2. decoration techniques; 3. association of decoration techniques; 4. association of shapes and decoration techniques; 5. ornamental motifs; 6. association of ornamental motifs; 7. association of shapes and ornamental motifs, all of them being displayed by site, context and absolute dating. This database was designed in order to be updated as soon as new absolute dated contexts are available. For each type and subtype resulted from querying the database using the aforementioned seven criteria, the associated AMS radiocarbon data were then calibrated, mention being made of their sums, and then displayed according to each context that contains the respective types and subtypes. In order to determine the use-period of each type and subtype, the 2σ calibrated values were taken into account. At the same time, each query criterion was displayed according to the chronological distribution of each type and subtype and according to their frequency within a limited time span (for example 1500–1400 BC) established through the mean interval of the 2σ calibrated value of each AMS date. In order to provide a proper overview of the correlation between pottery evolution and main events (abandonment of tell settlements, construction and destruction of mega-forts), the latter were marked in the tables depicting the chronological distribution of the pottery (Fig. 27; 29; 32; etc.).

The sites and the contexts

As a direct result of numerous research projects undertaken in the Lower Mureș during the last decades, a considerable number of radiocarbon dates is now available. Unfortunately, only a couple of these dates are associated with a clear find context and pottery assemblages. Therefore, only 34 radiocarbon dates coming from seven sites could be recorded in the database (Fig. 6–15; Tab. 1). Each of these sites will be described in the following paragraphs in alphabetical order, along with the find contexts from where the radiocarbon samples have been taken.

Foeni-Gomila Lupului

This site was investigated in 1994 by F. Gogâltan, who partially excavated the MBA settlement (Foeni-Gomila Lupului I). In the immediate vicinity of the MBA site, A. Szentmiklosi excavated four trenches and three smaller units during 2000 and 2004, thus discovering a LBA settlement (Foeni-Gomila Lupului II). Unfortunately, no complete report is available for any of these investigations; therefore, no comment can be made regarding the chronological relation between the two settlements. The excavation campaigns from 2000 and 2004 have led to the discovery of ca. 20–30 LBA features (*Szentmiklosi 2009*, 209–228). It seems that this settlement can be dated to the time period 1600–1300 BC (Fig. 6), although it is likely that the settlement was established during the MBA, as suggested by the excavation campaign from 1994. The radiocarbon

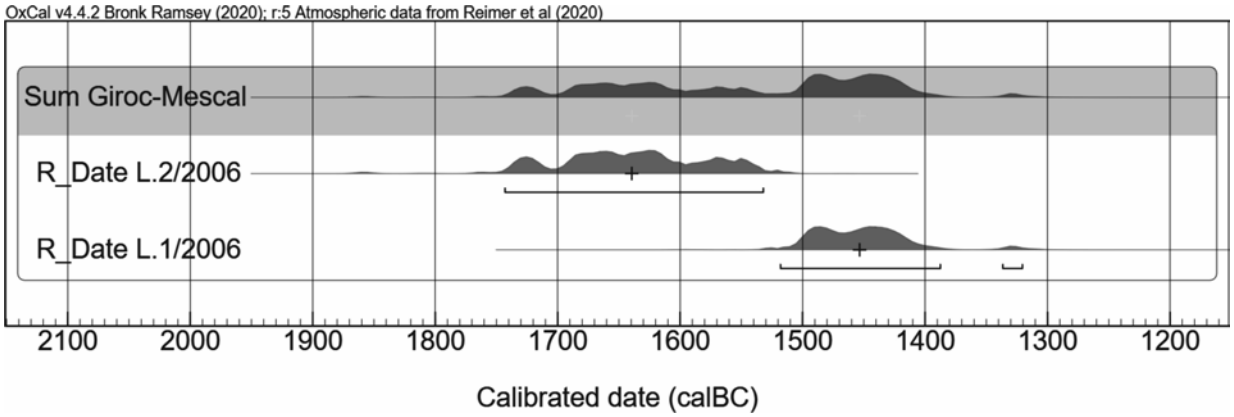

Fig. 7. The calibrated AMS dates from Giroc-Mescal. Graphic by the author.

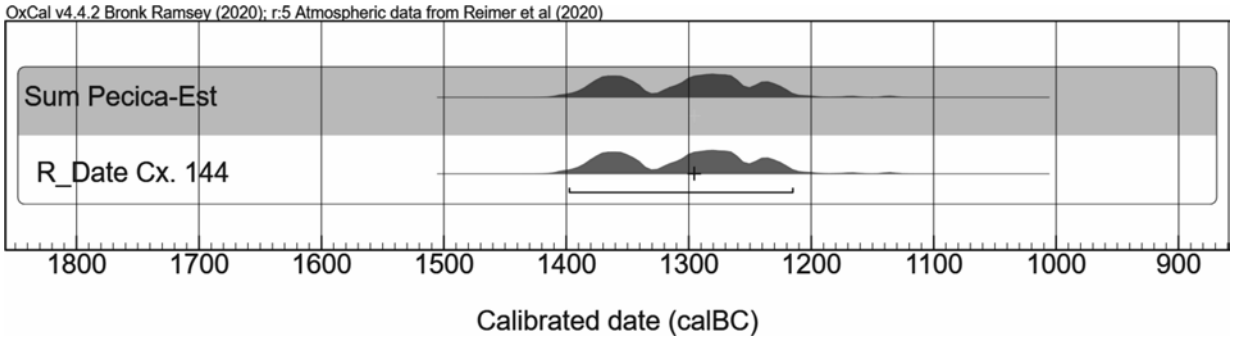

Fig. 8. The calibrated AMS dates from Pecica-Est. Graphic by the author.

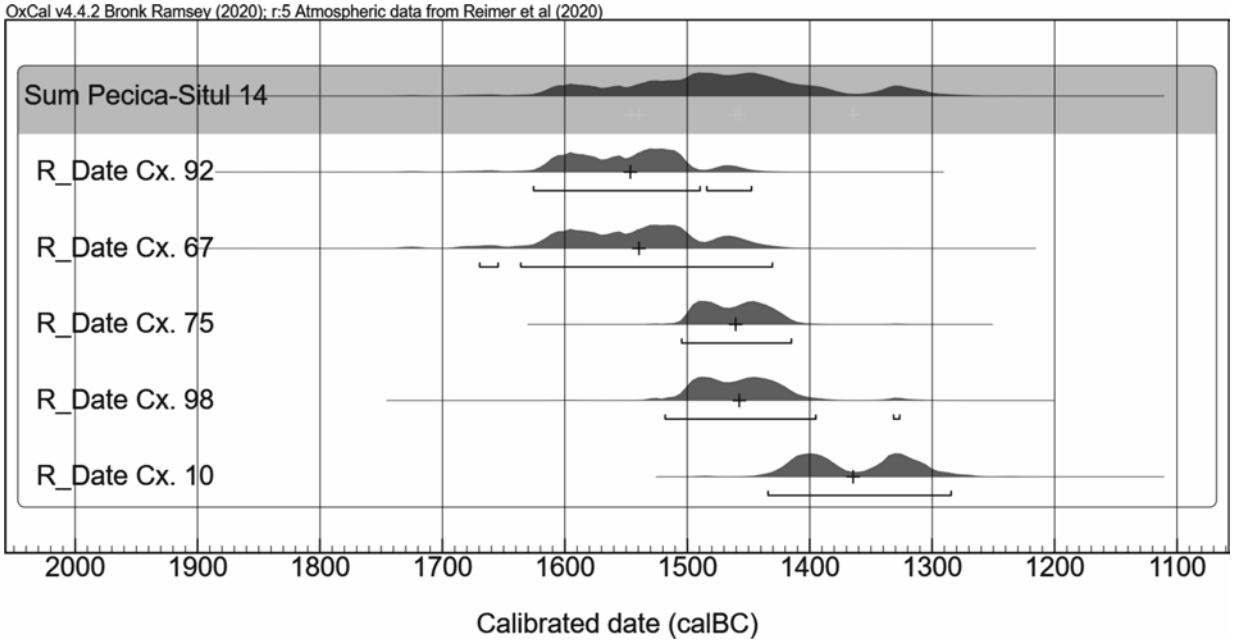

Fig. 9. The calibrated AMS dates from Pecica-Situl 14. Graphic by the author.

samples (Beta-256557, Beta-256558, and Beta-256559) were taken from large pits that contained a significant amount of pottery sherds, animal bones and daub fragments. Taking into account the fact that all radiocarbon dates from the three mentioned pits at this site are derived from charcoal, an old wood effect should be expected, slightly modifying the dates depicted in Fig. 6.

Giroc-Mescal

The first investigations undertaken at this settlement were conducted by F. Gogâltan during the 90s' (*Gogâltan 1994*; *Gogâltan/Stavilă 2020*), followed in 2006 by an excavation directed by F. Gogâltan and A. Szentmiklosi (*Szentmiklosi 2009*, 228–234). Given the limited extent of these investigations and the absence of detailed excavation reports, it can only be stated that the two features that were sampled (Beta-256561, Beta-256562) belong to a large time interval, between approximately 1700 and 1400 BC (Fig. 7). Both dates were derived from charcoal samples. The very early date of Beta-256562 (sampled from feature L. 2/2006) is most likely an indication of the old wood effect.

Pecica-East

This site was discovered in 2015, between 2015 and 2017 an area of 13,800 m^2 was excavated during several campaigns, leading to the discovery of numerous features dating to different periods (*Sava/Mărginean/Ursuțiu 2017*). Among these features there were three pits that contained LBA pottery. It should also be pointed out that the discoveries coming from the investigated area are close to the relatively contemporary settlements from Pecica-Site 15 (*Marta et al. 2012*) and Pecica-Forgaci. The radiocarbon date RoAMS 996.80 (Fig. 8) was taken from pit Cx. 144 that contained numerous pottery sherds and animal bones.

Pecica-Site 14

Investigations conducted over an area of 7762 m^2 have led to the discovery of 38 graves, out of which 24 were inhumation graves and 14 were cremation graves (*Ignat/Sava 2019*, 7, 8, fig. 3; 5; 6; 8; 10; *Sava/Andreica 2013*; *Sava/Ignat 2014*, 7–16, fig. 1–7; *2016*, 185, 186, fig. 4–7). Grave goods in the inhumation graves consisted of bronze objects (weapons – daggers, axes and ornaments – bracelets, pins, ornamental disks), amber artefacts and pottery (the typical assemblage consisted of one pot and one or two cups). Children and adolescent graves were the most richly furnished in terms of number and type of grave goods. The cremated remains along with few grave goods were placed in large urns; in almost all cases a cup or a dish had been placed either inside the urn or underneath it; some of the burials were also provided with bronze artefacts, mostly ornaments such as bracelets or different types of loops. The available data indicate that the inhumation graves can be dated between 1600 and 1300 BC (Fig. 9), but the cemetery could have a later phase composed of cremated burials. Although inhumation is the predominant burial rite at the site, cremation graves could be documented throughout the entire lifespan of the cemetery.

Up to the present moment five graves have been dated; the funerary assemblage of one of these graves consisted solely of bronze artefacts (Cx. 75) and therefore could not be included in the present analysis. The graves Cx. 67, Cx. 92 and Cx. 98 along with their grave goods have been described in detail in earlier publications (*Sava/Ignat 2014*, 7–16, fig. 1–7). Besides these burials, another inhumation grave (Cx. 10) whose funerary assemblage also consisted of two pottery vessels has been sampled (RoAMS 988.80).

Sântana-Cetatea Veche

The fortification from Sântana has been thoroughly investigated in the last years through excavations, geophysical surveys, LIDAR scanning, etc. (*Gogâltan/Sava/Krause 2019*; *Krause et al., in press*; *Sava/Gogâltan/Krause 2019*). The available data indicate that the mega-fort consisting of four fortification systems extending over an area of approximately 130 ha was erected during the 15th c. BC and was subsequently destroyed at the end of the 14th c. BC, or latest in the first part of the 13th c. BC (Fig. 10). By far the most impressive fortification system from Sântana is the third one that consists of a rampart made of earth, wood and stone having a width of almost 27 m and a height of 2.5 m on top of which a timber-and-daub wall was erected, and two large ditches. No less than 29 rather large structures have been identified through geophysical surveys, most of them located within the first enclosure. Several lines of evidence such as the destruction of the fortification systems, the numerous weapons found among the debris of enclosure III and the discovery of human skeletal remains within the fills of the ditches (some of them displaying evidence of trauma) indicate that latest in the first half of the 13th c. the fortification suffered a siege and was burned down.

Of special note is the abundance of gold and bronze artefacts at the site. At the same time, the discovery of glass and faience beads and graphite pottery points towards the orientation of the trade

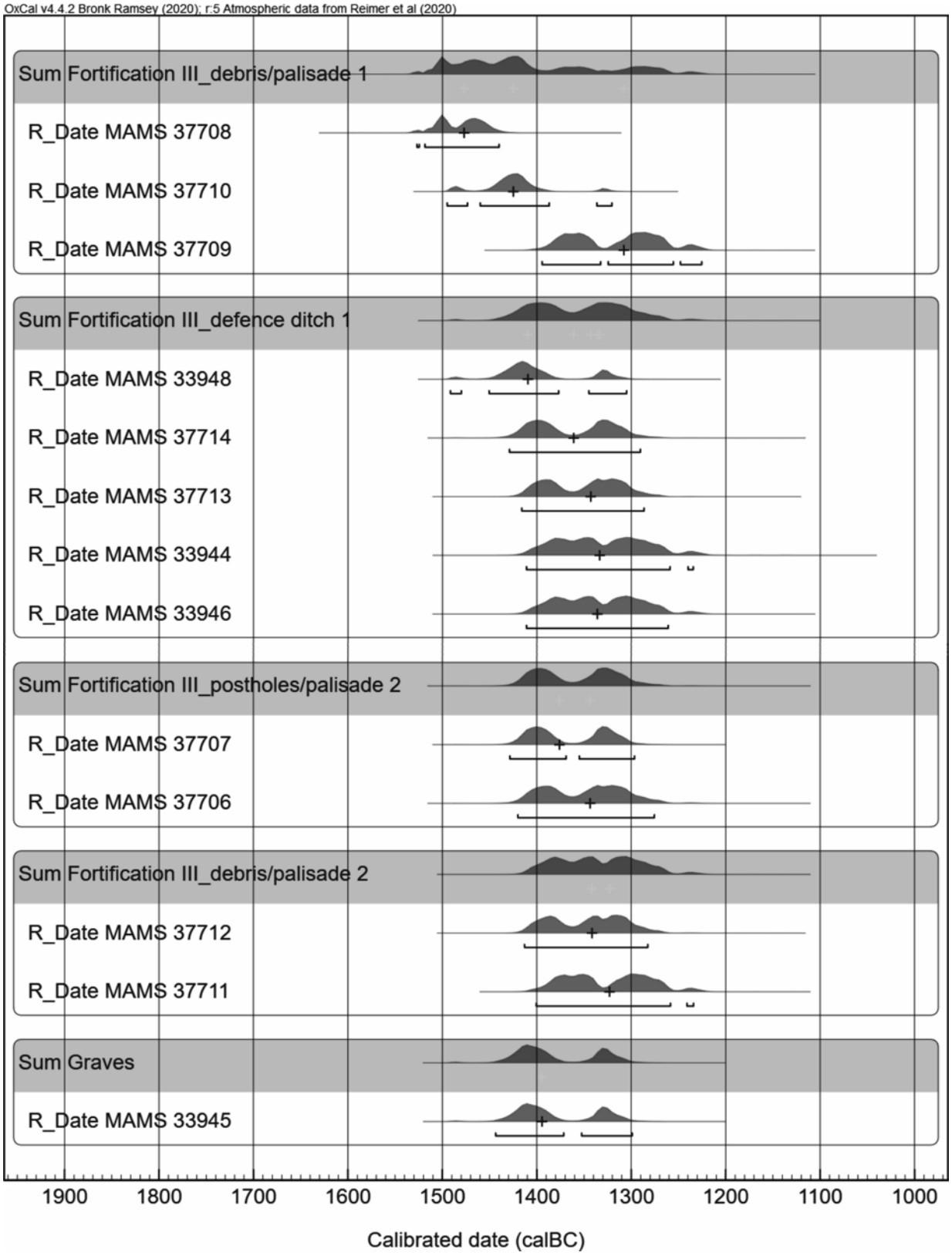

Fig. 10. The calibrated AMS dates from Sântana-Cetatea Veche. Graphic by the author.

