Note on a Pădureni type shaft-hole axe from northern Muntenia

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To Prof. Dr. habil. Valentin Dergaciov,
on the occasion of his anniversary

Abstract: In this article, starting from an artefact from the collection of the Prahova County Museum of History and Archaeology, I analyse Pădureni-type shaft-hole axes that can be united in a fairly well-defined variant from a typological point of view. The axe was discovered as a lone find in northern Muntenia, Podenii Vechi village, Bălțești locality, Prahova County, during field investigations carried out with a metal detector. The article discusses the typology of these axes, their geographical distribution, and their chronological and cultural attributions.
Key words: northern Muntenia, Bronze Age, metallurgy, shaft-hole axes, Pădureni type.

Notă despre un topor de tip Pădureni din nordul Munteniei. În acest articol, luând ca punct de plecare o piesă aflată în colecția Muzeului Județean de Istorie și Arheologie Prahova, sunt analizate topoare cu gaură de înmănușare transversală de tip Pădureni ce pot fi reunite în cadrul unei variante destul de bine definite din punct de vedere tipologic. Toporul a fost descoperit izolat în nordul Munteniei, satul Podenii Vechi, localitatea Bălțești, județul Prahova, în cadrul unor investigații de teren efectuate cu ajutorul unui detector de metale. Articolul discută tipologia acestor topoare, răspândirea lor geografică, dar și atribuirea lor cronologică și culturală.
Cuvinte-cheie: nordul Munteniei, epoca bronzului, metalurgie, topoare cu gaură de înmănușare transversală, tipul Pădureni.

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Introduction

In May 2021, a metal shaft-hole axe was found on the territory of Podenii Vechi village, Bălțești locality, Prahova County, during field investigations carried out with a metal detector by Mr. Cristian Cojocaru. The region is located at the

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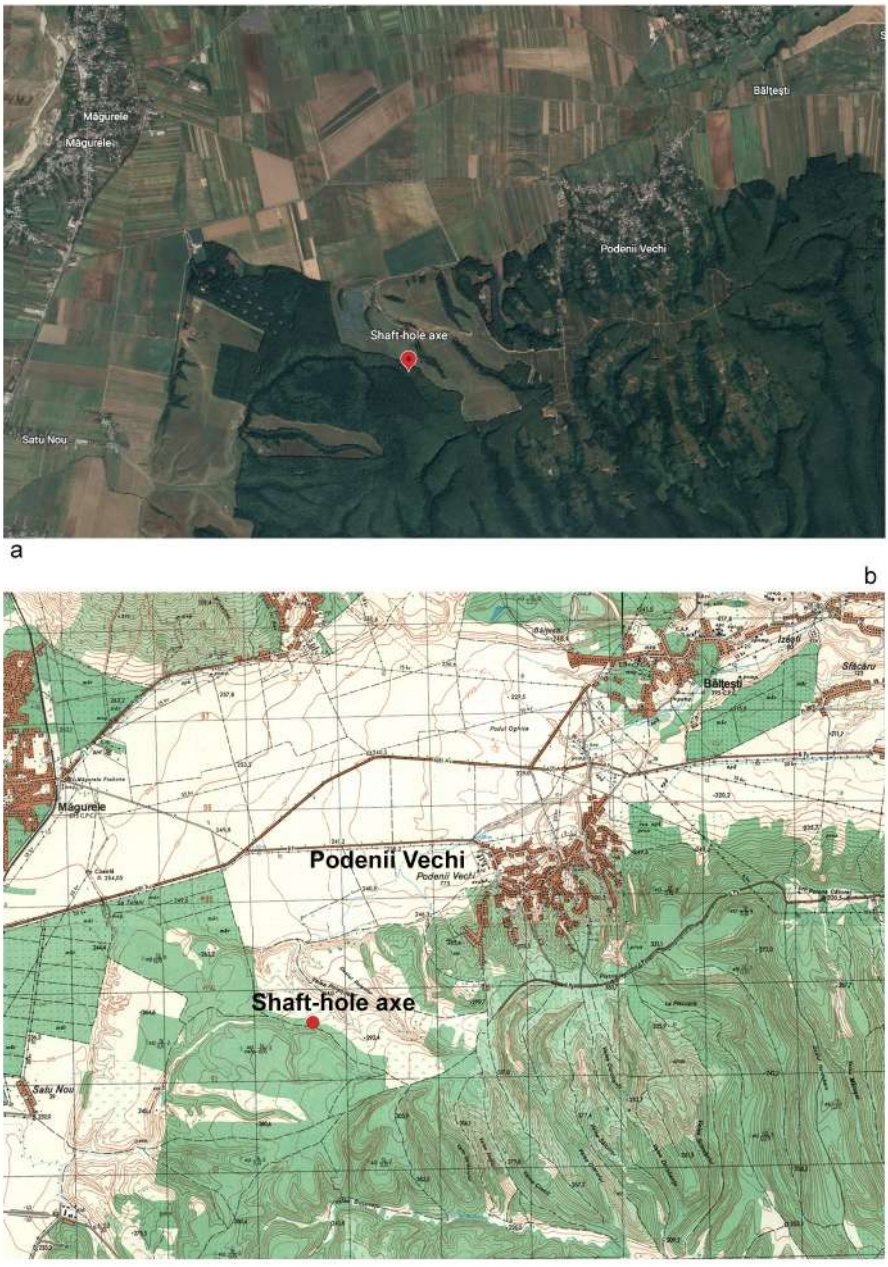

Fig. 1. Google Earth image with the discovery place of the axe (1), the discovery place of the axe on a map of Podenii Vechi village (2)

Fig. 1. Imagine Google Earth cu locul descoperirii toporului (1), locul descoperirii toporului pe harta satului Podenii Vechi (2)

southern border of the sub-Carpathians, a landscape characterised by alternating extensive hilly massifs and wide depressions (Niculescu 2008, p. 56). The Podenii Vechi village is part of the Podeni Depression, an area having the appearance of a plain surrounded by hills (Mihai, Nedelcu, Buterez 2015, p. 206). More precisely, the discovery place is located southwest of the village, at the meeting point between the north-western end of the Bucovelul Hill and the Podeni Depression, in a forested area close to a spring. The coordinates of the discovery place are 45.071830°N and 26.082211°E (**Fig. 1/a-b**). The artefact came into the custody of the Prahova County Directorate for Culture and was handed over to the Prahova County Museum of History and Archaeology, according to the address number 1892/05.05.2021. Starting from this axe, the aim of this paper is to discuss the typology, geographical range, and chronological and cultural attributions of a particular variant of the Pădureni type of shaft-hole axes.

Description of the find (Figs. 2-3)

The axe was found complete and in a good state of preservation. It has not been cleaned, and retains a light green patina. The proximal and distal edges of the shaft are cut in a semicircle, and in the inferior part of the butt there is an oblique prolongation forming a button of triangular shape with rounded edges, with small holes on its surface resulting from air bubbles formed during casting (**Fig. 3/b**). The blade has a hexagonal cross-section, with an almost straight upper edge and a curved lower edge. It is gradually splaying and, at the same time, thinning towards the rounded cutting-edge, which does not show traces of being used. The axe is decorated on the back of the shaft with a longitudinal ridge, from which two pairs of semi-circular parallel ribs start at the proximal and distal ends (**Fig. 2; Fig. 3/a**). The proximal ribs completely surround the shaft, while the distal ones disappear at the meeting point with the blade (**Fig. 2; Fig. 3/c, e**). The axe was cast in a closed bivalve mould with the sprue on the lower end of the prolonged butt.[2] Inside the shaft, in the direction of the blade, there is a depression/hollow resulting from the casting process. The axe has an overall slender appearance and finished look, with no rough surfaces. It has the following dimensions: length – 14 cm, butt length – 6.8 cm, cutting-edge width – 4.1 cm, shaft-hole diameter – 2.5×2.6 cm, weight – 411 g; the inventory number is 34.153548.

