LIUDMYLA SHATILO

TRIPOLYE TYPO-CHRONOLOGY

Mega and Smaller Sites in the Sinyukha River Basin

SCALES OF TRANSFORMATION IN PREHISTORIC AND ARCHAIC SOCIETIES | 12

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Preface of the series editors

With this book series, the Collaborative Research Centre *Scales of Transformation: Human-Environmental Interaction in Prehistoric and Archaic Societies* (CRC 1266) at Kiel University enables the bundled presentation of current research outcomes of the multiple aspects of socio-environmental transformations in ancient societies. As editors of this publication platform, we are pleased to be able to publish monographs with detailed basic data and comprehensive interpretations from different case studies and landscapes as well as the extensive output from numerous scientific meetings and international workshops.

The book series is dedicated to the fundamental research questions of CRC 1266, dealing with transformations on different temporal, spatial and social scales, here defined as processes leading to a substantial and enduring reorganisation of socio-environmental interaction patterns. What are the substantial transformations that describe human development from 15,000 years ago to the beginning of the Common Era? How did interactions between the natural environment and human populations change over time? What role did humans play as cognitive actors trying to deal with changing social and environmental conditions? Which factors triggered the transformations that led to substantial societal and economic inequality?

The understanding of human practices within often intertwined social and environmental contexts is one of the most fundamental aspects of archaeological research. Moreover, in current debates, the dynamics and feedback involved in human-environmental relationships have become a major issue, particularly when looking at the detectable and sometimes devastating consequences of human interference with nature. Archaeology, with its long-term perspective on human societies and landscapes, is in the unique position to trace and link comparable phenomena in the past, to study human involvement with the natural environment, to investigate the impact of humans on nature, and to outline the consequences of environmental change on human societies. Modern interdisciplinary research enables us to reach beyond simplistic monocausal lines of explanation and overcome evolutionary perspectives. Looking at the period from 15,000 to 1 BCE, CRC 1266 takes a diachronic view in order to investigate transformations involved in the development of Late Pleistocene hunter-gatherers, horticulturalists, early agriculturalists, early metallurgists as well as early state societies, thus covering a wide array of societal formations and environmental conditions.

During recent years, archaeologists from Kiel University carried out intense fieldwork and collaborative efforts in different Eastern European countries. In Ukraine we work closely together with the Department for Eneolithic and Bronze Age Archeology, Institute of Archeology of NASU, Mihailo Videiko from Kyiv Borys

Hrinchenko University, and Vladislav Chabanyuk from the Tripolye Museum in the village of Legedzyne.

The resulting publication on detailed cultural and social developments, especially based in ceramic analyses, which is presented here, is extremely helpful for our understanding of Tripolye transformation processes.

We are very grateful to the author, Mila Shatilo, and to the graphic illustrator, Carsten Reckweg, for their deep engagement in preparing this publication. We also wish to thank Karsten Wentink, Corné van Woerdekom and Eric van den Bandt from Sidestone Press for their responsive support in realising this volume, and Julian Laabs and Nicole Taylor for organising the entire publication process.

Wiebke Kirleis, Johannes Müller

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I would like to thank my supervisor, Johannes Müller, for the idea of creating this work and his guidance through it with providing access to all available materials. Many thanks also to Sławomir Kadrow, who took over the review of the study and to Knut Rassmann, who greatly contributed to the initialisation of a new stage in studies of the Tripolye giant settlements; this book is written on the basis of some of these results. I would like to express special thanks to all my colleagues of the D1 subproject ‘Population Agglomeration in Tripolye-Cucuteni Mega-Sites’, within the framework of which this research was carried out; working in this wonderful team turned out to be not only pleasant but also very productive.

I’m very grateful to many colleagues who have provided great assistance in conducting this research; in particular Vladislav Chabanyuk and his team of the Tripolye Museum, among them Nina Ses, who provided access to material that largely formed the basis of this work, as well as all other kinds of help during our regular stays in Legedzyne. Lennart Brandtstätter generously made available data from his Master thesis. Alexey Korvin-Piotrovskiy and Vitaly Rud contributed answers to numerous of the most diverse and spontaneous questions concerning Tripolye. Jutta Kneisel helped me a lot through productive discussions and advice on data processing, as well as Stefan Dreibrodt with whom I had fruitful talks about some aspects of Tripolye development. Sergey Ryzhov gave me the opportunity to use some materials from his research. Igor Tseunov and Oleksandra Buzko created a pleasant atmosphere during work in the archive of the Institute of Archaeology, NASU. Susanne Beyer, Sofie Juncker, Carsten Reckweg, Carina Lange, Julian Laabs, and Nicole Taylor contributed greatly to making this study presentable as a book. Elena Kuharskaya, Vitaly Otroshchenko and Alexander Petrashenko always supported me in all respects.

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Liudmyla Shatilo

Introduction

The *Tripolye* is an original cultural phenomenon in Eneolithic Europe. In most cases this label designates sites with similar settlement complexes and artifact assemblages, especially those which contain specific ceramics, figurines, typical house-building techniques (to a large extent), two-chamber pottery kilns (during a certain time period), a specific settlement layout, and other characteristics. Each of these elements underwent a long evolution and some transformations in the course of approximately 1000 years. The Tripolye sites are located across a vast territory, in the form of a wide strip stretching between the Prut and Dnieper rivers from the Southwest to the Northeast.

The north-eastern limit of the distribution zone of these sites, beyond which the artifacts with Tripolye features are almost never found, is in the *middle Dnieper* (between the modern cities of Kanev and Kiev). The *Prut River* is a very notional South-Western boundary of the complex, West of which this cultural phenomenon is called Cucuteni for a number of reasons. One of the most important reasons for the delimitation (although seemingly arbitrary) is the modern state borders (first between Romania and the Russian Empire, then between Romania, Moldova, and Ukraine).

The ceramic assemblages have great similarities on the both sides of the Prut; the same is true for the housebuilding techniques and other elements of culture. However, there are some significant differences, which are becoming more and more clearly visible in recent years. These distinctions may be even more significant than the pottery similarities. Thus, a complex circular settlement layout based on a ring street seems to be an almost exclusively Tripolye (Eastern) pattern, and the settlement layout with irregular rows of buildings is typical for Cucuteni. At the same time, at a certain chronological stage of development, the settlements of the latter type are also found in some territories East of the Prut. There are also other distinctions between Cucuteni and Tripolye, such as the presence or absence of stratified sites, settlement density, the size of the communities etc. Of course, the 'boundary' between Cucuteni and Tripolye is an exclusively artificial tool used for convenience in further descriptions, since in prehistory (and sometimes even up to the 20th century) the term 'border', apparently, had a slightly different semantic meaning; indicating, most likely, dividing lines between the territories of certain small communities/settlements, and not of such enormous contact zones as Cucuteni-Tripolye.

Leaving aside the Cucuteni sites and turning to Tripolye, one more feature of this complex should be mentioned. This is the phenomenon of the so-called *mega-sites* or *giant settlements*. They are represented by a specific group of sites, characterised by an agglomeration of the population which is reflected in the large size of the settlements, with a complex circular layout based on a ring street. They became known to the scientific community through aerial photographs in the 1960s. Since then, these sites and related problems of their social organisation, demography, chronology, nature, causes of decline etc., have been actively discussed in proto-historical studios. This topic became one of the main subjects of research in the work of the project 'Population agglomerations of Tripolye-Cucuteni mega-sites' in the framework of which this study has been carried out.

The Tripolye giant settlements are far from being characteristic for the entire zone of this cultural phenomenon; they are concentrated mainly in one region, which is in the 'Bug-Dnieper' interfluve in the *Sinyukha River basin* and are located not far from each other. It is here that one can trace the evolution of mega-sites from their first manifestations to their rather rapid disappearance. Despite the almost fifty-year history of studying such villages, they still remain relevant for research. And, just like 40 years ago, the clarification of key problems and questions on this topic rests on the *chronology*. Of course, it is precisely the chronology that is the 'skeleton' that makes all further research constructs, interpretations, and conclusions possible. Even the slightest change in the chronology can lead to revision of a number of questions and hypotheses. It is for this reason that the chronology requires constant attention, updating, and – whenever necessary – revision.

For that reason, the ***subject of this book*** and its main goal is to check/build the chronology for the region of the mega-sites. How relevant is this? The Tripolye relative chronology is considered to be very well developed; it has been used to build/update the chronologies of other cultural phenomena (*e.g.* the so-called Steppe Eneolithic). It is difficult to disagree with the fact that the already-distinguished basic stages of Tripolye development, in principle, reflect the ancient realities. In addition, the chronology of mega-sites is considered already established. However, when it comes to these chronologies, on closer inspection everything is not as clear as it seems at first glance. Therefore, a number of factors make this study relevant.

Unlike Cucuteni, in Tripolye there are almost no stratified sites. This fact provided an impetus for the development of detailed typo-chronological models based on the evolution of ceramic assemblages. For a long time, no other (non-typological) arguments were used for the construction of most of these models. Despite the development of various methods for updating chronologies, the models based on ceramics have not undergone any significant changes for several reasons. In particular, until the 2010s radiometric dating of Tripolye had developed extremely sluggishly and was not always carried out systematically. More recently, the situation has begun to change dramatically, in particular for the region with mega-sites. And today there are a number of new radiocarbon dates that should be taken into account when checking/compiling the chronology of the giant settlements and their region.

Another factor that goes hand in hand with the previous one is the drawing up of new, precise magnetic plans of settlements; these made it possible to revise, update, clarify, and even discover some important aspects of Tripolye settlement structures and elements. In interpreting them, again, the key element is the chronology.

The next factor that makes this study relevant is use of new and relatively new research methods and approaches. After the rather successful prior application of statistical methods to the Tripolye ceramics since the 1980s, a number of developments in statistical methods allow us apply, for example, correspondence analysis to Tripolye pottery assemblages.

On the other hand, and this is perhaps even more significant, today the approaches to understanding and interpreting archaeological material have changed radically; from interpretations of individual objects to the use of concepts such as, for example, *archaeological culture*. For instance, the interpretational basis of a number of fundamental approaches in Tripolye studies were the works of ethnographers from the second half of the 20th century. The rejection of the theory of ethnos and criticism of Bromley's works did not have an effect on post-soviet Tripolye studies: Local groups are still associated with a 'mythical' ethnos, the spread of ceramic types and specific elements (*e.g.* figurines or technologies) is associated with the spread (migration) of groups of people/populations. Revision of the approaches and theories on which the interpretations and constructions were based is one of the main priorities for current Tripolye studies. Since, however, this work is mainly concerned with chronology this question will only be slightly discussed in it.

Having touched upon the research approaches of earlier years, I would like to dwell on a rather significant point. It is characteristic of many works that chronologies and periodisations were often built either for the entire Tripolye zone, or for a part of it but with references the rest of the area. As an example, compiling the Tripolye chronology on the basis of often only a few radiocarbon dates, the authors see the beginning of the development of this phenomenon in the territory of Romania, and the final 'development of the culture' near the Black Sea and in the Kiev region. It seems that it would be advisable to limit ourselves to a smaller area and try to trace its development from the beginning of the appearance of the Tripolye elements there to their final stages. This seems to be relevant especially for the region with a high population density, concentrated in agglomerated settlements.

To check/build the chronology of this region, three basic groups of sources have been used in this work: *ceramics*, *radiometric data,* and the *dataset of Tripolye sites* in the region. Whenever possible, the materials from publications and reports have also been used, though the main focus was on both the processing of new data (from recent surveys and excavations, as well as a large collection of new absolute dates), and on already accumulated materials (primarily ceramics). Thus, an attempt was made to maximise the application of non-invasive methods.

The *methodological background* on which Tripolye relative chronology is constructed in this work is built upon a threefold approach to the construction of relative and absolute chronologies for sites, regions and even larger spatial units, as follows:

1. Identifying the artefact category that displays greatest variability in design and possible functions, so that it allows creation of a typological classification, including manifold types, classes, and categories.
2. After a typological differentiation is realised, statistical methods like correspondence analysis help in the construction of typological sequences. Independent of the purpose of the investigation, the results might represent temporal, spatial, social, or cultural divergence.
3. The identification of different meanings is possible only with the help of non-typological arguments. To interpret chronological models, vertical stratigraphies or absolute scientific dating is necessary: a congruence between the typological sequence and vertical stratigraphies or radiometric dates is necessary for spatial differences, distribution maps, and for social or other arguments.

As far as the *structure of the book* is concerned, it resulted from its goals and objectives.

For that reason, the first part presents more broadly some aspects of the history of the development of the general Tripolye chronology, since without this understanding it is very difficult to realise how and why the chronology of the 'mega-sites region' was created. Without going into the nuances of studying the Tripolye sites from different regions, these fundamental milestones in the creation of the Tripolye chronology used today are considered here.

In the second part, a narrowing of the geographical scope of the study to the size of the working zone is proposed. The boundaries of the working area (approximately 300 x 200 km) were established by taking into account the locations of key settlements, giant settlements, and other settlements in the micro-region with ceramics of the same or similar style as the selected key sites. This part discusses the basic information that will simplify an understanding of the region – it is devoted to the geography, relative chronology, as well as sources and methods used in this work.

The third and fourth parts are dedicated to the construction of chronology at two spatial levels – at the site level (one mega-site) and at the regional level. Two groups of sources – ceramics and radiocarbon dates – are used in these two parts. The results of the work, their possible interpretation, and the conclusions arising from them are presented in part five. Here, a third group of sources (the database of sites) is added to the discussion.

Thus, this book proposes approaching the understanding of the phenomena of a large agglomeration of the population in a relatively small area by revising the chronology. How long was the lifetime of the large settlements? Were they synchronous or built one after the other? How was a separate mega-site developed and how did it function? What caused the distinctions in ceramics between different settlements, what do they point to, which types of utensils changed faster, and which were more stable in production? Which 'special finds' can be used as chronological indicators? Understanding these and many other issues directly related to chronology can help shed light on the various spheres of interaction between the ancient communities that inhabited this region in the Eneolithic. Features of the social system and exchange (of symbols, knowledge, technologies, objects) between these communities, their changes and transformations were reflected in the material culture, the interpretation of which may change when the established chronology changes.

1 Relative Chronology of Tripolye: Research History and State of the Art

The history of research of the 'Tripolye Culture', including attempts at its periodisation and chronology, has been going on for more than a century. The first steps were taken by Vikenty Khvoiko who, in 1895, began to investigate the sites with the remains of clay structures, which he conditionally called 'ploshchadkas' (interpreting them as 'houses of the dead') and which contained ceramics he had not seen before (Kolesnikova 2008, 42-43). He summed up the results of his work in 1899 at the 11th Archaeological Congress in Kiev; it was then that the discovered sites got the name of *Tripolye Culture* (Khvoiko 1901, 736-812). Khvoiko repeatedly uses the term 'culture', but obviously did not attach any importance to it, and all the more did not specify what he meant by it.

Contemporary with the site near Tripolye on the Dnieper, in Romania, the settlement of Cucuteni was discovered in 1889 and studied. The synonymous site gave the name to a new culture. The first researchers encountered an unusual wealth of artefacts from the Cucuteni-Tripolye sites and were impressed first of all by their ceramics.

In general, ceramic is a fairly fragile material, so it requires frequent reproduction, during which the shapes and ornamentation of vessels gradually change. Due to this, clay objects are an excellent source for spotting typological differences which could be of chronological character and used for sequential constructions (provided that typology-independent dating methods, *e.g.* radiometric dates or stratigraphic proof of the chronological relevance of typological differences, are added). In addition, typological differences and similarities can be used to identify spatial distribution patterns of ceramic styles. During previous investigations, these spatio-temporal ceramic similarities in assemblages were often used to identify not only groups of ceramic styles, but also to interpret such ceramic groups as reflections of real distribution patterns of social units without any further argumentation.

Spatio-temporal understanding of Tripolye today is based on numerous studies starting from the definition of the huge phenomenon 'Tripolye' to its division into periods, as well as fragmentation into numerous groups (varieties, etc.). Previous studies were performed with the use of methods, available at that time, for analysing ceramic collections (which was often the main focus) and other artefacts, data on house-building, location of settlements, and the like. In some of the researchers' conclusions, first, the meaning of some of the terms used (*e.g. organic whole, ethnic ties,* etc.) was not always explained; second, other terms were used rather conditionally; third, some of the authors obviously expressed more precise individual hypotheses (*genetic connections* …). Therefore, in this part, it seems appropriate to retain the author's terminology in explicating the researcher's ideas or concepts, even if it is not accepted today by the scientific community or looks outdated or is recognised today as controversial.

1.1 Early typological models

Based on ceramic typology and without any further typology-independent arguments, Khvoiko worked out and proposed the first periodisation of Tripolye, dividing it into 'culture B' and 'culture A' (1901, 736-812). It should be noted that Khvoiko did not attach much importance to the terms he used – calling Tripolye 'A' and 'B' now *culture*s, then *groups*.

To 'culture B', which Khvoiko presumed to be an earlier one, he attributed the sites in Uman and Kaniv districts in the Middle Dnieper (Khalepie, Staiki, Rzhyshchiv, etc.), Kherson and Podolye regions, where the ceramics were decorated with monochrome painting or with an incised ornamentation, and many objects were not decorated at all. Considering these features to be 'more primitive', Khvoiko believed that they pointed to an earlier stage. 'Culture A' was distinguished as a later one, to which he attributed the sites of Tripolye, Veremye, Chernyahiv and Shcherbanovka, where some copper artefacts and painted ceramics were found. In culture 'B', there were neither copper nor drilled stone objects detected on the sites of group 'A' (Khvoiko 1901). Later it was proved that the sites referred to as 'culture A' were earlier and as 'culture B' later.

It seems that the zeitgeist of a purely evolutionary thinking was responsible for constructing a chronological model without any arguments for the chronological meaning of the observed typological differences between the sites.

In his research work, Khvoiko did not map the cultures he had distinguished; the stage of documentation of about 500 *ploshchadkas* he had excavated[1] is of extremely poor quality: drawings of the excavated objects were rare and done from memory; no photos were taken because of the then 'complexity of the method' (Kolesnikova 2008, 47-48). This can be partially explained by the excavation technique of the late 19th and early 20th centuries. However, in 1900, F. Vovk proposed and M. Belyashevskiy applied a more progressive method of investigating sites. The latter author published a review of one of Khvoiko's works, pointing out the weakness and precariousness of his historical reconstructions, the poor methods of fixing the finds, the absence of statistical data in describing artefacts and the unacceptable methods of his excavations: 'Unskilful amateurish diggings will only result in the destruction of the sites' (Belyashevsky 1904, 116-120). Nevertheless, Khvoiko is an important figure in the study and popularisation of Tripolye; his work made this 'culture' well known and raised interest in it.

At the same time, E. R. von Stern connected the Tripolye settlement discovered in Petreni with the cultures in Romania (Cucuteni), Galicia (Bilche Zlota, Gorodnitsa), Bucovina (Shypentsy), Bulgaria, Moravia and Hungary, which he dated to around 3000 BCE and called the 'pre-Mycenaean period' (Stern 1907, 48-52).

In the 1920s and 1930s, local periodisation schemes for Tripolye in Western Ukraine were developed (Kozlovsky 1924, 106-152; Kandiba 1937, 122-126). O. Kandiba singled out five phases of the development of the culture in the region: Nezwisko and Zalishchiky ('older ones') and Gorodets, Bilcha and Koshilovets ('younger ones'). These schemes were local and did not reflect the situation for the entire Tripolye.

In the first half of the 20th century, intensive investigations of Tripolye sites were organised in different areas and produced huge archives for typological studies at more regional levels. N. Makarenko studied sites Khallepie and Evminka, M. Rudinsky – Kadievtsy, V. Kozlovskaya – Veremye and Sushkovka, S. Gamchenko – Kolodyazhnoye, V. Bezvenglinskiy – Vladimirovka, Maidanetske and Talianki,

1 The number not surpassed so far by any researcher can be explained by the fact that very little time was allocated for excavating an object – up to two days.

M. Bolotenko – Usatovo, P. Kurinnoy – Tomashovka and Borisivka, E. Shtern – Petreni, N. Bilyashevsky – Borisivka.

Thus the considerable amount of material was accumulated and became available for working out the periodisation and chronology of Tripolye. Nevertheless, at this stage of research, typological ceramic characteristics were still interpreted as chronological sequences without using any arguments that could be obtained with scientific dating.

1.2 Passek's general periodisation of Tripolye

1.2.1 Passek's contribution

Generalisation and systematisation of accumulated material are associated with the name of Tatyana Passek (Passek 1935; 1940; 1949; 1961), who defined common characteristics for Tripolye sites and who constructed the still used typology of Tripolye ceramics and also worked out a periodisation of Tripolye sites. Her name is also associated with:

- the beginning of excavations of Tripolye houses not in tranches, but as a whole object
- the final interpretation of *ploshchadkas* as remains of dwellings with the first graphic reconstruction of them
- the proposing of a hypothesis on constructive firing of Tripolye *ploshchadkas*
- the beginning of experiments on burning reconstructed models of Tripolye houses
- the completion and publication of Kolomiyschina I (which was a wholly excavated settlement, with 39 houses investigated) excavation results
- the investigations in Vladimirovka, Floreshty, PolivanovYar, Soloncheny, Vykhvatintsy burial grounds.

Having analysed realistic anthropomorphic figurines, Passek interpreted the physical type of the population as Near Eastern (or 'Armenoid').

Passek created a general spatio-temporal model of Tripolye, which, in her opinion, had significant territorial and chronological distinctions between different groups of settlements. She based her model on considerable similarities of:

- ceramic designs
- system of economy
- mode of housebuilding.

Passek's main method of ceramic studies was typological analysis. Her classification of ceramics contained 21 types in accordance with the kind of ornamentation (Passek 1935, 141-155). She singled out stages of ceramic developments according to the established combination of types, taking into account local differences as well.

Her analysis was based on a consideration of three essential characteristics of ceramics: technological, morphological and stylistic aspects. She used them as **a set** of certain features (surface treatment and its ornamentation, the shape of the vessel, composition of the ceramic mixture, the degree of burning), but not as a **combination of them**. The defining characteristic was the decoration (cannelures, incised, painted, without ornamentation), which was often combined with technological aspects, and only after that were shapes taken into consideration.

Passek proposed a chronological division of Tripolye into three successive stages (Passek 1949, 6): early (A), middle (B) and late (C) Tripolye in the basins of the Dnieper (*Podneprovye*), the Southern Bug region (*Pobuzhye*) and the Dniester region

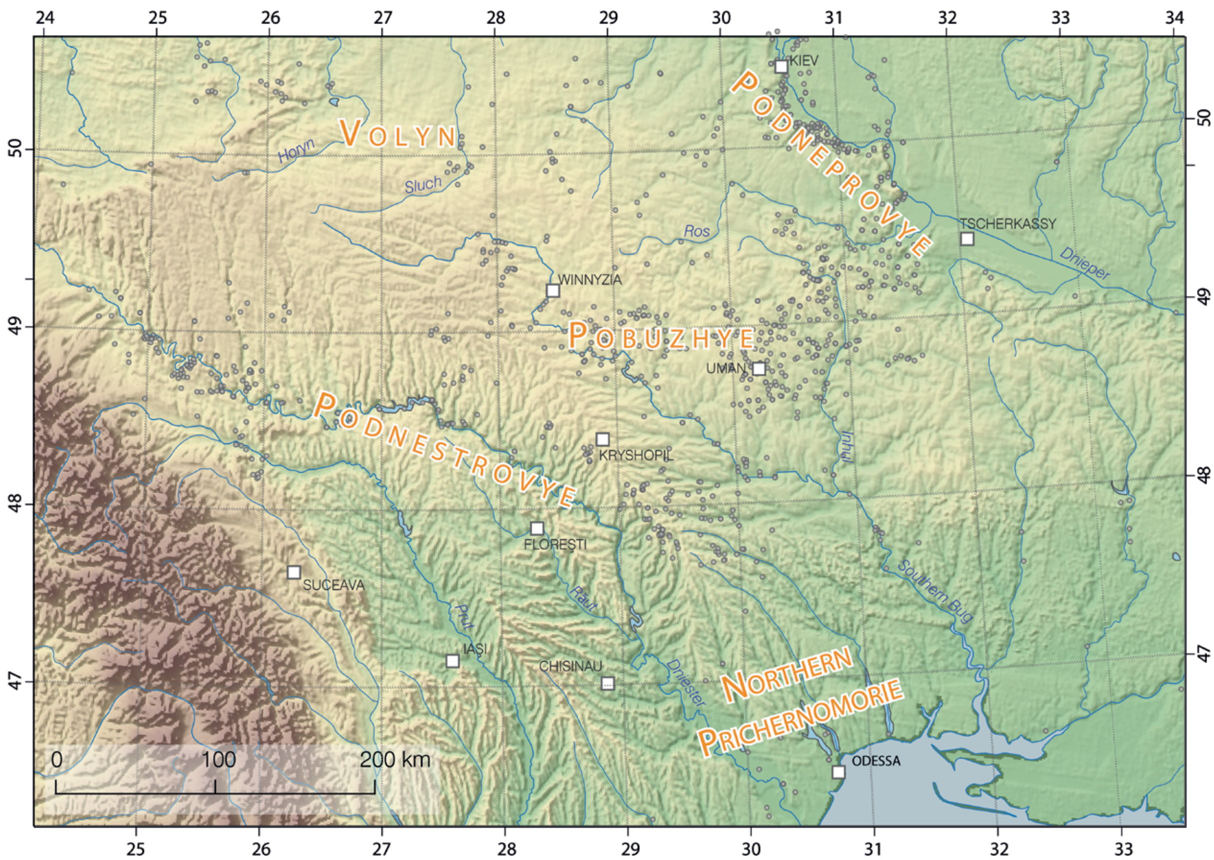

Figure 1. Tripolye regions by Passek (1949).

(*Podnestrovye*), and the northern Black Sea coastal zone (*Prichernomorye*), where at that time the only available information on late Tripolye sites existed (fig. 1). She introduced the letter γ instead of C to denominate the late stage in *Prichernomorye,* as there were important territorial distinctions in the region. Stages B and C (γ) were divided into two phases – I and II (see below). This scheme served as a basis for the construction of the periodisation of Tripolye sites.

Passek based her Tripolye model mainly on typological arguments. At that time of Passek's main activities, a stratigraphy neither existed nor was documented and nor were scientific dating methods known to prove a possible chronological development. Her main argument for the chronological interpretation of the Tripolye distribution area was typological sequence linkage to non-Tripolye typochronologies outside its area. And above all it was the linkage to Cucuteni phases through similarities in decoration and shape.

In contrast to Tripolye sites, where no stratigraphical features were observed, H. Schmidt (1932) was able to base his Cucuteni chronology on typology-independent arguments: the vertical stratigraphy at the key site of Cucuteni. He proposed to distinguish periods A and B on the basis of the materials of the site of Cucuteni, to which he later added a transitional period A-B. Shortly after that, Precucuteni culture was singled out during the excavations at Izvoarele (Matasa 1938).

V. Dumitrescu divided Cucuteni A into four stages and Cucuteni A-B and B into two and three stages respectively (1963; 1972). In contrast to Schmidt, these additional divisions of Cucuteni phases into stages were based only on typological observations without any arguments for a relative or absolute chronology.

The typological synchronisation of the relative chronology of Cucuteni (based partly on stratigraphical arguments) with Tripolye phases enabled Passek to create

Passek	Schmidt and Dumitrescu
Tripolye A	Precucuteni (1-3)
Tripolye B-I	Cucuteni A (1-4)
Tripolye B-II	Cucuteni A-B (1-2)
Tripolye C-I, γ- I	Cucuteni B (1-3)
Tripolye C-II, γ- II	Gorodishtya-Floresht

Table 1. Comparative chronology of Cucuteni and Tripolye.

a periodisation of Tripolye that obviously reflected the relative chronology of the general Tripolye ceramic development.[2]

As a result of her work in an attempt to synchronise Tripolye and Cucuteni sites, Passek created the correlation which is basically used up to today (tab. 1):

In principle, Passek's periodisation of Tripolye was accepted by the majority of typologists, as the model offered a significant sequence for the chronological interpretation of many differences within Tripolye pottery.[3] She herself was aware of the effort which researchers in future would have to put into applying new methods, which would be based not just on the typochronological methodology of the 19th century. In this respect, Passek was the first to deliver some samples of Tripolye features for radiocarbon dating. In 1962, she published a new chronological construction for the Neolithic and Eneolithic cultures on the south-western territory of the USSR and in the Danube region that was based on the radiocarbon dates of Cucuteni and contemporaneous sites in the Balkans (Passek 1964).

So, Passek constructed her periodisation (Passek 1949, 6), having integrated periods, stages and spatial divisions into one model. She used ceramic typology as the basic approach for the chronological differentiation and identified the Tripolye phases A-C. In doing so, she found it possible to associate contexts, for example houses, with these typological stages. Consequently, she became the first to manage to describe the Tripolye development for more than one category of social practice, for example for both ceramic development and architectural changes.

1.2.2 Tripolye ABC: Passek's general chronological scale

As Passek's categorisation of Tripolye stages is still valid, let's look at its general content.

Early Tripolye

Tripolye A

Spatial distribution: Middle Dniester – Podnestrovye and the Southern Bug – Pobuzhye (Savran, Borisivka, Krasnostavka, Luka-Vrublevetskaya) (Passek 1949, 28-41).

Main typological characteristics of ceramics:

1. Vessel shapes: rounded and pear-like, often on conical pedestals.
2. Decoration of the vessels from different sites had some similarities and was correlated with certain types of vessels: 'helmet-shaped' lids had polished (burnished) surfaces and an incised spiral ornamentation (sometimes filled with white paste), which

2 In addition to the Tripolye and Cucuteni sites, in the first half of the 20th century, a lot of effort was made to synchronise these cultures with contemporaneous Eneolithic sites in the Danube basin and the Balkans, as well as with the cultures of painted ceramics in the East. To construct her periodisation, Passek used, in addition to stratigraphic observations from multilayered Cucuteni sites (Izvoare, Cucuteni), their data and compared it with such sites as Turdaș, Boyan and Vinca (Passek 1949, 22-26).

3 However, not all researchers agreed with this synchronisation. Thus Dumitrescu believed that a number of Tripolye B-II sites were contemporaneous with Cucuteni B (1963, 15).

covered the entire surface of the lids; polished black and grey thin-walled vessels, decorated with cannelures and slightly stamped ornamentation along the ribs of the cannelures.
3. Manufacturing technology: high-quality well-polished pottery, and also rough kitchenware.
4. Other ceramic artefacts: monoculars, binoculars, much stylised anthropomorphic figures.

Other aspects: Architecture is represented by ground-level clay houses and a large number of pit dwellings (Passek 1949, 41). Tools are one-sided convex wedge-shaped axes, flint knives and scrapers.

Passek's typological similarities: Izvoare 1, Turdaș 1, Vinca 1, Boyan A.

Middle Tripolye

Tripolye B1

Spatial distribution: Middle Dniester – Podnestrovye and the Southern Bug – Pobuzhye (Kadievtsy, Kudrintsy, Fridrivtsy, Gorodnitsa, Nezwishka, Sabatinovka: Passek 1949, 42-54).

Main typological characteristics of ceramics:

1. Vessel shapes are mainly rounded and pear-like, sometimes on pedestals, with wide necks and rounded shoulders; a distinctive feature is roundness and slightly pronounced profile.
2. Decoration: a) incised with spiral ornamentation (on large and small vessels); b) cannelures with stamped ornamentation along their ribs (on small thin-walled vessels, represented only by fragments); c) roughly smoothed surface with finger pins, bumps or horizontal notches on corollas of kitchen pots; d) polychromic painting appears to cover the whole surface of medium-sized vessels; e) at Podnistrovye sites there are sporadic finds of monochrome black wares; most vessels are decorated in free ornamental style.
3. Technology: high-quality polished pottery and rough kitchenware.
4. Other ceramic artefacts: monoculars, binoculars and a large number of schematised anthropomorphic figurines in standing position with incised ornamentation, scoops, pintaderas and tokens (found in almost all the sites of the stage).

Other aspects: Architecture is represented mostly by ground-level clay houses; there are also pit dwellings. Typical tools: one-sided wedge-shaped axes, hoes of horn, triangular tips of flint arrows, hollowed bones (polishers). Copper artefacts are extremely rare.

Passek's typological similarities: Izvoare 2, Turdaș 3, Ariușd, Cucuteni A and Ruginoasa A.

Tripolye B2

During the period Tripolye B2 appear strong spatial distinctions; the distribution area extends to the Dnieper and south-east along the Bug and its tributaries, while life on the sites of the previous stages (A and B1) continues on the Dniester and the Middle Bug (Passek 1949, 54-108). All the variants of the culture are connected with each other and with previous stages, which indicates continuity in development.

Spatial distribution: Podneprovye, Pobubhye and Podnestrovye

Main typological characteristics of ceramics:

1. The shapes of vessels are represented by rounded pear-like profiles; however, new shapes with 'angular' shoulders appear.
2. Decoration: continuing development of incised ornamentation, polychrome ornamentation, the rapid development of black monochrome painting; cannelures disappear.
3. Technology: high-quality vessels made of well-pitted clay with smoothed surface, and kitchen pots with coarse admixtures in the clay, with striped smoothing.
4. Other ceramic artefacts: models of houses, binocular vessels and female figurines of different types continue to develop, but there are no more pintaderas.

Other aspects: Architecture is represented mostly by *ploshchadkas*; there are also pit dwellings. Tools: stone wedges, flint scrapers, knife-like blades, bone gimlets, triangular tips of flint arrows, hoes made from horn. Copper artefacts are extremely rare.

Spatial distribution of Tripolye B(2) typological elements:

In Podniprovye (Scherbanovka, Veremye, Tripolye, Kolomiyschina II) ceramics with incised ornamentation continue to develop:

- vessel shapes: pear- and crater-like vessels, jugs with a handle, bowls, and the like, 'conical' and 'helmet-shaped' lids
- decoration: a) incised ornamentation (however, the decoration is modified – the spirals are enclosed in wide belt stripes and are made with more – six to seven – lines); b) polychrome painting (but unlike the previous stage, the paint is applied in red with black outlines against white background, instead of black and white paint on red background during B1); c) the number of vessels decorated with black monochrome painting increases; d) the kitchenware is decorated with striped smoothing and relief decorations with embossed images of people and animals.

The material culture of Pobuzhye sites (Passek investigated only one – Vladimirovka) was very different from Podneprovye sites. In Vladimirovka, 18 houses in total were excavated (15 of the dwellings had been cut by a defensive German 500-m long ditch during World War II, were examined in 1946-47). It should be noted that the size of the settlement was unusually large (60-70 hectares), and its ceramic collection also had its own characteristics:

- The shapes are represented by pear-like and rounded vessels with a wide neck and finds of biconical forms.
- The decoration of the vessels constituted a) incised spiral ornamentation (mainly on pear-shaped vessels and 'helmet-shaped' lids), b) incised ornamentation covered with red, black and white paint, c) polychrome painting in red and black with outlines in white, d) large percentage of ceramics with black monochrome painting, e) kitchenware with surfaces smoothed in stripes.

Podnestrovye sites of this stage (Perteny, Shipenitsy) are mainly represented by vessels with monochrome black painting and kitchenware with striped smoothing, and there are also ceramics with polychrome decoration (black and red or white paint). Some vessels are decorated with images of animals or people (Passek 1949, 103-108). As for other clay artefacts, zoomorphic and anthropomorphic figurines, the shapes of which are similar to the ones of the subsequent stage, begin to appear.

Late Tripolye

Late Tripolye was divided into two stages and into two geographical regions: Podneprovye and Pobuzhye (C) and Podnestrovye, the southern part of Pobuzhye and Northern Prichernomorye (γ) (Passek 1949, 109).

At stage C (1) and γ (1), Passek saw significant changes in the assemblages, and the settlements become very diverse in different regions, but this stage is genetically related to the previous one. The shapes of ceramics change; instead of the rounded vessels of the previous periods, practically all of them become well profiled, with biconical outlines: craters with wide necks, biconical vessels, cups, goblets, and the like. The Tripolye collections show resemblance to the ones from site Cucuteni B and to numerous sites in the area Piatra Neamt.

Tripolye C (1)

Spatial distribution: *Pobuzhye* (Sushkovka, Tomashovka, Stara Buda, Popudnya, Kosenovka), *Podneprovye* – Middle Dnieper Basin (Kolomiyschina 1, Khalepye, Staiki, Veremye).

Main typological characteristics of ceramics:

1. Shapes are mainly biconical.
2. Decoration: vessels are decorated mainly with monochrome black paint, there is striped smoothing on kitchen pots, ornaments are enclosed in wide striped belts, and the vessels with incised ornamentation disappear in *Pobuzhye*; in *Podneprovye*, incised ornamentation (rounded shapes of vessels) continues to develop, along with black monochrome (biconical profiles) and kitchenware.
3. Technology: most vessels are of high quality with smoothed surfaces; fewer are rough kitchen pots.
4. Other ceramic artefacts include binoculars, standing anthropomorphic figurines, zoomorphic figures, and models of houses.

Tripolye γ (1)

Spatial distribution: Podnestrovye and southern Pobuzhye (Drabany, Kadievtsy, Velyka Muksha, Drakuzeny, Valeni, Kostisha)

Main typological characteristics of ceramics:

1. Shapes: biconical, rounded.
2. Decoration: mainly a) black monochrome ceramics, but there are also b) ceramics with incised ornamentation (?), and c) polychrome decoration (little and gradually disappears), and d) bichrome ornamentation, e) kitchenware with striped smoothing, and f) vessels with cord ornamentation appear.
3. Technology: vessels are of high quality with smoothed surfaces, rough kitchenware.
4. Other ceramic artefacts: standing schematised female figurines (with feet together or on a flat pedestal); zoomorphic figures are widespread as well.

Other aspects: Typical of all the zones of Tripolye of this period are ground-level clay houses. Tools include flat wedge-shaped axes, hoes made from horn, triangular tips of flint arrowheads, bone polishers. In Romania, the increasing number of copper artefacts is observed.

Passek's typological similarities: Cucuteni B.

During the stage of Final **Tripolye C (2)** and **γ (2),** the Tripolye distribution area spread to the region of *Northern Podneprovye*, to Volyn and to *Northern Pricherno-morye* (Northern Black Sea coast). Taking into consideration the peculiarities of the period, for which, apart from settlements, a significant number of cemeteries with burials is known, Passek also calls this stage 'gorodsko-usatovskiy' (Passek 1949, 158). Though the material culture changed, this stage is still typologically related to the previous ones and should be investigated within the Tripolye complex.

Tripolye C (2)

Spatial distribution: *Northern Podneprovye* and *Volyn* (Gorodsk, Kirilovskie Visoty, Raiki, Evminka, Lukashi, Bortnichi, Kolodyazhino: Passek 1949, 157-189)

Main typological characteristics of ceramics:

1. Shapes: a) bowls with straight or convex walls and rims that are cut inside; b) vessels with a wide neck, rounded shoulders and an elongated body (this shape resembles the crater vessels of earlier stages); c) vessels with a wide, high, elongated neck with bent outer edge and a rounded body (the shape developed from pear-like vessels). Technology: the ceramics are made of clay with a strong admixture of large grains of quartz sand or crushed shells and mica (sometimes with plant remains). The firing is uneven. Vessels are thick-walled, with a poorly smoothed rough surface, occasionally ornamented with small depressions along the corolla or shoulders or striped smoothing.
2. Shapes: a) bowls with conical, rounded or straight walls; b) vessels with a wide neck, bent outside edges, rounded shoulders. Technology: made of harder homogeneous clay with admixtures of quartz sand; firing is even. Incised ornamentation was applied only on the upper part (shoulders, corolla) with a fingernail, rope or edge of a flat instrument.
3. Cord ornamentation group, which is the most numerous. Shapes: a) conical and rounded bowls; b) vessels with a straight body and almost straight edges, with a slightly pronounced bottom. Technology: made of clay with a strong admixture of fine-grained sand; firing uneven. The ornamentation, impressed with obliquely twisted rope, rounded dimples (holes), oval grooves, moon-shaped impressions, was applied only on the upper part of the vessels, without making belts of stripes. On the vessels in (b), the ornamentation consists of horizontal stripes, moon-like impressions, a series of stripes forming a 'fir tree'. In general, these elements of ornamentation and the technique of their application are similar to the ones on the vessels of the Middle Dnieper distribution area.
4. The least numerous groups of painted monochrome vessels. Shapes: a) conical and rounded bowls; b) pear-like vessels with a low conical neck; c) low pots with a rounded body; d) vessels with a rounded body tapering downwards. The clay is dense, with fine sand admixtures. Decoration: black painting enclosed in a belt (sometimes the middle of the ornamentation is filled with red paint or an oblique grid of black strokes).

Other aspects: The architecture of houses is changing: *ploshchadkas* (with platforms) practically disappear and they are replaced by pit dwellings with clay fireplaces (Passek 1949, 158). At the same time, the existing *ploshchadkas* are represented by small disintegrated pieces or are made of only one thin layer. The role of animal husbandry and hunting is increasing. Flint tools are numerous and diverse; among them are axes (both flint and stone). The number of copper tools is increasing (including flat copper axes). Ceramics are changing as well: alongside vessels of Tripolye type (types 1-2 are declining and type 4 is represented as a remnant where the spiral pattern of the previous period completely disappears), and there are other ceramic types with cord-like ornamentation resembling Early Bronze Age ones that are typical of Middle Podneprovie. Another characteristic feature of Final Tripolye is that the surface of the vessels (with coarse admixtures) is not smoothed in stripes (kitchen pots).

Among other ceramic finds, there are neatly made clay spindles with rope and stamped ornamentation, typical of the entire Final Tripolye, and very schematised female statuettes.

Tripolye γ (2)

Spatial distribution: Lower Podnestrovie and Northern Prichernomorie (Kosilovtsi, Usatovo, Ternivka, Parkany: Passek 1949, 189-215)

Main typological characteristics of ceramics:

1. Large thick-walled vessels with poor ornamentation. Firing is slight and uneven, clay with admixtures of sand or crushed shells.
2. The vessels are of elongated crater shapes. Technology: made of a harder homogeneous clay with admixtures of quartz sand, firing is even, and the surface is well smoothed. A very characteristic feature in the ornamentation is a belt with hanging stretches of ribbons on the corolla.
3. Shapes: bowls are deep, with a slightly curved edge, convex walls, vessels with a wide neck and a rounded low body, spherical, strongly rounded amphorae, with four handles. Technologies: thin-walled vessels with a smoothed surface, uneven firing, dense clay mass with an admixture of fine-grained sand. Decoration: not of the Tripolye type, with stamped and cord ornamentation.
4. Deep bowls with convex walls, rounded pots with conical lids, pots with narrow necks and strongly rounded shoulders, biconical vessels. The clay is dense, with fine sand admixtures, even firing. Decoration: with paint (black ornamentation, the background is often filled with red paint) in the form of stripes; often the space is filled with a grid of fine strokes.

Other aspects: **Tripolye γ (2)** is typologically associated with the sites of Tripolye C (2), where similar processes of gradual transition to the Bronze Age can be observed. In the economy, animal breeding (sheep), fishing and hunting play a significant role.

The burial grounds of the Usatovo group are represented by both mound and flat types. In the latter, burial rituals and inventories (grave goods) are similar to those of the mound cemeteries, but are poorer. Prichernomorie barrows (Lower Podneprovie and Podnestrovie) show common features in funeral rites: bodies are placed in a flexed position, with a mound of earth over the graves and a stone dome-like tomb in the centre of the mound with a single or double cromlech or a surround of stones.

The ceramics both from the burials and from the settlements are of the same style. Vessels of one group are decorated with black and red painting, and those of the other with rope ornamentation. The prevailing shapes are rounded forms of small vessels, bowls and vessels with a conical lid.

Other widespread clay artefacts are spindles, female figurines (both of earlier types and of very schematised 'Usatovo type') and clay cube tokens.

Passek's typological similarities: post-Cucuteni B sites – the upper layer of Gumelnitsa B, Sultana and Căscioarele, Ariușd 2, Chernovody.

1.3 Typo-chronological alterations to Passek's periodisation

Passek's periodisation turned out to be practical and is still used. But as it was a purely typological model, further researchers proposed a number of typological arguments for some alterations in trying to make Passek's scheme more precise. Over time, the stage BI-BII was added to it (Vinogradova 1972; 1973); the symbol *C* came into use for the entire period of Late Tripolye (γ I and γ II went out of use).

Distinguishing the sites of Tripolye B from C, Passek (based on the data from the stratigraphy of sites Cucuteni A and B) used as one of the arguments the fact that she observed the spread of black monochrome ceramics and the dominance of sharply

Periods	Horizons	Ukraine, Moldova	Romania
		Linear Pottery Culture	
Early	1		Precucuteni 1
	2-3	Tripolye A1	Precucuteni 2
	4-6	Tripolye A2	Precucuteni 3
Middle	1	Tripolye B-I	Cucuteni A (1-2)
	2-3	Tripolye B-I	Cucuteni A (3)
	4	Tripolye B-I	Cucuteni A (4)
	5-7	Tripolye B-II	Cucuteni A-B (1-2)
Late	1-6	Tripolye C-I, γ-I	Cucuteni B (1-3)
	7-11	Tripolye C-II, γ-II	Gorodishtya-Floresht 1

Table 2. Chronological scheme after Chernysh 1982.

profiled shapes. Later V. Markevich added some more markers to these features while distinguishing Middle and Late Tripolye in Moldova:

- the spread of a number of other shape vessels
- in the decoration – the decline of spiral ornamentation
- the frequent use of symbols (sun, moon, plants, animals, etc.)
- the complete disappearance of incised decoration and binoculars
- prevalence of realistic clay objects
- certain peculiarities in housebuilding (Markevich 1981, 58).

T. Movsha proposed a more fractional division of the middle period of Tripolye, adding stage B3 (which was divided into three phases), which included settlements from both B2 and C1 (Movsha 1972, 16). This approach was developed by V. Zbenovich (1972; 1974) and V. Dergachev (1980), who proposed moving the sites from early stage C1 into stage B, indicating that C1 settlements have many more general characteristics in common with stage B2 than with stage C2. Although there is agreement with the above idea, most authors still use the traditional Passek scheme, without any fundamental changes.

In the second half of the 20th century, it became evident that different sites within each of the stages had a number of distinctions since Passek's scheme reflected only very general characteristics of longer periods; the Soviet researchers of the second half of the 20th century tried to detail this scheme using different methods.

1.3.1 Chronology and spatial diversity: Chernysh approach

In an attempt to create a general detailed chronology for the entire Tripolye, K. Chernysh (1982; 172-175) proposed dividing the Tripolye-Cucuteni cultural bloc into 24 horizons or levels (see the tab. 2) in nine key regions on the basis of a typological comparison of the ceramic collections that reflected, in her view, temporal and local characteristics.

In her scheme, she pointed out that the different local variants of the 'cultural community' may have had some specific features that could be traced with some degree of accuracy, but the existence of some of them needs additional argumentation. Chernysh also indicated that her levels reflected only an 'approximate' correlation of Tripolye and Cucuteni sites, since the degree of investigation of the sites and regions was different, and the gaps in the data could be readily seen. In addition, the stages (horizons) of the development of the communities were correlated with the development phases of Eneolithic cultures of Romania and Bulgaria. However, this scheme was quite complicated, and with the accumulation of new data it has not been used in practice in most regions of Tripolye distribution.

In general, the schemes of Chernysh and Passek are similar, with the difference that the horizons of Chernysh are much more detailed. Each horizon is represented by a number of sites from nine different regions (the division was based on the analysis of ceramic complexes). In fact, both schemes divide the history of Tripolye into a series of separate periods, which are compared for different regions. I. Palaguta called such schemes the 'stepped' ones (2016, 40). Their appearance might be connected with the desire to describe the general history of Tripolye and to correlate its development with neighbouring regions. And if, for Passek, this work is quite in the spirit of the time when similar schemes were developed for other regions of Europe, Chernysh's scheme can be explained by the desire to expand it by adding more details to the general line of Tripolye development (Chernysh 1981, 6) and certainly using the influence of her teacher Passek. In addition, Chernysh pays great attention to the consideration of the local features of Tripolye using the concept developed and applied since the mid 1960s.

1.4 From a monolithic Tripolye to a series of local-chronological groups

In search of an approach on how to classify the huge Tripolye phenomenon in time and space, Soviet scientists started to define local groups and types of sites. The main criteria used for this purpose were, first of all, ceramic styles along with other clay objects, housebuilding, layout of settlements, and other characteristics. The theoretical framework of this approach was outlined by Yuri Zakharuk (1964, 12-42).

1.4.1 Zakharuk's framework: ethnicity and material culture

Zakharuk's model was a logical outcome of the development of both Soviet prehistoric society studies and the Tripolye studies that should be taken into consideration:

- The materials accumulated during the excavations of Tripolye sites by the 1960s needed more detailed systematisation. The essential difference observed between the settlements of different regions (or even in one region) within one extensive period required the singling out of certain 'variants or parts' of the Tripolye 'culture'.
- For an analysis of Zakharuk's work, it is no less important to understand the general development direction of Soviet science. From the mid 1920s, the new tasks of *social-economic reconstruction* were put forward during archaeological researches. In such a way, Soviet archaeology seemed to counterpose the Russian one with its emphasis on studying, first of all, the material culture that later provided material sources for historical reconstructions.[4] At that time, a number of Moscow archaeologists constructed the base for a new 'updated' archaeology that should be an *independent* discipline (in contrast to a *source* one) – the history of material culture (Klein 2011, 11-13).[5] Some (Gukov, Badder, Vojcehovskiy) tried to reconstruct the ancient 'ethno-formation' (ethnogenesis) using archaeological data (applying historical information to interpret archaeological material, for example some chronicle records for excavated sites). Others tried to apply Marxist concepts to interpret ar-

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4 Although many pre-revolutionary archaeologists – Khvoiko was just one of them – tried to reconstruct the course of historical events.

5 As, according to the authors of that time, material remains provided more objective evidence of the past than ethnography or written sources, it became very important to study them. The main heroes in prehistory became not individuals, but groups of people and societies.

chaeological material (Arcihovsky).[6] At the same time, the theory of *socio-economic formations* (that is, the development of society vertically rather than horizontally) developed and became connected with *stadialism theory* (Marr), which laid the foundations of autochthonous hypotheses. One of the important points of *stadialism* was the emphasis on *historicism*, the desire to provide the stages with historical content and to come closer to understanding the causes and nature of the cultural changes in ancient societies. That meant the reconstructive side – or, as one would say today, narratives – was set as one of the most important research tasks.

- With that was observed a general tendency for the development of ideas of linkage of archaeological archives and 'ethnic' units. These ideas were spread at the end of the 19th and the first half of the 20th century both among the followers of Marx (Formozov, Bryusov, Childe, etc.) and nationalists (Virchow, Tishler, Cossina, etc.), although to achieve different goals. In the USSR, beginning in the late 1930s, the *cultural-historical approach* become dominant, when archaeological 'cultures' were identified with 'tribes' and even 'ethnoses' (Vasiliev 2008, 110-112). The analysed archaeological material had to be 'sociologised': it was to be given either 'ethnic' or 'stage' (stadial) attribution. In the process, the ideas of Marx, Engels and Morgan (or, to be more precise, the specific interpretation of their heritage) were taken as a basis for the new concepts and terminology.
- Another important factor that influenced Zakharuk was the rejection of the stadial theory (1950), which led to the fact that the development of prehistory was no longer studied within the 'big' periods; the researchers began to single out a huge number of '*notorious local cultures*' (Vasiliev 2008, 41).

Therefore, a need arose on the one hand to systematise the Tripolye material in a new way and on the other hand to try to provide it with some sociocultural elements of prehistory, for which a certain terminology was needed. This terminology was borrowed from ethnographers.

Zakharuk dealt with the questions of description and classification of archaeological remains as well as their interpretation. Similarly to the spirit of his time, he tried to reconstruct 'ethnic' units from archaeological archives. In principle, the construction of different spatial levels to unite sites that display similarities in material culture, architecture and economy with spatio-temporal groups was the core of Zakhurak's investigations.

Zakharuk studied the theoretical problems that dealt with an 'archaeological culture'[7] – the extent of reliability and adequacy of archaeological sources for the study of the problems of ethnic history, the criteria for identification of 'cultures', their classification and unification, and the way a 'culture' is related to an ethnic group. He argued that, having at hand archaeological sources, ethnic history can be studied with the use of two methods: 1) with the help of a specific or certain 'ethnic' marker, or 2) by studying the culture in a complex. Such markers as ceramics and their ornamentation, funeral traditions, architecture or layout of settlements (taken separately) can be attributed to 'ethnic' ones (Zakharuk 1964, 16, 17).

Considering such an approach (the first one) to be limited, Zakharuk introduces a new term: *archaeological complex of sites*, which consists of a) tools and weapons, b) ceramics, c) flora and fauna remains, d) decoration and ritual and art objects, e) architecture and layout of settlements, e) burial sites and rituals (1964, 20). According to him,

6 According to Marx (1955, 133), the development of society depends on the development of productive forces, in particular, tools. Therefore, with the support of archaeology, it was proposed to reconstruct the social and economic structures of society.

7 He used the traditional definition of archaeological culture of that time (e.g. Mongite 1955, 11) which is a 'conventional term used by archaeologists to refer to a complex of contemporaneous archaeological sites united by common territory and characterised by common features', i.e. pre-agreed and understandable only to those who agreed, valid only under certain conditions.

each of these groups has two sides: on the one hand, each object gives information about technology, manufacturing techniques, experience and traditions of the community, and on the other hand each object, depending on and due to its function, characterises different aspects of the economic activity, everyday life and ideology of the community.

Zakharuk realised that in material culture it is practically impossible to draw a line between technological (production) and 'ethnic' distinctions. For example, ceramics, because of their fragility, need to be constantly produced; their shapes and ornamentation are constantly changing, making ceramic a suitable material for building chronologies. In addition, ceramics reflect traditions of an 'ethnic' group, and therefore it was considered one of the most important sources for the identification of archaeological cultures and their local groups (variants). At the same time, ceramics taken separately cannot be a reliable source for studying ethnic issues. Comparing various sites within one archaeological culture that have some common features, he believed that it was possible to define types of sites or local groups (variations), with ceramics being one of the most special groups of artefacts.

Dividing a culture into separate groups made it possible to identify smaller communities, which in Zakharuk's general model were characterised by sharing a common territory and the same type of material culture.

1.4.2 Tripolye: Zakharuk's model

Zakharuk attributed Tripolye to one (separate) *ethno-cultural community*, and he considered (in principle 'believed') that local groups of sites represented '*local tribes*'. Zakharuk refers, among the Tripolye types of sites, to the Sophia type, Kolomiyschina I and Kolomiyschina II. According to him the prehistoric population of one settlement was *mono-ethnic* – characterised by one common culture and language. The groups of sites therefore represent separate groups of a *mono-ethnic population* (1964, 18). Zakharuk believed that the main theoretical task for ethnic reconstruction was to determine specific ethnographic features of territorial groups from contemporaneous sites, considering that they represented a certain tribal organisation of the population, where each settlement corresponded to a *tribal group*.

Local groups taken together, according to Zakharuk, demonstrate *intertribal organisation* and the structure of a bigger group of related 'tribes'. Then types of sites represent structural units of a culture, and therefore, in order to understand the latter, it is necessary to study all its types thoroughly. The main method used for this purpose is a typological one. If different types of sites on the same territory have a similar culture, they should also have 'genetic' links (Zakharuk 1952, 38). Having identified all the local groups and types of sites and their 'genetic' relationship, it would be possible to understand the structure of the culture. While types of sites represented certain territorial groups at a certain stage, then local groups demonstrated the stages in the development of these groups. Zakharuk constructed the structure of the Tripolye Culture as a diagram, defining the last one as a collection of territorially and chronologically related archaeological sites of a certain type that reflect their territorial distribution and stages of the historical development of groups of related tribes that in his view spoke the dialects of one common language. And still he considers Tripolye to be a culture and not a 'cultural area (zone)', indicating that it could have comprised several related tribes and that its types of sites were not an independent or isolated phenomenon, but were closely related to each other within the framework of one culture.

Seen from a recent perspective, the linkage of spatio-temporal units with 'ethnicity' is not expectable (Mosyn 2013; Yablonsky 2013; Shnirelmann 2013). First, ethnographical and ethnohistorical studies provide us with the notion that territorial units of similar material culture are historically only exceptions to the huge diverse expressions of 'ethnicity' in social practices. Second, in many archaeological 'cultures' spatio-statistical analyses of the distribution of artefact categories display mostly polythetic distribution patterns, which do not enable the identification of 'brick-like' units of material similarity. Third, in cultural anthropology the term 'ethnos' becomes more and more irrelevant (Tyshkov 2003; Sokolovsky 2013) and is no longer used.

Now, as well as in the last quarter of the 20th century, such an approach – when, having discarded (ignored) the initial conventionality of the term 'archaeological culture' has been associated with a certain human commonality (society) – not only drives archaeological science into a state of stagnation, but is also a rather dangerous tool, leading to different kinds of speculation. That is how the complexes (groups) of sites with similar material culture turned into mythical 'ethnoses' and peoples. And archaeologists, absolutising the meaning of the term and forgetting about its conventionality, began to use it with the concept '(ethnic) community'.

This example with the use of the term 'ethnos' as the same as 'tribe', 'union of tribes' and the like is rather revealing. As a result of the development of Soviet archaeology in the 1920s-1930s, there arose a need to assign 'sociological' or 'ethnic' labels to archaeological evidence, which was actively implemented, although there were active discussions on this issue with arguments in favour of both validity and inadequacy (deficiency) of such an approach. Since the late 1930s, discussions have subsided for a long time, and many researchers have automatically labelled archaeological material with previous historical interpretations that often had no relation to a real data background. From the 1950s, after the defeat of the *stadial* theory, which did not lead to a revival of discussions about reconstruction methods, prehistory and archaeology became increasingly empirical. Consequently, the archaeological material has been split up into a number of local cultures (variants) that, by force of habit, were associated with certain 'ethnoses'. It should be noted that, in contrast to Tripolye, Romanian researchers did not in practice divide Cucuteni into local chronological groups, although they noticed differences between contemporaneous groups of settlements (Mantu 1998).

It can be seen how over time, in the absence of active theoretical discussions, the conventional *terms* were turned into *concepts* and dominated archaeological literature. What could be observed was a kind of *absolutisation of the original meaning of the term*. As a result, the simple long-term use of old research works and terms led to a certain 'substitution of concepts', when *once a conventionally used term was replaced by a concept*. However, the substitution of concepts is a frequent occurrence, both in post-Soviet archaeology and in Tripolye studies.

In Tripolye there are a huge number of examples of substitution of a *conventional term* for its initial meaning (*concept*), and a *hypothesis* for the recognised and generally accepted *fact*: tokens, 'kitchen' and 'tableware' pottery, 'imports', two-storey dwellings, 'sanctuaries', 'proto-cities', and the like. After that, as a consequence, a number of doubtful theories have been built on the basis of this substitution.[8]

Despite some critical remarks that can be directed at Zakharuk's works today, his ideas are readily understandable in the zeitgeist of the sixties of the last century. His ideas triggered research into Tripolye to identify clear local and regional differences. Zakharuk laid the theoretical foundations of Tripolye research for many decades; the method he developed was efficient for substructuring Tripolye. However, over time, some authors stopped using his method of a full *complex of archaeological sites* for identifying types of sites, substituting it first of all with a ceramics complex.

8 As an example: during the excavations in Vladimirovka, Passek discovered clay installations of cruciform form in the houses and conventionally called them 'altars' by analogy with the altars of the Middle Minoan period in Crete (Passek 1949, 83). This term migrated into the descriptions of the Tripolye sites, where similar or round installations were found in main rooms of dwellings. Later, the conventionality of this term was ignored and it began to be used as a concept (meaning real altars). As a result, the presence of the 'seven altars' on the mega-structure in Nebelivka became one of the arguments for the interpretation of the remains as a 'temple' (Videiko and Burdo 2015, 25), which led the author to the conclusion that the 'temple' attested the existence of monumental architecture at Tripolye settlements (Videiko 2017, 120).

1.4.3 The development of the method of singling out local variants

In general, Tripolye sites became quite territorially diversified in the final stage (C2), and it was within this stage that researchers began to identify the types of sites – Sofiyivsky (Zakharuk 1952). Later four variants of the culture for the middle period B (Vinogradova 1972, 1973) and five local variants for the Late Tripolye (Dergachev 1978; 1980) were typologically singled out. At the same time, researchers worked on the problems of typological relationships of different cultural variants for the entire Tripolye, for example during the middle and late periods (Movsha 1972; 1984), or within one region (Kruts 1977).

Alongside her 'stepped' periodisation, Chernysh, relying on the typological analysis of ceramics, taking into account stratigraphic data and using the method of mapping the sites with similar characteristics, singled out a number of distinctive conventional spatio-typological groups from the Tripolye-Cucuteni sites:

- Carpathian and South Moldavian
- Prut-Dniester
- Dniester-Bug-Dnieper
- Bug-Dnieper
- Middle Dniester
- Upper Prut
- Upper Dniester
- Siret-Prut
- Dniester-Bug
- Volyn
- North Moldavian
- Prut-Dniester-Bug
- Middle Bug
- Prichernomorie (North Black Sea coast)
- Lower Danube (Chernysh 1981, 10).

Over time, the approach proposed by Zakharuk was adopted by other specialists, who began to actively identify the numerous Tripolye groups.

It should be mentioned that authors used various methods to single out local groups. These were mainly typological observations of ceramic assemblages. Over time, from the late 1970s, more and more *statistics* have been actively used in Soviet studies.

For example, it was the case in the so called "Kiev Center" of archaeological research (with which many names, mentioned in the second part of this part, are connected). This "school" is associated with the name of Vladimir Gening[9] who influenced *the methodological and theoretical shift in prehistoric studies*.

Trying to direct the research of young archaeologists into a new way, Gening worked on, among other things, the procedure of *formalised-statistical processing*, especially on the classification of such archaeological sources as ceramics and burial complexes. He comprehensively examines this source and methods of working with it in his monograph *Ancient Ceramics* (Gening 1992; 1983). It was under his influence

9 Gening, who is called the founder of the Kiev Center for Theoretical Archeology, worked at the Institute of Archaeology of the Academy of Sciences of USSR during 1974-1993 (Palienko 2016, 232). In 1978 he created the *Methodology and Theory of Archaeology Department* at the institute, which existed until the death of the researcher in 1993. The department was engaged in the formation of a unified database of funerary sites, methodological aspects of the analysis of archaeological sources, theoretical questions of archaeology, and many other issues. When developing research programs, the employees of the Institute of Cybernetics and some mathematicians were invited. The lectures and method seminars were organised at the Theory Department for everyone interested, during which discussions about methods and the subject of archaeology were held. Gening also initiated the translations of foreign publications for the library (Bunyatyan 1994; 1997; Palienko 2016, 232-242).

(as well as due to the regular method seminars started by him) that many archaeologists began to use statistics and other mathematical methods in their work. Tripolye specialists were no exception, which was reflected in the works of Kruts, Zbenovich, Tsvek, Korvin-Piotrovskiy, Gusev, Ryzhov, Tkachuk, and others.

At the same time,[10] in Chisinau, when working with ceramics of the Late Tripolye, Valentin Dergachev began to use the methods of mathematical statistics, he used metric indicators to compile typology, and, to avoid terminological confusion in the names of vessel shapes, he used the method of coding ceramics (Dergachev 1978, 31). Using the seriation method as a basis, he proposes to analyse ceramic complexes according to a stepwise scheme, where the highest link is the percentage of the mutual occurrence of morphological and stylistic signs of vessels (Dergachev 1980, 54-62). The typology of ceramics is determined by correlating all varieties of attributes. Later, Dergachev's method, in a somewhat revised form, was used by Sergei Ryzhov (Ryzhov 1999, 114; see part 2), and then by Eduard Ovchinnikov (2014, 141), and Vitaliy Rud (2018) to build periodisations in their working regions.

As a result of attempts at singling out local chronological groups, as well as the search for their typological relationships, some researchers even began to single out individual 'archaeological cultures' within the framework of Tripolye:

- Originally, Usatovo sites were considered to be a separate culture as a result of the works of Boltenko (1925; 1957). Later Passek and Ladinin attributed these sites to the late stage of Tripolye and, in general, this idea became dominant in the second half of the 20th century. Today, some researchers insist on the hypothesis that Usatovo represented a separate 'culture' (Petrenko 2003, 135-143), and others are strongly against it.
- T. G. Movsha (1984, 66), widely using the method of defining local groups, combined them (the groups) into a number of cultures for earlier periods – Petreni, Tomashovka, Zhvanets, and others. In the *Tomashovka culture*, she included the sites of Vladimirovka, Nebelivka and Tomashovka groups, which were later again divided by Ryzhov (1999, 5-7). Also, Movsha (1987, 9-10) proposed singling out a separate Kolomiyschina culture.
- N. Burdo (2012, 13) considers that only Brinzeny and Kosenovka local groups belong to Tripolye stage C2, while the rest (Sofievka and Usatovo) represent new post-Tripolye cultures.
- One of the most generally accepted points in Tripolye studies was the identification of the so-called 'Eastern Tripolye Culture'.

1.4.4 'Eastern' Tripolye

In the 1980s-1990s, Elena Tsvek distinguished 'Eastern Tripolye Culture' within Tripolye and proposed its periodisation (Tsvek 1980; 1985; 1999; 2006). Tsvek singled out four local variants within the Eastern Tripolye distribution: the Middle Bug, the South Bug, the Bug-Dnieper and the Dnieper.

Similarly to Tsvek, Tamara Movsha defended two lines of development: a 'Tripolye one', with ceramics with incised ornamentation and a 'Cucuteni one', with painted ceramics (Movsha 1984a, 66). In contrast, Natalia Burdo (2010, 50-51) criticises Tsvek's concept, indicating for example that Tsvek does not pay due attention to the Dnieper variant, in particular to the Kolomiyschina group, reducing by that the time of the existence of the 'Eastern Tripolye Culture'. The periodisation of 'Eastern Tripolye' fits into the general Tripolye periodisation (according to Burdo, a separate

10 In principle, the 'typology-statistical analysis' of Tripolye ceramics in the 1970s-1990s was 'in the spirit of the time'. A particular feature of a number of periodization schemes of those years (Popova 1972; Niţu 1980; Vinogradova 1972; Tsvek 1987) was that they were built on the basis of the percentage of groups of vessels that had been singled out taking into account the *decoration techniques* and various *'styles' of ornamentation*, without considering the vessel's morphology (Palaguta 2016, 58). Dergachev's approach undoubtedly stood out against this background.

Table 3. Summary of the reconstructed stages of the Eastern Tripolye Culture (according to Tsvek) synchronised with the development of the Dnieper and Bug local variants (according to Gusev, Movsha, Kruts).

	South Bug	Middle Bug	Bug-Dnieper	Dnieper
1 Stage BI, BI-BII	Sabatinovka1	Borisivka Bilikivskyy type	Zarubentsy Krasnostavka Onopriyivka	
2 Stage BI-BII		Klichev	Shkarovka Veseliy Kut	Cherbanovka Veremye
3 Stage BII		Voroshylovka type Nemyriv type	Miropolie Garbuzin	Kolomiyschina II
4 Stage CI, CII		Kurilovskyy type Gorodyshenska gr.		Kolomiyschina I Chapaevskiy type Lukashovskiy type Sofiyivsky type

culture must have its own periodisation). The label 'Eastern Tripolye' is not suitable, since the differentiation by cardinal directions is not quite appropriate as sites with ceramics decorated with incised decoration and with painted ornamentation are found both on the 'east' and on the 'west' of Tripolye territory.

Based on the assumption of the aforesaid, Burdo concluded 'the actual non-existence of Eastern Tripolye culture as a phenomenon' (Burdo 2010, 51). While carrying out a general analysis of Tripolye local groups, Burdo distinguish two related cultures: Tripolye-Precucuteni (with incised decoration) and Tripolye-Cucuteni (with painted decoration); that is, in fact, simply the replacement of the names of Tripolye 'cultures' (see also Burdo and Videiko 2012, 14-18).

According to E. Tsvek, Eastern Tripolye was originally formed and developed in the forest area of the Bug-Dnieper interfluve (basins of the Rivers Ros, Gorny and Gniloy Tikich and their tributaries). The culture is characterised by common features: the place of origin and ideological concepts, traditions in home economics and production (especially ceramics). The ceramic dishes were decorated with deep grooves, and there are practically no anthropomorphic plastics. Some common features can also be traced in housebuilding and settlement planning (Tsvek 2006, 5). Eastern Tripolye communities lived in large settlements (Vesely Kut, Onopriyivka, etc.). In addition, numerous leather, bone-cutting and flint workshops have been excavated.

In the Bug-Dnieper interfluve, Tsvek singled out a number of types of sites that successively developed one after another and suggested four stages in the development of the whole culture (Tsvek 2006, 59). Describing the development stages in the Dnieper, Middle Bug and South Bug local variations and their synchronisation, the researcher used the works of Zayets, Gusev, Kruts, and others (tab. 3).

The first stage is the formation of the 'culture', the gradual transformation of Precucuteni features. During this stage, according to Tsvek, three local variants developed – the Middle Bug, the South Bug and the Bug-Dnieper. These variants are represented by a number of types of settlements (or individual sites) that developed successively in time.

The earliest was the *Borisivka type*, which was formed under the influence of the cultures of the Carpathian Basin and is typologically connected directly with the

Phase	Local group (type, variant)	Region and sites	Features**	Sources
B-I	**Borisivka type** (according to Tsvek the first phase of Eastern Tripolye Culture)	***The Middle Southern Bug, River Sob, Upper Ros, Dniester*** (sites Borisivka, Pechera, Ladyzhyn, Ulanivka, Bubnova, Pliskiv-Chernyavka, Vila- Yaruzki, Ozaryntsi, Sokoltsi-Polig)	2) Ground-level clay houses 3) Pottery: kitchenware (pots), vessels without ornamentation, table vessels (bowls on pedestals, pear-shaped vessels and conical lids) decorated with an incised ornamentation, sometimes inlaid with white paste, painted decoration, cannelures (on cups) 4) A fragment of a model of a house? (Borisivka), binoculars, anthropomorphic plastic – fragments of large figures	Chernysh 1975; Burdo 2004d

Table 4. Borisivka type sites.
***The column 'Features' includes data on:*
1) site (size, layout, topography, ditches, etc.), 2) architecture (dwelling and auxiliary buildings, mega-structures, pits), 3) pottery (shapes, technology, decoration), 4) other special finds (binocular-shaped objects, sleigh and house models, figurines), 5) burials.

Dniester settlements like Luka Vrublevetskaya. For convenience, the characteristics of the types of sites and local groups are displayed in the tables 4-10.

According to Tsvek, at the beginning of the first stage, the settlements are small, with an area of 7-10 hectares; at the end (of the period) the area increases to 60 hectares. Buildings on the settlements are arranged in a circle. Ceramics are decorated mainly with incised decoration and cannelures. At this stage, the features typical of Precucuteni gradually disappear and the features characteristic of only these local groups appear (Tsvek 2012, 233; Gusev 1995, 252).

During the second stage, the area of settlements grows bigger again, there are outbuildings, and ritual and manufacturing structures are found in the settlements. The interior of houses changes: there are remains of dome stoves, couches and 'altars'. Sites of the Eastern Tripolye occupy the territory of the Middle Dnieper (Dnieper local variant).

The third stage is characterised by diminishment of the traditional Eastern Tripolye features. The settlements are still large, but in the ceramic collection the 'eastern' traditions are weakening. As a result of the Cucuteni 'tribes' advancement to the Southern Bug, Eastern Tripolye populations were colonised and after that assimilated.

During the fourth stage, the Eastern Tripolye 'population' settled on the Dnieper. Here settlements decrease in size, but the layout remains the same and the traditions of housebuilding continue to exist. In ceramics, all the basic shapes, patterns and elements of incised ornamentation are preserved.

Bug-Dnieper

The Bug-Dnieper local variant and its types of sites were singled out as a result of Tsvek's works (1980; 2006). In table 5 are their characteristics explained.

Middle Bug

In the 1990s, Zaets and Gusev conducted a study of Tripolye sites on the Southern Bug, as a result of which they proposed to differentiate Middle Bug local groups (first Zaets in 1987 'Northern Bug Group', and then Gusev 'South Bug' in 1995).

The distinctive feature of this group, according to Gusev, is the *syncretic* character of the material culture, which was the result of the amalgamation of 'local' (Eastern Tripolye) and 'newly-arrived' (Western Tripolye or Cucuteni) 'populations' (typological elements) with the gradual prevalence of the latter (Gusev 1995, 252). This local group is characterised by small settlements (5-30 hectares) with the location of houses either without clear planning or with a circular layout. Specific technological methods in ceramic production (adding a large amount of grus) were used, anthropomorphic figurines are stylised and some of them are big (up to 50 cm). Another characteristic feature of the group (and the most typical for

Phase	Local group (type, variant)	Sites	Features	Sources
B-I	**Zarubentsy** (shapes and ceramic decoration are similar to Precucuteni 3 and to Borisivka type)	Zarubentsy	3) Ceramics: with incised decoration (39.6% Precucuteni traditions, inlaid with white paste), cannelures with pits decoration (30% Precucuteni shapes, but local decoration), only cannelures (1.5%), kitchenware (20-25% of pots are similar to Cucuteni), painted (several fragments), without decoration (5-6%) 4) Binoculars, figurines (small sitting and fragments of standing bodies, all with incised ornamentation)	Tsvek 1989; 2006
	Krasnostavka (based on Zarubentsy, Precucuteni traditions weaker)	Krasnostavka, Greblya, Lisove, Tarashcha	1) Settlements on the low capes of swampy rivers 2) Adobe houses partially sunk into the ground; in the interior appear elevations and fireplaces 3) Ceramics with incised ornamentation, cannelure-dotted decoration (8%), Precucuteni shape, but local decoration, only cannulures (11.7%), ornamentation with dimples (11.7%), kitchenware (15%) with painting (1.5% 'imports'), without ornamentation (21.5%). Increase in the size of the vessels, the shape of the corolla and the assortment of vessels are changing (***e.g.*** the crater-like shape, 'grain' vessels and jugs appear) 4) Binoculars; flat cross-shaped figurines appear	Tsveck 1989; 2006
B-I B-II	**Onopriyivka**	Onopriyivka, Chizhivka (?)	1) Settlements on upper coastal terraces on edges of plateaux, significant increase in area of settlements, circular layout 2) Dwellings become bigger and more complicated in design and interior 3) Development of all forms of ceramics with incised ornamentation	Tsvek 1989; 2006
	Shkarovka	Shkarovka, Zyubriha, Lishchinovka, Mykolayivka, Shukayvoda	1) Settlements on lower terraces near riverbanks or on floodplains, on small capes surrounded by swampy lowlands 2) Clay, surface, multi-chamber (rectangular and r-shaped) dwellings 3) Characteristic feature of this type: vessels with black glossy surface. The rest of the pottery: with incised decoration (33-35%), cannelures, kitchenware, painted (1.8%), without decoration (26.8%) 4) Binoculars are widely represented; there are monoculars, practically no figurines, one cross-shaped amulet	Tsvek 1989; 2006
	Vesely Kut	Vesely Kut, Botvinovka, Bugachevka, Olhovets 2, Deshki, Kharkivka, Kopiyuvata	1) Large settlements on high, flat capes with a complex layout 2) Surface two-chamber adobe dwellings, with interior similar to the previous period, outbuildings 3) Ceramics: with incised decoration (47% sometimes inlaid with white paste), cannelures (20%), kitchenware, painted (much larger number, monochrome and bichrome ornamentation), without decoration (31-35%), 'grain vessels' up to 1 m high 4) Fewer binoculars, several fragments of figurines found, a lot of zoomorphic plastics	Tsvek 1989; 2006
B-II	**Miropolie**	Miropolie, Bachkurino, Vladislavchik?	1) Topography and layout of large settlements are similar to previous period 2) Dwellings and outbuildings, ***ploshchadkas*** disappear, instead of them a thin layer of clay floor 3) Ceramics: with incised decoration (43% but the ornamentation is applied carelessly, rarely inlaid with white paste), cannelures (3%), kitchenware, painted (8.5-10%, monochrome ornamentation), without decoration (a lot), first finds of vessels with legs 4) Large binoculars and tokens	Tsvek 1989; 2006
	Garbuzin	Garbuzin, Khristinovka, Semenovka	1) The topography and circular layout of large settlements are similar to previous periods 2) Surface-type houses with basements 3) Ceramics: with incised decoration (11-12%), kitchenware (the assortment of shapes increases), painted (60-63%, monochrome ornamentation), no decoration (small number), grain vessels decrease in number	Tsvek 1989; 2006

Table 5. Settlement types of the Bug-Dnieper group. See caption of Table 4 for explanation of categories used in 'Features' column.

all sites of the group) is the coexistence of pit structures next to the ground-level clay houses (Gusev 1995, 32, 37).

One more stable local tradition observed by Gusev was adding grus (coarse-grained particles of sand and gravel) to the ceramic mass, since painting ornaments on a rough surface is very impractical, but on some sites (with painted ceramics) this (Eastern Tripolye) tradition still exists (Gusev 1995, 250-251).

This group is distributed in the middle Southern Bug area and is represented by about 30 sites, which date from phase BI-BII until the end of CI. Within the group, there are a number of successive types (tab. 6).

Gusev associates the distribution of ceramic types and specific elements (*e.g.* figurines, technologies) with the distribution of distinct people/populations. Consequently, his ceramic distributions reflect in his view mobility and migration of people. He determines 'at least three waves of migration' (Gusev 1995, 239) from

Phase	Local group (type, variant)	Sites	Features	Sources
B-I B-II	**Bilykivtsi type** Formation is not clear, has Zalishchyky and Borisivka components	Bilykivtsi, Bilozirka, Vishenka I, Vishenka II, Gorodishche I, Zaluzhne, Tsvizhyn	1) Settlement layout is not clear 2) Coexistence of dwellings of surface type with clay-coated walls 3) Convex-walled squat vessels, the clay with chamotte, grus or sand admixtures, decoration incised (prevailing, 26%), monochrome ornamentation, sometimes bordered by white paint (18.5%), sometimes dishes decorated with cannelures 4) Binoculars	Gusev 1995; Gusev 2004
	Klischev type Merging of Eastern Tripolye 'population' with 'migrants' from the west (Soloncheny and Zalishchyky groups)	Klischev, Kosanove	Group derives mainly from one site, first 'Western Tripolye' site in the region (Ryzhov) 3) Mix of new traditions (painted ceramics) and local elements (technologies)	Ryzhov 2007; Gusev 1995
B-II	**Voroshylivka type** Formation: influence of western (Cucuteni) regions from Upper Podnistrovie (sites Rakovets, Bodaki, etc.) into Middle Pobuzhzhya. Some ceramic features resemble local Bilykivsky type	Voroshyliv-ka, Sosny, Selyshche	1) Small settlements: 2-8 ha, without a clear layout, sometimes with a 'nest' system 2) Surface-type and incised structures, sometimes dug-outs dominate (Sosny). No oven found (?) 3) 'Convex-walled' vessels that tend to biconical shape, more ribbed; tableware made of clay with admixtures of sand, chamotte, sometimes grus, high-quality firing, 0.5-3% ceramics with incised ornamentation, painted ceramics – black monochrome ($^{2}/3$ of them have decorations); kitchenware was made of clay, chamotte, grus, mica, herbal admixtures; decoration: 'pearls', scythe, scallop stamps, protrusions in the form of handles or animals 4) Clay house model (Voroshilovka)	Gusev 1995; Gusev 2004
	Nemyriv type Formation: under influence of Petreni group	Nemyriv, Carolina, Verbivka 2, Kryshtopivka	1) Settlements increase in size 2) Surface-type dwellings dominate 3) Pottery of biconical shapes, monochrome black-painted tableware, ornamentation schemes: decay of the S-shaped loop, the formation of tangent compositions, as well as 'front' ornamentation; kitchenware: decorated mainly with oblique and oval grooves, notches around the edge of corolla, protrusions in the form of a double hump	Gusev 1995
C-I	**Kurilovka type** Background: Voroshylovka type	Kurilovka, Kozhukhov, Lysohirka	1) Concentric circles in layout of settlements with areas of 8-30 ha 2) Surface-type adobe dwellings 3) Sharply profiled pottery with monochrome black painting, ornamentation on the upper part of the vessel, complete disintegration of the S-shaped loop, the formation of tangent compositions, as well as 'owl face' ornamentation, kitchenware of poorer quality, fewer in number 4) Anthropomorphic figurines are large (up to 50 cm), binoculars	Gusev 1995; Gusev 2004
	Gorodishche type The type is substituted by the sites Trokiv, Nemyriv-Mohylki, Rakhny, but this is the end of this line of development	Gorodishche 2	1) Settlements built up in a circle; areas increase 2) Surface-type adobe dwellings 3) Sharply profiled bowls with monochrome black painting, ornamentation in the upper part of the vessel, complete disintegration of the S-shaped loop, the formation of tangent compositions, as well as 'owl face' ornamentation; kitchenware of poorer quality is much lower in number 4) Binoculars decrease in number	Gusev 1995

Table 6. Settlement types of the Middle Bug local group. See caption of Table 4 for explanation of categories used in 'Features' column.

the western cultural areas to the Middle Bug: 1) early Tripolye, 2) the migration in the period BI-BII, when the population with painted ceramics arrived here, the most clearly traced at such sites as Klishchev type, and 3) movements of population with black monochrome ceramics during period BII. While in his view the 'migrants' from the first two waves were from the area of the Middle Dniester, the latter ones were from the Upper Dniester. The 'newly arrived' people joined the local one, and this created a sort of syncretism in this territory, where Eastern and Western Tripolye features coexisted and developed together.

It should be mentioned that the ratio of incised and painted ornamentation is regarded by some authors as a periodisation marker. However, if for the Dniester sites this indicates chronological changes, for the Bug-Dnieper interfluves it reflects 'ethnic' (after Gusev) rather than chronological ones, and then for the Middle Bug this marker can be both chronological and ethnic (Gusev 1995, 246). Gusev tried to understand the development of the latter region and the local types of sites: whether they reflect local features or chronological development. For this purpose, he analysed the ceramic collections of the sites, defining several ceramic characteristics that were different and typical either of 'Eastern' or 'Western' Tripolye zones (Gusev 1995, 247; tab. 7).

Features	Western Zone	Eastern Zone
1) Ceramic clay composition	Well clay, sand, chamotte; smooth surface	Kaolinised clay, sand, chamotte, grus (particles of sand and gravel); rough surface
2) Engobe	Pink, orange, close to red, bright colours, slight contrast with the colour of the ceramic paste	Colours 'mustard', pale orange; dim shades contrast sharply with the whitish ceramic paste
3) Technique of making incised ornamentation	Wide shallow groove, round in section	Narrow shallow groove with rectangular profile

Table 7. Differences between Western and Eastern Tripolye ceramic collections after Gusev 1995.

Using these markers, he analysed sites of the Middle Bug local group and concluded that some of the sites represent the western zone (Voroshilovka, Sosni, Kurilovka and Lisagorka), some eastern ones (Bilikovtsy, Verbovka 2), while the others (Belozyorka, Zvizhin, Verbovka1, Selishche, Nemyriv, Karolina, Gorodische 2) have syncretic features, that is, are typical of both traditions. In addition, using these markers, he again tried to reconstruct the internal movement of the population.[11]

As a result of the interpretation, Gusev concluded that the Middle Bug region was a kind of 'contact zone' between the two main variants of Tripolye and that the inter-pervasion of different traditions there was quite deep and took a fairly concentrated form.

In addition, the region has its own specific features: large anthropomorphic figurines on a cylindrical pedestal (Voroshilovka, Nemyriv, Vyshenka 2),[12] specific zoomorphic clay objects (stylised with flattened sides), flint technology – long streaming retouching, which is based on the classical blade industry, housebuilding and ceramic production (see above).

Dnieper

One of the more intensively investigated regions of Tripolye distribution (perhaps due to the long history of studying and/or proximity to Kiev) is the Podneprovie (or the **Dnieper**) one. Types of sites that were singled out in this region are known for almost complete dominance of the 'Eastern Tripolye' typological elements and for several burial grounds at a late stage (C2).

The first studies of the region are connected with the names of Khvoyka, Passek and Magura. As a result, the Kolomiyschina group of sites with ceramics mostly decorated with incised ornamentation was singled out. Later, Y. Zakharuk singled out the Sophievka type of site,[13] which he typologically linked with the sites of the Kolomiyschina type and also with the influence of local cultures on it (Zakharuk 1953). Sites between Kolomiyschina II and Sofiyivka types were studied in detail by V. Kruts, who singled out Chapaevsky and Lukashevsky types.

This 'line of development' is interpreted by researchers as the Eastern Tripolye: its characteristic could be seen up to the Final Tripolye (Movsha 1984a; Tsvek 1999; etc.); painted ceramics can be interpreted as 'imports'. At its later stage, Podneprovie was one of the most remote among other Tripolye regions and during that period one can see the rapid mixing of the Tripolye elements with other ceramic types in the assemblages, as well as the decrease in Tripolye types and the increase in new typological elements (tab. 8).

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11 Today it is becoming obvious that the research paradigm of 'different (ceramic) types = different populations and similar (ceramic) types = similar populations' hindered to some extent detailed and analytical investigations. The distribution of ceramic types as it is seen today has to be considered something that it actually was, the distribution of ceramics, not the distribution of people. Even the construction of two 'traditions' in two spatially separated areas seems to be problematic, as the overlapping zone in the middle does not allow the possibility without further arguments covering traditions.

12 Similar figurines were characteristic of Precucuteni.

13 Those are known first of all through the Sophievka-type burial grounds with cremations (Zakharuk 1952; Danilenko and Makarevich 1956; Kanivets 1956; Kruts 1968).

Phase	Local group (type, variant)	Region and sites	Features	Sources
B-II	**Kolomiyschina group** (until C-I), 2 types identified: Kolomiyschina II (B-II) and Kolomiyschina I (C-I), formed on basis of Scherbanivka-type sites under influence of Lyubets-Volyn painted pottery	*Middle Dnieper* (about 30 sites: Kolomiyschina I, Kolomiyschina II, Hrebeni, Balyko-Schuchynka, Yushky, Stayky, Zhukivtsi, Veremye)	1) Small settlements (40-60 houses) built in a circle 2) Surface-type dwellings 3) 3 ceramic types: with incised ornamentation; without ornamentation; a few are painted monochrome vessels 4) Clay models of buildings. Zoomorphic plastic is not typical	Passek 1949; Movsha 1985; Videiko 2004e
	Rzhishchev type (Grigoryevka) Ryzhov: migration of part of Western Tripolye population into the territory of Eastern Tripolye	*Middle Dnieper* (sites Rzhishchev, Ripnytsya I)	3) Main characteristic: the dominance of vessels with painted ornamentation, some % of pots without ornamentation	Ryzhov 2007
C-I	**Kolomiyschina I,** continuation of Kolomiyschina 2-type sites, influenced formation of Chapayevka-type sites	*Middle Dnieper* (Kolomiyschina I, Popova Levada)	3) Brown or black vessels with incised ornamentation, with smoothed surface without ornamentation or with thin scratched lines, an increase in the percentage of kitchenware, a small number with monochrome black painting	Movsha 1985; Videiko 2004e
	Chapayevka type, Origin: Kolomiyschina 1 and local Neolithic population	*Middle Dnieper* (sites: Chapaivka, Kazarovychi, Novy Bezradichi, Korchuvate, Kopiriv Konets)	1) High loess terraces 2) Dug-out or surface-type post dwellings 3) Tableware: without decoration or with incised simplified ornamentation (50-70%) painted ware, very few (up to 10% - 'imports'), kitchen ware 5) Chapayevka cemetery: supine (on the back) burials with W and NW orientation	Kruts 1977; Kruts, S. 1990
C-I C-II	**Lukashi type** Continue Kolomiyschina type line of development, substituted by Sophievka type	***Right and left Middle Dnieper banks*** (Kiev and Chernihov regions) about 14 settlements, also on the left bank -Kazarovichi, Lukashi, Yevminka I, Yevminka II (transition between Lukashy and Sofievka types), Lviv square in Kiev, Demidov, Protsiv)	1) Settlements on the high loess terraces (right Dnieper bank) and low floodplain terraces (left bank); layout: oval or circular 2) ***Ploshchadkas*** (surface-type), in the north dug-out. 3) Tableware with polished surface that can have incised decoration (46-78%), with painted decoration (4-22%), kitchenware (13-26%) 4) Anthropomorphic plastic (very few)	Kruts 1977; Movsha 1972; Dergachev 1980
C-II	**Sophievka type** Replaced by Bronze Age sites without any Tripolyen features	*Middle Dnieper* (about 25 sites: Kazarovichi, Bortnichi, Sirets I, Kirilovsky heights, New Bezradychi, Novy Petrovtsi, Puhovka, Vovcha gora, Domantove; 4 burial grounds: Sofiyivka, Zavalsky, Chervony-Khutir, Cherninsky)	1) Small settlements sometimes fortified (Kazarovichi) in two parts: with and without fortifications 2) Dug-out dwelling (Kazovichi, Bortnichi, Kirilovsky heights) 3) Mostly 'kitchenware' (sophievka type); there is also tableware; special funeral vessels (with a burning impurity and ochre). Decoration: protrusions, scrapes, finger impressions and corded decoration 4) There are a large number of copper items and very few anthropomorphic schematic plastics in the graves 5) Cremation (outside the settlements, urn and without urns, in pits): burials arranged in groups	Zakharuk 1952; Kruts 1977; Dergachev 1980

Table 8. Local groups and settlement types of the Dnieper variant of the Eastern Tripolye Culture (Dnieper line) See caption of Table 4 for explanation of categories used in 'Features' column.