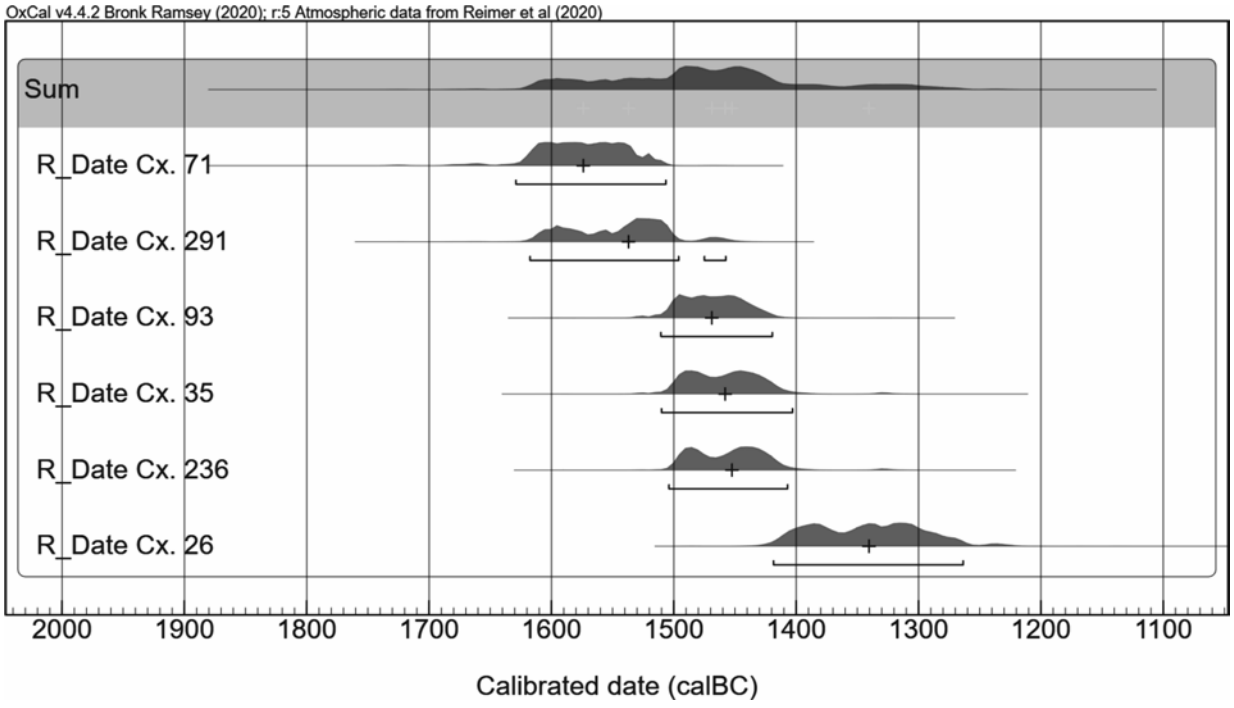

Fig. 11. The calibrated AMS dates from Șagu-Situl A1_1. Graphic by the author.

routes that secured the acquisition of raw materials and prestige goods. Of course, pottery is the most abundant category of finds at the site. Due to the site's characteristics, most of the resources were targeted towards investigating the fortification system. This is why for this study only the pottery that could be associated with secure contexts was analysed. Reference is being made here to the pottery uncovered within grave CX 41/S1 from where the sample MAMS-33945 was taken, and to the two vessels found in the fill of the ditch Cx. 38/S1 (sample MAMS-33948); both these features have been described in detail elsewhere (*Sava/Gogâltan/Krause 2019*, 164–170, fig. 5; 9). The pottery unearthed from the debris of the second palisade belonging to enclosure III (Cx 5/S5; samples MAMS-37711; MAMS-377120) has also been included in the database (*Gogâltan/Sava/Krause 2019*, 203–209, fig. 12–20; tab. 1). The dates for the second palisade belonging to enclosure III are similar to the absolute dates retrieved from the fill layers of ditch 1, a fact that indicates that a short amount of time elapsed between the construction of palisade 2, the filling of ditch 1 and the destruction of the fortification, all these event taking place during the 14th c. BC, or in the first decades of the 13th c. BC at the latest.

Șagu-Site A1_1

The settlement from Șagu-Site A1_1 stands out among the many LBA sites from the Lower Mureș. The site is located in the high Vinga plain, at the foothills of the Carpathian Mountains. Although the settlement is known since the 1980s', extensive excavations were only undertaken in 2010 (*Sava/Hurezan/Mărginean 2011*). Surface surveys indicate that the site originally extended over an area of about 23 ha. Within the 28,800 m^2 excavated area a number of 306 LBA features have been identified. The available radiocarbon dates indicate that the settlement was established during the 16th c. BC and continued to be in use until the 14th c. BC, or first half of the 13th c. BC (Fig. 11). Although most of the uncovered artefacts are indicative of various domestic activities being undertaken at the site, there are also finds that point towards animal rearing, activities related to the secondary use of animal products (*Sava V. 2014*) as well as pottery production. Perhaps one of the most salient features of the settlement's economy is reflected by the abundance of metalworking debris at the site. Evidence of metalworking has been unearthed in several pits of various shapes and sizes located within the settlement (*Sava/Hurezan/Mărginean 2012*). Although evidence of metalworking has been uncovered from the earliest phases of occupation at the site, most of the metalworking debris dates to the 15th and 14th c. BC.

The radiocarbon dates have been taken from six features, which most likely cover the entire lifespan of the settlement. The inventory of these pits consisted of several artefacts and numerous pottery sherds.

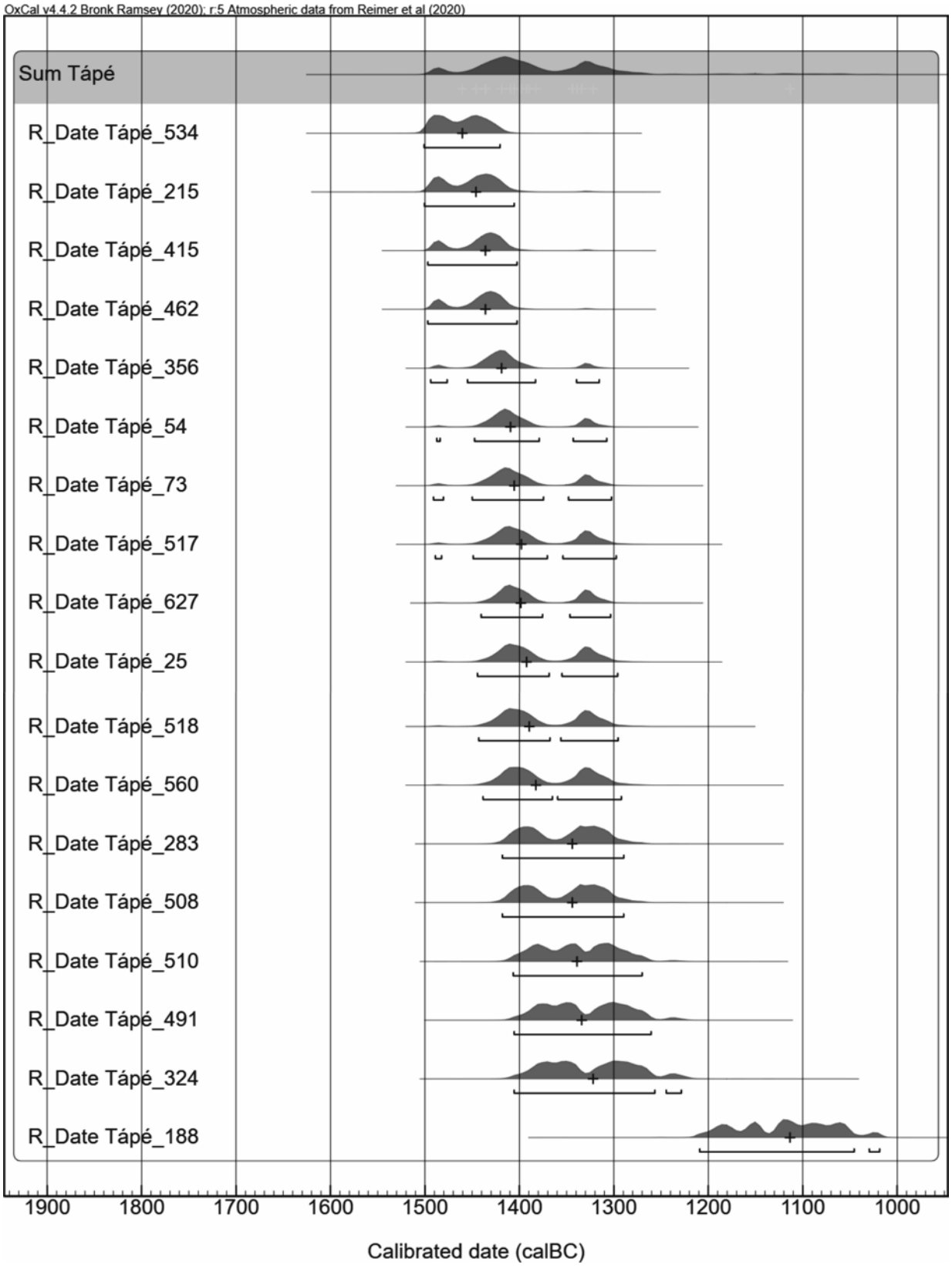

Fig. 12. The calibrated AMS dates from Tápé. Graphic by the author.

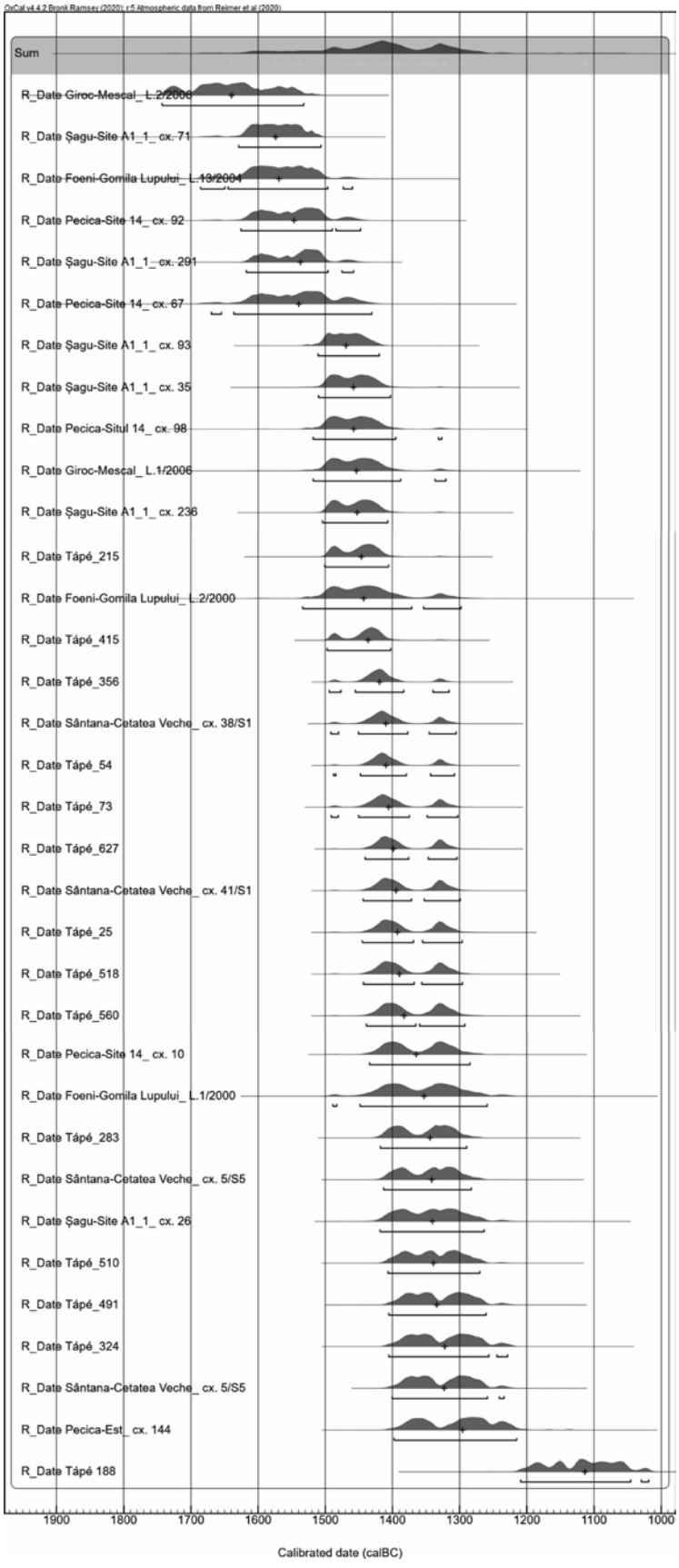

Fig. 13. The calibrated AMS dates coming from the analysed features. Graphic by the author.

Tápé-Széntéglaégető

Due to its considerable size and the fact that the results of the excavations undertaken here in the 1960s have been published in detail (*Trogmayer 1975*), this cemetery is undoubtedly a reference point for the LBA in the inner Carpathian region. Out of the 687 uncovered burials only a small percentage are cremation graves, while the rest are inhumation graves that continue a MBA tradition. The social characteristics resulting from the analysis of the combination of various grave goods have been already discussed in detail (*Blischke 2002*, 51–153); radiocarbon samples taken from 18 graves indicate that the cemetery was in use between approximately 1500 and 1250 BC (Fig. 12; *O'Shea et al. 2019*, fig. 5; tab. 3). It can be assumed that the cemetery was also used, albeit only infrequently, during the 12th and 11th centuries BC, as suggested by the date retrieved from grave 188.

RESULTS

According to the traditional relative chronology that for a long time was the only common denominator for all the different areas of the wider inner Carpathian region, the beginning of the LBA, or the appearance of the Cruceni-Belegiš I, Noua, Lăpuș, etc. pottery styles, was set around 1300 BC (*Ciugudean 2010*, fig. 4). After a decade of excavations in important LBA sites and the collection and publication of a considerable number of radiocarbon dates, the beginning of the LBA (as defined in most publications on the subject) is set much earlier (*Gogâltan 2019*, 48–51; *Sava/Gogâltan 2019*; *Sava/Ignat 2016*, 192–195). These opinions are confirmed by the new radiocarbon dates coming from the Lower Mureș that so far indicate that the LBA starts in this region in the 16th c. BC (Fig. 13–15). During LBA I, new settlements are being established in the region: Giroc-Mescal, Șagu-Site A1_1, Foeni-Gomila Lupului, for

a short period of time, the aforementioned sites are contemporary with the last phase of occupation on some MBA tells from the region such as Pecica-*Șanțul* Mare (*Nicodemus/Motta/O'Shea 2015*, tab. 1) and Klárafalva-Hajdova (*O'Shea et al. 2019*, fig. 8). All the aforementioned LBA settlements continue their existence during LBA II, when the mega-fort in Sântana-Cetatea Veche is constructed. The end of LBA II and the beginning of LBA III coincides with the destruction of the Sântana mega-fort, this time interval also being obtained after analysing the sum distribution of the calibrated dates and with the boundary end of the sequence depicted by the calibrated dates, with the exception of UGAMS 30830 (Tápé 188).

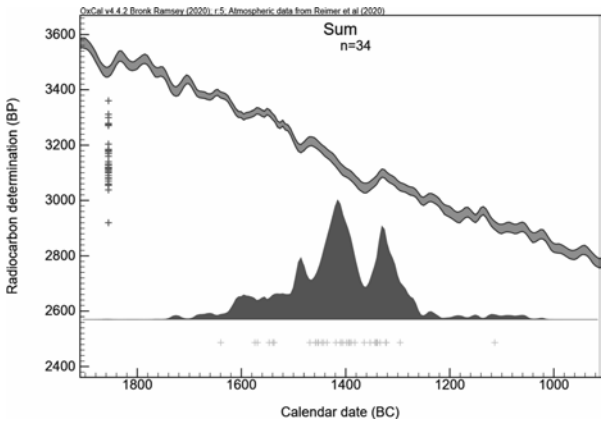

Fig. 14. The sum of the AMS dates coming from the analysed features. Graphic by the author.

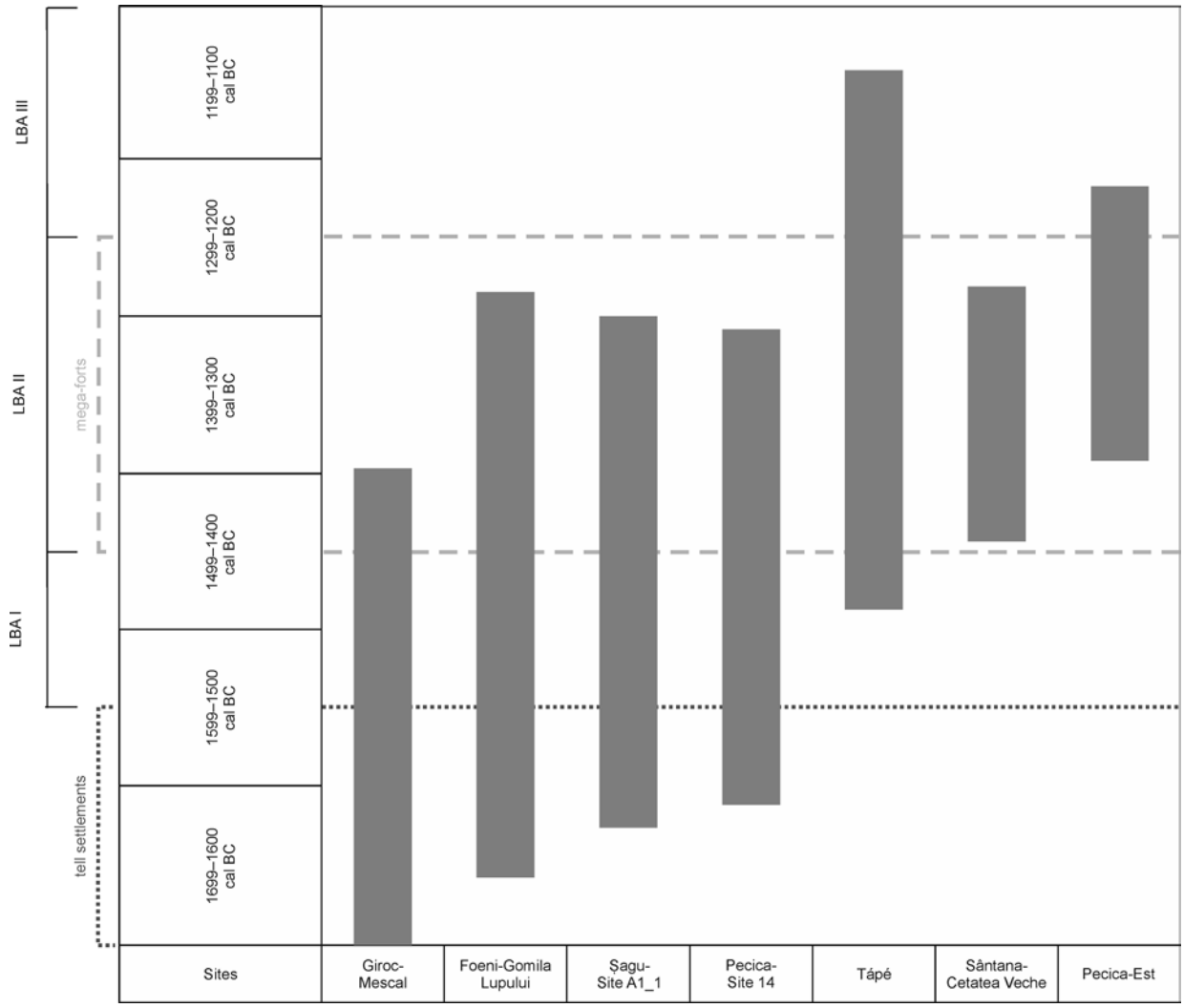

Fig. 15. Chronological evolution of the sites mentioned in the analysis. Graphic by the author.

