Poetovian wasters from Spodnja Hajdina near Ptuj

Janka ISTENIČ and Marjana TOMANIČ JEVREMOV
with a contribution by Małgorzata DASZKIEWICZ and Ewa BOBRYK

1. INTRODUCTION

At Spodnja Hajdina, near Ptuj, 25 oil lamps, five indented beakers, six cups, a large flagon and the bottom of a vessel were found within an area of approximately one square metre, during the laying of water-pipes. The vast majority of these items were undoubtedly wasters, which makes this a particularly interesting find for the study of pottery production at Poetovio (present-day Ptuj and Hajdina). Several of these objects have been included as reference-material in archaeometric research (Daszkiewicz, Schneider 1999, 174-175, 188-189, tables 1 and 8). Because of the importance of the material, it seemed appropriate to publish it in its entirety in this paper.

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2. CIRCUMSTANCES OF THE FIND AND ITS FIND-SPOT

On the 24th April 1974, while overseeing the digging of a water-pipe trench at Spodnja Hajdina near Ptuj (at the boundary between plots no. 1151/1 and no. 1152/3, as recorded in the official land-survey register for Hajdina), Blagoj Jevremov of the Ptuj Regional Museum (Pokrajinski muzej Ptuj) discovered a number of wasters (Fig. 1: 1; Fig. 2: 5). They lay approximately 110 cm below ground level, concentrated within an area of one square metre, and included 25 oil lamps (Jevremov 1977, 266; Jevremov 1985, 421; unpublished sources). The details of the discovery were never recorded on any field drawings or photographs, and the description of the find-spot of the vessels and lamps does not include any stratigraphic information.
Because of the discovery of this material, several trial trenches (4 by 4 metres) were dug between May 20th and June 4th 1974. Three were sited to the NE (Fig. 1: I-III), and two west of the find-spot of the lamps and other vessels (Fig. 1: IV-V). No structures or finds were discovered relating directly to the wasters discussed here, and there were no distinctive wasters among a significant amount of pottery found in the trial trenches. The finds and the documentation are stored at Ptuj Regional Museum.

3. DESCRIPTION, CLASSIFICATION AND CHRONOLOGY OF THE LAMPS

From the original context, 25 lamps were recorded. All but one were Firmalampen with an open nozzle-channel, and can be classified as Loeschcke Type X or Buchi Types Xa/b or Xb. The eleven Firmalampen stamped CASSI form a homogeneous group.

3.1 Firmalampen without a discus: Type Loeschcke X variant

Lamps 1-11 (Pls. 1-3; Fig. 3a,b) represent a variant of Loeschcke Type X or Buchi Type Xb. The upper part (discus and shoulder) is not typical of Firmalampen. It is decorated with two symmetrically placed birds in relief, most likely swans, positioned with their heads stretching up to the handle, and with their tails encircling the filling hole. Rising from the centre of the upper side of the lamp is a vertical handle, placed longitudinally, with a hole in

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VI, drawn by F. Luževič in December 1998 (copied from the original drawings made during the trial-excavations in 1974). All sources (without identification numbers) are stored in Ptuj Regional Museum.

2 For an outline of the typology of Firmalampen see: Istenič 1999, 149-150, 153.
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The lamp hangs horizontally when suspended from the hole in the handle (Fig. 4).

The majority of the lamps show clear signs of distortion, particularly nos. 1, 4-6 and 8 (Fig. 5a,b).

The surface of the lamps is either dark grey (between 5Y 4/1 and GLEY 1 4/1 4) or grey-brown (mixtures of 7.5 YR 5/1 and 5/2), often with red-brown (eg. 5 YR 5/4, 4/4), yellow-red (eg. 5 YR 5/8, 4/6), brown (eg. 7.5 YR 5/4) or grey-brown mottling (eg. 7.5 YR 4/1). The whole of the lower part of lamp no. 8 is red-brown. The surface is slightly rough to the touch and neither soapy nor dusty.

An examination of the surface using an X10 hand lens indicated a fine-grained fabric, with rare fine particles of mica and very rare fine to coarse quartzite grains. Coarse red-brown rounded porous inclusions were visible, particularly on the brown surface (probably indicative of a high iron content in the clay). The hardness ranges from 4 (on the red-brown mottling) to 7 (on the grey areas). When any two of the lamps are banged together, they produce a metallic ring.

There are no visible fractures. On the damaged portions of the lamps, where the surface of the fabric had been removed, the exposed core appears fine-grained and bluish-grey (GLEY 2 5/1).

As described, composition of the lamps corresponds rather well with Fabric Groups F 8 and F 8/7 from Poetovio (Istenič 1999, 87-89). However, they are much harder (the normal hardness for this Fabric Group being 3), and there is little or no mica apparent. The reasons for these differences can be attributed to the over-firing of these lamps at temperatures above normal, which were so high that they had resulted in distortion and other damage.

On the walls and the lower part of the nozzle of several lamps, smoothing-facets are visible (eg.

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3 For the terminology of Firmalampen parts see Buchi 1975, XXII.
4 Colours are defined according to the Munsell Soil Color Charts (2000, revised washable edition).
5 For the criteria for defining the size and density of the particles, see Istenič 2000, 8.
no. 3). On the lower part of lamp no. 8, traces of a slip can be observed.

All eleven lamps were probably made from the same mould. The clearest proof of this is the evidence of the CASSI stamps on the base, which are identical in size, in the shape of the letters and in the irregularities of the impressed Ss. The stamped swans, for example, also exhibit the same characteristics. The differential length of the lamps, varying from 97 to 113 mm, is the result of their distortion.

The CASSI stamp is known only on Firmalampen of Loeschcke type X. Initially they were produced in northern Italy,6 probably from the beginning of the 2nd century onwards (Buchi 1975, 19-20).

For example North Italian lamps stamped CASSI are known from Emona/Ljubljana (Petru 1972, Pl. 37: 20; 52: 6), Novo mesto (Knez 1969, Pl. 19: 2), Poetovio (Iványi 1935, 144, no. 1588, 1599, Pl. 81: 1,16)8 and probably also from Siscia/Sisak, Mursa/Osijek and Sirmium/Srem'ska Mitrovia (Vikić-Belančić 1975, nos. 507-509). Lamps of provincial production stamped CASSI are known, for example from Emona (Petru 1972, 38: 9), Carnuntum/Bad Deutsch-Altenburg (Alram Stern 1989, 68-69, no. 166, Pl. 27) and probably also Mursa and Siscia (Vikić-Belančić 1975, nos. 501, 505).11 Dora Iványi (1935, 143-145, nos. 1586-1609) mentioned several other Firmalampen stamped CASSI from Pannonian sites,12 but the

6 For the origins of the North Italian lamps, see Istenič 1999, 149 with bibliography, and Daszkiewicz, Schneider 1999, 184-190. An archaeometric approach has never been used previously on the CASSI stamped lamps (cf. Daszkiewicz, Schneider 1999, 190, Table 10).
7 Confirmed by WD XRF analysis, performed by Dr. G. Schneider (Arbeitsgruppe Archäometrie, Freie Universität Berlin: sample E496), unpublished.
8 Classified from an examination of the lamps.
9 Classified from the publication.
10 Classified from an examination of the lamp.
11 Classified from the publications.
12 At that time it was generally accepted that the lamps from Emona and its ager were also products of Pannonia.
nature of her publication does not allow one to distinguish North-Italian from provincial products.

