DOI: https://doi.org/10.32653/CH204856-870

Research paper

Galina V. Trebeleva,
Cand. Sci., Researcher
Institute of Archeology of RAS, Moscow, Russia
trgv@mail.ru

Marina E. Klemeshova,
Junior Researcher
Institute of Archeology of RAS, Moscow, Russia
marinaklem@mail.ru

Isabella V. Skakova,
Research Assistant
Institute of Oriental Studies of RAS, Moscow, Russia
bella.skakova@yandex.ru

Arkady I. Dzhopua,
Director
Abkhaz State Museum, Sukhum, Abkhazia;
Senior Researcher
Abkhaz Institute of Humanitarian Studies of ANA, Sukhum, Abkhazia
Arkadi100@rambler.ru

PLINTH FROM THE GYENOS TEMPLE: RESULTS OF TEST STUDIES USING THE BOBRINSKY METHOD AND XRD ANALYSIS

Abstract. Excavations resumed at the Gyenos temple site in 2019 uncovered a considerable collection of plinths. The diversity of plinths within the site's masonry suggests varying construction and/or repair phases during its operational history. This variation likely stems from plinth production by different teams and in separate workshops. This article details research into the ceramic tradition of preparing the initial plastic raw materials and molding paste. Plinth analysis followed a methodology previously established for other Eastern Abkhazian sites, incorporating a comprehensive approach utilizing the method of A.A. Bobrinsky and X-ray Powder Diffraction (XRD). Analyzed plinth fragments originated from two distinct excavation areas, eastern and western. The study identified three distinct molding paste recipes, with varying frequencies of occurrence. Comparison of the Gyenos temple's molding brick paste recipes with those previously analyzed from the Markul settlement temple revealed notable differences and similarities in manufacturing approaches and traditions. While these two sites are geographically close (approximately 10 kilometers apart) and situated within the same geological area characterized by abundant natural admixtures of hematite and goethite-containing ore minerals, implying local raw material sourcing, they exhibit distinct production characteristics. This proximity and geological similarity strongly suggest on-site plinth production. The tentative correlation between specific traditions and the temple's chronological phases requires further investigation with a larger sample size. The plinth composition analysis has produced compelling preliminary findings and will be pursued in future research.

Keywords: Gyenos; Markul settlement; Abkhazia; temples; Byzantine traditions; plinths; Bobrinsky's method; X-ray Powder Diffraction (XRD)

For citation: Trebeleva G.V., Klemeshova M.Y., Skakova I.V., Jopua A.I. Plinth from the Gyenos Temple: Results of test studies using the Bobrinsky method and XRD analysis. *History, Archeology and Ethnography of the Caucasus*. 2024. Vol. 20. N. 4. P. 856-870. doi.org/10.32653/CH204856-870

DOI: https://doi.org/10.32653/CH204856-870

Исследовательская статья

Требелева Галина Викторовна
к.и.н., научный сотрудник
Институт археологии РАН, Москва, Россия
trgv@mail.ru

Клемешова Марина Евгеньевна
младший научный сотрудник
Института археологии РАН, Москва, Россия
marinaklem@mail.ru

Скакова Изабелла Владимировна
лаборант-исследователь
Институт востоковедения РАН, Москва, Россия
bella.skakova@yandex.ru

Джопуа Аркадий Иванович,
директор
Абхазский государственный музей, Сухум, Абхазия;
старший научный сотрудник
Абхазский институт гуманитарных исследований АНА, Сухум, Абхазия
Arkadi100@rambler.ru

ПЛИНФА ИЗ ХРАМА В ГИЕНОСЕ (ГЮЭНОСЕ): РЕЗУЛЬТАТЫ ТЕСТОВЫХ ИССЛЕДОВАНИЙ С ПОМОЩЬЮ МЕТОДА А.А. БОБРИНСКОГО И РЕНТГЕНОФАЗОВОГО АНАЛИЗА

Аннотация. Раскопки на территории храма в Гиеносе, возобновлённые в 2019 г., дали богатую коллекцию плинф. Разнообразие плинф в кладке одного памятника маркирует различные этапы его строительства и/или ремонта во время функционирования, так как они были произведены разными бригадами и в разных мастерских. Статья посвящена исследованиям керамической традиции изготовления состава исходного пластичного сырья и формовочных масс. Изучение плинф проводилось по уже отработанной на других памятниках Восточной Абхазии методике: комплексное исследование с помощью метода А.А. Бобринского и рентгенофазовый анализ. Фрагменты плинф для исследования были взяты с двух разных участков: Восточного и Западного раскопов. В ходе исследования удалось установить, что существуют три рецептуры приготовления формовочных масс, представленные неравномерно. Рецептуры приготовления формовочных масс кирпичей из храма в Гиеносе были сопоставлены с ранее исследованными кирпичами с храма в Маркульском городище. Установлены как существенные различия, так и сходства в применяемых подходах и традициях их изготовления. Можно уверенно говорить об изготовлении плинф для этих двух памятников, расположенных близко друг от друга (на расстоянии 10 км), в двух различных местах. При этом эти производства располагались в одном геологическом районе, сырье, из которого они изготовлены, характеризуется присутствием значительного количества естественной примеси рудных минералов, содержащих гематит и гётит, т.е. являются местными. Это дает веские основания для вывода о том, что производство плинф размещалось непосредственно рядом с местом строительства. Второй вывод: соотношение отдельных традиций с хронологическими этапами существования храма носит пока предварительный характер, потому что для уверенного заключения требуется большее число выборки, и представлен пока в качестве гипотезы. Исследование состава плинф показало перспективность исследования и будет продолжено.

Ключевые слова: Гиенос (Гюэнос); Маркульское городище; Абхазия; храмы; византийские традиции; плинфы; метод А.А. Бобринского; рентгенофазовый анализ

Для цитирования: Требелева Г.В., Клемешова М.Е., Скакова И.В., Джопуа А.И. Плинфа из храма в Гиеносе (Гюэносе): результаты тестовых исследований с помощью метода А.А. Бобринского и рентгенофазового анализа // История, археология и этнография Кавказа. 2024. Т. 20. No 4. С. 856-870. doi.org/10.32653/CH204856-870

Introduction

The use of plinth, or thin burnt bricks, is a defining characteristic of the Byzantine architectural tradition. The manufacturing process for bricks was both intricate and meticulously regulated. It involved a multitude of specialized teams, including those engaged in clay extraction, soaking, moulding, brick-making in frames, drying, and firing. The standardization of brick production was achieved through the consistent replication of a uniform size, shape, and composition of the molding paste. A significant number of bricks were stamped with specialized stamps as a mark of quality. Usually, the bricks were manufactured in close proximity to the construction site [1, p. 141–145].

