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The Dacian Hoard from Bucureşti-Herăstrău. Archaeological and Archaeometallurgical Approaches

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Key-words: Hoard, Dacia, late Latène period, jewelry, Thasian tetrachraimai, recycling, X-Ray tests

Abstract: The late Latène hoard from Bucharest-Herăstrău (first half of the 1st century B.C.) comprises imported pieces from the Hellenistic-Roman centres (surely the tetrachraimai from Thasos, probably the mastos silver-cup and hypothetically the lost bronze situla) together with silver pieces, which, at least under the manufacturing aspect, seem to be local products of artisans from Barbaricum. The question that is raised rises is whether the metallographic analyses might pay clues for determining the origin of the different pieces from the hoard. The hypothesis according to which the raw material that represented the basis for the metalwork pieces would have been procured by recycling several coins similar to those discovered in the same hoard, could not be entirely confirmed, but at the same time the analyses did not categorically infirm it. This initial alloy seems to be similar with the one in the coins. The X-Ray test could not certify, but could not invalidate either if the jewelry and cup's silver-based alloy was obtained by recycling the coins.

Cuvinte cheie: Tezaur, Dacia, perioada târzie Latène, piese de podoabă, tetrachraime thasiene, reciclare, analize prin fluorescentă de raze X.

Rezumat: Tezaurul de epocă târzie Latène (prima jumătate a secolului I a.Chr.) de la Bucureşti-Herăstrău reunește piese realizate în centre elenistice și romane (cu certitudine tetrachraimele Thasiene, probabil cupa de argint de tip mastos și situla de bronz astăzi pierdută) și produse de argint care, cel puțin prin aspectul manufacturii lor, par a fi creații ale unor meșteri din Barbaricum. Se pune întrebarea în ce măsură analizele metalografice oferă indicii pentru determinarea originii diferitelor obiecte din tezaur. Ipoteza potrivit căreia materia primă folosită pentru realizarea podoabelor a fost procurată prin reciclarea mai multor monede asemănătoare celor descoperite în tezaur nu a putut fi pe de-a întregul confirmată, dar, totodată, analizele nu au putut-o infirma. Aliajul inițial al podoabelor pare să fie similar celui conținut

de monede. Analizele prin fluorescentă de raze X nu au putut certifica, dar nici nu au putut invalida dacă piesele de podoabă și cupa de argint au fost realizate prin reciclarea monedelor.

1. History and data regarding the discovery

On March 16, 1938, several inhabitants from Bucharest experienced an unexpected discovery in a sand pit – a hoard comprising several coins and metalwork pieces (fig. 1-4). The place of discovery was situated on the territory of Herăstrău quarter and therefore, the discovery has entered in the literature under this name to be. More precise, the hoard was discovered 700 m away from the No. 5 Romanian Railway station, on the Bucharest-Constanța track, and 80 m east off the road that links the station to the former Herăstrău village. In this area, during the last decade, a pretentious residential quarter was built. Only the name of a street, "Nisipari" (Rom.: *sand diggers*), reminds us today of the soil context where the hoard has been discovered.

The hoard was divided between the finders (Popescu 1948 35, reports no. 403 and 435/1938 of the Commission of Historical Monuments; cf. Mărghitan 1976, 33; 1994, 57-59). The attempt to commercialize several pieces determined a jeweller to alert the state's officials, who deployed an unexpected investigation and forced the finders to hand over the discovery to the Commission of Historical Monuments. Dinu V. Rosseti was delegated by the commission to undertake a further investigation on the site of the discovery; in the same time he was allowed to publish the research results on the hoard; this right was ceded a decade later to Dorin Popescu. The investigation performed by the passionate amateur archaeologist had led to the identification of another spiral bracelet termination and three coins. Finally, the hoard was

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integrated in the collections of the National Museum of Antiquities (report no. 216 from 14th of June 1939). It was displayed in 1971, when it entered in the heritage of the Romanian National History Museum (MNIR).

Currently, the hoard comprises 58 tetra-drachmas issued at Thasos and 10 metalwork pieces (either complete or in fragments), to which the edge of a bronze recipient, a handle and several fragments of iron plate might be added (Popescu 1948 37, fig. 2; 40, fig. 6/3-4, fig. 7/7; 1968, R22c.7-8). It is possible that the bronze and iron metal pieces are stored in the MNIR-Bucharest (*non vidi*). According to Popescu (1948 35), most of the hoard's inventory has been recovered, except two thirds of the coins that are now lost. To put it differently, the hoard might have initially comprised approximately 180 coins. One cannot mention whether some metalwork pieces have been lost or deteriorated between the moment of their discovery and the moment of their integration in the scientific evidence.

Furthermore, despite the archaeological investigation performed by Dinu V. Rosetti, whose results have not been systematically published, most probably due to irrelevant results, for the time being there is no consistent information regarding the discovery context, although the presence of an edge from a bronze recipient of big dimensions and of an iron handle in the hoard suggests that the inventory might have been placed in a situla.

2. The preservation state of the metalwork pieces

Except the silver cup (fig. 4/1), most of the metalwork pieces from the hoard has been received in a fragmentary shape. Some of the pieces have been the subject of some restoration processes, which, in some cases, have unfortunately affected the originals. Moreover, one should mention that were added of three plates that complete the missing spaces form the surface of phalera no. 1. (fig. 1/1a-c). Furthermore, one of the fragments detached from the edge of the same piece has been joined in the central area of the phalera's reverse (author's remark, November 2002). The dates when these interventions have been performed are uncertain, but some references may be found in several successive publications regarding the hoard. Thus, the modern completion of the missing part from the surface of one of the phalerae is already attested since some published illustrations were published in 1948 (Popescu 1948 36, fig. 1/2). In all these illustrations, the edge of the phalera

appears complete: in Pamfil Polonic's drawings published in 1968 (Popescu 1968, R 22a/1), in those of Elena Becheş, published eight years later (Mărghităn 1976 pl. 5), or in a photo published in 1980 (Die Daker 1980 43, fig. 22). They do not appear in the illustrations published in the '90s (Goldhelm 1994 178, no. 60.1; I Daci 1997 341, cat. no. 786); this fact suggests that the detachment of the piece from the edge and its positioning on the reverse side has taken place relatively late.

It also seems that, the reparation of the great spiral bracelet (fig. 2/1) is a late intervention. In the 1948 illustrations, the fragments that compose this bracelet were not welded yet (Popescu 1948 37, fig. 2/1). However, the traces of this modern welding may be observed in Pamfil Polonic's drawing (Popescu 1968 R22b/4), traces that were neglected in the next published drawings.

We have paid a special attention to these aspects mainly in order to emphasise the exaggerated modern persistence in interfering in spectacular pieces of the past. Despite the existing legislation on mobile heritage during the passed decades from the discovery of the Bucureşti hoard, the mentioned interventions suggest the poor level of tuition in prehistoric metalwork objects restoration. From the perspective of the metallographic tests, the dilemma of these interventions (welding, joining and completions) consists in the modification of the pieces' aspect and characteristics when compared to their original form.

3. Dating and cultural framing of the discovery

The main dating element of the Bucureşti-Herăstrău hoard is represented by the late Thasian tetra-drachmas, which entered in the Lower Danube area and in Transylvania during the last decades of the 2nd century BC and first decades of the next century (Bogdan-Cătănicu I. 1975). One could consider the hemispheric silver cup, which, through its morphology, belongs to the Hellenistic and late Republican luxury recipients' repertory of the middle of the 2nd - middle of the 1st century BC (Richter 1956 46; Küthmann 1958 116-119; Raddatz 1969 87; Horedt 1973 143; Graue 1974 30; Pfrommer 1993 21-22).

The analogies of the metalwork pieces from the inventory show that the discovery from Bucureşti-Herăstrău belongs to the early phase of the Dacian hoards' group (beginning and the middle of the 1st century BC), together with other inventories characterized by the association of costume and jewellery pieces with Thasian coins or with the

drachmas from the cities of Apollonia and Dyrrachium. Without entering in augmentative details of the Dacian hoards chronology (Horedt 1973 151; Spânu 2002 96-100; 2004 94-97), one should mention several eloquent examples that support this chronological framing. At Sâncrăieni (Popescu 1957, 1958), the *mastos* cups (for this terminology see Richter, Litt, Milne 1935 30), similar to those from Herăstrău, associate with a Thasian tetra-drachma, or another *mastos*, discovered at Lupu (Goldhelm 1994, 180-181; Glodariu, Moga 1997; Spânu 2002), associates with two 'knot fibulae'. A same fibula from the Clipiceşti hoard (Mitrea 1972) also associates with the Thasian tetra-drachmas. These discoveries suggest a relative synchronism between the circulation period of the tetra-drachmas' lots from the Lower Danube and the simultaneous usage of the *mastos* type cups and knot fibulae - the characteristically type of the early Dacian hoards.