In *Firmalampen*, an upper part without a discus is unusual. One of these extremely rare varieties of lamp from a North Italian workshop, for example, was found at *Aquileia* (Iványi 1935, 19, 263, nos. 3685-3690, Pl. 46: 15,17; Pl. 53: 4,6,9,11), which seems to imply Pannonian production. Iványi (l. c.) classified them as a variant13 of *Firmalampen* with a open nozzle-channel (Type XVII, corresponding to Loeschcke Type X), characterized by the absence of the discus and by relief decoration. Judging from the published photograph, a relatively poorly preserved lamp from *Brigetio*/Komárom (Iványi 1935, 263, no. 3690, Pl. 53: 6) seems to form a perfect analogy to the lamps from Ptuj.14 However, there is no mention of the stamp. Unfortunately, this lamp could not be located in Slovak or Hungarian museums,15 so it proved impossible to verify whether its underside was still preserved, or to examine its fabric macroscopically, or take a sample for chemical analysis. Consequently, a Poetovian origin for this lamp must remain a hypothesis.

From their typological classification, these lamps are dated to the 2nd or 3rd (perhaps also 4th?) century (cf. Istenič 1999, 155-157).

Description

There are no noteworthy differences in the quality of the stamped swans, so they are not mentioned in the descriptions of individual lamps. The same applies to the CASSI stamps, which are shallowly impressed and have both the letters S stamped double and slightly off-centre. The main characteristics of the pottery fabrics have been described in the introduction and are not repeated in the catalogue. The terms left/right and front/back refer to lamps with their nozzles facing forwards and upwards. The inventory numbers are those of Ptuj Regional Museum.

**Plate 1**

1. Grey-brown and red-brown mottled surface. The nozzle is markedly warped, especially on its lower part, where a fragment of another vessel (a handle or rim in Fabric F 8/716) is attached. On the underside, fingerprints made during the manufacture are visible. Length 111 mm. Inv. no. R 13553.

2. Grey-brown surface lacking well-marked mottling. Significant distortion on the upper side (the handle, the dent in the middle). Length 98 mm. Inv. no. R 13554.

3. Dark grey surface with well-marked red-brown mottling on the left side of the wall. On the damaged lower part of the nozzle, the blue-grey core is exposed and the nozzle is warped. The stamp is less well preserved than on the other lamps of this group. The lamp has been reconstructed and also slightly restored. Length 100 mm. Inv. no. R 13555.

4. Dark grey to grey-red surface with small brown-red and light brown-grey mottling. Marked distortion, comprising a deep crack at the beginning of the nozzle, shallow cracks on the swans, a well-marked "blister", and end of the nozzle warped. A blue-grey fragment of another vessel or lamp is attached to the "blister". Length 106 mm. Inv. no. R 13556; HTM and chemical analysis M509 (see Appendix); Figs. 5a,b.

**Plate 2**

5. Dark grey to grey-brown mottled surface; in two places (where the surface is damaged) a blue-grey core is visible. Marked distortion is apparent where the lamp side is squashed at the point where it becomes the nozzle. Length 97 mm. Inv. no. R 13557; Figs. 5a,b.

6. Dark grey surface without clearly marked mottling. There is significant distortion, especially on the lower part where fragments of other vessels or lamps (Fabric F 7/F 8) are attached in three places. Length 98 mm. Inv. no. 13558.

7. Dark grey surface with no clear-marked mottling. No marked warping, but perhaps a crack on the base. The lamp has been reconstructed and slightly restored. Length 111 mm. Inv. no. R 13559.

8. The surface is mottled: dark grey on the upper side, red-brown on the base; on the lower part, the remains of a thin brown-red slip are visible. There is a well-marked indented distortion at the side of the lamp (front right) and the bottom is warped. Length 97 mm. Inv. no. R 13560.

**Plate 3**

9. Grey-brown surface with brown-grey mottling. Slightly warped (particularly on the nozzle). Length 99 mm. Inv. no. R 13561; Fig. 4.

10. Dark grey surface with no clear-marked mottling, and on the damaged portion, a blue-grey core is visible. Clear dist-

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13 In the catalogue, Iványi classified such lamps under variant 3, and under variant 4 in the introduction (cf. Iványi 1935, 19, 263).
14 Iványi (l. c.) described the poorly preserved decoration as a “stylised frog”. The handle of the lamp is broken off.
15 J.I. would like to thank Dr. Jan Rájtar (Slovenská Akadémia vied, Nitra) and Dr. László Köcsis (Magyar Nemzeti Múzeum, Budapest) for their efforts to trace the lamp.
16 Classification from Istenič 1999, 87-89.
3.2 Regular Firmalampen (Loeschcke Type X and variant Xk) (Pls. 3-5; 12-23; Figs. 6-8)

Thirteen of the Firmalampen belong to the standard, very common type of Firmalampen with an open nozzle-channel, i.e. Loeschcke Type X; the two lamps with a short nozzle (nos. 14 and 15) are classified as the variant Loeschcke Type Xk.17 In view of the quality of their manufacture, they seem to correspond to Buchi Types Xa/b and Xb respectively.18 Lamps 12 and 13, 14 and 15 as well as 16 and 17 were probably all made from the same moulds.

The stamps are as follows: APRIO/F (no. 20), CERIALIS (no. 23), FORTIS (nos. 16-19, 22; Fig. 8b) and OCTAVI (nos. 12-13, 21; Fig. 8b). Two of the stamps are illegible (nos. 14-15), and one has not survived (no. 24). All the legible stamps are known from the lamps of North-Italian manufacture (Istenič 1999, 150-155; CERIALIS: Buchi 1975, 22-25; Gualandi Genito 1986, 271-272), as well as from lamps from provincial production-sources (Alram Stern 1989, 67, 69, 71-72, 78; Istenič 1999, 155-157, Fig. 146).