1.4.5 'Western' Tripolye

'Western Tripolye' was constructed by different archaeologists in a similar manner as ceramics were not used for defining ceramic styles but, without further scientific arguments, used as indicators of 'populations'.

In contrast to Tsvek's 'Eastern Tripolye Culture', S. Ryzhov proposed to distinguish 'Western Tripolye Culture' (2007, 448-476). He attributes to the latter of the sites with painted ceramics that appear in the territory of modern Ukraine during period B1 as a result of 'several waves of movement of communities with painted ceramics, partially pushing out, partially assimilating the Eastern Tripolye population ... moving away from the homelands, the newcomers with time acquired quite characteristic features in economics and everyday life, which differed both from Eastern Tripolye and from Cucuteni. This refers to the topography and layout of settlements, the architecture, the ceramic collection, including figurines, and in general in mutual influences, ways of evolution, historical destiny' (Ryzhov 2007; 448). Although Ryzhov also uses, along with ceramics, comparisons with other aspects of material culture, pottery is still his main criterion in the allocation and description of local groups and types of sites, and he tries to trace their evolution on this basis. He distinguishes about five large 'migration waves' from west to east and a lot of micro-movements.

In general, the idea of distinguishing the 'Western Tripolye' Culture, but in a somewhat different form, was put forward by T. Movsha (1984a, 60-83). She believed that Tripolye sites and burial grounds could be systemised on the basis of similarities of ceramic shape and ornaments and clay objects making up just *a few* local groups, beginning with periods BI-BII and ending with Final Tripolye (C2). This would allow the tracing of the history of the Tripolye-Cucuteni complex. For the middle and the beginning of the late periods (C1), Movsha singles out five local groups of sites: *Petreni*, *Koshilovtsy* and *Tomashovka* (related to Petreni), *Zhvanets* (with different 'genetics'), and in the region with incised ornamentation, *Penezhkov*[14]*-Shcherbanevska*. Four more local groups were singled out from the final stage (C2): Sofievka, Vykhvatinsy, Grodsko-Kasperovska and Usatovo.[15]

She also argued that several cultures could be clearly traced from the beginning of the Middle Tripolye: 1) Zhvanets in the zone of painted ceramics, 2) the culture made up of two local groups (parts) – Petreni and Tomashovka, and 3) Penezhkov-Scherbanevska in the zone with incised ornamentation (Movsha 1984a, 66). Describing Petreni-Tomashovka culture, Movsha included a number of sites (among them from the Cucuteni area) and divided the development into seven phases, assuming that part of the Petreni 'population' could have taken part in the formation of both the Koshilovka and Tomashovka groups.

Movsha identified the *Tomashovka local group* on the basis of ceramic collections (dishes and anthropomorphic plastics) and included in it some sites with painted ceramics from Vladimirovka to Tomashevka (and two earlier sites – BI-BII – Konetspole and Garbuzin).

Thus, Movsha put together a number of sites that had been identified earlier as different types into several local groups (or one culture). In general, her Petreni-Tomashovka culture coincides with the 'classical' 'Western Tripolye Culture', which had been singled out (first by Movsha and later by Ryzhov) on the basis of Zalishchentsi and Soloncheny types.

The Zhvanets group[16] (culture), which is located on the Middle Dniester and Prut, also included the Kosenovka group, situated far away on the Bug-Dnieper interfluve. This was a line of development somewhat different from the Petreni-Tomashovka. The differences can be traced:

- in the technologies of housebuilding (the floor was made of thin tiles without vegetable admixture that had been moulded and baked in advance and set in mortar)
- in ceramics (which were made of fine-grained clay, the surface was covered with colourful coating, the shapes were specific – vessels with a rounded body and high truncated-conical neck, with specific decoration).

The Zhvanets group, according to Movsha, was typologically related to the Gorodsko-Kasperovka, Vykhvatintsi and Usatovo groups. It was another branch of the culture with painted ceramics, typologically different from 'Petreni-Tomashevka'. In general, this concept is repeated in Ryzhov's works.

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14 Village together with Tripolye site Penezhkovo was renamed Bugachivka.

15 By the 1950s, as a result of Passek's, Lagodovskoy's and Zakharuk's studies, six local variants for Final Tripolye (C2) were identified: Sophievka, Usatovo, Grodzka-Volyn, Upper Dniester, Middle Dniester and South Bug. In the 1970s, Middle Dniester sites were renamed and called the Vyhvatinsky type of sites (Movsha 1971), and the Upper Dniester and the Southern Bug were put together into one group, the Kasperovska (Zakharuk 1971). Then they added to this group the sites of Volyn (Grodzka-Kasperovska group), but soon it was divided into separate variants: Kasperovka (later renamed Gordineshti) and Grodzka-Volyn, which was also divided into a number of types.

16 The group was singled out by Movsha, who first called it 'Zhvanets' (1971), and later by Dergachev under the name 'Brynzeny'.

Phase	Local group (type, variant)	Region and sites	Features	Sources
B-I *B-II*	**Zalishchenska group** Influence on formation of Klishchev-type sites	*Middle Dniester* (25 sites: Babin (Yama), Bilche Sad, Vasylkivtsi, Vyhnanka, Gorodnitsa on the Dniester, Gorodnitsa on the Zbruch, Shypyntsi A, Zalishchyky, Strilkivtsi, Fylpkivtsi, Shytkivtsi, Buchach, Bilche-Zlote, Mahala, Polivanov Yar II, Krutoborodyntsi I, Blyschanka II, Bilschivtsi II)	2) Ground-level clay houses. 3) Painted tableware (bichrome or monochrome painting in red and black on white background - up to 97%), with incised decoration (filled with white paste - 0,4 %), kitchenware with shell temper (2,6 %). 4) Binoculars, anthropomorphic figurines are rare	Kandiba 1937; Vinogradova 1972; Chernysh 1982
	Soloncheny variant, influence on formation of Racovets group of sites	*North-east Moldova + adjacent parts of Ukraine* (about 17 sites: Soloncheny II, Polivanov Yar, Perlicany)	1) Site size: up to 10 ha 3) Vessels with polychrome, bichrome or mono-chrome ornamentation (74-85%), cannelures (4%) 4) Binoculars and monoculars	Vinogradova 1972; Passek 1961; Burdo 2004e
	Klishchev type of sites		***See above – Middle Bug local group.***	
B-II	**Rakovets group** 2 phases: Rakovets and Mereshovka-Chetezuye 3 (a separate group after Tkachuk) In the early phase, they moved eastward: the assimilation of Eastern Tripolye people in Pobuzhye; the formation of Voroshilovka and Nemyriv types (Ryzhov); and on the Dniester, the basis for the formation of the Petreni group	*Podnestrovye* and *Pobuzhye* (about 15 sites) Rakovets, Trostyanchik, Busha, Uhozhany, Nemyrivske? Floresti 5, Mikhailovka 4, Stanislavka; Merezhovka phase: Mereshovka-Chetezuye 3, Brynzeny 8, Bilche-Zlote Park 2, Cucuteni- Chetezuye, Berezova, locality Bereg	3) Monochrome painted ceramics dominating, less often a bichrome pattern (phase 1), some tableware still has incised ornamentation, sometimes in combination with painting. 4) Binoculars	Ryzhov 2007; Tkachuk 2005
	Petreni group (+ C-I) Formed on the basis of late phase of Rakovets group (Ryzhov, Tkachuk) Influence on Chichelnik, Nebelivka, Tomashovka, and Koshilovets groups and on the Nemyriv type. Three phases	***Middle Podnestrovye and Bug-Dniester interfluve*** (about 50 sites: Petreni, Konovka, Khodaky, Stina 4, Yaltushkiv, Glavan-1, Bernashivka 2, Lipchani, locality Sad)	1) Different size of settlements: from 3-10 ha up to 30 ha (overall increase in size) 2) Adobe houses. 3) Painted decoration dominates, black paint, some-times with red, rarely with white paint. Characteristic feature: rounded shapes; in the middle phase: more sharp ribs, distribution of images of animals 4) Clay model of building from Konovka, binoculars	Movsha 1984b; Markevich 1981; Ryzhov 2007
	Shipintsi group (+ C1) Formed on the basis of of Nezvisko 3 Later becomes part of Koshilovtsy group (Ryzhov), with partially gradual development in Brynzeny group. 3 phases	*Upper and Middle Podnestrovye* About 20 sites: Shipintsi, Bielche-Zlote, Bielche-Sad 2, Verteba, Bilshchivtsi III, Nezvisko 3, Bodaki (by Tkachuk)	3) Painted ceramics, polychrome (white, dark brown and red - 3,3%), bichrome (black and red - 37%, black and white - 10%), black monochrome (50% of painted ornamentation). Shapes of the vessels: smooth profile, low shoulder (phase 1), sharply profiled (phase 2), in the late phase: reduction of shape and ornamental pattern varieties 4) Binoculars, sometimes without holes	Kandiba 1937; Chernysh 1982; Ryzhov 2007
	Vladimirovka group Origins: eastward migration of population with painted ceramics (according to Ryzhov it was Rakovets + Klishchev + Voroshilovka or, according to Movsha, from Petreni group). Replaced by the Nebelivka group. Three phases of development: Fedorovka (1), Vladimirovka, Andriyivka (2), Pereginovka, Polonistoye (3). Gordashivka: Phase between Vladimirovka and Nebelivka groups	***Basin of the Rivers Sinyukha, Yatran, Bolshaya Vys.***Vladimirovka, Peregonivka, Fedorovka, Andriyivka, Maslovo, Poloniste, Gordashivka 1	1) Large settlements. 7-95 ha on smooth slopes of promontory plains, circular layout 2) Characteristic feature: 'cross-like altars'. Surface-type dwellings with ***ploshchadkas,*** public buildings. 3) Characteristic feature: vessels with incised (inlaid with white paste) and painted ornamentation (monochrome). Vessels: kitchenware (10-15%), with incised ornamentation (1-3%), a combination of incised decoration and painting (1%), monochrome painting (the rest) 4) Clay models of buildings, realistic figurines, binoculars	Movsha 1984a; Ryzhov 1999, 2015

Table 9. Local groups and settlement types of the Dnieper variant of Western Tripolye. See caption of Table 4 for explanation of categories used in 'Features' column.

Phase	Local group (type, variant)	Region and sites	Features	Sources
	Nebelivka group Formation: on the basis of Vladimirovka group, and influence of Shipintsi and Petreni groups (in the last phase). Some connections with Petreni group. Tomashovka group formed on basis of Nebelivka group. Ryzhov allocated two phases, early and late, based on ceramics. In early phase, on territory of Vladimirovka sites, then significantly expanded	*The Southern Bug and the Dnieper interfluve between the basins of Ros, Vilshanka, Upper Gnilyi Tashlyk, Velyka Vys*. (about 20 sites: Nebelivka, Vilshana I, Hlybochok, Kvitky 1, Krivi Kolina, Nemorozh, Peremozhentsi, Kolodiste I, Kolodiste II, Pishchana, Yampol, Rozsohovatka)	1) Settlements differ in size (4-235 ha). Layout arranged in a circle 2) Surface-type adobe houses, public buildings, 'cross-like altars' on the mega-structure, round 'altars' in houses 3) Tableware: most with monochrome painting (up to 93%), rarely with an incised ornamentation (pear-shaped vessels and helmet-shaped lids, 1%), kitchenware. Peculiarity: some ornamental schemes are similar to Chichelnik's 4) Binoculars, clay models of buildings, anthropomorphic and zoomorphic figurines	Ryzhov 1993a; 1999; 2012a
	Kaniv group (+C1) Formed as a result of settling of Nebelivka group population to the Dnieper. Influence of part of the population on the formation of Lukashivka-type sites (?), 5 site types according to Ovchinnikov: Valyava (B2), Peremozhentsi, Kaniv-Novoselitsa1, Pekari 2, Grishchentsy 1 (C1)	Middle Podneprovie, Kaniv area, Ros river basin about 50 sites: Valyava 1, Kvitky 2, Petropavlivka, Peremozhentsi, hutor Nezamognik, Gorodishche Vilshanske 2, Kaniv-Novoselitsa1, Bobrytsa, Kaniv Gagarin Str., Kononcha, Pekari 2, Buda-Orlovetska, Khlystunivka, Hatyshche, Gryshchentsy 1	1) Settlements differ in size: 3-4 ha, 15-30 ha (most), and 50-70 ha. Circular layout, sometimes regular (in rows) 2) Mainly surface-type dwellings, some 'pit houses' 3) Characteristic feature: predominance of painted vessels (dark brown paint against orange angobe), specific manufacturing technology (different to Nebelivka). 4) Binoculars, anthropomorphic plastic: some have archaic forms and ornamentation, a new type appears (separately made legs with a jumper), many realistic figures	Movsha 1972; Ovchinnikov 2014
	Chichelnik group		*See below*	
	Shipintsi group		*See above*	
	Petreni group		*See above*	
	Chichelnik group Background: influenced by Petreni group Vladimirovka and Nebelivka groups (Ryzhov)? Influenced by Mereshkovka and Middle Bug sites (Tkachuk). Ryzhov: three phases. Had influence on Tomashovka group.	*Southern Podilla, Southern Bug basin between the Rivers Savranka and Kodyma and interfluve of the Southern Bug and the Dnestr* (settlements Chichelnik, Cherkasiv Sad II, Bily Kamin, Olgopol, Kryvitske, Stina 4)	3) Ceramics: basis for singling out the group. Tableware: black monochrome or black and red bichrome, biconical forms 4) Binoculars, sledge models	Tkachuk 2005c; Rud 2018
C-I	**Tomashovka group** Formed on basis of Nebelivka group with influence of Shipintsi group (painted decoration, figurines). Four chronological phases	*Interfluve of the Rivers South Bug and Dnieper* (sites: Dobrovody, Talianki, Maidanetske, Vasilkove, Sushkovka, Chichirkozivka, Moshuriv, Talne 2, Talne 3, Zelena Dibrova, Popudnya, Tomashovka, Kolodiste, Rozsokhovatka, Kaytanovka, Stara Buda)	1) Different sizes of settlements (1-320 ha) 2) *Ploshadkas*, round 'altars', two chamber houses, in them podiums with pithoi along the walls, public buildings 3) Characteristic feature: mainly tableware (80-90%) with black monochrome, typical vessels with sharp belly (closed pots decorated from the belly to the rim, bows inside). 'Tare' vessels (pithoi) are found only in this group. There are many 'signs' on ceramics, images of animals and 'trees' 4) There are binoculars and models of buildings, many models of sledges, schematic and realistic anthropomorphic figurines	Movsha 1972; Kruts 1989; Ryzhov 1999
	Kaniv group		*See above*	
	Koshilovtsi group Basis is local but strong influence of Brynzeny group and late Shipency (Tkachuk) or Varvarovka XV (Ryzhov). 4 phases after Tkachuk	*Interfluve of the River Dzhurin and River Seret, Upper Podniestrovie* (sites: Koshilivtsi-Oboz, Bolshevtsi V, Blyshchanka III, Bilche-Zlote Verteba, Kudrincy, Kremydiv, Zarvanycja, Bilyi Potik, Romanove Selo, Semenov-Zelenche, Kunisovtsi)	1) Settlements on the high or low terraces, houses arranged in parallel rows (?) 2) Surface-type adobe houses 3) **Characteristic feature**: polychrome painting in combination with monochrome 4) Site Koshilivtsi-Oboz: a lot of anthropomorphic figurines, zoomorphic figurines 5) In Bilschivtsi: burial complex in the catacomb, a man with his legs bent + burial of a dog + three human skulls	Kandiba 1937; Zakharuk 1971; Tkachuk 2005 c, 2005d; Movsha 1984a
C-I *C-II*	**Badrazhi group** – 3 phases	*Interfluve of the River Prut and Dniester* (Shura 1, Valya Lupului 2, Stari Badrazhi, Konovka, Polivanov Yar 1, Drabany 2)	1) Settlements up to 50 ha in size 2) Surface-type adobe houses 3) More roundish vessel shapes, decoration is applied to almost the entire surface, bichrome or monochrome ornamentation. Frequent use of red paint, bowls painted on both sides	Markevich 1981; Tkachuk 2005c, 2014
	Varvarovka 15 sites 1st phase of Babrazhi group after Tkachuk	*Middle Prut area, Reut River* (sites: Shura 1, Valya Lupului 2)	2) Surface-type adobe houses 3) New vessel shapes (more round vessels with large, smoothly bent outside rims) and decorations (closed pots decorated from bottom to the rim, bows from both sides). Painted ceramics dominating, more use of red paint	Markevich 1981; Tkachuk 2014
	Kosenovka group Origin connected with Brynzeny (Movsha) or Badrazhi (Tkachuk) group. 3 phases, the last phase attributed sometimes to a special site type `Kochergintcy-Shulgovka'	*Interfluve of the River South Bug and River Dnieper* (about 25 sites: Kosenovka, Vilkhovets, Apolianka, Moshuriv III, Vatutino, Bagva, Sverdlikovo, Kobrinovo, Skalivatka, Rezino, Sharin, Kochegintcy-Shulgovka)	1) Settlements have different sizes: most – 1-15 ha, few – 20-30 ha, two – 80-90 ha (Kosenovka, Olhvets). Some big sites have round layout 2) Surface-type adobe houses 3) Tableware with monochrome, painting (up to 94 %), in the 3rd phase decrease to 5-15% 4) Anthropomorphic and zoomorphic figurines	Movsha 1984a; 1990; Ryzhov 2001-2002

Phase	Local group (type, variant)	Region and sites	Features	Sources
C-II	**Brynzeny (or Zhvanets) group** Origin: traditions of Varvarivka 15 type or Badrazhy group. Replaced by sites of Gordineshty type	*Middle Prut area, middle and upper parts of Podnestrovie upper reaches* (about 25 sites: Brynzeny III, Zhvanets-Shchovb, Kosteshti 4, Varatovka-hill, Darabany, Konivka – Putsita locality, Neporotovo, Kuban, Brynzeny-Tsyganka Bilce-Verteba?)	1) Only settlements known, some with moats and ramparts. A settlement of two parts: fortified and unfortified located near each other on promontories of high river terraces or remnants (buttes), in places with good natural fortifications 2) Surface-type adobe houses, pit houses (fewer) 3) Most vessels with painted decoration (50-70%), monochrome and bichrome, often covering the entire surface, often with images of people, animals and signs, kitchenware (30-50%) 4) feature of the group: the presence of bone daggers, schematic anthropomorphic figurines of (only) Vykhvatinsy type	Dergachev 1980; Movsha 1984a; Markevich 1981; Kruts 2012b
	Gordineshty group Burials on basis of Brynzeny group. Later participation in formation of Corded Ware Culture	*Middle, Upper Prut area, Podnestrovie* (about 40 sites: Gordyneshti, Tsviklivtsi, Zhvanets Lysa Gora, Zveniachyn, Sandraki, Pechera, Nova Chartoriya, Kislytske)	1) 2-3-ha settlements, rib-shaped plateaus, remnants 2) Surface-type adobe houses, light type with incised floor, some incised dwellings. Flint workshop in Tsviklivtsi 3) Tableware: 30%, often painted with grid motifs. Morphological features reminiscent of the Brynzen group ones; characteristic feature: geometric lines that touch each other do not intersect, cord ornament on kitchenware 5) Burials in settlements (cremation, in dwellings under ovens) or separately (grave burials in mounds)	Movsha 1984a; Dergachev 1980; Markevich 1981; Kruts 2012b
	Vykhvatintsi group Origin: traditions of Varvarivka 15 type. Moving south, part of group forms Usatovo type. Dergachev: two periods.	*Middle Dniester, River Reut* (about 30 sites: Vykhvatintsi, Golerkany 1, Giderim, Branesty, Soloncheny 2, Rashkov, Slobodzeya-Voronkovo, Katerynivka)	2) Adobe houses 3) Most vessels with painted ornamentation (70%), monochrome, black paint with red elements. Decoration is similar to Zhvanets group, kitchen-ware: cord and stamped ornamentation 4) Terracotta on cube-like pedestals (typical of Usatovo). 5) Graveyards – Vykhvatintsy, Golerkany. Buried in truncated position on left side (75%), heads to the north-east, with ochre, kaolin clay or ash on the bottom of pits, covered with wood. Anthropology: differences between male and female skulls, mixing groups. The division of necropolises into sections – communal and family ones	Dergachev 1980; Markevich 1981; Dergachev and Manzura 1991; Movsha 1972
	Usatovo type (culture) Formed as a result of moving of Vykhvatintsi group south plus interaction with other types (from steppes – Mikhailovka lower layer, Middle Stog 2, and Chernovoda Culture and early Yamnaya Culture). Two periods	*North Pontic from the South Bug to the Danube* (about 50 sites: Usatovo, Mayaky, Akkembek Mound, Alexander Mound, 'Sadove' Mound, Danku 1, Danku 2, Utkonosivka, Nerushay, Borisivka, Shabalat, Palanka, Sukleia, Krasnogorka, Ploske, Orlovka, Turdovo, Olanesti, Floresti, Stoikany)	1) Several 'cult' settlements (?) (Usatovo, Mayaky) with ash mounds and ritual ditches (in limestone or soil) 3) Kitchenware (90%): with cord ornamentation, few painted ceramics – monochrome or bichrome 4) Anthropomorphic figures: stylised figurines on cubic pedestal with the neck elongated forward, flint processing technique: split (the steppe one). No zoomorphic figurines 5) Burial mounds (0.3-2.5 m high, 15-35 m in diame-ter) and graveyards, corpse-laying in crouched form, burial mounds: with a stone cromlech or stone facing of mounds. There are cenotaphs	Boltenko 1925; 1957; Passek 1949; Petrenko 2003
	Serezlievka type Dergachev and Manzura: formed components of the Usatovo and Gordineshty types in zone of contact with Eneolithic cultural groups from steppe. Rassamakin: this is Dnieper-Bug group. Singled out on the basis of burial in mounds. It is attributed to Tripolye conventionally because the traditions of the culture are not decisive	*North Pontic Steppe interfluves of the South Bug and the Dnieper* (sites: Serezliyivka, Vilshanka, Barativka, Yermolaevka, Zhivotilovka, Lyubimivka)	4) Anthropomorphic figurines of the Serezlievka type – schematic ones 5) Inhumations, main and inlet burials under the mound, often in cromlech	Dergachev and Manzura 1991
	Zhivotilovka (Zhivotilovka -Vovchansk) type. There are syncretic features with elements of Tripolye and Maykop	*North Pontic Steppes from the Danube to the inter-Don and the Volga* (burials: Zhivotilovka, Kalmykia, Suvorovo I, Sokolovo, Novomoskovsk, Orgzhonikidze, Kovalevka, Koshary)	5) Inlet burials, rectangular pits with steps, sometimes shelves and catacombs, single, paired burials in curved position.	Kovaleva 1977

Table 9. Local groups and settlement types of the Dnieper variant of Western Tripolye (continued).

Phase	Local group (type, variant)	Region and sites	Features	Sources
CII	**Khoriv type** Replaced by sites of Listvin type	*Upper reaches of the Rivers Stir, Ikva, Goryn and Sluch at the border of Podillya and Western Volyn* (sites Khoriv I, Ostrog – Castle Hill)	2) Pit houses 3) Prevailing kitchenware (86%), tableware has monochrome painting 4) A large number of Volyn flint tools, ornamented clay spindle whorls, schematic anthropomorphic figurines	Peleshchyshyn 1989; Videiko 2004f
	Troyaniv type Formed by Brynzeny group migration to Volyn (?), or local background with Brynzeny influence. Replaced by sites of Gorodok type. Three chronological stages. During them: loss of Brynzeny features and forming of original local traditions	*Upper reaches of the Rivers Rostavitsa, Teterev, Goryn and Sluch in Volyn* (about 25 sites: Troyaniv, Yagnyatin, Bilylivka, Rayki, Pavoloch, Korzhovka-Selysko 2, Korzhovka-Bashtan, Makharintsi-Step, Voytsehivka)	1) Remains of ditches and ramparts, houses arranged in a circle 2) Surface and deepened dwellings 3) Tableware decreasing to 10%, kitchenware decorated with cord impressions 4) Typical: conical clay spindle whorls mostly with incised ornamentation, schematic anthropomorphic standing figurines and zoomorphic figurines	Shmagliy 1966; Kruts 2012b
	Listvin type Formed: local background (Khoriv type) with Gordineshti influence. Two phases: Early (Listvin) and Late (Golishiv)	*Western Volyn, basins of Rivers Goryn, Styr, Ikva* (about 20 sites: Listvin, Lozy, Golyshiv, Zhorniv, Kostyanets, Maly Dorogostai)	1) Settlements in well-protected areas, in some production of plates and axes from Volyn flint 2) Pit houses 3) Mostly kitchenware ceramics, sometimes painted red, cord decoration	Peleshchyshyn 1989; Videiko 2004g
	Gorodosk type Formed: local background (Troyanove) with Gordineshti influence. Replaced by Corded Ware Culture	*Upper reaches of the Rivers Teterev, Sluch, Styr in Eastern Volyn* (about 10 sites Gorodsk, Lozy, Nova Chartoryia)	1) Small settlements located on inaccessible promontories, remnants of plateaux in river valleys, moats, ramparts 2) Surface and deepened dwellings 3) Unpainted (90%) and painted vessels, with kitchenware dominating (90%), decorated with cord imprints, tableware 11-5%. Many common features with Listvin type, some differences in ornamentation 4) Schematic standing figurines, miniature clay axes	Shmagliy 1961; 1966 Movsha 1972; Dergachev 1980; Kruts 2012b

Table 10. Local groups and settlement types of the Volyn line of Tripolye.

It can be seen that most of the local variants and types of ‘Western’ Tripolye sites were singled out by different authors in the second half of the 20th century; eventually some of the groups were renamed or were defined as belonging to other lines of development. The list of variants of ‘Western’ Tripolye (tab. 9) includes the most important types that are used to this day.

Volyn was different from other regions that stood aside from all the lines of development described above (tab. 10). In the 1950s, in connection with the fact that the sites of this line are distinguished by the loss of specific features typical of Tripolye, the question was raised as to whether a ‘separate culture’ existed or whether this was a Volyn branch of the Funnel Beaker (Bryusov 1952) or Corded Ware (Sulimirski 1960) Culture. However, a large number of the researchers believed that the sites represented the late stage of Tripolye (Petrov 1940; Passek 1949; Lagodovskaya 1953; Zakharuk 1954; Kruts 2012). A major contribution to the study of the sites of the region was made by N. Peleshchyshyn (1976; 1978; 1989), Smaglii and Kruts (Shmagliy 1961; 1966; Kruts 2012).

1.5 Conclusions

It can be seen that the history of working out the relative chronology of Tripolye and its periodisation with the subsequent division into contemporaneous/successive variants has been quite intensive, beginning from the first studies. The results of work during the first decades of the 20th century are very important, as at that time the foundations for further research into Tripolye were laid. It is worth mentioning that the sites, excavations and exploration which started then gave their names to the majority of local variants or types of sites, most of which continued to be actively explored in the ensuing period of the 20th century. Some of them are still important and investigated today.

Khvoiko outlined a purely speculative periodisation of Tripolye, dividing it into two 'cultures'; over time his methods of work, interpretation and periodisation became outdated. Further researchers began to rely upon other methods, such as stratigraphic and comparative analysis, mapping, typology, and statistics.

The first half of the 20th century was a period of studying the culture within the framework of the traditions of South-East European archaeology. Thus extensive typological analogies and comparisons with South-Eastern cultures of painted pottery were made. Passek used Arabic letters to mark the periods she had singled out, in analogy with other periodisation tables made at that time (Thessaly, Serbia, etc.), and she also used the stratigraphy of the multilayered settlements of Cucuteni and those in the Balkans as a basis for building her sequences of different Tripolye stages. On the whole, her periodisation remains unchallenged to the present day.

However, very soon the scientific paradigm changed. The spread of the *stadial* approach could be observed in defining research tasks and interpreting archaeological data that were conducted within the framework of the theory of *socio-economic formations*. At the same time, the territorial coverage of the investigations considerably narrowed. The authors were no longer interested in the development of archaeological cultures in neighbouring areas. The autochthonous approach began to prevail. The fiasco of the stadial concept in the 1950s did not lead to the complete rejection of autochthonism, but only triggered the tendency of singling out a large number of local groups or cultures.

With the accumulation of new material after World War II, a need arose to systematise it in a new way, classify (defining local groups and types of sites) and then interpret. The main criteria used for this purpose were typological parallels in ceramic assemblages along with housebuilding, settlement layout and other characteristics.

The theoretical foundation of the new approach was worked out by Zakharuk (1964). Introducing a new term of *archaeological complex of sites* for a group of settlements, Zakharuk proposed the methods of its identification and interpretation, attempting to make historic reconstructions by linking spatio-temporal units with 'ethnicity'. His method turned out to be efficient for substructuring Tripolye, but over time many archaeologists concentrated their efforts mostly on analyses of ceramics.

In the second half of the 20th century, researchers continued their attempts to develop generally detailed chronologies for the whole Tripolye on the basis of Passek's with the use of the method of typological comparison (*e.g.* Chernysh's scheme that tried to take into account different local Tripolye features).

In the last quarter of the 20th century, the whole Tripolye phenomenon was divided into two large 'cultural' areas – 'eastern' and 'western' – on the basis of certain peculiarities in the material culture.

The distinguishing of 'eastern' and 'western' types within Tripolye was in some way similar to the division of Romanian archaeology into 'Precucuteni' and 'Cucuteni', with the only difference that 'Cucuteni' groups developed in the time after the 'Precucuteni', but Tripolye groups coexisted. In fact, Eastern Tripolye is considered to be a continuation of Precucuteni traditions with the partial inclusion of some 'Cucuteni' elements, where the further development of communities with new (their own) features can be observed.

Most of the specialists (Dumitrescu, Tsvek, Movsha, Kruts, Ryzhov, Gusev) completely agree on the existence of two large areas within the framework of Tripolye – 'Eastern' and 'Western'. The main difference between them is in the decoration of table vessels (incised or painted). The formation of Precucuteni (eastern line) is associated with the influence of the Boyan and Vinca cultures, and Cucuteni (with painted pottery) – with Gumelnica and Petresti (Gusev 1995, 260).

It should be noted that in fact the foundations of an approach to the division of Tripolye were laid in the 1960s, and since then nothing fundamentally new in the methodological sense has been proposed: Tripolye has been divided into a number

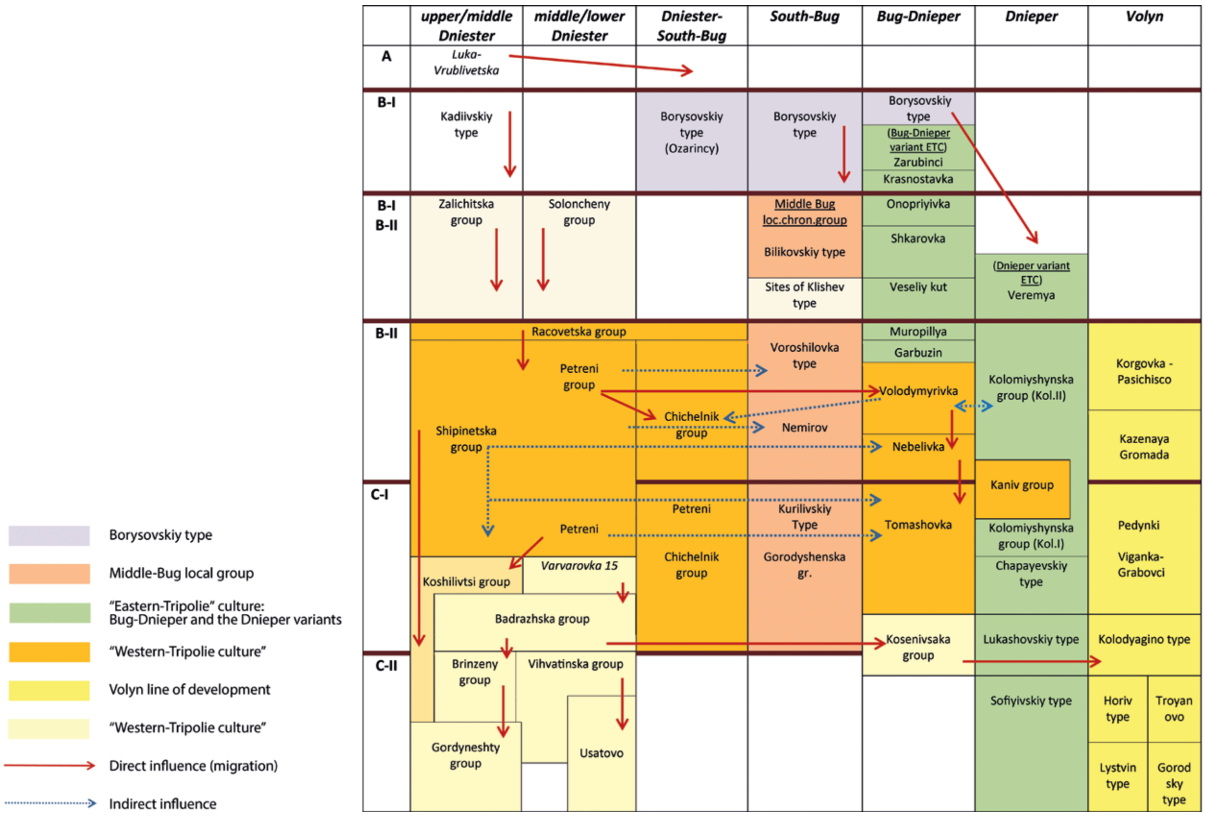


Figure 2. Relative chronology of Tripolye local groups, types and 'development lines' according to different authors.

of variants grouped into larger units (cultures, lines of development), which have led to the fact that today there are about 40 types or variants of culture.

So, by the beginning of the 21st century, the main cultural and chronological lines of Tripolye's development had already been outlined. These lines and types of sites can conventionally be placed in the table (see fig. 2 and fig. 3).

There have been different opinions and debates about the relevance of distinguishing a particular group or its place in a periodisation table since there are no absolute dates for many sites. Significant difficulties arose in the process of creating the tables and descriptions of different local groups and types of sites, as a number of types and groups have undergone numerous renaming or have been brought together with other groups; sometimes different researchers attribute a particular settlement to different types or chronological positions within the same group. While undertaking the process, each author has his own individual approach in describing criteria and details he has chosen to identify and characterise a particular group. A number of authors analyse only ceramics, confining themselves to an approximate description of them without specifying the method of their calculation. At the same time, the division of Tripolye into a number of smaller units and lines of development seems appropriate, since it gives the possibility to somehow put in order the chaos of numerous Tripolye groups.

The history of the creation of Tripolye's relative chronology shows that, basically, two approaches were used for its division (classification). The first one produced 'stepped' schemes, which cut the history of Tripolye into a number of well-defined phases (Passek, Chernysh). These could be comparable in different regions.

Another approach was based on the development of the method of distinguishing local groups and types of sites when 'lines of development' (ceramic styles) were traced. However, different 'lines of development' do not always fit into the strict framework of long periods, revealing a situation that could have been more

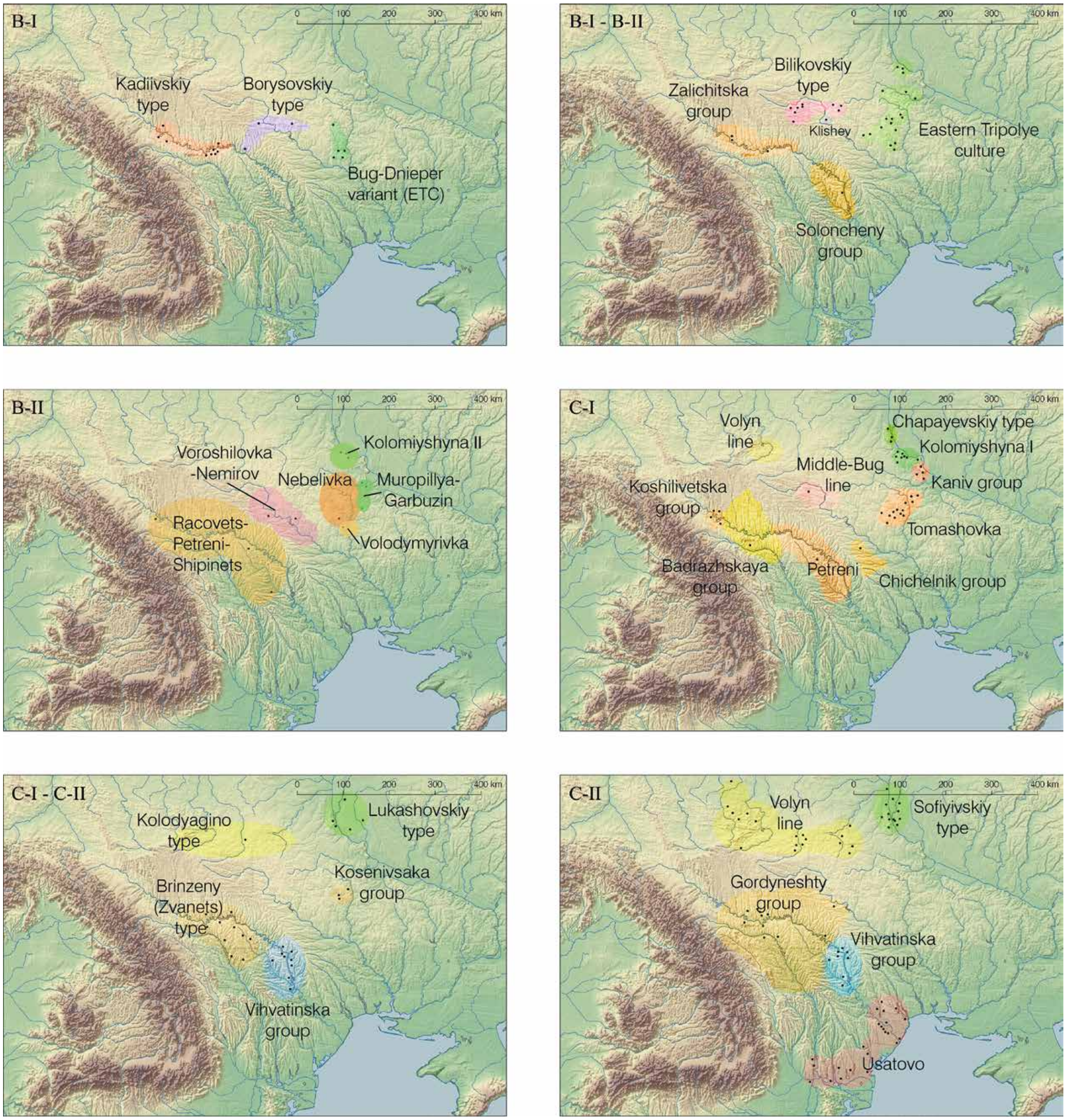


Figure 3. Location of Tripolye regional groups in different phases.

realistic. For example, one local group can 'develop' during several stages; the synchronous development of different ceramic styles can be traced in one region.

Most of the general research into Tripolye was aimed at creating its periodisation. At the same time, a paradox is noticeable when practically all the researchers agree that a number of CI sites belong period-wise to the period BII, but they still continue to use the term CI as a well-established and familiar definition.

The periodisations worked out in the 1930s-1960s were of general character for the whole of Tripolye. Beginning from the late 1970s and continuing to the early 2000s, the researchers actively started to form regional chronologies and to synchronise them with the neighbouring ones. At the same time, at the end of the 20th and the beginning of the 21st century, some researchers worked on the periodisations for the whole of Tripolye within the framework of longer periods (*e.g.* A, or CII). Stage CII in particular was studied in detail (see the works of Dergachev, Kruts and others).

It should be noted that in the 20th century, Tripolye researchers tried to analyse the available material, to interpret it as far as it was possible and to recreate the course of historical events. Perhaps this explains the preferable use of such terms as *population, ethnic ties, organic whole, migrations of groups, newly arrived population, genetic links, community*, and the like, rather than the more obvious descriptive definitions adopted today, such as the *ceramic types, typological links,* and so on. It was the time when the distribution of *ceramic types* was understood as the distribution of *distinct peoples/populations*. Consequently, the distributions of ceramics and other archaeological features were reflected mostly in the mobility and migration of people.

It should be noted that the research paradigm of 'different (ceramic) types = different populations' and 'similar (ceramic) types = similar populations' was widely used in interpreting finds not only in Tripolye, but also throughout South-Eastern Europe, for example in the Neolithic studies where similarities in spatio-temporal ceramic assemblages were often used not only to identify groups of ceramic styles, but also to interpret such ceramic groups without further arguments like the reflection of real distribution patterns of social units.

1.6 Research gaps and future tasks

It is possible to highlight some gaps in the history of working out the relative Tripolye chronology that have become particularly noticeable in the last 30 years:

- Thus the terminology is not unified. The researchers distinguish *periods, phases, stages* without any system, without giving clear definitions of concepts, and in different ways (different researchers use different terminology). The same can be said of the names of the types (shapes) of vessels, when under the same name (*e.g.* amphora), and different authors understand absolutely different types of artefacts.
- The fact of 'substitution of concepts', mentioned earlier, when the *term* is replaced by a *concept*, and *a hypothesis* by *the recognised fact*, leads to the construction of disputable equivocal models.
- Among the practical gaps, it should be noted that different regions have been explored to a different degree with the use of different methods. In some of the areas, there is an obvious lack of data to link the region to one or another typological group.
- Not only regions but also certain periods have been investigated to varying degrees; there is a lack of modern data on early periods in particular – A, B1.
- Often work has been 'distributed' unevenly within one microregion, period, or local group. The research is sometimes concentrated on a few certain sites, while not enough attention is paid to the study of neighbouring synchronous sites (*e.g.* Talianki, Vesely Kut, Vladimirovka).
- The publication of archaeological material has a varying degree of accuracy. Often works do not contain the information on the basis of which the author came to his conclusion – sometimes no data is published. For example, an author can write about the percentage of different types of ceramics, but on the one hand he/she does not show real numbers (10% is 7, 8 or 20 pots?) and on the other hand the method of his/her percentage calculations is not indicated (what a *unit* means, whether it represents a whole vessel, or a vessel with a full profile, or diagnostic fragments). As a result, it is extremely difficult to use these publications for further research (if at all).
- It should be noted that most of the excavated sites are not well published in principle and reports on the work carried out are often made carelessly. Different researchers have different methodological levels of processing ceramics. Some

specialists who have not examined ceramics have often published only a few photos of nice-looking pots, and the rest of the material has not been illustrated.
- Beginning from Zakharuk, the specialists on Tripolye have used the approach of distinguishing local variants and types of sites without offering other new approaches.

These gaps determine to a very large extent the **tasks** of future research in the field of the relative chronology of Tripolye, in particular: revision of the approaches and theories on which the interpretations and constructions have been based; more uniform investigations of different Tripolye regions and periods; publication of both new and old research material at the modern research level; unification of terminology for both time periods and ceramic artefacts; enriching the collection of radiocarbon dates with new ones (using the appropriate methods, followed by their description and criticism); and, of course, making archaeomagnetic maps of Tripolye sites. The latter seems to be one of the highest priorities, since the fields where the Tripolye sites are located are used for agricultural purposes, leading to their severe erosion and in some cases to full destruction.

The tasks listed above have begun to be partially implemented in the last ten years of Tripolye research. The description of this period has been deliberately omitted in this part because, first, the results of the studies and descriptions of recent approaches have been published properly (Kruts *et al.* 2011; Videiko 2013b; Chapman *et al.* 2014; Gaydarska and Chapman 2016; Rassmann *et al.* 2016; Müller 2016; Müller *et al.* 2016a; Müller *et al.* 2016c; Dal Corso and Kirleis 2016; Hofmann *et al.* 2016; Ohlrau *et al.* 2016; Chapman 2017; Diachenko and Menotti 2017; Nebbia *et al.* 2018; Hofmann *et al.* 2018) and, second, this topic is discussed in relation to the region of mega-sites in subsequent parts.

Finally, I would like to emphasise once again that this part contains only introductory information without which an understanding of the existing relative chronology of the '*mega-sites' region* could be somewhat difficult. It is worth noting that the Bug-Dnieper interfluve, to the territorial borders of which this study will be further limited, is obviously one of the first regions where Tripolye studies entered the new stage of investigation. For the sites of the region, new accurate archaeomagnetic plans are being made, comprehensive ^{14}C dating programmes are being carried out, and so on. Of course, this is because the so-called mega-sites are located there. However, a significant role in ensuring that the region is well studied and actively continues to be studied belongs to the work of a number of specialists who brought the people together in a team and formed a kind of school of Tripolye specialists (*e.g.* Movsha, Tsvek, Kruts, Shmagliy and others).

2 Introduction to the mega-site region, research questions, sources

The mega-site region has attracted a lot of attention from prehistory researchers of both South-East and Eastern Europe in general, and Tripolye in particular. This is due to several factors. The main one is that the so-called giant settlements or mega-sites, or, in other words, the settlements whose dimensions exceed most of the analogues of that time are located here. Another, and no less important and connected with the previous point, is the fact that these sites have been systematically intensively researched, practically non-stop, since their discovery in the 1960s, which should considerably simplify and enhance further research. Also, a certain role, of course, is played by the region's relative proximity to the main Ukrainian archaeological research institute (IA NASU), that is, to Kiev, as well as a more or less established infrastructure for organising the work (including the museum reserve 'Tripolye culture' in the village of Legedzyne) that facilitates the survey's implementation. Some of the other regions do not always have these advantages. The history of Tripolye research into the region and its mega-sites is described in numerous works (*e.g.* Videiko 2002; Pichkur 2003; Videiko 2004; Tsvek 2006; Kruts 2008; Diachenko 2009; Kruts 2012a, 70-71; Videiko and Rassmann 2016, 17-28).

This region is undoubtedly a place where the Tripolye phenomenon has been manifested clearly and distinctively. It has been studied by more than one generation of scientists who seemingly have already considered all the Tripolye aspects here. However, on closer examination, sometimes it seems that all this is just a beautiful facade, behind which there are mountains of unpublished material and unrealised analyses, which is especially true for the collections of ceramics.

In recent years, the study of Tripolye mega-sites has been undergoing one more recovery. This is due, first of all, to the Tripolye research projects which are carried out jointly by Ukrainian and Western European researchers (Chapman *et al.* 2014; Müller and Rassmann 2016; Chapman *et al.* 2016). Such cooperation has turned out to be quite fruitful, new more precise plans of settlements are being prepared, the absolute chronology of key sites is specified, isotopic analysis, simulations, analyses of phytoliths, lipids, geoarchaeological methods are used (Kruts *et al.* 2011; Rassmann *et al.* 2016; Dal Corso and Kirleis 2016; Hofmann *et al.* 2016; Dal Corso *et al.* 2018; Makarewicz *et al.* submitted). The results of collaborative work can complement and, in some cases, revise the existing models for the development of Tripolye in the region (Chapman *et al.* 2016; Korvin-Piotrovskiy *et al.* 2016a; Müller 2016; Müller *et al.* 2016a; 2016b; 2016c; Müller and Videiko 2016; Ohlrau *et al.* 2016; Chapman 2017; Diachenko and Menotti 2017; Nebbia *et al.* 2018).

Under such conditions, it is logical to turn once again to the chronology of the region, although it is considered to be fairly well established. The undoubted support for the new chronological constructions is a large series of new radiocarbon dates, as well as the application of new and relatively new research methods for the old (and new) material.

2.1 Research questions

The *main goal* of the work is to build a chronology of the selected working area with the use of old and new data including ceramics and absolute dating.

This is being done to improve both the understanding of the phenomenon of mega-sites and the dynamics of the region's development in Tripolye times.
To accomplish this goal, a number of *research tasks* have been set, in particular:

- review of the existing relative chronology and the methods on which it was built
- verification of the existing relative chronology
- building of a chronology of a separate mega-site
- building a chronology of the history of a region in Tripolye times, using both previously known materials and involving new data
- analysis of mega and smaller sites in terms of chronology
- evaluation ceramic styles development in the region
- problem of the relationships between different sites with the example of pottery
- discussion of the possible site duration
- review of the content of the concept of 'mega-sites'.

Thus it is proposed to analyse the chronology on a minimum of two spatial levels – of a separate site (mega-site) and of a chosen region. Based on this, more specific questions for different levels of chronology building are given in the respective parts.

2.2 Definition of the study region

First of all, let's outline the limits of the study area and give the territory under consideration an appropriate label.

When working on mega-site problems, the researchers often use the term '*Buh-Dnieper Region*', which is understandable and unquestionable to most Tripolye researchers (*e.g.* Tsvek 1980; Ryzhov 2000a, 107; Kruts 1987; 2003, 71; Movsha 2003, 85; Diachenko 2009a; Diachenko 2012, 116). However, the term needs to be more specific, since quite often the authors have in mind much smaller territories than the territory between the Rivers Southern Bug and Dnieper. Additionally, many sites that are also located between the Rivers Southern Bug and Dnieper are not included in the consideration of the region of mega-sites and have other regional labels, for example 'Pobuzhye' (Bug area), 'Kaniv Podneprovye' (*e.g.* Ovchinnikov 2014; Gusev 1995).

It is proposed to outline the limits of the study region taking into account only the territories where the following types of Tripolye sites are located:

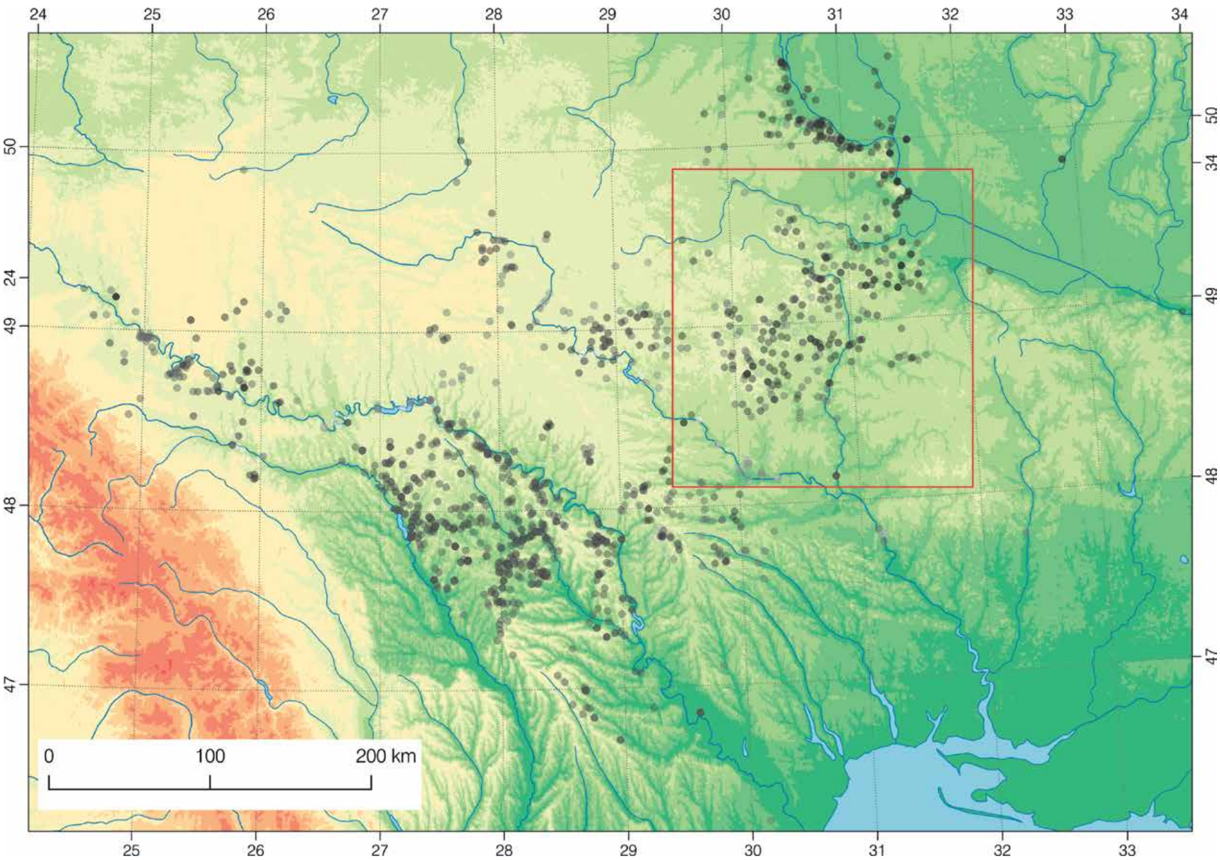
1. Selected key sites (some mega and smaller sites)
2. All 'mega-sites'[17]
3. The remaining settlements of the region that have the same/similar pottery style (belong to the same 'local group' or type of sites) as the selected key sites

For the pilot study, the section was taken in the central part of which Tripolye sites are located, meeting the requirements of the first two points mentioned above (288 x 201 km, fig. 4). Mapping of the Tripolye sites was undertaken within the sector (fig. 5). (A list of sites was compiled for this purpose; see Appendix 1) The mapping of the Tripolye sites of the chosen territory shows that they are located in a certain *corridor* that stretches from south-west to north-east, or from the middle course of the Southern Bug to the Kaniv Hills in the middle flow of the Dnieper.

Figure 4 (above right). Map with the distribution of Tripolye sites (except Tripolye C2) and the study region.

Figure 5 (below right). Working area with Tripolye sites (in pink – key sites and mega-sites the size of which exceeds 150 hectares).

17 To start with, sites with an area of more than 150 hectares were placed in this category, after Müller, Rassmann 2016, 1. According to the data that is available, there are five sites in this category.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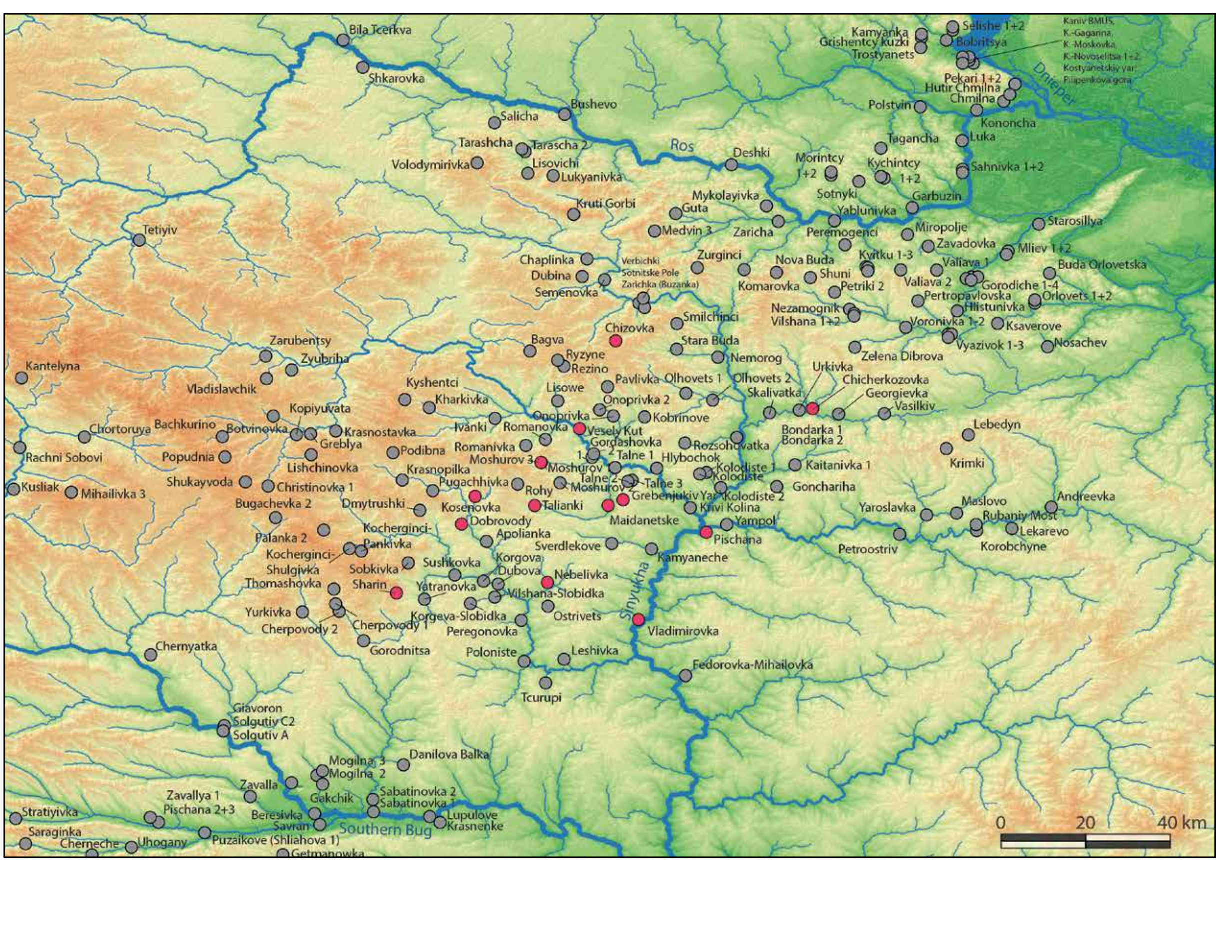
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Bushevo
Salicha
Tarashcha
Tarascha 2
Volodymirivka
Lisovichi
Lukyanivka
Ros
Deshki
Morintcy 1+2
Kychintcy 1+2
Sotnyki
Kamyanka
Grishentcy kuzki
Trostyanets
Selishe 1+2
Bobritsya
Kaniv-BMUS, K.-Gagarina, K.-Moskovka, K.-Novoselitsa 1+2, Kostyanetskiy yar, Pilipenkova gora
Pekari 1+2
Hutir Chmilna
Chmilna
Dnieper
Polstvin
Kononcha
Tagancha
Luka
Sahnivka 1+2
Garbuzin
Kruti Gorbi
Mykolayivka
Guta
Medvin 3
Zaricha
Yablunivka
Peremogenci
Miropolje
Zavadovka
Starosillya
Mliev 1+2
Tetiyiv
Chaplinka
Dubina
Semenovka
Verbichki
Sotnitske Pole
Zarichka (Buzanka)
Zurginci
Nova Buda
Komarovka
Shuni
Kvitku 1-3
Petriki 2
Valiava 1
Valiava 2
Buda Orlovetska
Gorodiche 1-4
Pertropavlovska
Hlistunivka
Orlovets 1+2
Smilchinci
Nezamognik
Vilshana 1+2
Voronivka 1-2
Ksaverove
Vyazivok 1-3
Nosachev
Zelena Dibrova
Chizovka
Stara Buda
Nemorog
Bagva
Ryzyne
Rezino
Zarubentsy
Zyubriha
Kantelyna
Vladislavchik
Kyshentci
Kharkivka
Lisowe
Pavlivka
Olhovets 1
Olhovets 2
Skalivatka
Urkivka
Chicherkozovka
Georgievka
Vasilkiv
Onoprivka 2
Kobrinove
Onoprivka
Kopiyuvata
Chortoruya
Bachkurino
Botvinovka
Krasnostavka
Greblya
Ivanki
Romanovka
Vesely Kut
Gordashovka
Podibna
Romanivka
Talne 1
Hlybochok
Rozsohovatka
Bondarka 1
Bondarka 2
Lebedyn
Rachni Sobovi
Popudnia
Lishchinovka
Moshurov 3
Moshurov 1
Kolodiste 1
Kolodiste
Kaitanivka 1
Krimki
Kusliak
Mihailivka 3
Shukayvoda
Christinovka 1
Krasnopilka
Pugachhivka
Rohy
Talne 2
Moshurov 2
Talne 3
Grebenjukiv Yar
Kolodiste 2
Goncharha
Bugachevka 2
Dmytrushki
Kosenovka
Talianki
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Kriví Kolina
Yaroslavka
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Rubaniy Most
Andreevka
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Dobrovody
Apolianka
Sverdlekove
Yampol
Pischana
Petroostriv
Kocherginci-Shulgivka
Sobkivka
Sushkovka
Korgova
Dubova
Kamyaneche
Thomashovka
Sharin
Yatranovka
Nebelivka
Vilshana-Slobidka
Sinyukha
Yurkivka
Cherpovody 2
Cherpovody 1
Korgeva-Slobidka
Peregonovka
Ostrivets
Vladimirovka
Gorodnitsa
Chernyatka
Poloniste
Leshivka
Fedorovka-Mihailovka
Tcurupi
Glavoron
Solgutiv C2
Solgutiv A
Mogilna 3
Mogilna 2
Danilova Balka
Zavalla
Gekchik
Sabatinovka 2
Sabatinovka 1
Zavallya 1
Pischana 2+3
Stratiyivka
Beresivka
Savran
Lupulove
Krasnenke
Saraginka
Cherneche
Uhogany
Puzaikove (Shliahova 1)
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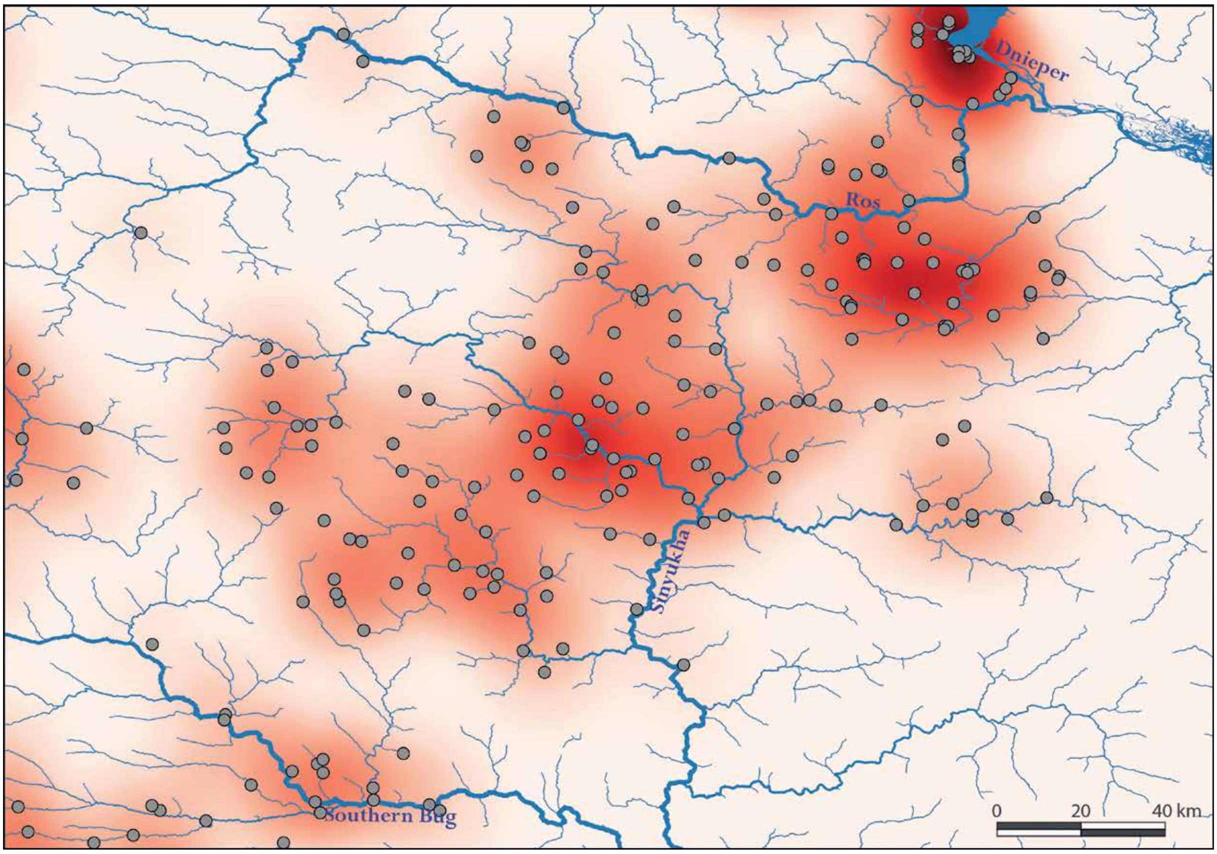

Figure 6. Tripolye sites in the Southern-Bug – Dnieper interfluve. In the background a heatmap displays different site clusters.

In this elongated section, *three clusters* of concentration (and several smaller sub-clusters) of Tripolye settlements can be distinguished which, as it can be seen, are well associated with river basins (fig. 6). So in the south-east, the sites are associated with the Middle Southern Bug basin, and in the north-east with the Ros river basin, small tributaries of the Dnieper and the Dnieper itself. Between these two zones of concentration of Tripolye settlements, there is a zone that is associated with the *Sinyukha river basin*. And this is the area to be investigated in this study. The conventional division line between the sites of the Sinyukha basin and the north-east zone (the 'Kaniv' or Kaniv Podneprovye one) will be the watershed.

The sites of *Kaniv Podniprovye* (the term is widely used in Tripolye studios) are intentionally involved in this study only occasionally, since for them there is no such important data as magnetic plans and new radiocarbon dates. On the other hand, one of the latest monographs on Tripolye is dedicated to this zone (Ovchinnikov 2014). In any case, this zone, according to the data on it available today, is the periphery of the phenomenon of mega-sites, and to analyse it both new data and examination of other sites of the Dnieper region (which stretches further to the north) are needed.

In contrast, the *Sinyukha basin area* is characterised by its specific features and peculiarities. For example, here are represented the sites of almost all Tripolye periods – from the early one to C2 – and, accordingly, very different ceramic styles. Regional or local groups (ceramic styles), which have been singled out for the Bug-Dnieper interfluve, practically do not extend beyond the catchment basin of the Sinyukha (except for a few sites for all groups except Vladimirovka). Because of a large number of mega-sites in this territory, surveys and research have been systematically carried out there, as a result of which a large number of Tripolye sites have been discovered. Apparently, the currently available data give more or less a full picture of Tripolye sites in the region. In addition, a number of archaeomagnetic maps have been drawn up for the settlements of the region, and a large number of new radiocarbon dates have been obtained.

Figure 7. Administrative division of the working area: regions (ukr. oblast) and districts (ukr. rayon).

As for the sites concentrated in close proximity to the *Southern Bug*, they, firstly, are mostly represented by the sites of the Early and beginning of the Middle Tripolye and, secondly, geographically tend to the neighbouring (south-western) zone of concentration of Tripolye sites.

Thus the basic region in this study will be the territory of concentration of Tripolye sites, located in the Sinyukha river basin. This name will be used as an appropriate label for the working area. The adjacent territories – Kaniv Podneprovye and the sites located closer to the Southern Bug – will be analysed in the work occasionally.

Administratively, as of 2018, the region (Sinukha river basin) is located in the central part of Ukraine, mainly in the Cherkasy and partly the Kirovograd *regions* (Ukr. oblast). Most settlements that are the focus of the work are concentrated in the Uman, Talne, Khristinovka, Mankovka, Shpola, Zvenigorodka, Katerinopol, Lysyanka, Zhashkiv, and Monastyrysche districts of the Cherkasy region. The sites in the Kirovograd region are not numerous and are mainly located in its western part, in the Holovanivsk, Novoarkhangelsk, Novomirgorod districts; several sites are located in the Dobrovelychiv districts (fig. 7). Let us turn to the consideration of the geography of the area studied.

2.3 Geography of the study region

Tripolye settlements functioned in a certain natural environment, which should be taken into consideration. To get a completer and more accurate picture of the existence of Tripolye sites, it would be reasonable to examine them in the natural environment. As to the basic components of the environment, here we are going to consider both those that are less susceptible to changes and those that are more exposed and underwent significant transformations over time. They are described in the order from less to more susceptible ones: tectonics – relief – hydrology – soils – vegetation – climate.

An understanding of geological processes is desirable, since tectonics explains the distribution of mineral resources, which, potentially, could clarify the choice of a place for settlements by certain communities (whether this was due to the availability of certain resources or because of a special form of landscape).

Of paramount importance is an understanding of the topographical relief of the land surface (terrain), which is fairly rugged in our region, and the hydrology, as all the Tripolye sites of the region in the study are located in river valleys of certain waterways.

The proto-historical landscape has been subjected to certain transformations, which have been the result of both natural factors and the result of human activity. Since, consequently, today's situation is not necessarily consistent with past environmental conditions, it is necessary to obtain an understanding of the past landscape potential and environmental dynamics. The anthropogenic effect on the modern environment must also be taken into consideration when conducting scientific analyses, since it affects the final results obtained and in some cases may distort them.

2.3.1 Tectonics

Our working area is located on the *Dnieper Upland*, on the so-called *Ukrainian Shield* (or Ukrainian Crystalline Massif), which is a blocky uplift of the Precambrian basement of the *East European Platform* (or Russian Platform). Being a part of the tectonic composition of the platform, the Shield constitutes an independent structure (Bondarchuk 1959; Tsarovsky 1960; Kalyaev 1977). The Shield extends from the Azov Sea in a north-westerly direction to the River Pripyat (almost 1,000 km), with an area of 136,500 km^2.

The Ukrainian Shield has an ancient (Precambrian) crystalline basement; the age of metamorphic and igneous (magmatic) rocks which constitute it is 3.5 billion years. The Shield formation is associated with the eruption of rocks, which then crystallised and underwent changes due to pressure and high temperatures (underwent metamorphism). As a result of these processes, granites, gneisses, basalts, schists, ferrous and magnetite quartzites were formed.

The Shield itself has an uneven surface; in addition, according to the latest concepts, it consists of six *mega-blocks (domains)*, that is, each part of which, along with common features, has its own characteristics in its geological structure. Mega-blocks are separated by deep *faults* and *interblock suture zones*. The boundaries of the blocks (domains) are expressed with varying degrees of clarity. Suture zones are extended linear structures which, as a rule, are younger than the domains (mega-blocks) they separate, and they are accompanied by anomalies in high electrical conductivity, facilitating the search for ore deposits; most of these minerals within the Shield are found in such zones (Burakhovich *et al.* 2015, 42, 56). Within the suture zones, there are deep faults, which can also form fault zones. Such faults are the places where some river valleys could have been formed.

Our region is located mainly within the *Ros-Tikich* domain or mega-block (its other names are Belotserkovsky, Belotserkovsky-Odessa, Belotserkovsky-Srednebugsky, Belotserkovsky-Bugsky, Bugsky-Rosinsky tectonic block (Prikhodchenko 2010, 101, 102; Burakhovich *et al.* 2015, 43). Some Tripolye sites are located on the *Kirovograd* (or Ingul) mega-block (Burakhovich *et al.* 2015, 43). These domains are separated by the *Golovanivsk suture zone*, with a number of deep faults. The *Talne* and *Pervomaisk zones of deep faults* are the biggest, between which there are numerous smaller faults – Maidanetske, Vardiev and others (Sheremet *et al.* 2012, 273-280; Burakhovich *et al.* 2015, 44-47).

The Ros-Tikich domain consists of granitoids. Associated with them are the deposits of stone (granite), kaolin, and graphite. Within the Kirovograd domain there are large deposits of uranium and graphite, as well as deposits and ore occurrences of lithium, gold and titanium. Within the Golovanivsk suture zone, new iron deposits, ore clusters and ore fields of radioactive metals (uranium and thorium) are predicted (Burakhovich *et al.* 2015, 59).

The crystalline basement of the Dnieper Upland is covered with a very insignificant layer of clay-sand rocks of the Meso-Cenozoic period. The thickness of this layer

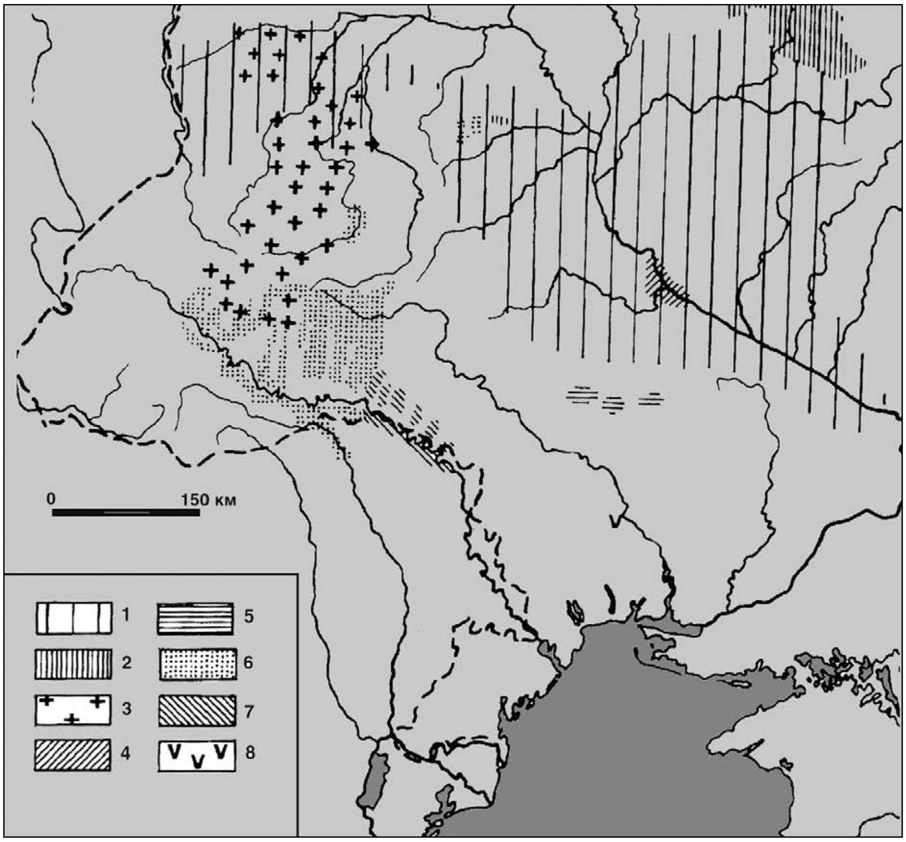

Figure 8. Tripolye flint sources (Petrun 2004). 1 Moraine flint; 2 Desna-type flint; 3 Volhynian flint; 4 Dniepro-Kaniv flint; 5 Crystal Shield flint; 6 Dniester-Prut flint; 7 Middle Dniester flint; 8 Bakshal-type flint.

does not exceed 100-200 m. Due to this, the shield components – *granites*, gneisses, magmatites and quartzites -come to the surface of the earth along river valleys, dry stream beds (gulches) and gullies.

In addition to these rocks, there are some *flint deposits* in the region. According to the alleged origin, distributed here are 1) moraine flint and 2) crystal shield flint (fig. 8).

The first type (moraine flint) is represented by different kind fragments of siliceous rocks of northern origin redeposited at different times that are connected with the Dnieper glaciation. Its remains are found on the northern periphery of the region.

The second type (crystal shield) of sedimentary-diagenetic flint (diagenesis) is found in thin sediments of limestone (with flint inclusions) of the Upper Cretaceous period. These deposits covered (partially or completely) the crystal shield. The outputs of these depositions containing flint have been found in a number of locations in the region, namely:

- in a gully near the village of Apolianka at a depth of about 5 m from the modern surface and above the deposits of limestone clay (Shidlovsky *et al.* 2004, 362)
- deposits and mines for the extraction of silicon raw materials near the village Korobchine (Tsvek and Movchan 1997)
- in the catchment area of the River Velyka Vys (along the banks of rivers, gulches and in geological outcrops), including the territory near the village of Andriyivka (Pichkur 2012, 180)
- in a small gully on the north bank of the pond Geliv, in the village of Maidanetske (Petrun 2004, 207)
- in the gulches Kremenishche and Kremenuvata between the villages Podvysokoe and Vladimirovka on the River Sinyukha (Petrun 2004, 207).

In addition to the moraine and crystal shield flint in relative proximity to the Sinyukha region, there are sources of *Kaniv* or *Dniepro-Kaniv* flint, which was used by the population of Tripolye sites in the Kaniv region (Pichkur and Shidlovsky 2005, 109-123).

Speaking about flint, it should be mentioned that for a long time it was believed that the Tripolye residents in the region (beginning from stage B2) used imported high-quality Volyn flint, but recent work in the region gives reasons to revise this statement somewhat (Shidlovsky *et al.* 2004, 361-365; Pichkur and Shidlovsky 2005, 109-123; Pichkur 2012, 169-181). The authors point out that there are not only the deposits of local flint in the region and that the morphological characteristics of the flint from some of these deposits do not differ from the Volyn flint (on the River Velyka Vys), but also that there is evidence of local production of the tools, both directly at Tripolye settlements and near the places of flint outcrops.

In addition, the information obtained for the region partially disproves the hypothesis on the basis of which it was assumed that at stage B2 Tripolye people in different regions converted (reorientated) from using mainly local flint to using almost exclusively the type from Volyn (Gusev 2005, 59-66).

There is a point of view that one of the main reasons for the choice of places for settlements in some territories in the region (for example near the villages of Apolianka and Korobchina-Andriyivka) was the flint outcrops there, as flint was the main raw material for making tools (Shidlovsky *et al.* 2004, 364).

Flint and granite deposits are of paramount importance for us, since the Tripolye population in the region actively used this raw material. As to the other minerals that are found at Tripolye sites (sedimentary rocks, igneous rocks, mineral aggregates) should be mentioned as well. However, the issue of the location of their deposits has been less investigated (Petrun 2004, 212-217).

2.3.2 Relief

The working region occupies the central part of the *Dnieper Upland*, which is a plateau that gradually descends (drops) in easterly and south-easterly directions. It is located between the River Southern Bug and the Dnieper (between the towns Kremenchug and Dnepropetrovsk). In the north, the upland reaches the River Sob and the Polesye Lowland, and in the south it reaches the Black Sea Lowland; its area is 80,000 km^2 (fig. 9). The formation of the Upland is associated with the protrusions of the Ukrainian Shield.

The surface of the Upland is hilly, with average heights of 220-150 m, and the highest point is 321 m. The Dnieper Upland is characterised by the alteration of flat watersheds, deep river valleys and gulches. A lot of valleys have 3-4 terraces. In the south, the Upland gradually goes down to form the Black Sea Lowland. Gulches, gullies and valleys are the main *mesoforms of the relief* of the Dnieper Upland.

Among the *anthropomorphic forms of relief* in the region are the quarries and dams. So quarries for the extraction of granite and other minerals are being developed here, for example near the towns of Talne and Korsun-Shevchenkovsky.

Figure 9. Landforms of the Tripolye sites distribution area.

2.3.3 Hydrology

Most of the Tripolye sites that are in the focus of this work are located in the catchment area of the *River Sinyukha*, which, flowing into the Southern Bug, is the latter's left tributary and part of its basin. Sinyukha receives the waters of other rivers, the most significant of which are Gorny Tikich, Gniloy Tikich, Tikich and Velyka Vys (*Katalog*… 1957). Let us dwell on it in more detail (fig. 10).

The source of the *River Gorny Tikich* (fig. 11) is in the northwest of the working area (near the village of Frontovka, Oratov district, Vinnytsia region). The river is characterised by winding currents, high, often stony (rocky) banks (there are several waterfalls and rapids). The length of the Gorny Tikich is 167 km. The largest town on the river is Talne (district centre). The Gorny Tikich has about 16 tributaries (right: Bezymyanny, Tsibulevka, Kanela, Kishchyha, Romanovka, Moshuriv, Talyanka; left: Tikich, Postava, Zhytnytsi, Torch, Burty, Serebriana, Kitiha, Berinka, Makshiboloto).

Almost parallel to the Gorny Tikich, but to the north-east, flows the River *Gniloy Tikich*. The source of the river is located near the village of Snezhki (Stavishche district, Kiev region), and it is 156 km long. The bottom and the banks of the river along its whole course, and especially along the upper one, are largely swampy; in the middle course there are outcrops of stone. The small towns Zvenigorodka and Lysyanka – district centres – are located on the river. The river has about 14 tributaries (right: Krasilivka, Svinotopka, Gonchariha, Zhab'yanka, Nemorozh, Popivka, Rosokhovatka; left: Cytsilia, Vovnyanka, Shpingaliha, Boyarka, Pisarivka, Shpolka, Kaetanivka).

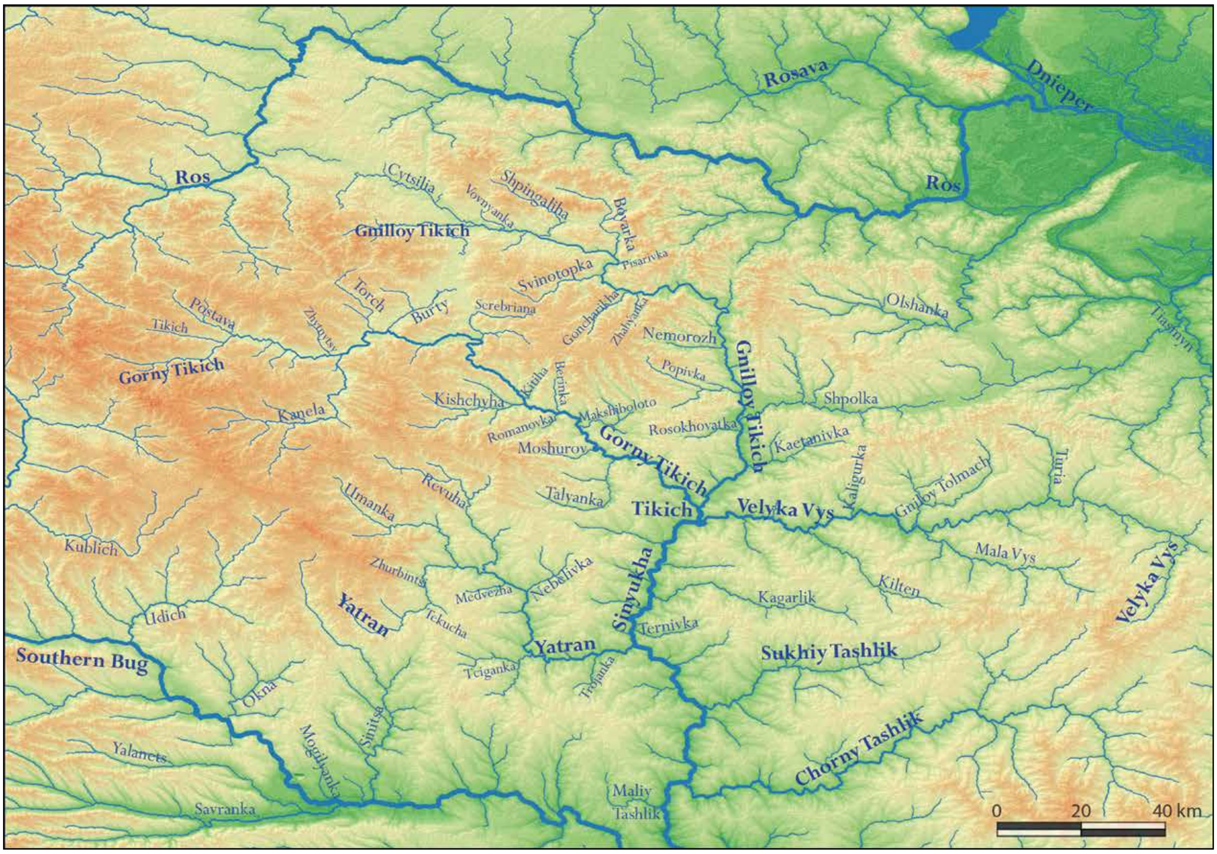
Ros
Rosava
Dnieper
Ros
Cytsilia
Shpingaliha
Vovnyanka
Boyarka
Gnilloy Tikich
Pisarivka
Svinotopka
Torch
Burty
Screbriana
Postava
Tikich
Zhurzhyntsy
Gonchariha
Zhabyanka
Nemorozh
Olshanka
Tiasmyn
Gorny Tikich
Popivka
Gnilloy Tikich
Shpolka
Kanela
Kishchyha
Kaetanivka
Rosokhovatka
Maksimoloto
Romanovka
Moshurov
Gorny Tikich
Kaligurka
Gniloy Tolmach
Turia
Umanka
Revuha
Talyanka
Tikich
Velyka Vys
Kublich
Mala Vys
Sinyukha
Zhurbintsi
Medvezha
Nebelivka
Kilten
Kagarlik
Velyka Vys
Udich
Yatran
Tekucha
Ternivka
Southern Bug
Yatran
Sukhiy Tashlik
Teiganka
Okna
Smitsa
Yalanets
Mogilyanka
Chorny Tashlik
Maliy
Tashlik
Savranka
0
20
40 km

Figure 12. The Sinyukha River. View from the site Vladimirovka, spring 2017.

Both rivers merge into one water artery opposite the village of Dobryanka, after which the river has the name *Tikich*. This river is not long: only 4.5 km to the point of the confluence with the River Velyka Vys.

The *Velyka Vys* flows in the eastern part of our region. The source of the river is near the village of Onikeevo (the Maloviskovsky district of the Kirovograd region); the river's length is 166 km. The upper reaches of the river are swampy; the current is winding. The largest town on it is Novomyrhorod. The Velyka Vysh has about 18 tributaries, the largest (more than 10 km long) are the Turia, Gniloy Tolmach, Kaligurka (on its right) and the Birzolovka, Mala Vys, Kilten and Olshanka (on its left).

Velyka Vys and Tikich merge near the village of Skalevaya (Novoarkhangelsky district, Kirovograd region) into the *River Sinyukha* with a length of 111 km before flowing into the Southern Bug. The town of Novoarkhangelsk lies on the Sinyukha, which is one of the cleanest rivers in the region, since there are no industrial enterprises on its banks (fig. 12). The slopes of the river have outcrops of rock. The largest left tributaries are the Pargovitsya, Kagarlik, Ternivka, Sukhiy Tashlik, Chorny Tashlik, Vilshanka, and the largest on the right are the Yatran, Chumata, Maliy Tashlik. The Sinyukha flows into the Southern Bug near the city of Pervomaisk.

The *Yatran* is one of the right tributaries of the Sinyukha, in the catchment area of which a large number of Tripolye sites are concentrated. The length of the river is 104 km and its source is near the village of Tomashovka (Uman district). The course is rather winding and there are outcrops of rocks. The right tributaries are the Tekucha, Medvezha, Tsiganka, Tsyurupa, Trojanka, the left the Zhurbintsi, Umanka, Revuha, Nebelivka. The city of Uman is located on the River Umanka, and there are a lot of granite outcrops on the Revuha.

An insignificant number of the region's Tripolye sites are located directly on the *Southern Bug* and its small tributaries (for example the Rivers *Mogilyanka* and *Sinitsa*) in addition to the river system described above. From the north, the region

Figure 10 (above left). Rivers of the working area.

Figure 11 (below left). The Gorny Tikich River in Buky, summer 2011.

Figure 13. The Ros River in the town Bohuslav.

is bounded by the river network of the Middle *Dnieper* (the basins of the Rivers *Ros* and *Olshanka*), where some Tripolye settlements of interest to us are located (fig. 13).

In the period under study, these rivers, according to some studies (Berchak 2014, 98-107; Denysik 2014, 5-11) were much more affluent; their water intake increased significantly during the last century (Lavrik 2014). The waters of the rivers in the region are used today for water supply, irrigation, and for the needs of hydropower, as well as for fishing and other purposes. Numerous dams hold back the flow of all the rivers in the region (with the exception of very small ones) to construct ponds and water reservoirs. Ponds are very often created within the territories of villages, and often in one village you can find several such anthropogenic 'lakes'. In the Cherkasy region alone there are 38 reservoirs and 2,314 ponds,[18] and in the Kirovograd Region 85 and 2,756 respectively[19] (fig. 14). All these constructions have significantly transformed the landscape, and today it is difficult to imagine the palaeohydrology of prehistoric times.

The *man-made reservoirs* of the region were built at different times. Thus the construction of some of the ponds is associated with the building of 'water' mills (Chebotarskiy 2014, 120). The first wooden mills are supposed to be associated with the period of Old Rus', when there were ancient Rus' settlements on the rivers (Zvenigorodka). There is little information about them (Sitnik 2014). Stone and brick buildings began to appear in the region several hundred years afterwards. These buildings are still preserved here and there to this day. In the Uman region, such constructions began to develop in the 17th century (Berchak 2014, 100). It was in the late 19th century that the power (capacity) of the rivers began to be used particularly actively (Melnichenko 2011; Chebotarsky 2014, 121-123).

18 https://poiskvodoema.com/vodoemy/ci/1-vodoemy/459-cherkasskaya (last visited 14.06.2019).

19 https://poiskvodoema.com/vodoemy/ci/1-vodoemy/203-kirovogradskaya (last visited 14.06.2019).

Figure 14. Pond in the centre of the village of Legedzyne, summer 2018.

Some of the reservoirs were constructed as part of the infrastructure of *sugar beet factories* (for example in the village of Maidanetske), which was built at the end of the 19th century (Steshenko *et al.* 1972). The production of sugar from beet requires a significant amount of water: water consumption for sugar beet production is one of the highest in the food industry (Lipsky 1962; Palamarchuk 1984; Silin 1967).[20]

The long-lasting use of the land for sugar beet cultivation must be taken into consideration when conducting the analysis of concentrations of elements in archaeological layers, as such cultivation significantly lowers certain concentrations, for example phosphorus (personal communication from Stefan Dreibrodt).

