FLUORITE – A MARKETABLE MINERAL COMMODITY FROM THE CENTRAL REGION OF MEDIEVAL HUNGARY

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Abstract: Several types of mineral beads can be found among the 11th–12th-century grave assemblages of the Carpathian Basin. This paper examines the distribution of fluorite beads representing one type in Central and Eastern Europe. The distribution patterns have enabled the identification of the source of the raw material and they also outline the period's main trade routes.
Keywords: East-Central Europe, 11th–12th centuries, fluorite, beads

The burials in the churchyard of the medieval county centre at Zalavár yielded a total of 74 greyish-white and light or dark purple multi-faceted beads made from a mineral substance (*Fig. 1*). According to Dr. Gábor Papp, director of the Department of Mineralogy and Petrology of the Hungarian Natural History Museum, these beads were made of fluorite.[1]

In his study on the beads from the Pusztaszentlászló cemetery, Béla Miklós Szőke discussed the chronological position and socio-economic contexts of the greyish, greenish or purplish faceted beads. Citing geologist Csaba Révész, he noted that the raw material of the beads was fluorite, which originated from the Velence Hills,[2] a low mountain range located near Székesfehérvár, in the central region of the medieval Kingdom of Hungary known as the *medium regni* from the thirteenth century onward.[3]

Szőke's assertions were widely accepted in Hungarian archaeological scholarship during the past decades, this being one of the reasons for Željko Tomičić's claim that "particular attention has been accorded to the necklaces strung of perforated, faceted amethyst and fluorite beads in Hungarian medieval studies, which in Giesler's typological scheme represented Type 41a."[4]

The two minerals, amethyst and fluorite, were associated by Tomičić. The two indeed appear as alternatives in Jochen Giesler's cited study published in 1982, since the latter used the previously published data in his analysis. However, he described the beads from the Halimba cemetery as having been made from fluorite.[5] Gyula Török, who uncovered the Halimba cemetery, wrote of amethyst beads in his initial Hungarian report on the burial ground.[6] However, before publishing the final monographic study on the site, he showed the new bead types appearing in the cemetery's final, third phase "described as being of amethyst in the archaeological literature owing to their purplish colour" to Dr. János Erdélyi, the geologist of the Department of Minerals of the Hungarian National Museum. The

[1] I would here like to thank Dr. Gábor Papp and Dr. Bálint Péterdi for their kind help while writing this study.

[2] Szőke–Vándor 1987.

[3] For a recent discussion of the term *Medium regni*, cf. Benkő 2015, with further literature.

[4] Tomičić 1995, 103.

[5] Giesler 1981, 45.

[6] Török 1954, 99–100.

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mineralogist cited as "Erdélyi CSc" in the final report declared that the beads had in fact been made from fluorite,[7] the identification later quoted by Giesler, in stark contrast to Herbert Bach and Siegrid Dušek, whose oft-cited study first mentions the Halimba cemetery as yielding amethyst beads,[8] even though there was not one single bead made from this mineral either among the finds from the latest phase, or the assemblages of the earlier phases.

Similar beads from the early Árpádian Age had first been described by Béla Pósta at the end of the nineteenth century. His excavation of the cemetery at Rákospalota yielded twenty-one "stone" beads from two burials as well as seven similar beads that could not be associated with any of the graves. Ágoston Franzenau, the then custodian of the Department of Minerals of the Hungarian National Museum, who happened to live in Rákospalota, "broadly identified them as fluorite beads".[9] However, this identification was buried deep in Pósta's book, *Régészeti tanulmányok Oroszföldön. II (Archäologische Studien auf russischem Boden. II*) [Archaeological Studies in Russia] and in the entries of the 1892 Acquisitions register of the Hungarian National Museum, and thus escaped scholarly attention,[10] given that the excavation itself remained unpublished until the appearance of Katalin I. Melis's study in 1997.[11]

The mineralogy of the beads must also be covered in this brief overview of previous research. Mineralogist Orsolya Kákay Szabó became interested in the beads of the Maroshegy cemetery in the wake of Kornél Bakay's studies on the burial grounds in the Székesfehérvár area. In her study published in 1974, she noted that archaeologists tended to identify the beads' material as amethyst based on their colour and she also drew attention to the grinding technique of the beads and the use of gimlets for drilling the perforations. However, these techniques could not be employed in the case of minerals with a similar hardness as amethyst, being only feasible for the much softer fluorite. The colour of the beads suggested a deposit in the Velence Hills, where raw material with a similar greenish-blue or purplish hue could be collected from surface outcrops. "It is noteworthy that the beads produced from fluorite occurring in the Velence Hills were highly sought-after because they can be found in grave assemblages across the entire county. Most archaeologists describe these finds as having been made from amethyst. It would be prudent have a mineralogist examine similar grave finds because this would shed light on the distribution range of the products of the 'workshop' active in the Székesfehérvár area. The bracelets and necklaces ground from fluorite of the Velence Hills are of outstanding significance because they represent the first known jewellery made from a mineral whose source lies in Hungary."[12]

Kákay-Szabó's assertions and research proposals remained buried in the 1974 Report of the Hungarian Institute of Geology and Geophysics, a publication that rarely reached archaeologists, particularly ones engaged in medieval studies.

Iván Mrázek's book, *Drahé kameny ve středověku Moravy a Slezska* [Gemstones in medieval Moravia and Silesia], which also covers fluorite beads, appeared in 2000 as the second volume of a thematic series. The Moravian geologist discussed not only the finds from the regions indicated in the book's title (which include two fluorite beads from a single site in Bohemia), but also the similar finds brought to light in Poland and Slovakia. Citing the results of his own studies, he challenged the identification of the finds' material as amethyst, the usual case in the archaeological literature. His knowledge of the Hungarian sites is restricted to the data cited in Bach and Dušek's study. In his view, the appearance of the earliest pieces in Poland was followed by the spread of fluorite beads in Moravia and Slovakia after the final third of the tenth century, and the specimens from Hungary marked the southernmost boundary of the distribution. Examining the potential sources, he excluded the fluorite deposits known to him because the raw material from these was unsuitable for the manufacture of beads, but he also challenged a Scandinavian or Kievan origin because beads of this type are not attested there. "Ultimately, we can only assert that the origins of the early medieval fluorite beads remain shrouded in mystery. The source of the beads' raw material (and, by association, their production centre) should probably be sought beyond Central Europe."[13]

[7] Török 1962, 104, note 45. J. Erdélyi's work on the beads is summarised by Sztrókay 1978. Katalin Szilágyi devoted a separate study to the beads of the Hailmba cemetery. However, she did not discuss the second most frequent type, the beads made of minerals, which she only included in her statistical evaluation: Szilágyi 1994, 75. She repeated her views in a later study: Szilágyi 1995, 65, 67.

