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CONNECTIVITY DURING THE FIRST HALF OF THE 2ND MILLENNIUM BC. CASE STUDY: THE BRONZE INDUSTRY FROM THE CARPATHIAN BASIN

Alexandra Găvan[1]

Abstract: *The bronze industry of the Carpathian Basin during the first half of the 2nd millennium BC is highly diverse, with a wide range of artefact types being produced and circulated during this period. This paper examines the different distribution patterns of selected bronze artefact types in order to highlight various local, regional and supra-regional networks of contact and interaction that existed during this period. These networks facilitated the flow not only of artefacts, but also of raw materials, ideas, people and technologies within and beyond the Carpathian Basin.*

Keywords: *connectivity; Bronze Age; bronze industry; Carpathian Basin*

Introduction

Connectivity during the Bronze Age is still a key research topic in the study of European prehistory, with recent finds and, above all, new analytical techniques showing just how interconnected Bronze Age Europe actually was[2]. The Carpathian Basin was a region fully integrated into the network of connections linking different parts of Bronze Age Europe. This is shown, among other things, by the distribution of certain artefacts, especially those made of metal (copper, bronze and gold)[3] or amber[4]. The importance of the river networks of this region as the main routes for trade and exchange, especially during the first half of the 2nd millennium BC, has also been emphasised[5]. The aim of this paper is to highlight the various local, regional and supra-regional networks of contact and interaction that linked different areas within and beyond the Carpathian Basin. This will be done by analysing the different distribution patterns of selected bronze artefact types produced in the Carpathian Basin during the first half of the 2nd millennium BC, a period that largely corresponds to the Middle Bronze Age according to the chronological system used in the region[6]. By adopting a multi-scalar perspective, this paper

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[2] See, for example, HARDING 2013; VANDKILDE 2014; KRISTIANSEN/SUCHOWSKA-DUCKE 2015; PERNICKA ET AL. 2016; RADIVOJEVIĆ ET AL. 2018; LING ET AL. 2019; HARDING 2020; 2021; MEHOFER ET AL. 2021; NØRGAARD ET AL. 2021; BERGER ET AL. 2022; LING ET AL. 2023.

[3] See, more recently, DAVID 2002; 2013; FISCHL 2012; FISCHL ET AL. 2013; SWIEDER 2013; FISCHL/KISS 2015; REZI ET AL. 2018; NESSEL/PERNICKA 2020; BERGER ET AL. 2022; KISS/ROMHÁNYI 2023; LING ET AL. 2023.

[4] STAHL 2006; GOGÂLTAN 2016; JAEGER ET AL. 2023a; JAEGER ET AL. 2023b; VANDKILDE ET AL. 2024.

[5] O'SHEA 2011; KISS 2011; DUFFY 2020.

[6] See for example FISCHL ET AL. 2015; GOGÂLTAN 2015; 2019; KISS ET AL. 2019.

will complement existing studies of Bronze Age connectivity in the Carpathian Basin by highlighting networks of interaction at multiple scales.

The bronze industry of the Middle Bronze Age (MBA) in the Carpathian Basin is very diverse, with a broad spectrum of artefact types being produced and circulated, especially in the second half of this period[7]. Ornaments and dress accessories dominate the bronze industry of the MBA in the Carpathian Basin, being found in high percentages especially in the composition of hoards. The main types are various pins and pendants, as well as buttons, rings, bracelets, armlets, armbands, and arm-guard spirals. The most common tools and weapons are axes of various types (including flat axes, flanged axes, palstaves, and shaft-hole axes of several subtypes), different types of daggers, chisels (either flat or socketed), sickles, spearheads and awls. During the MBA, the first swords also appear in the Carpathian Basin. They belong to the Hajdúsámson-Apa type and are generally considered to be the earliest swords in Europe north of the Aegean world[8]. In the following sections, the distribution patterns of some of these bronze artefact types produced during the MBA in the Carpathian Basin will be presented, starting with those that have a rather limited distribution area and moving on to those that have a very wide geographical range.

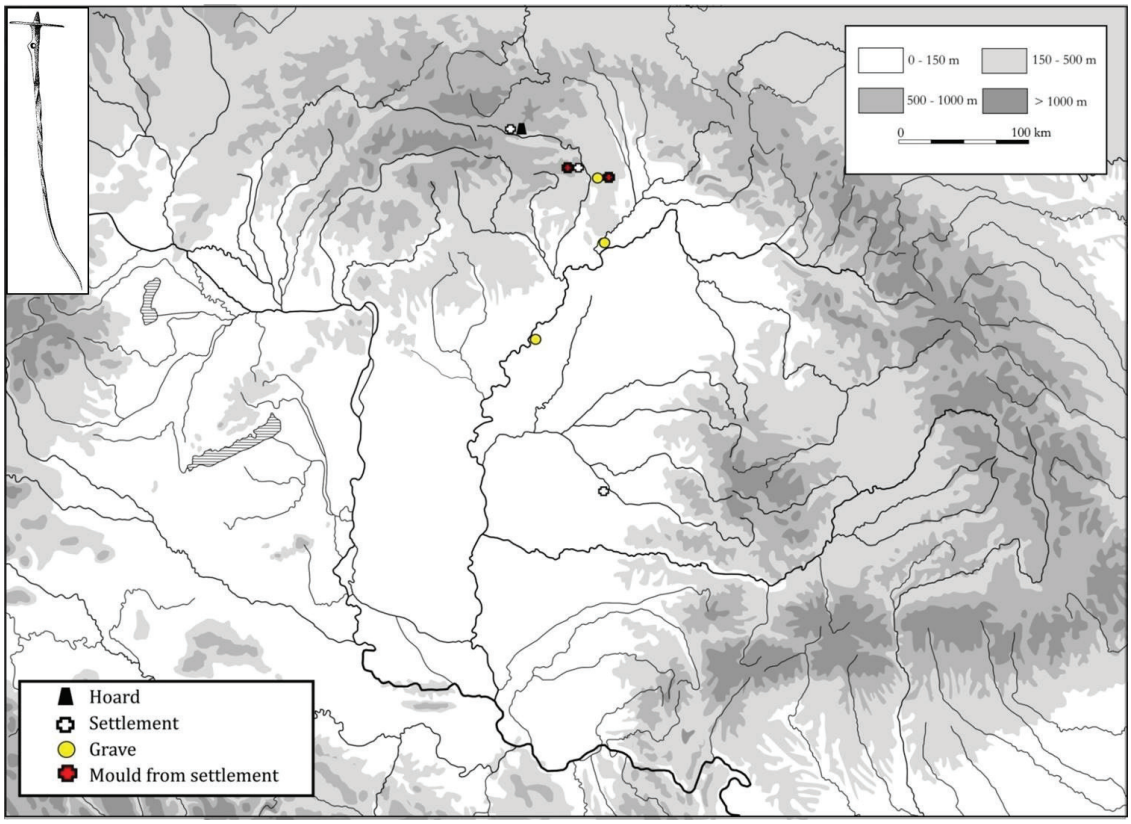

Figure 1. Distribution of Barca-type pins (after GĂVAN 2015).

