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TRACING MEDIEVAL MACES OF ROMANIA. EVALUATION OF THE MEDIEVAL MACE HEADS FROM THE NATIONAL MUSEUM OF ROMANIAN HISTORY IN BUCHAREST (ROMANIA)

MARTIN HUSÁR – SILVIU ION OȚA

Abstract: *During research (since 2018) in the medieval part of the depository of the Department of Archaeology in the National Museum of Romanian History in Bucharest, the authors of the article gathered the assemblage of seven mace heads and one whole mace. Exactly half of all the specimens (50 %, four items) come from an unknown place of discovery. The rest originated in three historical regions of Romania – Dobruja, Moldavia and Bukovina. Six out of eight mace heads / maces have not been published yet and the two published specimens have not been assessed satisfactorily. The aforementioned mace heads and mace date from the Early Middle Ages to the Late Middle Ages, or even the Early Modern Age. The authors of the article carried out the classification and chronological evaluation of the examined mace heads and mace and look for their analogies. They also focus on iron and non-ferrous metals applied to these mace heads through the prism of their radiographic and spectroscopic analyses.*

Key words: *maces – National Museum of Romanian History in Bucharest – Romania – Middle Ages – Early Modern Age.*

Po stopách stredovekých palcátov Rumunska. Vyhodnotenie stredovekých hlavíc palcátov z Národného múzea rumunskej histórie v Bukurešti (Rumunsko)

Abstrakt: *Počas výskumu (od roku 2018) v stredovekej časti depozitára Oddelenia archeológie Národného múzea rumunskej histórie v Bukurešti autori článku zozbierali súbor siedmich hlavíc palcátov a jedného celého palcátu. Presne polovica všetkých exemplárov (50 %, 4 ks) však nemá známe miesto svojho nálezu. Zvyšok má pôvod v troch historických oblastiach Rumunska – Dobrudži, Moldavsku a Bukovine. Z ôsmich hlavíc palcátov / palcátov nebolo doteraz publikovaných šesť a ani dva už publikované exempláre neboli zatiaľ uspokojivo vyhodnotené. Uvedené hlavice palcátov a celý palcát môžeme datovať od raného do neskorého stredoveku, prípadne až do raného novoveku. Autori článku predkladajú klasifikačné a chronologické vyhodnotenie skúmaných hlavíc palcátov a palcátu a pokúšajú sa nájsť aj ich analógie. Posudzujú tiež i železo a farebné kovy použité pri ich výrobe, a to cez prizmu ich rádiografických a spektroskopických analýz.*

Kľúčové slová: *palcáty – Národné múzeum rumunskej histórie v Bukurešti – Rumunsko – stredovek – raný novovek.*

1 Introduction, source criticism and research methods

Since 2018 the authors of this article have assembled seven mace heads and one entire mace in the medieval part of the depository of the Department of Archaeology at the National Museum of Romanian History (hereafter the MNIR) in Bucharest (Tab. 1). Half of them (exactly 50 %, i.e. four items) are not related to any particular archaeological site, any historical region or even any country. Their inventory numbers at the MNIR are: 32783, 37091, 37095, and 39314.

The remaining ones come from three historical regions of Romania, namely Bukovina, Dobruja, and Moldavia. Two specimens (25 % out of the whole) come from Moldavia and directly from the Suceava (Inv. No. 72052 from the MNIR) and Neamț (Inv. No. 69624 at the MNIR) Counties within present-day Romania. They are related to the archaeological sites of Baia and Bâtca Doamnei. The last two examples originated in Suceava County (Bukovina; Inv. No. 72102 from the MNIR) and Tulcea County (Dobruja; Inv. No. 17286 at the MNIR) of Romania. They are directly from Coșna-Floreni and Dinogetia/Garvăn-Bisericuța.

Six out of eight mace heads or maces (Inv. Nos. 32783, 37091, 37095, 39314, 72052, and 72102 from the MNIR) have not been published yet, but the two already published specimens

Tab. 1. Medieval mace and mace heads from the National Museum of Romanian History in Bucharest (Romania). Authors Martin Husár and Silviu Ion Oța.

Consecutive nos.	Inventory nos. in the MNIR	Site	Archaeological/ find context	Illustration	Literature	Measurements of the mace head (cm)			
						Total height	Total width	Inner section plan measurements of the handle opening	
1	17286	Dinogetia/Garvăn-Bisericuța (Tulcea County, Romania)	fortress	Fig. 5	Ștefan et al. 1967, 338, Fig. 182: 3; 184: 23	3.6	7	2.8 × 2.8 (upper part), 3 × 3 (lower part)	
2	32783	unknown	unknown	Fig. 7–8	unpublished	8.6	6.25	1.45 × – (upper part), 2.8 × 2.55 (lower part)	
3	37091	unknown	unknown	Fig. 4	unpublished	6.1	6.85	2.4 × 2.45 (upper part), 2.1 × 2.2 (lower part)	
4	37095	unknown	unknown	Fig. 6:1	unpublished	3.5	7.6	3.6 × 3.55 (upper part), 3.5 × 3.45 (lower part)	
5	39314	unknown	unknown	Fig. 10:1; 11; 12:1	unpublished	27.5	7.5	–	
6	69624	Bâtca Doamnei (Neamț County, Romania)	enclosed settlement	Fig. 3	Scorpan 1965, 447, Fig. 5: 9; Sófalvi 2021, Fig. 10: 9.	5	4.9	2.2 × 2.25 (upper part), 2.45 × 2.3 (lower part)	
7	72052	Baia (Suceava County, Romania)	unknown	Fig. 10:2; 12:2; 13	unpublished	25.2	5.8	–	
8	72102	Coșna-Floreni (Suceava County, Romania)	unknown	Fig. 6:2	unpublished	4.3	7.8	3.4 × 3.35 (upper part), 3.25 × 3.1 (lower part)	

(Inv. Nos. 17286 and 69624 at the MNIR) have not been evaluated satisfactorily. The latter specimens of mace heads were discovered within the fortress of Dinogetia/Garvăn-Bisericuța (Inv. No. 17286 from the MNIR) and the enclosed settlement of Bâtca Doamnei (Inv. No. 69624 at the MNIR) and thus can be stratified with a modest degree of accuracy.

The mace head from the fortress of Dinogetia/Garvăn-Bisericuța (Ștefan et al. 1967, 338, Figs. 182:3; 184:23), which is stored at the MNIR, was, along with other seven iron-worked mace heads (Ștefan et al. 1967, 338, 340, Figs. 182:4; 184:24–26), found in the penultimate or ultimate layer of the fortress's occupation, i.e. in the settlement of the 11th–12th centuries. It is proved by coins from the time of Emperor Alexios I Comnenus (1081–1118) that were unearthed in these layers too (Ștefan et al. 1967, 338). Unfortunately, only three[1] of the aforementioned seven iron-worked mace heads were published and their current location is unknown.

1 Except for the examined specimen with Inv. No. 17286 from the MNIR.

Tab. 1. Stredoveký palcát a hlavice palcátov z Národného múzea rumunskej histórie v Bukurešti (Rumunsko). Autori Martin Husár a Silviu Ion Oța.

Measurements of the mace head (cm)				Weight of the mace head/ mace (kg)	Suggested dating according to the authors of the article	Classification groups according to the authors of the article
Total length of the socket	Section plan measurements of the neck	Outer section plan measurements of the socket	Inner section plan measurements of the socket			
–	–	–	–	0.223	the 11th–12th centuries	Mace heads with 12 knobs in three rows (subgroup of exemplars with a prismatic core)
–	–	–	–	0.136	the 13th–17th centuries	Mace heads fitted with pentagonal vertical flanges
–	–	–	–	0.267	the 10th–13th (/15th) centuries	Mace heads with teardrop-like knobs
–	–	–	–	0.253	the 11th–14th centuries	Mace heads with 12 knobs in three rows (subgroup of star-shaped exemplars)
20	2.3 × 2.25	2.85 × 2.8	–	0.990 (the whole mace)	the 15th–17th (/18th) centuries	Mace heads with vertical flanges forming a bulb and a quite long socket
–	–	–	–	0.240	the second half of the 12th century – the middle of the 13th century	Mace heads with four rows of buds
18.6	2.05 × 2.05	2.7 × 2.5	2.1 × 2	0.753	the 15th–17th (/18th) centuries	Mace heads with vertical flanges forming a bulb and a quite long socket
–	–	–	–	0.307	the 11th–14th centuries	Mace heads with 12 knobs in three rows (subgroup of star-shaped exemplars)

The excavation of the enclosed settlement of Bâtca Doamnei also brought a mace head (Scorpan 1965, 447, Fig. 5:9; Sófalvi 2021, Fig. 10:9). This settlement belonged to the Kingdom of Hungary and dates from the second half of the 12th century to the middle of the 13th century. Among other movable objects, there were also found other parts of weapons, horse harness, tools, pottery, etc. Upon the site a silver bracteate was discovered, which was most probably minted by Hungarian King Béla IV (1235–1270) at the beginning of his reign (before 1241), when he was also the Duke of Transylvania. Other credible means for the above mentioned dating of the discussed site are, inter alia, spiked spurs or parts of double-edged swords (Aleksić 2007, 41; Mătasă–Zamoșteanu, I.–Zamoșteanu, M. 1960, 346–347; Pinter 2007, 89–90; Scorpan 1965, 441, 446–447, 451–453, Fig. 8; Sófalvi 2021, 33–36, Fig. 13).

Romanian scientists working in the field of study of archaeology or weapon science specialists have not principally focused on the topic of medieval maces, apart from at least three cases. During the late 1980s Nicolae-Marcel Simina and Gheorghe Anghel classified medieval bronze and iron mace heads from the collection of the National Museum of the Union in Alba

Iulia (Transylvania) and dated them between the end of the 11th century and the course of the 14th century (Simina–Anghel 1998, 166–167). They sorted them out into four categories – A to D – and category A also into three variants a, b, and c. As Andrei-Octavian Fărcaş mentioned in his master's thesis, their dating was mainly founded upon parallels from the territory of Hungary and Slovakia. However, he noted that these parallels belonged to the 12th century onward (Fărcaş 2016, 31). In his master's thesis Andrei-Octavian Fărcaş tried to examine all specimens of medieval mace heads (iron or bronze) found in Transylvania and deposited in the museums of Transylvania, which date from the 12th century to the middle of the 16th century (Fărcaş 2016, 12). He divided them into seven types (types I–VII) and two of these types were then categorised into several variants (variants II/1–2; VII/1–3; Fărcaş 2016, 29–41, 56–73). Andrei-Octavian Fărcaş (2016, 14) dated these specimens, which mostly lack an archaeological context, by analogies from Central and Eastern Europe that were, inter alia, also discovered in archaeological contexts, like in the case of the territory of Hungary. In 2003 five medieval and early modern mace heads (made of bronze or iron, but out of archaeological context) from the collection of the History, Ethnology and Fine Art Museum in Lugoj were published (Romanian Banat) as well (Pinca 2003, 333–338).

Additionally, there are publications that did not treat medieval maces principally, but alongside other (melee) weapons and armour from a particular Romanian museum or museums. Important museum research in this matter was done by Cristian M. Vlădescu, whose work was mostly based on objects of museum collections from his home institution – the "King Ferdinand I" National Military Museum in Bucharest. Firstly, he investigated the melee weapons of Western Europe origins from the 15th–18th centuries at the museums of Romania and in a study from the year 1968 he published two mace heads from the 15th century within the collections of the National Military Museum in Bucharest (Vlădescu 1968, Figs. 38–39). In the following years he presented some mace heads of Romanian troops in his studies dedicated to arms and armour of the second half of the 15th century (Vlădescu 1973, 58–86) and the 16th century (Vlădescu 1974–1975, 151–180). They mostly come from contextual iconographical representations (Vlădescu 1973, Fig. 5) and archaeological excavations (Vlădescu 1974–1975, Fig. 3a–c). In 1973 Cristian M. Vlădescu, Carol König and Dan Popa wrote a monograph on the 15th–18th century arms and armour from the large museums of Romania (Vlădescu–König–Popa 1973, 64). Among the aforementioned arms eight maces from the collections of the "King Ferdinand I" National Military Museum in Bucharest and the collections of the Peleş National Museum dated to the 15th–17th centuries were published (Vlădescu–König–Popa 1973, Fig. 71–73, 75–76). Anca Niţoi (2007) composed a monograph on the selected medieval and early modern arms, armour, horse riding gear and stirrups from the collections of the Brukenthal National Museum in Sibiu. She added eight mace heads and maces to this publication output of hers that are dated to the period between the 12th and 17th centuries (Niţoi 2007, 52–55).

Apart from the previously mentioned classification or typological systems for medieval mace heads from Romania, the next schemes for this kind of medieval weapons have been more or less relevant for the whole European continent so far. The mace heads (in the context of research on all arms and armour) from the territory of medieval Rus' were compiled by Анатолий Николаевич Кирпичников as early as 1966 in Russian, and the findings were then published in a corrected (although shorter) version in German in 1986 (Кирпичников 1966, 47–57, Рис. 10; Табл. XXV–XXVIII; XXIX:1–3; Table 13–14; Kirpičnikov 1986, 95–97, Abb. 17; Tab. XI:1). The author traced the development of the discussed weapons mainly between the 11th and 14th centuries, but he did not omit their usage in the 16th–17th centuries. He singled out seven types of these iron or bronze mace heads from the examined territory – I–II, IIA, III–VI (Кирпичников 1966, Рис. 10; Kirpičnikov 1986, Tab. XI). It is a very beneficial fact that from medieval Rus' there are available, besides stray finds and finds found out of archaeological context, also those that come from barrows and settlement layers.

Hungarian scholar, László Kovács (1971, 165–181), focused on iron and bronze star-shaped mace heads from the Hungarian National Museum in Budapest (Hungary) in his famous

article dating back to 1971. Most of these objects of the museum collections are stray finds and, unfortunately, lack archaeological context. László Kovács (1971, 181, 1. ábra) dated them to the 11th–14th centuries and distinguished five types – I–V. Slovak archaeologist Alexander T. Ruttkay (1976, 314–317), who in the 1970s examined weapons, a horse riding gear and a horse harness of the 9th to the 1st half of the 14th centuries from Slovakia, identified two variants (1 and 2) of type IV (a kind of star-shaped mace heads) of Анатолий Николаевич Кирпичников here (Ruttkay 1976, Abb. 45). They were represented by 12 bronze specimens from museum collections in the territory of present-day Slovakia.

In his survey of European arms and armour from the Renaissance to the Industrial Revolution, Ewart Oakeshott (2000, 62–68)[2] also touched on the subject of maces. Arms and armour from this period can be dated more precisely (in comparison with the earlier part of the Middle Ages) on the basis of artworks of various kinds. In his aforementioned monograph he presented (Oakeshott 2000, Fig. 12) four types of maces (M_1–M_4) and for the first two of them he also introduced their two variations (Oakeshott 2000, Figs. 12:A^1, A^2, B^1, B^2). Ewart Oakeshott (2000, 64–65) assessed a whole mace, namely its cast or forged head and a wooden, steel or iron haft. He dated his mace types from the late 15th century to the late 17th century (Oakeshott 2000, Fig. 12).

The essential typo-chronologies of medieval mace heads are also known from today's Bulgaria and two local archaeologists, Валери Йотов and Стоян Попов, have contributed to their composition. Валери Йотов (2004, 107–109, Каталог: 644–660, Таблица 18: Боздугани; 19: Боздуган; Табло LIII:644; LIV:645–655, 658, 660), who dealt with arms, armour, horse riding gear, and a horse harness of the First Bulgarian Empire, identified two types (1 and 2) of the iron mace heads and four variants of his first type (variants A–D). Lot of these parts of weapons are quite well known from the objects and layers of settlement archaeological sites. Type 1 was dated to the 10th–11th centuries and type 2 from the 10th century to the course of the High Middle Ages (post-11th century; Йотов 2004; Таблица 19: Боздуган).

A no less important typology of the medieval and early modern mace heads was presented by Стоян Попов in 2014 (Попов 2014). The aim of his research was to explain the development of maces with bronze and iron heads in Bulgaria between the 10th and 17th centuries (Попов 2014, 13–15). For this purpose he described in detail the collection of mace heads from the Vatevi Collection[3] (417 items), the National Institute of Archaeology with the Museum of the Bulgarian Academy of Sciences (30 items) and also some other specimens (3 items). Afterwards, he dated these objects, which mostly lack information about their archaeological or historical context, mainly on the basis of their parallels from Bulgaria or Europe. Stoyan Попов identified as many as 21 types (I–XXI)[4] within the examined set, which were dated between the aforementioned 10th and 17th centuries (Попов 2014, Табл. 1/Tabl. 1).