[8] Bach–Dušek 1971, 94, surprisingly citing the German-language publication.

[9] Pósta 1906, 352. Ágoston Franzenau was custodian of the Department of Minerals and Geology of the Hungarian National Museum from 1883 and its director from 1918 until his death in 1919.

[10] Inv. no. HNM 100/1892.1.–4., 5. –7., 26.–33., 112.–124.: ovoid fluorite beads with multiple or six facets.

[11] I. Melis 1997, 41–47.

[12] Kákay Szabó 1974, 339–342.

[13] Mrázek 2000, 90. I am grateful to Dr. Balázs Komoróczy for kindly making this volume available to me.

In the case of the fluorite beads found in Devín cemetery, Miloš Gregor et alii (2012) suppose that the raw material is probably of Bavarian origin.[14] In 2013, Ewa Lisowska completed her doctoral thesis, *Wydobycie i dystrybucja surowców kamiennych we wczesnym średniowieczu na Dolnym Śląsku* [The mining and distribution of mineral raw material in Lower Silesia during the early Middle Ages], in which she sought to identify the origins of the raw material of the fluorite beads known from four sites in the study region. "Fluorite beads are one of the most rarely discussed find types. To the best of this author's knowledge, there are no studies in the foreign scholarly literature that raise or address issues concerning the processing and origins of this raw material. Only G. Rapp mentions fluorite beads from Predynastic Egypt."[15] Based on Polish data, she suggested two possibilities,[16] either that the raw material was imported from the Near or Far East through the mediation of the Kievan Rus, or, given the frequency of the finds, that the raw material had been mined locally in the Kaczawskie Mountains. However, she conceded that the latter option found little support either among archaeologists or gemmologists.[17]

My own research began with the purpose of updating the list of known sites based on the findings of research conducted during the decades after the publication of B. M. Szőke's monograph in 1987 and to refine, if necessary, the chronology and socio-economic contexts of these finds.[18]

THE SELECTION OF THE SITES

Initially, the most important issue was how to determine the beads' raw material, even if tentatively, based on the descriptions in the publications, according to which the beads shimmering in translucent greenish, greyish, pinkish, pale or dark purplish hues – although sometimes they faded when exposed to light – were all of the longish, multi-faceted barrel-shaped variety. The facets are blunt-edged, rounded and often barely visible. Several bead strands included broken pieces. (The abrasion of the facets and the beads' fragility can be attributed to the mineral's property, its low hardness.) The identifications appearing in the descriptions – amethyst/fluorite or, using a more careful wording, simply mineral raw material – and the accompanying illustrations indicated that fluorite beads have been attested in 79 cemeteries of the early Árpádian Age. Nevertheless, the list of sites can only be conclusively finalised following the mineralogical examination of the finds.

The 79 sites did not modify the chronological framework set up by B. M. Szőke: the beads first attested in the late tenth-century cemetery investigated at Sárbogárd attained their greatest popularity during the final third of the eleventh century, although their use can be noted up to mid-twelfth century in the burials of girls and younger women.[19] (This broad chronology is valid not only for fluorite beads, but also for beads made from other minerals, and not solely in Hungary, but in the cemeteries uncovered in Moravia and Poland, too.[20]) New insights regarding the socio-economic contexts can be expected once the usage and distribution of beads made from rock crystal, carnelian and other minerals has been mapped, given that it was the mapping of the sites yielding fluorite beads that ultimately yielded new results.

THE SITES

The regional distribution of cemeteries yielding fluorite beads is uneven and this imbalance can no longer be explained by a differential research coverage or the lack of publications (see the Appendix).

The prominence of Transdanubia is obvious in terms of the number of sites and quantity of finds, followed by the regions north of the Danube, although the number of finds in the latter is much lower. Only a handful of

[14] Gregor *et al*. 2012, 165.

[15] Lisowska 2013, 145.

[16] Lisowska 2013, 225.

[17] Lisowska 2013, 149.

[18] This research was inspired by an e-mail that I received at Christmas 2015. Dr. Jürgen Vollbrecht uncovered a grave containing fluorite beads in Bautzen and asked questions about them, which made me realize the need for detailed research on the topic.

[19] A later date has been proposed in two instances: Grave 96 at Zagreb-Stenjevec, containing ten basket earrings and two unperforated "ornaments", was assigned to the later twelfth century in view of the earrings: Simoni 2004, Kat. 22; Ószéplak/Krasno: the single fragmentary fluorite bead recovered from this site lay among the hand bones in Grave 538, dated by a coin of András II (1205–1235): Krupicza 1978, 232 and tab. XXXI.

[20] Lisowska 2013, 147, highlighting their dating value.

cemeteries east of the Danube yielded fluorite beads. This uneven distribution provided important clues for the source of the beads' raw material, although it also called for an explanation for the imbalances in distribution.

THE RAW MATERIAL SOURCE

In Alexander Ruttkay's view, published in a study written in 1979, the source of the raw material used for the "amethyst" beads from the Ducó cemetery (Ducové-Moravany nad Váhom, SK), which still lacks a detailed publication, and from the other Slovakian burial grounds was Selmecbánya (Banska Štiavnica, SK).[21] His claim was seemingly supported by the series of sites located north of the Danube and by the fact that Selmecbánya appears among the roughly twenty locations where fluorite deposits have been identified.[22]

The first mention of the mine in the written sources dates from 1226; however, Zoltán Batizi suggested that the denarii of King István I (997–1038) were minted in Esztergom-Kovácsi from silver mined at Selmecbánya.[23] Yet, the fluorite beads known from sites north of the Danube could hardly have originated from this deposit since the fluorite crystals from Selm ecbánya are small, barely 1 cm large.[24] (As a matter of fact, the countless gemstone beads from the Kovácsi cemetery excavated during the past years did not include a single specimen made of fluorite, as kindly mentioned by Edit Tari, the site's excavator.)