The majority of these lamps show clear signs of warping or cracks, which are most evident in lamps nos. 12, 18-19 and 22 (Figs. 8a,b). There are also some lamps without damage attributable to production processes (nos. 15, 17).

From their colour, structure and surface texture, as well as from the core of the fabric, which is visible only in some, these lamps correspond perfectly to the group of eleven lamps with the CAS-SI stamp (cf. 3.1).

On typological grounds these lamps seem likely to belong to the 2nd-3rd (less likely to the 4th) centuries (cf. Istenič 1999, 155-157).

Description

The fabric is described in the main text and is not repeated in the catalogue. The terms left/right and front/back refer to lamps with their nozzles facing forwards and upwards.

Plate 3

12. Buchi Type Xb. Dark grey surface with a brown-red mottling. Significant distortion on the underside comprises a well-marked blister with a hole. There is a relief depiction of a theatre mask on the discus. The stamp, OCTAVI, has been double-stamped, slightly off-set. Probably from the same mould as no. 12. The nozzle had been slightly restored. Length 91 mm. Inv. no. R 13564; Figs. 8a,b.

13. Buchi Type Xb. Grey-brown to red-brown mottled surface. No warping. A relief depiction of a theatre mask on the discus. OCTAVI stamp, double-stamped, slightly offset. Probably from the same mould as no. 13. The nozzle had been slightly restored. Length 91 mm. Inv. no. R 13564; Figs. 8b.

Plate 4

14. Buchi Type Xb, a variant with a short nozzle.19 Grey-brown to red-brown mottled surface. Slightly warped on the underside, where the underside is indented. Length 99 mm. Inv. no. R 13562.

11. Dark grey surface with a small brown-red mottling. Slightly warped (asymmetric at the bottom). Reconstructed and restored (cca. 15%). Length 113 mm. Inv. no. R 13563; chemical analysis E606* (cf. fn. 24).

17 Loeschcke 1919, 257, 278, Pl. 1: Xk; Buchi 1975, XXVIII.


19 Buchi’s (1975, XXIV, XXVIII, Cat. nos. 16, 17, 30, 31, 124, 313, 314, 325, 350 etc.) classification of the short-nozzle-lamps is inconsistent, because he classifies them only on the basis of form (“tipo X-forma corta”), whereas the quality of the manufacture, which is taken into consideration in the classification of other Type-X lamps, is not defined. I would suggest, therefore, that the short-nozzle lamps should also be divided according to the quality of their manufacture, like the other Type X (a-c) lamps; the use of the term “short-nozzle” should draw attention to its particular form.
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base. Traces of a thin slip? The stamp is illegible. Fingerprints on the underside. Probably from the same mould as no. 15. Length 73 mm. Inv. no. R 13573.


16. Buchi Type Xa/b. Dark grey to red-brown mottled surface. No warping. Two relief images of a theatre mask on the discus. A well-made FORTIS stamp, and a more shallowly impressed stamp of a small garland underneath. Possibly from the same mould as no. 17. Length 88 mm. Inv. no. R 13566; chemical analysis E609* (cf. fn. 24).

17. Buchi Type Xb. Yellow-red surface with partly preserved thin darker yellow-red slip with small dark grey mottling. Stamped F(OR)TIS, with a small garland underneath. No distortion and no other manufacture-related damage are visible. The major part of the discus is missing, and also part of the underside. Fingerprints are visible on the inside surface of the lower part. Possibly from the same mould as no. 16. Length 92 mm. Inv. no. R 13578.

18. Buchi Type Xb. Dark grey surface with brown-grey and red-brown mottling. A crack on the bottom reveals a blue-grey core. Stamped FORTIS. A clearly-marked distortion on the bottom and the nozzle, as well as a 28-mm crack at the back of the reservoir, where the upper and lower parts of the lamp (which had been pressed separately into two moulds) were joined together; also a 33-mm crack on the underside. Part of another vessel or lamp is attached to the right side. Part of the nozzle terminal is missing. Length 87 mm. Inv. no. R 13571; Figs. 8a,b.

19. Buchi Type Xb. Dark grey surface with brown-grey and red-brown mottling. Stamped FORTIS, in well-shaped letters, but uneven. Distorted on the bottom, with blisters on the nozzle and sides. A 35-mm crack at the right side of the reservoir, where the upper and lower parts of the lamp (which had been pressed separately into two moulds) were joined together. Length 86 mm. Inv. no. R 13570.

Plate 5

20. Buchi Type Xb. Dark grey surface with brown-grey and red-brown mottling. A cleanly impressed stamp APRIO/F, in well-shaped letters. No distortion, but a 37-mm crack on the left side of the reservoir, where the upper and lower parts of the lamp, (originally pressed separately into two moulds) had been joined. Length 93 mm. Inv. no. R 13568.


22. Buchi Type Xb. Dark grey surface with grey and brown-red mottling. Blue-grey fabric on the nozzle fracture. Well-marked distortion. Stamped FORTIS twice, slightly misaligned, in well-shaped letters. The front part of the nozzle is missing. Two fragments of other ceramic vessels or lamps are attached to the body in two places. Surviving length 68 mm. Inv. no. R 13572; chemical analyses E601*, E602* (cf. fn. 24).

23. Buchi Type Xb. Grey surface. Blue-grey fabric visible in the fracture. Double-stamped CERIALIS with the stamps misaligned. No warping. Only the lower part of the lamp survived reconstructed from two pieces. Finger-prints on the in-

Fig. 6: Firmaalampen nos. 12-22 and relief lamp no. 25, upper- sides. Not to scale.
Sl. 6: Pečatne oljenke št. 12-22 in reliefna oljenka št. 25, zgornja stran. Brez merila.

Fig. 7: Firmaalampen nos. 12-22 and relief lamp no. 25, unders- ides. Not to scale.
Sl. 7: Pečatne oljenke št. 12-22 in reliefna oljenka št. 25, spodnja stran. Brez merila.
side surface. Length 88 mm. Inv. no. R 13575; chemical analysis E600* (cf. fn. 24).


3.3 Relief lamp
(Pl. 5: 25; Fig. 6)

Only one lamp (no. 25) from this context does not belong to the Firmalampen class, but rather to the Loeschcke Type VIII, characterized by a circular reservoir and a rounded nozzle lacking volutes (Loeschcke 1919, 31, Fig. 7). The type originated in Italy, where it was made from the beginning of the 1st century onwards and was still popular in the 3rd century.

