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LOCAL POTTERY IN THE LOWER BUG REGION AT THE EARLY STAGES OF URBANIZATION

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ABSTRACT

The purpose of the paper is to investigate the development of pottery in the Lower Bug region and its role in urbanization processes on the basis of historiographical, archaeological and paleogeographical data at the 6th century BCE.

Scientific novelty. For the first time the ceramic production are comprehensively considered into account the raw material base of the pottery of the ancient settlement on the example of Borysthenes. The relationship between social and natural factors in the development of pottery has been established. The role of this craft in the context of urbanization processes in the North-Western Black Sea region is determined. The early production of ceramics in Lower Bug is considered, covering different categories of sources. A method of studying the local pottery making in the ancient centres of the region is proposed.

Methodology. The study was based on a comprehensive analysis of historiographical and archaeological data and paleogeographical methods. The field stage of the research included the survey of sites with unsoddy deposits of various geological periods as potential pottery raw materials. A stratigraphic dissection of deposits, their macromorphological description and samples were taken from each sites for further laboratory research. The laboratory research included a micromorphological analysis of ceramic products to compare its characteristics with potential raw materials, as well as a granulometric analysis of the selected samples to determine their physicochemical properties.

Conclusions. Pottery as an independent type of craft was distinguished in Hellenic culture quite early and came to the centres of the Northern Black Sea region as an already formed occupation. Spatially, workshops were situated at the large cities, where the manufactured products not only satisfied local demand, but also served as goods for sale. As archaeological materials showed, the earliest evidence of local pottery production was discovered on Berezan island and date from the middle of the 6th century BCE. The active development of the settlement, i.e. the intensification of the urbanization of the space, belongs around the same period. Therefore, the development of crafts, in particular pottery, is a component of this multifaceted process.

Paleopedological studies, micromorphological and granulometric analyzes of potential pottery raw materials with the micromorphological features of ceramics allow us to talk about local production. It was found that craftsmen could use local raw materials to create the moulding mass, which was obviously multi-component. The materials mainly of the first half of the 6th century BCE from site "T" of Berezan settlement confirmed the assumption about the predominance of grey ceramics ("greyware") in the local pottery making at that time. Probably, the tradition of its production existed for a long time.

Keywords: antiquity, Lower Bug region, Borysthenes, pottery, historiography, interdisciplinary studies

МІСЦЕВЕ ГОНЧАРСТВО У РЕГІОНІ НИЖНЬОГО ПОБУЖЖЯ НА РАННІХ ЕТАПАХ УРБАНІЗАЦІЇ

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АНОТАЦІЯ

Мета статті. На основі історіографічних, археологічних і палеогеографічних даних дослідити розвиток гончарства у регіоні Нижнього Побужжя та його роль в урбанізаційних процесах VI ст. до н.е.

Наукова новизна. Вперше комплексно розглянуто керамічне виробництво з урахуванням сировинної бази гончарства античного поселення на прикладі Борисфена. Встановлено взаємозв'язок суспільних і природних чинників у розвитку гончарства. Визначено роль цього ремесла в контексті урбанізаційних процесів у Північно-Західному Причорномор'ї. Розглянуто раннє виробництво кераміки в Нижньому Побужжі з охопленням різних категорій джерел. Запропоновано методика вивчення місцевого виробництва кераміки в античних центрах регіону.

Методика. Дослідження базувалося на комплексному аналізі історіографічних та археологічних даних при використанні палеогеографічних методів. Польовий етап дослідження включав обстеження точок з незадернованими відкладами різних геологічних періодів, як потенційної гончарної сировини. На кожній точці проведено стратиграфічне розчленування відкладів, їх макроморфологічний опис і відібрано зразки для подальших лабораторних досліджень. Камеральний етап дослідження включав мікроморфологічний аналіз керамічної продукції для порівняння її характеристик з потенційною сировиною, також проводився гранулометричний аналіз відібраних зразків для встановлення їх фізико-хімічних властивостей.

Висновки. Гончарство, як самостійний вид ремесла, виокремилася у грецькій культурі досить рано і прийшло в центри Північного Причорномор'я вже у сформованому вигляді. Просторово майстерні тяжіли до великих міст, де виготовлена продукція не лише задовольняла місцевий попит, а й виступала товаром для збуту. Як показали археологічні матеріали, найраніші свідчення місцевого виробництва кераміки відкриті на о. Березань і датуються серединою VI ст. до н.е. Приблизно до цього ж періоду відноситься активна розбудова поселення, тобто активізація урбанізації простору. Тому розвиток ремесел, зокрема й гончарства, є складовою цього багатогранного процесу.

Палеопедологічні дослідження, мікроморфологічний і гранулометричний аналізи потенційної гончарної сировини разом з мікроморфологічною характеристикою кераміки дозволяють говорити саме про *місцеве* виробництво. З'ясовано, що для створення формувальної маси, яка була очевидно багатокомпонентною, майстри могли використовувати місцеву сировину. Матеріали переважно першої половини VI ст. до н.е. з ділянки «Т» Березані підтвердили припущення про переважання в цей час у місцевому керамічному комплексі сірої («сіроглиняної») кераміки. Традиція її виготовлення ймовірно проіснувала тривалий час.

Ключові слова: антична доба, Нижнє Побужжя, Борисфен, гончарство, міждисциплінарні дослідження

INTRODUCTION

The development of the ancient city as a phenomenon in the history of the ancient world is the basis of classical archaeology researches. Urban processes in the ancient Greek society are multi-vector according to the composition of the issues and have been repeatedly covered in historiography¹. Despite the significant region covered by the Hellenic civilization, the process of development of urban and extra-urban space traditionally connected with the key aspects of ancient archaeology: colonization, which is determined by the choice of location, and therefore by natural conditions; the development of urban space, which is reflected in the topography of the city and architectural planning; social and economic factors, i.e. the creation of political institutions, the development of local production and cultural life. All of these issues have a powerful historiographical base, which reveals various problems in the different parts of the *Ecumene*.