Some other forms of transformation of river systems in the region were the creation of landscape parks (for example Sofiyivka in Uman), the construction of drainage and irrigation canals, as well as hydroelectric power plants. Basically, the region's hydropower plants are small, with a capacity of less than 10 MW. Their construction began in the 1920s, when one of the first small hydropower plants in the

20 The active development of the sugar industry in the Russian Empire began in the 1820s, and by 1913 the Empire ranked second in the world in the production of beet sugar (Spichak and Ostroumov 2010; Plevako 1927; Vobliy 1928-1930). By this time, 203 out of the Empire's 241 sugar factories, were located in the territory of modern Ukraine, since the conditions for production were particularly favourable there. It was mostly due to the sugar industry development (in addition to the reform in agriculture in the Emancipation Reform of 1861) that the Cherkasy region became a significant centre for the production and sale of agricultural products in the second half of the 19th century (Melnichenko 2011a, 93). During the time of Soviet Ukraine, sugar production declined somewhat, but still continued; so, in 1975, 185 factories operated there. A significant drop in sugar production is observed from 1990 to 1997 (from 6.7 million tons to 2.034 million tons per year). Since the 2000s, sugar production has been about 2 million tons per year; in 2018 in Ukraine there were only 46 sugar factories (https://latifundist.com/infographics/view/101 last visited 14.06.2019), three of which are located in the Cherkasy region (https://www.saharonline.ru/factory_ua.php last visited 14.06.2019).

Figure 15. Draining water of the Northern pond in the village of Legedzyne, 2011.

USSR was built in the village of Buki on the River Gorny Tikich in 1929.[21] Many other small hydropower factories were built in the Cherkasy region in the 1950s. However, the functioning of such plants turned out to be economically unjustified and environmentally destructive, and today these constructions are mostly abandoned. One more factor that should also be taken into account is that the construction of hydroelectric power plants and reservoirs led to the extinction of a number of fish populations (Chebotarsky 2014, 124).

Today, in general, the use of many reservoirs in the region has decreased; they are used only for the purposes of irrigation, fish farming and recreation. The bottom and the banks of the ponds are often not cleaned and therefore they are silting up and becoming swampy and overgrown with reeds and trees. Many ponds are leased. However, when the tenant considers the object to be unprofitable, he can, without any good reason, drain the water in an inappropriate season (for example to collect fish). Such actions lead to overgrowth of the bottom and the actual destruction of both the pond and the riverbed (which, for example, happened in the village of Legedzyne in 2011, see fig. 15). As a result of the human intervention in the region's water resources, the floodplains (lakes) and oxbows have been almost completely destroyed, and the process of steppe advancing can be observed (Chebotarsky 2014, 125). The floodplains of rivers have lost their main characteristic – flooding. High waters and floods have disappeared, the banks do not receive overflowing sediments, and thus floodplain soils are not enriched any more (Denisik 2014, 7).

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21 https://cherkasy24.info/497-bucka-ges-bula-pershoyu-v-ukrayin-slskoyu-gdroelektrostancyeyu.html (last visited 14.06.2019).

2.3.4 Soils

Today, in the region where the Tripolye sites under study are located, there are mainly two types of soils: *chernozems* and *grey forest soils*. The former are a bit more dominant and represented by *regraded* and *podzolised chernozems*.

Typical (it is the type name) chernozems are practically not represented in the region. *Podzolised* chernozem is a kind of soil which, according to some data, has passed the steppe and forest stages of development. Due to this, it has the features of grey forest soils (alkalinity, acidity, reduced saturation of the bases, etc.) along with the 'typical' characteristics of chernozems. *Regraded* chernozems are a subtype of podzolic ones; there are some theories concerning their origin: 1) their formation was the result of the podzolic and leached chernozems improvement; or 2) their formation was a natural soil-creative process in places of complete forest destruction and the development of rich herbaceous vegetation.

Grey forest soils are represented by two kinds: *clear grey and grey podzolic* and *dark grey podzolic*.

All of these soils have *high natural fertility* or potentially high (light grey). These soils were formed on loess and loess clay loams. The deposition of loess sedimentary rocks (minerals) is associated with the Weichselian Pleniglacial (*c.*27 ka) and the Weichselian Late Glacial (*c.*11 ka) of the last Ice Age. W. Kirleis and S. Dreibrodt (2016) highlighted the occurrence of Holocene forest soils predating the Tripolye occupation phase of Maidanetske and adjacent sites of the Southern Bug-Dnieper interfluve. Accordingly, the region was forested and the chernozem formation and opening of the previously wooded landscape started synchronously or after the Tripolye occupation. As a working hypothesis, Kirleis and Dreibrodt suspect a co-evolution of the chernozem and the Tripolye occupation and draw a scenario of a land-use-induced steppe formation (agricultural steppe).

Today, many soils in the region are polluted, some do not meet sanitary standards,[22] and the hard erosion to which the soils are subjected today is affecting/destroying the archaeological sites more and more.

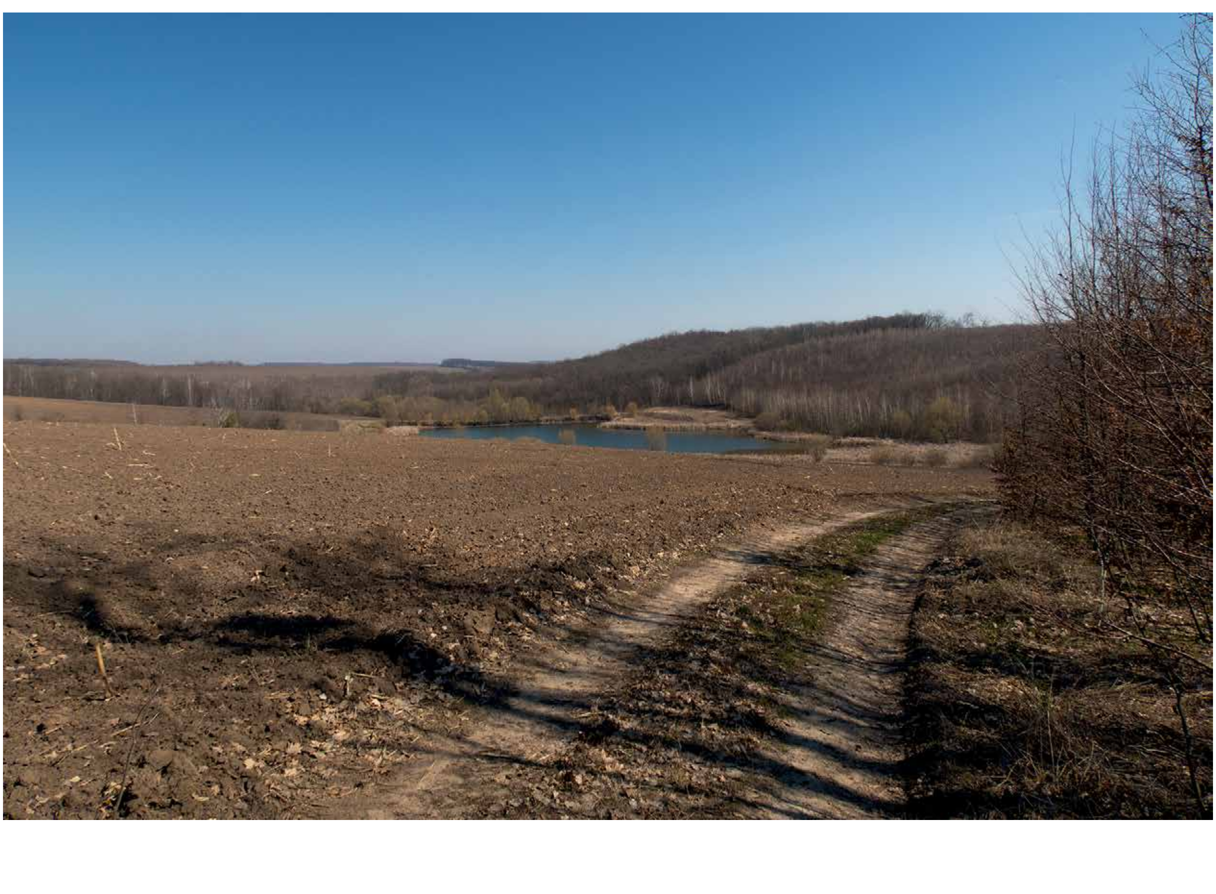
2.3.5 Vegetation

In addition to the river system and soils, vegetation is one of the natural components of the region which has also undergone tremendous transformations. Today, indigenous (native) vegetation practically does not exist; it has been destroyed in the last 300 years.

For example, natural *forests* – defined as, among other things, the ecosystems of the biosphere, which is made up of certain kind of plants such as trees, shrubs, grasses, mosses, forest floor and underground layer, as well as the corresponding layers – do not exist in the region any more. Instead, there are minor *plantations* of trees (pines, alders), which in the Cherkasy region, for example, occupy up to 15% of the territory (fig. 16 and fig.17). In addition, many roads and fields are enclosed by so-called '*windbreaks* (shelter *belts)*', which, of course, cannot be called forests, since, because of their size, no forest ecosystem can be developed there. Until recently, remains of natural forest landscapes could be found on the floodplains of rivers. However, due to active deforestation, flooding, drainage works and ploughing of the floodplain, there are practically no natural forest landscapes left (Denisik 2014, 7).

In the region, there are several nature reserves which have been organised to protect some natural areas. Among them is the so-called Black Forest (Kirovograd region), a large partially natural oak-hornbeam forest massif, where the authentic flora, fauna and natural lake with swamp part are partially preserved. It is a

22 https://dzvin.media/news/naybilsh-zabrudneni-grunti-na-smilyanshhini-ta-umanshhini/ (last visited 14.06.2019).



landscape, a kind of reserve of national importance, created in 1975. Unfortunately, modern satellite pictures show that significant parts of the forest are undergoing logging, despite the protected status of the area including part of this forest.

The situation was somewhat different in the 17th century when *Guillaume Le Vasseur de Beauplan,* a French military topographer for the Polish service, worked in the region and made a map of Uman lands (and of the whole of Ukraine). On this map (mid 17th century), the territory to the north of Uman is covered with a large forest, which at that time was already being cut down to access *potash* (potassium carbonate). Potash was used to make soap and glass (Berchak 2014, 103). On the later maps of the 18th century, the region is still full of forest symbols, although they are no longer seen near Uman. A document issued by Russian Emperor Alexander III in 1888 – 'Forest Conservation Regulations' – eloquently testifies to the scale of logging in the two following centuries. This document protected forest plantations that prevented landslides in the settlements and the banks of reservoirs from soil erosion (Berchak 2014, 103). In the 20th century, the territories covered by forests were cleared to expand the area of fields.

As a result, most of the territories between the rivers today have been turned into *fields* that are used for agricultural purposes (fig. 18). Active expansion of the field landscapes has been observed since the late 17th and 18th centuries, when the present development of the region began (with different parts of it settled at different times – if most of the villages in the Talne area were founded in the 17th century, then those in the Uman area were founded in the 18th century).

The vegetation of the study area is determined by the semi-arid forest steppe climate with dry but not drought summers (Kirleis and Dreibrodt 2016). The potential natural vegetation under present conditions would be characterised by a mosaic-like situation comprising woodland patches, patches of dry scrub and meadows or grassland. Summer-green oak-hornbeam-forests would be dominated by common oak, maple (*Acer*), ash (*Fraxinus*), hornbeam (*Carpinus*), and lime (*Tilia*).

Figure 18. Large agricultural fields close to Tripolye site Onopriyivka, spring 2017.

Figure 16 (above left). Plantations of trees and small agricultural fields close to the village of Legedzyne.

Figure 17 (below left). Plantations of trees and large agricultural field. View of Tripolye site Chizhivka, spring 2017.

Because of the border situation between steppe and forest steppe, the plant cover of the working area is potentially particularly sensitive to climatic changes. According to different palaeo-ecological archives, this is reflected in the vegetation history of the study region (Kremenetski 1995; 1997; 2003): under temporarily warmer and more humid climatic conditions, broad-leaved forests spread during the early Holocene, reaching their greatest extent in the phase between 4800 and 3200 BCE in the Tripolye period. These woodlands consisted of oak, lime, hornbeam and ash and reached the current Black Sea coast following the big river valleys of Dnieper, Southern Bug and Dniester. Later, after 3200 BCE and intensified during the period 2125-1700 BCE, a decline in the forestation and an expansion of the steppe zone to the north occurred, related to cooler and drier conditions.

Today, our region is *industrial-agrarian*. An important part of its economy is agriculture; almost all the former steppe, palaeolakes, oxbows and partially floodplains of the rivers have been ploughed up for *arable land*. It is necessary to take into account the fact that crops that are grown here (soybean, sunflower, corn) greatly exhaust the soil.

2.3.6 Climate

The modern **climate** of the region is moderately continental. Winters are mild, with frequent thaws; summers are warm, somewhat droughty. The average annual air temperature is 7.2°, in July 19.5°, in January -5.9°, the maximum is 39°, and the minimum is -37°. The period with a temperature of 10° is 160-170 days. The annual rainfall is 450-520 mm. Prevailing winds are from the north-west.

Only a limited and partly inconsistent amount of information is available regarding the climate in the late 5th and 4th millennia BCE (Kirleis and Dreibrodt 2016; Müller *et al.* 2017). Concluding from the point of view of soil formation phases (pedogenic cycles), which are expected to occur under warm and dry conditions, there seems to be a colder and wet phase to start with in the first half of the 4th millennium. In contrast, a change towards drier conditions is suggested for the same period based on southern Ukrainian pollen records (Kremenetski 2003). Both models agree with regard to the expectation of clearly drier conditions starting from the mid 3rd millennium BCE.

Also, T. Harper (2016) discusses possible coincidences of so-called Bond climate events and Tripolye settlement history. He tries to compensate for missing palaeoenvironmental (pollen) archives in the study region by using pollen data from the wider region including the Carpathians, Moldova and Ukraine in a modelling approach. On the basis of the results, he suggests a clear increase in precipitation and a drop in temperature which occurred with a time lag between about 3850 and 3150 BCE due to the so-called 5.9 ka event. He argues that this climate change might be an important factor for the emergence of Tripolye giant settlements, which are interpreted as the short-lived 'false urbanization' of recent migrant populations within single sites.

Summing up the geographical introduction to the description of the region, it should be noted that over the past millennia natural geosystems have undergone significant changes. They have been replaced by the natural *anthropogenic landscapes* that now dominate. To denote the latter, some geographers suggest using – instead of the traditional definition of '*forest-steppe*' – the '*forest-field*' (*anthropogenic field-forest*) (Denisik 2001), although this term does not seem to be entirely appropriate, since the forests there have been replaced by tree plantations. Apparently, modern landscapes have nothing to do with the landscapes of not just the Tripolye time, but even medieval ones.

Before looking more closely at the Tripolye *sites* of the outlined region, let us consider more intently the existing relative chronology of the region, since without this knowledge we can easily get lost in a huge number of these settlements.

2.4 Previous relative chronology of Tripolye sites

The relative chronology of the region was compiled gradually and is based fundamentally on all the principles and models described in the *previous part*. The basic stages (from A to C2) highlighted by Passek plus stage B1-B2 according to Vinodradova (Passek 1949; Vinogradova 1972; 1973) have been used here until now. In the second half of the 20th century, a number of local variants and/or 'cultures' were identified which filled out the 'skeleton' of Passek's chronology.

It was Tamara Movsha who suggested the main division of Tripolye sites of the region into 'groups' or 'cultures'. In 1972, she singled out two lines of development: *Penzhokove*[23] and *Vladimirovka*. The former 'continued the development' of the Borisivka line (early Tripolye with incised decoration), while the latter had unknown 'roots' in this region (with painted bowls) and, on its basis, the sites of the *Sushkovka-Tomashovka*[24] group were formed (Movsha 1972, 7). It is worth mentioning that Movsha described the sites of the Sinukha river basin geographically as Southern Bug sites (using the latter as the name of the region), and she called the sites that were closer to the Dnieper 'Middle Dnieper sites' and identified there two more groups of sites – Shcherbanovska and Kaniv – with incised decoration and painted ceramics respectively. They are replaced by the sites of two types – Kolomiyshchina 1 and Ros (Movsha 1972, 10).

In the 1980s, as a result of work in the Uman district, Movsha singled out *Kosenovka* sites, which, in her opinion, were of different origin (do not have a typological link to Tomashovka sites). She considered the Kosenovka group of sites to be an eastern version of Zhvanets (Brinzeni) sites (Movsha 1984a) and pointed to the proximity of Kosenovka sites to Varvarovka 15 on the Middle Dniester (though chronologically later). Three successive chronological stages were also outlined (Movsha 1990, 59).

More broadly, Movsha considered the *two lines* of development of Tripolye ceramic styles – one with incised decoration and the other painted – as two large cultural and historical areas inhabited by a number of local groups (Movsha 1972, 21).

Unfortunately, in the second half of the 20th century, it was apparently not customary when publishing archaeological material to describe in detail the methods by which the researcher came to his/her conclusions. This makes it difficult to work with this material now. Movsha formed her conclusions from visual observations of ceramic material and stratigraphic observations of multilayered sites (on the Dniester) and/or kurgans (in which Tripolye ceramics were also present). She also paid great attention to the presence of similar elements, on different sites (in ceramics – images of animals, general morphological features; in housebuilding – peculiarities in platform making, etc.), as well as the so-called 'imports' for synchronising certain sites.

Conducting a more detailed study of Tripolye sites with the ceramics with incised decoration, Elena Tsvek suggested that it was possible to differentiate the '*Eastern Tripolye*' Culture and in particular its Bug-Dnieper local variant in our region (see the previous part).

From the 1960s to the 2000s, the researcher carried out the excavations of 30 settlements and investigated 85 '*residential, economic, religious buildings and economic areas*' (Tsvek 2012, 228). To construct the chronology, Tsvek used mainly statistical calculations of various types of vessel decoration, at the same time examining separately the 'kitchenware' and two types of its surface decoration. An important role in building Tsvek's chronological constructions belongs to the variety of ceramic 'imports' found at the settlements, including pottery typical of the Tisapolgar, Bodrogkerestur and Lendel cultures (Tsvek 1999, 31-33; Tsvek 2006, 26).

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23 Today Bugachivka.

24 In the course of time, only the Tomashovka group label is used to define sites with characteristic ceramics.

In the 1980s S. Ryzhov started his work with the pottery material from B2-C2 sites of the 'Bug-Dnieper interfluve'. After the intensive surveys and excavations of these years, the basic (more detailed than it had been suggested before) chronology of Tripolye sites with painted ceramics was compiled (Kruts and Ryzhov 1985, 45-56; Kruts 1989, 119-120; Kruts 1993, 31). The researchers suggested ten chronological phases (three of which were for the Kosenovka group). However, this chronology still needed to be supported by strong 'ceramic evidence'.

By 1999, Ryzhov had processed more than 2,000 whole and restored vessels and about 200,000 pottery fragments from this region (Ryzhov 1999, 181). Based on these data, he compiled a *general ceramics classification* of the region and its *relative chronology* (Ryzhov 1999; 2012, 70-115). Additionally, Ryzhov's practical achievement was that he attempted to unify very diversified terminology used to describe ceramics (1999, 184). His classification and relative chronology are used in most Tripolye research into Bug-Dnieper interfluve sites (*e.g.* Kruts *et al.* 2013, 41; Müller *et al.* 2016a, 165-167; Müller *et al.* 2017, 23-24; Brandstätter 2017, 36).

Since the peak of the mega-sites development was during the B2-C1 periods, the chronology of which was created by Ryzhov, let us look at Ryzhov's work in more detail. Ryzhov analysed ceramic material from any collection in two stages. Firstly, he classified the finds. He classified ceramics according to '*technical, technological, morphological and stylistic defining characteristics (criteria)*' (Ryzhov 1999, 182). Considering '*technical and technological'* indicators to be the most conservative (Ryzhov 1999, 116), he singled out here three categories of ceramics: container/tare, kitchenware and tableware, considering (although with some reservations) that they reflect the special function of the vessels. *Morphologically*, he singled out eleven types of vessels (including binoculars) with their subsequent division into subtypes and variants (Ryzhov 2012b, 144-144). Apart from that he examined the *stylistic* features on bowls (singled out eight decorative schemes) and other vessels (twelve decorative schemes were differentiated). The decorative schemes were divided into a number of variations (Ryzhov 2012b, 146-150). Thus Ryzhov's classification was a kind of mixture of unsubstantiated division by functional criteria and typological grouping according to morphological and stylistic features.

The next stage of Ryzhov's work was to carry out his *formalised statistical analysis*. To calculate the ratio of tableware and kitchenware and the types of vessels and ornamental patterns – a part of the assemblage (collection) – he counted all the ceramics. He counted as one 'unit' complete vessels, fragmented vessels and separate fragments which could be reconstructed (the type and decoration of which could be determined) (Ryzhov 1999, 29). Based on his calculations,[25] he compiled the diagrams of:

- The ratio of tableware and kitchenware.
- The proportion of morphological types of ceramics.
- Different types of ornamentation.

Having compiled such diagrams for different sites and using the method of their comparison, he recognised as 'well defined':

- Local groups.
- Their chronological sequence.
- The phases of these local groups.

In particular, he 'substantiated the reasons' for singling out the Vladimirovka and Tomashovka groups (Ryzhov 1999; 2000a).

25 As it looks, he counted each house separately and then calculated the total to obtain the result for the whole site, although it is not clearly indicated in his texts.

In 1993, he singled out the *Nebelivka group* as a 'transitional link' between the above-mentioned groups (Ryzhov 1993a, 101-114). For this group, he assumed the existence of *two* phases, and for Tomashovka *four* (Ryzhov 2012a). In a recent paper (Ryzhov 2015, 153-166), the author suggested identifying *three* consecutive chronological stages (phases) in the Vladimirovka group, as well as transitional settlements (phases?) between the Vladimirovka and Nebelivka groups (Gordashivka 1, Ryzhov 2015, 162).

Ryzhov attributed the Kosenovka group to period C2 and believed that it replaced Tomashovka sites. For the Kosenovka group, he proposed the existence of three phases (Ryzhov 1999, 158); the last phase, which was more clearly singled out later, was attributed sometimes to this group, sometimes to a special type of 'Kochergintcy-Shulgovka' site, and sometimes to the 'final stage of the late phase of the culture in the region' or a 'separate local group' (Ryzhov 1999, 161; Ryzhov 2001-2002, 195).

In the course of time, the Ryzhov scheme was somewhat altered. Thus, while engaged in mathematical modelling, A. Diachenko proposed to single out several stages for the Nebelivka and Tomashovka groups; he also revised the position of a number of Ryzhov chronology sites (Diachenko 2009a; 2010; 2012). In general, Diachenko proposes a method for the clarification of the chronology and/or the dating of sites through data regarding their size (and number of houses) and therefore through the context of the demographic development of the population in both the studied and neighbouring regions. A similar approach has also been proposed for other regions (Tarapata 2015, 67-72).

In the 2000s, E. Ovchinnikov, having worked in the eastern parts of the Cherkasy region, suggested singling out or, to be more precise, reanimating the *Kaniv group* of sites distinguished by Movsha (Ovchinnikov 2005; 2007; 2014; and others), ascribing a number of Nebelivka settlements to it. He supported his arguments about the existence of a separate group by the fact that there are a number of technical and technological differences in the manufacture of ceramics between the Nebelivka and Kaniv groups (Ovchinnikov 2005; 2007, 11-13). Ovchinnikov attributed the Kaniv group sites to the 'Kaniv Dnieper region' (to which they belong geographically), having removed them from the 'Bug-Dnieper' region.

It should be noted that the shorter the chronological period for a particular site is (that is, reduced to the level of *subphase* or *stage*), the more often its position changes depending on the viewpoint (position) of different researchers, or years of publications. Sometimes a 'site location' is also changed (being moved from one 'local group' or 'culture' to another, *e.g.* from Eastern to Western Tripolye). For example, the Andriyivka site was ascribed first to the Kaniv group (Movsha 1972, 10) and then to the Vladimirovka group first stage (Ryzhov 1999, 42), and a bit later to the second stage of the same group (Ryzhov 2015, 162). The fluctuation is observed especially at the problematic 'transitional' stages – from the 'Eastern' to the 'Western' Tripolye, or from the Vladimirovka to the Nebelivka group. Thus, when Ovchinnikov distinguished a new Kaniv group of sites (Ovchinnikov 2014), he assigned a number of Nebelivka settlements to it.

As a result of the work which had been carried out, including that on the periodisation of the region's B2-C1 and C2 periods, the so-called 'Western Tripolye Culture' (Ryzhov 2007) was differentiated. The relative chronology of this segment of Tripolye development today seems evident in the following table 11:

Thus, today, we have a well-made harmonious chronological construction 'Vladimirovka-Kosenovka', derived largely from Ryzhov's work. However, there are a number of problems related to it.

First, Ryzhov's statistical calculations do not show real numbers. Moreover, these calculations are generalised at a 'local group' level, without the consideration of a single site or household level.

Second, it may not be very correct to count (to obtain the total) unbroken and reconstructed vessels together with separate shards to calculate the proportion/ratio

Phase	Local Group	Phases of Local Groups (and associated sites)		Subphases
	Vladimirovka	**1** Fedorovka-Mihailovka		**V early**
		2 Vladimirovka, Andriyivka, Maslovo		**V late**
		3 Peregonivka, Poloniste		**V late**
B2	Transitional phase	Gordashivka		
	Nebelivka	**1** Pishchana, Nebelivka, Krivi Kolina, + 14 sites (see tab. 19)		**N1**
		2	**Stage 1** Hlybochok, Yampil, Kolodiste 1, 2,	**N2**
			Stage 2	**N2**
C1	Tomashovka	**1** Popudnya, Stara Buda, Sushkovka, Dzendzelivka		**T1**
		2 Chichirkozivka, Dobrovody, Yatranovka, Novoukrainka		**T2**
		3	**Stage 1** Talianki, Maidanetske, Moshuriv 1, Talne 2, Vasilkiv, Kochergintcy-Pankivka	**T3 s1**
			Stage 2	**T3 s2**
		4 Tomashovka, Gonchariha, Bondarka 2		**T4**
C2	Kosenovka	**1** Kosenovka, Apolianka, Korgeva		**K1**
		2 Olhovets 1, Vilshana Slobidka, Zavadivka		**K2**
		3 Kochergintcy-Shulgovka, Sharin, Rohy and 9 other sites (see Ryzhov 2001-2002)		**K3**

Table 11. Relative chronology of 'Western Tripolye' subphases (after Müller 2016, 10).

of different vessel shapes, since these fragments can distort the result obtained (in principle, all the totals could be recalculated for verification, but again if the real numbers, that is to say, the exact number of whole forms and the exact number of fragments, were available).

Third, the chronology obtained has not been practically tested independently from typological models by scientific dating methods and requires verification.

And lastly, the most important problem when working with the material studied by Ryzhov is that most of it has not been published. In his dissertation (which has not been not published either), there are 96 pages of illustrations with drawings of ceramics, but neither the context of the finds nor the house number is indicated anywhere.

Having an idea of the current state of the relative chronology of the Sinyukha basin region, let us now turn to a brief description of the sources of Ryzhov's work.

2.5 Sources for chronological constructions

For the writing of this work, three main groups of sources have been used: settlements, ceramics and radiocarbon dates.

2.5.1 Sites of the region

Several studies have already been devoted to investigating the development dynamics of Tripolye settlement patterns such as the measurement and mapping of settlement sizes (*e.g.* Kruts 1989; Diachenko 2010a; Diachenko 2012; Ohlrau 2020).

The Tripolye sites of the region are also one of the sources of this study. The list of settlements is provided in Appendix 1. Sources for this list are Shishkin 1985; Kruts *et al.* 1981; Kruts *et al.* 1982; Kruts *et al.* 1985; Kruts *et al.* 2000a; Kruts *et al.* 2011; Kruts *et al.* 2013; Koshelev 2005; Videiko *et al.* 2004; Diachenko 2010b; Ovchinnikov 2014; Ryzhov 2015 and others.

In total, about 310 Tripolye sites that belong to different subphases have been found in our working area and 119 of them are located in the Sinyukha river basin. Most of them have been assigned to local-chronological groups or types of sites and even to subphases or stages of these groups. As for the other sites which are known (most of them are not included in the list), the degree of their investigation and publication is much smaller. For this reason, some difficulties have arisen during the listing of the settlements.

For many sites there is no information about their exact location, chronology (especially about subphases) and their sizes. Most sites are considered to be settlements, and one is the flint mining site (Rubaniy Mist). All the sites can be divided into five categories of settlements (according to the stage of research):

Category 1

The best-represented settlements are those for which there are the plans created as a result of carrying out geomagnetic surveys.

These surveys were conducted from 1970 to the mid 1990s by the employees of the Institute of Geophysics of the Academy of Sciences of Ukraine in Kiev (works of Dudkin, Zagnia, Rusakov and Golub). This team made maps of eleven settlements in the region: Mogilna 2, Mogilna 3, Fedorovka-Mikhaylovka, Glubochek, Yatranovka, Yampol, Moshuriv 1, Moshuriv 3, Olkhovets 1, Maidanetske, Talianki (Koshelev 2005, 60-181, 255-307). Several plans by Zagniy (Peschanoe and Talne 2) and Golub (Kosenovka) are unpublished. Also, a magnetic survey was started in several other settlements – Vesely Kut, Trostyanchik – but it did not show clear anomalies, so the studies were stopped (information from E. V. Tsvek).

The settlement plans obtained are informative to a varying degree. For Maidanetske and Talianki, a simplified method was used to carry out the survey, which resulted in the revealing of only the strongest magnetic anomalies. These, as shown by subsequent excavations, represent the so-called *ploshchadkas* (Koshelev 2005, 283). Thus the basic structure of the settlements became quite clearly visible on these plans. Some of the other plans were created with the use of an improved technology, which recorded a much larger number of anomalies of various natures. Therefore, in practice, it is much more difficult to work with these plans: in many cases they give only a very general idea of the settlement layout.

Since 2011, magnetic surveys have been conducted and maps of settlements more clearly showing the components of the sites have been made.

Unlike with previous work, due to the use of the equipment, it has now become possible to more accurately show the location of various objects on the plans in addition to those that had been recorded by previous surveys (so-called *ploshchadkas*), which were not seen on the archaeomagnetic plans before (*e.g.* pits, potter's kilns, 'mega-structures', ditches, trails, etc.).

By 2017, 16 settlement plans of this kind had been made (see Chapman *et al.* 2014; Muller *et al.* 2014; Rassmann *et al.* 2014; Rassmann *et al.* 2016; Ohlrau 2020) that represented the whole settlement (Apolianka, Talne 3, Moshuriv 1, Moshuriv 3) or only part of it (Maidanetske, Talianki, Dobrovody, Hlybochok, Kosenovka, Grebenyukiv Yar, Vesely Kut, Vladimirovka, Chyzhovka) or the part of the settlement on the area available for the survey (Nebelivka, Smaglievi Beregi [Moshuriv 2], Rogi).

The size and chronological position (within the limits of the existing relative chronology) have been determined for the settlements of this group. It is important to bear in mind that these settlements have been investigated to a very different degree. Thus the settlements of Talianki, Maidanetske and Vesely Kut underwent systematic long-term excavations, as a result of which 51 (by 2018), 73 and 24 houses respectively were completely excavated. However, only a small part of them has been published. At some of the sites, only one or two *ploshchadkas* were excavated (*e.g.* Hlybochok, Moshuriv 1, Moshuriv 3, Yampol), and some of these settlements were not excavated at all (Fedorovka-Mikhaylovka, Yatran, Rogi, Smagliyev-Berega-Moshuriv 2).

Category 2

The settlements for which there are data on their location and size were obtained as a result of a) deciphering Shishkin's aerial photographs,[26] b) field surveys and excavations. Some of these settlements are quite well known, their approximate size has been calculated and they were placed in the chronological table. Among the quite well-known settlements are Tomashovka, Sushkovka, Chichirkozivka, Olkhovets 1 and others. Shishkin published aerial photographs of 24 sites in total (Shishkin 1985, 74-76); magnetic surveys were later made on twelve of them.

Category 3

The sites at which fieldwork (surveys and excavations) were conducted were consequently assigned to a particular chronological stage and/or local group. However, their location is not always exact. Particularly difficult in this respect are the small sites, as well as settlements of the Early, Eastern and Final Tripolye, for example the sites of Krasnostavka, Lisove and others.

Category 4

Several settlements' exact locations are known on the map, but their chronology is not clear. They are the sites known only from the surveys.

Finally, there are sites that have neither a clear territorial reference nor a chronological position. Most of them are known from the surveys organised both at the beginning of the 20th century (for example Gamchenko's explorations) and in the second half of the 20th century (the surveys of Stefanovich, Didenko, Harban, Biletskaya, Nerodoy, and others – Videiko *et al.* 2004, 566-700). Sometimes, rechecking the location of a once-mentioned site did not give any results (see *e.g.* Kruts *et al.* 1981, 5). The fact that there is a certain amount of material does not necessarily indicate the existence of real settlements. Moreover, these sites do not even have an approximate chronological reference. For these reasons, these sites are not mapped in this work and therefore have not been analysed.

During the work on the sites, some discrepancies arose because of the names of the settlements. So several of them have different names in the literature – 'old' and 'new' – which can be explained by the fact that the sites were investigated by different specialists, who gave different names to the same settlement. There are a few such sites: 1) Iskrennoe (as indicated on Shishkin's deciphered photos) is called Vasilkov in other works; 2) site Moshuriv 2 is located in the ravine Smaglievy Berega, and both labels are in use, although the latter is more widespread in the literature (Ohlrau 2020); and 3) the settlement of Fedorovka is called Mikhailovka in earlier works (Shishkin 1985), which makes sense (the settlement is located to the east of the modern village of Novomikhailovka). So, whenever it is possible, double names are used in this work.

Particular attention should also be paid to calculations of the **settlement area**. This is a rather important aspect, because at the core of this study are the so-called mega-sites. More accurate measurements close to the realities will make it possible to give a more correct definition of the concept of mega-sites. As the previous studies have shown, data on the area of Tripolye sites are not always correctly calculated (Diachenko 2010a, 17-22). So Diachenko, in his work, pointed to the shortcomings of the calculations of settlement areas in previous years (using the rectangle formula – the ratio of the width and length of the site) – and recalculated the settlement areas of the 'Western Tripolye Culture' (using the oval area formula). Due to this, the assumed area of almost all settlements turned out

26 Shishkin was a military topographer who discovered a number of Tripolye settlements by deciphering his aerial photographs; also, it was due to him that giant settlements or mega-sites were discovered.

to be smaller (the largest sites have undergone the most significant changes, for example Talianki from 450 hectares to 341.5 hectares [Diachenko 2010a, 21] and meanwhile with a magnetic plan 320 hectares).

In addition to the settlements area of the 'Bug-Dnieper Region', those of the Middle Bug and Chichelnyk regional groups were recalculated with the use of the same method (Tarapata 2014, 6; Tarapata 2015, 70). Of course, such measurements are more accurate, but their results depend directly on the scrupulous, thorough measuring of the Tripolye findings distribution zone in the fields and the degree of preservation of the site. So, for example, some areas have undergone less erosion, which can reduce the area of the site, or excessively intense destruction, which can lead to the fact that the material extends beyond (are found far outside) the limits of the settlement.

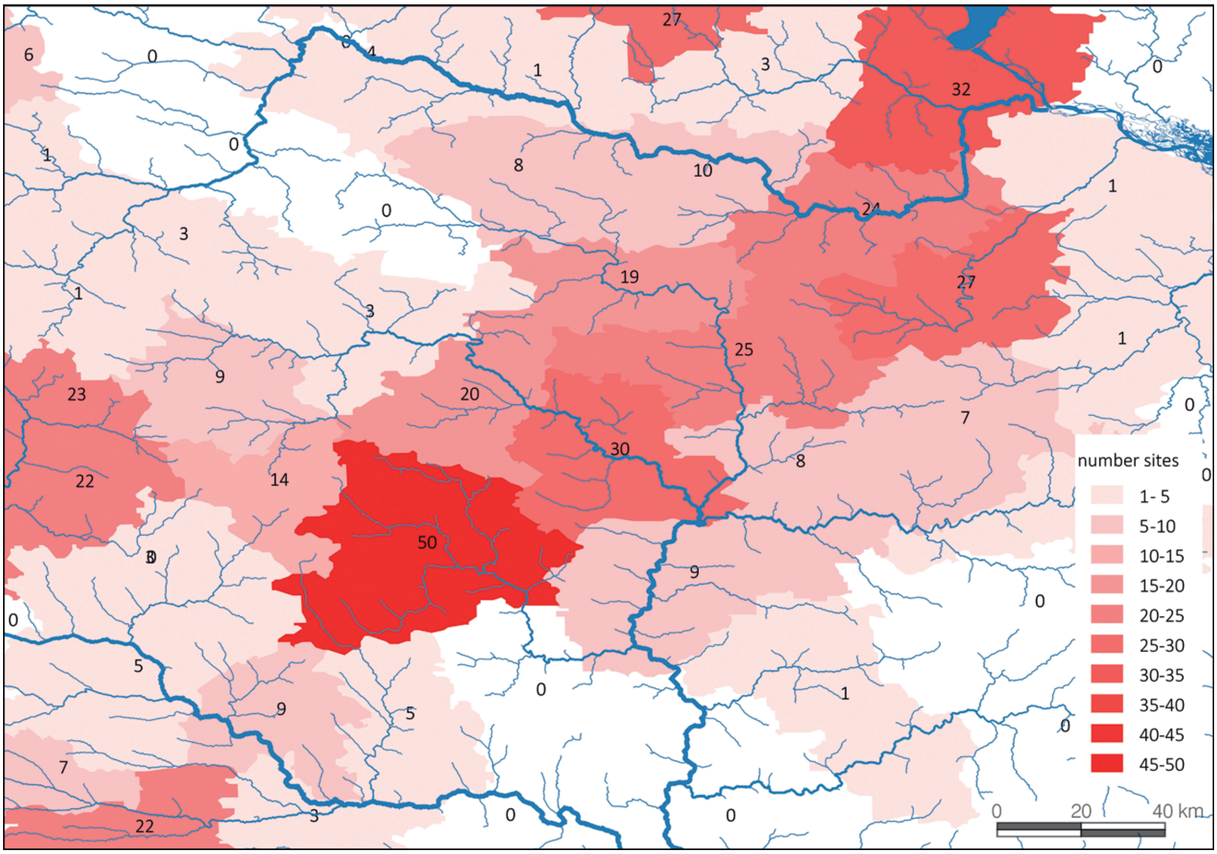
Today there a number of new ways that enable a more precise calculation of the area:

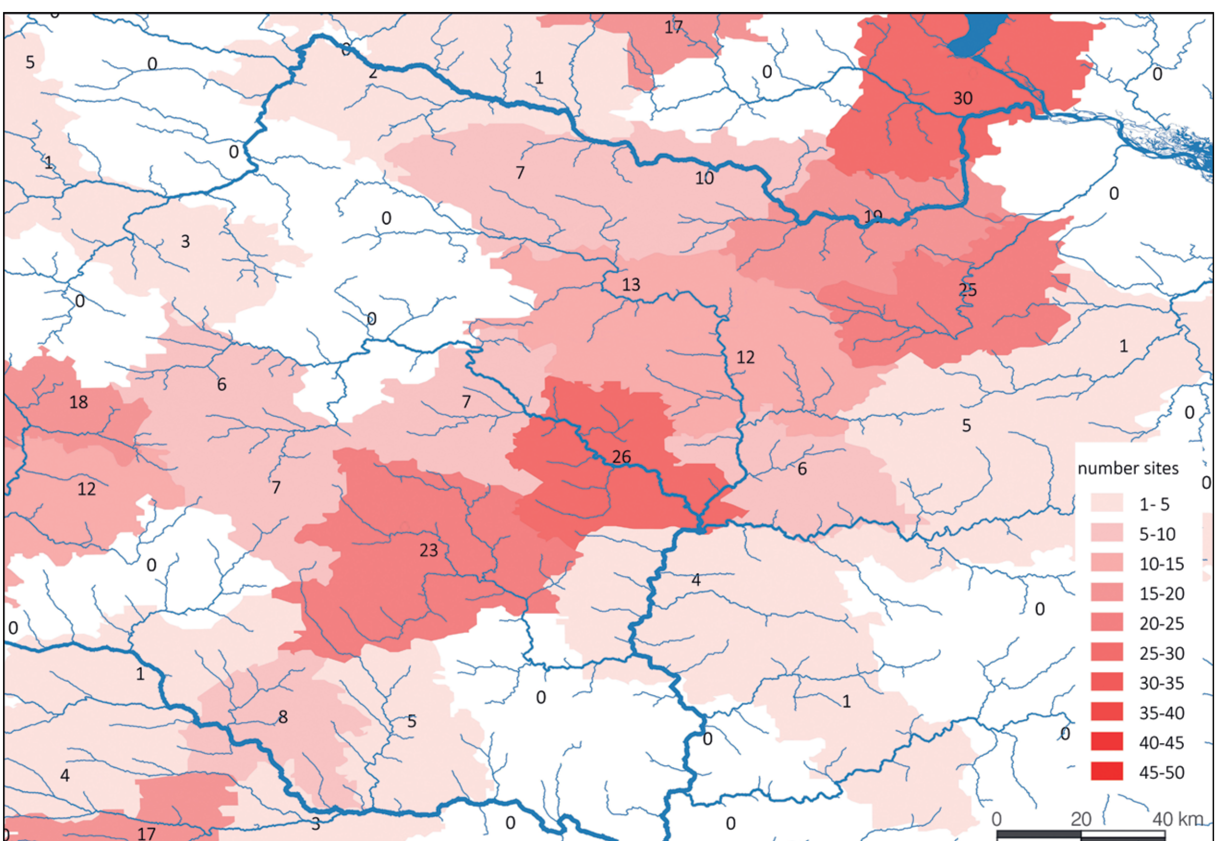
1. The most accurate data on a settlement area can be obtained when making magnetic maps of settlements. Altogether, 20 (plus two Early Tripolye settlements from the Southern Bug) magnetic maps of settlements have been created in our region.
2. Another way to obtain more accurate indicators of the sizes of the sites is to calculate them from aerial photographs (*e.g.* historical Google pictures in the software Google Earth) on which the contours of large Tripolye sites are quite clearly visible. Verification of the settlement area with the use of this method showed that only part of the data on their size corresponds to the new data received; other settlements have a smaller area. For example, the areas of sites Peregonivka and Valyava are less than half. It should be noted that large settlements are particularly well seen on satellite pictures. It is especially true for the settlements of periods B2-C1. The latter can be explained by special methods of housebuilding during these phases: when a standard house was built on a massive clay 'platform' that was properly burnt.
3. In some cases, more accurate estimates of the sizes of settlements could be obtained by means of significant points identified in older survey maps of Shishkin and Kruts.

The list of sites with data on the settlement areas is given with a reference to the methods of their calculation (see Appendix 1). In addition, it is proposed to introduce a distinction of (for sites that can be seen from satellite images) and indicate the site area which is seen in the photo and the proposed (complete) reconstructed area.

Let us turn to the collected dataset on Tripolye sites of the key region and work zone. Thus we are working with 310 sites in total; 119 of them are located in the Sinyukha river basin; their number varies for different periods and different local groups. This selection reflects the possible realities quite well, as the surveys in this region were conducted quite intensively. Of course, in addition to these sites there are at least 140 places which have been mentioned as Tripolye sites, but they are not ascribed to any period or group. To include them in the list of settlements of the region, they need to be checked, as the occasional discoveries of ceramics do not of course indicate the presence of a settlement there.

In order to understand how adequate the list compiled for this work is, let us have a look at the list of sites from the Encyclopedia of Tripolye Civilization (ETC) since today it is one of the most complete datasets (Videiko *et al.* 2004, 566-700). The sites of the Kaniv group are listed in the monograph by Eduard Ovchinnikov (2014, 203-212). The encyclopaedia contains comprehensive information on a particular site. The list also includes, in addition to well-investigated settlements, the sites known due to surveys that are mentioned in the literature and for which there is virtually no information other than the fact of their existence and the village with which they are associated (Videiko *et al.* 2004, 566-700).


number sites
1- 5
5-10
10-15
15-20
20-25
25-30
30-35
35-40
40-45
45-50
0 20 40 km


number sites
1- 5
5-10
10-15
15-20
20-25
25-30
30-35
35-40
40-45
45-50
0 20 40 km

Region (oblast)	District (rayon)	No. of sites from ETC	No. used in the work
Cherkasy	Gorodishche	27	25
Cherkasy	Zhashkiv	3	0
Cherkasy	Zvenigorodka	25	12
Cherkasy	Kamyansky	2	1
Cherkasy	Kaniv	32	30
Cherkasy	Katerinopol	8	6
Cherkasy	Korsun-Shevchenko	24	19
Cherkasy	Lysyanka	19	13
Cherkasy	Mankovka	20	7
Cherkasy	Monastyrysche	9	6
Cherkasy	Smila	1	1
Cherkasy	Talne	30	26
Cherkasy	Uman	50	23
Cherkasy	Khristinovka	14	7
Cherkasy	Cherkasy	1	0
Cherkasy	Shpola	7	5
Kirovohrad	Haivoron	9	8
Kirovohrad	Dobrovelychika	1	1
Kirovohrad	Novoarkhangelsk	9	4
Kirovohrad	Novomyrhorod	5	5
Kirovohrad	Ulianovka	5	5
Kirovohrad	Holovanivsk	0	4
Kiev	Bila Tserkva	4	2
Kiev	Bohuslav	10	10
Kiev	Kaharlyk	27	17
Kiev	Myronivka	3	0
Kiev	Rokytne	1	1
Kiev	Tarashcha	8	7
Kiev	Tetiiv	3	3
Zhytomyr	Ruzhyn	6	5
Vinnitsya	Bershad	5	1
Vinnitsya	Haisyn	22	12
Vinnitsya	Illintsi	23	18
Vinnitsya	Orativ	1	0
Vinnitsya	Teplyk	3	0
Vinnitsya	Pohrebyshche	1	1
Vinnitsya	Chichelnik	7	4
Odessa	Balta	22	17
Odessa	Savran	3	3
	Without rayon	0	2
Total	**39**	**450**	**310**

Figure 19 (above left). Frequency of sites per region (oblast) after Videiko et al. 2004.

Figure 20 (below left). Frequency of sites per region (oblast) according to the data set used in this study (Appendix 1).

Table 12. Sample size of sites in comparison to the sample in the ETC (Videiko et al. 2004).

The Tripolye sites described in the ETC catalogue are grouped by regions of Ukraine that are made up of districts, the sites within which are given in alphabetical order. This makes it easy to compare the list with ours. So 450 sites were included in the ETC, and 310 in the work. Table 12 contains more detailed information. For illustrative purposes, two maps have been compiled which show the number of Tripolye sites in different areas of the working zone (fig. 19 and fig. 20).

When comparing the maps, it can be seen that, on the whole, the general trend of the location of the Tripolye sites, which stretch from the south-west to the north-east in the form of a 'corridor,' can be seen in both pictures; moreover, in general, the density of the location of sites in different regions is also similar. Some distinction in the number of sites is observed in the districts of Uman, Khristinovka, Mankovka and Zvenigorodka. However, because of the lack of any other information on some of the Tripolye sites, with the exception of the 'fact' that there is such a site, they have not been included in our list.

Thus the compiled dataset of Tripolye sites of the working zone can be considered in a way that reflects the current state of research in the area.

If we look at the different regional-chronological groups of sites, we will see that Early Tripolye sites in the region are not numerous (18) and that the total of the 'Eastern Tripolye' sites (28) is much lower than the 'Western' sites (143), which include Vladimirovka, Nebelivka, Kaniv, Tomashovka, Kosenovka groups (and two sites of the Chichelnik group).

Continuing to consider the block of sources, let us turn to ceramics, which are one of the most important elements of the work; therefore, below, we consider the basic characteristics of Tripolye dishes, their labels and typologies.

2.5.2 Pottery

In general, pottery is the category of artefacts that shows a very high degree of preservation. In addition to their basic characteristics that reflect their direct functions (related both to the food industry – preparing, consuming and storing food – and other aspects – aesthetic, religious, etc.), dishes, as a source for historical reconstructions, also have some more very important characteristics: mass production and its constant development and change. Moreover, ceramic goods have significant differences from region to region and from period to period. These features make ceramics an extremely informative source for studying, first of all, societies that had no writing system. In particular, this material provides an excellent possibility to make chronological constructions. There are various ways to systematise/classify ceramics.

The history of the development of Tripolye ceramics classifications, the principles of their construction and development dynamics have been discussed in several articles (Kolesnikov 1982, 216-224; Yakovishina 2008, 458-466).

The classifications were made to solve specific research problems, to analyse not all the aspects of the ceramics as a whole, but to look into its separate *components* – clay mix texture, shape and ornamentation (Passek added the fourth component, technological processing, with the surface treatment as its criterion). Then certain criteria characterising the component studied were distinguished, and the classifications were made on the basis of their combinations.

The following classification types based (depending) on the research tasks include (after Kolesnikov 1982, 216-224):

1. One component of pottery: shapes (Khvoiko, Stern), ornamentation (Stern), clay mixture texture (Krichevsky).
2. Two components: shape + ornamentation (Khvoiko, Gamchenko), clay mixture + shape (Bibikov, Makarevich, Shmagliy, Zbenovich, Kruts).

3. Three components: technology + ornamentation + shape (Chernysh, Ryzhov), technological + clay mixture texture + shape (Movsha, Markevich).
4. Four components: technology + ornamentation + clay mixture texture + shape (Passek).

So the classification structure and the number of levels vary. It should be noted that there is a single approach neither to the choice of criteria nor to drawing up classifications; there is neither uniform general classification for Tripolye ceramics, nor has uniform *terminology* been developed.

To start with the first Tripolye studies, the vessels' names were assigned based on their *shape* or on a hypothetically functional purpose. This is how these type names/terms came into scientific use. Some names were borrowed from the antique ceramics (*craters, amphorae, pithos*); others represented the traditional commonly used utensil names of certain forms (*pots, bowls, lids, jugs*). Some vessels were called conventionally in a descriptive way by association with geometric or 'fruit' forms, optical devices, objects of everyday life or even with head-dresses (*biconical, spherical, pear-shaped, binocular-shaped, mortar-shaped vessels and helmet-shaped lid*s). Names were partly given according to their interpretation and reflected their assumed functional purpose (*kitchen pots, kitchen bowls, grain containers, ritual objects*). The latter are obviously the least suitable names, since their use without appropriate proof can lead to the effect of 'substitution of concepts' described in the first part. Pottery typology on the basis of its supposed functionality has been fairly criticised (for example Shepard 1961).

Despite being not perfect, these names have already become so traditional that it is very difficult to substitute them. To avoid confusion, I will continue to use some of them, but only conventionally.

In this work, the ceramics will be analysed based on their four basic characteristics: technology, morphology, capacity, and decoration. Let us briefly discuss the basic features of these categories.

2.5.2.1 Ceramics manufacturing technology

The components of the technological block undoubtedly include the mixture from which the vessels were made, the technology of its moulding and firing.

Clay paste. Local clays were used to produce ceramics (Kulska 1940; Markevich 1981), and it is assumed that Tripolye craftsmen did not use the clay as it was (in its pure form) (Ellis 1984; Ryzhov 2002, 6). Pottery paste was made of a mixture of various kinds of clay as well as organic and inorganic impurities. In particular, such mixtures were made to temper greasy clays (so that the dish did not crack during drying and lose its shape). The clay paste had a different composition which depended on the production process, functions, shapes and sizes of vessels as well as regional peculiarities. Of the clays, the most frequently used were carbonate clay types, with a low hydromica content, different marlstone clays, kaolin clays with an admixture of hydromica material and a low iron oxide content, and clay with a high iron content (Ryzhov 2002, 12).

The most traditional division of Tripolye ceramics according to manufacturing technology principles is the division into the so-called 'kitchenware' and 'tableware'. Additionally, Ryzhov singled out the ***container/tare*** category, as this type had not been known before and is typical only of the Tomashovka group. To this category he ascribed thick-walled high (0.7-1.2 m) pear-shaped vessels that were made of a special paste mixture with an admixture of chaff/husks and positioned on the longitudinal wall podium, near the stove or on the elevation. He considered them to be an integral part of the house interior (Kruts *et al.* 2001, 37-38, 52).

The most 'standardised' fabric in Tripolye is the so-called 'kitchen' (kind of coarse ware). Similarly, such a ceramics name as *Cucuteni C* is used (beginning with

Technology	Décor	Morphology	Size
admixture: shell, crushed limestone, sand, wood, quartz, mica, chamotte; firing – low-temperature, probably not in pottery kilns (?); round bottom modeling of the workpiece, forming the walls with knockout (Palaguta, Starkova, 2016: 53).	the use of various techniques of in-depth decors (puncture marks, drawn lines, indentations, stamps, tucks) and volumetric (various stikers) in the upper part of the vessels; smoothing down the outer and sometimes the inner surface, which remains scratches.	A fairly standard form which is a pot with a wide, bent outward corolla. Sometimes there are bowls.	Great variability.

Table 13. Characteristic of kitchen ware.

Schmidt 1932, 43-45, who introduced it) in the literature, following the Romanian archaeologists. There is a slight difference in the use of these terms, which has been discussed in the literature. Some researchers single out 'kitchen' ceramics for the periods of Precucuteni and Tripolye A, and 'Cucuteni C', only beginning from Tripolye B1 period (*e.g.* Burdo 2016, 7).

Perhaps the most striking feature of this ceramics is the technology and traditions in its manufacture, which, remained practically unchanged during all the time of Tripolye development (Mateau *et al.*). However, this kind of ceramics has been singled out on the basis of not one, but a complex of attributes, and first of all the manufacturing technology, which also influenced the development of a specific decor. An important characteristic of this pottery is the porosity of shards, which makes it less durable, however, permeable to water and heat-resistant. So, "kitchen" pottery is characterized by (tab. 13):

Some of the listed characteristics may be missing both on some sites or groups of sites, or on different vessels from the same complex. For example, the admixture of crushed shell, as the most striking characteristic of this ceramics, is not at all typical in Tomashovka complexes, other mineral additives were used as admixture or temper (Ryzhov, 2008). However, in general, ceramics of this type are quite similar to each other or, to be more precise, are clearly different from the 'tableware' (especially stages B2-C1). The amount of these ceramics in Tripolye complexes is small at 1-15%.

At stage C2, major changes are observed in this type of vessel, coarse ware begins to predominate in the ceramic complexes, and new forms of this kind of ceramics appear. Dergachev believes that the shapes of Late Tripolye 'kitchenware' (C2) were the imitations of the tableware forms. Consequently, the number of morphological variations in dishes in this category increases and can be easily compared with the forms of tableware (Dergachev 1980, 55, 56). Following this logic, it can be assumed that coarse ceramics lose, at least partially, their original functions and the difference between these categories of dishes becomes 'only' technological.

Coarse ware pottery attracted great attention from specialists, as they often saw an 'alien' element in it in Tripolye (Burdo 2016, 7; Palaguta 2001). Steppe cultures Sredniy Stog (Palaguta, Starkova, 2016) and Skelyanskaya (Rassamakin 1994; 1999) are most often regarded as the source of these ceramics in Tripolye, but there are no direct analogies of ceramics on the steppe sites. Movsha saw in these ceramics the evidence of the migration of the Sredniy Stog population to Tripolye (on the Dniester) to obtain metal goods (Movsha 1998, 127). Palaguta and Starkova reasonably noticed that the constant presence of these ceramics at Tripolye sites and every *ploshchadka* may indicate that the Tripolye population had mastered *new practices* without being influenced by the migration of the steppe population (Palaguta, Starkova, 2016, 56).

As for the use purpose of this pottery, one of its labels – kitchenware – reflects the views of most researchers on this issue. At the same time, there are no additional arguments for assigning it to cooking functions (Ryzhov 2008). Burdo, basing her assumption on the size variability of kitchen pots and their insignificant proportion in the ceramic complex, as well as the use of plastic elements in decoration and vessels on legs, presumes that this pottery had 'various functions, including ritual ones' (Burdo 2016, 8). Palaguta and Starkova suggested that ceramics such as Cucuteni C had special functions that were associated with the methods of cooking and/or storage of *special products* (Palaguta and Starkova 2016). In addition, these researchers insist that this pottery was produced in individual households.

In contrast to the 'kitchenware', the 'tableware' is quite diverse in terms of technology, morphology and decoration. In addition to the fact that in ceramics complexes this pottery is represented by an absolute majority, several cardinal technological changes have occurred in its development. One of the most striking might be the introduction of updraught double-chamber pottery kilns during stage B2 (*e.g.* Korvin-Piotrovskiy *et al.* 2016a; Ţerna *et al.* 2017; Videiko 2019; Rud *et al.* 2019b). After this invention, the tableware was made in a more or less standard way (up to stage C2).

The name itself – table- or fineware – implies a significant difference in the composition of the clay paste as well as the finishing facing the surface. So, in general, this type of shard is more compact, which is due to a smaller (compared to kitchenware) amount of impurities, as well as less 'coarse' additives. Among the admixtures used for ceramic tableware were shist, sand, quartz, stony rocks (granites, gneisses, siliceous shales, mica), carbonate rocks (shell rock, limestone, shells, marl). Plant admixtures are not among the typical ones. Firing of tableware, as a rule, is fairly smooth and preservation is good. Some engobed and painted tableware vessels resemble kitchenware paste (Ryzhov 2002, 13).

In the study area, before the introduction of double-chamber pottery kilns, tableware had been characterised by greater diversity (Tsvek 2006).

In the assemblages of 'Eastern Tripolye' ceramics (as well as in Early Tripolye), there are vessels with reduction firing, which is the result of intentional withdrawal of oxygen in the final phase of the firing process. Due to such firing techniques, the surface of the shard became black, grey or dark brown. In addition to such ceramics on the sites of Early and the first half of Middle Tripolye (B1-beginning B2), there are many finds of vessels with oxidisation firing. Besides having this diversity, ceramics from chronologically close sites (for example Chizhivka and Veseliy Kut) have significantly different admixtures.

Today, the most reliable evidence regarding the existence of vertical two-chamber pottery kilns is associated with the sites of the so-called 'Western' Tripolye (Korvin-Piotrovskiy *et al.* 2016b). As for the earlier periods, despite the postulation and publication of 'pottery kilns' in Eastern Tripolye before (Tsvek 1994, 64-66), this point of view now seems controversial. And if it is difficult to categorically deny the use of kilns before period B2, it might be that if this technology had been known then it could have been the exception rather than the rule. The scepticism is associated with the analysis of new geomagnetic plans, as well as with a large difference in the quality of tableware vessels.

Table pottery of phase B2-C1 is characterised by homogeneous pastes, in which macroscopically no temper material (except occasionally fine sand) is visible. Firing occurred under complete oxidising conditions with high temperatures between 800 and 1200 degrees Celsius.

At stage C2, some changes connected with the gradual disappearance of the 'tableware' occurred. At various sites, it amounts to only 30-20% or even less.

2.5.2.2 Capacity

The **capacity (volume) of vessels** is an important aspect of the analysis of ceramics, and in Tripolye there are limitless possibilities for this kind of research, since a huge number of archaeologically whole vessels remain. However, such studies in Tripolye have not been conducted yet.

Various works on the calculation of vessels' capacities are known for proto-historical studies of ceramics (Gening 1992, 53; Bailey 2000, 179-180; Gershkovich 2001, 282-285; Hofmann 2013, 387-389; Diachenko 2016, 491-502).

The holding capacity of vessels is an important (and objective) criterion for potential reconstructions of the functional purposes of goods, for the ratio of morphological types and classes singled out on the basis of vessel capacity, for studying chronological tendencies in their development, and for solving other problems (Rice 1987). For example, using this method, Bailey proved growing vessel capacities in the last phase of the settlement (up to 200l) and interpreted this as an indicator of even higher storage capacity in Ovcharovo. In contrast, Hofmann presumed, based on vessel capacities, that pottery vessels might not have been used for long-term storage in Okolište.

2.5.2.3 Morphology. Typology of vessel shapes

As already mentioned, **vessel morphology** is an important parameter for constructing chronologies, and, though there is no single vessel typology, basically the same or similar names are used for the pottery of the whole Tripolye complex.

Developing a typology of ceramic shapes, the authors propose very general types, within which the profile of a vessel can vary greatly. Consequently, the number of types as such is not very large. This is true also for our working area. Thus Ryzhov, in one of the last comprehensive works, identifies eleven types of vessel, including binocular ones (Ryzhov 2012b, 141-144). The author proposes, within each type, from three to ten subtypes, which may also have between one and four options. Ovchinnikov proposes twelve types of vessel shapes from the Tripolye sites of Kaniv Podneprovye (Ovchinnikov 2014, 73).

This paper suggests the typology of vessel forms given below that have some differences from the previous ones. To begin with, all the vessels were grouped into classes, within which we established a number of types, subtypes and variants. This is necessary in order to be able to analyse different groups separately.

As a result, the classification comprises the following levels:

Level 1 – classes (shape and size)

All the ordinary vessels are grouped into four **classes** on the basis of the criteria *shape and size*. Such attributes as *shoulders and neck* (with or without them), as well as the *diameter-height ratio*, are also taken into consideration:

1. *Class* ***bowls/lid***s: **open-type** concave vessels, most often in the form of a hemisphere, without shoulders and neck, whose diameter usually significantly exceeds the height.
2. *Class* ***pots:*** vessels of different sizes with a neck and shoulders, whose diameter for the most part is either a bit smaller than the height or slightly larger than it. Pots could be ***semi-open*** (the conventional name for vessels with quite a wide, as compared to the diameter of the shoulders, neck) and ***closed*** once (the diameter of the neck is much smaller than the diameter of the shoulders).
3. *Class* ***cups***: vessels of small size, similar to pots in shape, but the height is not more than 15 cm.

Level 2 – types (profile)

Further division into **types** on the basis of their profile outline:

1. Open forms:

- bowls
- lids

Level 1 ***Class***	**Bowls/lids**	**Pots (semi-open and closed)**	**Cups**
Level 2 ***Types***	1. Bowls 2. Lids	Semi-open pots: 1. Craters, crater-like vessels, pots Closed pots: 1. 'Biconical' – 'sphero-conical' 'amphorae' 2. Pear-shaped	1. Goblets 2. Cups
Level 3 ***Subtypes***	*Further division*	*Further division*	*Further division*
Level 4 ***Variants***	*Further division*	*Further division*	*Further division*

Table 14. Hierarchy of the vessel classification used in this work.

2. Semi-open pots:

- craters, crater-like vessels, pots

Closed pots:

- 'biconical', 'sphero-conical', 'amphorae'
- pear-shaped

3. Cups:

- goblets
- cups

Level 3 – subtypes

The 'type' groups are divided into the **subtypes** by some other features, such as more detailed characteristics of the corolla or shoulder profile, or the ratio of height to size, shoulder diameter and corolla diameter.

Level 4 – variants

We distinguish some **variants** within the subtypes according to other characteristics (some shape peculiarities which were not taken into account in previous levels), such as handles and spouts. So the typology could be visualised with the following table 14:

Lids

'Lids', in principle, do not form a distinct independent category of vessels, but rather a component. A lid, as an object (in the context of dishes), can be defined as the upper part of a vessel designed to cover its open upper part. That is, potentially a lid cannot be considered a self-contained facility, but is only a part (although, perhaps, extremely important) of a vessel unit. Speaking technically, two parts of a lid can be distinguished – the upper one, which can be used for holding and lifting (most often this is a clearly defined handle) and the lower one, which covers the top of a container for which the lid is designed.

When one talks about the 'lids' from Tripolye assemblages, these objects are far from clear and raise a number of questions. At the same time a 'lid' from Tripolye ceramic complexes is more 'self-sufficient' as an object than a 'lid' in the modern world. The point is that many 'lids' have a quite steady flat 'upper' part. Perhaps this was why the discoverer of Tripolye, Vicenty Khvoiko, in his illustrations of Tripolye antiquities depicted the artefacts, which we usually call 'lids', upside down, obviously considering them cups (glasses, see Khvoiko 2008). Some 'lids' characteristic of the middle stages of Tripolye practically do not differ in shape from craters, and therefore a researcher attributes the artefact to one or another type only according to traces of scratches from being used on ceramics.

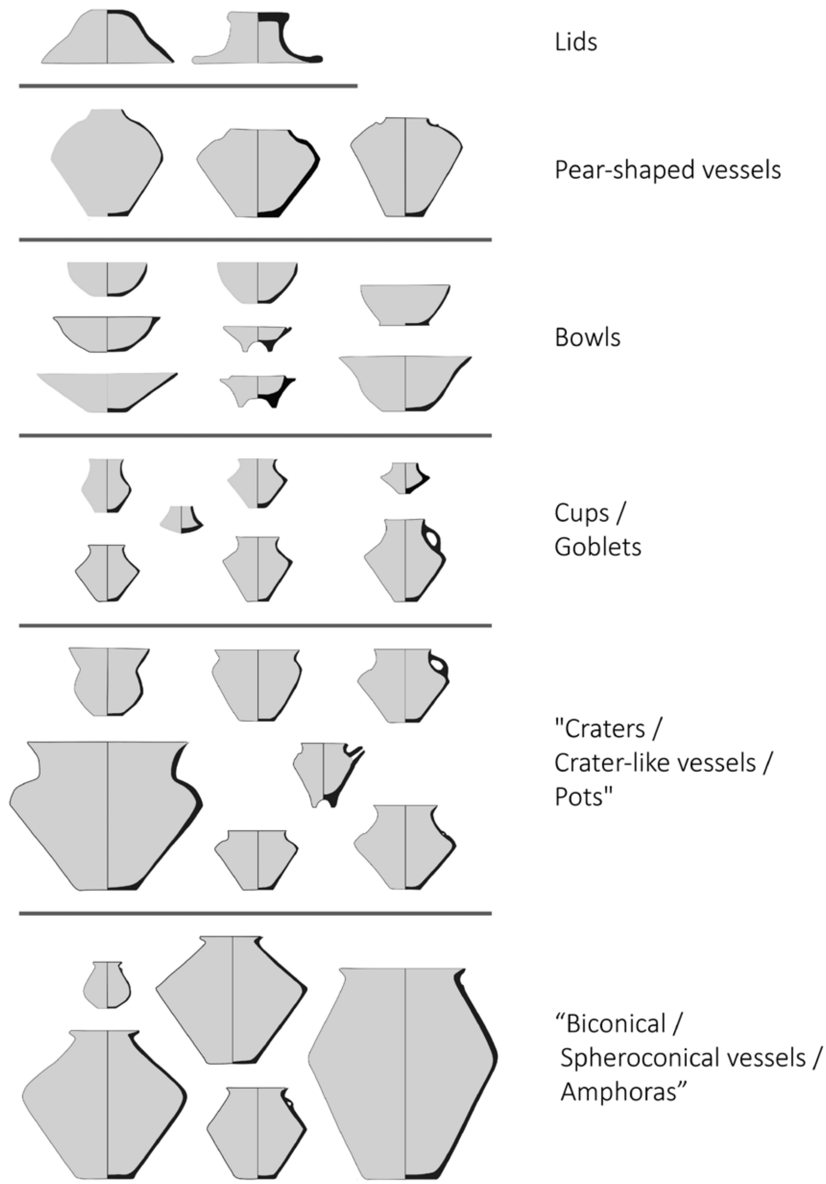


Figure 21. Morphological 'types' of ordinary vessels used in the work.

Lids in Tripolye often have decoration on the outer surface, incised or painted depending on the stage. Passek noted that the incised decoration on the lids continues for longer, while on other types painting already prevails (however, as well as on the pear-shaped vessels). It is important to mention that the type of ceramic clay, at least in our working area, is the 'tableware' and not the 'kitchenware' one.

As for the types of vessels which could have been covered with lids, they were most likely pear-shaped vessels that have a small straight or smoothly concave rim, which implies a lid. The fact that the pear-shaped vessels could have lids can be confirmed, in particular, by the findings of a miniature set from Cherkasov Sad 2.[27] Other vessels that could potentially have had ceramic lids are, first of all, 'biconical/ sphero-conical vessels', the diameter of the corolla of which is relatively small. However, their corolla sharply or gently bent outwards does not quite correspond to the shapes of Tripolye lids found before.

27 The table set of 15 miniature vessels, including the lid, which fits only the pear-shaped vessel.

Taking into account the small number of lids found, at sites in the Sinyukha basin in particular, and suggesting that there was still a need in Tripolye communities to 'cover' some vessels, it can be assumed that other ceramic objects, for example bowls, could have been used for these purposes. Some cups are used for this purpose in the exposition at the Museum of Tripolye Culture in the village of Legedzyne. Additionally, regarding the use of the other material as 'lids', it is widely known in ethnographic examples that wood and textiles are used for these purposes.

As for the name 'lids', as well as 'bowls' and 'pots', these are most likely the most appropriate labels, being absolutely descriptive and neutral.

Due to the general proportions in Tripolye and, in particular, our key region, two basic types of lids are distinguished. Their names are very strange and deeply rooted in the literature: these are 'helmet-shaped' and 'cup-shaped' covers. There are transitional options, as well as less established forms, between these basic types.

The first (helmet-shaped) lids were named so by Vicenty Hvoiko, by analogy of their shape with the shape of the 16-17th-century 'Swedish helmets', since these lids have a deep hemispherical upper part (body) (Burdo 2004c, 626). It is this type of lid that is sometimes difficult to distinguish from craters. Their universal use is quite likely.

The second type of cover (cup-shaped, obviously, according to Ryzhov) conditionally consists of two parts: the upper, which apparently served as a handle, and the body. The shape of the handle (for the Vladimirovka-Tomashovka line) can vary from a cylindrical to a cut cone, which possibly depends on its height (there are high and low ones). Such lid handles have a flat or rounded top. The 'Eastern Tripolye' lids, which, in principle, can be attributed to this type with a certain degree of conventionality, are slightly different. They consist of two hollow cones of different sizes without an upper part. There are often mouldings on larger 'cones'.

A distinctive feature of these two types of covers is a fairly deep and hollow body.

Another variety of cover is almost never found in our region and is typical of the earlier stages of Tripolye, for example the sites of Berezovskaya GES (B1) Sabatinovka and Bernashivka (4660-4250 BCE, Tripolye A). The lid consists of a squat body, oval in cross-section, and a small (compared to the body) cylindrical handle with a semicircular or conical ending. It is this variant that most closely resembles the household object used today.

Lids have not been found on the sites of the Final Tripolye in the Sinyukha basin. Variants of these artefacts have been found in other regions.

Pear-shaped pots

The next category of vessel, the pear-shaped pot, which is possibly associated with lids, got its name by analogy with the shape of hanging fruits of trees and shrubs – *Pyrus* (Lat.).

This kind of pot was, in principle, a part of the material culture of the Tripolye complex throughout all its periods. The evolution of this type of vessel can be traced from Early to Final Tripolye in almost all corners of the distribution of the cultural complex. The 'pythos' (or container) type of ceramics found in Tomashovka sites, which have large dimensions and which are clearly seen on the models of houses, also have 'pear-shaped' outlines.

'Craters/crater-like vessels/pots'

The main feature of this type of vessel corresponds, in principle, to one of the main characteristics of the ancient Greek type of vessel, from which the name 'crater' was borrowed. This feature is a wide neck, the diameter of which, on Tripolye pots, almost equals the diameter of the shoulders. At the same time, the craters are quite low (the ratio of the height to the diameter of the shoulders). As a rule, the vessels of this type were decorated on the outside and (at some stages) along the inside of the rim.

'Kitchen' pots can also be attributed to this type, by shape, as they have a wide neck that almost equals the rim diameter. However, because of their evidently specific features, they (their morphology) are analysed separately.

Tableware 'craters/crater-shaped vessels/pots', despite the fact that some researchers divide this category of finds into several types (*e.g.* Kruts *et al.* 2001, 46-47; Ovchinnikov 2014, 73), are considered in the framework of one unit in this work. Further on, their name will be reduced occasionally to the shorter 'craters'.

Bowls

Bowls form a category of dishes that differs from other vessels, as a rule, due to the absence of a belly. As one of the most universal forms, it is found in all Tripolye settlements of all the phases. Many forms of bowls did not undergo significant changes over time. It should be noted that this category includes quite different artefacts, with such differences as a modern plate, basin, salad bowl, bowl, washbowl, and the like. In this work, all finds of this kind are analysed together.

Cups and goblets

These constitute a category of smaller, as a rule, ceramic artefacts. The name 'cup' in the traditional sense means a small vessel for drinking. Vessels of similar shape but with larger dimensions are often called 'cup-like' or goblets (Ryzhov 2012b, 141). In this work, the type of *cup* includes only a specific group of small artefacts decorated simply, which are typical of the Tomashovka sites. Similar vessels with more complex decoration and other characteristics are attributed to the *goblets*. The differences between goblets and cups are the size, quality of their production and decoration. Goblets can, in principle, also be called *beakers*. The use of the label 'cup' for such vessels seems incorrect as these objects can be big.

'Biconical/sphero-conical vessels/amphorae'

The category of these vessels has been divided, in principle, into three separate types by the majority of Tripolye researchers in the region: biconical, sphero-conical vessels and amphorae.

The name 'biconical' reflects the profile characteristics, which can be obtained by putting two cut cones with wide bases together. Such vessels have a sharp or almost sharp carination. 'Sphero-conical' is obviously a name derived from the previous type; the vessels attributed to this category have a rounded carination. It should be noted that in practice it is often quite difficult to understand where the line between a biconical and a spherical shape is, since there are no clear criteria. Therefore, the researchers solve this question based on their individual (subjective) understandings. The name of the last type is 'amphora', borrowed from the name of the ancient Greek vessels, which literally means 'a vessel with two handles'. In practice, in Tripolye, it means that absolutely different vessels with two handles are called amphorae (although, for example, in Tomashovka assemblages the name handle has more than a symbolic meaning, since it is impossible to insert even a finger into the 'handle', which might have been the holes for a rope). Apparently, this name is not the best.

Since, studying samples available from our key settlements and arranging all the vessels according to the basic types, according to the proposed criteria, there was no significant difference between the three types, it has been decided to attribute these vessels to the same category.

Other categories of ceramics

It should be noted that this typology is compiled for vessels, which are the bulk of the finds at Tripolye sites. However, except for such artefacts, there are a number of objects that firstly are not so numerous as ordinary dishes and secondly have quite non-standard outlines. It is proposed to classify these items in a separate category, '***vessels of a special shape***'. These include items that carry the basic characteristics of vessels (which are containers and, accordingly, have a rim, body and bottom), but have a special shape and are quite rare. These are rectangular vessels, kernoi, zoomorphic and anthropomorphic vessels, as well as miniature vessels.

This is a rather diverse group of pottery which could have different functions, so if rectangular vessels could be used for household purposes, then everything is not so simple with miniature vessels. These finds are considered models of real pots and should be regarded as one of the manifestations of the *miniaturisation phenomenon*.

One can distinguish, in addition to *ordinary vessels* and *vessels of a special shape*, a category of clay artefacts that are not dishes themselves, but have some characteristics of vessels. These '***other objects with some vessel attributes***' include binocular objects, monoculars, models of sledges and of buildings (see Appendix 9, pl. 61 and 62). All of them have some vessel characteristics, but they are clearly not pots; in addition, they are a kind of 'typical Tripolye artefact'. The functional purpose of these items is not entirely clear. Since all these items are certainly chronological markers, they are included in some analyses (see Part 5). So I will briefly consider their characteristics.

'*Binoculars*' are pottery objects that consist of a pair of hollow tubes that can taper towards the middle or in other parts. The 'tubes' of binoculars are connected by bars (usually three). These objects, which form one of the 'cultural' markers of Tripolye are often referred to as 'vessels'. However, they are not as such, since they usually have no bottom. Such finds are interpreted as supports for small vessels, drums, religious objects, as 'models of container-type objects' (for more details see Palaguta 2007, 111), or even as kinds of 'anthropomorphic figures' (Ryzhov 2001, 17). The typology and spatio-temporal evolution of these findings was demonstrated by Ilya Palaguta (Palaguta 2007, 110-134; 2016). The mass appearance of these artefacts is associated with stage B1. With the degradation of the Tripolye cultural complex, some 'binoculars' start to have bottoms (stage C1). These objects were not found on the sites of the Final Tripolye (C2).

'*Monoculars*', which are somewhat similar to binocular objects but have one hollow tube, are more characteristic of the western areas of the Cucuteni-Tripolye complex (Palaguta 2007, 117). In our region, they are represented by a few exemplars.

Models of buildings and sledges are still not numerous categories of Tripolye material; each of these objects has its own individual characteristics and there are practically no identical finds.

Sledge models are similar in shape to an oval bowl or a rectangular vessel or variations of these forms that form the 'body' of the model.[28] The 'body' of models stands on two 'runners'. It is the presence of the runners with some constructive details that is behind the proposal to include the artefact in this group. The 'body' of a number of sledge models has double or single zoomorphic applications. Sledge models in Europe are so far known exclusively in the Tripolye complex and are typical mainly for our working area. The chronology of these artefacts is mainly stages B2-C1. This category of artifacts was recently studied by Natalie Chub, Free University of Berlin, with regard to its significance for the invention of the wheel and wagon[29].

Models of buildings to a lesser or greater extent carry in themselves the reproduction of the building or part of it. Along with very 'realistic' copies or reproductions of houses in Tripolye, some models have more of the look of vessels (bowls, 'fruit bowls' or rectangular vessels) with elements of the house (entrance, window, etc.). Models of buildings are found in the Neolithic and Eneolithic sites of South-Eastern Europe,

28 In one case, a 'body' has the shape of a cup, not a bowl (Kruts *et al.* 2013, 80, 81).

29 "Rad-, Wagen- und Schlittenmodelle der Cucuteni-Trypillja-Kultur als Zeugnisse für die Genese und die Ausbreitung der Innovation des Wagens", 2019.

from the early artefacts that were part of the 'Neolithic package' to the Late Tripolye finds (Shatilo and Hofmann 2017, 78; Shatilo 2016). The phenomenon of creating small copies of houses or parts of them is not limited to the Eneolithic and European territories. A number of Tripolye house models are known from our working area. A number of works are dedicated to house models (*e.g.* Passek 1938; Movsha 1964; Gusev 1996; Yakubenko 1999; Shatilo 2005; Palaguta and Starkova 2017)

Based on manufacturing techniques, both 'vessels of a special shape' and 'objects with some characteristics of vessels' are usually made of well-milled clay and have the same firing and other characteristics as 'table' ceramics.

To sum up, it is proposed to divide Tripolye pottery morphologically into the following main subordinate categories and types:

1. *Ordinary vessels* (bowls; lids; pear-shaped vessels; 'biconical/sphero-conical vessels/amphorae'; 'craters/crater-like vessels/pots'; cups and goblets).
2. *Special vessel shape* (rectangular-shaped vessels, kernoi, zoomorphic and anthropomorphic vessels, miniature vessels).
3. *Other objects with some vessels' attributes* (binocular objects, monoculars, sledge and house models).

2.5.2.4 Decoration

Numerous works are devoted to the decoration and 'ornamentation' of Tripolye ceramics; the majority of specialists somehow have dealt with this issue (for examples of the history of the question, see Kolesnikov 1982; Ellis 1984; Yakovishina 2014; Tkachuk 2004; Palaguta 2016). This topic is strongly connected with the decoration of Cucuteni ceramics. The authors considered Tripolye-Cucuteni decoration against the background of various research tasks such as:

- material description and classification
- solving chronological questions
- exploring inter- and intraregional differences
- analysing spatial distribution/population contacts
- understanding technological developments,
- discussing ideology and religious questions, and so on.

Two main aspects of decoration can be considered and they can be reduced to two questions:

1. What is depicted (pictured) on the vessels?
2. How is it depicted (with what technique and on what kind of surface)?

The first question is directly related to ornamentation: its designs, schemes, ornamental compositions, motifs and elements, that is, the 'picture' that is shown on the vessels; and the second with the techniques of applying this ornamentation and decoration on the vessels. For some techniques, it is rather difficult to draw a line between decoration and surface treatment (scraping on kitchenware, polishing, engobe). While the various ornamental techniques were already described and classified relatively early (first half of the 20th century) due to their objective characteristics, the question of ornamentation turned out to be more complex.

First, the typology of ornamentation 'schemes' has still not been developed for the whole Tripolye distribution area during the whole time of its existence. Second, approaches to the ornamentation's typology and methods of its processing differ greatly from one author to another. As Taras Tkachuk fairly expressed: '*The whole complex of elements of Tripolye-Cucuteni ornamentation, the principles of its organization and combinations, the rules of its formation and replacement have not been* *studied yet. … There is no complete investigation of the (Tripolye) ornamentation itself*' (Tkachuk 2004, 435).

It should be noted that not all 'typologies of decorations' clearly distinguish *techniques* and *schemes* of ornamentation. Instead, they are even presented in mixed form. This is due partly to the fact that certain 'patterns of decoration' were associated with certain (morphological) types of vessels, and in addition they could be related to some techniques of applying the decoration. Furthermore, connected classifications of decoration techniques and ornamentation are often not performed systematically (*e.g.* Schmidt, Passek).

Due to significant differences in the techniques and styles of decoration, Tripolye sites were grouped into local groups, which in some cases, as suggested, have a chronological character. In addition, the spread of these different ceramic styles has been associated with the movement of ethnic groups that are called 'tribes'. From today's perspective, these interpretations seem to be unacceptable.

Decoration techniques

The main techniques of decoration were identified as early as the first half of the 20th century, and changes in them became one of the important arguments for the typochronological models of Tripolye development (*e.g.* Passek 1949; Popova 1972; Tsvek 1987). For example, Passek singled out the following basic techniques: incised decoration, fluting (channelling), striped smoothing, monochrome, bichrome and polychrome painting, cord impressions, and decoration of 'kitchenware'.

The chronological significance of these techniques was established by, among others, Hubert Schmidt (1932) in his presentation of the stratified material from the Cucuteni site. He was able to show, among other things, the development from white-undercoated polychrome wares with negative (left open) paintings to clay-grounded or engobed monochrome wares with positive (painted on) painting. His observations also included the appearance of cord-decorated pottery in the most recent layers of Cucuteni.

Techniques of decorating Tripolye vessels show significant differences depending on the phases, on geographical distribution as well as, partly, on the vessel categories. For example, the techniques of 'kitchenware' decoration are more stable than the faster changing tableware. The significant difference in the techniques of the tableware decoration is the crucial point for grouping the Tripolye sites into 'Eastern Tripolye' and 'Western Tripolye'.

In all 'Eastern' Tripolye sites, tableware with incised decoration dominates. Tsvek compiled a chronology of the Bug-Dnieper variant of the 'Eastern' Tripolye sites that is based on changing relative frequencies of decoration techniques and their combinations (Tsvek 1980, 184; 2012, 241). Accordingly, she identified five groups and nine subgroups of ceramic decorations:

- **1**а – ceramics with incised ('deep-cut') ornamentation (углубленно-резной)
- **1**б – ceramics with incised-fluted ornamentation in combination with a 'toothed' stamp (углубленно-каннелированной орнаментацией в сочетании с зубчатым штампом)
- **1**в – ceramics with incised-fluted ornamentation (углубленно-каннелированной)
- **1**г – ceramics with incised-fluted ornamentation and painting (углубленно-каннелированной орнаментацией и окраской)
- **1**д – ceramics with incised-pitted ornamentation (углубленно-ямочной)
- **2**а – painted pottery
- **2**б – pottery with painted surface
- **3**а – 'kitchenware' with barbotine
- **4**а – 'kitchenware' with 'relief-stamped' decoration (рельефно-штампованной)
- **4**б – 'kitchenware' with punctured-incised decoration (накольчато-нарезной)
- **5** – pottery without decoration

In contrast to 'Eastern Tripolye' ceramics, 'Western Tripolye' is characterised by the absolute dominance of painting as a decoration technique. In the study region of this work, decoration techniques of 'Western' Tripolye pottery can be characterised as follows:

- dominating: monochrome painting, which is usually painted on an engobed surface (all local groups of 'Western' Tripolye – Vladimirovka, Nebelivka, Tomashovka, Kosenovka)
- rarely: combination of monochrome ornamentation with decoration in the form of white dots (Tomashovka group)
- a small percentage of dishes with incised decoration, which can be incrusted with white paste; the surface of the ceramics itself is painted (Vladimirovka, Nebelivka groups)
- numerous techniques of 'kitchenware' decoration – combs, notches, stamps, clips, plaques, and the like
- corded impressions (Vladimirovka, Kosenovka groups – rarely; Kochergintsy-Shulgovka site type – quite often).

Ornamental designs and schemes

As for the ornamentation, different research approaches were used to systematise and analyse them. So, for example, it is worth mentioning:

- study of the *evolution of spiral-shaped ornamentation* (which is considered to be one of the basic motifs for Tripolye ornamentation) from their first appearances to strongly transformed late schemes (*e.g.* Chernysh 1981; Palaguta 2009)
- dividing the decoration of the entire ceramic complex, limited in time and space, into different *schemes of decoration* (Ryzhov 1999)
- the study of *decorative elements* and the singling out of '*signs*' from them that have a very broad understanding (Tkachuk 2000; 2005a; 2005b).

It seems that this diversity of approaches was directly influenced by the material that was considered by different authors (Early Tripolye where spirals dominate or Late Tripolye where the ornamentation is very diverse and there are a number of 'signs').

Methodologically, ornamentation can be examined through drawings in horizontal projections or zones, in semicircular projections and in 'top view' (Palaguta 2009, 411). Each of these methods has its advantages and disadvantages: the view from above shows only part of the decoration, horizontal zones non-existent proportions, and so on.

Classifications of the ornamental schemes began to be developed in the 1920s-1930s (*e.g.* Kandiba, Chikalenko). For example, Kandiba described the decoration of vessels from the Shipentsi site for each morphological type of vessel. The decorations were presented in their chronological development, based on the phases A and B identified by him. In his work, the shape of the vessels is clearly associated with the decoration and in a certain way with three technological groups he distinguished (Kandiba 1937, 20).

At the same time, typologies of decoration which considered the ornaments independently from the shape of the vessels started to emerge. Such typologies specified only what kind of ornamentation can be found on the various vessels (see Palaguta 2016).

In his work, Schmidt (1932) analysed the style of ornamentation and identified *the stylistic groups of ornamentation* of ceramics α, β, γ, δ, ε, and ζ. Some of them were also divided into subgroups. Here, again, the design is sometimes mixed with the technique of the ornamentation. One progressive aspect of Schmidt's work was that he did not regard the style 'groups' α-ζ not *a priori* as chronological phenomena, but explicitly considered their coexistence.

Identification of ***schemes*** or designs and motifs of ornamentation on Tripolye pottery was made gradually and not always systematically. The scheme *Tangenten-*

kreisband was used first by Schmidt. He characterised it as a 'running spiral' (1932). The 'face' motif on the pots[30] is mentioned first in a work of Bogajewski (Bogajewski 1931, after Palaguta 2011, 247).

Over time, the terminology for describing the ornamentation patterns was increasingly developed: *metopes*, *volutes*, *festoons*, motifs of '*leaves*', '*owl face*' (*e.g.* Vinogradova 1972; Dergachev 1980). These names later became labels of the decoration schemes (Ryzhov 1999). The schemes and motifs of ornaments were singled out both with a descriptive purpose and with the aim of analysing them in order to highlight chronological and territorial differences between sites.

Regarding the use of ornaments as sources for the investigation of ideology and religion, the researchers used two main approaches:

- '*retrospective or historical and ethnographic analogies*' (involving all available analogies on the principle of formal similarities), mainly the works of the 20th and early 21st centuries, and
- the '*structural-semiotic*' approach (division of the ornamentation composition into smaller components and the identification of 'signs' within these designs) that was proposed by Tkachuk (Yakovishina 2014,102).

Both approaches were reasonably criticised (*e.g.* Tkachuk 2004; Palaguta 2011). In contrast to these approaches, Ilya Palaguta, being sceptical about the possibility of exploring the meaning or 'reading' of Tripolye ornamentation, suggested that most of the 'signs' on ceramics were elements of a 'technical ornamentation' or they served as markers for applying the main ornamentation, the semantic meaning of which could change both over time and from potter to potter (Palaguta 2011, 245-261).

Finally, ornamentation, including that on Tripolye vessels, is also considered a special kind of art, which could also be influenced by aesthetic factors (Palaguta 2009, 2011).

For our region, the typology of ornamentation was particularly well defined and demonstrated in Ryzhov's works (1999; 2012). For the Vladimirovka, Nebelivka, Tomashovka and Kosenovka groups, he singled out:

- twelve schemes for 'closed' tableware vessels (simplified-line; metopic; face-like [facade]); segment-shaped; *Tangentenkreisband*; tangent; 'owl face'; wavy; meander-line; volute; leaf-shaped; festoon (scalloped))
- eight schemes for tableware bowls (simplified-line; comet-shaped; 8-like shape (figure-eight-shaped); cross-shaped; wavy; festoon (scalloped); concentric rings; radial
- three schemes for 'kitchenware' ceramics (simplified-line, wavy and festoon)
- two schemes for container-type vessels (simplified-line; segment-shaped).