Italian made lamps of this type are rare in the regions north of the Alps (Leibundgut 1977, 36), and also in our area.20 Pannonian provincial products are also uncommon. In general, they are dated to the 2nd and 3rd centuries (Iványi 1935, 14; Leibundgut 1977, 36, fn. 2). Iványi classified them under her Type X (Iványi 1935, 13-14, Pls. 34, 35: 3-8).21

Compared with the Italian prototypes, they have a more massive and slightly oblong body. Another characteristic is a flat handle, sometimes with a hole. Lamp no. 25 is of higher quality than most of the lamps listed by Iványi.

From its colour, structure and surface texture, lamp no. 25 corresponds exactly to the group of eleven lamps stamped CASSI (see 3.1). In some examples, there are also similarities in the fractures, which exhibit small oblong holes that are not present in the few other broken lamps from this context (see the description) and are the result of firing at excessive temperatures. Warping is absent.

Description
Plate 5
25. A row of ovols impressed on the shoulders, within the circle in the middle is a rosette with tiny leaves. Dark grey surface with a brown-grey mottling. Part of the base is missing. In its thickest part (5 mm), which is approximately 1.2 mm in length, the fracture is blue-grey near the outer surface; elsewhere it is dark red-grey (10R 4/1) and distinctly porous; small oblong holes are visible. Where the walls are thinner, the fracture is homogeneous and blue-grey with no cavities. Inv. no. R 13567; chemical analysis E608* (cf. fn. 24).

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4. THE DESCRIPTION AND CLASSIFICATION OF THE VESSELS

In addition to the lamps, there were also several other vessels among the finds discussed here: five indented beakers (Pl. 6: 26-30; Fig. 9), six beakers with a strap handle, three of them conjoined (Pl. 6: 31-33; Figs. 10, 11), a large jug and a bottom of an enclosed vessel (perhaps a small flagon). The clear majority exhibit significant distortion that had occurred during the firing. In colour, structure, surface texture and in the core of the fabric (visible in only a few vessels), the vessels correspond to the lamps described above (section 3.1). The only exceptions are the indented beaker (no.

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20 Among the many lamps from the western cemeteries of Poetovio, for example, there is only one such lamp (Istenič 1999, 165; Istenič 2000, 155, Pl. 99: 6).

21 Iványi’s Type X includes rather diverse forms of lamps.
26), the flagon and the base of the possible flagon (nos. 37-38). The fabric of these corresponds to Poetovian groups F 7 and F 15 respectively (Istenič 1999, 87-89) and shows no clear-marked production damage (nos. 37-38) or no more than only moderate damage (no. 26).

All five of the indented beakers have six indentations each and are similar in shape; two and two (nos. 27 and 28, and nos. 29 and 30) have rims of the same shape. But are of different sizes. The handled beakers (nos. 31-36) are of the same shape and similar in their sizes. Before their distortion, they were probably of approximately the same size, suggesting that they had been manufactured according to uniform dimensions.

The indented beakers and handled beakers have excellent analogies among the pottery from the pottery kiln discovered in the immediate vicinity of these finds (Fig. 1: 2). Certain fragments also show clear damage which had occurred during the firing process (Strmčnik-Gulič 1993, Pl. 1: 3, 6, 13, Pl. 6: 1-16).

Indented beakers are not rare among the Poetovian pottery (for some of the published comparisons see: Kujundžić 1982, Pl. 3: 17, Pl. 8: 11-13, Pl. 11: 5; Istenič 1999, 117-118), and in general, are dated to the 1st-3rd centuries (Istenič, l. c.). With the exception of the finds from the pottery kiln, the handled beakers have no parallels among finds published so far. A flagon of similar shape to no. 37 was found, for example, in a Poetovian grave (Kujundžić 1982, Pl. 18: 17).

Description

Plate 6

27. Indented beaker. Dark grey to brown-grey surface. A fresh fracture is blue-grey. Well-marked distortion. Reconstructed from many fragments and restored in part; approximately a fifth of the vessel is missing; sherds attached to the base. Height 128 mm. Inv. no. R 13545; chemical and HTM analysis E610* (cf. fn. 24 and Appendix); Fig. 9.

28. Indented beaker. Dark grey to light-brown-grey, slightly mottled surface. Slightly warped (squashed on the side, and an elliptical rim). Reconstructed from many fragments and restored. Height 120 mm. Inv. no. R 13542.

29. Indented beaker. Dark grey to light-brown-grey, slightly mottled surface. No warping or any other signs of manufacturing-damage. Reconstructed from many fragments and restored. Part of a melted ceramic object is attached to the base. Height 88 mm. Inv. no. R 13544.

30. Indented beaker. Dark grey to brown-grey, slightly mottled surface. No warping or any other signs of damage in manufacture. Reconstructed from many fragments and restored. Height 80 mm. Inv. no. R 13543.
31. A beaker with a strap handle, narrow base and globular body. The relatively narrow rim is gently everted, with a shallow groove on its edge. There are seven slanting lines approximately 50 mm long impressed onto the body, which make this part of the beaker folded. The inner surface shows clear potter’s wheel-ribbing. Dark grey to brown-grey, slightly mottled surface. In several places, the damaged surface reveals a blue-grey core. The beaker has been reconstructed from many fragments and slightly restored. Height 95 mm. Inv. no. R 13548; Fig. 10.

32. A beaker of the same shape as no. 31. Red-brown fabric with a thin dark brown-grey mottled layer on the surface. The vessel has been reconstructed from many fragments, and approximately one third has been restored. Height 100 mm; Inv. no. R 13546; Fig. 10.

33. A beaker of the same shape as no. 31. Dark grey surface with a brown-grey mottle. Well-marked distortion in one place, due to its contact with part of another ceramic object (its fabric does not correspond to F 7/F 8), which has become fused to it. The beaker has been reconstructed from many fragments and slightly restored. Height 95 mm. Inv. no. R 13547; Fig. 10.

34-36. Three beakers of the same shape as no. 31. Dark-grey and brown-grey surface, no visible fractures. There is clear-marked distortion on two of the cups; the bodies of all three are conjoined. Also, a large and a small fragment of another vessel (dark grey surface, same fabric as the beakers) are attached to the beaker Inv. no. R 13552. One beaker is intact (Inv. no. R 13550), two have been reconstructed from many fragments and restored. The height of the least distorted beaker (Inv. no. R 13550) is 101 mm; the heights of the other two are 93 and 90 mm respectively. Inv. nos. R 13550, R 13551, R 13552; Fig. 11.