The Northern Black Sea region, covered by ancient Greek colonization from the Archaic period, is no exception. In chronological terms, it is worth paying special attention to the its north-western part, in particular to the Lower Bug. Colonization and urbanization processes appeared early here, which resulted in the founding of ancient centres on the Berezan island and Olbia. The development of settlement structures on the way to the creation of a polis took place according to the classic stages here:

- the period of early urbanization, when the settlement begins to grow as a result of the using of natural resources under the influence of social factors (for example, from the founding of the emporion to the development of the city);
- the period of suburbanization, when the city expands from its central core to cover the surrounding areas. Usually, this stage refers to the development of the *chora* and using of other natural resources outside the urban space to ensure the polis as a territorial state.

In this paper, we are particularly interested in the first stage, which caused the prerequisites for the second stage to unfold. Theoretically, the model of the urbanization process of the first stage can be reduced to several features of sustainable development that took place in parallel: architectural development according to the appropriate plan with optimal using of the topography of the area and the development of local production to provide for own needs and trade with Scythia in the early stages. In other words, the population, after choosing a place of settlement, prepared it for long-term residence. Despite the fact that polis, i.e. urban, culture has its attributes (temple order architecture, public buildings, etc.), it also assumes the presence of craftsmen in its social composition. Because the existence of a powerful settlement structure should be relying on some economic resource for the production of necessary goods. Therefore, the study of early urban processes can show why the population chose this territory for life and how the nature resource management of a limited area took place before the development of nearby territories as a *chora*. And this, in turn, is directly related to the study of the ancient economy.

¹ *Crielaard J.P. Cities // K.A. Raaflaub, H. van Wees (Eds.). A Companion to Archaic Greece. Malden, Massachusetts, Oxford: Wiley-Blackwell, 2009. P. 349-356.*

INTERRELATIONSHIP OF SOCIAL AND NATURAL FACTORS IN THE DEVELOPMENT OF POTTERY

The economy of ancient society was largely based on crafts, where metallurgy, jewellery, stone processing, woodworking, glassware manufacturing, spinning and weaving, leather processing, and pottery are traditionally evolved. All these industries had to satisfy, first of all, the demand of the local population and necessarily depended on local raw materials. Metalworking is the most studied among these industries, which is well documented in archaeological materials², in contrast to crafts associated with raw materials of organic origin. But pottery obviously was the most popular among the Hellenes, which provided the population with ceramics for cooking and storing food, various objects for cult and household purposes, etc. The role of this craft in ancient society was really important, and its development was a companion of urbanization processes in the North-Western Black Sea region.

Pottery came to the shores of the Pontus Euxinus as an already formed craft. So, the production of ceramics was finally separated into a professional work and distanced itself from artisanal production for the 7th century BCE. Archaeological researches of mainland Greece show that the process of pottery becoming as economic industry ended in the Late Bronze Age³, with the transition from the production of primitive common vessels to the development of professional workshops, where qualified craftsmen made products for sale. Special constructions for firing ceramics appeared at the Neolithic era in Greece, and the pottery wheel began to be used for the manufacture of ceramics in the early Aegean period⁴. Complete adaptation of pottery production to local demand traced from the 9th century BCE in Attica and its demonstrated by painted ceramics⁵. It is interesting that production centres, primarily craftsmen quarters, were located near settlement structures from the early stages of pottery, in particular near large cities (Thebes, Tiryns, Athens). And this indirectly indicates that the production of ceramics as an economic industry maybe was regulated by the city authorities and was connected with urbanization processes. The location of pottery quarters relative to the boundaries of the polis (city) also testifies to this. This issue is partially covered by Yu. Ziomecki in a general paper about the ancient Greek pottery⁶. According to his observations, pottery kilns were built within the settlement in a number of cases, in particular in cult areas, but there are known cases when workshops arose at the site of raw material deposits⁷.

As for the Northern Black Sea region, Tauric Chersonesos best demonstrates the development of potter's quarters, where the kilns were built outside the fortifications⁸ and it could be related to fire safety in the city. In addition, the example

² Treister M.Yu. The Role of Metals in Ancient Greek History. Series: Mnemosyne: Bibliotheca Classica Batava, Supplementum, 156. Leiden, New York, Köln: E.J. Brill, 1996. P. 21-38.

³ Ziomecki Ju. Pracownie ceramiczne w starożytnej Grecji. Wrocław: Zakład Narodowy im. Ossolińskich, 1965. S. 102-110; Vlachou V. From Pots to Workshops: The Hirschfeld Painter and the Late Geometric I Context of Attic Pottery Production / V. Vlachou (Ed.). *Études d'archéologie*, 8. Pots, Workshops and Early Iron Age Society Function and Role of Ceramics in Early Greece. Proceedings of the International Symposium held at the Université libre de Bruxelles 14-16 November, 2013. Bruxelles: CREA-Patrimoine. 2015. P. 49.

⁴ Ziomecki Ju. Pracownie ceramiczne... S. 117.

⁵ Vlachou V. From Pots to Workshops... P. 49.

⁶ Ziomecki Ju. Pracownie ceramiczne... S. 95-101.

⁷ Ibid. S. 97.

⁸ Борисова В.В. Гончарные мастерские Херсонеса (по материалам раскопок 1955-1957 гг.). *Советская археология*. 1958. № 4. С. 144.

of this polis clearly shows that the production of ceramics could really regulated by the city authorities, because there are no recorded mass traces of pottery quarters at the numerous settlements of the chora. So, as we can see, there is variability in the location of production centres, but in practice they shouldn't be too far from the place of clay mining in order to optimize the production process.

POTTERY IN THE CONTEXT OF URBAN PROCESSES IN THE NORTH-WESTERN BLACK SEA REGION

The historiography of this issue, which is related to the region of Lower Bug, contains many publications devoted to the development of the polis as an urban settlement structure. Most of them deal with the political aspects, while the economic background is mainly reduced to the priority role of trade in the development of the region. At the same time, different categories of sources can be base for the research of the pottery of Borysthenes and Olbia: raw material deposits in the region, remnants of pottery workshops (kilns and tools of masters), as well as ceramic products. Archaeological literature is aimed primarily at the study of the last two aspects, while the development of interdisciplinary studies today makes it possible to highlight the first of them.