Mirsad Sijarić (2014) made an overview of melee weapons as well as certain archery (arrowheads) and crossbow equipment (crossbow nuts) from the territory of Bosnia and Herzegovina between the 10th and the 15th centuries. He observed five types (I–V) of mace heads within the examined assemblage (9 items; Sijarić 2014, 256–288, 416). Only one specimen of these mace heads originated in archaeological context (grave 696 from the cemetery of Čipuljić).

Since there is no satisfactory, broadly used (by the scientific public), well-established or complete English description terminology for (medieval) mace heads or maces from native English-speaking countries, we have chosen some relevant scientific publications that at least partially provide inspiration in this field.

In this regard we were mostly influenced by frequently used terms proposed by senior or current scientists or even by collectors, blacksmiths, and reenactors. However, the inspirations

2 This monograph was first published in 1980.

3 It is probably the largest private collection of ancient and medieval arms and other military equipment in Bulgaria. This collection comprises about 5,000 objects, which have been gathered by the Vatevi family in Plovdiv since 1940s (Romfeya 2023; Trakart Research Centre-Museum 2023).

4 He also specified some of the discussed types through sub-types, variants and sub-variants.

given varied and we had to choose the most meaningful terms. From the scientific literature of native English-speaking countries, we used the incomplete terminology of (well-known) Ewart Oakeshott (2000, 62–68), Andrew Halpin (1988, 168–192) and Adam Daubney (2010, 194–200). Then we were also influenced by some other scholars beyond the above-mentioned scientists from native English-speaking countries. Against that background there is the description terminology of Стоян Попов from the year 2014 (145, Tab. III), which is most probably the secondary English translation of his initial Bulgarian terminology. Some of the terminology used might be found in two articles of Arkadiusz Michalak (2011, 173, 178, 181; 2019a, 137, footnote 41) as well. In other words, we present the frequently used and significant terms (and their synonyms or equivalents)[5] of our article in its first figure (Fig. 1).

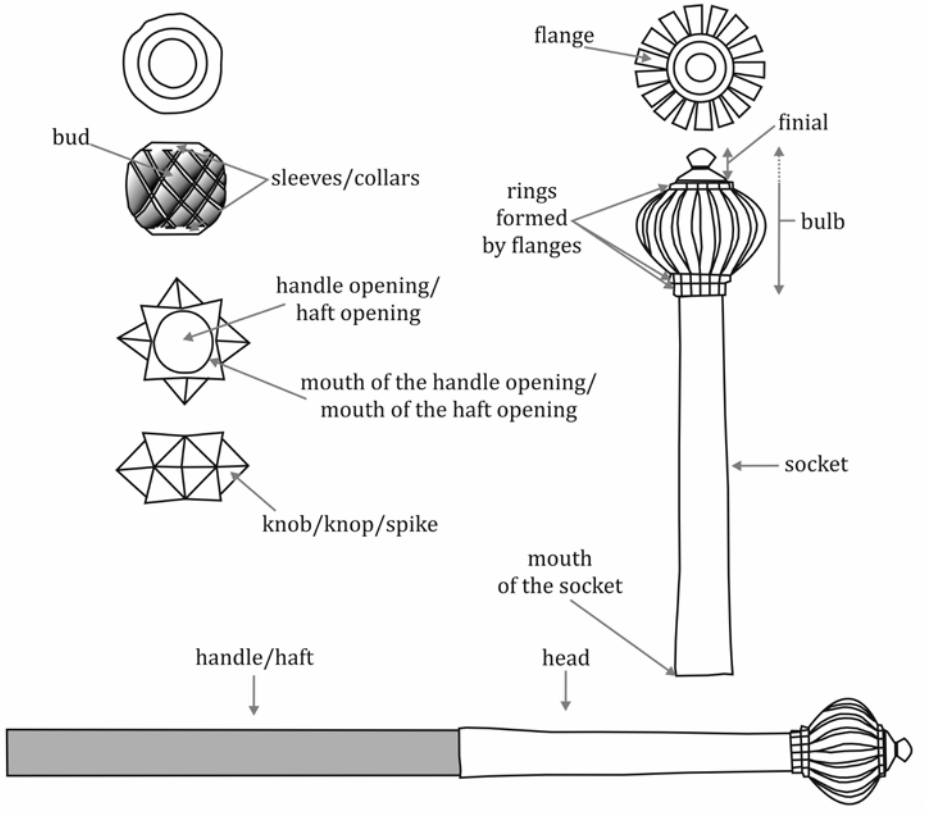

Fig. 1. Terminology regarding the examined mace and mace heads used by the authors in the article. Author Martin Husár.
Obr. 1. Terminológia skúmaného palcátu a hlavíc palcátov, ktorú v článku používajú jeho autori. Autor Martin Husár.

5 We list the terms in the order we prefer them (Fig. 1).

The goals of our article are to present as best as possible the materials, classification,[6] origins/analogies, and dating of the mace heads or maces from the MNIR in Bucharest. We also tried (inter alia), by using spectroscopy and radiography, to determine the purpose of the usage of some non-ferrous metals in the compositions of the examined objects. That is obviously connected with the issue of the employed production technology of maces as well. And afterwards we intend to put these pieces of knowledge together.

Scientific literature dealing with radiographic and spectroscopic analyses concerning medieval mace heads from Romania has not been published yet. For instance, some of medieval mace heads from Romania[7] are regarded as bronze specimens by individual scholars (who dealt with them) without providing the general public with any kind of spectroscopic examinations. Therefore, we need to be cautious in this matter; then their references to iron mace heads, which are easier to be determined visually, are rather more likely.

As mentioned above, we also had the examined mace and mace heads from the MNIR undergone radiographic and spectroscopic analyses, in particular at two institutions. In the first instance, they were made by the Center of Excellence for Restoration by Optoelectronic Techniques (hereafter the CERTO) at the National Institute of Research and Development for Optoelectronics – INOE 2000, whose residence is in Măgurele (Ilfov County, Romania). Radiographic analyses were carried out on the 13th of May 2022 and spectroscopic analyses on the 23rd of May 2022. The operator in radiography was Dr. phys. Laurențiu-Marian Angheluță, who provided us with his unpublished brief report (Angheluță 2022). During the radiographic/X-ray analyses the discussed mace heads were exposed to the research device in three working modes – at 60, 100, and 120 kV (kilovolts) energy thresholds. The used equipment includes: an ISOVOLT 160 M1 (whose main part is a flexible X-ray generator), dedicated scanner, and reusable exposure films.

The referred spectroscopic analyses from the CERTO were performed by the following techniques and equipment:

1) Laser Induced Breakdown Spectroscopy (hereafter the LIBS) – by a handheld LIBS spectrometer from SciAps (operating in Argon purge environment) that uses Q-switched Nd:YAG laser. The operator was Dr. eng. phys. Monica Dinu.

2) Fourier Transform Infrared Spectroscopy (hereafter the FTIR) – by a Perkin Elmer Spectrum Two FTIR spectrometer. The operator was Dr. eng. phys. Ioana-Maria Cortea.

3) X-ray fluorescence spectroscopy (hereafter the XRF) – by a portable Bruker TRACER III-SD equipment. The operator was Dr. eng. Luminița Ghervase.

The results of these spectroscopic analyses are summarised in an unpublished report that we received from the aforementioned scientists (Dinu–Ghervase–Cortea 2022).[8] The above mentioned LIBS analysis used a single pulse mode for the identification of the chemical composition of the metal layers. It employed ten pulses for stratigraphic analysis (providing us with progressive

6 We made a simple classification of the discussed assemblage (quite small in number) from the MNIR (and named these classes as groups or categories to be better treated in order to find their analogies (also within various typo-chronologies or pursuant to stratigraphic surveys) and date them. We were not intended to make typology for a large area and with special description entries for types, which could even embrace newly revealed artefacts in future. As Gergely Csiky (2015, 11, footnote 49) has already written: *"The classification arranges the artefacts based on their formal attributes ('Merkmal' in German, 'признак' in Russian), while the typology examines the links between the types and intends to show trends in their development."* The similar claims one can find in Barbara Ann Kipfer's Dictionary of Artifacts too (Kipfer 2007, 70, 326).

7 In the following lines and chapters we may also mention even other present-day countries and analogies for the discussed mace heads/maces in this matter.

8 These physicists or their colleagues previously gave similar analyses on archaeological finds (Ghervase et al. 2020; Radvan–Bors–Ghervase 2016, 1530–1538) and objects of a private collection (Simileanu 2016, 203–209) made from non-ferrous metals.

stratigraphic spectra). Then identified chemical elements were enumerated based on their relative abundance in the spectra. The FTIR spectra were assembled in the 4,000–380 cm^{-1} mid IR-region at 4 cm^{-1} resolution, by averaging eight scans. The XRF's measurements for our article were done for the screening of the chemical elements. The identified chemical elements were then listed according to their relevance in the spectra, as major (ma), minor (mi), trace (tr), or minor trace (m.t.) elements (Dinu–Ghervase–Cortea 2022, 2).

Another series of (unpublished) spectroscopic analyses was made by Dr Gheorghe Niculescu, PhD. (Niculescu 2023), from the X-Ray Investigation Department within the Section of the Physical-Chemical and Biological Investigations of the MNIR in Bucharest on the 8th of February 2023. They were additional, although quantitative, XRF analyses of the examined mace heads' particular parts. Gheorghe Niculescu used a handheld Bruker X-ray fluorescence spectrometer S1 Titan, which is equipped with Rh anticathode and SDD detector. The colleague of Gheorghe Niculescu from the aforementioned department of the MNIR, Mrs Zizi Baltă, took some macro photographs of the discussed mace heads from the MNIR on the 10th of March 2023. We have been provided with these photographs courtesy of her and the director of the MNIR.

The outcome and observations achieved and made by the above-mentioned analyses will be treated in the following chapters mainly concerning classification and chronology of the discussed mace heads and mace. Readers of this article will also be provided with their larger context pursuant to their parallels or stratigraphic surveys. The discussed collection of the seven medieval mace heads and one entire mace from the MNIR can be arranged into the following five groups or categories (Fig. 2).[9] The first group is comprised by only one mace head with four rows of buds,

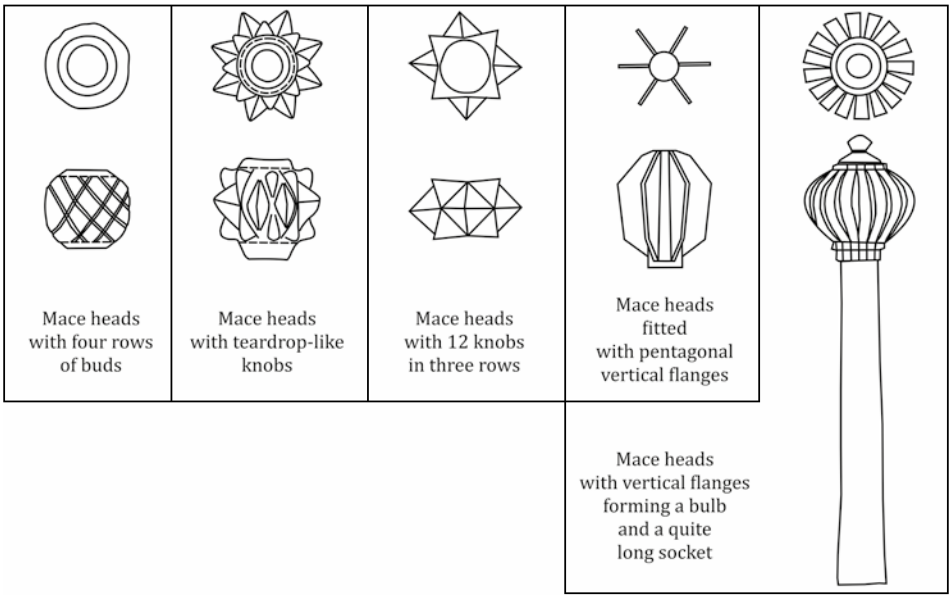

Fig. 2. Classification groups of the medieval mace heads from the National Museum of Romanian History in Bucharest (Romania). Author Martin Husár.

Obr. 2. Klasifikačné skupiny stredovekých hlavíc palcátov z Národného múzea rumunskej histórie v Bukurešti (Rumunsko). Autor Martin Husár.

9 The group of mace heads with 12 knobs in three rows might be divided even into two subgroups, i.e. the subgroup of specimens with a prismatic core and the subgroup of star-shaped specimens.

a mace head with teardrop-like knobs belongs to the second group, the following group consists of three mace heads with 12 knobs in three rows, the specimen of a mace head fitted with pentagonal vertical flanges is in the second to last group, and, finally, two mace heads with vertical flanges forming a bulb and a quite long socket are in the last group.

2 Mace heads with four rows of buds

The specimen from the enclosed settlement of Bâtca Doamnei (Inv. No. 69624 at the MNIR) is the only mace head within this group (Fig. 3). It was brought to the MNIR from the History and Archaeology Museum in Piatra Neamț in 1974. The Museum register of the MNIR lists it as a 13th century item. This mace head was finally registered at the MNIR in 1975.[10]

It has three-sided buds[11] in the first and fourth rows and four-sided buds in the second and third rows. A place that separates the buds is engraved with lines, which mostly look black. We suppose that the mace head could have been equipped with upper and lower sleeves. The inner cross-section of the mouth of the handle opening is circular in shape, although the inner walls (inside the handle opening) make up a concave space (Fig. 3:1b, h).

Following the results of the LIBS and XRF spectroscopic analyses performed by the CERTO the essential chemical element of the mace head from Bâtca Doamnei was iron and there are

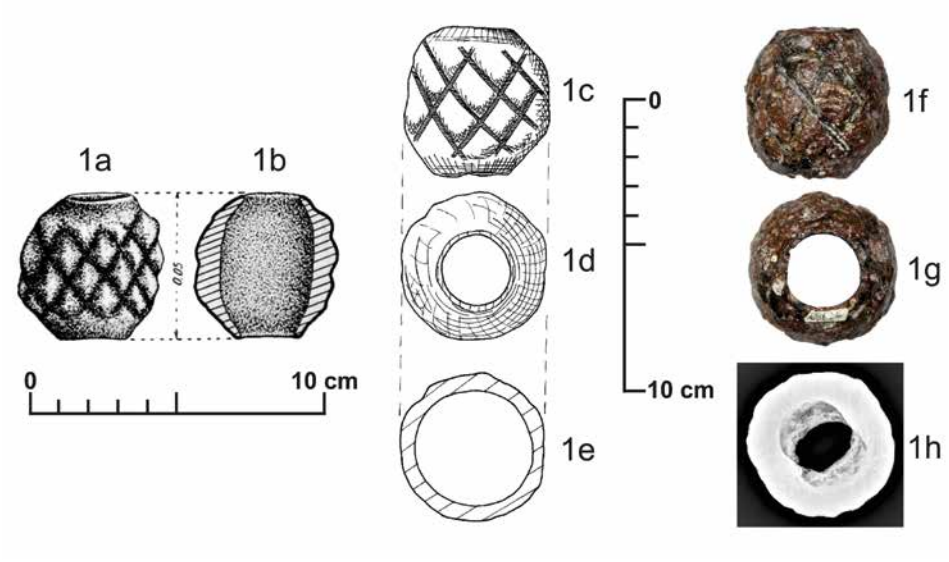

Fig. 3. Medieval mace head from the enclosed settlement of Bâtca Doamnei (Neamț County, Romania) – inventory number 69624 at the National Museum of Romanian History in Bucharest (Romania). 1a–b – drawings after Scorpan 1965, 447, Fig. 5:9; 1c–e – drawings by Georgiana Ducman; 1f–g – photographs by Martin Husár; 1h – X-ray image at 100 kV energy threshold by Laurențiu-Marian Angheluță (after Angheluță 2022); 1a–h – iron, traces and minor traces of non-ferrous metals. Scale: 1a–h.

