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## Pottery of the Chornolis culture in the middle Dnieper region

**Abstract:** The article presents the method and results of an investigation of 885 ceramic sherds from Chornolis hillfort, Tyasmyn hillfort, and Kalantaiv hillfort of the Chornolis culture in the middle Dnieper region. Although highly fragmented ceramic sherds are the most frequent type of archaeological material at these sites, this is the first time their morphology and decoration have been statistically analysed. The discovered correlations among pottery parameters helped us to establish a framework for comparison of the hillforts. These findings clarified the microchronology of the sites and cultural relationships of the Chornolis culture.

**Keywords:** Chornolis culture, fragmented ceramics, morphological analysis, hillforts, middle Dnieper region.

During the late Bronze Age, significant changes took place in the territory of Eastern Europe. The powerful associations of the Noua and Sabatyniv cultures declined, and the range of the Srubna culture was reduced. At this time, Chornolis culture sites appeared along the Dnieper's right bank, in the Dniester region, and in the basins of the Donets, Vorskla, and Orel Rivers. According to the latest research, this culture appeared not later than in the 12<sup>th</sup> century B.C. (Klochko 1998). A new stage of its development, involving massive construction of settlements in the forest-steppe of the Dnieper's right bank, began with the arrival of the Cimmerians to the Black Sea region in the 9<sup>th</sup> century B.C. (Makhortykh 2005). The nature of this territory as a well-travelled area conditioned the significant typological variability of its material culture and the diversity of traditions.

The most extensive research into the Chornolis culture was conducted by O. Terenozhkin in the 1950s and 1960s (Terenozhkin 1961). Later, L. Krushelnytska distinguished the Dniester region of the Chornolis culture and provided a detailed description (Krushelnytska 1985; Krushelnytska 1998), while B. Shramko, H. Kovpanenko, and O. Romashko explored sites on the Dnieper's left bank (Shramko 1957; Kovpanenko 1957; Kovpanenko 1967; Romashko 1978). However, certain elements of the material culture, most notably pottery, have not undergone comprehensive analysis. Published in 2017, Y. Gershkovich's "Subotiv hillfort", presenting a detailed analysis of pottery from the eponymous site is a notable exception here

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(Gershkovich 2017). Within the past decades, the study of the Chornolis culture has been focused primarily on such issues as the relations between farmers and nomads, the functioning of metallurgical sites, and the genesis of forest-steppe cultures of the Scythian age. Pottery has attracted the attention of researchers only indirectly; the publications present only intact forms, which constitute an insignificant portion of the material and are not a representative source of information. Thus, numerous ethnocultural speculations regarding the Chornolis culture lack a substantial background and require a better evidential base.

## 1. Overview of the sites

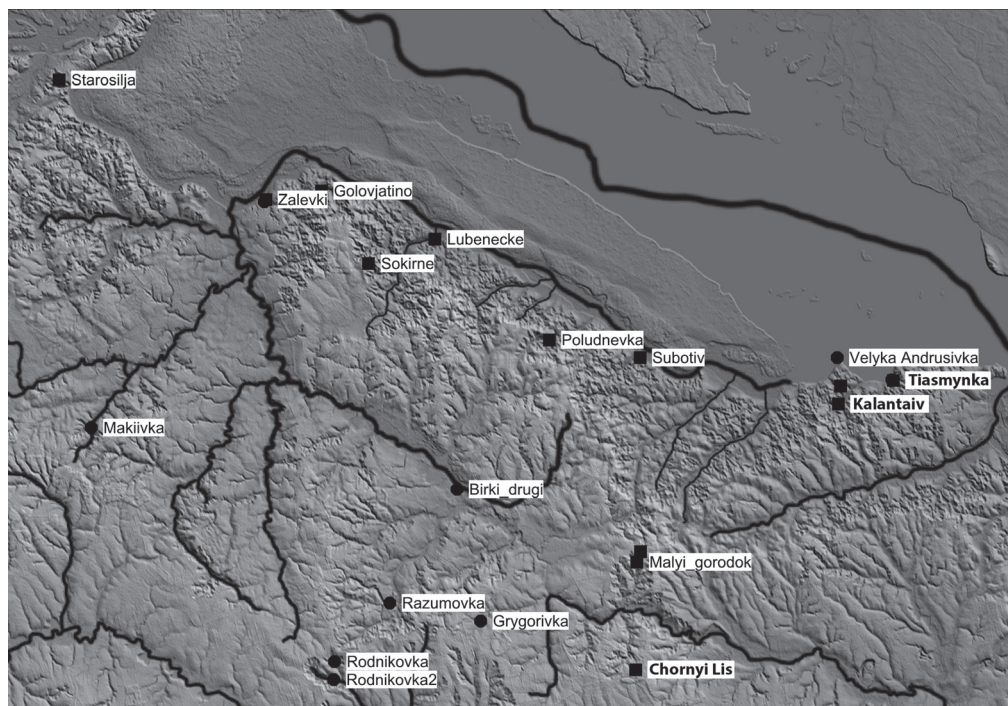
The Middle Dnieper region has the most prominent and richest in material sites of the Chornolis culture, which are the first Early Iron Age hillforts in the territory of Ukraine (Fig. 1). Around 20 such sites are known (Terenzhkin 1961; Darahan, Kashuba, Razumov 2010), but for the needs of pottery analysis, three hillforts have been selected, namely Kalantayiv, Tiasmyn, and Chornolis.

An important criterion for the selection of these sites is their territorial arrangement. The first two lie at a short distance, about 10 km, from each other, in the lower course of the Tiasmyn River. At present, they are located on the shore of the Kremenchuk water reservoir. The hillfort of Chornolis is 40 km away from these two and occupies a wide plateau between two ravines on the right bank of the Chornoliska River (in the Inhulets basin). This means it belongs to a different river basin. The available materials indicate that these hillforts existed for a short period of time (Terenzhkin 1961), which allows for tracing possible peculiarities in pottery variations in space as well as in time. Besides, the Kalantaiv and Tiasmyn hillforts have a similar structure and have produced similar finds, while the Chornolis hillfort is different.

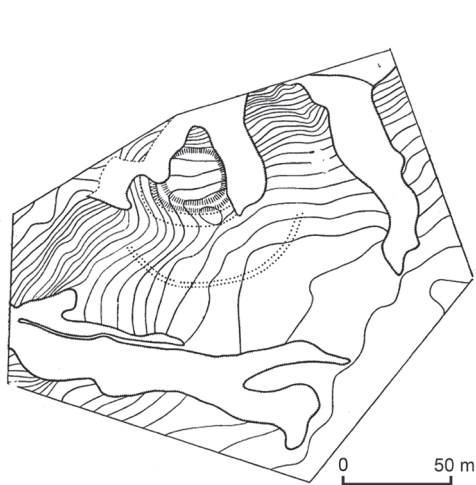
The Kalantaiv hillfort is located on the first low-rise terrace near the foot of the Tiasmyn's high valley wall. In this region, the plateau is laced with a network of deep ravines. This feature was taken into account when the hillforts were built, since having ravines on three sides offered additional security. From the low-sloped side, the promontory is separated by a rampart and a ditch (Fig. 2). Similarly to other hillforts of the Tiasmyn group, the Kalantaiv hillfort was small in size, with a diameter of 40 m. The excavations of Y. Pokrovskaya and H. Kovpanenko in 1956-1957 demonstrated that cultural layers within the fortification were almost absent and were concentrated primarily along the northern and western parts of the rampart at a depth of 0.6–1 m and in the fill of the ditch (Pokrovskaya, Kovpanenko 1956).

The Tiasmyn hillfort is located at the edge of a ravine entering the floodplain of the Tiasmyn River. It has steep slopes on three sides and is protected from the plateau side with a double line of artificial fortifications that divide the gently sloping surface of the settlement into two parts (Maksimov, Petrovskaya 1959, 26). The northern part of the promontory has a round fortification with a diameter of 60 m. From the low-sloped side, where the ravines are closest to each other, the southern fortification is located (Fig. 3). The north-eastern and western parts of the territory along the rampart of the round fortification were the richest in finds. The cultural layer was insignificant within the southern fortification and absent beyond the outer rampart (Terenzhkin 1961, 30).