In the papers of different years, we find limited information about the ecological resources of the territory after colonisation, but this aspect shouldn't be ignored at the early stages of urban planning processes. There aren't many comprehensive publications devoted to the history of the poleis of Lower Bug region. In this context, should be mentioned the study of A. Wąsowicz, devoted to the spatial planning of the polis of Olbia⁹. The author considered mainly the topographical and planning aspects of the urbanization process, therefore the building remains was the main source base of the monograph¹⁰. There are also mentioned the fact that according to physical and geographical zoning the region of Dnipro and Bug estuary characterized by the presence of a large deposits of clay. They could be used as a natural building resource for settlers¹¹, and also for pottery. According to A. Wąsowicz, ceramics from the excavations of the Olbia necropolis and nearby settlements from the end of the 7th to the beginning of the 6th centuries BCE show that Borysthenes and Olbia had local pottery production¹². However, information about the development of this craft is quite limited.

Publications on classical archaeology of the Northern Black Sea region of the middle and second half of the 20th century mainly relate to the analysis and typology of ceramic products, and the opening of pottery kilns on the territory of the Olbia¹³ made it possible to talk about the local ceramics production¹⁴. But pottery of

⁹ Wąsowicz A. Olbia Pontique et son territoire. L'aménagement de l'espace. Series: Annales littéraires de l'Université de Besançon, 168 (Centre de recherches d'histoire ancienne, vol. 13). Paris: Les Belles Lettres, 1975.

¹⁰ Ibid. P. 5-6.

¹¹ Ibid. P. 25.

¹² Ibidem.

¹³ Славин Л.М. Отчет о раскопках Ольвии в 1935 и 1936 гг. / Ячменев Н.И. (отв. ред.). Ольвия. Т. 1. Киев: АН УССР, 1940. С. 12; Славин Л.М. Наслідки археологічних досліджень ольвійської експедиції в 1947 і 1948 рр. / П.П. Єфименко (відп. ред.). Археологічні пам'ятки УРСР. Т. 4. Київ: АН УРСР, 1952. С. 55; Ветштейн Р.І. Керамічні випалювальні печі Ольвії перших століть нашої ери. / С.М. Бібіков (відп. ред.). Археологічні пам'ятки УРСР. Т. 7. Київ: Видавництво Академії Наук УРСР, 1958. С. 61-62.

¹⁴ Книпович Т.Н. Керамика местного производства из раскопа «И» / Ячменев Н.И. (отв. ред.). Ольвия. Т. 1. Киев: АН УССР, 1940.

Borysthenes and Olbia considered outside the context of the polis development. It represented as an integral attribute of Hellenic life and economy¹⁵, but its role in social development is not defined. In addition, pottery products appeared often as a source for the study of architecture (roof tiles, etc.) and art (coroplastic art, painted vases), while pottery as a craft was not described comprehensively. Some aspects of the pottery development of Borysthenes and Olbia were also considered in a historiographical paper¹⁶. There are confirms the fact that ceramic production was related to urban centres in its spatial arrangement. For example, like to Tauric Chersonesos, there aren't clear traces of pottery production on the Olbian chora.

Modern historiography also includes publications deal with the paleoecology of the settlement structures of Lower Bug region. Previously, such papers showed mainly the study of the topography of ancient sites¹⁷. But now multidisciplinary researches becoming more popular, where paleogeographic data are the basis for the reconstruction of climatic conditions and the study of the raw material base. Therefore, such studies (paleobotanical, paleozoological, paleopedological) make it possible to restore the conditions of ancient society life at various stages of its development. For example, we find some information in the paper of M.M. Ievlev about the key issue of early urban processes in the region i.e. the role of the natural factor in the choosing a place for the founding of Olbian polis¹⁸. According to the author, the settle of the colony on Berezan island, and later the founding of Olbia, related mainly to geographical location of the area near large rivers and less to the resource potential of these territories. A trade considered as a priority branch of the economy on the 7th century BCE and it directly dependent on water arteries (Hypanis, Borysthenes), through which the Hellenes kept in touch with the barbarian tribes of the Forest-Steppe zone¹⁹ and developed own colonies. However, there are different opinions about the colonization impulse in the Northwest Black Sea region. Among them, the raw material factor is important²⁰, with the assumption of the fact that craftsmen had a significant place in the colonization of the region. According to M. Ievlev, climatic conditions were not favorable for the development of agriculture from the middle of the 7th to the first quarter of the 6th centuries BCE and the population concentrated on other works such as fishing, mining (mainly for metallurgy), production of glass and ceramics²¹.

Yu. Vinogradov, as a supporter of the theory of "raw material" colonization, also puts the development of local crafts in the foreground in comparison with the

¹⁵ Кругликова И.Т. Античная археология. Москва: Высшая школа, 1984. С. 26, 31-33; Шелов Д.Б. Ремесленное производство // Рыбаков Б.А. (гл. ред.). Археология СССР. Античные государства Северного Причерноморья. Москва: Наука, 1984. С. 167-170.

¹⁶ Kotenko V.V., Sheiko I.M., Kozlenko R.O., Kushnir A.S. Studying of antique pottery of Olbia and Borysthenes (historiographical aspect) // Археология. 2021. № 4. С. 120-130.

¹⁷ Шилик К.К. К палеографии Ольвии // Крыжицкий С.Д. (отв. ред.). Ольвия. Киев: Наукова думка, 1975. С. 51-91.

¹⁸ Иевлев М.М. Очерки античной палеоэкологии Нижнего Побужья и Нижнего Поднепровья. Киев: Видавель Олег Филук, 2014. С. 137-149.

¹⁹ Ibid. С. 139-141.

²⁰ Виноградов Ю.Г. Политическая история Ольвийского полиса VII-I вв. до н.э. Историко-эпиграфическое исследование. Москва: Наука, 1989. С. 51-53; Доманский Я.В., Марченко К.К. Базовая функция раннего Борисфена // Крыжицкий С.Д. (отв. ред.). Borysthenika-2004. Материалы международной научной конференции к 100-летию начала исследований острова Березань Э.Р. фон Штерном. Николаев, 2004. С. 24.

²¹ Иевлев М.М. Очерки античной палеоэкологии... С. 157.

agriculture at the early stages of the settle of the Lower Bug region. However, in his opinion, the priority was metalworking and glass production, because such raw materials and products were more interesting to Hellenic trade²². With regard to pottery, it can be assumed that the first settlers (and this area was not densely populated before the Greek colonization) used local deposits of clay mostly for products of their own consumption.