Obr. 3. Stredoveká hlavica palcátu z opevneného sídliska Bâtca Doamnei (Župa Neamț, Rumunsko) – inventárne číslo 69624 v Národnom múzeu rumunskej histórie v Bukurešti (Rumunsko). 1a–b – kresby podľa Scorpan 1965, 447, Fig. 5:9; 1c–e – kresby Georgiany Ducmanovej; 1f–g – fotografie Martina Husára; 1h – röntgenová snímka pri hraničnej energii 100 kV od Laurenția-Mariana Angheluțu (podľa Angheluță 2022); 1a–h – železo, stopy a nepatrné stopy neželezných kovov. Mierka: 1a–h.

10 Information from the Museum register of the MNIR.

11 By the word "buds" we mean slight convex protuberances.

also traces of copper and manganese (Dinu–Ghervase–Cortea 2022, 4–5). Silicon was detected from the yellowish surface layer by the LIBS as well. There are no traces of precious metals on the surface of the discussed mace head. The quantitative XRF analysis (probe R1961) from the MNIR indicates the majority share of iron in the mace head, namely 99.8 % of this metal (Tab. 2; Niculescu 2023). According to the LIBS and (primarily) FTIR spectroscopy techniques, we can assume that the surface of the mace head is affected by restoration. Gypsum, polyethylene wax and nitrocellulose could have been used in this regard (Fig. 3; Dinu–Ghervase–Cortea 2022, 4–5). Unfortunately, accounts of the referred restoration are missing at the MNIR. The radiographic analysis has not brought anything special, although it proved that a concave space inside the haft opening is visible on an X-ray image too (Fig. 3:1h; Angheluţă 2022).

In the previous chapter we have already mentioned that the enclosed settlement of Bâtca Doamnei can be dated from the second half of the 12th century to the middle of the 13th century. However, analogies for the examined mace head could have been used for a quite longer time span, i.e. between the 10th and the 13th centuries. They are made of iron, yet one specimen from the Vatevi Collection in Plovdiv (Bulgaria) was even gilded (Попов 2014, 150 – Inv. No. 7, Fig. on p. 151). Parallels to the discussed mace head from the territory of present-day Bulgaria and from the former Volga-Kama Bulgaria prove this view. Стоян Витлянов (1996, 39, 103, Табл. XVI:1) dated one similar exemplar from Плиска (Bulgaria) to the 10th–11th centuries and Веселин Парушев (1998, 69, 71, Обр. 5) took another similar mace head from the collection of the Regional History Museum in Добрич (Габровско, Bulgaria) to be a specimen from the 12th

Tab. 2. Chemical composition of the medieval mace heads from the National Museum of Romanian History in Bucharest (Romania) according to the quantitative XRF analyses of Dr Gheorghe Niculescu, PhD. (X-Ray Investigation Department, Section of the Physical-Chemical and Biological Investigations of the National Museum of Romanian History in Bucharest), dated the 8th of February 2023.

Tab. 2. Chemické zloženie stredovekých hlavíc palcátov z Národného múzea rumunskej histórie v Bukurešti (Rumunsko) podľa kvantitatívnych XRF analýz Dr. Gheorghe Niculescu, PhD. (Oddelenie röntgenologických výskumov, Sekcia fyzikálno-chemických a biologických výskumov Národného múzea rumunskej histórie v Bukurešti), z 8. februára 2023.

Consecutive nos.	Inventory nos. in the MNIR	Nos. of the selected probes of the quantitative XRF analyses	Chemical composition of the mace heads (%)							
			Cu	Fe	Zn	As	Sn	Sb	Pb	Other chemical elements
1	17286	R1960	76.63 +/– 0.13	0.5 +/– 0.02	3.13 +/– 0.02	0.13 +/– 0.02	16.64 +/– 0.09	0.15 +/– 0.03	1.99 +/– 0.06	circa 0.83
2	32783	R1964	36.67 +/– 0.12	62.08 +/– 0.13	0.05 +/– 0	0.03 +/– 0.01	0.15 +/– 0.03	0	0	circa 1.02
3	37091	R1969	0.07 +/– 0.02	99.5 +/– 0.38	0	0	0.11 +/– 0.04	0	0.05 +/– 0.02	circa 0.43
4	37095	R1972	0.16 +/– 0.01	99.68 +/– 0.18	0.01 +/– 0.01	0	0.02 +/– 0.01	0	0.08 +/– 0.01	circa 0.05
5	39314	R1977	54.73 +/– 0.11	40.75 +/– 0.09	0.06 +/– 0	0.1 +/– 0.01	3.84 +/– 0.04	0.26 +/– 0.02	0.25 +/– 0.01	circa 0.01
	39314	R1978	28.11 +/– 0.16	71.82 +/– 0.21	0.03 +/– 0.01	0.04 +/– 0.02	0	0	0	circa 1
6	69624	R1961	0.10 +/– 0.01	99.8 +/– 0.16	0	0	0	0	0.01 +/– 0.01	circa 0.09
7	72052	R1974	0.75 +/– 0.05	99.94 +/– 0.39	0	0	0.15 +/– 0.05	0	0.02 +/– 0.02	circa 0.16
8	72102	R1956	0.19 +/– 0.01	99.64 +/– 0.2	0	0	0.02 +/– 0.02	0	0	circa 0.15

century or the beginning of the 13th century. Regarding Валери Йотов's typology of mace heads of the First Bulgarian Empire we may identify the examined mace head with variants B and C of type I, which were mostly found within settlements dated to the 10th–11th centuries (Йотов 2004, 108–109, таблица 18: Боздугани – 1B-1C; 19; Табло LIV:645, 647–651). Also, we are able to recognise specimens like the mentioned one within the large Vatevi Collection from Bulgaria. It resembles mace heads of Стоян Попов's types I (Barrel-shaped maces with buds) and IV (Barrel-shaped maces with a surface covered with rhombs). He dated[12] the former type between the middle of the 10th century and the middle of the 11th century or possibly even later and the latter type to the late 11th century – the 12th century (Попов 2014, 43, 55–59, 135, 146–151, 212–248, Табл. 1/Tabl. 1). It seems that mace heads, similar to the discussed one, were used in the former Volga-Kama Bulgaria during the 10th–13th centuries as well (Shpakovsky–Nicolle 2013, 34, Fig. 9 on page 34).

3 Mace heads with teardrop-like knobs

Only the specimen with Inv. No. 37091 at the MNIR belongs to this category or group (Fig. 4). This mace head was brought to the MNIR from the Peleș National Museum in 1973.[13] It is a mace head with eight teardrop-like knobs in the upper and lower rows and eight four-sided knobs[14] in the central row. The upper and lower sleeves are present there as well. At least the knobs from the

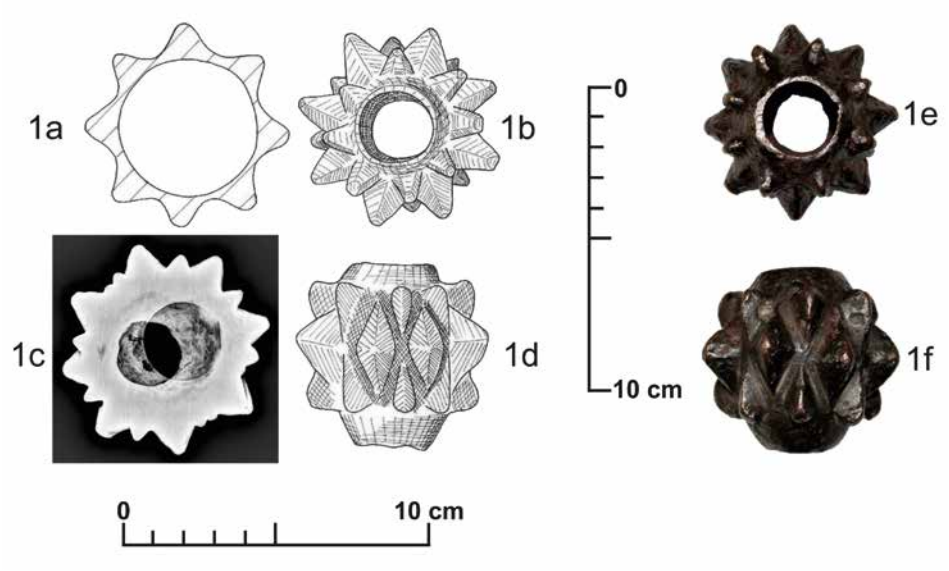

Fig. 4. Medieval mace head from an unknown site – inventory number 37091 from the National Museum of Romanian History in Bucharest (Romania). 1a–b, d – drawings by Georgiana Ducman adjusted by Martin Husár; 1e–f – photographs by Martin Husár; 1c – X-ray image at 100 kV energy threshold by Laurențiu-Marian Angheluță (after Angheluță 2022); 1a–f – iron, minor traces of non-ferrous metals. Scale: 1a–f.

Obr. 4. Stredoveká hlavica palcátu z neznámej lokality – inventárne číslo 37091 v Národnom múzeu rumunskej histórie v Bukurešti (Rumunsko). 1a–b, d – kresby Georgiany Ducmanovej upravené Martinom Husárom; 1e–f – fotografie Martina Husára; 1c – röntgenová snímka pri prahovej energii 100 kV od Laurenția-Mariana Angheluțu (podľa Angheluță 2022); 1a–f – železo, nepatrné stopy neželezných kovov. Mierka: 1a–f.

12 According to their analogies.

13 Information from the Museum register of the MNIR.

14 Unlike teardrop-like knobs, by these knobs we mean pyramidal protuberances of lozenge-shaped section.

central row were framed with two engraved lines/grooves. Every line is approximately 0.125 cm wide and the space between these lines makes up 0.3 cm. The inner cross-section of the mouth of the haft opening is circular in shape and the inner walls (inside the haft opening) form a concave space (Fig. 4:1c).

The LIBS and XRF spectroscopic analyses carried out by the CERTO show that the main chemical element of the mace head with inventory number 37091 was iron. There are no traces of precious metals on the surface of the mace head and lead was not proved inside its handle opening (Dinu–Ghervase–Cortea 2022, 3). The quantitative XRF analysis from the MNIR confirmed the above-mentioned report in regard to iron (probe R1969). There is 99.5 % of iron in it. Some traces of other chemical elements are there as well, for example nickel (0.23 %) and tin (0.11 %; Tab. 2; Niculescu 2023). The X-ray image at 100 kV energy threshold confirmed that there is a concave space inside the handle opening of the examined mace head (Fig. 4:1c; Angheluţă 2022).

On the basis of the typological-chronological analyses of mace heads and the dating of the particular sites the following analogies of the discussed mace head can be dated to the 10th–13th (/15th) centuries. These analogies are composed of iron or bronze. Their knobs[15] were often framed by engraved lines/grooves. Also, it was proved that some of the bronze ones, like the specimen with Inv. No. 85.10057 (Kovács 2016, 38, Fig. 03 on page 38) from the Hungarian National Museum in Budapest (Hungary), were even filled with lead. However, this technique was not proved inside the examined mace head.

The mentioned analogies could be recognised in the Balkans, the former Byzantine Empire and the collections of the Hungarian National Museum in Budapest. There are four[16] mace heads like the examined specimen (D'Amato 2011, Fig. 26:3–6) from the Collection of the World Museum of Man (Florida, USA), which also consists of objects from the Balkans that was once under the control of the Byzantine Empire (D'Amato 2011, 7). They were categorised by Raffaele D'Amato (2011, 41–43) into his "Round knobbed types" dated from the 10th to 12th centuries. One stratified specimen of this kind of mace head [Gaitzsch 2005, 11, 214 (ST6), Taf. 53:ST6, 73:5 (ST6)] originated in the former city of Pergamon, and comes directly from the layer of the late Byzantine-Ottoman periods. This layer is dated to the 12th–15th centuries.

In present day Bulgaria we are familiar with analogous bronze and iron specimens from Велики Преслав (Витлянов 1996, 39, 103–104, Табл. XV:2; XVI:2–4)[17] and the Vatevi Collection. The latter ones are part of Стоян Попов's type X (spherical maces with prolonged pyramidal knobs), whose specimens have 5–11 knobs in 3–5 rows (Попов 2014, 75–81, 137, 310–346, Табл. 1/Tabl. 1). This type was dated to the 12th–13th centuries (Попов 2014, Табл. 1/Tabl. 1). It might be noticed that knobs of some of these specimens are framed by engraved lines/grooves (Попов 2014, Figs. on pp. 315, 317, 319, 327, 333, 335, 345). One comparable bronze mace head with knobs, which are framed by two engraved lines/grooves, is related to the primary context of grave 696 from the cemetery of Čipuljić in present-day Bosnia and Herzegovina (Sijarić 2014, 268–273, T. LVII, 1). This specimen of Mirsad Sijarić's type III of mace heads was found in the grave alongside a spur and belt buckle, which enable to date its context to the early 13th century (Sijarić 2014, 268–273). Finally, the above-mentioned mace head filled with lead from the collections of the Hungarian National Museum in Budapest (Kovács 2016, 38, Fig. 03 on page 38) has nine teardrop-like knobs in the upper row, nine four-sided knobs in the central row and nine teardrop-like knobs in the lower row. Its knobs are framed by two engraved lines/grooves. Tibor S. Kovács (2016, 38) dated this object of a museum collection[18] to the 11th–13th centuries.

15 Between 5 and 11 in 3–5 rows.

16 Two of them have got their knobs framed by engraved lines/grooves (D'Amato 2011, Fig. 26:3, 6).

17 These mace heads were dated by Стоян Витлянов (1996, 39, 103–104) to the 10th–11th centuries.

18 It has Inv. No. 85.10057. and was formerly a part of the Mauthner Collection. Then it was moved to the Archaeological Institute and in 1985 to the Hungarian National Museum (Kovács 2016, 38).

4 Mace heads with 12 knobs in three rows

Three specimens of medieval mace heads from the MNIR (Inv. Nos. 17286, 37095, and 72102) are found in this group. They are mace heads with 12 knobs in three rows. Four three-sided knobs[19] are in their upper and lower rows and four four-sided ones[20] are in their central row.

There are two subgroups of the discussed group of mace heads. The first subgroup is defined by a specimen with Inv. No. 17286[21] (Fig. 5). Its damaged core looks quite prismatic because the four-sided knobs of lozenge-shaped section from the central row do not reach the upper and lower brims / handle openings of the mace head. The second subgroup comprises specimens with Inv. Nos. 37095 (Fig. 6:1) and 72102[22] (Fig. 6:2). Their four-sided knobs of almost square-shaped section from the central rows reach the upper and lower brims/haft openings of the mace heads and therefore the mace heads look more star-shaped than the aforementioned specimen with a prismatic core. The all three aforementioned mace heads are circular in shape when it comes to the inner cross-section of the mouth of the handle opening. The handle opening of the mace head from the fortress of Dinogetia is cylindrical from inside (Fig. 5:1g) and the inner walls (inside the handle opening) of the specimens with Inv. Nos. 37095 and 72102 form a concave space (Figs. 6:1e; 2e).

The mace head with Inv. No. 17286 was brought to the MNIR from the "Vasile Pârvan" Institute of Archaeology in 1971.[23] On the basis of the LIBS and XRF spectroscopic examinations from the CERTO we can say that this broken mace head from Dinogetia/Garvăn-Bisericuța was made of a copper-tin-zinc alloy with traces of lead, silver, and antimony and minor traces of cobalt (Dinu–Ghervase–Cortea 2022, 10). The quantitative XRF spectrometric analysis from the MNIR also showed (probe R1960) copper (76.63 %), tin (16.64 %), zinc (3.13 %), and lead (1.99 %) as the main chemical components of this mace head (Tab. 2; Niculescu 2023). It partly confirms the previous assessment of Ion Barnea that it is made of bronze (Ştefan et al. 1967, 338). There is also an adhesive area on the surface of the mace head, which is most likely of an organic nature and it could probably be related to the restoration of the mace head at the MNIR (Dinu–Ghervase–Cortea 2022, 10). The radiographic analysis did not reveal any special or hidden feature of the mace head (Fig. 5:1g; Angheluță 2022).