From a historical point of view, the inventory of the Bucureşti Herăstrău hoard was probably organised during the period of the Mithridatrical Wars, when the king of Pontus, Mithridates the 6th Eupator, had established a huge coalition of Greek cities and barbarian elites on the Northern and Western areas of the Black Sea (Appian, *Mithr.* 15.53 and 69; Danov 1979 111-113; Vinogradov 1987 68; Sullivan 1989, 26-27; Nawotka 1997 42; Avram, Bounegru 1997; Simonenko 2001; Oppermann 2004 233-234. Poenaru Bordea 1979, 1999 and Callataÿ 1998 debated also some numismatic aspects of the mithridatrical West-pontic policy). In the same time, the first Roman republican armies had reached the north Balkan areas and the Danube borders (the campaign of C. Screbonius Curio, 74 BC: Florus, *Epit.* 1.39; Frontinus, *Strateg.* 4.1.43; Festus VII, 5; the campaigns of Marcus Terentius Varo Lucullus, 72-71 BC: Appian, *Illyr.* 30.85). Both powers were obviously interested to attract and seduce with gifts and promises the unfaithful barbarian local aristocracy. The dynamical complexity of that historical background must be kept in mind in order to understand the relatively heterogeneous character of the inventory of our hoard.

4. The signification of the inventory

There are multiple interpretative valences of the hoard's inventory. The hoard comprises important pieces from the Hellenistic-Roman centres (surely the coins, probably the cup and hypothetically the lost bronze situla) together with pieces, which, at

least under the manufacturing aspect, seem to be local products of artisans from Barbaricum. The question that is raised rises is whether the metallographic analyses might pay clues for determining the origin of the different pieces from the hoard.

However, the scarce or the frequent morphological analogies of the different metalwork pieces suggest a polarization of the significations associated in the hoard. Each of the two spiral bracelets from Bucureşti Herăstrău are unique pieces, with no close analogies of the morphological terminations and the decor organization. Due to the simplified aspect of the zoomorphic endings, these two bracelets cannot be included in the typological series of the spiral bracelets, whose terminations present massive plaques decorated with scales (fig. 5) (Medeleţ F. 1976).

Because of the unskilled of the representation of the human figures, the gilded phalerae seem to be creations of a toreutic workshop from Barbaricum (fig. 7). The style of the Bucureşti-Herăstrău phalerae is similar to the so-called "graphic stile of the Pontic area" illustrated by several metal works of 'Sarmatian' toreutic from the 2nd and 1st centuries B.C. (Pfrommer 1993, 12-13; Mordvinseva 2001, 29-30, 37, fig. 4; cf. Spânu 2006). The chain from Bucureşti-Herăstrău illustrates a well-known system of loop-in-loop joining links used during the whole Antiquity (Higgins 1961 16, fig. 4c-d; Strong, Brown 1976 55-59, fig. 68-69; Williams, Ogden 1994 26, fig. 24; this chain system is also called "la chaîne collone" or "chaîne à maillon multiples", Boitet 1962 157, no.4 or the "Fuchsschwanzkette", Horedt 1973 137, Deppert-Lippitz 1984 8, but also "Isthmion type" chain), but is more likely possible to be a local product.

Regardless where it has been produced, the *mastos* type cup illustrates the endorsement at the Lower Danube of a type of recipient meant for drinking, specific for the ceremonial banquets of the late Hellenistic period. This simple shape of cup knew a large diffusion from the Middle East to the Iberian Peninsula (fig. 6) (Spânu 2002 115-120, Abb. 25, 130, Beil. 3), but some recipients from the Varna hoard reflect the closest dimensional analogies to the Bucureşti-Herăstrău cup (Venedikov 1961 357-361, fig. 4-6).

Imported coins of high value and large diffusion in Danubian countries, such as the Thasian tetradrachmas, (fig. 8) did not circulate within a monetary economy (Aitchison 1988 274-277) and this is why they have to be included among the indices or attributes of a high local social status. In other words, pieces with a unique morphology,

symbolic signification and particular iconography are associated to a ceremonial cup with a cosmopolitan resonance. Otherwise an annexation between local iconographical samples from the late La Tène period and imports, such as the mastos type cup or even sets of cups, although it is not frequent, cannot be considered unusual, due to the fact that we also find it in Transylvania, in the Lupu hoard, or in the North-West of Bulgaria, at Jakimovo (Milcev 1973).

On the other hand, the fact that the hoard's inventory reflects the structure of a costume set is based on several plausible presumptions (fig. 9). First, one might assume that both of the phalerae have been manufactured with one fibula welded on the reverse (fig. 1/2). In this case, the two "fibulae-phalerae" formed a pair, a situation that has been observed in several hoards that contain silver fibulae of different shapes (Horedt 1973 153; Dumitrașcu, Molnar 1975 60; Zirra, Spănu 1992 409; Rustoiu 1997 80-81, tab. 1; Spănu 2002 100-101). A suggestive analogy for our case is given by the pairs of fibulae with *au repoussé* representations of human figures from the hoards of Bălănești (Popescu 1969; Die Daker 1980 195-196, cat. no. 349, 56, fig. 32) and Coada Malului hoards (Horedt 1948 266, 277; Popescu 1954 91-95, fig. 1-3; Mărgitan 1976 31-32, pl. 1/2, 2-4), both located in Muntenia (the South Romania). Although these pieces have a different system, the significance of such a pair of human representations is probably a common one, and it reveals a particularity of the late La Tène iconography from Muntenia. However, it should be mentioned that the technical solution of applying phalerae over the fibulae is not a local one. This construction is also attested in the North-pontic milieu, for instance: the broaches from Sokolovo (Simonenko 1994 109, nr. 17, 126, fig. 8; 2004 139, 166, fig. 4/8), and Smol'janinova (Simonenko 2004 139, 166, fig. 4/7), but most frequently in Crimea: Širokaja Balka (Simonenko 1993 64-66, fig. 20/b), Ust'-Alma (Puzdrovskij 2004 fig. 2/6, fig. 4), Tavel', curgan no. 2 (Daševskaja 1991 121, pl. 65/3), Neapolis Skytica (Daševskaja 1991 121, pl. 65/4; Zaicev, Mordvinčeva 2004 199, fig. 7/9; Zaytsev 2004 162, fig. 112/2; 172, fig. 122/1), or at Beliaus in the grave no. 156 (Daševskaja, Mihlin 1983 143, fig. 9; Daševskaja 1991 121, pl. 65/1a-b, 2; Zaicev, Mordvinčeva 2004 201, fig. 9/28). Other samples were found in some middle/late Hellenistic contexts from the Balkan Peninsula, for instance in Mesembria Pontica/Nesebar, Bulgaria (Galabov 1955 141-144, fig. 7-8b, fig. 9b and 11; Tonkova

2002 104-105, pl. I/6) or in Dyrrachion/Dures, Albania (Treister 2001 189-190, fig. 93). Perhaps the idea of combining fibulas with brooches should be searched in the handcrafts milieus of the late Hellenistic pontic Greek cities (fig. 7).

Although is hard to determine the function of the chain, the question is whether its role was to join the two "fibulae-phalerae". Thus, one should mention the chain attached to the two silver knot fibulae with unknown provenience (probably Transylvania) and which today are part of the Hanns-Ulrich Haedeke Collection, Germany (Haedeke 2000 18, no. 10).

It is uncertain how the spiral bracelets were worn, due to the big diameter of the opening. Nevertheless, the fact that the inverse rotation of the extremities, eased by the malleability of the metal, permitted the "adjustment" of the spiral to the thickness of the arm (Horedt 1973 140) should be mentioned. The possibility of wearing them at the leg must not be excluded (Pârvan 1926 548; Medelet 1993 16-17; 1995 199), but, unfortunately, we miss consistent clues regarding this fact (for instance, burial graves). It is hard to believe that pieces of big dimensions, with special symbolic significations, had a marginal position as far as the costume or they were worn underneath the garment.

Consequently, if we accept in the inventory of the București-Herăstrău hoard, the usage of the two phalerae as the fibulae's ornamental elements, probably connected by a chain, we may admit the association between a garment closing complex accessory and an adornments set of arms, otherwise said a sole costume set. On top of that, unlike in the case of other hoards with a high number of mastos type cups (Sâncrăieni or Varna hoards), at București-Herăstrău we only find one cup of this kind of recipient, that means that we already have suggestive arguments to deduct in the structure of the spectacular inventory merged social identity symbols of an elite member of those times.

5. The archaeological interpretation of the X-Ray Fluorescence analysis of the coins and jewellery from București-Herăstrău

5.1. Problems raised

From today's research perspective of the Dacian hoards, the metallographic analyses that were taken within the Arheomet project do not represent a première. Previous analyses (Preda 1957; 1958; Țintea, Kovács 1964; Stoicovici, Winkler 1967; Stoicovici, Stoicovici 1973; 1974), performed in the

'60s and '70s in the University of Cluj labs by using different methods, have targeted a modest number of objects; the results prove their general character, lacking sometimes accuracy and suffering especially from the absence of a constant collaboration and of a fertile dialog between archaeologists and their physicists partners (Spânu 2005, 87-89). Thanks to several debates between the members of the Archeomet project, an agreement was reached to study the Bucureşti-Herăstrău hoard, which presented several suitable characteristics: discovered under satisfactory circumstances, it is the only Dacian hoard from the collections of MNIR-Bucharest, where distinct categories of objects associate: costume and jewellery pieces, a silver recipient and a significant lot of tetra-drachmas issued at Thasos. In other words, the crucial argument for choosing the hoard was the complexity of its inventory.