A suitable raw material could have been obtained from Gyöngyösoroszi, a village in northern Hungary, on the southern slope of the Mátra Mountains, given that the crystals in this deposit are considerably larger (3 cm). However, there are no burial grounds in the broader area whose finds included fluorite beads. Large crystals suitable for bead manufacture can be solely found in the Velence Hills. The distribution of archaeological sites likewise points to this region. There are no written sources on this deposit. The rediscovery of this fluorite deposit in 1951 reads like a grotesque fairy tale: one fine August day, while working on Mt. Üveghegy [Glass mountain] at Pákozd, "geologist Béla Jantsky […] was almost blinded by the dazzling light reflected from a palm-sized cleavage surface in one of the rocks crushed by Soviet tanks that had previously partaken in a military exercise in the area."[25]

DISTRIBUTION OF SITES IN THE CARPATHIAN BASIN

A closer look at the distribution of sites reveals certain concentrations even within one or another region (*Figs 2–3*). The cemeteries yielding a rich array of beads are located on the northern shoreline of Lake Balaton, along the "military road", a major artery of communication, whose existence and use is mentioned in the sources from the early Árpádian Age onward. The road turned slightly southward in the Lower Zala Valley, probably in the Zalavár area. The southernmost point in the bead finds strung out along the road is marked by Grave 96 of the Zagreb-Stenjevec cemetery, used in the eleventh–thirteenth centuries. In addition to ten basket earrings, this burial yielded a dark purple and a translucent "ornament", the former described as a polygonal amethyst, the latter as a polygonal or barrel-shaped amethyst or rock crystal.[26] In the case of fluorite beads, the Croatian terminology employs the term "amethyst and fluorite" *("ametist i fluorit")*, but purplish pieces are consistently described as amethyst.[27] Given this general usage, the uncertainties in the description prompted the tentative inclusion of these two beads among the ones made of fluorite.

From Székesfehérvár, the road led north-eastward to the Pest ferry.[28] The "bead route" then ran along the Danube's northern bank north- and westward along the river's left bank tributaries, principally in the Nyitra /Nitra Valley. The concentration of sites around Nyitra (Nitra, SK) and in the city's broader area is particularly striking (even if the number of beads is low because the cemeteries have only been partially excavated). However, the by far the highest number of fluorite beads came to light not in this area, but along the Vág/Váh in the region lying

[21] Ruttkay, A. 1979, 22; for the central Slovakian mines in general, cf. Ruttkay, A. 1996, 407.

[22] *Minerals* 2002, 187–188. For the Hungarian deposits, cf. GEODA 23 (2013):3.

[23] Batizi 2018, 168. Garamszentbenedek Abbey received the estate or village of Baka in 1075, where there was a separate land for the mine (*terra Banensium*) in 1156. Although silver mining is mentioned only in 1270, it could have been mined well before this date. I am grateful to B. F. Romhányi for the data.

[24] *Minerals* 2002, 188.

[25] Papp 2018, 1559.

[26] Simoni 2004, Kat. 22.

[27] Jeršek 2018, 29, 33, 34.

[28] Györffy 1987, 341.

Fig. 1. Zalavár-Kápolna. Strands of fluorite beads from the graveyard around the church. 1: Grave 105/96; 2: Grave 37/51; 3: Grave 107/96; 4: Grave 145/96; 5: Grave 114/96; 6: Grave 86/1951; 7: Grave 60/96; 8: Grave 126/96 (photo: author)

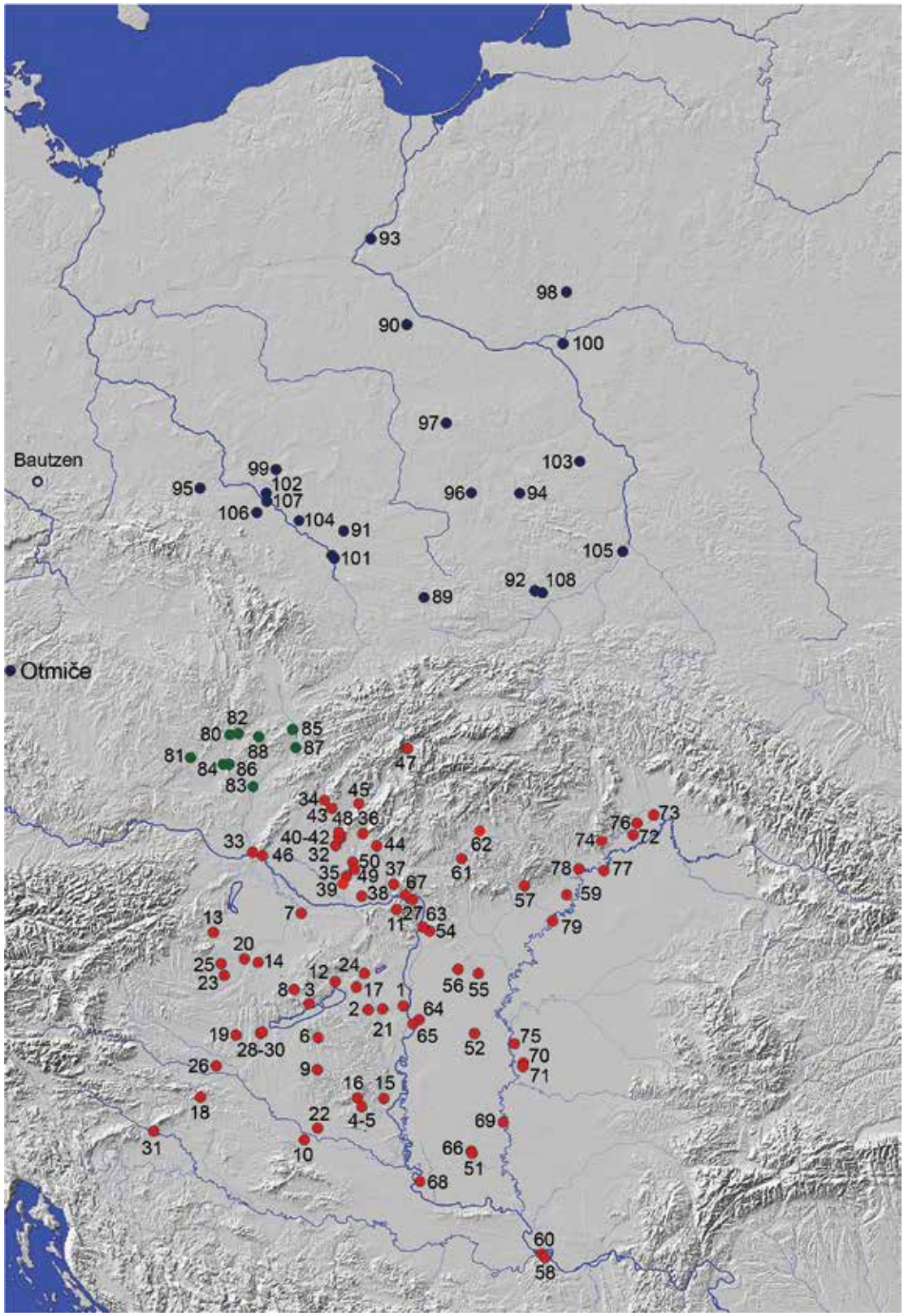

Fig. 2. Sites yielding fluorite beads (basic map: Balázs Holl)