[2] For an extensive analysis of the casting technology of shaft-hole axes during the Bronze Age, see Băjenaru, Tuțulescu 2021.

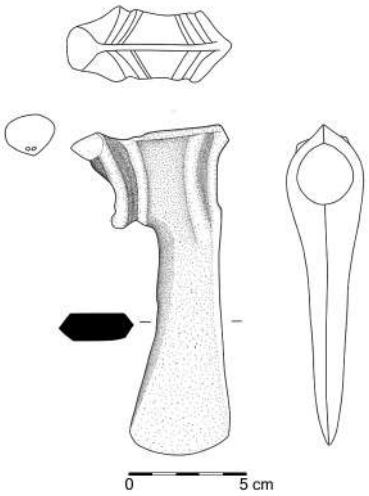

Fig. 2. Drawing of the axe from Podenii Vechi
Fig. 2. Desenul toporului de la Podenii Vechi

Discussion

Typology

According to its typological characteristics, especially the extended butt ending in a button, the hexagonal cross-section of the blade, and the merging angle between the blade and the shaft, the shaft's semi-circular cuts, and the decoration with parallel ribs, the axe from Podenii Vechi can be attributed to the Pădureni type. I have discussed this type of axes on another occasion as well, therefore below I will focus my attention on the particular variant exemplified by this newly discovered axe from Prahova County (Preda-Bălănică, Frînculeasa, Garvăn 2018).

The Pădureni type axes were defined and described for the first time more than 50 years ago, by Alexandru Vulpe, in his extensive analysis of shaft-hole axes, which is still the starting point for any typological approach to this category of artefacts (Vulpe 1970, p. 42-48, Taf. 8-11; Vulpe, Tudor 1970, p. 422, Fig. 1). As already noted, the heterogeneity/diversity of the axes assigned to the Pădureni type, between which there are significant typological differences in some cases, led Alexandru Vulpe to distinguish two variants of these axes: one with heavier, more massive axes (Variant 1 - Parava) and one with more slender examples (Variant 2 - Bicfalău) (Vulpe 1970, p. 12, Abb. 1; Vulpe, Tudor 1970, Fig. 1). Later, the discovery of new specimens led to further re-evaluations of this type by several researchers (Palincaș 2000; Băjenaru 2017; Puskás 2019). Given the characteristics of the axe

Fig. 3. Photographs of the axe from Podenii Vechi
Fig. 3. Fotografii ale toporului de la Podenii Vechi

found in Podenii Vechi mentioned above, it can be assigned to the second, more developed variant of the Pădureni axes. Especially useful in this respect is the study of Nona Palincaș, who further elaborated the typology and distinguished several variants and sub-variants, taking into account criteria such as: the presence or absence of ribs on the shaft, along with the extension of the butt and the heavy, intermediate, or slender appearance of the blade (Palincaș 2000, p. 264). According to this typology, the axe recently discovered in Podenii Vechi can be assigned to the variant with ribs and the sub-variant with an extended butt, with a generally slender appearance.

Chorology and chronology

The study of shaft-hole axes is a challenging topic, stemming from the peculiar ways in which these objects were produced, manipulated, and discarded during the Bronze Age. As has already been pointed out, although shaft-hole axes can be assigned to wider, more generic types, very often specimens present particular characteristics that distinguish them from other typologically close axes (Marinescu 2018, p. 8). For many of them it could be said they are unique, a fact that was explained in part by the casting technology, using moulds made of

clay or soft, very brittle rocks that could only rarely be reused (Munteanu 2010, p. 161). Another aspect worth mentioning is that practices related to shaft-hole axes are very specific; they commonly occur either isolated, as single depositions, or in hoards comprised of multiple similar specimens (Palincaș 2000, p. 264; Băjenaru 2010; Hansen 2010, 2011; Szeverényi 2013). The combination of these two aspects makes discussions about the chronological and cultural attributions of shaft-hole axes particularly difficult and, in the absence of relevant stratigraphic contexts to securely date them, the analyses mainly rely on typological and chorological criteria.

Axes of the Pădureni type have a wide distribution area, covering the intra-Carpathian region, the north and also south of the Lower Danube area, and even reaching as far as Greece (Vulpe 1970; Palincaș 2000; Băjenaru 2017; Kleitsas 2019). Nona Palincaș highlighted that there are also chorological distinctions between the different variants and sub-variants of the Pădureni type (Palincaș 2000, Fig. 3). Thus, while the axes without ribs are mostly concentrated on both sides of the Carpathian curvature, the ones decorated with ribs are found in a wider area (Palincaș 2000, p. 264). Below, I will evaluate the specimens that represent the closest typological analogies to the Podenii Vechi axe.

One has to mention here an axe from Meseșenii de Sus (Sălaj County) (Bejinariu 2003, p. 29, Pl. XX/3), one from București (Palincaș 2000, Fig. 1), and an axe recently discovered in Sigmir (Bistrița-Năsăud County) (Marinescu 2018, Fig. 2). The axe from Meseșenii de Sus has a very similar appearance; there are only some small differences that could be observed. The blade of the axe is slightly more curved and splays more pronouncedly towards the cutting-edge, the back of the shaft is decorated with a thicker longitudinal ridge, from which two semi-circular parallel ribs start at the distal end and three at the proximal end, and the prolongation at the inferior part of the butt forms a button of a rather trapezoidal shape (**Fig. 4/a**).

The same could be said about the axe from Sigmir, the differences consisting of the more curved blade, a more pronounced semi-circular cut of the proximal and distal ends of the shaft, and a more narrow prolongation of the butt (**Fig. 4/c**). The axe from București has a virtually identically decorated shaft, the differences consisting of the curved butt that has a small prolongation and not an oblique extension ending with a button, the blade that is more splayed towards the rounded and asymmetrical cutting edge, and the more massive/heavy aspect (**Fig. 4/b**). One also has to mention here a fairly typologically homogeneous series that is especially found south of the Danube, characterized by the prolongation of the butt, the presence of ribs, in almost all cases one pair at the distal and proximal ends of the shaft, with only one exception of an axe having two pairs of ribs on the