The ancient city of Gyenos (Fig. 1, 2), from which today only the eastern hill with the remains of the Byzantine temple of the end of the 5th to the 6th centuries remains, was an important centre of Byzantine influence. The temple was excavated between 1981 and 1986 [2]. However, the plinth was not subjected to a detailed examination. In accordance with the prevailing view among scholars, the researchers have concluded that the dimensions of the plinth remained largely unchanged throughout the Byzantine period and that it cannot be employed to ascertain the date of construction of the edifice in question [1, p. 145]. However, we must respectfully disagree with this assertion. The production of plinths is a standardized process, and the presence of a great variety of plinths most likely marks precisely the different stages of its construction and/or repair during its functioning. This is because they were produced by different teams and in different workshops. Consequently, when the research at the site was resumed in 2019 and a considerable quantity of construction bricks was unearthed during the excavations, it was resolved to conduct a comprehensive analysis of them utilizing natural scientific methods.

Materials and methods

The geometric dimensions (thickness, width, and, to a lesser extent due to fragmentation, length) of all identified plinth fragments were analyzed [3]. The presence of stamps on the plinths was also recorded [3, pp. 18–40; 4, pp. 75–89]. Subsequent analysis examined the composition of the plinth material, as the moulding recipe reflects the ceramic traditions to which the plinths belong. D.D. Yolshin, a prominent St. Petersburg researcher of pre-Mongol Old Russian building materials, observes that initial visual assessment of the ceramic material can differentiate plinths from various production centers and across different periods [5, p. 397]. Petrographic analysis is the principal method for determining the composition of plinth moulding masses. This method involves examining the physical properties of the clay and identifying the constituent minerals. This established method has proven effective in determining both the clay type and the composition of its inorganic mineral inclusions. However, petrographic analysis has limitations in distinguishing between artificial and natural inclusions within the clay, hindering the identification of technological manufacturing traditions. Consequently, in a 2021 pilot study of Abkhazian plinths conducted by the Markul expedition team, A.A. Bobrinsky's method was employed in conjunction with X-ray Powder Diffraction [11; 12]. This study, which analyzed ten plinth fragments from five selected Eastern Abkhazian monuments, revealed consistent patterns in plinth moulding paste composition, demonstrating the potential efficacy of this combined approach for similar research. Therefore, a test study of plinths from the Gyenos temple was undertaken to further this investigation.

Plinth samples were collected from two distinct excavation areas: the eastern and western sectors, with four samples from each. Excavation of the eastern sector, initiated in 2019 southeast of the temple altar, comprised two contiguous 4x4-meter pits, reaching a depth of approximately six meters. The upper layers consisted of spoil from previous excavations, from which a substantial number of fragmented plinths from the temple's destruction period were recovered. The western excavation, located west of the temple within the narthex, aimed to investigate structures contemporaneous with the temple. In 2019, this excavation comprised two 4x4-meter squares in the southwestern part of the narthex. Subsequent expansion has resulted in ten 4x4-meter squares, encompassing the entire southern part of the narthex.

The intact plinth discovered during the research underwent detailed measurement [3, p. 12]. Analysis revealed a significant difference in thickness between plinths from the eastern and western excavations. The eastern excavation plinth fragments are hypothesized to originate from the temple's altar area, while those from the western excavation are believed to derive from the narthex walls. The eastern plinths are notably thinner than those from the west [3, pp. 12–13]. This disparity suggests that the narthex and the temple were not constructed concurrently, with the narthex likely being a later addition.

Plinth moulding paste was analyzed using fresh fractures and an MBS-10 binocular microscope with optical magnification up to 56x (Fig. 5). This analysis identified the type of initial plastic raw material (IPRM) [13, pp. 17–20], the degree of iron content [14, pp. 421–425], the initial state of the crushed IPRM (moist or dry) used for paste production [15, p. 108; 13, p. 33], and the IPRM's silt content [16, pp.]. The type, size, and quantity of natural and artificial organic and mineral inclusions in the IPRM were also determined [15, pp. 76, 79–82, 105–108, 109–113; 13, pp. 22–25, 33–45, 67, 70–71, 85–86]. The firing temperature of the bricks was estimated (above or below 850˚C) [13, p. 93].

Mineral inclusions were identified through petrographic and X-ray Powder Diffraction conducted at the N.M. Fedorovsky VIMS. XRD is a quantitative and qualitative method for identifying crystalline phases within a mixture by analyzing the sample's diffraction pattern. This method is described in detail in various publications, such as [17; 18]. In ceramic studies, XRD enables the determination of the investigated substance's mineral (phase) composition in percentage terms.

Discussion

The results of the study of initial plastic raw material (IPS), moulding paste (MP) composition and firing temperature are presented in Table 1

Table 1. Results of the study of plinth fragments from Gyenos using the method of A.A. Bobrinsky

Sample No.	Moulding Paste	Plastic raw materials, composition of moulding paste	Firing temp.
Eastern excavation			
Gyenos Temlpe-1	Cl + fine S + OM fine Sand 1:4-1:5	clay, medium sandy, low iron	850˚C or slightly above
Gyenos Temlpe -2	Cl + fine S + OM Fine sand 1:4	clay, medium sandy, low iron	less than 850˚C
Gyenos Temlpe -4	Mixture of two types of Cl + OM	mixture of two clays: highly sandy medium iron (red) (~95%) and fine-grained low iron content (less than 5%)	slightly below 850˚C
Gyenos Temlpe -7	Cl + fine S + OM fine sand 1:4	clay, medium-grained sand, high iron content	slightly below 850˚C
Gyenos Temlpe -10	Mixture of two types of Cl + OM fine sand 1:4	mixture of two clays: medium-grained medium iron (red) (~85-90%) + low sandy weakly tinny (light yellow) (~10-15%).	850˚C or slightly higher
Western excavation			
Gyenos Temlpe -3	Mixture of two types of Cl + Medium S + OM medium sand 1:4	mixture of two clays: low sandy, medium iron (red) (~85-90%) + low sandy, low iron (light yellow) (~10-15%)	slightly below 850˚C
Gyenos Temlpe -5	Mixture of two types of clay + very fine Sand+ OM Very fine sand 1:5	mixture of two clays: medium sandy medium iron (red) (~60-70%) and low sandy low iron (yellow) (~30-40%)	850˚C or slightly higher

Gyenos Temlpe -6	Cl + fine S + OM Fine sand 1:4	low sandy, high iron	slightly below 850˚C
Gyenos Temlpe -8	Cl + fine S + OM Fine sand 1:4	medium sandy, high iron	below 850˚C
Gyenos Temlpe -9	Cl + fine S + OM Fine sand 1:5	highly sandy, high iron	slightly below 850˚C

Note: CL – clay, S – sand, OM – organic mortar, S – sand, with variations: very fine (0.2-0.4 mm), fine (0.5-0.9 mm), medium (1-1.9 mm)

Plinth production utilized moist clay. Analysis revealed that five samples contained clay with high iron content, while four samples comprised a mixture of two clays with medium iron content. One sample exhibited low iron content clay. The moulding paste in four samples consisted of clays with varying iron content, including medium iron content (medium or high) and low iron content. In recipes utilizing a single clay type, medium sandy (four samples) and high sandy (one sample) raw materials were predominant. One sample was low sandy clay. Consequently, the production of plinths for the Gyenos construction employed a diverse range of clay sources.