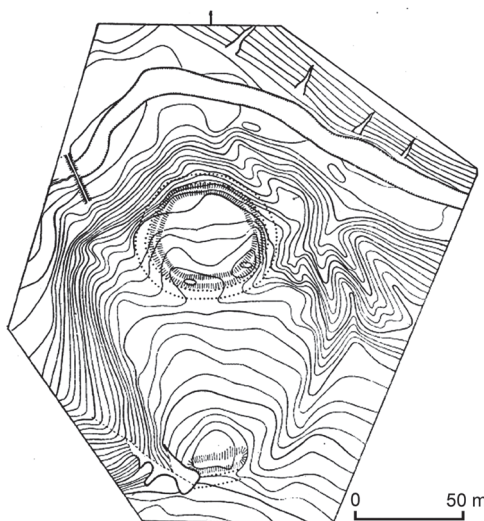
The Chornolis hillfort was constructed on a wide plateau between deep and long ravines on the right bank of the Chornoliska, a right-bank tributary of the Inhulets River (Terenzhkin 1961, 14). It consists of three fortifications, built with consideration of the beneficial use of deep ravines (Terenzhkin 1949, 2). The inner fortification is located on a promontory formed by two ravines. From the low-sloped side, it is protected by a tall (up to 2 m) rampart with a 2-meter-deep ditch in front of it. The fortification is small: about 100 m long and 70 m wide.



**Fig. 1.** Main sites of the Chornolis culture in the Middle Dnieper region



**Fig. 2.** Kalantaiv hillfort by O. I. Terenozhkin (after Terenozhkin 1961)



**Fig. 3.** Tiasmyn hillfort by O. I. Terenozhkin (after Terenozhkin 1961)

Another fortification, 600 by 400 m in area, is located on the plateau, and its line of defence is heavily ploughed and hardly noticeable. There is another fortification 200 meters away from it, which is protected by a rampart up to 1.5 m tall (Fig. 4). The most intense cultural layer, up to 1.2 meters thick, was found in ash-pits within the second fortification. Potsherds were also found in the layer of black soil within the rampart (Terenozhkin 1949, 8).

## 2. Methods of investigation

In archaeology, various approaches are used for construction of typological models of pottery. Most of them use technological or morphological characteristics as the main criteria (Dunnell 1971). The prevailing typologies for the early Iron Age are morphologically oriented, although lately, petrological, radiological, and other archaeometrical methods have been used, increasing the number of characteristics in typologies. The term itself implies that morphological systems focus on the attributes of the shape of vessels, such as volume, profile, and minor elements (pedestals, collars), which are important primarily for wheel-made pottery. The ornamental pattern is an important but separate diagnostic factor, on which stylistic analysis is based. The research has focused on formalization of raw data, and their analysis with the use of statistical methods should place emphasis on the procedures of classification. This aspect is determined by the absence of studies of Chornolis pottery focusing on the application of decorations,

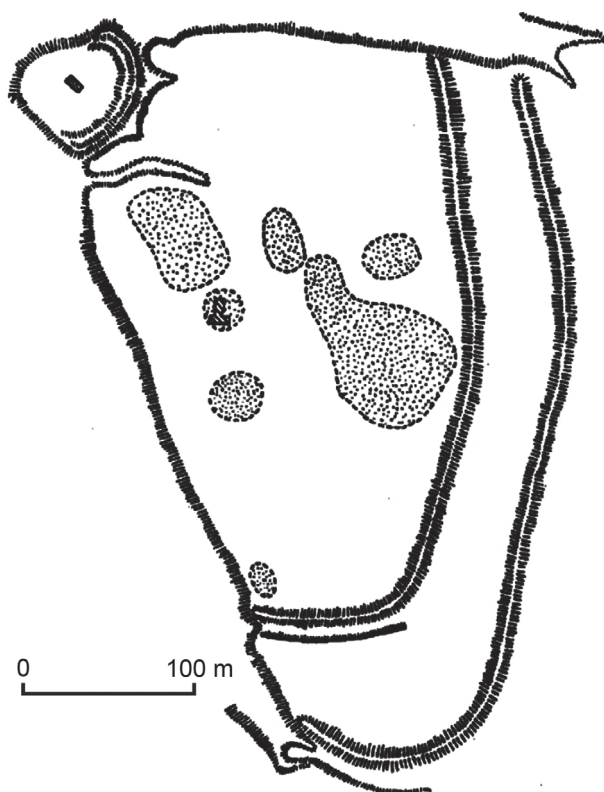


Fig. 4. Chornolis hillfort by O. I. Terenozhkin (after Terenozhkin 1961)

semantics of ornamental motifs, and other information of the kind. Without doubt, pottery decoration bears significant informative potential, but beginning the process of reconstruction in the area of ideological motivation behind semantically significant elements and the systems of their composition requires prior systematization of sources, which is necessary to begin the typological analysis.

V. Gening's program of statistical processing of data is one of the most fundamental attempts to approach the analysis of massive amounts of ceramic material (Gening 1973). By measuring the features of ware, various objects can be compared. The features can be determined on the basis of absolute measurements (parameters) and their correlation (proportions). For instance, M. Kashuba and H. Smirnova investigated materials from the Dniester region on the basis of V. Gening's methodology and then compared the results from different sites using the Brainerd-Robinson technique to determine their similarities (Smirnova, Kashuba 1988). Y. Gershkovich also used methods of V. Gening and A. Bobrinsky in his investigation of ceramics from the Subotiv hillfort. This material consisted predominately of intact pottery, divided into 6 classes: pots, bowls, dippers, mugs, cups, and unprofiled pots, it was thus more appropriate for mathematical typology (Gershkovich 2017, 94).

However, despite the praiseworthy commitment to specification and systematization of raw data, such an approach in all parameters implies that the potters exercised a corresponding specification and systemization. Considering the technology of ceramic manufacture and the homemade production of pottery, this approach seems less than effective. In the case of systematization of materials for the sake of description, it is necessary to determine the essential parameters and distinguish the "effective" and "ineffective" ones. For this, a researcher needs complex mathematical verification of the initial criteria, which in practice is more often than not limited to subjective choice.

The analysis of the pottery from the Chornolis culture hillforts was based on four autonomous classes of material: pot rims sherds, bowl rim sherds, base sherds, and body sherds. At the initial stage, the investigation was performed within the indicated classes, then the connections and interrelations between the classes within the hillfort were analysed. After considering the results of the analysis, an attempt to compare pottery complexes from particular hillforts was made.

Each class has a corresponding set of parameters, according to which every fragment was described. They are divided into metrics: fragment height (cm), thickness (cm), rim diameter (cm), neck diameter (cm), body diameter (cm), base diameter (cm), neck height (cm), and shoulder height (cm); the stylistic criteria are: shape of the rim edge, shape of the near-base part, decoration of the rim edge, decoration under the rim, neck decoration, shoulder decoration, body decoration, and texture; the criteria indicating the technology of production are main admixture and colour. The latter two parameters were identified visually. Traditionally, the Munsell colour system is used to identify the colour of pottery, but considering the colour irregularity of the surface of separate fragments and much lesser variation, a simpler scheme was used in this research – Zakharov's colour triangle.

The most informative class is pot rim sherds, since they enable description according to the highest number of parameters. Bowl rim sherds offer fewer metrics. Meanwhile, the class of body sherds is important primarily for the analysis of ornamental patterns, since it is impossible to identify to what kind and part of the vessel they pertain. When the base sherds were analysed, the parameters of base diameter and body profile were taken into account.

The fragmentary nature of ceramic remnants and their mostly small size did not allow for calculation of most of the coefficients. Thus, the system of V. Gening (Gening 1973) did not prove effective enough for the typological analysis of Chornolis pottery due to its focus on

intact vessels, which allows for the comparison of all morphological parts. Thus, for the majority of the selection, it was possible to develop a purely statistical typology only for the upper parts of vessels (above the neck). Some fragments allowed identifying the parameter of shoulder height, which was also taken into account during the development of the typology. However, most of the rim sherds ended below the neck but did not reach the shoulder, which made measuring the latter parameter impossible. The absence of markers of the given parameters for the vast majority of the fragments prevented the development of a purely statistical typology. For this reason, further analysis was conducted in two directions: statistical typology was developed on the basis of incomplete data, and intuitive typology was based on the angle of a shoulder's incomplete part and the overall profile of the fragment.

