Provenance studies of early mediaeval fast wheel pottery from Pliska, Bulgaria

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ABSTRACT The problem of the provenance of a special type of early mediaeval fast wheel table ware with yellow colour from Pliska — the capital of the First Bulgarian state — was addressed by a combined chemical and mineralogical approach. A comparison of ceramic samples and raw materials from the region, where highly calcareous marl depositions are abundant, was made. The chemical analyses (XRF, EMPA, LA ICP-MS) show that a group of non-tempered ceramic samples is characterised by a high amount of CaO (between 14 and 26%) and find a good match with several marl samples. The latter belong geologically to the Gorna Oriahovica formation (Lower Cretaceous period), which is located to the south of Pliska and consists mainly of clayey marls. This statement was mineralogically and paleontologically confirmed by thin sections observations. Chemical evidence was obtained that another group of samples containing sand were made from a mixture of the same material with sand. Coating layers — red slip and lead glaze, with which some of the vessels are covered — were additionally analysed using an EDAX Si-Detector coupled with a VEGA SEM.

1. Introduction

Pliska, the first known capital of the medieval Bulgarian State, is situated in Northeast Bulgaria (Fig. 1a). The earliest archaeological evidence from the palace centre dates from the second half of the eighth century (Rashev, 1983, p. 257-259). Although in AD 893, Preslav was nominated the first City, Pliska continued to exist as an important production centre until its end in the middle of the 11th century (Dimitrov, 1999, p. 55-56). It covers an area of about 23 km² and consists of an Outer and Inner City encompassing a Citadel, which were fortified by an earth wall with ditch, a stone fortress and a brick wall, respectively (Figs. 1b, 1c). The Citadel enclosed the living quarters of the ruling family with the representative administrative and religious edifices situated to the south of it. The major buildings were connected by underground passages, to each other and to outside the fortress, enabling a fast escape in times of trouble.

In a secret passage connected with the so-called Krum palace (Fig. 1c), a set of more than 30 flagons with one or two handles and spouted vessels of extraordinarily good quality were found (Rashev, 1983, p. 261-263, Pl. 3.5). They were thrown on a fast potter's wheel and have a light yellowish colour. Some of them are covered with a thin layer of unknown composition. Special features of the flagons are the profiled rims, the elongated handles, decorated with engraved palmettes, and the massive feet. According to R. Rashev this precious tableware belonged to the Bulgarian Khan and was used on official occasions at the court. At a time of danger — supposedly the conquest of the Krum's residence in 811 AD by the Byzantine Emperor Nikephoros — the vessels were hidden in the passage, which was subsequently destroyed by fire.

