

## EVIDENCE OF BRONZE WORKING AT DUROSTORUM

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**Abstract:** This article draws up a catalogue of 91 various artifacts (moulds, crucibles, linings, wasters, casting sprues) related to bronze working in the Roman settlement at Durostorum. The site is a prevailing crafts centre, evidenced by the collection of thousands of small finds made of clay, metal, bone and glass, many wasters from all over its surface as well as the presence of many kiln and pottery waste pits prints.

**Keywords:** Durostorum; Moesia Inferior; metal working workshops; moulds; wasters.

**Rezumat:** În articol sunt catalogate 91 de artefacte diverse (tipare, creuzete, anvelope, piese rebutate, capete de turnare) legate de prelucrarea bronzului în aşezarea romană de la Durostorum. Situl prezintă o puternică componentă meşteşugărească, certificată de recoltarea de pe suprafaţa sa a mii de piese mărunte din lut, metal, os şi sticlă, multe rebutate, precum şi de prezenţa a numeroase urme de cuptoare şi gropi cu deşeuri ceramice.

**Cuvinte-cheie:** Durostorum; Moesia Inferior; ateliere metalurgice; tipare; rebuturi.

The materials presented below are the result of research carried out on the territory of the Roman settlement at *Durostorum* (Ostrov, Călăraşi county)<sup>1</sup>. As previously mentioned<sup>2</sup>, the settlement was a crafts centre as evidenced by the collection from the area of thousands of small finds made of clay, metal, bone and glass, many wasters as well as by the identification of many kiln and pottery waste pits prints (Pl. IA).

The majority of the items described below were discovered in waste assemblages. Four of them, numbered G41, G41B, G41C and G80<sup>3</sup>, lay in a border area of the settlement (Pl. IB), seasonally used for clay extraction and reused, sometimes concurrently, for waste depositing. Except for one<sup>4</sup>, all coin finds in the area frame in the first three quarters of the 2<sup>nd</sup> century AD. Subsequent to the clay extraction, these assemblages (clay extraction pits) were filled at some point with materials resulted from a small workshop<sup>5</sup> dealing with bronze and bones and antlers materi-

<sup>1</sup> The settlement, located within the territory of Farm 4 - Ostrovit, site code 62547.01, is known in the specialty literature as having economic and very likely administrative connections with ancient *Durostorum*, lying less than 3.5 km to the west - see Arginteanu 1920, 1; Culică 1978, 113; Muşeteanu 2003.

<sup>2</sup> Elefterescu 2004-2005, 221; Elefterescu 2005a; Elefterescu 2005b; Elefterescu 2008; Elefterescu 2010a; Elefterescu 2010b; Elefterescu 2011a; Elefterescu 2011b.

<sup>3</sup> Until the stratigraphic situation of this assemblage, excavated only in small part in 2009 is clarified, it was numbered G41D, name under which appears in Elefterescu 2010a, 163.

<sup>4</sup> Coin from Constantius II (351-354 AD, cf. Dima, Elefterescu 2009, 216, catalogue no. 1301).

<sup>5</sup> Circumstances often found, for instance, in the crafting workshop at Dierna - see Bodor, Winkler 1979, 149. Similar examples may be quoted at: Villeneuve-Saint-Germain (Aisne), where many pits containing evidence for the working of various metals and bones and antlers materials were identified (Debord 1993, 78-82); at Blicquy (Hainaut) - see Amand 1975, 10-11, 14. The author believes that the presence of crucible fragments, "pellets", ingots and leafs seem to confirm the existence of a crafting workshop and

als working<sup>6</sup>. It was most likely discontinued or was under development<sup>7</sup>. Beside abundant crucible and small bronze items casting mould fragments, complete bronze or fragmentary items<sup>8</sup>, small pieces of slagged earth, lead remains<sup>9</sup>, animal bones with traces of processing<sup>10</sup>, a few bronze coins<sup>11</sup> were also discovered, thus further confirming above dating.

The rest of the items were discovered either by chance on the Danube bank or in the material recovered from two refuse pits (both former clay extraction pits), numbered G10 and G21. From pit G21 come the coins struck at Nicopolis (Septimius Severus: Caracalla Augustus), Philippolis (Commodus), Nicaea (Septimius Severus: Caracalla Augustus), Marcianopolis (Diadumenian, Elagabal)<sup>12</sup>, which additionally confirm the note in an 1985 article<sup>13</sup>, where the studied assemblages were chronologically dated from the second half of the 2<sup>nd</sup> century AD until the first half of the following century. Such conclusion was substantiated by most of the archaeological

its appendages (Amand 1975, 19-20); a similar example in Britannia, at Caerleon, where the remains of a workshop emerged in the filling of a dismantled fountain – see Zienkiewicz et alii 1993, 124.

<sup>6</sup> We believe that many of the workshops made items requiring the working of several raw material types. See to this effect Jospin 2005, 61; Chardron-Picault 2005, 135: „Comme à Alésia et à Autun, la diversification des artisanats, travail des alliages à base de cuivre, travail du fer et travail de l'os, suggère une production d'objets dont la fabrication implique plusieurs matériaux”; Vomer Gojković 2008, 174 for Poetovio. In Dacia, we mention the workshop at Tibiscum (Benea 1983, 218; Benea 2004, 267), the workshop at Dierna, for bronze as well as glass working (Bodor, Winkler 1979, 153; Cociș 2006, 111), the workshop at Moldova Nouă – “Ogașul Băieșului” where, in the rooms of a single building, emerged evidence of iron, silver and bronze working (Bozu 1996, 77). The note made by D. Benea (2004, 219) concerning the crafting activity in the *vicus* settlement at Tibiscum: „Conlucrarea officinelor apare firească și probabil ar putea constitui un indiciu al existenței unei comunități complexe de artizani, sub aspectul meșteșugurilor, stabilită pe arealul așezării vicane de la Tibiscum” (“The cooperation of the *officinae* seems natural and could likely evidence an existent complex crafting community of artisans, established within the area of the *vicus* settlement at Tibisum), is possibly also valid in the case of the settlement at *Durostorum-Ostrov*.

<sup>7</sup> Possibility further supported by the lack of relations between the potsherds of the same pot.

<sup>8</sup> Most of these artifacts were deposited, beside a few small bronze items, all clearly used, in a fragmentary beaker decorated in the barbotine technique (Pl. II/8, 10): sewing needles, hairpins (Pl. II/7, 9), a votive applique (a small bust of god Mars) (Pl. II/11 a-b), a perforated applique (Pl. II/12). They were likely deposited for re-melting. Similar circumstances were recorded both in Dacia, at Potaissa (Bărbulescu 1994, 109); at Tibiscum (Benea 2008, 108) and Porolissum (Țeposu-Marinescu, Pop 2000, 171, note 521), as well in other parts of the Roman empire – see Amand 1975, 18, 43; Roussel 1979a, 216; Redó 1995, 290, Pl. 218-220.

<sup>9</sup> Even though the activity of lead artisans is undoubtedly confirmed in the settlement by the very high number of discovered items, many wasters (see Elefterescu 2004-2005; Elefterescu 2005a, 61-63, 65-67; Elefterescu 2010b), the small, insignificant quantity discovered within these assemblages (G41, G41B, G41C, G80) makes us believe it was likely a material used to obtain the bronze alloy (Cociș 2006, 112) and not the evidence of the production of lead items in this workshop.

<sup>10</sup> Most half-finished cattle ribs (Pl. II/1-4).

<sup>11</sup> In G41 were identified four asses from Trajan, Hadrian, Antoninus Pius and Antoninus Pius: Diva Faustina and a *dupondius* from Antoninus Pius (Dima 2002, catalogue no. 158); Dima, Elefterescu 2009, 138, catalogue no. 619-622; 62, catalogue no. 109. In G41C were discovered two items: Antoninus Pius: Marcus Aurelius, As; AE ã 11.13 g; 23.8 × 26.1 mm. (MDJC, inv. no. 55299); cast copy, unspecified provincial workshop: Antoninus Pius?, OR á 4.94 g; 17.9 × 21 mm; missing fragment, cast (MDJC, inv. 55308); determination M. Dima.

<sup>12</sup> Dima, Elefterescu 2009, 109, catalogue no. 427; 110, catalogue no. 430; 111, catalogue no. 438; 123, catalogue no. 518; 128, catalogue no. 547; 135, catalogue no. 600; 150, catalogue no. 685; 153, catalogue no. 707.

<sup>13</sup> Mușețeanu, Elefterescu 1985, 76, regarding the assemblages numbered G1-G7.

material, including the coins, recovered in the following years by rescue excavations performed in many collapsed assemblages<sup>14</sup>.

## Catalogue of finds

The presentation order of the items in the catalogue is as follows: name of the item; plate; preservation state; sizes; description of the item; archaeological context; bibliography; analogies; place of storage/preservation; inventory number. Also, for item sizes we used the following abbreviations: L = length; l = width; h = height; gr. = thickness; d = diameter; dmax = maximum diameter; Lp = preserved length; lp = preserved width; hp = preserved height.

We mention that since most of the items are common, well spread and frequently used during the Roman period, we attempted to limit analogies, with a few exceptions, to only the moulds, wasters and items with confirmed production place.

### A. Moulds

As also shown by R. Florescu in 1980, three different casting procedures of metal objects are known: by monovalve and bivalve moulds and by the “lost-wax” method<sup>15</sup>.

All the moulds discovered in the perimeter we investigated were, in principle, disposable (made by “lost-wax” method)<sup>16</sup>. We say in **principle** as we believe that part of the moulds, subsequent to small changes, were or could be reused. These moulds obtained by simple impressing<sup>17</sup> may be **univalve**, **bivalve** and **multivalve**. Although there are items which could be cast in univalve moulds (thin, single-sided item)<sup>18</sup> there is no material evidence to the fact insofar, except for a small fragment, unfortunately poorly preserved (catalogue no. 31).

From the making point of view, the discovered moulds clearly differentiate in two groups. The first (catalogue no. 5–7, 16–17) includes carefully made moulds, with regular shapes, generally made of a fine fabric containing much kaolinite, well fired prior fitting and lining<sup>19</sup>. Their walls are in general thin (possibly also due to the fabric and firing quality). The second group (catalogue no. 1, 9–15, 27) comprises items

<sup>14</sup> Fountains, clay pits (the majority secondarily transformed into waste pits), pits near pottery firing kilns. It seems, at least in the current state of research, that in the northern area (from the Danube), the existent assemblages did not exceed this period. We are strictly referring to the Roman period, as in the area appeared sporadically, sometimes cutting Roman assemblages, scarce prints of early medieval inhabitancy (9<sup>th</sup>–10<sup>th</sup> centuries).

<sup>15</sup> Florescu 1980, 347.

<sup>16</sup> Cociş 2007, 404, with the bibliography from note 28.

<sup>17</sup> We use this term in the sense that impressing was made simply, directly, without intermediary operations, even in the case of multivalve moulds.

<sup>18</sup> Beside bronze objects that could be cast (appliques, belt buckles, decoration or cult plates), still in univalve moulds were cast bronze mirrors (Treister, Zolotarev 1993, Figs. 1–3, 7–9), and very likely, the lead frames for square “glass mirrors” which, compared to those round, with handle, had no groove/support edge of the lid on the back side, which would have clearly required a second valve.

<sup>19</sup> The lack of lining traces in some of the items suggests the existence of two times for firing/drying of the mould: a first time where the valves were separated; b. the second, after they were glued and coated (thus explaining the clear differentiation of the lining layer).

generally made carelessly, of a coarser fabric, sandy, with various intermediate firing degrees (possibly simple drying near a heat source).

Among the presented moulds, we noted in two cases identical moulds in shape, manufacture and fabric, discovered in different assemblages, located at approximately 200 m distance one from the other (G10 and the pit assemblage in S IIC): the first three items (catalogue no. 12-15) are brooch moulds and the following three (catalogue no. 24-26) – were used to make knobs.

By the conclusion of the first part of the catalogue, we presented two small fragments that seem to belong to bivalve moulds with broad casting funnel. The following support their framing to the mentioned category: the find context, respectively the fabric of which they were made and the general appearance. Also adds their resemblance to bivalve moulds with casting funnel discovered in different cultural and geographical contexts – for instance, from Dura Europos comes the valve of a bivalve mould exhibiting a small funnel, similar to that of our item<sup>20</sup>, in the upper part. Also, the bronze bipedis moulds used for “lost wax” casting are similar to the analysed items<sup>21</sup>. Due to the small preserved parts and the lack of use prints we cannot be sure of identification. Nevertheless, we introduce them in our catalogue with the required precaution.

## A1. Bivalve moulds obtained by simple impressing

1. Bivalve mould. Pl. IV\*. Complete, definitely not used. Lp = 75.2 mm; l = 69.7 mm; gr. = 16.6–20.4 mm. Casting imprint sizes: d = 65 mm. Many cracks and lining flaking. Fine, sandy fabric, with light brown mica particles, with areas from grey to dark grey. Circular valves. After fitting and lining, the mould became ovoid. The thickness of the coating layer varies from 2 to 3.7 mm (much thicker in the contact areas of the two valves and the casting orifices area where it had to form also a small funnel). Obtained by simple impressing for making (by casting) of a large size ring. Systematic archaeological research\*\*, S IIC, 607, G41C, -2.50–3.20 m deep. Elefterescu 2010a, Pl. 2, 163–164. MDJC, inv. no. 54656.

2. Mould valve. Pl. III/1 a-b. Preserving a small part. Possibly not used. Lp = 31.8 mm; l = 29.2 mm; gr. = 8.5 mm; depth of imprint = 2.3 mm. Casting imprint sizes: d approx. = 80 mm; l = 5 mm. Fine, very sandy fabric, with many mica particles, light orange, with brown to black-grey hues on the outside, brown with a slight orange hue on the inside. Probably circular shape. According to the print, it is, likely, a ring mould. Systematic archaeological research 2006, S IIC, 578, G41, trench 014 C-E; -2.40–3.27 m, close to the bottom pit, below a yellow earth layer. Unpublished. MDJC, inv. no. 54671.

3. Mould valve. Pl. III/3 a-c (c – positive in modelling clay). Complete. Definitely not used. Lining layer with thicknesses from 0.5 mm to 3.2 mm cracked and flaked on

<sup>20</sup> Toll 1949, 43, Pl. IX/35.

<sup>21</sup> One of the halves of a bronze bivalve mould for casting brooches by “lost wax” method was discovered in 2008 in one of the buildings of the military *vicus* on Pomet Hill at Porolissum. The item was dated by the excavators to the 3<sup>rd</sup> century AD – see Gudea, Tamba 2008, 95–96.

\* The drawings were made by Gabi Dobre, photos by Florin Rădulescu and make-up by Răzvan Clondir, whom I also thank this way.

\*\* With four exceptions (catalogue nos. 34; 81; 83; 89), all presented items were discovered by the author herein.

small portions.  $L = 49.3$  mm;  $l = 41.1$  mm; print depth = 1.2 mm. Casting imprint sizes:  $L = 36.6$  mm;  $l = 22.5$  mm. Sandy brown fabric, with stains from light orange to grey. On the outside, colour variations from grey to dark grey. Oval shape. On the preserved valve, the casting orifice has a small crest. On one of the sides, the imprint outline is slightly doubled (by model slipping). Used to make objects likely belonging to horse harness. Likely after the gluing and hardening of the mould, during the firing process or after its completion, the two valves broke loose. Systematic archaeological research 2009, S IIC, 607, G41C, between -2.50–3.20 m. Unpublished. MDJC, inv. no. 54658.

4. Mould valve. Pl. III/2 a-c (c - positive in modelling clay). Used.  $L_p = 37.2$  mm;  $l = 13.4$ – $2.6$  mm;  $h = 7.5$ – $7.9$  mm; print depth = 4.2–4.8 mm. Casting imprint sizes:  $L_p = 33.7$  mm;  $l = 6.5$  mm;  $l$  attachment ear = 13.3 mm. Fabric, due to the strong firing<sup>22</sup>, is hard to describe. Black colour with slight grey hues. Lining with colour variations from grey to dark grey. Used to make a belt tongue. Although at first sight (massiveness of the item, imprint depth), we were tempted to believe we are dealing with a monovalve mould<sup>23</sup>, the irregular surface and the existent lining contradicts such possibility, however for certain, the second valve was but a simple smooth plate lining tracing the preserved valve. Crack by both ends. The second layer (very thin, of 1 mm) survived on less than half the mould surface. Systematic research 2009, S IIC, 607, G41C, -2.50–3.20 m. Unpublished. MDJC, inv. no. 54660.