The main goal of the metallographic aspect of the study was to determine the unity or the diversity of the elements composition of the pieces from the hoard. The intention was to determine through tests several clues that might have supported or rejected several hypotheses regarding the origin of the Dacian metalwork raw material and the technological processes used by the craftsmen of the 1st B.C. century. Therefore, answers to the following questions have been searched:

1. How many sources of raw material may be determined?

2. Do the pieces of the hoard constitute a technological unit?
3. If the raw material source of the manufactured pieces is local or was imported?
4. If the source is not local, could one determine indications regarding the imported coins' recycling? At the end of the 19th century, Téglás (1892 408) and later Preda (1957 and 1958) have suggested the hypothesis of recycling imported silver coins in order to produce local late La Tène jewellery. Western archaeologists had brought abundant evidence in favour of the prehistorically recycling (see the synthesis of Bradley 1988). To put it differently, can one determine a similitude relation between the metallographic structure of the adornments, cup and coins?

5.2. Results

Out of the complete set of jewellery pieces, only 15 of the 58 Thasian tetra-drachmas (selected by Dr. E. Oberländer-Târnoveanu) of the Bucureşti-Herăstrău hoard have been subjected to the same type of metallographic analyses (X-ray fluorescence) in the lab of the National Institute of Nuclear Physics and Engineering – Bucharest-Măgurele (on the relativity of this method and its limits see Pernicka 1990 83). Dr. Cojocaru performed the analysis; the results are presented in the table below:

Objects	inv. no.	Cu%	Zn%	Ag%	Sn%	Au%	Pb%	Bi%
1.a Phalera - inside	8415	4.560	0.320	85.600	2.870	1.690	3.340	0.460
1.b Phalera - gilded outside	"	-	-	-	-	22.000	-	-
2. Phalera	11140	2.500	0.120	92.400	2.100	0.990	1.600	0.200
3. Chain	8419	1.380	0.160	95.800	-	1.710	0.780	0.160
4. Fragmentary spiral bracelet	11141	12.330	0.240	76.000	9.600	0.560	1.180	0.090
5. Fragmentary spiral bracelet	11142	16.150	0.340	74.000	7.430	0.300	1.780	0.090
6. Fragmentary spiral bracelet	8416	38.500	0.200	46.400	11.600	0.620	2.400	0.230
7. Fragment of bracelet	8417	31.500	-	49.000	10.450	2.650	6.030	-
8. Fragment of bracelet	11143	6.190	0.420	87.300	4.400	0.790	0.700	0.250
9. Concave and arched band	8420	16.070	1.550	71.400	7.750	0.760	2.150	0.280
10. Mastos type cup	11144	3.150	0.300	95.700	-	0.460	0.330	0.060
Thasian tetradrachma	6952	0.182	0.055	94.240	-	5.132	0.111	0.280
Thasian tetradrachma	6954	0.523	0.103	97.960	-	0.812	0.463	0.133
Thasian tetradrachma	6958	0.137	0.070	98.220	-	1.043	0.120	0.414
Thasian tetradrachma	6959	0.078	0.106	97.740	-	1.377	0.062	0.634
Thasian tetradrachma	6965	0.792	0.175	97.880	-	0.345	0.495	0.316
Thasian tetradrachma	6966	0.267	0.066	97.540	-	1.520	0.119	0.484
Thasian tetradrachma	6967	0.463	0.108	98.440	-	0.669	0.119	0.201
Thasian tetradrachma	6969	0.104	0.056	99.090	-	0.049	0.518	0.186
Thasian tetradrachma	6970	0.139	0.184	96.020	-	3.073	0.030	0.555
Thasian tetradrachma	6971	1.140	0.248	97.970	-	0.367	0.204	0.072
Thasian tetradrachma	6973	2.112	0.081	97.260	-	0.374	0.138	0.038
Thasian tetradrachma	6978	0.745	0.046	98.420	-	0.448	0.189	0.154
Thasian tetradrachma	6980	0.086	0.067	97.700	-	1.428	0.011	0.704
Thasian tetradrachma	6989	0.123	0.120	98.160	-	1.366	0.070	0.157
Thasian tetradrachma	6990	2.830	0.066	96.290	-	0.263	0.477	0.075

5.3. Interpretation of the results

5.3.1. Indications of the deliberate modifications of the alloy's composition

The most important conclusion, that led to the interpretation of the undertook metallographic analyses, is represented by the possibility to highlight a deliberate intervention of the ancient metalwork artisans in the dosage of the alloy based on the silver metallographic structure out of which the metalwork pieces have been manufactured, especially those that reveal their local-barbarian origin through their morphology and ornamentation. It might be presumed the fact that the deliberate modification of the alloy based on silver and its depreciation by adding bronze comprising cooper and tin (fig. 10/2) have not been caused by the precious metal scarcity, but more likely by the need of strengthening certain objects, namely the bracelets. Additions of important quantities of tin in order to produce strengthened alloys stand out in the case of some bracelets of Chersones from the 1st - 4th centuries AD (Olgovsky 2001 110, tab. 1). Important percentages of tin were identified in some Roman bronzes (Dr. Cojocaru's remark), but this metal seems to be present also in late medieval alloys (Pintea 1966 and Stoicovici, Tiniș, Tiniș 1966).

The usage of such an alloy, containing a significant percentage of tin and cooper probably responded to the need of strengthening some bracelets made out of relative thin wires and rods (0.2 cm in diameter; only the section of the great bracelets' spiral body is 0.6 cm). By using a silver alloy with a higher title, the finite form of these pieces would have been too easily deformed. Probably, the added tin and cooper has been far too generous: all the bracelets in the hoard were easily broken, even since ancient times, or during their discovery.

In turn, the mastos type cup, which, through the accuracy of the execution and also through the external analogies (some of them at very far distances), seems to be rather the product of a Hellenistic workshop, since it presents a metallographic structure with no additional tin and copper. In this case, the explanation of this ascertainment should be searched in the execution technique of this type of recipients through hammering at high temperatures on a lathe. A malleable alloy was

preferred, therefore presenting a higher purity level, for the easy hammering of the bowl's elegant conic form.

A similar explanation may as well be put forward for the absence of tin from the chain's composition. In this case, the small dimensions of the thin wire links that make up the chain might have made necessary the usage of a malleable alloy. Links from a wire that was too rigid would have broken up much easily.

Therefore, no matter if the pieces from the hoard are all locally manufactured or not, the performed analyses suggest the fact that the artisans from late La Tène/late Hellenistic period deliberately changed the structure of the raw material, depending on the functional and the aesthetic properties the desired object should have had.

The deliberate character of the alloy's alteration is suggested also by the correlation of tin and cooper quantities (the relative constant proportion of tin-cooper ratio) in the case of metalwork pieces (fig. 10/2). On the other hand, the only piece that presents a disproportionate tin-cooper ratio among the other pieces is the great spiral bracelet (different of the other bracelets from the hoard due to its dimensions and weight, but as well due to its ornamental valences). In other words, the question is if this piece of special dimensions, morphology and ornamentation, would not mean the creation of a specially structured alloy.

5.3.2. Do the pieces of the hoard present a technological unity?

The presence or absence of tin and the varying percentage of copper determine a partition of the metalwork pieces from the București-Herăstrău hoard in two groups (fig. 10/2). One group consists of pieces from an alloy with significant Sn, Cu and Pb supplement, namely the bracelets and the bowls. The other group contains pieces manufactured out of an alloy in which Sn is absent, and the Cu and Pb values are reduced (the cup and the chain).

The metallographic structure of these two latter pieces is very similar to that of the Thasian coins. Regardless where they have been manufactured, these observations show the fact that from metallographic and, implicitly, technological perspective, the inventory of the hoard is not a unitary one. The significance of this observation should not be exaggerated. We may assume the pieces with a

different morphology were manufactured by different techniques. On the other hand, although the percentage values of the secondary elements (Au, Zn, Pb, Bi) of the bowls are different from those of the bracelets, the ratio between them is nevertheless similar (!). The same observation can be made in the case of the mastos-cup, of the chain and of the tetra-drachmas, secondary elements of which although they are not close, they are still found in a close ratio (fig. 10/1).