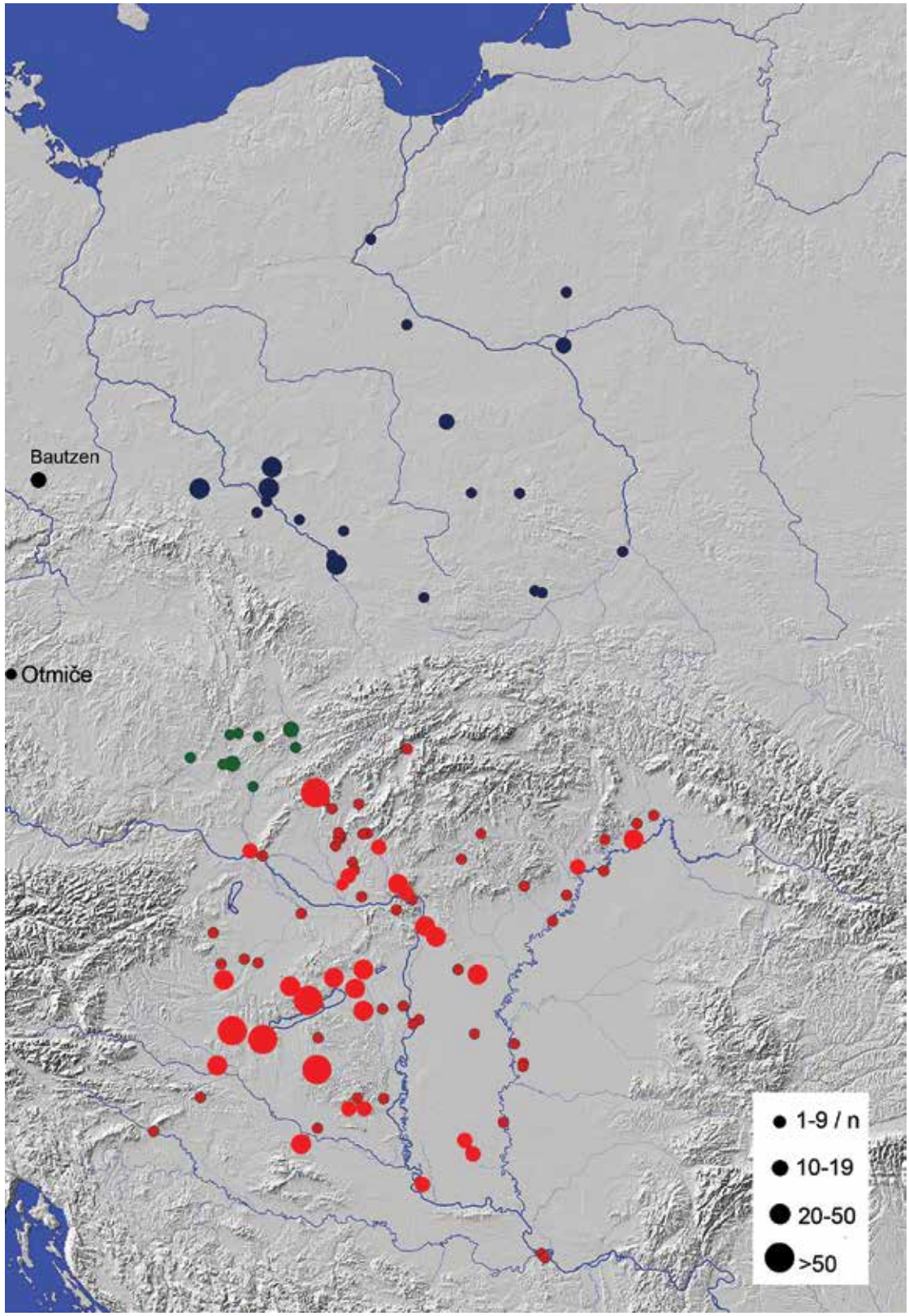

Fig. 3. Number of fluorite beads according to sites (basic map: Balázs Holl)

north of the Danube, specifically in the Ducó cemetery lying in the "border zone". A tolling station (Banka) on the Vág/Váh is mentioned this area in 1270,[29] which, judging from the bead finds, had already been active in the eleventh–twelfth centuries, which can in all likelihood be associated with the relative proximity of the road leading to Brno through Holics (Holič, SK).

Looking at the region between the Transdanubian road and the right Danube bank, the lack of fluorite beads in the settlements lying in the northern third of Transdanubia is striking. The fluorite beads do not outline a route along the right Danube bank, confirming Károly Mesterházy's contention regarding the findspots of tenth-century imports for a broader time period too: "The major trade route was not the *limes* road along the right Danube bank, but the former military road along the northern bank."[30]

In all likelihood, the three fluorite beads known from Győr-Pósdomb reached that site along the water route of the Rába, while the exemplar from Kesztölc can be explained by the connections maintained with Garamszentbenedek Abbey;[31] seven fluorite beads have also been reported from Visegrád, from the cemetery uncovered in the area of the resort of the Hungarian National Bank.

A smaller concentration can be noted in County Vas; the westernmost occurrence at Középpulya (Mittelpullendorf, A) can be assigned to this group.

Similarly to the Ducó cemetery, the remarkably high number of beads in the Pusztaszentlászló burial ground (129 pieces in all) can be explained by the site's geopolitical location, even if the exact line of the road leading to Slavonia remains controversial.[32]

Flowing from Székesfehérvár into the Danube, the Sárvíz, which could be navigated before its regulation in the eighteenth century, probably acted as the communications route south towards Pécs. The sites at Sellye and Josipovo (HR) south-west of Pécs probably mark the location of the ferry across the Drava.

South of the Pest ferry, the next crossing-place across the Danube at Solt is indicated by the fluorite beads from the cemeteries at Solt-Tételhegy and Solt-Kalimajor. Further downstream, the beads from Vajska and two suburbs of Belgrade, Mirijevo and Karaburma, mark the series of finds along the Danube, which in all likelihood also reflect the location of ferries.

The sites east of the Danube can be divided into two typical groups. Early Árpádian Age cemeteries with fluorite beads have been uncovered near the ferries across the Tisza (predominantly along the river's upper reaches),[33] a chain that extends into the Bodrogköz region (Karcsa, Szomotor, Lelesz). The other group of sites probably lay along or near the roads passing through the Danube-Tisza interfluve. The sites making up the two groups are not haphazard: the sites outline a route that coincides with the salt transportation routes recently mapped by Beatrix F. Romhányi[34] and provide a fine illustration of the use of the Tisza ferries already during the early Árpádian Age.