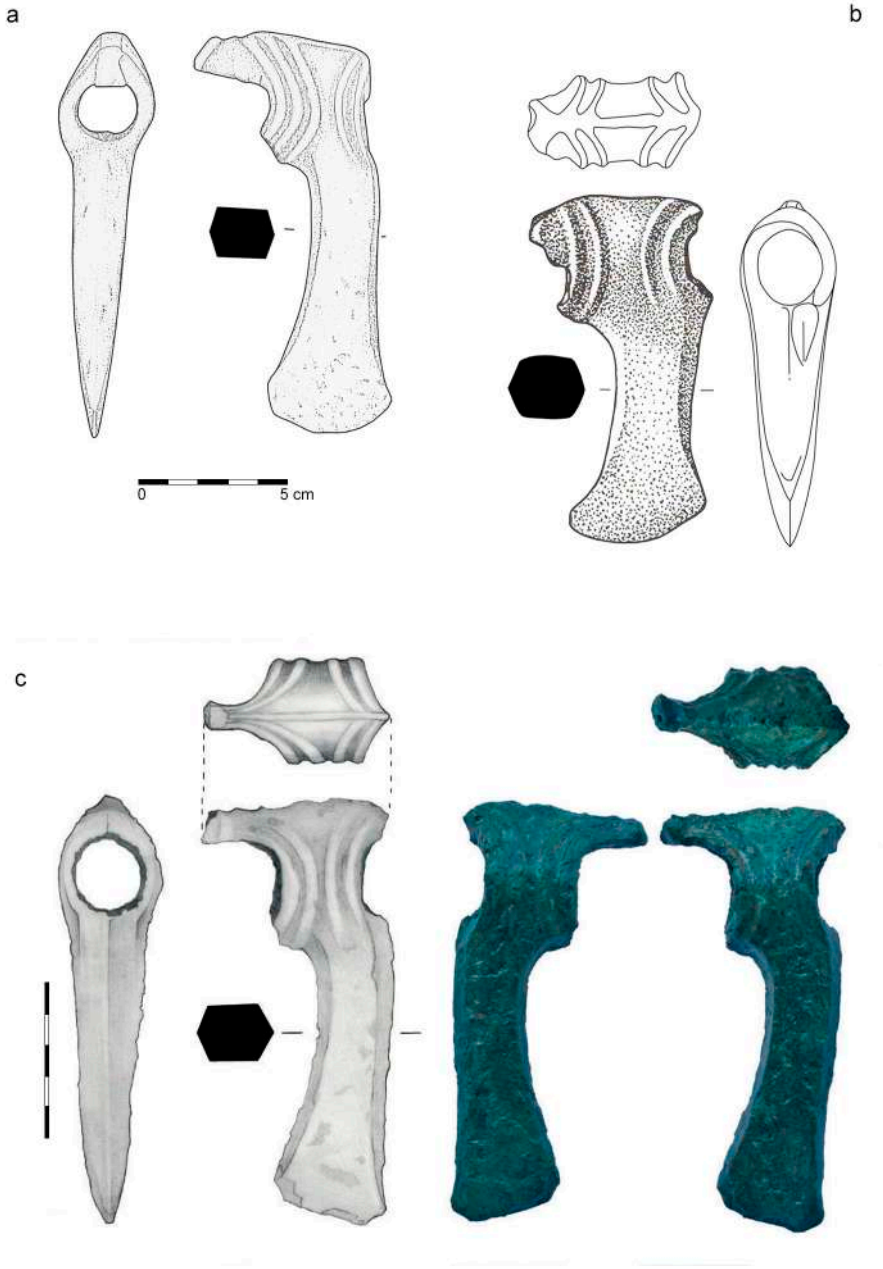

Fig. 4. Axes of the Pădureni type: a. Meseșenii de Sus; b. București ; c. Sigmir (after Bejinariu 2003, p. 29, Pl. XX/3; Palincaș 2000, Fig. 1; Marinescu 2018, Fig. 2)
Fig. 4. Topoare de tip Pădureni: a. Meseșenii de Sus; b. București ; c. Sigmir (după Bejinariu 2003, p. 29, Pl. XX/3; Palincaș 2000, Fig. 1; Marinescu 2018, Fig. 2)

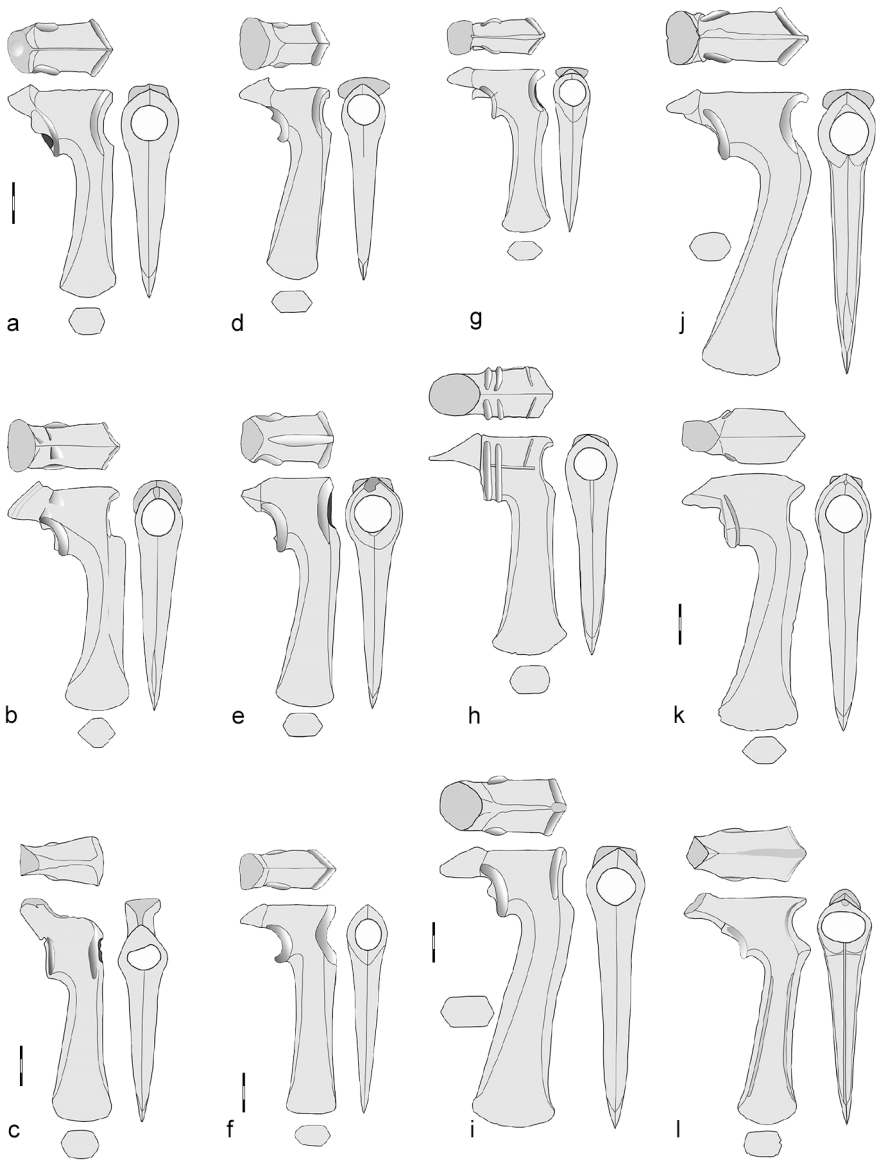

Fig. 5. Axes of the Pădureni type: a. Roșiorii de Vede; b. Tatul; c. Mengishevo; d. Emen; e. Hotnitsa; f. Telish; g. Pleven; h. Raven; i. Pazardzhik; j. Pazardzhik; k. Yambol; l. Bratovo (after Băjenaru 2017, Figs. 1-5)

Fig. 5. Topoare de tip Pădureni: a. Roșiorii de Vede; b. Tatul; c. Mengishevo; d. Emen; e. Hotnitsa; f. Telish; g. Pleven; h. Raven; i. Pazardzhik; j. Pazardzhik; k. Yambol; l. Bratovo (după Băjenaru 2017, Fig. 1-5)

proximal end and one pair on the distal end of the shaft (**Fig. 5**) (Băjenaru 2017). When compared to these axes, the specimen from Podenii Vechi stands out only because of the more elaborate decoration of the shaft.