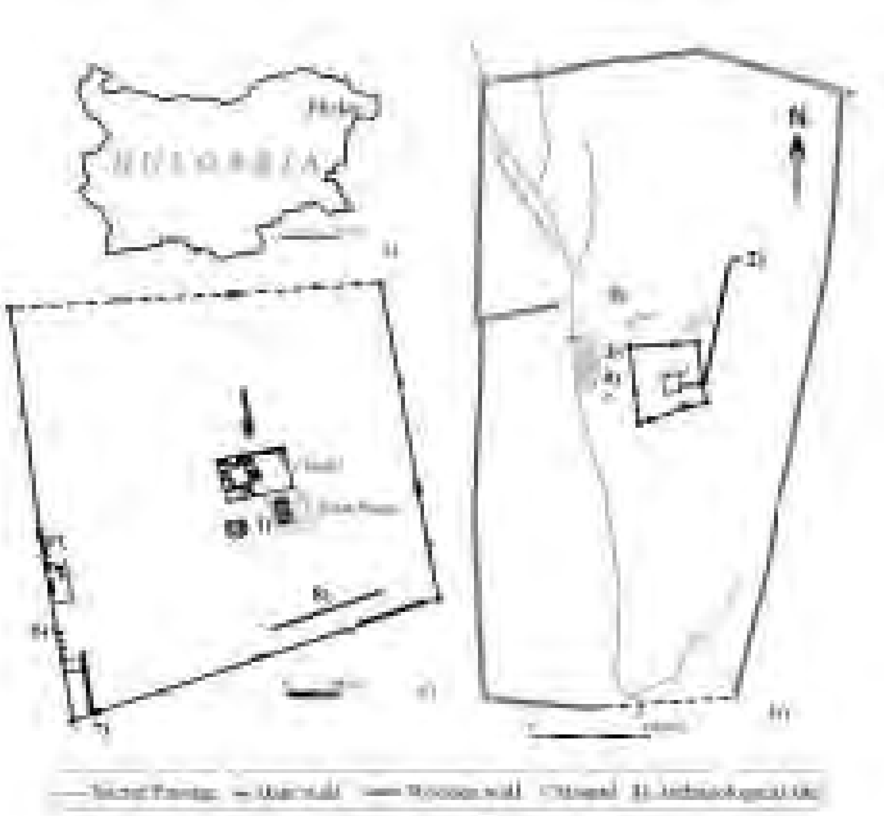


FIG. 1 – The capital of Pliska. Sampling sites. 1. Geographical situation of Pliska; 2. Outer City of Pliska; 3. Inner City of Pliska. 1) Secret passage, Sample Index GG; 2) Early medieval settlement under the Great Basilica, Sample Index GB; 3) Early medieval settlement in the Asar dere area, Sample Index Ad; 4) Excavations of the Bulgarian-German team in the same area, Sample Index AD; 5) Trenches in the Outer City, Sample Index AS; 6) West wall of the stone fortress, south part, Sample Index WM; 7) South gate and near-by wall of the stone fortress, Sample Index SM; 8) Early wooden wall of the Inner City, Sample Index HM.

One spouted vessel was found in 1934 within mound XXXIII (Stanchev, 1948, p. 232, Fig. 2_{14}), situated to the northwest of the stone fortress (Fig. 1b). Similar fragments came to light during the excavations of the Bulgarian-German team in the Asar dere area, west of the Inner City. However, this type of vessel is not known from other archaeological sites in Bulgaria and their origin is a matter of debate. R. Rashev considers them a product of a Byzantine workshop specialized in non-standard pottery available only to a limited number of consumers. Pointing out the similarities and the differences with the so-called Late Avar yellow pottery (end of the seventh-beginning of the ninth century) from the Carpathian basin (Bialeková, 1997; Garam, 1969), S. Angelova assumes they were produced locally by travelling potters coming from Central Asia or belonging to the native post roman population (Angelova, 1984, p. 91-94). According to S. Stanilov the vessels were brought to Pliska as a result of non-military contacts between Bulgaria and the Avar Empire, or possibly by a sporadic penetration of the Avar population into Bulgaria (Stanilov, 1997, p. 210).

The vessels from the secret passage do not stand alone amongst the ceramics from Pliska. Fast wheel yellow pottery always appears in small quantities in the earliest cultural layers (second half of the eighth-first half of the ninth century) — flagons with profiled rims and elongated handles, jugs, bowls and small jars (Fig. 2). Some of them are covered with a red slip and/or have incised runic signs on the shoulders. This pottery can be divided into two groups: pottery with and without sand[3]. The first group can be further separated into pottery with fine- or coarse-grained sand. Both groups may contain crushed potsherds. The colour of the prevailing part of the fragments without sand is, according to the Munsell

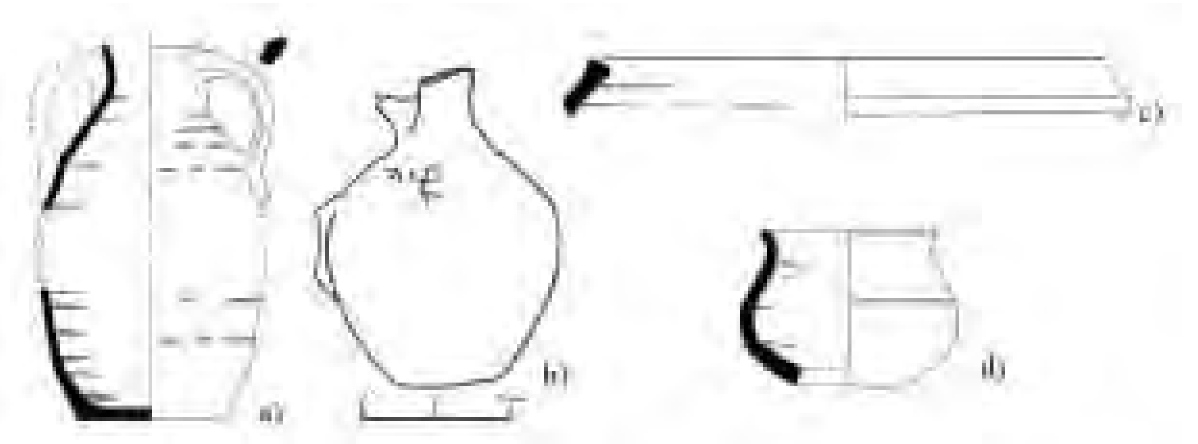


FIG. 2 – Fast wheel pottery from Pliska. a) South stone wall. Excavations of A. Milchev in 1964. Ceramic sample SM 02. M=1:10; b) Cemetery by Novi Pazar (Stanchev et al., 1958, Plate XIII, 4); c-d) Settlement in Asar dere area. Excavations of A. Milchev in 1959-1961. M=1:5.