5. Mould valve. Pl. V/1 a-d (c - positive in modelling clay). Definitely used. Preserving approximately two thirds of the item.  $L_p = 35.7$  mm;  $l = 37.5$  mm;  $h = 6.3$ – $7.6$  mm; print depth = 1.5 mm. Casting print size:  $L$  probable = 27 mm;  $l = 22$  mm. Whitish fabric with vague grey hues in the breakage, very fine, likely with much kaolinite (also emerge a few ferrous small inclusions and small hollows left by firing certain organic origin fragments). The item is rectangular with round corners. Mould used to cast an almost square applique, with decorated narrow edges and five orifices, likely for attachment. No traces of the lining layer survived. Systematic archaeological research 2009, S IIC, 604, G41, trench 02 B; -2.10–2.70 m. Unpublished. MDJC, inv. no. 54657.

6. Mould valve. Pl. V/2 a-b. Definitely used. Preserved approximately two thirds of the item.  $L_p = 45.1$  mm;  $l = 31.3$  mm;  $h = 7.2$ – $8.6$  mm; print depth = 1.5 mm. Casting print sizes:  $L_p = 35.4$  mm;  $l = 26.4$  mm. Mould used for casting a rectangular applique, with decorated narrow edges. Poor prints of the lining layer. Fine fabric, likely kaolinic, whitish on the outside, with hues from smoky to light grey (in the metal contact area) in the breakage (similar to the fabric of the previous mould). The fabric plasticity, at the time of impressing, was relatively low, which in addition to the striated appearance of the fabric (in the break) point to an incomplete/incorrect prepared fabric. By the preserved end, on the exterior side, a small rectangular elongation is noticeable, which seems to have played the role of guiding when fitting the moulds. The item is rectangular, with rounded corners. Systematic research 2010, S IIC, G80.

<sup>22</sup> It is possible this valve, due to its soundness, was used for several times, not being necessary to break it in order to remove the object.

<sup>23</sup> The drawings were made by Gabi Dobre, photos by Florin Rădulescu and make-up by Răzvan Clondir, whom I also thank this way. Also, we kept in mind that many of such items (belt tongues), exhibit filing traces on the back side (Florescu 1980, 347).



Unpublished. Analogies: from the workshops of *legio I Adiutrix* at Brigetio comes a mould for a rectangular applique<sup>24</sup>. MDJC, inv. no. 55533.

7. Mould valve. Pl. III/5. Intensively used. Preserving half a valve, likely ovoid.  $L_p = 48.4$  mm;  $l_p = 25.3$  mm;  $h = 5.9$ – $10$  mm; print depth =  $1.8$  mm. D preserved of the casting imprint =  $23.1$  mm. Mould, likely used for casting a circular pendant. The second layer (the lining), very well preserved, and is practically common body with the impressing layer. The fabric contains fine iron oxide particles, mica particles, possible also small calcareous particles, which frames it in ceramic group 4<sup>25</sup>, of which a large part of the pottery items discovered in the area are made. Due to the intensive use, the fabric became porous, of low density. On the preserved side, a small cut seems to have played the role of creating the air and excess metal vent. Systematic research 2010, S IIC, G80. Unpublished. MDJC, inv. no. 55534.

8. Mould valve. Pl. V/3. Used. Preserving only a small part. Surviving lining preserved in the item imprint.  $L = 33$  mm;  $l = 16.1$  mm;  $h = 6.9$ – $8.3$  mm; print depth =  $0.5$  mm. D preserved of the casting print =  $22.2$  mm. Fine fabric, very sandy, with black stains. On the outside, colour variations from grey to dark grey. Oval shape. Mould likely used for casting a circular pendant, similar to that made by the previous mould. In the elongated area appears a flaring extension, very likely representing the casting gate and vent areas. The fact that the edge groove is concave in the preceding valve (catalogue no. 7) and convex in this valve, and on the other hand, the sizes which seem similar, make us believe that the two valves fragments represent the mould of the same item type. We mention though they definitely come from two different moulds. Systematic research 2009, S IIC, 607, G41C, -2.50–3.20 m. Unpublished. MDJC, inv. no. 54664.

9. Mould valve. Pl. III/4. Preserved two thirds of the item.  $D = 34.4$  mm;  $h = 11$  mm; print depth =  $3.5$  mm. D preserved of the casting print =  $20.7$  mm. Fine fabric, very sandy, with many mica particles in composition, light orange with brown hues. Approximately circular shape. Mould used to make a circular item. Due to fact that subsequent to use, except for a small area around the gate (and the gate itself) the entire interior surface became flaked, we cannot specify whether it represents the mould of a circular pendant or, appealingly (see resemblances with the moulds at Carnuntum)<sup>26</sup>, yet less likely, a coin mould. Cast coins represent a significant percentage of the coin material of the settlement<sup>27</sup>. The lining with thicknesses from  $0.5$  mm to  $4.3$  mm is cracked and flaked, especially in the fracture area. The imprint, deep, covers at least three quarter of the diameter of the cast item. This shows that the two imprints did not necessarily have to be equal (in depth). Systematic research 2009, S IIC, 607, G41C, -2.50 and -3.20 m. Unpublished. MDJC, inv. no. 54661.

10. Mould valve. Pl. V/4 a-b (b – positive in modelling clay). Preserving approximately half of the piece. No trace of a possible lining, possibly not used.  $L_p$  (very close to the total length) =  $30$  mm;  $l_p = 13.3$  mm;  $h = 5.8$ – $7.4$  mm; print depth =  $0.8$ – $1.2$  mm. Casting imprint sizes:  $L = 18/7$  mm;  $l = 7.7$  mm. Fine, very sandy fabric, with many

<sup>24</sup> Bónis 1986, Pl. 2/5.

<sup>25</sup> Muşeteanu, Culică, Elefterescu 1980, 284.

<sup>26</sup> Găzdac, Humer 2008.

<sup>27</sup> Dima, Elefterescu 2009, 142–203.

mica particles in composition. The fabric colour varies from light orange, creamy to smoky. Elongated shape. On the piece back side, deforming caused during impressing is noticeable. Possibly waster<sup>28</sup>. Mould used to make a flat decorative accessory in shape of a pawn (applique). Most likely, the piece was fitted with the aid of the two side stems (of which only one survived), after the completion of the item, by bending. Systematic research 2006, S IIC, 587, G41, 13 D-F (a small part), -2.00–3.20 m. Unpublished. Analogies: Similar items, belonging to a horse harness, yet with different attachment systems, were found in Pannonia, at Tihany<sup>29</sup>. MDJC, inv. no. 54670.

11. Mould valve. Pl. VI/1 a-c (b - positive in modelling lay). Preserving approximately half item. No trace of any lining, possibly not used. Lp = 33.7 mm; lp = 3.6 mm; h = 8.4–9.7 mm; print depth = 0.4–2.1 mm. Casting imprint sizes: Lp = 24.3 mm; l = 14.4 mm. Fine, sandy fabric, with many mica particles in composition, whose colour vary from light orange to grey. The appearance of the item, including the uneven back, seem to point to the same workshop, if not, the same artisan who made the preceding item as well (catalogue no. 10). Waster? Rectangular shape. Preserving the catchplate imprint<sup>30</sup> and part of foot. Mould used to cast a strongly profiled brooch. Systematic research 1998, S IIC, 270, G41, 08C; -0.83–1.27 m. Muşeteanu, Elefterescu 1998<sup>31</sup>; Elefterescu 2011a, 1, Pl. II/1a-b. Analogies: from the fort at Gilău comes a similar item<sup>32</sup>, and from the workshops of *legio I Adiutrix* at Brigetio comes a mould for casting two items identical with this piece<sup>33</sup>. MDJC, inv. no. 43376.

12. Mould valve. Pl. VI/3 a-b. Preserving approximately the lower third. Used. Exhibits lining traces. The lining, alike the mould, evidences the same sloppy execution, the making being strictly functional. Lp = 31.1 mm; l = 31 mm; h = 4.8–10.5 mm; print depth = 1.4–1.9 mm. Casting imprint size: Lp = 22.3 mm; L catchplate = 17.1 mm; h catchplate = 5.3 mm. Fine, sandy fabric, with many mica particles in composition. The fabric colour varies from strong orange on the outside to light orange with creamy hues on the inside. A few fissures emerged during impressing are noticeable. Rectangular shape. Preserving the catchplate imprint<sup>34</sup> and part of foot. Mould used to cast a strongly profiled brooch. Rescue excavation 1987, G10. Elefterescu 2011a, 2, Pl. II/2. MDJC, inv. no. 55321.

13. Mould valve. Pl. VI/5a-c (b - positive in modelling clay). Used. Lp = 18 mm; lp = 28.5 mm; h = 8–8.4 mm; print depth = 0.5–4.1 mm. Casting imprint sizes: L catchplate = 17.4 mm; h catchplate = 5.3 mm. Fine, sandy fabric, with many mica particles in composition. Very thick lining, surviving in continuous layer. Mould used for brooch casting. Surviving the catchplate area. Similar to the preceding. Systematic

<sup>28</sup> Due to the ragged appearance and lack of lining.

<sup>29</sup> Palágyi 1990, Fig. 13 (79.11.55); Fig. 14 (79.11.44; 79.11.47); Fig. 16 (79.11.24; 79.11.38; 79.11.1).

<sup>30</sup> Cociş 2004, type 4 (with rectangular catchplate), Pl. CLXX/4. The author believes that brooches of the type *endure until mid 3<sup>rd</sup> century AD* - see Cociş 2007, 32; knee brooch (type Cociş 19a5b1), half-finished, Pl. 1/11.

<sup>31</sup> C. Muşeteanu, D. Elefterescu, *The traces of a workshop for casting small bronze objects discovered at Ostrov-Ferma 4*. Paper presented in the National Session "Pontica" in 1998.

<sup>32</sup> Cociş 2004, type 8b2b1 brooch, catalogue no. 452.

<sup>33</sup> Bónis 1986, Pl. 1/1–1a.

<sup>34</sup> Cociş 2004, 32, type 8, Pl. CLXX/8. Types 8 and 16 emerged sometime after mid 2<sup>nd</sup> century AD and were in circulation until mid following century.

research 2009, S IIC, 607, G41C, -2.50-3.20 m. Elefterescu 2011a, 3, Pl. II/3. MDJC, inv. no. 54663.

**14.** Mould valve. Pl. VI/4 a-c (b - positive in modelling clay). Preserved the catchplate area. Used. Similar appearance with the preceding.  $L_p = 16.3$  mm;  $l_p = 28.4$  mm;  $h = 7.9$  mm; print depth = 1.4 mm. Casting imprint sizes: L catchplate = 15.7 mm; h catchplate = 4.9 mm. Mould used to cast a brooch. Systematic research 2009, S IIC, 605, G41C, 2.40-2.70 m. Elefterescu 2011a, 4, Pl. II/4. MDJC, inv. no. 54666.

**15.** Mould valve. Pl. VI/2 a-b. Preserved the catchplate area. Possibly not used. Similar with the preceding ones.  $L_p = 16.6$  mm;  $l_p = 26.7$  mm;  $h = 9.9$  mm; print depth = 2-3.3 mm. Casting imprint sizes: L catchplate = 14.7 mm; h catchplate = 4.9 mm. Mould used to cast a brooch. Systematic research 2007, S IIC, *passim*. Elefterescu 2011a, 5, Pl. II/5. MDJC, inv. no. 55535.

**16.** Mould valve. Pl. VII/1 a-c (c - positive in modelling clay). Preserving approximately one third. Possibly not used. No lining traces,  $L_p = 41.1$  mm;  $l_p = 19.5$  mm;  $h = 4.8-7.1$  mm; print depth = 0.1-2.8 mm. Casting imprint sizes:  $L_p = 37.4$  mm; L catchplate = 13.2 mm; h catchplate = 11.6-13.9 mm. Fabric with much kaolinite (two small areas preserve a whitish colour and it has a cretaceous appearance), smoky, very fine (with only a few ferrous inclusions and small gaps left by firing certain organic origin fragments emerge). The fabric plasticity, at the time of impressing, was relatively low, which is proven by the many cracks appeared as a result. Relatively neat appearance, the mould thinness, the intended regular shape and last but not least the fabric, approximate this mould and the subsequent to the preceding moulds (catalogue no. 5-6). Rectangular shape. Narrow catchplate, almost square, with a slightly curved edge. Mould used for casting a brooch. Systematic research 2009, S IIC, 605, G41C, between -2.40 and -2.70 m. Elefterescu 2011a, 6, Pl. III/1a-b. Analogies: moulds with similar prints appear in the brooch workshop at Napoca<sup>35</sup>. MDJC, inv. no. 54659.

**17.** Mould valve. Pl. VII/2 a-c (c - positive in modelling clay). Preserved the catchplate area. Definitely used. Thin lining layer, well preserved.  $L_p = 23$  mm;  $l_p = 23.4$  mm;  $h = 2.9-4.9$  mm; print depth = 0.1-1.9 mm. Casting imprint sizes:  $L_p = 37.4$  mm; L catchplate = 13.7 mm; h catchplate = 11.5-13.7 mm. The fabric appearance and specificities are identical with that of the preceding item (yet the imprint is of a slightly different item). Following use, it became smoky on the inside (identical with that of the previously mentioned items), and pink-orange on the outside. Rectangular in shape. Mould used for brooch casting. Systematic research 2009, S IIC, 607, G41C, between -2.50 and -3.20 m. Elefterescu 2011a, 7, Pl. II/6a-b. MDJC, inv. no. 54662.

**18.** Mould valve. Preserved a part of the mould, yet we cannot specify what sort of items were cast. Thin lining layer, relatively well preserved. Definitely used. Preserving two fragments very thick:  $33.1 \times 34.1$  mm;  $H = 11-15.4$  mm; print depth = 4.8 mm. The fabric appearance and specificities approximates it to mould inv. no. 755534. Following use, it became grey-black on the inside and, with variations from light-pink to pink-orange, on the outside. Rectangular in shape. Systematic research 2009, S IIC, 607 (G41C, between -2.50 and -3.20 m) and 608 (the area on top of G41C). Unpublished. MDJC, inv. no. 54665.

<sup>35</sup> Cociş 2004, Pl. CLXXI/5-8.



19. Mould valve. Preserved only a small part.  $15.2 \times 2.4$  mm;  $h = 14.4$  mm; print depth = 2.9 mm. Thin lining layer, relatively well preserved. Definitely used. Identical appearance and specificities with the preceding item. It might even belong to the same mould, given the edges, concave in this item and convex in the previous. Subsequent use, it became grey-black on the inside and light pink on the outside. Systematic research 2009, S IIC, 607, G41C, between -2.50 and -3.20 m. Unpublished. MDJC, inv. no. 55536.

20. Mould valve. Fragmentary. Lined, not used.  $36 \times 44.5$  mm;  $gr. = 18.4$  mm. Fine, very sandy fabric, with many mica particles and occasional traces of vegetal materials, orange-brown. Possibly oval valve. Mould used, most likely to cast a circular item. Systematic research 2010, S IIC, G 80. Unpublished. MDJC, inv. no. 56638.

21. Mould valve. Fragmentary. Strongly fired, lined, used.  $38.5 \times 41.2$  mm;  $gr. = 7.5-14.2$  mm. Fine, sandy fabric, black-grey on the inside and sand-colour on the outside. Similar to the preceding item in shape, yet thinner. Seems to have been used in making a circular item. Systematic research 2010, S IIC, G 80. Unpublished. MDJC, inv. no. 55539.

22. Mould valve. Fragmentary. Strongly fired, lined, used.  $35.6 \times 42.9$  mm;  $gr. = 6.2-10.7$  mm. Fine, sandy fabric, orange-grey with dark hues on the inner side and orange on the outer side. Similar to the preceding in shape. Despite the poor state of preservation, the small surviving areas seem to indicate its use in making a circular item. Systematic research 2010, S IIC, G 80. Unpublished. MDJC, inv. no. 55540.