We find confirmation of such assumptions in the monograph of O. Odrin, devoted to the ecology of the economy of the Northern Black Sea region. In his opinion, the geological resources of Lower Bug region in ancient times can be defined as small and not very diverse, but they were quite capable of providing various branches of production, including pottery²³. In addition, the natural conditions of that time provided the necessary supply of wood for firing ceramics²⁴. Thus, Borysthenes and Olbia were provided with the necessary minimum of raw materials first of all for “domestic” pottery, such as cookingware, lamps of various types, etc.

EARLY POTTERY MAKING IN LOWER BUG REGION

North-Western Black Sea region was settled quite early by ancient Greek colonists. Borysthenes i.e. ancient settlement on the Berezan island, stands out among the sites of Lower Bug region. Its history in the Archaic and Classical periods is inextricably linked with the polis of Olbia. It can be explained by geographical proximity, so their historical and cultural development should be considered together. Moreover, the urbanization processes in Berezan, as well as the development of local crafts, were importance for the formation of the material culture of the Olbian polis.

Modern studies of collections of imported ceramics from the Archaic period have shown that the foundation of Borysthenes as an emporion dates back to the beginning of the third quarter of the 7th century BCE, because a series of the earliest samples of painted vessels can be date from this time²⁵. Intermediary trade with the barbarian tribes of the Forest-Steppe zone was important in the economy of the settlement at this time. And such colonization impulse became the starting point for the settlement of the North-Western Black Sea region by the Ionians, which formed the basis of further urbanization processes here.

Early urban processes on Berezan island should be limited chronologically to the 6th century BCE, because there isn't any reliable evidence, such as cultural layers, dated back to the 7th century BCE²⁶. The early stages of the Borysthenes traced mainly on imported ceramics, which show the main vectors of its interpoleis contacts in the Archaic period²⁷. It also indicates the priority of foreign trade in the early stages of its development. But we have less information about its domestic economy, in particular pottery. Therefore, discovering of the “Kerameikos” on the Berezan settlement (site

²² Виноградов Ю.Г. Политическая история Ольвийского полиса... С. 55-56.

²³ Одрин О. Экология государства античных держав Північного Причорномор'я. Київ: Інститут історії України, 2014. С. 108.

²⁴ Ibidem.

²⁵ Буйских А.В. Архаическая расписная керамика из Борисфена (раскопки 1960-1980 гг.). Киев: ИА НАН Украины, 2019. С. 192.

²⁶ Буйських С.Б. Ольвія та Березань в контексті заснування іонійського колоніального поліса в Нижньому Побужжі // Музейний вісник. 2012. № 12. С. 53-54.

²⁷ See more: Буйских А.В. Архаическая расписная керамика...

“ГШ”)²⁸ gave a reason to rethinking the economic situation in the region. It became clear that the production of ceramics in the Archaic period, namely in the second half of the 6th century BCE, was developed on this site. These kilns and artefacts were subjected to comprehensive study. The configuration, technological features of the kilns and the closest analogies from other ancient centers have already described in historiography²⁹. The discovery of the pottery complex *in situ* and the good fixation of the finds made it possible to conduct interdisciplinary researches on the basis of these materials. For example, a joint Ukrainian and German project on the study of local ceramic production in Borysthene showed some interesting results. Ceramic samples from discovered kilns and samples from Olbia were examined by neutron activation analysis³⁰. According to the conclusions of the researchers, the previous assumptions that the production of ceramics in the early stages was aimed mainly at the self-sufficiency of the settlement are confirmed³¹. In addition, it became clear that economic contacts between Borysthene and Olbia were quite close during the period of activity of the pottery quarter on Berezan. This is indicated by the similarity of ware in both of these centers. Chronologically these kilns belongs to the middle – second half of the 6th century BCE³². At this time, there was a stationary settlement with some features of urbanization processes in building³³. It played the role of a raw material and craft centre and coexists with Olbia³⁴.

In order to continue the study of the local Berezan pottery, samples of raw materials and products were selected from the nearby site “T” (Temenos), which has been studied previously (fig. 1, 1). The excavation was started by V.V. Nazarov in 1996 on the trench of S.M. Mazarati by 1984. Since 2005, this site has been explored by V.V. Krutilov, and since 2020, excavation has been continued here under the leadership of O. Smyrnov. A specific feature of the site “T” is the presence of a common horizon with the site “ГШ”. Building remains are represented here by various types of structures: dwellings of the second quarter of the 6th century BCE, pits and remains of a sacred building of the end of the 6th – the first quarter of the 5th century BCE³⁵. Archaeological objects show that the site “T” actively functioned before the polis urbanization³⁶ and at the its early stages (objects of the middle – the second half of the 6th century BCE and some later).

²⁸ Крутилов В.В., Бондаренко Д.В. Керамические обжигательные печи Борисфена середины VI в. до н.э. (по материалам раскопок 2011-2013 гг.) // Археологія і давня історія України. 2015. № 1 (14). С. 205-216.

²⁹ Ibid. С. 206-2011; Krutilov V.V., Mommsen H., Fornasier J. Ein Ofenkomplex des 6. Jhs. v. Chr. aus Borysthene. Neue Perspektiven zur Herkunftsbestimmung griechischer Keramik im nordwestlichen Schwarzmeerraum // Fornasier J., Bujskich A.V. (Hrsg.). An den Ufern des Bug. Bonn: Verlag Dr. Rudolf Habelt GmbH, 2021. S. 256-262.

³⁰ Ibid. S. 253-276.

³¹ Ibid. S. 272.

³² Крутилов В.В., Бондаренко Д.В. Керамические обжигательные печи Борисфена... С. 215; Mommsen H., Fornasier J. Ein Ofenkomplex des 6. Jhs. v. Chr. aus Borysthene... S. 254.

³³ Chistov D., Krutilov V. The archaic town on the Berezan island: new studies on the chronology and urban planning of the Berezan settlement // Povalachev V. (Hrsg.). Phanagoreia und darüber hinaus... Festschrift für Vladimir Kuznetsov. Göttingen: Cuvillier Verlag, 2014. P. 216; Бондаренко Д.В., Чистов Д.Е. «Квартал гончаров» (участок «ГШ») в системе застройки и в экономике архаического Борисфена // Stratum plus. 2021. № 3. С. 235-259.