The specimen with Inv. No. 37095 from the MNIR was brought to the MNIR from the Peleș National Museum in 1973 and the mace head from Coșna-Floreni (Inv. No. 72102 at the MNIR) was transferred to the MNIR from the Bukovina Museum (Suceava) in 1975.[24] The LIBS and XRF spectroscopic analyses performed by the CERTO give evidence that the essential chemical element of the mace head with Inv. No. 37095 from the MNIR is iron and there are traces of other elements too (calcium, carbon, copper, manganese, zinc, etc.; Dinu–Ghervase–Cortea 2022, 6). In the chemical composition of this mace head iron forms 99.68 %, as the quantitative XRF spectrometric analysis (probe R1972) from the MNIR shows (Tab. 2; Niculescu 2023). The X-ray analysis confirmed a concave space inside the haft opening of the mace head (Fig. 6:1e; Angheluță 2022).

Following the LIBS and XRF spectroscopy techniques from the CERTO, the mace head from Coșna-Floreni mainly consists of iron. Then it comprises only minor traces of other chemical elements (for instance, copper) as well. Moreover, in the rust area of this mace head a slight chlorine signal was detected that can regard a burial environment, degradation products or stabilisers (Dinu–Ghervase–Cortea 2022, 8–9). According to the LIBS the light areas of the

19 The aforementioned knobs are triangular sectioned.

20 The particular knobs are projections of lozenge-shaped (as in the case of the specimen with Inv. No. 17286 from the MNIR) or almost square-shaped section (as in the instance of the specimens with Inv. Nos. 37095 and 72102 from the MNIR).

21 It comes from the fortress of Dinogetia/Garvăn-Bisericuța (Tulcea County, Romania).

22 This specimen is from Coșna-Floreni (Suceava County, Romania).

23 Information from the Museum register of the MNIR.

24 Information from the Museum register of the MNIR.

mace head's surface might concern a copper-aluminium alloy with traces of tin (Fig. 6:2d) that could have been a kind of decoration. This contrasts sharply with the results of the XRF analyses from the CERTO as well as from the MNIR. They more or less have proved only iron. The quantitative XRF analysis (probe 1956) from the MNIR recorded 99.64 % of iron and only 0.19 % of copper in this specimen (Tab. 2; Niculescu 2023). The aforementioned light areas on the mace head's surface are most likely connected with the undocumented cleaning or polishing of the mace head that could have caused the false detection of a copper-aluminium alloy (with traces of tin) by the LIBS. Paraffin from the inside of the haft opening of the discussed mace head could

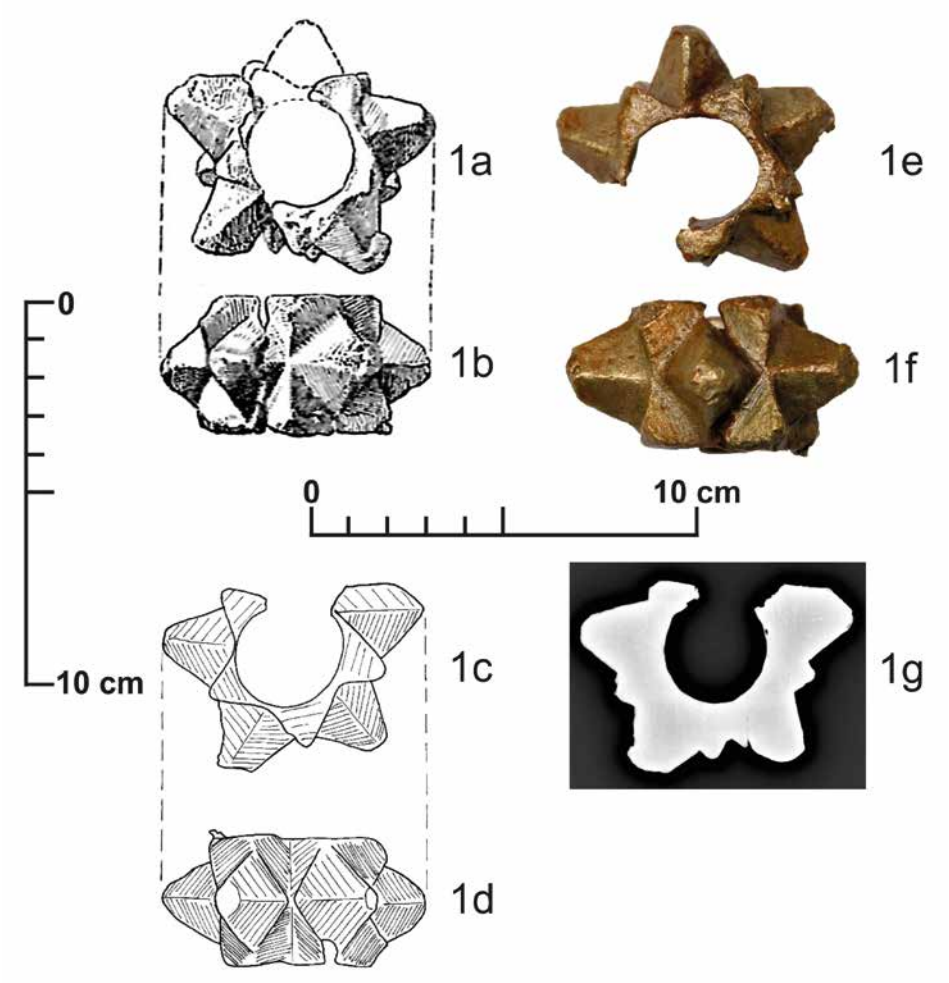

Fig. 5. Medieval mace head from the fortress of Dinogetia/Garvăn-Bisericuța (Tulcea County, Romania) – inventory number 17286 at the National Museum of Romanian History in Bucharest (Romania). 1a–b – drawings after Ștefan et al. 1967, Fig. 184:23; 1c–d – drawings by Georgiana Ducman; 1e–f – photographs by Martin Husár; 1g – X-ray image at 100 kV energy threshold by Laurențiu-Marian Angheluță (after Angheluță 2022); 1a–g – copper-tin-zinc alloy, traces of lead, silver, etc. Scale: 1a–g.

Obr. 5. Stredoveká hlavica palcátu z pevnosti Dinogetia/Garvăn-Bisericuța (Župa Tulcea, Rumunsko) – inventárne číslo 17286 v Národnom múzeu rumunskej histórie v Bukurešti (Rumunsko). 1a–b – kresby podľa Ștefan et al. 1967, Fig. 184:23; 1c–d – kresby Georgiany Ducmanovej; 1e–f – fotografie Martina Husára; 1g – röntgenová snímka pri hraničnej energii 100 kV od Laurenția-Mariana Angheluțu (podľa Angheluță 2022); 1a–g – zliatina medi, cínu a zinku, stopy olova, striebra, atď. Mierka: 1a–g.

be related to the restoration of the mace head at the MNIR too, as the FTIR analysis indicated (Dinu–Ghervase–Cortea 2022, 9). The radiographic analysis proved a concave space inside the haft opening that is visible on an X-ray image (Fig. 6:2e; Angheluță 2022).

Unfortunately, there are only few published scientific studies concerning chemical composition of medieval mace heads from Central and Eastern Europe (Imiołczyk–Zdaniewicz 2022, 153). What is more, these investigations were conducted with the use of different methodologies. The well-performed analyses mainly come from Poland and few of them are from the Czech Republic (Bohemia), Sweden and Ukraine. Almost all of the mentioned medieval non-ferrous mace heads consist of copper-tin alloys of varying proportions (Imiołczyk–Zdaniewicz 2022, 153; Marek–Miazga 2012, Tab. 1).

Four of them contain between 77.29 and 79.81 % of copper and between 16.92 and 19.23 % of tin (Michalak 2019, 151, Tab. 1).[25] We can compare them with one specimen from our assemblage – the mace head with Inv. No. 17286 from the fortress of Dinogetia. It is also mainly

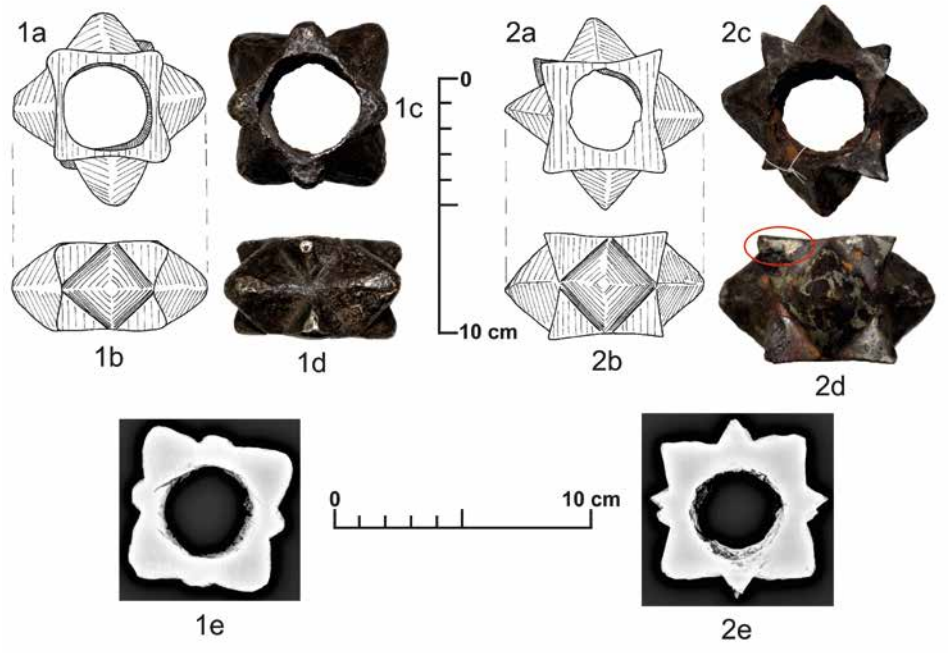

Fig. 6. Star-shaped medieval mace heads (subgroup of mace heads with 12 knobs in three rows) from the National Museum of Romanian History in Bucharest (Romania). 1 – unknown site – inventory number 37095; 2 – unknown site in Coșna-Floreni (Suceava County, Romania) – inventory number 72102; 1a–b, 2a–b – drawings by Georgiana Ducman; 1c–d, 2c–d – photographs by Martin Husár (2d – photograph by Martin Husár with the marked area of the mace head's surface regarding its light areas); 1e, 2e – X-ray images at 100 kV energy threshold by Laurențiu-Marian Angheluță (after Angheluță 2022); 1–2 – iron, traces of non-ferrous metals. Scale: 1–2.

Obr. 6. Hviezdicovité stredoveké hlavice palcátov (podskupina hlavíc palcátov s 12 ostňami v troch radoch) z Národného múzea rumunskej histórie v Bukurešti (Rumunsko). 1 – neznáma lokalita – inventárne číslo 37095; 2 – neznáma lokalita v Coșna-Floreni (Župa Suceava, Rumunsko) – inventárne číslo 72102; 1a–b, 2a–b – kresby Georgiany Ducmanovej; 1c–d, 2c–d – fotografie Martina Husára (2d – fotografia Martina Husára s vyznačenou plochou povrchu hlavice palcátu, týkajúcou sa jej svetlých oblastí); 1e, 2e – röntgenové snímky pri hraničnej energii 100 kV od Laurenția-Mariana Angheluțu (podľa Angheluță 2022); 1–2 – železo, stopy neželezných kovov. Mierka: 1–2.

25 One specimen from Buczek (Poland) and Praha-Nové Město (the Czech Republic), and two specimens from the vicinity of Uddevali (Sweden; Michalak 2019, Tab. 1).

composed of copper (76.63 %) and tin (16.64 %) following the aforementioned results of probe R1960 from the MNIR (Tab. 2; Niculescu 2023).

Inner spaces of medieval star-shaped mace heads[26] from these areas used to be sometimes filled with lead or they contained (Imiołczyk–Zdaniewicz 2022, 155–156; Strzyż 2005, 109) a rather high lead content[27] (Imiołczyk–Zdaniewicz 2022, 150). On the one hand, lead is relatively heavy and this state or practice might have been followed in order to increase the weight of mace heads and thereby increase and enhance their manoeuvrability too. However, on the other hand, the addition or existence of lead to copper alloys has allowed better casting[28] in moulds when there has been a need for a complex cast (Šedo 2011–2012, 263).

A star-shaped mace head with two sleeves and a socket, which was chiefly made of copper and lead, is known, for example, from Librantowa (Lesser Poland Voivodeship, Poland; Liwoch 2016, 676)[29] and from the collection of the Archaeological Museum in Cracow (Lesser Poland Voivodeship, Poland; Rudzińska et al. 2013, Tab. 1).[30] They might come from the second half of the 13th century – first half of the 14th century (Liwoch 2016, 678) and the 13th century (Rudzińska et al. 2013, 139). The specimen of the copper-alloy mace head from the same Polish voivodeship – Lesser Poland Voivodeship (namely from Kraków-Częstochowa Upland) – mainly comprises copper, antimony and lead (Imiołczyk–Zdaniewicz 2022, 150–154, Fig. 6).[31] This specimen is dated between the 12th century and the first half of the 14th century (Imiołczyk–Zdaniewicz 2022, 147). It can be considered a shape parallel to the specimens of our subgroup of the star-shaped mace heads, although it is equipped with one sleeve, unlike the specimens of this subgroup.

Shape analogies for both subgroups of mace heads with 12 knobs in three rows were made of iron or non-ferrous metals (e.g. bronze). The stratigraphy of the fortress of Dinogetia/Garvăn-Biseriçuţa enables to date the mace head with Inv. No. 17286 (the sole specimen of the subgroup of specimens with a prismatic core) from the MNIR to the 11th–12th centuries, whereas its parallels could be dated from the 9th through 14th centuries. Pursuing various typo-chronologies of mace heads and the dating of the particular sites, the specimens of the subgroup of star-shaped mace heads can be dated to the 11th–14th centuries.[32]

Parallels to the subgroup of mace heads with a prismatic core were probably used in Central, Southeastern and Eastern Europe and the former Byzantine Empire. Raffaele D'Amato (2011, 33–36, Fig. 22) classified six analogous iron specimens from the Collection of the World Museum of Man, Florida as "Polygonal quadrangular types". These mace heads probably originated in the Balkans under Byzantium and are related to the 9th–14th centuries (D'Amato 2011, 33). Two other similar specimens come from a Late Byzantine period layer from the former city of Pergamon. This layer dates from the 12th–14th centuries [Gaitzsch 2005, 11, 214 (ST4, ST5), Taf. 53:ST4, 73:4 (ST5)]. One bronze and one iron specimen of this kind of mace heads are present in the collection of the National Museum of the Union in Alba Iulia. Nicolae-Marcel Simina and Gheorghe Anghel classified them with their variant Aa and dated them between the end of the 11th century and the 14th century (Simina–Anghel 1998, 166–168, Figs. 1:5; 4:1). In the territory of Transylvania, we could consider them as well, as shown by two bronze specimens (objects of museum collections) of Andrei-Octavian Fărcaş's type I, "Mace heads with four central pyramidal knobs and without a socket", which was dated to the 12th–13th centuries (Fărcaş 2016, 29–31, 60–61, Fig. I.6–I.7).

26 These mace heads were of various forms. For instance, they were fitted with sleeves and sockets or they lacked them.

27 At this point in the analysis, we do not examine for all of the specimens discussed whether lead was artificially added during the casting process or was already part of the original ore. This is because this information has not been collected for the MNIR specimens, and it is also problematic to obtain such information for all of their analogues.

28 Lead increases fluidity of copper alloys (Šedo 2011–2012, 260).

29 81–91 % of copper and 3–7 % of lead.

30 60–70 % or 81–91 % of copper and 15–20 % or 3–7 % of lead.

31 In non-corroded areas copper moderately surpasses 50 % and lead as well as antimony are almost in analogous proportions, i.e. about 13–14 %. Tin reaches about 1.5 % there.

32 We do not count or deal with analogous specimens with the upper and/or lower sleeves to the above mentioned parallels of both subgroups of mace heads with 12 knobs in three rows.