5.3.3. The problem of the relation between the metalwork coins and pieces

The hypothesis according to which the raw material that represented the basis for the metalwork pieces manufacturing would have been procured by recycling several coins similar to those discovered in the same hoard, could not be entirely confirmed, but at the same time the analyses did not categorically infirm it. The interpretation of the Bi/Au/Ag ratio (Fig. 10/1) does not lead to segregation between coins and jewellery; only the variation of Cu and Sn can point it. To put differently, in the case of the bracelet and the cup, an initial alloy based on silver has been enriched on purpose with Cu and Sn. This initial alloy seems to be similar with the one in the coins. The X-Ray test could not certify, but could not invalidate either if the jewelry and cup's silver-based alloy was obtained by recycling the coins.

Appendix.

The description of the metalwork pieces

Note: I express my gratitude to the director of MNIR, Dr. Crișan Mușteeanu, for the permission to examine the metalwork pieces of the Bucureşti-Herăstrău hoard in November 2002. For the description of the preserved Thasian coins, see Popescu 1948 42-49.

1. The phalera with the representation of a human bust represented by hammering (*au repoussé*) and *poinçonnage* techniques, has a slightly oval form, with the vertical diameter higher than the horizontal one (9.2 to 8.5 cm). The outside is gilded. The plinth, with a width of 0.5-0.6 cm, is decorated with a zigzag performed with the help of a punch with right point. The plan out of which the bust has been manufactured is placed on the higher level than the surface of the phalera with approximately 1 cm, therefore the piece presents a

trapezoidal profile. The side panels of the phalera have been ornamented, in turn, with groups of 2-3 lines. The bust is surrounded by a circular row of pearls. The strong profiled head is represented in frontal position. The eyes are over-dimensioned, with accentuated eyelids and eyelashes made by a slide punching; the nose is accidentally flattened; the mouth slightly opened, with the extremities marked through a small round hollow. The garment is indicated by two groups of accentuated strips, symmetrically disposed to the median axis of the chest. In the neck area, three rows of relatively concentric punches indicate the folds of a collar, or maybe the necklaces. The areas placed on both sides of the head have been made by punching and are ordered on relatively horizontal rows. The anatomical indications for the gender of the figure have not been clearly marked, but one can suppose that the represented character is a woman. The beardless face, but also the long coiffure, pleads in favour of this latter case. A bronze fibula with the leg twisted over the arch (8 cm long) has been fixed by dwelling on the reverse side of the phalera. Modern interventions make uncertain the traces of the fibula's dwelling. The phalera is significantly deteriorated on the left side (the left shoulder and the area above it are missing), as well the right extremity of the chest; modern completions have been performed in both missing areas. MNIR Bucharest - inv. no. 14 523/8415; W = 20.15g. Fig. 1/1.

2. Phalera with the representation of a human bust, made by *au repoussé* and *poinçonnage* techniques, is similar to the precedent phalera. The superior-left part of the phalera is missing, including the forehead, a significant part of the coiffure and the left shoulder. Interventions for completing the missing part have not been undertaken, as in the case of the previous phalera. On the reverse, on the superior part, slight traces of ancient dwelling may be observed. A similar fibula to the one jointed on the first phalera has been probably fixed on the reverse of this one. MNIR Bucharest - inv. no. 14 572/11140; the diameters of the phalera = 8.7 / 7.2 cm; W = 11.60g. Fig. 1/2.

3. Fragmentary chain comprising 51 links jointed in the double loop-in-loop system (each link passes through the previous two). Heavily deteriorated, some of the rings are missing. MNIR

Bucharest - inv. no. 8419; L = 18.7 cm; thickness = 0.4 cm; W = 4g. Fig. 1/3.

4. Fragmentary spiral bracelet manufactured of circular section wire (the diameter of the section is 0.6 cm), forming five coils, with only one preserved termination. The extremity is formed by a short prismatic volume (2.7 cm length/1 cm width/0.6 height), with the side panels slightly over-raised, continuing with a small conic ophidian like ending, with a circular section, with the eyes represented as two incised circles. The extremity is preceded by two groups of three (and one of two) incised lines. MNIR Bucharest - inv. no. 14 600/11141; height = 14 cm; the diameter of the spiral's opening varies between 12.45 and 9.33 cm; W = 247g. Fig. 2/1.

5. Fragmentary spiral bracelet manufactured of circular section wire (the diameter of the section is 0.2 cm), with one termination preserved; the extremity is formed by a slighted bolded volume and a flattened extension, decorated by an incision flanked by two rows of punching, probably suggesting an ophidian head; two coils are preserved from the body of the bracelet. MNIR Bucharest - inv. no. 14 601/11142; the diameter of the opening = 8.9 cm; W = 18.13g. Fig. 2/2.

6. Fragmentary spiral bracelet manufactured out of cylindrical section wire (the diameter of the section varies between 0.2 and 0.3 cm) with only one termination preserved, with the extremity slightly bolded and rounded. MNIR Bucharest - inv. no. 14 473/9148; diameter of the opening = 7.1 cm. Two detached fragments are part of the same bracelet, MNIR Bucharest - inv. no. 8418a and 8418b, L(a) = 4.8 cm, L(b) = 6.7 cm; the weight of the three fragments together = 20.58g. Fig. 3/1.

7. Fragment of bracelet manufactured of circular section wire (the diameter of the section is 0.2 cm); the extremities are missing. MNIR Bucharest - inv. no. 14 474/8417; D = 7.8 cm; W = 13.77 g. Fig. 3/2.

8. Fragment of bracelet (circular?) manufactured of circular section wire (the diameter of the section is 0.3 cm), then with a quadratic section (0.4 on the side) on the face of the preserved termination. MNIR Bucharest - inv. no. 14 602/11143; the diameter of the opening = 10/9.3 cm; W = 37.41g. Fig. 3/3.

9. Concave and arched silver band; MNIR Bucharest - inv. no. 8420; the diameter of the section = 8.35 cm; the length of the unfolding = 13 cm; W = 6g. Fig. 4/2.

10. Mastos type cup in the shape of a truncated cone and with a round bottom. In the interior, under the bolded edge, a fluting of 0.2 cm length; the inferior part presents repairing traces, probably dating from antiquity; MNIR Bucharest - inv. 14 567/; the diameter of the lip = 17.7 cm; height = 10.1 cm; the thickness of the panel=0.4 cm; W = 467g. Fig. 4/1.

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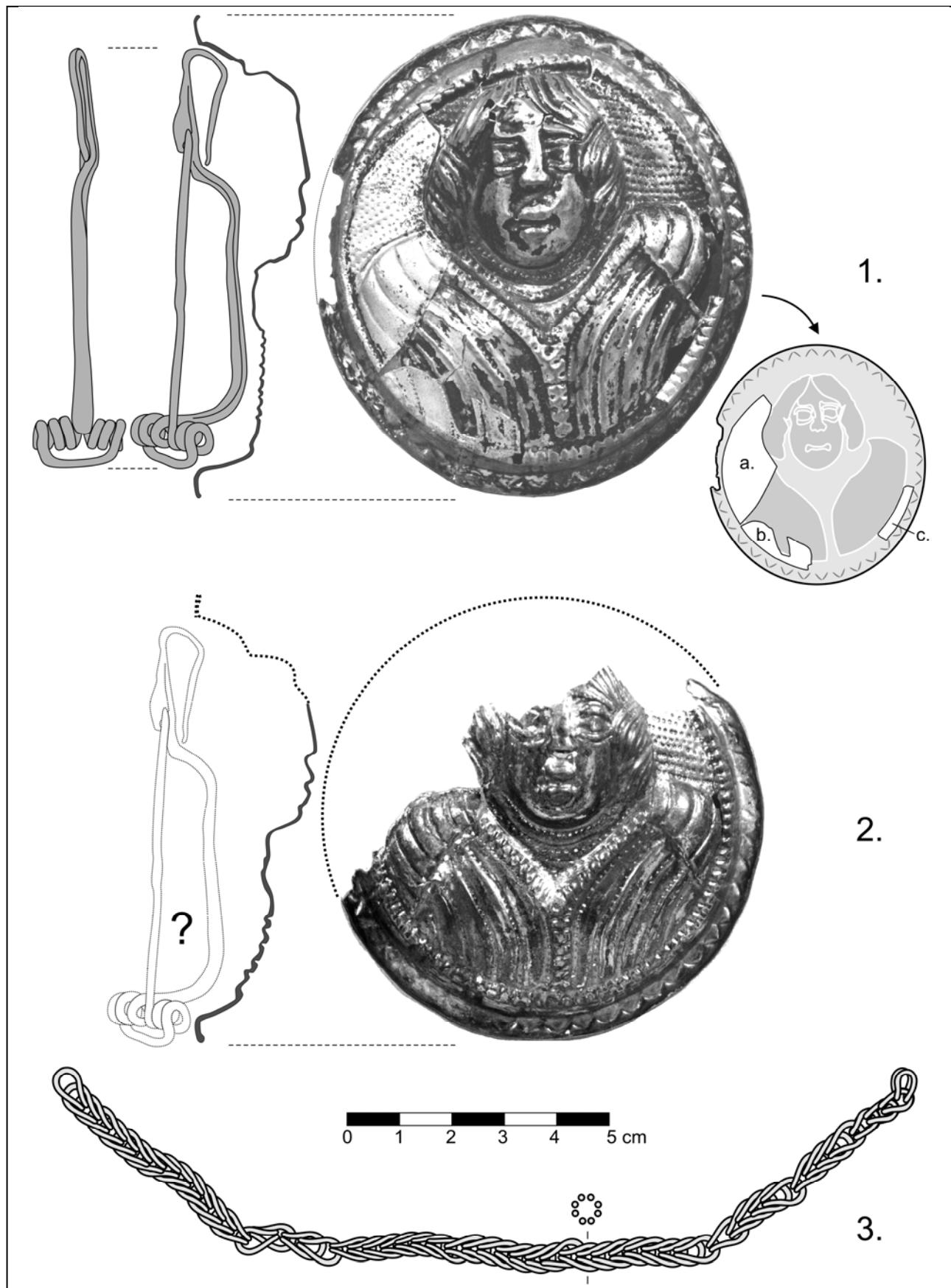


Fig. 1. The Bucureşti-Herăstrău Hoard. 1.-2. The Phalerae - draw and photo after original; the bronze fibula on the back side of the no. 1 phalera after D. Popescu 1948, 40-41, fig. 6/4 and 7/4. 3. The chain - draw after original.