In addition, it should be noted that there are different traditions used for the production of moulding paste. In general, three distinct recipes can be identified:

1. Clay + sand + organic mortar (60%);
2. Mixture of two clays + sand + organic mortar (30%);
3. Mixture of two clays + organic motar (10%).

Recipes were observed with and without the artificial addition of sand to clay. Where a mixture of two clays was used, the large number of samples from previous studies at different sites, combined with the pottery traditions of later periods in Abkhazia (particularly among modern potters in the Gali district), suggests that the selection of mixed raw materials was intentional. This strongly indicates that such recipes represent not isolated instances, but rather a stable and widespread pottery tradition rooted in a specific concept of the initial plastic raw material.

Three samples (Gyenos Temple-2, Gyenos Temple-7, Gyenos Temple-8) from different parts of a single object, despite varying thicknesses, exhibit identical compositional characteristics. This suggests either simultaneous brick production with varying thicknesses or non-uniform brick thickness. The research primarily focuses on brick fragments with a single thickness measurement. Brick length and width were determined using mold dimensions, while thickness was estimated based on mold fill density. The absence of rigid mold stops may explain the observed thickness variations. Three identical plinth fragments exhibit varying thicknesses: 3.6 cm (Gyenos Temple-8), 4.2 cm (Gyenos Temple-7), and 5 cm (Gyenos Temple-2). These fragments were recovered from different excavation locations (Gyenos Temple-8 in the western sector; Gyenos Temple-2 and Gyenos Temple-7 in the eastern sector). This evidence strongly suggests that Gyenos Temple-8 does not originate from the same plinth as Gyenos Temple-7 and Gyenos Temple-2. Definitive conclusions regarding the last two specimens, with a thickness difference of only 8 mm, are not possible.

Given the limited sample size and the exploratory nature of this analysis, it is instructive to compare these results with those obtained from plinths discovered during the excavations at the Markulsky settlement temple (Fig. 1, 3) [19]. The results of the clay analyses are presented in Table 2.

Table 2. Results of the study of fragments of plinths from the temple in the Markul settlement using the method of A.A. Bobrinsky

Sample No.	Moulding Paste	Plastic raw materials, moulding paste composition	Firing temp.
Markul Temple-1	Mixture of 2 Cl + OM	mixture of two clays, highly sandy medium iron (red) (~85%) + low sandy low iron (light yellow) (~15%)	850˚C or higher

Markul Temple -2	Cl + OM	highly sandy, medium iron	850˚C or higher
Markul Temple -3	Mixture of two Cl + OM	mixture of two clays, medium sandy low tinny (but more tinny, red) (~95%) and low sandy low tinny (yellow) (~5%)	850˚C or higher
Markul Temple -4	Mixture of two Cl + Fine Sand + organic mortar fine sand 1:4	mixture of two clays, medium sandy medium tinny (red) (~95%) and medium sandy weakly tinny (yellow) (~5%)	850˚C or higher
Markul Temple -5	Mixture of two Cl + Very fine sand + OM very fine sand 1:4	mixture of two clays: medium-sandy low iron (red) (~95-97%) and medium-sandy low tinny (yellow) (~3-5%)	850˚C or higher
Markul Temple -6	Cl + Om	medium sandy medium iron	850˚C or slightly higher
Markul Temple-1-21	Cl + Om	highly sandy medium iron	a little less than 850˚C
Markul Temple-2-21	Clay + Om	medium sandy medium iron	850˚C or slightly higher

A detailed analysis of the data on the structure and composition of the plinths found at the Markulskoye ancient settlement temple revealed the presence of samples exhibiting varying compositions of moulding masses. Three distinct compositions were identified:

1. Clay + organic solution (50%)
2. Mixture of two clays + organic solution (25%)
3. Mixture of two clays + sand + organic solution (25%)

A comparative analysis of the moulding mass compositions employed in the construction of the two aforementioned temples reveals notable similarities and differences. At the Markul temple, the most frequently observed composition (50% of samples) consists of clay combined with organic mortar. This specific composition is entirely absent from the bricks of Gyenos. Conversely, the "clay + sand + organic mortar" composition predominates at Gyenos (60% of samples), a composition not detected in any of the Markul temple bricks.

Samples with comparable moulding paste compositions were also identified at both sites. Specifically, one sample from Gyenos (Gyenos-4) exhibits compositional similarities to samples from the Markul temple (Markul Temple-1 and Markul Temple-3), consisting of a mixture of two clays and an organic solution. Instances of correspondence were also observed in the "mixture of two clays + sand + organic solution" composition, present in Gyenos Temple-3, Gyenos Temple-5, Gyenos Temple-9, Markul Temple-4, and Markul Temple-5. Analysis of the mineral composition revealed distinct characteristics in the sand used as an artificial admixture in the moulding paste of the plinths at the two sites. While both sites exhibited a sharp-angular grain structure, the grain size varied, measuring between 0.5 and 1.2 mm at one site and between 0.3 and 0.5 mm at the other. However, the Gyenos plinths exhibit a distinct composition, with hematite constituting the majority of the sand particles. Visual estimation suggests that this ore mineral comprises between 65% and 80% of the sand used in their construction, with the remainder primarily consisting of quartz grains. Conversely, the Markul temple plinth incorporates a different sand composition, with ore mineral particles ranging from 40% to 60% and quartz comprising the remaining 40% to 60%. These discrepancies in raw materials are corroborated by the XRD results (Table 3). Notably, pyroxene impurities were identified in five samples from Gyenos, a finding not previously observed in samples from other sites or in samples of natural clays and raw materials. This admixture is present in all samples designated "moulding paste of clay + sand + organic mortar," a type of moulding paste absent from the Markul Temple.

Table 3. Phase (mineral) composition of plinth from the buildings of the Markul settlement and Gyenos, wt. %

Minerals	Markul Temple (T)						Gyenos Temple (G)									
	T-1	T-2	T-3	T-4	T-5	T-6	G-1	G-2	G-3	G-4	G-5	G-6	G-7	G-8	G-9	G-10
Sum of crystalline phases	56	50.5	34	57.5	51.5	56	61.5	58.5	66.5	48	42.5	43	69.5	67	63	46.5
X-ray amorphous phase	44	49.5	66	42.5	48.5	44	38.5	41.5	33.5	52	57.5	57	30.5	33	37	53.5
Haematite Fe_2O_3	8	3.5	6	5.5	9	8	4	2	1	6	6	4	2.5	2	4	6
Quartz SiO_2	34	36.5	25	31	31.5	32	21	19	25	13	18	16	22	16.5	18	18
Pyroxene $CaMgSi_2O_6$	–	–	–	–	–	–	1	–	–	–	–	2	0.5	1	3	–
Montmorillonite	6	–	–	13	–	8	21	21	23	17.5	11	5	24	22	20	8
Plagioclase (anorthite) $Ca[Al_2Si_2O_8]$	4	7	3	6.5	8	6.5	9	13	11.5	7	7	12	15	17.5	13.5	11
K-feldspar $K[AlSi_3O_8]$	2	3	–	–	2	1	5	3	5	4	–	3	5	5.5	3	3
Anatase TiO_2	0.5	0.5	сл.	0.5	<0.5	0.5	0.5	0.5	1	0.5	0.5	1	0.5	1	0.5	0.5
Barite $BaSO_4$	–	–	–	<1	–	–	–	–	–	–	–	–	–	1	–	–
Mullite $(Al_4SiO_8)_{1,2}$	1.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Amphibole	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–
Calcite $CaCO_3$	–	–	–	–	<0.5	–	–	–	–	–	–	–	–	–	–	–
Corundum Al_2O_3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Pseudobrukite Fe_2TiO_5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Cristobalite SiO_2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Conclusion

The results obtained strongly suggest that the plinths for the two sites, located 10 km apart (Fig. 1), were produced at two distinct locations. However, the raw materials employed in these separate productions appear to have originated from the same local geological area. This area is characterized by a substantial natural presence of ore minerals, specifically hematite and goethite, as established in prior research [19]. This evidence supports the inference that plinth production occurred in close proximity to each respective site.