One might find specimens of mace heads with a prismatic core on archaeological sites and museums from present-day Bulgaria as well. Валери Йотов recognised them as type 2 of his typology. It was dated by him from the 10th century to the beginning of the 12th century (Йотов 2004, 109, таблица 18: Боздугани – 2; 19; Табло LIV:655, 658, 660). In spite of this dating of type 2, some of its exemplars were unearthed in the settlement of Бдинци, which is dated to the 9th–10th centuries, and the fortress of Желъд used in the 9th and 14th centuries (Йотов 2004, каталог). The Vatevi Collection contains, apart from other mace heads, specimens of Стоян Попов's sub-type VIIA that were called "Prismatic maces with four pyramidal knobs, which have got the upper handle opening of a smaller diameter than the lower one" (Попов 2014, 65, 135, 282–297, Табл. 1/Tabl. 1). The referred mace head from the MNIR (Inv. No. 17286) also has the upper mouth of its handle opening narrower than the lower one. Sub-type VIIA from the Vatevi Collection was dated between the second quarter of the 11th century and the first half of the 13th century (Попов 2014, 135, Табл. 1/Tabl. 1). In addition, some comparable exemplars (made of iron) are from Велики Преслав, which were dated to the 11th–12th centuries (Витлянов 1996, 39–40, 104, Табл. XVI:6, 9, 11), and from the collection of the Regional History Museum in Добрич. According to Веселин Парушев the latter ones come from the period between the end of the 10th century and the beginning of the 11th century (Парушев 1998, Обр. 2) and from the 12th–13th centuries (Парушев 1998, Обр. 7–9).

Equivalent mace heads to the subgroup of specimens with a prismatic core could also be found in the archaeological collection of the Military Museum in Belgrade (Serbia) and they were categorised as the 11th–12th century objects (Пековић 2006, 112–113, Figs. on pp. 112 and 113 – Inv. Nos. 16368 and 16370). In the collections of the Hungarian National Museum in Budapest (Hungary) we can assign such a mace head from Eger to László Kovács's type IV, which is dated from the 12th century to the middle of the 14th century (Kovács 1971, 172–178, 181, 4. ábra: 4). The examined kind of mace heads was also a part of armament in early medieval Rus'. It can be demonstrated by some specimens of them within Анатолий Николаевич Кирпичников's type I. This type had once been dated to the 9th–11th centuries (Кирпичников 1966, 48, Рис. 10: I; Табл. XXV:2) and then to the 11th century (Kirpičnikov 1986, 95, 97, Tab. XI:1).

The subgroup of star-shaped mace heads and its specimens in Romania are found, in addition to the MNIR, in the depositories of the Banat and Transylvanian museums. One bronze mace head is stored in the collection of the History, Ethnology and Fine Art Museum in Lugoj (Romanian Banat) and was dated to the 11th–14th centuries, following its analogies (Pinca 2003, 333, 335–336, Pl. I/1). One bronze specimen and another iron one of this kind of mace heads were classified with Nicolae-Marcel Simina and Gheorghe Anghel's variant Aa. They come from the collection of the National Museum of the Union in Alba Iulia and were dated, as the above-mentioned variant Aa, from the end of the 11th century to the 14th century (Simina–Anghel 1998, 166–168, Fig. 1:1–4). Andrei-Octavian Fărcaș added five analogous bronze specimens to his type I of mace heads from the collections of the Transylvanian museums. As we pointed out before, he dated his type I to the 12th–13th centuries (Fărcaș 2016, 29–31, 58–60, Fig. I.1–I.5).

Specimens of the star-shaped mace heads' subgroup from the collections of the Croatian History Museum in Zagreb (Croatia) were most likely made of copper and bronze. They were determined as the 11th–14th century objects of the museum collections (Bošković 2002, 166, Fig. on p. 166 – kat. n. 24–25). Among mace heads from the collections of the Hungarian National Museum in Budapest (Hungary) we can also observe a specimen of our subgroup III.2, namely from Somogyvár (Hungary), which was categorised with László Kovács's type IV. He dated this group between the 12th century and the middle of the 14th century (Kovács 1971, 172–178, 181, 5. ábra: 4). Same mace heads were most likely put in practice in the North Caucasus region in the 13th–14th centuries as well (Горелик 2002, 66, Fig. 9 on page 67).

Specimens in the star-shaped form and without sleeves cannot be spotted in museum collections or in archaeological contexts from the territory of Bulgaria. They are still fitted with one or two sleeves. For example, such specimens were classified in the Vatevi Collection and the

collection of the National Institute of Archaeology with Museum in Sofia as Стоян Попов's type XIII (Star-shaped maces with 12 knobs) and sub-types XIIIA (bronze maces) as well as XIIIB (iron maces) and dated between the early 12th century and the middle of the 14th century (Попов 2014, 89–91, 137, 358–403, Табл. 1/Tabl. 1) or to the 12th–14th centuries (Popov 2018, 154, 169–170, Figs. 2–5).

5 Mace heads fitted with pentagonal vertical flanges

Only the specimen with Inv. No. 32783 from the MNIR is associated with this group (Fig. 7–8). The markedly corroded and damaged mace head (its flanges are squeezed) is fitted with four (formerly 5–6 or even 8) pentagonal vertical flanges[33] with rounded edges. The inner cross-section of the mouth of its haft opening or socket was most likely circular in shape. The socket from inside is in the form of a bevelled cone. The mace head was brought to the MNIR from the Bucharest Municipality Museum in 1973.[34]

The X-ray analysis proves that the socket is in the form of a bevelled cone from inside (Fig. 7:1h; Angheluţă 2022). The main constituent of the mace head, which was detected during the LIBS and XRF spectroscopy analyses at the CERTO, was iron. The flanges are solely

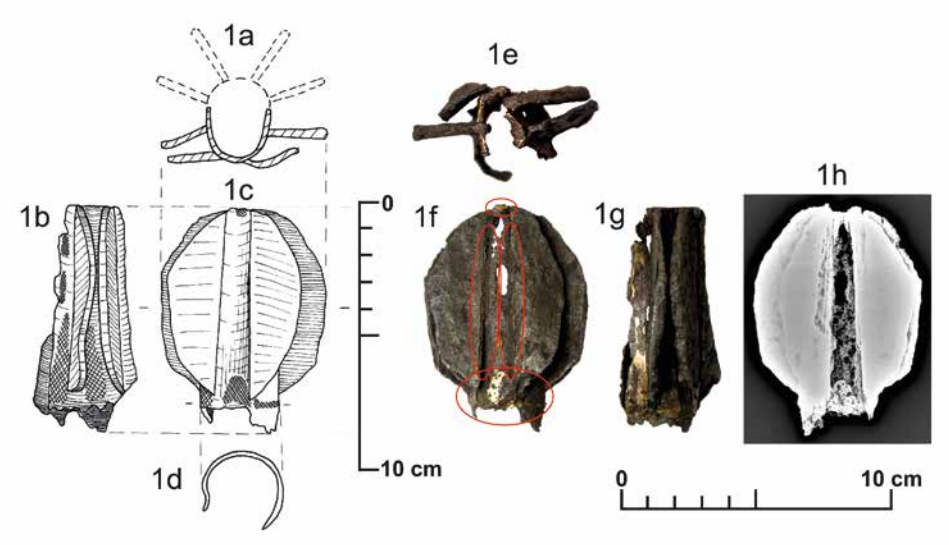

Fig. 7. Medieval mace head from an unknown site – inventory number 32783 at the National Museum of Romanian History in Bucharest (Romania). 1a–d – drawings by Georgiana Ducman; 1e–g – photographs by Martin Husár (1f – photograph by Martin Husár with the marked areas of the mace head regarding its soldering and/or decoration by copper); 1h – X-ray image at 60 kV energy threshold by Laurenţiu-Marian Angheluţă (after Angheluţă 2022); 1a–h – iron, copper, and minor traces of tin, etc. Scale: 1a–h.

Obr. 7. Stredoveká hlavica palcátu z neznámej lokality – inventárne číslo 32783 v Národnom múzeu rumunskej histórie v Bukurešti (Rumunsko). 1a–d – kresby Georgiany Ducmanovej; 1e–g – fotografie Martina Husára (1f – fotografia Martina Husára s vyznačenými plochami hlavice palcátu týkajúcimi sa jej spájkovania a/alebo zdobenia meďou); 1h – röntgenová snímka pri hraničnej energii 60 kV od Laurenţia-Mariana Angheluţu (podľa Angheluţă 2022); 1a–h – železo, meď a nepatrné stopy cínu, atď. Mierka: 1a–h.

33 Quoting the online Cambridge Dictionary "a flange" is principally: "*A flat surface sticking out from an object,...*" (Cambridge Dictionary 2023).

34 Information from the Museum register of the MNIR.

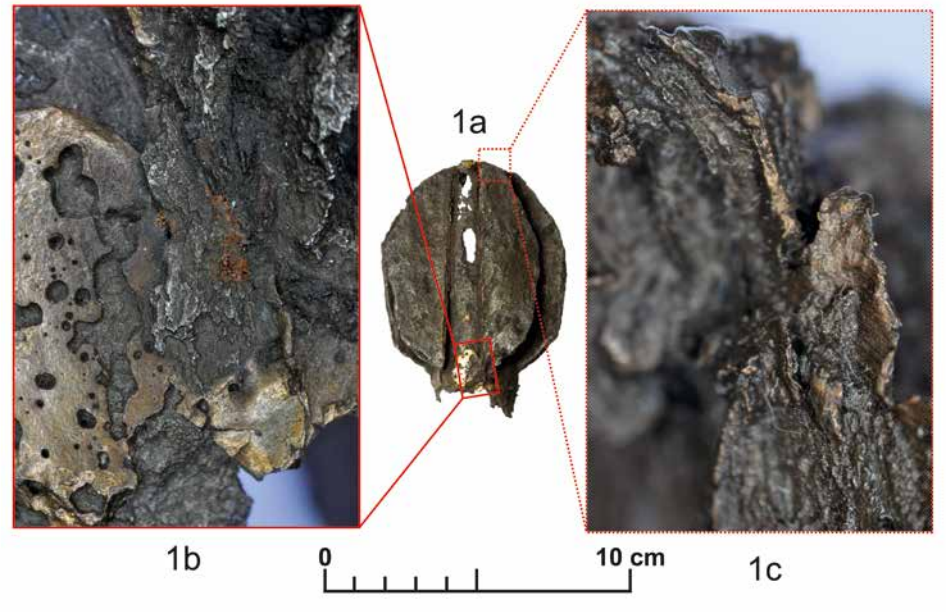

Fig. 8. Medieval mace head from an unknown site – inventory number 32783 at the National Museum of Romanian History in Bucharest (Romania). 1a – photograph by Martin Husár; 1b–c – macro photographs by Zizi Baltă; 1a–c – iron, copper, and minor traces of tin, etc. Scale: 1a. Not to scale: 1b–c.

Obr. 8. Stredoveká hlavica palcátu z neznámej lokality – inventárne číslo 32783 v Národnom múzeu rumunskej histórie v Bukurešti (Rumunsko). 1a – fotografia Martina Husára; 1b–c – makrofotografie od Zizi Baltă; 1a–c – železo, meď a nepatrné stopy cínu, atď. Mierka: 1a. Bez mierky: 1b–c.

composed of iron. Next, the identified copper was most probably used here as solder[35] and maybe as decoration too, although it concerns only the area between the flanges of the mace head and its socket (Fig. 7:1f). Eventually, the XRF from the CERTO reveals that, alongside iron, copper and other elements, tin is minor trace element here as well (Dinu–Ghervase–Cortea 2022, 7).

These observations were also testified by the quantitative XRF analyses and macrophotography from the MNIR. It turns out that the socket of the mace head, first and foremost its larger part, might have been made of iron. Then it was probably covered with a copper sheet and finally rewrapped in iron again. It is quite clear on the basis of macro photographs of the socket's upper and lower parts made by Zizi Baltă (Fig. 8:1b–c) and a photograph of the socket's upper part took by Martin Husár (Fig. 7:1e). The data obtained from the lower part/mouth of the socket by the quantitative XRF spectroscopic technique from the MNIR are influenced by the above-mentioned situation. Probe R1964 recorded 62.08 % of iron, 36.67 % of copper, and 0.15 % of tin in this damaged area (Tab. 2; Niculescu 2023).

Analogies for the group of mace heads fitted with pentagonal vertical flanges were made of iron and bronze and were dated between the 13th and 17th centuries. These parallels are related to the typological-chronological analyses of mace heads, the dating of the particular sites, and iconographical representations. The analogies have six to eight vertical flanges that are pentagonal or heptagonal. Vertical iron flanges might have been soldered with copper to a socket in the shape of a bevelled cone. It is also proved by the specimen with Inv. No. 54.1982 from the Hungarian National Museum in Budapest dated to the 16th century (Kovács 2016, 71, Fig. 24 on p. 71). This

35 To put it simply, copper or copper alloys have got lower melting points (copper: 1,084.62 °C) than iron (1,538 °C) and thus are more suitable for joining parts (e.g. flanges) of less meltable metals, like iron.

iron specimen has eight pentagonal vertical flanges that were soldered with copper to the hollow cylinder core of the head or socket, most probably like in the case of the mentioned specimen from the MNIR. Something similar is noticeable on the portrait of Polish Crown Prince Ladislaus Sigismond Vasa from the second quarter of the 17th century (Fig. 9; Gutowski 2015, 47, 197, Fig. 15, 90). We do not know whether copper or another non-ferrous metal is displayed here or not, but this metal also decorates the mace head's finial, socket, rim of flanges and it alternates iron parts of a ring placed under the flanges.

The Collection of the World Museum of Man in Florida, which encompasses Byzantine specimens from the Balkans, also contains one bronze specimen from the Eastern Balkans with six pentagonal vertical flanges with rounded edges (D'Amato 2011, 41, Fig. 24:1–1a) that is classified within Raffaele D'Amato's "Flanged hexagonal types". It was itself dated to the 13th–14th centuries, although the aforementioned "Flanged hexagonal types" are dated by Raffaele D'Amato (2011, 41) broadly, i.e. to the 12th–15th centuries. Another mace with six pentagonal vertical flanges, the so called guild mace, comes from the collections of the National Military Museum in Bucharest (Vlădescu–König–Popa 1973, text regarding Fig. 76, Fig. 76). It was produced right in the year 1666.

In the Vatevi Collection from Bulgaria we might notice two specimens that are fitted with six pentagonal vertical flanges, like the discussed mace head from the MNIR (Попов 2014, 105, 442–443, 488–489, Табл. 1/Tabl. 1). The first one (Inv. No. 353.293.) was made of bronze and

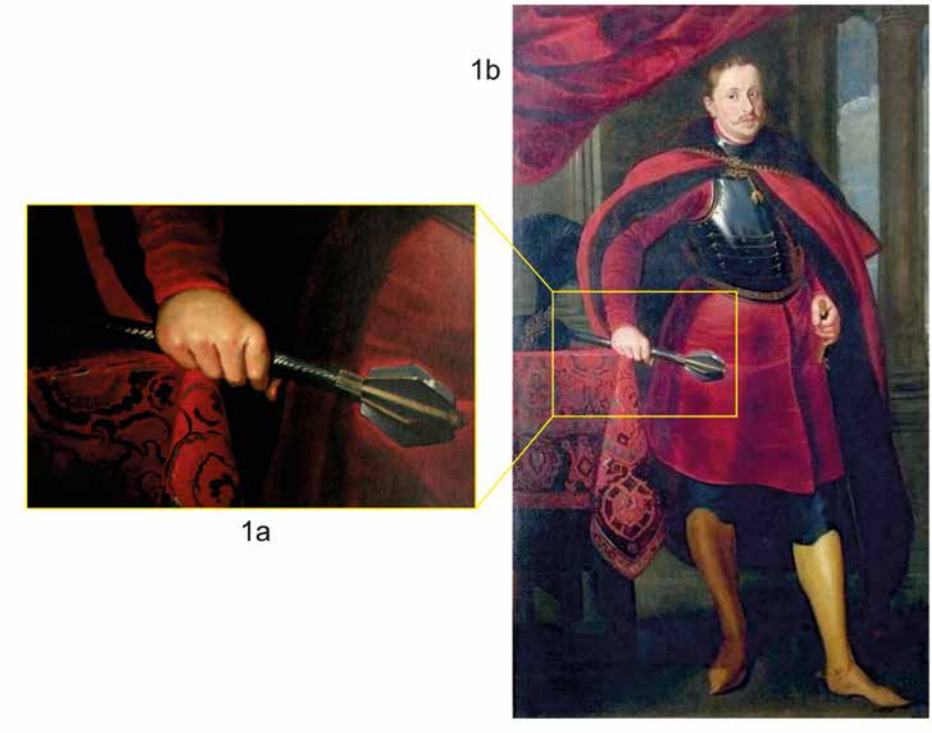

Fig. 9. Portrait of Polish Crown Prince Ladislaus Sigismond Vasa (the second quarter of the 17th century). 1a – detail of the aforementioned portrait (after Gutowski 2015, 197, Fig. 90); 1b – the whole portrait (after Gluszek 2023).