Each of these schemes has numerous variations: 47 in total for 'closed vessels' and 24 for bowls. The schemes for 'table', 'kitchen' and 'containers' that have 'closed shapes' are comparable with each other.

It should also be noted that almost all ceramic schemes of the 'Western' Tripolye singled out by Ryzhov exist in all local groups and their phases. The variability between these larger design groups concerns rather the absolute and relative frequency of their occurrence as well as variations on a more detailed level. Separate in this respect are the sites of the Kosenovka group, whose decoration style shows significant differences compared to assemblages of other local groups.

In conclusion, it should be noted that, in this work, a combination of similar techniques of decoration, ornamental patterns, as well as the technology of ceramic production and a specific set of vessel shapes, are together considered '***ceramic styles***'.

30 Because of some similarity to a face.

2.5.3 Radiocarbon dates

The last group of sources comprises the radiocarbon dates. This is one of the most important sources, allowing independent testing of typological models and establishing the absolute age of certain events.

Using ^{14}C dates and data for specific phases from completely different regions, most of the researchers tried to build chronologies of entire cultural complexes. As an example, compiling the Tripolye chronology, the authors see the beginning of the development of this phenomenon from the territory of Romania based on only very few dates and complete the 'development of the culture' by dating the sites on the Black Sea and in the Kiev region. Attempts to build a chronological scale for a single region were not numerous.

Already since the 1960s, ^{14}C data have been used to understand the absolute and relative chronology of Tripolye societies. One of the first researchers who tried to establish the absolute age of the Tripolye sites using radiocarbon dating was Passek, who dated the Tripolye from the first half of the 4th millennium BCE until the middle of the 3rd millennium BCE (Passek 1964).

Based on the works of the predecessors who received the first radiocarbon dates (Titov 1965; Dumitrescu 1968; 1974, and others), Chernysh enriched the Tripolye stages that she had identified with absolute dates and synchronised them with the Cucuteni phases and with other Eneolithic cultures of South-Eastern Europe, first of all in Romania and Bulgaria (Chernysh 1982, 175). According to her analyses, Tripolye A started about 4750 BCE, and Tripolye C2 was completed no later than 2750 BCE.

It was not earlier than 1980s and 1990s that the data stock increased to a critical amount (*e.g.* Telegin 1985; Wechler 1994). In the 1980s, at the Institute of Archaeology of the Academy of Sciences of the URSR, a coordination centre was established for the study of archaeological material with the use of exact methods of natural sciences. Within this program, which was worked out by D. Telegin, Tripolye material began to be widely dated (Telegin 1985, 10). In particular, dates were obtained for the settlements of Krasnostavka, Shkarovka, Vesely Kut, and Maidanetske. Most of the early radiocarbon dates were obtained in the laboratory of the Institute of Geochemistry and Physics of Minerals, Academy of Sciences of the URSR ('Kiev laboratory', Ki).[31] Based on the data, Telegin identifies five chronological phases of the development of Cucuteni-Tripolye.

In 1994, K.-P. Wechler received and presented some new dates, which together with the available ones made up the total of 51 ^{14}C dates from Tripolye settlements, and analysed them. Pointing out the poor quality of older data because of high standard deviations and the small number of dates from early periods of Tripolye, he criticised Telegin's model, which was based on non-calibrated dates. ^{14}C dates showed a very long duration of the Cucuteni/Tripolye cultural complex between ca. 4800 and 3000 cal BCE.

Early attempts to use ^{14}C data faced some problems: on the one hand, many of the early dates had very high standard deviations and were therefore inaccurate (*e.g.* Wechler 1994). On the other hand, the data analysis methods were still limited and archaeologists were often not trained enough to adequately evaluate the data.

In general, the absolute dating of Tripolye and of the mega-sites in particular developed rather sluggishly. This can be explained by factors such as a good degree of development in relative chronology, poor development of the ^{14}C method (especially calibration) during the early active phase of the research into Tripolye mega-sites (1970s-1980s), and the

31 Today, the attitude of researchers to the dates obtained in the Kiev laboratory ranges from their full acceptance to recognising their absolute erroneousness (Gaskevich 2014, 4). Very often these dates disagree with the dates obtained in other laboratories. In addition, there are the so-called 'old' and 'new' dates obtained in Kiev (the 'new' dates are after 1998). The dates obtained since then do not agree with the 'old' ones and, according to Gaskevich's observations, taking as an example the Bug-Dniester culture, make the calendar age of the sites 500 years older (Gaskevich 2010, 231).

period of certain stagnation, which led to partial conservatism among some Tripolye researchers in the 1990s to early 2000s. Regarding the dating of mega-sites, only a few dates were obtained before 2008 (six) for Maidanetske and Talianki.

In recent years, the database of ^{14}C data from Cucuteni/Tripolye sites has increased significantly, also due to the work of various projects with international participation (*e.g.* Lazarovici 2010; Rassamakin 2012; Uhl *et al.* 2014 [2017]; Harper 2016; Ţerna *et al.* 2016; Müller *et al.* 2016a; Chapman *et al.* 2018). Owing to this growing database, we now are able to verify relative chronological sequences based on ceramics much better.

2.6 Research methods

As mentioned above, in this work, I use three main groups of sources: ceramic assemblages, radiometric data and the dataset of Tripolye sites in the region. During the work with each group of sources, the appropriate methods have been used.

2.6.1 Pottery analysis

The sample of ceramic vessels examined was classified according to technical characteristics, shape and decoration. Where possible, the classification of technological features includes aspects such as temper, surface treatment and firing conditions (firing intensity and firing atmosphere), aiming at the determination of intended visual appearance, the conditions of production, and functional aspects. At several sites noted from the literature, the classification of technical properties was limited to the schematic subdivision of tableware and kitchenware. The classification of vessel shapes was performed visually according to a four-level hierarchical structure including 1) vessel categories, 2) types, 3) subtypes, and 4) variants.

Stylistic variability represents a complex phenomenon, in whose concrete manifestation different factors usually play a role (*e.g.* Plog 1983; Parkinson 2006; Hofmann 2019). In the present work, primarily the chronological dimension of stylistic variability within the ceramic materials of Tripolye sites is examined by means of seriations. This method is based on the coexistence of types and properties in closed or relatively closed finds, which may have shorter or longer lifetimes (Schier 1995,172-176; Eggert 2001, 201-221). Due to overlaps of the lifetimes of different types, with suitable ordination procedures and under favourable conditions, sequences of inventories can be created which follow the relative-chronological order of the inventories. However, additional criteria (*e.g.* ^{14}C dates) are necessary to verify these relative-chronological sequences. Seriations were performed by correspondence analysis using the Excel Add-in CAPCA v3.1 from Torsten Madsen, Galten, Denmark.[32]

There are several reasons to believe that inventories of burnt Tripolye houses represent in many cases closed finds *stricto sensu*. Probably the inventory of houses represents snapshots at the time when the buildings were burnt down. Other categories of contexts such as pit backfilling do not represent closed finds in the strict sense. Artefact collections of these so-called ‘relatively closed finds’ might have accumulated over longer periods of time and under more complex depositional circumstances (Sommer 1991).

As an additional method both to identify earlier categories of ceramic vessels and to explore their functions, the capacities of 439 vessels from six settlements have been recorded and analysed. The calculations of the capacities have been performed from drawings through the calculation of average diameters (measuring and averaging the inner diameter every 1 cm) and through the application of the formula for calculation of the cylinder volume (V = πr2h).

32 www.archaeoinfo.dk (last visited 2019-09-17).

Based on the capacities calculated in this way, different vessel categories can be reliably distinguished in certain cases. On the other hand, within certain categories of closed vessels, different size categories can be distinguished which likely reflect functional differences as well.

2.6.2 Modelling of ^{14}C dates

Calibration and Bayesian modelling of the ^{14}C-dates was performed using the software OxCal v. 4.3.2 and the functions 'boundary', 'gap', 'span' (Bronk Ramsey 2009; Reimer *et al.* 2013). Through the modelling of boundaries, it is possible to reduce significantly the dating span of the samples and to come up with much more accurate models for the dating of certain events or (better) sequences of certain events.

The main method to test the quality and potential validity of the calculated model involved the OxCal agreement indices (Amodel and Aoverall). These indices provide measures and diagnostic tools to establish how well any posterior distribution agrees with the prior distribution. They should usually be over 60% and show whether the probability of a model is unacceptably low and should thus be discarded. Additionally, data series were in some cases simulated (function R_Simulate) in order to test the probabilities of certain scenarios such as the relative chronology (Bronk Ramsey 2009).

The results of the probabilistic calibration of radiocarbon dates and the probability density function are displayed in tables and graphs. In each case, 68% and 95% confidence intervals are reported as standard. Additionally, for boundaries, the maximum of the probability distribution is displayed as 'highest probability', since this represents the most acceptable point for an estimate of ^{14}C dates (Michczynski 2007). However, with regard to these results, we should consider that large differences in the estimates can occur in relation to true calendar ages where the calibration curve has large wiggles and rather flat areas with steep parts at the ends.

2.6.3 Analysis of settlement patterns

The analyses of settlement patterns took into account, in different ways, especially the number and size of settlements from a temporal perspective. The number of settlements per phase served as a proxy for the regional settlement and population density. To make this value comparable in view of the unequal phase lengths, the number of settlements per 100 years was also presented. Analogous to surveys in the Euphrates region, the minimum aggregated (summed) settlement area per phase and per 100 years of settlement duration were used as alternative proxies (Wilkinson *et al.* 2012).

Insofar as the chronological information was fuzzy, the number or size of settlements was divided equally between the phases in question using aoristic methods (Mischka 2004).

Temporal changes in settlement sizes were investigated using univariate statistical methods and graphically represented by means of boxplots. For this purpose, the software PAST (PAleontological STatistics) Version 3.25 was used. Gaussian density distributions were used to analyse the distribution of settlement sizes within the different phases. In order to record changes in the settlement system and in the site hierarchies, rank-size distributions were analysed as well.

To demonstrate regional differences within the working area, the analyses mentioned were carried out once for the entire sample (which includes parts of the Ros, Dnieper, Sinukha and Southern Bug river basins) and compared with the sample from the Sinukha river basin.

3 Chronology on a local scale: the case of Talianki

3.1 General information

3.1.1 Discovery and excavations

The Talianki site is one of the Tripolye mega-sites and it has been known to researchers since the 1920s (Kruts 2008, 33); in the 1960s Stefanovich traced several Tripolye settlements there (Dudkin 2004a, 510). However, after the work of Shishkin, who, being an army topographer, made some aerial photographs of the locality and decoded them (Shishkin 1973, 35, 40), and the surveys carried out afterwards, it was established that this site represented one large settlement. Regular investigations at the site began in 1981 (under the direction of V. Kruts) and, with short intervals (1995-1997; 2002), have been continued to this day (Kruts and Ryzhov 1981; Kruts *et al.* 2001; Kruts *et al.* 2005; Kruts *et al.* 2008; Korvin-Piotrovskiy and Menotti 2008; Kruts *et al.* 2009; Kruts *et al.* 2011; Kruts *et al.* 2013). During this time, a number of objects were excavated – 51 *ploshchadkas*, six pottery kilns, several pits (up to the end of 2016). The material is stored in the finds of the Institute of Archaeology of the National Academy of Sciences of Ukraine, Cherkasy Regional Local History Museum and the Museum of Tripolye Culture in the village of Legedzyne.

Based on the data of relative chronology, Talianki was attributed to the sites of the Tomashovka local-chronological group, phase 3, stage 1 (Kruts and Ryzhov 1985, 52).

3.1.2 Archaeomagnetic plans

To obtain a more detailed settlement plan, during 1983-1986 some magnetic studies were carried out (on an area of 232 hectares), and a plan of the site was made (works by V. Dudkin and employees of the Institute of Geophysics of the Academy of Sciences of Ukraine G. Zagniy, V. Golub, A. Khomenko). As a result, it turned out that the settlement layout had the shape of an elongated oval running from north-west to south-east (Kruts *et al.* 2001, 17-18). The 'oval' was formed by two rows of buildings, the north-western part of which was heavily built up, in contrast to the central and southern parts of the settlement. In addition, in the southern part, there was one more row of buildings encircling the settlement.

Figure 22. Pond on the Talyanka River. View from the site Talianki, summer 2012.

In 2011-2012, a high-resolution archaeomagnetic survey was conducted (the work of K. Rassmann, D. Peters, C. Mischka, R. Ohlrau, A. Windler) as a result of which a new site plan was obtained (Kruts *et al.* 2011; Chapman *et al.* 2014; Rassmann *et al.* 2014). The total area investigated was 194 hectares, of which the settlement itself occupied 120 hectares (Ohlrau 2015, 42).

This plan as a whole agrees with the map compiled by Dudkin but is more accurate, with the geomagnetic anomalies being more or less clearly seen. On the plan, there are significantly more different anomalies (which were identified as pits, pottery kilns, pathways, etc. in the course of further investigations), while on the Soviet scientists' maps it is mostly buildings that can be seen (Kruts *et al.* 2013). According to recent studies, the settlement area is 320 hectares, of which 120 hectares comprise unbuilt space (Ohlrau 2015, 42).

3.1.3 Topography

The settlement is located on the promontory-like plateau between the villages of Talianki and Legedzyne (Talne district, Cherkasy region). The plateau is formed by the River Talyanka and a gully with a stream flowing into it on the east and north (Kutsaya balka), and on the west and south by another tributary creek of the Talyanka (fig. 22).

3.2 Research questions

Thus it can be seen that the settlement of Talianki is a fairly well-studied site with a lot of data for chronological constructions. A few questions related to this site can be outlined:

- What is the intra-site chronology?
- Can we talk about any kind of phases in its development and, if so, were there various phases in Talianki's development?
- What was the sequence of the settlement development?
- Are there any typological differences in the material from different parts of the settlement and, if so, can these differences be chronological indicators?
- What is the site's chronological position compared to the settlements of the period?
- What is the position of the site in the Tripolye periodisation scheme, and how is its data correlated with the data from the settlements of other regions?

Answers to the first parts of the questions can be attempted with the help of data obtained as a result of systematic excavations and the artefact and geomagnetic plan analysis; the results should be tested with the absolute dating. The answers to the other parts can be obtained after a comparative analysis of data from other sites.

3.3 Data base

3.3.1 The archaeomagnetic plan

One of the most important sources for studying the settlement is the availability of the magnetic plan (even though it is not complete). On the plan, some objects that were left by human activities can be seen; they belong to different periods – Tripolye ones, later Bronze Age kurgans, some modern buildings. As for the Tripolye ones, there are a number of pits, pottery kilns, houses and so-called 'mega-structures'. Let's stop off at the house configurations.

The plan of the Tripolye site clearly shows numerous burnt houses arranged in different ways (fig. 23):

- One of the main clearly visible characteristic features of the settlement plan is the two main rings of buildings ('**o**' – the outer ring, and '**i**' – the inner one), which outline the settlement. They probably border the main 'road' of the site.
- Inside the two circles of houses, there are different buildings which I will conventionally call 'interior build spaces'. In different parts of the settlement, three types of interior build space can be observed, based on the position of the houses: 1) rows or lines of houses that are parallel to the outer rings, forming a kind of 'incomplete rings' – in the southern part one can see one or two half rings, in the northern part two to six; 2) houses that form 'radial streets' placed perpendicularly to outer (and inner) rings and are located in the direction from the rings to the 'centre' of the settlement can be clearly seen in the northern part (about 14 lines), the central part (minimum three lines), and this type of development can be observed in the southern part as well (three unfinished lines); 3) the structures built between the different types of the interior build space that fill the gaps.
- Several structures are located outside the main ring '**o**'.

In contrast to the two main rings, incomplete inner rings are interrupted by radial rows of houses that run from the 'main' inner ring towards the centre of the settlement. This is especially clearly seen in the northern part of the settlement. In some parts of the settlement, these 'incomplete rings' are represented by separate clusters

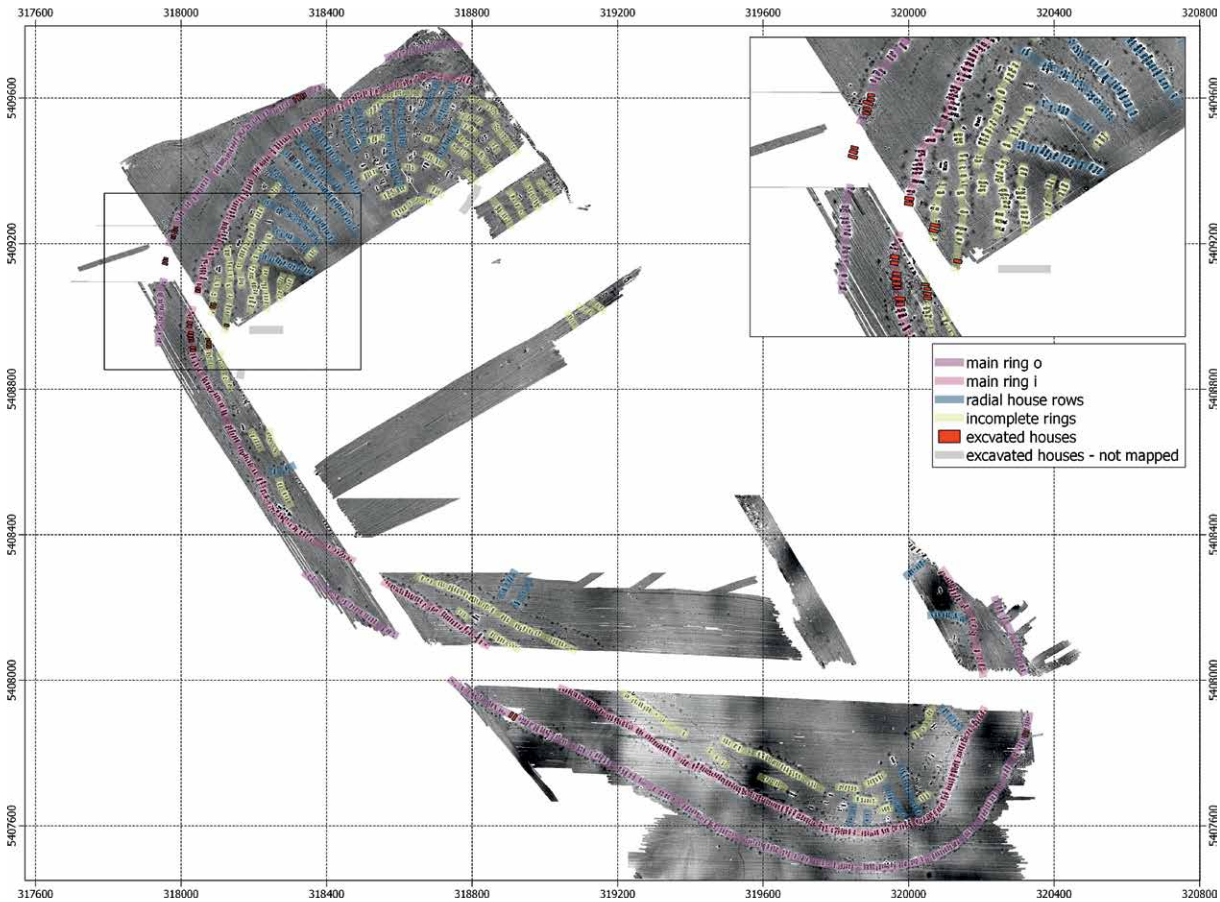


Figure 23. Archaeo-magnetic plan of the settlement Talianki with marked components and excavation areas (Plan after Rassmann et al. 2014).

or groups of houses (three to six). The radial lines (that are often double) are often located opposite the space between the structures of the main ring **'i'** (in one case opposite the unfinished ring), which can be interpreted as an entrance/exit from the settlement (eight occurrences). Studying the archaeomagnetic plans, some researchers have suggested that the 'main rings' of Tripolye settlements represent the basic unit of the site, since this feature is inherent in almost all the known B1-2-C1 Tripolye sites (Chapman *et al.* 2014; Müller *et al.* 2014; Rassmann *et al.* 2014; Rassmann *et al.* 2016; Ohlrau 2020). Having established the types of Talianki building arrangements, it would be interesting to trace their chronological sequence.

Let's consider the data available from excavations in more detail.

3.3.2 Excavations

As already mentioned, there are many excavated objects in Talianki, for example 51 houses (stage on 2020). Since the excavations focused mostly on the same category of feature – burnt houses normally with large pottery assemblages – the conditions for an understanding of the intra-site chronology are very favourable. Let's put the data from the excavated houses in the table 15:

As can be seen from the table, there are quite a lot of data from different parts of the settlement for making comparisons:

- outer ring 'o' – **16** houses (northern part: nos. 7, 8, 9, 10, 24, 25, 26, 45, 46, 47, 50, 51; southern part: nos. 13, 14, 43, 44)
- inner ring 'i' – **8** houses (nos. 28, 29, 34, 35, 36, 37, 38, 39)
- 'unfinished' rings – **9** houses (nos. 17, 18, 30, 31, 32, 33, 40, 41, 42)

Excavation Areas	House No. (year of study)	Settlement Part	^{14}C Date	Published
I	1 (1981)	Central part		Kruts *et al.* 1981
II	2 (1982), 4, 5, 6 (1983)	Central part, radial line		Kruts *et al.* 1982; Kruts *et al.* 1983; house no. 2: Ryzhov 1990
III	3 (1982?)	Central part		
IV	7, 8 (1984), 9, 10 (1985)	Northern part, outer ring ('o')	9 (1)	Kruts *et al.* 1985; Kruts *et al.* 1986
V	11, 12 (1985)	Eastern part, radial line?		Kruts *et al.* 1986
VI	13, 14 (1986)	Southern part, outer ring ('o')	13-14 (4)	Kruts *et al.* 1987
VII	15 (1987), 16 (1988)	Central part, radial line		Kruts and Ryzhov 1988
VIII	17, 18 (1989?)	Northern part, inner unfinished ring?		Kruts and Ryzhov 1989
IX	19 (1990)	Northern part, radial line	19 (3)	Kruts and Ryzhov 1991
X	20, 20a (1991)	Central part, radial line		Kruts and Ryzhov 1994
XI	21 (1992)	Central part, radial line		Kruts and Ryzhov 1994
XII	22, 23 (1993)	Central part, radial line		Kruts and Ryzhov 1994
XIII	24 (1994), 25(1998), 26(1999)	Western part, outer ring ('o')		Kruts and Ryzhov 1995; Kruts *et al.* 1999
XIV	27 (2000)	Central part	27 (1)	Kruts *et al.* 2000b
XV	28, 29 (2001), 34, 35(2005), 36, 37 (2006), 38, 39 (2007)	Western part, inner ring ('i')	28 (1) 29 (1) 30 (1) 35 (1) 37 (1)	Kruts *et al.* 2001; Korvin-Piotrovskiy and Menotti 2008; Kruts *et al.* 2006a; Kruts *et al.* 2006b
XVI	30, 31 (2001), 32, 33(2003)	Western part, inner unfinished ring		Kruts *et al.* 2001; Kruts *et al.* 2005
XVII	40, 41(2008)	Western part, inner unfinished ring	40 (5), 41 (4)	Kruts *et al.* 2008
XVIII	42 (2009)	Western part, another inner unfinished ring	42 (5)	Kruts *et al.* 2009
XIX	43 (2009), 44(2010)	Southern part, outer ring ('o')	43 (3)	Kruts *et al.* 2009 (house no. 44, not published)
XX	45, 46 (2011), 47 (2012), 50 (2016), 51 (2017)	Northern part, outer ring ('o')	45 (1), 46 (2), 47 (3), 50 (1)	Kruts *et al.* 2011; Kruts *et al.* 2013.
XXI	48, 49 (2013-2014)	Northern part, inner ring ('i')	48 (1) 49 (1)	Kruts *et al.* 2016

Table 15. Archaeological excavations in Talianki: trenches, house numbers, ^{14}C dates, references.

- radial lines (streets) – **13** houses (nos. 2, 4, 5, 6, 11, 12, 15, 16, 19, 20, 21, 22, 23)
- 'central part' – the location is not completely clear – **3** houses.

It seems that the research strategy in Talianki was quite effective, the houses from different parts (especially the northern and western ones) of the site have been investigated, and there are ^{14}C dates for 18-19 buildings. However, as can be seen from Table 15, the published material is available only for 20 (out of 51) houses, mostly representing the excavations of the north-western part of the settlement, while there is almost no publication of excavated houses located on 'radial streets' and practically no material from the southern part of the site. Thus there is obviously a lack of data from some parts.

Today there are several points of view on the intra-site chronology of Talianki that are based on the available data.

3.4 Models of formation and development

In the late 20th century, mainly 'relative-chronological' methods (such as pottery typology) were used to identify internal development phases of a settlement. Thus Ryzhov distinguished two stages in the development of the settlement based on his analysis of the ceramics from 18 buildings (Ryzhov 1990, 83-90) through the quantitative proportion of shape types and ornamentation. In general, the proportion compiled was homogeneous for all dwellings, but the vessels from dwelling number 2 (which had some similarities with the vessels from house number 3) were distinctly different. These ceramic complexes (the correlation of vessels) resembled, according to Ryzhov, assemblages from Chichirkozivka, an earlier Tomashovka group settlement. For this reason, Ryzhov suggested that the settlement was built in two stages:

1. First, the houses were built in the central part and along the inner circle.
2. After that, the houses around the outer circle were constructed with the continuing infilling of the central part (Ryzhov 1990, 87). In the final stage, according to him, all the buildings of the site were used concurrently.

Diachenko, by using mathematical modelling, calculated the percentage of possible contemporary houses (that is 78% during the main occupation) and proposed a zone-related development of groups of houses both diachronically and synchronically (Diachenko 2009, 2010).

Menotti and Rassamakin used ^{14}C dates to monitor the chronological development of the Talianki settlement and supported the assumption about its two-phase construction (Rassamakin and Menotti 2011, 654-655). They presumed that first the people settled in the north-western quarter and then (as new communities arrived) expanded south-eastwards. The construction started from the inner circle, and groups of houses were built diachronically (and some of them possibly synchronically) (Rassamakin and Menotti 2011, 654-655).

So three possible ways of settlement development have been discussed for Talianki:

a. '*inside out model*' according to which the development took place from the centre to the outside that might have taken place from inner to outer circles
b. '*zone-related development*' (Diachenko 2009; 2010)
c. '*north-west* to *south-east* phasing', a two-phase chronological development (Rassamakin and Menotti 2011, 654).

If we assume the theory that the two outer rings are the basic elements of a Tripolye settlement plan, several speculative chronological models could be put forward for consideration:

- Two outer rings of houses could have existed without internal (unfinished) ones and without radial lines of buildings, but not vice versa: incomplete and radial lines of houses without outer circles are unlikely to have comprised a settlement. Consequently, it would be possible to assume that the construction started from the two 'outer' rings (or at least from one '**i**') and then building up of the inner space followed.[33] As to the interior space, it could be assumed that first the radial streets were built and after that unfinished rings, since radial constructions do not allow the completion of the 'rings'. However, the construction could have also been synchronous.
- First, the 'unfinished ring' houses were constructed, but soon the area of the settlement increased due to the construction of a main ring '**i**'. Subsequently, radial streets were constructed in the space left between the 'unfinished rings'.
- The main building space elements (rings, radial streets) were completed at the same time with some blank spaces left between them, in which houses were later built.

These assumptions could be either proved or disproved (tested) with the use of data obtained from systematic excavations, analysis of artefacts and absolute dating.

33 A similar idea of a settlement development was also put forward for the Maidanetske site (Shmagliy and Videiko 1990, 91-94). This model could be called 'ring by ring development'.

3.5 ^{14}C dates of Talianki

So far, 43 ^{14}C dates from different laboratories (Kiev, Oxford, Poznan) are available for the Talianki settlement (see Appendix 2). The sampling material in most cases was bone and in three cases charcoal (Oxford data). Most dates originate from 'houses' or, better to say, 'housing areas', but there are also several dates for pottery kiln 'F'. All the charcoal data belong to the group of the oldest data which might indicate an old wood effect. Since the contextual information in most cases is not complete – we know only the excavation area and sometimes the square – the information value of the dates is limited.

3.5.1 Calculating dating probabilities of individual house areas

In order to be able to identify chronological trends in the sequences obtained by correspondence analysis, the most probable start and end dates for every dated house area were modelled separately using the function *boundary* in the calibration software OxCal (tabs. 16 and 17). To determine the most probable date range, the highest dating probability was read off manually from the calibration plots. Since only a single sample was available from most house areas, start and end dates are frequently very close to the 1-sigma dating range of the calibration of single dates. In cases with more than one sample, the agreement of the dates could also be tested using the function *R_Combine*. This function assumes all samples are related to the same event. An integrated chi-square test shows how probable this assumption is for the dates included. Therefore, in some cases, individual dates needed to be excluded from the analysis.

The results of the analysis are displayed in Figure 24. Accordingly, the earliest dates originate from the area of kiln F and house 47. Among the house areas, at least two groups can be distinguished: the houses 47, 50, 45, 46, 42, 43 and 19 belong to the earlier group of dwellings dating before 3710 cal BCE. A group of houses' dates are consistent and most probably date back to the first half of the 36th century BCE (35, 37, 30, 48, 41, 27, 28). In addition, house areas 40 and 29 are dated to within both earlier and later house groups. Three house areas provided dates from the time after 3650 cal BCE (13/14, 9). It is likely the date from house 49 and the earlier dates from kiln F are outliers.

It is striking that the houses from the different dating groups show no significant distribution within the different settlement areas (as defined above). Therefore, currently, we cannot deduce the intra-site chronology of the settlement from the ^{14}C dates alone. For this purpose, pottery assemblages of houses without ^{14}C dates also need to be included in the analysis.

Figure 24. Talianki, highest dating probablities for individual house areas.

Table 16. Modelled highest probabilities for the start and the end of house areas and the kiln area in Talianki obtained by the calibration using the OxCal boundary function.

House Area	Dates (n)	Start (highest)	End (highest)	Duration	Remarks
9	1	3640	3530	110	
13/14	4	3655	3520	135	
19	3	3910 or 3800	3710	200 or 90	
27	1	3700	3640	60	
28	1	3700	3640	60	
29	1	3770	3655	115	
30	1	3715	3640	75	
35	1	3760-3705	3650	55-110	
37	1	3700	3655	45	
40	5	3735	3670 or 3690	45 or 65	Without Ki-15994 (poor agreement)
41	4	3690	3665	25	Without OxA-19840 (poor agreement)
42	5	3790	3715	75	Without outlier Poz-109311
43	3	3780	3715	65	
45	1	3915	3770	145	
46	2	3930	3750	180	
47	3	3945	3800	145	
48	1	3705	3655	50	
49	1	3500	3355	145	
50	1	3800	3770	30	
Kiln F	3	3950	3800	150	Without Poz-87469 (poor agreement)

Dwelling	Dates (n)	Start	End	Median	Highest Probability	Remarks
9	1	3637	3527	3569	3630 or 3580-3530	
13/14	4	3634	3524	3571	3630 or 3590-3560 or 3535	R_Combine = 4767±28, X^2-Test: df = 3 T = 1.3 (5% 7.8)
19	3	3910	3715	3791	3910 or 3800 -3710	R_Combine = 5012±22, X^2-Test: df = 2 T3.3 (5% 6-0)
27	1	3695	3643	3669	3650	
28	1	3695	3641	3665	3620	
29	1	3762	3661	3712	3700	
30	1	3713	3640	3687	3690-3650	
35	1	3757	3653	3696	3700-3660	
37	1	3712	3651	3692	3690-3655	
40	5	3766	3700	3730	3735-3670 or 3690	R_Combine (without Ki-15994) = 4953±21, X^2-Test: df = 3 T 5.4 (5% 7.8)
41	4	3699	3656	3681	3690-3660	R_Combine (without OxA-19840) = 4910±27, X^2-Test df = 2 T = 2.2 (5% 6.0)
42	5	3788	3715	3759	3790-3715	R_Combine without outlier Poz-109311 = 4992±18, X^2-Test: df = 3 T = 3.4 (5% 7.8)
43	3	3766	3711	3743	3780-3715	R_Combine = 4972±20, X^2-Test: df = 2 T = 2.6 (5% 6.0)
45	1	3936	3715	3822	3915-3770	
46	2	3932	3768	3834	3930-3750	R_Combine = 5021±27, X^2-Test: df = 1 T = 1.1 (5% 3.8%)
47	3	3943	3804	3868	3945-3800	R_Combine = 5067±27, X^2-Test: df = 2 T = 0.2 (5% 6%)
48	1	3701	3656	3683	3690-3650	
49	1	3499	3361	3453	3480 or 3365	Outlier?
50	1	3935	3716	3822	3800	
Kiln F	3	3926	3778	3880	3890 or 3790	R_Combine = 5025±20, X^2-Test: df = 2 T = 5.7 (5% 6.0)

Table 17. 1-sigma probability distributions of single dates and results of the application of the OxCal function R_Combine.

3.6 Talianki pottery

3.6.1 Methodological remarks

The ceramics from the Talianki settlement were processed and described by S. Ryzhov (until 2012), who also worked with the ceramic material from other ‘Western Tripolye’ sites of the Bug-Dnieper interfluve (periods B2-C2). Ryzhov’s statistical calculations (see previous part), based on his classification, showed the probable distinctions between different local groups and stages, but they can hardly work on the intra-site chronology, because the types were distinguished with the use of different criteria and display different characteristics.

In view of the present condition of the Talianki ceramic material, different approaches are possible to analyse it. First of all, I propose to divide all the ceramics into two large categories: ‘*restorable (reconstructable) forms*’ and ‘*fragments*’.

The ceramics attributed to the category ‘restorable (reconstructable) forms’ could be unbroken or disintegrated vessels, or parts of vessels, that make it possible to restore the vessel profile and its dimensions/size. That is, one ceramic unit must correspond to one vessel. The category ‘restorable (reconstructable) forms thus could be the vessels that were unbroken at the time of the abandonment of the house.

The ceramics attributed to the category ‘fragments’ should be the remaining sherds whose type (that is shape and decor) could be sometimes restored, but this is not applicable to all fragments. The proper ‘fragments’ represent either a part of the cultural layer before the construction/functioning of the house, or some vessels that were broken during the functioning of the house, or part of the cultural waste that appeared in the house after it had been left.[34]

Grouping the material according to this principle seems more appropriate since, on the one hand, it can help to avoid distortions during calculations (which can result in coming to wrong conclusions) and, on the other hand, if we assume that the houses on the settlement were not abandoned simultaneously but at different times, then perhaps it would be possible to reconstruct the chronological order. But, again, the fragments were published rarely, and therefore we are not really able to analyse them.[35]

Conversely, of course, when a statistical analysis is conducted, fragments should also be taken into account. That is, it seems necessary to make a comparison between the total percentage ratio (when both a 'whole' vessel and a separate fragment are calculated as one unit, which is the method used by Ryzhov to determine the percentage of kitchenware and tableware) and the percentage obtained while calculating all the fragments – separate sherds and those that make up 'whole' vessels.

Thus it is proposed to use two types of calculations, which can be illustrated with the following example: we count for one house (*49*):

1. The total number of ceramic units, where there are **42** 'whole' vessels (consisting of 791 fragments) and **918** sherds, is **960** units, forming 100%. Calculating the percentage, we get:

   whole forms **4.38%**, fragments **95.62%.**

2. The total number of all the fragments (including the pieces that make up the whole forms): 791 + 918 = 1,709 (100%). Calculating the percentage, we get:

   whole forms **46.28%,** fragments **53.72%.**

Further calculations show that potentially the separate fragments (53.72%) can stand for, as a minimum, 157 whole vessels, that is, the minimum total number of vessels in the dwelling could be 42 + 157 = 199.

A similar calculation can be carried out for different types (groups) of vessels in a house.

Undoubtedly, this method requires further development. However, this analysis clearly shows the distortions obtained when using only the 'total percentage ratio' (1). Applying such an analysis as well would allow us to calculate the potential number of vessels of different types in one dwelling.

However, since at this stage we have only 'restorable forms' (and no fragments), we will have to work basically with them.

The method of correspondence analysis is generally accepted during th undertaking research to build a chronology based on ceramic data (*e.g.* Müller and Zimmermann 1997). For this reason, I describe below attempts at applying this method to analyse the Talianki material.

34 The percentage of individual 'sherds' (fragments) is higher than that of the 'whole' forms (even if the number of sherds that make up the 'whole' vessel are counted). Consequently, these individual fragments could reflect all the phases of a functioning house. It should be emphasised that a significant number of ceramic fragments are characterised by worse preservation conditions in comparison with disintegrated vessels and other 'restorable' forms. Analysing the distinctions between these sherds and 'whole' forms (by shape, decor, etc.), we might get some interesting results ('lifespan' of certain categories of vessels or some data on intra-site chronology).

35 Ryzhov published mainly the vessels which can be attributed to 'restorable forms'.

House No.	Bowls Table/kitchen	Rectangular-shaped Vessels	Lids	Craters	Crater-shaped Vessels	Pots Table/kitchen	Guttuses Table/kitchen	Biconical Vessels	Sphero-conical Vessels	Pear-shaped Vessels	Amphorae	Goblets/Jugs	Cups	Total
28	6			1		3/2		2	1	1	1	2/1	5	25
29	2/1	1	1	1	1	0/4		3	1			3	2	20
30			1			0/1		3	1			3	1	9
31						0/1	0/1			1	1		2	6
32	3			1		2/2			1		2	1	4	16
33	10			2	2	1/8		6	4	1	1	7	2	44
34	3				2	1/1		4			2+1	1	13	28
35	3	2	1					1		1	1	3	6	18
36											1	1	2	4
37	4		1				1	1	2		1	1	8	19
38	2				1	0/1						1	5	10
39	1		1	1				3			1	3	4	14
40	4			1	1	0/4	1	3	2			2/1	3	22
41	2	1	1			1/3		1			1	2	3	15
42	3				1	0/1		3	1	1		1	4	15
43	3			1		0/1		1					1	7
45	1		1		1	0/1		4		1	1	2	8+1	21
46	2					0/1		2				/1	13	19
47	10			2	1	1/3		7	2		2	5/1	14	48

Table 18. Talianki, frequency of vessel types in houses after Ryzhov.

3.6.2 Testing Ryzhov's typology

In order to test Ryzhov's typology for our purposes, it is proposed to place the available published ceramic material ('restorable' forms) in a table, arranging it in the basic groups (classes) (13 in total) according to morphological criteria (based on Ryzhov's types, but ignoring his 'techno-technological' division, see tab. 18).

The table shows that there are 360 published vessels ('restorable' forms) to enable the correspondence analysis. Binoculars have been excluded since they are not proper vessels.[36]

To start with, I analysed the available house inventories from Talianki at the classification level of vessel classes in order to: 1) test whether there are any functional differences between the house inventories; and 2) test the method of Ryzhov, who considered (in his PhD thesis) the frequency of vessel classes (besides decoration systems) as a suitable criterion to establish chronology at a regional level.

My assumptions regarding the function of the vessel classes are based on the size, proportions, openness, and technology.

The inventories of 19 houses with 360 vessel units were able to be used for the analysis. These inventories were analysed by correspondence analysis using the Excel AddIn CAPCA. The samples are fairly unevenly distributed among the houses, with the number of vessels per house varying between 4 and 48 units.

36 They do not have any container volume, that is, the capacity which by definition any vessel has (Palaguta 2007, 111).

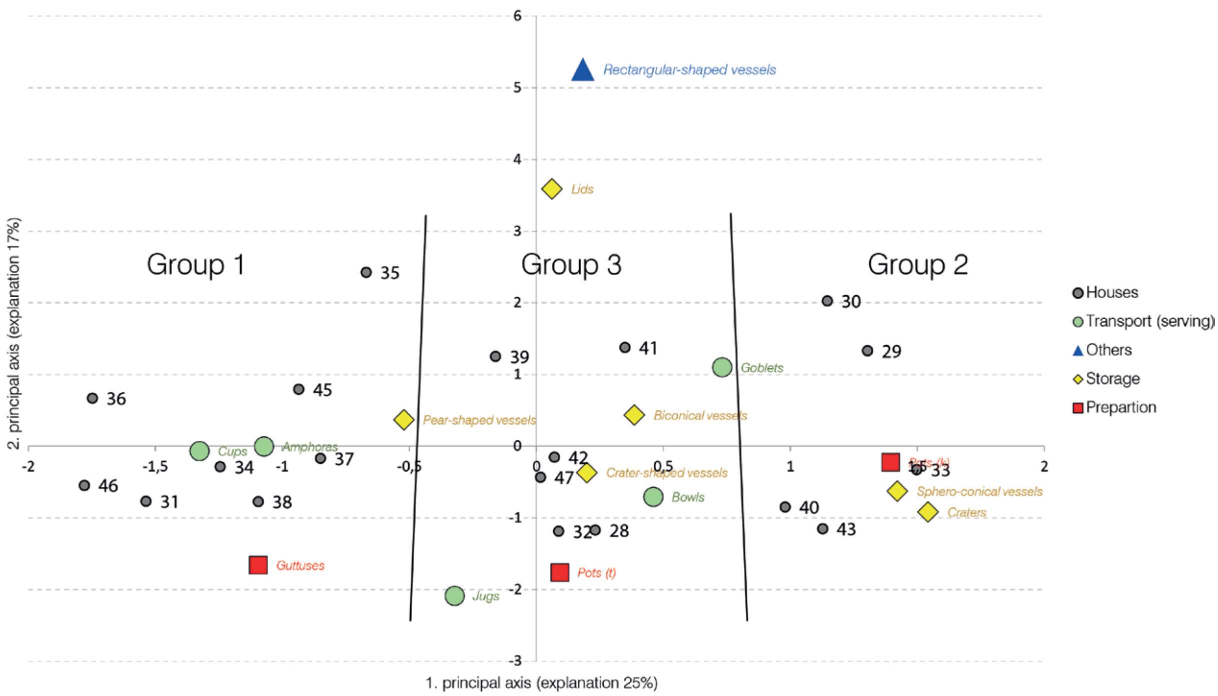


Figure 25. Talianki, Ordination diagram of the CA for testing functional differnces beetween house inventories according to the frequency of vessel types after Ryzhov.

On the first axis of the correspondence analysis (explanation of 25% of the total variability), three groups of houses can be distinguished: on the left side are house inventories displayed with higher frequencies of cups, amphorae, guttuses, and pear-shaped vessels (group 1: houses 31, 34, 36, 35, 37, 38 and 46). On the right side, the houses are arranged that contain crater-shaped and sphero-conical vessels and kitchenware pots (group 2: houses 29, 30, 33, 40, 43). In the centre, the house inventories are grouped that contained larger amounts of bowls, goblets, biconical vessels, crater-shaped vessels, jugs, tableware pots, lids, and rectangular vessels (group 3: houses 28, 32, 39, 42, 47).

The second axis of the analysis (explanation of 17% of the variability) shows a distinction between houses with lids and rectangular vessels on the upper side and houses without these vessel categories. Accordingly, lids and rectangular vessels appear exclusively in houses of group 3 (fig. 25).

The analysis reveals distinct differences between the investigated house inventories which seem, however, not to be based on general functional differences. Basically, inventories of all houses contained vessels for serving, storage and food preparation. Consequently, preliminarily at least, we cannot exclude the possibility that the differences show chronological differences.

In order to understand the distinction, two further analytical steps have been performed: firstly, I mapped the groups in the plan of the site and, secondly, I tested the chronological relevance based on the available ^{14}C dates.

Unfortunately, the samples are to some extent very unequally distributed as almost all inventories included are located in a small area in the north of the settlement. The distribution of the inventory groups in the different site areas turns out to be unspecific since all three inventory groups are represented not only in both of the main house rows of the central street but also in slightly more centrally situated dwellings (fig. 26). This clearly speaks against a chronological importance of the observed inventory differences. However, we still cannot exclude the possibility that the houses within the different rows have different ages.

From the inventories which were included in the analysis, there are 15 radiocarbon dates available to test the chronological relevance of the inventory differences

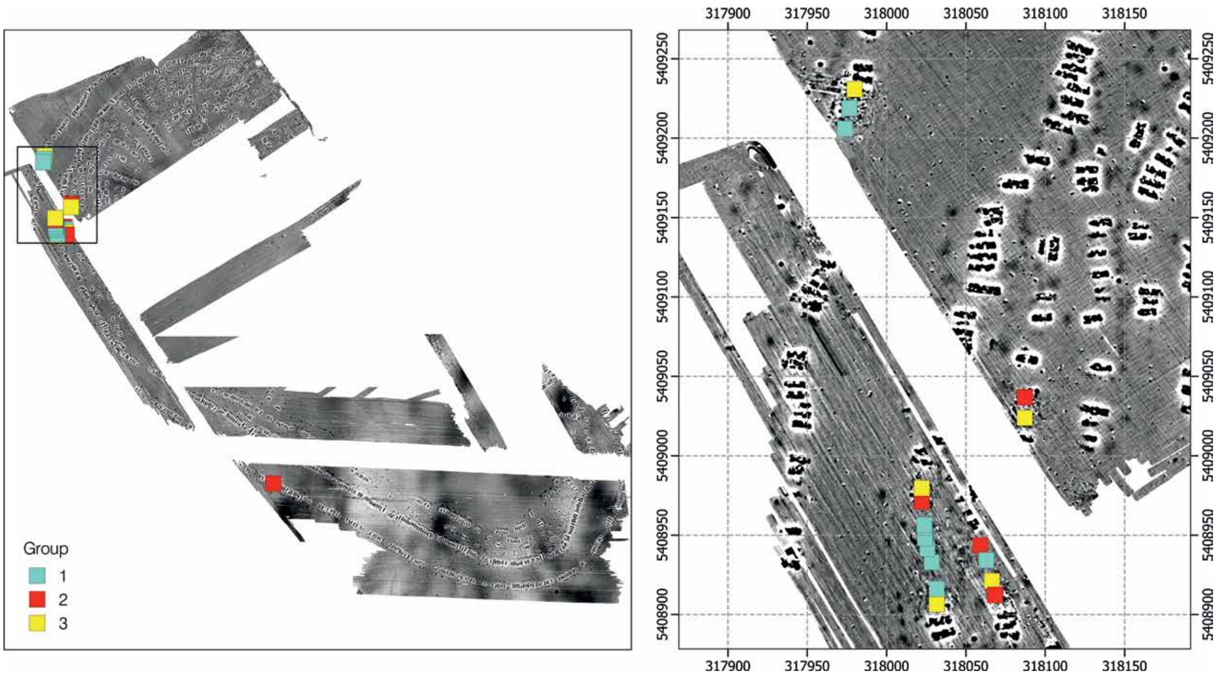


Figure 26. Talianki, Mapping of inventory groups according to the CA in Figure 25.

(group 1: two dates from houses 35 and 37; group 2: six dates from houses 28, 41 and 42; group 3: from houses 29, 30, 40, and 43). Those data were calibrated in the software OxCal (v.4.3.2) by means of the function sum. According to this analysis, the highest dating probability for all three groups is consistent after 3700 cal BCE. This is also true if we exclude Kiev and Oxford data as proposed, for example, by Harper (2013).

As the analysis described clearly shows, the differences in the frequency of vessel classes in the households are most likely not based on chronological differences, but on some other, currently not detectable, criteria. It would be surprising if this were the case. In order to come to a chronological differentiation of the Talianki inventories, a more differentiated type classification, located at the classification level 'type', is probably necessary.

If we look more attentively at the resulting picture and at what these different groups of vessels are, then great doubts arise that this grouping actually has any chronological meaning; most likely it simply reflects the state of the data that were taken for analysis.

Proceeding from the foregoing, it seems necessary to create another systematisation of the material for carrying out the CA that would be based on the principles described in the previous part.

3.6.3 Ceramic typology

3.6.3.1 Typology of shapes

The typology was compiled exclusively on the material of the Talianki site and included a sample from each of 29 houses (house areas). To begin with, all the vessels were grouped into categories, within which we got a number of types, subtypes and variants.

As a result, the classification is made up of the four levels described in the previous part. A more specific division into smaller groups started at level *3 (subtypes)* where pottery groups are divided by the shape of the corolla (bowls) and the corolla and shoulders (the remaining vessels) and other criteria. Cups and goblets were grouped into subtypes based on the shape of the corolla and shoulders, as well as according to the proportion of the height, shoulder diameter and corolla diameter. As to the variants, they were distinguished according to other characteristics (some shape peculiarities).

It should be noted that the vessels vary greatly in size. So such factors as the size of the vessels were taken into consideration as well. All the available Talianki ceramics were measured (see Appendix 4), but the measurements are not very accurate because of the poor scale next to each vessel, so the figures can only be used approximately, with a high probability of making certain corrections.

A number of pots are quite large (height 120-40 cm), some medium (40-20 cm), and others small (less than 15 cm). Thus:

- 'Craters…' and 'biconical/sphero-conical-amphora' type could be divided into large vessels 60-40 cm, vessels from 40 to 20 cm, and vessels that are shorter than 20 cm.
- The pear-shaped type has large containers with heights of more than 60 cm, pots from 30 to 20 cm, and three vessels from 15 to 12 cm.

3.6.3.2 Classification of decoration

During work with the ceramic ornamentation from Talianki, the following factors must be considered:

- Different forms of ornamentation are strongly associated with the morphological types of the vessels; almost every *scheme of decoration* corresponds to a certain type of vessel. This can be partly explained by the fact that a certain type of surface was needed for the application of a certain kind of ornamentation.
- So a 'metope' scheme is characteristic only of goblets (*e.g.* see Appendix 9, pl. 9:6; 12:2; 23:6; 36:7) and a 'face-like' one for amphorae (*e.g.* see Appendix 9, pl. 23:1; 25:1; 26:1). The tangent pattern is mainly presented on biconical/sphero-conical vessels and craters, which are comparable in size (*e.g.* see Appendix 9, pl. 9:7; 10:3; 20:4; 21:4-5).
- There are other ornamental patterns that are found on the morphological types of differently sized classes of vessels (*e.g.* leaf-like for large craters and for small goblets).
- It is also possible to distinguish different types of *zoning*: some vessels are painted completely from rim to belly (*e.g.* see Appendix 9, pl. 7:2; 10:5; 21:2; 25:3; 28:3-4), others have horizontal zones (*e.g.* see Appendix 9, pl. 7:1; 9:4, 7, 8; 10: 1-3; 12:4, 6-7), and the third vertical ones (*e.g.* see Appendix 9, pl. 9:6; 27:3; 30:3, 4; 33:7; 36:7).
- The smaller the vessel, the simpler its ornamental scheme is, the fewer elements its decoration contains.

It seems that the shape and surface of the vessel determined the type of decoration. The characteristic feature of vessels with small handles under the rim zone (so-called 'amphorae') is that the handles were inside large drawn circles, which were joined together by lines ('face-like' of a 'facade' scheme). The characteristic feature of large and medium-sized biconical vessels is horizontal zoning and complex ornamental patterns in one narrow closed belt. The pear-shaped vessels were usually entirely decorated from the neck to the body. Craters have, as a rule, a horizontal division into several zones with ornamentation in two of them. Some of the goblets have a vertical division into zones, while the cups have a very simple decoration in the form of horizontal lines and vertical strokes.

In an attempt to avoid a priori associations of certain types of decoration with certain morphological types, a number of *ornamental components* for each vessel were identified independently:

- ***main pattern***: a kind of decoration which is most pronounced on the vessel (occupies a central place, best seen), for example, ornamental schemes like tangent, metopic meander, face-like (facade), *Tangentenkreisband*, and so on;

- ***secondary pattern***, which is also well-pronounced on the same vessel, but differs from the main one and is often located in the rim zone (represented mainly on craters and never on bowls);
- ***encircling lines*** that run either under the vessel rim or in the space from the rim to the corolla, or along the corolla (on bowls). On most vessels, they were often just straight, black horizontal lines (one or several), but on some vessels they are more complex (in the form of a grid, dotted lines, strokes, horizontal tick marks etc.);
- ***filling of space*** between the main pattern and dividing lines, practically invisible element, is made in the form of very thin horizontal or cross lines;
- ***signs***: a schematic picture of an object, mostly painted in a space where there is no other ornamentation, in specially allocated zones ('dogs', 'trees', 'leaflet-grain', 'comet or animal', etc.).

In order to avoid misunderstandings, it is necessary to immediately make a reservation regarding the 'signs'. The discussion about using 'signs' applied on Tripolye ceramics has a long historiography (see Tkachuk 2004). When analysing decorative elements on Tripolye vessels, it is possible to use the sign classification proposed by Charles Pearce, who divided the signs into three types: likenesses or icons, indications or indices and symbols (Pearce 2009, 88-95). Under likeness, he understood more or less a copy of real objects or phenomena, and under the last two types more abstract features (the index as a factual connection to its object, and the symbol as a habit or rule for its interpretant). In Tripolye, the first group included images of plants, animals, people, and the like (*e.g.* Tkachuk 2004). In this work, the signs under consideration are the images from the first group, the other 'signs' are considered to be somewhat problematic because the line between the 'sign' and the ornamentation element is not clear (for a critique of the presence of a large number of signs on Tripolye ceramics, see *e.g.* Palaguta 2009; 2011).

All the above-mentioned ornamental components were distinguished on each vessel and examined separately. Decoration was considered separately for bowls and other vessels.

In addition, the ornamentation on cups was considered separately as well, since they represent a rather abundant vessel type (more than 100 units, that is, more than a quarter of all vessels with which work is possible), which is fairly well published (obviously because the cups are preserved in good condition). However, the decoration on this type of vessel is very simple: a different number of black horizontal encircling lines and the zone between the lines over the rib that is filled with dashes or other elements. Seven combinations of black lines and three variants of filling were distinguished.

3.6.3.3 'Signs' – separately-standing decoration components

When considering the decoration of vessels in Talianki, a number of free (separately)-standing *decorative elements* can be distinguished, some of which can be interpreted as 'signs' (animals, plants, see Tkachuk 2004). These free (separately)-standing elements are part of several ornamental schemes, that is, there is a relationship between 'signs' which are associated with both certain morphological types of vessels and certain ornamental schemes:

- In the type 'craters' (only the group with a neck) and 'biconical-sphero-conical' vessels, free-standing signs and other elements are found in combination with ornamentation in the narrow frieze (mainly with a tangent scheme, but also in a segment-shaped scheme), that is, where there is a 'place' for drawing (between the frieze, where the main decoration is located, and the rim – *e.g.* see Appendix 9, pl. 10:29; 12:7; 21:5; 22:7; 23:10).

- On goblets, ‘signs’ are drawn in the empty zones of the metope, and sometimes in a segment-shaped scheme, as a rule in a combination of an oval cut at the bottom of this zone and often also above it (*e.g.* see Appendix 9, pl. 23:6; 30:3; 32:11; 33:7; 36:7). In the same areas, there are also such decorative elements as vertical or horizontal strokes and ‘stairs’.
- The bowls have a large number of ‘signs’ (inside), which are often associated with a ‘comet-like’ scheme or with the empty space inside the bowl (either completely empty or between a slightly insignificant ornamentation – *e.g.* see Appendix 9, pl. 17:3; 18: 1-2).
- On the ‘amphorae’, there are no clear patterns. Sometimes there are ‘signs’ that are found in the empty zones of other types of vessels – ‘lenticular oval’, horizontal strokes.
- On the ‘pear-shaped vessels’ and lids, signs (as well as ornamental schemes where there is a ‘place’ for a ‘sign’) are missing.

Those free-standing elements that are found in ‘empty’ zones can also be seen in the ornamentation (stairs, lenticular oval, ‘comet’). However, these are mostly less ‘realistic’ images (*e.g.* see Appendix 9, pl. 7:1, 3; 9:7). It is very rare that free-standing elements are applied without there being an ornamental component – an oval arch (single or double in the lower part of closed vessels), and in several cases this or other elements are on the outer/external surfaces of bowls.

3.6.4 Analyses of pottery

3.6.4.1 Combination of forms of decoration at the level of individual vessel units

To continue with the analyses of the decoration of the vessels which *have the most decorative elements*, biconical/sphero-conical vessels of large and medium size, goblets and cups were taken. The ornamentation elements of one vessel were analysed together as a **combination**, so one vessel was taken as one unit. These vessels were analysed by correspondence analysis using the Excel AddIn CAPCA.

Biconical/sphero-conical vessels

Large and medium-sized biconical/sphero-conical vessels showed almost perfect parabola-shaped arrangements in the ordination diagram of the first (explanation 11.75%) and second (explanation 9.0%) axis (fig. 27). On the left end of the parabola, vessels with the festoon and tangent decorative scheme are grouped, while in the centre only the tangent one. On the right end are located the vessels with volute and meander decorative schemes. Accordingly, the correspondence analysis sorts the vessel units by decoration schemes. The arrangement hardly has anything to do with chronological development since individual houses are represented in different parts of the ordination diagram.

Goblets

The picture of goblets was somehow similar to the previous one (fig. 28), where, on the left side of the parabola, goblets with metopic decorations were located, on the right leaf-like ornamentation. Houses 2, 29, 30, 41, and 45 (that belong to different chronological groups) contain both types of decoration.

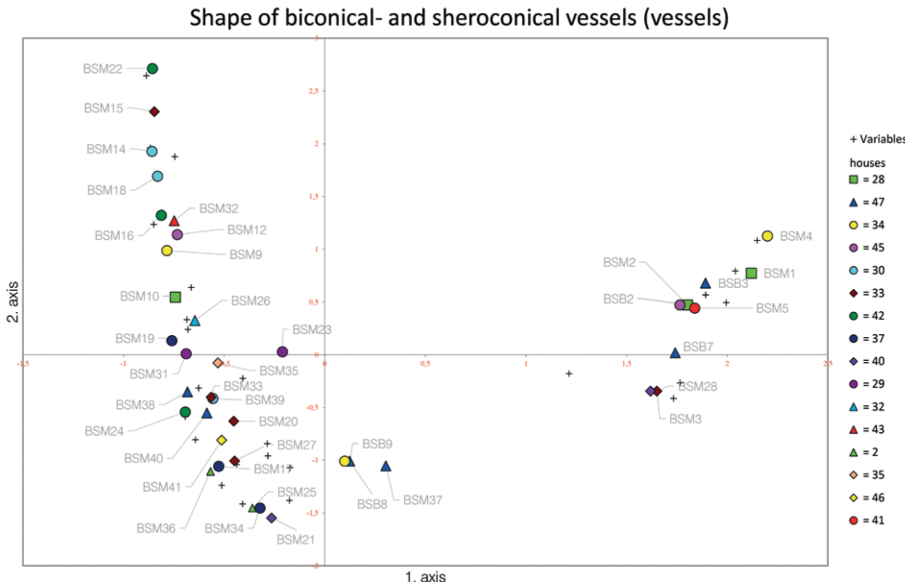


Figure 27. Talianki, Ordination diagram of the CA with analyses of combination of decorations on biconical and spheroconical vessels at the level of individual vessel units.

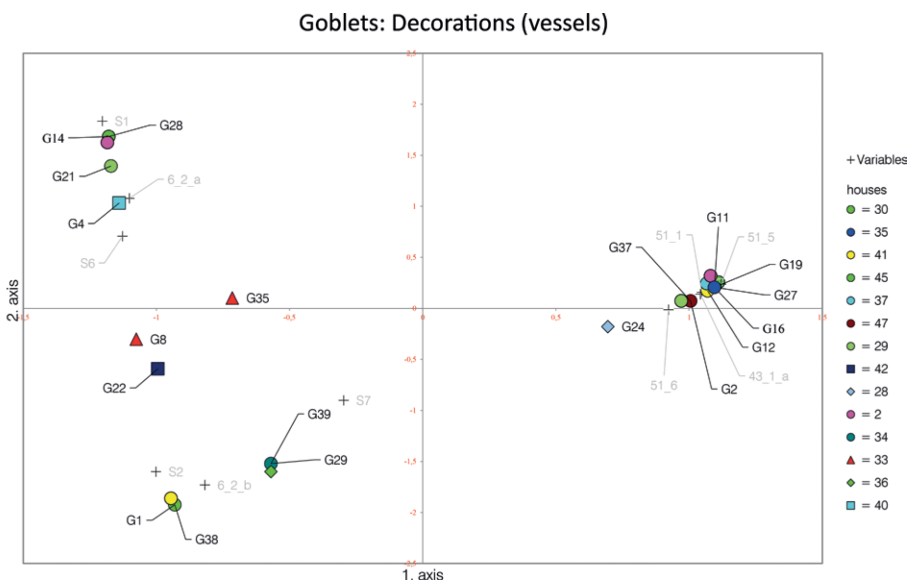


Figure 28. Talianki, Ordination diagram of the CA that analyses combination of decorations on goblets at the level of individual vessel units.

Cups

Forms of decoration on cups (fig. 29), as already mentioned, were classified according to the combination of horizontal lines (1-7) and their filling (a-c). The picture according to the analyses is quite clear: most of the vessel units are clustered at two points in the upper left corner of the ordination diagram of the first two axes, due to the decoration that is similar to main decoration 'a' and the decoration schemes 1 or 2 and 4 or 5. Only a small number of cups are clustered in other parts of the ordination diagram. As indicated by the cups from different houses in different clusters, the forms of decoration of cups do not show chronological differences. However, on the second axis of the analysis (explanation 22.8 % of the variability) main groups are separated by one small group with houses 28 and 43. This group has another kind of filling between lines (main decoration c). House 43 is associated with the earlier group of houses, but 28 with the later one. The first axis of the analysis (explanation 29.12% of the variability) shows a distinction between the main two big groups and three small groups. These groups have a different combination of hori-

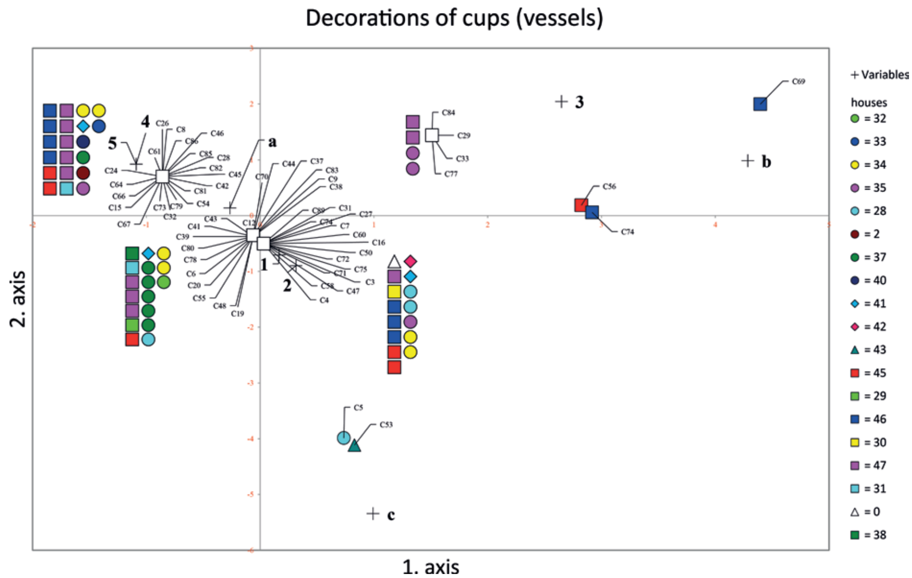


Figure 29. Talianki, Ordination diagram of the CA that analyses combination of decorations on cups at the level of individual vessel units.

zontal lines and filling from the two main groups. As to these three groups' absolute dating, ^{14}C dates are available only for house 35, which belongs to the earlier group of houses. On the right side of the axis, there are two groups consisting of cups from houses 45, 46 and 47 – actually neighbouring houses – which might indicate their connection with each other.

So, as can be seen, the combination of decoration elements (vessel as a unit) improbably shows chronology but demonstrates a very clear distinction of variations in decoration.

3.6.4.2 Combination of shapes and forms of decoration at the level of house inventories

The next step was to analyse combinations of subtypes in house inventories (excavation areas) separately for the most frequent shape types, represented by bowls, 'craters', biconical/sphero-conical vessels, goblets and cups. It is proposed to analyse morphology (subtypes and variants) and forms of decoration of each of these types. The typology of vessel shapes is presented in Appendix 8 and the figures of ceramic house inventories are presented in Appendix 9. In the study I analysed more vessels in this thesis than are shown in Appendix 9. The complete inventories can be found in the following works: Kruts *et al.* 1981; Kruts *et al.* 1982; Kruts *et al.* 1983; Kruts *et al.* 1985; Kruts *et al.* 1986; Kruts *et al.* 1987; Kruts and Ryzhov 1988; Kruts and Ryzhov 1989; Kruts and Ryzhov 1991; Ryzhov 1990; Kruts and Ryzhov 1994; Kruts and Ryzhov 1995; Kruts *et al.* 1999; Kruts *et al.* 2000b; Kruts *et al.* 2001; Kruts *et al.* 2005; Kruts *et al.* 2008; Korvin-Piotrovskiy and Menotti 2008; Kruts *et al.* 2009; Kruts *et al.* 2011; Kruts *et al.* 2013; Kushtan 2015; Brandtstätter 2017.

Bowls

As mentioned above, two main shape types of bowls are distinguished: with spherical profile and conical. In this work, numerous subtypes (and in some subtypes few variants) have been distinguished for all bowls according to the shape of the rim, similar wall outlines and depth (see Appendix 8 pl. 1-2). It should be noted that, firstly, the spherical and conical bowls developed synchronously and, secondly, that the morphological subtypes are quite close to each other.

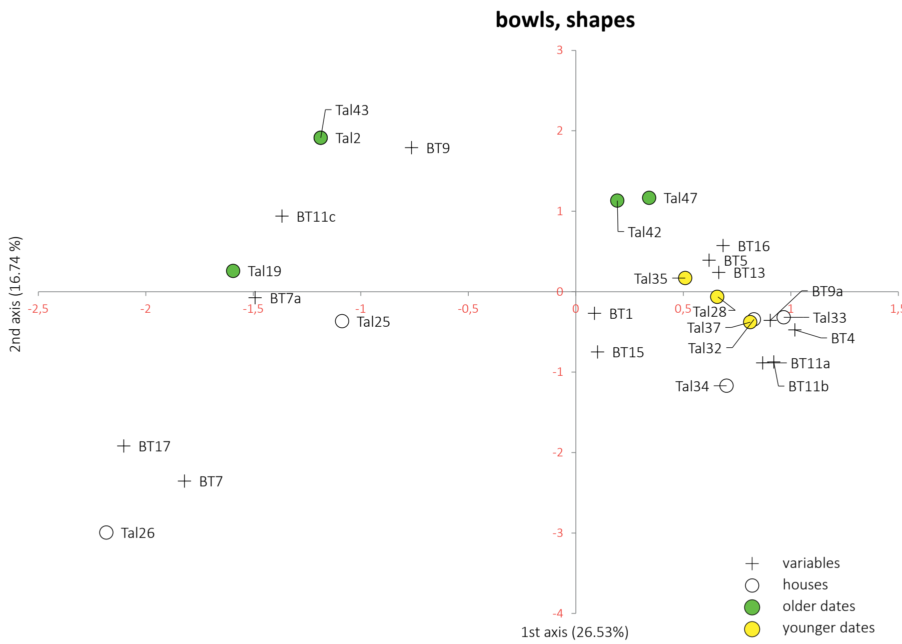


Figure 30. Talianki, Ordination diagram of the CA which analyses combination of morphological sub-types of bowls at the level of house inventories.

The ordination diagram of the correspondence analysis of bowls' morphology (fig. 30) shows a kind of asymmetric parabola-shaped arrangement. This division represents some chronological pattern, since houses in the centre (19, 43, 42, 47) are older dated, and houses on the lower right end of the parabola (35, 28, 37) – younger. The following development of bowls can be traced by considering the arrangement of earlier and later houses:

- In the analysis, the BT11 subtype of conical bowls with straight walls and pointed rim of medium depth turned out to be common to almost all dwellings and was excluded from the analysis (example of this bowls subtype see Appendix 9, pl. 14:1; 17:3; 30:2; 36:2). However, some variants of this subtype – BT11a, BT11b, and BT11c – are displayed at different ends of the graph. The development from the deep bowls of this variant (BT11c) to the flatter ones (BT11a) and to the very low (flat) bowls (BT11b) can be traced.
- Conical bowls with a rim smoothly bent outwards develop from subtypes with a very thickened corolla (BT17) to the variant with almost no such thickening (BT13).
- The subtype of bowls that have a transitional shape from a spherical to conical develops from bowls with a pointed rim (BT19) to a variant with a rounded rim (BT9a).
- Spherical bowls develop from very deep ones with a vertical wall (BT7) and a V-shaped lower part (BT7a) to an almost perfect spherical body (BT5). The latest subtype of this group consists of bowls with almost vertical rims, forming barely noticeable ribs with wall (BT4).
- As for the subtypes BT1, BT15 and BT16, they most likely constitute a separate group of special bowls that are characteristic of both late and early dwellings. These bowls are usually small and have 'legs', many of which are richly decorated.

If we look at the ordination diagram of the correspondence analysis of *decoration* of the bowls (fig. 31), some tendency is observed that on the left side of the first axis are grouped houses (35 and 29) that show more signs (S1 'leaflet-grain' and S3 'comet or animal'). At the top of the second axis, there is a kind of group of houses (47, 42, 32, 34) that have more decoration on the outside surface of bowls and drops or other small decorative elements inside in the centre of the bowls (i_1_2; o_1_1). In

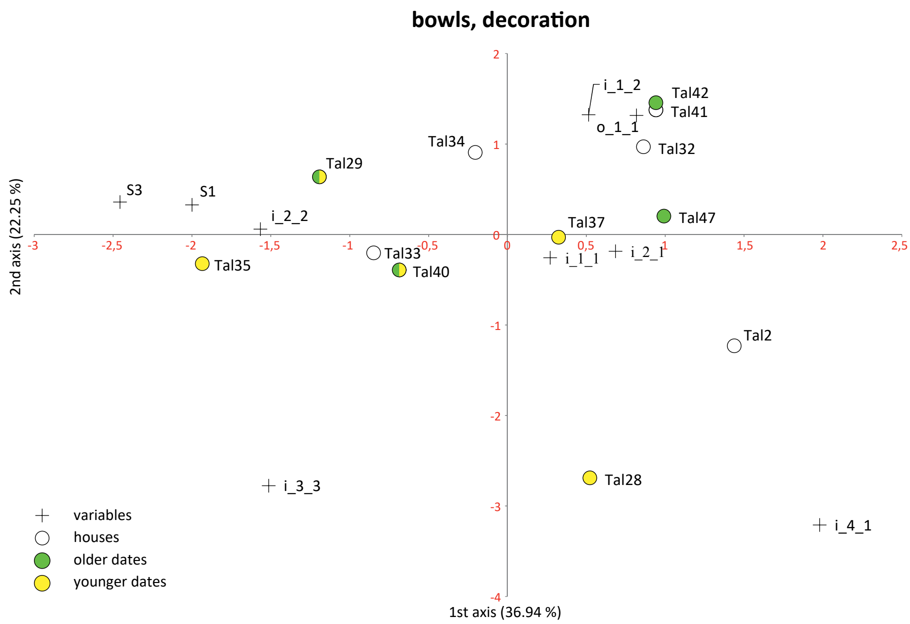


Figure 31. Talianki, Ordination diagram of the CA which analyses the combination decorations of bowls at the level of house inventories.

the lower part of the second axis, there is a group of houses (28, 2) that have more of a cross-like scheme of decoration (1_4_1). In the centre of two axes, there is a small group of houses (37, 47) that have many dots in the centre of the bowls (i_2_1) and variations of lines on the rim (i_1_1).

This division might display a certain chronological character, since the younger houses are arranged in the lower part of the second axes, and the older ones in the upper.

'Craters'

The type 'craters, crater-like vessels, pots' has been divided into eleven subtypes (see Appendix 8 pl. 4), which make up two groups: vessels with a high clearly defined 'neck' (Cr3-Cr6) and craters with a large and wide rim bent outwards (Cr11-Cr14), as well as a variant with a slightly shorter, practically straight rim (Cr7-Cr9). Within these groups, the vessels have been divided on the basis of a similar profile, including the shape of the belly and the degree and nature of the bending of the rim.

The correspondence analysis of this category of vessel reveals a parallel development of both groups. The resulting ordination diagram (fig. 32) shows an asymmetric parabola with a poorly developed left half. The marking of houses with later and earlier dates shows that this arrangement can be chronological in nature:

- A group of craters with a 'neck' develops from an elongated subtype (Cr4) with a belly that tends to be biconical in more squat subtypes that have both a clearly biconical belly (Cr3) and a belly tending to biconicality and a rounded 'shoulder' (Cr5). The latest in this group is a subtype with a rounded belly which, unlike all previous subtypes, turns smoothly into the neck (Cr6). It is worth noting the gradual lengthening of the 'neck' from Cr4, where it is rather short, to Cr6, where it is the highest.
- As a result of a similar development, a variant with a shorter and almost straight rim develops from a subtype with a biconical belly (Cr7) in vessels with a rounded belly and a very smoothed transition from the shoulder to the neck (Cr9).
- The remaining craters are somewhat less dynamic in development. The strongly profiled clearly biconical subtype (Cr11) and vessels with a very smooth profile and a rounded belly (Cr12) belong to the older group. These subtypes are replaced by craters with an S-shaped profile and now without a sharp belly (Cr13). The last is a subtype with a round body and a smooth profile; the transition from a practically indistinguishable shoulder to the rim is shown with a rib inside the vessel (Cr14).

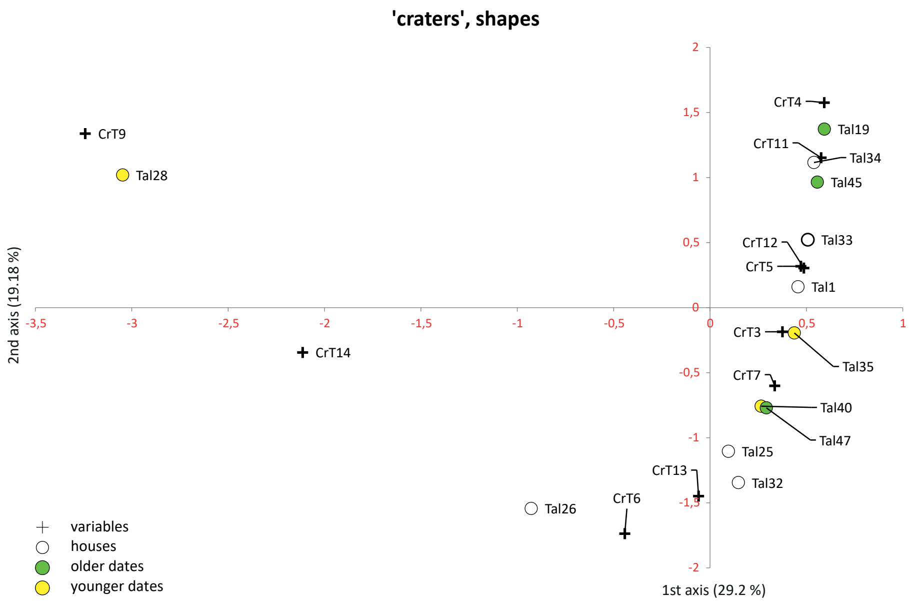


Figure 32. Talianki, Ordination diagram of the CA which analyses the combination of morphological sub-types of 'craters' at the level of house inventories.

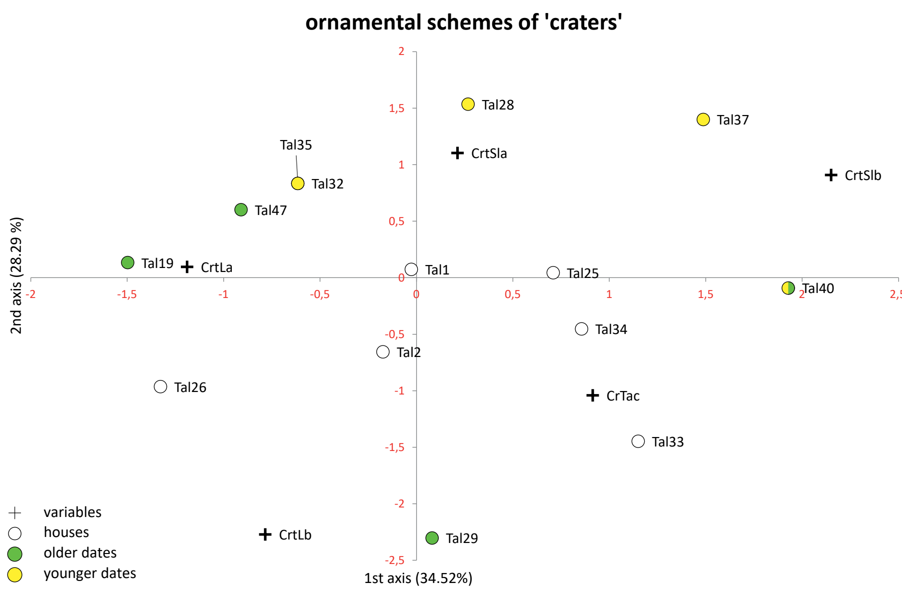


Figure 33. Talianki, Ordination diagram of the CA which analyses the combination of decoration schemes of 'crater' vessel type at the level of house inventories.

It should be noted that sharply pointed biconical forms for all craters disappear in the youngest dwellings.

In the correspondence analysis of the decoration of this type of vessel, the ordination diagram shows a certain separation of old and young houses along the second axes (fig. 33). Accordingly, CrtSlb and CrtSla ornamental patterns are associated with younger houses (32, 28, 37), while CrtLa and CrtLb are associated with the older ones (19). However, this classification reflects a strong association of ornamentation schemes with certain morphological groups of vessels rather than a chronological development. The decoration types CrtLa and CrtLb (variants of the leaf-like scheme) are characteristic of craters (morphological subtypes Cr11-Cr14), CrtLa and CrtLb (versions of a simplified linear scheme) of pots (morphological subtypes Cr7-Cr9) and CrTac – tangent scheme – of all remaining types.

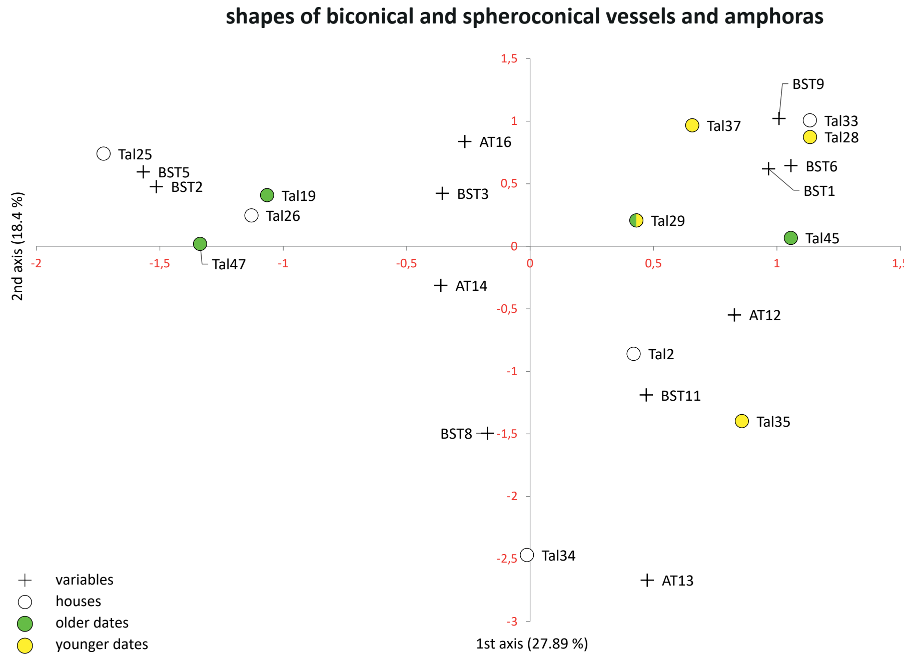


Figure 34. Talianki, Ordination diagram of the CA which analyses the combination of morphological sub-types of 'biconical/sphero-conical' vessels at the level of house inventories.

Biconical vessels

The 'biconical/sphero-conical' vessel type was divided into eleven subtypes (criteria-specific body profile). This also includes five variants of so-called 'amphorae' which have a small handle below the rim (see Appendix 8 pl. 5).

The ordination diagram of the correspondence analysis, representing the shape of 'biconical/sphero-conical' vessels, shows that the different subtypes and variants are arranged in parabola-like order with a strongly asymmetric left half, which is mainly due to the 'amphora' variants (fig. 34). The BST4 subtype has been deleted, as it is found in almost all house areas. Vessels of this subtype have a biconical belly and average proportions (compared on the one hand with the elongated pots of BST5 and BST2 and on the other hand the squat vessels BST1, BST3, BST6, and BST8).

On the upper left end of the arrangement, there is a group of houses displayed (47, 19, 25-26) that are associated with elongated biconically and spherically profiled vessels with a high belly (BST5, BST2). On the opposite right end, there is a group of houses displayed (28, 37, 33) with squatter spherical and biconical vessels, the latter showing slightly concave walls in the upper part (BST1 and BST6). In addition, there are vessels with a wide neck (BST9). If we look at the dating, the first group described (houses 19, 47) have earlier dates, the right group later ones. Between these groups are houses with different dates – younger and older. As for the vessels, there are subtypes of the mix of biconical and sphero-conical vessels (BST3 and AT16).

We can note the predominance and a gradual decrease in the elongated proportions (BST5, BST2 and AT14) on the left side of the graph. In addition, one can trace the appearance in the centre and a gradual increase in the number of vessels with a wide neck (which is over 1.3 times more compared to the bottom) on the right side of the graph (BST11, AT12, BST9). Sphero-conical and biconical forms develop synchronously. The belly of all vessels is above their middle part, except for the amphorae (AT13).

Let's move on to the chart with the *decoration* of this type of vessel. During the work on forms of ornamentation, various ornamental patterns and their variants were designated. In addition, the forms of decoration were divided into those with the main motif covering the entire upper part of the vessel ('continuous' – BSD1-10) and those that are placed in a narrower frieze above the belly of the vessels ('frieze' – BSD11-16). Separately, different variants of the tangential ornamental pattern were designated ('tangent' – BSD17-22). This was done because the placement of the main

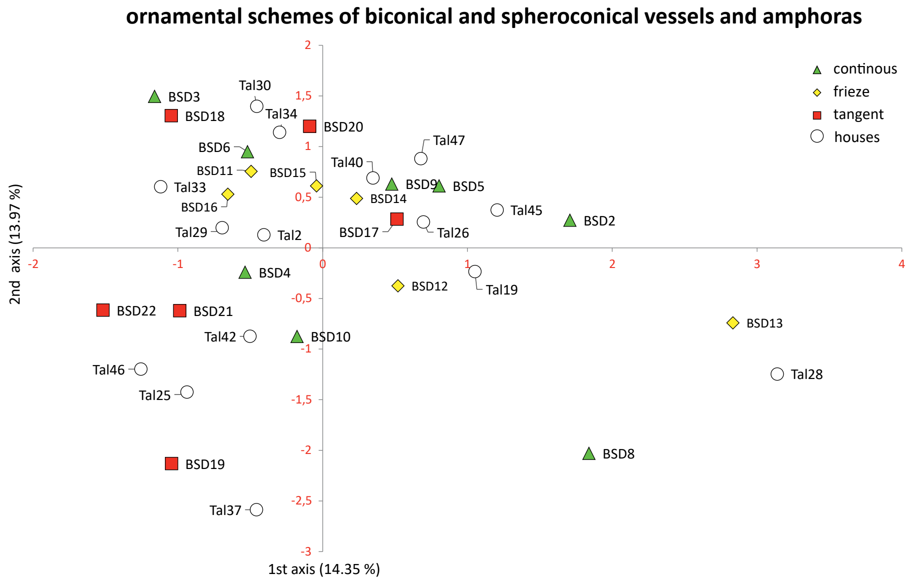


Figure 35. Talianki, Ordination diagram of the CA which analyses the combination of decoration schemes of 'biconical/sphero-conical' vessels at the level of house inventories.

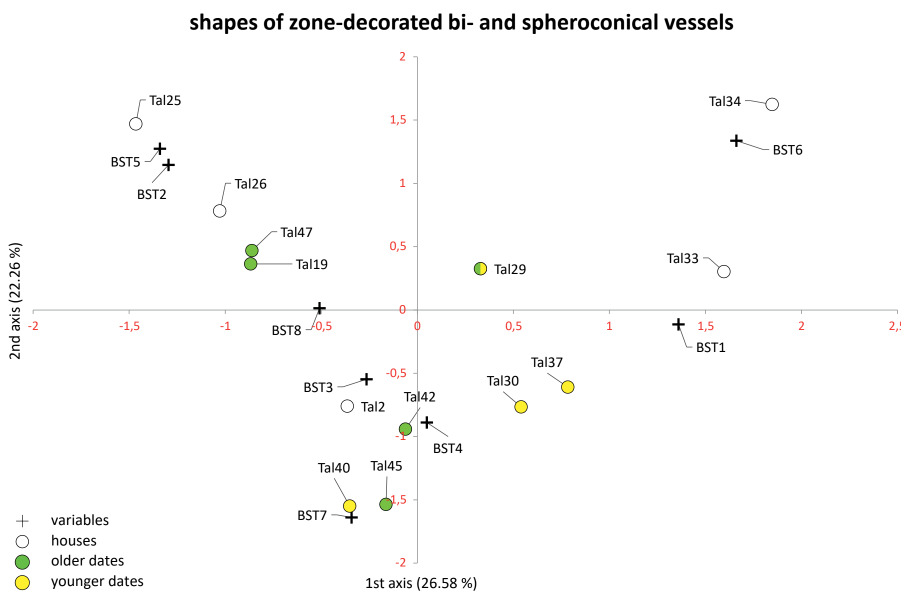


Figure 36. Talianki. Ordination diagram of CA which analyses combinations of morphological sub-types of zone-decorated 'biconical/sphero-conical' vessels at the level of house inventories.

pattern in a narrow frieze is a specific feature of the Tomashovka regional group and therefore, perhaps, reflects a certain chronological development.

However, during the consideration of the resulting ordination diagram of the correspondence analysis (fig. 35), it is clear that vessels with decoration in a narrow frieze and with the decoration of the entire half of the vessel, different versions of the tangent, face-like (facade) and simplified linear schemes develop synchronously and that no chronological developments can be traced.

To complete the picture, only vessels with decoration in a narrow frieze (that also includes tangent ornamentation) were taken for the next analysis of the forms of pots of this type. The ordination diagram of the correspondence analysis (fig. 36) shows a parabola-like arrangement with a slightly concave left half. Judging by the marking of the houses for which ^{14}C dates are available, this grouping may reflect chronology. In principle, many types and their location confirm the conclusions regarding the morphological development described above (according to the fig. 34). But, unlike in the previous analysis, the association of elongated vessel subtypes (BST5 and BST2) with older dwellings seems more obvious.

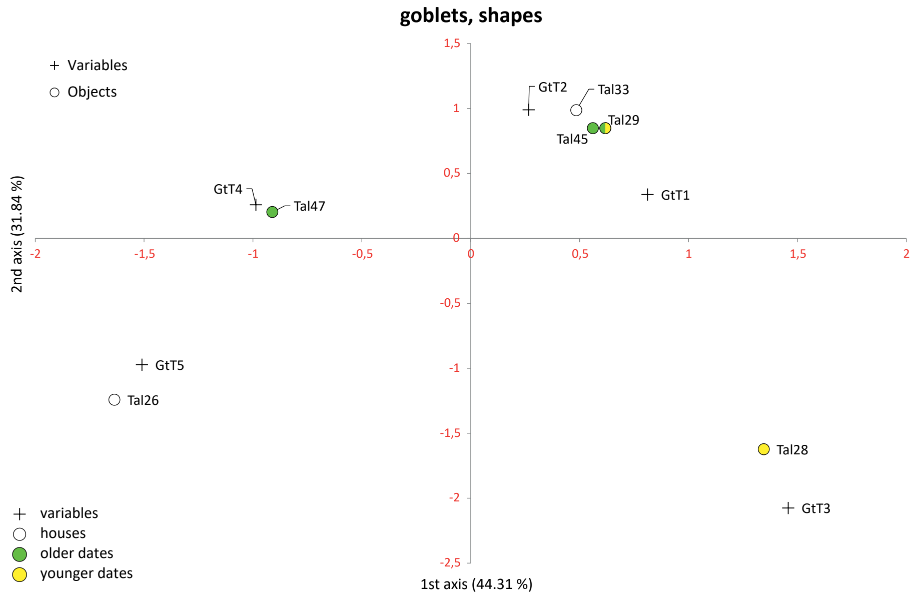


Figure 37. Talianki, Ordination diagram of the CA which analyses the combination of morphological sub-types of goblets at the level of house inventories.