Tab. 2. List of the pottery forms (Fig. 16).

Types	Subtypes
1. Dishes	1A. Dish with straight rim (of reduced size) 1B. Low dish with biconical body 1C. Dish with biconical body 1D. Dish with biconical body and a short neck 1E. Dish with lobed rim 1F. Biconical dish with small lobes on the rim 1G. Dish with straight rim (of a large size) 1H. Dish with inverted rim 1I. Dish in the shape of a truncated cone 1J. Large dish with S-shaped profile
2. Cups	2A. Cup with flared rim, short neck, low globular body and straight base 2B. Cup with globular belly and a handle reaching up to the rim 2C. Cup with a globular body, wide mouth and a handle rising slightly above the rim 2D. Small cup with a globular body, umbo-shaped base and a handle rising slightly above the rim 2E. Cup with slightly flaring rim, long and straight neck, narrow biconical belly and a straight base 2F. Cup with a straight rim, globular, slightly biconical body and foot 2G. Cup with a globular belly, ringed base and wide mouth
3. Pots	3A. Pot with constricted neck 3B. Pot with wide mouth and biconical body 3C. Pot with globular belly and slightly flaring rim
4. Biconical vessels	4A. Low biconical vessel with wide mouth and flaring rim 4B. Vessel with two small handles, tall and slender neck, biconical body and flat base 4C. Vessel with a straight mouth, tall neck, biconical body and flat base
5. Footed biconical vessels	–
6. Large biconical vessels with flaring rim, biconical body and flat base	–
7. Vessel with slightly flaring rim, short neck, long and slightly biconical body and flat base	–
8. Trays	–
9. Lids	–

Pottery shapes

The typological analysis of the pottery assemblage here under study has revealed that only for 25.36% of the sherds (140 items) could the original shape be reconstructed. A total of nine main shapes could be identified, which were further divided in 23 subtypes (Fig. 16; Tab. 2). By correlating the chronological distribution of the pottery shapes with the main historical events in the Lower Mureș (the abandonment of tell settlements, the construction of mega-forts, etc.) and the three phases of the relative chronology (LBA I, II and III) we can gain an overview of the connection between these main events and the emergence or disappearance of certain pottery shapes (Fig. 17). While certain shapes such as some dishes (1A, 1F), pots (3C) or biconical vessels (4A) seem to be in use for only a limited amount of time, other shapes such as dishes 1D and 1E along with the large biconical vessels 6 were used for a long period of time. There are certain types and subtypes, such as dishes of the type 1B and 1C, cups belonging to the type 2A, biconical vessels of the types 4B and 4C or lids belonging to

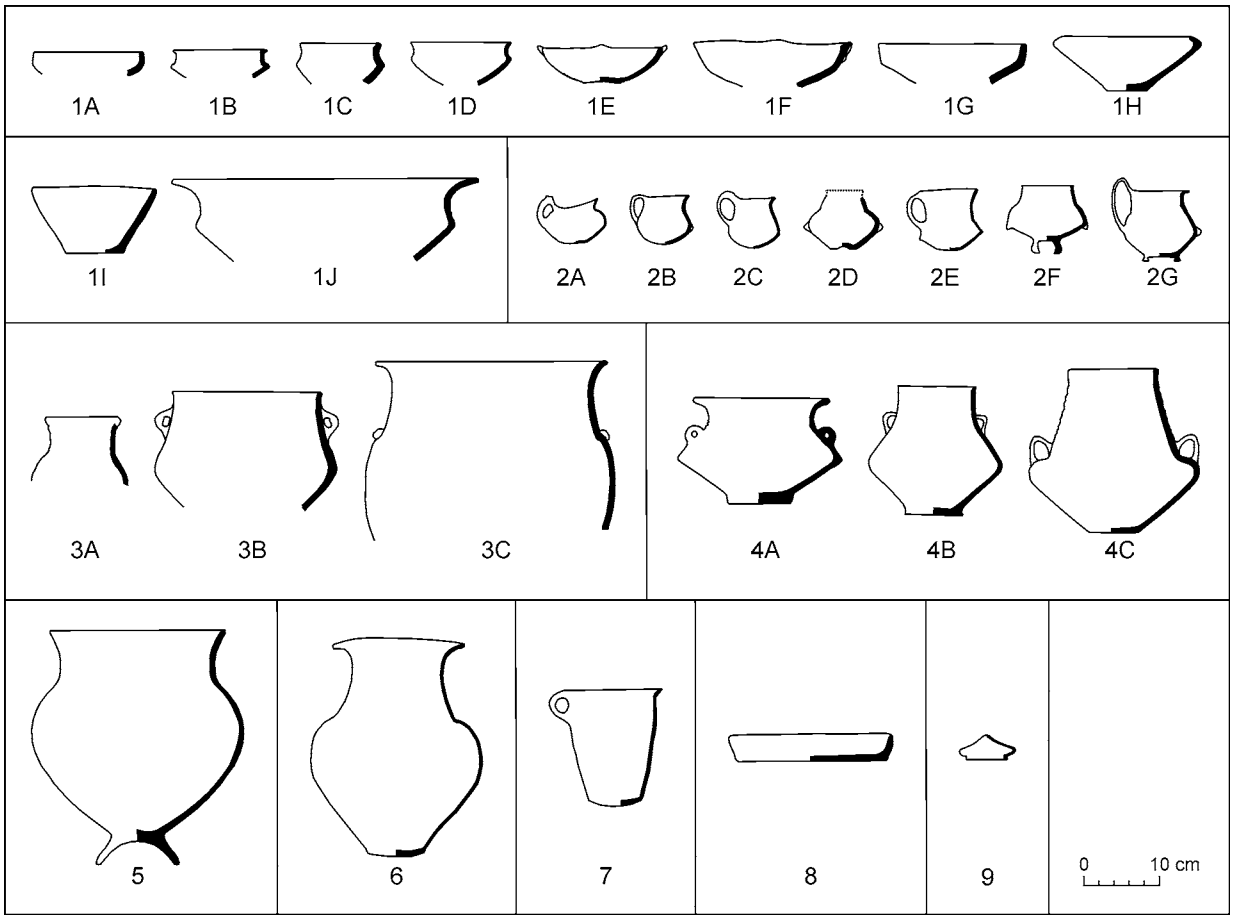

Fig. 16. Typological table of pottery shapes. Graphic by the author.

type 9 that can be correlated with the phase LBA II. Although the chronological distribution of certain types of vessels is very relevant for this discussion, much more important is the frequency in which these types and subtypes are found within specific time frames (Fig. 18). Thus, even if the subtype 1D seems to be in use for a very long period of time, it is most frequently encountered between 1500 and 1300 BC; the same is true for subtype 1E whose most frequent use is limited to the period between 1500 and 1400 BC. At the same time, shapes such as 1H or 6 have a constant frequency throughout their rather short interval of use that lies mostly between 1500 and 1300 BC. In certain instances, by combining the absolute chronology with the frequency of shapes, we can identify shapes that were specific to a certain time frame; for example, dishes of the 1E and 1G types, cups belonging to the type 2G and biconical vessels of the 4A type are shapes characteristic for the period between 1600 and 1400 BC, while the dishes belonging to the types 1E and 1 I, the cups of the 2B type and the biconical vessels of type 4C are characteristic for the period 1500–1400 BC.

Pottery decoration techniques

Five main decoration techniques could be identified on the analysed pottery: incision (1), channelled decoration (2), pseudo-twisted cord (3), embossed decoration (4) and impression (5). Incised, channelled and embossed decorations are the most frequently used techniques, while impressions and pseudo-twisted cord decoration are seldom employed. Pseudo-twisted cord decoration can only be encountered on pottery coming from Giroc-Mescal and Foeni-Gomila Lupului. It is noteworthy that all five decoration techniques span the entire LBA I and II. Thus, better results can be obtained by combining the chronological distribution of decoration techniques with their use frequency (Fig. 19; 20). As a result, both general patterns in the development of decoration techniques and specific aspects of a certain limited chronological sequence could be identified. By correlating these findings with the main events from the region, it can be easily noticed that after 1400 BC (a time period that corresponds to the emergence and evolution

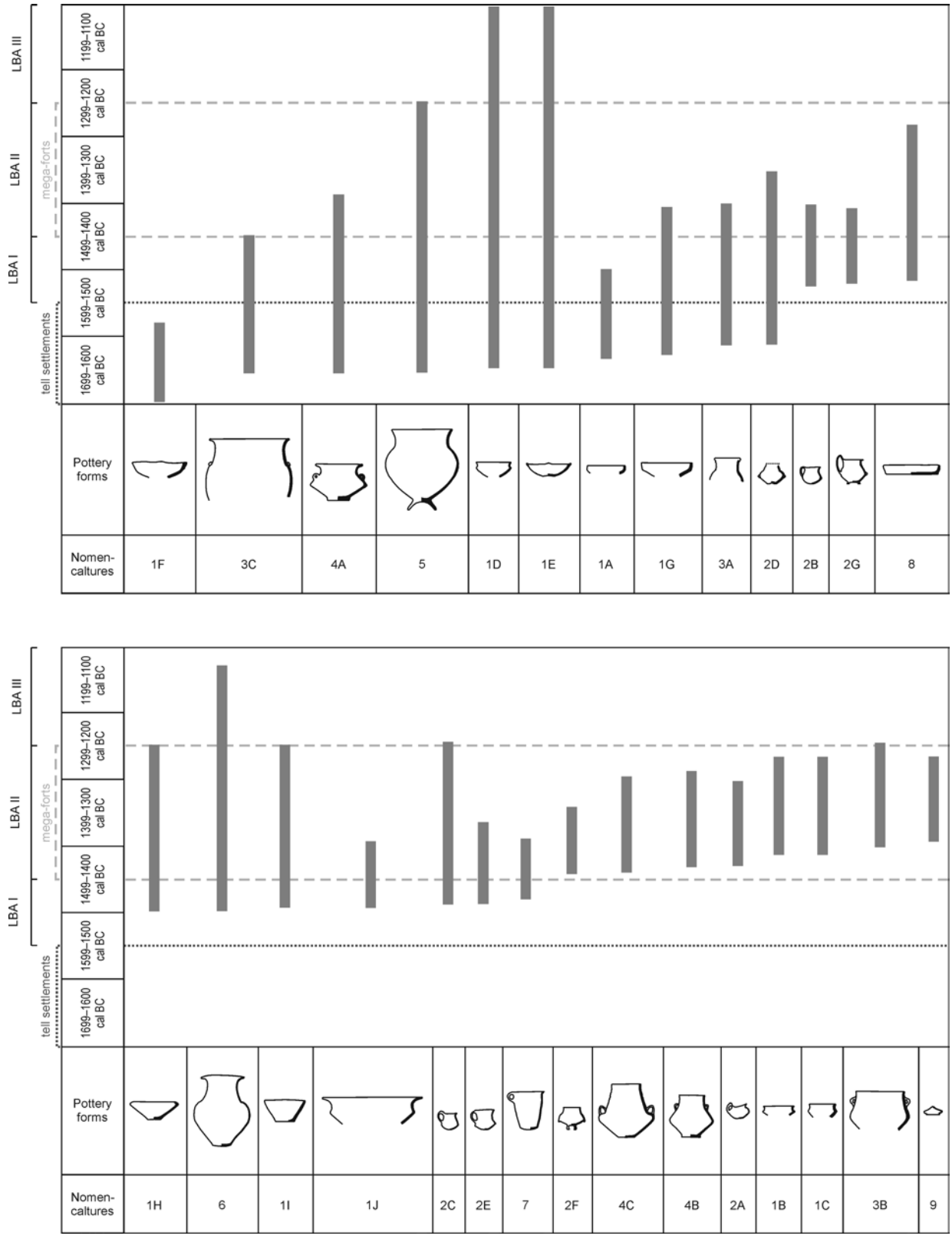

Fig. 17. Chronologic distribution of pottery shapes. Graphic by the author.

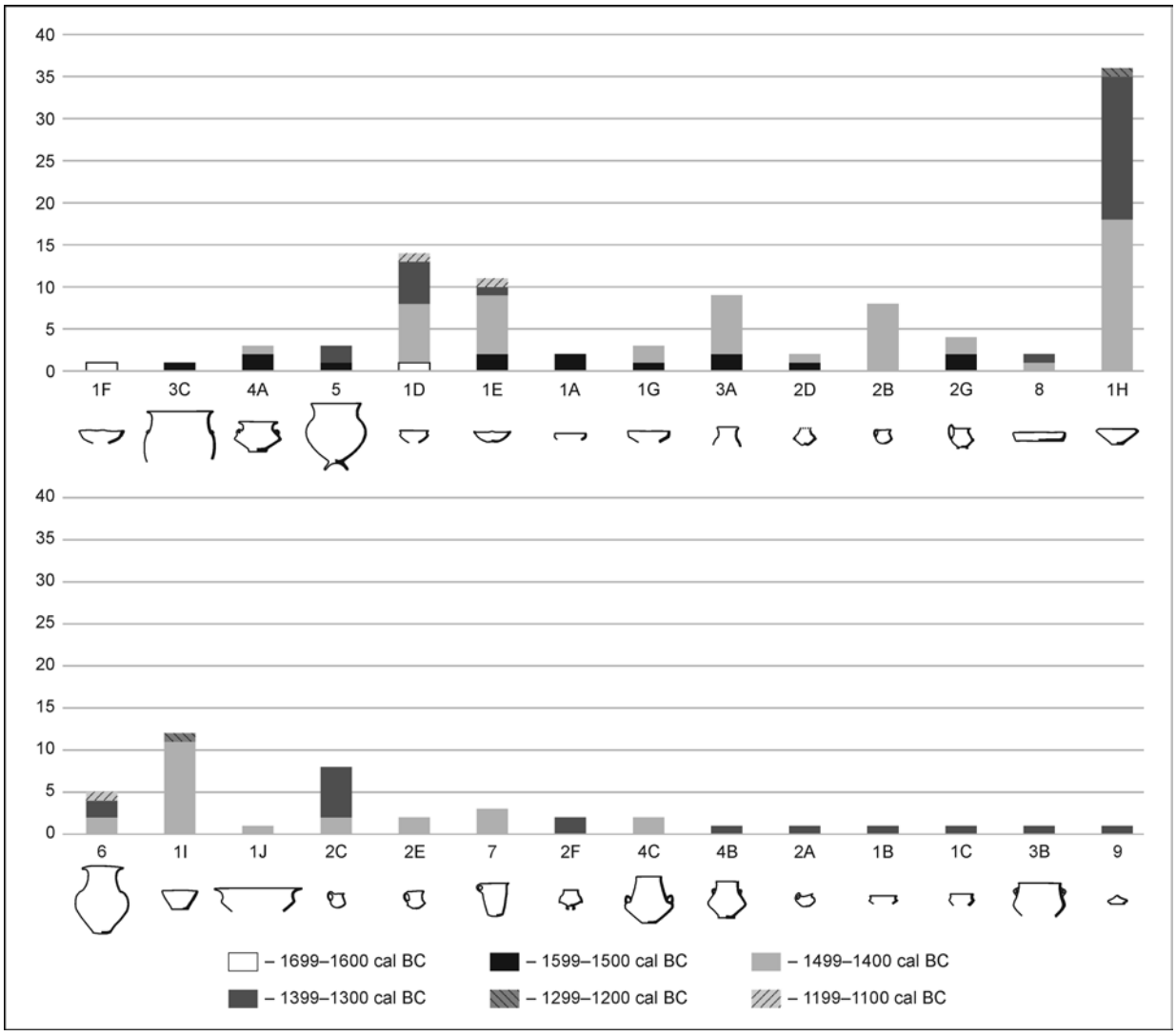

Fig. 18. Chronologic distribution of pottery shapes and their frequency. Graphic by the author.