It should be noted that these conclusions are preliminary due to the limited sample size. This research was exploratory, designed to evaluate the applicability of A.A. Bobrinsky's method and XRD analysis to plinths from a single site and to inform the direction of future research.

Sand containing a high concentration of ore mineral particles was observed in all samples, indicating its intentional use in the moulding paste. Several analogous moulding paste traditions are discernible at both sites, although their proportions vary. A definitive conclusion regarding quantitative proportions based on different moulding paste composition traditions requires a more substantial sample size, as the current sample is not representative and lacks sufficient statistical data. Nevertheless, the distinctive characteristics of these observed traditions warrant further investigation. Based on existing site dating data, a correlation between these traditions and specific chronological markers may be hypothesized.

The Markul temple was constructed around the turn of the 4th and 5th centuries [20], with subsequent evidence of repairs and rebuilding. The Gyenos temple is believed to date to the turn of the 5th and 6th centuries. Given Gyenos's identification as an ancient polis and Markul's recognition as a local settlement, it is highly probable that an earlier temple existed at Gyenos, dating no later than the 4th century. However, it remains unclear whether this earlier temple occupied the same location as the extant temple or was situated on a different, now lost, hill. The 2022 excavation discovery of a Bronze Age sanctuary at the Gyenos temple site suggests the reasonable assumption that the 4th-century temple was constructed on this pre-existing sacred site. The sanctuary consisted of a pebble-paved platform supporting an idol. This cult complex, including a naos, a temple hall, was partially overlain by the foundation of a narthex (see Figure 4). Intermediate layers between the sanctuary and the layer contemporaneous with the temple were absent (4, p. 89). As the temple has not yet been excavated to its foundational level, it is reasonable to hypothesize that the 4th-century structure's foundation lies beneath that of the 5th- or 6th-century temple, potentially incorporating building materials from the earlier structure. Consequently, the analogous moulding paste compositions observed in select samples from Gyenos and Markul may indicate the contemporaneous existence of these composition traditions. Furthermore, it is plausible that the Gyenos temple's construction incorporated materials from a pre-existing structure on the same site.The studies of the plinths, which have been conducted thus far, have demonstrated their prospective value. It is the intention of the research team to continue these studies.

Acknowledgements. The research was supported by the Russian Science Foundation, project No. 22-18-00466 "The North-Eastern Black Sea Coast in Antique and Medieval Times: Historical Modelling Based on GIS Technologies, Geoarchaeology and Archaeometry."

Финансирование. Работа выполнена при поддержке РНФ проект № 22-18-00466 «Северо-Восточное Причерноморье в античное и средневековое время: историческое моделирование на основе ГИС-технологий, геоархеологии и археометрии».

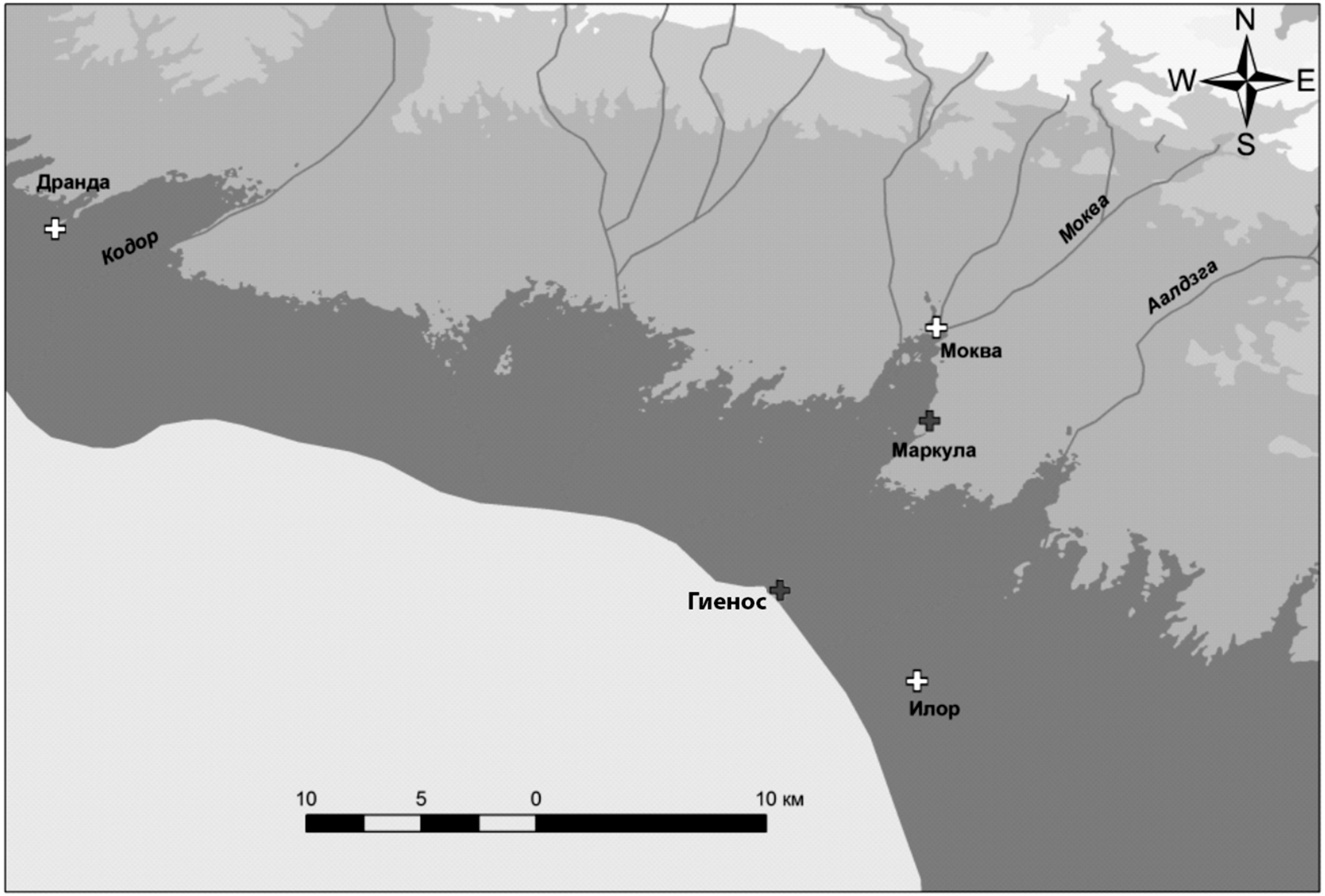

Fig. 1. Map of southeastern Abkhazia indicating the locations of the Gyenos and Markul sites