Plate 7

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5. THE DISCUSSION AND INTERPRETATION OF THE FIND

An overwhelming majority of the objects presented in this paper show clear signs of failed firing. These signs involve distortion, blisters and cracking, which were not caused during the drying of the pottery, for example, but usually occur as a result of firing at excessive temperatures. Two samples, one of lamp no. 4 (sample M509) and one of indented beaker no. 27 (sample E610) were analysed under a high-temperature microscope. These analyses showed that the damage had indeed occurred because the temperature at the time of firing was too high for the raw material (clay) used. One over-fired sample (lamp no. 4) had reached at least 1100°C, the second one (beaker 27) had reached at least 1250°C. Poetovian Fabric Group F 7/F 8 was normally fired at 800 to 1000°C (cf. Daszkiewicz, Schneider 1999).

Sample M511 was taken from the clay item attached to beaker no. 33. Macroscopically it differs clearly from fabric F 7/8. MGR analysis showed that it had been exposed to 1050-1100°C and was not over-fired (see Appendix). Perhaps it had constituted part of oven furniture which had supported or separated vessels in the kiln during firing. It can be assumed that the beaker, softened because of the high temperature in the kiln, had come into touch with this object and had fused to it.

The unevenly fired, only partly undamaged lamps, or the lamps with a different amount of damage, as well as the HTM analyses of two samples (see above and Appendix) all imply that the temperature in the kiln had been unevenly diffused. Only a fraction of the lamps and vessels (or their parts) had not been exposed to damagingly high temperatures; these match the characteristics of the most common group of Poetovian fabrics, i.e. F 7 (cf. Istenič 1999, 87-89). Had they been fired at normal temperatures, we may assume that the damaged lamps and vessels would have corresponded perfectly to the macroscopic appearance of the Fabric Group F 7/F 8. This was confirmed by the chemical analyses of all of the nine analysed samples (lamps 11,
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16, 22-25, beaker no. 27 and the fragment attached to lamp no. 22\textsuperscript{24}; lamp no. 4\textsuperscript{25}). They all belong to the chemical groups A and B, which correspond to the Fabric Group F\textsubscript{7}/F\textsubscript{8}, defined from macroscopic observation. Group F\textsubscript{7}/F\textsubscript{8} is the most common local fabric at Poetovio (Istenič 1999, 87-89; Daszkiewicz, Schneider 1999).

The discarded ceramic wasters indicate the presence of a pottery workshop nearby. Part of it comprised a pottery kiln, discovered 15 metres away (Fig. 1: 2), which was excavated in 1974 (Strmčnik-Gulič 1993; Strmčnik-Gulič 1988; Strmčnik-Gulič 1977). Inside it were a number of ceramic vessels, among them beakers with a handle identical in shape to beakers nos. 31-33 (o. c., Pl. 1: 3.6 - a distinctive waster, 13) and indented beakers similar to beakers nos. 26-30 (o. c. Pl. 2). It is not clear whether these belong to the last batch of vessels fired in this kiln (Strmčnik-Gulič 1993, 484) or whether they had been dumped there from one or more possible kilns nearby.\textsuperscript{26} The wasters discussed in this paper were most likely all made at the same time. They date to the 2\textsuperscript{nd} or 3\textsuperscript{rd} century on the basis of the lamps and indented beakers.

Istenič

6. CONCLUSION

The items discussed here were made at Poetovio in the 2\textsuperscript{nd}-3\textsuperscript{rd} centuries. The majority of them are wasters from a pottery kiln. They are cracked, distorted and even fused with other items. The damage was due to firing at excessive temperatures, which were unevenly diffused within the kiln and which reached to at least 1250°C.

Inadequate archaeological documentation makes it impossible to determine whether the items had been deposited into a pit or maybe dumped on a waster heap. The relatively homogenous composition of the wasters seems to imply a deposit of failed products from a single batch.

The wasters discussed here and the pottery kiln found in their immediate vicinity suggest a pottery workshop. It represents one of the few pottery workshops recorded at Poetovio on the right bank of the River Drava. They are indicated from pottery (tile?) kilns. A group of four kilns was found at lot no. 1087/1 in 1087/3 l.s.r.\textsuperscript{27} Hajdina (Fig. 2: 4; Mikl Curk, Lubsina Tušek 2002). Single kilns were found at lot no. 1082/1-2 l.s.r. Hajdina (Fig. 2: 2; Smodič 1958-1959, 39-40), at Gubec street, lot. no. 1086/21 s.r. Hajdina (Fig. 2: 3; Vomer Gojkovič 1998, 18-22), at the eastern border of plot no. 504 l.s.r. Hajdina\textsuperscript{28} (Fig. 2: 1), as well as at the boundary between plots nos. 1998/1 and 2004/21 s.r. Ptuj (Fig. 2: 6; Tušek 1985, 241-242).

Numerous remains of Poetovian pottery and brick workshops have been excavated on the left bank of Drava, at Rabelčja vas (Horvat et al. 2003, 167, 170, 181, Fig. 14, with further bibliography; Tomanič Jevremov 2004, 97-99). They indicate vast pottery and brick workshops and are consistent with the picture of Poetovio as an important centre for pottery and brick production and distribution, an impression evident from previous research on local pottery products and their distribution (Istenič 1999, 15-16, 167-172, 191-202).

Istenič, Tomanič Jevremov

Aknowledgements

Dr. Jana Horvat and Andreja Dolenc Vičič (both Inštitut za arheologijo ZRC SAZU) kindly gave us topographic and other information collected in Database of archaeological find-spots at Ptuj. Dr. Jana Horvat also read the paper and contributed valuable comments. Dr. Vivien Swan enhanced the translation by Katarina Jerin.

\textsuperscript{24} The overview of the analysed samples and results (after Daszkiewicz, Schneider 1999, 174-175, 188-189, Tables 1 in 8).

<table>
<thead>
<tr>
<th>sample no.</th>
<th>inv. no.</th>
<th>chem. group</th>
<th>no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>E600*</td>
<td>PMP R 13575 A</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>E601*</td>
<td>PMP R 13572 B</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>E602*</td>
<td>PMP R 13572 A</td>
<td>22, attached part</td>
<td></td>
</tr>
<tr>
<td>E606*</td>
<td>PMP R 13563 B</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>E607*</td>
<td>PMP R 13577 B</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>E609*</td>
<td>PMP R 13578 B</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>E608*</td>
<td>PMP R 13567 B</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>E610*</td>
<td>PMP R 13545 A</td>
<td>27</td>
<td></td>
</tr>
</tbody>
</table>

\textsuperscript{25} See Appendix, Table 1.

\textsuperscript{26} It was common practice to dump wasters from nearby kilns into abandoned kilns (Dr. Vivien Swan, verbal information).

\textsuperscript{27} L.s.r. = land-survey register for Hajdina.