[7] For overview studies of bronze metalwork during this period see, for example, NOVOTNÁ 1966; MOZSOLICS 1967; HÄNSEL 1968; BÓNA 1975; KOVÁCS 1975; 1977; 1984; SCHUMACHER-MATTHÄUS 1985; BÓNA 1992; GOGÂLTAN 1999; DAVID 2002; MOLNÁR 2011; GĂVAN 2015; SZEVERÉNYI/KISS 2018.

[8] BADER 1991, 37–57; KEMENCZEI 1991, 8–10; DAVID 2002, 369; SICHERL 2004, 47–52; SZEVERÉNYI/KISS 2018, 37–40.

The geographic distribution of selected MBA Carpathian bronze artefacts

Among the bronze artefacts characteristic of the MBA bronze industry in the Carpathian Basin that have a very restricted distribution, we can include the so-called "Barca" type pins. This type was defined by M. Novotná and consists of pins with disc-shaped heads having one or more concentric ribs and a central protruding spike, and necks that are thickened and have a lateral perforation or eyelet, while the shaft of the pins is usually twisted in the lower part[9]. The name of this type comes from the fortified settlement at Košice-Barca (Slovakia), where several such pins and their casting moulds were discovered[10]. Only a few finds of this type are known thus far, mostly coming from settlements and cemeteries in the eastern Carpathian Basin (Fig. 1), and they are generally dated to the Koszider period from the end of the MBA[11].

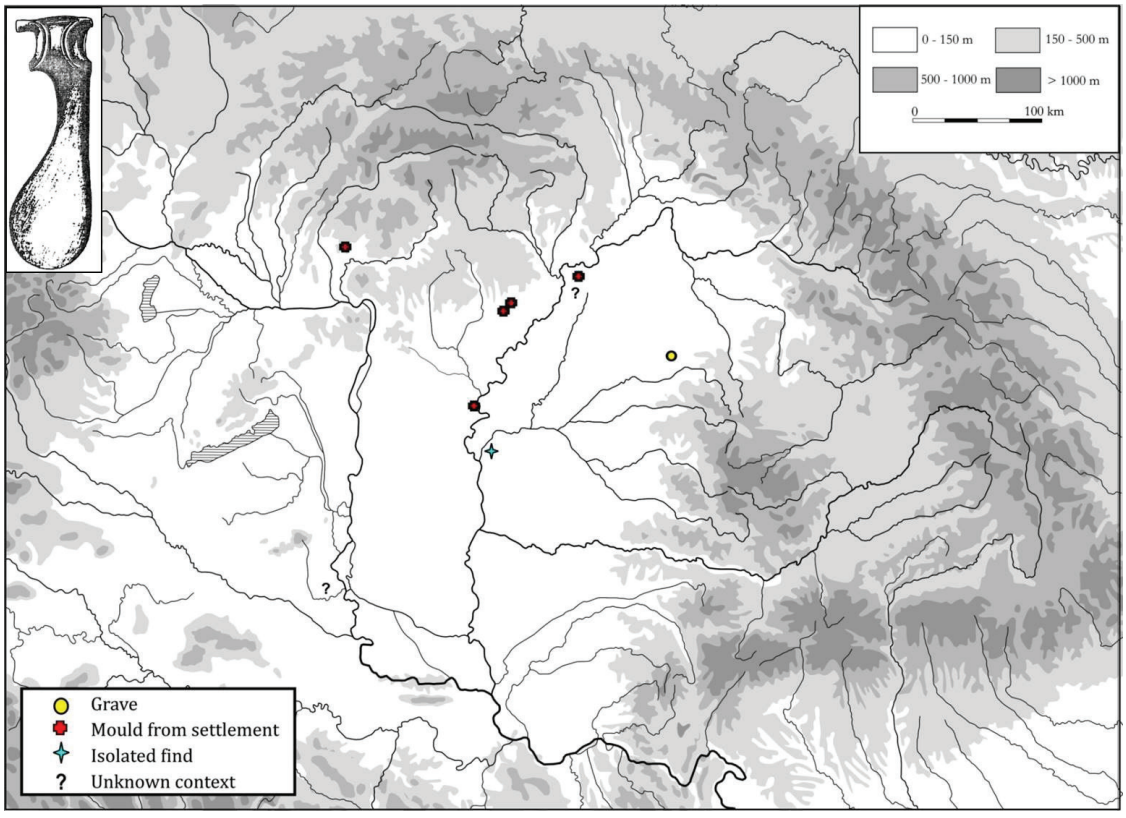

Figure 2. Distribution of Tószeg-type shaft-hole axes (after GĂVAN 2015).

Other bronze products with a limited distribution area are the axes of the Tószeg type, which are usually counted among the shaft-hole axes typical of the MBA metal production in the Carpathian Basin. These axes have a rounded cutting edge, a wide and curved blade, and pronounced edges of their sockets[12]. The few published finished products and casting moulds of Tószeg-type axes are mostly concentrated in the Middle Tisa Basin, with two finds located further to the west: one at Santovka[13] in south-western Slovakia, and another stray find from

[9] NOVOTNÁ 1980, 48.
[10] NOVOTNÁ 1980, 48, no. 274–277, 281–283; 184, no. 1503–1505, pl. 7/274–277, 281–283.
[11] NOVOTNÁ 1980, 49.
[12] ROSKA 1942 (Type "Kúnszentmárton"); MOZSOLICS 1967, 18−19 (Type "Cd"); VULPE 1970, 61.
[13] MARKOVÁ 2000, 393–394, fig. 1–2.

around Kotlina[14], in the Baranja region of north-eastern Croatia (Fig. 2). A slightly different distribution pattern can be observed for the Hajdúsámson type shaft-hole axes, which are characterised by distinct depressions running parallel to the edges of their sockets, long slender blades, straight cutting edges and curved butts[15]. The type takes its name from the famous hoard found at Hajdúsámson in north-eastern Hungary, which contains several axes of this type[16]. The Hajdúsámson axes also have a relatively limited distribution area, covering parts of north-western Serbia, eastern Hungary, western Romania and Transylvania[17] (Fig. 3).