Рис. 1. Карта юго-восточного региона Абхазии с указанием расположения памятников (Гиенос и Маркульское городище)

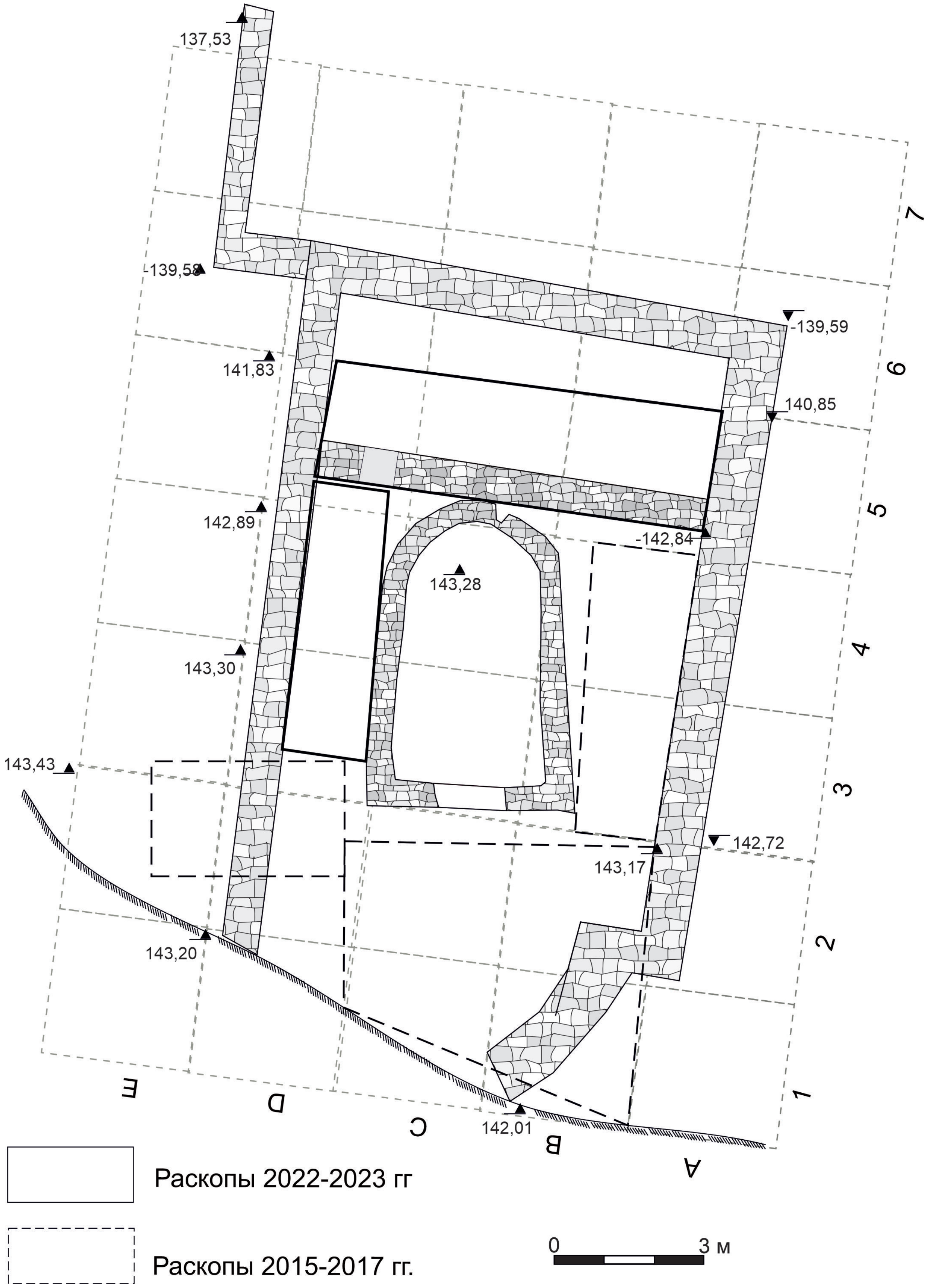

Fig. 2. Plan of the central part of the eastern hill at the Gyenos site, indicating excavation locations

Рис.2. План центральной части восточного холма городища Гиенос с указанием мест расположения раскопов