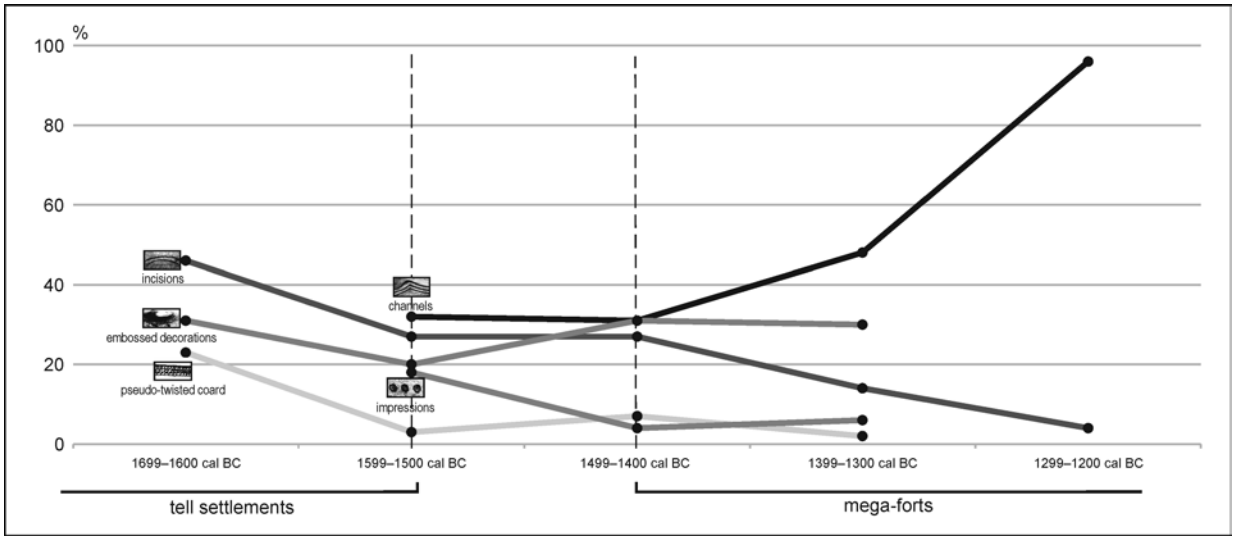

Fig. 19. Chronologic distribution and frequency of pottery decoration techniques. Graphic by the author.

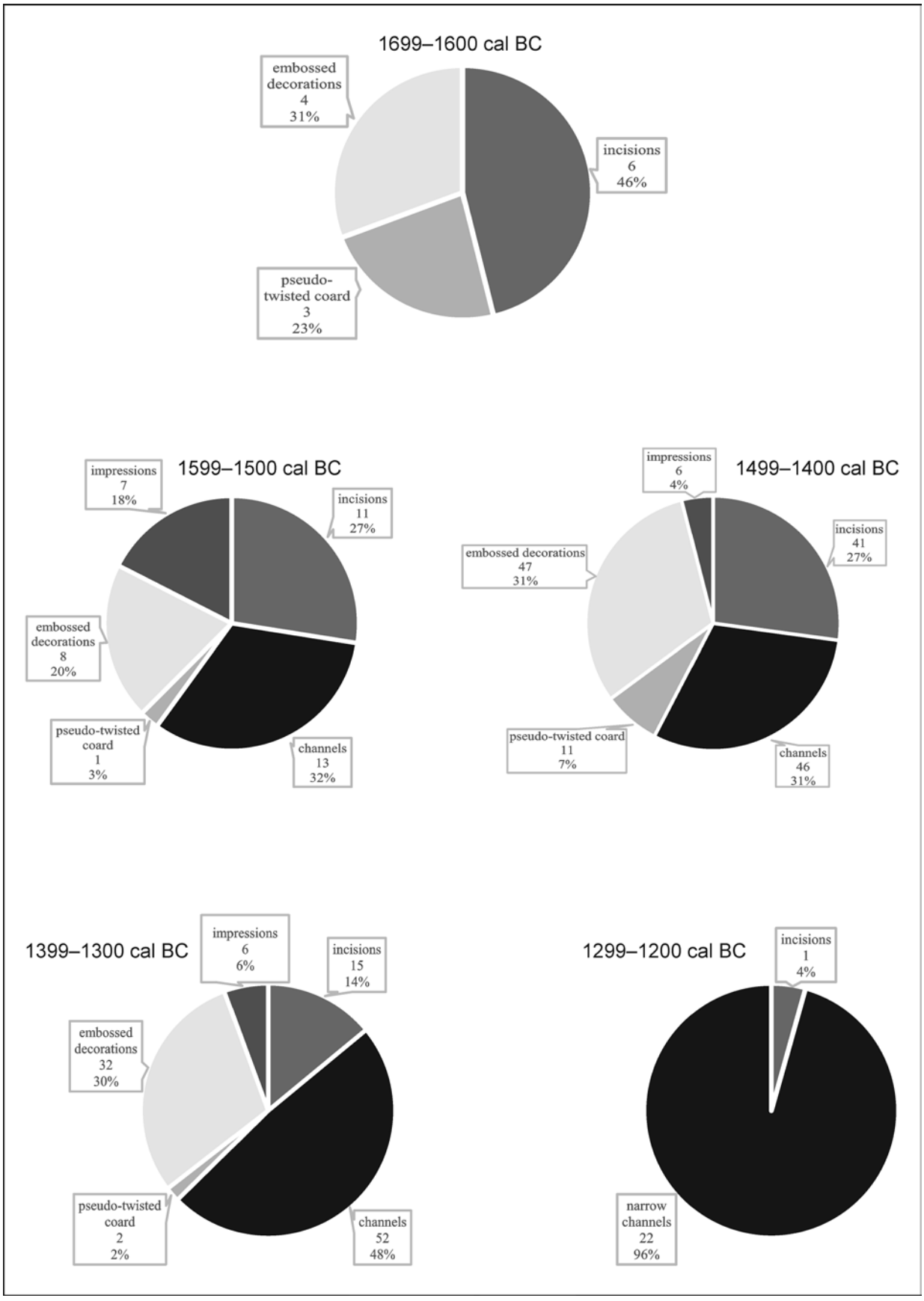

Fig. 20. Chronologic distribution and frequency of pottery decoration techniques over the centuries. Graphic by the author.

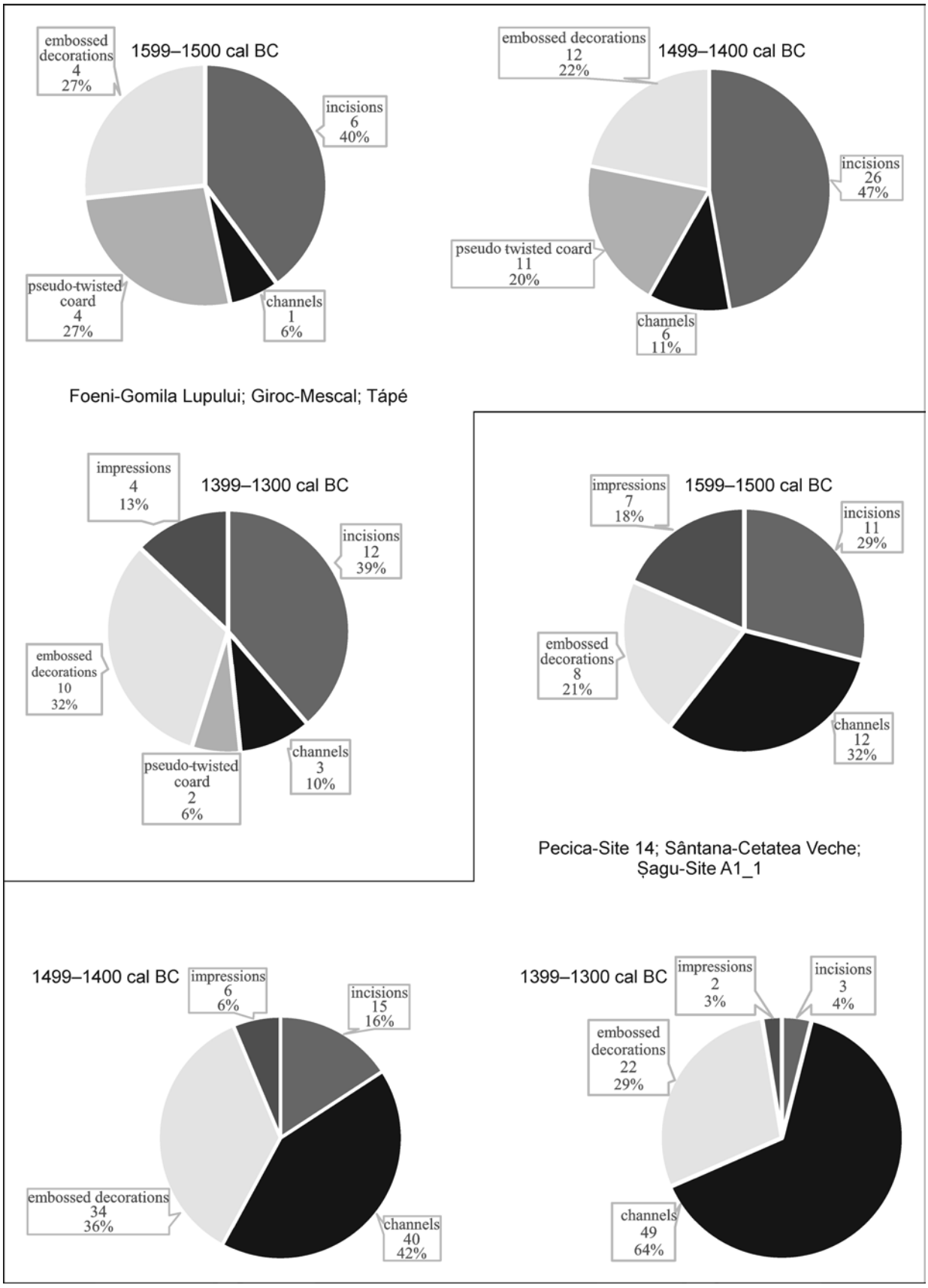

Fig. 21. Chronologic distribution and frequency of pottery decoration techniques over the centuries displayed according to the two groups of sites. Graphic by the author.

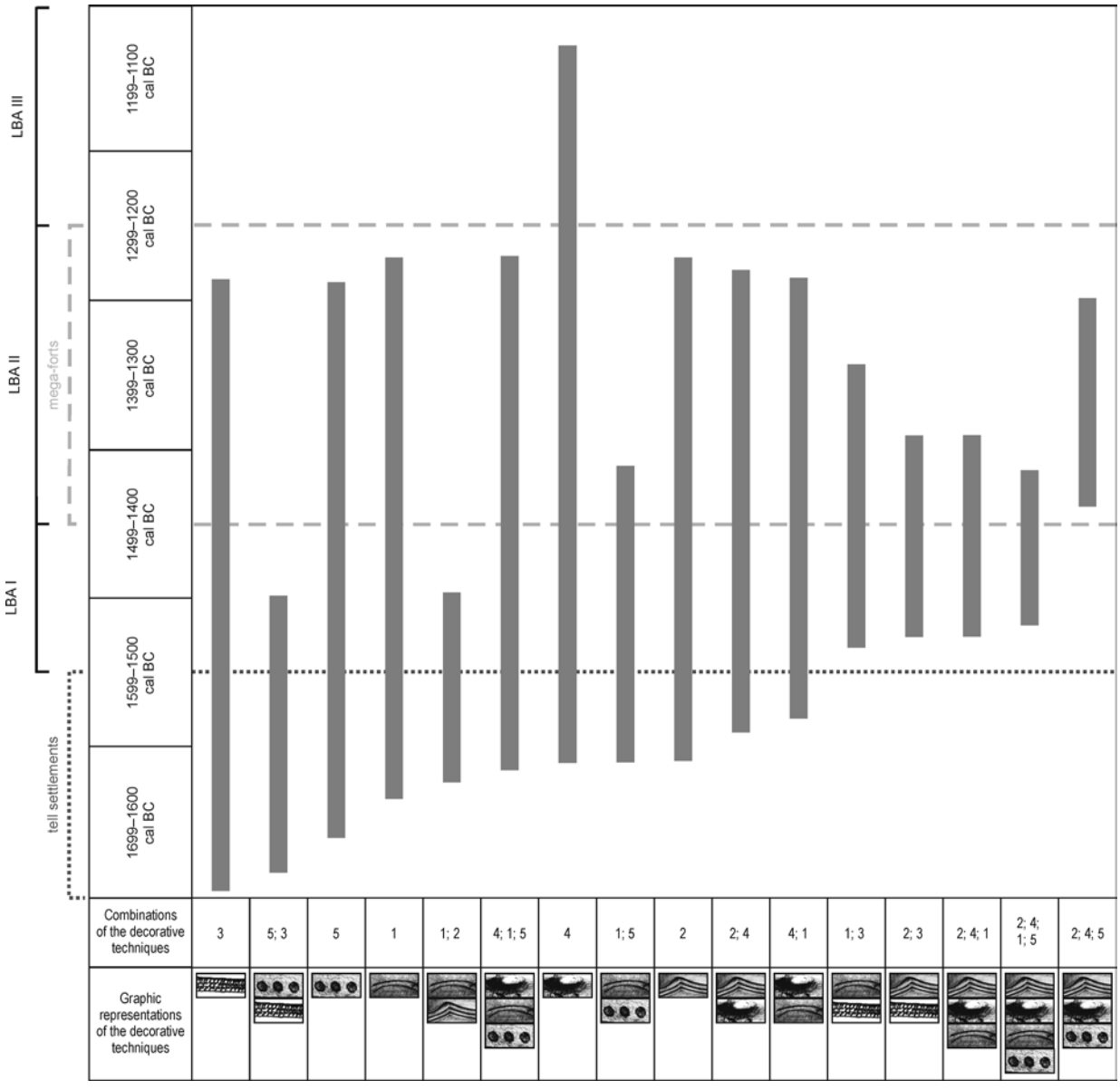

Fig. 22. Chronological distribution of the association of pottery decoration techniques. Graphic by the author.

of mega-forts), channelled decoration becomes the dominant decoration technique at the expense of incised decoration. Furthermore, the fact that there are more vessels with channelled decoration than vessels bearing incised decoration in most early contexts (approximately 1600–1400 BC) raises serious questions regarding the traditional relative chronology schemes that assign incised decoration an earlier date and channelled decoration a later date.

By sorting the decoration techniques according to archaeological sites and the three main time periods represented in our study, it can be noted that the sites cluster in two groups (Fig. 21). The first group entails the sites from Foeni-Gomila Lupului, Giroc-Mescal and Tápé. Incised decoration is clearly prevalent among the analysed contexts from these three sites, while pseudo-cord decoration is only found at Foeni and Giroc; furthermore, channelled decoration is seldom on pottery belonging to this group. On the other hand, within the second group (that consists of the sites from Pecica-Site 14, Sântana-Cetatea Veche and Șagu-Site A1_1) channelled decoration is the predominant decoration technique as early as the time period 1600–1500 BC, while between 1400 and 1300 BC over 60% of the analysed pottery has channelled decoration. As a result of the undertaken analysis, two major preferences regarding pottery decoration techniques can be observed in the Lower Mureș. It seems that

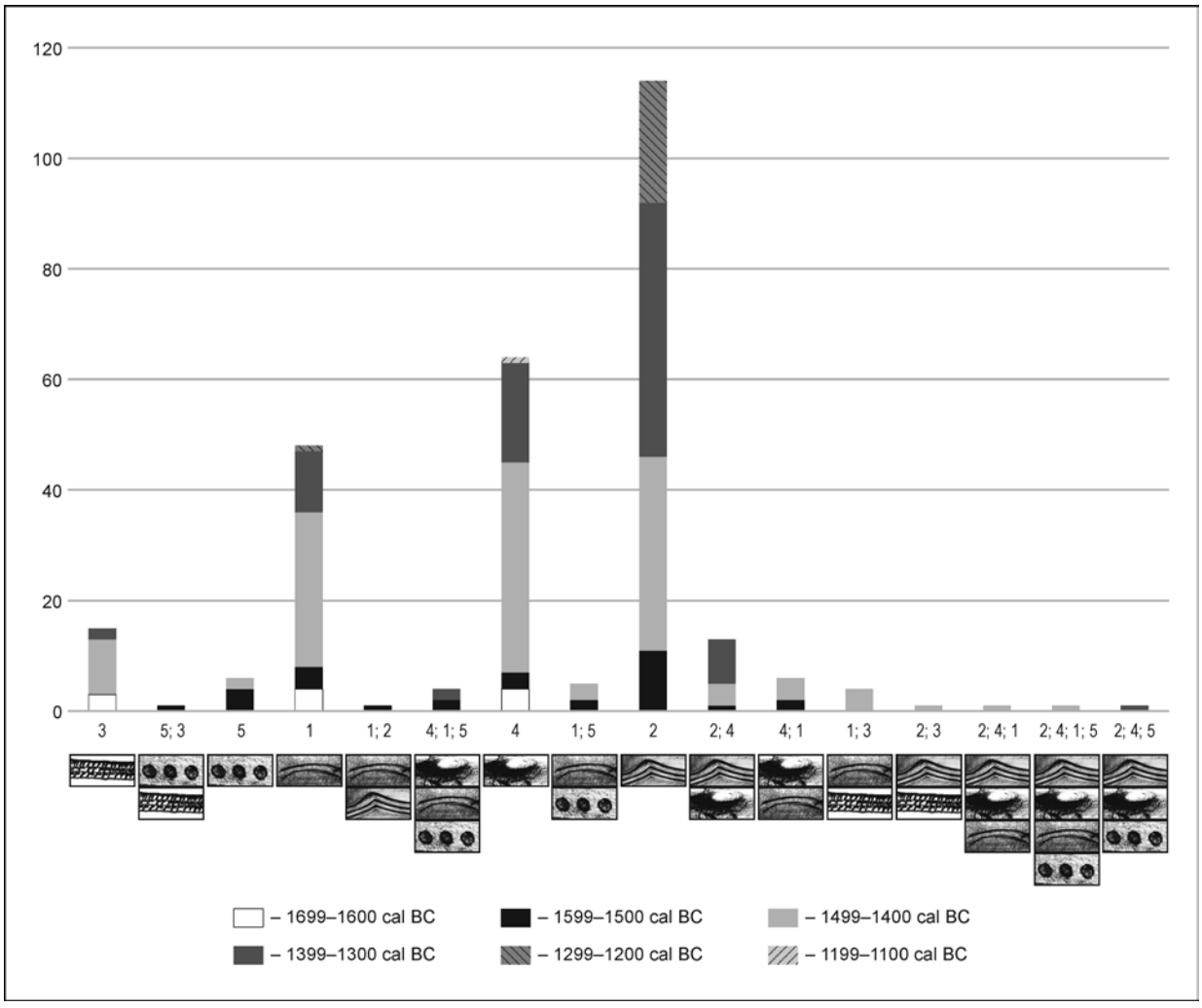

Fig. 23. Chronological distribution and frequency of the association of pottery decoration techniques. Graphic by the author.

certain sites such as Foeni, Giroc and Tápé continue MBA decoration traditions, while at other sites such as Pecica, Sântana and Șagu channelled decoration is being widely adopted as early as LBA I (*Sava V., in press*). In this context, recent opinions regarding the spread of channelled pottery from the northern Tisza region, north-western Romania and north-eastern Hungary (see for example *Dietrich 2015*, 166; *Metzner-Nebelsick 2012*, 65, 66, 72) should be called into question, or at the very least nuanced. The available data indicate that channelled pottery is prevalent after 1600 BC in some sites from the Lower Mureș Basin. This does not deny the importance of the northern Tisza region in the spread of the channelled pottery; however, in the absence of absolute dates coming from contexts with channelled pottery in that region, it is hard to make strong claims based on relative chronology alone.