Salt was one of the most important commodities of inland trade from the very beginning[35] and other commodities were also transported along the roads and waterways used in its trade. There can be no doubt that these roads played a prominent role in the far-ranging contacts of the settlements associated with the Transdanubian cemeteries yielding fluorite beads, either because the settlement lay along or in the immediate proximity of the transportation route, as Rábasömjén and Mesteri-Intapuszta,[36] or because its occupants, or at least some of them, were active participants of the inland trade conducted along them.[37] Whichever the case, this issue can only be resolved through the detailed study of the road network using both archival sources and the archaeological record as well as of the diachronic changes in geographic conditions since there were major shifts in this network in Transdanubia during the Árpádian Age.[38] Studies along these lines would incidentally also shed light on the intriguing issue of why some cemeteries with an abundance of fluorite beads were also remarkably rich in tin/lead ring jewellery.

On the testimony of the current archaeological record, the "treasure of the *medium regni*" did not reach the region beyond the Tisza and Transylvania,[39] while, at the same time, the beads attest to intense contacts between

[29] Husár–Ivanič 2019, 714 and obr. 1.

[30] Mesterházy 1993, 456.

[31] Györffy 1987, 295.

[32] Glaser 1932, 158–160; Szűcs 2002, 326.

[33] For the crossing places across the Tisza in the Árpádian Age, cf. Weisz 2005.

[34] F. Romhányi 2018, 201, Fig. 7.1.

[35] Kubinyi 1994.

[36] Szilágyi 2012, 96, Fig. 13.

[37] It has been noted in several cases, for example at Visegrád and Kaposvár, that only one of two or more contemporaneous cemeteries lying close to each other contained fluorite beads.

[38] Glaser 1929.

[39] László Kovács interpreted the lack of fluortie beads (as well as of spherical carnelian and rock crystal beads and of square green glass beads) among the beads of the Magyarhomorog cemetery as one of the site's singular traits: Kovács 2019, 400.

Transdanubia and the regions north of the Danube. K. Mesterházy's studies have furnished convincing proof that in exchange for the beads, Transdanubia and the regions north of the Danube received Byzantine and Balkanic commodities from the Tisza region.[40]

BEYOND THE CARPATHIANS

Fluorite beads have been reported from thirty-one sites in the region beyond the Carpathians (*Figs 2–3*): two beads from a cemetery in Bohemia (Otmiče),[41] forty-eight beads from eight cemeteries in Moravia and possibly similar beads (whose number remains unknown) have been mentioned from another cemetery.[42] These nine sites lie in the region's south-easterly area near the Hungarian border, in the foreland of the Holics ferry.

A substantial number of Hungarian coins were deposited in burials during the eleventh century, the latest of which were mostly minted by András I (1043–1060). Disregarding a few years in the first third of the eleventh century, minting in Moravia began in the 1060s.[43] A comparison of the distribution of Hungarian coins and of fluo-

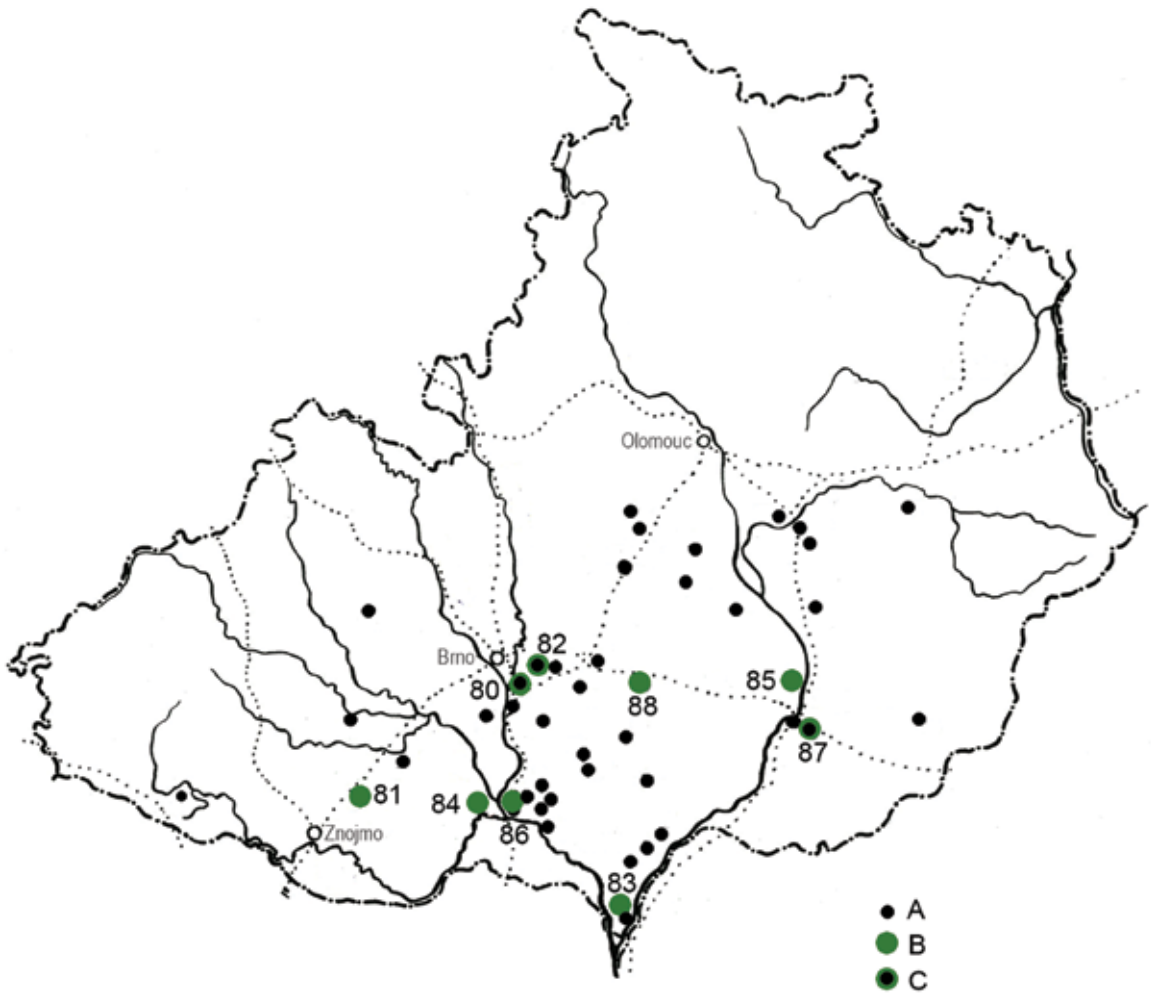

Fig. 4. Hungarian coins and fluorite beads in Moravia (partly based on ŠMERDA 1989, Obr. 1).
A: Hungarian coins; B: Fluorite beads; C: Hungarian coins and fluorite beads

[40] MESTERHÁZY 1993, 464–465, Figs 1 and 2.
[41] MRÁZEK 2000, 76.
[42] MRÁZEK 2000, 76 and 59–67.
[43] ŠMERDA 1989; VIDEMAN–MACHÁČEK 2013.

rite beads reveals that the latter can be found along the medieval trade routes as far as Brno (four cemeteries did not contain a single Hungarian coin), while Hungarian coins can be found across the entire region (*Fig. 4*). In other words, the two find types have a differential distribution, similarly as in Hungary.