\textsuperscript{28} Found in march 2002 (verbal information Marija Lubsina Tušek, Zavod za varstvo kulturne dediščine Slovenije, Območna enota Ptuj).
All of the photographs are work of Tomaž Lauko. Drawings on Plates 1-7 were made by Uroš Stiškovski and Ida Murgelj (Narodni muzej Slovenije), except nos. 26 and 37 which were made by Nejka Uršič Jesenik (Pokrajinski muzej Ptuj).

Figure 1 was made by Ivo Bizjak and figure 2 by Mateja Belak (Inštitut za arheologijo ZRC SAZU). Roman Hribar (Narodni muzej Slovenije) prepared the computer lay-out of all the pictorial material.

**APPENDIX**

**Wasters from Spodnja Hajdina - determination of “firing” temperatures**

Małgorzata DASZKIEWICZ and Ewa BOBRYK

The aim of this laboratory study was to determine the temperatures reached by three ceramic items: an over-fired fragment of lamp no. 4 (M509), an over-fired fragment of indented beaker no. 27 (E610) and a probable ware support for use in the firing chamber (M511) which had been fused to beaker no. 33 (see Istenič, Jevremov above).

Two analytical procedures were employed: MGR-analysis to determine the temperature reached in sample M511, and high-temperature microscopy (HTM) for identifying the temperatures to which the lamp (M509) and the indented beaker (M610) had been exposed.

MGR-analysis enables the range of original firing temperatures to be estimated. The temperature at which the first changes in the re-fired fragments become apparent indicates the original firing temperature. This, however, does not apply to grey/black sherds. The temperature at which these change to a reddish colour depends on the nature of the grey colour, which can be the result of the reduction of iron-oxide or to the presence of organic material, or both. After this, further changes indicate the original firing temperature, as described.

The examination of pottery under a high-temperature microscope is a tool for estimating the four characteristic temperatures of ceramic material: the beginning and end of sintering (end of sintering is the last temperature at which a reduction in size without a change in shape occurs), the softening point (first changes in shape), the melting point (when the sample becomes spherical or almost spherical in shape) and the flowing point (when the melted sample creates a one-millimetre layer on the support). From the thermal behaviour observed during examination of a sample it is possible to determine the original firing temperature.

**MGR-analysis**

Eight thin slices were cut from the sample. One of these sections was left as an indicator of the sample’s original appearance, whilst the remaining seven were fired in a laboratory chamber furnace, each one at a different temperature. Firing was carried out at 900, 950, 1000, 1050, 1100, 1150 and 1200°C in air, static, with a heating rate of 200°C/h and a soaking time of 1h at the peak temperature (i.e. holding the kiln at the same temperature).

**High-temperature microscopy**

The size of a cube of, e.g. 3 by 3 mm, cut from each sherd, changed with the temperature and was measured from a series of photographs. Heating was carried out in air, static, with a heating rate of 300°C.

**Results**

1. Lamp no. 4 (sample M509), fabric F8, chemical group B (*Table 1*).

*Figure 12* shows the thermal behaviour up to 1350°C. Up to 1100°C no changes were observed. Expansion started when the sample reached 1100°C. This was the temperature to which the sample was originally fired. The relative linear expansion was 2.47% at this temperature and continued up to melting point. Melting of the sample occurred after heating at 1350°C; this is shown in the curve as a decrease in the relative linear expansion. An absence of sintering shows that this lamp had originally reached a temperature.

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29 Ware supports could be of many types and belong to the so-called kiln furniture. They were used (and are still used in modern pottery workshops) e.g. to hold the vessels clear of each other, or clear of the kiln walls, to aid stacking and balance vessels during the firing and to prevent pots from sticking together. Ware supports are made from the same or similar raw materials like the vessels or are made from refractory materials (cf. Rada 1989, 78-180).

30 Relative linear changes (expansion or sintering) are calculated from the ratio \( S = (\ln - \text{lo}) / \text{lo} \times 100\% \) with \( \text{in} \) = linear dimension of a sample after heating at a given temperature, \( \text{lo} \) = linear dimension of a sample before heating.
higher than the temperature of the end of sintering and that it was already within range of the softening. This induced the effect of over-firing.

2 Indented beaker no. 27 (sample E610), fabric F7/8, chemical group A (cf. fn. 24 and Table 1). Figure 13 shows the thermal behaviour up to
Sample E 610

Fig. 13: High-temperature microscopy: indented beaker no. 27 (Sample E610), Fabric F7/8 Chemical Group A. The first expansion is recorded at 1250°C, which corresponds to the original firing temperature.

Sl. 13: Vzorec M510 (gubanka št. 27, keramika F 7/8, kemijska skupina B), analiziran v talilnem mikroskopu. Oblika in velikost se začneta spreminjati pri 1250 °C, tj. pri temperaturi, ki ji je bil vzorec izpostavljen pri prvem žganju.

31 Melting point = the sample becomes spherical or almost spherical in shape.
32 Sintering = the sherd is well compacted, it becomes smaller in size in comparison to the original sample, whilst its edges remain sharp.
1350°C. No melting, but only bloating (i.e. blisters) appeared. The first expansion registered at 1250°C (corresponding to the original firing temperature), the relative linear expansion at this temperature was 13.7%. The expansion was recorded up to 1350°C. An absence of sintering, as in sample M509, showed that this sample had already reached the temperature range of softening during its “ancient” firing, resulting in the distortion of the vessel.

3. The ware support (sample M511), fused with beaker no. 33 (see Fig. 10), clearly differs from fabric group F 7/F 8 and from chemical groups A and B (Table 1). In MGR analysis the first changes in colour could be seen after re-firing in air at 900°C (Fig. 14), due to the changes in the firing atmosphere. A clear second change was observed after re-firing at 1100°C. This means that the temperature to which this material in the kiln had been subjected was within the range of 1050-1100°C. At 1200°C the surface of the re-fired fragment (M511) was slightly over-melted. Above this temperature, this material would have been over-fired and so it would not have been stable and would not have functioned satisfactorily as a vessel support in the kiln chamber.

The temperature to which sample M511 was subjected during its original firing had been higher than the normal firing-temperature of pottery made in Poetovio (800-1000°C), and was so high that samples with a thermal behaviour similar to sample M509 (the handled beaker) would have fused to it. As is shown on Figure 10 the beaker no. 33 collapsed. This is because the beaker had reached its softening point and therefore fused to the ware support, which had still not been over-fired.