All five decoration techniques appear in most of the contexts here under analysis. Although the excessive fragmentation of the pottery should be taken into account when interpreting these results, there is a tendency towards not combining different decoration techniques (Fig. 22; 23). Incised decoration is most frequently combined with impressions, embossed decoration or pseudo-cord decoration, while channelled decoration is mostly combined with embossed decoration. There are very few pottery sherds on which channelled decoration is found alongside incised decoration; usually, the two decoration techniques are mutually exclusive. The chronological distribution of the decoration techniques points towards some general tendencies, such as a marked increase in the combination between channelled decoration and embossed decoration between 1600 and 1300 BC.

There are no clear patterns at the present moment regarding the combination of pottery shapes and decoration techniques (Fig. 24; 25). Most of

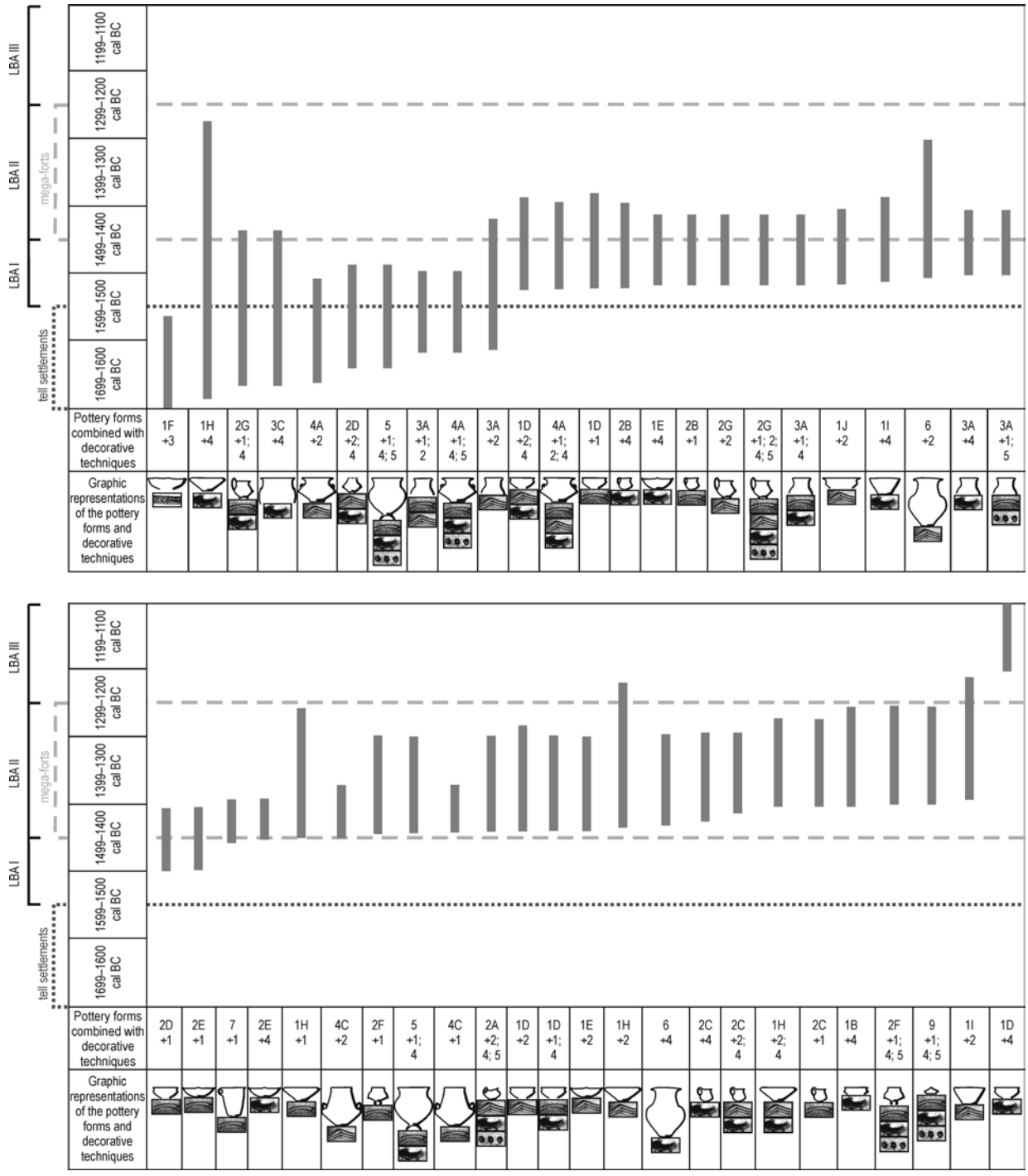

Fig. 24. Chronological distribution of the association of pottery decoration techniques according to pottery shapes. Graphic by the author.

the examples can only be found in single entries, a fact that cannot lend the certainty of a plausible explanation. Nevertheless, there is a clear preference for embossed decoration on dishes with inverted rims (1H + 4), or for channelled decoration on large biconical vessels (6 + 2) and dishes with short neck and biconical body (1D + 2).

Ornamental motifs

For more than 52% of the pottery sherds registered in the database the ornamental motifs could be reconstructed. A total of 59 ornamental motifs could be identified, the majority of which were made by incision, followed by channelled

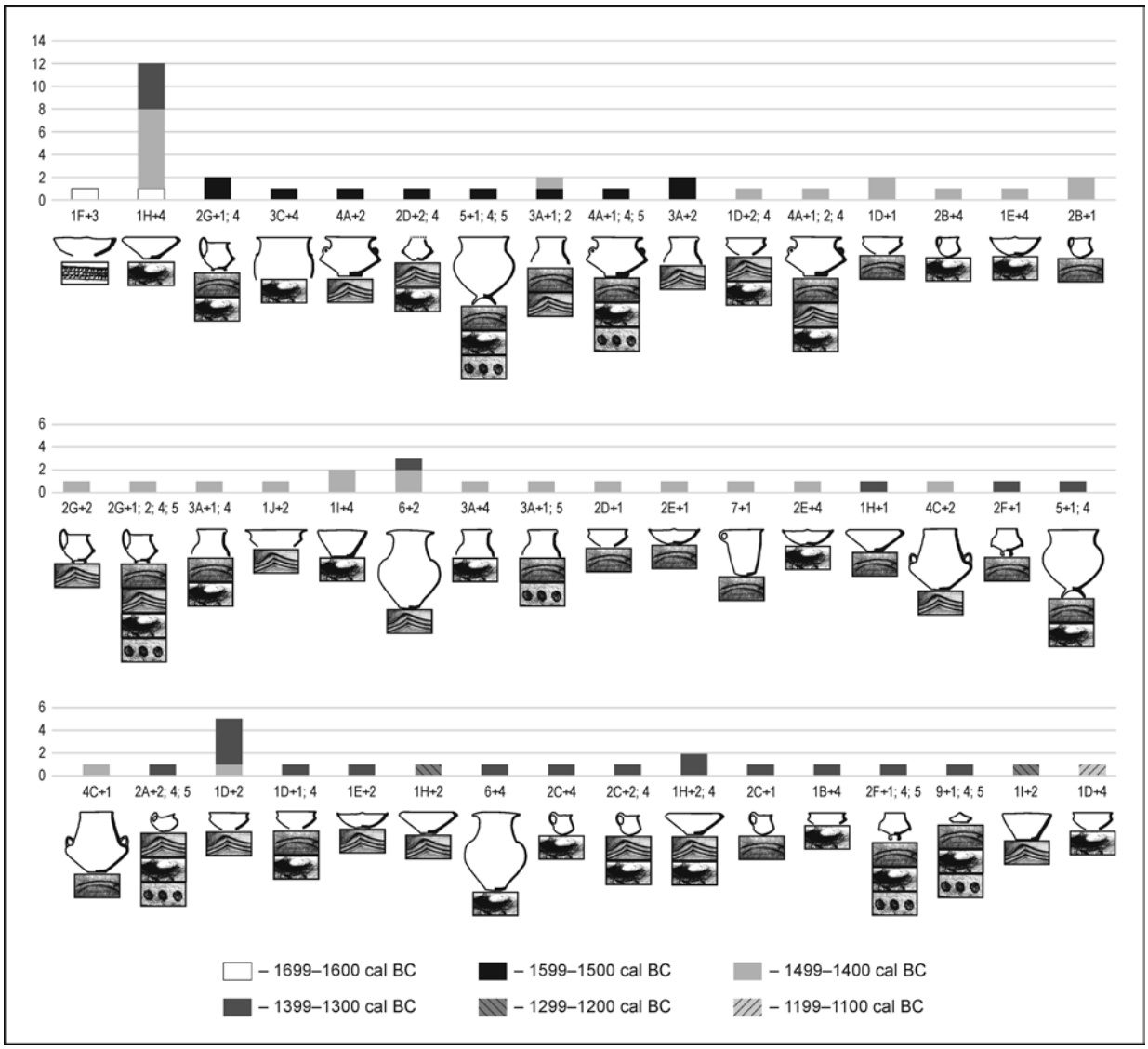

Fig. 25. Chronological distribution and frequency of the association of pottery decoration techniques according to pottery shapes. Graphic by the author.

decoration, embossed decoration, impression and pseudo-cord decoration (Fig. 26; Tab. 3).

It can be easily noticed (Fig. 27; 28) that incised ornamental motifs are among the earliest, and that they continue to be in use for a long period of time, being employed in parallel with motifs made by channelled decoration. One of the most long-living ornamental motifs is the conical knob (4.1). Although numerous motifs are being used simultaneously for a long period of time, some of them seem to be associated with shorter chronological sequences, as is the case for the incisions displayed in a star shape on the base of the vessels (1.13), the wide double incisions displayed in a triangle (1.16), the wide double incisions displayed in an upturned triangle (1.17), the row of triangular incisions displayed on the inner rim (1.19) or the elongated and pointed knobs (4.3). The frequency of the motifs within different chronological sequences adds new information. For example, the rows of incised arches (1.12) and the rows of circular impressions (5.1) are mostly used between 1600 and 1500 BC; the rows of wide horizontal incisions (1.8), the wide horizontal channellings (2.11), the horizontal pseudo-corded lines (3.1), the vertical pseudo-corded lines (3.2) and the conical knobs (4.1), although being used for a longer period of time, are encountered predominantly between 1500 and 1400 BC; different types of channellings, such as the narrow horizontal ones (2.2), the narrow channellings displayed in a circle on the base of the vessel (2.3), the narrow channellings

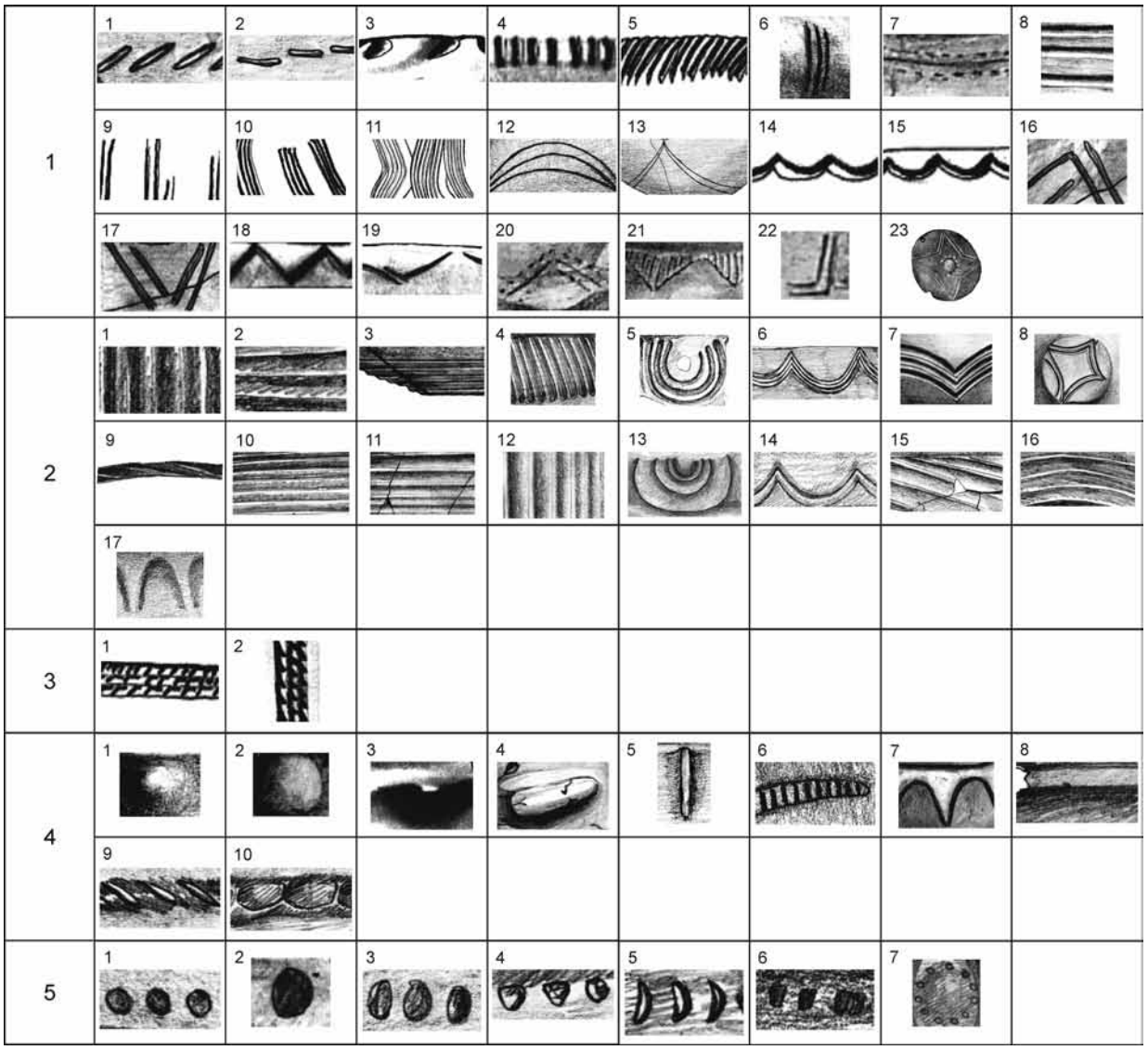

Fig. 26. Typological table of decorative motifs. Graphic by the author.

displayed semi-circularly (2.5), the wide vertical channellings (2.12), the wide channellings displayed semi-circularly (2.13) and the wide channellings displayed in a garland pattern (2.14) are characteristic for the period between 1400 and 1300 BC, while the narrow oblique channellings displayed on the rim (2.9), the narrow channellings displayed semi-circularly on the inner rim (2.10) and the wide channellings displayed in a circle on the rim (2.16) are encountered after 1300 BC.

The combination of different ornamental motifs offers more clues regarding certain preferences (Fig. 29; 30). The repertoire of these combinations is rather rich. An important point that should be outlined is the connection between the chronological evolution of the LBA and a decrease in the complexity of pottery decoration. Thus, while between 1600 and 1500 BC the surface of the pottery vessels was decorated with numerous ornamental motifs, after 1400 BC there is a gradual reduction in the number of ornamental motifs being employed, leading to a considerable decrease in the combination of ornamental motifs after 1300 BC. As a rule, the vessels with channelled decoration display fewer motifs than the ones with incised decoration.

In most cases, the combination of ornamental motifs with pottery shapes is not conclusive due to the limited number of entries in the database (Fig. 31; 32). The only visible tendency is the frequent association of dishes with inverted rims with the conical knob ornament (1H + 4).

Tab. 3. List of the decorative techniques and motifs (Fig. 26).