charts, 10YR 8/2-8/4, 7/3-7/4 *very pale brown;* their surface is smooth, sometimes polished in leather-hard condition; and their slip is bright red. Most of the fragments with sand are 7.5YR 6/6, 7/6 and 5YR 7.5YR 6/6, 7/6 *reddish yellow* in colour; their surface is rough with visible sand grains; and their slip is dark red. Such pottery is known from several sites in Bulgaria[4], Rumania[5] and Moldavia[6], but its highest concentration is in Pliska. Evidence for its local production — furnaces or fire wastes, has yet not been found. As for the vessels from the secret passage, different origins are considered: produced by potters, belonging to the native population; imported from neighbouring Byzantine towns or produced by Byzantine craftsmen taken to Bulgaria as captives (Doncheva-Petkova, 1973, p. 17, 1992, p. 496; Angelova, 1984, p. 93-94, 110).

By means of chemical and petrographic analyses of the ceramics from Pliska and raw materials from its region we addressed the following questions: Are the vessels from the secret passage made from the same material as the rest of the fast wheel pottery? And is this type of pottery a local production?

2. Sampling and analytical methods

During the period of the Lower Cretaceous, the region of Pliska belonged to the zone of clay-lime sedimentation and, more precisely, to the sub-zone of marl sedimentation (Cankov et al., 1968, p. 224-227, Fig. 24). The boundary between two geological formations lies south of Pliska: the Razgrad Formation (clayey limestones and marls), overlain to the south by the Gorna Oriahovica Formation (marls and clayey marls). Both are of Hauterivian-Aptian age but have different chemical compositions. It was difficult to obtain any marl samples in the immediate surroundings of Pliska, because the fields south and east of present day town were intentionally covered with soil in order to be agriculturally used. Sediment samples were taken south of the earth wall (TP 01) and in the dry bed of the Asardere River north of the stone fortress (TP 16). At the same place a small hill of dark grey clay was found (TP 02). Marl samples (TP 09-15) were taken from different outcrops within 5 to 8 km south, southeast, east and northeast from Pliska. White and yellow clay (TP 05-06) were obtained from a kaolin deposit about 30 km north of Pliska.

The first series of 48 ceramic samples from eight archaeological complexes within the territory of Pliska were analysed (Figs. 1b-c). For four of them only the study of their covering layers is completed. 22 samples are without sand, 8 with fine-grained sand and 18 with coarse-grained sand.

The chemical analyses were carried out in the Mineralogical Institute of the Johann Wolfgang-Goethe University, Frankfurt am Main. From the samples containing sand, powder press tablets consisting of a homogeneous mixture of 8 g finely ground ceramic powder (<20µm) and 2 g HOECHST Wax C-Micro powder were prepared. They were analysed by X-ray fluorescence analysis (XRF), using a PHILIPS PW1404 X-ray fluorescence Spectrometer, equipped with a 100kV generator, a 3kW side window tube with a RH-anode and six crystal changer (LiF200, LiF 220, LiF420, Ge, PE, PX1). The spectrometer was calibrated using international rock and soil standards. Ten major (SiO_2, TiO_2, Al_2O_3, Fe_2O_3, MnO, MgO, CaO, Na_2O, K_2O, P_2O_5) and sixteen trace elements (S, V, Cr, Ni, Cu, Zn, Rb, Sr, Y, Zr, Nb, Ba, Ce, Pb, Th, U) were determined. Electron microprobe analysis (EMPA) with a Jeol Superprobe JXA-8900 was performed for major and minor elements (SiO_2, Cr_2O_3, TiO_2, Al_2O_3, FeO, MnO, MgO, CaO, Na_2O, K_2O, P_2O_5, NiO) for the samples without sand. From the finely ground ceramic powder, glass beads were melted on an Ir-strip heater and embedded in a Plexiglas holder with epoxy, which was then polished and covered with a conductive carbon layer. Laser _blation Inductively Coupled Plasma Mass Spectrometry (LA ICP-MS) on the same glass beads was carried out for trace elements, including the Rare Earth Elements (Li, Be, B, Sc, V, Cr, Mn, Co, Ni, Cu, Zn, Ga, Ge, As, Se, Rb, Sr, Y, Zr, Nb, Mo, Ru, Rh, Pd, Ag, Cd, Sn, Sb, Cs, Ba, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Hf, Ta, W, Au, Hg, Pb, Bi, Th, U). A Merchantek LUV213™ ultraviolet Nd-YAG laser microprobe was used, coupled with a Finnigan MAT ELEMENT2™ high resolution ICP double-focussing mass spectrometer.