The careless execution, shape and last but not least the discovery within the same archaeological context of the last three items evidence their making by the same artisan and the use as model of a single piece.

23. Mould valve. Preserving a small fragment, which according to the appearance, shape and clear existent lining layer makes us argue it represents the edge of a bivalve mould, fitted, lined and used. Systematic research 2009, S IIC, 607, G41C, between -2.50 and -3.20 m. Unpublished. MDJC, inv. no. 55542.

## A2. Multivalve moulds for simple impressing

24. Mould valve. Pl. VIII/3 a-c (c - positive in modelling clay). Preserving approximately two thirds of the lower valve. Not used.  $Dp = 46.4$  mm;  $h = 15.8$  mm. Casting imprint sizes:  $d = 24.6$  mm;  $h$  of the small *umbo* at the knob top = 5.5 mm; indent depth in the knob upper part = 3.1-5.4 mm. Fine, sandy fabric with much mica particles; the interior surface is cream-clayish and the exterior - displays stains from cream-clayish to orange. The fabric plasticity, at the time of impressing, was relatively low, which was proven, as mentioned above, by the many fissures emerged as a result. Circular shape, relatively neat appearance. On the mould edge preserves one of the knobs used for guiding when fitting the valves. The shape and sizes of the obtained item make us believe that the mould was composed of a lower valve, circular, and several vertical valves (very likely four), concave. Thin lining layer also due to the massiveness of the mould (the more the sizes of the item to be imprinted are larger, the greater the thickness of the impressing surface). Despite the fact it was definitely fitted and lined, therefore prepared for casting, for reasons unknown to us, it did not

occur. Mould made for casting a decorative knob. Systematic research 2009, S IIC, 608, area above G41C, with mixed material. Elefterescu 2011b, 1, Pl. II/1. MDJC, inv. no. 54667.

25. Mould valve. Pl. VIII/1 a-c (c - positive in modelling clay of both active sides). Not used. Vertical valve, fragmentary. Lp = 32.7 mm; h = 27.3 mm; gr. = 7.1-10.4 mm. Casting imprint sizes: h = 20.6 mm. Concave, elongated shape. On the lower edge survives one of the fitting holes, and on one of the sides - one of the fitting rods used for sliding when assembling the valves. Both the appearance, specificities of the fabric and lining as well as the find place are identical to the preceding, which makes us consider they are the valves of the same mould. Systematic research 2009, S IIC, 608, area above G41C, with mixed material. Elefterescu 2011b, 2, Pl. II/2. MDJC, inv. no. 54668.

26. Fragmentary mould valve (similar to the preceding). Pl. VIII/2 a-b. Unused. Hp = 49.3 mm; l. In upper part = 30.8 mm; lp in lower part = 11.9 mm; gr. = 10.2-11.4 mm. Casting imprint sizes: h = 32 mm; h upper part = 16.7 mm; hp of peg = 9.6 mm; h collar print = 6.2-7.7 mm. On the lower part, complete, survives one of the fitting holes, and on the right side, the fitting rod. Both the appearance, specificities of the fabric and lining are identical with item no. 12 herein, being discovered in the same feature. Concave, elongated shape. Mould used to cast a decorative knob. Given that the piece preserves complete the upper part and left side in at least 90%, we may draw a description/reconstruction of this mould type. It comprised a lower, circular valve and four trapezoid, grooved vertical valves. Four fitting rods lay on the lower valve. The vertical valves were provided in the lower part and on the left side with a fitting hole, and on the right side - with a fitting rod each. Noticeably, in the previous piece, the fitting rod was set in the lower third, while in the discussed valve it is placed in the upper third. Likely, such interrelated fitting rods were designed for a better and safer fitting of the valves. The gate formed to obtain the fitting peg was also used for metal casting. Given the evidence indicating the production of bone decorations, of the small bust of god Mars and the existence of certain toiletry boxes decorated with such knobs as well<sup>36</sup>, we may assume that such artifacts may have been produced in the workshop at Durostorum. In the collection of the Museum of Călărăși there are numerous such knobs, some with shapes and sizes similar to those of the items obtained with the presented moulds. Rescue excavation 1984, G 10. Elefterescu 2011b, 3, Pl. II/3. Analogies: since these knobs, with their numerous variants and uses are common items, discovered in very large numbers in Roman period settlements, we believe that listing analogies is no longer required. MDJC, inv. no. 55322.

27. Mould valve. Pl. VII/3 a-c (b - positive, both active sides in modelling clay). Trivalve mould, used. Preserving one of the two vertical valves of the mould. Very well preserved lining layer, in continuous slip (1.3 mm thickness). L = 35.1 mm; h = 26.3 mm; gr. = 7.7-12 mm. Casting imprint sizes: d knob = 22.4 mm; h peg = 12.3 mm; L gate = 14 mm. Mould used to cast a decorative pin/knob. Fine, sandy fabric, with many mica particles; the inside surface is cream-clayish and the exterior varies from

<sup>36</sup> Gáspár 1986, Pls. XXXII; CCCXXII-CCCXXIV; CCCXXVI; LXXVI-LXXVII; Gáspár 1997, Pls. XXXV and LXXIII; Redő 1995, Pl. 218, 220; Elefterescu 2008, Pl. X.

cream-clayish to smoky-grey. The print surface is grey. The appearance and specificities of the fabric are very similar to items number 24 and 25 herein. Two fitting holes are set on the upper mould edge. On the internal side, on either sides of the imprint, appear two fitting rods. The area of the casting hole is strongly everted, air and excess discharge being made by the tip of the fitting peg. Systematic research 2006, S IIC, *passim*. Unpublished. Analogies: two similar items (yet of different sizes), were discovered in Bulgaria, in a Thracian barrow grave dated to the 2<sup>nd</sup> century AD. They were part of the fitting elements of small toiletry box belonging to the deceased<sup>37</sup>. MDJC, inv. no. 54669.

28. Mould valve. 27.9 × 31.1 mm; gr. = 6.9–8.7 mm. Casting imprint sizes: d probable = 40 mm; Lp stem = 8.1 mm. Despite the fact that the shape of the preserved fragment resembles that of the bivalve moulds, the sizes and existence of a fitting rod makes us believe it is a multivalve mould<sup>38</sup>. Used. Very well preserved lining layer, in continuous slip, very thick (2.5 mm). Relative fine, sandy fabric, with frequent inclusions of mica particles, sporadically with traces of vegetal materials in composition. Grey orange in colour with black hues on the inside and orange with pink hues on the outside. The imprint of a circular object with a strong, wide stem. Systematic research 2010, S IIC, G 80. Unpublished. MDJC, inv. no. 55537.

29. Small fragment of a possible multivalve mould (there is a fitting hole), strongly burnt. The vitrification degree, synonymous with that of the crucibles, points to a possible secondary burning after the disuse of the item. Grooved valve. The fitting hole is set on the upper edge. Systematic research 2010, S IIC, G 80. Unpublished. MDJC, inv. no. 55538.

### A3. Varia

30. Fragmentary mould valve. Relatively well preserved lining. Intensively used. Very fine, strong dark fabric. It likely belonged to a circular mould, tubular. Systematic research 2009, S IIC, 607, G41C, between -2.50 and -3.20 m. Unpublished. MDJC, inv. no. 55541.

31. Small fragment of a mould valve strongly burnt, possibly secondary (until it became vitreous). 19 × 22 mm; h = 7–12 mm. Rectangular shape. It seems to belong to a univalve mould. Rescue excavation 1988, G 21. Unpublished. MDJC, inv. no. 43355.

32. Mould?. Pl. XI/1. Preserving a small part of the casting funnel area. No traces of use. Hp = 30 mm; d casting mouth = 30 mm; gr. = 11.1 mm. Fine, sandy, grey fabric. Systematic research 2010, S IIC, G 80. Unpublished. MDJC, inv. no. 55543.

33. Mould?. Preserving a small part in the casting funnel area. Smaller sizes than the preceding. No traces of use. Hp = 22 mm; lp = 20 mm; gr. = 0.8 mm. Fine, sandy fabric, with many mica particles, light orange, with a slight grey hue in the casting funnel area. Systematic research 2010, S IIC, G 80. Unpublished. MDJC, inv. no. 55544.

<sup>37</sup> Bujukliev 1984, Fig. 20 a-b.

<sup>38</sup> Large pieces, including bivalve moulds, had to be provided with fitting elements – see Jankov 1994, Fig. 1 and Minkova, Jankov 2004, 320, Fig. 1 – decorative applique for toiletry boxes, with d = 65–72 mm; gr. = 25 mm, dated to the end of the 1<sup>st</sup> century – early 2<sup>nd</sup> century AD, produced in a workshop belonging to a *villa rustica*.

## B. Crucibles

### B1. Crucibles (original use)

They are items made in general of fire clay<sup>39</sup> having, according to use, a porous appearance with many large hollows, grey-bluish and occasionally strongly vitrified on the outside. Their shape and appearance is similar to the many crucibles discovered, regardless the period and geographical area, on many archaeological sites like: Buciumi<sup>40</sup>, Porolisum<sup>41</sup>, Potaissa<sup>42</sup>, Tibiscum<sup>43</sup>, Moldova Nouă<sup>44</sup>, Gomolava<sup>45</sup>, *Claudia Celeia*<sup>46</sup>, *Flavia Solva*<sup>47</sup>, Vindobona<sup>48</sup>, *Nemetacum* (Arras)<sup>49</sup>, Villeneuve-Saint-Germain (Aisne)<sup>50</sup>, *Mediolanum* (Côte-d'Or)<sup>51</sup>, Jemelle (Rochefort, prov. de Namur, Belgium)<sup>52</sup>, Blicquy (Hainaut)<sup>53</sup>, Caerleon<sup>54</sup>, Walesland Rath, Pembrokeshire<sup>55</sup>, *Burrium* (Usk?)<sup>56</sup> etc.

Without the benefit of physical-chemical analyses<sup>57</sup>, we may say there are three types of fabric of which the crucibles we shall present below were made and that there is no visible relation between shape and fabric.

**Group a.** Most crucibles were made of a fine, dense fabric. After use, depending on the temperature to which they were exposed, various size air wholes appeared on their surface, the fabric becoming grey with different degrees of vitrification on the outside. The rather large appearance and structure differences is given by the large number of crucibles made of this fabric and the used manufacture techniques

<sup>39</sup> Analyses performed on some of crucible fragments discovered in Dacia show they were made at Potaissa of a mixture of lime, feldspar and quartz (Bărbulescu 1994, 109, Fig.18/9) and at *Dierna* (Orșova) of a "pottery fabric composed of best quality kaolinite, quartz and feldspar, which burns white flame and withstands high temperatures" (Stoicovici 1978, 245).

<sup>40</sup> Chirilă et alii 1972, 58, Pl. XXXI/1-3 - many fragments coming from at least 25 crucibles.

<sup>41</sup> Gudea 1989, Pl. CV/9-10.

<sup>42</sup> Bărbulescu 1994, 109.

<sup>43</sup> Benea, Bona 1994, Fig. 43-44, 47-48; Benea 2008, Figs. 3/1-5; 4/1-3; 5-6.

<sup>44</sup> Bozu 2009, 153 - metal processing workshop, where were identified three crucible fragments with metal traces.

<sup>45</sup> Gomolava 1986, 86, Fig. 260 - cone shaped crucibles, with copper oxide traces.

<sup>46</sup> Kolšek 1993, 265, Fig. 20, crucibles dated to the 2<sup>nd</sup>-3<sup>rd</sup> centuries AD.

<sup>47</sup> Gschwantler, Winter 1989-1990, 112, catalogue no. 1 (h = 93 mm; d = 38-47 mm; capacity 60 cm<sup>3</sup>).

<sup>48</sup> Sedlmayer 1998, Abb. I/1aM, 1bR.

<sup>49</sup> Arras-*Nemetacum* 1986,138, no. 294, end of the 2<sup>nd</sup> century AD.

<sup>50</sup> Debord 1993, Fig. 13/3-4.

<sup>51</sup> Roussel 1979b, 223. In this site operated three metal working workshops during the 1<sup>st</sup>-3<sup>rd</sup> centuries AD - see Roussel 1979a, 215.

<sup>52</sup> Bousier et alii 2001, Fig. 7.

<sup>53</sup> Amand 1975, 26, Figs. 10; 11/1-3. The microchemical analyses evidenced bronze traces on the inside (copper alloy with few zinc), and on the outside - wooden charcoal traces.

<sup>54</sup> Zienkiewicz et alii 1993, Fig. 46. The crucibles were discovered on all levels, confirming the fine metal working (copper, silver, gold alloys) during the entire existence period of the site (AD 75-200).

<sup>55</sup> Wainwright 1971, 90, 124-126, Fig. 36, crucibles dated to the 1<sup>st</sup> century BC - 1<sup>st</sup> century AD.

<sup>56</sup> Evans et alii 1989, catalogue no. 360, 365, Fig. 15.

<sup>57</sup> Zienkiewicz et alii 1993, 125: "most of the crucibles and trays are simply hand modelled of fire clay, which is remarkably homogenous; Benea 2008, 122-123: "The crucibles were made of clay fabric with grey or kaolinite tempers. In order to protect the recipient walls during the melting process and prevent metal sticking to the crucible, a protective layer was applied, which in the modern period consists of one part of sodium carbonate and three parts sodium borate (borax)".

(catalogue no. 35–39, 41–42, 44–45, 47–49, 51, 57–58, 61; in this pottery category also frame two of the lids – catalogue no. 75–76).

**Group b.** Seven of the items are made of a porous fabric, even with spongy appearance in some cases (displaying traces of many vegetal fragments in composition). In general, the walls of these recipients are thicker, likely for added endurance as well, given the poor quality of the fabric (catalogue no. 50, 52–53, 62 and lids no. 77–78).

**Group c.** The last group is produced of a fine fabric, dark-grey, slightly porous, with rare calcareous inclusions (catalogue no. 53, 59–60).

Item no. 64 evidences the existence of certain crucibles, which for various reasons, originally or after a few uses, had received a protective layer<sup>58</sup>. The specialty literature also describes the technique of the so-called moulds/crucibles. This technique consists in the reuse of multivalve moulds: after the wax melted and leaked, a crucible filled with the casting material was added, valves were fitted again and covered in a layer of consolidating clay and were used for casting objects. Unfortunately, the very small sizes of our fragment and the lack of analogies in the area, known to us, leave the issue open to discussion.

Subsequent use, most of the crucibles had the interior covered with slag and bronze oxides and the exterior with a vitreous layer, with colour variations from grey-greenish, brown-greenish, brown-dark brown to black.

34. Crucible. Pl. X/1. Preserving the lower third. Not used. Hp = 35.6 mm; dmaxp = 48.2 mm. Fine, brown-whitish fabric, with light grey to light maroon hues. The numerous small fissures in the surface evidence reduced plasticity of the clay of which it was made. According to the interior, with more regular walls, it was possible that a mould was used in obtaining the crucible (a simple wood piece with truncated-cone end), which it freely traced, without the use of the wheel. Truncated-cone shape with thick walls, at least in the preserved area (9.1 mm), slightly flattened bottom. Sizes and shape similar to the following item. Shore, 1956, *passim*. Elefterescu 2005a, 45. MDJC, inv. no. 40010.

35. Fragmentary crucible. Pl. X/2 a-c. Several fragments. H = 73.5 mm; dg ≈ 60 mm; gr. walls = 3–10.3 mm. Deformed and deep fissures on whole body, as result of intense use. Truncated cone shape, lightly inverted rim. Systematic research 2009, S IIC, 607, G41C, between -2.50 and -3.20 m. Unpublished. MDJC, inv. no. 55309.

36. Fragmentary crucible. Hp = 49.4 mm; gr. of walls = 10.2 mm. Inside the recipient is noticeable an iron slag piece overlapping bronze oxide traces, remained during casting. In the lower third, part of the wall became friable and whitish subsequent burning. Similar, very likely, to the preceding item (catalogue no. 35). Systematic research 2009, S IIC, 605 (G41C, between -2.40 and -2.70 m) and 608 (area above G41C). Unpublished. MDJC, inv. no. 55310.