Twenty sites are known from Poland,[44] most of which lie along the main trade routes that generally follow the rivers (*Fig. 5*). The Kiev–Meissen route traverses the country's southerly region in a west to east direction. Twelve of the twenty sites lie along or near this route and the overwhelming majority of the known Polish beads came to light on these settlements. The Opole site, lying in the foreland of the Moravian Gate, yielded an outstandingly high number of thirty-five fluorite beads. The route passes through Bautzen in Germany, where a girl's grave uncovered in 2015 contained ten fluorite beads.

The various glass beads from the settlements at Wrocław-Ostrów Tumski and Opole-Ostrówek were in use during roughly the same period as the beads manufactured from minerals: the trade in glass beads was most intense during the period spanning the third fourth of the eleventh century and the earlier twelfth century, corresponding to their greatest popularity as costume accessories.[45]

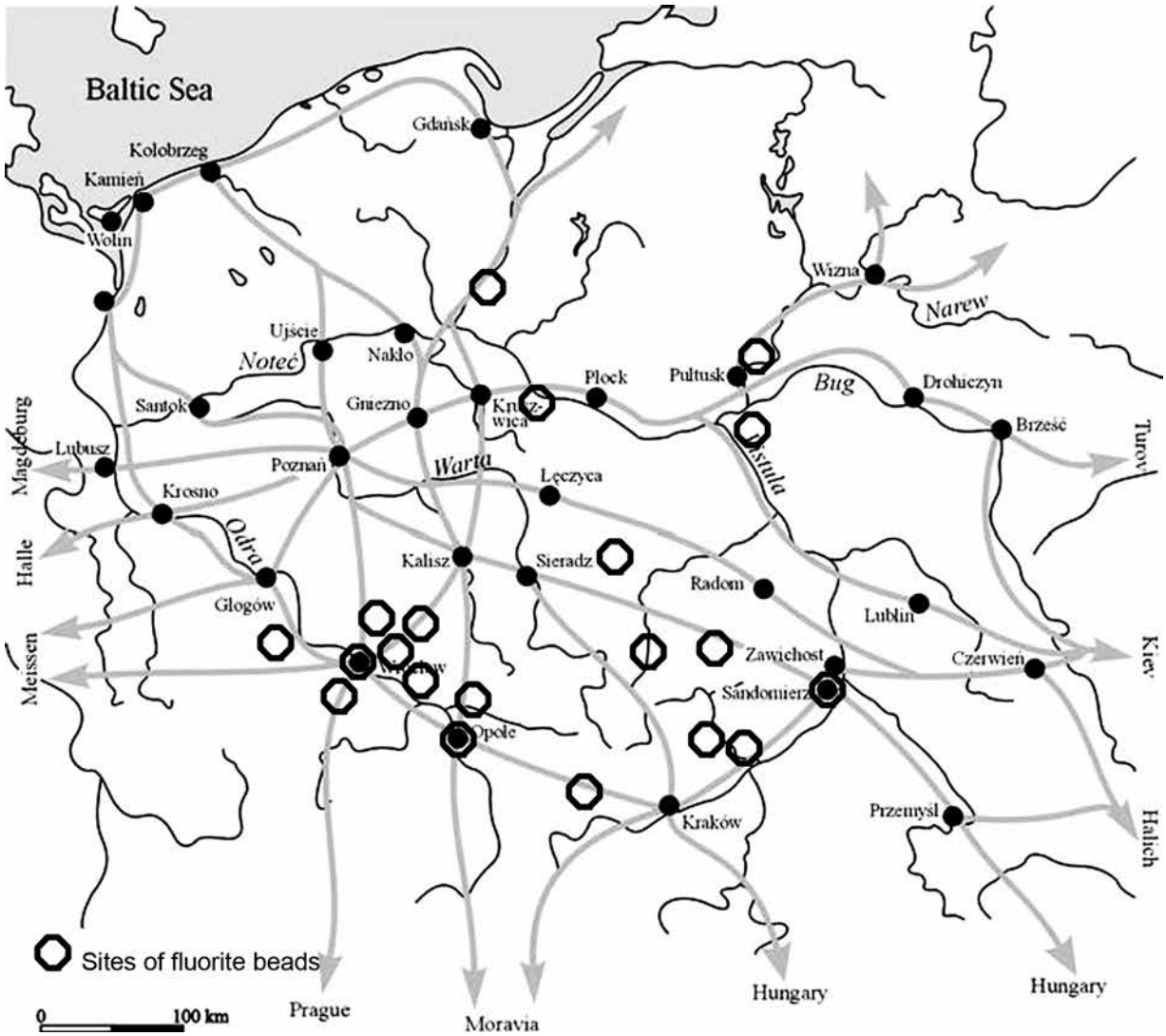

Fig. 5. Sites yielding fluorite beads in Poland and the twelfth–thirteenth-century road network (partly based on BUKO 2007, Fig. 84)

[44] I would like to thank Kalina Skóra for her kind help in collecting the Polish sites.

[45] PANKIEWICZ *et al*. 2017, 42–43.

This brief overview clearly demonstrates that the number of sites yielding fluorite beads as well as the number of finds from Moravia and Poland is much lower than in the Carpathian Basin, both in terms of sites and fluorite beads.

CONCLUSION

1. The distribution of the finds and the data on the raw material suitable for the manufacture of beads clearly show that the eleventh–twelfth-century fluorite beads of the Carpathian Basin were made from fluorite originating from the Velence Hills.

2. Most studies on articles of foreign origin focused on one or another artefact type and their distribution as well as on demonstrating possible contacts between certain regions, but – with very few exceptions – failed to address the physical dimensions of, or routes whereby, these connections were established. The distribution of the fluorite beads originating from the Carpathian Basin dating from the period between the late tenth and the mid-twelfth century has provided important data for the reconstruction of the medieval *medium regni* and of the inland trade connections and trade routes of the Carpathian Basin during the early Árpádian Age, furnishing additional support for the line of the early salt transportation routes as outlined in more recent studies. The fluorite bead distribution patterns are also an indication of the intensity of the communication between macro- and micro-regions as well as of some of their boundaries during a period for which there is a scarcity of written sources.