Assuming that there is no universal methodology for working with archaeological materials, the choice of the methodology of investigation of Chornolis pottery required clear understanding of the purpose and objectives of the research. Since this material has never been fully represented in publications and is known mostly by intact forms that constitute the minor part of all collections, detailed characteristics of all the fragments of pottery and their comparison became the first objective. This allows viewing the material in its entirety. The second objective was to develop a provisional typology of representative categories of pottery, which, as it turned out, could be adopted only for pot rim sherds. The third objective was mathematical verification of the created typology and its correction through the use of statistics, since it is a powerful basis for argumentation of a choice of certain criteria for type assignment. Thus, correlative analysis allowed for measurement of the closeness of relationships between the parameters of description; the frequency analysis showed how exactly the values are distributed in the correlating parameters; and the correspondence of coefficients according to V. Gening allowed transfer of the intuitive typology into the mathematical dimension.

### 3. Description of parameters based on the class of material

Within the research, three collections totalling 885 fragments of pottery were investigated, including 399 items from the Kalantaiv hillfort, 352 items from the Tiasmyn hillfort, and 134 items from the Chornolis hillfort. Archaeologically intact vessels are almost absent, and are represented by three pots in the collection from the Kalantaiv hillfort, and one miniature vessel from Chornolis.

*Pot rim sherds* constitute the most numerous and informative category of pottery. In the collection from the Kalantaiv hillfort there are 146 rim sherds originating from pot-like vessels, and 137 rim sherds come from the Tiasmyn hillfort. The Chornolis hillfort has the lowest number of fragments, with only 53 rim sherds. The rim sherds differ in their condition, so in one-third of instances certain qualitative parameters, primarily the diameters, could not be determined. Thus, further classification places more importance on such secondary parameters as colour, admixtures, neck height, rim edge shape, and texture, which can be determined in nearly all the fragments.

Although the Chornolis hillfort is represented by a smaller number of ceramic fragments, they are in better condition and are bigger in size in comparison with the pottery from the other hillforts. The Kalantaiv collection demonstrates the opposite situation: a relatively large number of very small fragments. This can be explained by different factors: from the manner of moulding to the character of selection of material during the excavations.

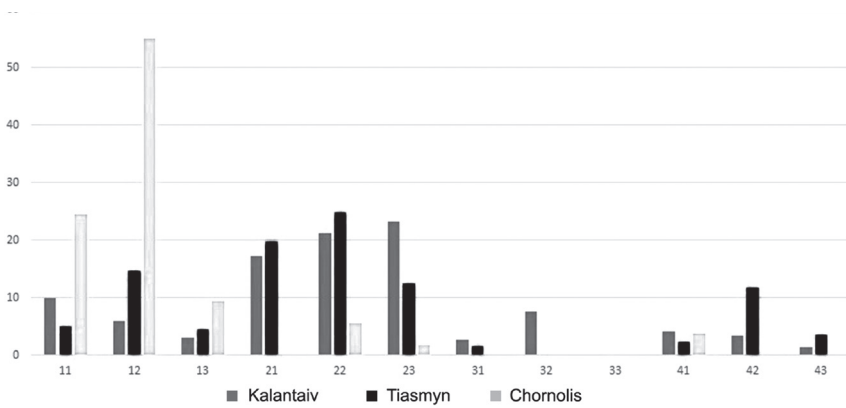
The colours of pot rim sherds from the Kalantaiv and Tiasmyn hillforts are almost synchronously distributed within the range of brown, with only single items of different colour. However, the Chornolis pottery differs in this parameter. It is much more uniform, and over half of the fragments are grey, which is not common for the other two hillforts (Fig. 5)

In all three collections, quartzite is the most noticeable admixture. The pottery from the Kalantaiv hillfort shows higher variability, since the share of fragments tempered with quartzite is smaller, and the diversity of other admixtures, such as sand and chamotte, is greater (Fig. 6).

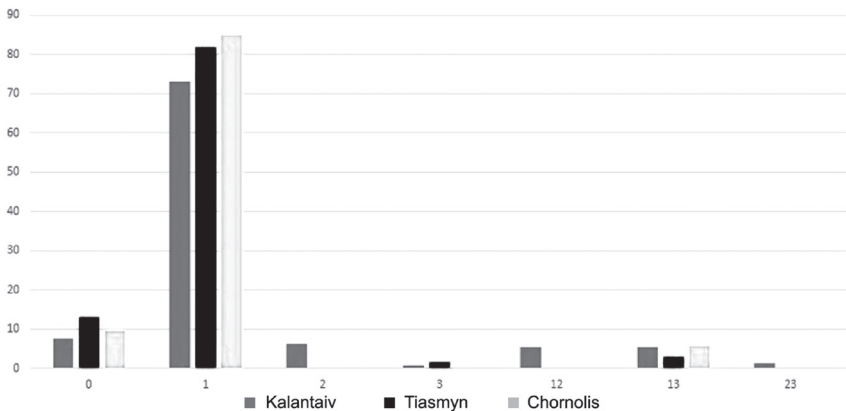
The thickness of the rim sherds is mainly 0.8–1.0 cm at all hillforts, and the differences between them remain within the statistical discrepancy (Fig. 7).

With the exception of marginal units of pottery, from distinctly small (up to 10 cm) to very big (>35 cm), the majority of pot rim sherds in all the collections are 15 to 25 cm in diameter. Special mention should be made of the abnormally large number of rims with a relatively small diameter (11–14 cm) at the Chornolis hillfort, while most of the rims from Kalantaiv and Tiasmyn are 15–19 cm in diameter (Fig. 8).

The smallest variety of patterns in rim ornamentation is observed in the Chornolis hillfort, which also has the most distinctive zonal standardization (Fig. 9). Segmented cordons on vessel



**Fig. 5.** Colour table of pot rim sherds: 11 – dark-grey, 12 – grey, 13 – light-grey, 21 – dark-brown, 22 – brown, 23 – light-brown, 31 – dark-chestnut, 32 – chestnut, 33 – light-chestnut, 41 – orange, 42 – yellow, 43 – light-yellow



**Fig. 6.** Admixtures table of pot rim sherds: 0 – undistinguished, 1 – quartzite, 2 – chamotte, 3 – sand

shoulders are present in all the collections, but for the Chornolis, they are virtually the most important element of decoration. There are several varieties of segmented cordons in the investigated materials, but in the case of rims, the segmentation made by fingertip impressions is almost the same for all fragments. Apart from that, the Chornolis fragments have a small number of perforations under the rims, while in the Kalantaiv and Tiasmyn hillforts, almost half of the decorated rim sherds are perforated. The Kalantaiv hillfort is notable for its chaotic set of decorative elements: pearls, as well as most of the geometric patterns, are unique for this set, and are not encountered elsewhere in this category, although they constitute an apparent minority in comparison with the decorations typical of all the collections, such as perforations, indentations, cordons, and plastered relief. The last are present in all three hillforts, but in small quantities, three to four items per site (Fig. 10).

About 80% of the rims at the Kalantaiv and Tiasmyn hillforts have coarse but processed, nearly smoothed out, surfaces. At the Chornolis hillfort, the majority of the pottery has well-processed, smooth surfaces irrespective of the size and shape of ware, and there are significantly fewer rough and coarse fragments, although these are present as well.