In a more general approach, other axes assigned to the Pădureni type could be mentioned here, such as the isolated finds from Hălchiu (Brașov County) (**Fig. 6/a**) (Vulpe 1970, Taf. 9/138), Malnaș (Covasna County) (**Fig. 6/b**) (Vulpe 1970, Taf. 8/130), Marpod (Sibiu County) (**Fig. 6/c**) (Vulpe 1970, Taf. 9/140), Vârghiș (Covasna County) (**Fig. 6/d**) (Vulpe 1970, Taf. 9/136), Cernat (Brașov County) (**Fig. 6/f**) (Puskás 2019, Fig. 3), Avrămești (Harghita County) (**Fig. 6/g**) (Vulpe 1970, Taf. 7/105), Moigrad (Sălaj County) (**Fig. 6/h**) (Vulpe 1970, Taf. 9/139), Câmpia Turzii (Cluj County) (**Fig. 6/i**) (Rustoiu 1995, Pl. 2/1), Micești (Cluj County) (**Fig. 6/j**) (Vulpe 1970, Taf. 10/178), Northern Transylvania (**Fig. 6/k**) (Vulpe 1970, Taf. 13/205),[3] an axe from Sălaj County (**Fig. 6/e**) (Bejinariu 2003, p. 29, Pl. XIX/1), one axe from Oarța de Sus-*Ghiile Botii* (Maramureș County) (Kacsó 2004, Pl. XXXVIII/2), and also some of the axes of the Pădureni hoard (**Fig. 7**) (Covasna County) (Vulpe 1970, Taf. 9/119-128; 12/190; 18/273). These specimens show similarities with the axe from Podenii Vechi in terms of blade shape, the presence of ribs on the shaft, and the prolongation of the butt. The overwhelming majority of them come either from unknown contexts, are isolated discoveries, or form part of larger hoards comprised of similar specimens.

The debates regarding the absolute dating of these axes seem somewhat contradictory at first glance. Recently, Radu Băjenaru argued for the dating of the emergence of the casting technology of axes in closed bivalve moulds, with the sprue on the lower end of the prolonged butt starting in the first century of the second half of the 3rd millennium BC (Băjenaru, Tuțulescu 2021, p. 153-154). The same author dated the above-mentioned axes found south of the Danube to the second half of the 3rd millennium BC, without excluding the circulation of these items in the first centuries of the next millennium as well (Băjenaru 2017, p. 119).

The discussions about the axes of the intra-Carpathian area, where many specimens of this type are found **(Fig. 8)**, revolve around the Wietenberg culture. It was Alexandru Vulpe who originally linked them with the Wietenberg culture and dated them accordingly, given that axes of the Pădureni type are found mainly in the area of south-eastern Transylvania (Vulpe 1970, p. 48). The formal similarity with axes of the Monteoru type, mainly found in Moldova, led Alexandru Vulpe to establish a typological correspondence between the first two variants of the Pădureni and Monteoru types (Vulpe, Tudor 1970, p. 422).

[3] The axes from Avrămești and Northern Transylvania were originally assigned by Alexandru Vulpe to the Pătulele, and more specifically the Hajdúsámson, types. However, we agree with the re-evaluation of these items made by Nona Palincaș and included them into our analysis (Palincaș 2000, p. 263).

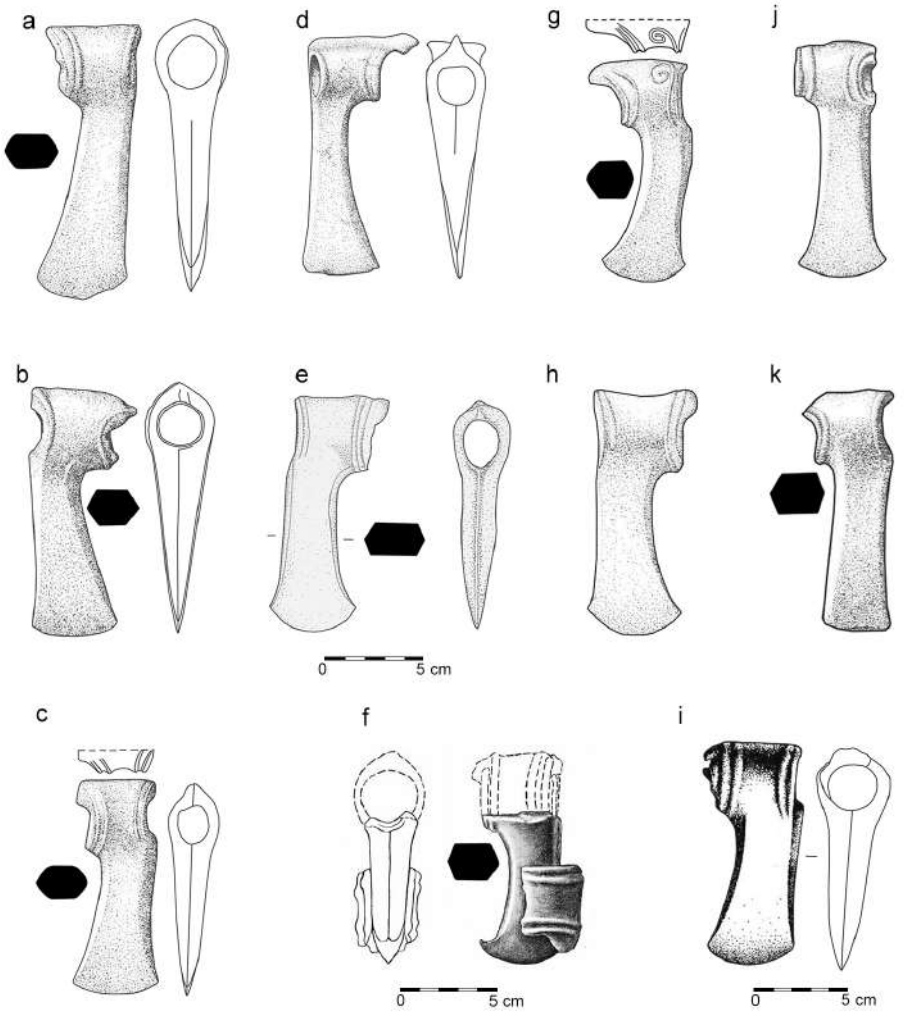

Fig. 6. Axes of the Pădureni type: a. Hălchiu; b. Malnaș; c. Marpod; d. Vârghiș; e. Sălaj; f. Cernat; g. Avrămești; h. Moigrad; i. Câmpia Turzii; j. Micești; k. Northern Transylvania (after Vulpe 1970, Taf. 9/138; 8/130; 9/140; 9/136; 7/105; 9/139; 10/178; 13/205; Rustoiu 1995, Pl. 2/1; Bejinariu 2003, p. 29, Pl. XIX/1; Puskás 2019, Fig. 3)
Fig. 6. Topoare de tip Pădureni: a. Hălchiu; b. Malnaș; c. Marpod; d. Vârghiș; e. Sălaj; f. Cernat; g. Avrămești; h. Moigrad; i. Câmpia Turzii; j. Micești; k. nordul Transilvaniei (după Vulpe 1970, Taf. 9/138; 8/130; 9/140; 9/136; 7/105; 9/139; 10/178; 13/205; Rustoiu 1995, Pl. 2/1; Bejinariu 2003, p. 29, Pl. XIX/1; Puskás 2019, Fig. 3)