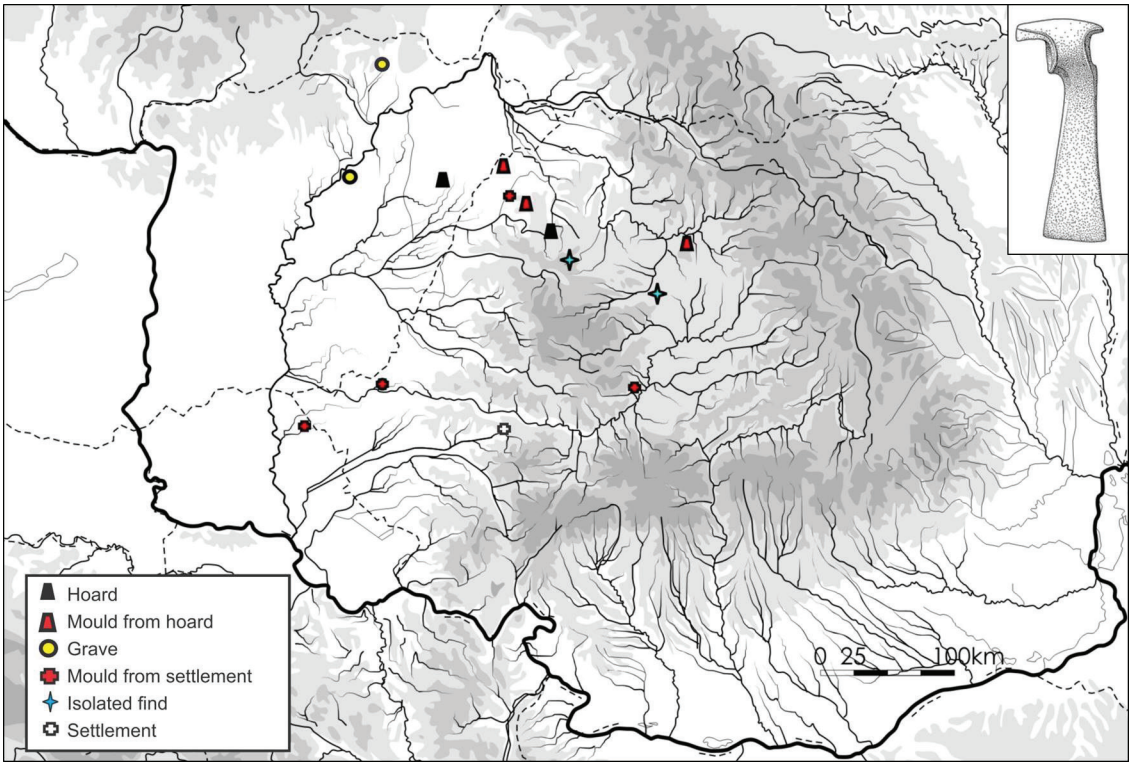

Figure 3. Distribution of Hajdúsámson-type shaft-hole axes (after GĂVAN 2015).

A slightly wider distribution area can be observed for the disc-shaped pendants with crossed ribs, which occur in large numbers in MBA assemblages (particularly hoards) associated with the Encrusted Pottery culture in Transdanubia (Fig. 4), from where they are thought to have originated[18]. These circular pendants have one or more concentric ribs near the margin (one of which runs along the edge) surrounding two vertical ribs that intersect in the centre of the pendant, dividing it into four quarters, each of which is decorated with a small knob in some examples[19]. Ornaments of this type are also known from southern Slovakia[20] or the Vatya milieu

[14] MOZSOLICS 1967, 18.
[15] MOZSOLICS 1967, 18 (Type "Cb");VULPE 1970, 49; GOGÂLTAN 1999, 144.
[16] MOZSOLICS 1967, 137–141, pl. 10/2–5; 11/1–4.
[17] HÄNSEL 1968, PL. 13/23; GĂVAN 2015, fig. 37.
[18] MOZSOLICS 1967, 91; HÄNSEL 1968, 118−119; BÓNA 1975, 215, map IX; FURMÁNEK 1980, 12; KISS 2012, 97–100.
[19] MOZSOLICS 1967, 91−92; HÄNSEL 1968, 118−119; FURMÁNEK 1980, 12; HONTI/KISS 2000, 78–80; JANKOVITS 2017, 62–67.
[20] FURMÁNEK 1980, 12.

in central Hungary[21], with only two finds known from areas further to the east (Fig. 4). A more even distribution within the central Carpathian Basin can be observed for the moon-shaped pendants with a central ornament, which are often richly decorated and have a small perforation in the upper part for hanging[22]. They appear most frequently within hoards, although a few examples are known from settlement or burial contexts or as single finds[23]. Their distribution covers the middle Danube region in central Hungary and the Tisza River basin (Fig. 5).