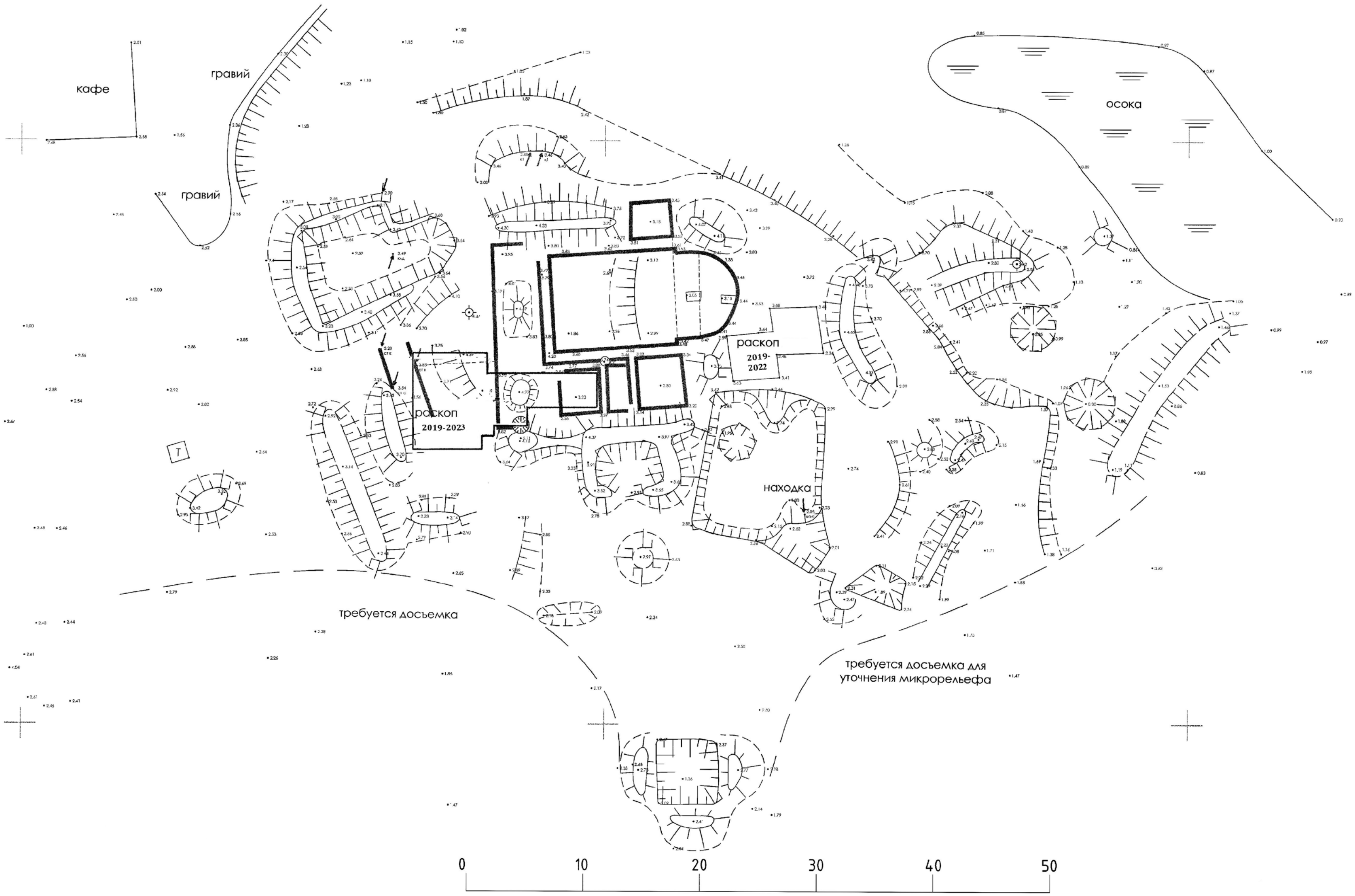

Fig. 3. General plan of the Markul site temple

Рис. 3. Храм на Маркульском городище, общий план

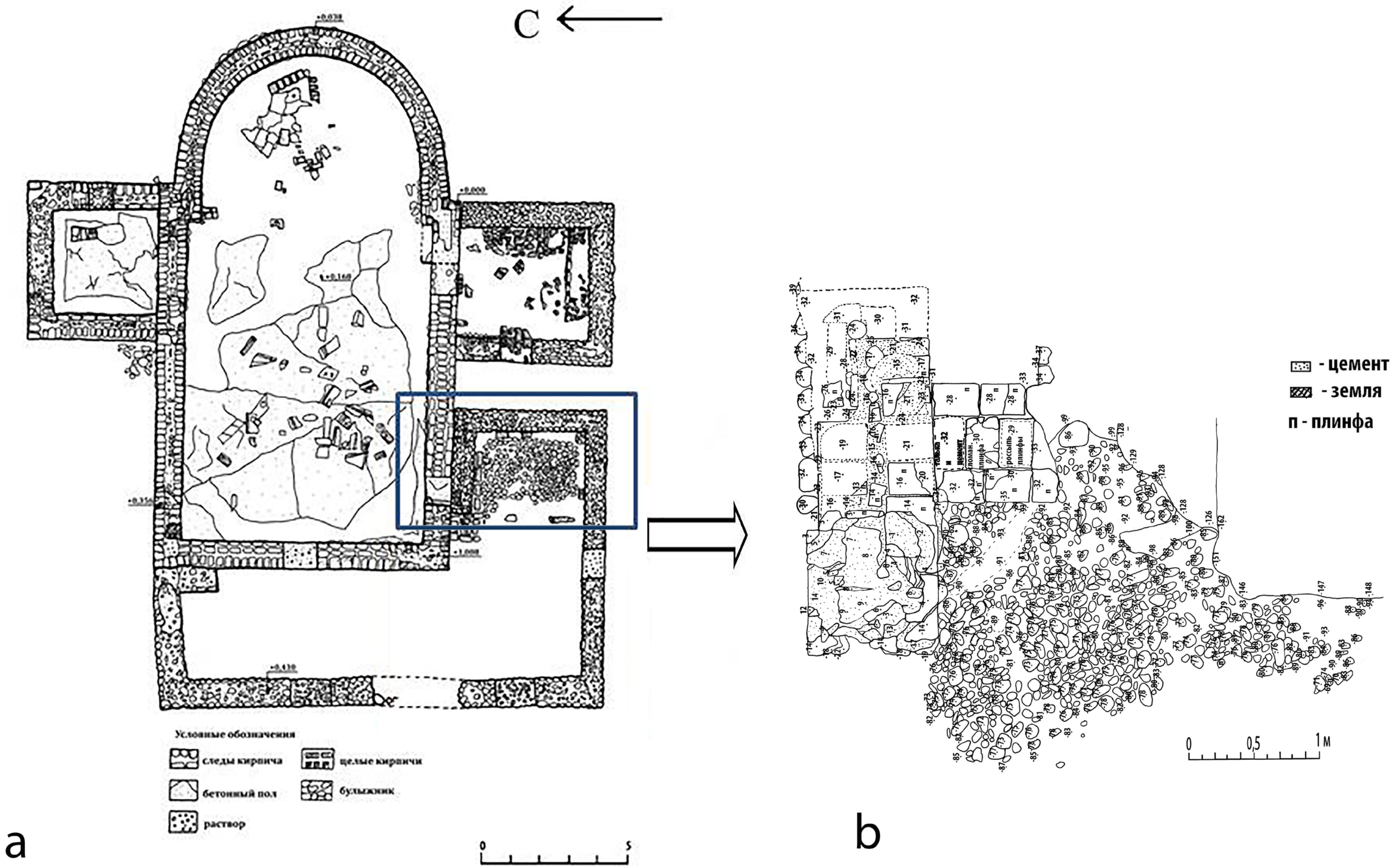

Fig. 4. General plan of the Gyenos site temple, showing the sanctuary location (a), and plan of the sanctuary with the naos and narthex walls indicated

Рис. 4. Храм на городище Гиенос: общий план с указанием места святилища (а) и план святилища со стенами наоса и нартекса храма