The analyses of the coating layers were carried out in the Laboratory of the Polish Institute for Archaeology and Ethnology in Warsaw, using an EDAX Si-Detector coupled with a VEGA SEM. The red slip of two samples without sand (2.5YR 5/8 *red*, 2.5YR 6/8 *light red*) and two with sand (2.5YR 4/6 *red*, 5YR 5/6 *yellowish red*) were studied, as well as the yellow layer of two samples from the secret passage.

3. Results

The Rare Earth Element patterns show a coherent group for the dark grey clay, the ceramic samples without sand, the marl and the sediment samples (Fig. 3) differing only in overall abundances. The patterns of the two kaolin clays (TP 05-06) are entirely different, which allowed us to exclude these highly siliceous materials from further consideration. The major elements offer more possibilities for differentiation, which is best seen in the correlation between CaO and SiO_2 (Fig. 4). The samples from the secret passage have a very similar chemical composition to the ceramic samples without sand, i.e. they are dominated by a high amount of CaO. They all form a coherent group together with sediment sample TP 01 and marl samples TP 09-13, which belong to the Gorna Oriahovica formation. These marls and ceramics plot together in almost every other variation diagrams for major and trace elements. This strongly suggests that these marls were used for the production of the vessels from the secret passage and the pottery without sand. Sediment sample TP 16 and marl samples TP 14-15, which belong to the Razgrad formation, form a separate group with higher CaO. They neither coincide with any ceramic material nor form a mixing line and therefore do not come to question.

The ceramic samples with and without sand show a negative correlation between SiO_2 and CaO. This and similar variations in other oxide-SiO_2 diagrams could be evidence that

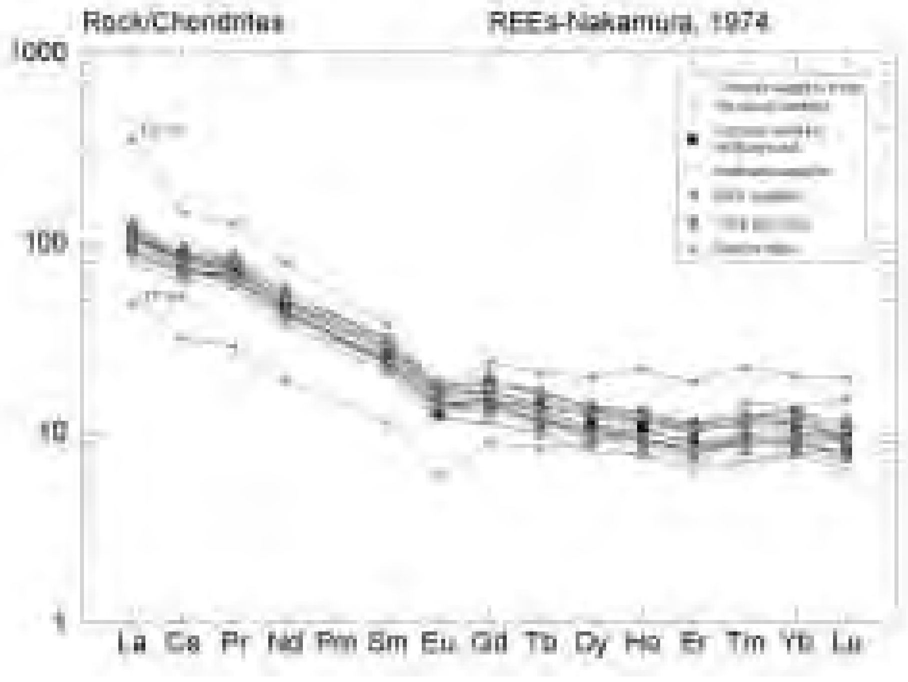


FIG. 3 – Diagram of the Rare Earth Elements. LA ICP-MS Data.