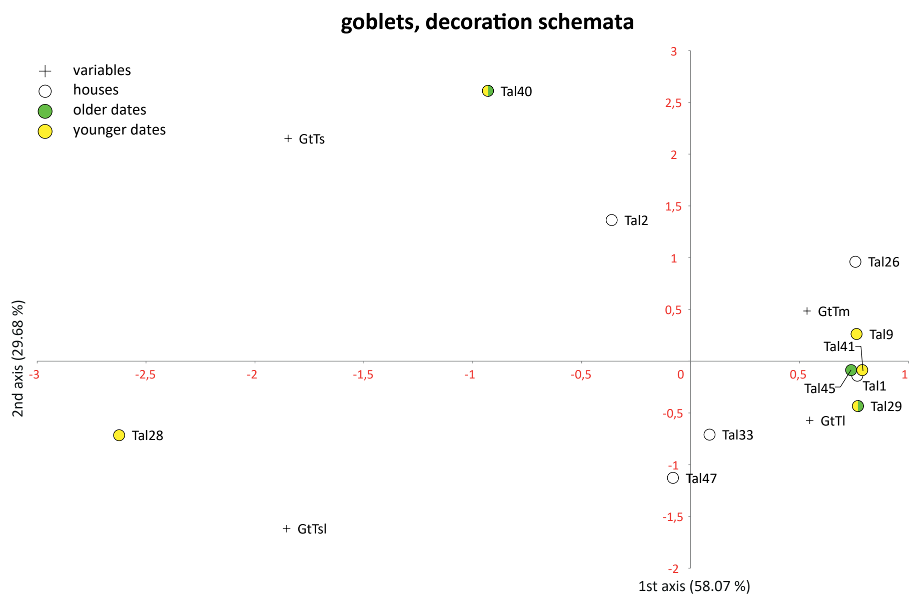


Figure 38. Talianki, Ordination diagram of the CA which analyses the combination of decorations of goblets at the level of house inventories.

Goblets

Six subtypes were distinguished in the type ‘goblets. The differences between subtypes lie in the height of the belly relative to the total height and the different profile of the rim (see Appendix 8 pl. 3).

The ordination diagram of the correspondence analysis of goblet shapes led to a nice parabola-shaped arrangement in the ordination diagram of the first and second axis (fig. 37), the chronological nature of which is confirmed trough mapping of houses with absolute dates. One can trace the gradual rise of the belly of this type of vessel from low (GtT5) to the belly in the middle of goblets (GtT4), to types with a belly high above the middle of the vessel (GtT2), and, finally to the highest belly – GtT3. In addition, in the centre is a type of squat goblet with a wide neck (GT1).

The correspondence analysis of forms of decoration on goblets in the ordination diagram of the first two axes shows at best only a very weak parabola-like arrangement, which seems not to represent a chronological order of the houses (fig. 38). Basically, all houses are clustered together, since the bulk of these vessels were decorated in metope

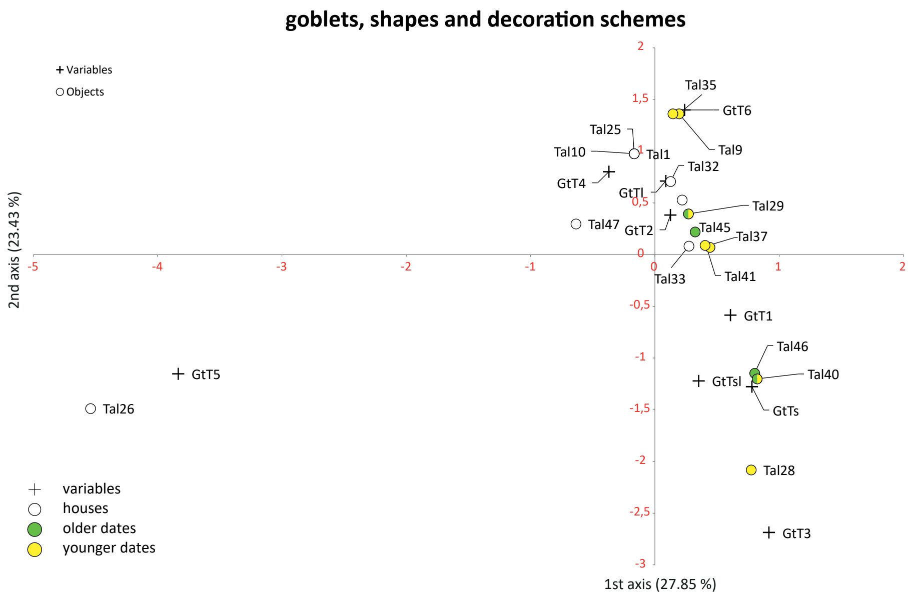


Figure 39. Talianki, Ordination diagram of the CA which analyses the combination of decorations and morphological sub-types of goblets at the level of house inventories.

(GtTm) and leaf (GtTl) schemes. Simplified linear schemes and segment-like schemes (GtTsl and GtTs), to which younger *ploshchadkas* (no. 28 and no. 40) tend, are placed separately.

To complete the picture, let's analyse the decoration and the morphological groups of goblets together. The resulting diagram shows a certain grouping in the form of a parabola with a very weak left side (fig. 39). Upon closer examination, it becomes clear that this arrangement was strongly influenced mainly by the morphological type.

In the framework of the given classification system, the shapes perhaps seem better suited to show a chronological division of goblets. If we take the order as given, which was obtained based on the analysis of vessel shapes, the contemporaneity of different decoration schemes becomes visible (leaf-shaped and metopic).

Cups

Cups were divided into 20 subtypes according to their proportions, the shape of the upper part and the shape of the bottom. However, during consideration of the subtypes, it became clear that they include quite different vessels. During further work, twelve subtypes were distinguished, which included cups that were most visually connected with each other (see Appendix 8 pl. 3). Half of the subtypes have a straight or slightly inclined rim (CT7-CT12), and the other half have a sharp (CT1, CT2, CT6) rim or one gently bent outwards (CT3, CT4, CT5).

The correspondence analysis of the shape combinations (fig. 40) in houses results in the parabola-like grouping of the subtypes and the objects in the ordination diagram of the first and second axes.

On the left side of the parabola are houses that have more recent dates (28 and 41), on the right houses with earlier dates (47, 42, 19), and in the centre there is a mixed group of earlier and later houses (35, 29, 37, 45). If this shows a chronological order, then we can characterise the development of the cups as follows:

- Cups with straight rim (CT7-CT12) and with a sharp rim or one smoothly bent outwards (CT1-CT6) develop alongside each other.
- Over time, shapes become simpler (CT7 and CT11).
- Cups with a low belly existed all the time (CT5, CT7-10, CT12), but there is a tendency for higher belly transitions (CT1-4), and the highest variant is recorded for the youngest houses (CT6).
- In addition, one can trace the tendency to the 'long neck' of cups to disappear; this is especially noticeable in pairs of similar subtypes (CT8 and CT7; CT12 and CT11).

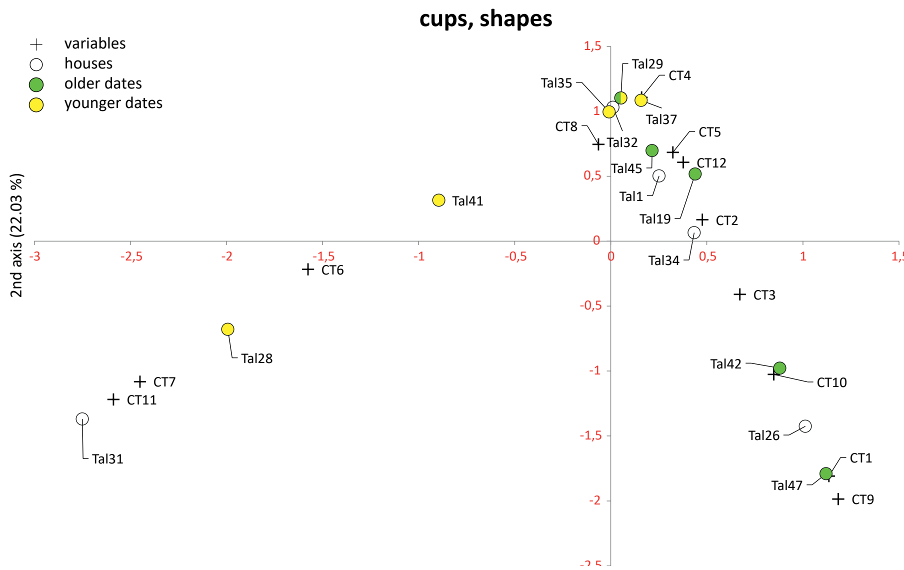


Figure 40. Talianki, Ordination diagram of the CA which analyses the combination of morphological sub-types of cups at the level of house inventories.

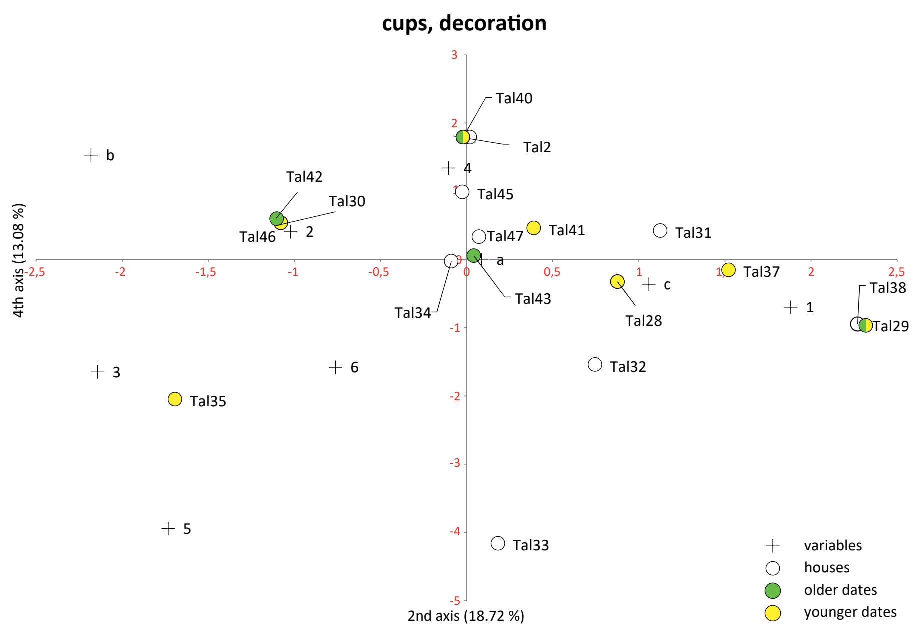


Figure 41. Talianki, Ordination diagram of the CA which analyses the combination of decorations of cups at the level of house inventories (2nd and 4th axis).

It should be noted that in all houses as many cups of different shapes were found, but they did not make clear combinations among themselves.

Decoration of cups is in general rather uniform (fig. 41, fig.42). The criteria for the classification (fig. 43) were the filling of the main decoration zone (a-c) on the one hand and the structure (scheme) of horizontal divisions on the other hand (1-6: number and sequence of horizontal lines). Out of four dimensions analysed (axes 1-4), only the second axis shows some kind of sequence (explanation 18.7%). In contrast, the first (explanation 35.5%), third (explanation 14.4%) and fourth axes (explanation 13.8%) show separations of rare types: first main zone c, third structure 6 and fourth structure 5. On the left side of the second axis are inventories arranged with cross-hatched main zone and decoration schemes 3 and 5. In the centre occur the most frequent combination of decoration scheme 4 and main decoration a. On the right side are grouped inventories with main decoration c and scheme 1. As the mixed occurrence of younger and older house inventories in all parts of the axis shows, the decoration schemes are not chronologically significant.

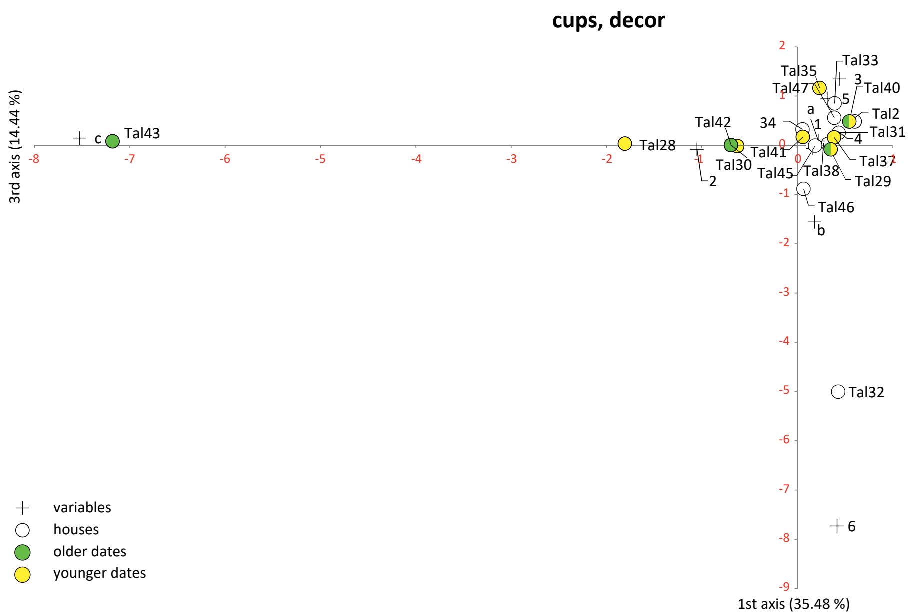


Figure 42. Talianki, Ordination diagram of the CA which analyses the combination of decorations of cups at the level of house inventories (1st and 3rd axis).

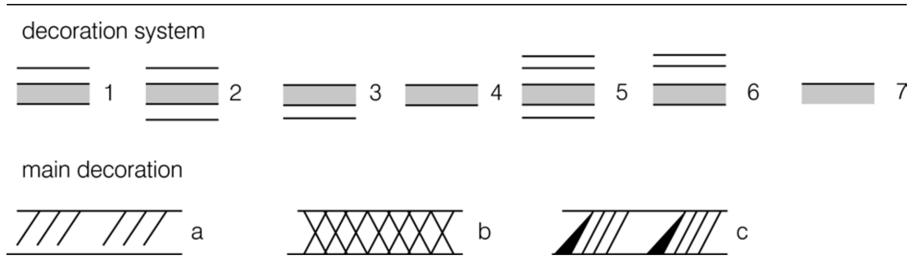


Figure 43. Talianki, decoration systems and main decoration schemes of cups.

3.7 Interpretation of ^{14}C dates and pottery analysis

The absolute dates obtained show that for some houses there are older dates, and for the others – younger ones. On this basis, we can presume that there was a minimum of two chronological groups of houses during the development of the settlement. Thus houses 47, 50, 45, 46, 42, 43, and19 make up the **older group** of buildings. Houses 35, 37, 30, 48, 41, 27, 28, 13/14, and 9 were attributed to a **younger group**. Houses 29 and 40 show a longer continuance, that is, we can assume their at least partial existence in both chronological groups.

It might be incorrect to attribute a certain house area to a certain chronological group on the basis of few absolute dates, often with an unclear context, that were obtained for most house areas. However, a series of graphs obtained during the correspondence analysis of ceramics inventories, which resemble a parabola-shaped agreement, show a certain grouping of the older houses in one part of the curve, and the younger ones in the other.

The ordination diagrams, which presumably show some chronological sequences, are of the morphology of the bowls, 'craters', biconical/sphero-conical vessels, goblets, cups, shapes of zone-decorated biconical and sphero-conical vessels, combination of goblet shapes and decoration schemes, and perhaps the decoration on the bowls.

So on graphs that were made of morphological indices and combinations of vessel shapes and decoration, houses from older and younger groups are often located on opposite sides. They make up two groups – *older* and *younger*. Usually, on these diagrams, there is also a *middle group* that includes houses dated both earlier and later. It is striking that house **40,** which according to the ^{14}C dates show its existence at least partially in both chronological groups, is located mainly in the middle of this 'mixed' group. Let's consider the location of other houses with ^{14}C dates on the ordination diagrams since it is possible to trace some tendencies. Here are some *observations* on those houses:

47 – Clearly displayed in the older group and on most diagrams, it is located on the most extreme 'edge', which suggests it is one of the oldest houses on the site. This corresponds to the analysis of the ^{14}C dates.
46 – Falls almost completely out of the graph; wherever it appears, it has a tendency towards the middle group.
45 – Tends to the older group.
43 – Falls almost completely out of the graph; wherever it appears, it tends to the older group.
42 – Tends to the mixed group.
41 – Displayed in the younger group.
37 – Tends to the young group.
35 – Tends to the young and mixed group.
30 – Falls almost completely out of the graph; wherever it appears it tends to the younger group.
29 – Tends to the older group.
28 – Clearly displayed in the younger group.
19 – Clearly tends to the older group.
9 – Falls almost completely out of the graph; wherever it appears it tends to the younger group.

Houses **48** and **27**, which are dated to the young group, completely fall out of the graphs.

Now let's have a look at the houses for which there are no dates. The graphs built on the basis of ceramics show that these houses might belong to one of the above-mentioned chronological groups:

34 – Tends to both the young and old groups.
33 – Tends to both the young and mixed groups.
32 – Tends to the mixed groups.
31 – Falls almost completely out of the graph; wherever it appears, it clearly tends to the younger group.
26 – Tends to the older group and to so far the oldest house 47.
25 – Tends to both the older group and the mixed one.
10 – Falls almost completely out of the graph; wherever it appears, it tends to the old group.
2 – Tends to the mixed group.
1 – Tends to the old group.

Houses **36**, **38** and **39** that were also analysed fell out of the graphs completely. There are dates for, in addition to these houses, the pottery **kiln F** and house areas **50** and **13/14** that can be used for interpretation.

Thus, when correspondence analysis on the charts was conducted, three groups of dwellings were obtained: 'early', 'late' and 'mixed'. A separate examination of each house shows that they show a fairly stable link to one of these groups.

Interpretation:

- Houses 1, 10, 19, 25, 26, 29, 42, 43, 45, and 47 can be presumably attributed to the older group.
- Within the earlier group, house 47, pottery kiln F and perhaps house 26 tend to be a bit older than the others.

- Houses 9, 13/14, 27, 28, 30, 31, 37, 41, and 48 can be presumably put in the later group.
- Within the younger group houses 9 and house areas 13/14 tend to be a bit later than others according to the ^{14}C dates.
- Houses 2 (which Ryzhov considered to be the oldest in the settlement), 32, 33, 34, 35, 40, and 46 can be attributed to the group of houses that existed at least partly during both chronological groups.

Let us consider the location of these houses on the *settlement plan*:

- The outer ring 'o': houses 10, 25, 26, 45, 47, and 50 belong to the earlier group, 9, 13/14 to the later, and 46 to the mixed.
- Outer ring 'i': house 29, belongs to the earlier group, 28, 37 and 48 belong to the late group, 34 and 35 to the mixed group.
- 'Unfinished rings': house 42 belongs to the early group, 30, 31 and 41 to the late group, and 32, 33 and 40 to the mixed group.
- 'Radial streets': house 19 belongs to the early group, 2 to the mixed group.
- 'Central part' (location is not very clear): house 1 belongs to the early group, 27 to the late group.

Let us consider the attribution of houses to a particular chronological group in *house clusters* (some compact groups of buildings in different parts of the settlement). In most cases, excavations in Talianki were carried out in such clusters. In total, no less than 16 fully or partially (that is, at least two houses) of such clusters were investigated. Exceptions are houses 1, 19, 27, and 42 (no houses close to them were excavated). In this work, eight clusters were included in the analysis completely or partly (at least two houses). Let's look at their dating:

- Cluster of houses N ***7-8-9-10***: 9 belongs to late group, 10 to the early one; there are no data for 7 and 8.
- Cluster of houses N ***24-25-26***: 25 and 26 belong to the early group; there are no data for 24.
- Cluster of houses N ***45-46-47-50***: 45 and 47 belong to the early group (and 47 is even a bit older), 46 to the mixed one; 50 has an early dating.
- Cluster of houses N ***28-29***: 28 belongs to the late group, 29 to the old group.
- Cluster of houses N ***34-35-36-37***: 37 belongs to the late group, 34 and 35 to the mixed group, and 36 has fallen out of the analysis.
- Cluster of houses N ***38-39***: both houses have fallen out of the analysis.
- Cluster of houses N ***30-31-32-33***: 30 and 31 belong to the late group, 32 and 33 to the mixed one.
- Cluster of houses N ***40-41***: 41 belongs to the late group, 40 to the mixed group.

Based on the considered observation and the analysis that were undertaken, some preliminary *conclusions* regarding the Talianki intra-site chronology may be drawn (fig. 44):

- There is a chronological difference between different objects excavated on the site: they are not synchronous. One part of such objects (mainly houses or house areas) make up the 'old (early) group' and another part the 'young (late)' one. This division is also confirmed when a correspondence analysis of ceramics inventories is conducted. By themselves, these two large chronological groups are not homogeneous, so in the 'early' group there are earlier and later houses; exactly the same trend is observed in the 'late' group. In addition, a number of houses can be dated, at least partly, to the lifetime of both groups.

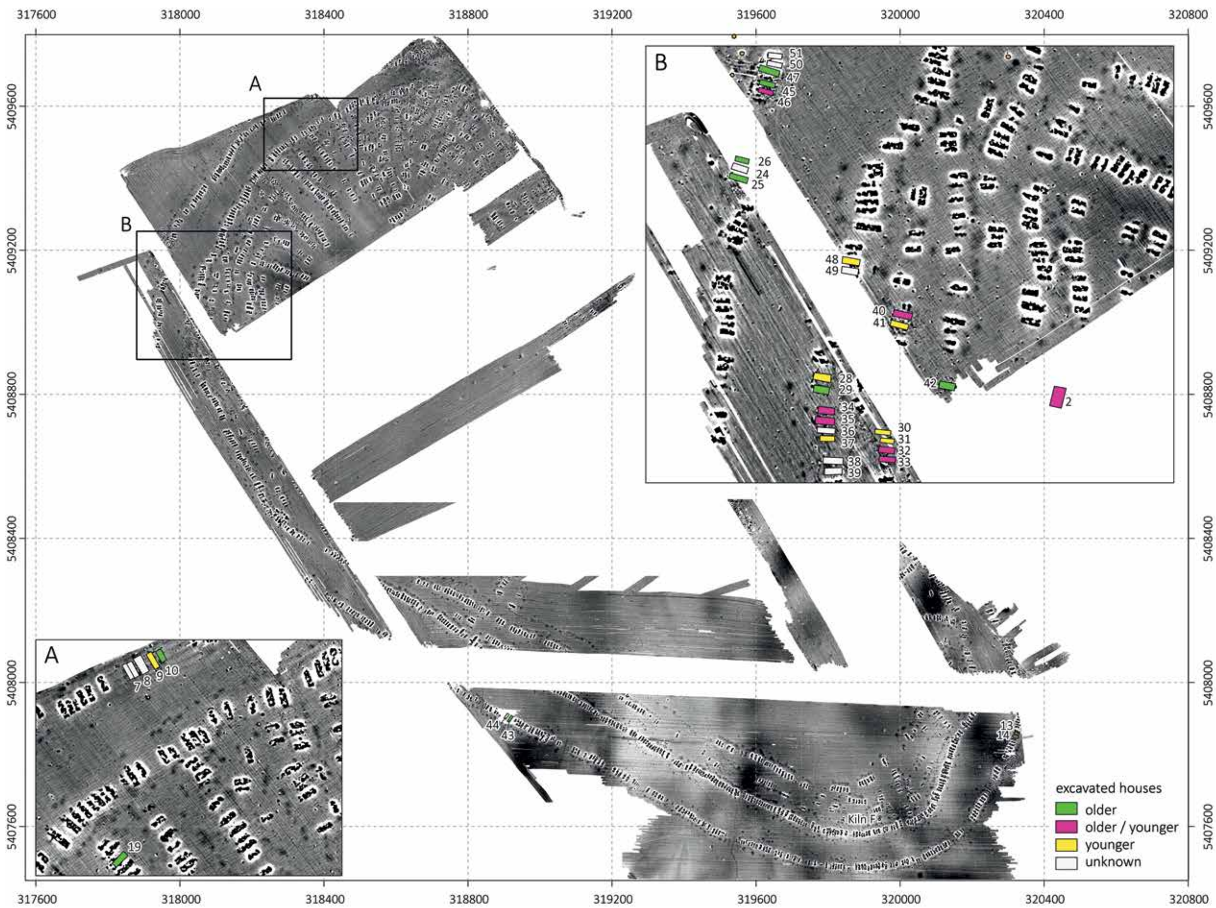


Figure 44. Talianki, archaeo-magnetic settlement plan with mapping of the relative dating probabilities based on analysis of ceramic house inventories and modelling of ^{14}C dates.

- Both northern and southern parts of the settlement were populated at the same time (house 47 in the northern part and kiln F in the southern part of Talianki have the earliest dates). From today's perspective, according to the available data, it seems that the first houses were built in the outer ring 'o', which nevertheless was not completely built up. The construction of the houses in the 'unfinished' rings, radial streets, central part and maybe inner ring 'i' also started at the same time (or slightly later).
- Over time, the construction of the houses in all the parts of the settlement mentioned above continued. It might not have happened at the same time, rather step by step. A large number of new houses could be observed after 3710 BCE. It seems that the number of houses becomes much smaller at the end of the life of the site.
- The time span of the functioning of the houses could be different; a number of houses could have had a long life and might be presumably attributed to both chronological groups.
- Chronological differences within the site can be traced within *house clusters*, where houses 1) seem to be built at different times and 2) could have different periods of existence. At the same time, the oldest objects, as well as the large number of the first houses, are observed in the outer ring 'o'.

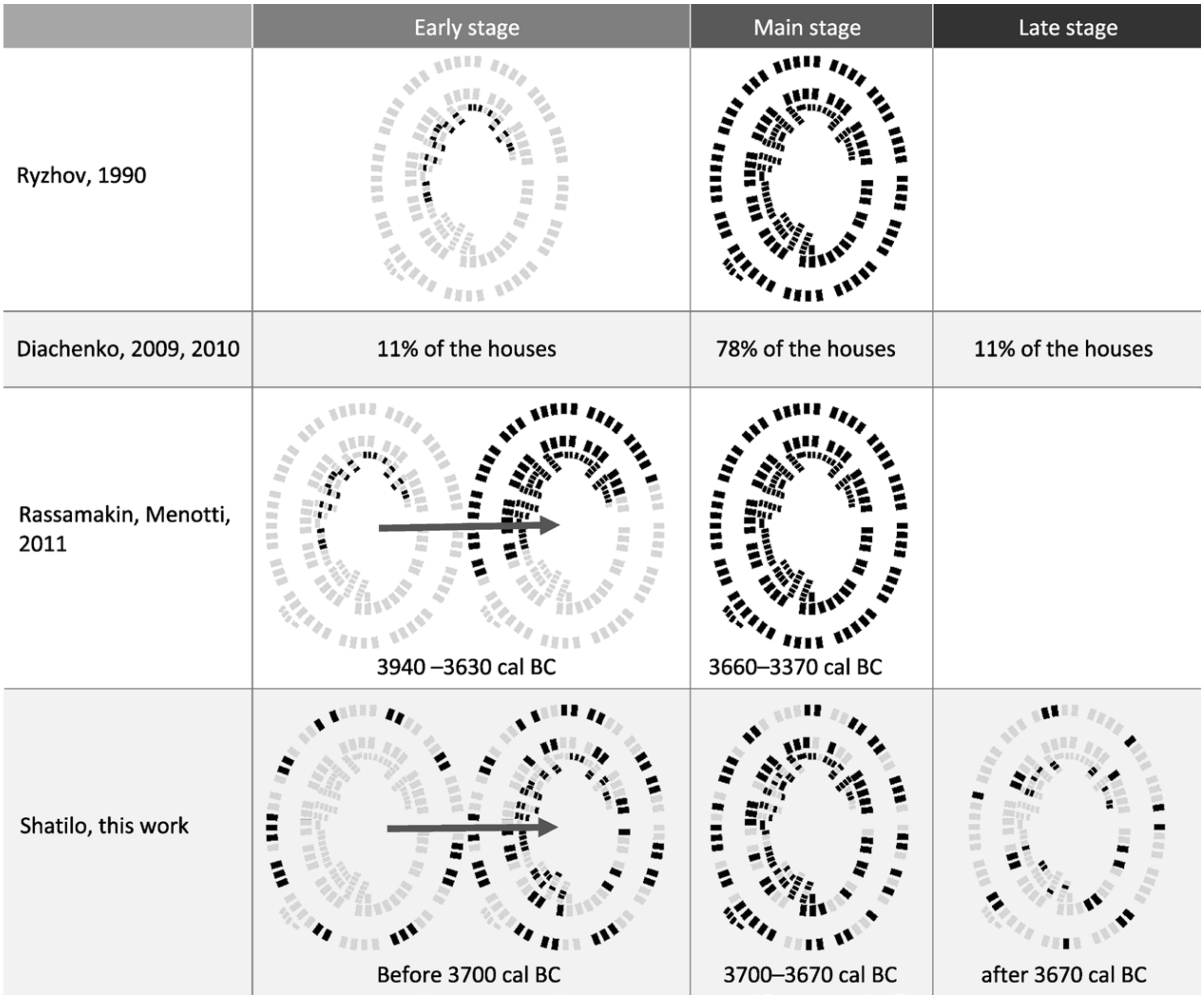


Figure 45. Talianki, visualisation of models of the intra-site chronology according to different authors.

3.8 Conclusions

According to the available ^{14}C evidence, the settlement at Talianki existed, with a certain probability, between about 3900 and 3600 cal BCE (or a shorter period).

Based on the currently available evidence, very obvious *chronological differences* between the large components of the site, like the different house rings or segments, cannot be seen. Earlier models which assumed the development of the site starting from its northern part or from the centre of the settlement (which were developed on much smaller data sets) cannot be confirmed.[37] On the other hand, chronological differences are (so far) detectable within house clusters. This might mean that the houses within such clusters could not have been built (or used?) at the same time (fig. 45). This picture could indicate a much lower building density during the formative stage of the settlement and the infill in gaps in the house rows and clusters over time. Alternatively, we also need to take into consideration possible periodical renewing of dwellings. Additionally, at the inception of the site, the first houses seem to have been built in the outer ring 'o', which nevertheless was not completely built up, since the number of its houses are dated to the late group.

37 For a comparison between earlier models and the variant (D) proposed here, see Figure 45.

So far, it is possible to identify several tendencies of *pottery development* in Talianki by means of combination statistics (correspondence analysis). These developments seem to concern mostly vessel shapes. In contrast to vessel shapes, decoration styles tend to exist synchronously.

Both general and specific trends can be identified for each of the basic morphological types:

- The parallel development of different groups within the framework of one type (in the type of 'craters' – vessels with a long neck and without it; cups – vessels with a straight corolla and with a smoothly bent corolla; bowls – conical and spherical shapes; biconical/spherical vessels – two groups as their names indicate).
- More elongated vessel proportions are characteristic of older houses (in the type of 'craters' and biconical/sphero-conical vessels).
- For younger houses, simpler forms (cups) have been noted, simplified decoration (goblets), as well as a tendency to pots' more rounded ribs ('craters').
- Moreover, in the type of 'craters', a gradual increase in the length of the 'neck' is noted in the group of craters with a neck.
- Goblets are characterised by a clear tendency to the raising of the ribs of the vessels in comparison with the total height.
- Cups show the same tendency, which is observed against the background of the continuous existence of types with a low rib.
- In addition, with cups, there is a decrease (if not complete disappearance) of the vessels with 'neck'.
- Finally, a more dynamic development of vessel shapes is associated with special decoration enclosed in a narrow frieze, and above all with a tangential ornamental pattern (in 'craters', 'biconical/sphero-conical' vessels).

Of course, these observations are directly dependent on the data available.
Regarding decoration, it has been analysed in three directions:

1. Components of decoration and their combination.
2. Ornamental patterns (of the main motif).
3. Dividing the space for the application of the main pattern (zoning).

The work performed shows clear differences neither in the combination of parts of the decoration nor in different ornamental patterns and their variants. So far, the most chronologically sensitive seem to be the enclosed in a narrow frieze (especially tangent) in combination with vessel shapes. This can be explained by the fact that when new morphological types appeared a new popular decorative pattern enclosed in a narrow frieze was applied to their surface. It should be noted that the application of the so-called 'signs' is also associated with the allocation of certain zones and with decoration enclosed in a narrow frieze (as a rule).

In summary, the strong dependence of decoration – its zoning, ornamental patterns and their complexity – on the morphological type and size of the vessels should be emphasised.

4 Chronology on a regional scale: sites of the Sinyukha river basin

This part of the work is dedicated to the verification/correction/compilation of the chronology of the Tripolye sites of the Sinyukha catchment area using the available data as a basis. Two main groups of sources – ceramics and ^{14}C dating – will be used to implement this basic task. As information on vertical stratigraphies is mostly missing because of the settlement behaviour, mainly ^{14}C dates will be used to verify the chronological position of ceramic typological groups. To begin with, the key sites will be described and the available ^{14}C dates will be considered. Then it is proposed to carry out some analyses of the four basic pottery characteristics: technology, morphology, capacity, and decoration. In the interpretational part, it is proposed to use the modelling of ^{14}C dates for the construction of chronology by placing the ceramic styles and possibly also the sites within their temporal framework.

More specifically, in this part, I would like to dwell on the following general research issues:

- verification of the existing relative chronology
- building of a chronology of the region in Tripolye times, using both the materials known before and involving new data
- evaluation of the development of ceramic styles in the region
- comparison of the key sites through the analyses of the ceramics.

4.1 Key sites: selection and overview

Before considering the ^{14}C dates and ceramics, let us make clear what key sites we have and how reasonable their choice is.

The list of sites within the working area (see Appendix 1) includes 310 sites. One hundred and nineteen of them belong to the Sinyukha catchment area. Most of the sites have been assigned to a certain phase and/or a local group of Tripolye.

The sites of Vladimirovka, Nebelivka and Tomashovka groups are considered to be most researched. For a better choice of our key sites, let's have a look at this issue in more detail.

Out of all the sites of the Vladimirovka group, only *Vladimirovka* settlement was excavated (Ryzhov 2015, 153); at other sites, only sondages (schurfs/test trenches) and field surveys with the collection of surface material were made. Out of the numerous sites of the Nebelivka group, which, according to Ryzhov, accounts for more than 40 settlements (Ryzhov 1999, 56),[38] seven were excavated (*Kolodiste 1,*

38 Today, it has been divided into the Nebelivka and Kanev groups.

Regional Group	Site	What was excavated	Year	Source
Vladimirovka group	Fedorivka-Mihailovka	Was not excavated**		Dudkin 2004b, 563
	Andriyivka	Sondage of 1 ***ploshchadka***?	1987-89	Tsvek and Ozerov 1987
	Andriyivka	Sondage of 2 ***ploshchadkas***?	1988	Kruts and Ryzhov 1988
	Poloniste	Was not excavated		
	Vladimirovka	5 ***ploshchadkas***	1927-28	Yakubenko 2004, 104
	Vladimirovka	1 ***ploshchadka*** (no.1)		Yakubenko 2004, 104
	Vladimirovka	1 ***ploshchadka*** (no. 2)	1939	Yakubenko 2004, 104
	Vladimirovka	20 ***ploshchadkas***, 2 pits	1940, 1946-47	Passek 1949
	Vladimirovka	1 ***ploshchadka***	1989-90	Yakubenko 1992
	Peregonivka	Was not excavated		
Nebelivka group	Nebelivka	Numerous objects		
	Pishchana	1 ***ploshchadka***	1988	Kruts and Ryzhov 1988
	Pishchana	2 ***ploshchadkas***	2005	Chernovol and Ryzhov 2005
	Krasnopilka 3	sondage	1983	Kruts ***et al.*** 1983
	Nezamognik	6 ***ploshchadkas***	1999-2000	Ovchinnikov 1999
	Krivi Kolina	Few ***ploshchadkas***	1980s	Kruts ***et al.*** 2000a, 34
	Rozkoshivka	No information		
	Christinovka	1 ***ploshchadka***	1970s	Tsvek 1974
	Verhniachka	No information		
	Verbuvata	No information?		
	Vilshana Slobidka	Was not excavated?		
	Ostrivets	Sondage?	1986	
	Nemorozh	No information		
	Yampil	Sondage	1988	Kruts and Ryzhov 1988
	Yampil	1 ***ploshchadka*** (?), sondage?	1995?	Dudkin 2004c, 635-636
	Hlybochok	2 ***ploshchadkas***	1994-95	Ryzhov 1995; Ryzhov 2000b
	Kolodiste (1?)	6 ***ploshchadkas***	1899-1904?	Belyashevsky 1899; 1900; 1904; Spitsyn 1904
	Rubany Mist	Pit ('pit house') with flint processing complex	1988-90	Tsvek and Movchan 1990
	Buda Orlovetska	Was not excavated?		
	Ksaverove	Was not excavated?		
	Gorodiche (1?)	Was not excavated?		
	Vilshana (1?)	1 ***ploshchadka***, 1 pit	1997	Chernovol 2012
	Peremozhentsi	9 pits?	1995	Ovchinnikov 1999
	Zavadivka	Was not excavated		

Table 19. List of researches at the sites of the Vladimirovka, Nebelivka and Tomashovka groups.
***was not excavated needs to be understood as that there were no large-scale excavations and suggests that the site could have been surveyed, maybe with a test trench, but the type of work is not specified.*

Pishchana, Hlybochok, Kolodiste 2, *Nezamognik*, Chaplinka, Nebelivka), three of them (Kolodiste 2, Chaplinka, Nebelivka) after 1999 (Chernovol 2012, 62; Ovchinnikov and Chernovol 1999; Ovchinnikov *et al.* 2000). As for the Tomashovka group, about ten sites have been excavated, some of them by Kruts's team (*Chichirkozovka, Talianki, Kochergintcy-Pankivka, Moshuriv 1*) and one (*Dobrovody*) by Movsha (and later by Kruts), which implies a rather high level of field fixation and documentation. At the same time, the main activity of researchers (until 2010) was focused on two sites: *Talianki* and *Maidanetske*.

Regional Group	Site	What was excavated	Year	Source
Tomashovka group	Popudnya	23 *ploshchadkas*	1911	Himner 1933
	Stara Buda	7 *ploshchadkas*	beginning 20th cent.	By Yakimovich, Passek 1949, 127
	Sushkovka	Few ploshchadkas	1916, 1926	Kozlovska 1926
	Dzendzelenivka	No information		
	Chichirkozivka	1 *ploshchadka*	1984	Kruts ***et al.*** 1985
	Dobrovody	3 *ploshchadkas*	1981-1983	Movsha 1984c
		1 *ploshchadka* (no. 4)	2004	Kruts ***et al.*** 2005
		1 kiln, partly mega-structure	2015	Korvin-Piotrovskiy ***et al.*** 2016
	Yatranivka	Was not excavated		
	Novo-Ukrainka	Was not excavated		
	Talianki	See separate list in Part 3		
	Maidanetske	See separate list: Müller ***et al.*** 2017, 94; Ohlrau 2020		
	Kochergintcy-Pankivka	1 *ploshchadka*	?	Videiko 2004b, 256
	Moshuriv 1	1 *ploshchadka*	1981	Kruts ***et al.*** 1982
	Talne 2	surveys? 7 *ploshchadkas*	1990	Kruts and Videiko 1991
	Vasilkiv	Sondage	1992	Videiko 1992; 2004d, 79-80
	Tomashivka	Few *ploshchadkas*	1925-26	Kurinny 1926; 1927
	Gonchariha	Was not excavated?		Kruts ***et al.*** 1985
	Bondarka 2	Was not excavated?		Kruts ***et al.*** 1984
	Mala Mochulka	No information		
Total	45	98 *ploshchadkas*, 28 of them were excavated in the second half of 20th century 13 pits 12 not excavated 6 without information		

Table 19. (continued).

Let's compile a list of researches at the sites of the Vladimirovka, Nebelivka and Tomashovka groups (after Ryzhov 1999). All the listed sites are attributed by Ryzhov to a certain chronological group and phase (tab. 19).

Thus, in total (before the 2010s), excluding Talianki and Maidanetske, about 98 *ploshchadkas* had been excavated, most of them in the first half of the 20th century, 28 in the second. In addition, a number of other objects have been excavated, for example pits. However, from the list, only the Talianki excavation reports (Kruts *et al.* 2001; Kruts *et al.* 2005; Kruts *et al.* 2008; Korvin-Piotrovskiy and Menotti 2008; Kruts *et al.* 2009; Kruts *et al.* 2011; Kruts *et al.* 2013) and just recent research into Maidanetske (Müller *et al.* 2017) have been published.[39]

Most of the selected key sites for this work are considered to be the best researched and those for which it is possible to obtain some information using non-invasive methods. Archaeomagnetic surveys and test trenches have been undertaken at some of the sites. Let us have a look at them.

39 The results of the work on other settlements (where such documentation is available) can, if one is fortunate, be found in the archives. The level of reporting varies greatly.

Chichirkozivka

The site is located in the fields between the villages of Chichirkozivka and Yurkivka (Zvenigorodka district, Cherkasy region) on a part of the terrace on the right bank of the River Shpolka, which is on the south of the site. The settlement is bounded on the west by a gulch with a stream, and on the east by a valley of the River Chicherkoza (Kruts *et al.* 1985, 10-19). The settlement area was estimated to have an area of up to 255 hectares. As a result of the recalculation of the settlement area on recent and historical aerial pictures in the Google Earth program (a part of the settlement is quite clearly visible on aerial photographs), it has been reduced to 130-180 hectares (130 hectares is the area of the site that is clearly visible in the picture, and 180 hectares is the maximum area of the plateau).

The site was discovered in 1904 by O. Dolinsky; in the 1970s-1980s I. Hirnyk and V. Mytsik carried out some surveys on the site (Hirnyk and Videiko 1989, 83-90). In 1984, a team led by V. Kruts excavated one house (*ploshchadka* N1) here and a pit near it (Kruts *et al.* 1985, 10-19). House N1 was located on the eastern edge of the settlement and was under a kurgan (diameter of about 30 m) which contained two burials from the Yamnaya Culture. The material is stored in the scientific finds of the IA NASU, Cherkasy Regional Museum and in Talne.

Chichirkozivka was assigned to stage C1 of the third phase of the Tomashovka group (Kruts and Ryzhov 1985, 47, 49, 52). However, after a few years the site was re-assigned to the second phase of the same group (Kruts 1989, 119; Ryzhov 1999), and this position remains relevant in modern literature (Diachenko 2010a, 21; Ohlrau 2015, 19). Together with Chichirkozivka, the settlements of Dobrovody, Yatranovka, Novoukrainka and several dwellings from Talianki were assigned to this phase as well (Ryzhov 1990, 83-90; Ryzhov 1999, 89).

Chizhivka

Chizhivka is located between the villages of Chyzhivka and Tikhonovka (Zvenigorodka district, Cherkasy region), in the *Sinozhad* area, on the plateau formed by the bend of the nameless stream which defines the settlement from the east. In the south of the settlement there is a natural ravine, and on the north side there is a trench between the field and the forest. The area of the settlement is about 20 hectares (precise measurements are impossible at the moment because part of the site is covered with forest).

The settlement was discovered by L. S. Leshchenko and in 1962 examined by V. A. Stefanovich and by a teacher from the local school, O. F. Gorbanenko. In 1973-1974, the settlement was investigated by the expedition of the Institute of Archaeology of the Academy of Sciences USSR (IA AS USSR), headed by O. V. Tsvek. The materials are stored in the finds of the Uman Local History Museum and at the school in the village of Chyzhivka (Tsvek 2006, 50).

Having analysed the material, O. V. Tsvek attributed Chizhivka to the late period of the Krasnostavky type or to the Onopriyivka type, which she dated to the second half of stage B1 or the beginning of B1-B2 (Tsvek 2006, 50, 65). In any case, the site relates to the Bug-Dnieper variant of the ‘Eastern Tripolye Culture’ (Tsvek 2006, 50). The problem with dating is caused by the insufficient material for analysis.

In 2017, a magnetic survey of a part of the settlement was carried out, and a test trench was excavated to obtain material to clarify the relative and absolute dating of the site (see ^{14}C dates part).

Dobrovody

The Dobrovody settlement was located on a plateau near the western outskirts of the village of the same name (Uman district, Cherkasy region). The plateau is formed by the River Revukha and a ravine, which is on the west of the site and merges with the Revukha to the south of the village. The eastern part of the site is under the village houses; the northern part is bisected by the Uman-Cherkasy road. The estimated area of the settlement, based on different studies, varies from 200-250 hectares (Kruts 2008) to 210.9 hectares (Diachenko 2010a, 21) or to even less – 150 hectares (Ohlrau 2015, 19). In this work, the size of the settlement is estimated at 210 hectares.

The settlement has been known to researchers since the 1920s, and since then it has been surveyed occasionally and some surface finds have been collected (for example through the work of V. Stefanovich). The site became well known after Shishkin's aerial photography. Based on the available pictures, Shishkin believed that the settlement had an internal quarterly development (Shishkin 1985, 73). In order to verify the aerial photography data, in 1970 a survey was conducted at the settlement under the direction of M. Shtiglits (Shishkin 1973). In 1981-1983, three *ploshchadkas* were investigated by the Dobrovody team of the Tripolye expedition of the IA AS USSR under the direction of T. Movsha (Movsha 1982; 1984c, 13-25; Kruts *et al.* 2005). During the same period, the excavations of the kurgans on the territory of the settlement were conducted (under the direction of I. Artemenko), with the aim of checking their possible connection with the period of the abandonment of the site. However, no such connection could be found. In 2004, another dwelling, no. 4, was investigated (Kruts *et al.* 2005).[40] In 2015, a pottery kiln and part of a 'mega-structure' were excavated (Korvin-Piotrovskiy *et al.* 2016b, 201-202). The material from the excavation is stored in the scientific finds of the IA NASU, in the Museum of Tripolye Culture in the village of Legedzyne; some finds are in the National Historical and Ethnographic Reserve 'Pereyaslav'.

In August 2011, a magnetic survey of part of the settlement was carried out (Rassmann *et al.* 2014). As a result of the work, a map of the north-western and part of the central areas of the Dobrovody settlement was made. Because a significant part of the settlement is located on the territory of the modern village and at the time of the survey the main (south-western) part of the settlement was under corn and sunflower fields, the studies were rather limited. The total area under research was 24 hectares, of which the settlement itself occupied 17.5 hectares (Ohlrau 2015).

Dobrovody is attributed to the second phase of the Tomashovka local group (Ryzhov 1999, 89; Kruts 2008, 35).

Grebenyukiv Yar

The site is located on the eastern outskirts of the village of Maidanetske (Talne district, Cherkasy region) near the Talne-Novoarkhangelsk road, in the south-eastern part of the slope plateau with a height of up to 20 m and formed on the north and south by dry creeks, and on the west by a stream flowing into the River Talyanka. The site area is estimated at 3.3 hectares.

The site is known due to the surveys of Mytzyk and Hirnyk in 1981, when they discovered seven concentrations of archaeological material on the field (houses). The site was excavated under the direction of Shmagliy in 1982, 1985, 1989 and 1990. As a result, three objects that were interpreted as 'dwellings' and twelve pits were investigated[41] (Shmagliy and Videiko 1982; Burdo 2004b, 133-135). It should be noted that already at that time the site was described as being in a condition close to complete destruction. The material is stored in the scientific finds of the Institute of

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40 The house N4 was located in the central part of the settlement. During the excavation, apart from the dwelling itself, two walls were found that 'fell out' outside the house – the front (eastern) and longitudinal (southern) ones. This discovery made it possible to better understand the design of the walls of similar *ploshchadkas* and to help identify the walls in further researches at Tripolye settlements (Kruts *et al.* 2005).

41 The Early Tripolye 'dwellings' are quite different from typical '*ploshchadkas*', since the platform itself is missing and the clay coating does not form clear contours, that is, a rectangle, like most of the later Tripolye houses.

Archaeology of NASU, the Archaeological Museum of the IA NASU, and the Cherkasy Regional Local History Museum.

The site is dated with the *'Classic or Middle Early' Tripolye A3 1-2 – Precucuteni 3* (Burdo 2001, 63). In 2014 and 2016, as a result of magnetic surveying, a map of the settlement part was made. In 2014, a test trench was laid to clarify the site's dating (see ^{14}C dates part).

Kosenovka

The settlement is located on a plateau formed by ravines to the east and west, and on the south of it is the valley of the River Kolodichna (also known as the Gavrilovka), which flows into the Revukha. The plateau is located to the south-west of the village of Kosenovka (Uman district, Cherkasy region). The settlement area is about 80 hectares.

The site has been known since the 1920s. It became possible to measure the site area after the deciphering of Shishkin's aerial photographs, and in 1982-1988 a team of the Tripolye expedition of the IA AS USSR led by Movsha investigated five *ploshchadkas* and several pits (Movsha 1982; 1983; 1987; 1990). As a result of this work, Movsha singled out, in particular, the sites of the Kosenovka group. In 2004, during the work of the Tripolye expedition (the excavations headed by Yakubenko and Buzyan), another house (no. 6) was investigated in which some human remains were found (Kruts *et al.* 2005, 77-91). The material is in the Pereyaslav-Khmelnitsky Museum of Tripolye Culture, in the Archaeological Museum of the IA NASU and in the Legedzyne Museum of Tripolye Culture.

In addition to the excavations, an archaeomagnetic survey of the settlement was made (led by Golub?); the material remained unpublished. In 2016, a high-resolution magnetic measurement of part of the site was made, as a result of which it was discovered that the settlement was surrounded by a moat. Unfortunately, the area of the work performed does not allow us to obtain an idea of the development of the entire site.

According to the relative chronology, the site is attributed to the first phase of the Kosenovka local group and is considered, along with Olkhovets 1, to be one of the last giant settlements.

Maidanetske

The settlement is located to the west of the village of the same name (Talne district, Cherkasy region), on a plateau rising above the valley of the River Talyanka to the east of it and above the valley of a stream flowing into the Talyanka from the west and south-west. The settlement area is 200 hectares.

The site became known after the works of B. Bezvenglinsky (1927, when several dwellings were excavated), Stefanovich's surveys, and Shishkin's deciphered aerial photographs. Since the 1970s, the site has been investigated on a permanent basis. In 1972-91, it was investigated by expeditions headed by Schmagliy from the Institute of Archaeology (Shmagliy and Videiko 1990; 2003). During that time magnetic surveys were carried out, as a result of which an almost complete site plan was drawn up, which became one of the exemplary plans in Tripolye studies.

During 2011-12 and 2016, high-resolution magnetic measurements of large areas of the site were carried out, as a result of which many more archaeological objects were discovered and a detailed description of the settlement development was made. Between 2013 and 2016, the excavation oftest trenches in different parts of the site and the systematic and exemplary excavation of different categories of features which were determined in the plan of the magnetic survey were performed. Extensive sampling was performed in all the trenches for typo-chronological studies, radiometric dating, soil-scientific and geochemical investigations, zoo-archaeological and palaeobotanical analysis (Müller *et al.* 2014; Videiko *et al.* 2015a; 2015b; Ohlrau 2015; Müller and Videiko 2016; Müller *et al.* 2016c; Ohlrau 2020).

Maidanetske is attributed to the Tomashovka local group, phase 3 (Ryzhov 1999, 90), second stage (Diachenko 2012, 125).

Moshuriv 1 and Moshuriv 3

The settlement Moshuriv 1 is located between the villages of Moshuriv and Potash (Talne district, Cherkasy region) on slope plateau of the River Moshuriv's left bank (also known as Kuryachiy brod), which runs around the site from the south and east. There is a dried-up creek on the north-east of the site. The site area is seven hectares.

The first work in Moshuriv 1 was undertaken by V. Stefanovich in the 1960s. In 1981, the Talianki team of the Tripolye expedition of the IA NASU, led by Kruts, carried out surveys of the settlement and made a visual plan (based on the location of the finds of archaeological material). Besides, dwelling no. 1 was excavated in the eastern part of the settlement (Kruts *et al.* 1982, 3-27). The material is stored in Cherkasy Regional Local History Museum. The results of the work are not published.

The site was attributed to the Tomashovka group, to its third phase (Ryzhov 1999, 90). Such settlements as Talianki, Maidanetske, Talne 2 and others are attributed to the same phase.

Not far from the Tomashovka settlement Moshuriv 1, not more than 100 metres to the west, another site was discovered, with the ceramics of the Kochergintcy-Shulgovka type (or the third phase of the Kosenovka group). It got the name Moshuriv 3 (as the name Moshuriv 2 had already been given to another site, which is located south of the village of Moshuriv).

In 1996, an archaeomagnetic survey was carried out on an area of nine hectares, as a result of which a plan was drawn for the western part of Moshuriv 1, behind the limits of which a number of anomalies were discovered that were attributed to Moshuriv 3. One of the anomalies of the latter settlement was excavated, and one *ploshchadka* was investigated by S. Ryzhov's team (Ryzhov 1996; Ryzhov and Weimer 1996). The *ploshchadka* (8 x 4 m) was given the reference N2. In it was a female burial, which was attributed to the *Belogrudovska culture* (Final Bronze Age). The material is stored in the Legedzyne Museum of Tripolye Culture; only a few pictures of the ceramics were published (Ryzhov 2001-2002, 189-192). The plans of Moshuriv 3 and a part of the Moshuriv 1 site have been published (Dudkin 2004d, 357).

In 2016, one more magnetic survey was carried out at the settlements (Ohlrau 2020) and confirmed the data of the previous survey, but resulted in a much more detailed plan, like all high-resolution magnetic plans. In order to check the dating of Moshuriv 1, a test trench was made in 2016 above the pit of the Tripolye time (see the part on ^{14}C dates).

Pishchana

The settlement is located 4 km south of the village of the same name (Talne district, Cherkasy region), in the Chobot locality, which is a narrow, sloping projection from north to east of the plateau, formed by the Rivers Tikich and Velyka Vys (which, joining to the south of the plateau, merge into the River Sinyukha). The plateau banks are high (8-15 m above the river level) and steep. Such topography is not typical of Tripolye settlements in the region. The site area is about 15-16 hectares.

In the literature, this Tripolye settlement has been known since the end of the 19th century (Domanitsky 1899, 174); small-scale surveys were carried out in subsequent years (Stefanovich and Didenko 1968). Also, the Tripolye settlement 'Pishchana' is known from the deciphered aerial photographs (Shishkin 1985, 75). However, on Shishkin's plan, the settlement is located not on the plateau described above between the Tikich and the Velyka Vys rivers, but on the plateau formed by the confluence of the Gorniy Tikich and the Gniloy Tikich. This location is much closer to the village of Pishchana (about 1.5 km). It remains unclear whether an error occurred on Shishkin's map, or whether there were two Tripolye settlements in this area. Since the 1980s, investigations have been carried out at the place mentioned above. In 1987-1988, the Talianki team of the IA AS USSR Tripolye expedition headed by Kruts excavated dwelling no. 1 in the western part of the site (Kruts and Ryzhov 1988, 42). In 2005, a team of the Tripolye expedition of the IA NASU headed by D. Chernovol excavated two dwellings (no. 2 and no. 3) in the south-eastern part of the settlement (Chernovol and Ryzhov 2005, 3). A cultural layer (settlement?) of the *Penkovo culture*, early Slavic period (5-7th centuries AD), was also found in this part of the settlement. Material is stored in the Cherkasy Regional Local History Museum and in the Museum of Tripolye Culture in the village of Legedzyne.

In addition to the excavations, there is also a settlement plan, which was drawn up in 1988 as a result of a magnetic survey carried out by a team from the Institute of Geophysics of the Academy of Sciences of the USSR led by G. Zagniy. This settlement plan was not published though. According to the description, the houses formed two concentric ovals (Kruts *et al.* 2000a, 40), although this is hardly seen in the picture. The 2005 report provides a different description of the site plan: '*ground mud houses (ploshchadkas) are partially located in one row along the edge of the plateau, and partially located in groups in the central part of the settlement*' (Chernovol and Ryzhov 2005, 3).

The settlement Pishchana was dated to the end of the middle (B2)/beginning of the late (C1) stage of Tripolye (Kruts *et al.* 2000a, 40; Chernovol and Ryzhov 2005, 3), which would be attributed to the second phase of the Nebelivka group. At the same time, Ryzhov attributed it to the first phase of the Nebelivka group (Ryzhov 1991; Ryzhov 1999, 56), along with such settlements as Nebelivka, Krasnopolka 3, Khutor Nezamognik and Krivi Kolina (so the second assumption contradicts the first one).

Sharin 3

The settlement is located on the western outskirts of the village of Sharin (Uman district, Cherkasy region) on the oblong sloped plateau formed by a left tributary of the River Yatran, on the north-east of the site and another tributary of the river, which flows southwards (the names of the tributaries are not clear). The site area has not been not calculated.

The investigation of the settlement started because of the reconstruction of the E95 highway St Petersburg-Odessa (increasing the width and construction of a new bridge). As a result of the construction works, part of (and possibly the whole) site was destroyed. Archaeological research on the site was conducted in 2003 and 2004 (Kushtan and Ovchinnikov 2003, 9-24; Kushtan, Nazarov and Ovchinnikov 2004, 3-31).

According to the literature, the Tripolye settlement of Sharin has been known since 1966 (after the work of Stefanovich). Some survey work on this site was also carried out by Kruts (Kruts and Ryzhov 1986). However, the authors of the rescue works came to the conclusion that this was a newly discovered (previously unknown) site, as judging by the description of the site given by Kruts the Tripolye settlement was located not at this place but further to the north-east, on the other side of the ravine and spring (Kushtan, Nazarov and Ovchinnikov 2004, 3). Taking into consideration the aforesaid, there might have been two small contemporaneous Tripolye settlements near the village of Sharin (another possibility would be that the description of the site in 1980 was not correct, since in 2003 the team did not find a Tripolye site at the place suggested before). Following the same argumentation, the settlement studied in 2003-2004 was named Sharin 3 (Sharin 2 was the site from the Bronze Age that was found not far away, Kushtan, Nazarov and Ovchinnikov 2004, 4).

In 2003 and 2004, a number of schurfs, trenches and excavations were made at the Sharin 3 site. Several *ploshchadkas*, many pits and other objects from the Tripolye period were discovered. Besides Tripolye layers, there are some from the *Belogrudovska culture* (the Final Bronze Age), minor finds from the *Babino cultural circle* (*Transition period* of the Bronze Age), and material from the *Scythian period* on the site (Kushtan 2015, 429). Most of the research material has been partly published (Kushtan 2005; Kushtan 2006; Kushtan 2015). The Tripolye settlement was attributed to the Kochergintcy-Shulgovka type (or the third phase of the Kosenovka group). The material is in the Museum of Tripolye Culture in Legedzyne.

Talianki

General information on this site is given in Part 3.

Vesely Kut

The site Vesely Kut is located in the vicinity of the village of the same name (Talne district, Cherkasy region), on the right bank of the River Gorny Tikich, on the cape of the first floodplain terrace, which extends into a plateau. The settlement has natural boundaries on the three sides – the waters of the Gorny Tikich on the north and east, and a natural ravine on the south.

Vesely Kut is rightfully attributed to the earliest 'settlement giants' (Tsvek 1980; 1985; 1999; 2006; Ohlrau 2015); and for a long time it was believed that its area reached 150 hectares (ibid.), but as a result of archaeomagnetic surveys it became possible to obtain more accurate data, according to which the area of the settlement was about 60 hectares.

The settlement was discovered by a history teacher from the village of Popuzhenka in 1970. In 1974-86 and in 1993 it was explored by the expedition of the Institute of Archaeology headed by O. V. Tsvek. During this time, 24 '*ploshadkas*' were excavated completely and 32 were trenched (Tsvek 2006, 22). The material obtained is stored in the finds of the Institute of Archaeology of the National Academy of Sciences of Ukraine.

In 2017, a magnetic survey of part of the settlement was carried out, and a test trench was excavated to obtain material to clarify the relative and absolute dating of the site (see the part on ^{14}C dates).

O. V. Tsvek placed the settlement within the Bug-Dnieper variant of the Eastern Tripolye Culture of stage B1-B2 and attributed it to the cognominal type of sites (type Vesely Kut). According to the author, the sites of the same type are Botvinovka, Bugachevka, Deshky, Kharkivka, Kopiuvata (Tsvek 2006, 26).

Vladimirovka

The site is located to the south of the village of the same name, partly under its houses and gardens (Novoarkhangelsk district, Kirovograd region). Topographically, the settlement is located on the plateau of the high right bank of the River Sinyukha. The site is confined by the river and a dried-up creek (which could have been an ancient channel of the Sinyukha) to the east, to the north by the stream Bondarivka (Passek 1941, 212). The settlement area is about 95 hectares.

Vladimirovka was discovered by M. K. Yakimovich, an employee of the Uman Regional Museum, in 1925. From 1927 to 1928, it was excavated by the Uman Local History Museum. In subsequent years, it was examined by such researchers as B. P. Bezvenglinsky, S. S. Magura and V. E. Kozlovskaya (Yakubenko 2004, 104). In 1939-40 and 1946-47, the Tripolye expedition of the IA AS USSR and the Institute of History of Material Culture of the Academy of Sciences of the USSR, which was headed by T. S. Passek, worked there. The remains of 20 houses and other objects were excavated during the works (Passek 1940; 1947; 1949). A large number of houses were excavated for rescue purposes since, during World War II, part of the settlement was cut through by an anti-tank moat (4.5 m wide and up to 2 m deep), which damaged a number of houses. As a result of the work of the expedition, a settlement plan was drawn (made by fixing the finds on the ploughed field and using the excavation data), which made it possible to discover around 150 dwellings (Passek 1949, 79). From 1989 to 1990, the research was carried out by the Tripolye archaeological expedition of the State Historical Museum of the Ukrainian SSR under the direction of O. O. Yakubenko (Yakubenko 2004, 104).

The materials are stored mainly in the National Museum of the History of Ukraine, the Hermitage and the State Historical Museum in Moscow.

Recently, surveys were undertaken on the site to test the method of establishing the edge of the built-up area (Nebbia 2017, 110-112). Walking from the middle of the site towards the outside, using a 40 m spacing, the surveyors counted the number of pottery sherds.

In 2017, a magnetic survey of part of the settlement was carried out, and a test trench was excavated to obtain material to clarify the relative and absolute dating of the site (see part on ^{14}C dates).

T. S. Passek attributed Vladimirovka to stage B2 (Passek 1949, 79). T. G. Movsha singled out a separate regional group, named after this site (Movsha 1972, 7). This group incorporated, in addition to Vladimirovka, the sites of Fedorivka-Mikhailovka, Andriyivka, Polonyste, Gordashivka1, Peregonivka, Maslove, and others. S. M. Ryzhov attributed the site to the second phase (out of the three that he had singled out) of the group development (together with Andriyivka and, probably, Maslovo) (Ryzhov 2015, 162).

Now let's review the ^{14}C dates with which key sites will be further analysed.

4.2 ^{14}C dates

4.2.1 The selection of samples

In recent years, a large number of ^{14}C dates have been obtained from Tripolye sites in the Sinyukha river basin (total 289, see Appendix 2). There were two approaches in selecting the samples.

1. Dates obtained from modern excavations performed within the framework of the ongoing research project include the Maidanetske site with 90 dates, Chichovka and other sites. For Maidanetske, the samples for dating were selected purposefully, and a number of test trenches were systematically made, in addition to larger excavation areas in different house rows. The extensive dating of Maidanetske was aimed at reconstructing the history of the development of a separate mega-site (Müller *et al.* 2014; Videiko *et al.* 2015a; 2015b; Ohlrau 2015; Müller and Videiko 2016; Müller *et al.* 2016c; Müller *et al.* 2017; Ohlrau 2020). Also, a number of samples were taken from the neighbouring Talianki settlement.
2. Dates from older excavations: Unlike with Maidanetske, the samples for dating from Talianki, Kosenovka, Dobrovody and other sites were taken from the assemblages of earlier and recent excavations undertaken by Kiev colleagues; they were unearthed with the use of more traditional excavation methods (that is, without the fixing of point coordinates). The analysis of the dates obtained gave a rather positive result: for example, a series of dates fits in one temporary period, and these dates are quite clearly consistent with the new data on Maidanetske. Moreover, the strategy to concentrate the research on the north-western part of the Talianki site and to excavate one house row after another situated in the same house cluster (Kruts *et al.* 2001; Kruts *et al.* 2005; Kruts *et al.* 2008; Korvin-Piotrovskiy and Menotti 2008; Kruts *et al.* 2009; Kruts *et al.* 2011; Kruts *et al.* 2013) was of great significance for the construction of the site's chronology. This strategy allowed the assumption of a chronological difference not only in different parts of the site but also within the clusters of houses.

Thus both methods of selecting samples for dating turned out to be successful. The subsequent dating of the sites included both the digging of test trenches and the dating of animal bones from old excavations for key sites. As the key sites were chosen from the settlements where archaeomagnetic surveys were performed, as well as from the sites for which ceramic assemblages are available (on the basis of which various analyses can be performed), one of the sites most closely meeting these criteria – also happening to be the largest (by area) known mega-site – proved to be the Talianki one. The subsequent site selection included: 1) sites of the Tomashovka group, 2) sites of earlier Nebelivka and Vladimirovka groups, where the 'classic' giant settlements developed as a phenomenon, 3) even earlier sites of Eastern Tripolye, where one can observe the process of agglomeration of the population and emergence of the first large settlements, 4) the sites of the Kosenovka group, which represent the final ones in the group of mega-sites in the region, and finally 5) sites of the Kochergintcy-Shulgovka type – the last Tripolye settlements in the region.

Of course, the use of animal bones from old excavations without reliable contextualisation might be debated. However, it can be acceptable, considering that, firstly, the households dated (whenever possible) were those from which ceramic collections are available (that were used to perform the analysis) and, secondly, some sites are extremely difficult to date because fieldwork there is hampered due to the existing legally undefined 'copyright to the settlements' (in Tripolye, in particular). In addition, dates were obtained for the Sharin 3 site, which, according to the authors of the excavations, has been practically destroyed.

The samples for dating from the old excavations are from the sites of Talianki, Pishchana, Dobrovody, Kosenovka, and Sharin 3.[42] Below is a description of the contexts of the finds and the analysis of the dates obtained.

4.2.2 The analyses of the ^{14}C samples per site

Kosenovka. A total of twelve dates have been obtained for the settlement, all from the excavations of 2004, when *ploshchadka* no. 6 (10 x 4.5 m) was investigated, and the material published (Kruts *et al.* 2005, 77-91; 107-108). Six of the samples were animal bones. All the bones were 'within the limits' of house no. 6 – in or near its remnants. Two samples were located under the *ploshchadka*. Two models were compiled for the analysis of the dates obtained.

In the first model (tab. 20), it is assumed that the finds and samples 'under the platform' correspond to an earlier phase: the beginning of the functioning of the house and the bones found on the *ploshchadka* and within this cultural layer belong to a later period of use. Thus, using the *boundary* function in the program OxCal, the most probable beginning and end of the house life were modelled (based on the available samples), and these correspond to 3690-3650 BCE.

In the second model (tab. 21), it is assumed that the samples under the *ploshchadka* and on top of it come from the same period, that is, that they do not have a chronological difference. Using again the *boundary* function, the most probable beginning and end of the house's functioning were modelled (based on the available samples), which corresponds, as in the previous model, to 3690-3650 BCE.

In addition to the six dates for the animal bones, six dates for the human remains found in the Tripolye cultural layer in the course of examining house no. 6 (Kruts *et al.* 2005, 78-91, 107-108) were obtained at the beginning of 2019. Both human burials and finds of disarticulated human bones at Tripolye settlements is an extremely rare

42 Material from the settlements of Talianki (partly), Pishchana, Kosenovka and Sharin 3 was kindly given by the colleges of the Tripolye cultural reserve in the village of Legedzine, Vladislav Chabanyuk and Nina Ses, from another part of Talianki by Alexey Korvin-Piotrovskiy, head of the Tripolye expedition NASU. Material from Dobrovody was obtained in joint research together with Korvin-Piotrovskiy (2015).

Table 20. Kosenovka. Results of Bayesian ^{14}C modelling for house 6 (model 1).

Model 1			A model	114.3%
			A overall	120.3%
House 6	68.2%	95.4%	Median	Highest
Start h.6	3711-3667	3771-3651	3694	**3690**
Span under h.6	0-9	0-34	3	5 or 30
Duration under h.6	0-26	0-96	12	
Boundary u.h.6-h.6	3691-3600	3702-3651	3676	3685 or 3660
Span h.6	0-15	0-36	7	10 or 35
Duration h.6	0-24	0-60	12	
Boundary end h.6	3675-3640	3696-3625	3658	**3650**

Table 21. Kosenovka. Results of Bayesian ^{14}C modelling for house 6 (model 2).

Model 2			A model	125%
			A overall	128.3%
House 6	68.2%	95.4%	Median	Highest
Start h.6	3710-3666	3758-3651	3693	**3690**
Span h.6	0-34	0-72	22	40
Duration h.6	0-51	0-121	32	
End h.6	3677-3636	3696-3612	3654	**3650**

Table 22. Kosenovka. Context and anthropological determination of human bone finds.

WHAT	WHERE
2 fragments of the human femur diaphysis (partially burnt)	In a depression at the level of the ancient surface in square B3 (second part in square B2)
Upper part of the diaphysis of the humerus with pieces of the epiphysis, and fragments of several ribs	Square B3, 'southern' bone accumulation
Pieces of the upper parts of tibia and fibula and patella	Square B3, 'northern' bone accumulation
Fragments of a long bone (burnt)	Square B3, 'western' bone accumulation
Cranial vault with the orbit, a large fragment of the diaphysis of the arm (humeral?), two fragments of ribs (all the bones were slightly burnt)	Square B2
Fragments of two femurs (one is burnt), part of the pelvis, lower epiphysis of the ulna, and three vertebrae	Square Д3, at the level of the ancient horizon
A fragment of the frontal part of the skull with the edge of the orbit and the upper epiphysis of the ulnar, fragment of radius with the lower epiphysis	Square Г4
Fragments of the cranial vault	Square Г5
Large fragment of thick-walled cranial vault	Square E4
Lower epiphysis of the humerus	Square Д5
Ulnar, upper epiphysis	Square A4
Part of the upper jaw of a person with strongly eroded teeth	In the excavated earth opposite to square B2

phenomenon (in the Sinyukha basin we know only those from Kosenovka and from the settlement of Kolodistoe before stage C2). Disarticulated human bones from Kosenovka house no. 6 were found on top of the remains of adobe structures, among the rubble of pieces of baked clay and outside the house (Kruts *et al.* 2005, 78). They are small parts of bones from different parts of the skeleton and from different individuals. Some of the bones have traces of burning and some are calcinated because of fire. The authors of the excavation suggested that some parts of the bones are associated with the destroyed burial of a 'later period, and the burnt remains may

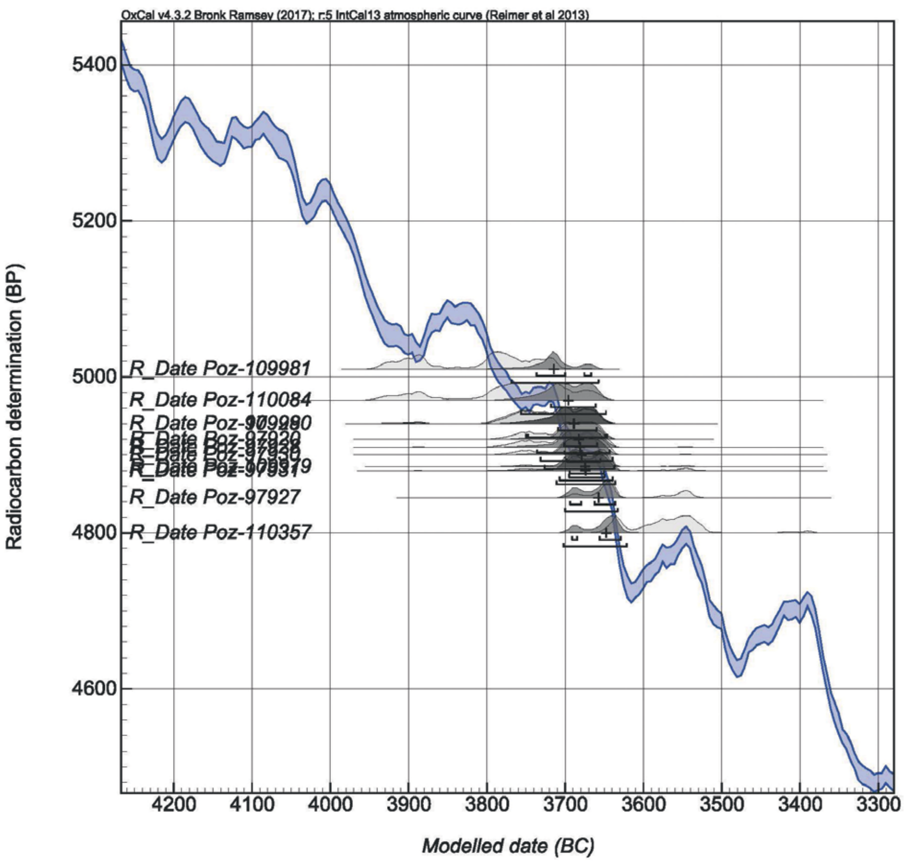


Figure 46. Kosenovka, Bayesian modelling of ¹⁴C dates (model 3).

Model 3 All Kosenovka dates			A model	97.5%
			A overall	91%
House 6	68.2%	95.4%	Median	Highest
Start h.6	3762-3698	3798-3667	3727	**3715**
Span h.6	29-112	0-152	76	80
Interval h.6	35-134	0-182	91	
End h.6	3660-3617	3693-3593	3638	**3635**

Table 23. Kosenovka. Results of Bayesian ¹⁴C modelling for house 6 (model 3).

presumably be associated with the house that could have burnt as the result of an accidental fire in which some people died (Kruts *et al.* 2005, 79).

Here is the list of what was found and where (tab. 22):

Svetlana Kruts, who made a palaeoanthropological description of the finds (Kruts *et al.* 2005, 107-180), concluded that the bones represented the remains of six people (three women, a child, and probably two men). In order to conduct a new examination using modern methods, six bone samples from four to six individuals were dated. All of them are of the Tripolye period and close to the dates of the bones of animals obtained for Kosenovka.

Through the R_Combine function, it was determined that these dates potentially belong to one event. However, one date (Poz-110086) is earlier than the others (4228-4042 cal BCE: 1-sigma probability). This bone (as well as sample Poz-110084) was completely cremated and the collagen destroyed. Due to these circumstances, it was the human bone apatite rather than collagen that was dated in these bones. To use this sample in further (chronological) analyses, some additional arguments

Table 24. Kosenovka. Results of Bayesian ^{14}C modelling for house 6 (model 4).

Model 4			A model	96.2%
			A overall	97.4%
House 6 hb	68.2%	95.4%	Median	Highest
Start h.6 hb	3817-3715	4010-3696	3781	**3770 or 3760**
Span h.6 hb	0-102	0-239	68	105 or 95
Interval h.6 hb	0-178	0-446	124	
End h.6 hb	3711-3611	3768-3476	3659	**3675 or 3655**

are needed (which may appear, for example, after strontium isotope analysis). Here, this sample is considered an outlier because of its great age.

Thus five dates obtained from human bones were included in model 2 (since the context of the finds does not allow their attribution to a certain phase – the beginning-end of the use of the house). Model 3 (tab. 23) assumes that the samples from house no. 6 are dated with the highest probability from 3715 to 3635 cal BC (fig.46).

One more date analysis was made on human bones (model 4 tab. 24). The date Poz-110357 was excluded from the model, as it was marked as poor by the laboratory. The date itself is slightly later than the others. As can be seen from the table, in general, human remains from Kosenovka are slightly older than the animal bones. This may be due to certain factors. Firstly, the fact that human remains may not be contemporaneous with house N6 attests the complicated taphonomic processes there. Secondly, the dates might be affected by the condition of the samples: some of them were completely cremated, some partly burnt, and others were rather small. Human bones could have got into the dwelling from earlier objects, which could be located both in the given settlement and beyond it. It is necessary to draw attention once again to the extraordinariness of such finds in Tripolye settlements. In any case, for further interpretation of human remains, a number of other analyses should be made (for example strontium isotope analysis).

Sharin 3. For the dating of the site, eight samples were taken from the rescue excavations of 2003 and 2004 (six samples of animal bones and two human bones). In 2003, trenches were made in different parts of the Tripolye settlement and, in particular, in 'excavation area no. 4', '*house 3*' was excavated, which was later interpreted as a pit from the Tripolye time (Kushtan, Ovchinnikov, 2003). Two dating samples (Poz-109274 and Poz-109275) were taken from this pit. In 2004, *ploshchadka* 2 and the pit near it were investigated in excavation area no. 5 (Kushtan, Nazarov and Ovchinnikov 2004). From these areas, four samples of animal bones were dated. Two disarticulated human bones (two fragments of human femurs) were found in one of the pits near the site (no. 1), as well as in the accumulation of Tripolye pottery near the *ploshchadka*. Anthropological definitions were made by Svetlana Kruts (Kushtan, Nazarov and Ovchinnikov 2004, 47). Both bones have also been dated. It should be noted that *ploshchadka* no. 2 was cut by several pits of the *Belogrudovska culture* (Final Bronze Age – 1300-900 BCE, Kushtan 2013, 84). The material is partially published (Kushtan 2005; Kushtan 2006; Kushtan 2015). To determine the absolute age of the site, the authors of the excavation also gave some samples to the Kiev laboratory (ten samples), most of which were ceramics (four) and clay daub (four).

As a result of the recent dating of the samples from Sharin 3, it turned out that only four of them belong to the Tripolye period (see fig. 47). Three dates – Poz-109293 (1188-1045 cal BCE – 1-sigma probability range), Poz-109983 (1390-1276 cal BCE – 1-sigma probability range) and Poz-109984 (1260-1130 cal BCE – 1-sigma probability range), the last two of which are human remains, date back to the Belogrudovska culture. One date, Poz-109294 (476-392 cal BCE – 1-sigma probability), belongs to *the Scythian time*, and these dates are fully consistent with the findings on the site (Kushtan 2015, 429).

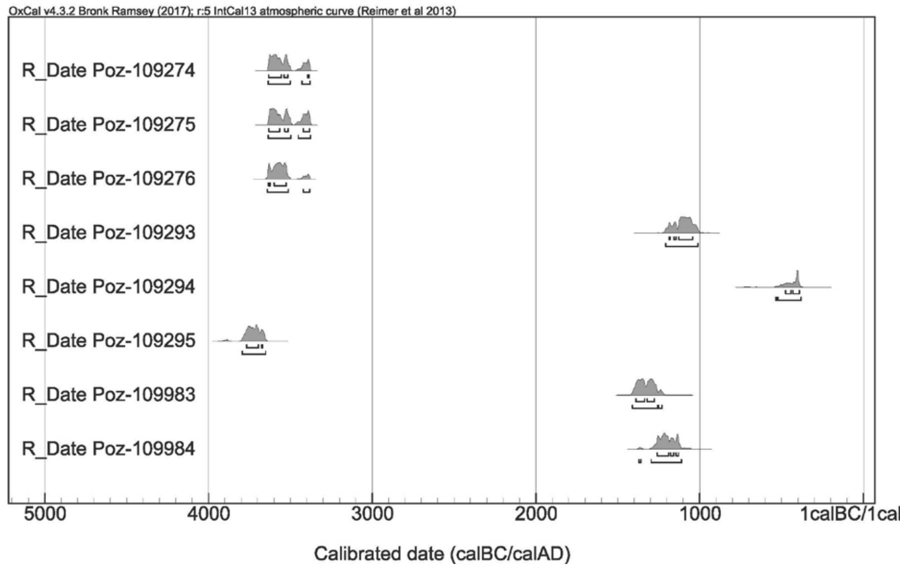


Figure 47. Scharin 3, Available ^{14}C dates.

Model Sharin 3			A model	109.3%
			A overall	109.2%
	68.2%	95.4%	Median	Highest
Start Sharin 3	3786-3660	4039-3640	3738	**3680**
Span Sharin 3	62-192	31-323	140	155
Interval Sharin 3	78-354	5-765	240	
End Sharin 3	3610-3450	3639-3168	3511	**3525**

Table 25. Sharin 3. Results of Bayesian ^{14}C modelling.

All the remaining Tripolye dates were modelled together (Sharin 3 model, tab. 25). As a result, the samples most likely date the period from 3680 to 3525 cal BCE. These results do not agree with the data obtained in the Kiev laboratory (Kushtan 2015, 436) and show an earlier date of the Tripolye objects from this site.

Talianki. The description of the work on the samples from this site is given in Part 3.

Dobrovody. Six samples of animal bones for dating were taken from the excavations performed in 2015. During that field season, two objects were investigated: pottery kiln ‘A’ and the so-called mega-structure situated in the ring corridor of the site, which was cut with two long trenches (Korvin-Piotrovskiy *et al.* 2016b, 201-202). Three dates were obtained for kiln A, one of which was derived from under the stone embedded into the kiln channel. This date, most likely represents a *terminus ad quem* for the kiln construction. The two other dates provide a *terminus ante quem* for the use of the kiln as they were found in the filling of the kiln canals and had no traces of burning. The other three samples relate to the mega-structure. They likely originate from the use of the mega-structure. It should be noted that the cultural layer was extremely poorly preserved. So far, the excavation material has not, in practice, been published.

To begin with, the dates for the pottery kiln were modelled using the function *boundary*. In this model, additionally, an operation life of ten years is assumed for the kiln, using the function *gap*. As a result, the kiln model suggests that it could have been constructed in about 3800 cal BC, and it could have been used most probably until the mid 38th century BCE (tab. 26). The kiln could have been filled up with household waste before 3700 cal BCE. It should be noted that this relatively long duration seems to be due to the plateau in the ^{14}C calibration curve between 3930 and 3720 cal BCE (fig. 48).

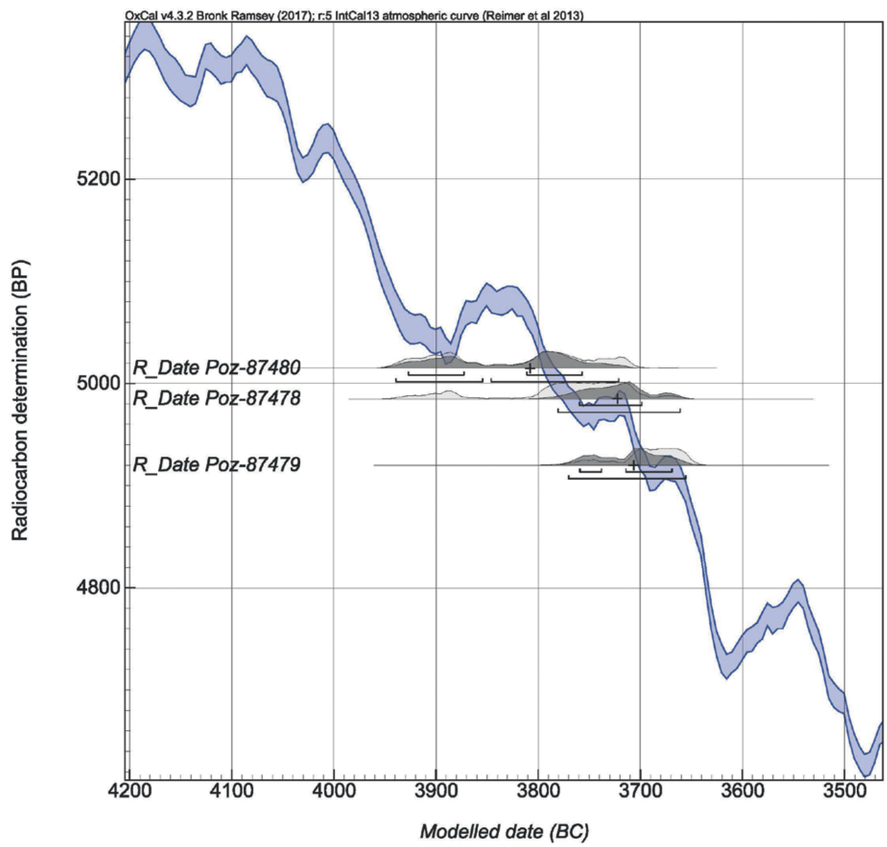


Figure 48. Dobrovody, Bayesian modelling of ^{14}C dates from kiln A.

Model Dobrovody Kiln A			A model	83.8%
			A overall	90.5%
	68.2%	95.4%	Median	Highest
Start construction	3953-3758	4082-3713	3850	**3800**
Duration kiln construction	0-75	0-260	39	50
Boundary construction use	3886-3729	3915-3711	3790	3760
End kiln use	3777-3704	3827-3668	3744	**3750**
Duration kiln backfill interval	0-73	0-210	40	50
Boundary end kiln backfill	3744-3654	3776-3569	369	**3700**

Table 26. Dobrovody. Results of Bayesian ^{14}C modelling of kiln A.

Model Dobrovody MS			A model	94.5%
			A overall	97.1%
	68.2%	95.4%	Median	Highest
Start MS	3970-3767	4573-3714	3892	**3800**
Span MS	0-97	0-193	52	80
Interval MS	0-255	0-886	147	
End MS	3889-3636	3923-3006	3718	**3720**

Table 27. Dobrovody. Results of Bayesian ^{14}C modelling of the mega-structure.

Based on the model (tab. 27), the highest probability of the dating samples from the mega-structure fits into the time interval of 3800-3720 cal BCE, thus being practically contemporary with the pottery kiln.

Model Pishchana House 2			A model	99.8%
			A overall	100.5%
	68.2%	95.4%	Median	Highest
Start P h2	4001-3839	4283-3799	3948	**3960**
Span P h2	0-73	0-152	45	150
Interval P h2	0-202	0-710	121	
End P h2	3915-3743	3954-3491	3808	**3810**

Table 28. Pishchana. Results of Bayesian ^{14}C modelling of house 2.

Model Pishchana House 3			A model	91.1%
			A overall	91.2%
	68.2%	95.4%	Median	Highest
Start P h3	4246-3960	5141-3822	4088	**4030 or 4000**
Span P h3	77-321	35-344	233	320 or 290
Interval P h3	88-683	33-1653	467	
End P h3	3900-3490	3935-2709	3654	**3710**

Table 29. Pishchana. Results of Bayesian ^{14}C modelling of house 3.

Pishchana. Seven animal bones were selected as samples for the dating of the site Pishchana. They had been discovered during the 2005 excavations of two *ploshchadkas*, no. 2 and no. 3 (Chernovol and Ryzhov 2005). Three bones derive from the contexts of one *ploshchadka* and three from the other. One bone was found in a pit outside the houses. The material from the settlement has not been published. Several models were created for the analysis of the dates obtained.

The first two models analyse separately the chronological information obtained for each dwelling (tab. 28 and tab. 29).

The modelled dates for house no. 2 show that the highest probability of the dating of the samples is within 3960-3810 cal BCE.

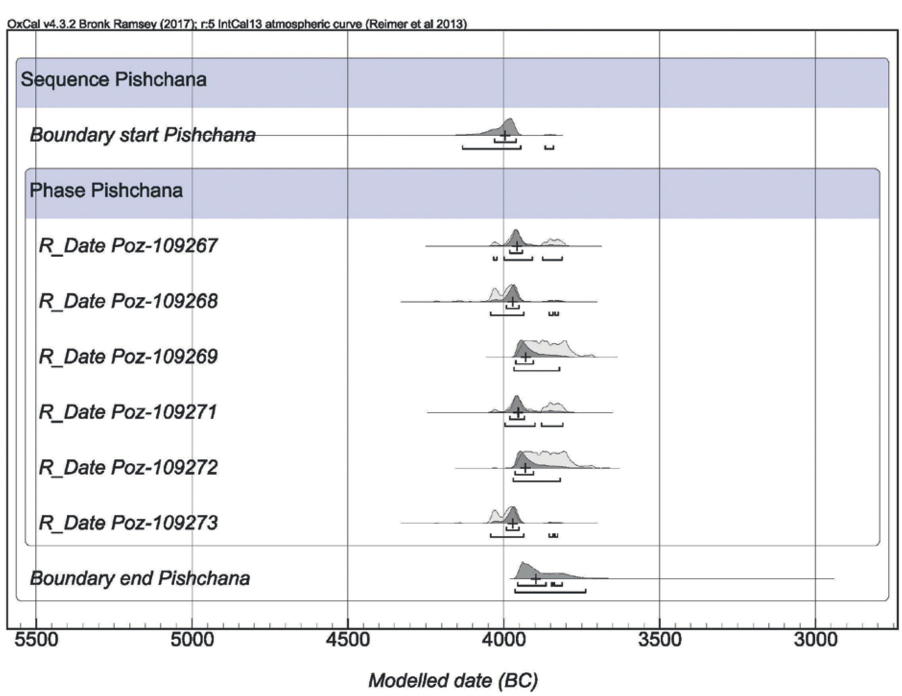


Figure 49. Pishchana, Bayesian modelling of ^{14}C dates (all dates).

Model Pishchana			A model	123.4%
			A overall	120.8%
	68.2%	95.4%	Median	Highest
Start Pishchana	4031-3961	4133-3841	3996	**3980**
Span Pishchana	0-107	0-199	69	40
Interval P	0-167	0-337	105	
End Pishchana	3956-3813	3964-3739	3898	**3940**

Table 30. Pishchana. Results of Bayesian ^{14}C modelling of all dates.

Model 1 Moshuriv 1			A model	93.1%
			A overall	95%
Pit	68.2%	95.4%	Median	Highest
Start pl4	3997-3806	4430-3768	3914	**3850**
Span pl4	0-5	0-5	3	60 or 80
Duration pl4	0-199	0-621	128	
Boundary pl4-pl3	3828-3732	3901-3680	3783	3790 or 3770
Span pl3	0-40	0-94	26	70 or 90
Duration pl3	0-155	0-399	102	
Boundary end pit	3756-3630	3789-3431	3675	**3700**

Table 31. Moshuriv 1. Results of Bayesian ^{14}C modelling of test trench 1.