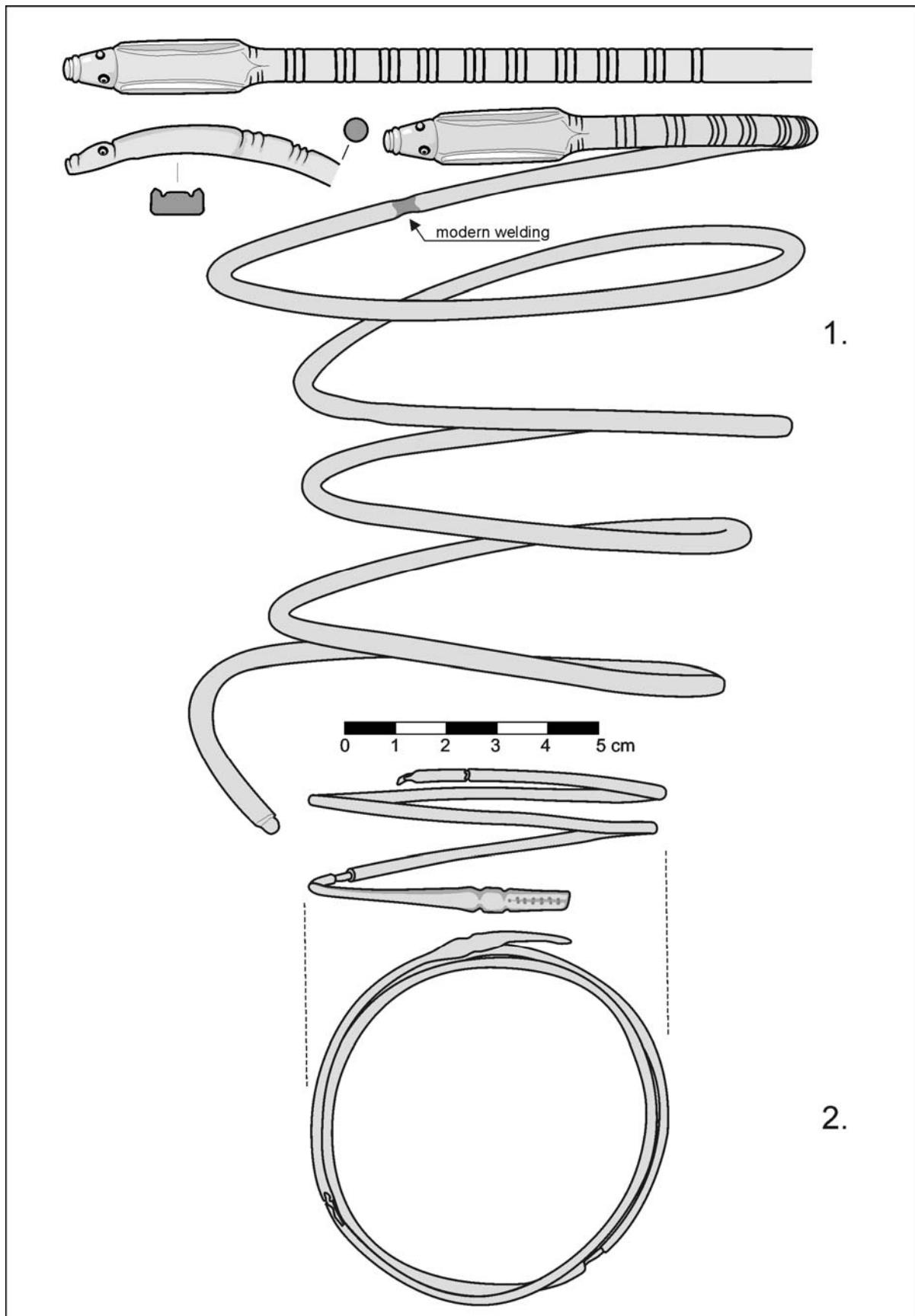


Fig. 2. The Bucureşti-Herăstrău Hoard. 1.-2.: the spiral bracelets - draw after original.