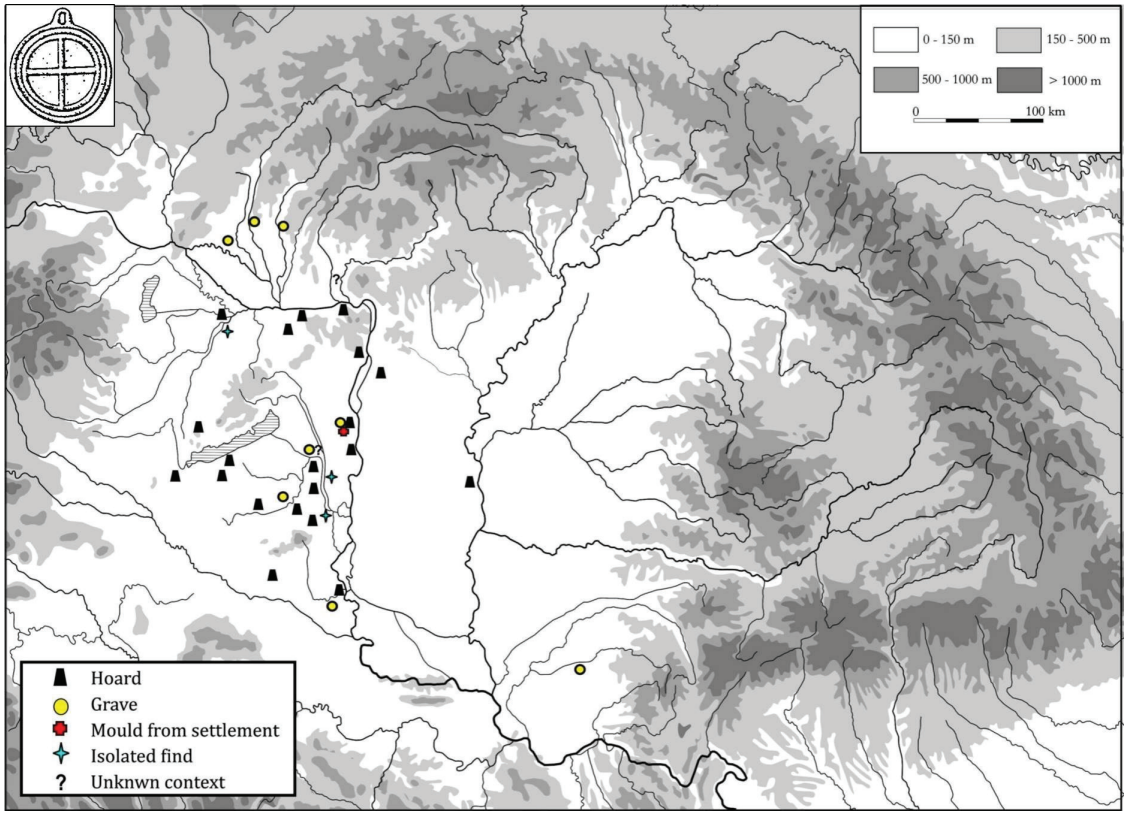

Figure 4. Distribution of crossed-ribs pendants (after GĂVAN 2015).

All the bronze artefacts discussed in the paragraphs above can be considered as typical products of specific areas within the Carpathian Basin, sometimes being found also in neighbouring regions. However, there are also some products of the MBA bronze industry in the Carpathian Basin that have a much wider distribution, being also found in more distant parts of Bronze Age Europe. This is the case for the crest-butted axes (*Nackenkammäxte* in German), which are usually distinguished from the rest of the shaft-hole axes by the extended width of the upper part of the socket (resembling a ridge)[24]. Over time, several different typological divisions have been developed for these axes, mostly based on their formal characteristics as well as their decoration, with some subtypes persisting well into the Late Bronze Age (LBA)[25] according to

[21] See, for examples, the disc-shaped pendants with crossed ribs from the cemetery in Dunaújváros *Duna-dűlő* (BÓNA 1975, 56, 219); Jankovits 2017, pl. 105.

[22] MOZSOLICS 1967, 89; HÄNSEL 1968, 121–122; KOVÁCS 1986, 28–36; JANKOVITS 2017, pl. 107B.

[23] See, for example, KOVÁCS 1986, 32–33; KACSÓ 1998, 15–16; DAVID 2002, 446–447; JANKOVITS 2017, 99–106.

[24] MOZSOLICS 1967, 20–21 (Type "D"); HÄNSEL 1968, 58–61; VULPE 1970, 53 (Type "Apa-Nehoiu"); NOVOTNÁ 1970, 30 ("Schaftlochäxte mit Nackenkamm"); DAVID 2013, 95–96.

[25] See, for example, MOZSOLICS 1967, 20–21; HÄNSEL 1968, 58–61, 187–188, lists 44–46; VULPE 1970,

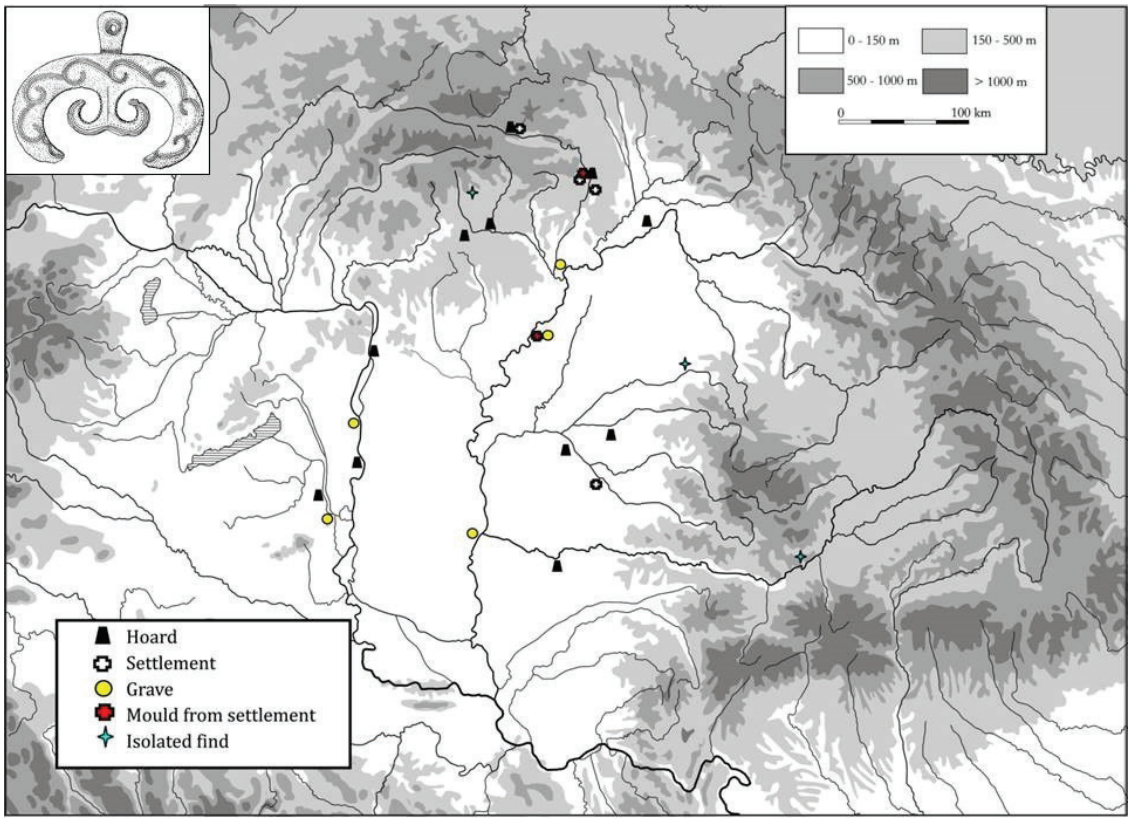

Figure 5. Distribution of moon-shaped pendants with a central ornament (after GĂVAN 2015).

the chronological system used in this region (see above). Crest-butted axes dating to the MBA are generally considered to be characteristic products of the metal industry of the Carpathian Basin, with their main occurrence in this region, although similar artefacts are found to the east and south-east of the Carpathian Arc, and further west in Austria, with one find extending as far north as north-east Germany[26] (Fig. 6). They are most commonly found as part of hoards or as isolated finds, although some axes of this type are known from cemeteries or settlements[27].