Decoration techniques	Decorative motifs
1. Incisions	1.1. Row of short oblique incisions 1.2. Row of short horizontal incisions 1.3. Row of short oblique incisions (alveoli) displayed on the rim 1.4. Row of short vertical incisions displayed on the inner rim 1.5. Row of short oblique incisions displayed on the inner rim 1.6. Row of slightly concave incisions 1.7. Stripe made of a horizontal incision framed by small incisions 1.8. Rows of wide horizontal incisions Rows of incised arches 1.9. Rows of vertical incisions 1.10. Rows of incisions displayed in a semi-circular pattern 1.11. Rows of wavy incisions 1.12. Rows of incised arches 1.13. Incisions displayed in a star shape on the base of the vessel 1.14. Wide incisions displayed in a garland pattern 1.15. Wide incisions displayed in a garland pattern on the inner rim 1.16. Double wide incisions displayed in a triangle shape 1.17. Double wide incisions displayed in an upturned-triangle shape 1.18. Row of narrow incisions displayed in a triangle shape 1.19. Rows of triangular incisions displayed on the inner rim 1.20. Stripe made of a triangular incision framed by small impressions 1.21. Incised upturned triangles filled with vertical incisions 1.22. L-shaped incisions 1.23. Incisions displayed in a star shape
2. Channellings	2.1. Narrow vertical channellings 2.2. Narrow horizontal channellings 2.3. Narrow channellings displayed in a circle on the base of the vessels 2.4. Narrow oblique channelling 2.5. Narrow channellings displayed semi-circularly 2.6. Narrow channellings displayed in a garland pattern 2.7. Arches made of narrow channellings 2.8. Narrow channellings displayed in a star shape on the base of the vessel 2.9. Oblique narrow channellings 2.10. Narrow channellings displayed semi-circularly on the inner rim 2.11. Wide horizontal channellings 2.12. Wide vertical channellings 2.13. Wide channellings displayed semi-circularly 2.14. Wide channellings displayed in a garland pattern 2.15. Wide oblique channellings 2.16. Wide channellings displayed in a circle on the inner rim 2.17. Wide channellings displayed in arches
3. Pseudo-twisted cord	3.1. Horizontal pseudo-twisted cord lines 3.2. Vertical pseudo-twisted cord lines

Tab. 3. Continuation.

Decoration techniques	Decorative motifs
4. Embossed decorations	4.1. Conical knob 4.2. Circular knob 4.3. Elongated and pointed knob 4.4. Elongated rectangular knob 4.5. Vertical narrow rib 4.6. Indented rib 4.7. Embossed arches 4.8. Horizontal rib 4.9. Stripe made of indentations 4.10. Stripe made of alveoli
5. Impressions	5.1. Row of circular impressions 5.2. Circular impression 5.3. Row of oval impressions 5.4. Row of small impressions shaped like an upturned triangle 5.5. Row of crescent-shaped impressions 5.6. Row of rectangular impressions 5.7. Impressions displayed in a circle

DISCUSSION

In addition to identifying stylistic features characteristic for different chronological sequences expressed in absolute dates, in some cases it was also possible to follow the evolution of certain pottery shapes and certain combinations of ornamental motifs for a period spanning two centuries. A first example is the biconical vessel richly ornamented with various incised motifs, embossed decoration and channelled decoration uncovered in the settlement from Șagu-Site A1_1, cx. 291 a feature dated to the 16th c. BC. This vessel shape and the manner in which the ornaments are displayed are the prototypes for the specimen found in grave cx. 98 from the cemetery at Pecica-Site 14 (Fig. 33) dated to the 15th c. BC. Another example is that of the vessels uncovered in grave cx. 67 from Pecica-Site 14 and in feature cx. 93 from Șagu-Site A1_1 (Fig. 34). Although the same ornamental motifs are being preserved, in both cases the incised decoration is gradually replaced by channelled decoration.

Another important aspect in the context of discussing the emergence and development of LBA pottery is the visible continuation of a strong MBA tradition in pottery shapes, decoration techniques and ornamental motifs (*Duffy et al. 2019*, fig. 6; *Sava/Gogâltan 2019*, 227; *Sava/Ignat 2016*, 195). In a broader context, it can be stated that some MBA pottery styles such as Otomani-Füzesabony or Wietenberg continue to be used until 1400–1300 BC, being contemporary with some LBA pottery styles. At the same time, some of the LBA pottery styles such as Cruceni-Belegiš, Pișcolt-Cehăluț/Hajdúbagos, Noua, and Lăpuș continue many MBA pottery traditions, especially the use of incised decoration. After 1500 BC, channelled decoration becomes the predominant type of pottery decoration in western Romania and eastern Hungary, while large biconical vessels, dishes with inverted rims and cups with high handle rising above the rim become the standard pottery shapes for a vast area. The channelled decoration and the aforementioned pottery shapes are in fact elements of an MBA tradition that will be in use until late in the EIA.

There were two main pottery styles evolving during the MBA in the Lower Mureș: Mureș and Cornești-Crvenka. The analysis of the excavations undertaken at Pecica-*Șanțul* Mare, the tell settlement where the most representative pottery assemblage of the Mureș style was uncovered (*Soroceanu 1991*, fig. 4; 10–15) indicated that certain MBA shapes, techniques and ornamental motifs were preserved in the LBA, reference being made here to cups of the 2D type, dishes belonging to types 1A and 1G, trays (8) and vessels of type 7; as for the decoration techniques, there is a clear tendency, especially in the upper layers from Pecica, towards an increased

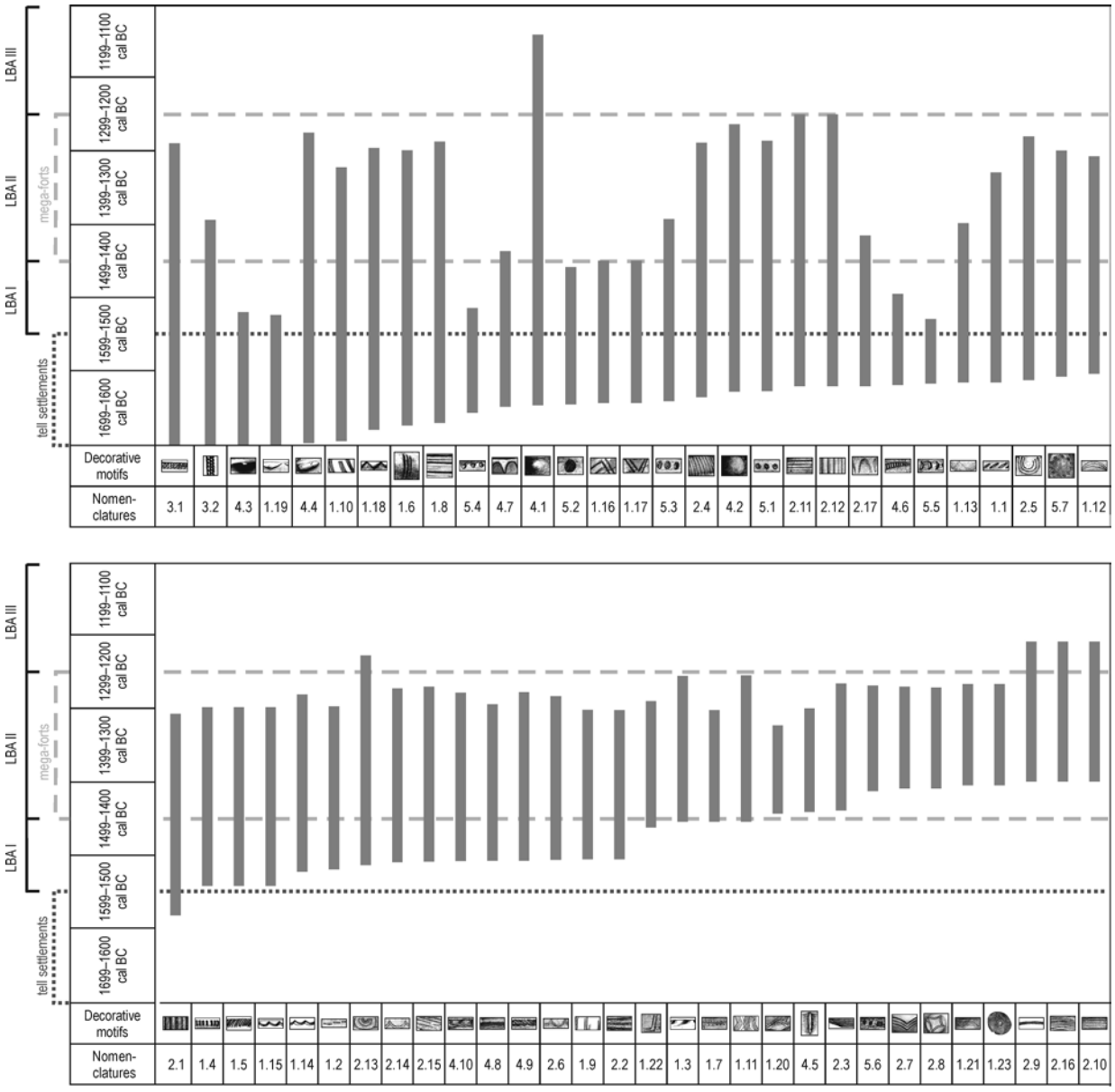

Fig. 27. Chronological distribution of decorative motifs. Graphic by the author.

use of channelled decoration; ornamental motifs that stem clearly from a MBA Mureș tradition are the narrow channellings displayed in a semi-circle (2.5), the circular knobs (4.2) and the impressions displayed in a circle (5.7). A similar phenomenon is encountered in other parts of western Romania, for example north of the Mureș River during the last phase of the Otomani-Füzesabony pottery style (*Molnár 2014*, 70–78, 85–92), or in the Sătmar plain in the contemporary Suciu de Sus I group (*Pop 2009*, 13–18). A more significant number of elements from the Cornești-Crvenka pottery style (*Gogâltan 2004*; *Gumă 1997*, 43–47) are being continued during the LBA, such as cups belonging to type 2G, pots of the 3A type, dishes belonging to the 1E type or incised ornaments such as the rows of slightly concave incisions (1/6), rows of incised arches (1.12), wide incisions displayed in a garland pattern (1.14), wide incisions displayed in a garland pattern on the inner rim (1.15), rows of narrow incisions displayed in the shape of a triangle (1.18) and rows of triangular incisions displayed on the inner rim (1.19). Besides some specific MBA traditions that are continued during the LBA, such as large inhumation cemeteries, the placement of the dead according to strict rules and deposition practices, there are also several shapes, decoration techniques and ornamental motifs that are in use during both the MBA and the LBA. All these facts indicate that the LBA in the Lower Mureș Basin is defined by several MBA traditions.

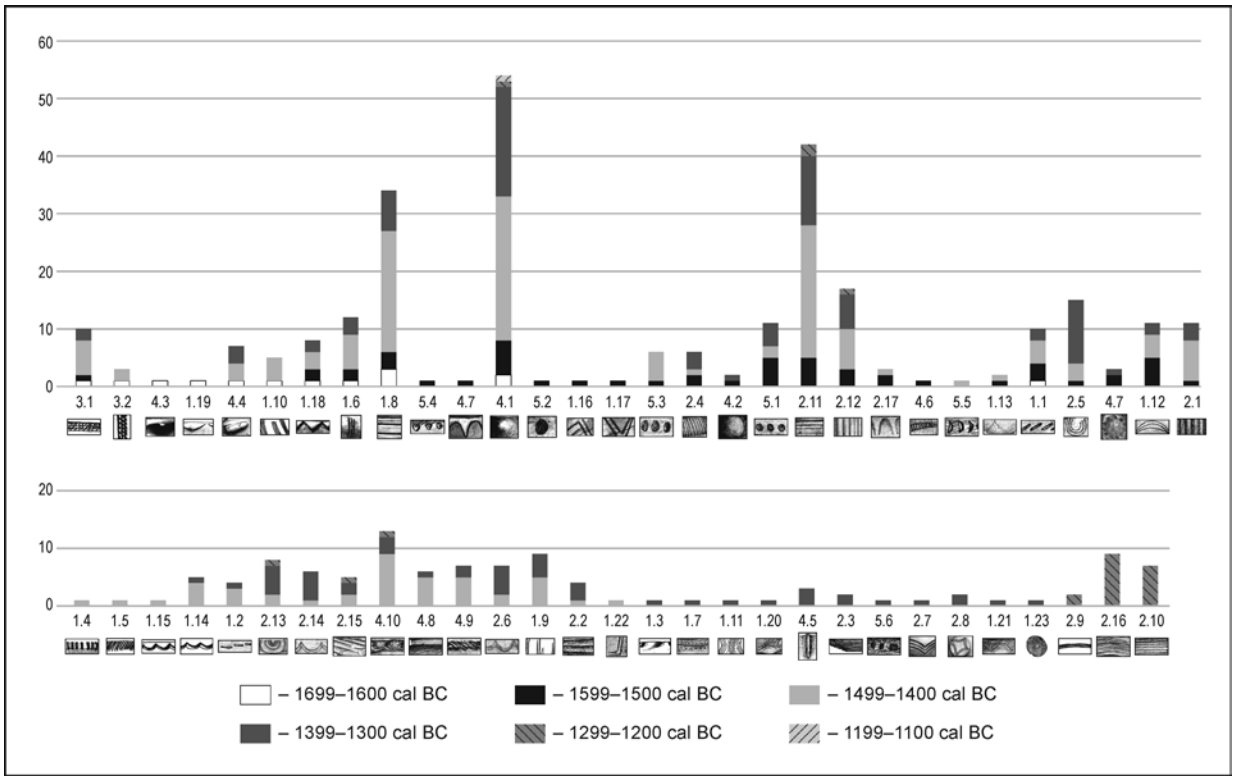

Fig. 28. Chronological distribution and frequency of decorative motifs. Graphic by the author.

At the same time, a continuation of some of the shapes, decoration techniques and ornamental motifs developed throughout LBA I and LBA II into LBA III (a chronological sequence equated with the use of Gáva pottery) can be observed. This is also reflected by the inclusion within the Gáva pottery repertoire of certain shapes such as dishes with inverted rims (1H), dishes in the shape of a truncated cone (1I) and large biconical vessels (6), along with numerous channelled decoration motifs such as narrow vertical channellings (2.1), narrow horizontal channellings (2.2), narrow channellings displayed in a garland pattern (2.6), wide channellings displayed in a garland pattern (2.14), wide oblique channellings (2.15), etc. (*Kósa 2018*, 14–29; *László 1994*, 65–87, 111–124; *Leviţki 1994*, 79–107; *Pankau 2004*, 51–83; *Szabó* 2017). It should be mentioned that during LBA III channelled decoration becomes the predominant decoration technique. Beginning with this phase and until the end of the LBA this fashion spreads throughout most of Romania, the Moldavian Republic, Slovakia, Hungary and Serbia. Even during the first phase of the EIA, until the 7th c. BC, channelled decoration continues to be the preferred pottery decoration technique (*Ursuţiu 2002*, 49). Parallel to the development of channelled decoration, we can also see a preference for certain shapes such as biconical vessels (6), biconical dishes with inverted rims and cups with handles rising above the rim. Although channelled pottery from the inner Carpathian region is commonly, and erroneously, exclusively associated with the Gáva style, it should be noted that during the Gáva period we are only witnessing the peak of channelled decoration usage, this technique originating much earlier and continuing its evolution even after the disappearance of the Gáva pottery.

The pottery analysis undertaken in the paragraphs above has shown that delineating relative chronological sequences based on the typological evolution of pottery cannot be used as a substitute for radiocarbon dates. Furthermore, as more absolute dates become available, it becomes increasingly clear that existing typo-chronologies need to be substantially revised. The aim of this paper, besides establishing the absolute chronology of pottery coming from the contexts presented above, was to devise a relative chronological scheme that can be easily applied to the Lower Mureş region. By combining the contextual analysis with the absolute chronology and the typology of shapes and pottery decoration, it became clear that establishing relative chronological markers based on the evolution of specific artefacts is almost impossible. Instead, stressing out historic events of a general character

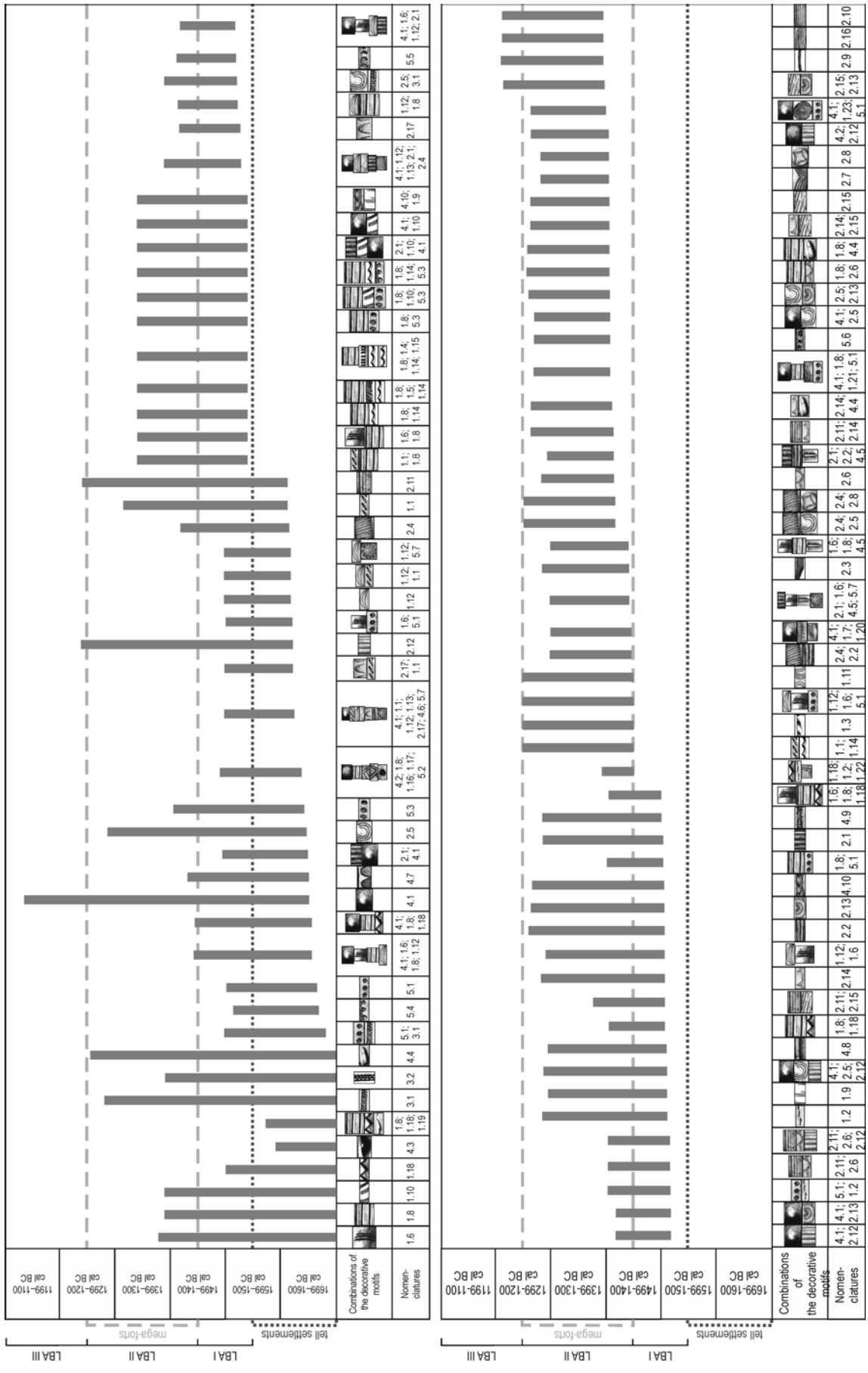

Fig. 29. Chronological distribution of the association of decorative motifs. Graphic by the author.