Obr. 9. Portrét poľského korunného princa Ladislava Žigmunda Vasu (druhá štvrtina 17. storočia). 1a – detail uvedeného portrétu (podľa Gutowski 2015, 197, Fig. 90); 1b – celý portrét (podľa Gluszek 2023).

catalogued within Стоян Попов's sub-type XVID of type XVI (Barrel-shaped maces with vertical flanges). It was dated from the middle of the 13th century to the 14th century. The latter one (Inv. No. 401.377.) was produced from iron and belongs to Стоян Попов's variant XVIIB2 of type XVII (Polygonal vertical flanges with a short sleeve) and could be dated between the second half of the 14th century and the 15th century. Two iron mace heads with pentagonal vertical flanges and handles are also part of the archaeological collection of the Military Museum in Belgrade (Пековић 2006, 114, Figs. on p. 114 – Inv. Nos. 16367 and 16823) and were dated to the 14th–15th centuries.

In the territory of medieval Rus' mace heads akin to the above-mentioned ones were in operation too. Анатолий Николаевич Кирпичников defined his type VI (шестоперы) by iron and bronze specimens with six pentagonal vertical flanges and dated them to the 13th–14th centuries (Кирпичников 1966, 54–55, Таблица 14, Рис. 10:VI) and then to the 13th–16th centuries (Kirpičnikov 1986, 97, Tab. XI:12). There were also specimens with six heptagonal vertical flanges, as from the fortress of Звенигород in present-day Western Ukraine. The stratigraphy and history of this fortress as well as the typological-chronological evaluation of this mace head enable to connect it with the 13th–17th centuries (Liwoch 2006, 75, 78, Рис. 5:3). Specimens of mace heads with several flanges might have been in common use in the territory of present-day Uzbekistan, the North Caucasus region, the Lower Volga region and former Volga-Kama Bulgaria during the 13th–14th centuries (Горелик 2002, 66, Figs. 13, 15, 18–19 on p. 67).

Some mace heads of the examined form are also in the depositories or exhibitions of the Central European museums. We have already introduced the 16th century specimen with Inv. No. 54.1982 from collections of the Hungarian National Museum that is supplied with eight pentagonal vertical flanges (Kovács 2016, 71, Fig. 24 on p. 71). It is also terminated by a flat-knob finial, unlike the mentioned mace head. Other specimens with six pentagonal vertical flanges, which were also decorated with non-ferrous metals, come from the collections of museums concerning the former Crown of the Kingdom of Poland (Gutowski 2015, 88–89, 168–169, 194–195, 203, Figs. 27–27a, 88–88a, 100). They originated in Central Europe (Gutowski 2015, 88–89, Fig. 27–27a) and Turkey (Gutowski 2015, 168–169, 203, Figs. 88–88a, 100) and could be assigned to the second half of the 16th century and the course of the 17th century.

In association with iconographic representations of the mace heads fitted with pentagonal vertical flanges we can detail the following examples. Firstly, it concerns the aforementioned Portrait of Polish Crown Prince Ladislaus Sigismond Vasa dated to the second quarter of the 17th century, which is stored in the Princes Czartoryski Foundation under Inv. No. XII-353 (Gutowski 2015, 47, 197, Fig. 15, 90). The portrait depicts, among other things, a ceremonial mace with six pentagonal vertical flanges (Fig. 9). Other representation of a very comparable ceremonial mace head[36] can be found on the sarcophagus of Prokop Sieniawski at the Pieskowa Skała Castle (branch of Wawel Castle). It has Inv. No. 990 and is dateable to the year 1626 (Gutowski 2015, 196, Fig. 89).

6 Mace heads with vertical flanges forming a bulb and a quite long socket

The specified group consists of two mace heads (Inv. Nos. 39314 and 72052 from the MNIR) that both are supplied with 16 semi-oval vertical flanges forming a bulb, which is terminated by a bi-conical finial (Fig. 10:1–2). The flanges form one upper ring and two lower rings. The mace heads also have relatively long sockets. The necks of these mace heads are oval in cross-section. The outer and inner cross-sections of the mace heads' sockets are circular in shape. Moreover, a wooden handle (circular in cross-section) is connected to the specimen with Inv. No. 39314 (Fig. 10:1a), although we do not know whether this handle is original or not.[37] The mace was transferred to the

36 It has got six pentagonal vertical flanges as well.

37 Total length of the handle: 26.7 cm; section plan measurements of the handle's end: 2.85 × 3.1 cm; section plan measurements of the handle under the mouth of the socket: 2.55 × 2.55 cm; total length of the mace (including the handle): 54.2 cm.

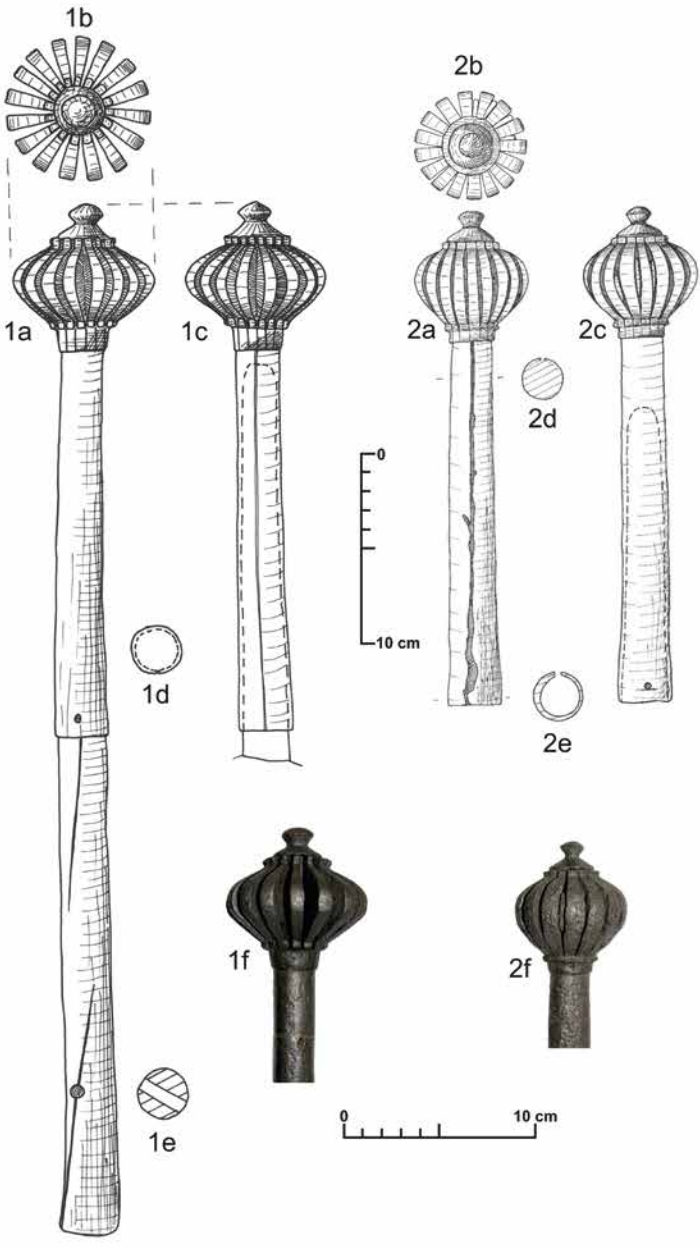

Fig. 10. Medieval mace heads with vertical flanges forming of a bulb and a quite long socket from the National Museum of Romanian History in Bucharest (Romania). 1 – unknown site – inventory number 39314; 2 – unknown site in Baia (Suceava County, Romania) – inventory number 72052; 1a–e, 2a–e – drawings by Georgiana Ducman; 1f, 2f – photographs by Martin Husár; 1a, c–e – iron, copper-tin alloys, other non-ferrous metals, wood; 1b, f – iron, copper-tin alloys, other non-ferrous metals 2a–f – iron, copper, copper alloys (including bronze). Scale: 1–2.

Obr. 10. Stredoveké hlavice palcátov s relatívne dlhou tuľajkou a so zvislými listami tvoriacimi cibuľu z Národného múzea rumunskej histórie v Bukurešti (Rumunsko). 1 – neznáma lokalita – inventárne číslo 39314; 2 – neznáma lokalita v Baia (Župa Suceava, Rumunsko) – inventárne číslo 72052; 1a–e, 2a–e – kresby Georgiany Ducmanovej; 1f, 2f – fotografie Martina Husára; 1a, c–e – železo, zliatiny medi a cínu, iné neželezné kovy, drevo; 1b, f – železo, zliatiny medi a cínu, ostatné neželezné kovy; 2a–f – železo, meď, zliatiny medi (vrátane bronzu). Mierka: 1–2.

MNIR from the Brukenthal National Museum (Sibiu, Romania) in 1973. The mace head with Inv. No. 72052 most likely originated in Baia (Suceava County, Romania). It was brought to the MNIR from the Mihai Băcescu Water Museum of Fălticeni (Romania) in 1975.[38]

Iron (with some amount of carbon and manganese) is the main chemical element of the whole mace head with Inv. No. 39314 from the MNIR, as it was found out by the LIBS and XRF analyses from the CERTO (Dinu–Ghervase–Cortea 2022, 13–14). These analyses from CERTO also proved copper-tin alloys between the unlinked ends of the socket Fig. 11:1c–d) and on the surface of the socket (Fig. 11:1f). Acording to the XRF from the CERTO bronze on the socket has some traces of arsenic and lead (Dinu–Ghervase–Cortea 2022, 13–14). In the MNIR the quantitative XRF analyses were performed at the area of the lower part of the mace head's socket, exactly above its mouth, and at the area of the second lower ring of the mace head's bulb (Niculescu 2023). They indicated a relatively high percentage of copper (54.73 %) and tin (3.83 %) in the first spot (probe R1977; Tab. 2; Niculescu 2023).[39] According to probe R1978 the latter area (Fig. 11:1a) contained 28.11 % of copper and 71.82 % of iron (Tab. 2; Niculescu 2023). We can state that copper was found between the aforementioned unlinked iron ends of the socket. On the basis of the macro photographs of Zizi Baltă we might presume copper or a copper alloy between the flanges of the examined specimen (Fig. 11:1e) as well. Copper and copper-tin alloys might have been used in the above-mentioned parts of the mace head as solder, bonding agent and decoration,[40] or to flatten its uneven surface.[41] As far as the radiographic analysis of the mace head with Inv. No. 39314 from the MNIR is concerned, it slightly uncovers the shape of the mace head's core (under its bi-conical finial), which the flanges were connected to (Fig. 12:1; Angheluță 2022).

According to the LIBS spectroscopy technique iron (with some amount of carbon and manganese) is the essential chemical element of the mace head from Baia with Inv. No. 72052 from the MNIR. A copper alloy (with a high content of phosphorus and traces of silver following the LIBS) and bronze (with tin, antimony and silver traces following the LIBS) were identified by the LIBS and XRF carried out by the CERTO (Dinu–Ghervase–Cortea 2022, 11–12) in double-layer area at the mouth of the mace head's socket (Fig. 13:1g; Dinu–Ghervase–Cortea 2022, 11–12). Then copper and iron as major chemical elements appear in the place of the both lower rings of the bulb and the area between the unlinked ends of the socket (Fig. 13:1a, f).[42] On the basis of the XRF from the CERTO the shinier area shows similar levels of iron and copper, in the dark ones iron prevails (Fig. 13:1a, f; Dinu–Ghervase–Cortea 2022, 12). Copper or copper alloys could have been used there as decoration, solder, bonding agent or to flatten an irregular surface, as in the previous case of a mace head (Inv. No. 39314). The FTIR and LIBS analyses from the CERTO indicate that six 0.5 cm thick structures between the flanges of the mace head (e.g. Fig. 13:1c, e) can be explained as iron degradation products (iron oxides; Dinu–Ghervase–Cortea 2022, 11–12) or iron slag originated in the process of the mace head's production (Niculescu 2023). The quantitative XRF analysis from the MNIR (probe R1974) indicates that one of the flanges, right next to one of the aforementioned structures, comprises 99.94 % of iron (Tab. 2; Fig. 13:1e; Niculescu 2023). On the top of the iron degradation products there are adherent deposits concerning restoration (Paraloid B-72, silicate; Dinu–Ghervase–Cortea 2022, 12). The X-ray analysis moderately revealed how the flanges of the mace head were attached to its core beneath the bi-conical finial (Fig. 12:2; Angheluță 2022).

The specimens of the last discussed group of mace heads, which are fitted with semi-oval vertical flanges with one upper ring and two lower rings (terminated by a bi-conical finial), could be dated to the 15th–17th (/18th) centuries on the basis of the typological-chronological analyses of mace heads, the dating of the particular sites, and iconographical representations. The

38 Information from the Museum register of the MNIR.

39 Iron shares 40.75 % here.

40 In the area the second lower ring, between the flanges and the unlinked ends of the socket.

41 On the socket.

42 It might also be applied for room between the flanges of the mace head according to the macro photographs of Zizi Baltă (Fig. 13:1d).

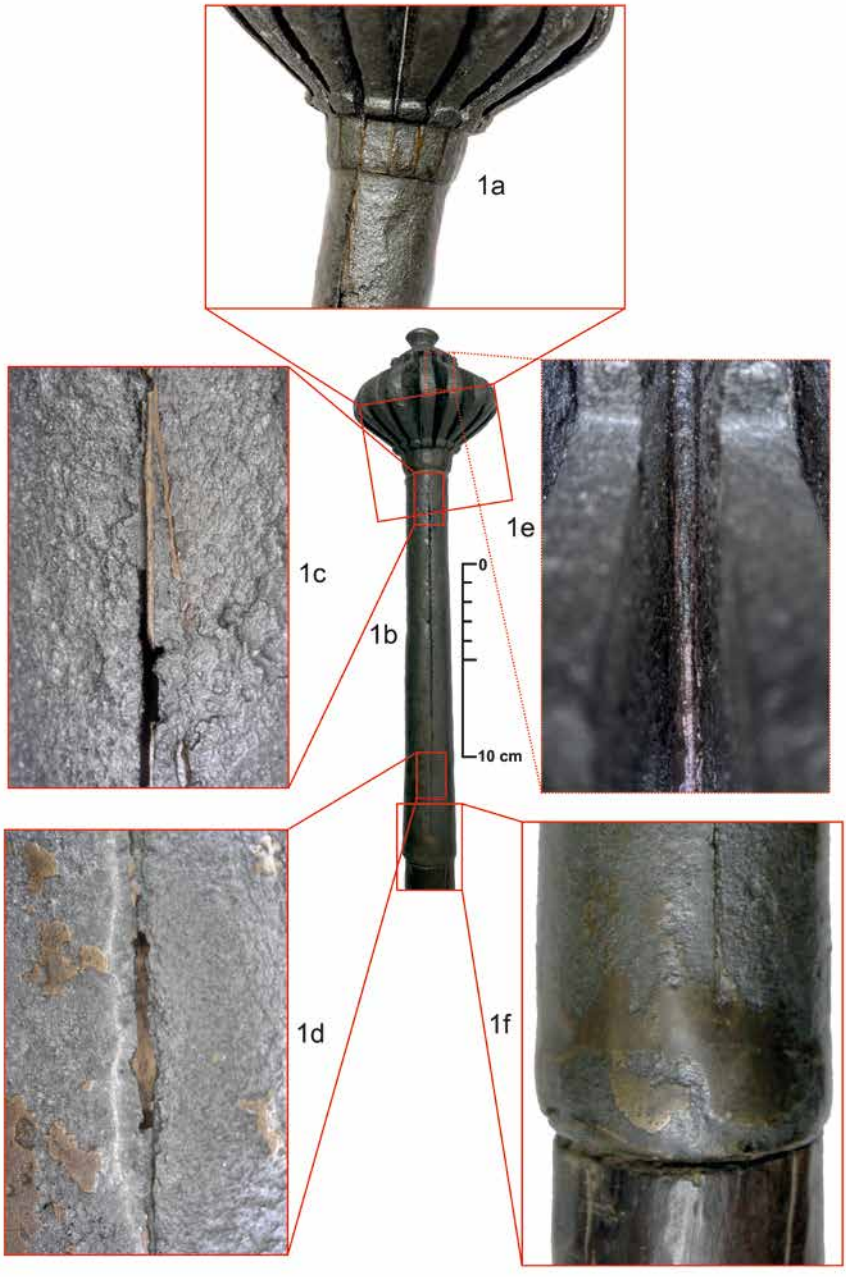

Fig. 11. Medieval mace head from an unknown site – inventory number 39314 at the National Museum of Romanian History in Bucharest (Romania). 1a, b, f – photograph and macro photographs by Martin Husár; 1c–e – macro photographs by Zizi Baltă; 1a, c–e – iron, copper-tin alloys, other non-ferrous metals; 1b, f – iron, copper-tin alloys, other non-ferrous metals, wood. Scale: 1b. Not to scale: 1a, c–f.