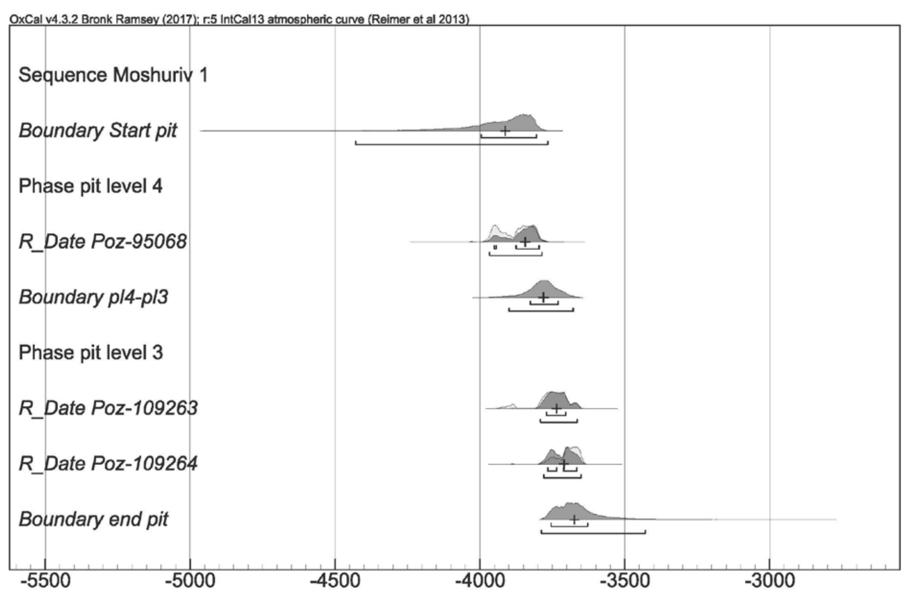


Figure 50. Moshuriv 1, Bayesian modelling of ^{14}C dates (model 1).

The model for house no. 3 gives a very large gap between the most probable beginning and end of the functioning of the house (based on the samples). That is why a third model was proposed, in which all the available dates were analysed together (fig. 49). The date Poz-109265 was excluded from the analysis since it represents an outlier according to an outlier model in OxCal (Bronk Ramsey 2009). Based on the proposed model, the highest probability of the dating of the samples for Pishchana is between 3980 and 3940 cal BCE (tab. 30).

The sites from which the samples for dating were selected from the test trenchesare Grebenyukiv Yar, Chizhivka, Vesely Kut, Vladimirovka and Moshuriv 1.

Moshuriv 1. In 2016, a test trench, which partially cut a pit, was made at the settlement. The material from the pit was scarce, containing hardly any material for

Model 2 Moshuriv 1			A model	93.6%
			A overall	93.4%
	68.2%	95.4%	Median	Highest
Start	4047-3802	4968-3721	3935	**3860**
Span	71-206	28-286	145	200
Interval	78-511	0-1390	333	
End	3755-3535	3788-2786	3627	**3660**

Table 32. Moshuriv 3. Results of Bayesian ^{14}C modelling.

absolute dating. Three samples were chosen for dating, two of which were on the second level in the upper part of the pit's filling, and one on the third level, in buried soil. Based on this, model 1 Moshuriv 1 makes it possible to assume the existence of two backfilling phases of the pit (tab. 31).

Thus, based on the rather inconsistent dates, this object in the Moshuriv 1 settlement can be dated to the relatively long period 3850-3700 cal BCE (fig. 50). The second model involves the analysis of all dates within one phase (tab. 32). This makes the pit slightly younger, which is most likely to date from 3860-3660 cal BCE.

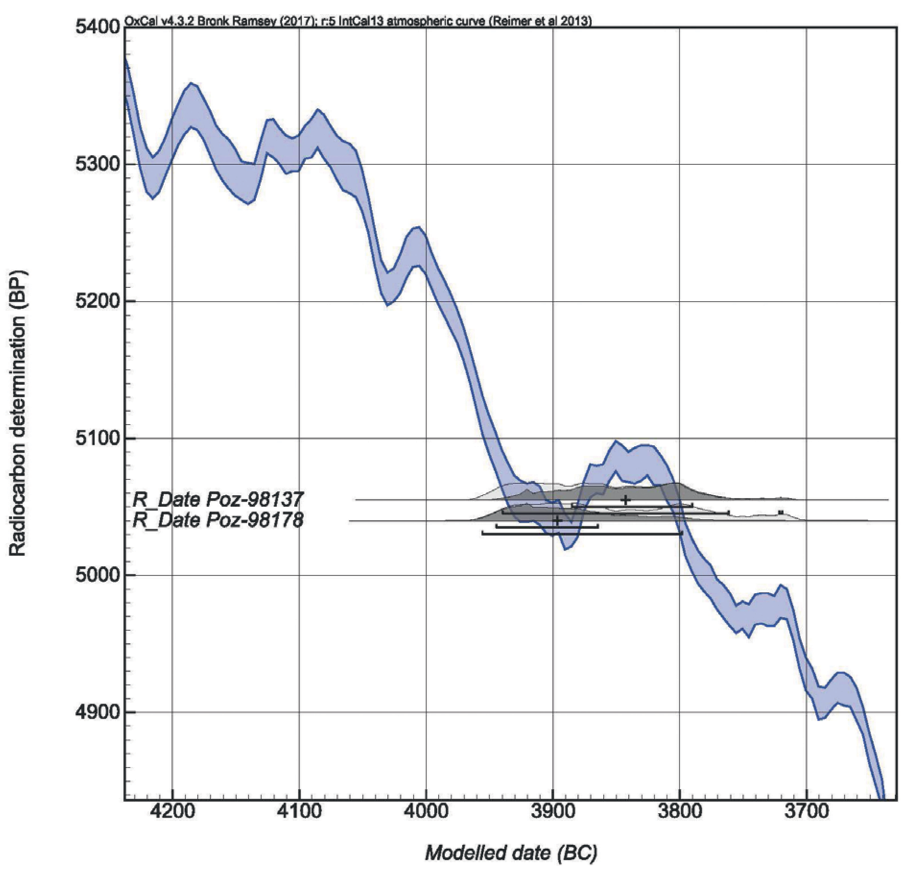


Figure 51. Vladimirovka, Bayesian modelling of ^{14}C dates (model 1).

Vladimirovka. In 2017, during the geomagnetic survey, a test trench was excavated on this site. The trench cut a pit of the Tripolye period. Unfortunately, most of the bones found there were unsuitable for dating. It became possible to obtain dates for only two samples (fig. 51). Since the samples were in different levels of the pit, the first model for Vladimirovka assumes the existence of two chronologically different backfilling events (tab. 33).

Model 1 Vladimirovka			A model	106.1%
			A overall	105.6%
Pit	68.2%	95.4%	Median	Highest
Start pl4	3985-3842	4215-3775	3926	**3920**
Span pl4	0-5	0-5	3	
Duration pl4	0-83	0-357	39	
Boundary pl4-pl2	3928-3833	3946-3781	3877	3880
Span pl2	0-5	0-5	3	
Duration pl2	0-83	0-367	39	
Boundary end pit	3925-3757	3947-3508	3809	**3800**

Table 33. Vladimirovka. Results of Bayesian ^{14}C modelling (first model).

Model 2 Vladimirovka			A model	105.7%
			A overall	105%
	68.2%	95.4%	Median	Highest
Start	4055-3807	4495-3794	3959	**3940**
Span	0-56	0-136	30	
Interval	0-375	0-1026	202	
End	3918-3664	3936-3192	3764	**3800**

Table 34. Vladimirovka. Results of Bayesian ^{14}C modelling (second model).

As can be seen from the model, the samples from the pit can be dated, with the highest probability, to between 3920 and 3800 cal BCE.

The second model assumes that there is no chronological difference between the levels of the pit. This model reduces the highest probability of dating the samples from the pit by 20 years (tab. 34).

Vesely Kut. The test trench to obtain the material for the dating was, as well as in the previous case, made during the geomagnetic survey at the site. Three samples for dating were found in the trench. In addition, in the south-eastern part of the settlement, several dwellings, ploughed up to a great extent, were recorded – altogether four spatially limited find spots. Material, including animal bones, was collected from these four surface find concentrations. Five bones of animals were dated. Such an 'experiment' was done for several reasons. Firstly, based on the remains from these concentrations and, to put it simply, destroyed houses, it was quite clear that we were dealing with a Tripolye cultural layer. Since the magnetic survey was made there, we have an excellent opportunity to link a specific material with a specific house area on the settlement map. Secondly, with the focus on chronological studies and, in particular, the work on the chronology of sites, the dating of different parts of the site is of particular interest (and in this case we are dealing with one of the first 'giant settlements'). The situation with the destroyed *ploshchadkas* was one of the possibilities to realise this. As a result of dating, it became clear that the four dates are from the Tripolye time and are close to the dates obtained from the pit. One date, Poz-97921 (from house 'A'), was from a later period – 359-208 cal BCE (1-sigma probability). It is within the timeframe of *the Scythian time* according to the periodisation accepted in Ukrainian archaeology.

Several models could be built as a result of the work on dating Vesely Kut. To begin with, we turned to the finds from the *pit* of the Tripolye period discovered during the excavation of the test trench. One dating was made of the animal bones from the fifth level of the pit, the other two dates of the ash tree charcoal, the remains of which were found in both the fifth and sixth levels of the pit. Thus the first model for dating the samples from the pit takes into account stratigraphic data and assumes

Model 1 Vesely Kut Pit			A model	87.1%
			A overall	90.9%
Pit	68.2%	95.4%	Median	Highest
Start pl6	4255-4070	4516-4019	4191	**4170**
Span pl6	0-5	0-5	3	
Duration pl6	0-108	0-393	55	
Boundary pl6-pl5	4170-4045	4228-4016	4113	4060
Span pl5	0-35	0-106	14	
Duration pl5	0-107	0-327	57	
Boundary end pit	4151-3962	4222-3817	4031	**4040**

Table 35. Vesely Kut. Results of Bayesian ^{14}C modelling (first model).

Model 2 Vesely Kut Pit			A model	88.7%
			A overall	90.5%
	68.2%	95.4%	Median	Highest
Start	4261-4061	4622-4005	4197	**4170**
Span	0-102	0-200	66	
Interval	0-278	0-954	169	
End	4148-3938	4226-3557	4010	**4040**

Table 36. Vesely Kut. Results of Bayesian ^{14}C modelling of the pit (second model).

Vesely Kut House B			A model	99.2%
			A overall	99.2%
	68.2%	95.4%	Median	Highest
Start	4899-4016	4899-4011	4333	**4170**
Span	0-5	0-5	3	
Interval	0-936	0-1570	532	
End	4153-3244	4163-3244	3848	**4000 or 3990**

Table 37. Vesely Kut. Results of Bayesian ^{14}C modelling of house B.

Vesely Kut House C			A model	88.7%
			A overall	90.5%
	68.2%	95.4%	Median	Highest
Start	4779-3976	4779-3974	4273	**4035**
Span	0-5	0-5	3	
Interval	0-938	0-1509	594	
End	4028-3259	4030-3259	3743	**3970**

Table 38. Vesely Kut. Results of Bayesian ^{14}C modelling of house C.

Vesely Kut House D			A model	88.7%
			A overall	90.5%
	68.2%	95.4%	Median	Highest
Start	4356-4056	4936-4046	4241	**4230/4225 or 4160**
Span	0-79	0-181	45	
Interval	0-479	0-1372	267	
End	4195-3845	4222-3209	3985	**4050**

Table 39. Vesely Kut. Results of Bayesian ^{14}C modelling of house D.

Table 40. Vesely Kut. Results of Bayesian ^{14}C modelling of all dates.

Vesely Kut All Dates			A model	101.4%
			A overall	100.5%
	68.2%	95.4%	Median	Highest
Start	4179-4051	4286-4007	4131	**4070**
Span	0-132	0-220	94	
Interval	0-195	0-339	130	
End	4040-3965	4146-3873	3997	**4000**

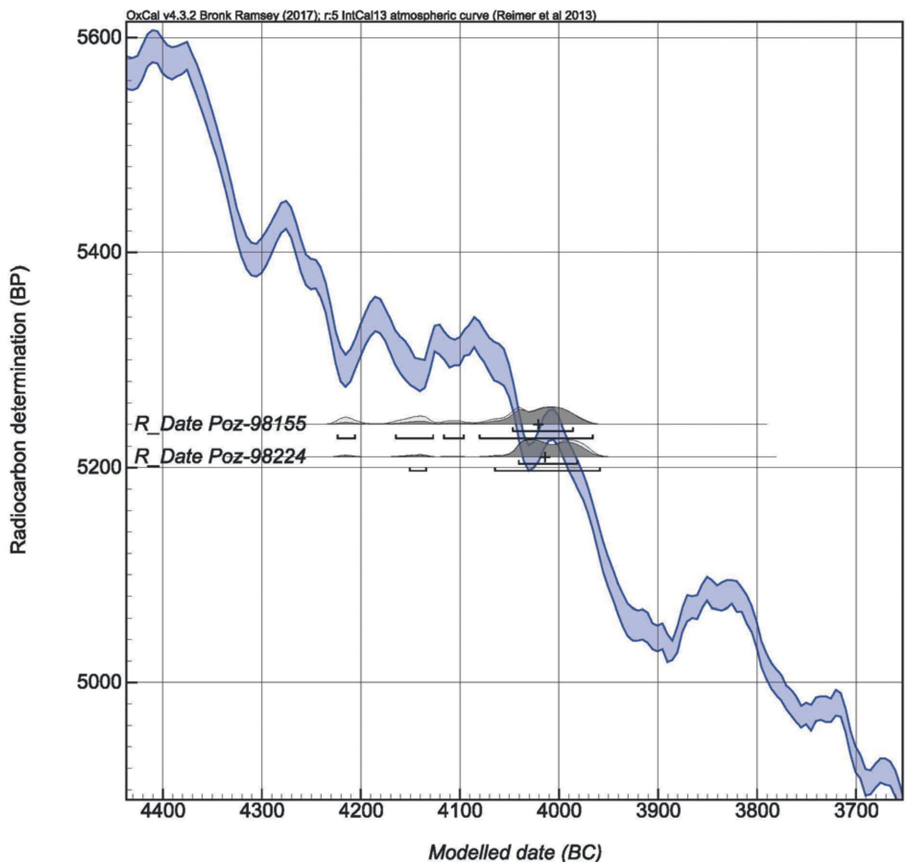


Figure 52. Chizhivka, Bayesian modelling of ^{14}C dates.

a chronological difference between different levels of the pit (tab. 35). In such a situation, they are dated, based on the highest probability, to 4170-4040 cal BCE.

The second model assumes the absence of a chronological difference between the fifth and sixth levels of the pit, which in absolute dates looks like this: 4170-4040 cal BCE (highest probability), which is similar to the previous result (tab. 36).

The dates for each concentration of destroyed dwellings were modelled separately. Accordingly, the sample from house 'B' based on the highest probability is dated to 4170-4000 or 3990 cal BCE (tab. 37); house 'C' to 4035-3970 cal BCE (tab. 38); house 'D' to 4230-4225 or 4160-4050 cal BCE (tab. 39).

Finally, the last model sums up all the dates from Vesely Kut (tab. 40). The result of this was the total dating of the samples from the site within the range from 4070 to 4000 cal BCE (the highest probability).

Chizhivka. Like in Vesely Kut and Vladimirovka, a test trench was made through the pit in the settlement of Chizhivka during the magnetic survey. It should be noted that the cultural layer of the site has extremely eroded. In total, three samples from the pit were dated: one was an animal bone and two were cereal grains found during

Chizhivka Pit			A model	115.8%
			A overall	114.2%
	68.2%	95.4%	Median	Highest
Start	4223-3988	4904-3977	4099	**4050**
Span	0-40	0-158	20	
Interval	0-348	0-1225	173	
End	4041-3849	4051-3219	3949	**3990**

Table 41. Chizhivka. Results of Bayesian ^{14}C modelling.

Model 1 Grebenyukiv Yar Pit			A model	103.8%
			A overall	107.3%
Pit	68.2%	95.4%	Median	Highest
Start pl6	4584-4490	4729-4467	4545	**4530**
Span pl6	0-5	0-5	3	
Duration pl6	0-51	0-198	27	
Boundary pl6-pl5	4539-4483	4576-4462	4512	4510
Span pl5	0-16	0-46	7	
Duration pl5	0-52	0-121	31	
Boundary pl5-pl3	4504-4450	4531-4410	4474	4460
Span pl3	0-5	0-5	3	
Duration pl3	0-89	0-258	52	
Boundary end pit	4482-4372	4510-4210	4417	**4450**

Table 42. Grebenyukiv Yar. Results of Bayesian ^{14}C modelling (first model).

flotation. Two samples date from the Tripolye time (fig. 52) and one – Poz-98166 – yielded a dating of 2278-2136 cal BCE (1-sigma), which according to the chronology refers to the Bronze Age Transitional period (Kushtan 2013, 84). No material belonging to the Bronze Age was found in the trench. The two samples, which were dated to the Tripolye time, came from the same level of the pit – the sixth one. So it is not possible to build a model that would be based on stratigraphic data. That is why both dates were placed in one model, which dates the highest probability of the filling of the pit (at least its sixth level) within a period from 4050 to 3990 cal BCE (tab. 41).

Grebenyukiv Yar. In 2014, a test trench was made which allowed the exploration of a pit of the Tripolye time. As a result, six samples were obtained for dating (five animal bones and one grain). As the dating shows, one date (Poz-87468) is much younger than the rest and relates to Middle rather than Early Tripolye (as this site is dated according to the relative chronology data). Moreover, the sample was identified by the laboratory as poor. For these reasons, it is considered an outlier for our purposes. Another date (Poz-87465) falls within the *Late Modern Period*. The remaining four dates derived from three levels of the pit, which made it possible to construct the first model on the assumption that there is a chronological difference between the different backfilling levels of the pit (tab. 42).

The first model shows the interval between 4530 and 4450 cal BCE as the highest probability of the dating of the samples (fig. 53). The second model assumes, like for the previous sites, the absence of a chronological difference between the layers of the pit (tab. 43). However, in this case, the samples are dated to 4540/4530-4450 cal BCE (the highest probability).

Maidanetske. Eighty-three ^{14}C data are currently available from the giant settlement Maidanetske. Apart from one item dated earlier by the Berlin laboratory, the data were dated in the context of ongoing Ukrainian-German cooperation (Müller *et al.* 2016a; Ohlrau 2020; Müller *et al.* in prep.). The sampling included the systematic

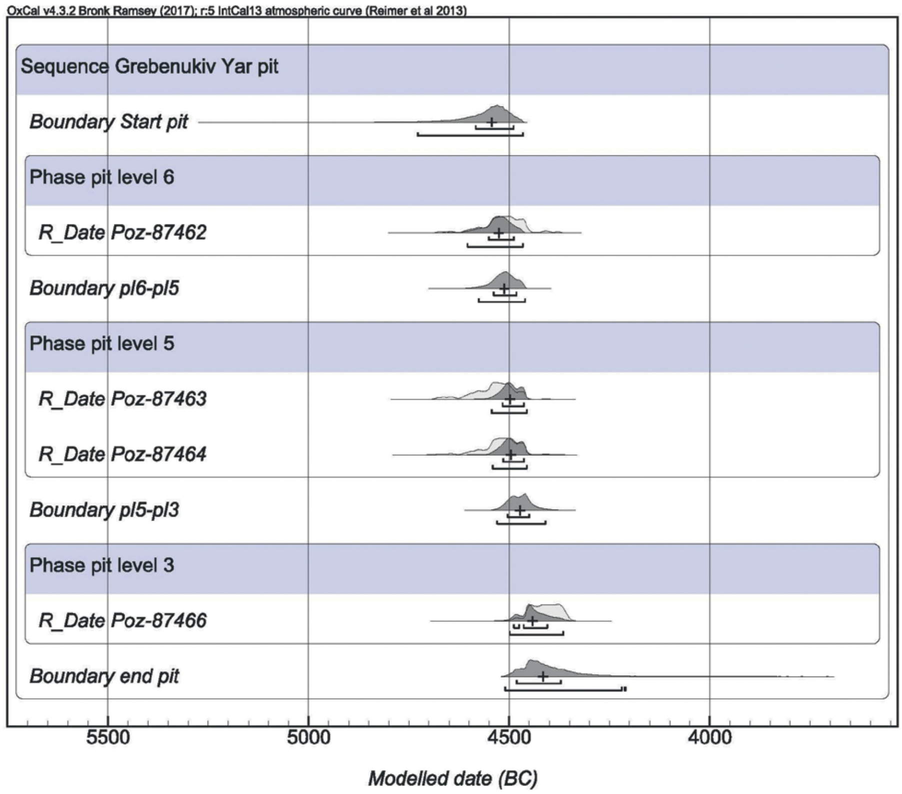


Figure 53. Grebenyukiv Yar, Bayesian modelling of ^{14}C dates (model 1).

Model 2 Grebenukov Yar Pit			A model	94.2%
			A overall	96.7%
	68.2%	95.4%	Median	Highest
Start	4590-4483	4750-4459	4547	**4540 or 4530**
Span	0-100	0-181	69	
Interval	0-189	0-479	126	
End	4492-4377	4531-4225	4429	**4450**

Table 43. Grebenyukiv Yar. Results of Bayesian ^{14}C modelling (second model).

evaluation of features in different concentric house rings and parts of the settlement, the excavation of test trenches in different parts of the site, and the systematic and exemplary excavation of different feature categories which we determined on the plan from the magnetic survey. As part of the doctoral thesis of René Ohlrau, Bayesian statistics were used to calculate chronological models for the different excavation areas, which take into account the available stratigraphic information (Ohlrau 2020).

The ^{14}C dates and Bayesian models mentioned suggest an occupation of the settlement from 3990 to 3640 cal BCE and dwelling activity ranging from 3935 to 3640 cal BCE. To estimate the number of potentially contemporaneous dwellings out of this total, Ohlrau (2020) used calibrated and modelled *termini a quo* radiocarbon dates of 19 house contexts. Accordingly, a peak in construction activity is observed between 3765 and 3710 cal BCE.

Nebelivka. The mega-site has been systematically dated in the course of the comprehensive work conducted in recent years (Chapman *et al.* 2018). In particular, ninety-five radiocarbon dates have been obtained. The sampling strategy was based on the existing settlement plan and included dating of various sectors of the site, including the outer and inner rings of buildings and radial 'streets' as well as groups of houses. To obtain the samples, 130 cores in 91 *ploshchadkas* were made.

Since the strategy turned out to be unsuccessful, test pits were excavated later on to obtain bone samples from different houses. Further modelling of the dates obtained showed that the beginning of the site occupation can be dated to the period 3985-3880 (95.4%) and the end to 3855-3750 (95.4%). Thus, based on the interpretation proposed by the site's researchers, the duration of its existence could have been from 45 to 225 years (95.4%) (Chapman *et al.* 2018).

4.2.3 Remarks on the methodology

Thus the proposed modelled dates will be used as our *information source basis* for further work, both for the verification of analyses of ceramics and for further modelling of absolute dates. The latter is necessary since the 'narrowing of the dating range' even to such a high degree (based on the highest probability) is still very long, and in the best case it shows 50 year intervals (for example for the dating of one sample). In many cases, the interval is much longer. It should be noted that such large intervals for some settlements can be explained by plateaux or large wiggles on the calibration curve (as, for example, for periods B1-B2 and C2). In addition, as even a quick glance at the list of samples for dating shows, it is no more than two to six dates for many sites. The quality of the models of absolute dates is directly connected with their number, that is, for example, if there are more than a few dates for the dating of a settlement, its time frames may be somewhat narrower. Another problem with our dates is the use of samples from old excavations for which the stratigraphic data were practically not recorded, which makes further modelling difficult.

In the case of some settlements (for example Chizhivka, Vladimirovka, Vesely Kut, for which there are only a few dates), they fall on a plateau – like part of the calibration curve – and the dating of objects is possible both in the first half of the time interval of 1-sigma and the second one. In such cases, the typological models based on, for example, ceramics can help to determine the interval more accurately.

When we turn to the period between 3800 and 3630 cal BCE (Talianki-Kosenovka), the situation there is radically different. The length of the calibration curve here, on the contrary, is quite favourable (tending to vertical), which makes it possible to carry out a rather 'narrow' dating of the samples.

Further steps in the modelling of absolute dates will be aimed at *grouping the dates* from different settlements, simulations for the testing of both the existing and the proposed chronological models based on typological observations.

4.2.4 The sequence of key sites

In view of the foregoing, there is a fairly representative group of new absolute dates at our disposal, which makes it possible to build some models of chronological development. The charts with the totals of dates that summarise the modelling performed (fig. 54) show that most of them are in the time interval between 3950 and 3630 BCE. In addition, a chart has been drawn up for a better visualisation of the analysed data (fig. 55). To compile it, the dates analysed in Section 4.2.2 were used, excluding the outliers.

For Maidanetske, the phases proposed by René Ohlrau (2020) were plotted, and for Talianki conventional phases based on the modelling of dates in Part 3 (see fig. 24). For Nebelivka, the boundaries of the beginning and end of the site's functioning have been calculated, including the highest probability and excluding six dates as obvious outliers (dates OxA-31731, Poz-32550, Poz-32551, Poz-72464, Poz-72466, Poz-727159). The result almost coincides with John Chapman's team's results (after Andrew Millard, radiocarbon dating, in: Chapman *et al.* 2018). The ^{14}C chronology of Tripolye according to Harper was placed at the bottom of the graph, to compare how our region fits in it (Harper 2013).

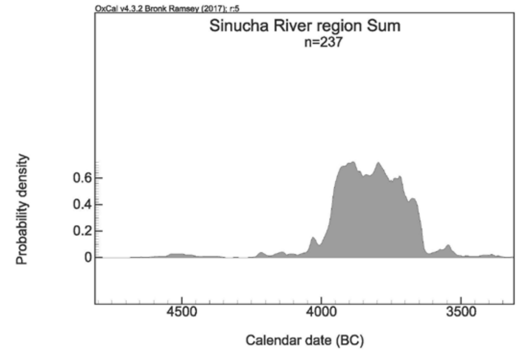


Figure 54. Summed dating probability of [14]C-data from Tripolye settlements of the Sinyukha River catchment.

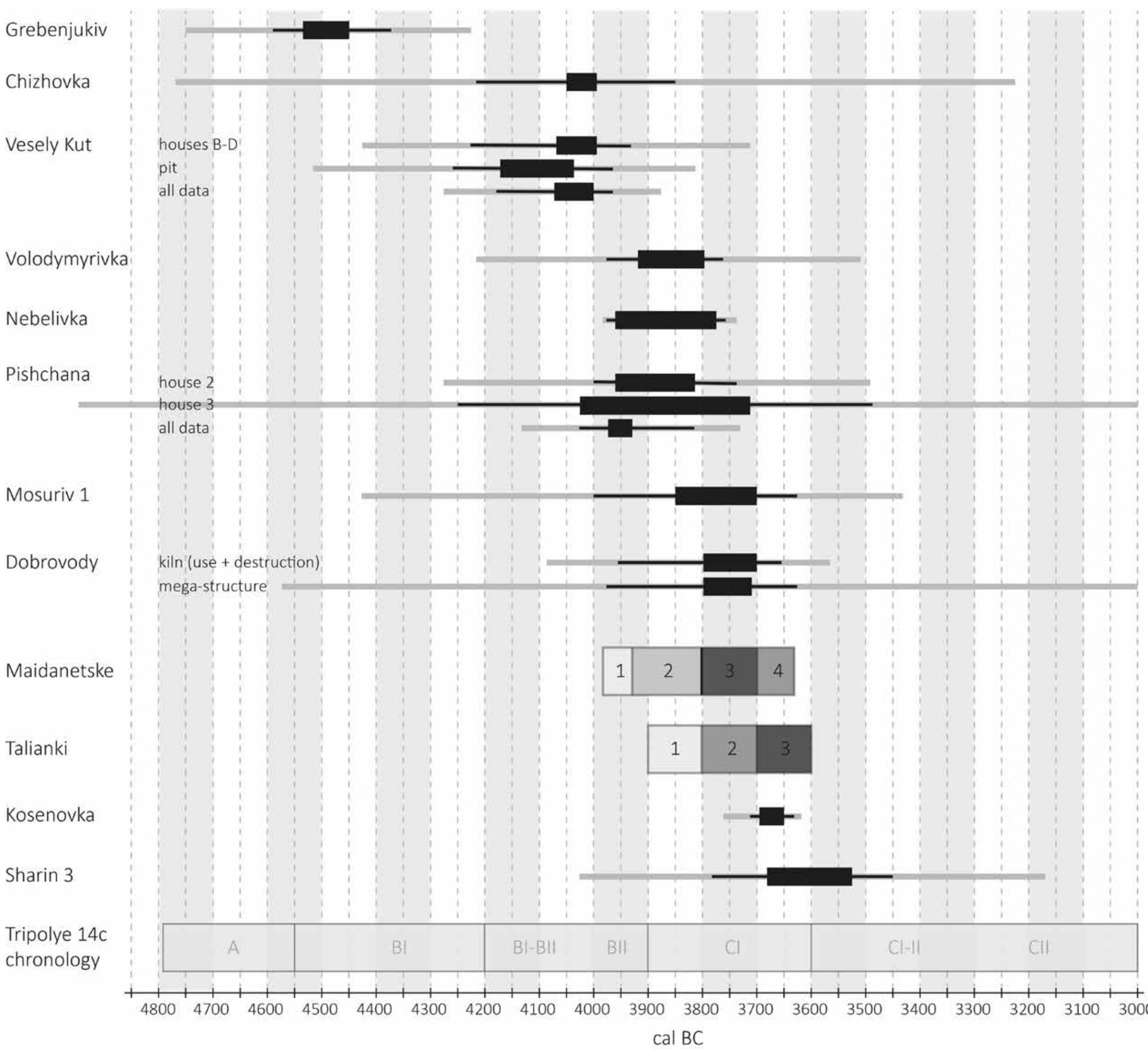


Figure 55. Résumé of the [14]C modelling results from the Sinyukha River basin (grey lines: 95.4% dating probability. Black lines: 64.8% probability and black box – highest dating probability).

The question still remains of how much the available data support the existing relative chronology. At first glance, the dates received are in good agreement with the established periodisation of the Tripolye sites. Thus the sites of Eastern Tripolye date back to an earlier time interval, followed by the settlements of the Vladimirovka and Nebelivka groups, after which the sites of the Tomashovka group take its place on the chronological scale. Let's consider the details, especially the sequence of the sites' lifetime.

BCE	Local group	Phase	Site	Duration	Simulated dates
		K2-K3	Vilhovets		
3350 – 3600	Kosenivska (K)	K1	Kosenovka	3475-3600	Kos 1 – 3590 Kos 2 – 3535 Kos 3 – 3485
		T4	Tomashovka		
		T3, st 2	Maidanetske	3600-3700	Maid 1 – 3660 Maid 2 – 3675 Maid 3 – 3690
3600 – 3850	Tomashivska (T)	T3, st 1	Talianki	3700-3750	Tal 1 – 3710 Tal 2 – 3725 Tal 3 – 3740
		T2	Dobrovody	3750-3800	Dobrov 1 – 3760 Dobrov 2 – 3775 Dobrov 3 – 3790
		T1	Sushkovka		

Table 44. Simulated dates of selected mega-sites.

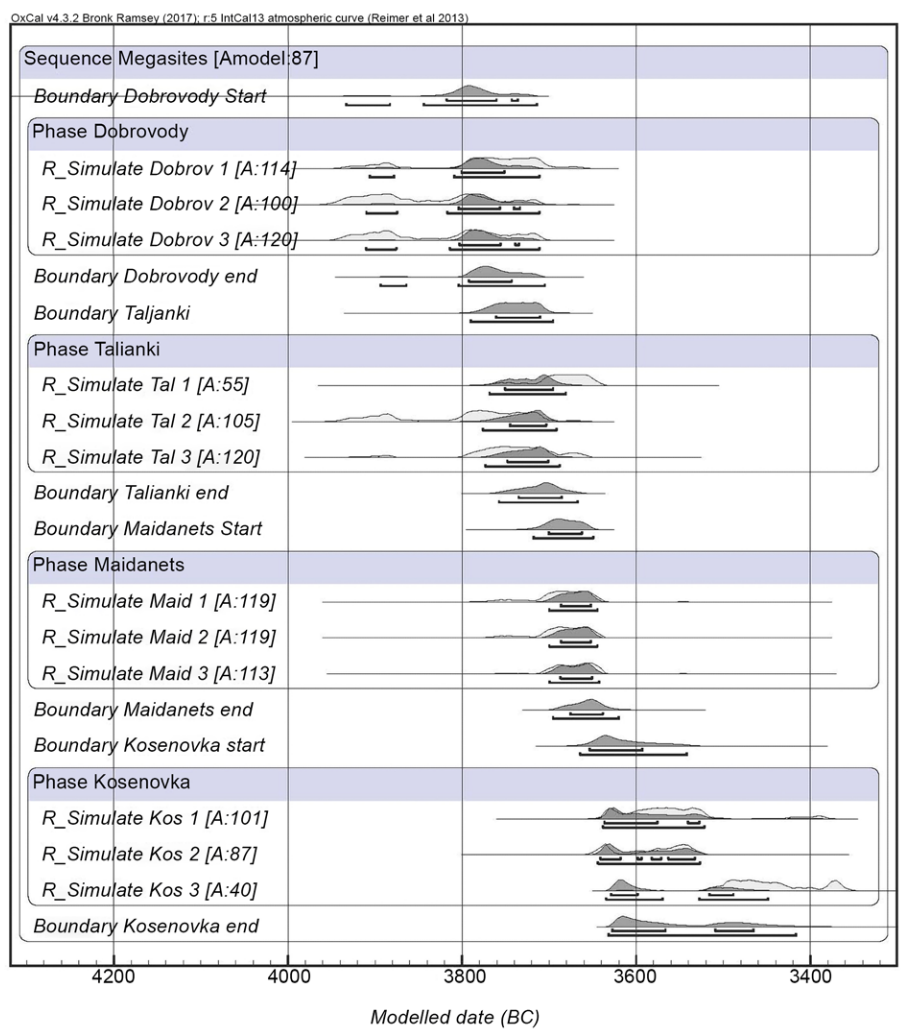


Figure 56. Simulation of the mega-sites sequence assuming a continuous development.

A fairly common model that relates to the most famous mega-sites is a theory that assumes the following sequence of their occupation: Dobrovody (T2) – Talianki (T3, stage 1) – Maidanetske (T3, stage 2) (*e.g.* Diachenko 2012, 125; Müller 2016, 10). This sequence was built on the basis of Ryzhov's periodisation and with the use of the mathematical modelling by Diachenko. It suggests two variants: when the sites are contiguous

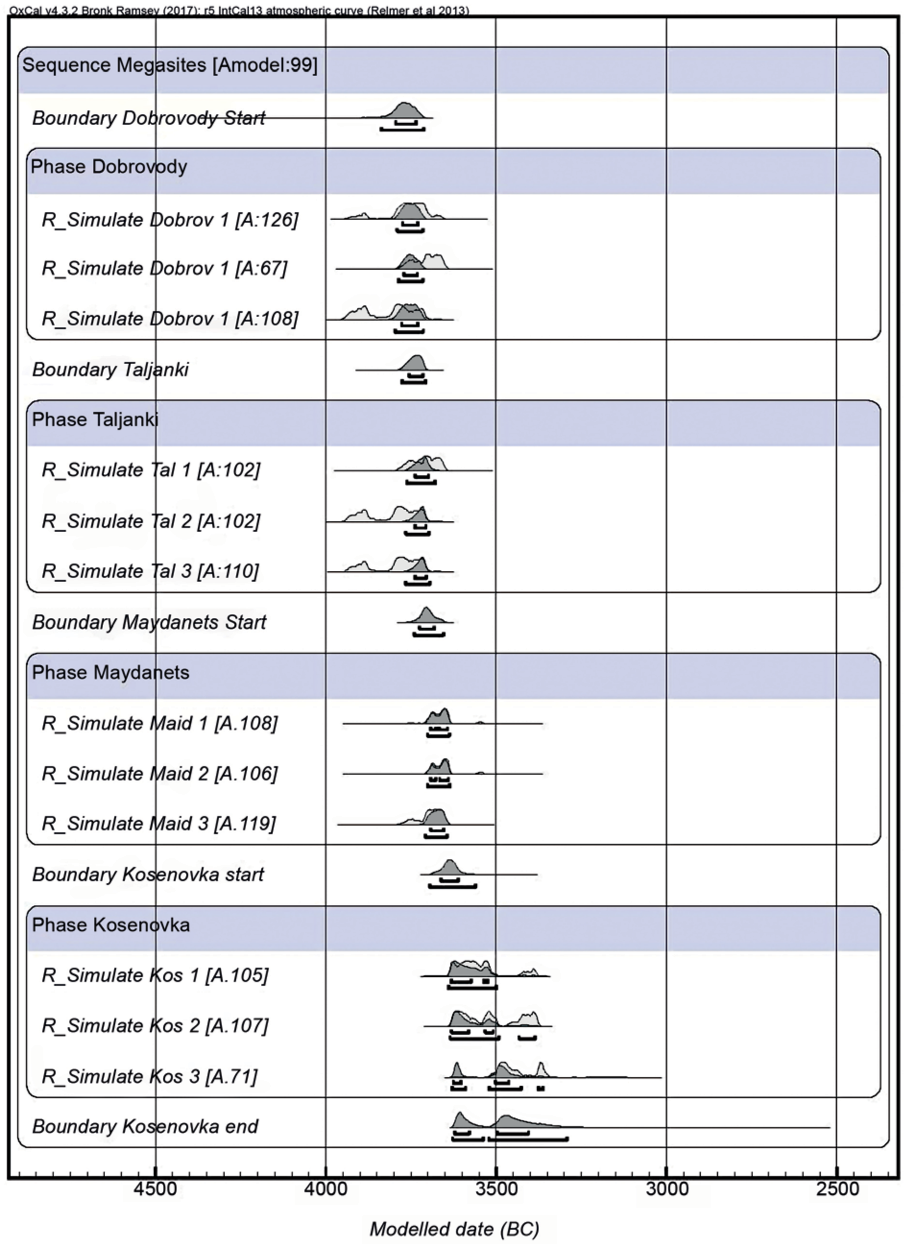


Figure 57. Simulation of the mega-sites sequence assuming an overlapping development.

and when overlapping. In recent years, more and more researchers have tended to the second alternative. As well as referring to these three sites, the same works have suggested that Kosenovka is a later settlement, which was founded some time after the largest Tomashovka giant settlements had been abandoned (*e.g.* Diachenko 2009). Since we have a few absolute dates for these four sites, it is not difficult to test this model with them.

Let's start by analysing the assumption that such checking is potentially possible (since it is traditionally believed that the duration of a separate Tripolye site was no longer than 50 years, and a sufficiently favourable section of the calibration curve is available for a modelling of ^{14}C dates). To begin with, let's take as a basis the chronological table compiled by Johannes Müller (2016, 10). By selection of the necessary sites from the table 44 and a comparison of their existence with a certain period, three calendar dates have been simulated for each site (approximately the beginning, middle and end of the site's functioning).

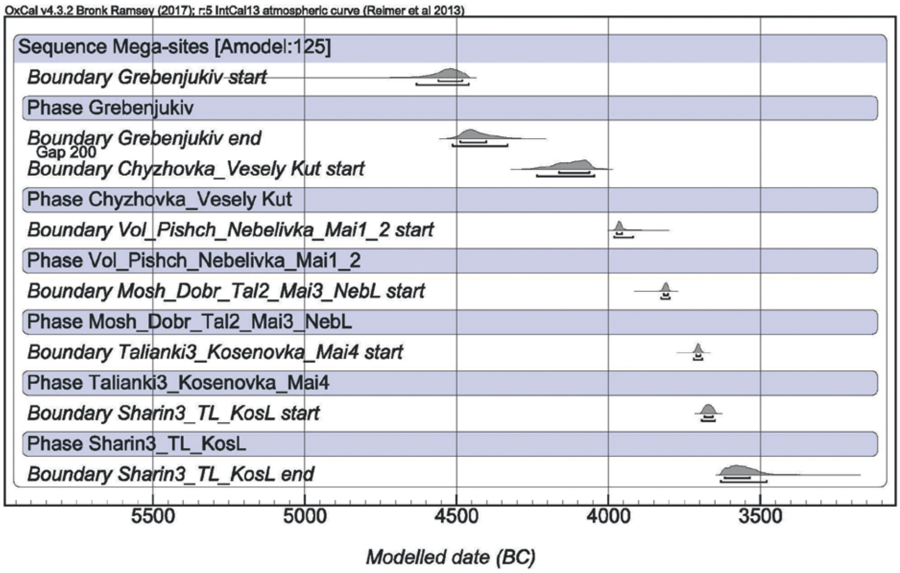


Figure 58. Modelled Sequence of sites of the Sinyukha River basin.

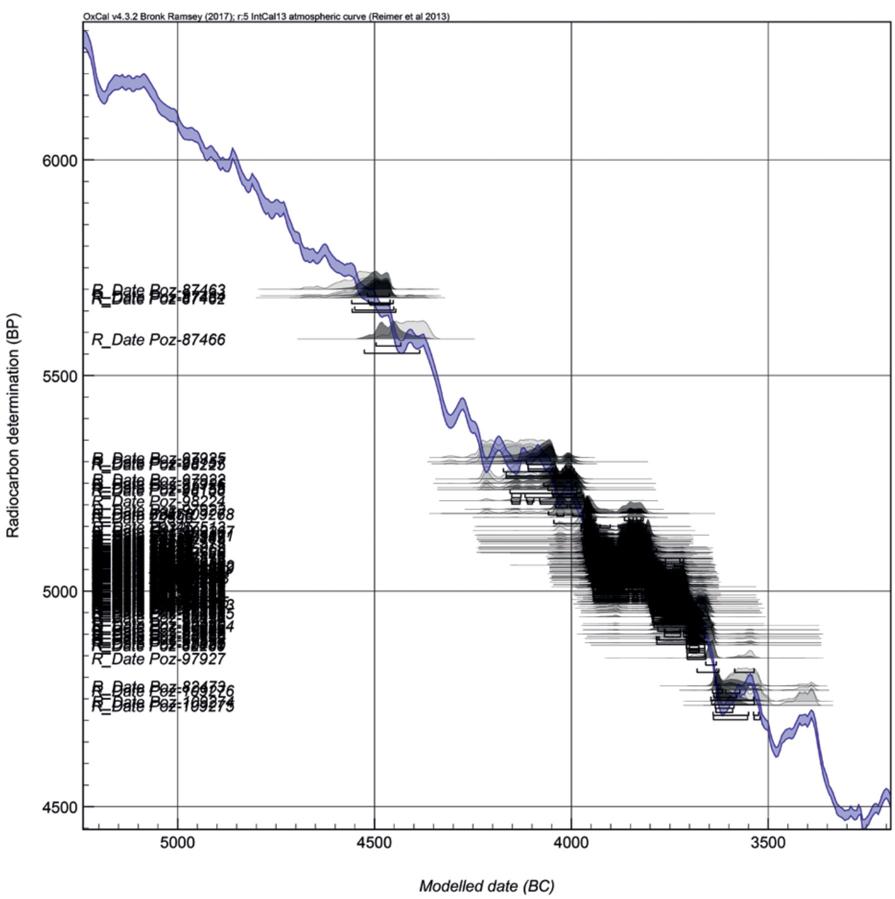
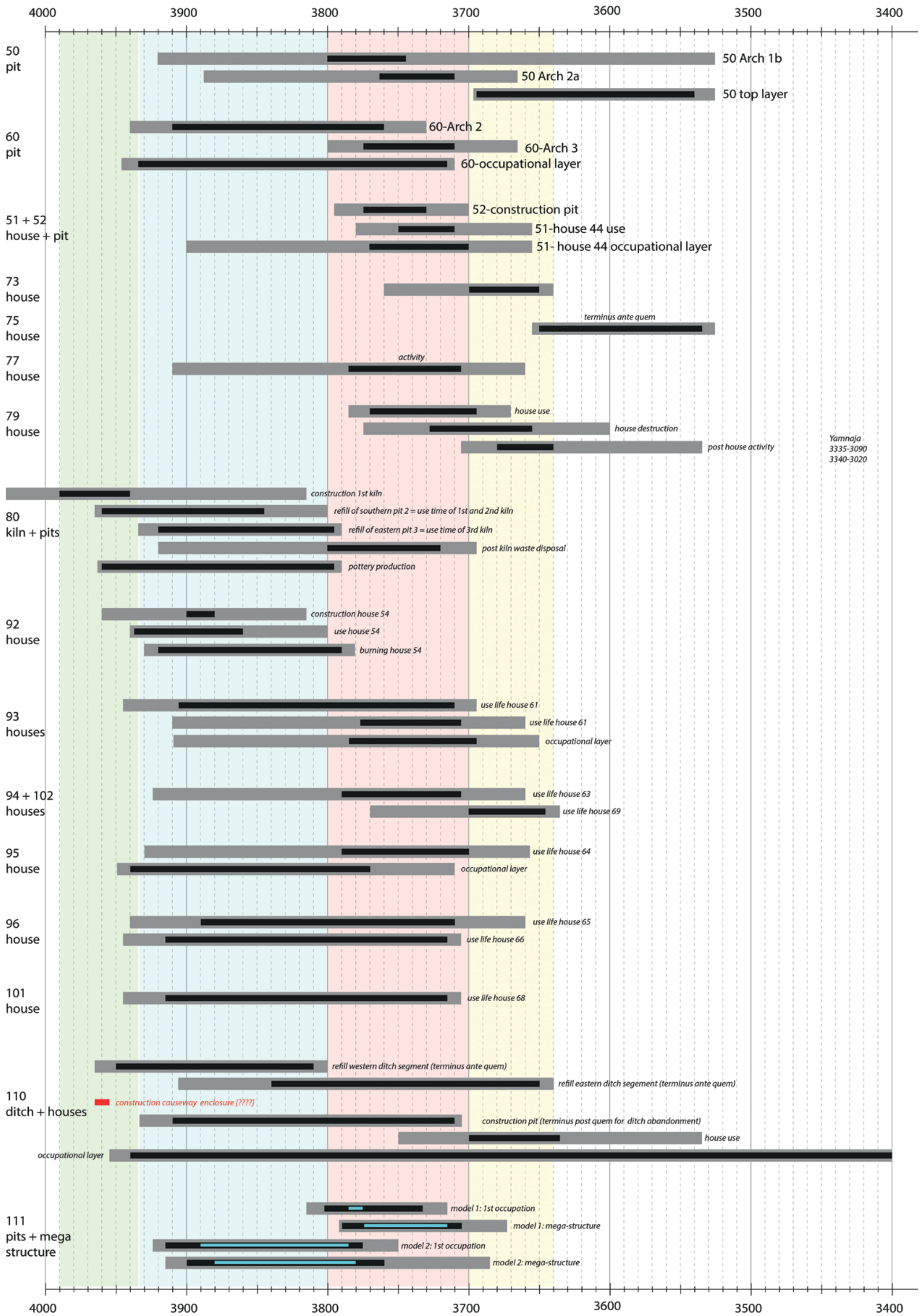


Figure 59. Modelled Sequence of sites of the Sinyukha River basin (plot on curve).

These dates serve as the basis of two models, which assume contiguous (fig. 56) and overlapping (fig. 57) development phases of these sites. The model showed a rather high possibility of such a development of events (99), so the next step was to replace the simulated dates in the model with the real ones. the resulting graph showed that this model is not possible, being based on the available data (0 probability).


4000
3900
3800
3700
3600
3500
3400
50
pit
50 Arch 1b
50 Arch 2a
50 top layer
60
pit
60-Arch 2
60-Arch 3
60-occupational layer
51 + 52
house + pit
52-construction pit
51-house 44 use
51- house 44 occupational layer
73
house
75
house
terminus ante quem
77
house
activity
79
house
house use
house destruction
post house activity
Yamnaja
3335-3090
3340-3020
80
kiln + pits
construction 1st kiln
refill of southern pit 2 = use time of 1st and 2nd kiln
refill of eastern pit 3 = use time of 3rd kiln
post kiln waste disposal
pottery production
92
house
construction house 54
use house 54
burning house 54
93
houses
use life house 61
use life house 61
occupational layer
94 + 102
houses
use life house 63
use life house 69
95
house
use life house 64
occupational layer
96
house
use life house 65
use life house 66
101
house
use life house 68
110
ditch + houses
refill western ditch segment (terminus ante quem)
refill eastern ditch segement (terminus ante quem)
construction causeway enclosure [????]
construction pit (terminus post quem for ditch abandonment)
house use
occupational layer
111
pits + mega
structure
model 1: 1st occupation
model 1: mega-structure
model 2: 1st occupation
model 2: mega-structure

Therefore, this test showed that the proposed scenario is too simplified and such a sequence of sites does not correspond to the absolute data obtained. Of course, this does not categorically indicate that this part of the relative chronology is wrong; it only indicates the need for further work on the problem.

A model was built (fig. 58, fig. 59) in search of such a sequence of sites that fits with the absolute dates obtained. Before the building of this model, various options (scenarios) of the sequence and/or synchronisation of sites for which there are ^{14}C dates had been modelled. In this last attempt, it was investigated how the dates best fit together.

For this analysis, the dates analysed in Section 4.2.2 excluding the outliers have been used. First, the dates for the periods (B1-B2, B2, C1, etc.) were modelled separately and it was checked how different dates matched together.

During the compilation of the model, the *phasing* function in the OxCal software was used (both overlapping and contiguous). Since the dates for Grebenyukiv Yar are the earliest and there is a sufficiently large period of time between the dates for this site and all the others, this phase was 'completed' (a contiguous function was used). The same was done with the dates from the villages of Chizhivka and Vesely Kut, since these dates also constitute a separate block on the timeline. Since different modelling options did not give any result (because of the large plateau on the calibration curve), both settlements were included in the same phase. To determine their sequence or synchronism, some additional analyses are needed (for example on ceramics) and/or further investigation of these sites.

Since the graph showed an obvious chronological gap between Grebenyukiv Yar and the sites of Eastern Tripolye, a *gap* of 200 years was set between them in the model. This value was determined by tests with different durations.

As for the dates from the sites of Vladimirovka, Nebelivka, Pishchana, Moshuriv, Dobrovody, Talianki, Maidanetske, Kosenovka and Sharin 3, they were best combined when phasing them with the use of the overlapping function.

Due to the long plateau of the calibration curve between 3950 and 3780 BCE, it was not possible to distinguish the dates of Vladimirovka, most dates from Nebelivka and those from Pishchana. Therefore, they were included in one phase. An exception is some (eight) dates from Nebelivka, which are younger than the other ones. These data were assigned to the following phase (dates: OxA-29576; OxA-29597; OxA-31641; OxA-31642; OxA-31663; Poz-72473; OxA-31744; Poz-72467). In addition, the two Nebelivka dates OxA-29349 and Poz-72468 were classified as outliers and excluded from the analysis. In the case of the sample OxA-29349, this might be due to the old wood effect.

During the work with the data from Maidanetske, René Ohlrau's modelling and his proposed division into 'phases' of this site were used (Ohlrau 2020). For convenience, a graph with these data (see fig. 60) has been drawn up. In the creation of my model (fig. 58), the Maidanetske dates have been divided into three groups according to the objects and phases. The first group of dates (which includes the first and second Maidanetske phases according to Ohlrau and comprises 17 dates) has been included in one phase with the settlements of Pishchana, Vladimirovka and Nebelivka (main part of the data). This phase included several of the oldest dates from Talianki (the objects are kiln 'F' and the settlement layer under *ploshchadka* 50).

The next group (phase) included the sites of Moshuriv 1, Dobrovody, some of the dates from Talianki, the main (third) phase of Maidanetske, and the remaining Nebelivka dates.

The subsequent phase consisted of most of the dates from Talianki, the remaining dates from Maidanetske (phase 4) and those from house 6 in Kosenovka. Yet the human bones that were discovered during excavations in Kosenovka have not been included in the model.

The final phase included mainly the dates from the settlement of Sharin 3, as well as one date from Talianki and Kosenovka, which fell in this time interval.

In such a way the model has been compiled whereby Tripolye development in the region has been divided into seven chronological phases. In this way, the order

Figure 60 (left). Maidanetske. Results of Bayesian modelling after Ohlrau 2020.

of the sites is different from that in the traditional models. It should be noted that this model gives a rather high probability (125). The model shows first of all the data structure and the order of sites according to the radiometric dating. To what extent it can reflect realities and whether it works in principle is another question that will be raised at the end of the part in the general discussion. At this stage, it is important to look at the data on the ceramics and understand how these data can help in building the chronology.

4.3 Regional analyses of pottery

4.3.1 The data base

Turning to some analyses on ceramics, it should be noted that the data for conducting various kinds of analysis are presented unevenly. The data collected largely reflect the situation with the results of previous research and especially publications.

The data for Eastern Tripolye settlements come mainly from the project's test trenches (two key sites). The research into these early mega-sites is still in its initial stages.

The best data that we have at our disposal come from the sites of the 'Western Tripolye Culture, especially from the sites of the Tomashovka group and, to be even more specific, from Talianki and Maidanetske.[43] In particular, the 'Western Tripolye' development line is represented by ten key sites. Undoubtedly, the fact that there are data on the ceramics of these sites (published and from field reports) is, in the first place, a tribute to Sergei Ryzhov, who for the last 40 years has been processing and describing ceramics with painted decoration from the Tripolye sites in the Sinyukha catchment area. The data obtained from the works of Elena Tsvek, Mykolay Shmagliy and Mihailo Videiko, Dmitry Chernovol, Dmitry Kushtan as well as Ryzhov's studies have been used in this work.

As already mentioned in the introduction, it is proposed to carry out some analyses on four basic characteristics: technology, morphology, capacity, and decoration. The analyses are aimed not only at typochronological research, but also at solving some other problems that arise from the artefacts proper. However, in the conclusions in this part we will focus on chronological moments. The other outcomes will be included in the next part of the work.

4.3.2 Technology: Kitchenware versus other ware

Let's turn to the consideration of fabrics. As to the technological aspect, the division of Tripolye ceramics, including those from the sites of the Sinyukha catchment area, into 'kitchenware' and 'tableware' is the most accepted. The ratio of these two types of ceramics is a traditional argument in chronological constructions (Kolesnikov 1982, 216-224). Let's examine this subject once again taking into consideration the available data, focusing attention on kitchenware (its quantity and other characteristics).[44]

For the eleven key sites, there are some sources on this topic. For the settlements of Chizhivka, Vesely Kut, Vladimirovka, Moshuriv 1 and Maidanetske, they are the data obtained from the project excavations, for the Grebenyukiv Yar, Pishchana,

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43 Not much attention has been given to the site of Maidanetske in this study since just recently this settlement was the subject of several special and detailed studies (Müller *et al.* 2017; Brandstädter 2017; Ohlrau 2020).

44 In this part, the 'container' ceramics are not analysed.

Moshuriv 3 and Talianki sites (partially) the data from field reports; another part of the data for Talianki, Kosenovka and Dobrovody is published material.

Basically, in quantitative terms, for each site, there is some information on about one house (for Pishchana from two houses), and only for Talianki and Maidanetske are there many more data. For Talianki, Ryzhov calculated the ratios of 'kitchen-' to 'tableware' for 32 different *ploshchadkas*. Unfortunately, the information on some households (that includes few houses) has been given in total (average percentage), which complicates further analyses (see Appendix 3). It was also Ryzhov who had calculated the ratio for the settlements of Pishchana, Dobrovody, Moshuriv 1, Moshuriv 3, Kosenovka and Talianki, which means that the data can be comparable. The method of calculation: '*to determine the ratio of table and kitchen ware, all ceramics are calculated*' (Ryzhov 1999, 29). For Maidanetske, there is information from twelve different objects; the ratio was calculated according to the total number of fragments (that is, for 'whole forms' which are made up of a number of fragments; the number of fragments was also taken into account). So, potentially, the data from the project excavations and Ryzhov's works are comparable.

Phase	Dating BCE
1	4530-4450
2	*c.*4200-4000
3	*c.*4000-3800
4	*c.*3800-3700
5	*c.*3700-3500

Table 45. Regional phases for the Sinyukha river basin used to evaluate the percentage of kitchenware.

Since there are some radiocarbon dates for all the settlements (except Moshuriv 3), each object was attributed to a certain phase, according to the chronological sequence. It was done by using the modelled ^{14}C dates (highest probability) for each site (and/or object from a site); the site (or its object) was assigned one of the conventionally distinguished phases (see tab. 45). These phases have been distinguished by cutting the time intervals that would be consistent with the absolute dates in the best way possible. This has been done solely for the convenience of checking ceramic data, **without using any of these phases or dates in the future**. As to Moshuriv 3, it was given the same date as Sharin 3 since, taking into consideration their ceramic complexes, they may be synchronous (Ryzhov 2001-2002, 188).

In this work, in the section on the topic of manufacturing technologies of ceramics, in particular regarding 'kitchen-' and 'tableware', the following questions are of interest:

1. Are the *percentage ratios* a chronological indicator and, if so, to what extent is it possible to determine, with the use of this method, the chronological difference between 'long' periods (for example B1-B2, B2, C1), shorter 'phases' and even a temporary difference within one settlement?
2. Is there a difference in the ratio of different types of ceramics in different households at the level of one site (using as an example Talianki and Maidanetske) and can it, for example, reflect intra-site chronology?
3. How do the percentage calculation methods influence the final result of calculations?
4. To what extent are these terms 'homogeneous', that is, in speaking about 'kitchen' or 'table' ceramics of different periods, local groups and settlements? Do we bear in mind similar artefacts or rather different ones?
5. How were different 'technological' groups of Tripolye ceramics developing in our working area?
6. How can an understanding of this topic help in the comprehension of the functional purpose of different categories of ceramics?
7. To what extent does 'kitchenware' correspond to its label and can be an 'alien' element in the Tripolye pottery assemblages?

Let's have a look at what answers to the above questions we can get from the available data.

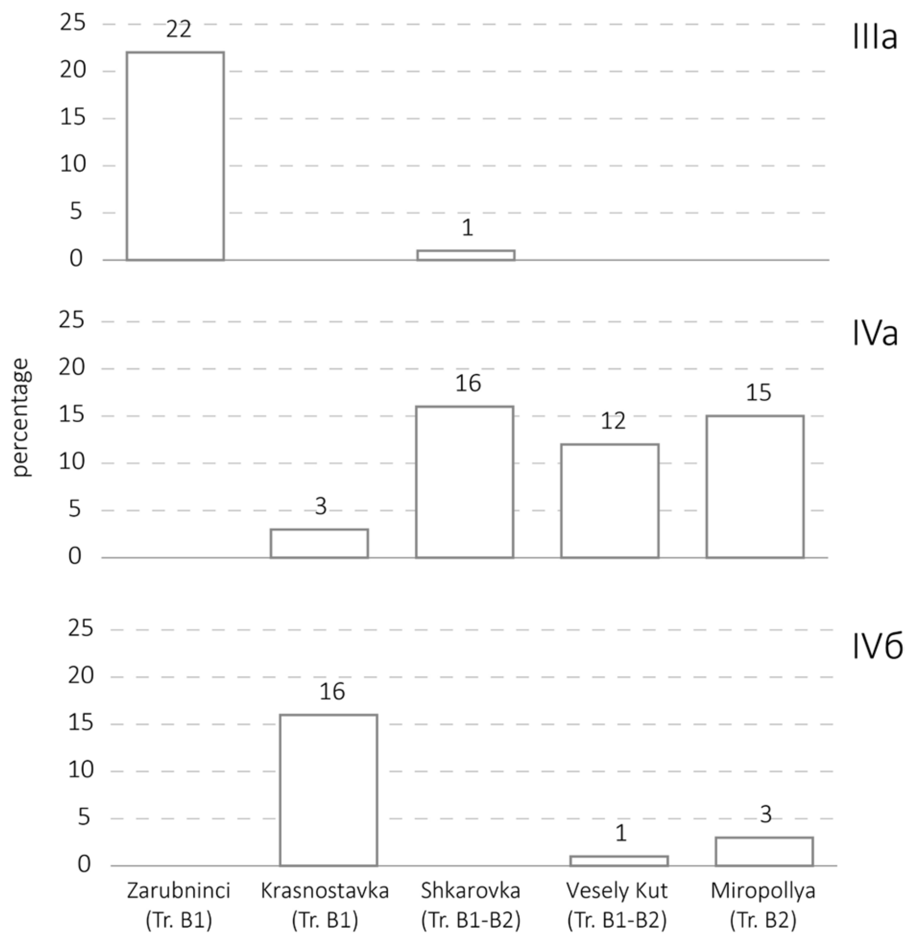


Figure 61. Three groups of kitchenware decoration techniques after Tsvek 2012, 241 Fig. 5.

4.3.2.1 Tripolye kitchenware from Sinyukha. 'Western Tripolye' pots

Let us take the generally accepted chronological schemes for the sites of the Sinyukha catchment area. Tsvek, in her model for the 'Eastern Tripolye' settlements, calculated the percentage ratio of different ceramic groups that had been singled out on the basis of *different decoration techniques* (Tsvek 2012, 241). Altogether, there are eleven such groups. Based on this division and using other reasoning, Tsvek singled out *seven* subsequent types of sites of the Bug-Dnieper local variant of the 'Eastern Tripolye Culture' (see part 1 and part 2). Three of the groups are the types of 'kitchenware' surface treatment (see fig. 61).

For a chronologically later period (the development line 'Vladimirovka-Tomashovka'), Ryzhov used a decreasing percentage of kitchenware as one of the arguments for building relative chronology. In particular, the author points out that on the sites of the Vladimirovka group, the number of these ceramics is the highest, on **average** 10-15% (Ryzhov 2015, 155). As to the sites of the Nebelivka group, the kitchenware **averages** 6-7% of the entire ceramic complex, although at some sites it reaches 20% (Ryzhov 1999, 44; Ryzhov 2012a, 94). At Tomashovka sites, the ceramics of this type **average** 5% of the whole complex of pottery (Ryzhov 2012a, 101), see Figure 62.

For the 'kitchenware' of the Vladimirovka group, crushed shells, sand, fine grus sand, and sometimes grog (chamotte) were used as temper. The shapes constituted a small number of bowls and numerous pots, sometimes with legs. The surface of the pots is scratched and is decorated with notches (incisions), 'pearls', deep vertical or inclined scratching (on the rim), imprints (impressions) of a scallop stamp, various

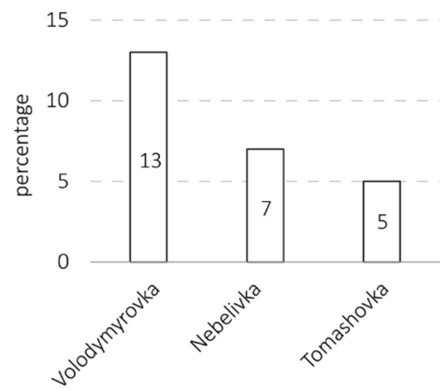


Figure 62. The percentages of kitchenware for three local groups, after Ryzhov 1999, Figure 107.

impressions, cord impressions, and finger impressions. In addition, a number of vessels have moulded (relief) decoration: ear-like handles, pinches, mouldings, and coniform protrusions. Pottery of the 'kitchenware' type on the sites attributed to the Nebelivka group has almost the same characteristics as the ceramics of 'Vladimirovka' settlements. Rarely are some pots covered with a thin layer of clay or painted with ochre (Ryzhov 1993a, 103).

Tomashovka's 'kitchenware' paste also has temper derived from such materials as grus sand, sand, quartz, mica, shells, limestone, and grog. However, the percentage of the ceramics with shells is significantly lower than in the previous groups (about 10% of all kitchenware in Maidanetske, according to Shmagliy and Videiko 2001-2002, 91; 13% in Talianki according to Ryzhov 2008; 135). Shapes included pots (sometimes with legs) and a few bowls. An interesting and new shape is the so-called *gutus* (which is a kind of pot). The name, borrowed from antiquity, quite clearly conveys a feature of this kind of vessel, often small in size, on the belly of which there is a spout with a hole through it. These artefacts are extraordinary and quite interesting in terms of their use.

As for the decoration of the 'kitchenware', its techniques are the same as for the previous groups. The pots are often decorated with relief decorative mouldings on the belly or rim (in the form of a crescent, a circle, a cone, in pairs or single); zoomorphic mouldings are widespread. Also, pots often have handles of various shapes (Kruts *et al.* 2013, 53). Some of the kitchenware (about half in Talianki, according to Ryzhov 2008, 138) and all the bowls are without decoration.

Let us have a look closer to the data from Vladimirovka, Nebelivka, Tomashovka groups (see Appendix 3). Examining the table (Appendix 3), one can see the striking differences in the percentage ratio of kitchen- to tableware, especially for the sites with a large number of data – Talianki and Maidanetske. On the other hand, if you take, for example, the averaged data (that is, calculating the average percentage) for the three local groups – Vladimirovka, Nebelivka, Tomashovka – then on the sites of these groups, kitchenware make up respectively:

- 10.5% (data – 1 site – Vladimirovka – one test trench)
- 6.2% (data – 1 site – Pishchana – two houses)
- and 5.1% (data – 1 site – an average of 30 houses from Talianki).

Tomashovka's data remain almost unchanged if we add the Moshuriv 1 and Dobrovody sites to Talianki. The average amount of kitchenware will be 5.4%. This basically corresponds to Ryzhov's data. If we add the data on Maidanetske, the picture somewhat changes – 6.4%. At the settlement itself, the average percentage of kitchenware is 8.3%. It would seem that this can be explained by the fact that not only houses but also other objects – pits, a pottery kiln, and a mega-structure – were excavated on this site. However, the average percentage from two houses from the list is 8.8%, while the average percentage of kitchenware from the pits is 10%, and

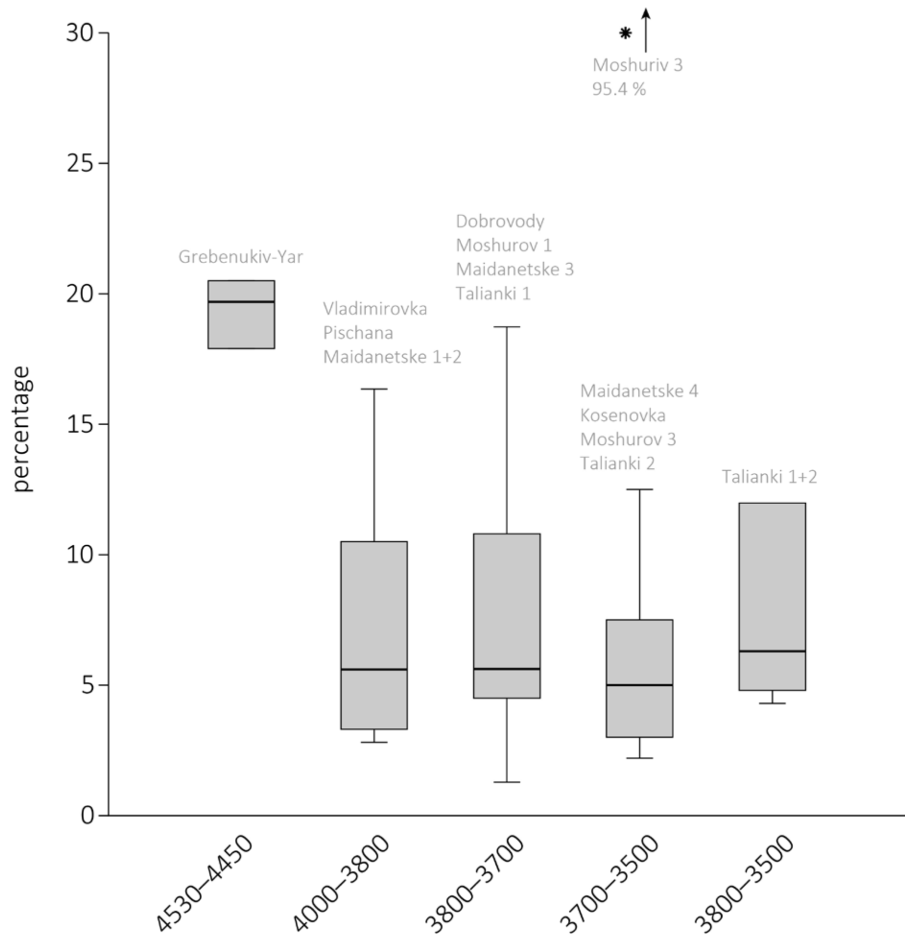


Figure 63. Box plot diagram which displays the percentage of kitchenware. Dates on the x-axis are BCE.

in the pits under the mega-structure 18.7%. A low percentage is seen only for the pottery kiln and the pit associated with it – 2.5%.

No patterns in the distribution of kitchen- and tableware in different objects (pits, houses, etc.) can be observed in the analysis of the data on Maidanetske. There is an exceptionally large variability in every type of context.

Let us have a look at the data from Talianki, since it is possible to compare the data only for different houses from different parts of the settlement. The minimum number of 'kitchen' ceramics was found on *ploshchadka* 27 (0%), and the maximum was the average number for house 2 (17.3%). That is, the difference in number for the site *ploshchadkas* is more than 17%. The average percentage of this kind of pottery in the settlement is 5, 26%. Mapping the amount of kitchenware on the settlement plan showed that the difference in clusters of buildings ranges from 4.3 to 0.5%, that is, the amount of this type of ceramics in neighbouring houses varies, and no patterns can be traced. Similarly, no tendencies and consistent patterns in different amounts of kitchenware while comparing different parts of the settlement (southern and northern) and different parts of the settlement (outer and inner rings and unfinished rings) can be observed.

Let check how the quantities of kitchenware changed over time by putting the data (percentages) in the box plot chart below according to the conditional chronological phases marked in Figure 63 Some of the houses from Talianki have been assigned to phase 4-5 (3800-3500 BCE).

In general, the data on the settlements of the Vladimirovka, Nebelivka and Tomashovka groups and on the settlement of Kosenovka do not show differences in the quantities of kitchenware. The graph also shows separately the sites of Grebenyukiv Yar and Moshuriv 3, which chronologically also drop out of the sites represented.

House 48	Complete Shapes	Fr Walls	Fr Bottom	Fr Rim
Kitchen	4 (52 fr)	22	11	12
Table	30 (482 fr)	554	57	135

Table 46. Talianki. Frequency of kitchen- and tableware in house 48.

House 49	Complete Shapes	Fr Walls	Fr Bottom	Fr Rim
Kitchen	2 (19 fr)	32	7	6
Table	40 (772 fr)	661	47	154

Table 47. Talianki. Frequency of kitchen- and tableware in house 49.

Method No.	Kitchen	Table	Kitchen	Table
	House 48		**House 49**	
1	11.8%	88.2%	4.8%	95.2%
2	**7.3%**	**92.7%**	**3.8%**	**96.2%**
3	5.9%	94.1%	5%	95%
4	14.7%	85.3%	9.4%	90.6%
5	8.8%	91.2%	4%	96%

Table 48. Comparisons of different methods for the calculation of the percentage of fabrics.

Before analysing the question of kitchenware on the sites of earlier and later phases of the Tripolye period in the region, let's see to what extent different methods of calculating the percentage ratio of different types of ceramics influence the final result.

To compare the results of calculating with the use of different methods, let's take *ploshchadkas* no. 48 and no. 49 in Talianki, since in this case it is possible to try different calculations (as there are data). For these houses, the number of restored *whole* vessels and the number of fragments of which they consist have been counted; the remaining fragments that were found (rims, walls and bottoms) have been counted separately (tab. 46 and tab. 47).

Ceramics from each house have been sorted into table- and kitchenware. There are five ways to calculate their percentage ratio:

1. *The ratio of whole shapes (vessels).* As suggested, it was the whole forms that were such at the time of the abandonment of the house (see Part 3), and this can reflect the 'real' ratio of different groups of pottery. The bones found in the *ploshchadkas* can also show the final time of its functioning (Hofmann *et al.* 2019), so it is possible to determine chronology more accurately. Disadvantage: almost nobody writes the real numbers of whole vessels in publications.
2. *The ratio of all fragments.* In this case, the number of fragments that make up, for example, one pot is also calculated. This method is mainly presented in Appendix 3.
3. *The ratio of units (whole shapes + all remaining fragments).* Whole forms are not divided into fragments, but summed as one unit with fragments.
4. *The ratio of the minimum number of vessels 1.* There are several ways to count the minimum number of vessels from one object. In this case, it is presumed that each fragment of a bottom is a part of one pot (of course, the method of such calculations with information on the percentage of bottom preservation is more accurate, but there is no such possibility for this example). Consequently, the number of bottoms is added to the whole forms.
5. *The ratio of the minimum number of vessels 2.* Another way to calculate the potential number of vessels is to count rims. In this model, it is assumed that each rim fragment represents one pot. Here the number of corollas is added to the whole

shapes. As in the previous case, the calculations taking into account the percentage of the safety of the rims would be more accurate, but we have no data for this.

Let us have a look at the difference between the results obtained using the above methods on the basis of the same data (tab. 48):

As can be seen from the table, the difference in calculations with the use of different methods for house 48 is 8.8%, and for house 49 5.6%.

The data obtained is given also to demonstrate the urgent need for precise indications of counting methods and the necessity to give real numbers both in publications and in field reports.

4.3.2.2 Early and 'Eastern' Tripolye kitchenware

Let us turn to the data on the early stages of Tripolye. Unfortunately, they are much less. Two main points characterise the technological aspect of the ceramic complexes of Early and 'Eastern Tripolye' compared with the 'Western Tripolye' assemblages: firstly, there is much more variety in clay paste, methods of firing and surface treatment and, secondly, the difference between the 'table-' and 'kitchenware' on these sites is not as obvious as in a later period (B2-C1).

The authors of the excavation at the site of **Grebenyukiv Yar** point out that the ceramic paste of kitchenware (which consists of clay with admixtures of coarse and finely ground chamotte and/or sand) do not differ much from the 'tableware' paste (Shmagliy and Videiko 1982, 5; Burdo 1990, 196). The difference is observed in 1) the degree of surface treatment and 2) the typology of morphological forms. Kitchen ceramics, therefore, are 'coarser', their surfaces are poorly treated and they are coated with thin clay (Burdo 1990, 196). Embossed images, fingernail tucks and sometimes barbotine were used for decoration. Tableware, in contrast, has a carefully smoothed surface, thinner walls, and was produced under both oxidising and reducing firing conditions. Ceramics of this type are 'more richly ornamented': incised decoration, stamped, flutes, cannelures, and red paint. There are differences in shape: the kitchenware – jugs (pots?), fruit bowls, strainers and pear-shaped vessels; the tableware – pots, cups, bowls, vases, fruit bowls, craters, pear-shaped vessels, scoops (Burdo 1990, 196-197).

Thus this 'kitchenware' has no 'classical' characteristics of this type of ceramic (see part 2), namely, multivariable 'coarse' impurities different from those of 'tableware' and a pot as the main morphological type.

Chronologically, the sites of 'Eastern' Tripolye come later. Let's look at the development of the ceramics group which is here called 'kitchenware'. The descriptions are given from the works of Tsvek (2006, 59-77), since the quantitative data on the findings at these settlements are practically not published (especially at site or object level), and our own data will be described below.

At the sites of the *Zarubyntsy type*, 'kitchenware' ceramics (with roughly processed barbotine surface) are 20-25%. The shapes are only of pots with a wide neck with decoration with pin impressions and relief protrusions (Tsvek 2006, 60). The ceramics of this type from different sites located both on the Gorny Tikich and the Southern Bug are very similar. A new type of ceramic with crushed shell in the paste turns up during this period.

These types of sites are followed by the settlements of the *Krasnostavka type* (according to Tsvek), where the 'kitchenware' percentage is less – only 15% (the vessels are decorated with various 'notches (incisions) and pin impressions'). The ceramics with barbotine practically disappear, but the number of pots with the admixture of shells in the paste increases to 4.2%. The latter is also decorated with 'curvilinear stripes framed with pin impressions or scallop stamps' (Tsvek 2006, 63). Tsvek believes that these vessels had been imported from the sites of the Skel-

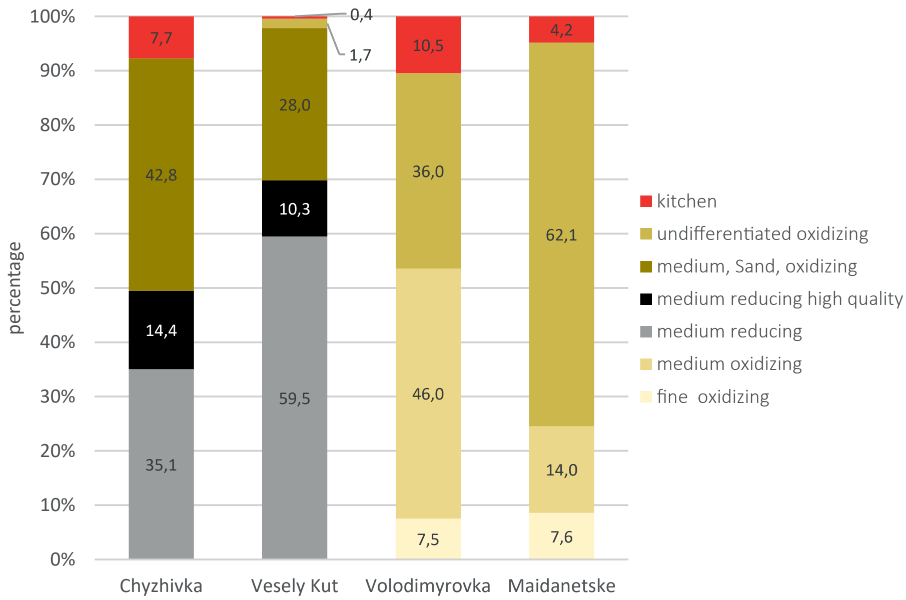


Figure 64. Percentage of different fabrics on selected key sites.

yanskaya culture in the steppe zone. The quantitative and qualitative characteristics of the ceramics from *Onopriyivka-type* sites (that chronologically follow them according to Tsvek) have not been published yet.

On the sites of the *Shkarovka type*, which, according to Tsvek, belong to stage B1-B2, ceramics with barbotine are practically not found (0.6%, and not on all the sites), and the number of kitchenware with 'embossed-stamped ornamentation' increases. The kitchen ceramics from the sites of the *Vesely Kut type*: vessels with embossed-stamped ornamentation (with 'pearls on the rim and compositions of a scallop stamp on the belly) completely take the place of the vessels with rustic decoration. A new characteristic for this type of vessel manifests itself in some pots with sand admixtures in the clay paste. The shapes of the ceramics from the sites of period B1-B2 constitute mostly pots; there are also bowls.

For stage B2, Tsvek attributed two types of settlements in Eastern Tripolye – Miropolye and Garbuzin. *Miropolye* kitchenware is characterised by simplified decoration while the shapes remain the same. So the chevron is replaced by horizontal rows; different kinds of pin impressions are applied instead of a scallop stamp. Also, sometimes there are pots with moulded protrusions (anthropomorphic? and/or heart-shaped); the vessels on legs appear. The ceramic paste sometimes changes as well: some vessels are made of clay with admixtures of sand or mica. In *Garbuzin*, this type of vessel has similar characteristics (forms, decoration). New elements of the decoration are scratchings and imprints of twisted cord. In addition to shells, hematite and sand are added to the ceramic paste (especially for larger vessels). Large vessels, something like 'containers', appear (Tsvek 2006, 75).

The successive groups of sites singled out by Tsvek are formed of two to six or seven settlements. It is a pity that statistical calculations were not made for every group of sites, and that there are no calculations for individual settlements or excavated objects.

As already mentioned, in 2017, during the geomagnetic survey at two sites (Chizhivka and Vesely Kut) of 'Eastern' Tripolye, test trenches were also excavated, which made it possible to partially examine the Tripolye-period pits on both of them. As a result of the processing of the ceramics from the trenches, a bar plot was compiled which displays the percentage of different technological groups of the ceramic fabrics. For comparison, the data on ceramics from the test trenches in Vladimirovka and Maidanetske (trenches 50, 51, 60, 80 and 92) were included in the diagram (fig. 64). The method of calculating the ratio of different types of ceramics is the same – based on the total number of fragments.

As can be seen, the percentage of kitchen ceramics varies in the range of 10-0.4%. For Chizhivka, the amount of this type of ceramics (7.7%) is larger than for Veseliy Kut (0.4%). Through a comparison of these data with the Tsvek table, it can be seen that, in principle, the total 'kitchenware' at the sites of the Vesely Kut type is a little less than on the sites of Krasnostavka type.[45] Actually, the difference in the amount of kitchenware on the two 'Eastern Tripolye' sites (7.3%) is even less than, for example, the difference in the number of these types of ceramics within one settlement (for example at Maidanetske and Talianki). This is also true if one is to look at the difference in the data for the four sites in the bar plot, which is 10.8%.

What is clearly seen in the bar plot is that, unlike in the case of the 'kitchenware', there is a huge difference in 'tableware' fabrics between the 'Eastern' and 'Western' Tripolye sites. In particular, a large percentage of the pottery from 'Eastern' settlements has reducing firing, which is quite characteristic. This category disappears on 'Western' sites (along with the distribution of high-quality painted ceramics and pottery kilns).

To sum up, based on the available data, the 'kitchenware' of 'Eastern' Tripolye already has the features that characterise these ceramics as a type (in technology, decoration and morphology; see part 2).

4.3.2.3 Final Tripolye

To complete the review, let's have a look at the sites of final Tripolye from the Sinyukha catchment area (the sites of the Kochergintcy-Shulgovka type or the third phase of the Kosenovka group). During this period, very intense changes in the entire ceramic complex can be observed (Ryzhov and Weimer 1996; Ryzhov 2001-2002; Kushtan and Ovchinnikov 2003, 9-24; Kushtan, Nazarov and Ovchinnikov 2004, 3-31; Kushtan 2015, 429). In the ceramic complex of these sites, 'tableware' makes up, in contrast to all previous Tripolye periods, an absolutely small number – 5-15% (described by Ryzhov 2001-2002, 188-191). The predominating 'kitchenware' has such admixtures in the clay as grus, coarse sand, quartz (for 50-55% of this type of ceramics), fine sand and quartz grains (20%), chamotte, parts of kaolin, sometimes crushed limestone, and crushed shells (less than 3%) and hematite. The surface is smoothed, sometimes coated, with pure clay. Sometimes, additional painting with red ochre is observed. Forms are pots and a small number of bowls (3-5%). Pots often had very characteristic (for Final Tripolye) horn-shaped handles (or mouldings) on their bellies. The decoration (only on pots and not often on kitchenware, 3-5%) included cord impressions (60-70%), triangular, oval and rectangular impressions, pin impressions, notches, scallop stamp imprints, and thin lines. Ryzhov notes that at these later sites, a clear line between tableware and kitchenware seems to be blurred, which is expressed, above all, in manufacturing technologies, when practically the same admixtures are used in clay (albeit in different concentrations). In addition, some tableware vessels had undergone reducing firing, which had not been used for this pottery type since the days of Eastern Tripolye.

Therefore the 'kitchenware' type of ceramics was modified to a large extent and, perhaps, was no longer a continuation of the development of this pottery type (there is a small percentage of decorated pots, the decoration of the cord pattern dominates, there are no scratches, and the pottery paste changes). Two types of fabrics are no longer opposed, but slightly differ from each other.

45 Chizhovka, according to Tsvek, refers either to settlements of Krasnostavka or Onopriyivka type, for the latter type there is no data.

4.3.2.4 Interpretation and consequences

As can be seen from the above, 'kitchenware' of Early, Eastern and Western Tripolye (Vladimirovka-Tomashovka) has significant differences. Similarly, hardly comparable are the vessels from Early and Middle/Late Tripolye sites, which were called 'tableware'. This diversification can be partially explained by global changes in ceramics manufacturing techniques and the adaptation of pottery kilns (see part 2).

Turning to the question of whether the ratio of 'kitchen-' to 'tableware' can be used as a chronological indicator, then, based on the data presented, the answer is no. The exceptions are the Final Tripolye sites of the region, where the 'kitchenware' almost completely replaces the 'tableware' (for example, at the settlement of Moshuriv 3, only one painted vessel was found, according to Ryzhov and Weimer 1996).

Regarding the chronological indicators of 'kitchen' ceramics, they are most likely in the change in different methods of decoration.

The question of whether the 'kitchenware' from the sites of period C2 is a result of the development of the specific type of vessel of periods B1-C1 remains open. Also, not everything is clear with the sites of Early Tripolye. According to Burdo, the ceramics of the *Cucuteni C* type (that is, the one which is considered the most typical of ceramics through a number of features and that is called 'kitchenware' here) are only a kind of 'kitchenware' and appear only in stage B1 (and, accordingly, were used until the end of C1 – Burdo 2016, 7-38). The proposed chronological limit for this ceramic type is also in full accord with the data for our region. However, it is not clear what, according to Burdo, 'kitchenware' actually is, although she remarks that 'pre-Cucuteni' (kitchen) ceramics are noticeably distinctive from the 'Cucuteni C' type ceramics in their moulding compound and surface treatment. Thus the question of terminology remains unclear. For the neo-Eneolithic sites of South-Eastern Europe, there is a division into *fine* and *coarse ware*. Some researchers use these terms also for the Tripolye assemblages (*e.g.* Ohlrau 2020). It should be borne in mind that, compared with the finds from South-Eastern Europe, the Tripolye artefacts are not quite 'fine' and, moreover, are far from being 'coarse'. In any case, it is the author who chooses the label. Perhaps it makes sense to use the term 'coarse' ware for the ceramics with coarse impurities for Tripolye A and C2 and leave 'kitchenware' as the term for a rather specific type of ceramic of the periods B1-C1.

Regarding the functional use of the 'kitchenware' type of ceramics, its stable number on the sites of both Eastern and Western (Vladimirovka-Tomashovka) Tripolye shows that these pots were a stable part of the Tripolye economic system. The fact that the percentage of these vessels, which can be seen from the analyses, did not show tendencies towards gradual changes speaks only in favour of their domestic use and indirectly supports Starkova and Palaguta's assumption about such vessels being used for storage/cooking of certain food (possibly new one; Palaguta and Starkova 2016, 56).

Indeed, the parallel development and use of 'kitchenware' (alongside 'tableware') can speak for some aspect of cooking (cuisine) which was consistently present until the latest Tripolye sites (even then the dramatic changes in the ceramics assemblages at stage C2 do not support the disappearance of these traditions). However, this assumption requires additional arguments. Analyses of plant oils and animal fats (lipids) could to some extent shed light on this problem.

Another aspect that is mentioned by many experts on Tripolye is the extent to which this integral part of the ceramic complex (kitchenware) is an 'alien' element and the result of the expansion/migration of the 'steppe' population into the Tripolye environment (Movsha 1961, 186-199; Dergachev 2000; Manzura 2000; Palaguta and Starkova 2016, 52-56; and others). The fact that a certain amount of kitchenware is found in all the complexes analysed above (in the tables) – and not only in every investigated house, but also in all other excavated objects (mega-structure, pits, pottery kilns) – makes it possible to say that it is not an indicator of migration and that this type of ceramic ware cannot be used as an argument in any 'ethnic' interpretations and the search for differences between groups of population and movements of people (migrations). This was also rightly pointed out by Starkova and Palaguta, with the proviso that it was culinary traditions rather than people that 'spread'.

Concerning the name 'kitchen', this label can be used only conditionally, since it remains unclear (and, apparently, will remain so) whether vessels of this type were used for 'kitchen' purposes and, if so, the question remains whether some tableware could be used for the same purposes. Further studies in this direction are extremely promising.

4.3.3 Vessels' morphology

Along with fabrics and decoration, the morphology of ceramic artefacts is one of the important aspects of typo-chronological constructions, the Tripolye ones in particular. At the same time, it should be noted that practically none of the researchers place the shape of vessels on the first levels in classifications, preferring the quality of surface treatment and the composition of paste (Kolesnikov 1982, 220-221).

Before proceeding to the analysis of vessel morphology, let us turn once again to the relative chronology by Ryzhov and its verification by Lennart Brandtstätter, since it is directly related to the analysis of vessel shapes and decoration.

4.3.3.1 Testing the relative chronology by Ryzhov (1999)

Recently, Lennart Brandtstätter carried out a seriation of technological, morphological (shape) and stylistic (decoration) characteristics of ceramics of the period Tripolye B2 and C1 of the Southern Bug-Dnieper interfluve (Brandtstätter 2017), based on a data set from Ryzhov's work (1999). He also included the inventories of the recent excavations at the Maidanetske site in this seriation. With regard to both the content and the terminology, the type classification used for the analysis refers to Ryzhov's publication (Ryzhov 2012b).

The data were extracted from the diagrams in the appendix of Ryzhov's dissertation. In these diagrams, the frequency of each individual type is displayed for ten 'stylistic units': Vladimirovka (V), Nebelivka (N1-N2), Tomashovka (T1-T4), and Kosenovka (K1-K3), which are understood as inventories of successive phases. Three different frequency levels are recorded: 1-9 items, 10-99 items and >100 items. It should be emphasised that within the individual 'stylistic units' the frequencies of different sites are merged. As a result, it is practically impossible to assess the contribution of individual sites to the overall result.