³⁴ Буйських С.Б. Ольвія та Березань в контексті заснування... С. 54.

³⁵ Крутилов В., Смирнов О. Розкопки сакрального комплексу на Березані // Археологічні дослідження в Україні 2017 р. Київ: ІА НАН України. 2019. С. 164.

³⁶ Смирнов О., Бондаренко Д., Васильчук О. Роботи на о. Березань (ділянка «Т») // Археологічні дослідження в Україні 2020 р. Київ: ІА НАН України. 2022. С. 180-183.



1



2

Fig. 1. Settlement on Berezan island:
1 – site “T”; 2 – stratigraphy of coastal strip sediments with a selected sampling horizon

METHODOLOGICAL ASPECT OF LOCAL POTTERY STUDYING

An interdisciplinary approach to the study of pottery is based on the comparison of pottery of different periods with potential raw materials near settlements. First of all, it is the comparison of petrographic, geochemical and mineralogical characteristics of ceramics with deposits of different geological periods³⁷.

The methodology of studying pottery for the territory of Lower Bug in antiquity is determined by the following stages. During the fieldworks, sites with deposits of different geological periods were investigated and their preliminary stratigraphic dissection was made (figs. 1, 2), macromorphological description and micromorphological analysis were carried out; samples of ceramic products were selected to compare their characteristics with raw materials; thin sections with an intact structure of deposits and ceramic products were made (with their micromorphological analysis), a granulometric analysis of potential pottery raw materials was carried out³⁸. The methodology of research is based on petrographical papers of the ancient periods³⁹.

The macromorphological description of the layers from Berezan is follows:

Table 1.
Macromorphological description of layers on Berezan island (2021)

Information about the site	Description
Site 10 (according to field documentation). Settlement: Berezan island (coast, the western part of the island). 46°35'55" north latitude, 31°24'36" eastern longitude	<p>The investigated layer of sediments with a total thickness of about 15 m. Upper layers with a thickness of 2.0-2.5 m: Upper Pleistocene formations.</p> <p>Above there is a layer of Holocene sediments of soil like to modern chernozem with a thickness of up to 1 m. Below there is probably Vytachev sediments with a thickness of up to 1.5 m.</p> <p>Under them there is a lithodeme of Neogene sediments with a total thickness of up to 12 m. At a depth of 2.5 to 3.5 m there is a layer, probably of the Middle-Upper Pliocene suite. It is light-dark green with rust-brown inclusions, possibly related with iron deposition.</p> <p>The deposits is oily, heavy to medium loam, lumpy and friable. The sediments contain veins of carbonates as an impregnation and micellar forms, which actively boil with 10% HCl solution. Deposits no contains</p>

³⁷ E.g.: *Matviishyna Zh.M., Doroshkevych S.P., Kushnir A.S.* Assessment of Influence of Paleogeographical Conditions on the Formation of Mineral Raw Materials for the Manufacture of Ceramic Products (on the Example of Opishnyanske Deposit of Clay Rocks) // Ukrainian geographical journal. 2021. № 1. P. 15-24.

³⁸ *Котенко В., Шейко І.* Сировинна база як фактор розвитку гончарства античних центрів Північно-Західного Причорномор'я (Ольвія та Березань) / Звіт про науково-дослідну роботу за договором від 05.05.2021 р. № 13/03-2021 (№ держ. реєстрації 0121U112024). Київ, 2021.

³⁹ *Ownby M.F., Giomi E., Williams G.* Glazed ware from here and there: Petrographic analysis of the technological transfer of glazing knowledge // Journal of Archaeological Science: Reports. 2017. Vol. 16. P. 616-626; *Miše M., Quinn P., Charlton M., Serneels V., Montanari A.* Production and circulation of Late Hellenistic fine table ware in Central Dalmatia, Croatia // Journal of Archaeological Science: Reports. 2020. Vol. 33. P. 1-18; *Quinn P.S., Burton M.* Ceramic Petrography and the Reconstruction of Hunter-Gatherer Craft Technology in Late Prehistoric Southern California // Quinn P.S. (Ed.). *Interpreting Silent Artefacts: Petrographic Approaches to Archaeological Ceramics.* Oxford: Archaeopress, 2010. P. 267-295; Soil Micromorphology. *Libros web, monografias, trabajos de investigación, conferencias, atlas... sobre la Edafología y los suelos.* URL: <http://www.edafologia.net/english/index.htm>; *Ting C., Taxel I.* Indigeneity and innovation of early Islamic glaze technology: the case of the Coptic Glazed Ware // *Archaeological and Anthropological Sciences.* 2020. Vol. 12 (1). Article 27. DOI: 10.1007/s12520-019-01007-y

	<p>visible carbonate formations, doesn't react with HCl. Lower sediments of the section in the interval from 3.5 to 5.5 m represented by medium loamy compacted carbonate sediments.</p> <p>The lower layer of sediments from 5.5 to 7.0 m is sandy with pronounced veins of rust-brown colour in the middle and lower parts of the sediment profile. In the upper part, there are sugar-white sandy deposits with a thickness of 30-50 cm.</p> <p>The lower layer of sediments (dense) is composed of shell rock, which could be used by the local population for buildings. And the lowest one is denser. These deposits are found in various forms on the territory of the local settlements.</p>
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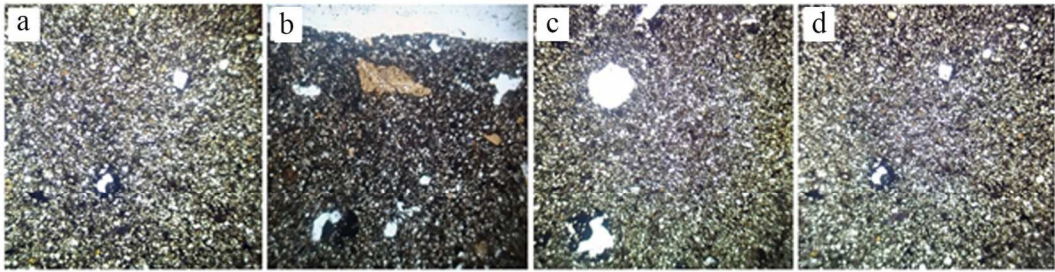
Fragments of ceramics were selected for the study according to the presented catalog:

Table 2.
Catalog of samples of ceramic products from Berezan island (2021)

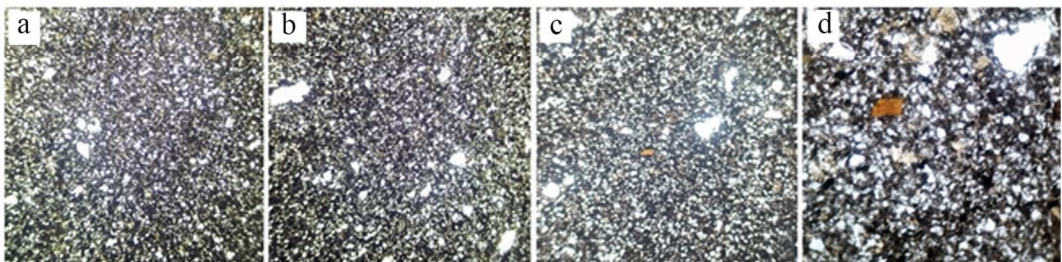
Fig.	Site	Marks	Notes	Reaction with HCl ⁴⁰
1	Berezan	K/Б-1	The wall of a greyware jug, ornamented with a strip of dark paint (local imitation of the Ionian ceramics), excavations by V. Nazarov, (AB/...), 2004. Wall thickness is 0.5-0.7 cm. Site "T"; The 1 st half of the 6 th century BCE.	-
2	Berezan	K/Б-2	The bottom with the lower parts of a greyware vessel (closed shape), Бep.-04, List 34. Excavations by V. Nazarov 2004. Wall thickness is 0.3 cm. Site "T". The 1 st half of the 6 th century BCE.	-
3	Berezan	K/Б-3	The bottom of a polished greyware vessel, Бep., List 13 (?). Excavations by V. Nazarov. 2004 (?). Wall thickness is 0.8-0.9 cm. Site "T". The 1 st half of the 6 th century BCE.	+
4	Berezan	K/Б-4	The wall of a redware vessel, ornamented with stripes of red paint, local production of the 6 th century BCE (?). Wall thickness is 0.8 cm. Backfill - 2021. Excavations by O. Smyrnov, 2021.	+
5	Berezan	K/Б-5	The bottom of an open-shape vessel (fish plate?), the 6 th century BCE. Wall thickness is 0.5 cm. Backfill - 2021. Excavations by O. Smyrnov, 2021.	+
6	Berezan	K/Б-6	Fragment of a backed clay from building, the 6 th century BCE. Backfill - 2021. Excavations by O. Smyrnov, 2021.	+++

⁴⁰ A small amount of HCl was added to the fresh chipping of each ceramic fragment in order to determine the presence of carbonates in the dry mass at the macromorphological level that reacted with acid. The intensity of boiling directly depends on the concentration of carbonates in the material. Designation: "+++" - intensive reaction; "++" - medium reaction; "+" - slight reaction; "-" - no reaction.

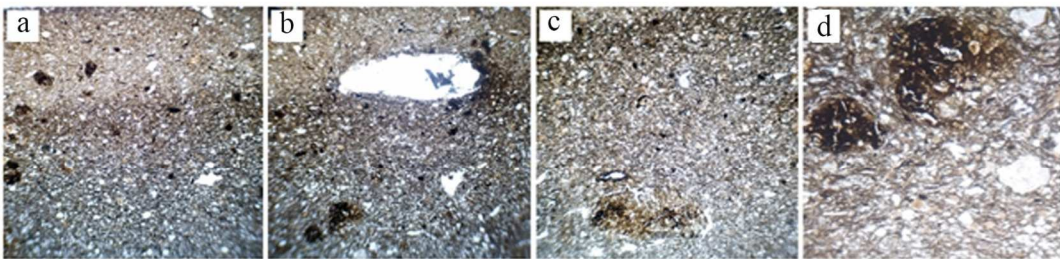
1



2



3



4

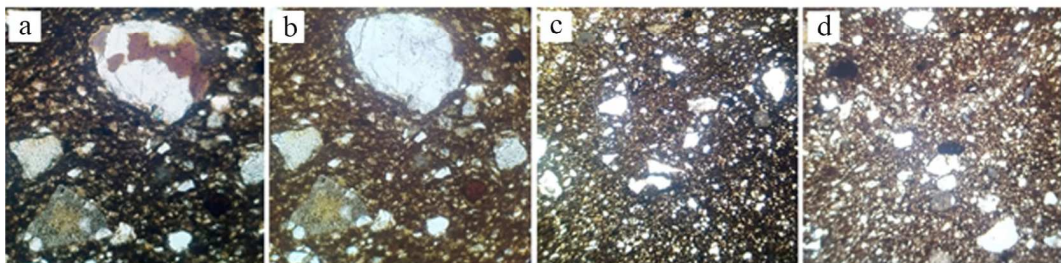


Fig. 2. Micromorphological analysis of ceramics from Berezan island:
 1 - fragment of K/B-1; 2 - fragment of K/B-2; 3 - fragment of K/B-3; 4 - fragment of K/B-4.

The results of the micromorphological analysis are follows:

Sample 1 (fig. 2, 1). Ceramic fragment K/Б-1. All images are magnified at 40x. The photos were taken in crossed nicols. The material is dark grey, homogeneous and densely packed, which probably indicates good mixing of the raw material. Most of them is sandy in nature. Photo “b” probably shows small fragments of ceramics that were added to the moulding mass. Individual grains of quartz are present in all photos.

Sample 2 (fig. 2, 2). Ceramic fragment K/Б-2. All images are magnified at 40x, excepted image “d”, where a magnification is at 100x. All photos were taken in crossed nicols. The material is dark grey, homogeneous, densely packed, which probably indicates good mixing of the raw material. Most of them is sandy in nature. Individual grains of quartz are present in all photos, photos “c” and “d” probably show small fragments of ceramics that were added to the moulding mass.