Obr. 11. Stredoveká hlavica palcátu z neznámej lokality – inventárne číslo 39314 v Národnom múzeu rumunskej histórie v Bukurešti (Rumunsko). 1a, b, f – fotografia a makrofotografie Martina Husára; 1c–e – makrofotografie od Zizi Baltă; 1a, c–e – železo, zliatiny medi a cínu, iné neželezné kovy; 1b, f – železo, zliatiny medi a cínu, iné neželezné kovy, drevo. Mierka: 1b. Bez mierky: 1a, c–f.

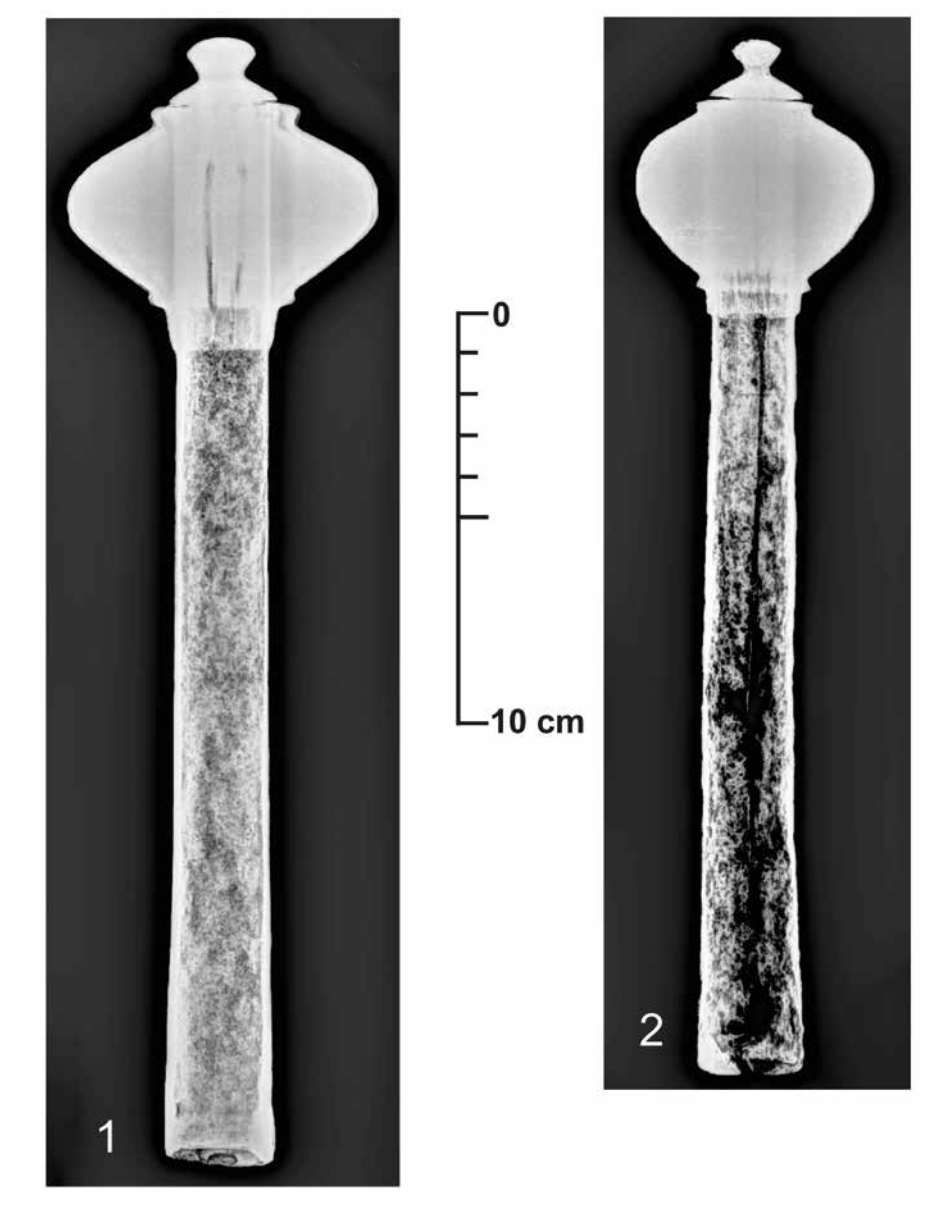

Fig. 12. Medieval mace heads with vertical flanges forming of a bulb and a quite long socket from the National Museum of Romanian History in Bucharest (Romania). 1 – unknown site – inventory number 39314; 2 – unknown site in Baia (Suceava County, Romania) – inventory number 72052; 1–2 – X-ray images at 120 kV energy threshold by Laurențiu-Marian Angheluță (after Angheluță 2022); 1 – iron, copper-tin alloys, other non-ferrous metals; 2 – iron, copper, copper alloys (including bronze). Scale: 1–2.

Obr. 12. Stredoveké hlavice palcátov s relatívne dlhou tuľajkou a so zvislými listami tvoriacimi cibuľu z Národného múzea rumunskej histórie v Bukurešti (Rumunsko). 1 – neznáma lokalita – inventárne číslo 39314; 2 – neznáma lokalita v Baia (Župa Suceava, Rumunsko) – inventárne číslo 72052; 1–2 – röntgenové snímky pri hraničnej energii 120 kV od Laurențiu-Mariana Angheluță (podľa Angheluță 2022); 1 – železo, zliatiny medi a cínu, iné neželezné kovy; 2 – železo, meď, zliatiny medi (vrátane bronzu). Mierka: 1–2.

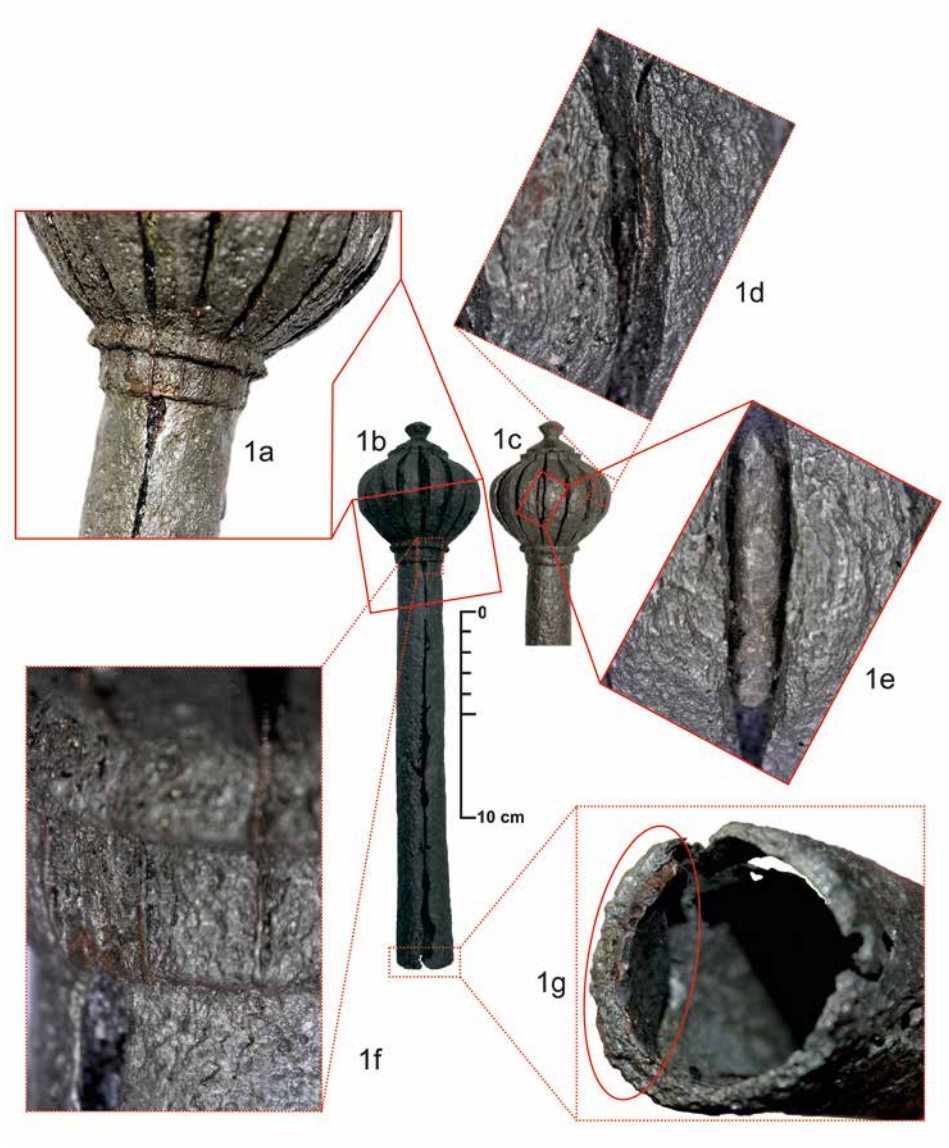

Fig. 13. Medieval mace head from an unknown site in Baia (Suceava County, Romania) – inventory number 72052 at the National Museum of Romanian History in Bucharest (Romania). 1a–c, g – photographs and macro photographs by Martin Husár; 1d–f – macro photographs by Zizi Baltă; 1g – macro photograph by Martin Husár with the marked area of the iron mace head concerning the application of copper or copper alloys (including bronze); 1a–g – iron, copper, copper alloys (including bronze). Scale: 1b–c. Not to scale: 1a, d–g.

Obr. 13. Stredoveká hlavica palcátu z neznámej lokality v Baia (Župa Suceava, Rumunsko) – inventárne číslo 72052 v Národnom múzeu rumunskej histórie v Bukurešti (Rumunsko). 1a–c, g – fotografie a makrofotografie Martina Husára; 1d–f – makrofotografie od Zizi Baltă; 1g – makrofotografia Martina Husára s vyznačenou plochou železnej hlavice palcátu týkajúcou sa aplikácie medi alebo zliatin medi (vrátane bronzu); 1a–g – železo, meď, zliatiny medi (vrátane bronzu). Mierka: 1b–c. Bez mierky: 1a, d–g.

aforementioned analogies for this group of mace heads from the MNIR were made of iron and equipped with 12–18 semi-oval vertical flanges. Their flanges were probably soldered at least with copper to the cores of their heads, as can be demonstrated by some specimens from the museum collections from present-day Bulgaria (Попов 2014, 127; Popov 2018, 157).

The area of present-day Romania and Moldova might have been the place where the mace heads with vertical flanges forming a bulb and a quite long socket were abundantly applied. It could be proved by their presence in several museums there, along with the MNIR. Two iron specimens, made of iron and furnished with 12 and 15 semi-oval vertical flanges, come from the collection of the History, Ethnology and Fine Art Museum in Lugoj in Romanian Banat (Pinca 2003, 334–336, Pl. II:4–5). They were dated to the 15th–17th centuries (Pinca 2003, 336). One iron mace head (Inv. No. F604) from the National Museum of the Union in Alba Iulia (Transylvania) was classified by Andrei-Octavian Fărcaș as sub-type VII/2 (Flanged mace heads with large rounded flanges and very long sockets). It has 13 semi-oval vertical flanges and was related to the 16th–17th centuries (Fărcaş 2016, 38–41, 72, Fig. VII/2.1). Other mace heads of this form, attached to wooden handles, are deposited in the collections of the National Military Museum (Bucharest) and Peleş National Museum (Prahova County, Muntenia). These specimens are supplied with several discussed flanges and were possibly made of iron. They date from the 15th century (Vlădescu 1968, 103, Fig. 3) or between the second half of the 15th century and the first half of the 16th century (Vlădescu–König–Popa 1973, text regarding Figs. 71–73, Figs. 71–73). Lastly, an iron specimen of mace head with a wooden handle comes from the collections of the "Iulian Antonescu" Museum Complex in Bacău. This specimen was found somewhere in the cadastre of Rădeni (Călăraşi District, Moldova) and was dated to the 15th century (Dejan–Ilie edd. 2017, 106, Fig. on p. 106; Ilie–Dejan edd. 2018, 190, Fig. on p. 190).

Several iron mace heads of the examined group are stored within the collection of the National Institute of Archaeology with Museum in Sofia (Bulgaria) and the Vatevi Collection. They were included in sub-type XXIA (Bulb-shaped fighting head of densely arranged vertical flanges and a cap with a bud above) by Стоян Попов (2014, 129–131, 137, 516–535, Табл. 1 / Tabl. 1; Popov 2018, 157, Fig. 17–30). These mace heads have 12–18 flanges and were most likely fixed to the cylindrical core by copper (Попов 2014, 127; Popov 2018, 157), as we have already noted. Стоян Попов (2014, 131, 137, Табл. 1/Tabl. 1; Popov 2018, 157) related this kind of mace heads to the 15th–17th centuries. The same author remarked that similar maces/mace heads to his sub-type XXIA were already used in Western and Central Europe during the 15th century (Попов 2014, 131; 2018, 157). He cited the monograph of Ewart Oakeshott (2000, 65–67) concerning this claim. Nevertheless, these maces are not fully comparable to the examined form of maces, except for having flanges. These flanges, however, have various shapes.

The maces with relatively small and spherical heads and robust flanges were popular in Turkey in the 17th century and also reached European countries that tried to impede the expansion of the Ottoman Empire (Gutowski 2015, 173, 175). It can also be confirmed by specimens that are analogous to the mace heads of the above-mentioned discussed group from the MNIR and are present at the collections of museums concerning the former Crown of the Kingdom of Poland. For instance, we know about such a mace with probably iron head and wooden handle from the collections of the National Museum in Poznań / Military Museum of Wielkopolska (Inv. No. MNP WB 167). It comes from Turkey and is dated to the 17th century (Gutowski 2015, 173–174, 206, Fig. 104).

In the end, the examined mace heads with vertical flanges forming a bulb and a quite long socket might be seen in specific instances by means of iconography. We can point out some examples in this regard. The discussed form of a mace head might be seen on one folio (Fol. 24r) of the Wedding Festival Book of Archduke Ferdinand II (of Austria) that was made after the year 1582[43] (Fig. 14:1b; Gutowski 2015, 45, Fig. 13). This mace is depicted in the right hand of

43 The author is Sigmund Alsässer from Innsbruck and it is deposited in the Vienna Museum of Art History (Inv. No. KK 5270).

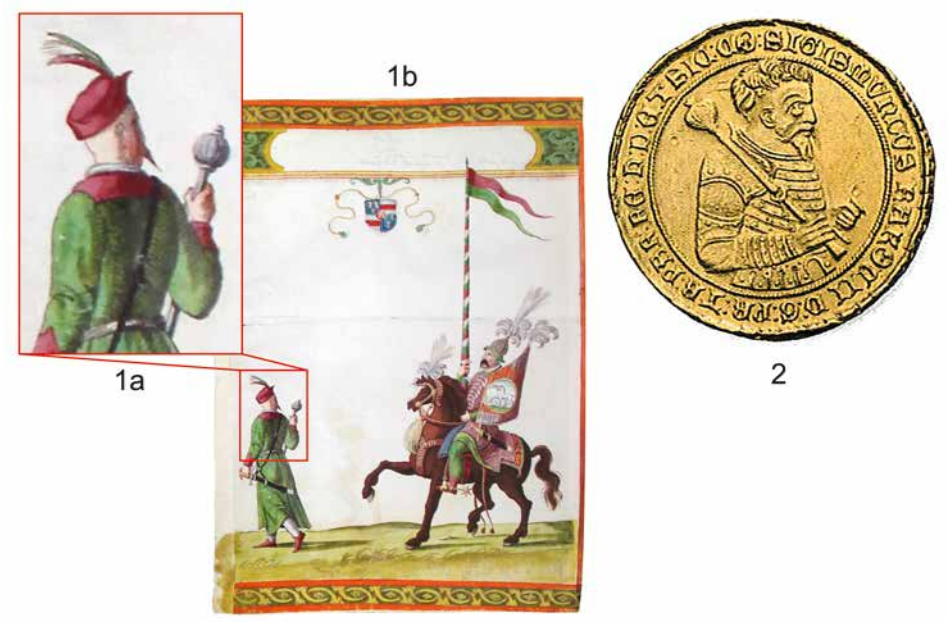

Fig. 14. Iconographical representations in relation to the mace heads with vertical flanges forming a bulb and a quite long socket from the National Museum of Romanian History in Bucharest (Romania). 1 – Wedding Festival Book of Archduke Ferdinand II, Fol. 24r (after the year 1582; after Gutowski 2015, 45, Fig. 13); 2 – ten-ducat coin of Sigismund Rákóczi, the Prince of Transylvania (the year 1607; after Kovács 2019, Fig. on p. 22).