A somewhat similar distribution can also be observed for the shaft-tube axes dating to the first half of 2nd millennium BC (Fig. 7). These types of axes are characterised by tubular shafts, narrow blades, and curved butts[28]. Their distribution covers a very wide area, from Scandinavia in the north to Bosnia and Herzegovina in the south, and from central Germany in the west to south-eastern Transylvania in the east. Within this area they are most common in the Carpathian-Bohemian mountain ring[29]. Shaft-tube axes were most frequently deposited in hoards or in burials, and there may be typological as well as chronological distinctions between the two contexts, with the earlier axes mostly found in burials and the later axes almost exclusively deposited in hoards[30]. The only known moulds for the production of such axes come from

53–60; KOVÁCS 1982, 44–46; DAVID 2002, 283–287, fig. 4.3; DAVID 2013, 94–107, fig. 4, 6.

[26] NOVOTNÁ 1970, 31; VULPE 1970, 56; MAYER 1977, 34; DAVID 2002, 305–307, Karte 14; DAVID 2013, 96–99, 104, Karte 1–2.

[27] GĂVAN 2015, 95–98.

[28] MOZSOLICS 1967, 24–33, fig. 3 ("Schaftröhrenäxte"); HÄNSEL 1968, 55–58 ("Schaftröhrenäxte"); NOVOTNÁ 1970, 53–54 (type "Křtěnov"); DAVID 2002, 329–334, fig. 5.3.

[29] DAVID 2002, 338–342.

[30] DAVID 2002, 345–356, fig. 5.5.

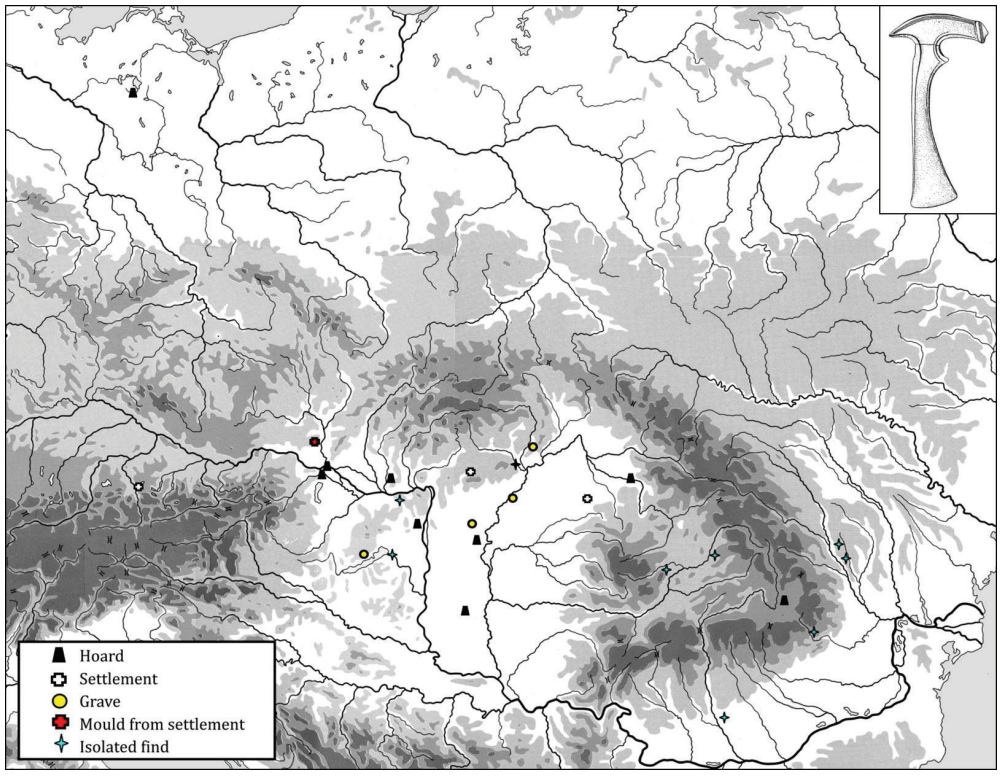

Figure 6. Distribution of crest-butted axes (after GĂVAN 2015).

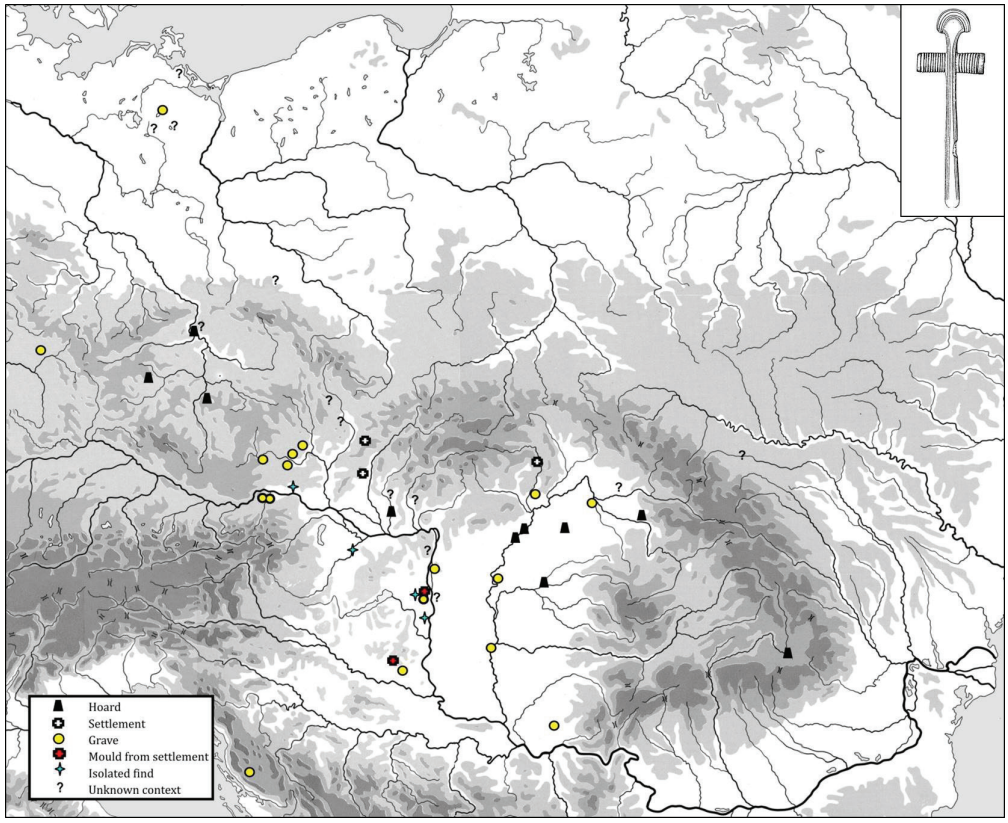

Figure 7. Distribution of shaft-tube axes (after GĂVAN 2015).

the tell site of Dunaújváros[31] and from the settlement associated with the encrusted pottery culture at Pécs-Szabolcs in Transdanubia[32].