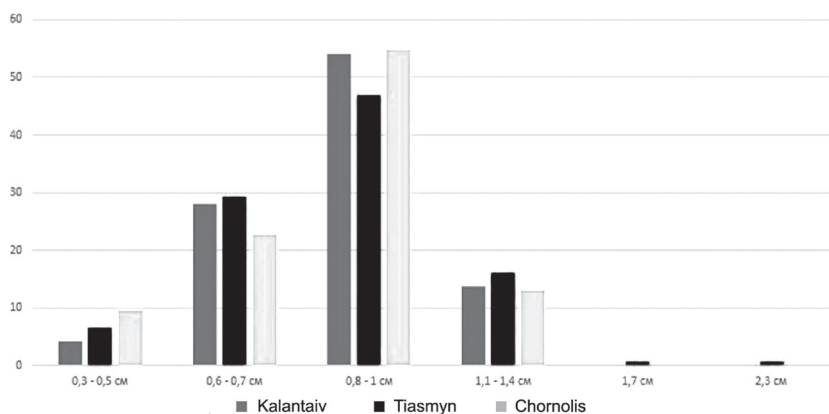


Fig. 7. Thickness of pot rim sherds

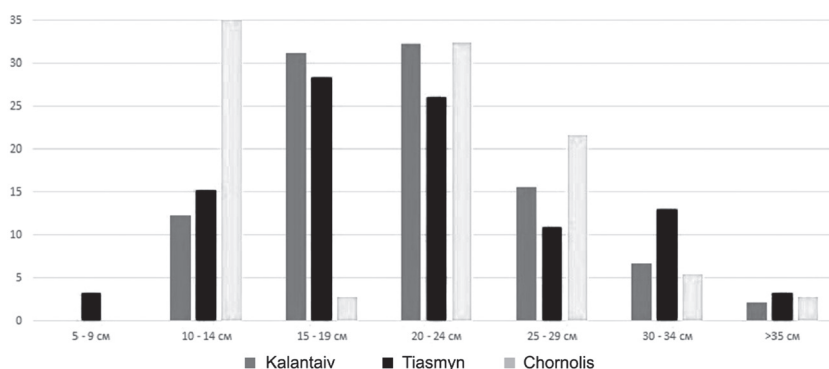


Fig. 8. Diameter of pot rim sherds



Measuring the metric parameters allowed distinguishing four values of vessel profiling according to the system of V. Gening. Ranking the collections according to these values enables classification of ware sherds by presumed types (Fig. 11).

The first value, neck height, describes the height of neck in relation to its diameter. For the Kalantaiv hillfort, it was possible to identify it for 84 fragments (57.3%) of 146; for Tiasmyn – for 90 fragments (65.6%) of 137; and for Chornolis – for 35 fragments (66%) of 53. The slightly uneven distribution is linked to the fragmentation of the pottery, which often did not allow for identification of certain parameters for calculations. As one can see in the diagram (Fig. 12), a certain increase in irregularity is observed only for fragments from Chornolis between the values of 0.175 and 0.227. The other two hillforts demonstrate a steady increase fluctuating between 0.053 and 0.5. High values over 0.4 were observed in the Chornolis and Tiasmyn collections. This indicates the presence of vessels with tall and narrow necks. These vessels are mostly small, with rim diameter up to 10 cm. Since they are typologically similar to other vessels, they cannot be classified as a separate variety of miniature vessels. Most likely, they were used to store valuable liquids, or solids such as salt. The smallest values in this selection are mostly large vessels with short necks.

The neck width values were determined for four fragments (2.7%) from the Kalantaiv, 28 fragments (20.4%) from the Tiasmyn, and 9 (16.9%) from the Chornolis hillfort. The small sample size and weak variability of the value makes it hard to draw conclusions from the obtained results. Only the presence of the highest and the lowest values in all collections can be registered. The smallest values within the range of 0.7–0.8 indicate strongly profiled vessels with globular bodies and usually strong profiling of the neck. High, decorated shoulders are typical for the majority of these vessels. The largest values, on the contrary, indicate weakly profiled vessels with a neck diameter equal to or slightly smaller than the body diameter. The neck is relatively short but strongly curved outwards. By placing all values on one diagram, one can see that there is no clear division into groups; the values increase moderately smoothly (Fig. 13). However, considering the data from every hillfort, several types can be identified by distinguishing fragments with similar values and significant gaps between them.

The value of neck profiling was identified for 83 fragments (56.8%) from Kalantaiv, 89 fragments (64.9%) from Tiasmyn, and 35 fragments (66%) from the Chornolis hillfort. Generally, the values vary within the range of 0.66 to 10. The lowest values indicate weakly profiled rims

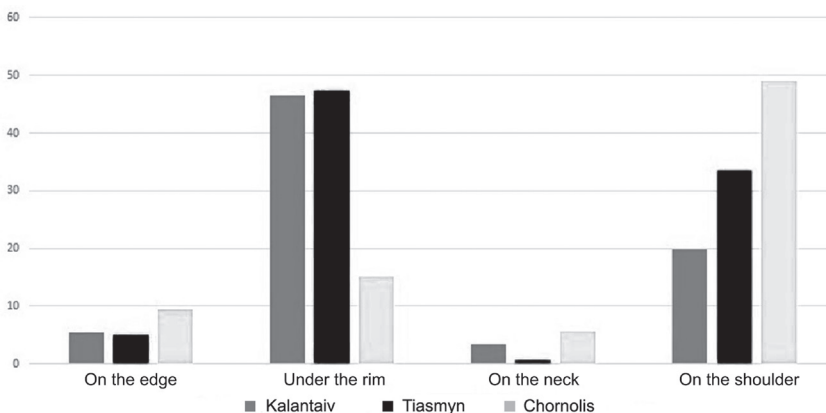


Fig. 9. Decoration location of pot rim sherds

with almost vertical necks. In most cases, they have short necks and weakly profiled shoulders. The highest values, therefore, belong to strongly everted rims, but mostly short necks. The general diagram shows that the fragments from Chornolis and Tiasmyn hillforts form rather distinct groups, while the values for the Kalantaiv hillfort gradually increase without separation into groups (Fig. 14).

The value of shoulder profiling is the last one that allowed calculation. It was identified for 10 fragments from the Kalantaiv hillfort, 27 fragments from Tiasmyn, and 11 fragments from the Chornolis hillfort, for a total of 48 fragments. This value varies from -0.2 to 0.63. The negative value indicates that the vessel is widest at the rim; the bigger the negative value, the smaller the diameter of the body in relation to the rim. The highest positive values, thus, indicate rounded vessel bodies (Fig. 15). As can be seen from this diagram, the vessels with negative or zero values are present exclusively at the Chornolis hillfort and constitute the majority there. The values of the Kalantaiv hillfort gradually increase from 0 to 0.63, thus gradually distributing over the entire variety of shapes, except those characterized with negative values. Although the Tiasmyn hillfort represents the entirety of positive values, the majority of its ware is between the values of 0.02 and 0.11, which indicates certain standardization of shapes.

*Bowl rims* are also an informative category that allows investigating the presence of types, or at least similar groups of pottery. However, their quantity in these collections is much lower. Specifically, there are 32 bowl rim sherds from the Kalantaiv hillfort, 36 fragments from Tiasmyn, and 27 from Chornolis, which is not much less than in the previous two collections in comparison with the other categories. This circumstance leads to low efficiency of statistical methods and inaccuracy of mathematical typology. Therefore, their typology was based on intuitive classification into provisional types according to the shape of the drawn profiles (Fig. 16).

The range of colours of bowl sherds as compared to the pots shifts towards the variations of grey at all hillforts, but Chornolis is where grey dominates. At the Kalantaiv and Tiasmyn hillforts, grey fragments do not exceed 45%, and the rest is distributed between the shades of brown and yellow almost equally. At the Chornolis hillfort, almost 90% of the bowls are grey. The bowls are even more uniform in terms of admixtures: almost all of them distinctly contain quartzite. The thickness of bowl sherds does not differ from pot sherds. Although the Kalantaiv hillfort has marginal cases, up to 1.7 cm thick, most of the rims are alike and rather thin, predominantly 0.8–1 cm.

In the category of rim diameter, there is a prominent group of bowls with a rim diameter between 18 and 32 cm, which constitutes about 70% of all identified diameters. Within this range, the values gradually increase at all hillforts. Since this can be also said about bigger diameters, it is impossible to distinguish ware types based on their size. Special mention should be made of two large dishes with the diameter of 55 cm from the Kalantaiv hillfort, and two vessels with the diameters of 7 cm and 10 cm from Tiasmyn and Chornolis hillforts, which should be identified as separate kinds of ware based on their intended purpose.