37. Fragmentary crucible. Body and rim fragments. Similar to item no. 35 herein, yet shorter. Hp. (≈ 90%) = 54.4 mm; dg ≈ 50–60 mm; gr. of walls = 4.9–9.5 mm.

<sup>58</sup> Walke 1965, 61, 160, Taf. 129/7–9, 11; Chardron-Picault 2005, Fig. 2–3 – Vertault-Vertillum (Côte-d'Or) and Fig. 8 – Augustodunum; Roma sul Danubio 2002, III, 7, 224 – Carnuntum; Kortüm, Lauber 2004, 16, Pl. 46 and 219; 265, Pl. 226; 18–19 – Walheim; Ulbert 1969, 57, Pl. 61/8–10 – Rheingönheim (fort).



Systematic research 2009, S IIC, 607, G41C, between -2.50 and -3.20 m. Unpublished. MDJC, inv. no. 55313.

38. Fragmentary crucible. Body and rim fragments. Hp ( $\approx 90\%$ ) = 42.2 mm; gr. of walls = 4.9–9.2 mm. Strongly deformed, the item surfaces are almost vitreous. Similar to the preceding item. Systematic research 2009, S IIC, 607, G41C, between -2.50 and -3.20 m. Unpublished. MDJC, inv. no. 55314.

39. Fragmentary crucible. Surviving part of rim and wall. On the latter lies a large bronze slag piece, most likely glued subsequent to casting. Hp = 42.3 mm; dg  $\approx$  40 mm; gr. of walls = 5.4–6.8 mm. Similar to the preceding ones. Systematic research 1997, S IIC, 180, G 33, trench 014a; -1.80 m.; Elefterescu 2005a, 45. MDJC, inv. no. 43373.

40. Fragmentary crucible. Preserving a fragment covering almost the entire height of the crucible. Similar to the preceding items. Hp ( $\approx 90\%$ ) = 59.6 mm; gr. of walls = 5.4–10.8 mm. Systematic research 2005, S IIC, 549, G 41, between -1.60 and -2.60 m. Unpublished. MDJC, inv. no. 56632.

41. Fragmentary crucible. Preserving part of rim and wall. Hp = 20.3 mm; gr. of walls = 4.5–5.1 mm. Truncated cone shape, with slightly inverted rim. Similar, very likely, to item no. 37 herein. Systematic research 2010, S IIC, G 80. Unpublished. MDJC, inv. no. 55546.

42. Crucible. Fragment of base and body. Hp = 42.1 mm. Truncated cone shape. Similar, very likely, to item no. 37 herein. Systematic research 2009, S IIC, 607, G41C, between -2.50 and -3.20 m. Unpublished. MDJC, inv. no. 55311.

43. Crucible. Small fragment of body and rim. Hp = 23.2 mm; gr. of walls = 4.4–7.2 mm. Truncated cone shape, slightly inverted rim. Similar to previous recipients. Systematic research 2002, S IIC, 448, G 41, trenches 08–012G; between -0.86–1.32 m deep. Unpublished. MDJC, inv. no. 56629.

44. Fragmentary crucible – surviving part of rim and wall. Strongly deformed and deep fissures in the body upper part, all as a result of intensive use. Truncated cone shape. According to the walls' thickness and curvature, it seems that the item was relatively short and broad (H  $\approx$  40 mm; dg  $\approx$  50 mm). Hp. = 36.7 mm; dg  $\approx$  50 mm; gr. of walls = 5–10.9 mm. Systematic research 2003, S IIC, 472, trenches 02 B–D, between -0.65–1.35 m deep. Elefterescu 2005a, 45. MDJC, inv. no. 47912.

45. Fragmentary crucible – preserving part of rim and wall. Hp = 24 mm; dg  $\approx$  30 mm; gr. of walls = 4–7 mm. Flattened rim, thus obtaining a broad gate. Truncated cone shape, slightly inverted rim. Similar, likely, with item no. 35 herein. Systematic research 2010, S IIC, G 80. Unpublished. MDJC, inv. no. 55545.

46. Fragmentary crucible – preserving two small wall fragments. One of the fragments (of the upper part) evidences we are dealing with an item similar to the preceding, having a flattened rim in order to obtain a gate. Likely truncated cone shape, slightly inverted rim. Systematic research 2010, S IIC, G41B. Unpublished. MDJC, inv. no. 56631.

47. Fragmentary crucible, of which preserved a small rim and body fragment. Fine fabric, similar in appearance and colour to that of item no. 35 herein. Systematic research 2002, S IIC, 447A, G 41, trench 012E; between -2.98 and 3.52 m deep, below a layer of yellow earth. Unpublished. MDJC, inv. no. 55559.

48. Fragmentary crucible, preserving a small body fragment. Fine fabric, similar in appearance and colour to item no. 35 herein. Systematic research 2001, S IIC, 434, trenches 010-011 D-E, -0.70-1.60 m deep. Unpublished. MDJC, inv. no. 55547.

49. Fragmentary crucible, preserving part of the body. Due to the very high temperatures to which it was exposed, the item has the structure of a sandwich. It seems to belong to a crucible with sizes at least similar to item no. 35 herein, possibly with a larger diameter (a small deepening seems to have played the role of balancing the base). Systematic research 1998, S IIC, 354, G 41, trench 09 1-2 D, E; -1.15-1.20 m deep. Unpublished. MDJC, inv. no. 43375.

50. Fragmentary crucible, preserving part of rim and body. Pl. X/4 a-b. Hp = 53 mm; gr. of walls = 8.9-9.3 mm. Coarse fabric, spongy structure, very likely with many organic fragments in composition; variable colour, from cream-clayish to dark grey. The recipient has thick walls. In the lower part, the surface became vitreous. Truncated cone shape, very likely of sizes similar to crucible no. 35 herein. Systematic research 2009, S IIC, 607, G41C, between -2.50 and -3.20 m deep. Unpublished. MDJC, inv. no. 55255.

51. Fragmentary crucible, preserving a small rim and body fragment. The recipient has thick walls and a bronze print survived on the inside. Systematic research 1997, S IIC, 145, G 33, trench 06 a; -1.42-1.80 m deep. Unpublished. MDJC, inv. no. 55255.

52. Fragmentary crucible, preserving a small body fragment. Fine fabric, porous, grey. The recipient has thick walls and was intensively used. Systematic research 1998, S IIC, 258, G 33, trench 04 B; at -0.53-0.79 m deep (outside the pit) and at -0.79-0.92 m deep nearby. Unpublished. MDJC, inv. no. 55549.

53. Fragmentary crucible, preserving a small base and body fragment. Hp = 30.4 mm. Fine, slightly porous fabric, with a few calcareous inclusions, yellowish on the exterior and purple in the break. The interior surface of the recipient is covered with spongy matter, dark coloured. Systematic research 2009, S IIC, 608, from the area on top of G41C. Unpublished. MDJC, inv. no. 55312.

54. Fragmentary crucible, missing the base. Pl. X/3 a-b. Hp = 32 mm; dg ≈ 41-45.9 mm; gr. of walls = 3.6-9.6 mm. Due to intense use, of the very thick layer of bronze and metal oxides deposited especially on the interior walls of the vessel, it is hard to establish the fabric of which the crucible was made. The exterior surface, grey, exhibits vitreous areas or covered with oxides. Hemispherical shape, of small size, with rim inverted to obtain a gate. Systematic research 2006, S IIC, 564, area G 41, trenches 011-017 H, -0-2.00 m deep. Unpublished. Analogies: Tibiscum<sup>59</sup>, Caerleon<sup>60</sup>. MDJC, inv. no. 55323.

<sup>59</sup> Benea, Bona 1994. 98, 100, Figs. 47/6; 48/2. Similar items in shape and sizes, yet at least the specimen illustrated by Fig. 47/6 has no casting funnel. The workshop where they were found was deemed by the excavators as specialised in making silver and gold jewellery. Interestingly, in the fourth workshop at Tibiscum, partially investigated, all discovered crucibles had a *metal casting funnel*. This last workshop is dated to the first half of the 3<sup>rd</sup> century AD based on a brooch deemed waster; see also Benea 2008, Fig. 7/2.

<sup>60</sup> Zienkiewicz et alii 1993, 126, Fig. 46/1. The crucible is d = 29 mm, has vitrified walls and on the base - slag and gold droplets.

55. Fragmentary crucible, preserving two fragments of rim and body. Hp = 25 mm; gr. of walls = 3.5–7.8 mm. Fine, slightly porous fabric. Identical in shape with the preceding item. Systematic research 2005, S IIC, 557, G 41, trenches 015–016 E (½)-F, -1.37–1.90 m deep. Unpublished. MDJC, inv. no. 56628.

56. Fragmentary crucible, preserving a rim and body fragment. Hp = 29.9 mm; gr. of walls = 4.2–9.3 mm. Vitrified. Similar to preceding items. Systematic research 2002, S IIC, 448, G 41, trenches 08–012G; -0.86–1.32 m deep. Unpublished. MDJC, without inv. no.

57. Fragmentary crucible, preserving the upper third. Hp ( $\approx$  90%) = 30.8 mm; gr. of walls = 3–6.4 mm. Truncated cone shape, slightly inverted rim. Systematic research 2010, S IIC, G80. Unpublished. MDJC, inv. no. 55550.

58. Fragmentary crucible, preserving a rim and body fragment. Hp ( $\approx$  90%) = 31.6 mm; gr. of walls = 3.9–7.9 mm. Strongly deformed, the item's surfaces are almost vitrified. The general appearance is similar to that of item no. 38 herein. Of small sizes, likely hemispherical, with broad rim. Systematic research 2009, S IIC, 607, G41C, between -2.50 and -3.20 m deep. Unpublished. MDJC, inv. no. 55551.

59. Fragmentary crucible. Missing small part of the body and rim. Pl. XI/2 a-b. H = 22 mm; dg  $\approx$  40 mm; gr. of walls = 3.4–5.3 mm. Large rim portions became vitreous. Strongly fissured on the inside as a result of intensive use. Fine, slightly porous fabric, dark grey. Of very small sizes, truncated cone, broad mouth. Systematic research 2009, S IIC, 607, G41C, between -2.50 and -3.20 m. Unpublished. Analogies: Tibiscum<sup>61</sup>. MDJC, inv. no. 55254.

60. Fragmentary crucible, preserving part of the body. Seems to come from an identical piece with the preceding (catalogue no. 59). Less pronounced use traces. Systematic research 2009, S IIC, 604, G 41, trench 02 B, -2.10–2.70 m deep. Unpublished. MDJC, inv. no. 55552.

61. Fragmentary crucible, preserving the upper third. Hp ( $\approx$  90%) = 23.7 mm; gr. of walls = 4.4–7.6 mm. Truncated cone shape, broad mouth, slightly inverted. Smaller diameter than the preceding two. Systematic research 2010, S IIC, G 80. Unpublished. MDJC, inv. no. 55553.

62. Fragmentary crucible, preserving a body fragment. Likely coming from a large size crucible. Systematic research 2003, S IIC, 482, G 41, passim. Unpublished. Analogy: Micia<sup>62</sup>. MDJC, inv. no. 55554.

63. Fragmentary crucible, preserving a body fragment. Although the appearance of the fragment is almost identical to that of the preceding item, the existence of a lining layer clearly shows we are dealing with two different recipients. Systematic research 2005, S IIC, 557, G 41, trench 015–016 E (½)-F, -1.37–1.90 m deep. Unpublished. MDJC, inv. no. 56633.

<sup>61</sup> Benea, Bona 1994. 98, Fig. 47/3; 48/3 – the workshop where they emerged was considered by the authors as specialised in making gold and silver jewellery; see also Benea 2008, Fig. 7/3.

<sup>62</sup> Petculescu, Mitar, Barbu 2007 – a bottom/base of a large size crucible was discovered in the depositions on the workshop level.

## B2. Crucibles (secondary use)

### *Crucibles obtained by converting common wares*

The conversion of common wares into crucibles may be also found at Dierna<sup>63</sup>, Moldova Nouă<sup>64</sup>, *Vicus Fortunae (Poetovio)*<sup>65</sup>, Verulamium<sup>66</sup>. Special artifacts seem to be the items discovered at Caerleon<sup>67</sup>. Even better documented is the lining method (consolidating crucibles with the aid of a clay layer) in glass making workshops<sup>68</sup>. It is though worth mentioning that the majority of these wares (used in glass making workshops) are of relatively large sizes, being used in reheating and colouring glass fabric and/or its clearing<sup>69</sup>.

**64.** Crucible/bowl. Pl. XI/3 a-c. Preserving eight rim and body fragments. Crucible obtained by hardening the exterior surface of a small cup. The item is of small sizes, has a strongly everted rim and grooved body. Fine, sandy fabric, with small ferrous particles in composition, yellow-whitish. In areas affected by temperature, the colour is grey. Inside the piece, which became dark with dark purple areas, are noticeable slag pieces and bronze droplets. Slag pieces also appear on the exterior of the piece. Based on structure, appearance, endurance to high temperatures, the consolidating layer seems to have been made of the same clay as in crucible no. 35 herein. The lining seems to have not covered the entire vessel (one of the fragments has no lining traces, being covered with a thin layer of vitreous appearance), at least at a certain point of its use. Systematic research 2009, S IIC, 607, G41C, between -2.50 and -3.20 m. Unpublished. Analogies: a small bowl changed into a crucible was discovered at Tibiscum<sup>70</sup>. For analogies of the recipient shape see Rădulescu 1975, Pl. IV/1-3; Popilian 1976, one-handled cups type 3; Mușeteanu, Elefterescu 1985, 73, catalogue no. 5a, Pl. III. MDJC, inv. no. 55256.

<sup>63</sup> Stoicovici 1978, 245; Bodor, Winkler 1979, 144, Fig. 3; 149; 153.

<sup>64</sup> On site "Ogașul Băieșului" (miner settlement dated to the 2<sup>nd</sup>-3<sup>rd</sup> centuries AD), excavations carried out showed that four of the investigated building rooms functioned as workshops-foundry - see Bozu 1996, 77.

<sup>65</sup> Vomer Gojkovič 2008, 174, Fig. 2.

<sup>66</sup> Frere 1972, 81, Fig. 141, Pl. LII a-b; some of the crucibles preserved gold traces on the inside.

<sup>67</sup> Items similar to small cups, the author believing though they are crucibles made on the potters' wheel, whose walls were lined with fire clay on the outside - see Zienkiewicz et alii 1993, 124, Fig. 46/10.

<sup>68</sup> D. Foy and M.-D. Nenna show that pots made of fire clay, often discovered in glass making workshops by the end of the Antiquity, are used during the 1<sup>st</sup>-4<sup>th</sup> centuries AD not only in the *officinae* from Gallia, but from all over the Roman West and that despite the refractory qualities, these crucibles were lined in clay - see Foy, Nenna 2001, 64-65. At Avenches, they are in the shape of cylinder pots (form 3), being covered with a protective clay crust (Amrein 2001, 81-84, cf. Motte, Martin 2003, 316). At Tibiscum these recipients "...were simple red ceramic pots, usually covered on the outside with a protective clay layer of 1 cm thick, for increased endurance of the pots to high temperatures..." (Benea, Bona 1994, 101). A dating similar to the workshops in the settlement at Durostorum-Ferma 4 is at Sanxay (Vienne), where a settlement active during the 2<sup>nd</sup>-3<sup>rd</sup> centuries was identified (Simon-Hiernard, Dubreuil 2003, 160; 195; 198, Fig. 3-4. Other examples come from the settlements at Lyon (La Butte) (Motte, Martin 2003, 316) and Tibiscum (Benea 1983, 208-209; Benea 2004, 167, 169).

<sup>69</sup> Benea, Bona 1994, 101.

<sup>70</sup> Benea 2008, Fig. 4/4 - based on drawing, the text does not specify that respective item was reused as crucible.

65. Crucible/small cup. Small rim and shoulder fragment. The recipient shape and fabric are similar to the preceding. On the vessel walls appear large bronze oxide pieces. Systematic research 2001, S IIC, 425, G 41, trench 011 C-E; -1.50 m. Unpublished. MDJC, inv. no. 56637.

66. Crucible/small cup. Small rim fragment. Similar to the preceding. Systematic research 2009, S IIC, 607, G41C, between -2.50 and -3.20 m. Unpublished. MDJC, no inv. no.