Among the Bronze Age artefacts typical of the Carpathian Basin bronze industry, disc-butted axes are one of the most studied categories, not least because of their distinctive appearance and the elaborate decoration on many axes of this type[33]. Here we are concerned only with the disc-butted axes of the B1 type according to Nestor's typology, which are axes with a short shaft-tube that date to the MBA[34]. Type B1 disc-butted axes have their densest distribution in the Carpathian Basin, but are also found outside this area, with axes of this type occurring further north, north-west, west and east of the main distribution zone[35] (Fig. 8). Disc-butted axes of type B1 are most commonly found in hoards or as grave goods, with only a few axes coming from settlements or as isolated finds (see Fig. 8).

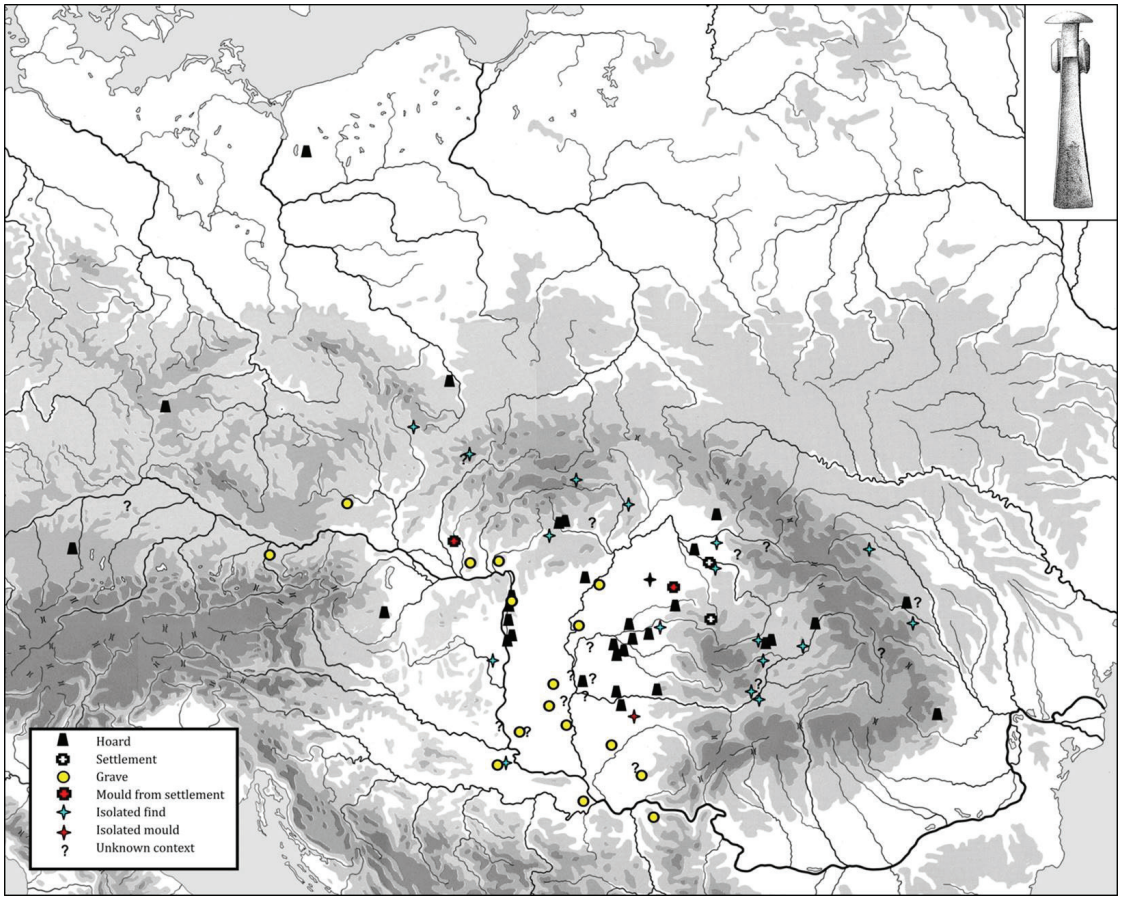

Figure 8. Distribution of type B1 disc-butted axes (after GĂVAN 2015).

[31] MOZSOLICS 1967, 137, pl. 20/5.

[32] KISS 2012, 132, 139, fig. 37/4.

[33] See, for example, NESTOR 1938, 178–192, pl. 72–73; MOZSOLICS 1967, 34–49, fig. 6; HÄNSEL 1968, 61–65, 189–193, Lists 47–53; VULPE 1970, 66–99; DAVID 2002, 47–90.

[34] MOZSOLICS 1967, 45. This type is called "Nackenscheibenäxte mit gedrungener Tülle" in Vulpe's typological scheme (VULPE 1970, 70–77). A more detailed classification of this type can be found in DAVID 2002, 83–89.

[35] VULPE 1970, 77; DAVID 2002, 199–202, Karte 5–7.