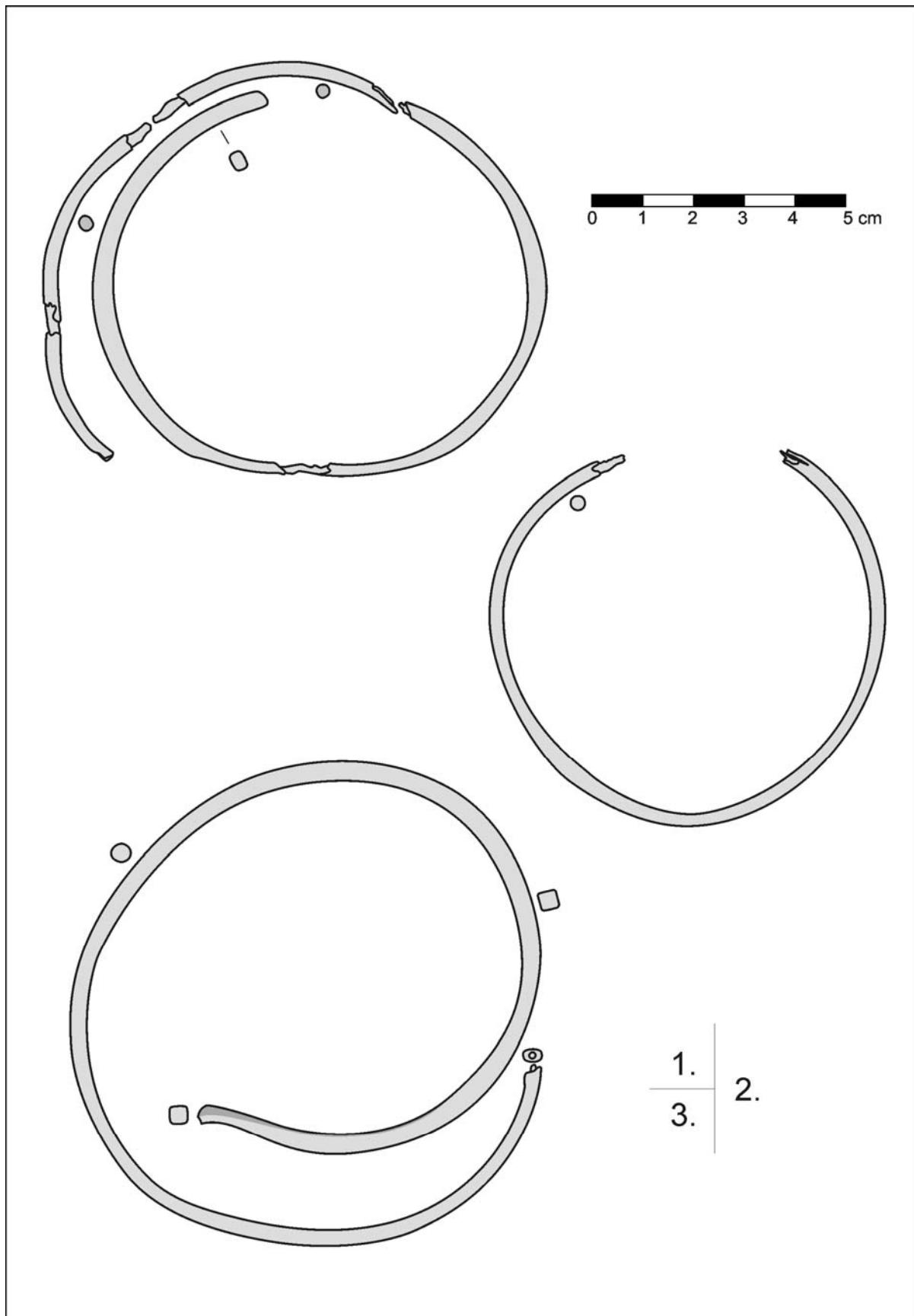


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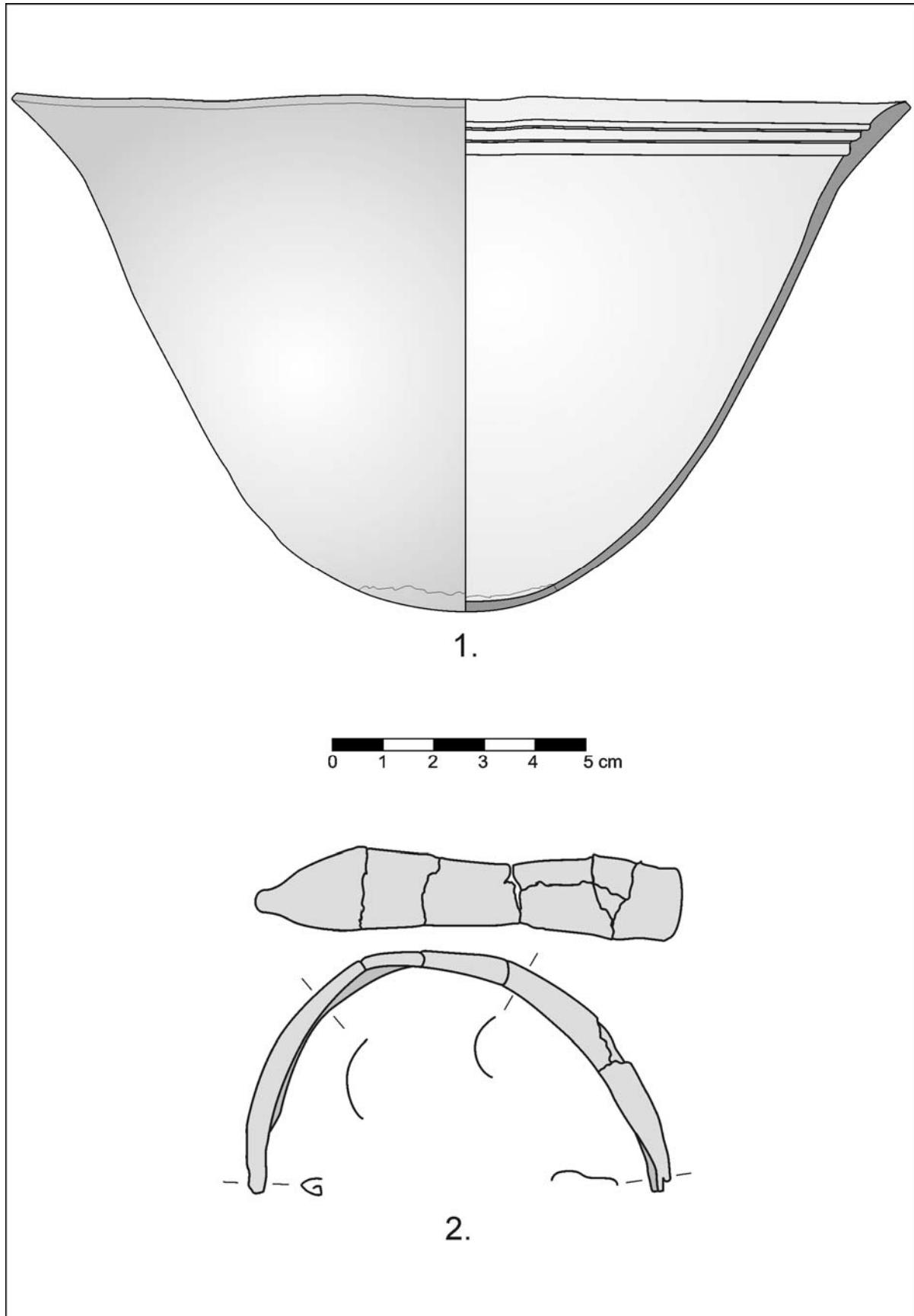


Fig. 4. The Bucureşti-Herăstrău Hoard. 1. Mastos cup – draw after original. 2. Concave silver band – draw after original.

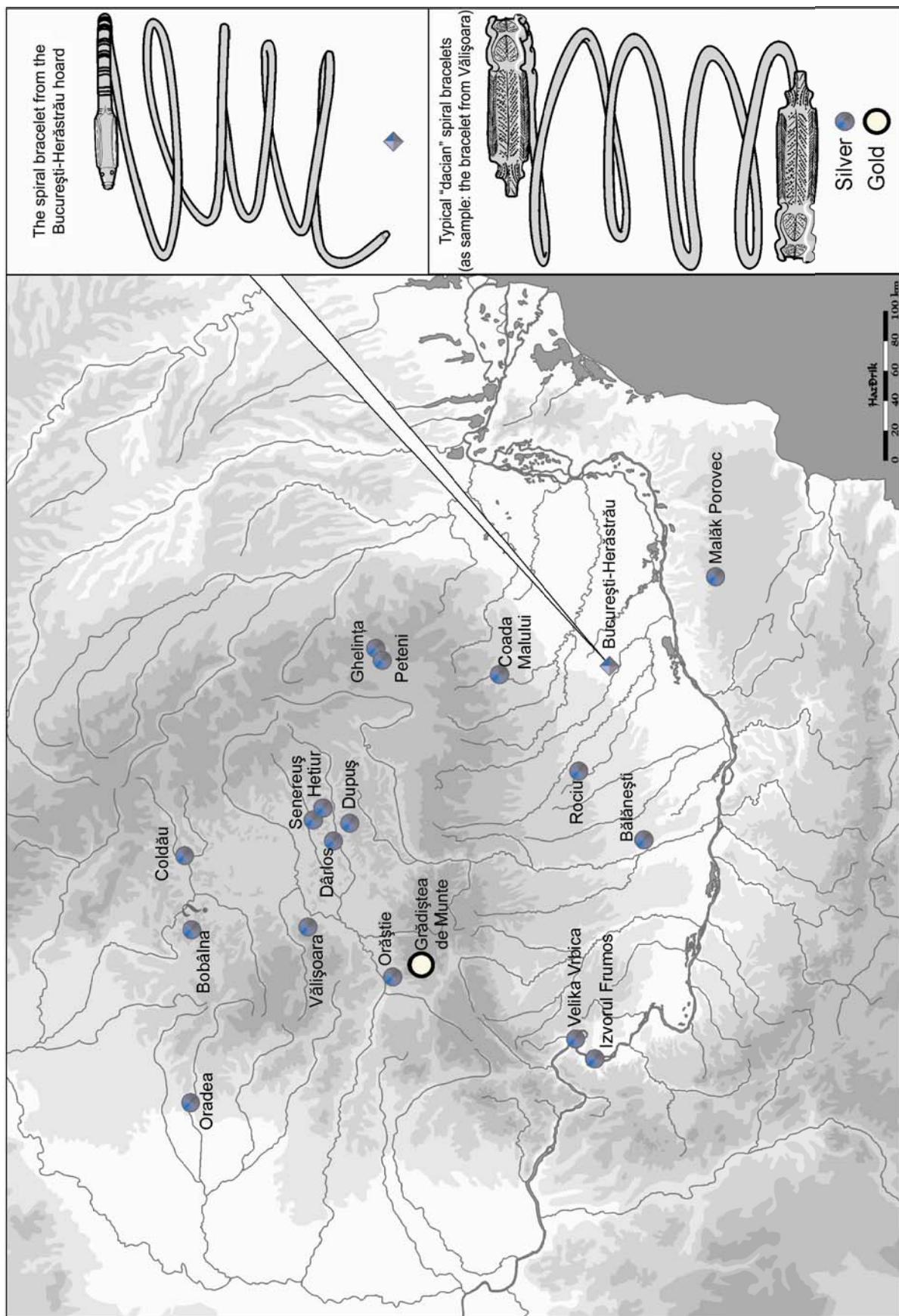


Fig. 5. Distribution of spiral "Dacian" bracelets.