3. The distribution of sites and the number of finds from regions beyond the Carpathians confirms the Hungarian origins of the fluorite beads that were hitherto identified as being of "indeterminate origin". Although an export commodity of little value, these beads nevertheless played a role in foreign trade. On the testimony of the sites, the route leading to Poland through the Moravian Gate played a particularly important role in the early Árpádian Age. The well-identifiable Polish imports, including lead that was largely neglected in previous studies, arrived to the Carpathian Basin along this route during this period.[46]

APPENDIX

SITES YIELDING FLUORITE BEADS – DATA TABLES

A: Site; B: Cemetery/Graveyard; C: Fully/Partially explored; D: Number of beads; E: Number of graves with beads ('n': no exact data; S: stray finds); F: References or inventory number (HNM AD: Hungarian National Museum Archaeological Department)

I. Transdanubia

	A	B	C	D	E	F
1	Baracs-Apátszállás	G	P	n	n	Kulcsár 1999, 176.
2	Dág	G	P	62	5+S	Pokrovenszki 2015, 109–110, 113, 119, 120, 123.
3	Dörgicse	G	P	67	n	Pintér 2009, 58, 60–61.
4	Ellend-Nagygödör dűlő	C	F	14	3	Dombay 1960, 140, 142, 146.
5	Ellend-Szilfa dűlő	C	F	15	2	Dombay 1960, 153, 155.
6	Fiad-Kérpuszta	C	F	8	1	Szőke B. 1953, 251.
7	Győr-Pósdomb	C	P	3	1	Mesterházy 2014, 486.
8	Halimba-Cseres	C	F	29	11	Török 1962, 104.
9	Kaposvár-Apáti	G	P	73	9+S	Bárdos 1978, 196; Bárdos 1987, 23 (Site name: Költő–Varga 2019, 195.)
10	Josipovo-Ciganka (HR)	C	P	23	1+S	Tomičić 1997, 17, 22.
11	Kesztölc-Magasok	G	P	1	1	Parádi 1963, 69.
12	Királyszentistván	G	P	33	2	Pintér 2004, 99–121.
13	Középpulya/Mittelpullendorf (A)	C	P	5	1	Obenaus 2010, 68–69.

[46] Mesterházy 1993, 466, Fig. 3.

	A	B	C	D	E	F
14	Mesteri-Intapuszta	G	P	13	2	Kiss G. 2000, 127; Ilon 2004, No. 252.
15	Palotabozsok	C	P	5	3	Dombay 1961, 83.
16	Pécs-Vasas (=Pécs-Somogy)	C	P	4	1	Dombay 1961, 73.
17	Polgárdi	?	?	22	?	Unpublished. HNM AD Inv. no. 1884.61.1
18	Popovec-Bregi (HR)	C	P	3	1	Tomičić 1995, 102.
19	Pusztaszentlászló	C	F	128	16	Szőke–Vándor 1987, 60.
20	Rábasömjén	G	P	2	1	Papp I. K. 2012, 215.
21	Sárbogárd-Tringer tanya	C	F	3	1	K. Éry 1968, 130.
22	Sellye	C	F	8	1	Kiss A. 1968, 70.
23	Sorokpolány-Berekalja	C	F	23	3	Kiss G. 2000, 173, 175.
24	Székesfehérvár-Bazilika Székesfehérvár-Maroshegy	G	P	13 34	1 3+S	Dercsényi 1943, 20. Bakay 1968, 58, 59, 65.
25	Szombathely-Szent Márton-templom	G	P	3	1	Kiss G. 2000, 245.
26	Tüskeszentgyörgy/Sveti Juraj u Trnju (HR)	G	P	30	3	Tomičić 1999, 46–47; Jeršek 29, Kat. Br. 20, 23, 26.
27	Visegrád-Várkert-MNB üdülő	C	P	7	2	Szőke M. 1973, 119.
28	Zalavár-Kápolna	G	F	75	9	Cs. Sós 1963, 169–174. The finds from the new excavations are unpublished.
29	Zalavár-Monostor	G	P	2	2	Unpublished.
30	Zalavár-Község	C	F	1	1	Tettamanti 1971, 219.
31	Zágráb-Stenjevec (HR)	G	P	2	1	Simoni 2004, Kat. 22.

II. North of the Danube

	A	B	C	D	E	F
32	Csápor/Čapor (SK)	C	P	9	1	Točik–Paulik 1979, 107.
33	Dévény/Devín (SK)	G	P	18	2	Plachá–Divileková 2012, 54, 62.
34	Ducó/Ducove-Kostelec (Moravany nad Vahom) (SK)	G	F	66	9	Ruttkay, A. 1979, Catalogue No. 15, 17, 19, 20, 21, 22.
35	Érsekújvár/Nové Zámky (SK)	C	P	18	3	Rejholcová 1974, 438, 442.
36	Feketekelecsény/Čierne Kľačany (SK)	C	?	n	n	Ruttkay, M. *et al*. 2013, 232.
37	Kiskeszi/Male Kosihy (SK)	C	F	20	2	Hanuliak 1994, 45.
38	Madar/Modrany (SK)	G	P	1	1	Polla 1961, 87.
39	Naszvad/Nasvad (SK)	G	P	2	1	Nevizánsky–Prohászka 2018, 20.
40	Nyitra-Iskola utca/Nitra-Školská ulica (SK)	G?	P	3	1	Ruttkay–Ruttkayová 2018, 185.
41	Nyitra-Šindolka/Nitra-Šindolka (SK)	C	F	n	2	Fusek 1998, 107.
42	Nyitra-Molnos/Nitra-Mlynarce (SK)	C	P	1	1	Točik 1960, 271.
43	Nyitrasárfő/Nitrianská Blatnica (SK)	G	P	n	n	Ruttkay, A. 1977, 246.
44	Óbars/Starý Tekov (SK)	G	P	14	1?	Točik 1952, 36, 47, obr. 37.
45	Ószéplak/Krasno (SK)	G	F	11	5	Krupica 1978, 212, 221, 232, 237 (Gogová 2013, 59: different data).
46	Pozsony-Vár/Bratislava-Hrad (SK)	G	P	<4	3	Polla–Štefanovičová 1962, 822.
47	Turócszentmárton/Turciansky Svatý Martin (SK)	G	P	1?	1	Budinsky-Krička 1942–1943, 38–39.
48	Zobordarázs/Dražovce (SK)	G	P	1		Kraskovská 1961, 171.
49	Zsitvabesenyő/Bešenov (SK)	C	P	1?	1	Kraskovská 1958, 428, 434.
50	Zsitvafödémes/Ul'an nad Žitavou (SK)	C	P	7	1	Liptáková 1963, 226.