Sample 3 (fig. 2, 3). Ceramic fragment K/Б-3. All images are magnified at 40x, excepted image “d”, where a magnification is at 100x. All photos are taken in crossed nicols. The material is dark grey and densely packed. A significant amount of organic material in the mass (dark brown clots) may indicate relatively low firing temperatures. Photo “d” shows a good mixing and a proportionate amount of sand and clay material in the moulding mass. Relatively sharp transitions in colour, in particular in photos “a” and “b”, may be evidence of mechanical impact after making of the product in the process of its using.

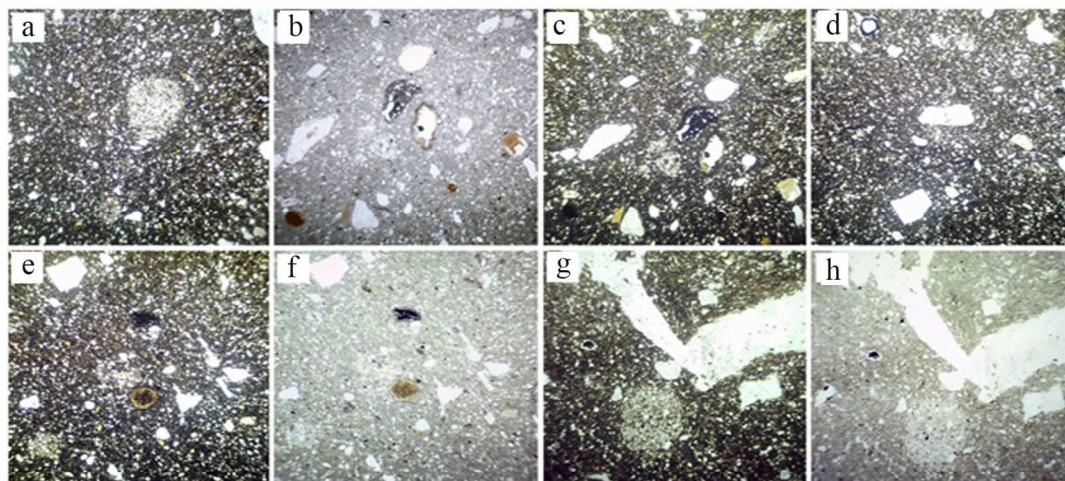
Sample 4 (figs. 2, 4). Ceramic fragment K/Б-4. Images “a”, “b” magnified at 100x, images “c”, “d” magnified at 40x. Photos “a”, “c”, “d” were taken in crossed nikols, and photo “6” took in parallel nikols. A brownish-grey material is observed through the microscope. A good mixing of raw materials and a slight predominance of clay material in the moulding mass is noted. The mineral composition includes feldspar (photos “a”, “b”), grains of quartz and carbonate rocks (photos “a-d”). There is also a significant amount of dark to black organic material, which probably indicates firing at low temperatures. There are also probably insignificant fragments of ceramics in a brown mass (photo “b”). Along with this, the remains of paint and/or other decoration (and/or the remains of the contents of the vessel) traced on the grains of the mineral skeleton (photo “a”).

Sample 5 (fig. 3, 1). Ceramic fragment K/Б-5. All images are magnified at 40x. Photos “a”, “c”, “d”, “e”, “g” were taken in crossed nikols, “b”, “f”, “h” were taken in parallel nikols. The light grey material of the moulding mass observed through the microscope. A significant amount of sandy material and a concentration of calcite are noted (photos “a”, “g”, “h”), there are also probably organic remains (photos “e”, “f”), remains of ceramic fragments (photos “b”, “c”), which were added to the moulding mass. Remains of paint and/or other decoration (and/or remains of vessel contents) traced on the grains of the mineral skeleton (photos “b”, “c”). Large pores in the material (photos “g”, “h”) are probably associated with mechanical damage after the making of product and/or with the burning of organic material during firing.

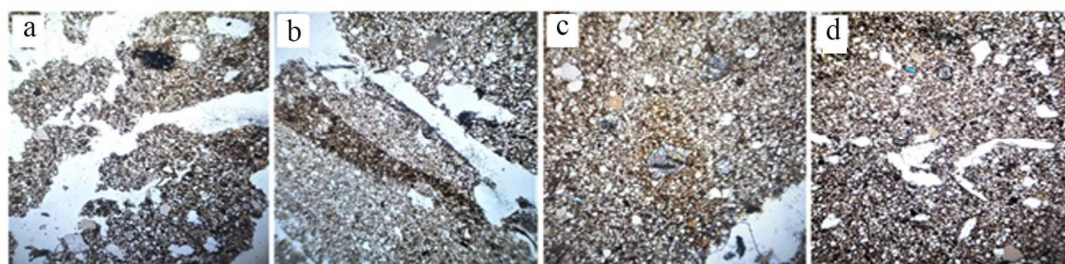
Sample 6 (fig. 3, 2). Ceramic fragment K/Б-6. All images are magnified at 40x. Photos “c”, “d” were taken in crossed nikols, and “a”, “6” were taken in parallel nikols. The light grey mass with a brownish tint observed through the microscope. There are concentrations of carbonate and quartz formations (photo “b”), single grains of plagioclase and hornblende. On the example of photo “b”, we can see how the pore

with organic material (probably less dense) burned out during heat treatment, and the pore located below retained organic material. Photo “a” shows mechanical damage and/or burning out of organic material.

1



2



3

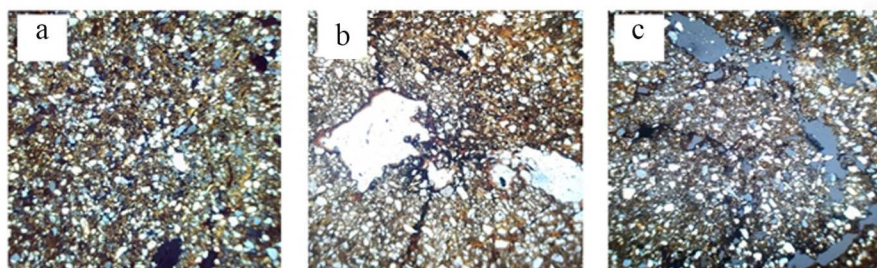


Fig. 3. Micromorphological analysis of ceramics and deposits from Berezan island:
1 – fragment of K/Б-5; 2 - fragment of K/Б-6; 3 – micromorphological structure of deposits.