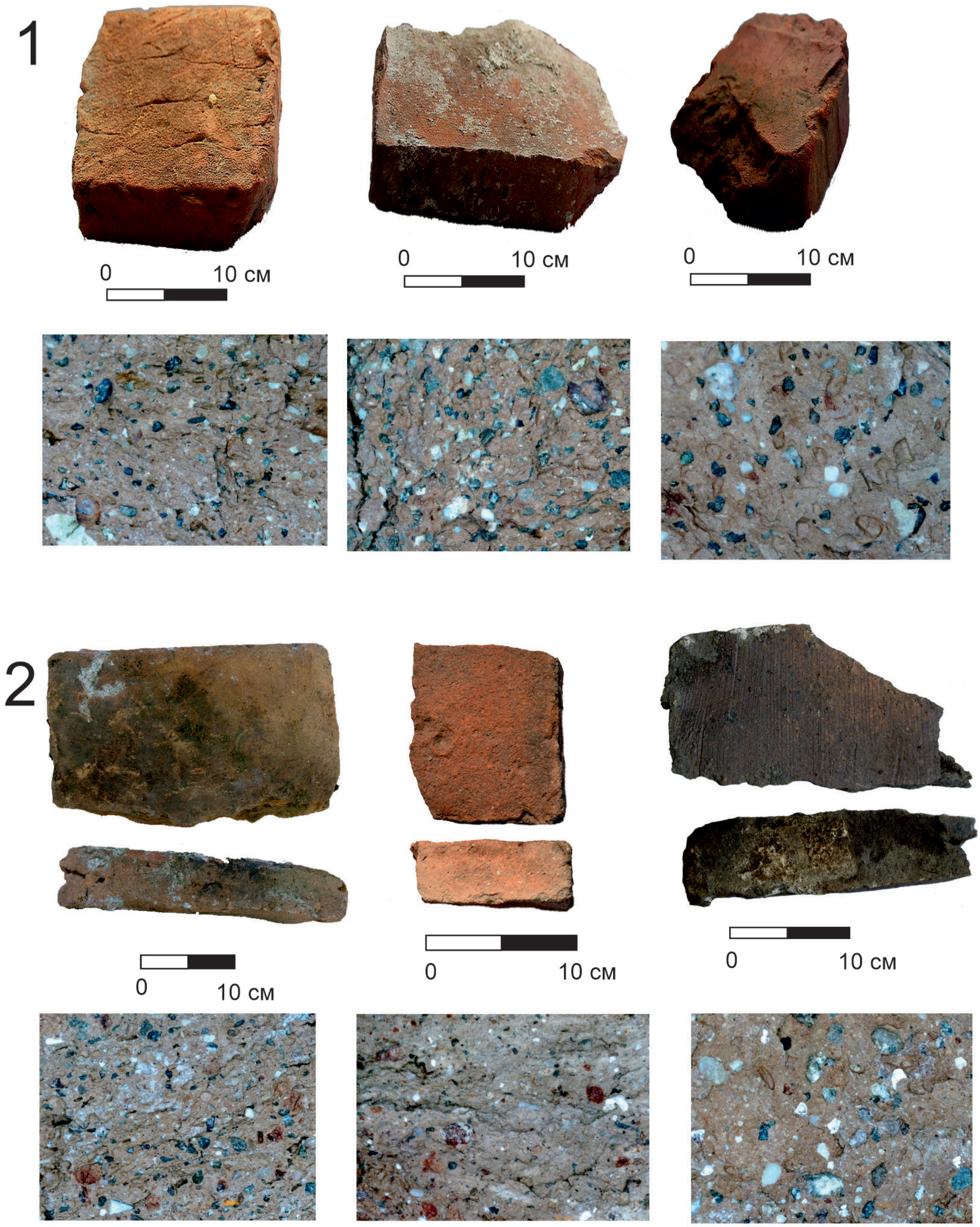

Fig. 5. Plinths and fractures from the Gyenos (1) and Markul (2) sites

Рис. 5. Фотографии плинф и их изломов из Гиэноса (1) и Маркульского городища (2)

REFERENCES

1. Ousterhout R. *Byzantine Builders*. Transl.: L.A. Belyaev; ed. and comment.: L.A. Belyaev, G.Yu. Kyiv, Moscow: KORVIN PRESS, 2005. (In Russ)

2. Shamba SM. *Gyuenos-1*. Tbilisi, 1990. (In Russ)

3. Skakova IV., Skakov AYu., Dzhopua AI. Plinth of the early medieval temple in Gyuenos (Ochamchira, Republic of Abkhazia): publication of excavation materials from 2019–2021. *Byzantino Caucasica*. I. Moscow: Institute of Oriental Studies of RAS, 2021: 9-53. (In Russ)

4. Skakova IV., Skakov AYu., Dzhopua AI. Early Medieval Temple in Gyenos (Republic of Abkhazia): Results of Work in 2022. *Byzantino Caucasica*. II. Moscow: Institute of Oriental Studies of RAS, 2022: 69-109. (In Russ)

5. Jolshin DD. New Studies of the Old Russian Plinth: Results and Prospects. *Archaeology and Ancient History of Ukraine*. 1. Kyiv: 395-407. (In Ukr)

6. Peacock D.P.S. Bricks and Tiles of the Classis Britannica: Petrology and Origin. *Britannia*. 1977; 8: 235-248.

7. Ristic MM., Širković SK., Korac VR. *Care of Serbian Medieval Monasteries*. Beograd: Srpska Akademija Nauka i Umetnosti, 1989. (In Russ)

8. Betts I. Thin-section and neutron activation analysis of brick and tile from York and surrounding sites. *Recent Developments in Ceramic Petrology*. London: British Museum Publ., 1991: 39-55.

9. Jolshin DD. Old Russian plinth: technology and typology. Proceedings of the IV All-Russian Archaeological Congress. 3. Kazan, 2014, pp. 40–44.

10. Vinogradov A.Yu., Jolshin D.D., Kulkova M.A. Medieval building ceramics of Transcaucasia according to petrographic analysis. In: *D.V. Beletsky, A.Yu. Vinogradov (eds). History and Art of Christian Alania*. Moscow: Taus, 2019: 382-392. (In Russ)

11. Klemeshova ME., Trebeleva GV., Kizilov AS., Glazov KA., Sokolov SV. Experience of applying the method of A.A. Bobrinsky for studying ceramic vessels in the study of the composition of molding masses of plinths of medieval temples and fortresses of Eastern Abkhazia. *Geoarchaeology and Archaeological Mineralogy – 2021. Proceedings of the VIII All-Russian Scientific Conference*. Miass – Chelyabinsk, 2021:, 97-101. (In Russ)

12. Klemeshova ME., Trebeleva GV., Kizilov AS., Glazov KA., Sokolov SV., Yurkov GY. Application of the Method of A.A. Bobrinsky to Study the Brick Paste Composition from Eastern Abkhazian Medieval Temples and Fortresses. *Geoarchaeology and Archaeological Mineralogy. Springer Proceedings in Earth and Environmental Sciences* / Ankusheva N.N., Chechushkov I.V., Epimakhov A.V., Ankushev M.N., Ankusheva P.S., eds. Springer, Cham, 2022. [Electronic resource] URL: https://doi.org/10.1007/978-3-031-16544-3_17 (accessed: 20.11.2023).

13. Bobrinsky AA. Pottery technology as an object of historical and cultural study. In: *Bobrinsky A.A., Tsetlin Yu.B., Vnukov S.Yu., Glushkov I.G., Grebenshchikov A.V., et al. Actual Problems of Studying Ancient Pottery: Collective Monograph*. Samara: Samara State Pedagogical University, 1999: 5-109. (In Russ)

14. Tsetlin YuB. On determining the degree of ferruginization of the raw materials for the production of clay dishes. *Questions of Archaeology of the Volga Region*. Issue. 4. Ed. I.N. Vasilyeva. Samara, 2006: 421-425. (In Russ)

15. Bobrinsky AA. *Pottery of Eastern Europe. Sources and Methods of Study*. Moscow: Nauka, 1978. (In Russ)

16. Lopatina OA., Kazdym AA. On the natural admixture of sand in ancient ceramics (towards a discussion of the problem). *Ancient Pottery: Results and Prospects of Study*. Moscow: Institute of Archaeology of RAS, 2010: 46-57. (In Russ)

17. Kovba LM., Trunov VK. *X-ray Powder Diffraction (XRD)*. 2nd ed., suppl. and rev. Moscow: Moscow State University Press, 1976. (In Russ)

18. *X-ray analysis of the main types of rock-forming minerals*

СПИСОК ЛИТЕРАТУРЫ

1. *Оустерхаут Р.* Византийские строители / Пер.: Л.А. Беляев; ред. и комм.: Л.А. Беляев, Г.Ю. Ивакин. Киев, Москва: КОРВИН ПРЕСС, 2005. – 332 с.