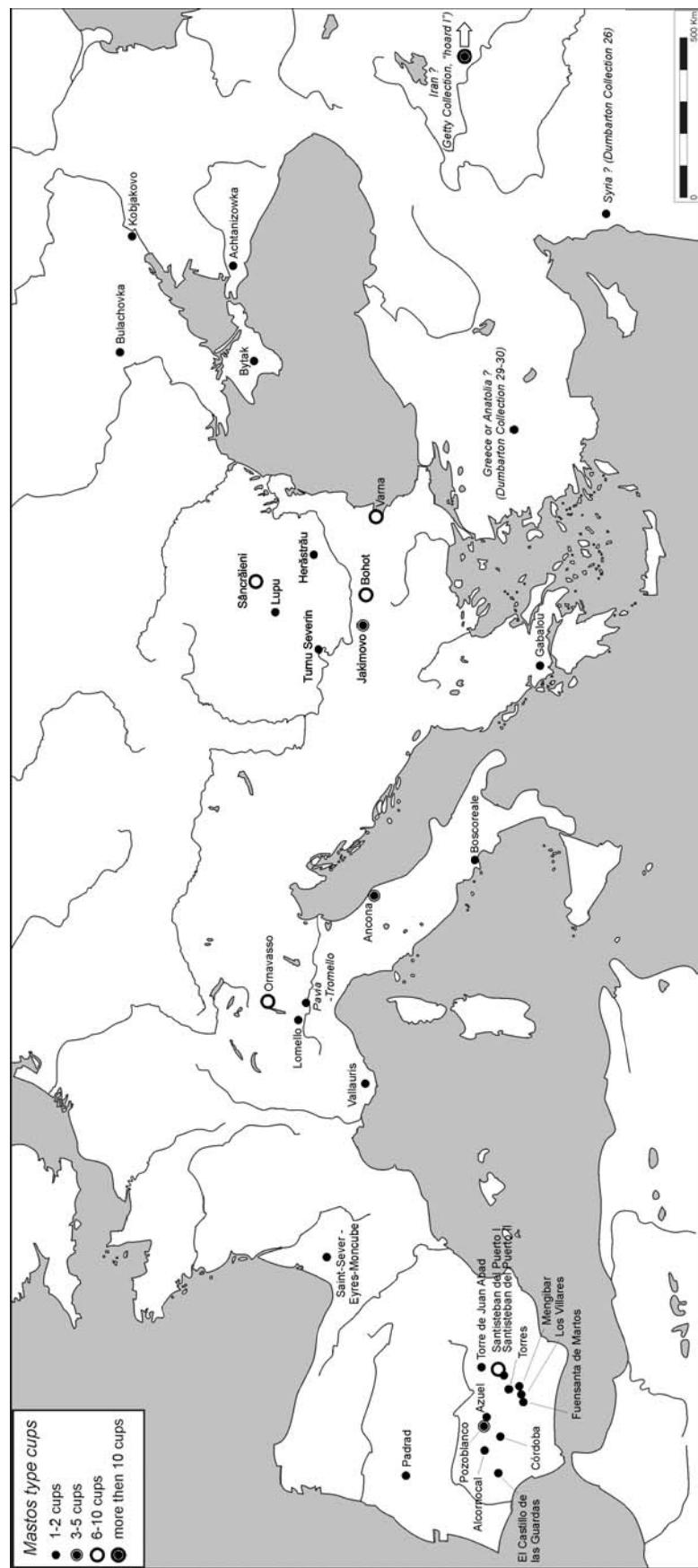


Fig. 6. Distribution of mastos type silver cups in Europe and Near East.

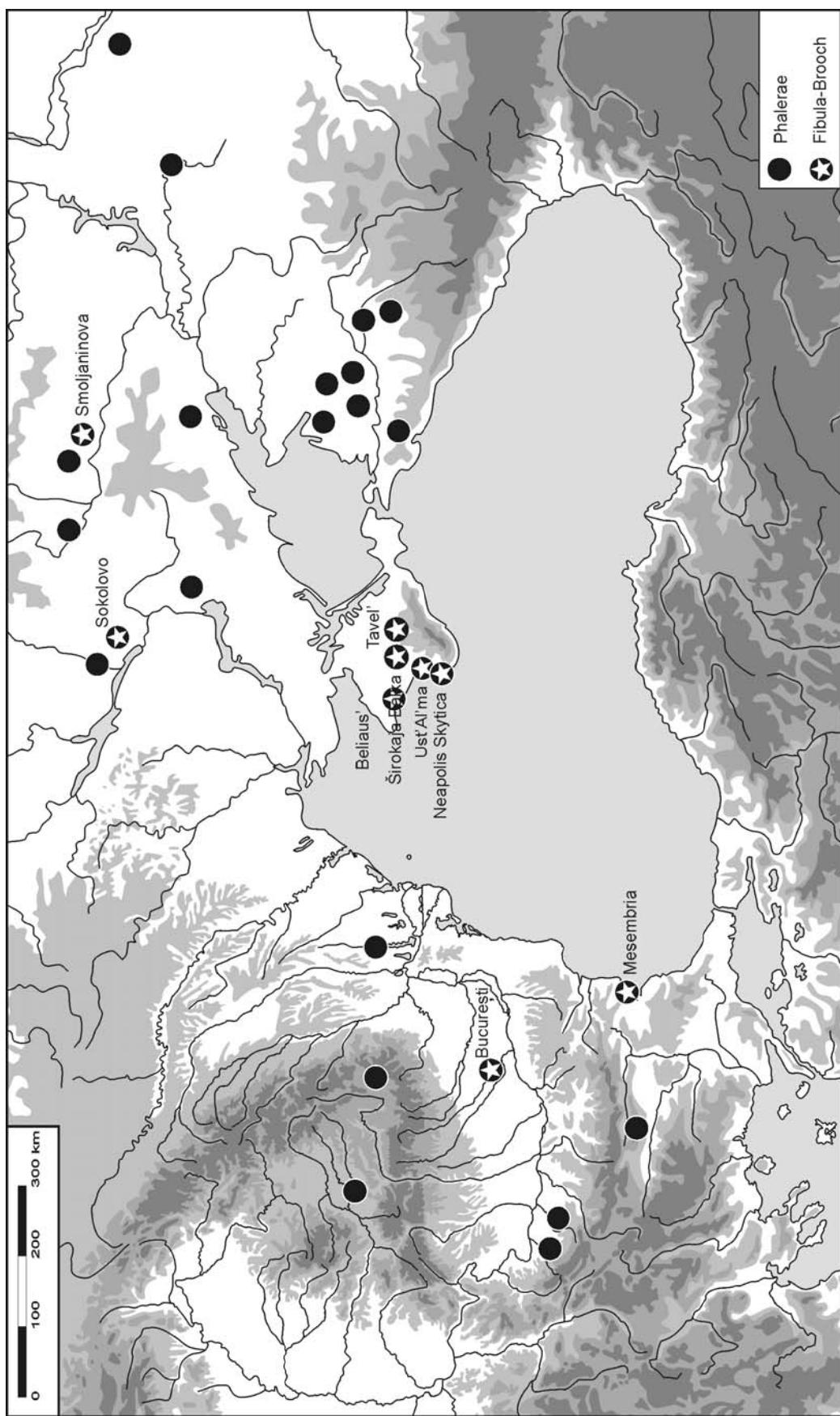


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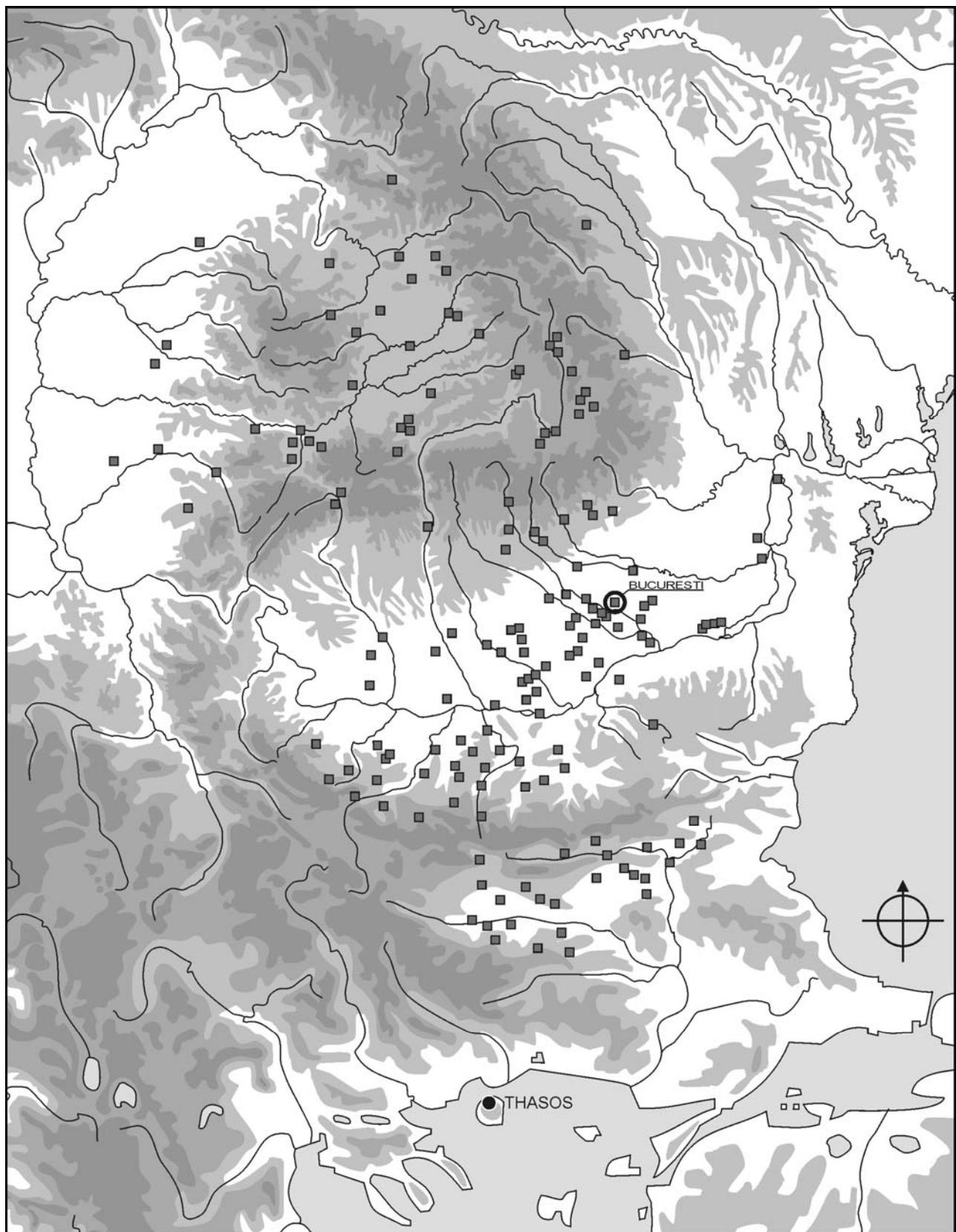