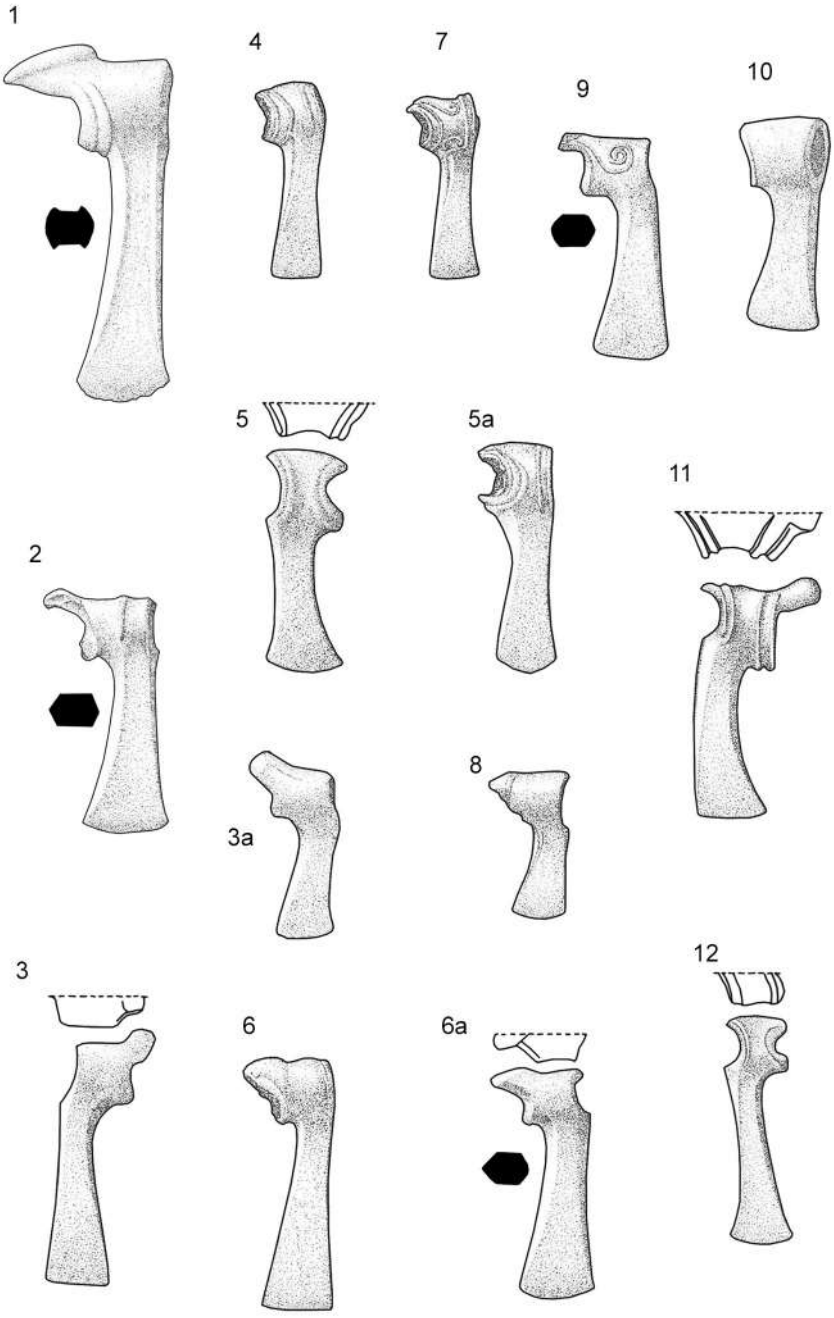

Fig. 7. The Pădureni hoard (after Vulpe 1970, Taf. 9/119-128; 12/190; 18/273)
Fig. 7. Depozitul de la Pădureni (după Vulpe 1970, Taf. 9/119-128; 12/190; 18/273)

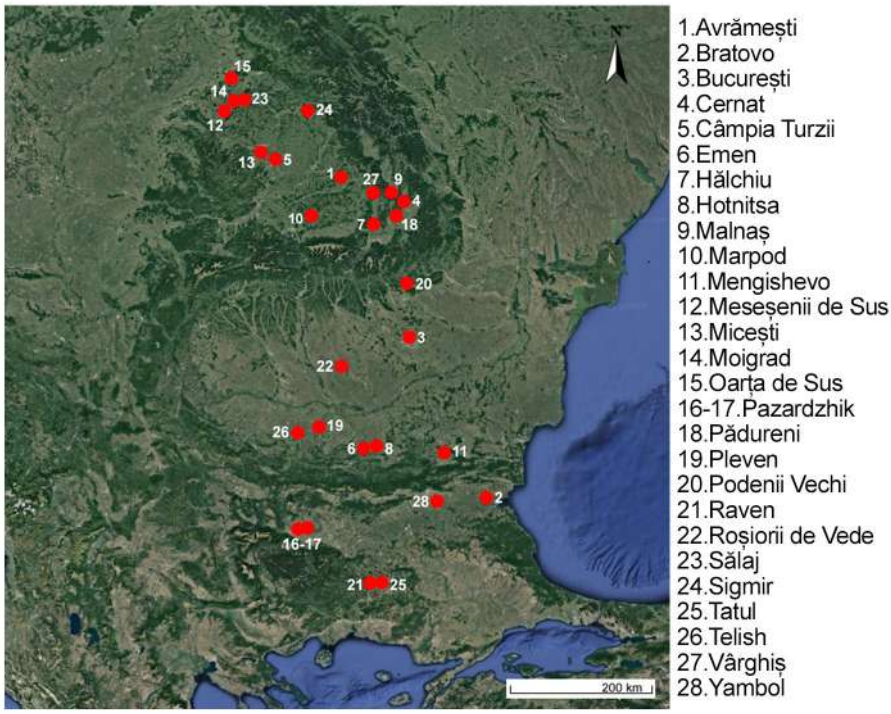

Fig. 8. Map of the axes mentioned in the text (source: Google Earth)
Fig. 8. Harta topoarelor menționate în text (sursa: Google Earth)

Alexandru Vulpe dated the first variants of the Pădureni and Monteoru type to the chronological phase of Monteoru Ic3-Ic2, while the later, more developed variants were assigned to the chronological level of Monteoru Ic2-IA (Vulpe 1970, p. 48). A dating to the level of Monteoru Ic3-Ic2, without excluding the possibility of an extended interval also covering Monteoru IA, was advanced by Nona Palincaș for the axe from București (Palincaș 2000, p. 264). In terms of the absolute chronology, this would fit into the end of the 3rd and the first half of the 2nd millennium BC. For the periodisation and absolute chronology of the Monteoru culture, recent research by Ion Motzoi-Chicideanu and Monica Șandor-Chicideanu advanced the interval to between 2200-1800 BC for what was called the *Ic3 package*, 1800-1700 BC for Monteoru Ia-IIa, and 1700-1500 BC for Monteoru IIb (Motzoi-Chicideanu, Șandor-Chicideanu 2015, Table 6).