As the correspondence analysis showed the separation of Kosenovka inventories on the one hand and inventories of the other sites on the other hand in the first axis, it could be realised after a first pass that this group, obviously, used different shapes and decorations from other groups. Therefore, in the next pass, the data of the 'Kosenovka' stylistic units were removed from the analysis. Later, the inventory of the stylistic unit 'Tomashovka 4' (T4) was also removed since it probably was placed on the wrong position between the units Tomashovka 1 and Tomashovka 2.

In the ordination diagram of the first two axes, the remaining inventories become grouped in a parabolic arrangement in the order V → N1 → N2 → T1 → T2 → T3. Accordingly, for the local groups Vladimirovka, Nebelivka and Tomashovka, the correspondence analysis of Lennart Brandtstätter seems to confirm the relative chronology as postulated by Ryzhov on the basis of typological arguments.

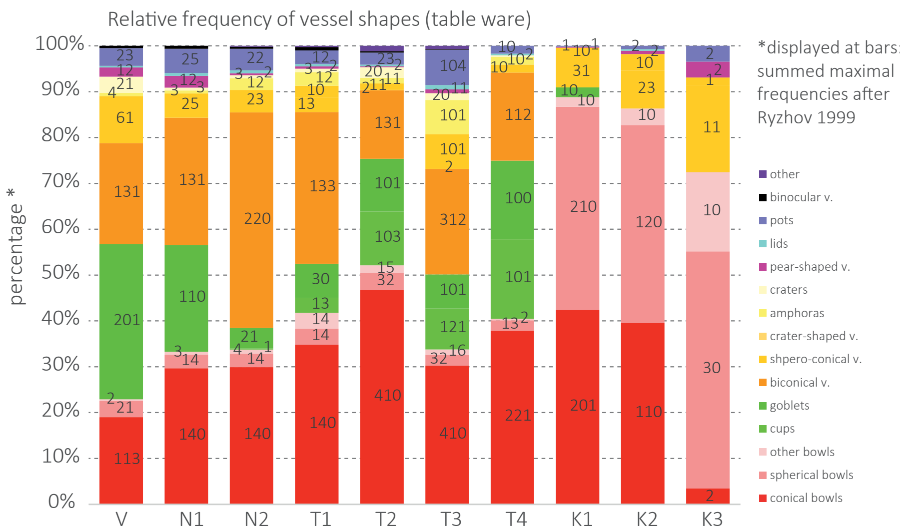


Figure 65. Relative and absolute frequency of table ware vessel types in stylistic units (groups of settlements) according to Ryzhov 1999.

On a very coarse temporal resolution, the resulting sequence is confirmed by the ^{14}C chronology as elaborated in the part about ^{14}C dates: this includes the earlier dating of the Vladimirovka and Nebelivka inventories between about 3950 and 3800 BCE and the later dating of the Tomashovka style after 3800 BCE. However, when we go into further detail inconsistencies become visible: ^{14}C data suggest, for example, the contemporaneity of the sites of Vladimirovka (V) and Nebelivka (N1) and also of Dobrovody (T2), Moshuriv 1 (T3) and Maidanetske (T3). Pishchana (N1) is even older than Vladimirovka (V), contrary to the tendency in the correspondence analysis.

The contradictions identified do not automatically mean the failure of the analyses. Different explanations for the inconsistencies mentioned can be proposed: on the one hand, the absolute data are available only from a few settlements, whose actual typological contribution in the correspondence analysis cannot be easily estimated on the basis of the summarised data; on the other hand, the ^{14}C dates show for several sites a much longer occupation than previously thought, which suggests probable large time overlaps between settlements. By contrast, Ryzhov's and Brandtstätter's analyses included only relatively small find inventories that hardly cover the entire temporal depth and typological variability of the sites. Consequently, the discrepancies identified between the absolute dating on the one hand and the positioning of inventories in the correspondence analysis on the other hand could result from long occupations of the settlement and selective samples of finds.

Even if currently the sequence of Brandtstätter's correspondence analysis can be verified at only a very general level by means of the ^{14}C data, we would like to provisionally assume that long-term trends in the development of the ceramic material are reflected in it. These tendencies will be presented in the next part.

Basic trends in pottery development

Based on the positive assumption that the sequence of site inventories proposed by Ryzhov and Brandstätter shows at least roughly a chronological order, we will try to describe in the following the basic chronological trends of pottery development. Source-critically, it should be noted that the sample size is very different in the different stylistic units: while Tomashovka 2 and 3 inventories are very large, Tomashovka 4 and Kosenovka 1-3 are represented only by a very small number of 100 vessel units, at the maximum. The stylistic 'poverty' of these units is surely because of the small number of finds. Slightly better represented are the potentially early inventory units 'Vladimirovka' and 'Nebelivka 1-3' with a maximum of 90-300 vessel units.

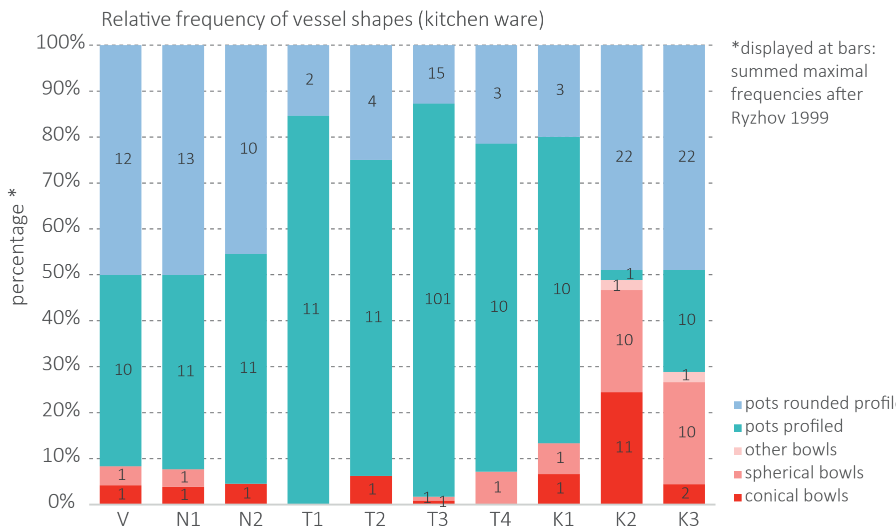


Figure 66. Relative and absolute frequency of kitchen ware vessel types in stylistic units (groups of settlements) according to Ryzhov 1999.

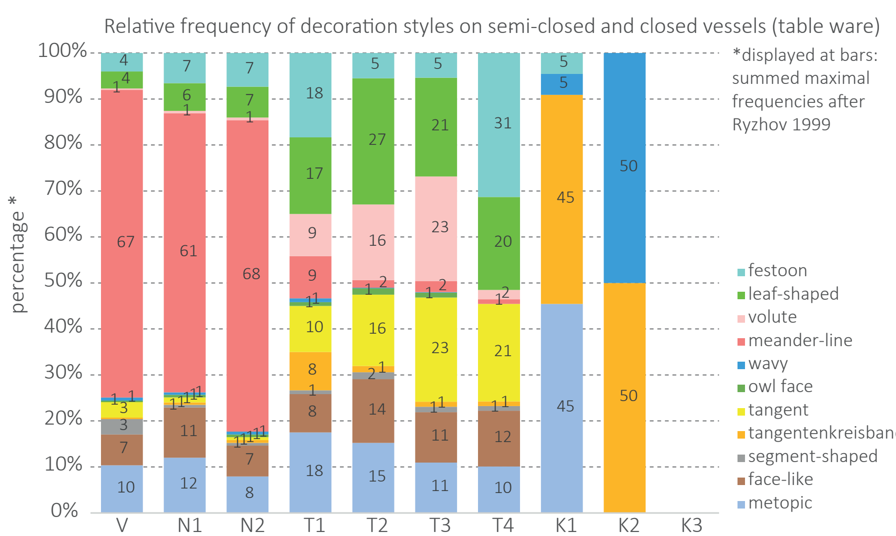


Figure 67. Relative and absolute frequency of painted decoration schemes on semi-closed and closed vessels in stylistic units (groups of settlements) according to Ryzhov 1999.

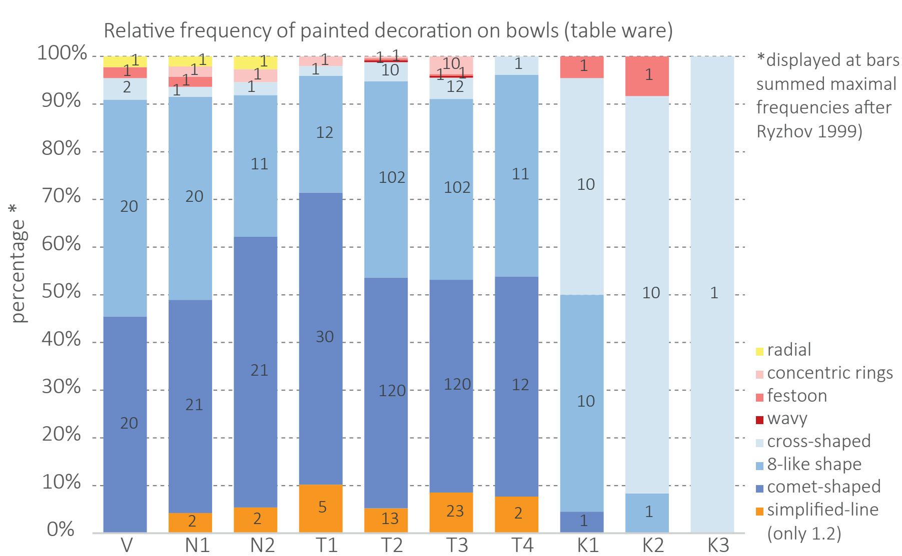


Figure 68. Relative and absolute frequency of painted decoration schemes on bowls in stylistic units (groups of settlements) according to Ryzhov 1999.

Ryzhov distinguished 15 vessel categories and 53 types and variants according to the category *shape*. In the different inventory units, considerable differences in the frequency of vessel classes can be observed (fig. 65).

Within tableware vessel shapes until T2, we observe a continuous increase in the percentage of bowls in the assemblages of up to about 50%. The same trend continues in Kosenovka inventories, where this percentage increases up to more than 80%. However, the case with closed and semi-closed (storage?) vessels is different; the percentage of them reduces. The relative frequency of lids and pear-shaped pots is quite stable until T4.

In the group of kitchen pots, we see a significant increase in the percentage of more profiled shapes, which decreases in the Kosenovka group (fig. 66). An increase in the percentage of bowls in Kosenovka inventories can be observed.

For the category of closed and semi-closed vessels, Ryzhov distinguished twelve different decoration style groups of painted pottery, each of which has different types and variants. Absolutely remarkable is the observation that most of these ornamentation style groups were used over a long period of time and that the settlements investigated differ mainly in the frequency of these painted decoration styles (fig. 67).

Accordingly, Vladimirovka and Nebelivka inventories are dominated in particular by the meander-line style (>60%), followed by metopic and facade style with approximately 10% each and leaf-shaped and scalloped styles with 4-7%.

New in Tomashovka inventories are significant proportions of the style groups ‘tagent’ (10-20%), volute (9-23%) and *Tagentenkreisband* (8-1%). Leaf-shaped decoration is with 17-27% now clearly more frequent than in Vladimirovka and Nebelivka inventories. Furthermore, we are registering unchanged percentages of the styles metopic (17-10 %), facade (18-14 %) and scalloped (5.5-30%). Meander-line style exists but is reduced in its frequency to 9-1 %. Perhaps it became replaced by the now much more frequent volute style.

Due to the very small number of samples of a maximum of 22 vessel units (K1), Kosenovka inventories cannot be evaluated based on Ryzhov’s sample.

Different categories of painted decoration of bowls show an astonishing consistency in Vladimirovka, Nebelivka and Tomashovka assemblages (fig. 68).

Highly remarkable is that most painted decoration categories already occur in Vladimirovka and Nebelivka assemblages and existed (in different frequencies) also in Tomashovka inventories.

4.3.3.2 Research questions

Turning to the consideration of the Tripolye ceramics of the region from the point of view of their shapes, let us select a number of questions of interest to us:

- Do the vessel shapes change over time and, if so, is it possible to trace any chronological differences within a ‘phase’ of a regional group/regional group with the vessel shapes analyses?
- Is it possible to see any differences between them through the vessels’ morphology?
- Which types/subtypes/variants of vessels underwent more rapid changes?
- Which of the types/subtypes/variants of the vessels are more stable (change slowly/not change)?
- Is there any subdivision of Tripolye vessels into different size classes?
- To what extent are the shapes of Tripolye ceramics uniform, especially from sites with painted decoration (that is, where pottery kilns were used)?

Before considering different types, subtypes and variants of vessels, let us focus on measuring the ceramics.

4.3.3.3 Measurements of ceramics

A series of measurements of ceramics makes it possible to carry out a number of analyses and to simplify the work on grouping and understanding the material. This work is particularly relevant to be realised with Tripolye ceramics since it is a very large group of finds. What is more, a large number of whole pots have been found on the Tripolye sites of the Sinyukha catchment area in particular. So, for example, for house no. 47 in Talianki, it has been estimated that there are about 104 whole and archaeologically whole vessels (Kruts *et al.* 2013, 41-53). Of course, this house stands out because of the amount of the ceramic material and may be an exception rather than the rule, but the number of 30-40 whole vessels in a single house on the sites, for example, of the Tomashovka group, is quite widespread. Many publications and museum collections have lots of graphic and restored pots.

While studying Tripolye ceramics, the authors from time to time made different measurements of vessels (*e.g.* Kruts *et al.* 2001, 37-56). Thus Ryzhov measured the height, the maximum diameter and sometimes the thickness of the vessel walls (characteristic of certain types). At the same time, it remains unclear whether the varieties of certain ceramic types identified by him (most often 'small', 'medium' and 'large') are grouped randomly or regularly (multimodally), in other words to what extent his 'size division' was systematic.

In this work, 439 vessels from the sites of *Pishchana, Talianki, Dobrovody, Maidanetske, Kosenovka* and *Sharin 3* were measured. The measuring was aimed at obtaining some data for 1) verification of singling out morphological types, 2) tracing the dynamics of the development of certain types of vessels (chronological, intra-site, etc.), and 3) calculating the vessels' capacity in order to clarify some questions. For each vessel, the diameter of the rim, belly, bottom, and height were measured (see Appendix 4).

The numbers of vessels measured at the sites are Pishchana – 47, Dobrovody – 37, Maidanetske – 74, Kosenovka – 25, Sharin 3 – 15, Talianki – 241. The drawings of the vessels in publications (Kruts *et al.* 2001; Kruts *et al.* 2005; Kruts *et al.* 2008; Korvin-Piotrovskiy and Menotti 2008; Kruts *et al.* 2009; Kruts *et al.* 2011; Kruts *et al.* 2013; Kushtan 2015; Brandtstätter 2017) and one report (Kruts and Ryzhov 1988) have been used as the sources (figures of ceramic house inventories are presented in Appendix 9).

Thus it can be seen that the pots from the sites of the Tomashovka group dominate; the Nebelivka and Kosenovka groups are represented by the vessels from only one house each (the settlements of Pishchana and Kosenovka). The sites of the Kochergintcy-Shulgovka type are represented by an insignificant number of finds from the site Sharin 3. This sampling reflects the state of publication and the availability of the material for analysis; however, this data might be sufficient for a pilot study.

In the previous parts (2 and 3), a typology of ceramic shapes comprising four levels was proposed. At the first level, the vessels were sorted into three classes according to the shape and size: bowls/lids, pots and cups. At the second level, the pots were grouped into types according to the profile characteristics: semi-open (craters/crater-like vessels/pots) and closed pots (biconical/sphero-conical/amphorae and pear-shaped vessels). At the level of types, cups were separated into cups and goblets.

Let us take the data on the measurements of the vessels from Talianki (as the best representative site) in order to check whether the types selected correspond to the proportional division.[46] Let's build two scatter plots and put in them all the data from Talianki. The first scatter plot demonstrates the ratio of vessel height to rim diameter.

For a complete picture, the so-called 'amphorae', which are often singled out as a distinct type, were allocated their own colour. However, in this work these

46 The ceramics analysed were taken from *ploshchadkas* 28-43 and 45-47.

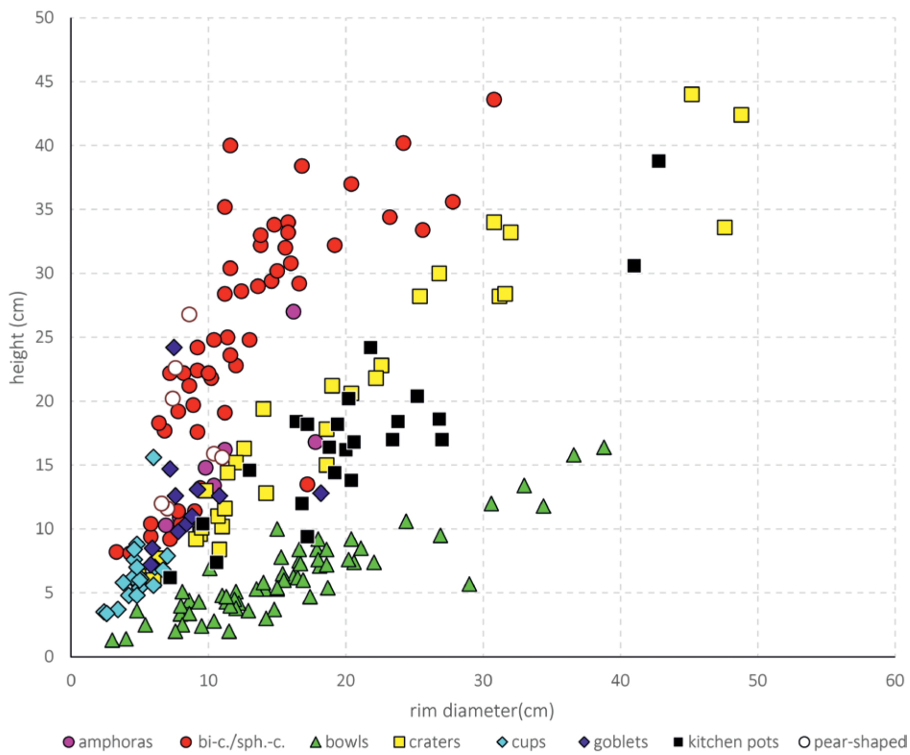


Figure 69. Talianki: scatter plot no. 1: the ratio of height to rim diameter in different types of vessels.

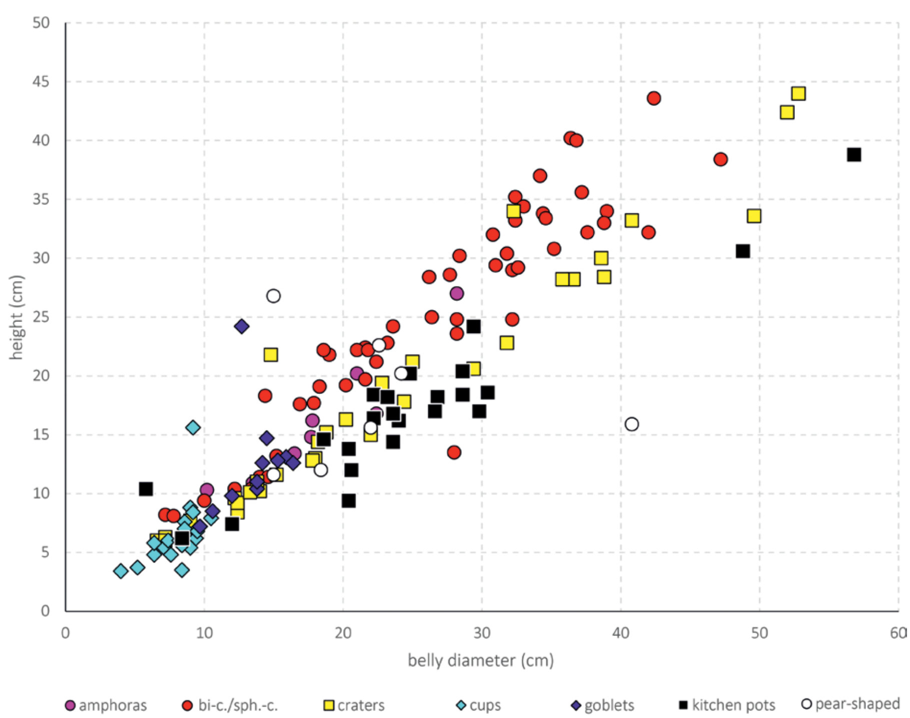


Figure 70. Talianki: scatter plot no. 2: the ratio of the height to belly diameter in different types of vessels.

vessels are considered an integral part of the 'biconical/sphero-conical vessel' type. In addition, 'kitchen pots, despite the fact that morphologically they belong to the type 'craters/crater-shaped vessels/pots', were given a distinct colour as well, for a better understanding of this particular category of ceramics.

Figure 69 shows a convincing grouping of different types of ceramics from Talianki. Bowls make up a separate group, which, apparently, can be subdivided into several size classes. The largest dishes are up to 40 cm in diameter and 17 cm in height. However, most bowls do not exceed 10 cm in height and 22 cm in diameter.

The next group of pottery is ‘craters’, that is, the type ‘craters/crater-shaped vessels/pots’, which also includes ‘kitchen’ pots. A large number of the latter (kitchen pots) still stands out slightly from the ‘craters and table pots and, due to their proportions, resemble bowls. This type of vessel is also subdivided into several size classes. One group – up to 23 cm high with a rim diameter of up to 22 cm and the vessels of larger size – might be subdivided into several groups.

Well distinguished is the group ‘biconical/sphero-conical’ vessels, which comprises the highest (proportionally elongated) vessels of the entire complex. Beginning from 8 cm, these vessels reach 45 cm in height. The rim diameter varies between 3 and 31 cm. This type can also be subdivided into several size classes (according to the heights of up to 12 cm, 17-25 cm, 28-45 cm). It is interesting that pear-shaped vessels, which are not numerous, also come into this group according to their proportions. As for the ‘amphorae’, they, in principle, are also close to ‘biconical/sphero-conical’ vessels, although the rims of some amphorae are rather wide; as a result, they are proportionally closer to the craters.

Cups (the vessels up to 9 cm high and with a rim diameter of 7 cm), differ, in principle, from other vessels and make up a separate compact group.

Larger vessels that were given the name goblets are scattered on the chart.

In general, the vessels with a height from 7 to 12 cm and with a rim diameter from 6 to 10-11 cm make up a multitudinous mixed group of different types of vessels.

Let’s look at, apart from the ratio of the height to rim diameter, the ratio of the height to belly diameter, putting the data in scatter plot no. 2 (fig. 70). This graph also shows differences in the proportions of different types of vessels, which, however, are less pronounced than in the previous graph.

The division between ‘craters/crater-shaped vessels/pots’ and ‘biconical/sphero-conical vessels’ is also clearly noticeable, as in the previous chart. As to the ‘amphorae’, it is quite clearly seen here that they constitute one group with ‘biconical/sphero-conical vessels’. And, on the contrary, the pear-shaped vessels are scattered at random in different parts of the graph.

A difference can be seen between the cups and goblets; the latter type on this chart constitutes a more compact group, which is more separate from the ‘biconical/sphero-conical vessels’ and amphorae. At the same time, the small vessels (up to 10 cm in height with a rib diameter of 14 cm) are also slightly mixed here.

In addition, in Figure 70, different size classes are visible, but their more detailed analyses will be given later.

It can be concluded that examining the proportions of different types of vessels from Talianki showed that 1) the selected morphological types of vessels make up proportionally corresponding groups; 2) the ‘problematic’ (that not so clearly differs in proportions) is a few types of a small number of vessels (or a component part of a larger type) – amphorae, pear-shaped vessels and some goblets, which in different scatter plots are located either within the type ‘biconical …’, or within the type ‘craters ..’; 3) in principle, all the small vessels have similar proportions; 4) different types of vessels can be divided into different size classes; and, besides, 5) sticking to well-defined ‘proportional standards’ catches the eye as well.

To understand whether the data from other settlements analysed can be compared with the Talianki ones, and for a better understanding of what size classes we can talk about, let us have a look at the proportions of the four types of vessels, with the use of all available data. Let’s look separately at the proportions of ‘kitchen’ pots. Cups and pear-shaped vessels are excluded from the analyses. The first ones will be passed over because they are of practically the same size, and the second type because of their small number (except for seven vessels from Talianki, there are only four such vessels from other settlements).

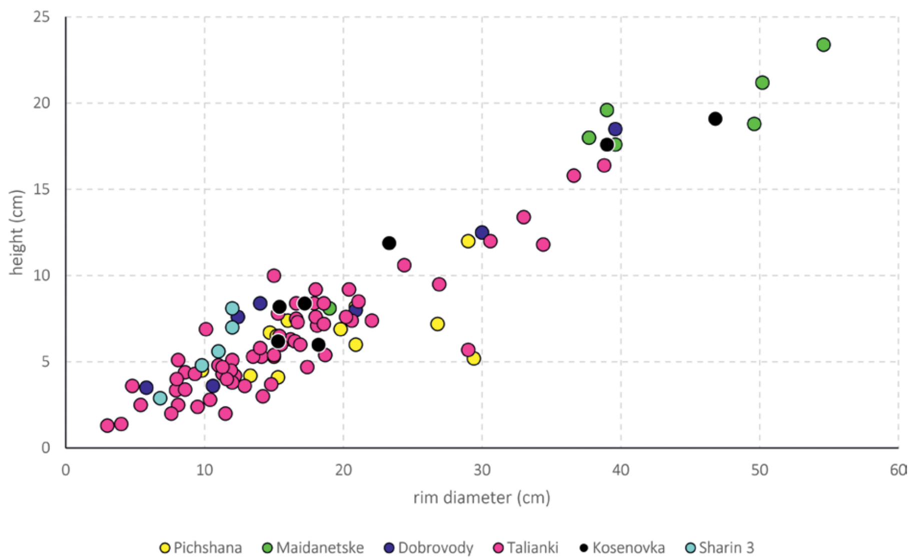


Figure 71. Scatter plot no. 3: the ratio of the height to diameter of rims of bowls from the sites of Pishchana, Maidanetske, Dobrovody, Talianki, Kosenovka and Sharin 3.

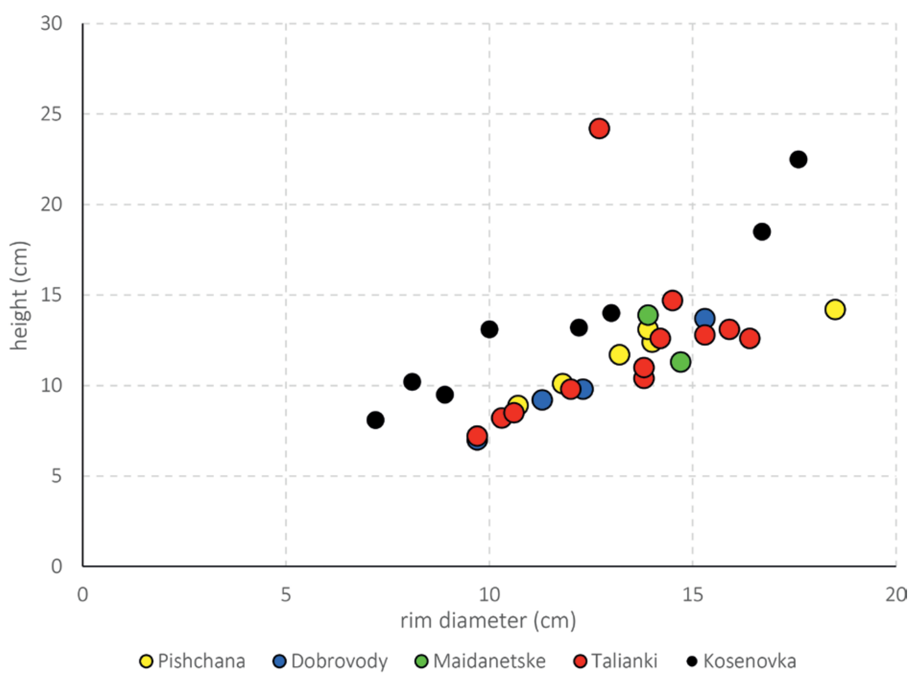


Figure 72. Scatter plot no.4: the ratio of the height to rim diameter of the goblets from the sites of Pishchana, Dobrovody, Maidanetske, Talianki, and Kosenovka.

Let's start with the bowls.

Figure 71 shows that data from other settlements corresponds well not only to the proportions of bowls from Talianki, but also to the size classes. The bowls can be subdivided into several size classes: a) most bowls are up to 10 cm high with a diameter of up to 22 cm; b) the diameter of some bowls varies between 22 and 35 cm with a height of 5-15 cm; c) the remaining bowls make up one (maybe two) group of large dishes with a height of more than 15 cm and a diameter in the range of 35-55 cm. The analysis of every site individually shows that the data from Dobrovody are best compared with those from Talianki. At this settlement, there are bowls of all size classes; the smallest bowls are also represented in the biggest number. The bowls from Kosenovka show similar results. There are no large bowls in Pishchana, and no small ones in Maidanetske. In the case of Maidanetske, this is explained by the situation with the sampling (only one house from which possibly not all the

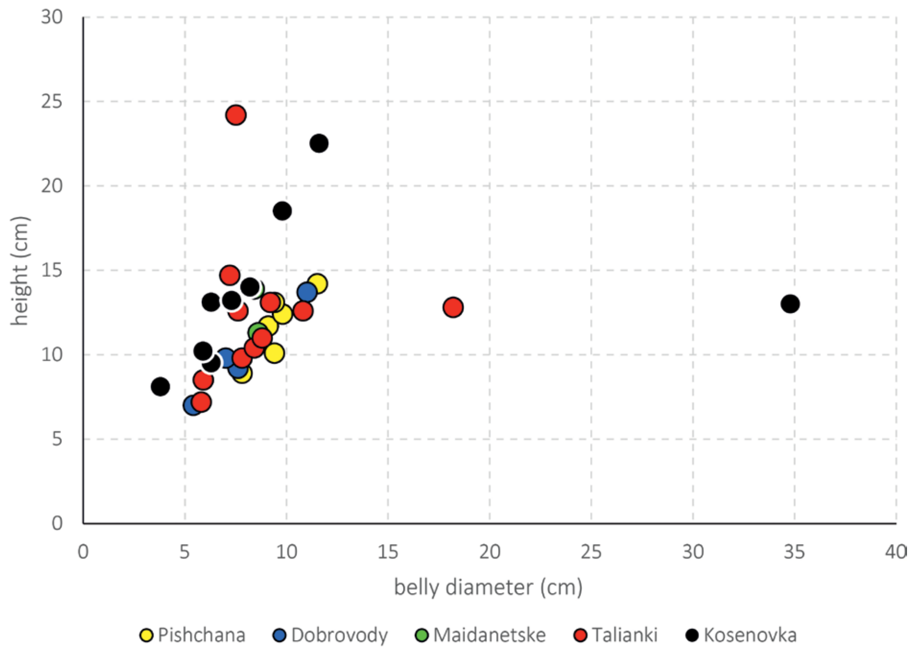


Figure 73. Scatter plot no. 5: the ratio of the height to belly diameter of the goblets from the sites Pishchana, Dobrovody, Maidanetske, Talianki and Kosenovka.

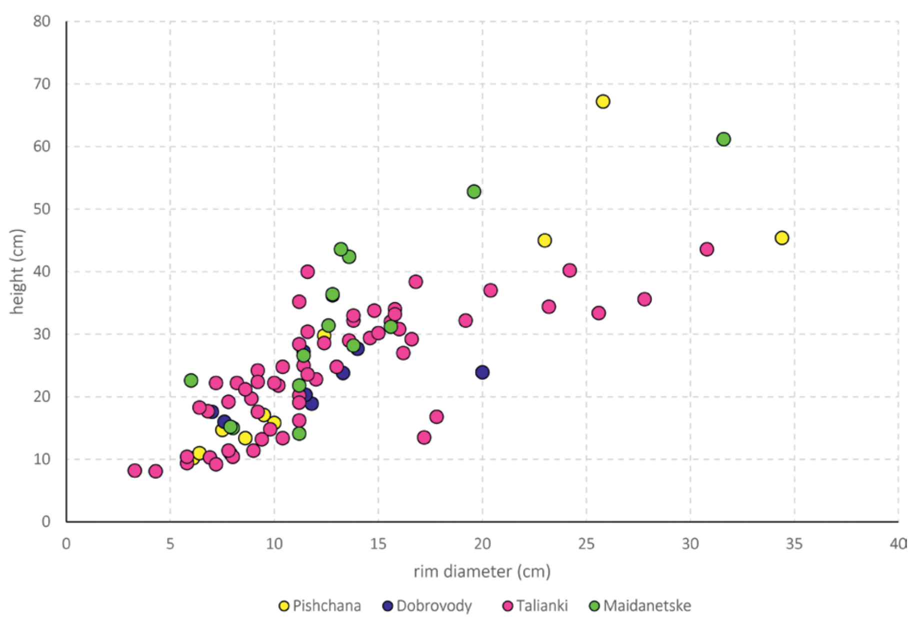


Figure 74. Scatter plot no. 6: ratio of the height to rim diameter of the 'biconical/sphero-conical vessels/amphorae' from the sites Pishchana, Dobrovody, Talianki and Maidanetske.

bowls are pictured). The results from Sharin 3 are interesting. On this site, there are no large bowls, although the samples were taken from different objects.

The ratio of the goblets' height to rim diameters shows that they are not subdivided into size classes, but are more or less grouped together (fig. 72). The exceptions are some vessels of this type from Talianki and Kosenovka, which so far are still explained as outliers. The proportions of the main group of goblets are 7-15 cm high, rim diameter 5-12 cm. An important result is that the proportions of the goblets from Kosenovka are not readily comparable with the vessels of this type from all the other sites and make up a kind of a parallel subgroup.

Let us look at the proportion of the height to belly diameter of the goblets.

Scatter plot no. 5 confirms the previous results (fig. 73). The proportions of the main group of goblets are height 7-15 cm, belly diameter 9-17 cm. The goblets from Kosenovka stand apart from the others even more.

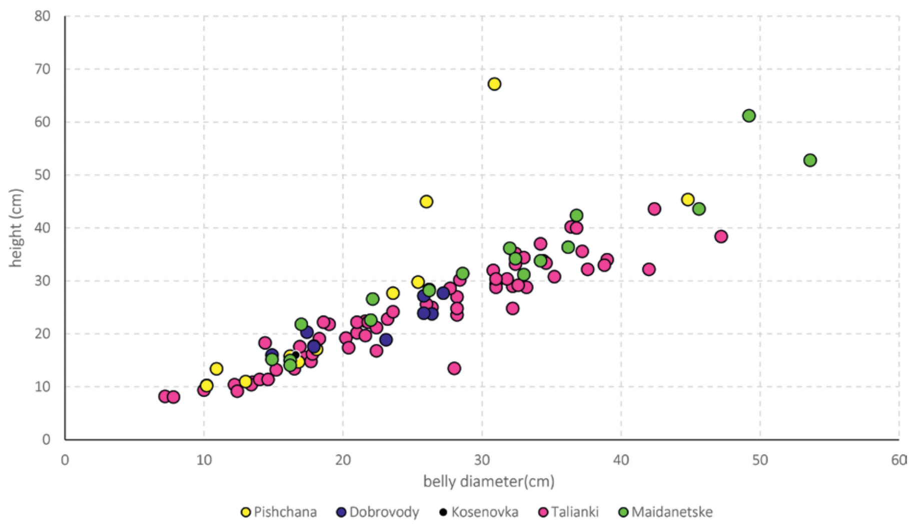


Figure 75. Scatter plot no. 7: ratio of the height to belly diameter of 'biconical/sphero-conical vessels/amphorae' from the sites Pishchana, Dobrovody, Kosenovka, Talianki and Maidanetske.

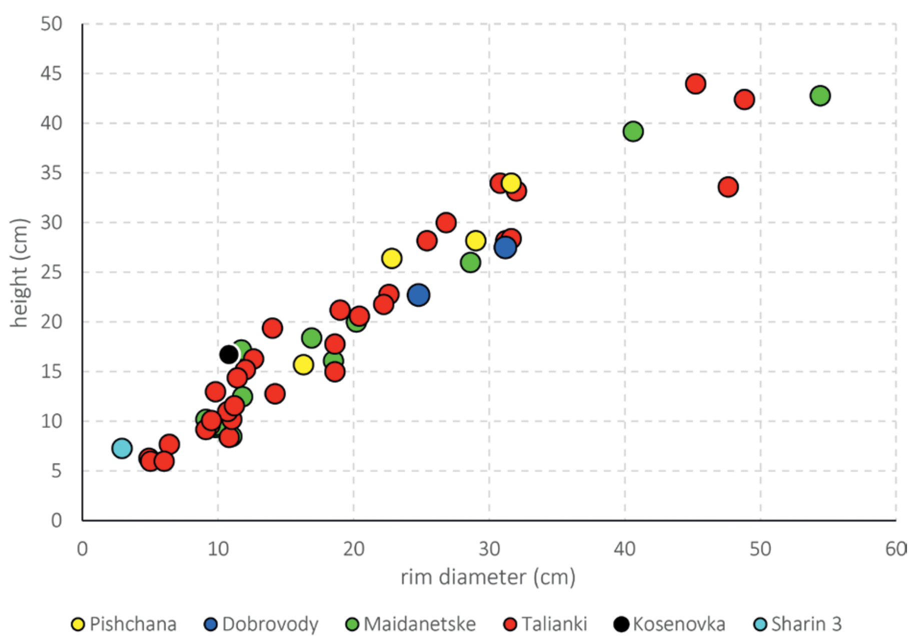


Figure 76. Scatter plot no. 8: the ratio of the height to rim diameter of the 'craters/crater-like vessels/pots' from the sites Pishchana, Dobrovody, Maidanetske, Talianki, Kosenovka and Sharin 3.

The type 'biconical/sphero-conical vessels/amphorae' is one of the most numerous. In addition, they vary in sizes greatly – from 8 cm to 50 cm high vessels. Scatter plot no. 6 shows quite large variability in the rim diameters of this dish type (fig. 74). In general, the data from the settlements presented correlate with each other, although large vessels from Talianki are slightly lower than the ones from Pishchana and Maidanetske. It is possible (somewhat conventionally) to distinguish two large groups of vessels. The first, quite significant, one comprises the vessels which reach a height of 44 cm with a rim diameter of 17-18 cm (perhaps it can be divided into two groups, with the borderline between 25 cm high and 12 cm rim diameter, but the precise distinction is not clearly seen). The vessels of the second group are characterised by lower proportions and are not so numerous. In general, the vessels are 30-50 (some up to 70) cm high with a rim diameter of 17-35 cm.

Scatter plot no. 7, which shows the ratio of the height to belly diameter of the same type of vessel, has certain differences. The vessels of different sizes are fairly well proportioned (fig. 75). The difference between the vessels from different settle-

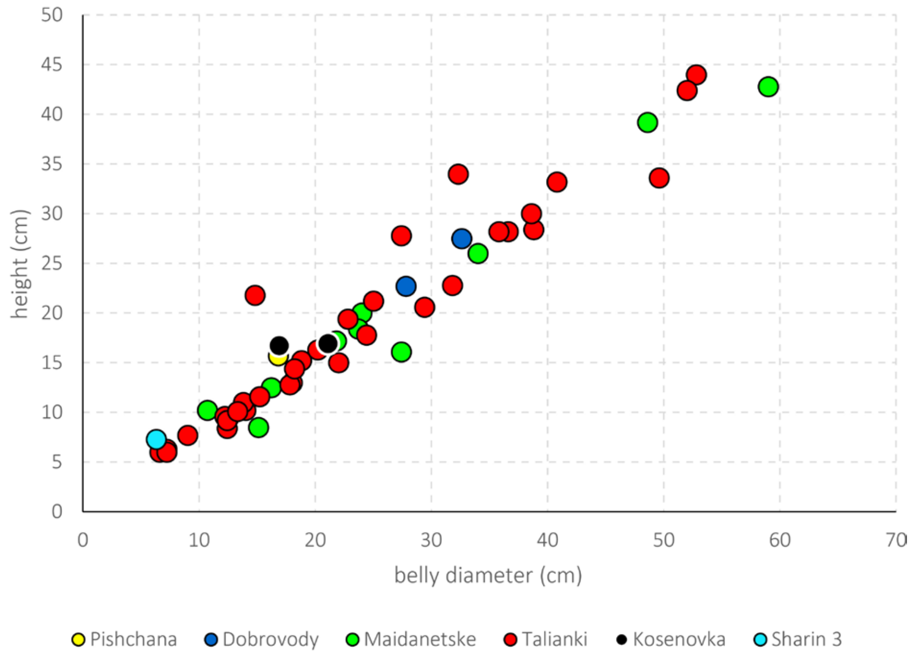


Figure 77. Scatter plot no. 9: the ratio of the height to belly diameter of 'craters/crater-like vessels/pots' from the sites Pishchana, Dobrovody, Maidanetske, Talianki, Kosenovka and Sharin 3.

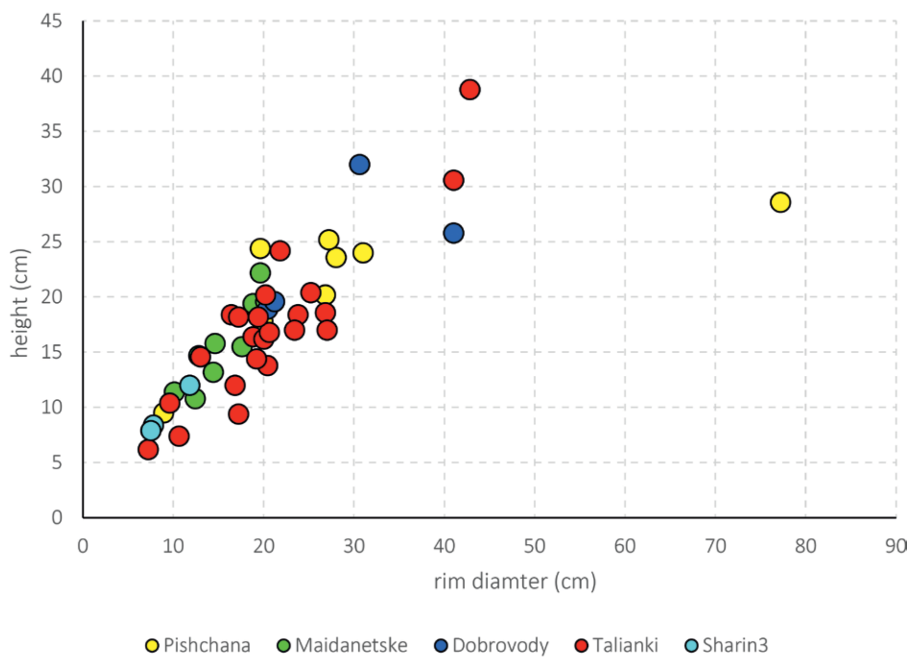


Figure 78. Scatter plot no. 10: the ratio of the height to rim diameter of the 'kitchen' pots from the sites Pishchana, Maidanetske, Dobrovody, Talianki and Sharin 3.

ments is practically not observed, except for a few vessels from Pishchana, which have distinct indices. Analysing size classes makes it possible to distinguish several groups: a) up to 42 cm in height, the belly diameter of 40 cm; b) up to 62 cm in height, the belly diameter up to 54 cm.

Next we'll proceed to analyse the type 'craters/crater-like vessels/pots'. 'Kitchen' pots are excluded from the samples for a better understanding of these artefacts. The ratio of the height to rim diameter of this type shows that the proportions are readily observed (fig. 76). There are no separate groups that would give grounds to divide this type of vessel into three constituent parts – craters, crater-like vessels and pots – observed, but if desirable they could be subdivided into size classes. There might be several size classes: a) 5-35 cm in height, shoulder diameter of 3-33 cm,

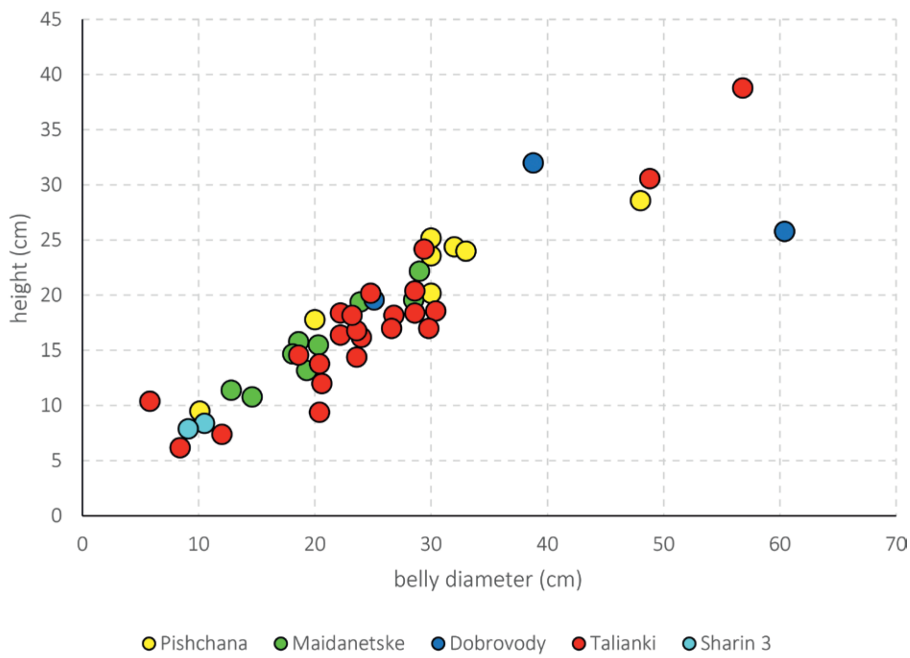


Figure 79. Scatter plot no. 11: the ratio of the height to belly diameter of the 'kitchen' pots from the sites Pishchana, Maidanetske, Dobrovody, Talianki and Sharin 3.

and b) 34-45 cm in height, belly diameter 40-55 cm. As for the differences between the sites, the small size of these vessels is observed only for Sharin 3 and Kosenovka.

The scatter plot on the ratio of the height to belly diameter of the 'craters/crater-like vessels/pots' fully confirms the conclusions made for the previous scatter plot no. 9 (fig. 77).

It is possible to subdivide the vessels into several groups (size classes): a) 5-35 cm in height, with a belly diameter of 6-41 cm; b) 34-45 cm in height with a belly diameter of 48-60 cm.

To finish the analyses of the proportions, let us have a look at the ratio of the height to rim diameter of the 'kitchen' pots from five sites. In general, these pots do not reach such large sizes as the vessels analysed above (fig.78). There is no clear subdivision into size classes here; most 'kitchen' pots have a height of 5-25 cm and a rim diameter of 7-30 cm. Large vessels can be considered outliers. A comparison of the sites shows that in Sharin 3 there are no large pots whilst in Pishchana larger vessels prevail (this might reflect the situation with the sampling).

However, if we look at the ratio of the height to belly diameter of 'kitchen pots', it would be possible to subdivide the vessels into several groups (size classes): a) 5-12 cm in height, with a belly diameter of 5-15 cm; b) 9-21 cm in height with a belly diameter of 17-33 cm; c) 25-40 cm in height with a belly diameter of 38-61 cm (fig. 79).

Summing up the review of measurements of ceramics and the actual analysis of the proportions of different types of vessels, we can say that:

- The ratio of the height to belly diameter for most types is a more constant (or less variable) index than the ratio of the height to rim diameter. The importance of this feature has been repeatedly emphasised in the works of Rice, who even considers it to be the main characteristic of the vessel's shape in understanding its use (Rice 1987, 216-217).
- This is especially visible in the case of 'biconical/sphero-conical vessels/amphorae'.
- Not all the types can be subdivided into size classes; for example, for small vessels (cups, goblets), they are not traced.
- Best of all, different size classes can be seen within the types of bowls (note that the sampling for this type is one of the most representative).

- The larger the sizes of vessels, the smaller their number is. This can be explained both by the situation with the sampling (pictures of large vessels are less likely to be published, as their restoration is a labour-consuming process) and by the 'mobility' factor. Large vessels are usually not very 'mobile' (that is, they are rarely transferred from place to place), and as a result they may have had a longer lifespan.
- In Sharin 3 there are no large vessels.
- In general, all types of ceramics from different settlements are readily comparable.
- The difference has been traced on certain types of vessels. So the goblets from Kosenovka have different proportions compared to the ones from all other sites. There are also differences for 'biconical …' vessels with Pishchana. The vessels from the Tomashovka types of sites, on the contrary, are fairly 'standard' ones.
- Finally, we should note a very high degree of 'proportionality' of vessels, when with increasing size the basic proportions of different types of vessels were maintained.

4.3.3.4 Morphological types of vessels

In this work, six morphological vessel types have been proposed. The difference from the previous typologies has arisen because: 1) some vessels from different types have been combined into one morphological type; 2) the type 'miniature vessels' has been removed, the artefacts from which were assigned to a separate ceramics category of '*special vessel shape*' (together with kernos, rectangular vessels, zoomorphic and anthropomorphic vessels); and 3) 'binoculars' have been excluded, since it is quite obvious that these items do not have the character of vessels (there is no bottom!). 'Binoculars' (along with monoculars, sledge models and models of buildings) have been placed in a separate ceramics category '*other objects with some vessel attributes*', which seems to be quite an interesting group of objects, also for chronological constructions.

Therefore, the following morphological types are proposed (fig. 21):

- Lids
- Pear-shaped vessels
- 'Craters/crater-like vessels/pots'
  - kitchen pots
- Bowls
- Cups
  - goblets
- 'Biconical/sphero-conical vessels/amphorae'

These types were subdivided into subtypes, variants and size classes which whenever possible (depending on the data obtained) were analysed (the typology of vessel shapes is presented in the Appendix 8).

As for the sites, at our disposal are data from nine settlements, which are ascribed to different groups and phases of Tripolye (see Appendix 9). Five settlements – Talianki, Maidanetske, Moshuriv 1, Dobrovody and Chichirkozovka belong to the Tomashovka group, one – Pishchana – to the Nebelivka group, one – Kosenovka – to the group with the same name, and two – Moshuriv 3 and Sharin 3 – to the type of Kochergintcy-Shulgovka (or the third phase of the Kosenovka group). There are also differences in the amount of data. The most representative is the site Talianki. There are ceramics from three houses in Pishchana. There are finds from different objects (pits, *ploshchadkas*) from Sharin 3. All other sites are represented by finds from only one house each.

Site, house	*LT1*	*LT2A*	*LT2B*	*LT2C*	*LT3*
Pishchana 1	2				
Pishchana 2	2		1		
Dobrovody 4	2		1		
Maidanetske				1	
Talianki 19		1			
Talianki 25				1	
Talianki 45		1			
Talianki 35					1
Talianki 29	1			1	
Talianki 30		1			
Talianki 37			1		
Talianki 41		1			
Chichirkozovka 1		1			

Table 49. Types and subtypes of lids, where the background colour shows the chronological sequence according to radiometric dating (no date for Chichirkozovka).

Lids

Let us have a look at the available data on the lids from the Tripolye sites of the Sinyukha basin.

There are 21 lids in our collection, 18 of which have been attributed to one or another subtype (the rest are represented by being devoid of characteristic features in the fragments and two by poor quality photographs). This can hardly be connected with the state of the data (when, for example, not everything is drawn/published) since, for example, in Talianki, ordinarily there are no more than one or two lids at one *ploshchadka*, and often there are no lids at all. Except for the total number, which is small, as can be seen from Table 49, there is practically no connection between different types and settlements/houses.

Regarding the typology of the lids, three basic types and three subtypes of the second type have been distinguished (Appendix 8, pl. 2):

LT1 – ‘helmet-shaped’ lids, which look like overturned bowls with a corolla smoothly bent outwards and a roundish bottom; because of the fragmentation of the material and the small quantity, a more detailed division has not been made.
LT2A – ‘cup-like’ lids, low (squat) without a high cylindrical handle.
LT2B – ‘cup-like’ lids, with a high cylindrical body (handle), with a flat top and a rib inside, where the ‘handle’ comes to the bottom.
LT2C – ‘cup-like’ lids, with an average cylindrical body (handle), without a rib inside, where the ‘handle’ comes to the bottom.
LT3 – lids which look like overturned deep conical bowls with a small handle; at the top of these, there are mouldings in the form of small cones (‘horns’) with holes. Similar lids (especially handles) are common on the sites of Final Tripolye (C2), for example in the Vykhvatintsi and Usatovo groups.

From Table 49 it can be seen that most ‘helmet-shaped’ lids are found on older sites – Pishchana and Dobrovody – and the ‘cup-like’ ones at the later settlements. Moreover, the types LT2A and LT3 are found only at Talianki. It can be seen that the ‘cup-like’ lids with a high cylindrical body prevail on earlier sites (LT2B), the ones with a ‘middle’ body occupy an intermediate position (LT2C), and the ‘cup-like’ lids without a cylinder (LT2A) are more characteristic of later contexts (Talianki, houses that date from the second half of the existence of the site). Type LT3, which was supposedly actively developed at the sites of Tripolye C2 (but not in our region) also originates from Talianki (*ploshchadka* 35, where such a lid has been found, is attributed to both phases of the settlement).

Site, house	PST1	PST2	PST3	PST4
Pishchana 1	2			
Pishchana 3	3			
Maidanetske			1	
Dobrovody 4	1	1		
Moshuriv 1				1
Talianki 42			1	
Talianki 45			1	
Talianki 35			1	
Talianki 2	1			
Talianki 33		1		
Talianki 28		1		
Talianki 36			1	
Talianki 31			1	
Talianki 1	1			
Talianki 26		1		
Chichirkozovka 1		1		

Table 50. Types and subtypes of pear-shaped vessels. The background color shows the chronological sequence according to radiometric dating (darkest grey indicates contexts without a date).

Pear-shaped pots

The collection of pear-shaped vessels in this work comprises 22 items. It is the pear-shaped vessels that are associated with those for which the clay lids known to us were used. In this regard, it is interesting that the number of both types of ceramics that are available for working on is comparable, 22 and 21 pieces respectively.

As in the case of the lids, the number of this type of vessel does not occur frequently enough for CA. Despite this, it is still possible to trace some trends in the development of the subtypes of these vessels.

In total, four subtypes of pear-shaped pots have been identified (Appendix 8, pl. 4):

PST1 – with a high neck and straight rim, with sloping shoulder, coming into a rounded (spherical) belly.
PST2 – with a medium-height neck, the rim inclined inwards and a spherical-conical belly, the shoulder is slightly more horizontal than in the previous type.
PST3 – with a low rim zone inclined inside the vessel, the rim is almost the shoulder extension; the belly is biconical.
PST4 – with a high rim, clearly separated from the body, almost horizontal shoulder and pronounced biconical belly. Compared to the first subtype, this one has fairly squat proportions.

Thus it is possible to trace the evolution from more elongated vessel shapes with roundish bellies to more low and biconical forms (tab. 50). In addition, there are more pear-shaped vessels on the earlier sites than on the later ones. At the same time, for example in the settlement of Pishchana, these vessels are archaeologically whole, and in Talianki often only fragments are found. Pear-shaped vessels are not found at the sites of Final Tripolye (C2) in the Sinyukha basin.

'Craters/crater-like vessels/pots'

Our samples consist of about 80 vessels from eight sites, which represent both the earlier (Pishchana) and the later ones (Sharin 3) in the region. Fifteen subtypes have been distinguished within this category of vessel (Appendix 8, pl. 4). Three subtypes (CR1, CR2 and CR15) are characteristic only of Pishchana (CR15), Kosenovka (CR2)

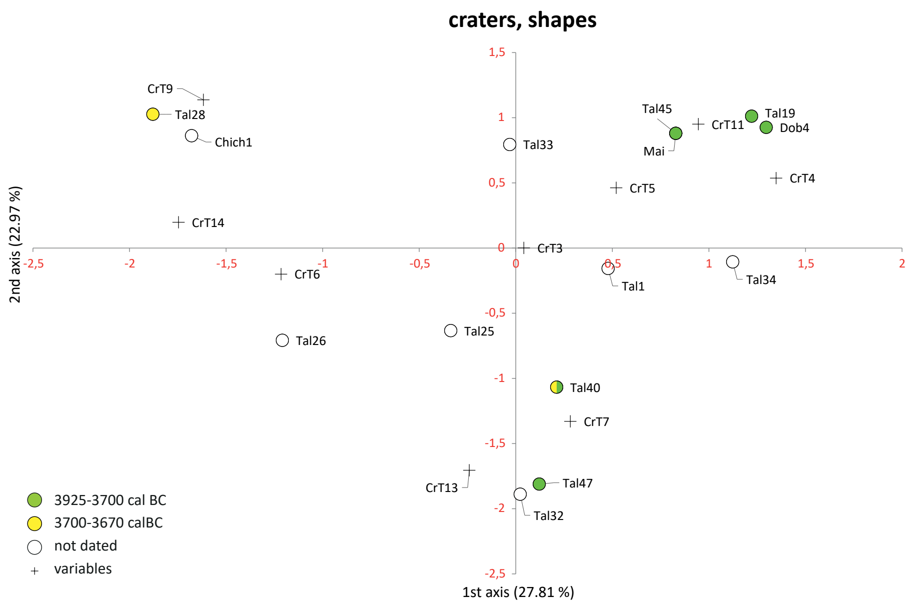


Figure 80. Sinyukha region. Ordination diagram of the CA which analyses morphological sub-types of 'craters' at the level of house inventories.

and Sharin 3 (CR1), and no other 'crater' subtypes have been found in these settlements (for an example of these subtypes of craters see the Appendix 9, pl. 50:1-2; 55: 10, 11; 60: 4). So they automatically dropped out of the CA. Thus the sampling group contains only the vessels from the Tomashovka group.

The graph obtained as a result of CA (fig. 80) showed that different objects and subtypes make up a parabola-shaped agreement with massive right part. The mapping of different chronological phases within the ordination diagram showed that this arrangement could have a chronological character. In principle, the type development repeats the Talianki one, where vessels with a high clearly defined 'neck' (Cr3-Cr6) develop parallel to other big groups (without clear 'neck'). It should be emphasised that the tendency to the gradual lengthening of the neck observed in Talianki could be further demonstrated: thus, in Kosenovka craters, the neck is even longer than in Talianki, and in Sharin pots the 'neck' is the longest. At the same time, in Pishchana, which is chronologically earlier than the Talianki site, no craters with 'neck' are observed. All other tendencies are the same as in Talianki (see Part 3).

Let's have a look at *'kitchen' pots.* In general, the distinctive feature of their forms, as in the case of 'craters', is a wide opening whose width almost equals the width of the belly, which is, among other things, very high, being in the highest quarter of the vessel.

Our sampling is based on about 150 vessels. About 20% could not be attributed to a specific subtype because of their fragmentation or poor quality of the picture. Significantly, this type has been found in all the settlements that were selected for the analysis. However, the kitchen pots from Kosenovka are represented by only a few fragments that could not be compared with other subtypes. The subtypes from the settlements of the Final Tripolye layer (Kocherzhintsi-Shulgovka type) (KPT12-KPT115) make up a separate group that is not connected with other subtypes singled out for the earlier sites. A total of 16 subtypes have been singled out.

It should be noted that it was extremely problematic to compile a typology for this type of ceramic since, in principle, each pot is characterised by some of its own individual features, and most similarities are observed among the pots from the same house. The defined subtypes reflect the specifics of the upper part of the vessel in combination with a common profile. The graphs compiled (fig. 81 and fig. 82) do not show clear distributions by subtypes; however, some trends can be observed.

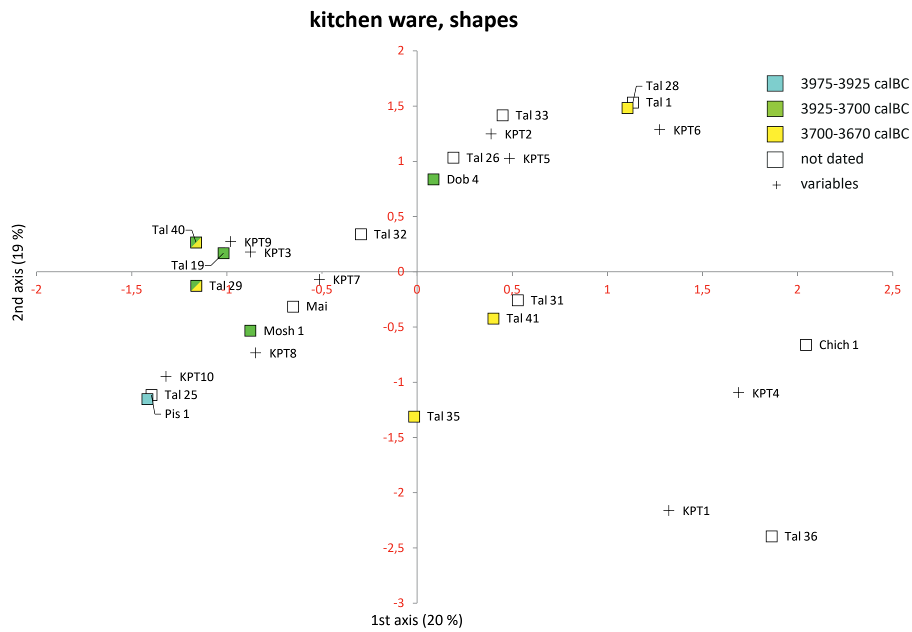


Figure 81. Sinyukha region. Ordination diagram of the CA which analyses morphological sub-types of kitchen pots at the level of house inventories.

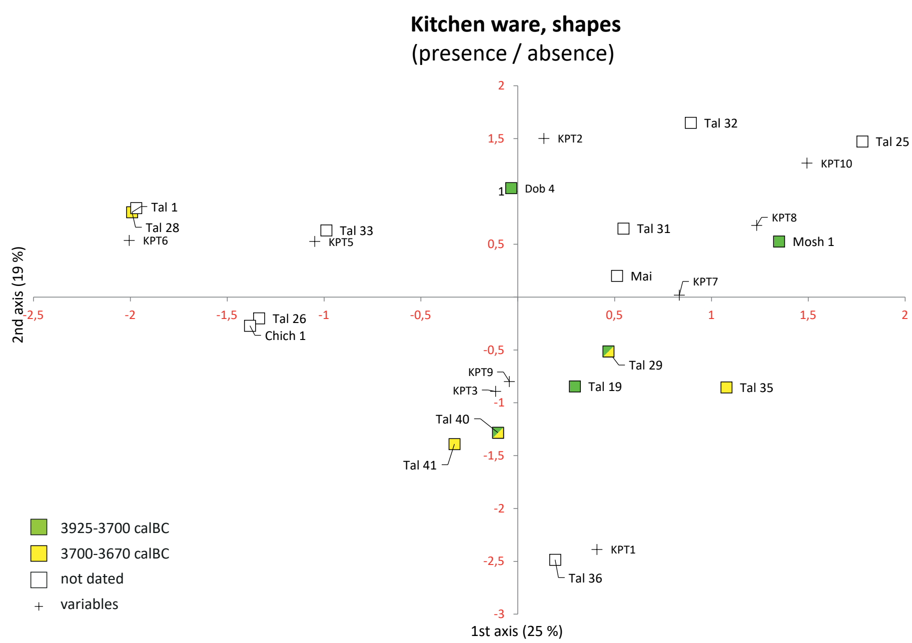


Figure 82. Sinyukha region. Ordination diagram of the CA which analyses presense/ absense of morphological sub-types of kitchen pots at the level of house inventories.

Figure 81 shows the position of the earliest site (Pishchana) on the left, followed by earlier houses from Talianki (19, 29 and 40; the last two houses are attributed to both phases of Talianki's lifetime, despite the late date) and Moshuriv 1. House 4 from Dobrovody is located nearby, and then there are later *ploshchadkas* from Talianki. A separate group is formed by house 36 from Talianki and house 1 from Chichirkozovka. If we assume that the graph reflects the chronological development of different subtypes from the figure's left to the upper right corner, this will indicate with regard to the forms of kitchenware that generally poorly profiled pots with a straight or corolla bent slightly outwards are characteristic of both early and late sites. However, profiled types developed from the KPT7 subtype with a steep shoulder and a rim bent distinctly outwards to a strongly profiled KPT5 with a rim bent sharply outwards, an S-shaped profile and a large round shoulder.

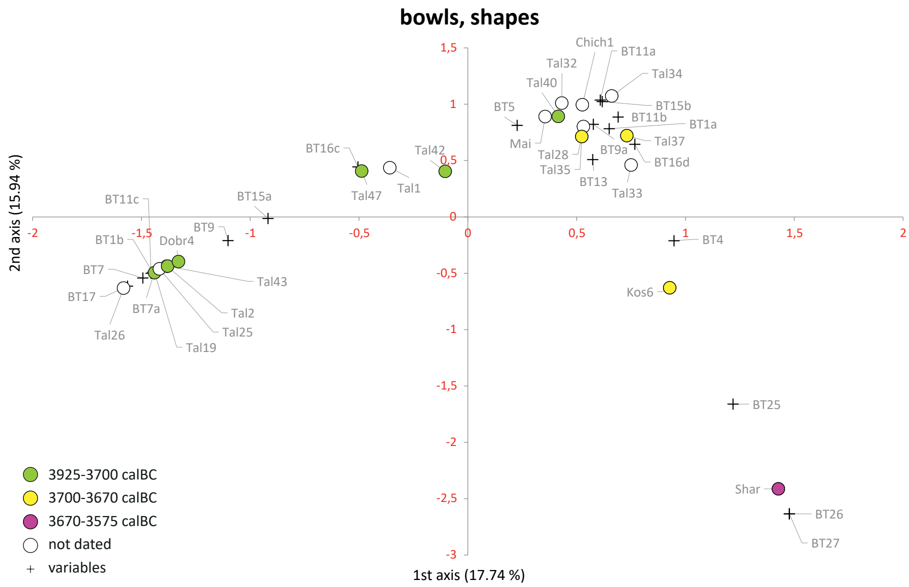


Figure 83. Sinyukha region. Ordination diagram of the CA which analyses morphological sub-types of bowls at the level of house inventories.

A similar tendency can be observed if we simply look at the presence/absence of a subtype among different houses (fig. 82) instead of the number of a certain subtype of finds. In this graph, the earlier houses are placed in the upper right quarter, and the later ones at the bottom and on the left. Here, also, slightly profiled vessels are characteristic of late and early types, but profiling is gradually developing over time. To this is added the tendency towards belly biconicality (biconical subtype KPT6 and subtype KPT9 tending to biconicality).

Bowls

The sample amounts to about 170 bowls, of which 16% could not be attributed to any type because of the fragmentation of the material. A total of 27 subtypes and variants have been defined. In the ordination diagram of CA (fig. 83) subtypes and objects form a parabola-shaped agreement with weakly developed right end. When the objects were correlated with absolute dates, it turned out that such an arrangement reflects chronological tendencies, since the oldest objects are located at one end of the parabola, the and the other youngest at the other. In the centre is a large group which includes houses that date between late and early ones.

In general, the development of shapes of bowls is characterised by the same trends that have been described for Talianki (see Part 3). However, since other sites were added, now younger houses (Shirin 3 and Kosenovka settlements) are characterised by the further development of shapes. So there are bowls with a marked bottom (with a ledge – a subtype of BT25) and deep spherical bowls with handles (BT26). Since the subtypes BT1, BT15 and BT16 were common to later and earlier houses, variants that turned out to be chronological were identified in them. The BT15 subtype develops from the variant with the rounded end of the rim (BT15a) to the variant with the sharp rim end (BT15b). The BT1 subtype develops from bowls with zoomorphic application where only the animal's head (BT1b) is present to the variant where the animal on the zoomorphic application has a neck (BT1c). It should be noted that there is no zoomorphic application in a bowl from Pishchana (the same subtype).

Cups

During the work on this category of object, in contrast to the work on the chronology of Talianki, goblets and cups were brought together into one type. There is no

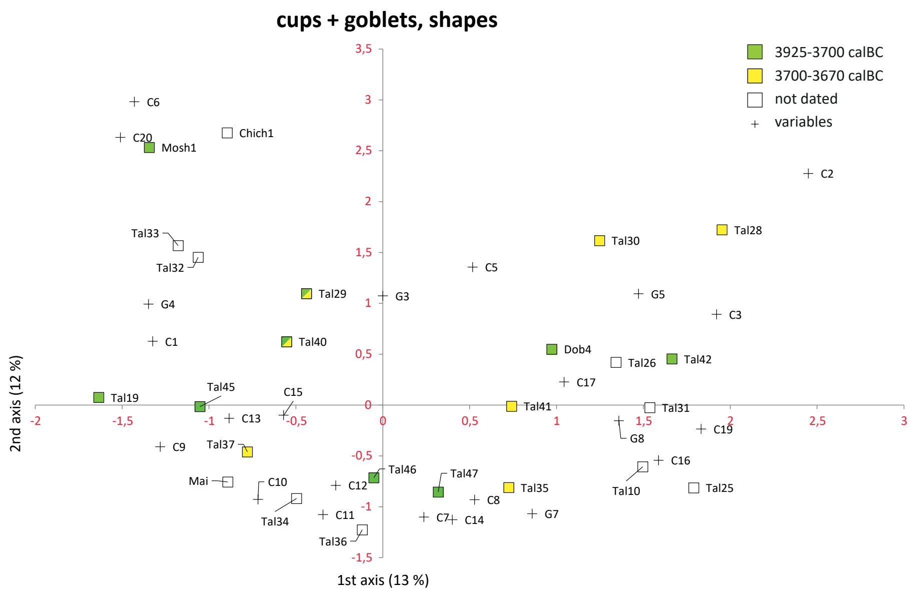


Figure 84. Sinyukha region. Ordination diagram of the CA which analyses morphological sub-types of cups and goblets at the level of house inventories.

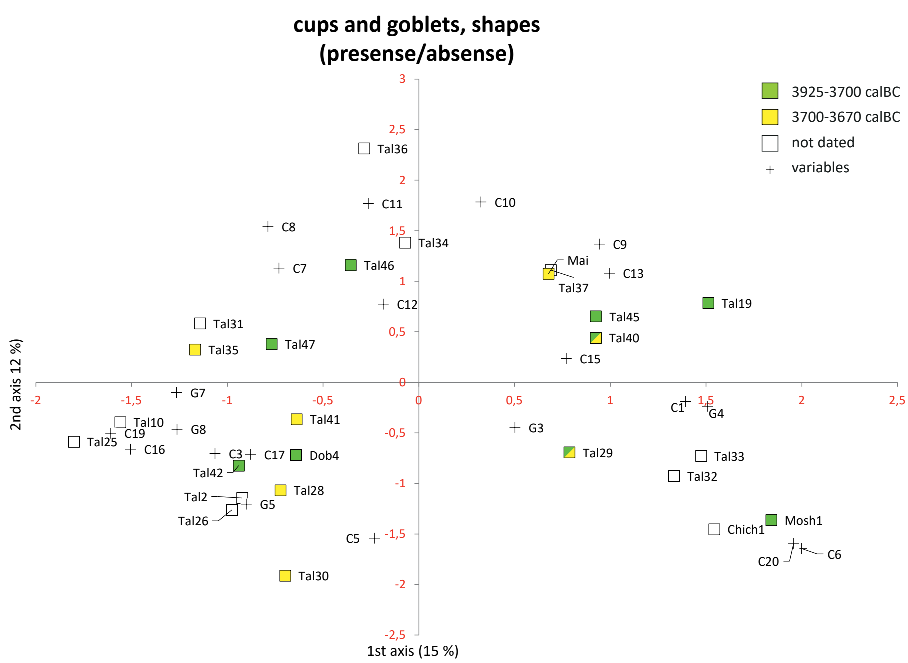


Figure 85. Sinyukha region. Ordination diagram of the CA which analyses presense/absense of morphological sub-types of cups and goblets at the level of house inventories.

essential difference *in the profiles* of goblets and cups; there are more distinctions in their size and volume.

During the work on the typology, the subtypes were defined on the basis of metric measurements and differences in vessel proportions.

The total sample included 88 goblets and 130 cups. They were subdivided into subtypes – 20 for goblets and 26 for cups. CA resulted in two graphs (fig. 84), which show agreement in the form of a thickened parabola. Adding the dates for different objects to the ordination diagrams showed that there is no consistent pattern in the distribution of older and younger houses; the same picture is observed when we analyse the presence/absence of one or another type of cup for each house (fig. 85). In the contemplation of the placement of different types of vessels within the ordination diagram, it was also not possible to trace any tendency in the de-

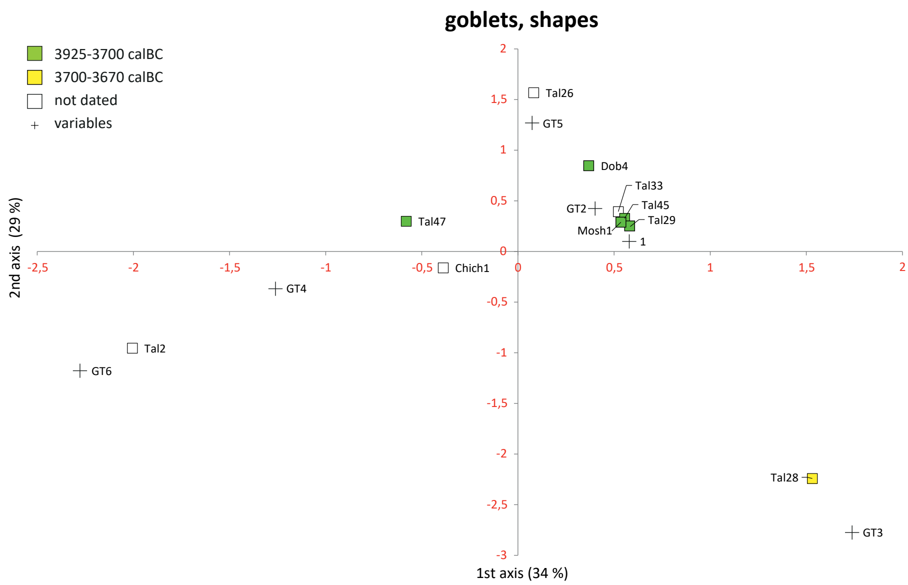


Figure 86. Sinyukha region. Ordination diagram o of the CA which analyses morphological sub-types of goblets at the level of house inventories.

velopment of forms. The combinations of some subtypes or their exclusion are not reflected in the results.

All this makes us wonder why it is the cups that do not give any results. There may be different reasons for such a situation. Let us again look at goblets and cups separately since goblets and their evolution are known for almost all Tripolye periods and the category of vessels, which in this work are called cups, is exclusively characteristic of the Tomashovka group.

So the fact that the cups do not show clear patterns in the development of the forms can be explained, firstly, by the fact that the proposed typology is too detailed and the differences in forms are just variations of synchronous subtypes! Secondly, the situation with the cups may be to some extent a more extreme reflection of the overall picture regarding the ceramics of this period (3900-3650 BCE), which is extremely difficult to analyse (see below for reasons). In addition, as already mentioned, cups are quite a specific type.

Observations during excavations of Tripolye *ploshchadkas* show that ordinarily cups are found both inside the house (on the floor, on *ploshchadkas*) and under the platform, that is, under the living room. Thus some cups can be associated with earlier actions (periods) in the house's lifespan, and some with later ones. Since we do not have data on the taphonomy of the ceramics analysed in this work, it is not possible to separate these cups. It is also important to note that the decoration of these vessels differs from the decoration of other vessels, and not only due to the simplicity of execution (a combination of several horizontal lines and groups of oblique strokes), but also very often due to the characterisation through carelessness, 'poor quality'. The quality of the clay vessels itself is also not the best (at least in modern perceptions) in comparison with other Tripolye pots. The cups are often much more thick-walled, the surface of some cups is poorly smoothed, and the vessels are manufactured quite carelessly. The volume of these vessels is very small, which may indicate that they were not very functional. The above observations make it possible to suggest the 'one-time' use of the cups for certain purposes, when the vessel quality did not matter (feasting?). However, these are just reflections.

Goblets

The goblet morphology graph has been obtained as a result of CA (fig. 86). As in most of the previous cases, the subtypes defined for Pishchana and Kosenovka do not have common points of contact with the Tomashovka goblets.[47] Some of the other defined subtypes fell away because of the small number of samples. The remaining six subtypes in combination with the objects from which they come formed a parabola-shaped agreement in the ordination diagram of the first two axes. Since there are older houses in the centre of the parabola, a young house (from Talianki, 28) in the lower right part of the graph, and also house 47 from Talianki (which was attributed to one of the oldest houses of the settlement) on the left side of the parabola, it was concluded that this tendency in the distribution of goblet types on the graph is chronological.

Indeed, if we look at the distribution of different subtypes, then a clear tendency and logic in the evolution of these pots is obvious. The evolution can be seen in the gradual 'raising' of the goblet bellies. So on the left side of the graph there are vessels with the widest part of the vessel below the centre or with the belly in the middle, in the centre there are subtypes where the belly is slightly higher than the centre of the goblets, and in the lower right there are the pots with a high belly. This tendency is also accompanied by the development of forms from more low to more high and elongated ones.

If we look at the goblets from Pishchana, both defined subtypes have a very low belly, which is located in the lower quarter of the vessels (for an example of these subtype of goblet see the Appendix 9, pl. 50: 3-5). This also supports the general tendency. Speaking about goblets from Kosenovka (for an example of these subtype of goblet see the Appendix 9, pl. 55: 1-6), it is important to note that they have very different proportions: the belly is situated below the vessel's centre and they are very 'elongated'.

'Biconical/sphero-conical vessels/amphorae'

This is a fairly large category of vessels. Our sample consists of about 190 pots with a complete or almost complete profile (as well as numerous fragments whose specific forms are not observed and so have not been used). During work on the typology of these vessels, different variants of its categorisation were tried, including metric measurements and consistent patterning of their grouping. However, the most effective method turned out to be the division of the material based on the profile, including the height of the belly, the position and shape of the shoulders, as well as general parameters (that is, the division into 'low', 'elongated' and the vessels between these two variants, where the parameters were determined by the ratio of the height to diameter of the belly).

All the vessels were divided into 17 subtypes and variants, based on the criteria described (Appendix 8, pl. 5). Amphorae were distributed among different subtypes. As with most of the previous analyses, the subtypes in which most vessels were from Pishchana, Kosenovka, Sharin 3 and Moshuriv 3 fell out of the analyses.

The ordination diagram of the first two axes of the CA showed that different objects and subtypes formed a parabola-shaped agreement (fig. 87). Putting the dates for dated objects on the graph showed that it reflected chronological development, since the oldest Talianki houses 47 and 19 are located in the upper left part, and younger Talianki houses in the upper right part. In the middle, lover part there is a mixed group with objects dated earlier and later. Turning to the ceramics, one can see a parallel development of both biconical and sphero-conical forms. In general, the development in shape that was traced in Talianki repeats itself here (see Part 3). The same is the case when we look at the development of 'zone decorated' bi- and sphero-conical vessel shapes (fig. 88). So adding data

47 This type of ceramic is not typical of the sites of the Kocherzhyntsi-Shulgovka type, and in particular the sites of Moshurov 3 and Sharin 3.

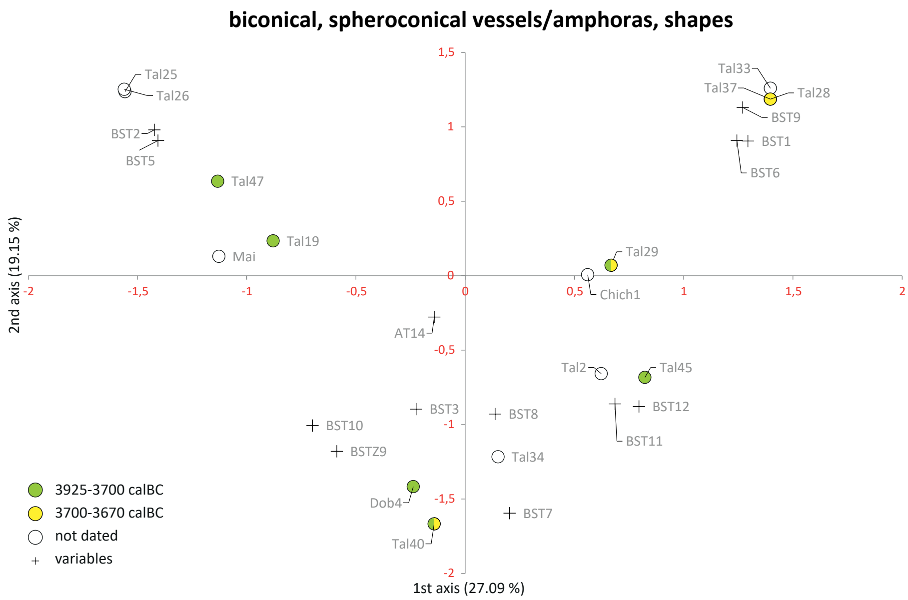


Figure 87. Sinyukha region. Ordination diagram of the CA which analyses morphological sub-types of 'biconical/sphero-conical' vessels at the level of house inventories.

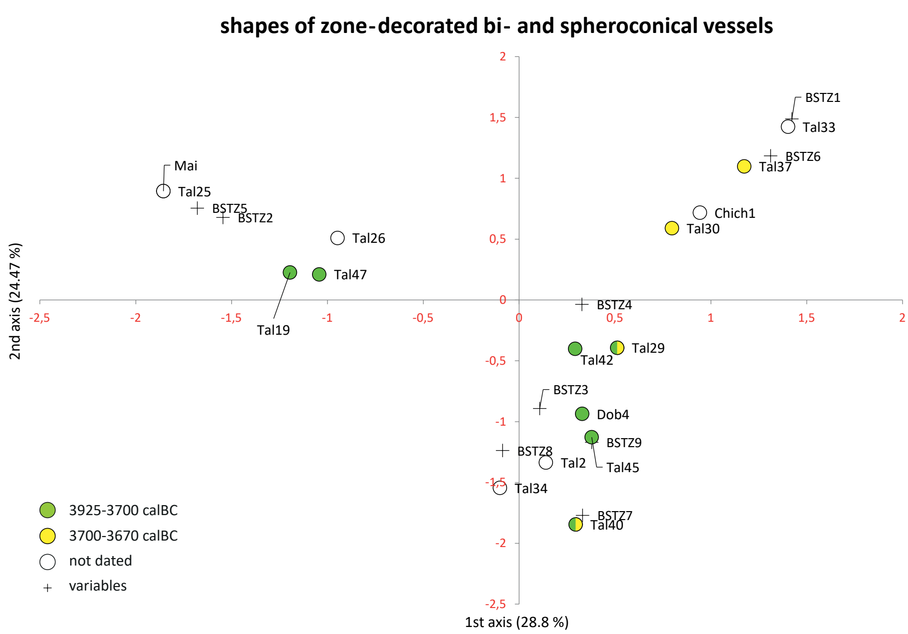


Figure 88. Sinyukha region. Ordination diagram of CA which analyses combinations of morphological sub-types of zone-decorated 'bi- and spheroconical' vessels at the level of house inventories.

from other settlements to the Talianki data showed that the development observed could also be traced at other Tomashovka sites.

4.3.3.5 Summary

CA showed certain tendencies in the distribution of different subtypes within some basic types, including the chronological ones.

A big obstacle both in working out the typology and conducting CA in principle was the obvious dominance of the material from Talianki. This might be an important factor that could lead to errors, especially in establishing typologies for the ceramics from non-Tomashovka sites. The samples from Pishchana, Kosenovka and later sites were in by far small numbers compared to Talianki. A certain obstacle may be the distinctions between the inventories of different houses, which may reflect functional and/or other differences.

The results that have been obtained can be summarised by comparing them with the list of questions proposed at the beginning of this part. Thus chronological differences in the morphology of different classes of vessels exist and they are especially well seen in different phases of Tripolye (B2, C1) or ‘local variants’, which, in principle, is a generally recognised fact and is not disproved by anyone. To some extent, this is the case with different categories of dishes, eight of which have been analysed. Regarding the difference between the vessels within smaller phases, verification was possible only in the case of the Tomashovka group, and indeed some tendencies in the changes in dishes can be traced (most tendencies are the same as those observed for Talianki, see Part 3):

- In the case of lids, there is a tendency to gradually replace ‘helmet-shaped’ subtypes with ‘cup-shaped’ ones, while the cylindrical lid of the latter becomes shorter over time and practically disappears.
- Pear-shaped vessels evolve from more elongated, rounded in the rib pots to more squat and biconical forms.
- Craters are characterised by a gradual increase in the length of the ‘neck’ in the vessels that have it. In the earlier sites of the Nebelivka group craters do not have such ‘necks’ and at late Kosenovka and Kochergincy-Shulgovka sites craters have the longest ‘neck’, especially in the last group.
- In the case of some kitchen pots, the changes are not so well pronounced, but some of the subtypes become more profiled, and pots with a biconical belly also appear.
- Numerous subtypes of bowls also underwent specific changes; a significant number of them do not show chronological alterations. Some specific subtypes and variants have clearly chronological character.
- It was not possible to trace changes in the cups. However, they themselves are a chronological indicator since they are typical only of the Tomashovka group.
- The development of goblets over time sees a gradual raising of the belly and in the Tomashovka group also the evolution from low to elongated proportions.
- The ‘biconical/sphero-conical vessels/amphorae’ are characterised by the evolution of more squat proportions from more elongated shapes; quite dynamic developments in these vessels are associated with a decoration that is drawn in a narrow frieze, especially with a tangent one.
- In almost all vessel types, the parallel development of different groups within one big type could be observed (‘crater’ types – vessels with a long neck and without it; ‘biconical…’ vessels – biconical and sphero-conical types and groups of vessels with a wide rim; bowls – conical and spherical shapes).
- To conclude, we can say that having examined the ceramic forms, it is seen that goblets, ‘biconical …’ vessels and craters can be considered the more dynamic ones. Bowls and ‘kitchen’ pots have more stable forms, and only some of their subtypes are good chronological indicators.

4.3.4 Capacity

As for the holding capacity of Tripolye vessels, no special studies have been carried out either for our working area or for the vessels from the entire zone. This is a sad gap, since there are all sorts of possibilities for such studies: during the excavation of Tripolye objects, ceramics proved to be the most numerous, and there are lots of whole and archaeologically whole pots among the finds.

An attempt at this kind of research has been made in this work. Vessel capacities have been calculated for the sites **Pishchana**, **Talianki**, **Dobrovody**, **Maidanetske**, **Kosenovka** and **Sharin 3**. All of them are based on pictures of published material

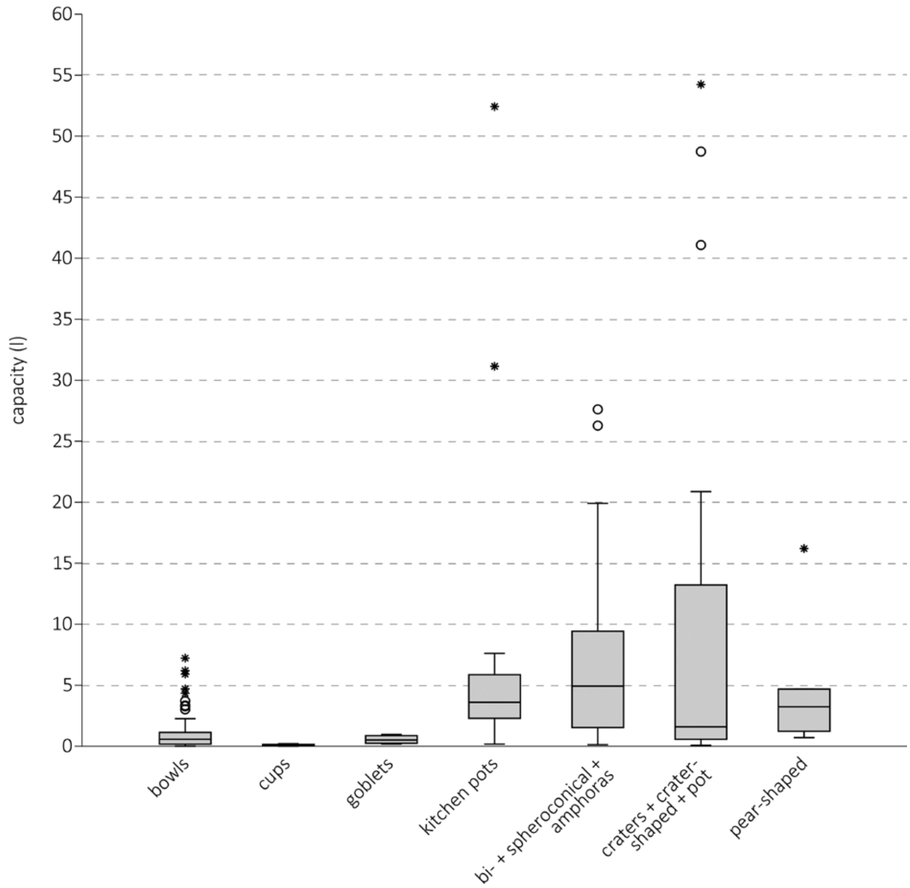


Figure 89. Box plot displaying the capacity of different types of vessels from Talianki.