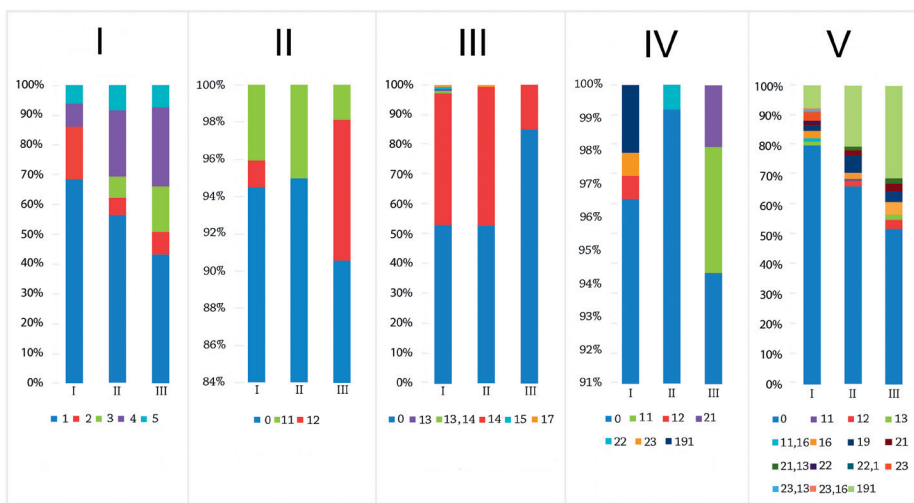
The majority of bowls were not decorated at all, and in exceptional cases the decorations comprised incisions on the edge and plastered relief under the rim. In this parameter, the pottery of Tiasmyn and Chornolis hillforts shows more similarity. The former has four fragments decorated with incisions and, separately, plastered relief; the latter has only three fragments decorated with incisions on the rim edge. The decorations at the Kalantaiv hillfort show more variety: apart from fragments with incisions and cordons, there are also bowl rims with perforations and punctuations from the inside. However, due to the small selection, such information is unlikely to indicate any similarities or differences among the hillforts concerning this parameter.

The bowl rim edges are mostly even in all cases, but the bowls from the Chornolis hillfort are different in this parameter since a quarter of them have rims that curve inwardly. The texture of the fragments from Kalantaiv and Chornolis hillforts is almost equally represented by rough and smooth surfaces; at the Chornolis hillfort, smoothed-out surfaces have significant prevalence. At every hillfort, only one glazed fragment was found.

In most cases, the *base sherds* are extremely fragmented, revealing primarily how the vessel walls merge into the base sections. However, it is impossible to link such fragments to any type, or at least category of pots. The situation is even more complicated because this is the least numerous category of primary classification. There are 50 fragments from the Kalantaiv hillfort, only 30 fragments from Tiasmyn, and as few as 8 from Chornolis. However, in order to create a comprehensive picture, it is important to represent this category of pottery as well (Fig. 17).

The irregularity of base thickness measurements is significant: they vary from very thin (0.5 cm) to thick (1.9 cm); the latter are more common for the bases that are the thickest part of the vessel. However, the mean value of base thickness is the same for all the hillforts: 1.1 cm.

The shape of the near-base part is the only original parameter in this category, so it is especially important. The base sherds were systematized based on the presence of a rim where the body and base merge. Most of the fragments from the Kalantaiv hillfort have an even junction of body and base (46%), or a small rim (48%), and only in isolated cases is the transition gradual. At the Tiasmyn hillfort, 16% of fragments have gradual transition, but most of the base sherds have even junction. Six of the eight Chornolis base sherds also have even junction. Therefore, even junction of the body and the base is a distinctive feature of Chornolis pottery.



**Fig. 10.** Decoration table of particular segments of rim sherds: I – shape of the rim edge: 1 – even, 2 – thick, 3 – thin, 4 – flanged, 5 – roll collar; II – decoration of the edge; III – decoration under the rim; IV – decoration of the neck; V – decoration of the shoulder. Numerical rating of the decorations: 0 – absent, 11 – incisions, 12 – fingertip impressions, 13 – punctuations, 14 – perforations, 15 – pearls, 16 – plastered reliefs, 17 – punctuations from the inside, 18 – incised lines, 19 – cordons, 191 – segmented cordons, 21 – stamping, 211 – stamping filled with white paste, 22 – cords, 221 – cords filled with white paste, 23 – scratched patterns, 231 – scratched patterns filled with white paste. Within each set of diagrams: I – Kalantaiv hillfort, II – Tiasmyn hillfort, III – Chornolis hillfort

*Body sherds* provide the most comprehensible information about various kinds of decoration, since their selection during the excavations was determined primarily by its presence. Unfortunately, this makes it impossible to identify the share of undecorated fragments. In the collections, 94% of fragments from Kalantaiv, 70% of fragments from Tiasmyn, and 76% of fragments from Chornolis were decorated. The undecorated fragments are distinct either due to their large size or due to the surface processing, namely glazing, which often was a decoration of its own accord. Like in the category of pot rim sherds, cordons are the most common decoration. Notably, while Chornolis has equal quantities of smooth and segmented cordons, a significant predominance of segmented cordons is observed at the other two hillforts. Scratched patterns are also present in all the collections of pottery, but their quantity does not exceed one quarter of the entire set of decorations. Plastered reliefs occur somewhat less often; moreover,

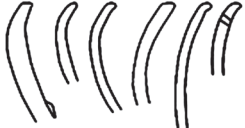














					The neck height value
I type	II type	III type	IV type	V type	
					The neck width value
					The value of neck profiling
					The value of shoulder profiling

Fig. 11. Types of pots by V. F. Gening's system of vessel profiling values

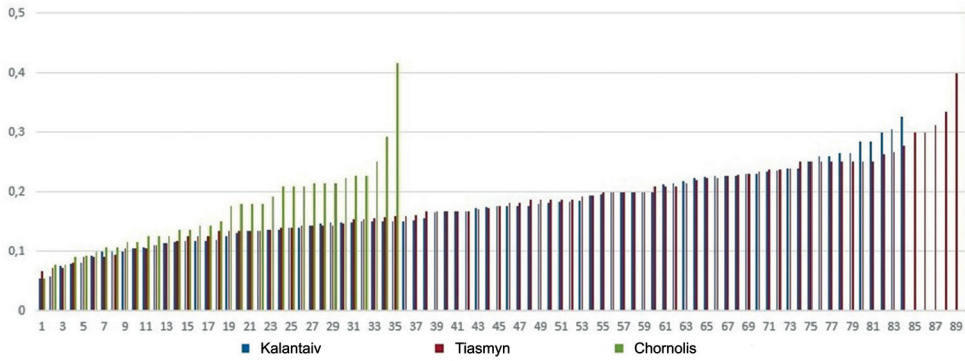


Fig. 12. Distribution of pot rim sherds by the neck height value

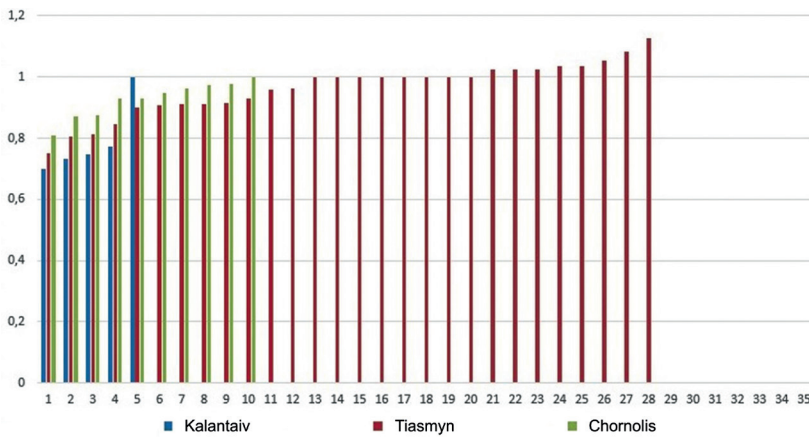


Fig. 13. Distribution of pot rim sherds by the neck width value

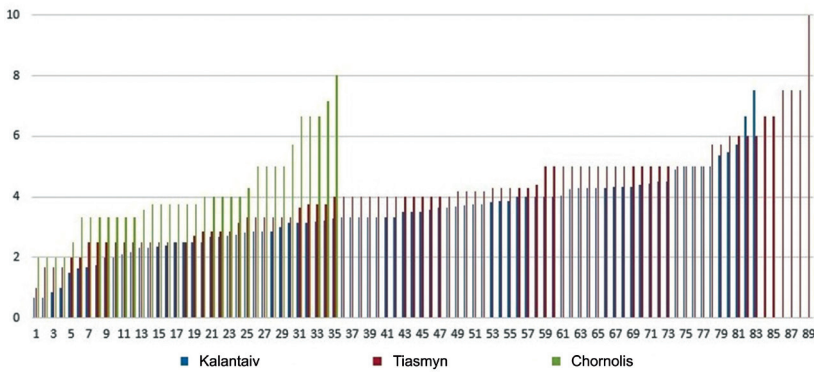


Fig. 14. Distribution of pot rim sherds by the value of neck profiling

in almost all cases they were found apart from the body they belonged to. Sometimes the plastered reliefs were decorated with denticular or corded ornament. Very rare patterns were filled with white paste, mostly in combination with denticular stamping (Fig. 18). One body sherd from the Kalantaiv hillfort was decorated with a drawing. Its image is provided without a reading of its semantic meaning or interpretation (Fig. 19).