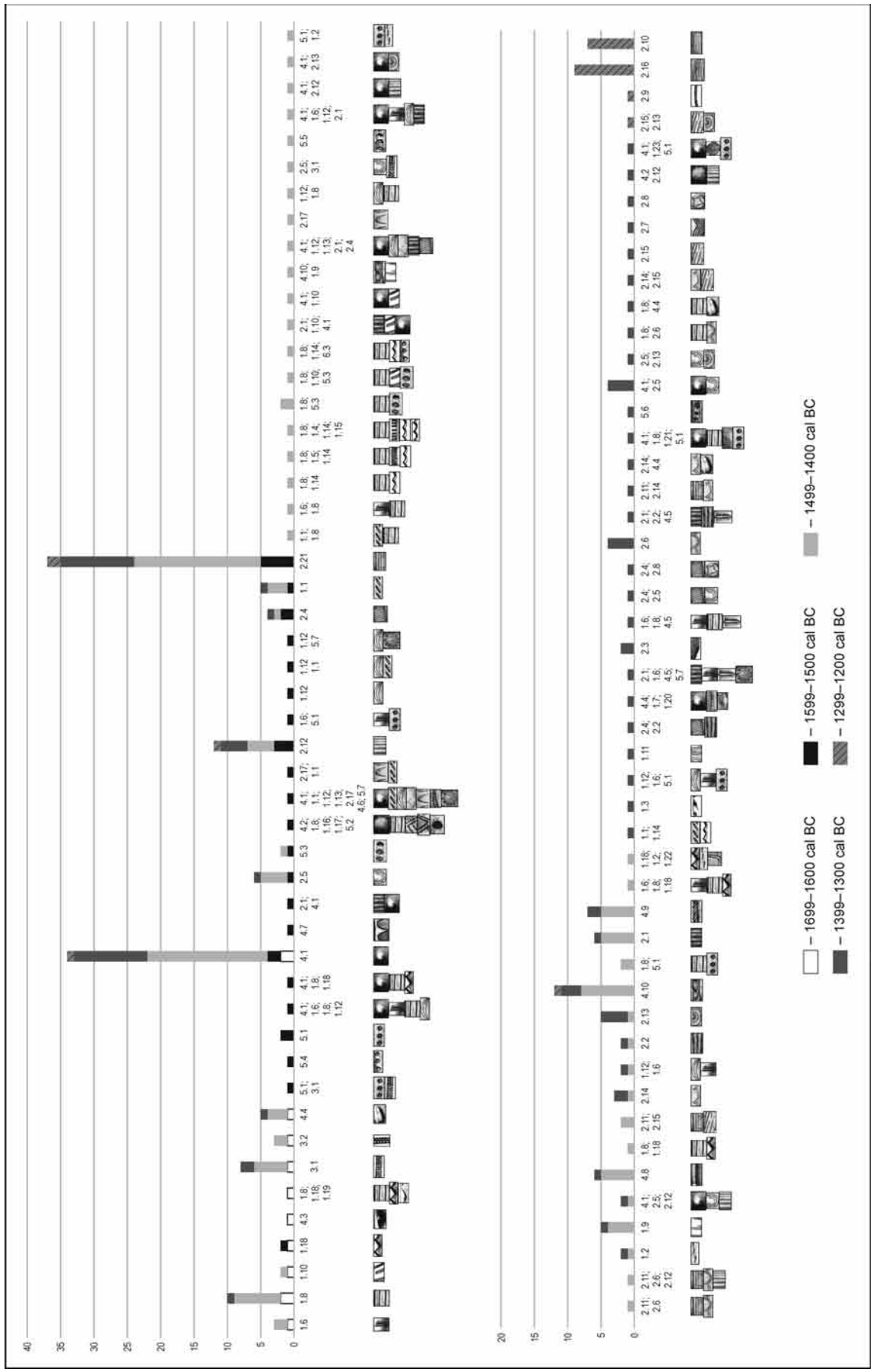

Fig. 30. Chronological distribution and frequency of the association of decorative motifs. Graphic by the author.

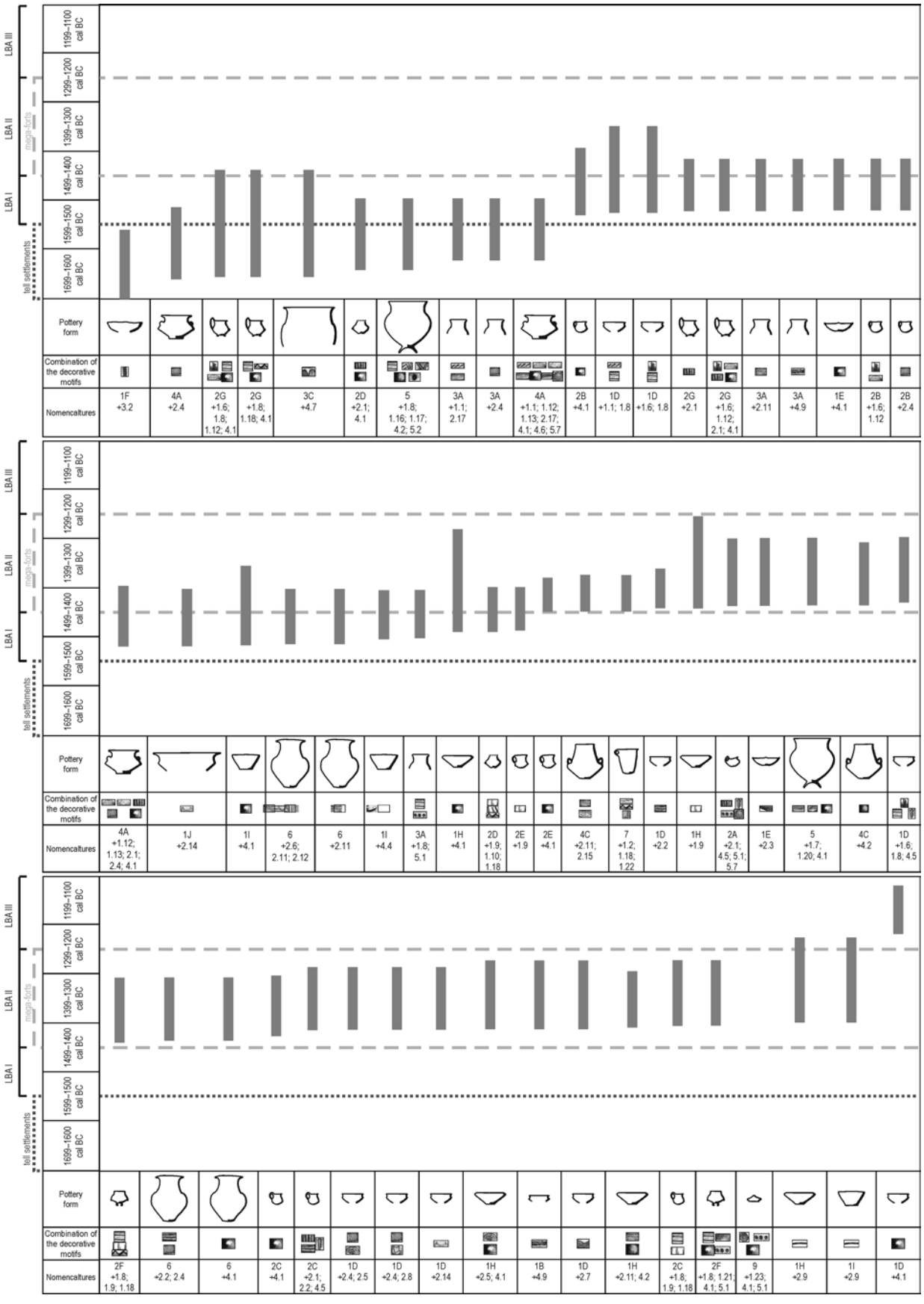

Fig. 31. Chronological distribution of decorative motifs according to pottery shapes. Graphic by the author.

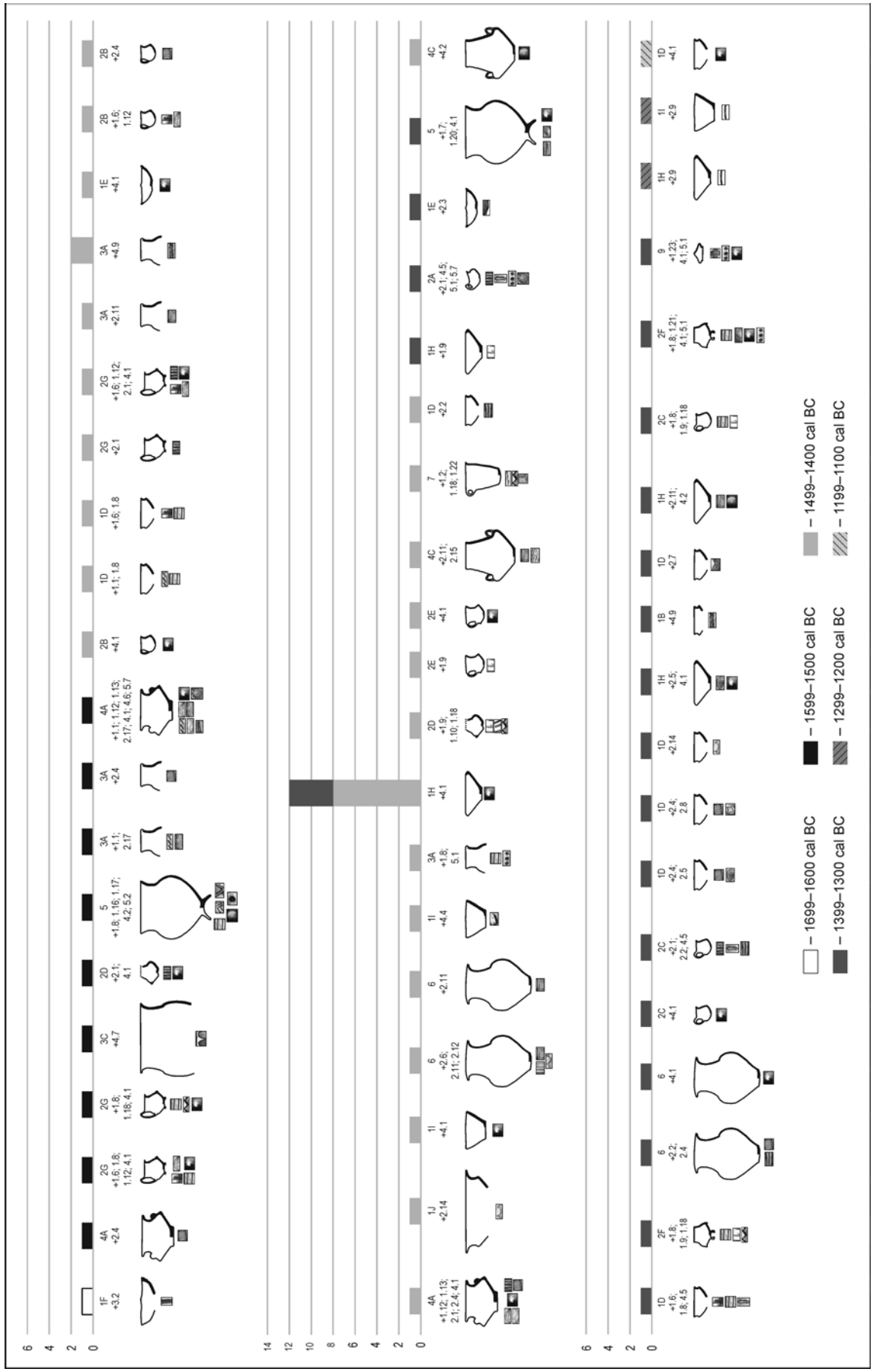

Fig. 32. Chronological distribution and frequency of the association of decorative motifs according to pottery shapes. Graphic by the author.

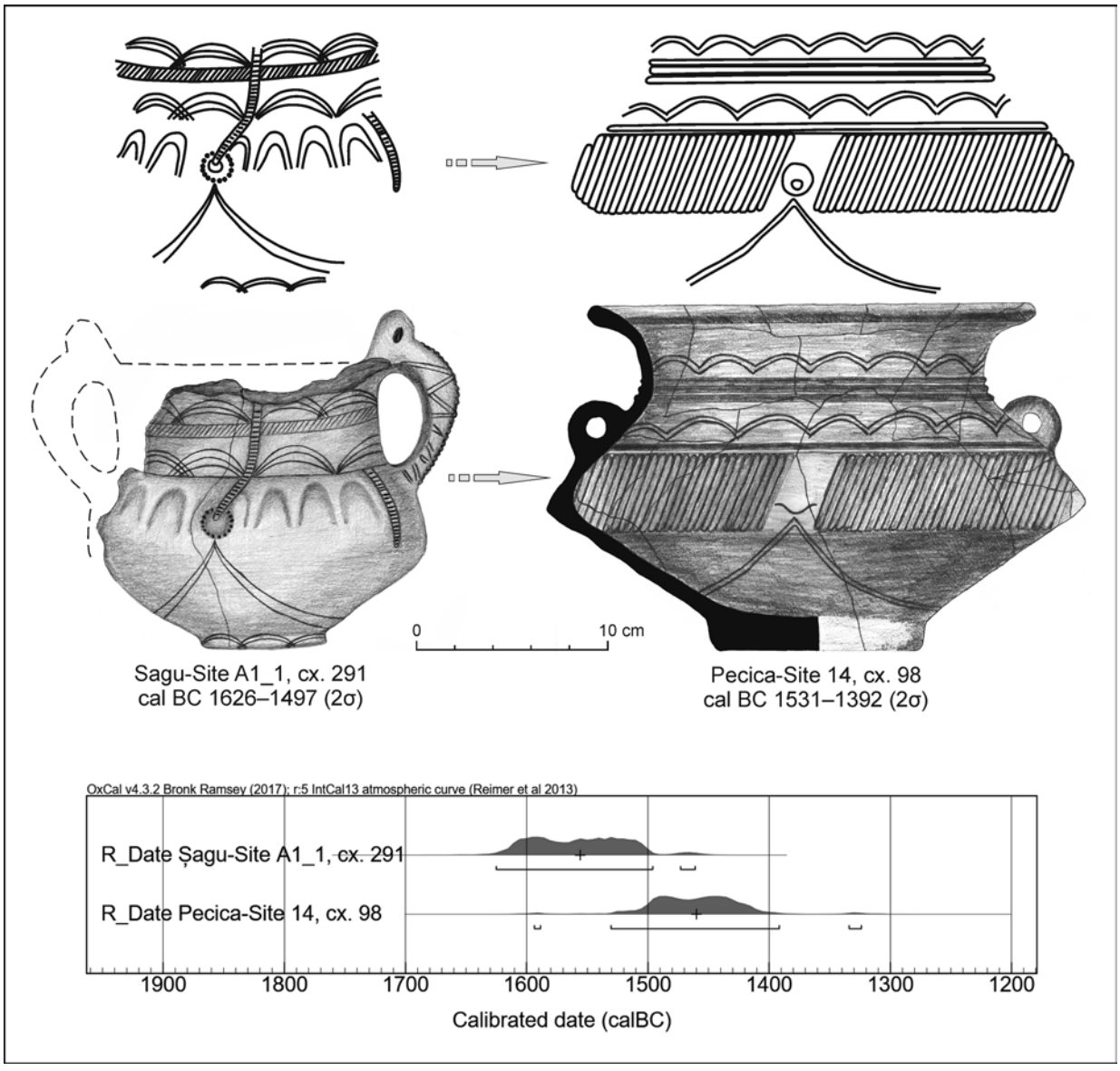

Fig. 33. An example of the evolution of pottery shapes, decoration techniques, and decorative motifs over one century. Graphic by the author.

seems to be a better criterion for devising a relative chronological system that should be complemented and validated by using radiocarbon dates. The main events taking place in the Lower Mureș Basin during the LBA have already been discussed in previous publications (*Gogâltan/Sava 2019*; *Sava/Gogâltan 2019*; *Sava/Ignat 2016*). As a result, the LBA in this region was divided in three main chronological phases (see above). LBA I coincides with the time interval framed on the one hand by the abandonment of tell settlements, and on the other hand by the construction of mega-forts, and can therefore be dated between 1550 BC–1450 BC (this chronological interval being established based on the relationship between the abandonment of the tell settlement from Pecica-Șanțul Mare – approximately 1550 BC and the construction of the third enclosure from Sântana-Cetatea Veche – approximately 1450 BC); LBA II covers the lifespan of the third enclosure from Sântana-Cetatea Veche and the use period of Rings I and II from Cornești-Iarcuri, a period that can be dated between approximately 1450 BC and 1250 BC. LBA III coincides with the destruction of enclosure III from Sântana and Rings I and II from Cornești, as well as the abandonment of the settlements from Șagu-Site A1_1, Foeni-Gomila Lupului etc.; while the beginning of LBA III can be clearly outlined, the absence of archaeological excavations targeted at the investigation of this phase hinders a more detailed discussion regarding the duration