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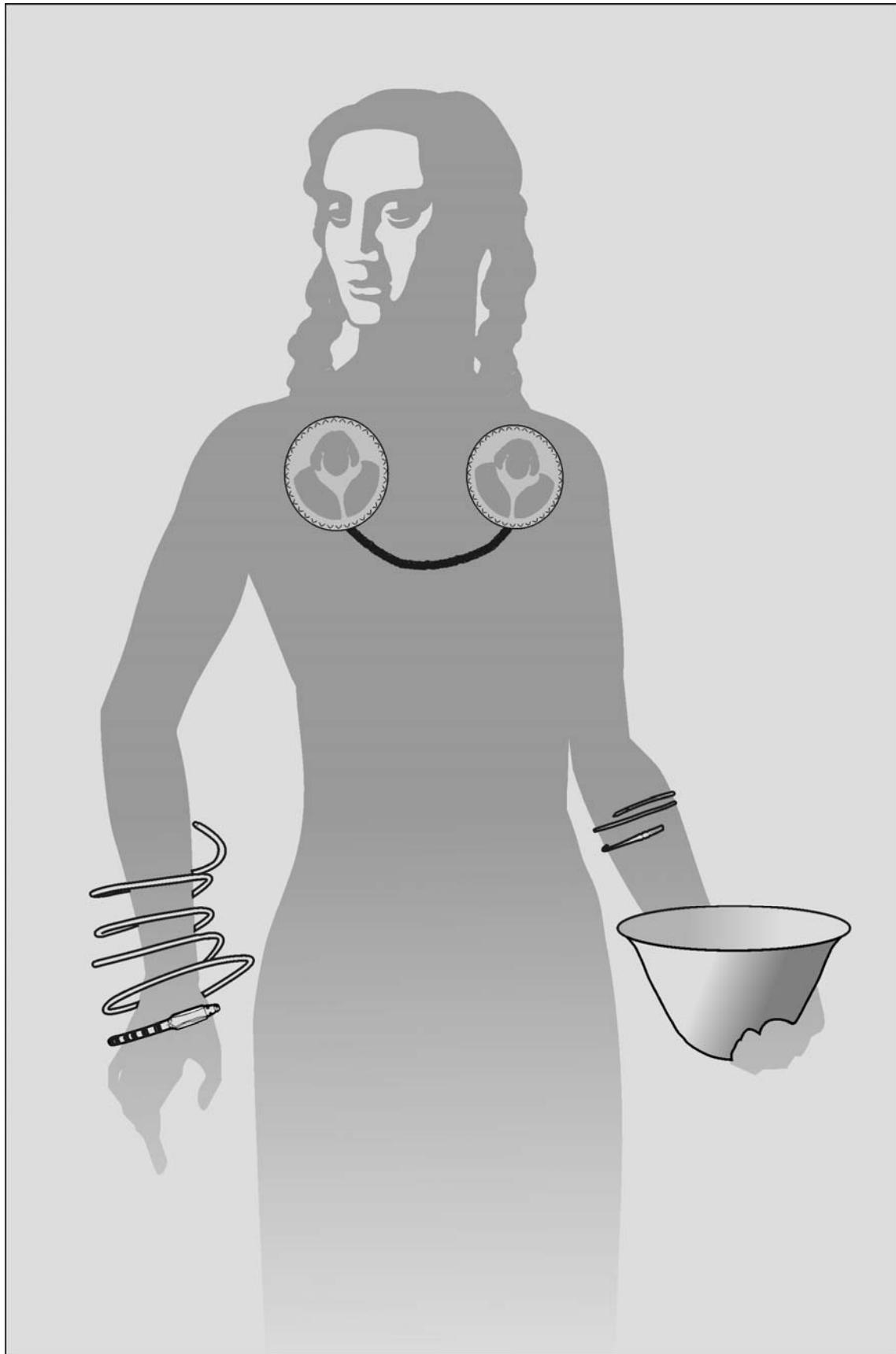


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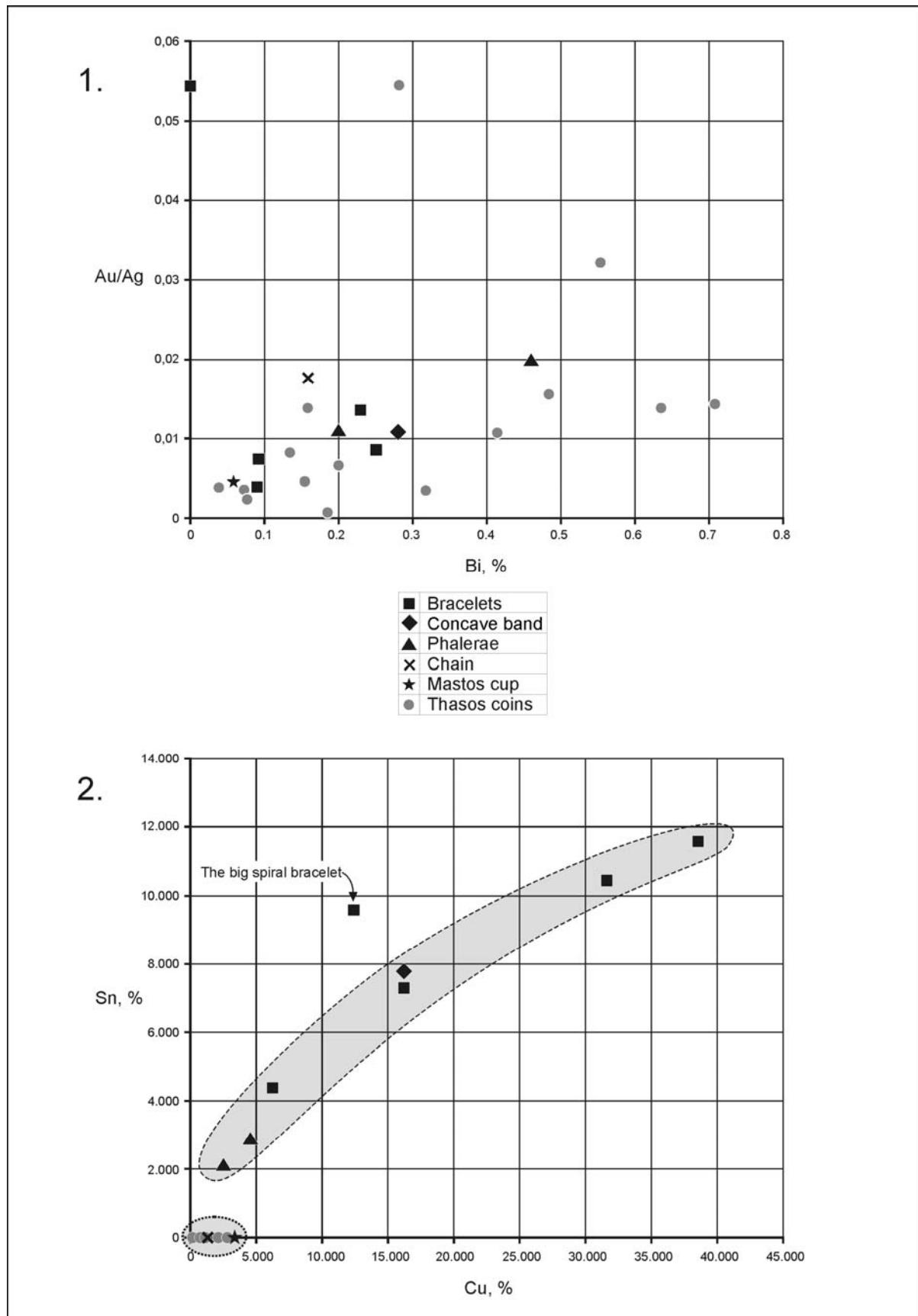


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