One axe found in a relevant chronological context could provide more precise information about the time frame when these axes were used. This is the axe from Oarța de Sus-*Ghiile Botii* (Maramureș County), found in a pit (feature No. 22) in

clear association with Wietenberg II ceramics (Kacsó 2004, p. 60, Pl. XXXVIII/2). The axe shows features similar to the Pădureni type; the proximal and distal edges of the shaft are cut in a semicircle, and in the inferior part of the butt there is a prolongation having the aspect of a pointed end. The blade is splaying towards the cutting-edge, the axe is decorated on the back of the shaft with a very prominent longitudinal curved ridge, close in shape to axes of the Balșa and Hajdúsámson type, and two pairs of semi-circular parallel ribs start at the proximal and distal ends of the shaft. Alexandru Vulpe considered the Balșa and Hajdúsámson axes typologically very close to the second variant of the Pădureni axes, and given their distribution in central Transylvania he related them to the Wietenberg culture as well (Vulpe 1970, p. 52; Vulpe Tudor 1970, p. 423). He also advanced the idea of the contemporaneity of the Hajdúsámson, Balșa, second variant of the Pădureni, and second variant of the Monteoru axes (Vulpe, Tudor 1970, p. 426). Their dating to the level of the Wietenberg II phase is supported by other discoveries, such as a shaft-hole axe typologically similar to specimens of the Balșa, Hajdúsámson, and Pădureni axes found in Bistrița-*Dealul Târgului*, very close to the discovery place of a golden pot decorated with ornamental motifs typical of the Wietenberg II phase (Gogâltan, Marinescu 2018, p. 63, 70, Fig. 83). The persistence of this type of axe, including up to a later Wietenberg phase (III or C according to different authors), was also suggested (Rustoiu 1995, p. 75; Baltag, Boroffka 1996 p. 387-389; Marinescu 2018, p. 11).

Two absolute dates were obtained for pit No. 22 from Oarța de Sus-*Ghiile Botii*, from burnt grains, with rather different results. The first (ID Ly-9190) indicated 3265±30 BP = 1615-1452 cal BC 2σ (95.4% probability), while the second gave a considerably earlier date (Bln-5626) 3507±37 BP = 1935-1700 cal BC 2σ (95.4% probability)[4] (Kacsó 2015, p. 432). Given that the absolute chronology of the Wietenberg culture has been a topic of intense debate and diverse approaches by several researchers over the past decades[5], discussing these two rather puzzling absolute dates within the wider series of dates obtained for this culture would help assess their reliability (Bălan, Quinn, Hodgins 2016; Palincaș *et alii* 2019; Quinn *et alii* 2020). Of the two C14 dates obtained, the one indicating an earlier time interval is more consistent with other C14 dates obtained from animal bones found in features assigned to the Wietenberg II phase from Derșida (Palincaș *et*

[4] Calibrated with OxCal v4.4.4 Bronk Ramsey (2021): r:5: Atmospheric data from Reimer et al. (2020).

[5] The periodization of the Wietenberg culture is a very complex topic, beyond the scope of this article. Currently, multiple periodization systems are being used at the same time, between which correlations can be made, either defining phases from I to IV, or from A to D, or an early, classical, and late phase (Chidioșan 1980, p. 68-84; Boroffka 1994, p. 285-290; Bălan, Quinn, Hodgins 2016; Palincaș *et alii* 2019; Quinn *et alii* 2020). In this article we are referring to the periodization in four stages, from I to IV.

alii 2019, p. 40). In a recent article, based on Bayesian modelling, the probable start and end dates of the Wietenberg A ceramic decoration technique were placed from 1960–1900 cal BC to 1850–1760 cal BC (at 68% confidence) (Quinn *et alii* 2020, p. 55). One C14 date for the Wietenberg III phase, which comes from a sample from Luduș and is considered reliable by Palincaș *et alii* (2019), indicates (RoAMS 16-07) 3422±36 BP = 1876-1620 cal BC 2σ (95.4% probability), however with 80.6% probability dated between 1779-1620 cal BC (Berecki 2016, p. 137, Tab. 27).

These facts provide arguments for a later date of the variant of the Pădureni axes analysed in this paper. However, this does not constitute a problem since, as Radu Băjenaru argued, the casting technology of shaft-hole axes in bivalve moulds with the sprue on the lower end of the prolonged butt lasted for a considerable time, covering the entire Middle Bronze Age (Băjenaru, Tuțulescu 2021, p. 154). Furthermore, as items with a high and lasting social value, the axes were likely preserved and transmitted from generation to generation over a longer period of time (Băjenaru 2010, p. 153-154; Băjenaru, Tuțulescu 2021, p. 140). This interpretation is supported by the association in certain situations of some specimens with more primitive typological features, which would fit in the early stage, with some that have a more elaborate appearance and could be attributed to later development stages. The most suitable example in this respect is the Pădureni hoard itself; the typological diversity of the axes within it could indicate that the respective items, with different origins and which were created in distinct stages, were accumulated over a considerable period of time and subsequently deposited together (Băjenaru 2010, p. 153; Dietrich 2010, p. 196-197). Therefore, the C14 date obtained for pit no. 22 from Oarța de Sus-*Ghiile Botii* indicates the likely moment/interval of the deposition of the shaft-hole axe, during the Wietenberg II phase, without much possibility to define more clearly the moment when the item was produced or for how long it was kept before deposition. The same applies for the shaft-hole axe discovered in Podenii Vechi, which might have been produced and then circulated for a considerable amount of time, most likely in the first centuries of the 2nd millennium BC, before being deposited.

Metallurgical composition

The axe was analysed compositionally,[6] with two measurements being taken, the first on a cleaned area and the second one on the patina (**Table 1**).

[6] The analysis was performed by the X-ray fluorescence method using the Tracer 5' portable spectrometer from the "Horia Hulubei" National Institute for Research and Development for Physics and Nuclear Engineering at Bucharest-Măgurele (IFIN-HH).

Analysis	Ag	Sn	Au	Hg	Pb	Cu	Zn	As	Ti	Fe	Co	Ni	Zr
cleaned area		11.053		0.012	0.179	87.282	0.128	1.027	0.066		0.024	0.209	0.021
Patina	0.215	65.797	0.174		0.592	28.397	0.035	3.057	0.083	1.564		0.087	

Table 1. Compositional analysis (in wt %) of the axe from Podenii Vechi
Tabel 1. Analiza compoziţională a toporului de la Podenii Vechi

It should be noted that the amount of tin is higher than that identified for the other specimens of this type that were analysed. For the series of axes known from south of the Danube, the amount of tin ranges between 0.5-5% (Băjenaru 2017, p. 118). For northern Muntenia, analyses are also available for the axes of the Sinaia hoard, showing tin concentrations between 1.7 and 3.5%, and for the axe from Teişani (inv. No. 64-19704), indicating 1.2% Sn (Junghans, Sangmeister, Schröder 1968, nr. 8637-8661; Preda-Bălănică, Frînculeasa, Garvăn 2018, p. 186-187). A closer value of tin, 9.09% for the cleaned area, was measured for the Pădureni type shaft-hole axe, without rib decoration on the shaft, recently discovered in Slon (Preda-Bălănică, Frînculeasa, Garvăn 2018, Table 1). The use of copper-tin alloys in casting shaft-hole axes had already become a more and more established practice by the middle of the 3rd millennium BC in the Danubian-Carpathian region; adding an increased quantity of tin influenced not only the hardness but also the colour of the final product, resulting in a more gold-like appearance (Popescu, Constantinescu 2021, p. 292-293, with literature).