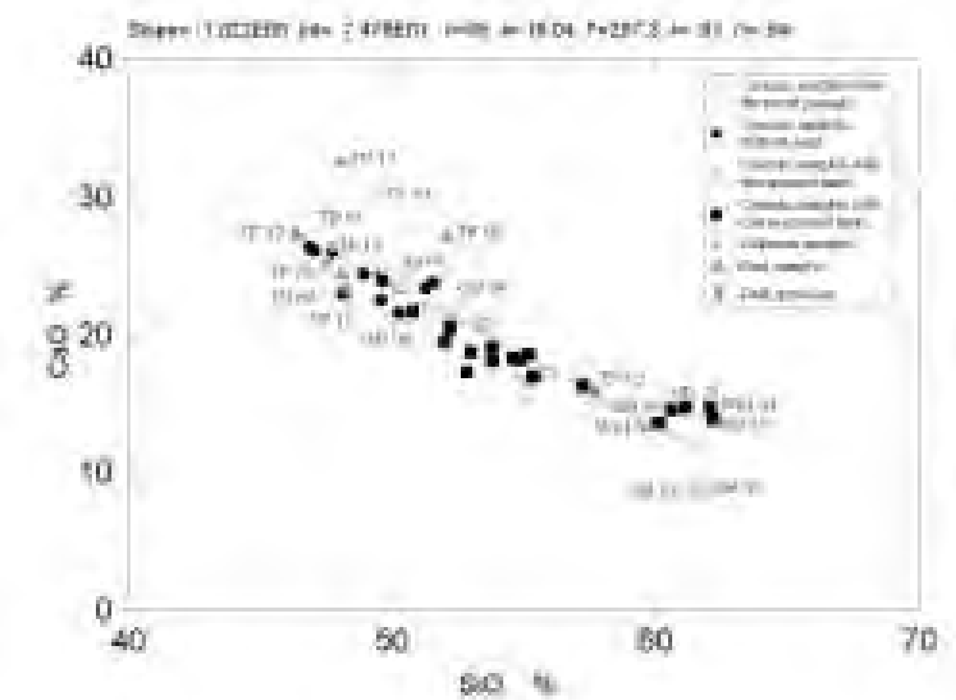


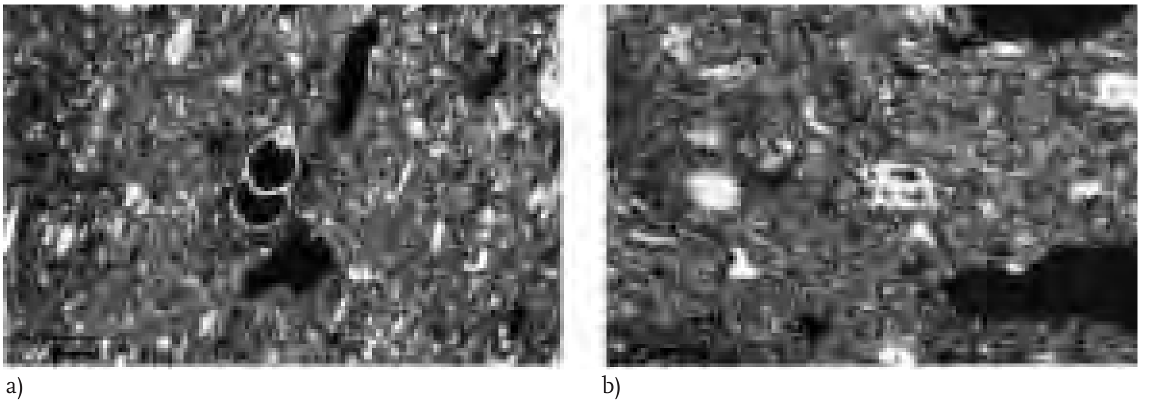
FIG. 4 – Correlation between SiO2 (%) and CaO (%). XRF and EMPA Data.

sand was added as temper to the marls, from which the pottery without sand was made. Further petrographic studies are required. The dark grey clay (TP 02) falls into the group of the pottery with sand, yet does not contain any visible grains. If sand were added, the mixtures should have even higher SiO_2.