67. Crucible/small cup, preserving a body fragment. The entire exterior surface is strongly vitrified, including also slag pieces. Systematic research 1998, S IIC, 187, above and in G 33, trenches 08-09 b-c; -0.75-1.70 m. MDJC, inv. no. 43374.

68. Crucible/average size vessel. Pl. XI/4 a-b. Body fragment. The recipient was obtained by lining an average size vessel (according to the walls' thickness). Fine, sandy fabric, whitish. Based on structure, appearance, endurance to high temperatures, the consolidating layer seems to have been produced of the same clay with crucible no. 35 herein. Systematic research 2002, S IIC, 445E, G 60, 02 (20 cm)-04 F, -1.10-1.60 m. Unpublished. Analogies: similar sizes and shape with those of the vessels at *Vicus Fortunata* (Poetovio)<sup>71</sup>. MDJC, inv. no. 55555.

From assemblage G41C also come four small fragments of lined small cups, morphologically identical with those presented herein.

### B3. Lining

69. Fragmentary lining. It consolidated the outer surface of an average size vessel, likely a bowl. Semifine fabric, with much organic matter (currently having a porous appearance and a light grey colour). On the inside wall, in fact attached to the wall, there is a piece of bronze oxide or even of metal and beside, traces of another piece, this being likely due to the successive application of clay layers (for consolidation or repair). We do not exclude the possibility that these metal fragments reached there accidentally. Systematic research 2009, S IIC, assemblage G 41, passim. Unpublished. MDJC, inv. no. 55556.

70. Fragmentary lining. Likely consolidated the exterior surface of an average to small size vessel. Systematic research 1999, S IIC, 383, above G 41, trenches 09-010 (30 cm) 1/2 D; -0.60-1.20 m. Unpublished. MDJC, inv. no. 55557.

71. Fragmentary lining. Likely consolidated the exterior surface of an average to small size vessel. Systematic research 2009, S IIC, 607, G41C, between -2.50 and -3.20 m. Unpublished. MDJC, inv. no. 55558.

72. Lining. Preserving rim and body fragment. Db = 100 mm. Many fissures on the exterior. Fine, sandy fabric, with many mica particles and rare iron oxide particles in composition, brown in colour, with yellow stains on the outside. On the inside and good part of the walls' thickness, the fabric became black with slight grey hues. The cut and clearly finished rim, the smooth interior, even though with many fissures, suggests the possibility that the layer covered/consolidated a hemispherical bowl, with vertical rim, changed into a crucible. On the inside appear traces of iron oxide. Rescue excavation 1988, G 21. Unpublished. MDJC, inv. no. 43352.

<sup>71</sup> Vomer Gojkovič 2008, 174, Fig. 2.



73. Lining. Preserving rim and body fragment. Db = 100 mm. General appearance similar to the preceding, yet the smaller height and find context make us believe it as the lining of the above item lid. Rescue excavation 1988, G 21. Unpublished. MDJC, inv. no. 43353.

74. Lining. Preserving two fragments that seem to belong to the same item. Very thick lining layer (7.9–11.5 mm), with the exterior strongly barbotined (we do not know whether this specificity also had a practical, intended role, the surface increase resulting in preserving the temperature). Coarse fabric, with vegetal fragments and calcareous inclusions in composition, of variable colour, after use, from brown-orange to black. Systematic research 2009, S IIC, 607, G41C, between -2.50 and -3.20 m. Unpublished. MDJC, inv. no. 56636.

#### B4. Crucible lids

75. Deformed crucible lid. Pl. XII/1. Preserving part of the rim, body and one knob. Db = 60 mm; hp = 27.5 mm. The fabric seems (according to the appearance, structure, colour, endurance to high temperatures), similar to crucibles in group a. The difference, also possibly just an accident, is given by the existence in the fabric structure of at least one iron oxide piece, used in the area as temper for certain pottery categories<sup>72</sup>. Very thick walls, with many fissures. On the surface appear traces of iron and bronze oxides. Circular shape, with convex interior. Systematic research 2001, S IIC, 435B, G 41, trench 011D, -2.60–3.33 m. Unpublished. MDJC, inv. no. 42982.

76. Crucible lid. Pl. XI/2 a-b. Preserving part of the rim, body and one knob. Db = 50 mm; hp. = 24.3 mm. Fabric with no visible inclusions, of grey-brownish colour in the break and grey-bluish on the outside. Following the high temperatures to which it was exposed (close to the vitrification point), the fabric exhibits in the break a porous appearance, of low density. It is very possible that the lack of original plasticity also contributed to this appearance, which is supported as well by the visible disinterest for shape, appearance, the worker clearly aiming at usefulness. The lid edges, whose surfaces became vitreous, are stained with oxides. Circular shape, with flat useful surface. Slightly deformed. Systematic research 2001, S IIC, G 41, passim. Unpublished. MDJC, inv. no. 55315.

77. Fragmentary crucible lid, of which part of the rim and wall survived. Db = 80 mm; gr. of walls = 7.1–12.9 mm. Rough execution, strictly functional. Grey-smoky fabric, coarse, porous structure, similar to item no. 50 herein. Very thick walls. Circular shape, concave on the inside. Slightly deformed. Systematic research, S IIC (uncertain marking). Unpublished. MDJC, inv. no. 55320.

78. Fragmentary crucible lid, of which part of the rim and wall survived. Db ≈ 120 mm; gr.p. of walls = 8.6–15.1 mm. Fabric similar to the preceding. Very thick walls, very large, which supports the idea of the existence within the workshop of average and large crucibles<sup>73</sup>. Circular shape, concave on the inside. Systematic

<sup>72</sup> There are two specific groups of common wares in the area – pottery groups 4 and 9 – see Muşeteanu, Culică, Elefterescu 1980, 284; Muşeteanu, Elefterescu 1985, 67–68.

<sup>73</sup> From the glass workshops at Hambach comes a dark grey fabric vessel, covered on the outside with a clay protection mantle. This vessel was of 6 litres in capacity (15 kg of glass paste) – see Gaitzsch 2001, HA 500, Figs. 15–16; Wedepohl, Gaitzsch, Follmann-Schulz 2001, 56, Fig. 1.

research 1999, S IIC, 405, S IIC, G 41, trenches 05-07 ½D; -0.80 m. Unpublished. MDJC, inv. no. 47913.

There are no analogies for our items insofar, with one exception, at Tibiscum (and that for glass working workshops)<sup>74</sup>.

### C. Semi-finished and waster items

We start by mentioning that often, in the literature, we found that artifacts exhibiting clear use traces (applique with bent fitting peg, lock plate with already pierced key orifice, spikes, bent nails, hence fitted, a “waster” brooch yet having a black glass bead fitted in a cabochon etc.) were deemed wasters. If specimens identified as deposited for re-melting have no bearing on the context analysis, those discovered in workshops and deemed their products clearly corrupted the conclusions, being believed local products.

79. Zoomorphic brooch (“Tierfibel”), depicting a horse. Pl. XII/3 a-c. Complete. Brooch. L with excess casting = 47.2 mm; L = 35.1 mm; l = 19.2 mm; gr. = 2.7 mm. Cast in a bivalve mould of unequal valves, finishing not removed. Waster, made in a mould with blurred details (or the mould was made after a piece with worn details). In the lower part it exhibits bent portions and faults in the basic field. The fastening systems in the back side were not finished. Field research, shore, passim. Elefterescu 2011a, 8, Pl. III/2 a-c. Analogies: An identical specimen with unknown find place was published by D. Popescu in 1945<sup>75</sup>. Similar items in shape were discovered at Buciumi<sup>76</sup>, Dura Europos<sup>77</sup> and Lauriacum<sup>78</sup>. Two similar items are framed by J. Matouschek and H. Nowak in the category of horse and rider brooches, variant 2a<sup>79</sup>. S. Cociş dates such simple brooches, with no enamel and detached spring discovered in Dacia during the entire 2<sup>nd</sup> century AD<sup>80</sup>. By mid the same century is dated an item discovered at Thamusida<sup>81</sup> and another discovered in the cemetery at Viminacium<sup>82</sup>. A brooch similar in shape, of silver, was recently discovered in one of the two main graves of a barrow in the Târgovişte (Bulgaria) region, dated to the last quarter of the 2<sup>nd</sup> century AD<sup>83</sup>. MDJC, inv. no. 55560.

<sup>74</sup> Benea 2004, 170 – around oven no. 2 for glass melting were discovered “two handmade lids, in Dacian manner, of a coarse fabric with much large temper in composition. The pieces had on the exterior surface a glaze layer. Inside, glass traces were found”.

<sup>75</sup> Popescu 1941-1944, 501, Pl. IX/100; Cociş 2004, type 22a1, catalogue no. 1399, Pl. C/1399.

<sup>76</sup> In building no. 4 (*praetorium*) of the fort – see Chirilă et alii 1972, 90, Pl. XCVI/4; Gudea, Lucăcel 1979, 338, Pl. XV/167; Cociş 2004, type 22a1, catalogue no. 1398, Pl. C/1398.

<sup>77</sup> Toll 1949, catalogue no. 166, Pl. XVII (L = 39 mm; l = 23 mm).

<sup>78</sup> Jobst 1975, 114, 207, type 29, zoomorphic brooches (“*Tierfibeln*”), variant B (horse-shaped), catalogue no. 322, Pls. 46; 70.

<sup>79</sup> Matouschek, Nowak 1986, type 2, variant a (“*Pferde-und Reiterfibeln*”), 188-189, 220, Figs. 13-14, photo 19/13-14.

<sup>80</sup> Cociş 2004, 118-119.

<sup>81</sup> Gerharz 1987, 96, Abb. 14/96 (Thamusida, Maison du dallage).

<sup>82</sup> Redžić 2008, 66, Pl. XXIV/272 – type XXVI, variant 1, zoomorphic brooches dated to the first half of the 2<sup>nd</sup> century AD (by coins from Faustina Minor and Marcus Aurelius).

<sup>83</sup> Rusev 2012, 338, M1, Pl. 6/2.

80. Belt tongue. Pl. XII/4 a-b. Complete. L = 35.4 mm; l = 10.4–11.9 mm; gr. = 2.9 mm. Sizes of the cast item (without finishing): L = 7–10 mm; l = 2.7–13.1 mm; gr. = 6.5–7.9 mm. Cast in a bivalve mould, finishing not removed. Waster. Compared to the preceding mould (catalogue no. 79), the mould in which the item was cast had equal prints in depth (the finishing is by mid thickness of the item) and on one of the valves lay a small orifice for air and excess metal removal. The item has no casting flaws, nothing visible to justify the finishing cessation. Systematic research 1998, S IIC, 288, G 41, trench 09C; -0.64–0.85 m. Analogies: from Porolissum comes a waster (fact evidenced by the inexistent orifice and non-removed finishing)<sup>84</sup>. MDJC, inv. no. 43377.

81. Buckle. Pl. XIII/1 a-b. Complete. L = 28.1 mm; l = 18.2–23.2 mm; gr. = 3.7 mm. Sizes of the cast item (without finishing): L = 25.9 mm; l = 16.2–23 mm; gr. = 3 mm. Cast in a bivalve mould, non-removed finishing. Mould with slightly unequal prints. The item has no casting flaws. Collection Vasile Culică<sup>85</sup>. Unpublished. Analogies: the valve of a mould for making an identical item was discovered at Tibiscum, among the ruins of a military character workshop, dated to the 2<sup>nd</sup> century AD, specialised in making harness pieces<sup>86</sup>. Similar items were discovered in the fort at Buciumi<sup>87</sup>, Porolissum<sup>88</sup>, Dierna<sup>89</sup>, Micia<sup>90</sup>, Carnuntum<sup>91</sup>, Brigetio (in the workshops of *legio I Adiutrix*)<sup>92</sup>, Lauriacum<sup>93</sup>. MDJC, inv. no. 55563.

82. Spike. Pl. XIII/4. Complete. L = 25 mm; l = 1.9–10.9 mm; gr. = 3–8 mm. Sizes of the cast item (without finishing): L = 24.9 mm; l = 2.7–7.7 mm; gr. = 6.5–7.9 mm. Cast in a bivalve mould, non-removed finishing. Mould with unequal prints. It shows no casting flaws. Field research, shore, passim. Elefterescu 2005a, 60. MDJC, inv. no. 41211.

83. Spike. Pl. XIII/3. Complete. L = 16.5 mm; l = 2.9–6.6 mm; gr. = 2.1–4.5 mm. Sizes of the cast item (without finishing): L = 16.5 mm; l = 1.9–4.5 mm; gr. = 2.1–4.5 mm. Cast in a bivalve mould, non-removed finishing. Mould with equal prints. It shows no casting flaws. Collection Vasile Culică. Unpublished. MDJC, inv. no. 55564.

<sup>84</sup> Gudea 1989, 658–659, Pl. CCXIII/13 – type XXII (belt appliques with lamellar body) (sic!).

<sup>85</sup> We mention that most of the items in the collection come from the field research carried out by late V. Culică in the area of the settlements at *Durostorum*-Ferma 4 Ostrovit and *Sucidava* (Pârjoaia/Izvoarele, Constanța county). Although we are not sure to which of the settlements they belong, we believed necessary to publish herein two of the items (catalogue nos. 81 and 83).

<sup>86</sup> Benea, Bona 1994, 97–98, Fig. 44/4; Benea 2008, Fig. 5/4.

<sup>87</sup> Chirilă et alii 1972, 69, buckles no. 7, Pl. LXXI/11, 34; LXXI/42.

<sup>88</sup> Gudea 1989, 675–676, catalogue no. 11 (in fact 12)–17 (in fact 18), Pl. CCXXII – type VI buckles (with attachment ear and semicircular body, the variant with triangular ear). From Porolissum also come two moulds that seem to have been used still for casting buckles (which seems to be evidenced as well by the large number of items and the similar sizes of the buckles above with respective moulds) – see Gudea 1989, 509, Pls. CV/1 and Pl. CV/6. See also Gudea 1986, Fig. 34, image in the middle.

<sup>89</sup> Bodor, Winkler 1979, Fig. 8/3–4. One of the illustrated pieces – Fig. 8/3 – is definitely a local product (the drawing shows that the finishing was not removed); Cociș 2006, 113.

<sup>90</sup> Petculescu 1991, Figs. 1–2, 9 (we hereby thank the author for the information); Alicu, Țentea 2005, 68, Fig. II/2–3 – two waster buckles, similar in shape; Petculescu 2006, 140–141.

<sup>91</sup> Gschwantler, Winter 1989–1990, 128, catalogue no. 21, piece dated to the interval comprised between mid 2<sup>nd</sup> and mid 3<sup>rd</sup> centuries AD.

<sup>92</sup> Bónis 1986, Pl. 2/1.

<sup>93</sup> Wieser 1999, 15, Taf. III/14 – piece with not removed finishing.

84. Ring-key. Pl. XIII/2 a-c. Fragmentary (missing ring). D ring = 18.5 mm; L active part = 18.3 mm; hp = 23.6 mm; gr. = 12.1 mm. Cast in a bivalve mould, non-removed finishing. Waster. Mould with unequal prints. Many casting flaws (the proper key displays many hollows and the upper half of the ring may have not been even). It clearly shows that the active part of the key was cold worked to suit the corresponding lock element (subsequently, it was cast and finished). Field research 1984, shore, passim. Unpublished. Analogies: A ring-key (tubular) waster was discovered at Micia<sup>94</sup>, another at Porolissum<sup>95</sup>. MDJC, inv. no. 15205.

85. Decorative knob. Pl. XIII/8 a-b. D top = 7.5-9.8 mm; d base = 10-11.5 mm; h = 20.8 mm. Complete. Cast in a bivalve mould, non-removed finishing. Waster. Mould with slightly unequal prints. It shows many casting flaws (many hollows). Pawn-shaped knob with an attachment orifice by the base. Field research 2003, shore, passim. Unpublished. MDJC, inv. no. 56634.

86. Decorative knob. Pl. XIII/6. D top = 7.2-8.3 mm; d base = 7.9-8.1 mm; hp. = 13.5 mm. Complete. Cast in a bivalve mould, non-removed finishing. Waster. Bobbin-shaped knob. An attachment stem (possibly fragmentary) lies by the base. Field research 2007, shore, passim. Unpublished. MDJC, inv. no. 56635.