The situation with colouring is repeated in this category, since at Kalantaiv and Tiasmyn hillforts, grey and brown fragments are equally common, with small quantities of chestnut-brown and orange shades. However, at the Chornolis hillfort, shades of grey also prevail.

Other categories of ceramic ware, such as dippers, which are considered a prominent feature of the Chornolis culture, were found in small quantities, with several fragments per hillfort.

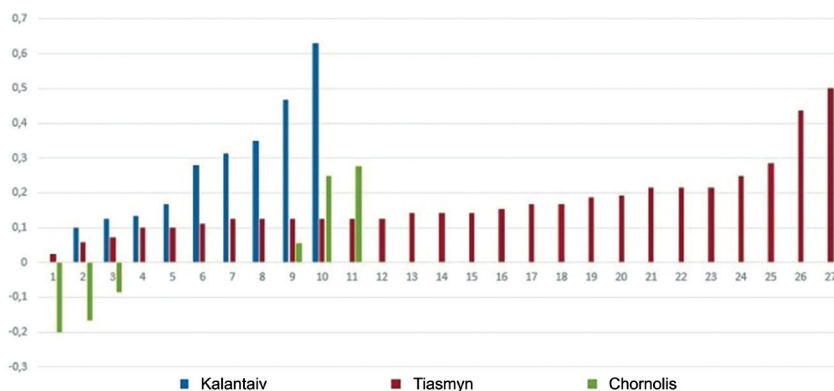


Fig. 15. Distribution of pot rim sherds by the value of shoulder profiling

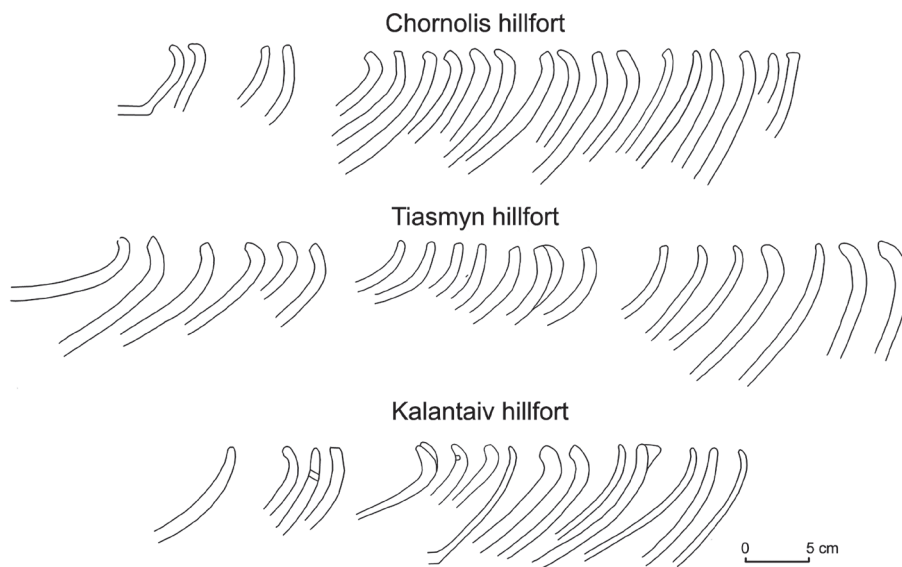


Fig. 16. Profiles of bowl rim sherds

Mugs are rare as well. Moreover, this category cannot be distinguished from small pots, and the presence of mugs is confirmed with one handle found at the Kalantaiv hillfort. Therefore, it is meaningless to classify dippers and mugs as separate categories during the analysis of the material. The number of miniature vessels was approximately the same at all sites and did not exceed 10 items per hillfort. These categories are fully represented in previously published works (Terenzhkin 1952).

#### 4. The results of analysis of correlations between description parameters

The analysis of correlations between the parameters of description has shown that at the Kalantaiv hillfort, only vessels with the diameter of 17 cm had cordons on their necks. Meanwhile, shoulder decorations are present mostly on the fragments that did not allow identifying the diameter, but the mean height value is almost 10 cm. This can be explained by better preservation of smaller fragments. At this site, the thickness of pot and bowl rims prominently correlates with the body diameter. Therefore, it can be stated that in more than half the instances, bigger vessels had thicker walls. At the same time, there is a correlation between rim thickness and the presence of decoration at its edge: incisions and indentations. Apparently, this is explained by technological aspects of production, since the application of a pattern requires a working area; the rest of the vessels had thin and even rim edges. At all sites, glazed texture fully correlates with dark grey colour, which is a known distinctive feature of Chornolis pottery. Besides, glazed fragments are rarely ornamented because glazing itself was a decorative element and, apparently, did not require additional ornamentation. The Chornolis hillfort has the most prominent tendency of combination of smooth texture and grey colour, although both characteristics constitute the majority there. The other two hillforts have a similar tendency, although the combination of grey colour and smooth texture is present in about half the instances there.