III. Danube-Tisza interfluve

	A	B	C	D	E	F
51	Bácsfeketehegy/Feketić (SRB)	?	?	10	1	Stanojev 1989, 122–123.
52	Bugac-Pétermonostor	G?	P	4	n	Rosta 2014, Fig. 13, b
54	Budapest-Árpádföld, Timúr utca	G?	P	27	2	Melis 1997, 58–59.
55	Cegléd-Kövespart	G	P	29	n	Unpublished. Kossuth Múzeum, Cegléd. Old archive 17212/1926. Site: Tari 2000, 49.
56	Dánszentmiklós-Tetveshalom	G	P	4	1	Unpublished. Uninventoried. Kossuth Múzeum, Cegléd
57	Eger-Székesegyház	G	P	26	3	Kozák 1986, 7, 9, 11.
58	(Beograd) Karaburma (SRB)	G	P	n	n	Bajalović-Hadži Pesić 1984, 78, Cat. No. 191.
59	Mezőcsát-Csicske	G	P	5	2	Szabó 2006, 45.
60	(Beograd) Mirijevo (SRB)	G	P	n	n	Bajalović-Hadži Pesić 1984, 79, Cat. No. 200.
61	Piliny-Sirmány hegy	C	P	9	3	Nyáry 1902, 219; Nyáry 1904, 69.
62	Perse/Prša (SK)	C	P	1	1	Točik 1992, 171.
63	Budapest-Rákospalota, Sín utca	C	P	28	2+S	Melis 1997, 47.
64	Solt-Tételhegy	G	P	8	2	Petkes 2014, 93.
65	Solt-Kalimajor	C	P	9	1	Langó *et al*. 2015, 206.
66	Szeghegy/Lovćenac (SRB)	C	P	10	1	Szász 1911, 308; Stanojev 1989 54–56.
67	Szob-Bőszob	G	P	11	n	Unpublished. HNM AD 62.49.1.–11.A. Report of János A. Horváth, 1933 (manuscript): HNM Central Archive 10.SZ.I., 422.VII, 195.XIII.1985.
68	Vajszka/Vajska (SRB)	?	?	17	2	Stanojev 1989, 36–37.
69	Zenta-Csecstó-Paphalom/Senta (SRB)	TK	R	3	2	Stanojev 1989, 105–109.

IV. Sites along the river Tisza

	A	B	C	D	E	F
70	Hódmezővásárhely-Kápolna dűlő	G	P	3	n	Szeremlei 1901, 408.
71	Hódmezővásárhely-Nagysziget	C	F	n	n	Révész 2020, 149–150.
72	Karcsa-Kormoska	C	F	25	5+S	Révész 2011, 530, 532–535.
73	Lelesz/Leles (SK)	G	P	n	n	Presented by Emese Csoltkó at the Conference of Young Archaeologists of the Middle Ages at Sátoraljaújhely, in 2016. The excavations: Šimčík–Molota 2014.
74	Sárazsadány	C	P	7	1	Horváth 2019, 111.
75	Szegvár-Orom dűlő	C	F	4	1	Bende–Lőrinczy 1997, 205, 233.
76	Szomotor/Somotor (SK)	C	P	13	3	Pastor 1955, 277–279.
77	Tiszalök-Köves telek	G	P	6	1	Tóth 2014, 82.
78	Tiszalúc-Sarkad	C	F	14	2	Kovács 2015,196.
79	Tiszaörvény-Templomdomb	G	P	5	S	Unpublished. HNM AD Inv. No. 74.48.1.–5.C.

V. Moravia

	A	B	C	D	E	F
80	Brněnské Ivanovice	C	P	1	1	Mrázek 2000, 60; Site: Živný 2005, 248.
81	Horní Dunajovice	C	P	5	1	Mrázek 2000, 66; Site: Živný 2005, 260.
82	Jiřikovice	C	P	9	1	Mrázek 2000, 61; Site: Živný 2005, 263.
83	Lanžhot	C	P	n	n	Mrázek 2000, 66; Site: Živný 2005, 267.
84	Mušov	C	F	5	1	Mrázek 2000, 64; Site: Živný 2005, 267.
85	Nová Dědina	G?	P	10	1	Mrázek 2000, 67; Site: Živný 2005, 278.
86	Strachotín-Petrova louka	G?	P	13	1	Mrázek 2000, 64–65; Site: Živný 2005, 301.
87	Uherské Hradište	G	F	11	4	Mrázek 2000, 66–67; Galuška 2018, 265, 318, 341, 345–346.
88	Vicemilice	C	P	4	1	Mrázek 2000, 63.

VI. Poland

	A	B	C	D	E	F
89	Będzinie, Gora Zamkowa	C	P	2	1	Rogaczewska 1998, 56.
90	Brześć Kujawsk	C	P	4	1	Kaszewcy 1971, T. VII. 710.
91	Dębiniec	C	F	9	4	Pokuta–Wojda 1979, 100.
92	Gorysławice	C	P	n	n	Kurasiński–Skóra 2016, 81. Site: Glínska 2019, 272–274.
93	Kałduś	C	P	1	1	Chudziak–Stawska 2006, 62, T. 11.
94	Końskie	C	F	2	1	Gąssowski 1950, 106–107.
95	Legnica	C	?	21	n	Lisowska 2013, 147. T. 16.
96	Lubien	C	P	6	1	Kurasiński–Skóra 2012, Fig. 30.
97	Lutomiersk	C	P	13	5	Nadolski *et al*. 1959, 84.
98	Maków Mazowiecki-Bazar Nowy	C	P	2	1	Marciniak 1960, 121.
99	Masłowiec	C	F	22	n	Abramek 1980, 237, 241.
100	Nieporęt	C	?	15	n	Rauhut 1951–1952, 339.
101	Opole	*	P	35	*	Lisowska 2013, 147. Table 16.
102	Psary	C	P	28	2	Trębaczkiewicz 1963, 142.
103	Radom	C	P	4	1	Kurasiński–Skóra 2016, 79.
104	Ryczyn	C	P	n	n	Kurasiński–Skóra 2016, 81.
105	Sandomierz	C	P	7	1	Gąssowski 1969, 424.
106	Tyniec Mały	C	P	6	n	Lisowska 2013, 147. Table 16.
107	Wrocław-Ostrów Tumski	*	P	9	*	Lisowska 2013, 147. Table 16.
108	Złota pińczowski	C	P	3	1	Gąssowski 1953, 85.

*from cemetery and settlement together

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