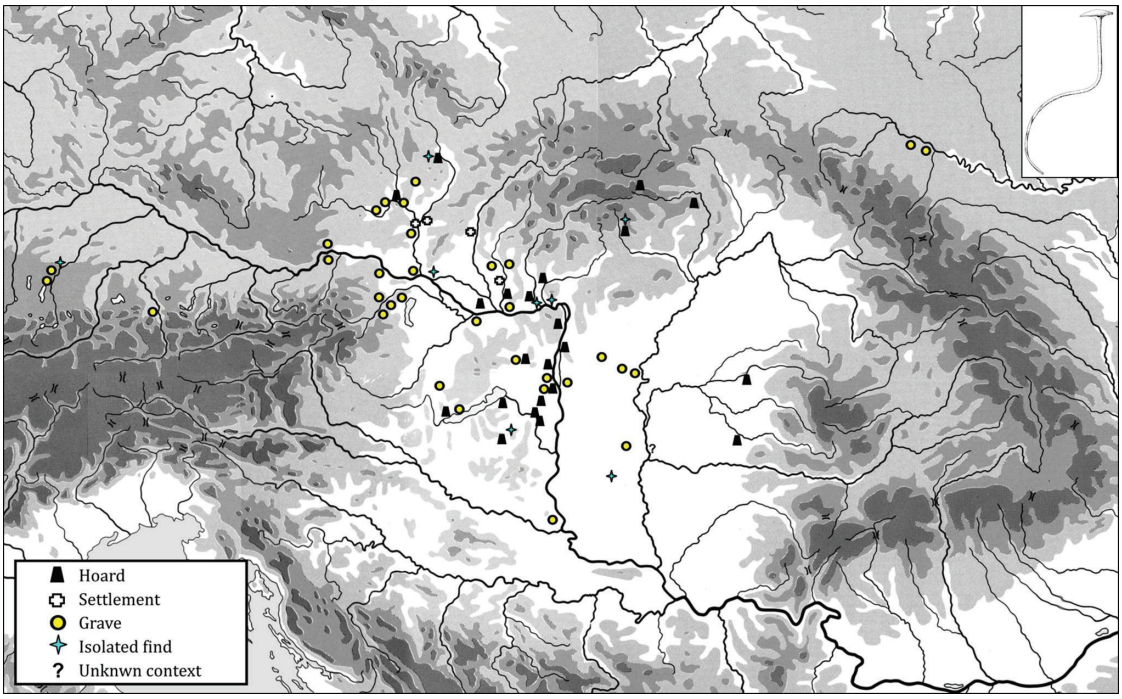

Figure 9. Distribution of sickle-shaped pins (after GĂVAN 2015).

Another typical metal form originating in the Carpathian Basin, and one that is widely distributed, is the sickle-shaped pin. These pins have shafts that are plain in the upper part and twisted in the lower part, with the typical sickle-shaped curvature for most of their length, while their rather large heads are usually dome-shaped, perforated and very often decorated[36]. Sickle-shaped pins are generally thought to have evolved from earlier pins with spherical, conical, biconical or mushroom-shaped heads with oblique perforations[37]. Over time, several classifications of this type of pin have been developed, mostly based on the shape of the head and its decoration[38]. Sickle pins occur mainly in hoards or burials, rarely in settlements or as individual finds, in a relatively large area bordered by Bavaria and Saxony in the west, south-eastern Poland in the north-east, Slavonia in the south and western Romania in the east[39]. However, their densest distribution is in the central Danube basin and southern Moravia (Fig. 9).

In the second half of the MBA, the first swords appear in the Carpathian Basin. These are the solid-hilted swords of the Hajdúsámson-Apa type, which, as previously mentioned, are among the earliest swords in this part of Europe (see above). They are often elaborately decorated and each sword appears to be unique, with its own individual shape and ornamentation[40]. These swords have a metal hilt, four to five rivets, a rounded hilt plate, blades with parallel or convex edges, and a central rib[41]. They are thought to have been made locally in the Carpathian Basin[42]

[36] HÄNSEL 1968, 77; NOVOTNÁ 1980, 60; ŘÍHOVSKÝ 1983, 3; DAVID 1998, 281.

[37] MOZSOLICS 1967, 84; HÄNSEL 1968, 77–78; NOVOTNÁ 1980, 46; DAVID 1998, 281–282; INNERHOFER 2000, 71.

[38] See, for example, HÄNSEL 1968, 78–82, 198–201, Lists 67–73; ŘÍHOVSKÝ 1983, 2–5; RITTERSHOFER 1983, 293–299; DAVID 1998, 284–294, fig. 1.

[39] NOVOTNÁ 1980, 66–67; ŘÍHOVSKÝ 1983, 5; DAVID 1998, 301–305, Karte 1; INNERHOFER 2000, Karte 12; GODIŠ 2019, fig. 3.

[40] BADER 1991, 40; BUNNEFELD 2016a, 382.

[41] KEMENCZEI 1991, 8; BUNNEFELD 2016b, 39–40.

[42] BADER 1991, 51; KEMENCZEI 1991, 10; DAVID 2002, 390–393.

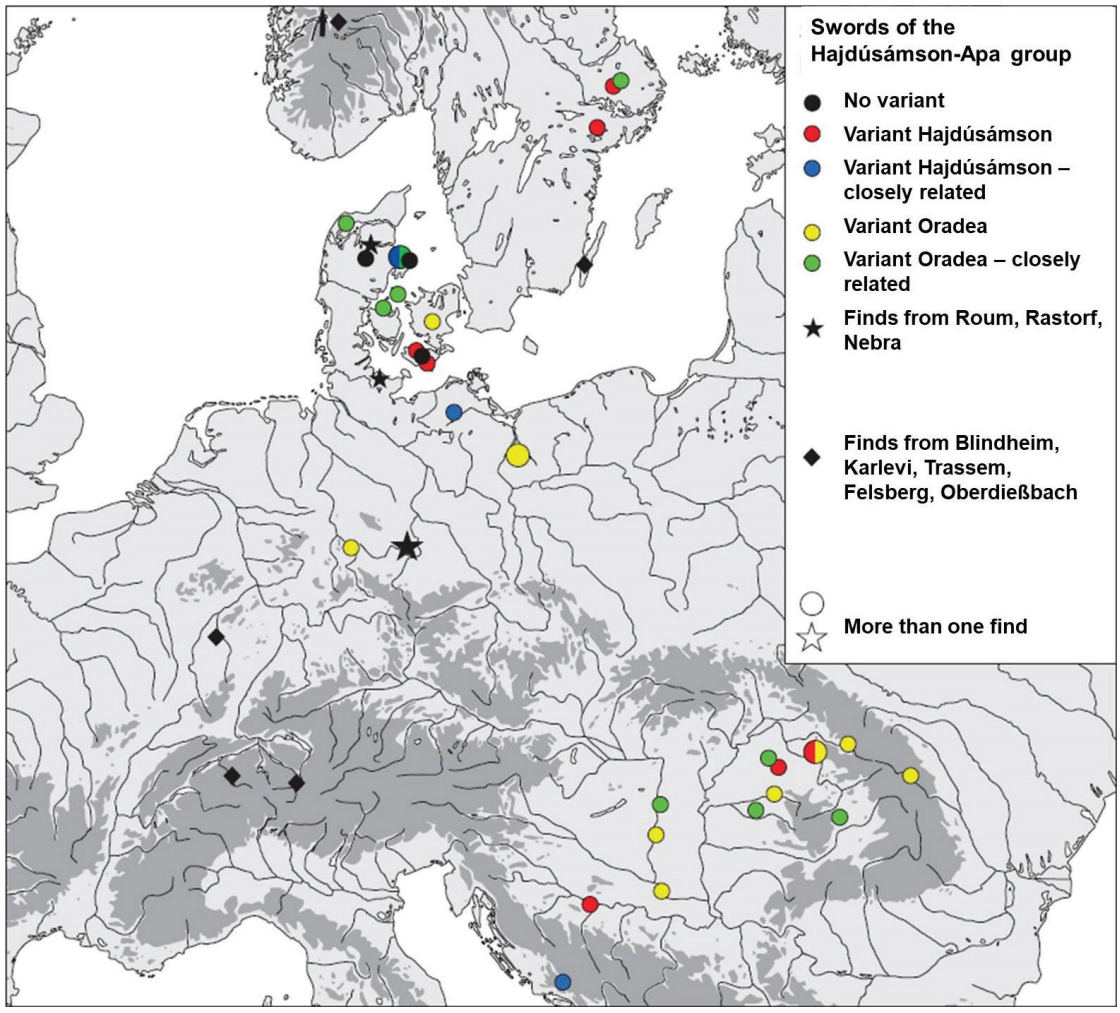

Figure 10. Distribution of the swords of the Hajdúsámson-Apa type (after BUNNEFELD 2016b).