87. Fragmentary waster. Pl. XII/5 a-b. Lp = 46.8 mm; l = 14.5 mm; gr. = 6.5-7.9 mm. Sizes of the cast item (without finishing): Lp = 43.4 mm; l = 2.7-13.1 mm; gr. = 6.5-7.9 mm. Cast in a bivalve mould, non-removed finishing. Mould with unequal prints. Field research, shore, passim. Elefterescu 2005a, 60. MDJC, inv. no. 41210.

#### D. Casting sprues

88. Casting excess (casting sprue). Field research, shore, passim. Unpublished. MDJC, inv. no. 21788.

89. Casting excess (casting sprue). Field research 1978, shore, chance find E. Pană. Unpublished. MDJC, inv. no. 55562.

90. Casting excess (casting sprue). Pl. XIII/7. Seems to come from a multiple mould, with two gates, likely for two items cast concurrently. Systematic research 1999, S IIC, 389, G 41, trenches 09-010 1/2 D (15 cm); -1.57-2.02 m. Unpublished. MDJC, inv. no. 55561.

91. Casting excess (casting sprue). Pl. XIII/5 a-b. Seems to come from a multiple mould, with several gates. Systematic research, shore, passim. Unpublished. MDJC, inv. no. 52070.

Analogies for casting sprues are numerous, therefore we shall present a few examples discovered on the sites at Tibiscum<sup>96</sup>, Dierna<sup>97</sup>, Maria Saal, Zollfeld<sup>98</sup>, Blicquy (Hainaut)<sup>99</sup> etc.

<sup>94</sup> Alicu, Țentea 2005, 68-69, Fig. II/5.

<sup>95</sup> Tamba 2008. Among the pieces discovered in building LM1 are also presented two ring-keys (Fig. VI/3, 30), which seem wasters or half-finished items.

<sup>96</sup> Benea 2008, Fig. 4/7.

<sup>97</sup> Cociș 2006, Pl. 2/10-12; Benea 2008, Fig. 17/1-3.

<sup>98</sup> Gschwantler, Winter 1989-1990, 114, catalogue no. 4.

<sup>99</sup> Amand 1975, Fig. 11/4; 12/5.

However, we cannot disregard the possibility, suggested for the time being by only the last two presented items, that the workshop/workshops in the area made also use of multiple moulds especially for the concurrent cast of several objects.

## Conclusions

We believe that the pedoclimate conditions<sup>100</sup> and the vicinity to a water course, which allowed the circulation of merchandise at lower prices, underlay the emergence and development of this settlement, which, in our view, is clearly defined as a true crafting quarter<sup>101</sup>, related (regardless distances, to the ancient topography and legal form of the settlements) to the fort and *canabae* located less than 3 km away.

Similarly to the finds in Dacia<sup>102</sup>, the production of these workshops seems to have been limited to making small items, of daily use and small trading value.

The simple impressing means likely also allowed the reproduction of items not found in the artisan's repertoire, the items brought by the orderer being easy to copy<sup>103</sup>, possibly with even small changes to the model<sup>104</sup>. Such modelling proficiency, the possibility of small changes<sup>105</sup>, the existence of travelling artisans or of those called in for special orders<sup>106</sup>, make it hard, in our view, if not occasionally even impossible<sup>107</sup>, to confirm, alike the case of the finds from other settlements, the local **prints/peculiarities**, with the mention we are strictly referring to the production of small common objects<sup>108</sup>, fact also mentioned by S. Tassinari and F. Burkhalter in their presentation of the ancient metal working workshop at Tartous (Syria)<sup>109</sup>.

<sup>100</sup> The ancient settlement is located in a loop-shaped valley, protected from wind, rich in springs, of which some reached the area of the pottery workshops (even now, above this area appear small reed portions). Moreover, in the area many portions lay nearby sloping banks, which facilitated the construction of pottery firing kilns.

<sup>101</sup> See the case of the workshops at Montée at Butte, which operated extensively during the second half of the 1<sup>st</sup> century AD. This *officina* belonged to a vast ancient crafting quarter, located on the left bank of Saône River. The workshops located there (pottery and glass making), thus benefited of a naval access way facilitating both imports of raw materials as well as the export of finished goods – Motte, Martin 2003, 318. Other examples include the “*industrial assemblage*” at Usk (*Burrium?*), dated to the 1<sup>st</sup> century – early following century (Evans et alii 1989, 33–35, 66) and the great crafting centre discovered in the Arbanas quarter at Radomir. The latter, located on the Struma river bank, was dated to the 2<sup>nd</sup> century – mid 3<sup>rd</sup> century AD – see Ljubenova 1985, 37.

<sup>102</sup> See to this effect the numerous and valuable contributions of L. Țeposu-Marinescu, N. Gudea and especially D. Benea and S. Cociș on the topic.

<sup>103</sup> Barnea 1955, 102–104; Adam, Feugère 1982, 134–139.

<sup>104</sup> A very clear example, a mould at Dura-Europos (Toll 1949, 43). See also Adam, Feugère 1982, 133–145, Fig. 10.

<sup>105</sup> We believe that such checks were made simply, by casting clay, the differences emerged upon drying facilitating the removal of the piece without the mechanical destruction of the mould.

<sup>106</sup> Morel, Chevalley 2001, 141–162, Fig. 3–10. A simple feature in the courtyard of a *villa*, whose owner, sufficiently “elevated” and “rich”, ordered the making of a large size statue to a specially arrived artisan. Noticeable is the simplicity/precariousness of the feature.

<sup>107</sup> The used metal, of different sources, coming inclusively from re-melting certain discarded or waster items, makes irrelevant its analyses.

<sup>108</sup> At the risk of easily contradicting ourselves, we cannot fail to note the clear unity of the two mould groups: from *Durostorum*-Ostrov and Porolissum – see the practically identical appearance of the three moulds discovered on this site (at least this results from the published photo) – see Gudea 1986, Fig. 34.

<sup>109</sup> Tassinari, Burkhalter 1984, 87.



Before concluding, we believe justified, to pose the question of the specially made models<sup>110</sup> and their necessity (why the need for making two almost identical models, when the same model could be used for successive impressing<sup>111</sup>). We wish to mention that, far from denying the existence of the “standard models”<sup>112</sup> as previously specified<sup>113</sup>, we believe that original items, often brought for copying by even the orderer were used especially for making objects of small commercial value and for a usually local market. These unfunctional “standard models” made of lead, bronze, zinc, iron, bone and wood might have rather been commercial presentation samples. It is hard to accept the idea of the use of lead (material of high malleability) or bone or wood standards (small items, the standard having a definite poor endurance when pressed into the mould)<sup>114</sup>. It is yet possible that casting test specimens made of lead existed (malleable and with a low melting point) for changing decoration or particularising an item when directly working on the fresh imprint and especially for checking the wear degree of reusable moulds<sup>115</sup>.

As a general conclusion, we believe that the existence of the workshops (regardless, in principle, the worked material)<sup>116</sup>, servicing a local or provincial market, also dealing with the repair of already existent pieces (be it either tools, weapons, accessories or jewellery), workshops that made various objects, fashionable and according to the demographic (local tradition or immigrant group) and social structures (purchasing power), were part of the daily life of any more developed Roman settlement (under civil or military administration) (starting with small *vicus*, *canabae* type settlements etc.).

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<sup>110</sup> Rustoiu 1997, 24–25; Cociş 2004, 25–26.

<sup>111</sup> Cociş 2004, type 22f2, Pl. CLXXI/3 – clay mould discovered at Napoca, obtained by the “lost-wax” method, bearing the prints of two similar, **yet not identical** zoomorphic brooches.

<sup>112</sup> Cociş 2004, 24.

<sup>113</sup> Elefterescu 2010a, 164.

<sup>114</sup> See to this effect the fact that for “Jezerine” brooches, wax models, despite the fact they could be easily curved by heating (yet clearly increasing accident fragmentation risks), are cast in rectilinear format, curves being obtained after bronze casting – Adam, Feugère 1982, 133–145, Fig. 10.

<sup>115</sup> A possible example is the lead brooch (half-finished? or water?) in the collections of MNIT, inv. no. I. 396. It obviously lacks the part onto which the spring was attached, and the catchplate is already bent – see Crişan 1979, 297–299, 309, Pls. VII/3; XVIII/2 (bronze brooch with unfinished semicircular plate, inv. no. I. 396, Şimleul Silvaniei, Sălaj county); Cociş 2004, type 19, knee brooches “*likely a model for this type specimens*” (Cociş 2004, 89), Pl. LXI/903 – type 19a1b1b; Pb; Porolissum, MNIT, inv. no. I. 396 (Cociş 2004, 190). The catchplate was bent after removal from the mould, which is clearly noticeable on the brooches discovered still in Dacia (Cociş 2007, Pl. 1/1 (correct Pl. 1/2) and Pl. 1/12).

<sup>116</sup> The existence and trade of the raw material, also impacting transport facilities (various metal ingots and glass), the reuse of materials (including glass), the small necessary quantity (most of the items being of small size), make possible the working of materials which were not found, were not extracted in the respective area. Incidentally, in the deposit of the Lower Danube Museum of Călăraşi counts a red coral piece brought from the Mediterranean areas, likely for working (for making beads), item discovered by chance in the settlement.

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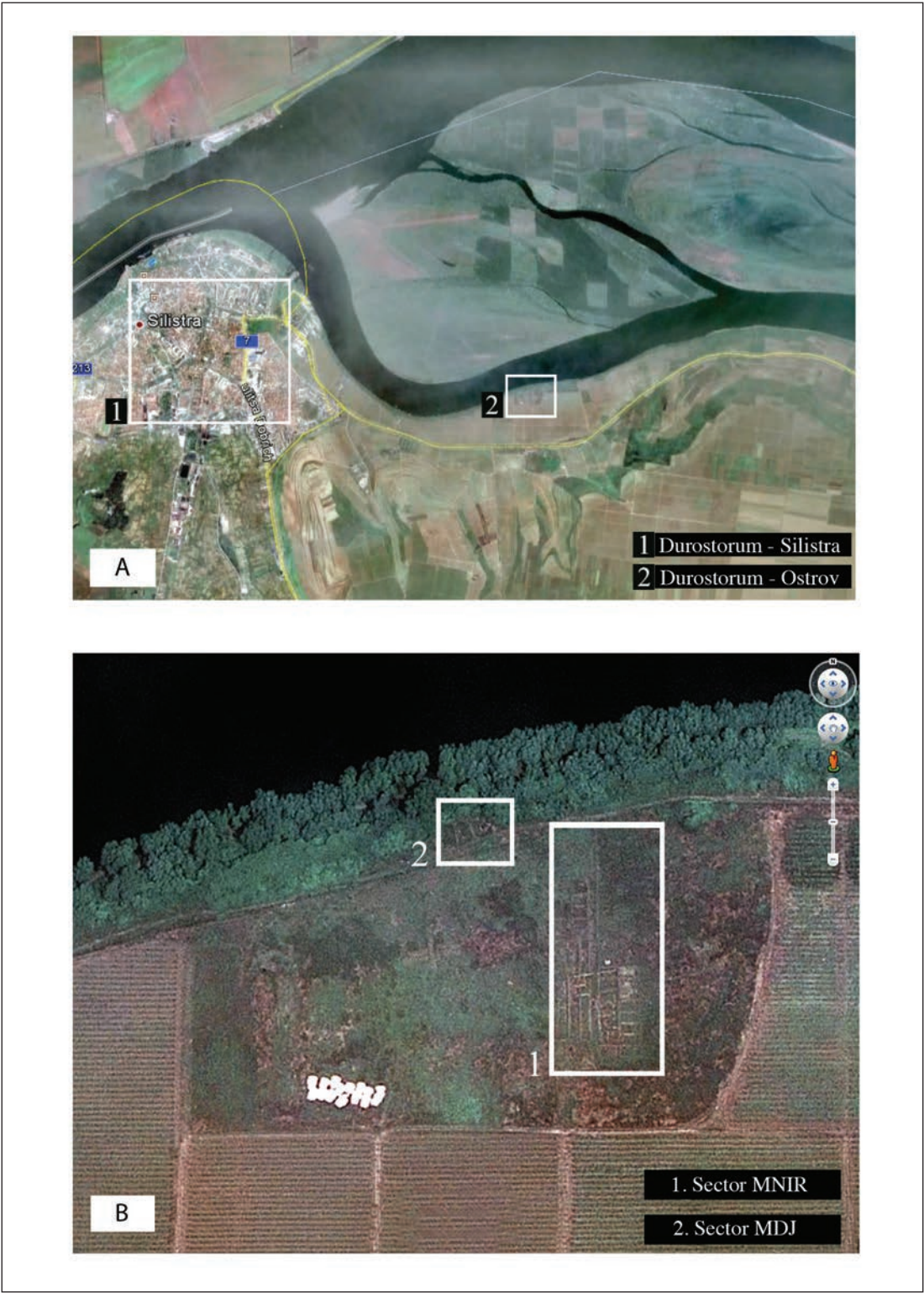
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Pl. I. A. Map: *Durostorum*-Silistra, *Durostorum*-Ostrov (see on Google Earth). B. The site area at *Durostorum*-Ostrov (see on Google Earth).

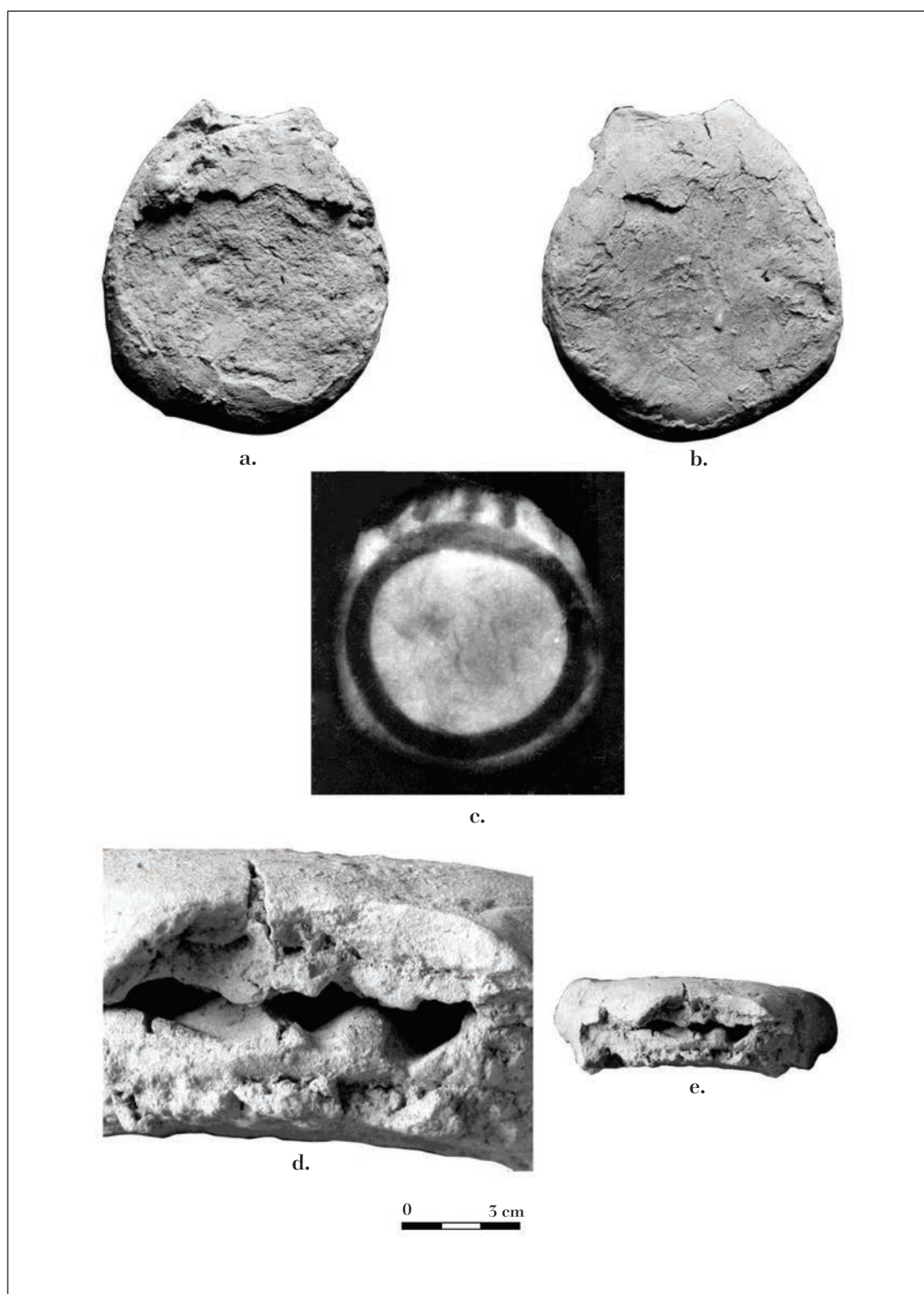


PL. II: 1-5. Half-finished items in assemblage G41C; 6, 11-12. Bronze items most likely deposited for remelting; 7, 9. Items for which there is no evidence of having been made in the workshop: sewing needles, hairpins and an *auriscalpium*; 8, 10. Barbotined pot (8 - inside detail).