For the objective correlation of the data, we present the results of the analysis of the material that could be a component of the pottery moulding mass.

Sample 7 (fig. 3, 3). Micromorphological structure of deposits of potential pottery raw materials. All images are magnified at 40x. Photos “a”, “b” were made in parallel nikols, and photo “B” was made in crossed nikols. A brownish light-grey weakly aggregated mass observed through the microscope, which has a sandy and dusty structure. Traces of argillation and ferruginization can be traced in the mass and concentrated along the walls of the pores. Comparing the micromorphological structure of the sample of potential pottery raw material and the ceramic fragments, we note that the last doesn't contain any traces of mineral formations or structural separations that would indicate the “importation” of the raw material from which the ceramics were made.

A sample of potential pottery raw material for granulometric analysis was taken from deposits at a level of 3.0-3.5 m from the upper layer according to the stratigraphic description presented in Table 1 (6/2 2.5Y – light brownish grey, inclusions – 6/8 2.5Y – olive yellow). The results of the analysis can be interpreted as follows. The material of potential pottery raw material was unlikely independent. This is indicated by a relatively large proportion of sand and a small proportion of physical clay. At the same time, the micromorphological structure of these deposits is similar to ceramic fragments K/Б-1, K/Б-2, K/Б-3, and K/Б-6: a similar colour, a commensurate amount of sandy deposits, and a small amount of other inclusions (quartz, etc.), which is indicated by the granulometry data (Tab. 3)⁴¹. Therefore, it can be assumed that this material was used for the making of the such products, but deposits with a larger proportion of clay material were added and it is worth investigating separately.

CONCLUSIONS

Thus, based on the results of the analysis of the historiography and the application of interdisciplinary methods, we have the following conclusions. Pottery as an independent type of craft was distinguished in Hellenic culture quite early. Spatially, workshops were situated at the large cities, where the manufactured products not only satisfied local demand, but also served as goods for sale. And it is the basis of the study of ancient imports in various regions today.

Pottery came to the centres of the Northern Black Sea region in an already formed craft, i.e. with professional craftsmen who possessed the necessary skills for building kilns and making ceramics. The products, namely the cookingware and tableware, was supposed to provide the household of the settlers with the beginning of a stable life. Archaeologically, this is demonstrated by the presence of a formed cultural layer (early horizon).

Archaeological materials show that centres of mass, serial and systematic ceramic production in the Northern Black Sea poleis associated specifically with the urban

⁴¹ To determine the content of fractions of different sizes in the soil material, namely sand, dust and silt fractions, appropriate samples were taken and sent to the Laboratory of landscape ecology of the Taras Shevchenko Kyiv National University. The classification of soil material according to its mechanical composition, which is based on the correlation of physical sand and physical clay, was made according to N.A. Kachynskiy. The corresponding features of the soil according to the classification of M.M. Godlin were also indicated.

Table 3
The results of testing a sample of potential pottery raw materials
for granulometric composition

Fractions name	Fraction size, mm	Quantitative, %	Attribution according to the classification of N.A. Kachynskiy	Attribution according to the classification of M.M. Godlin
Coarse sand	1,0-0,25	0,42365088	Medium loamy deposit	Sandy and medium loamy deposit
Fine sand	0,25-0,05	33,45358432		
Coarse dust	0,05-0,01	30,1955088		
Average dust	0,01-0,005	2,8243392		
Fine dust	0,005-0,001	18,1089984		
Silt	<0,001	14,9939184		
Physical clay	<0,01	35,927256		

centres (Tauric Chersonesos, Nymphaion, Tyras), while pottery quarters are less known at the settlements of the chora. The situation was similar in the ancient centres of Lower Bug region. As archaeological materials showed, the earliest evidence of local pottery production was discovered on Berezan island and date from the middle of the 6th century BCE. The active development of the settlement, i.e. the intensification of the spatial urbanization, refers probably to the same period. Therefore, the development of crafts, in particular pottery, is a component of this multifaceted process. Of course, the presence of kilns is not an exclusively feature of the city as a multifunctional social phenomenon, but the presence of such findings indicates the stability of the existence of the settlement structure with a tendency to its development on a permanent basis.

As for Olbia, excavations on the settlement have not such results. One of the reasons is the multi-layered type of the site: pottery kilns were destruction as a result of disposal, which makes their documentation extremely difficult. On the other hand, the earliest known traces of pottery from the territory of Olbia date back to the last quarter of the 5th century BCE⁴². That is, until that time ceramics (mainly for local use) could be produced somewhere else (for example, in Borysthenes), or outside the settlement and this area is still not discover.

Paleopedological studies, micromorphological and granulometric analyzes of potential pottery raw materials with the micromorphological features of ceramics, allow us to talk specifically about the *local* production, because archaeological sources are not very informative in this regard. Despite the fact that the sampling is extremely limited, it makes it possible to assume that the craftsmen could use local raw materials for the moulding mass, which was multi-component. The materials of the first half of the 6th century BCE (according to the accompanying finds) from the site "T" of Berezan settlement confirmed the assumption about the predominance of grey ceramics ("greyware") in local pottery production. Based on the archaeological sources of Borysthenes and Olbia, the tradition of its making probably existed for a long time. Thus, local pottery production in Lower Bug region appeared at the early

⁴² Буйських А.В. Виробнича майстерня на Південному теменосі Ольвії // Чабай В.П. (гол. ред.). І Всеукраїнський археологічний з'їзд. Матеріали роботи. Київ: ІА НАН України, 2019. С. 328.

stage of urbanization and it helps to create a comprehensive picture of the formation of the early polis structure not only of Borysthene, but also of the region as a whole.

Funding. Field and laboratory researches was carried out according to SRP for young scientists of the NAS of Ukraine 2021-2022 “Raw Material Base as a Factor in the Development of Pottery of the Ancient Centres of the North-Western Black Sea Region (Olbia and Berezan)” (№ 0121U112024); The historiographical part of the paper has been prepared according to grant of the NAS of Ukraine to research laboratories/groups of young scientists of the NAS of Ukraine to conduct research in priority areas of science and technology development 2022-2023 “Social and Natural Factors of Early Urbanization Processes in the North-Western Black Sea Region (on the example of antique centres)” (№ 0122U002159).

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