and have a very large distribution area. In addition to the finds of this type in the Carpathian Basin and adjacent areas, other similar swords are known from a wider region covering central, western, and northern Germany, and extending as far as Scandinavia (Fig. 10)[43]. The typologically related swords from the latter regions are considered to be imports or local imitations[44]. Most of the swords of the Hajdúsámson-Apa type in the Carpathian Basin have been found in hoards or as single finds[45]. Further north and west, similar finds occur mostly as single items deposited in wetlands or as grave finds, and more rarely in hoards[46].

Discussion

It is clear from the above that the different types of bronze artefacts produced in the Carpathian Basin during the first half of the 2nd millennium BC display several distribution patterns, revealing networks of contact and interaction at multiple scales. For example, certain

[43] BADER 1991, 51; KEMENCZEI 1991, 10; SWIEDER 2013, 540–541, fig. 4; VANDKILDE 2014, 614; FISCHL/KISS 2015, 50; BUNNEFELD 2016b, 40, 50–51.

[44] VANDKILDE 1996, 225; SWIEDER 2013; BUNNEFELD 2016a, 382.

[45] BADER 1991, 38–39; KEMENCZEI 1991, 8; SZEVERÉNYI/KISS 2018, 39–40.

[46] VANDKILDE 1996, 244; BUNNEFELD 2016b, 39.

bronze objects have a distribution restricted to specific micro-regions within this area. This is especially evident in the case of some personal ornaments (such as Barca-type pins and disc-shaped pendants with crossed ribs – Fig. 1, 4) or certain weapons, such as the Hajdúsámson and Tószeg shaft-hole axes (Fig. 2–3). Although these artefacts tend to be concentrated in particular locations within the Carpathian Basin, their occurrence in neighbouring areas testifies to the existence of local and intra-regional networks of exchange and interaction. There are also ornaments with a broader geographic distribution. The moon-shaped pendants with a central ornament, for example, are evenly distributed throughout the central Carpathian Basin (Fig. 5), while the sickle-shaped pins have a wider geographical range and are also found outside the Carpathian Basin (Fig. 9).

Other categories of MBA metalwork from the Carpathian Basin, especially weapons, are known from even more distant parts of Europe. In addition to the well-known case of the Hajdúsámson-Apa swords (Fig. 10), other weapons with a broad geographical range include crest-butted axes, disc-butted axes, and shaft-tube axes (Fig. 6–8). The wide spatial distribution of these artefacts is indicative of the existence of far-reaching connections linking the Carpathian Basin with more distant areas, particularly central and northern Europe and Scandinavia. This does not mean, however, that bronze objects had the same function and meaning throughout their distribution, as indicated by local differences in their find contexts (Fig. 1–9).

While the geographical distribution of typologically related bronze artefacts suggests networks of exchange and interaction, the existence of these networks is further supported by recent analytical work on artefact types discussed in the section above[47]. In a more recent study, a series of bronze objects belonging to some of the types discussed in the paragraphs above (Hajdúsámson-Apa swords, shaft-tube axes, shaft-hole axes of the Hajdúsámson type, crest-butted axes, disc-butted axes and similar finds) coming from Romania, Hungary, Germany, Denmark and Norway were analysed in order to determine their lead, tin and copper isotopic ratios, as well as their chemical compositions. The aim was to better understand the relationship between these artefacts, as well as when and where they were made[48]. In line with previous studies[49], it was concluded that the copper in the analysed artefacts most likely originated from the copper sources in the Mitterberg region of Austria and the Hron valley in the Slovak Ore Mountains[50]. What is new about this study however is that it posits that, while the copper in some of these analysed bronze objects can be clearly attributed to either the Mitterberg ores, or the Hron valley sources, there are also a number of other artefacts whose chemical and lead isotopic compositions lie in the region between these two copper sources, thus suggesting a mixing line. These investigations suggest the mixing not only of different copper bases, but also of different bronze batches[51]. The mixing of ores has also been argued for bronze artefacts coming from other areas, such as Denmark[52].

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[47] DANI ET AL. 2013; PERNICKA 2013; BUNNEFELD 2016a; PERNICKA ET AL. 2016; BRÜGMANN ET AL. 2018; LING ET AL. 2019; DANI ET AL. 2020; NESSEL/PERNICKA 2020; NØRGAARD ET AL. 2021; LING ET AL. 2023.

[48] BERGER ET AL. 2022.

[49] See, for example, PERNICKA 2013; PERNICKA ET AL. 2016; RADIVOJEVIĆ ET AL. 2018, FIG. 7; LING ET AL. 2019.

[50] BERGER ET AL. 2022, 58–61; another recent study investigating a batch of MBA artefacts from the tell at Százhalombatta also reached the conclusion that the copper in these newly analysed objects also originated from the same two major sources: the Slovakian Ore Mountains and the Mitterberg ores in the Eastern Alps (LING ET AL. 2023).

[51] BERGER ET AL. 2022, 59, 62–70.

[52] NØRGAARD ET AL. 2021.

Conclusions

The distribution of bronze artefact types produced in the Carpathian Basin during the MBA demonstrates the existence of networks of exchange and interaction at multiple scales. While certain bronze objects reveal local and regional networks linking different areas within the wider Carpathian Basin, several artefact types with a broad geographical range clearly indicate that the Carpathian Basin was fully integrated into the network of connections linking different parts of the Bronze Age world. Although much of the social context of these interactions is still beyond our knowledge, we have to bear in mind that the spatial distribution of artefacts made of bronze is indicative not only of connections between regions, but also of connections between people. Recent analytical work on bronze artefacts has also demonstrated that, starting with the first half of the 2nd millennium BC, there were multi-directional transfers not only of raw materials (copper), but also of finished artefacts, ideas, and technologies. This gives us a more nuanced understanding of cultural contacts and trade networks in Bronze Age Europe.

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