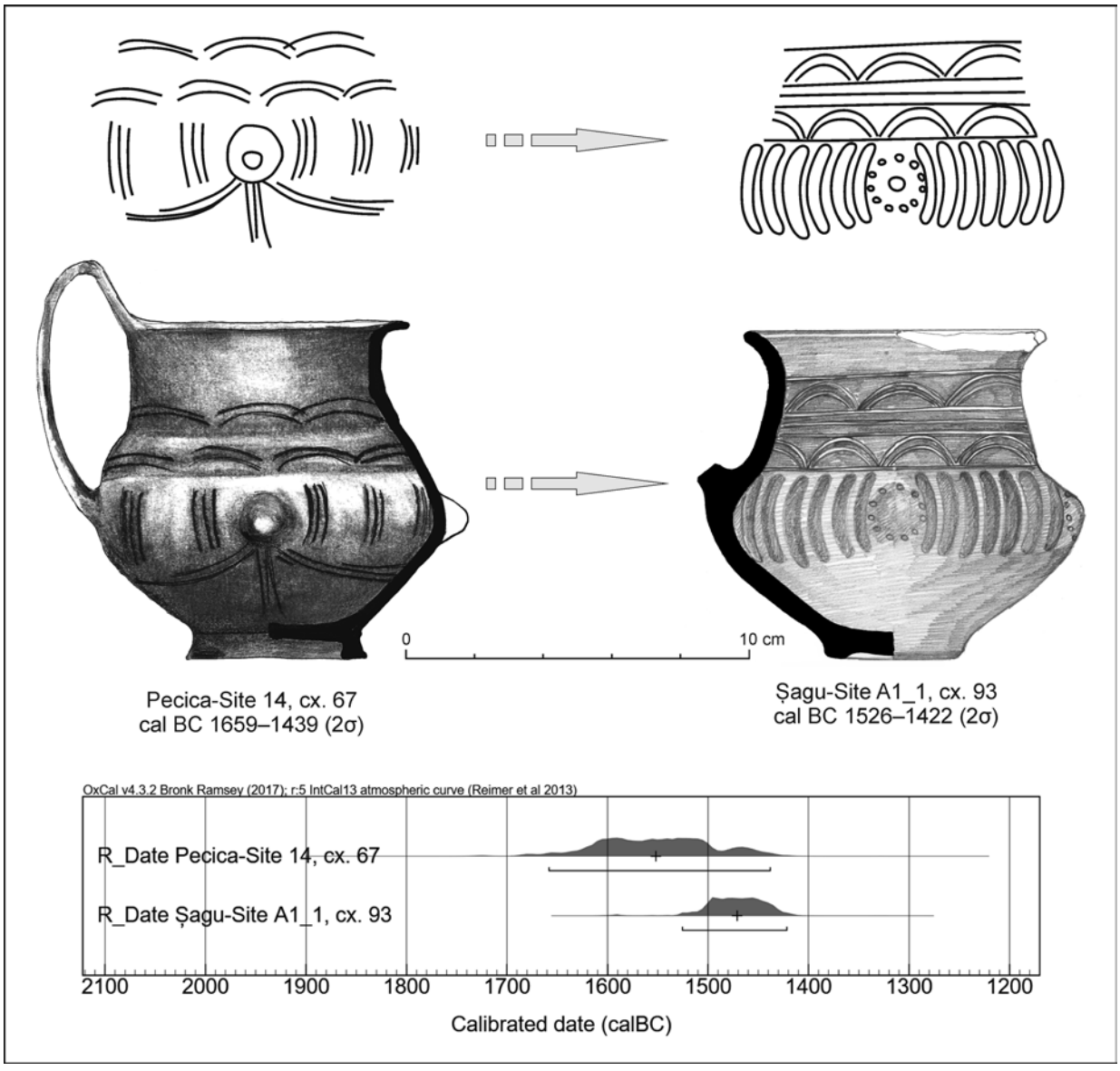

Fig. 34. An example of the evolution of pottery shapes, decoration techniques, and decorative motifs over one century. Drawings by A. Bezvovan, R. Tănăsache and the author.

and end of this chronological stage. It should be mentioned that the chronological phases suggested in this paper have also been adopted in other publications dealing with the LBA from the inner Carpathian region (*Gogâltan 2019*).

CONCLUSIONS

As could be seen, most of the dates incorporated within this analysis fall within an interval between approximately 1600 and 1300 BC. These absolute chronological markers frame the end of the MBA along with the LBA I and LBA II phases. By far the most frequent pottery shapes are the dishes, followed by cups and biconical vessels, shapes that will become ubiquitous after 1500 BC. Within the repertoire of decoration techniques, incised decoration (a MBA tradition) is replaced by channelled decoration, while within the field of ornamental motifs there is a tendency towards standardization during the LBA. However, it should be noted that several pottery traditions, each with its own trajectory and characteristics, coexisted in the Lower Mureș during the LBA. While some communities (Foeni, Giroc) continue to frequently employ incised and pseudo-cord decoration until approximately 1300 BC, other communities (Pecica, Șagu) adopt channelled decoration from early on (1600–1500 BC).

The pottery analysis undertaken here offers a new perspective on the chronological evolution of the Lower Mureș and surrounding regions during the LBA. First, the radiocarbon dates from Giroc-Mescal, Foeni-Gomila Lupului, Șagu-Site A1_1 and Pecica-Site 14 confirm earlier assumptions (*Sava/Gogâltan 2019*, 223; *Sava/Ignat 2016*, 191, 192) that the last MBA layer from Pecica-Șanțul Mare is contemporary with several settlements and cemeteries that can be assigned to the LBA I based on the assemblages found within. Beginning with the construction of the mega-forts (ex. Sântana-Cetatea Veche), the standardisation of pottery shapes and decoration and the widespread adoption of channelled decoration become more and more visible in the material record. These characteristics become even more salient after the destruction of the mega-forts and the distribution of Gáva-type pottery.

The results of this analysis that combined pottery with radiocarbon dates and contexts show that pottery cannot be used as a stable chronological marker in order to construct relative chronological schemes. At the same time, the importance of incorporating radiocarbon dates in the typological and stylistic analysis of pottery is clearly highlighted. Furthermore, the analysis revealed that the evolution of a certain shape, decoration technique or ornamental motif can follow different trajectories even within the same micro-region, which challenges the paradigm of archaeological cultures/styles uniformly distributed over large areas.

On another level, the profound changes of the pottery styles are closely connected with the main events of the LBA. Events like the abandonment of the tells, the construction of mega-forts, and the associated socio-economic growth, can only be properly understood within the broader framework of developments taking place in Europe during the period between the 16th–15th and 13th–12th centuries BC. Here reference is being made to the emergence of the Terramare culture (*Cardarelli 2009*; *Vanzetti 2013*) whose evolution closely resembles that of the LBA in the Lower Mureș. At the same time, similar trajectories can be documented all over Europe, reflected by a steady increase in the number of weapons in the archaeological record, the construction of numerous fortifications, the ubiquity of violent conflicts, an increase in mobility, the pervasiveness of bronze artefacts or the development of trade routes (see, for example *Hansen 2019b*; *Harding 2007*; *Jung 2016*; *Jung/Mehofer 2013*; *Krause 2019b*; *Kristiansen/Larsson 2005*; *Molloy/Horn 2020*; *O'Brien 2018*; *Terberger et al. 2018*). This entire system suffers a collapse during the 13th–12th centuries BC.

The main challenge for future studies dealing with the LBA in the inner Carpathian area and surrounding regions will be the collection and publication of a larger number of radiocarbon dates from features with rich ceramic assemblages in order to establish a reliable absolute chronology. These dates should then form the basis of a chronology of the main events that shaped the history of each region.

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Mladšia doba bronzová v juhovýchodnej časti Karpatskej kotliny

Victor Sava

SÚHRN

Opustenie niektorých tellových sídlisk zo strednej doby bronzovej v oblasti dolného Mureša na juhovýchode Karpatskej kotliny viedlo v priebehu 15. stor. pred n. l. k výstavbe rozsiahlych hradísk, ktoré zanikli v 13. stor. pred n. l. Reprezentatívne lokality boli síce archeologicky skúmané, ale veľké množstvo získaných artefaktov, vrátane keramiky zatiaľ nebolo podrobne analyzované. Cieľom práce je vyplniť túto medzeru a predstaviť podrobnú analýzu spájajúcu dostupné rádiouhlíkové dáta, polohy, z ktorých boli tieto vzorky odobraté a súvisiace nálezy keramiky. Do databázy je zahrnutých 34 rádiouhlíkových dát z 33 sídliskových objektov zo siedmich lokalít (Foeni-Gomila Lupului; Miroc-Mescal, Pecica-východ, Pecica-lokalita 14, Sântana-Cetatea Veche, Șagu-lokalita A1_1, Tápé-Széntéglaégető), ktoré stanovili absolútnu chronológiu keramiky z *oblasti d*olného Mureša. Z *uvedeného počtu* objektov pochádza 552 úplných nádob a črepov. Databáza obsahuje aj informácie o všetkých hlavných morfologických znakoch keramiky (tvar a výzdoba), spolu s technologickými vlastnosťami (techniky zdobenia).

Podľa tradičnej relatívnej chronológie bol vo Vnútorných Východných Karpatoch počiatok staršej doby bronzovej alebo vznik keramiky štýlu Cruceni-Belegiš I, Noua, Lăpuș datovaný do doby okolo roku 1300 pred n. l. (*Ciugudean 2010*, obr. 4). Po desaťročiach výskumov na významných náleziskách a po zozbieraní a publikovaní značného množstva rádiouhlíkových dát bol začiatok staršej doby bronzovej posunutý hlbšie do minulosti (*Gogâltan 2019*, 48–51; *Sava/Gogâltan 2019*; *Sava/Ignat 2016*, 192–195). To sa potvrdilo novými rádiouhlíkovými dátami z dolného Mureša, ktoré zatiaľ naznačujú, že staršia doba bronzová sa v tomto regióne začala v 16. stor. pred n. l.

Typologická analýza skúmaného súboru keramiky ukázala, že pôvodný tvar bolo možné rekonštruovať len u 25,36 % črepov (140 kusov). Spolu sa rozpoznalo deväť hlavných tvarov, ktoré boli ďalej rozdelené na 23 podtypov (obr. 16; tabela 2). Podarilo sa určiť spolu 59 výzdobných motívov, z ktorých väčšina bola rytá. Nasledovalo kanelovanie, reliéfna výzdoba, vtlačovanie a pseudošnúrová výzdoba (obr. 26; tabela 3). Na analyzovanej keramike bolo teda identifikovaných päť základných výzdobných techník: rytie (1), kanelovanie (2), pseudošnúrová výzdoba (3), reliéfna výzdoba (4) a vtláčaná výzdoba (5). So pseudošnúrovaním sa stretávame len na keramike z Giroc-Mescal a Foeni-Gomila Lupului. Identifikovali sa dva hlavné vzory vo vývoji výzdobných techník a špecifické aspekty istej obmedzenej chronologickej postupnosti. Po zohľadnení týchto zistení v širšom kontexte hlavných udalostí v regióne možno konštatovať, že po roku 1400 pred n. l. (časový úsek, ktorý korešponduje so vznikom a vývojom rozsiahlych hradísk) sa kanelovaná výzdoba stala dominantnou výzdobnou technikou na úkor rytej výzdoby. Navyše fakt, že nádob s kanelovanou výzdobou je v najstarších kontextoch (približne 1600–1400 pred n. l.) viac než nádob s rytou výzdobou, otvára otázky týkajúce sa systémov tradičnej relatívnej chronológie. Tá pripisuje rytej výzdobe starší pôvod a kanelovanej výzdobe mladší. Pri rozdelení výzdobných techník podľa archeologických lokalít a troch hlavných časových období zastúpených v tejto štúdii si možno všimnúť, že lokality sa zhlukujú do dvoch skupín (obr. 21). Prvá skupina obsahuje lokality z Foeni-Gomila Lupului, Giroc-Mescal a Tápé. Medzi analyzovanými kontextmi z týchto troch lokalít jasne prevláda rytá výzdoba, kým pseudošnúrová výzdoba sa nachádza len na lokalitách Foeni a Giroc. Navyše kanelovaná výzdoba je na keramike z tejto skupiny veľmi zriedkavá. V druhej skupine (pozostávajúcej z lokalít Pecica-poloha 14, Sântana-Cetatea Veche a Sagu-poloha A1_1) prevláda kanelovaná výzdoba už od obdobia 1600–1500 pred n. l., zatiaľ čo medzi rokmi 1400 a 1300 pred n. l. má kanelovanú výzdobu viac ako 60 % analyzovanej keramiky. Výsledky analýzy odhalili dva hlavné prúdy vo výzdobných technikách v oblasti dolného Mureša. Zdá sa, že na niektorých lokalitách, napríklad Foeni, Giroc a Tápé, pokračovala výzdobná tradícia staršej doby bronzovej, kým na iných lokalitách, ako Pecica, Sântana a Sagu, sa používala kanelovaná výzdoba už v strednej dobe bronzovej I. V tejto súvislosti by sme mali spochybniť alebo aspoň upresniť doterajšie názory na rozšírenie kanelovanej keramiky zo severného regiónu Tisy, severozápadného Rumunska a severovýchodného Maďarska (pozri napr. *Dietrich 2015*, 166; *Metzner-Nebelsick 2012*, 65, 66, 72). Na viac ako 52 % keramických črepoch zaregistrovaných v databáze sa výzdobné motívy dali zrekonštruovať.

Ďalším dôležitým aspektom v diskusii o vzniku a vývoji keramiky strednej doby bronzovej je viditeľné pokračovanie tradície staršej doby bronzovej v keramických tvaroch, výzdobných technikách a motívoch (*Duffy et al. 2019*, obr. 6; *Sava/Gogâltan 2019*, 227; *Sava/Ignat 2016*, 195). Analýza ukázala, že niektoré vlastnosti keramiky zo strednej doby bronzovej pretrvávali aj v mladšej dobe bronzovej. Zároveň môžeme pozorovať pokračovanie niektorých tvarov, výzdobných techník a motívov, ktoré sa vyvinuli v stupňoch I, II a III mladšej doby bronzovej (časové obdobie zodpovedajúce používaniu gávskej keramiky).

Vykonaná analýza ukázala, že vytýčenie úsekov relatívnej chronológie na základe typologického vývoja keramiky nemôže nahradiť rádiouhlíkové dáta. S pribúdajúcimi dostupnými absolútnymi dátami je čoraz jasnejšie, že typologickú chronológiu je potrebné podstatne zrevidovať. Cieľom tejto práce je, okrem iného, stanoviť

absolútnu chronológiu keramiky, ktorá pochádza z vyššie spomenutých lokalít a vytvoriť systém relatívnej chronológie, ktorý by sa dal ľahko aplikovať na oblasť dolného Mureša. Kombinácia kontextovej analýzy s absolútnou chronológiou a typológiou tvarov a keramickej výzdoby ukázala, že stanoviť markery relatívnej chronológie na základe vývoja špecifických artefaktov je takmer nemožné. Namiesto toho sa zdá, že zdôraznenie historických udalostí všeobecného charakteru je lepším kritériom pre vytvorenie systému relatívnej chronológie, ktorý by malo doplniť a potvrdiť použitie rádiouhlíkových dát. Hlavné udalosti, ktoré sa odohrali v údolí dolného Mureša počas mladšej doby bronzovej už boli pertraktované v predchádzajúcich publikáciách (*Gogâltan/Sava 2019*; *Sava/Gogâltan 2019*; *Sava/Ignat 2016*).

Predmetná štúdia ponúka ponúka nový pohľad na chronologický vývoj dolného Mureša a okolitých regiónov v strednej dobe bronzovej. V prvom rade rádiouhlíkové dáta z lokalít Giroc-Mescal, Foeni-Gomila Lupului, Sagu-poloha A1_1 a Pecica-poloha 14 potvrdzujú predchádzajúce predpoklady (*Sava/Gogâltan 2019*, 223; *Sava/Ignat 2016*, 191, 192), že posledná vrstva staršej doby bronzovej z lokality Pecica-Santul Mare je súčasná s niekoľkými sídliskami a pohrebiskami, ktoré je možné priradiť k I. stupňu strednej doby bronzovej na základe v nich nájdených súborov. S počiatkom stavania rozsiahlych hradísk (napr. Sânta-na-Cetatea Veche) je v materiáli čoraz viac viditeľnejšia štandardizácia keramických tvarov, výzdoby a rozšírené preberanie kanelovanej výzdoby. Tieto vlastnosti sú ešte výraznejšie po zničení rozsiahlych hradísk a rozšírení keramiky gávskeho typu.

Výsledky analýzy, ktorá kombinovala keramiku s rádiouhlíkovými dátami a nálezovými kontextmi ukázali, že keramika sa nedá použiť ako stabilný chronologický ukazovateľ pre vytvorenie systémov relatívnej chronológie. Zároveň je potrebné zdôrazniť, aké dôležité je zahrnúť rádiouhlíkové dáta do typologickej a štylistickej analýzy keramiky. Analýza tiež odhalila, že vývoj istého tvaru výzdobnej techniky alebo vzoru môže sledovať rôzne trajektórie, dokonca aj v rámci toho istého mikroregaiónu. To spochybňuje paradigmu archeologických kultúr/štýlov rovnomerne rozšírených v rozľahlých oblastiach.