4. The different thermal behaviour of the three analysed samples is due to differences in their chemical compositions (Table 1). The indented beaker no. 27 (sample E610) belongs to chemical group A and is characterised by its softening point at c. 1250°C. Thermal behaviour of the lamp no. 4

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33 Softening = the sample changes in shape.
34 Slightly over-melted (sovM) = over-melting of the sample surface is observed, no change in shape, edges remain sharp (standardised classification of matrix types by MGR-analysis; Cf. Daszkiewicz, Bobryk 2003, 77-80.)
Janka ISTENIČ and Marjana TOMANIČ JEVREMOV

(sample M509) which belongs to chemical group B is characterised by a lower softening point (c. 1100°C). The difference in softening points is due to a much higher silica modul (ratio Al₂O₃ to SiO₂) and to a much lower content of flux (here: iron, magnesium and potassium) in sample E610 (Table 1). The ware support (sample M511) not belonging to chemical groups A nor B has a similar amount of flux as sample M509 but much less aluminium oxide.

<table>
<thead>
<tr>
<th>Sample No</th>
<th>SiO₂</th>
<th>TiO₂</th>
<th>Al₂O₃</th>
<th>Fe₂O₃</th>
<th>MnO</th>
<th>MgO</th>
<th>CaO</th>
<th>Na₂O</th>
<th>K₂O</th>
<th>P₂O₅</th>
<th>Cr</th>
<th>Ni</th>
<th>Zn</th>
<th>Ba</th>
<th>LOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indented beaker no 27, fabric F7/8, chemical group A (Daszkiewicz, Schneider 1999, 176, Table 2)</td>
<td>65.55</td>
<td>1.39</td>
<td>22.73</td>
<td>4.55</td>
<td>0.03</td>
<td>1.31</td>
<td>0.69</td>
<td>1.10</td>
<td>2.41</td>
<td>0.21</td>
<td>117</td>
<td>37</td>
<td>64</td>
<td>109</td>
<td>109</td>
</tr>
<tr>
<td>Lamp no. 4, fabric F8, chemical group B</td>
<td>63.99</td>
<td>1.09</td>
<td>20.57</td>
<td>6.90</td>
<td>0.04</td>
<td>2.22</td>
<td>0.79</td>
<td>1.11</td>
<td>3.13</td>
<td>0.18</td>
<td>140</td>
<td>68</td>
<td>142</td>
<td>184</td>
<td>125</td>
</tr>
<tr>
<td>Ware support</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M511</td>
<td>1.12</td>
<td>16.96</td>
<td>7.47</td>
<td>0.13</td>
<td>2.12</td>
<td>1.15</td>
<td>1.56</td>
<td>2.96</td>
<td>0.36</td>
<td>99</td>
<td>53</td>
<td>114</td>
<td>142</td>
<td>129</td>
<td>303</td>
</tr>
</tbody>
</table>

Table 1: Chemical analysis data. Analysis were carried out in the laboratory of the Arbeitsgruppe Archäometrie FU Berlin by WD-XRF (G. Schneider and M. Daszkiewicz). Analysis of samples ignited at 880°C, LOI = losses of ignition, in sample M509 a gain of ignition is found caused by the oxidizing of Fe²⁺ to Fe³⁺.

GUALANDI GENITO, M. C. 1986, Le lucerne antiche del Trentino. - Patrimonio storico e artistico del Trentino 11, Trento.
ISTENIČ, J. 1999, Poetovio, zahodna grobišča I / Poetovio, the western cemeteries I. - Kat. in monogr. 32.
ISTENIČ, J. 2000, Poetovio, zahodna grobišča II / Poetovio, the western cemeteries II. - Kat. in monogr. 33.
Ponesrečeni poetovionski keramični izdelki s Spodnje Hajdine pri Ptuju

1. UVOD

Na Spodnji Hajdini pri Ptuju so pri kopanju vodovodnega jarka na površini približno enega kvadratnega metra našli petindvajset oljenk, pet gubank, šest čaš z ročajem, velik vrč in splošni del posode. Velika večina teh predmetov se nedvomno ponesreči keramični izdelki, zato je ta najdbi posebej zanimiva z vidika preučevanja izdelave lončenih izdelkov v Postojnici. Nekateri predmeti so že bili kot primerjalno (referenčno) gradivo vključeni v arheometrične raziskave (Daszkiewicz, Schneider 1999, 174-175, 188-189, preglednici 1 in 8). Ker gre za pomembno gradivo, je smiselna njegova celostna objava, ki je namen tega članka.

Istenič

2. OPIS NAJDIŠČNIH OKOLIŠČIN


3. OPIS IN OPREDELITEV OLJENK

3.1 Pečatne oljenke brez diska

Oljenke št. 1-11 (t. 1-3; sl. 3a,b) predstavljajo različico tipa Loeschcke X (t. 1-3; sl. 3-5).

Oljenke št. 1-11 (t. 1-3; sl. 3a,b) predstavljajo različico tipa Loeschcke X (t. 1-3; sl. 3a,b) predstavljajo različico tipa Loeschcke X, ki jo je B. Jevremov označil kot tipa Loeschcke Xa/b ali Xb.3 Enajst pečatnih oljenk s pečatnimi oznaki leži vodoravno, če je obešena za luknjo v ročaju (sl. 1 sl. 1-3; sl. 2-5). Pečat je nedvomno tipa Loeschcke Xa/b ali Xb.3 Enajst pečatnih oljenk s pečatnimi oznaki leži vodoravno, če je obešena za luknjo v ročaju (sl. 1 sl. 1-3; sl. 2-5). Pečat je nedvomno tipa Loeschcke Xa/b ali Xb.3 Enajst pečatnih oljenk s pečatnimi oznaki leži vodoravno, če je obešena za luknjo v ročaju (sl. 1 sl. 1-3; sl. 2-5). Pečat je nedvomno tipa Loeschcke Xa/b ali Xb.3 Enajst pečatnih oljenk s pečatnimi oznaki leži vodoravno, če je obešena za luknjo v ročaju (sl. 1 sl. 1-3; sl. 2-5). Pečat je nedvomno tipa Loeschcke Xa/b ali Xb.

Iványjeva (1935, 143-145, št. 1586-1609) omenja številne druge oljenke s pečatom CASSI s panonskih najdišč, vendar objava ne omogoča razlikovanja med severnoitalskimi in provincialnimi izdelki.