Conclusions

The discovery of an axe of the Pădureni type in the Muntenia Sub-Carpathians, for which the closest analogies can be found in Transylvania, testifies once again to the intense circulation of these artefacts between the intra- and extra-Carpathian regions through the easily accessible passes of the Curvature Carpathians. The presence of isolated specimens of one type in the distribution area of the other was already noticed decades ago with regards to the Pădureni and Monteoru axes, and was interpreted as being indicative of connections between the Wientenberg and Monteoru communities (Vulpe, Tudor 1970, p. 422-423; Rustoiu 1995, p. 75). The axe recently discovered in Slon, also typical of the Pădureni type, with an extension of the butt but no rib decoration on the shaft, was deposited on one of the most important paths connecting Transylvania and Muntenia throughout history (Preda-Bălănică, Frînculeasa, Garvăn 2018). Other single finds in the region come from Teişani and Tătaru, and one also has to add here the well-known hoard from Sinaia (Vulpe 1970; Preda-Bălănică, Frînculeasa, Garvăn 2018).

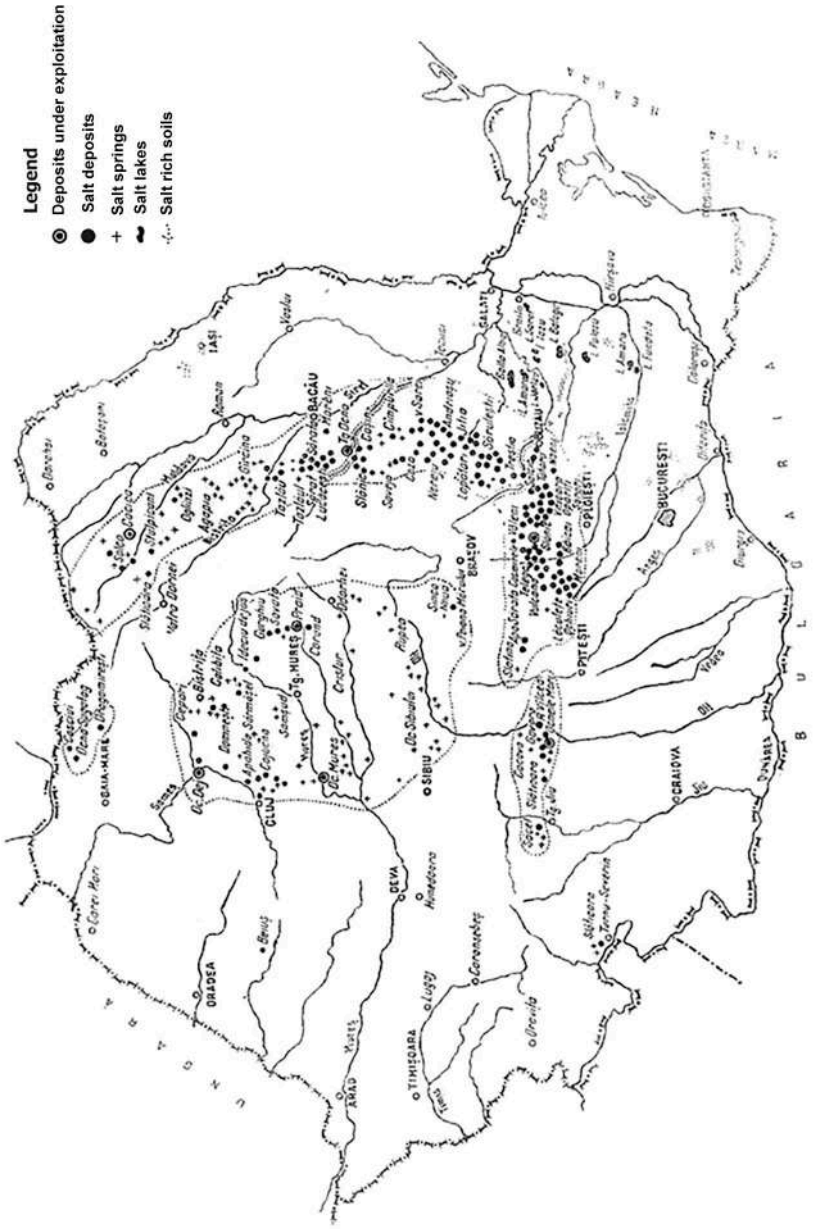

Fig. 9. Map of salt resources
(originally Drăgănescu 1997, after Constantinescu 2020, Pl. 158)
Fig. 9. Harta resurselor de sare
(original Drăgănescu 1997, după Constantinescu 2020, Pl. 158)

It has already been pointed out that these axes often occur in regions where resources of salt are available **(Fig. 9)** (Rustoiu 1995, p. 73, note 8; Preda-Bălănică, Frînculeasa, Garvăn 2018, p. 188). In this case as well, approximately 6 km to the north of the discovery place of the Podenii Vechi axe, there is the Sărățel, which is a chlorosodic spring characterised by a very high degree of mineralization, due to processes that leach the salt deposits; these springs are widespread in the Prahova Subcarpathians, and their concentrations of salt are influenced by the speed of the water flow and the size of the stream (Mihai, Nedelcu, Buterez 2015, p. 206). This area is considered the western border of the Monteoru culture (Constantinescu 2020, p. 15, Pl. 156). However, in the current state of research, it is not possible to connect the shaft-hole axes to a settlement site, as none are known in the vicinity. The only such mention is that of a site attributed to the Tei culture, perhaps a late phase, as indicated by the ceramics decorated with *Besenstrich*, located 11.1 km north-east of the discovery place of the axe[7]. One has to take into account, however, that the region is rather understudied and future surface surveys might change this picture.

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Bibliography

Baltag, Boroffka 1996: G. Baltag, N. Boroffka, *Materiale arheologice preistorice de la Albești, jud. Maramureș*, Studii și Cercetări de Istorie Veche și Arheologie 47, 1996, p. 375-393.

Bălan, Quinn, Hodgins 2016: G. Bălan, C. P. Quinn, G. Hodgins, *The Wietenberg Culture, Periodization and Chronology*, Dacia N.S. 60, 2016, p. 67-92.

Băjenaru 2010: R. Băjenaru, *Between Axe and Dagger: Early Bronze Age Weaponry in the Lower Danube Area*, in: R. Băjenaru, G. Bodi, C. Opreanu, V. V. Zirra (Eds.), *Recent Studies in the Past and Present I. Human Heritage and Community: Archaeology in the Carpathians and Lower Danube Area from Prehistory to the Early Medieval Age*, Transylvanian Review 19, Supplement No. 5: 1, 2010, p. 151-162.

Băjenaru 2017: R. Băjenaru, *Toporul de metal din zona Roșiorii de Vede și câteva precizări cu privire la tipul Pădureni*, Buletinul Muzeului Județean Teleorman 9, 2017, p. 117-127.

[7] Unpublished find, site identified by Alin Frînculeasa.

Băjenaru, Tuțulescu 2021: R. Băjenaru, I. Tuțulescu, *Un topor de metal de la Băile Olănești, jud. Vâlcea și câteva observații cu privire la tehnologia de turnare a topoarelor cu gaură de înmănușare transversală din epoca timpurie a bronzului de la Dunărea de Jos*, Pontica LIV, 2021, p. 137-179.

Bejinariu 2003: I. Bejinariu, *Opinions on the Wietenberg type finds from the Sălaj County*, in: C. Kacsó (Hrsg.), *Bronzezeitliche Kulturerscheinungen im karpatischen Raum. Die Beziehungen zu den benachbarten Gebieten. Ehrensymposium für Alexandru Vulpe zum 70. Geburtstag Baia Mare 10.-13. Oktober 2001*, Baia-Mare, 2003, p. 25-68.