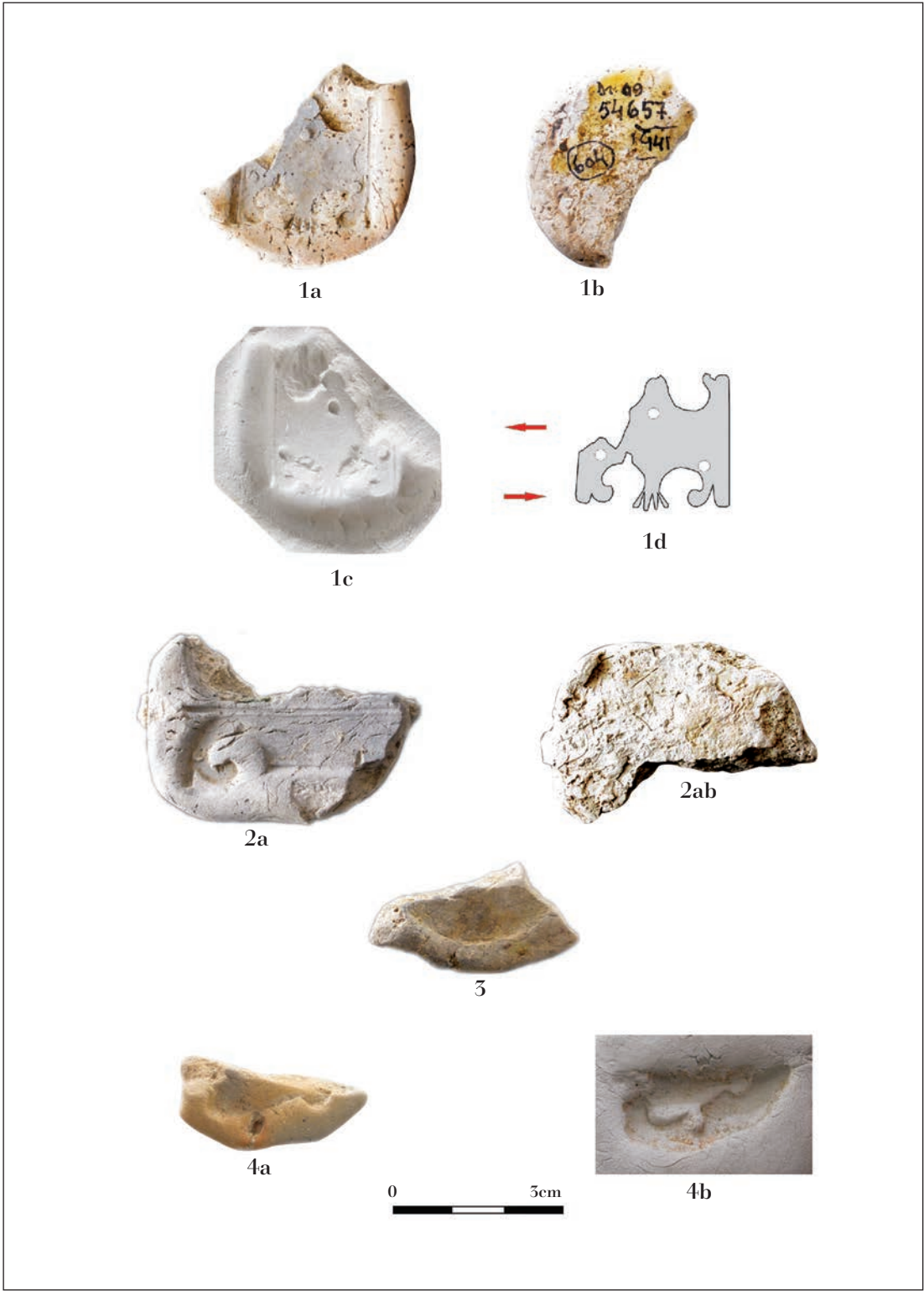
Pl. III. 1-5. Clay moulds.



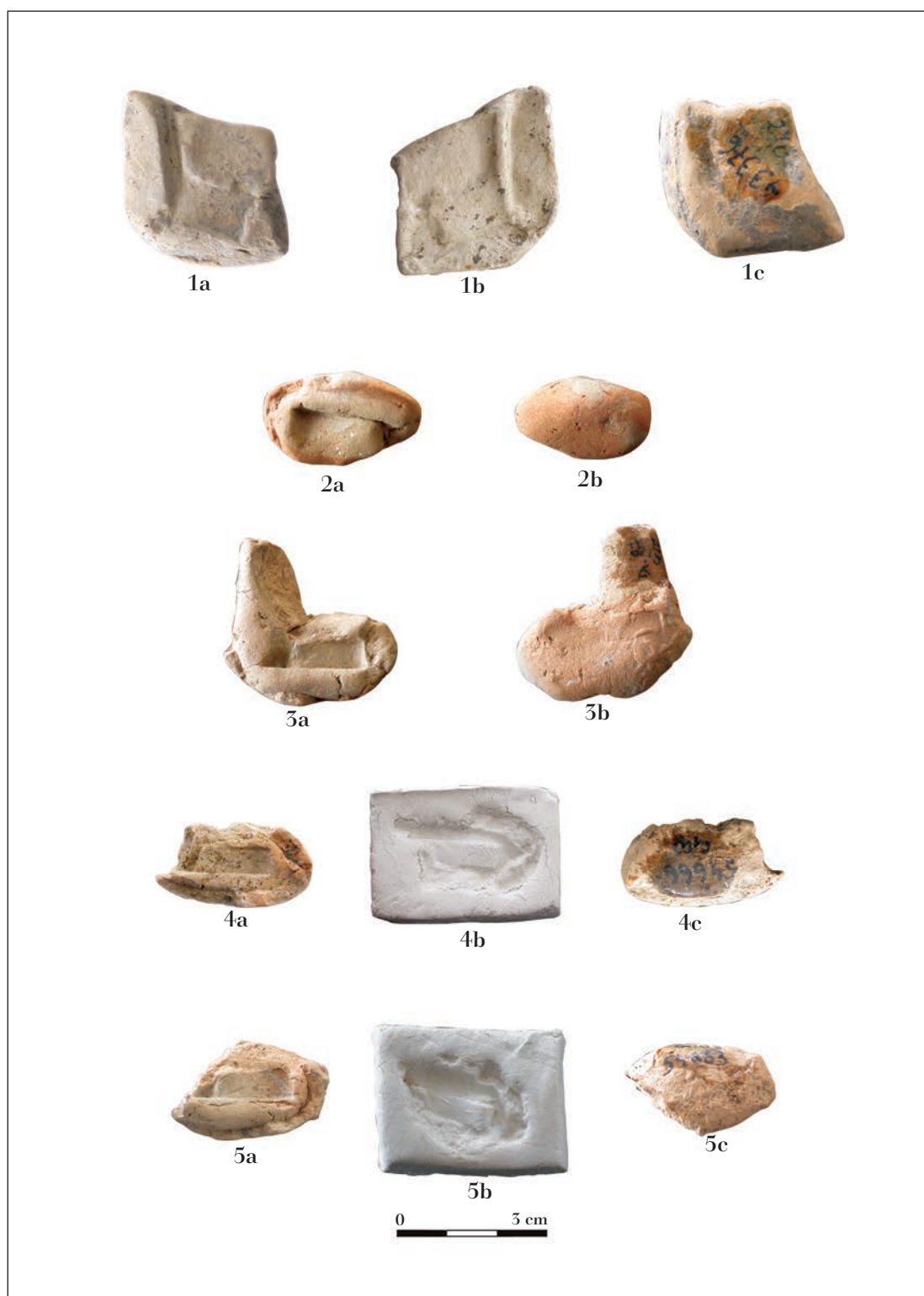


**Pl. IV.** Clay mould, not used, for casting bronze rings: **a-b.** General views; **b.** radiography; **c-d.** details.

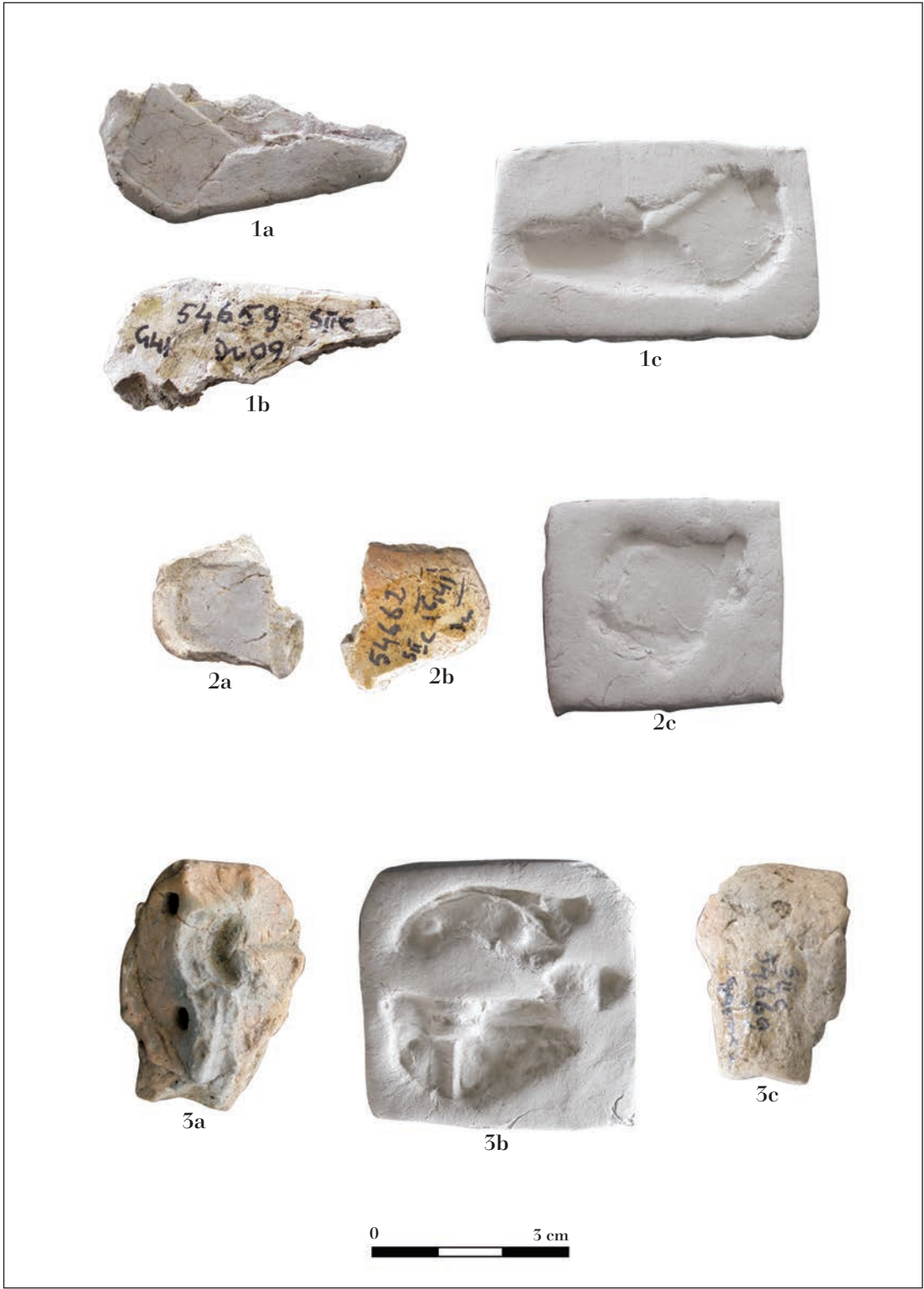




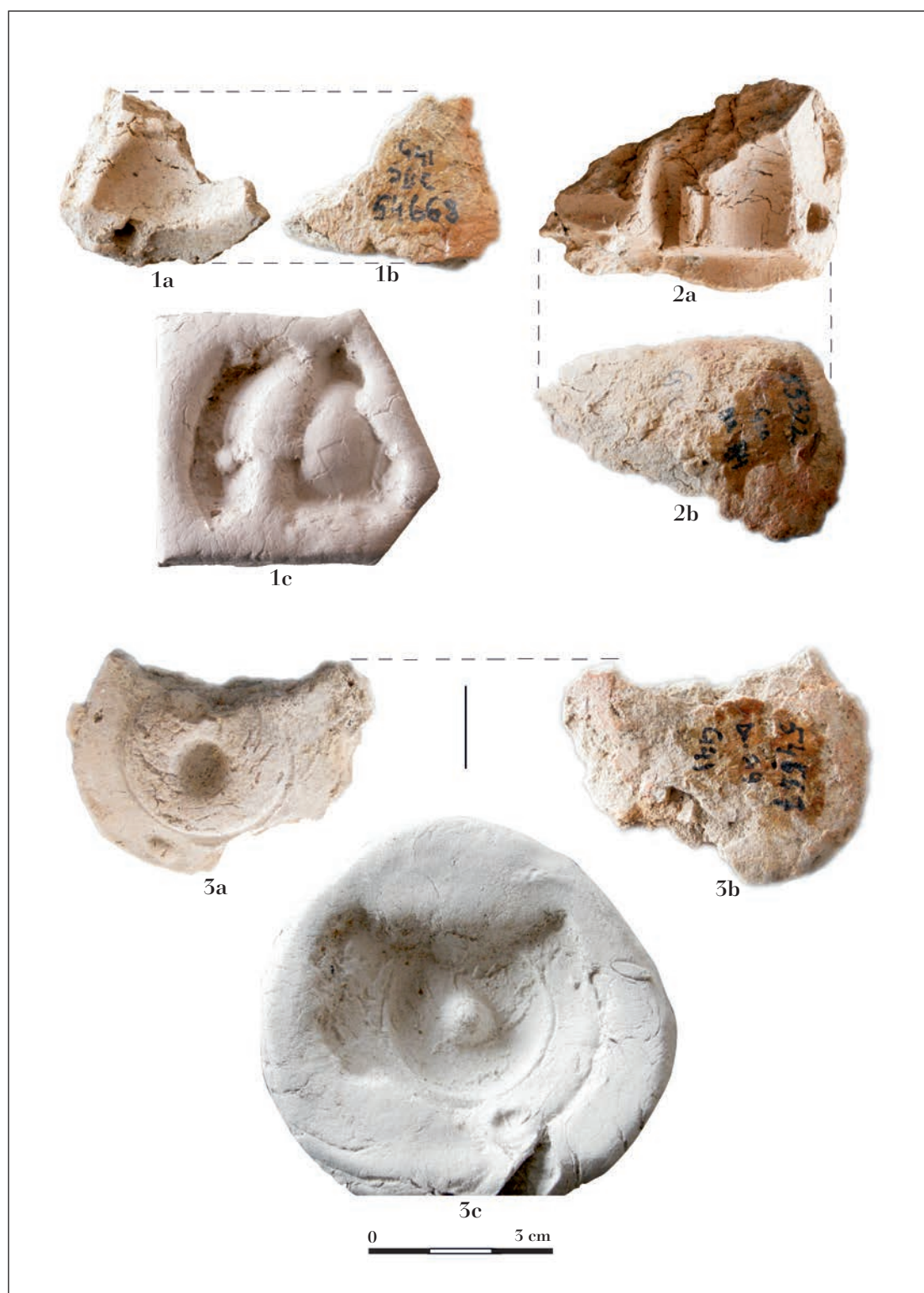
Pl. V. 1-4. Clay moulds for casting various items.