Tablica 3

| Običajne pečatne oljenke (tip Loeschcke X in različica X) |
|-----------------|-----------------|-----------------|-----------------|-----------------|
| (t. 5: 12-23, sl. 6-8) |

slo. 5a,b

13 pečatnih oljenk sodi v običajen in zelo pogost tip pečatnih oljenk z odprtim kanalom, tj. tip Loeschcke X; oljenki s
kratkim noskom (št. 14 in 15) uvričamo v razliko Loeschcke X.18 Ob upoštevanju kvalitete izdelave ustrezajo tipoma Buchi Xa/b oz. Xb.19 Obliko št. 12 in 13, 14 in 15 ter 16 in 17 se bote zelo verjetno odsimljene v istih kalupih.
Večina oljenk kaže jasne znake deformacije oblike ali/ in razpok, ki so posebej izrazite pri oljenkah št. 12, 18-19 (sl. 8a,b). Zastopane pa so tudi oljenki, ki ne kažejo poškodb, za katere bi lahko domnevali, da so nastale med njihovo izdelavo (št. 15, 17).
Glede barve, strukture in otipa površine ter tudi jedra keramike, ki je vidno le pri manjšem delu oljenk, te oljenke povsem ustrezajo skupini enajstih oljenk s pečatom CASSI (glej 3.1).


Opis
Opis keramike je podan v glavnem besedilu in ga v katalogu ne ponavljamo. Omembe levo/desno in spredaj/zadaj se nanašajo na oljenk, ki so postavljene z noskom naprej ali/ofanje.

Tabla 3

Tabla 4

Tip Buchi Xb. Temnosiva površina z rajvorječimi lisami. V razpokah na dnu je vidna modrosiva keramika. Pečat FORTIS. Iznagoto deformirana (dno, nosek), na zadnji strani (na mestu, kjer se stikata zgornji in spodnji del oljenk, ki sta bila odsimljena vsak v svoj kalup) je 28 mm dolga razpoka, na dnu pa razpoka dolga 33 mm. Na desnem boku je prilepljen del druge posode ali oljenke. Deleč zaključka nosna manjka. Dolžina 87 mm. Inv. št. R 13571; sl. 8a,b.

Tabla 5

3.3 Reliefna oljenk
(št. 5; 25; sl. 6)


3.3 Reliefna oljenk
(št. 5; 25; sl. 6)
Iványijeva jih je uvrstila v svoj tip X (Iványi 1935, 13-14, t. 34, 38; 2) ti se od italijanskih vzorcev razlikuje po masivnejšem in rahlo podolgovatemu telesu. Zanje je značilen tudi plosčat ročaj, ki je lahko preluknjan. Oljencek št. 25 je izdelana kvalitetneje kot večina oljenk, ki jih navaja Iványijeva. Glede barve, strukture in otipa površine oljencek št. 25 povsem ustreza opisani skupini enajstih oljenk s pečatom CASSI (glej 3.1). Deloma kaže enake značilnosti tudi prelom, v katerem so opazne podolgovate luknjice, ki jih pri redkih prelomih drugih oljenk iz obravnavanega konteksta nismo opazili (glej opis) in so posledica previsoke temperature žganja. Oblika ni deformirana.

Opis

Tabla 5

|---|---|

4. OPIS IN OPREDELITEV POSOD

Poleg oljencek so bile v obravnavanem kontekstu tudi posode: pet čaš gubank (št. 26-30; sl. 9), šest skodelic s trakastim ročajem, od tega tri sprijete (št. 31-33; št. 10, 11), velik vrč in spodnji del vrča. Velika večina posoda kaže izrazite deformacije, ki so nastale med žganjem. Te posode glede barve, strukture in otipa površine ter tudi jedra keramike, ki je vidno le pri majhnem delu posod, ustreza oljencekom in opisu v poglavju 3.1. Izstopa za t. 6: vrč, ki je sprijeta s skodelico - M511 (glej Appendix). Inv. št. R 13554; prim. op. 25. Vseh pet čaš gubank ima po šest gub in podobnati obliki; poškodbe skodelic s trakastim ročajem, ki jih navaja Iványijeva.


št. 27. Čaša gubanka. Keramika F7, z vrelo korak na površini in prelom, ali tudi enoto, lahko prilagodljivo podaljšana. Višina 88 mm. Inv. št. R 13544.


št. 29. Čaša gubanka. Keramika F7, z vrelo korak na površini in prelom, ali tudi enoto, lahko prilagodljivo podaljšana. Višina 88 mm. Inv. št. R 13544.


št. 34. Skodelica s trakastim ročajem. Dno je ozko, trebuh oblikovan kot elipsasto. Zlepljena iz številnih odlomkov in dopolnjen. Višina 95 mm. Inv. št. R 13548; sl. 10.


5. DISKUSIJA IN INTERPRETACIJA NAJDBE

Velika večina obravnavanih predmetov kaže izrazite značke neuspešnega žganja. Ti znaki so deformirane oblike, mehurje in razpoke, ki ne nastanejo npr. pri sušenju keramike, pač pa so pričakovane poškodbe pri žganju na previsoki temperaturi. Analizi oljenke št. 4 (vzorec M509) in gubanke št. 31-32 pričakovane poškodbe pri žganju na previsoki temperature med žganjem, ki jo je znašala pri oljenki najmanj 1100 °C, pri gukanjih pač pa najmanj 1250 °C. Temperatura pri običajnem žganju (za podatek se zahvaljuje vodji nadzora Mariji Lubšina Tušek).

Obravnavani vzorci so zadevali ponesrečene izdelke iz lončarske peči (dr. Vivien Swan, ustna informacija).


6. SKLEP

Zahvale

Dr. Jana Horvat in Andreja Dolenc (obe Inštitut za arheologijo ZRC SAZU) sta prijazno posredovali topografske in druge podatke, ki sta jih zbrali v Temeljni podatkovni zbirki arheoloških najdišč Ptuja. Dr. Jana Horvat je tudi prebrala besedilo članka in prispevala koristne pripombe. Prevod Katarine Jerin je lektorirala dr. Vivien Swan.

Fotografije 3-11 je naredil Tomaž Lauko, risbe na tablah 1-7 pa Uroš Štižkovski in Ida Murgelj (vsi Narodni muzej Slovenije), razen št. 26 in 37, ki ju je narisala Nejka Uršič Jesenik (Pokrajinski muzej Ptuj). Sliko 1 je pripravil Ivo Bizjak (s.p., Storitve z računalniško, foto in video opremo), sl. 2 pa Mateja Belak (Inštitut za arheologijo ZRC SAZU). Vse slikovno građivo je računalniško obdelal in pripravil za tisk Roman Hribar (Narodni muzej Slovenije).
Pl. 2: Ceramic lamps nos. 5-8. Scale =1:2.
Pl. 3: Ceramic lamps nos. 9-13. Scale = 1:2.
Pl. 5: Ceramic lamps nos. 20-24. Scale = 1:2.
Pl. 6: Indented beakers and handled beakers nos. 26-33. Scale = 1:3.
Pl. 7: Jug (no. 37) and the lower part of an enclosed vessel (no. 38). Scale = 1:3.