Berecki 2016: S. Berecki, *The Bronze Age Site from Luduș*, Bibliotheca Musei Marisiensis. Seria archaeologica 10, Cluj-Napoca, 2016.

Boroffka 1994: N.G.O. Boroffka, *Die Wietenberg-Kultur. Ein Beitrag zur Erforschung der Bronzezeit in Südosteuropa*, UPA 19, Bonn, 1994.

Chidioșan 1980: N. Chidioșan, *Contribuții la istoria tracilor din nord-vestul României. Așezarea Wietenberg de la Derșida*, Oradea, 1980.

Constantinescu 2020: M. Constantinescu, *Începuturile culturii Monteoru. Așezarea de la Năeni-Zănoaga Cetatea 2*, Muzeul Județean Buzău, Biblioteca Mousaios 15, Cluj-Napoca, 2020.

Dietrich 2010: L. Dietrich, *Eliten der frühen und mittleren Bronzezeit im südöstlichen Karpatenbecken*, Praehistorische Zeitschrift 85, 2010, p. 191-206.

Drăgănescu 1997: L. Drăgănescu, *Originea sării și geneza masivelor de sare*, Ploiești, 1997.

Gogâltan, Marinescu 2018: F. Gogâltan, G. Marinescu, *Aur pentru zei. O descoperire aparținând epocii bronzului de la Bistrița-Dealul Târgului (nord-estul Transilvaniei). Gold for the Gods: A Bronze Age Discovery from Bistrița-Dealul Târgului (North-East Transylvania)*, Cluj Napoca, 2018.

Hansen 2010: S. Hansen, *Communication and exchange between the Northern Caucasus and Central Europe in the fourth millennium BC*, in: S. Hansen, A. Hauptmann, I. Motzenbäcker, E. Pernicka (Eds.), *Von Majkop bis Trialeti. Gewinnung und Verbreitung von Metallen und Obsidian in Kaukasien im 4.-2. Jt. v. Chr. Beiträge des Internationalen Symposium in Berlin vom 1.-3. Juni 2006*, Kolloquien zur Vor- und Frühgeschichte 13, Bonn, 2010, p. 297-316.

Hansen 2011: S. Hansen, *Metal in South-Eastern and Central Europe between 4500 and 2900 BCE*, in: Ü. Yalçin (Ed.), *Anatolian Metal V*, Bochum, 2011, p. 137-149.

Junghans, Sangmeister, Schröder 1968: S. Junghans, E. Sangmeister, M. Schröder, *Kupfer und Bronze in der frühen Metallzeit Europas*, Studien zu den Anfängen der Metallurgie 2 (1-3), Berlin, 1968.

Kacsó 2004: C. Kacsó, *Mărturii arheologice*, Seria „Colecții Muzeale" I, Baia Mare, 2004.

Kacsó 2015: C. Kacsó, *Repertoriul arheologic al județului Maramureș*, Colecția Historia, 2nd extended edition, Baia Mare, 2015.

Kleitsas 2019: C. N. Kleitsas, *The Hoard of Rodotopi in Ioannina (Epirus, NW Greece) and the Copper Single-Edged Shaft-Hole Axes of the Early Bronze Age in the Helladic Area*, Archäologischer Anzeiger 1, 2019, p. 1-35.

Marinescu 2018: G. Marinescu, *Două topoare cu orificiu transversal de înmănușare recent descoperite în nord-estul Transilvaniei*, Revista Bistriței XXXII, 2018, p. 7-19.

Mihai, Nedelcu, Buterez 2015: B. A. Mihai, A. Nedelcu, C. Buterez (ed.), *Județul Prahova. Spațiu. Societate. Economie. Mediu*, București, 2015.

Motzoi-Chicideanu, Șandor-Chicideanu 2015: I. Motzoi-Chicideanu, M. Șandor-Chicideanu, *Câteva date noi privind cronologia culturii Monteoru*, Mousaios 20, 2015, p. 9-53.

Munteanu 2010: R. Munteanu, *Începutul bronzului mijlociu în depresiunile marginale ale Carpaților Orientali*, Bibliotheca Memoriae Antiquitatis XXIV, Piatra-Neamț, 2010.

Niculescu 2008: Gh. Niculescu, *Subcarpații dintre Prahova și Buzău. Studiu geomorfologic sintetic*, București, 2008.

Palincaș 2000: N. Palincaș, *Un topor de bronz găsit în București și câteva observații cu privire la tipul Pădureni*, Buletinul Muzeului „Teohari Antonescu" (Giurgiu) S.N. 5-6, 2000, p. 263-269.

Palincaș *et alii* 2019: N. Palincaș, M. Rotea, T. B. Sava, G. O. Sava, O. Gâza, M. Bodea, C. David, *Revisiting the Radiocarbon-Based Chronology of the Wietenberg Culture (Middle Bronze Age Transylvania): A Debate of Supra-Regional Relevance,* in: N. Palincaș, C. Ponta (Eds.), *Bridging Science and Heritage in the Balkans: Studies in archaeometry, cultural heritage restoration and conservation*, Archaeopress, 2019, p. 38-51.

Popescu, Constantinescu 2021: A.-D. Popescu, B. Constantinescu, *Bronze artefacts of the 3rd millennium BC. Case studies from the Carpathian-Balkan area*, in: K. Leshtakov, M. Andonova (Eds.), *Galabovo in South-East Europe and Beyond. Cultural Interactions during the 3rd–2nd Millennium BC. Proceedings of the International Conference held on 24th – 27th October 2018 in the town of Galabovo*, Sofia, 2021, p. 276-315.

Preda-Bălănică, Frînculeasa, Garvăn 2018: B. Preda-Bălănică, A. Frînculeasa, D. Garvăn, *Un topor cu gaură transversală de înmănușare descoperit la Slon (com. Ceraşu)*, Studii și Cercetări de Istorie Veche și Arheologie 69/1-4, 2018, p. 175-190.

Puskás 2019: J. Puskás, *Egy középső bronzkori balta Csernátonból (Cernat, RO): Adatok a „Pădureni" típusú balták tipológiájához és deponálási szokásához/ A Middle Bronze Age Axe from Csernáton/Cernat (Covasna County, Romania): Contributions to the Typology and Deposition of the Pădureni-Type Axes*, Archaeologiai Értesítő 144 (1), 2019, p. 97-119.

Quinn *et alii* 2020: C. P. Quinn, H. Ciugudean, G. Bălan, G. Hodgins, *Rethinking time, culture and socioeconomic organisation in Bronze Age Transylvania*, Antiquity 94(373), 2020, p. 44-61. https://doi.org/10.15184/aqy.2019.231

Rustoiu 1995: G. Rustoiu, *Un topor de bronz de la Câmpia Turzii*, Buletinul Cercurilor Științifice Studențești 1, 1995, p. 73-82.

Szeverényi 2013: V. Szeverényi, *The Earliest Copper Shaft-Hole Axes in the Carpathian Basin: Interaction, Chronology and Transformations of Meaning*, in: A. Anders, G. Kulcsár (Eds.), *Moments in Time, Papers Presented to Pál Raczky on His 60th Birthday*, Budapest, 2013, p. 661-669.

Vulpe 1970: A. Vulpe, *Die Äxte und Beile in Rumänien*, I, PBF IX, 2, 1970, München.

Vulpe, Tudor 1970: A. Vulpe, E. Tudor, *Cu privire la topoarele de metal cu gaură de înmănușare transversală*, Studii și Cercetări de Istorie Veche 21, 3, 1970, p. 417-427.