2. *Шамба С.М.* Гюенос-1. Тбилиси, 1990. – 136 с.

3. *Скакова И.В., Скаков А.Ю., Джопуа А.И.* Плинфа раннесредневекового храма в Гиеносе (г. Очамчира, Республика Абхазия): публикация материалов раскопок 2019–2021 гг. // Byzantino Caucasica. I. М.: ИВ РАН, 2021. С. 9–53.

4. *Скакова И.В., Скаков А.Ю., Джопуа А.И.* Раннесредневековый храм в *Гиеносе (Республика Абхазия): итоги работ 2022 г.* // Byzantino Caucasica. II. М.: ИВ РАН, 2022. С. 69–109.

5. *Ёлшин Д.Д.* Новые исследования древнерусской *плинфы*: итоги и перспективы //*Археологія* і *давня* історія *України*. 1. *Київ*. С. 395–407.

6. *Peacock D.P.S.* Bricks and Tiles of the Classis Britannica: Petrology and Origin // Britannia. 8. 1977. С. 235–248.

7. Ристић М.М., Ћирковић С.К., Кораћ В.Р. *Опеке српских средњовековних манастира*. *Београд*: Srpska Akademija Nauka i Umetnosti, 1989. – 104 *с*.

8. *Betts I.* Thin-section and neutron activation analysis of brick and tile from York and surrounding sites // Recent developments in ceramic petrology. London: British Museum Publications Ltd, 1991. С. 39–55.

9. *Ёлшин Д.Д.* Древнерусская плинфа: технология и типология // Труды IV Всероссийского Археологического съезда. 3. Казань, 2014. С. 40–44.

10. *Виноградов А.Ю., Ёлшин Д.Д., Кулькова М.А.* Средневековая строительная керамика Закавказья по данным петрографического анализа // Белецкий, Д.В., Виноградов, А.Ю. *История и искусство христианской Алании*. М.: *Таус*, 2019. *С*. 382–392.

11. *Клемешова М.Е., Требелева Г.В., Кизилов А.С., Глазов К.А., Соколов С.В.* Опыт применения методики А.А. Бобринского для изучения керамических сосудов при исследовании состава формовочных масс плинфы средневековых храмов и крепостей Восточной Абхазии // Геоархеология и археологическая минералогия – 2021. Материалы VIII Всероссийской научной конференции. Миасс – Челябинск, 2021. С. 97–101.

12. *Klemeshova M.E., Trebeleva G.V., Kizilov A.S., Glazov K.A., Sokolov S.V., Yurkov G.Y.* Application of the Method of A.A. Bobrinsky to Study the Brick Paste Composition from Eastern Abkhazian Medieval Temples and Fortresses // Geoarchaeology and Archaeological Mineralogy. Springer Proceedings in Earth and Environmental Sciences / Ankusheva N.N., Chechushkov I.V., Epimakhov A.V., Ankushev M.N., Ankusheva P.S., eds. Springer, Cham, 2022. *[Электронный ресурс]* URL: https://doi.org/10.1007/978-3-031-16544-3_17 *(дата обращения: 20.11.2023)*.

13. *Бобринский А.А.* Гончарная технология как объект историко-культурного изучения // Бобринский А.А., Цетлин Ю.Б., Внуков С.Ю., Глушков И.Г., Гребенщиков А.В. и др. Актуальные проблемы изучения древнего гончарства: Коллективная монография. Самара: Самарский гос. пед. ун-т, 1999. С. 5–109.

14. *Цетлин Ю.Б.* Об определении степени ожелезненности исходного сырья для производства глиняной посуды // Вопросы археологии Поволжья. Вып. 4. / Отв. ред. И.Н. Васильева. Самара, 2006. С. 421–425.

15. *Бобринский А.А.* Гончарство Восточной Европы. Источники и методы изучения. М.: Наука, 1978. – 272 с

16. *Лопатина О.А., Каздым А.А.* О естественной примеси песка в древней керамике (к обсуждению проблемы) // Древнее гончарство: итоги и перспективы изученияю. М.: ИА РАН, 2010. С. 46–57.

17. *Ковба Л.М., Трунов В.К.* Рентгенофазовый анализ. Издание 2-е, дополненное и переработанное. М.: Изд-во МГУ, 1976. – 232 с.

(layered and framework silicates). Ed. V.A. Frank-Kamenetsky. Leningrad: Nedra, 1983. (In Russ)

19. Klemeshova ME., Trebeleva GV., Yurkov GYu. Comparative analysis of natural raw materials and ceramic products from the excavations of the Markul settlement and pottery production center near the village of Atara in Eastern Abkhazia. *Brief Communications of the Institute of Archaeology*. 2023; 272: 291-310. (In Russ)

20. Trebeleva GV., Sakaniya SM., Shvedchikova TYu., Yapryntsev AD. On the problem of dating burials from the necropolis of the Markul settlement at the temple (Abkhazia, 4th–14th centuries): based on the analysis of inventory, jewelry, as well as the correlation of inventory and non-inventory burials, their stratigraphy and isotope analyzes. *Thing in the Context of the Funeral Rite. Proceedings of the International Scientific Conference*. Moscow, 2020: 242-250. (In Russ)

18. Рентгенография основных типов породообразующих минералов (слоистые и каркасные силикаты) / Ред. В.А. Франк-Каменецкий. Л.: Недра, 1983. – 359 с.

19. *Клемешова М.Е., Требелева Г.В., Юрков Г.Ю.* Сравнительный анализ природного сырья и керамических изделий из раскопок Маркульского городища и гончарного производственного центра у с. Атара в Восточной Абхазии // Краткие сообщения Института археологии. 2023. № 272. С. 291–310.

20. *Требелева Г.В., Сакания С.М., Шведчикова Т.Ю., Япрынцев А.Д.* К проблеме датировки погребений из некрополя Маркульского городища при храме (Абхазия, IV–XIV века): на основе анализа инвентаря, украшений, а также корреляции инвентарных и безынвентарных погребений, их стратиграфии и анализов изотопов // Вещь в контексте погребального обряда. Материалы международной научной конференции. М., 2020. С. 242–250.

Received 30.11.2023
Accepted 18.01.2024
Published 15.12.2024

Поступила в редакцию 30.11.2023 г.
Принята в печать 18.01.2024 г.
Опубликована 15.12.2024 г.