The division between the two groups seems quite obvious but there are exceptions. Some samples of the group without sand occasionally contain single sand grains, which may belong to the clay material or may have been accidentally mixed into it. This can influence the analyses and a difference between visual and chemical classification may arise (Fig. 4/GG 08). The sand of the tempered pottery is not equal in amount and mostly irregularly distributed. This could be the reason why the macroscopic division into ceramics with fine- and coarse-grained sand is not reflected by the chemical analysis and some of the samples with sand (GB 06, Ad 01) plot with the pottery without sand. Moreover, it is unclear why Ad 01 shows certain differences in TiO_2, MgO, Cr, Cu. Sr, Y and Zr compositions in comparison with the tempered pottery.

Five samples with a large amount of coarse-grained sand (GB 09, GB 10, GB 23, WM 03, WM 04) lie above the regression line and form a separate group in most of the element correlations. The differences in the chemical composition of this group may be due to the use of another sand deposit. Studies of thin sections should provide further evidence. Two other samples (GB 20-21), which have brownish colour and almost no sand, plot somewhat lower than the regression line and are clearly distinct in most of the correlation diagrams. We assume that in this case the potters used different clay, which is richer in Al_2O_3 and Fe_2O_3.

Thin sections of three samples without sand were studied. Some microfossils were observed in sample AD 02 (Fig. 5). There is no evidence for their secondary deposition, i.e. they are neither crushed nor are their surfaces damaged. They have a calcareous shell, which indicates that the sediments containing them were formed in a shallow water basin. All these features allow these foraminifers to be determined as typical lower cretaceous forms. In all the thin sections the clay minerals make up to 70% of the mineralogical composition. The calcium carbonate is simultaneously deposited with the clay particles. Thus, the material should be classified as clayey marl, which corresponds to the Gorna Oriahovica geological formation. In this way the paleontological and mineralogical data confirm the results of the chemical analysis.



a) b)

FIG. 5 – hin sections of sample AD 02. a) Foraminifer Textularia, cross-polarized light, magnification 10x; b) Foraminifer Haplophragnium, cross-polarized light, magnification 20x.

The chemical composition of the slip is characterized by a high amount of Fe_2O_3, relative to the ceramics, and the red colour is probably due to the crystallisation of hematite. The slip of the samples without sand has about 10% Fe_2O_3. One of them has distinctly higher concentrations of SO_3 - 1,29% and Cl_2O - 2,12%, which might be the reason for its lighter shade. The slip of the samples with sand has less Fe_2O_3 (6,80% and 6,26% respectively), but more Na_2O (about 1%). One of them has a very high amount of K_2O - 5,53%. Summing up, dissimilarities in the amounts of Fe_2O_3, SO_3, Cl_2O, Na_2O and K_2O cause the various shades of the red slip. Most probable the potters used different outcrops of the so-called “red ochre”.

The chemical composition of the yellow layer is dominated by a high amount of PbO_2 - 45,11 and 43,59% respectively. The vessels from the secret passage were probably covered with a very thin layer of lead glaze. This is evidence that the technique of glazing was already known in mediaeval Bulgaria at the beginning of the ninth century.

4. Conclusions

The combined chemical and mineralogical approach to the fast wheel pottery from Pliska provides definite evidence for its local manufacture. The workshops were most probably in the possession of the ruling class or the khan, which could explain the existence of such a small-scale and high quality production, which was only required to cover the needs of the capital city. The origin of these potters and the interesting question of the simultaneous existence of technologically and morphologically similar, though not identical pottery in the Carpathian basin at the same time, require further detailed historical and archaeological investigation.

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NOTES

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3 "Sand" is used not in the geological sense of the word, but for opaque or white grain inclusions.

4 *Cemetery by Novi Pazar*, about 5 km east of Pliska - one jug (Fig. 2b). *Pagan cult monument by village Zlatna Niva*, about 5 km west of Pliska - one fragment (Rashev, 1991, p. 214). *Mound XX*, west of Pliska - fragments (oral communication from S. Stanilov). *Aul of Khan Omurtag by the village Khan Krum*, about 25 km southwest of Pliska – fragments (private observations). *Preslav* - early fortification, about 35 km southwest of Pliska - fragments (oral communication from I. Shtereva). *Cemetery by village Nozharevo*, municipality of Silistra, about 65 km northwest of Pliska - one flagon and several fragments (Rashev et al., 1989, p. 218).

5 *Settlement Bucov-Rotari* - one flagon (Comşa, 1979, p. 30). *Cemetery by Sultana*, municipality of Kălăraşi - small jars with one handle (Fiedler, 1992, p. 449, Gr. 79 and 80, Taf. 39, 13 and 14).

6 *Settlement Kalfa* - fragments (Chebotarenko, 1964, p. 98, Fig. 20).

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