Obr. 14. Ikonografické zobrazenia v súvislosti s hlavicami palcátov s relatívne dlhou tuľajkou a so zvislými listami tvoriacimi cibuľu z Národného múzea rumunskej histórie v Bukurešti (Rumunsko). 1 – Slávnostná svadobná kniha arcivojvodu Ferdinanda II., fol. 24r (po roku 1582; podľa Gutowski 2015, 45, Fig. 13); 2 – desaťdukát Žigmunda Rákocziho, kniežaťa Sedmohradska (po roku 1607; podľa Kovács 2019, obrázok na strane 22).

the walking armed man on the above mentioned folio 24r (Fig. 14:1a). An analogous specimen is reproduced on the ten-ducat coin (for the year 1607) of Sigismund Rákóczi, the Prince of Transylvania (1607–1608). This mace is in the right hand of the prince (Fig. 14:2; Kovács 2016, 22, Fig. on p. 22; 2017, 207–208; 2019, 22, Fig. on p. 22). The last example concerns the oil painting called "Kuruc Officers" by an unknown painter, which is dated to the early 18th century (Kovács 2016, 140, Fig. on p. 140; 2019, 138, Fig. on p. 138). The mace is in the right hand of one of the portrayed officers, although it seems that it has a quite short socket, unlike the specimens of the discussed group.

7 Discussion and conclusion

Our research in the medieval part of the depository of the Department of Archaeology of the MNIR in Bucharest (since 2018) brought the assemblage of seven mace heads and one whole mace.

The first three groups of mace heads from the MNIR (those with four rows of buds, then the specimens with teardrop-like knobs and finally the mace heads with 12 knobs in three rows) represent specimens that were either made of iron or a copper alloy. It can be demonstrated that almost all examined non-ferrous medieval mace heads from Poland, Bohemia, Sweden and Ukraine were made of copper-tin alloys of varying proportions. Four of these specimens

are very similar to the specimen from the fortress of Dinogetia/Garvăn-Bisericuța (Inv. No. 17286 at the MNIR) made of a copper-tin alloy as well. They have almost the same ratios of copper and tin. We can even find some medieval copper-tin-alloy specimens from Europe with a high proportion of lead (to make them heavier or to ease the casting of their complex forms) or antimony.

The last two groups of mace heads from the MNIR (the specimens fitted with pentagonal vertical flanges and those with vertical flanges forming a bulb and a quite long socket) consist of specimens that were mainly composed of iron. Non-ferrous metals (copper, bronze, or other copper alloys) were used there to solder or decorate them, bind their unconnected parts, or even to flatten their uneven surfaces.

Regarding the shape analogies for the examined groups of mace heads from the MNIR the following could be asserted. It has transpired that the parallels to the mace heads with four rows of buds come only from Bulgaria and former Volga-Kama Bulgaria. We are acquainted with analogies for the mace heads with teardrop-like knobs and the mace heads with 12 knobs in three rows mostly from the Carpathian Basin, the Balkans and Eastern Europe. Besides, there are analogies for the subgroup of star-shaped mace heads from North Caucasus as well. Parallels to the mace heads fitted with pentagonal vertical flanges come from the Balkans, Central, Southeastern, and Eastern Europe, and Central Asia. The mace heads with vertical flanges forming a bulb and a quite long socket are known from the Balkans, the Ottoman Empire and countries that fought this empire.

The mace heads with teardrop-like knobs and the mace heads fitted with pentagonal vertical flanges as well as mace heads with a prismatic core (the first subgroup of the mace heads with 12 knobs in three rows) were most likely used in the territory of the Byzantine Empire in the Balkans too. Specimens of the mace heads with 12 knobs in three rows, mace heads fitted with pentagonal vertical flanges and mace heads with vertical flanges forming a bulb and a quite long socket are also present in museums of Romania and were discovered in this territory.

Only the last two discussed groups of mace heads from the MNIR, which reach the Early Modern Period, have reliable and recognisable iconographical analogies. They had been in operation since the 13th century (the mace heads fitted with pentagonal vertical flanges) and 15th century (the mace heads with vertical flanges forming a bulb and a quite long socket), although their recognisable parallels are right from the Early Modern Period, from the 16th–17th centuries. Unfortunately, the first three groups of mace heads from the MNIR lack such exact iconographical analogies.

The above-mentioned first two examined groups of mace heads from the MNIR date from the end of the Early Middle Ages to the High Middle Ages, namely from the 10th to the 13th century (Fig. 15). The dating of the mace heads with four rows of buds might be linked to the stratigraphy of the enclosed settlement of Bâtca Doamnei, which is related to the period from the second half of the 12th century to the middle of the 13th century. In connection with the mace heads with teardrop-like knobs we might assume that its specimens could have been used even up to the 15th century. The mace heads with 12 knobs in three rows can be related to the time span from the end of the Early Middle Ages to the beginning of the Late Middle Ages. Its first subgroup (the mace heads with a prismatic core) is dated to the 9th–14th centuries and the latter one (the star-shaped mace heads) to the 11th–14th centuries. Furthermore, the specimen from the fortress of Dinogetia/Garvăn-Bisericuța, which represents the aforementioned mace heads with a prismatic core at the MNIR, can be related to the last layer/layers of the aforementioned fortress's occupation – to the 11th–12th centuries. The mace heads fitted with pentagonal vertical flanges were probably used in the 13th–17th centuries, that is to say from the High Middle Ages to the Early Modern Period. Finally, the mace heads with vertical flanges forming a bulb and a quite long socket from the MNIR are connected with the Late Middle Ages and the Early Modern Period and might be dated to the 15th–17th centuries, or even possibly to the 18th century.

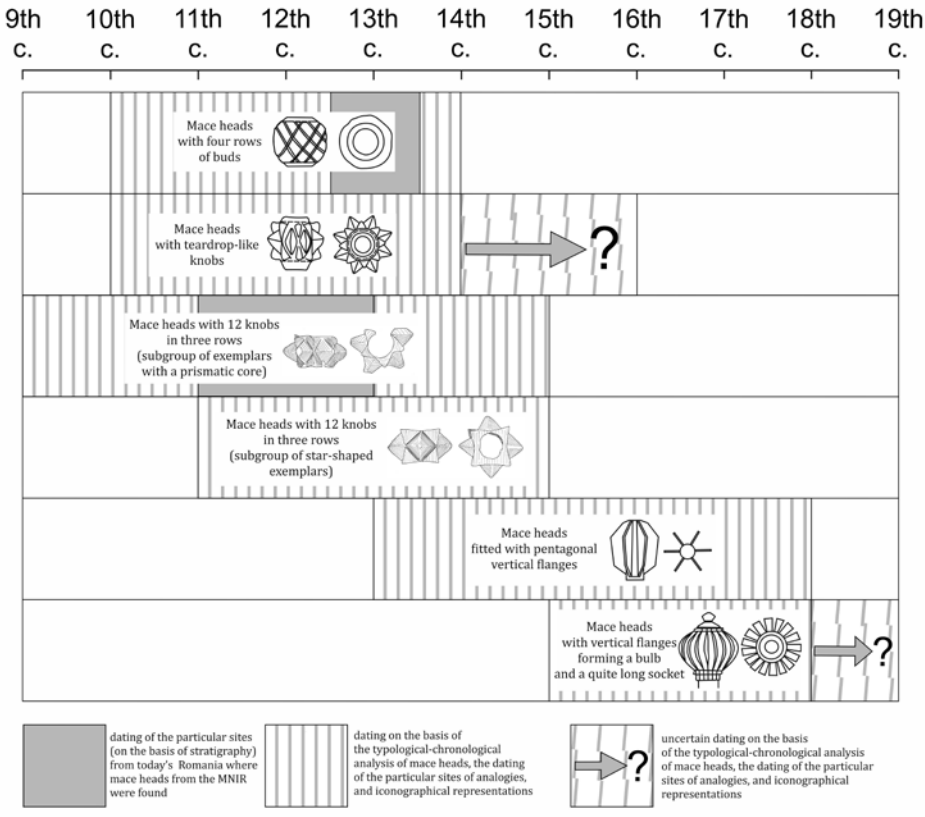

Fig. 15. Chronology of the selected forms of the medieval and early modern mace heads from Central, Southeastern and Eastern Europe and from the former Byzantine and Ottoman Empires. Author Martin Husár.

Obr. 15. Chronológia vybraných tvarov hlavíc stredovekých a ranonovovekých palcátov zo strednej, juhovýchodnej a východnej Európy a z bývalej Byzantskej a Osmanskej ríše. Autor Martin Husár.

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Zhrnutie

Po stopách stredovekých palcátov Rumunska. Vyhodnotenie stredovekých hlavíc palcátov z Národného múzea rumunskej histórie v Bukurešti (Rumunsko)

Výskum autorov článku (od roku 2018) v stredovekej časti depozitára archeologického oddelenia Národného múzea rumunskej histórie v Bukurešti (ďalej MNIR v Bukurešti) priniesol popis (obr. 1) a komplexné spracovanie súboru siedmich hlavíc palcátov i jedného celého palcátu (tab. 1). Autori vyčlenili päť klasifikačných skupín posudzovaných hlavíc palcátov (obr. 2), pre ktoré našli i príslušné paralely.

Prvé tri skupiny (hlavice palcátov so štyrmi radmi relatívne nevýrazných výčnelkov, hlavice palcátov so slzovitými ostňami a hlavice palcátov s 12 ostňami v troch radoch) posudzovaných hlavíc palcátov (obr. 3; 4; 5; 6: 1–2) z MNIR predstavujú exemplár, ktoré boli vyrobené buď zo železa, alebo zo zliatiny medi (tab. 2). Na základe medzinárodného výskumu možno preukázať, že takmer všetky skúmané neželezné stredoveké hlavice palcátov z Poľska, Čiech, Švédska a Ukrajiny boli vyrobené zo zliatiny medi a cínu v rôznom pomere. Štyri z týchto exemplárov sú podielom medi a cínu výrazne podobné exemplár z pevnosti Dinogetia/Garvăn-Bisericuța (inventárne číslo 17286 v MNIR), ktorý je tiež vyrobený zo zliatiny medi a cínu. Dokonca vieme aj o niektorých stredovekých exemplároch z Európy, ktoré boli odliate zo zliatiny medi a cínu s vysokým podielom olova (aby boli ťažšie alebo aby sa uľahčilo odlievaniu ich zložitých foriem) či antimónu. Posledné dve skupiny (hlavice palcátov s päťuholníkovými zvislými listami a hlavice palcátov s relatívne dlhou tuľajkou a so zvislými listami tvoriacimi cibuľu) hlavíc palcátov (obr. 7–8; 10–13) tvoria exemplár, ktoré sú zložené prevažne len zo železa (tab. 2). Neželezné kovy (meď, bronz alebo iné zliatiny medi) sa v tejto súvislosti používali na ich spájkovanie alebo zdobenie, spájanie ich nespojených tuľajok alebo dokonca na vyrovnávanie ich nerovného povrchu.

Pokiaľ ide o tvarové analógie skúmaných hlavíc palcátov z MNIR, je možné konštatovať nasledovné. Ukázalo sa, že paralely k hlaviciam palcátov so štyrmi radmi relatívne nevýrazných výčneľkov pochádzajú len z Bulharska a bývalého Povolžského Bulharska. Analógie pre hlavice palcátov so slzovitými ostňami a hlavice palcátov s 12 ostňami v troch radoch poznáme prevažne z Karpatskej

kotliny, Balkánu a východnej Európy. Okrem toho existujú analógie pre druhú podskupinu (hviezdicovité hlavice palcátov) hlavíc palcátov s 12 ostňami (v troch radoch) aj zo severného Kaukazu. Paralely k hlaviciam palcátov s päťuholníkovými zvislými listami pochádzajú z Balkánu, strednej, juhovýchodnej a východnej Európy a strednej Ázie. Hlavice palcátov s relatívne dlhou tuľajkou a so zvislými listami tvoriacimi cibuľu sú známe z Balkánu, Osmanskej ríše a krajín, ktoré proti tejto ríši bojovali. Potom hlavice palcátov so slzovitými ostňami, hlavice palcátov s päťuholníkovými zvislými listami, ako aj tie z prvej podskupiny (hlavice palcátov s hranolovým jadrom) hlavíc palcátov s 12 ostňami v troch radoch, sa s najväčšou pravdepodobnosťou používali aj na území Byzantskej ríše na Balkáne. Exempláre hlavíc palcátov s 12 ostňami v troch radoch, hlavice palcátov s päťuholníkovými zvislými listami a hlavice palcátov s relatívne dlhou tuľajkou a so zvislými listami tvoriacimi cibuľu sa nachádzajú i v zbierkach iných múzeí Rumunska a boli na tomto území aj objavené.

Iba posledné dve posudzované skupiny hlavíc palcátov z MNIR (obr. 9, 14), ktoré zasahujú do obdobia raného novoveku, majú spoľahlivé a dobre rozpoznateľné ikonografické analógie. Používali sa od 13. storočia (skupina hlavíc palcátov s päťuholníkovými zvislými listami) a 15. storočia (skupina hlavíc palcátov s relatívne dlhou tuľajkou a so zvislými listami tvoriacimi cibuľu), hoci ich rozpoznateľné paralely sú práve z obdobia raného novoveku, teda zo 16.–17. storočia. Žiaľ, prvé tri skupiny posudzovaných hlavíc palcátov takéto presné ikonografické analógie postrádajú.

Prvé dve posudzované skupiny hlavíc palcátov z MNIR sú datovateľné od konca včasného stredoveku do obdobia vrcholného stredoveku, konkrétne od 10. do 13. storočia (obr. 15). Datovanie hlavíc palcátov so štyrmi radmi relatívne nevýrazných výčnelkov by mohlo byť viazané na stratigrafiu opevneného sídliska Bâtca Doamnei (obr. 3), ktorá súvisí s obdobím druhej polovice 12. storočia až polovicou 13. storočia. V súvislosti s hlavicami palcátov so slzovitými ostňami nie je vylúčené, že tieto exempláre sa mohli používať až do 15. storočia. Hlavice palcátov s 12 ostňami v troch radoch možno vzťahovať na časové rozpätie od konca včasného stredoveku do začiatku neskorého stredoveku. Prvá podskupina tejto skupiny skúmaných objektov (hlavice palcátov s hranolovým jadrom) je datovateľná do 9.–14. storočia a druhá (hviezdicovité hlavice palcátov) do 11.–14. storočia. Okrem toho exemplár z pevnosti Dinogetia/Garvăn-Bisericuţa (obr. 5), ktorý reprezentuje podskupinu palcátov s hranolovým jadrom v MNIR, možno spájať s poslednou vrstvou/vrstvami osídlenia uvedenej pevnosti, t. j. s 11.–12. storočím. Hlavice palcátov ďalšej skupiny, exemplárov s päťuholníkovými zvislými listami, sa pravdepodobne používali v 13.–17. storočí, teda od vrcholného stredoveku po raný novovek. A napokon ostatné hlavice palcátov z MNIR, tie s relatívne dlhou tuľajkou a so zvislými listami tvoriacimi cibuľu, sa týkajú neskorého stredoveku a raného novoveku a môžu byť datované do 15.–17. storočia, prípadne až do 18. storočia.

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