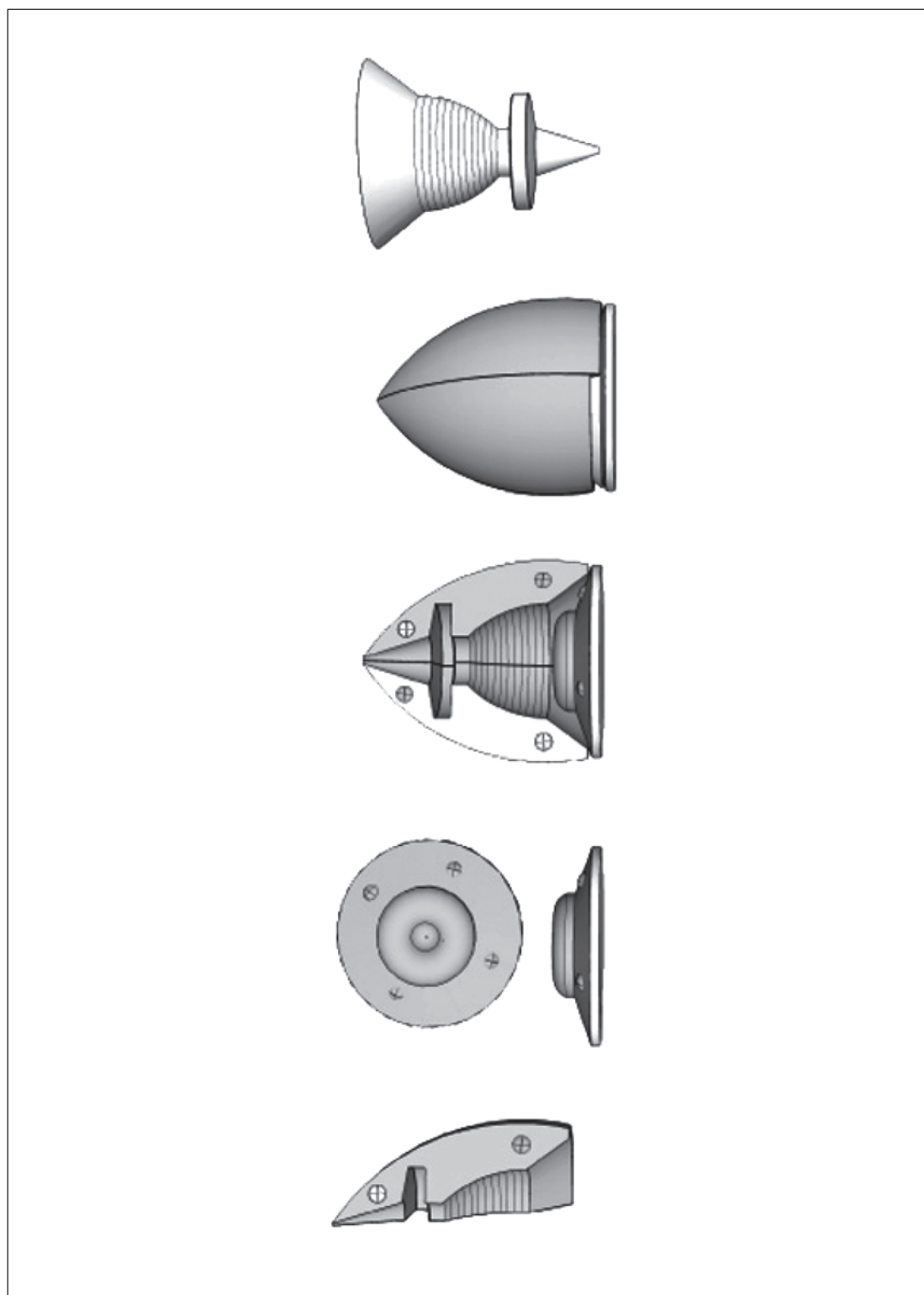
Pl. VI. 1-5. Clay moulds for brooch casting.



Pl. VII. 1-2. Clay moulds for brooch casting; 3. Mould for casting a decorative nail/knob.



PL. VIII. 1-3. Clay moulds for decorative knobs.

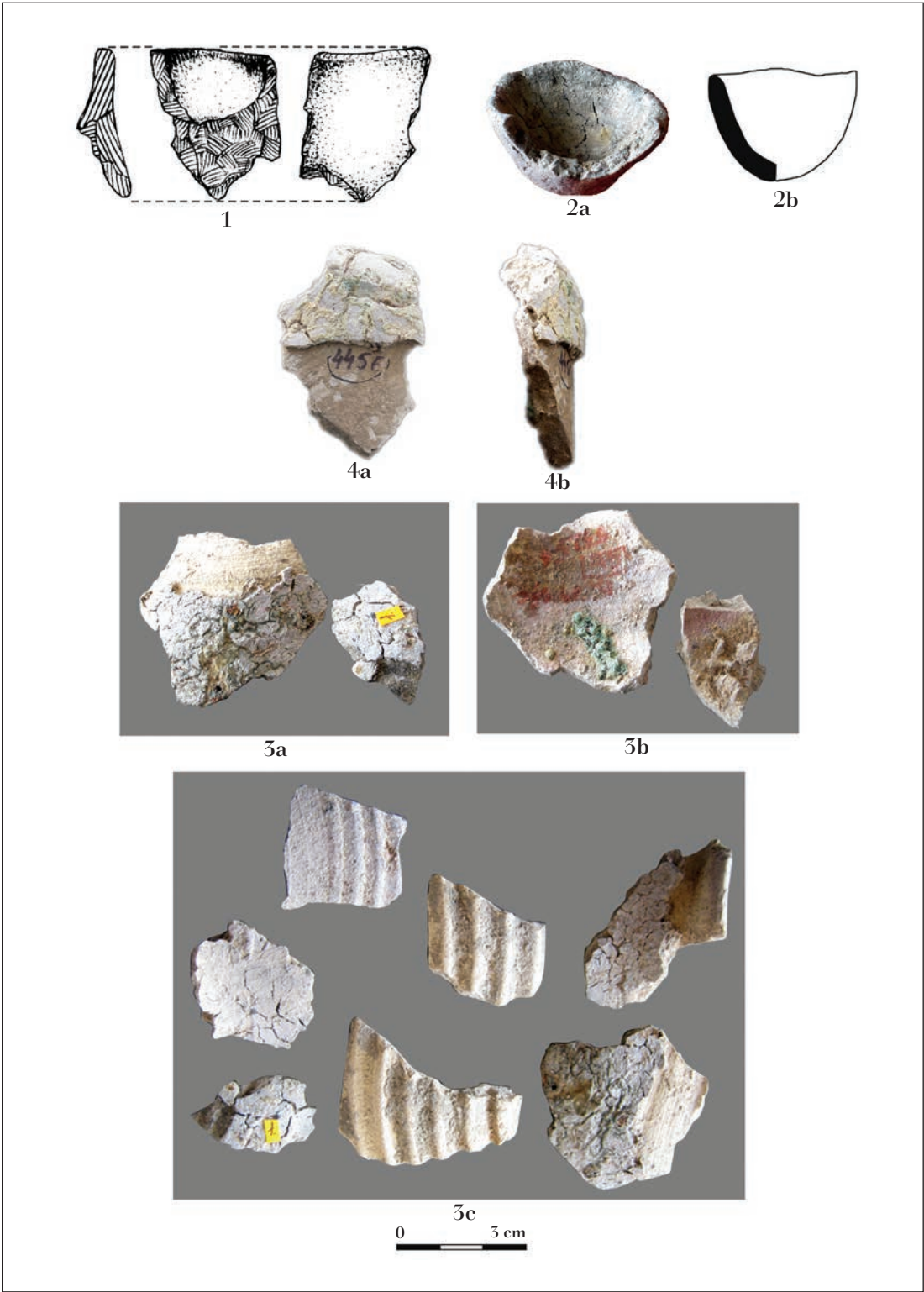


Pl. IX. Mould for decorative knobs - virtual reconstruction Răzvan Clondir.

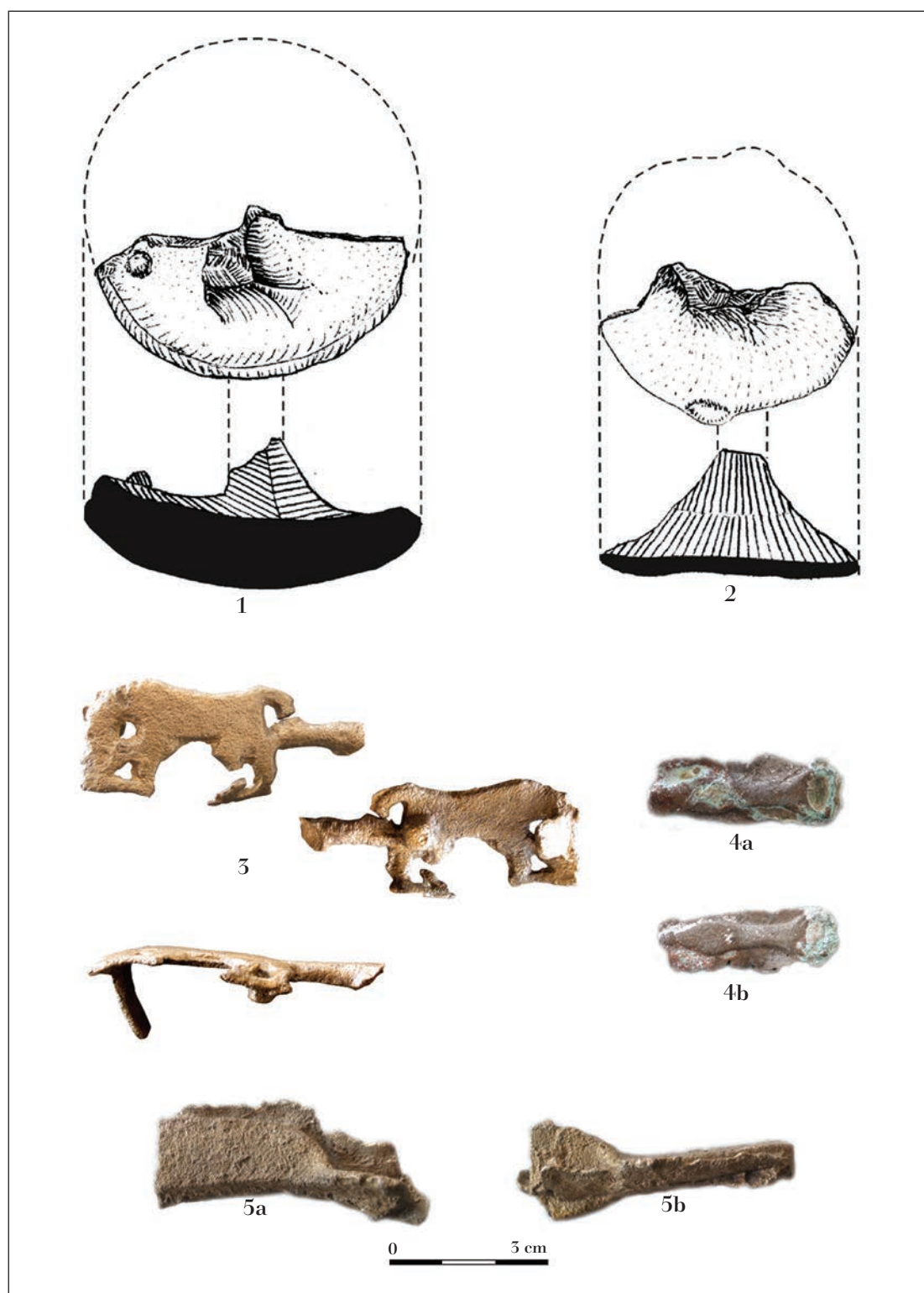




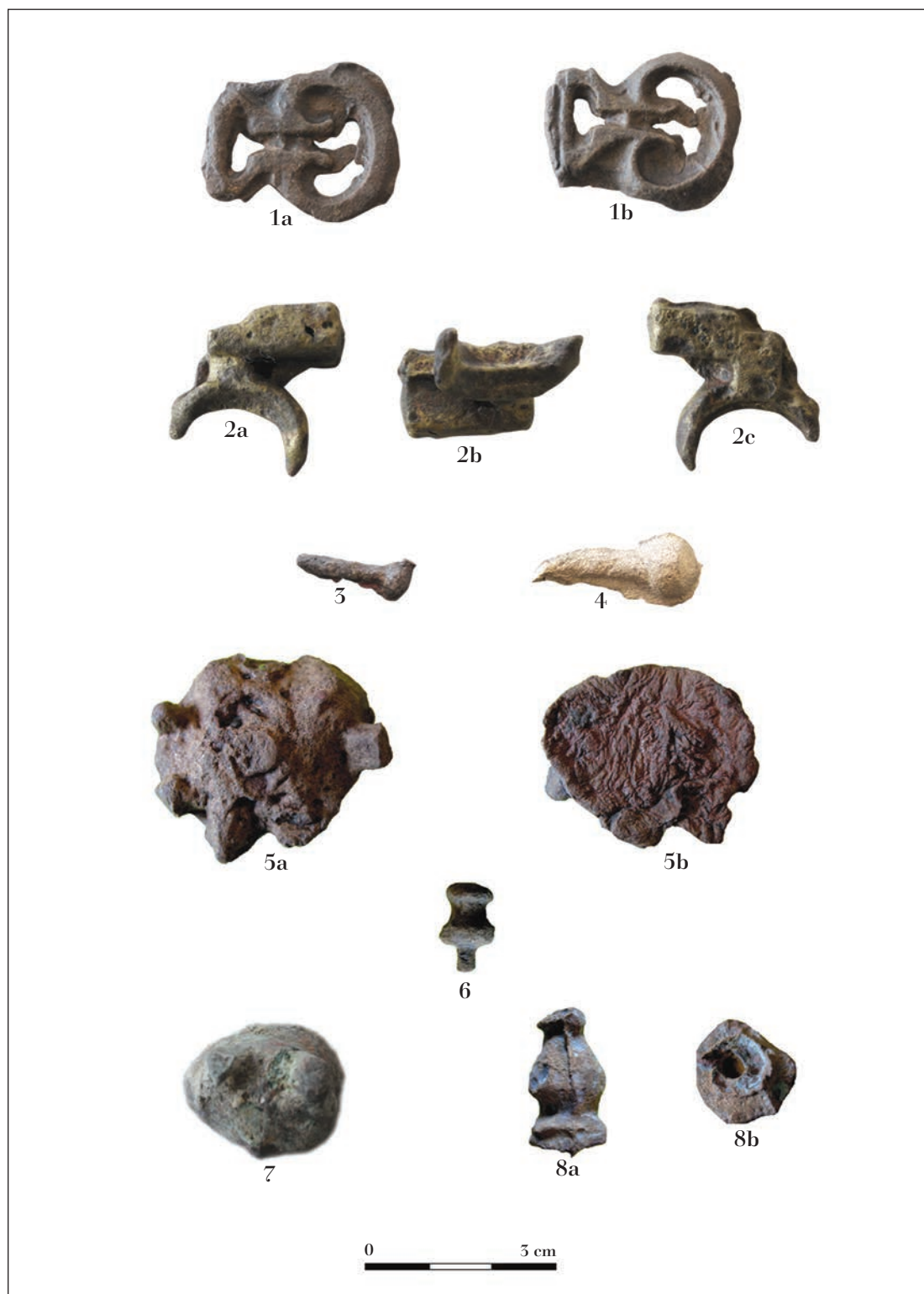
Pl. X. 1-4. Crucibles.



Pl. XI. 1. Mould (?). 2. Crucible. 3-4. Crucibles obtained by the reuse of common ware.



Pl. XII. 1-2. Crucible lids; 3-5. Wasters.



Pl. XIII. 1-4, 6, 8. Wasters; 5, 7. Casting sprues.