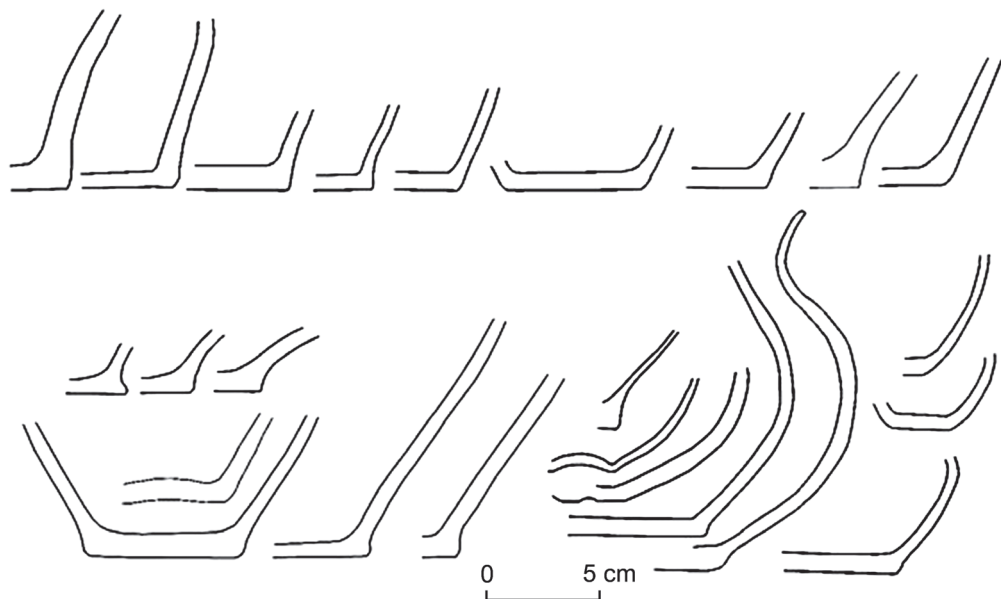


Fig. 17. Types of profiling of base sherds

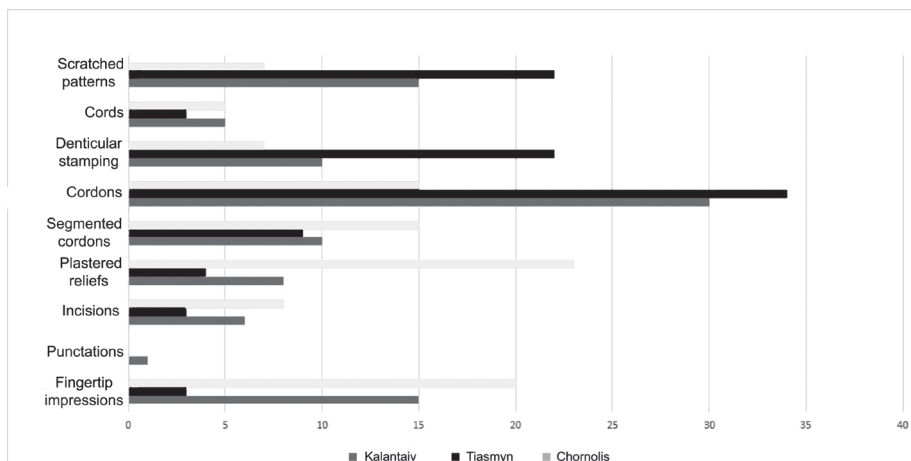


Fig. 18. Distribution of decorations of body sherds on particular sites

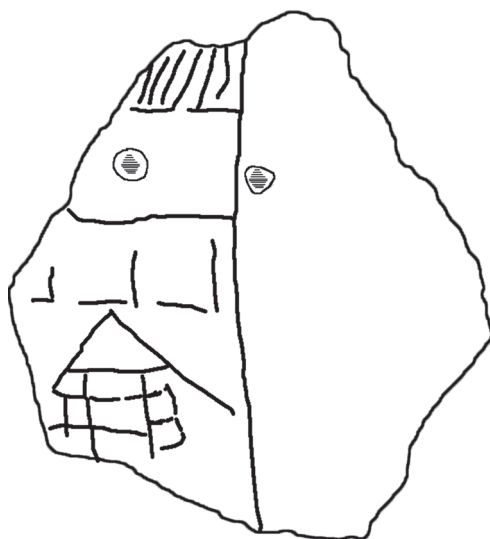


Fig. 19. Pot body sherd from the Kalantaiv hillfort

The values of description parameters are mostly uniform, so it is difficult to identify distinct types. A clear distinction was observed only in the value of neck profiling at the Chornolis hillfort. For some parameters, this is caused by small overall differences between the smallest and the biggest values, which eliminates possible distinctions. However, in most cases, lack of standardization is the logical conclusion. Even on the diagrams that show weak overall distribution, one can sometimes notice distinct types, the presence of which is likely explained by imported ware, or more valuable items that were produced by masters in batches. The latter type possibly includes large black-glazed pots, dippers, etc. However, the pottery was mostly produced at home without clear distinction into types.

Thus, a set of unique features can be identified for every site for further comparison.

At the Chornolis hillfort, dark grey and grey pottery occurs the most often. The ware is the least fragmented there, and rim diameters display noticeable standardization. In terms of pottery decoration, perforation under the rim is rare, and rims and their edges are rarely decorated. However, the share of ornamented shoulders is much higher, which can be explained with better preservation of fragments in comparison with the other sites. However, even taking this factor into account, the number of decorated shoulders at Chornolis is much higher than at the other sites. Apart from that, cordon ornaments and plastered reliefs are more common there. It is prominent that the correlation of pot and bowl rims is much higher at this site, indicating a much higher percentage of tableware.



The Tiasmyn hillfort is characterized by its similarity to the Kalantaiv hillfort and how it differs from Chornolis. Primarily, this regards such parameters as colour and diameters of fragments, as well as a large amount of ware ornamented with perforations under the rim. However, according to some parameters, it occupies an intermediate position between the Chornolis and Kalantaiv hillforts. Although the overall percentage of decorated ware is smaller here, more vessels are decorated with cordons than at the Chornolis hillfort. At the same time, some decorations found at this site, namely finger-made indentations and incisions, are extrinsic to the other two.

In the majority of descriptive parameters, the Kalantaiv hillfort is similar to Tiasmyn, but different from Chornolis. Above all, this is manifested in the above-mentioned shape of the rim edge, decoration under the rim edge, and shoulder decoration. The latter two parameters demonstrate the highest variability of decorations. Although the share of cordon decoration and plastered relief is traditionally high, a large percentage of ware is decorated with punctuations, stampings, cords, incised lines, etc.

It was more challenging to find consistency in the shapes of the vessels. The variety of types and correlations is associated not only with the overall picture but with the individual sites as well. Just as in the previous description, we can point out a bigger quantity of similar shapes shared by the Tiasmyn and Chornolis hillforts, and the opposite situation in the case of Kalantaiv and Chornolis. However, the variability of this indicator is not as uniform as in the case of numeral values. Almost all the diagrams of the Kalantaiv hillfort display the highest gradation in the system, especially in the value of neck profiling, while in Chornolis it is the lowest.

## 5. Conclusions

It can be concluded that an insignificant quantity of ware fragments from the investigated hillforts bear features that are traditionally considered inherent to the Chornolis culture. For instance, black-glazed graphite-coated pottery, which is considered inherent to the cultures of the Danube region, is present at all sites, but in relatively insignificant quantity. The ware with carved patterns filled with white paste is limited to solitary instances. Apart from that, there are low numbers of dippers and mugs at the sites. This situation seems to be typical for the Chornolis culture: investigation of the Sybotiv hillfort showed that pots and bowls are the dominant type of pottery there and the number of dippers and mugs is no more than 8% (Gershkovich 2017, 94).

On the basis of the collected material, an attempt to explain the differences in the ceramic complexes of the sites has been made. Most of the data indicate chronological, not territorial differences. For instance, the attributes of pottery that could have depended on the location of the sites, such as the presence of admixtures, demonstrate full uniformity. Quartzite was the main admixture at all sites, regardless of their location and the distance between them. Another parameter that could have confirmed the differences in the clay mass is colour, but based on the analogies from other sites, it indicates the technology of ware production rather than the peculiarities of the local clay. Such conclusions provide a reason to associate the existing differences in the statistical data with the different chronology of the sites.

The analysis of ceramic complexes of the Chornolis culture performed by O. Terenozhkin identified two chronological horizons associated with the stratigraphy of the Subotiv hillfort, which is the most comprehensively explored and rich in findings (Terenozhkin 1961, 47–82). Y. Gershkovich distinguished specific types of decoration of pottery from this site. Subotiv-2 is the earlier horizon and dates back from the late 11<sup>th</sup>–10<sup>th</sup> century BC to the middle of the 9<sup>th</sup> century BC (Gershkovich 2017, 183). Its features include various cordons and linear ornaments.

Subotiv-3 (from the middle to the late 9<sup>th</sup> century BC (Gershkovich 2017, 183)) is characterized by more numerous ornamentation patterns, such as plastered reliefs, punctuations, zigzags, S-shaped signs, cordons, and geometric lines (Gershkovich 2017, 160). The three hillforts investigated in this research were qualified as sites of the late Chornolis culture. By applying the criteria used by Terenozhkin to distinguish the upper and lower horizons of the Subotiv hillfort, an attempt could be made to determine the relative microchronology of the sites within the late stage of the Chornolis culture.

The horizon of the Chornolis hillfort has more archaic features, therefore it could be the earliest. It is characterized by more fragments within the range of the shade of grey; glazing; an approximately equal amount of segmented and non-segmented cordons; plastered bulges; and shoulder ornamentation. Meanwhile, the colours of non-grey range, ornamentation under the rim edge, scratched patterns, and perforation under the rim are thinly represented. The morphological features are more uniform, and the number of vessels with wide necks, having rim diameter bigger or equal to the shoulder diameter, is also higher. The amount of tableware exceeds the kitchenware.

The second horizon is associated with the Kalantaiv hillfort, which is opposite to Chornolis in many parameters. This period has such characteristic features as the prevalence of the brown spectrum; ornamentation under the rim edge; scratched patterns; and segmented cordons. The morphological features include irregularity of vessel shapes and various degrees of globularity. Such ornamental patterns and vessel profiling are characteristic elements of the sites of the Zhabotyn period and the Scythian age in general.

According to the majority of parameters, the Tiasmyn hillfort occupies an intermediate position between Chornolis and Kalantaiv, although it gravitates towards the latter, despite the fact that some parameters, such as decoration of body sherds, are similar to those of Chornolis. The heterogeneity of the materials from the Kalantaiv hillfort can be explained by the fact that during the excavations, the researchers considered the hillfort and the nearby settlements as synchronous, and did not separate their collections (Pokrovska 1956). Unfortunately, it is impossible to separate them now, nor to confirm or refute the idea of their synchronicity. With this in mind, it is proposed to date Tiasmyn and Kalantaiv hillforts within one chronological horizon until the appearance of new sites which could possibly explain the difference between them.

The intercultural relations are traditionally reconstructed on the basis of ornamental patterns and shapes of vessels. For example, the majority of vessels from the Subotiv hillfort continue a local tradition of the Bilohrudiv culture. External influences are represented by the Hallstatt-like pottery (35–40%), as well as by the Bondariha culture traditions from the northeast (2.6%) and the Srubna culture traditions from the east (2.8%) (Gershkovich 2017, 170–177). The examined material from the Kalantaiv, Tyasmyn, and Chornolis hillforts and the composed general table of patterns confirm most of the known directions of communication (Fig. 20). The non-segmented plastered cordon on the vessel shoulder, which was a characteristic trait of the Bilohrudiv and Lusatian cultures, was present at all sites. This decoration was the most popular one at the Chornolis hillfort, which correlates with its hypothetical chronology and confirms its association with the Bilohrudiv (Terenozhkin 1961) and Lusatian cultures (Klochko 2006, 254). Body sherds with finger-made indentations were found at the Chornolis and Kalantaiv sites. In the Chornolis horizon, this can be associated with the Bilohrudiv culture, while in the Kalantaiv horizon, due to the appearance of punctuated ornamentation, this can be associated with the Bondariha culture. Such syncretism was previously found at the sites of Orel and Samara (Romashko 1995). Besides, this hillfort has a larger number of globular vessels, typical of the Danubian cultures, which could mark the beginning of Danubian influences on the Dnieper

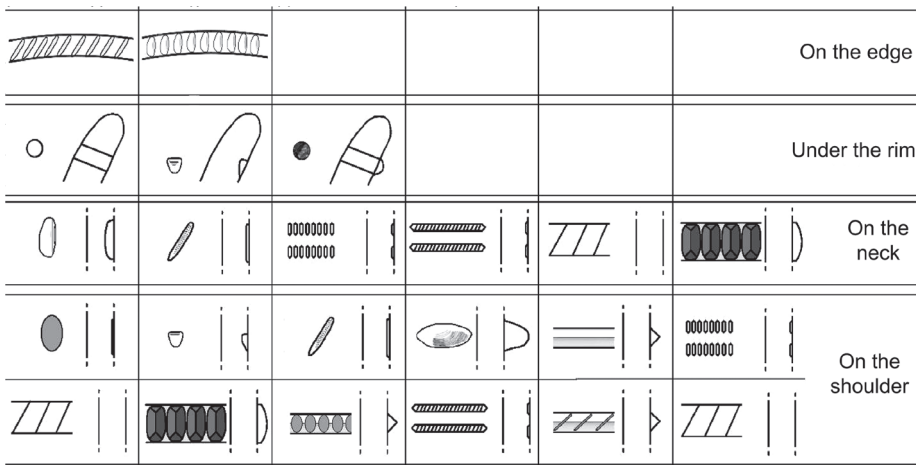


Fig. 20. Most popular ornament patterns

region, which eventually led to the formation of sites of the Zhabotyń stage (Darahan 2011). The most informative element of decoration is perforation under the rim, which was frequent at the Kalantaiv and Tiasmyn hillforts. Later, this feature became typical for the ware of the Zhabotyń stage and Scythian age, and its prevalence on these sites confirms their later chronology. However, the absence of a large number of Danubian influences, peculiar for the Zhabotyń stage, indicates that these sites ceased to exist before the hypothetical migration of a new population from the Danubian region, that is, before the mid-8<sup>th</sup> century B.C. It is not yet possible to determine the period of their existence on the sole basis of the data obtained from the pottery.

#### Ceramika kultury czarnoleskiej w regionie środkowego Dniepru

W artykule przedstawiono metodykę i rezultaty badań 885 fragmentów ceramiki kultury czarnoleskiej z trzech grodzisk w dorzeczu środkowego Dniepru. Choć fragmenty ceramiki są najczęściej spotykaną kategorią materiałów archeologicznych na tych stanowiskach, to po raz pierwszy morfologia i ornamentyka tych fragmentów zostały przeanalizowane statystycznie. Odkryte korelacje między parametrami ceramiki umożliwiły dokonanie porównania tych grodzisk. Ustalenia te w dużej mierze sprecyzowały mikrochronologię analizowanych stanowisk oraz ich zewnętrzne relacje, w obrębie kultury czarnoleskiej i poza nią.

#### References

- Darahan M. N., 2011 *Nachalo rannego zheleznoho veka v Dneprovskoi Pravoberezhnoi lesostepi*. Kyiv: KNT.
- Dunnell R. C., 1971 *Systematics in prehistory*, New York: Free Press.

- Gening V. F.**, 1973 *Programma statisticheskoi obrabotki keramiki iz arkhologicheskikh raskopok*, Sovetskaiya Arkheologiya, 1, pp. 114–136.
- Gershkovich Y. P.**, 2016 *Subotiv hillfort*, Kyiv.
- Klochko V. I.**, 1998 *The chronology of the Subotiv settlement*, Radiocarbon, 40 (2), pp. 667–673.  
2006 *Ozbroiennia ta viiskova sprava davnoho naseleattia Ukrainy*, Kyiv: Artek.
- Kovpanenko H. T.**, 1957 *Poselennia periodu piznoi bronzy i rannoho zaliza poblyzu Okhtyryky*, Arkheolohiia, 11, pp. 96–105.  
1967 *Plemena skifs'kogo chasu na Vorskli*, Kyiv.
- Krushelnytska L. I.**, 1987 *Vzaiemozviazky naseleattia Prykarpattia ta Volyni z plemenamy Skhidnoi ta Tsentralnoi Yevropy*, Lviv.  
1998 *Chornoliska kultura Serednoho Prydnistrovia (za materialamy neporotivskoi hrupy pamiatok)*, Lviv.
- Makhortyh S. V.**, 2005 *Kimmeriitsy Severnogo Prichernomoria*, Kyiv.
- Maksimov E. V., Petrovskaya E. A.**, 1959 *Arkheologicheskie pamiatniki v okrestnostiakh s. Bolshoi Andrusovki na Tiasmine*, Kratkiye soobshcheniya Instituta arkheologii USSR, 8, pp. 22–29.
- Pokrovskaya E. F.**, 1956 *Otchet Stetsovsko-Kalantayevskogo otriada Kremenchugskoi ekspeditsii, vol. 1* (held in the archives of IA NANU).
- Romashko V. A.**, 1978 *Pamiatniki predskifskoi epokhi v Orelesko-Samarskom mezhdureche*, (in:) V. A. Romashko (ed.), *Kurgannye drevnosti Stepnogo Podneprov'ia III – I tys. do n. e.*, Dnipropetrovsk.  
1995 *Pozdnii bronzovyi vek v pograniiche lesostepi i stepi Levoberezhnoi Ukrainy (XII – X vv. do n. e.)*, Dnipropetrovsk.
- Shramko B. A.**, 1957 *Novye pamiatniki predskifskogo vremeni na Severskom Dontse*, Kratkiye soobshcheniya o dokladakh i polevykh issledovaniyakh Instituta istorii materialnoy kultury, 67, pp. 50–64.
- Smirnova G. I., Kashuba M. T.**, 1988 *O dvukh lokalnykh gruppakh kultury pozdnego chernolessia na Srednem Dnestre*, Arkheologicheskiiy sbornik Gosudarstvennogo Ermitazha, 29, pp. 18–28.
- Terenozhkin O. I.**, 1952 *Rozvidky i rozkopky v 1949 r. v pivnichnii chastyni Kirovohradskoi oblasti*, Arkheolohiia, 7, pp. 110–135.  
1961 *Predskifskii period na Dneprovskom Pravoberezhe*, Kyiv.