(Kruts *et al.* 2001; Kruts *et al.* 2005; Kruts *et al.* 2008; Korvin-Piotrovskiy and Menotti 2008; Kruts *et al.* 2009; Kruts *et al.* 2011; Kruts *et al.* 2013; Kushtan 2015; Brandtstätter 2017) and one report (Kruts and Ryzhov 1988). The total sample is 439 vessels, which represent different types of ceramics from the sites of different periods (see Appendix 4). Most ceramic vessels come from Talianki. The samples from other sites are much less numerous, which reflects the state of research and publication.

The calculation of the capacity of each vessel was carried out as follows: first, the vessel was scaled up depending on its size (1: 1; 1: 2, and so on). Then its average radius was calculated (for this, the measurements of the vessel radius and every height inside the vessel were made in centimeteres). After that, the vessel capacity was calculated using the cylinder capacity formula: **V = π r2h**, where **r** is the average radius, and **h** is the height of the object. The capacity of all vessels is given in litres.

The biggest drawback of the analyses performed is that all the measurements, carried out mainly on the pictures in different publications, are based on the *scale* indicated next to the picture. Consequently, a proportion of the calculated capacities may be incorrect or have a certain degree of deviation, since the scale cannot always be accurately calculated, and it is not always clearly stated in the pictures. In further work, including that for writing reports, it would be very useful to introduce a standard presentation for the related information in the tables accompanying the pictures, for example the height of vessels.

In this work, the calculations of the vessel capacities were aimed at clarifying some questions, in particular:

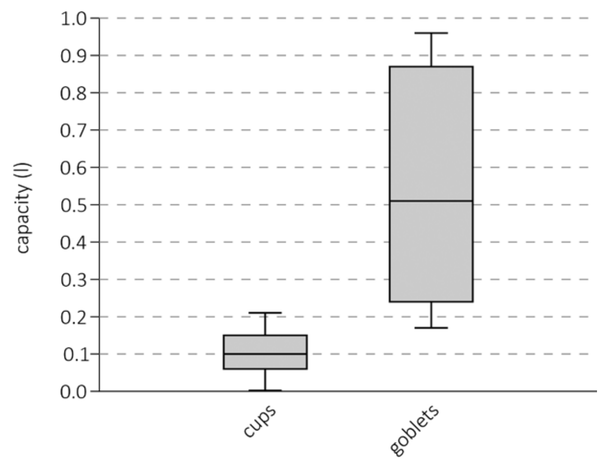


Figure 90. Box plot displaying the different capacities of cups and goblets from Talianki.

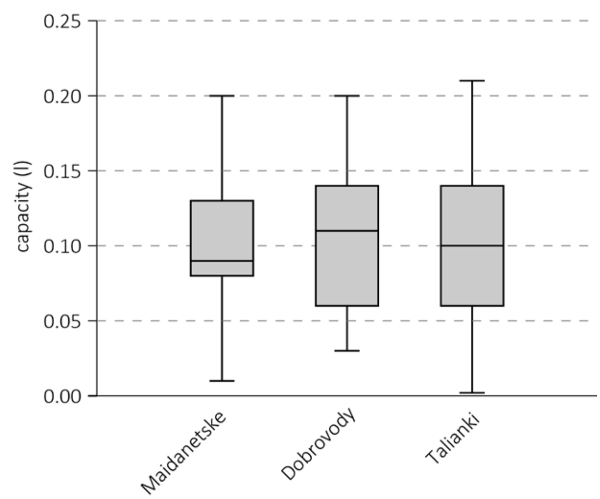


Figure 91. Box plot comparing the capacities of cups from Maidanetske, Dobrovody and Talianki.

- a comparison of possible classes, singled out on the basis of the vessel types and the capacity of vessels, selected according to manufacturing techniques and/or morphology
- the presence/absence of chronological dynamics in this matter
- the presence/absence of differences/similarities in the vessel capacity at the level of different settlements
- the possibility of the capacity calculations shedding light on the question of functionality of certain vessels.

Let's start with the analyses of the data from one settlement – Talianki. Firstly, let's calculate the capacity of vessels of the same type. This seems necessary in order to understand whether there is a kind of connection between a vessel type and its capacity. The division into types is not clear, so the bowls are not divided into conical and spherical, as the number of spherical bowls with data on their capacity is quite insignificant (much less than the conical ones). In addition, there is a separate column for 'kitchenware', as it has been shown that this is a separate, rather specific category of dish, and a separate comparison of its capacity might help in its understanding.

As the box plot shows (fig. 89), bowls, cups and goblets (which are also distinguished as separate types) also make up, by capacity, a separate group that is smaller than all other types (from capacity of less than a litre to mainly 1 litre; the capacity of a number of bowls is greater, up to 7.5 l). The capacity of other types of dishes

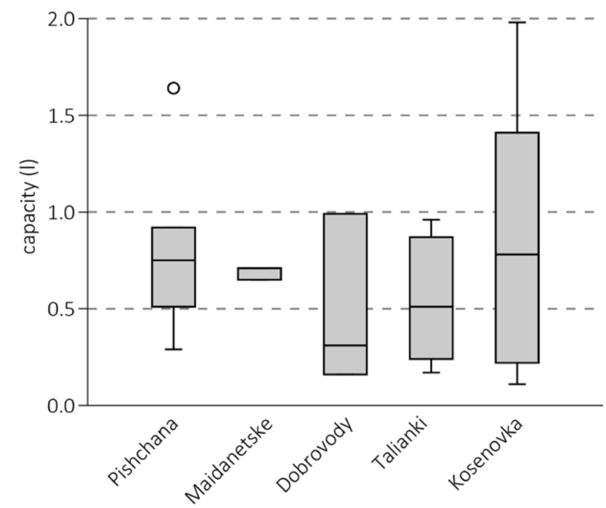


Figure 92. Box plot comparing the capacities of goblets from Pishchana, Maidanetske, Dobrovody, Talianki and Kosenovka.

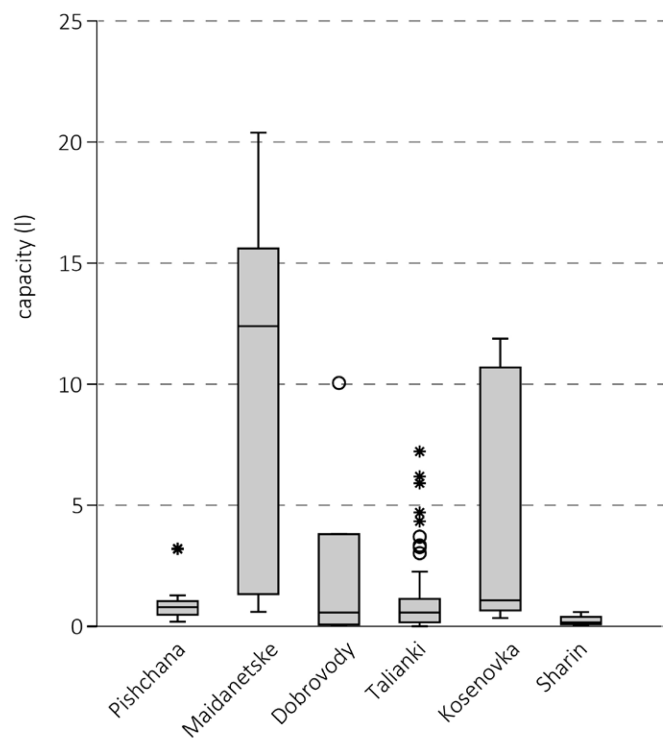


Figure 93. Box plot comparing the capacity of bowls from Pishchana, Maidanetske, Dobrovody, Talianki, Kosenovka and Sharin 3.

('kitchen' pots, biconical/sphero-conical/amphorae, craters/crater-shaped vessels/pots and pear-shaped vessels), all of which belong to one category of 'pot', vary a lot, with the capacity of some vessels up to 55 l. Consequently, this box plot also indirectly gives grounds for the division into basic classes.

Cups and goblets. These types of vessels were placed in a separate box plot (fig. 90), which shows a fairly clear difference between them. Undoubtedly, this can only reflect the situation with the sampling. To calculate the capacity of the vessels, only a small number of this type of ceramic was taken intentionally, since it can be seen from the analysis of the findings from Talianki that there is practically no difference in their sizes. At the same time, there are more drawings of both cups and goblets published than any other types. This is because they are often found unbroken, and therefore the graphic fixation of their drawings does not cause problems (since they do not need to be restored).

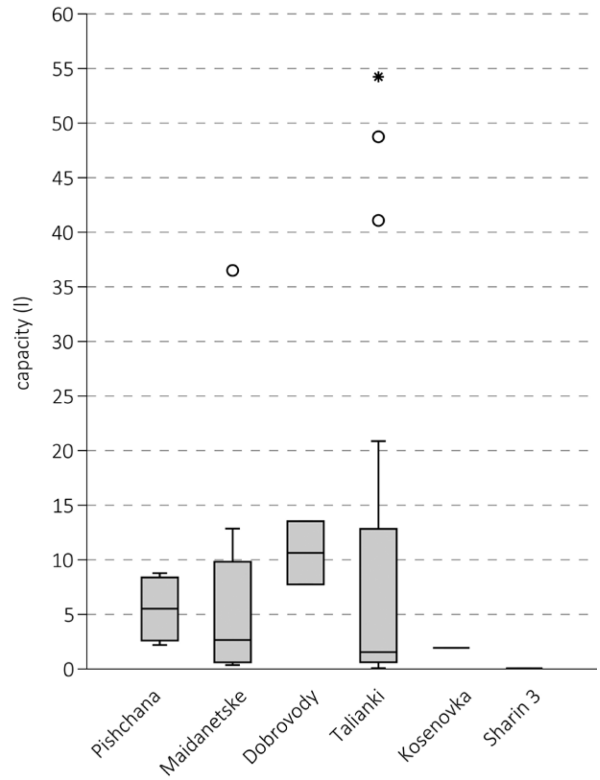


Figure 94. Box plot comparing the capacity of 'craters/crater-like vessels/pots' from the settlements of Pishchana, Maidanetske, Dobrovody, Talianki, Kosenovka and Sharin 3.

Let's place the cups from all the settlements in a separate Figure 91. Here, we will be able to compare the capacity of this type of vessel only from the sites of Maidanetske, Dobrovody and Talianki. This is because this type is typical of the settlements of the Tomashovka group and is less common at other sites.

As the box plot shows, the average capacity of the cups from these sites ranges from 90 to 110 ml. In principle, no difference in the cups' capacities among the three settlements can be seen. Let's have a look at the capacity of goblets.

The box plot in Figure 92 with the data on goblets differs from the previous one and shows certain difference among the sites. However, from Maidanetske, there are only two vessels, making it unrepresentative. The difference among the sites of Pishchana, Dobrovody and Talianki is not so significant: most vessels have capacity of 400 to 800 ml. However, the data on Kosenovka is somewhat different, although the average capacity (median) here is about 800 ml, individual vessels' holding capacity varies considerably. This may be explained by the fact that this vessel type from the sites of the Kosenovka group is very different from those from Nebelivka and Tomashovka.

Thus the only tendency traced in the development of goblets may be the different capacities of these vessels from Kosenovka, which reach 2l cm.

Bowls are among the most widespread ceramic artefacts in Tripolye settlements. This is largely because this type of dish can be 'recognised' with even a small rim fragment, or a part of a wall (since the conical bowls were painted inside). The sample for this type comprises 108 pieces from all the selected settlements.

The box plot on the bowls shows a very varied picture (fig. 93). The most widespread capacity of the bowls from Pishchana, Talianki, Dobrovody and Kosenovka is about 1 l. The data from Maidanetske differ significantly from other sites. The bowls' capacity here is quite large – up to 20.5 l, with most of the bowls having a capacity of 16 l. How can such indicators be explained? Firstly, the sample size from this site is not large, only seven dishes. Secondly, these are the finds from one house, which for some reason could have had large bowls. Thirdly, we cannot exclude an error in the measurements

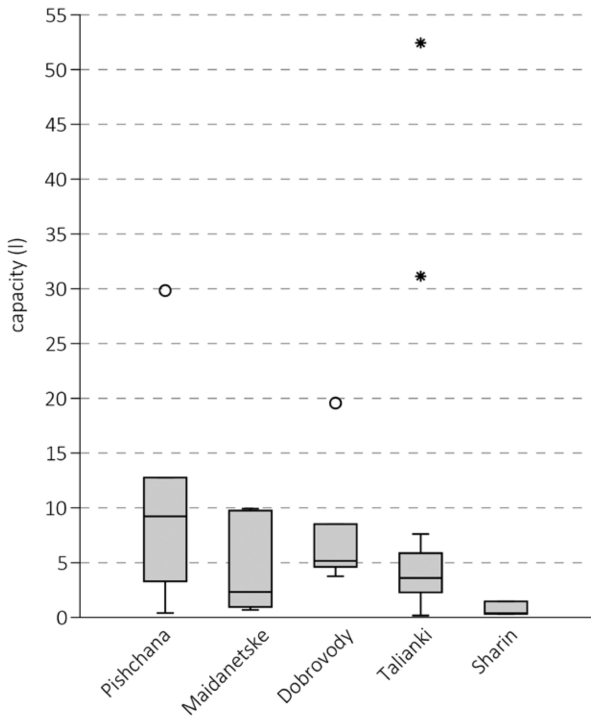


Figure 95. Box plot displaying the capacity of 'kitchen pots' from the settlements of Pishchana, Maidanetske, Dobrovody, Talianki and Sharin 3.

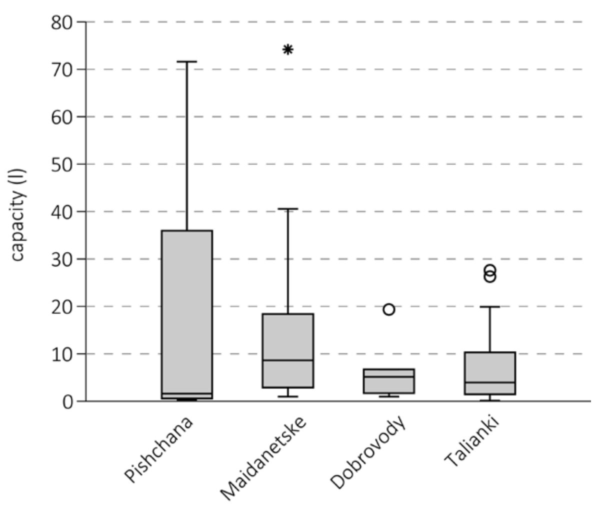


Figure 96. Box plot displaying the capacity of 'biconical/sphero-conical vessels/amphorae' from the settlements of Pishchana, Maidanetske, Dobrovody, and Talianki.

associated with a probable scale inaccuracy in the picture. Analyses of bowls from other Maidanetske houses will most likely modify the data and clarify the picture.

Bowls from Sharin 3 also stand out from the general picture, on the whole they have a smaller capacity, not exceeding 1 l.

Capacities of the vessels of *'crater/crater-like vessels/pots'* also mostly reflect the situation with the sampling.

The number of this type of vessel from Kosenovka and Sharin 3 (one vessel from each) obviously does not make it possible to adequately compare it with the vessels from other sites. The closest comparison in terms of volumes comes from the sites of Talianki and Maidanetske (fig. 94). The sample of crater-type vessels from these settlements is also the largest. With a median of 2-3 l, there are some pots with a very large capacity – more than 35 l. The data from Dobrovody are represented by only two vessels with capacities of 13.7 and 5.5 l. For Pishchana, the capacity of this type of vessel varies between 2 and almost 9 l.

Thus, regarding this type of vessel, the three settlements practically fall out of the comparison, and, as for the rest, the slightly smaller capacity of vessels from Pishchana is potentially observed compared to the Tomashovka group of sites – Talianki and Maidanetske (or rather the absence of very large vessels). As for Talianki and Maidanetske, their data are perfectly comparable, and only one very large crater at Maidanetske could be explained by the fact that for this site there is data on only one house.

'Kitchen' pots were placed in a separate box plot in Figure 95. Here, there are no pots from Kosenovka (as there is no graphic reconstruction).

This graph shows a certain data difference between the settlements. In particular, there is a noticeable tendency towards a decrease in the capacity of 'kitchen' pots from the chronologically earlier site (Pishchana) to the latest one (Sharin 3). At the same time, the vessels of the Tomashovka group are located between them.

The same tendency to a reduction in vessels' capacity is also observed when the *'biconical/sphero-conical vessels/amphorae'* types of ceramics are analysed (fig. 96).

So, for Pishchana, a very large variation from 300 ml to 71.5 l is observed in the capacity of this type of vessel. The average capacity of the pots is about 1 l. In the case of the three settlements of the Tomashovka group, the average capacity varies within 2-4 l, while the biggest vessels practically do not exceed 30-40 l.

Thus a slight decrease in the capacity of this type of vessel over time can be seen. The sample from the settlements represented in the box plot is about or a little more than 10 units, which, in principle, are sufficient for preliminary conclusions. And, if this tendency really reflects a more or less realistic picture at the settlements, then this could by no means be explained by the general decrease in the capacity of vessels from the Tomashovka sites. Firstly, the box plot in Figure 94 clearly demonstrates rather large capacities for vessels of the type 'craters …' from the sites of the Tomashovka group, that is, 'craters' rather than 'biconical … vessels' could have been used for the purposes for which large vessels were needed. Secondly, in the ceramic assemblages from Tomashovka type settlements, there is a specific type of vessel (perhaps a new one, according to Shumova 1988), the so-called pithos (plural pithoi) – 'a large storage container' type of vessel. Such vessels are 70-120 cm high, with walls 3-5 cm thick, and pear-like in shape, made of the paste which is similar in composition to the clay paste used for wall coating (Kruts *et al.* 2001, 37-38). Usually, the remains of this type of vessel are represented only by a few fragments, and in principle their existence could raise doubts as to whether they were not part of the house interior in open models of buildings.

Results

Summarising the analyses of the capacities of vessels from some Tripolye settlements in the Sinyukha catchment area, we can say that, despite the rather contradictory results, it is possible to come to certain conclusions.

In general, the majority of Tripolye vessels measured have a small capacity of several litres. Of course, we should make a reservation that the restoration of large vessels, unlike that of small vessels, is labour- and time-consuming, and the latter were most likely drawn (and therefore measured and analysed) in much smaller numbers.

The vessels of the Tomashovka group have the biggest uniformity in capacity, and the vessels from Nebelivka group (Pishchana) show similar characteristics. The vessels from Kosenovka stand a little apart and the biggest distinctions are observed for Sharin 3 ones. On the whole, the vessels measured from Sharin 3 are of a much smaller capacity.

It should be noted that the exclusion of certain vessel types from one or another of the settlements from the graphs is often explained by the absence of this type of vessel at the settlement. So the cups are mainly characteristic only of the Tomashovka group, and goblets have not been found at the Sharin 3 site. Pear-shaped vessels

	68.2%	95.4%	Highest	Sites
Start Tripolye A	4561-4482	4632-4461	4520	
Tripolye A			70 years	Grebenyukiv Yar
End Tripolye A	4489-4402	4515-4333	4450	
Hiatus? No data			375	
Start Tripolye B1/B2	4163-4064	4236-4047	4075	
Tripolye B1/B2			110	Chizhivka, Vesely Kut
Transition Tripolye B1/B2→B2	3973-3956	3982-3920	3965	
Tripolye B2			155	Vladimirovka, Pishchana, Nebelivka, Maidanetske 1-2
Transition Tripolye B2→C1	3818-3805	3827-3798	3810	
Tripolye C1-1			105	Moshuriv 1/Dobrovody/Talianki 2/Maidanetske 3/Nebeliva Latest
Transition Tripolye C1-1→C1-2	3712-3698	3719-3691	3705	
Tripolye C1-2			35	Talianki 3/Kosenovka/Maidanetske 4
Transition Tripolye C1-2→C2?	3685-3658	3693-3649	3670	
Tripolye C2?			95	Sharin 3, Talianki Late, Kosenovka Late
End Tripolye C?	3617-3535	3631-3480	3575	

Table 51. Chronological model for the working area.

are not typical of the Kosenovka group and of the sites of the Kochergintcy-Shulgovka type. In general, the range of forms (which could be compared with the vessels from earlier settlements) from Sharin 3 is much poorer. In addition, in Kosenovka and Sharin, there are a number of vessels that were not included in the description due to the lack of analogies in forms with other analysed sites, that is, there is no gradual evolution of some ceramic types that could be traced on earlier sites.

Regarding the capacity of vessels on different sites, it can be seen that no distinction in the capacity of cups has been observed. As to the type 'goblets', the vessels from Kosenovka stand apart. A possible decrease in the capacity of 'kitchen' pots and 'biconical…' vessels could be traced that might have different explanations. In the case of the 'kitchenware', this may reflect a possible gradual evolution in the use of these types of vessels, and, in the case of 'biconical …' vessels, it might be explained by the probable replacement by other large vessel forms such as craters or 'pythoi'. The bowls do not show any tendencies that could be explained by their poor sampling.

As a conclusion, it is clear that further research in this direction may be promising, but for better results complete ceramic assemblages should be analysed, preferably from several houses (objects) of one settlement. For example, the best results have been obtained with the data from Talianki. In addition, a significant advantage to contribute to further work would be obtained from listings with indications of at least one metric index (for example, height), since many deviations in analyses can be caused by incorrectly calculated vessel sizes.

After the grouping of the ceramics according to different criteria and a description and analysis of the groups with the use of various analytical tools and techniques, a number of results have been obtained. Now let's turn to the interpretation of the information obtained.

4.4. Interpretation and conclusions: Tripolye development

Let us focus on the questions raised at the beginning of this part. The main ones were revising the existing relative chronology and building a chronology based on the available data.

As shown by the radiometric dating analysis, the basic phases of the development of Tripolye in the region is generally confirmed. So the Early Tripolye site Grebenyukiv Yar is chronologically the very first, followed by the sites of Eastern Tripolye stages B1 and B1-B2, which are replaced by settlements B2 and C1. However, not everything is so clear with the sites of Tripolye C2. If we look at a more detailed phasing within these large periods, then certain problems arise. In addition, the model regarding the 50-year life duration of a mega-site, evidently, should be reviewed as well.

Let us have a look at the chronological model constructed (tab. 51) and how it agrees with the ceramic data.

So Early Tripolye 'A' is represented by only one site and only four dates, which, however, are in good agreement with each other. According to the relative chronology, the site is dated to 'Classic or Middle Early' Tripolye A3 1-2-Precucuteni 3 (Burdo 2001, 63); this suggests a later date than that of, for example, the site Bernashivka 1 (Tripolye A2, 1, according to Burdo, in Videiko 2004a, 86).

Bernashivka 1 is considered to be the earliest known Tripolye site on the territory of modern Ukraine (Chernovol 2016, 20). There are five radiocarbon dates for the site (Rassamakin 2012, 37), of which one was obtained in Oxford, four dates obtained in the Kiev laboratory of which two are 'old' (see part 2), showing the middle of the 6th millennium BCE, which, based on the modern understanding of Tripolye chronology (*e.g.* Harper 2013) does not correspond to reality. The other three dates were obtained from Chernovol's excavations in 2009. Modelling these last three dates gives very conflicting results. Rassamakin even considers one of the dates to be absolutely unacceptable (Rassamakin 2012, 23). Nevertheless, the modelling of these three dates demonstrates that the beginning of Bernashivka can be attributed to 4884-4557 cal BCE (68.2%) with the highest probability of 4700 cal BCE, and the end to 4414-4022 cal BCE (68.2%), with the highest probability of 4255 cal BCE. Thus the dating becomes broader. If we exclude the dates obtained at the Kiev laboratory and leave one Oxford date (which is the oldest) out, the dating is 4686-4586 cal BCE (68.2%). However, this date was obtained from charcoal, which cannot exclude the old wood effect, since other Kiev dates are later. Thus several conclusions can be drawn from this: Bernashivka, according to the absolute dates, is either slightly earlier or contemporaneous with Grebenyukiv Yar; the latter site has very well-matched dates compared to other early sites, including Bernashivka, which in principle do not contradict the data on the relative chronology.[48]

In our model, Grebenyukiv Yar is followed by a 'gap' that might be explained both by the lack of data and a real chronological pause in the Tripolye period in the region. The latter is also noted by the authors (*e.g.* Burdo, in Videiko 2004a, 86). In addition, after a pause at the end of stage A, a number of B1 Eastern Tripolye sites appear in the Sinyukha basin, which can partially fill this chronological gap.

After that there are two 'Eastern Tripolye' sites, which date from stage B1-B2 (Vesely Kut) and either the end of B1 or the beginning of B1-B2 (Chizhivka). The dates obtained for these settlements do not give any possibility to convincingly trace their sequence. This is also true of the ceramic complex. For this reason, they make up one chronological layer.

The next step is represented by a large group of dates and settlements of three local groups – Vladimirovka, Nebelivka and Tomashovka. The dates for these settlements agree very well, but the duration of this phase is quite long – 155 years according to the highest probability. This may be due to the plateau on the calibration curve. However, even this time period is clearly not enough to 'fit it into' the missing phases of the relative chronology – the first and third of Vladimirovka, the second of Nebelivka, and the first and second Tomashovka groups. Based on the

48 Hereinafter, in view of the absolute inconsistency, the dates obtained in the Kiev laboratory are not involved in the discussion.

traditional general perception, the duration of such a phase should be 50 years (see next part). In total, at least 150 years have fallen out.

Another problem is the apparent lack of chronological sequence, according to the existing relative chronology. According to it, the site Vladimirovka should be earlier, and Nebelivka and Pishchana (which are attributed to the same phase) later. Moreover, they can be not only sequential, but also partially synchronous (Ryzhov 1999; Diachenko 2012). However, the structure of the dates obtained shows that the objects from Vladimirovka, with a more optimistic attitude, are synchronous with Nebelivka and Pishchana, and with a more detailed one, even later than Pishchana and the beginning of Nebelivka. If we turn to the ceramic data, then we will see no significant difference either in shape or in decoration and technology (see, for example, fig. 65-68). And if we look at the extent to which the sites of these groups have been studied (see tab. 19), we get the impression that the chronological sequence of these groups is just a construction and the distinctions noted in the material are of a different nature (territorial differences, specificities of contact zones, etc.).

The datings from Maidanetske and Talianki date the earliest traces of activity at the mega-sites: in Talianki the pottery kiln in the southern part, the cultural layer of the settlement under house 50 and house 47 in the northern part; and in Maidanetske also the kiln and the pit associated with it, house 92 and the 'ditch'. And if several Talianki dates can chronologically fall into another phase, then the data from Maidanetske makes up a significant group with well-fixed objects.

The ceramics of the Tomashovka group on the one hand and the Vladimirovka-Nebelivka group on the other have noticeable distinctions, which, apparently, are chronological. At some Nebelivka settlements, some Tomashovka ceramics was found (Ryzhov 1999), which also points in favour of the partial coexistence of these ceramic styles.

The next chronological layer has similar characteristics and problems as the previous one. There are also a lot of well-agreed data with a considerable duration (105 years). The data are represented by a small group of dates from Nebelivka, most of the dates from Maidanetske, Dobrovody, Moshuriv 1, and the houses from Talianki. The fact that some Nebelivka dates overlap the ones from the main phase of Maidanetske has been already emphasised by the authors of the excavations (Chapman *et al.* 2018).

If we turn to the generally accepted relative chronology, then, as has been already noted above, a second phase of Nebelivka sites and the first of Tomashovka's must have existed before these four Tomashovka sites. In addition, from this group of settlements, Dobrovody was attributed to the second phase, Talianki and Moshuriv to the first stage of the third phase, and Maidanetske to the second stage of the third phase (Ryzhov 1999; Diachenko 2012). The model built during our work moves the main occupation of Maidanetske to the first place, together with Dobrovody and Moshuriv, while big part of the houses from Talianki probably existed later, during the next chronological stage.

The next chronological stage (phase) is represented by a significant number of the houses from Talianki, several objects from Maidanetske and house 6 from Kosenovka. If we turn to Tomashovka sites, then, based on the analysis done, in particular the *morphology of ceramics*, it can be seen that this tendency is affirmed, and objects from Maidanetske (*ploshchadka* 15), Dobrovody (*ploshchadka* 4) and Moshuriv (*ploshchadka* 1) may indeed be *older* than some of Talianki's dwellings attributed to this horizon. As for the object tested from Chichirkozovka (*ploshchadka* 1), the CA shows, a tendency towards this (Talianki main) chronological horizon.

It should be noted that, unlike the few dates for Moshuriv and Dobrovody, the data from Maidanetske and Talianki look quite convincing. In addition, the existing settlement plans agree well with such a chronology. And although both mega-sites might demonstrate, based on their plans, a deep crisis in the mega-site model, Talianki still looks like a later site. It is manifested in the degradation of the mega-structures phenomenon, a possible cessation of the construction (development) on the settlement. Also, part of the plan received for Dobrovody is very similar to the Maidanetske.

As for the position of Kosenovka in this group, this question is perhaps one of the most problematic and debatable in the whole model. During the study of the mega-sites in the Sinyukha basin region, the archaeologists working there divided themselves into two groups. Some believed that the earliest Kosenovska group sites (to which, by the way, Kosenovka itself belongs) are contemporaneous with the latest Tomashovka settlements (Movsha 1984a; Tkachuk 2003; Burdo and Videiko 1998). Others insist that the Kosenovka sites, with a certain break, replaced the Tomashovka ones (Kruts and Ryzhov 1985; Diachenko 2009). The arguments of the first group come from the finds of Tomashovka ceramics in Kosenovka, the imitation of Tomashovka figurines in Apolianka, radiocarbon datings, the analysis of 'signs' in the tableware ornamentation. The arguments of the second group stem from a comparison of population indices and different cultural complexes.

Indeed, the analysis of the ceramics shows that there are tremendous differences between Kosenovka and Tomashovka ceramics, their morphological subtypes practically do not overlap, and the proportions are different as well. On the other hand, the dates obtained for Kosenovka house 6 and for some houses from Talianki are located on an exclusively relevant segment of the calibration curve, which allows a rather narrow dating of these objects (within 35 years in this model). Thus, if we assume the sequence and not the contemporaneity of these settlements, this still should have happened almost immediately, one after another. It should be noted that the house from Kosenovka has five well-agreed datings, as well as human remains (not included in the model), which are slightly earlier than the house. Also worth mentioning are the findings of the ceramics with Kosenovka group characteristics during the excavation of mega-structure no. 3 at Maidanetske (Hofmann *et al.* 2019). Apparently, the solution to this question lies in the field of solving theoretical assumptions, as well as further research. However, since, first of all, the data indicate the possibility of such a chronological position, in this work Kosenovka remains in this chronological layer.

Finally, the last stage is represented mainly by the datings from the site Sharin 3, and one from Kosenovka and one from Talianki, which may well be also outliers. The fact that the sites of Kocherzhintsy-Shulgovka type are the last of the Tripolye period in the region is considered generally accepted and is supported by weighty ceramic arguments.

Summing up, we can come to the conclusion that, in general, the model showing this sequence of sites still agrees with the data, although there are a number of problematic points. They are a 'narrowing' of the chronology, a lack of space for a number of subphases, almost factual disappearance of stage C2 (there is only one small group of sites that reach not more than 30 hectares in area left), and ceramic styles overlap each other and are partially synchronous. As for the existing general relative chronology (Passek´s ABC), it is for the most part affirmed with minor corrections. Thus the sequence of the Vladimirovka and Nebelivka groups, the numerous subphases in both these groups and the Tomashovka group, as well as the chronological sequence of Tomashovka and Kosenovka groups, are less obvious.

The model constructed can be taken as a basis, and the stages distinguished in it are proposed to be identified as *seven chronological phases of Tripolye in the Sinyukha basin region*.

5 Tripolye mega and smaller sites of the Sinyukha river basin

In this final part of the work, it is proposed to look at some aspects of the history of the region of the Sinyukha river basin in Tripolye time based on the proposed seven-phase chronology. Some results have been obtained in previous parts, which relate, inter alia, to the chronology of both a separate mega-site and the entire region in Tripolye time. In particular, it was shown that a separate settlement could have had a longer lifetime than previously thought and that different ceramic styles do not always reflect the time difference; often different types of decoration, for example, could coexist (and therefore the concept of 'local groups", which is based on pottery styles) requires revision. Of course, the results of the work that has been carried out are important not in themselves, but in a wider context. For instance, changes in chronological constructions entail inevitable revision of other interpretations to which this part is devoted.

To begin with, let's turn to some traditional narratives and interpretations about the Tripolye in this region in order to identify the gaps that should be avoided. After that, it is proposed to look at such aspects as the size barrier between large and small sites, the chronology of one site, the periodisation of the Sinyukha region in Chalcolithic Tripolye settlements in time and space. Separately, it is proposed to consider one model as an explanatory basis for understanding the Tripolye phenomenon in the region. If in previous parts, two groups of sources were discussed (ceramics, absolute dates), then here it is proposed to use additionally the third group – the data set of Tripolye settlements.

5.1 Commonly discussed narratives on the history of Tripolye sites between the Southern Bug and the Dnieper

When considering the Tripolye sites of the Bug and Dnieper interfluve, researchers discuss a number of issues related to the development of the Tripolye phenomenon here and, in particular, to mega-sites. Many hypotheses and narratives regarding this topic have been proposed. Let us mention the main ones.

Most attention has been paid to the '*functioning*' (**how?**) of Tripolye sites in the region. Of course, *chronology* has been the foundation stone on which many narratives have been built and can be highlighted here:

- Discussion regarding the duration of the life of a Tripolye site (Markevich 1981; Chernysh 1982; Kruts 1989), and
- The sequence (chronology) of the existence of different mega and smaller sites in the region (*e.g.* Kruts and Ryzhov 1985; Kruts 1989; Ryzhov 2012a; Diachenko 2012).

More works have focused on the second question than on the first one, although it was the solution to the first problem that determined the entire further discussion regarding the chronology of the region. The established point of view is that the history of the region embraces both a number of *large migrations*, which are identified by the appearance of various 'local groups' (ceramic styles), for example Vladimirovka and Tomashovka, and a number of *micro-migrations* from one site to another, within the framework of such local groups' subphases (*e.g.* Kruts 1989; Kruts 2012a; Ryzhov 2012a; Diachenko 2012). This model assumes that the duration of the existence of a site and separate subphases within which the settlements existed was about 50 years.

It is within the framework of chronological issues that **ceramics** and various ceramic styles (local groups and/or types of sites) are very often considered (*e.g.* Dergachev 1980; Markevich 1981; Gusev 1995; Ryzhov 1999; Ovchinnikov 2014; Palaguta 2016). And it is in the context of **local groups**/types of sites (ceramic styles) that many narratives have been written that include descriptions of sites, their distribution and distinctive features of the material culture, primarily ceramics.

The **demographic** question which is reflected in a number of works (*e.g.* Kruts 1993; Diachenko 2016; Müller 2016; Ohlrau 2020) also directly depends on the solution of the two chronological issues mentioned above. Often, demographic issues are being addressed as well 'within the framework' of local groups, since they, based on the generally recognised model, are considered chronological groupings of sites.

A large block of works is directly focused on *reconstructions of the way of life* of the ancient population and the *environment* in Tripolye times (**what?**), namely:

- technologies (*e.g.* flint – Pichkur 2012; ceramics – Ryzhov 1999, 2007; house building – for example, Kruts, V. 1990; Korvin-Piotrovskiy *et al.* 2012; Shatilo 2016; Chernovol 2019; etc.); and technological innovations (*e.g.* pottery kilns – Korvin-Piotrovskiy *et al.* 2016a; sledges – Shatilo 2017)
- 'religious activities': 'ritual burning of settlements' (*e.g.* Burdo 2009; Kruts 2003b), the remains of temples or sanctuaries (*e.g.* Tsvek 1993; Videiko and Burdo 2015)
- public activities and social organisation (*e.g.* Müller *et al.* 2018; Chapman 2017; Nebbia *et al.* 2018; Müller *et al.* 2018; Gaydarska *et al.* 2019; Hofmann *et al.* 2019).
- the economic basis for maintaining the sites of the region, above all its mega-sites (*e.g.* Kruts 1989; Pashkevych 1991; Harper 2012; Kirleis and Dal Corso 2016; Ohlrau *et al.* 2016; Dal Corso *et al.* 2019)
- the natural background (*e.g.* Kirleis and Dreibrodt 2016; Dal Corso *et al.* 2019; Dreibrodt 2020).

A separate large block comprises the works devoted directly to *giant settlements*, or *mega-sites*. So they discuss:

- the *nature (or type)* and definition of these large settlements – 'giant settlements' (village-type) (Kruts 2008, 33-48; Ohlrau 2020), proto-cities (Shmagliy and Videiko 1990, 12-16) or regional centres for large-scale assembly over one month per annum (*The Assembly Model* or its variations: Nebbia *et al.* 2018; Chapman *et al.* 2019; Diachenko and Menotti 2017; Gaydarska *et al.* 2019).
- the spread (expansion) of these big sites – whether mega-sites were a regional phenomenon or typical of the whole of Tripolye (Videiko 2018)
- the geographical position of the mega-sites on the forest-steppe border (*e.g.* Kruts 1989; Kirleis and Dreibrodt 2016; Ohlrau 2020).

The topic of the **emergence of the mega-sites** includes a number of questions – reasons, 'sources', time, and so on. Here, it is important to understand, in addition to the chronology, what is meant by the term 'mega-site'. There are several points of view on the process of the *formation* of large settlements (**why?**):

1. Protection from external threat of anthropogenic nature – against 'steppe groups' (Chernysh 1977; Kruts 1989; Anthony 2007) or against groups of the Tripolye population (Zbenovich 1990, 12).
2. As a result of social processes within the Tripolye community: the initial processes of urbanisation (Videiko 1998).
3. A combination of social and natural factors: demographic pressure on the environment (Manzura 2000; 2003/2004) or 'west-east' migrations of the Tripolye population (Diachenko 2012; Diachenko and Harper 2016).

This is certainly a rather symbolic division, since the authors often include various factors in their models. So, for example, Vladimir Kruts associated the appearance of the Tripolye sites with migrations of the population from the Prut and Middle Dniester areas. According to Kruts, those regions were overpopulated due to a natural increase, and as a result of '*extensive primitive producing economy, when the local resources can't provide the subsistence minimum of the population living there'* part of the population moved to another territory with a similar environment (Kruts 1989, 117). Noting that the Tomashovka local group settlements that were located on a territory 30-40 km wide along the southern strip of forest-steppe zone, the author considered that the emergence of especially large settlements was connected with the concentration of a large population for protection from the 'steppe'. Earlier this idea had been proposed by Chernysh (1977). The arguments include:

- traces of contacts with the steppe (Tripolye ceramics in burials and settlements in the steppe)
- the aforementioned immediate proximity of these 'two worlds'
- the inexpediency of building large settlements from the point of view of economy
- 'aggressive' way of life of the steppe population, demonstrated in later periods by parity of reasoning and documented in written sources.

It seems that much less attention has been paid to the **final stages of the giant settlements'** existence than to the previous questions. As explanations for the large settlements' decline, the following reasons have been suggested:

- Climatic explanations (Harper 2016).
- Environmental (ecological) barriers (Kruts 1989; Dal Corso *et al.* 2019).
- Epidemics (Rascovan *et al.* 2019).
- External pressure (population from the steppe – Kruts 1989).
- The collapse of the social system (hierarchisation process – Hofmann *et al.* 2019).

Finally, there are several hypotheses about the fate of the population that once lived in mega-polities, namely:

- departure of part of the population to the steppe with further switching to another type of economic activity (Movsha 1984a)
- movement of the population to the west (Kruts 1989)
- migrations of the population in different directions and assimilation with the local population.

Thus it can be seen that there are quite a few assumptions, hypotheses and narratives on the history of Tripolye sites of the working region, many of which are *directly dependent on chronology*. As this overview demonstrates, with the exception of reconstructions of the ancient population lifestyle and the environment in Tripolye times, we are dealing mainly with two types of narratives that tell us about:

1. The history of 'mega-sites'.
2. The history of individual ceramic styles ('local groups').

Regarding the first type of narrative, the dominance of this topic is certainly logical, since it is of this region that the unique phenomenon of mega-sites is characteristic. However, it should be emphasised that the study of smaller sites should undoubtedly be carried out along with the study of the giant settlements for a better understanding of them.

As for the second type of narrative, such an approach needs to be revised, since various ceramic styles, taken by themselves, should be considered within the framework of the issues relating to ceramics and not blindly transferred to the ancient population.

Let's consider below several topics that are directly related to the results of the proposed chronology, in which an attempt will be made to step over the gaps of the previous narratives (mega-site centricity and focusing on individual ceramic styles). So it is proposed to consider the possible lifetime of an individual Tripolye site, the chronology and periodisation of the Tripolye sites of the Sinyukha region and the dynamics of these sites' development in time and space. In addition, the grouping of the region's sites based on their size will be separately considered.

Before addressing these issues, let's turn to the list of sites in the region and their chronological position.

5.2 The correlation of the sites' data set with the seven-phase development of Tripolye in the Sinyukha river basin

In the previous part, based on the analyses, seven chronological phases were singled out with the sites related to them. For further analyses, let's correlate the site **data set** of the selected working area with these phases. So each site for which there is chronological data was attributed to one or another chronological stage (phase), based on the proposed chronology (tab. 52).

Since a number of sites did not have any clear chronological data that would correlate with one of the phases, such settlements were distributed equally between the phases to which they could potentially be assigned (*i.e.* 0.5% or 0.333%). Let us have a look at the phases and the sites attributed to them:

- All of the Early Tripolye sites (A) have been attributed to the first phase.
- The second phase turned out to be more problematic because of the lack of both radiocarbon dates and ceramic assemblages. According to the traditional chronology, after the settlements represented in the Tripolye A region, there is a short break, after which Eastern Tripolye settlements appear on the territory of the working zone (after Burdo in Videiko 2004a). Since the Eastern Tripolye sites for which there are dates have been attributed to phase three, the settlements that, according to Tsvek, date earlier than them (types Zarubyntsy and Krasnostavka) have hitherto been attributed to the second phase. Apparently, chronologically, they should tend to the third phase.

	68.2%	95.4%	Highest	Associated Traditional Phase
	4561-4482 BCE	4632-4461 BCE	4520 BCE	
I			70 years	Tripolye A
	4489-4402 BCE	4515-4333 BCE	4450 BCE	
II			375 years	Tripolye B1?
	4163-4064 BCE	4236-4047 BCE	4075 BCE	
III			110 years	Tripolye B1/B2
	3973-3956 BCE	3982-3920 BCE	3965 BCE	
IV			155 years	Tripolye B2
	3818-3805 BCE	3827-3798 BCE	3810 BCE	
V			105 years	Tripolye C1
	3712-3698 BCE	3719-3691 BCE	3705 BCE	
VI			35 years	Tripolye C1, beginning of Tripolye C2
	3685-3658 BCE	3693-3649 BCE	3670 BCE	
VII			95 years	Tripolye C2
	3617-3535 BCE	3631-3480 BCE	3575 BCE	

Table 52. Phases of development of Tripolye in the Sinyukha basin with dating probabilities.

- The third phase incorporates the sites of Onopriyivka, Shkarovka and the Vesely Kut type, corresponding to period B1-B2.
- The fourth phase is represented by the sites of Miropolye, Garbuzin, Vladimirovka, Nebelivka, Chichelnik groups (several sites that fell into the working area, come within this phase based on the latest dating – Rud *et al.* 2019a), the Nemyriv type, and part of Kaniv group. That is, in addition to some sites with new dates, all the sites of period B2 have been attributed to the phase.
- The fifth and sixth phases included Tomashovka settlements. Whenever possible, the settlements were assigned to one or another phase, but most were evenly distributed between them (50%) according to *aoristic* principles. Because of such a situation, and also taking into account the short estimated lifetime of the sixth phase (35 years, the highest probability), it was decided to bring together the data on phases five and six while making some graphs and maps.
- The sites of the Kochergintcy-Shulgovka type have been attributed to the seventh phase.
- Some sites for which the chronology is better developed have been attributed to several phases, based on the data, in this way Nebelivka to the fourth and fifth, Maidanetske to the fourth, fifth and sixth, and Talianki to the fourth, fifth and sixth.
- The Kosenovka settlements of the first stage have been assigned to the sixth phase, and the ones from the second stages have been evenly distributed between the sixth and seventh phases. The settlement of Olkhovets 1 was attributed to the sixth phase, since its settlement layout seems to tend towards Tomashovka's and is completely different from C2 sites for which there are magnetic plans. The consideration of satellite images and the magnetic map of this site (Koshelev 2005) reveals that the layout has more similarities with B2 and C1 settlements than even with Kosenovka.
- Some sites have only been known to be of period 'B', so these settlements were equally divided among phases two, three and four.
- Similarly, the sites with B2-C1 datings were equally distributed between the fourth and fifth phases, and the ones with 'C' chronology between the fifth and sixth (since the seventh phase is represented by the settlements with very specific ceramics that can be easily distinguished from other Tripolye ones). Even if such a distribution is considered unreliable, it does not in any case significantly influence the results, since we are talking about twelve settlements (out of 197 known in the area).

The sites correlated according to the seven chronological phases have been used in carrying out further analyses, starting with establishing a barrier between large and small sites.

5.3 Exploring the threshold between small and large sites

Let's look at the threshold between large and small settlements in order to group the sites. This becomes especially relevant in the Sinyukha region, where the so-called mega-sites are located.

The concept of 'mega-sites' itself consists of two components. The first, technical one is establishing the size limit or threshold beyond which a Tripolye site is no longer considered to be 'normal' or 'ordinary' and becomes 'mega' or 'giant'. The second concerns the understanding of the nature of these settlements as a phenomenon. The latter issue that sparked a lively discussion earlier (*e.g.* Kruts 2008; Shmagliy and Videiko 1990; Diachenko and Menotti 2017) was recently discussed in more detail by René Ohlrau (2020, 254-259). However, this issue is still not fully resolved.[49] In this part, let us consider the first problem, taking into account the collected dataset of the sites (Appendix 1).

The label 'mega-site' was proposed relatively recently, around 2010 (Hale *et al.* 2010). The term 'giant settlements' is also relatively new and came up around 1990 apparently, when a conference was held on three Tripolye expeditions (in Talianki, Maidanetske and Vesely Kut) and an abstract book called *Early farming giant settlements of the Tripolye culture in Ukraine*' was published. This publication reflects the period of searching for a suitable label, since along with 'giant settlements' there are such names as 'agro-giant settlements', 'super-settlements', 'proto-cities', 'super-centers' and simply 'big-sized' or 'large' Tripolye settlements, which were the names used before the conference, after their discovery (*Early farming* … 1990, 219; Zbenovich 1990, 10-12; Shmagliy and Videiko 1990, 14-16). In the literature we can also find 'large, high-population centres' (Ellis 1984, 185). That is, both immediately after their discovery and several decades later, the main emphasis was placed on the size of these sites.

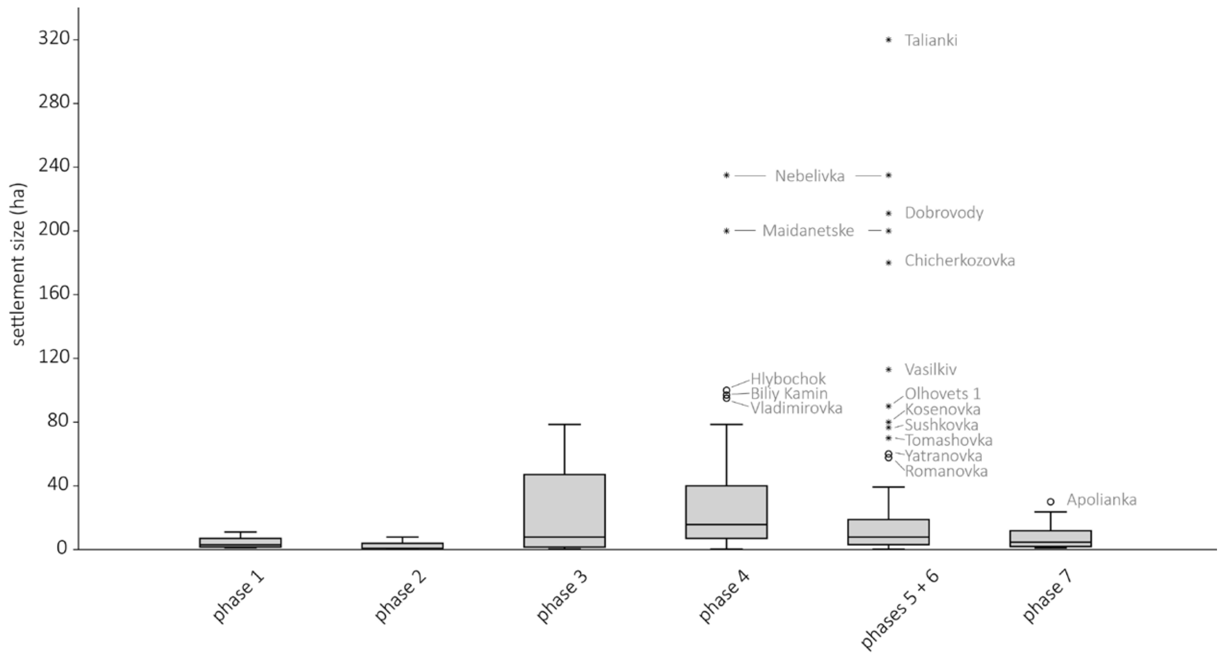
Regarding the size barrier (maximum area), this is a kind of a threshold below which the Tripolye sites are considered 'normal' or 'regular-sized' and above which they are ranked as very large ones; here the opinions vary.

Videiko, equating the giant settlements with 'proto-cities', indicates that the earliest of them were built in Eastern Tripolye and mentions Onopriyivka, which according to him was 80 hectares (Videiko 2004c, 436). Kruts does not give any exact figure, but attributes to 'giant settlements' the ones with an area exceeding 100 hectares (Kruts 2003a, 72). Diachenko, systematised the data on the settlements of the Vladimirovka-Tomashovka line and, having used rank size distributions, identified three groups of settlements: small (up to 30 ha), medium (35-80 ha) and large ones (100-350 ha), and eight subgroups (Diachenko 2012, 118-120). Müller and Rassmann define mega-sites as sites that are larger than *c.*150 hectares in area (Müller and Rassmann 2016, 1), while Ohlrau distinguishes the statistically informed threshold at around 30 hectares (Ohlrau 2020).

In such a situation and taking into account the data collected on the area of the settlements, a lot of which have been recalculated, it is difficult not to use the chance to offer an alternative point of view.

Let us have a look at the data set of Tripolye sites. We have 197 sites whose areas are known (78 of them from the Sinyukha basin). All the sites were attributed to one

49 The data that is available today do not allow to unambiguously answer the question to what extent small sites have the same infrastructure (e.g. the presence of kilns) and layout as mega-sites.



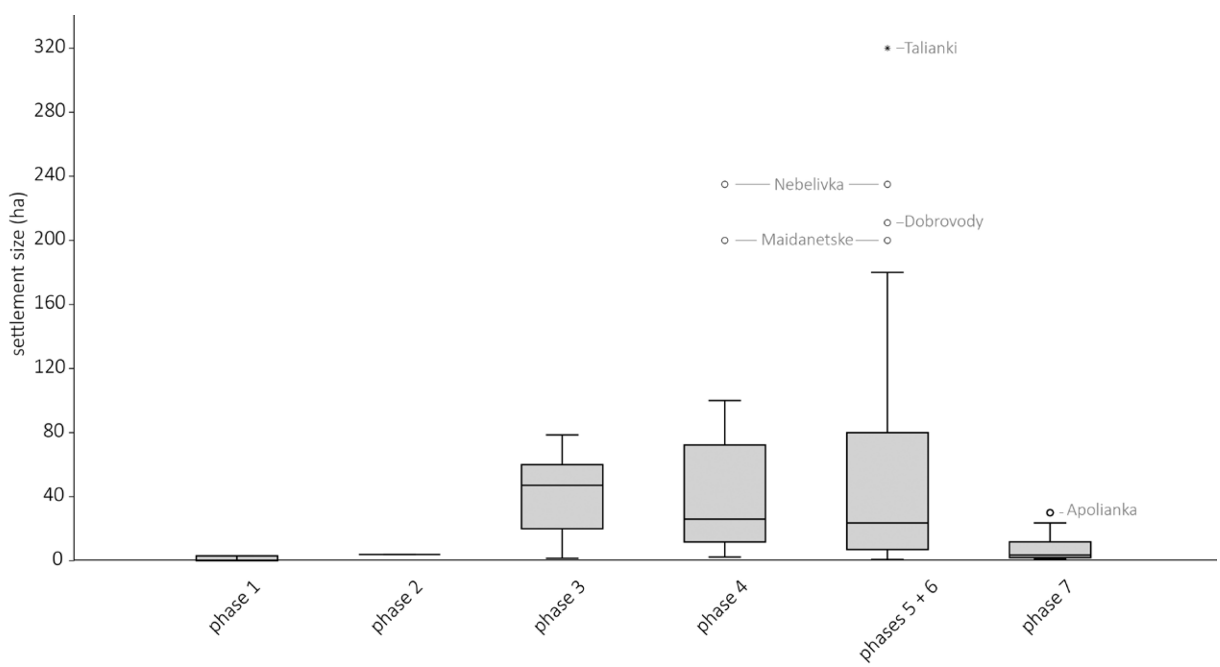


Figure 97 (top of page). Settlement sizes per phase in the study region (all sites).

Figure 98 (below). Settlement size per phase, Sinyukha river basin.

of seven chronological phases. The next step was to compile two box plots – one for the entire working zone, and another for the Sinyukha basin sites (fig. 97 and fig. 98). In principle, both graphs are comparable, but there are quite significant differences.

The first two phases are represented by a small number of sites with a small area, and there are hardly any settlements from the Sinyukha basin (only three in two phases).

In the third phase, both the number and the area of the settlements significantly increase. At the same time, if the statistical median for the sites of the entire working zone increases almost twofold compared with phase two (from 3.9 to 7.85), then this median for the Sinyukha river basin jumps from 3.9 to 47.1, that is, increasing by 12 times(!). This clearly shows the dominance of large settlements in the latter region.

	Phase 1	Phase 2	Phase 3	Phase 4	Phases 5 & 6	Phase 7
N	6	7	13	59	98	14
Min	**1.2**	**0.3**	**0.3**	**0.3**	**0.2**	**1**
Max	**11**	**7.85**	**78.54**	**235**	**320**	**30**
Mean	4.3	3.298571	23.80692	33.42593	25.49765	7.597143
Std. error	1.592273	0.9521515	8.524438	5.775538	5.335963	2.385346
Variance	15.212	6.346148	944.6585	1968.054	2790.305	79.65827
Stand. dev.	3.900256	2.519156	30.7353	44.36275	52.82334	8.925148
Median	**2.5**	**3.93**	**7.85**	**15.71**	**7.48**	**4.15**
25 percentile	1.5	0.79	1.385	7	3.13	2
75 percentile	8	3.93	53.56	40	19.0375	11.8
Skewness	1.297514	0.7511572	1.063684	2.737161	3.634699	1.786634
Kurtosis	0.539893	0.9827141	-0.5942317	9.209895	14.14875	2.441729
Geom. mean	3.09973	2.220903	6.811073	14.45652	8.022052	4.394424
Coeff. var.	90.70364	76.37113	129.1023	132.7196	207.1694	117.4803

Table 53. Statistical characteristics of settlement sizes in the study region (all sites).

	Phase 1	Phase 2	Phase 3	Phase 4	Phases 5 & 6	Phase 7
N	1	2	5	25	33	12
Min	**3**	**3.93**	**1.57**	**2.36**	**0.7853975**	**1**
Max	**3**	**3.93**	**78.54**	**235**	**320**	**30**
Mean	3	3.93	41.446	48.168	59.73877	8.305
Std. error	0	0	13.78847	11.71937	14.03108	2.738368
Variance	0	0	950.6091	3433.593	6496.751	89.98394
Stand. dev.	0	0	30.83195	58.59687	80.60242	9.485986
Median	**3**	**3.93**	**47.12**	**26**	**23.6**	**4.3**
25 percentile	1.5	2.9475	10.785	11.89	7.426988	2
75 percentile	1.5	2.9475	69.27	68.65	78.3	11.8
Skewness	0	0	-0.2226323	2.174652	1.825046	1.565258
Kurtosis	0	0	-1.425657	4.701821	2.759963	1.552963
Geom. mean	3	3.93	23.3709	26.53112	21.20897	4.666145
Coeff. var.	0	0	74.39065	121.651	134.9248	114.2202

Table 54. Statistical characteristics of settlement sizes in the study region (Sinyukha river catchment only).

In the fourth phase, the number of sites increases significantly (four to five times), the area of settlements also growing. It is interesting that the median for all sites grows (again doubles to 15.7), but it falls (to 26) for the Sinyukha sites, although it is there where the largest (mega) sites are located. This suggests that a significant number of 'smaller' sites are already emerging there. The diagrams clearly show the appearance of a number of soft and extreme statistical outliers with an area of 90+ hectares. At the same time, in the Sinyukha box plot, some of them are already moving to the maximum percentile limits, and there are only two 'super-settlements' – Nebelivka and Maidanetske – left as outliers. This may indicate that for the Sinyukha sites, the settlement size of up to 100 hectares is statistically acceptable.

No less interesting are the fifth and sixth phases. If the median for all sites falls by half (up to 7.48) compared to the previous phase, then a decrease of only a few hectares (up to 23.6) is observed for the Sinyukha basin. In principle, the interquartile distribution of the Sinyukha site area for phases four and five and six is almost identical, although the maximum distribution is much larger for the latter compound phase. The diagram for all sites, on the contrary, shows a significant reduction in the 'normal' distribution of the site area and a large number (ten) of soft and extreme statistical outliers. Six of these outliers are included in the maximum statistical distribution for the Sinyukha diagram. For this region, only Maidanetske, Dobrovody, Nebelivka, and the extreme outlier Talianki are considered to be outliers.

The seventh phase looks almost identical on both diagrams, since during this time interval the sites are concentrated mainly in the Sinyukha basin. Compared with the data from the previous phase, for the entire region, there is a gradual decrease in the 'normal' distribution of the site area, the median drops to less than half (to 4.15), but for the Sinyukha sites this 'decrease' has a very different scale when the median of the site area drops sharply by almost six times (to 4.3). An outlier on both diagrams is the settlement of Apolianka.

Statistical characteristics show that the minimum site areas for the entire region range from 0.2 to 1.2 hectares, and for the Sinyukha sites from 0.8 to 4 hectares (see tabs. 53 and 54).

Several conclusions can be made. The contrast between the data for the entire working area and for the Sinyukha basin turned out to be a rather productive approach, which clearly shows some peculiarities of the mega-sites region that would be lost within a larger territorial framework. So it is clearly seen that large sites emerge on a practically uninhabited territory and they are not accompanied by a large number of smaller sites. At the next chronological stage, small settlements, which on average are still larger than the small sites in the neighbouring territories, are already emerging in this microregion. Another important result that can be seen is a sharp drop in the Sinyukha settlement area during the seventh phase, which is hardly noticeable against the background of the entire working zone.

To complete the picture, let's look at the available data on settlement sizes using the Gaussian kernel density distributions, again grouping them according to the chronological phases and comparing the data for the entire working zone and for the Sinyukha basin.

The diagram (fig. 99) shows the distribution of the site sizes for different periods. Such a distribution and possible grouping of sites might help in understanding the threshold between large and smaller sizes in order to understand the development dynamics.

As can be seen, the division of the sites into several groups of 'smaller', 'larger' and partly 'medium' (but still 'big') sizes is acceptable. However, the thresholds for each period will be different. Moreover, as in the previous case, the diagrams for the entire working zone and for the Sinyukha basin have significant distinctions.

So, for the first phase, it may be possible to differentiate between small sites and slightly larger ones, the threshold between which will be about 6 hectares. However, it is not yet clear how reliably the site area was measured, and so far it cannot be verified. Similarly, for the second phase, the threshold is within 6 hectares, beyond which there is one site. For the Sinyukha basin (the data on the two phases are presented together), the amount of the data does not allow talk of any trends at all. It should be noted that in general these early phases are represented by a small number of settlements and the number of sites with a known area is even less.

It is to be distinctly seen that during phase three at the latest large sites emerged. And if for the entire working zone the threshold between smaller and larger sites is within 40 hectares, then the Sinyukha sites are represented almost exclusively by large settlements.

The charts (graphs) for phase 4 and phases 5 and 6 are very similar. So one can observe a small tendency for large settlements exceeding 50 hectares to appear and also the clear emergence of groups of sites exceeding 150 hectares. At the same time, there are much fewer smaller sites from the Sinyukha basin than from the entire zone, and

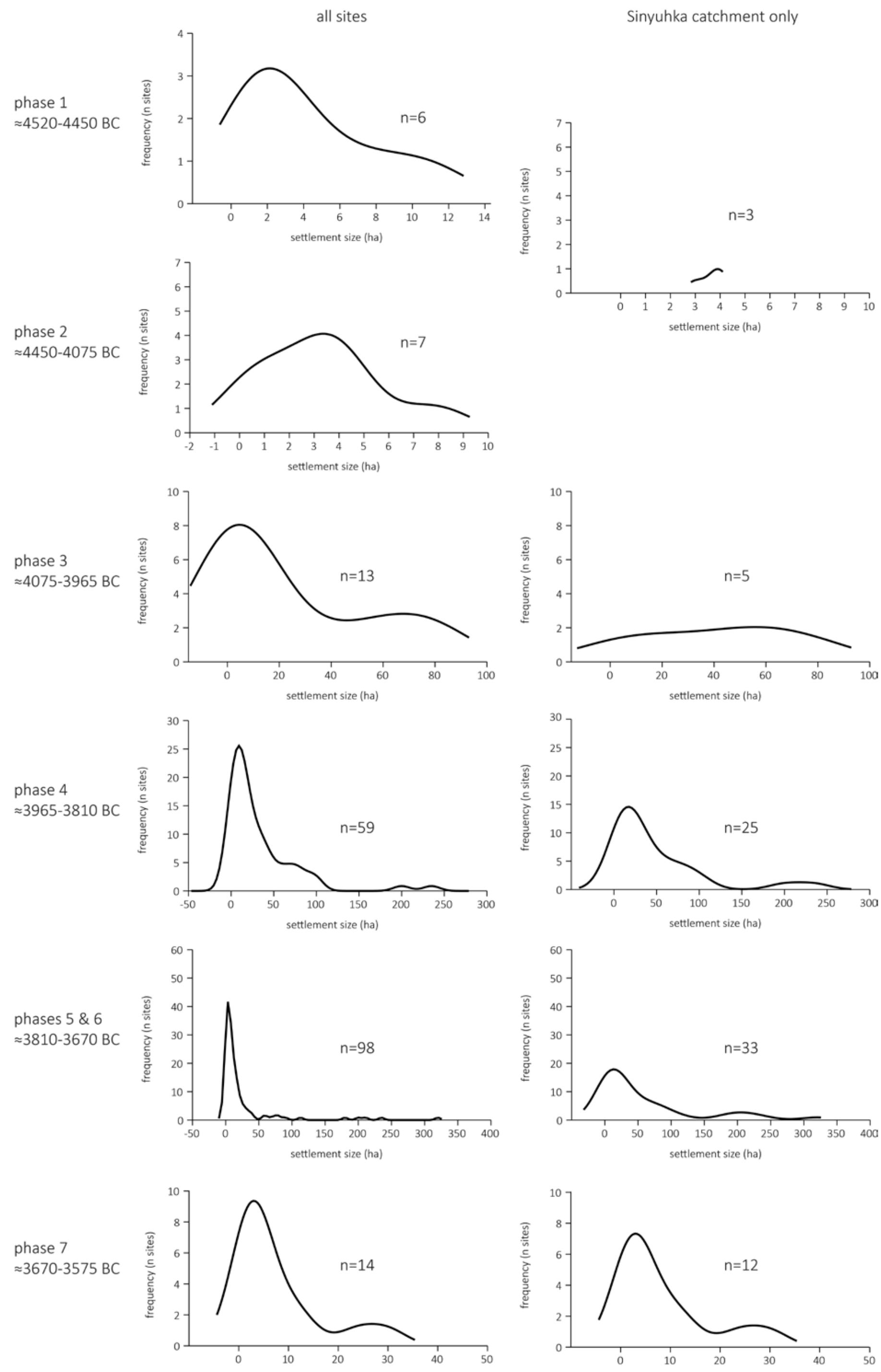


Figure 99. Gaussian kernel density distributions of settlement sizes in phases 1-7 for all sites on the left side and in the Sinyukha catchment on the right side (cf. Hammer 1999-2019, 28).

the contrast between the smaller and 'mega-sites' is not so significant. It should be noted that the number of sites for these phases is much larger than for the others.

Regarding phase 7, both graphs are almost identical, since the Final Tripolye sites in our work zone are located mainly in the Sinyukha basin. The threshold between sites is at around 18 hectares, which is significantly less than at previous chronological stages. Moreover, the group of large sites (which consists of two settlements, Apolianka and Vilshana-Slobidka) cannot be completely comparable with the large sites of the previous phases. So Apolianka has a significantly large size due to the specific layout, which is represented by very scattered individual houses and groups of several houses.

It can be summarised that the Tripolye sites, both from the entire working zone and the Sinyukha basin, are represented by a **bi-** or **polymodal size distribution** according to the area criterion at least from the third phase. The threshold between these distributions increases from 40 to 50 hectares, while in the fourth, fifth and sixth phases a group of sites exceeding 150 hectares is also clearly distinguished. This trend is abruptly interrupted in the seventh phase. That is, we cannot talk about the fixed threshold between larger and smaller settlements, but about a *step-by-step process increasing areas* and agglomeration of settlements.

5.4 Lifetime of individual Tripolye sites

One of the central questions about the functioning of the mega-sites and the smaller sites, which is directly connected with the chronology, is the question of the duration of the existence of an individual site. Without doubt, demographic, economic and social interpretations are directly connected with the solving of this problem.

Let us discuss this topic and try to address the following questions:

- What is the underlying basis for the generally accepted lifetime of a single Tripolye site?
- What were the rejected alternative points of view on this issue?
- What adjustments can be made today?

During her time, Passek assumed that the settlement of Vladimirovka existed for a long time, with its area gradually expanding (Passek 1949, 98). The author saw the arguments in favour of this in the diverse nature of the finds (primarily ceramics) and in different types of houses – *ploshchadkas* and pit houses (nowadays they are considered to have been just pits). However, an alternative, which soon became widely accepted, was found to this concept.

In Tripolye studies, the dominant concept of a relatively short period (50 years) of the existence of a Tripolye site and, in particular, a mega-site, which has been established to a great extent in the literature, has hardly lost its position for more than 40 years (*e.g.* Markevich 1981; Chernysh 1982; Kruts 1989; Diachenko 2012; Videiko 2013a; Rud 2018; etc.).

5.4.1 Single site duration model

This hypothesis has been based on two assumptions successively pronounced and connected with each other. The first one is the firm belief about a relatively short lifetime of a site. The second one is the ability to calculate this time period. Let us have a look at how this concept was developed.

Exploring LBK and Tripolye in Middle Dniester and, in particular, investigating the very interesting multi-layered site of Nezvysko, Chernysh came to a conclusion regarding a similar lifestyle on the sites of both 'cultures' (Chernysh 1962, 82). Based on Child's hypothesis regarding the habitation in the LBK villages for an average of 10-20 years,[50] Chernysh suggested that the Tripolians had the same farming system. According to Chernysh, on the site of Nezvysko, the Tripolians built a new settlement on the same place five times with certain chronological intervals in the course of

50 Which Child explains by: 1) the type of agriculture – hoe farming, which implied the use of territories until complete exhaustion, which resulted in the fact that 2) the population had to leave the settlement in search of new lands, which was indirectly confirmed by 3) 'practices of some African tribes' (Child 1929).

400 years (Chernysh 1962, 83-84). The duration of the existence of a separate site is not specified. The author explains the systematic moving of the Tripolians from place to place by the rapid depletion of the soil used for crops. This model is illustrated by an ethnographic example from Africa.

A few years later, Vadim Masson, in his article on prehistoric agriculture, also spoke out about the 'short duration of settlements' of the Tripolye Culture because of the pronounced extensive nature of agriculture (Masson 1965, 67).

In the 1980s, it was proposed to expand the concept of 'Tripolye sites' short duration' with details of a more or less definite figure.

Studying Late Tripolye (C) in Northern Moldova, Vsevolod Markevich decided on 50 (50-60) as the possible number of occupation years for one site (Markevich 1981, 10, 65-66). In his work, Markevich identified nine consecutive types of sites (for C1 and C2) and predicted the discovery of up to three additional stages in the future (Markevich 1981, 65). The site types or stages were distinguished on the basis of the typology of artefacts and, in the first place, on the morphology and ornamentation of vessels (using statistics), since he considered the changes in ceramics to represent an exclusively chronological phenomenon. Assuming that Late Tripolye, represented in the region by ten to twelve types of sites and having developed there for about 500-600 years, Markevich calculated the lifespan (occupation) of one site (as well as a stage duration) of 50-60 years. He substantiates his hypothesis with the additional arguments: 1) the above-described short duration of settlements of the Tripolye 'Culture', 2) the lifespan (obviously, average) of a mud house on a twig frame, and 3) analogies with the 52-year Aztec calendar cycle (Markevich 1981, 10). With the example of the Aztec calendar, he indirectly explains the abandonment of things (ceramics) in dwellings because of the 'End of Days, or Apocalypse' (Markevich 1981, 65).

At the same time, Chernysh (1982, 191-192) comes to the same conclusions (an average of 50 years for one stage), analysing several uncalibrated dates from Western Tripolye sites (middle stage, first half – B1).

If the previous theories were based on the data from the western regions of Tripolye, then in 1989 the 'eastern' version of this model was proposed (Kruts 1989, 117-132). The model of Vladimir Kruts is consistent with the conclusions of Markevich, but is based on more accurate calculations and specific data. Kruts focuses on the Bug-Dnieper sites with painted pottery (from the end of subphase B2 and to the beginning of phase C2).

Based on 1) a small number of radiocarbon dates (after Movsha 1984a, 60-83), according to which these sites existed for 500 years, and that the sites 2) represent ten phases or types of sites (according to Ryzhov), Kruts came to the conclusion that the duration of each phase and the lifetime of each settlement averaged 50 years (Kruts 1989, 120-121).

Then, choosing a well-explored area of 3,000 km^2, where about 50 settlements had been discovered, he assumed that there were five contemporaneous settlements with an average area of 100 hectares for each of the ten phases; the average population density was calculated in the same way (about five people per km^2). That is, for example, a site of the size of Talianki was practically the only one in the region (with no contemporaneous settlements), and there should have been another settlement covering about 200 hectares at the same time as Maidanetske. With that, Kruts noticed that his calculations were of an average value, in particular with respect to population density, due to the varying degree of the artefacts collected and the lack of intra-site chronology. It should be noted that Kruts was mainly interested in the demographic and economic development of the Tripolye sites in the region.

In general, this concept of Tripolye sites' short duration has taken root in the literature, although the estimated duration could vary from 50 to 80-90 years (Videiko 2013a, 90; Videiko 2016, 64-67). Moreover, relying mainly on relative chronology and the proposed 50 years of a site's lifespan, some researchers, up to the present day, have been quite sceptical about the possibility of using radiocarbon dating as a method for determining the duration of a phase (as well as a settlement's lifetime) with the argument that the 'span' of ^{14}C dates exceeds the 50-year interval which is axiomatically attributed to the Tripolye sites and phases (Videiko 2013a, 90; Videiko 2016, 64-67).

Thus it can be seen that the model for a 50-year duration of the Tripolye sites is based on preliminary observations on some sites, on some selected sites grouped together on the basis of the typology of ceramics, on poorly worked-out absolute chronology, and on calculations.

It should be noted that, undoubtedly, the models listed were quite important and advanced at that time in the attempts to define the lifetime of the settlements and explain the mechanisms of their development. It was a big step forward in Tripolye studios at a time when intensive research in the regions was in full swing. However, today, due to the availability of new data, there is a need for their critical revision.

5.4.2 Discussion

Currently, with the data from recent studies, which were primarily aimed at studying individual mega-sites (Müller *et al.* 2017; Chapman *et al.* 2018), there is an opportunity to revise this concept. This is due, first of all, to the fact that the results of systematic dating of various objects and inventories from several settlements have been obtained.

Thus the radiocarbon datings for Nebelivka, according to Andrew Millard, showed that the occupation of Nebelivka could have lasted for 45-225 years (95.4%) (after Andrew Millard, radiocarbon dating, in Chapman *et al.* 2018). From the chronological model proposed in this work, Nebelivka datings are placed in the fourth chronological stage, the duration of which, according to the highest probability, is 155 years. In addition, a few of the dates from some objects of this site are later and are assigned to the fifth chronological stage (its duration is 105 years according to the highest probability). And even if we assume that these dates may tend towards the fourth stage, they still do not agree with the dates of this chronological segment. This would suggest that, firstly, the dated Nebelivka objects are not contemporaneous and, secondly, the site, in accordance with the data, could have existed for more than 150 years.

Another mega-site for which a substantial number of absolute datings has been obtained is Maidanetske. Based on these dates, René Ohlrau identifies four phases there and relates the general occupation of the site to 3990-3640 cal BCE, which is 350 years (Ohlrau 2020). According to the chronological model in this work, the Maidanetske data are distributed between three chronological stages: the fourth, which includes Ohlrau's first and second phases (155 years, the highest probability), the fifth (105 years, the highest probability) and a small number of objects in the sixth (35 years, the highest probability). Taking this into account, the duration of the site is reduced to 295 years. Of course, the plateau on the calibration curve and the resulting large span in datings can distort the data, and in reality the site could have had both a shorter lifetime and a longer one. However, according to the consistency of datings, Maidanetske could have existed for at least 100 years. And, as in the previous case, different objects from the site that have been dated are not contemporaneous.

A slightly smaller number of dates, which, however, is quite large (43 samples), has been obtained for the mega-site Talianki, and the datings agree well with each other. In this work, a number of analyses were performed on the ceramics from the settlement, some of which gave results regarding chronology. Thus it has been shown that inventories of different houses are not synchronous; in total, three groups of houses have been identified – older, younger, and those that could have been supposedly contemporaneous with both the first and second groups. These observations are consistent with absolute dates. So, in Talianki, the first houses, according to the available data, were built in the outer ring 'o', which was not

Site	Phase	Centuries BC									
			35	34	33	32	31	30	29	28	27
Zarubyntsy	B1										
Krasnostavka	B1										
Shkarovka	B1-B2										
Kharkovka	B1-B2										
Vesely Kut	B1-B2										
Vladimirovka	B2										
Pishchana	B2										
Miropolye	B2										
Garbuzin	B2										
Stara Buda	C1										
Chichirkozovka	C1										
Bondarka	C1										
Maidanetske	C1										
Talianki	C1										
Kosenovka	C1										

Table 55. Archaeomagnetic dates of Tripolye sites after Kruts 2008 and with some modifications in light grey by Videiko 2016, 67.

completely built. Slightly later, a step-by-step construction of houses started in all settlement parts. A large number of new houses were built after 3710 BCE. Chronological differences within the site can be traced within *house clusters*, where houses were built at a different time and could have had a different duration. Accordingly, Talianki is located in the fifth (105 years, the highest probability) and sixth (35 years, the highest probability) stages of the proposed chronology, and the earliest activity on the site took place during the fourth stage (155 years, the highest probability). And if the datings of the early activities and houses tended towards the fifth stage, then still the duration of the main occupation of the site is within 3800-3650 cal BCE, which is about 150 years.

The above-mentioned data are definitely in conflict with the generally accepted narrative about the 50-year lifetime of an individual Tripolye site. However, it was already during the creation of this model that some data provided support neither for this figure nor the model as a whole.

At the end of the 20th century, an interesting method for constructing the intra-site chronology of mega-sites was the so-called **archaeomagnetic dating**, one of the results of which was, in some way, the determination of the duration of some parts of the site (G. Zagniy and O. Rusakova). They gave, in contrast to the typological constructions and the proposed calculations, quite unexpected and, apparently, an unwanted (controversial) result, which, of course, was rejected because it 'contradicted (previous) data' (Shmagliy and Videiko 1990, 93; Videiko 2013a, 89).

The method involves dating the moment of 'the destruction of a building' or, in other words, the moment of its firing. This method does not imply the determination of the exact date, but 'dates' the centuries. Such datings of Maidanetske and Talianki showed a divergence in the dating of different buildings within 50-150 years. Based on Kruts's data (Kruts 2008, 236-237), 15 sites were dated with this method, nine of which can be attributed to large settlements or mega-sites (see tab. 55).

An analysis of the table shows that the dates for centuries do not correspond to modern radiocarbon dating. However, the sequence of sites is quite clearly comparable with the data of both relative and absolute chronology.

Although the method is complex and controversial, it is interesting in that it shows the partial contemporaneity of some Tripolye settlements within larger stages (especially C1 and B1-B2). The second interesting observation is the rather long duration of sites (longer than was proposed and has been generally accepted since the 1980s) that lasted for several centuries. It is rather difficult to analyse the dates obtained, since different researchers cite different data (Videiko 2013a; 2016; Kruts 2008). Moreover, shorter periods were obtained for the site Chichirkozivka, for example. But only one *ploshchadka* was excavated there (so only one object was dated), against, for example, Maidanetske where about 20 archaeomagnetic datings of different objects were obtained (Videiko 2013a, 89).

So the results of archaeomagnetic dating make it possible to suggest 1) a longer time duration of a site, 2) a mismatch in the time of dwellings within one large settlement, and 3) synchronous existence of some sites, including ‘giant settlements’.

It should be noted that most of the above observations both on the data of absolute, archaeomagnetic dating and the ceramics concern primarily large mega-settlements. However, most of the Tripolye sites in the region were not ‘mega’. What can be said about the duration of their existence? Unfortunately, much less attention has been paid to the sites of this type, and, as a result, in the best case, not more than one or a few houses have been excavated on the smaller sites or schurfs dug, and in most cases only field surveys were carried out. And, for the most part, these materials have not been published. The situation with the absolute dates is even worse. There are several datings for such sites: those for the settlements of Moshuriv 1, Chizhivka, Grebenyukiv Yar were taken from one object, and that for Pishchana from two houses. The datings obtained turned out to be situated in ‘problematic’ areas of the calibration curve (with large plateaux), except for Grebenyukiv Yar and Moshuriv (whose datings are well modelled) and give a large time interval that cannot be correlated with the datings of other settlement inventories because of their absence. That is, dating of one or two objects does not allow us to obtain the variability of the material dated.

As for the hypotheses about the duration of small sites, they are also traditionally limited to the ‘50 years’ model. Alexander Diachenko assumed that these sites (period B2-C1) are ‘branched-off’ ones and their lifetime was very short, about 30-35 years (Diachenko 2012, 123). However, because of the lack of data and strong arguments, this is difficult to verify. That is, today it is the smaller settlements (which make up the majority of the sites) that are creating one of the biggest gaps to be filled in the compilation of the chronology of the region of mega-sites.

5.4.3 Lifetime of a Tripolye site: conclusions and perspectives

Summing up, we can conclude that the example of the largest sites from the Sinyukha region Nebelivka, Maidanetske and Talianki, illustrates that 1) houses and objects in one settlement are not synchronous, 2) the lifespan of these sites exceeds 50 years, even with the most sceptical viewpoint regarding radiocarbon dating, and 3) the duration of an individual mega-site is at least 100+, and even more likely 150+ years. Similar results have been recently obtained for the Tripolye sites of Nebalivka and Stolniceni, Northern Moldova (Chapman *et al.* 2018, Ţerna *et al.* 2019). This agrees with the archaeomagnetic dating.

In addition, the example of Maidanetske-Talianki shows that it is problematic to calculate the ‘universal’ or ‘average’ lifetime of a large settlement, as some of them could have had a shorter lifespan (*e.g.* Talianki) and others could have had a longer one (*e.g.* Maidanetske). Of course, these observations reflect only the current state of data and research methods, and some contradictions and modifications in the future are inevitable.

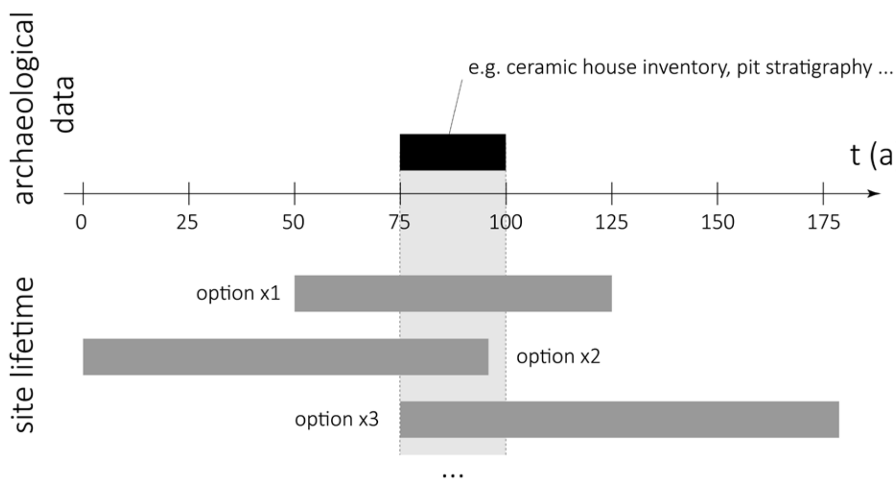


Figure 100. Assumed influence of limited amount of data on the dating result.

Another result of the dating of sites is that some mega-sites and smaller sites, especially with similar pottery styles, are completely or partially synchronous. This raises a number of questions regarding the nature of these ceramic styles and their variations (distinctions within the same style/local group), which, as earlier models implied, were chronological ones. If we assume that a number of the mega-sites were contemporaneous, then a review of a number of models and narratives regarding the history of Tripolye giant settlements of the region will be inevitable.

The above observations raise the question of how representative absolute datings are, in particular for sites with a limited amount of data, and what analysis of a limited amount of data, for example the excavation of one (or several) objects from one site, can give us. Apparently, both the first and second can give us a potential 'point' in time or 'segment' on the chronological scale. This 'point' can be located somewhere within a large chronological framework. For example, we have six dates for the settlement of Kosenovka (house no. 6). This object dates from the second half of the lifespan of Talianki. However, the settlement itself could have had, of course, a longer lifespan than the estimated 50 years: this point could be at the beginning of its occupancy, in the middle period or at the end. Taken separately, this date gives only partial information. Taking into account the ceramics, this dwelling can be associated most likely with the beginning of the existence of the settlement, since some other settlements that date from a later period (Sharin) have Kosenovka-type ceramics as well.

In the same way, the position of a site within one 'local' group (its subphase), proposed by Ryzhov, was determined mainly on the basis of the materials from schurfs or one (sometimes several) excavated object (see tab. 19, part 4). And this material cannot be interpolated to the entire settlement, especially a large one. It is assumingly only a 'point' in time or 'segment' on the timeline. This assumption can be illustrated (fig. 100) and it primarily concerns large sites. Regarding smaller settlements (their lifetime), some further investigation is necessary to make preliminary conclusions.

5.5 Chalcolithic settlements in the Sinyukha basin: structural changes, periods of development, model of social organisation

In this part, it is proposed to synthesise the previously obtained results of the work and to consider some new aspects of the development of Tripolye in the region, taking into account the suggested seven-phase chronology. This is necessary to draw up a *periodisation*, which should show the characteristics, dynamics and peculiarities of the development of the Tripolye phenomenon in the given region, in contrast to *chronology*, which shows only the sequence of events in time.

To compile the periodisation, it is proposed to conduct a comparative analysis of various aspects of the Tripolye socio-economic system (population, technology, world outlook/social organisation), using, as far as possible, the groups of sources the work is based on (ceramics and the data set of Tripolye settlements). Various aspects of the Tripolye socio-economic system can be traced when considering:

- dynamics of emergence and disappearance of settlements in the working area
- evolution of settlement organisation
- development of the ceramics production technologies and decoration techniques
- sequence, innovation or parallel development of different ceramic styles
- development of some categories of special finds.

It is proposed to trace which aspects of, for example, ceramic development, are more dynamic and which are more constant, where we deal with changes that may reflect a turning point in the development of communities in the region and with technologies or other factors that occur during their stable development.

Based on these and other observations on technological, organisational and other aspects, it is proposed to see if it is possible to distinguish different periods of polyvariability, stability, crisis and search for new organisational models in the study region.

5.5.1 Regional settlement dynamics

Let's consider a phase-by-phase change in the number of sites as one of the indicators of the dynamics of population development.

The number of Tripolye settlements varies greatly in different chronological phases (see Appendix 1). The diagram in Figure 101 shows the *aoristic* distributions of settlement numbers and aggregate minimal settlement area in phases 1-7 for both the entire working area (a) and the Sinyukha basin (b). As can be seen, the data are generally comparable, but there are some differences.

If we look at the number of settlements for different chronological phases, the picture changes significantly: the number of sites increases in the second phase, and this is especially noticeable for the Sinyukha basin, since there were hardly any settlements during the first phase; in the third phase, the number of sites decreases. In the fourth phase, there is an incredible leap in the number of sites in the entire region (more than two and a half times), it is even more pronounced for the Sinyukha basin. During the fifth and sixth phases, the number of sites continues to grow. This process ends with a dramatic drop in the number of settlements in the seventh phase (more than fivefold in the entire region, and less than fourfold for the Sinyukha basin). This indirectly indicates a definite sharp decline in the population of the region.

A comparison of the total summed areas of all the settlements for which it is known, by periods, leads to these tendencies becoming even more pronounced. Small total areas of the settlements of the first phase decrease in the second, and

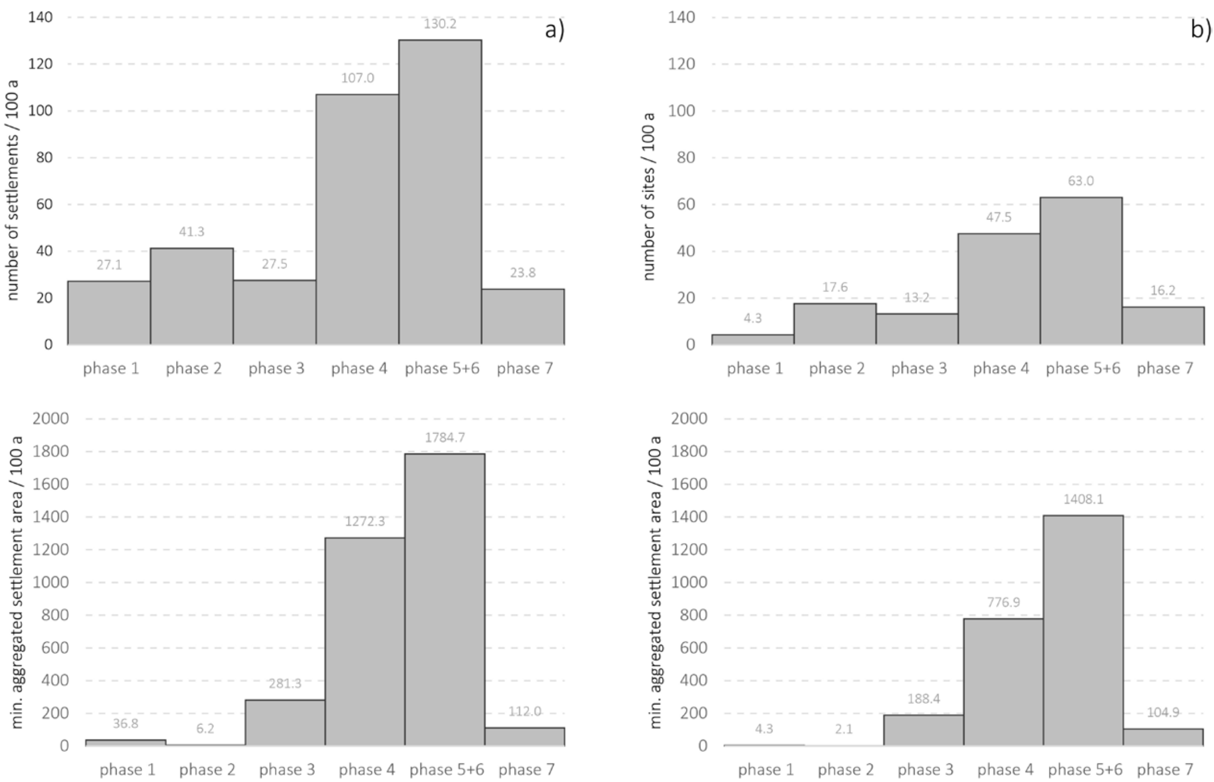


Figure 101. Aoristic distribution of the number of settlements and the aggregated minimal settlement area in phases 1-7: a) all sites; b) Sinyukha river catchment.

significantly increase in the third. Moreover, this increase is largely due to the mega-sites of the Sinyukha region. Both the comparison of the number of sites and the aggregate minimal settlement area show a strong increase in the area of sites when moving from the third to the fourth and then to phases 5 and 6. What is interesting is that, in contrast to the sharp rise in the entire zone, this process in the Sinyukha basin looks more stepwise. This tendency rapidly breaks down in the seventh phase, which is still represented by a certain number of sites.

So, from the foregoing, several significant observations can be emphasised. First, for phase three, there is an increase in the aggregate minimal settlement area, despite a smaller number of sites in general. This points to the emergence of large settlements and the disappearance of some small ones. Moreover, this is observed mainly in the Sinyukha basin. Secondly, the process of increasing the sites' area (despite the obvious tremendous scale) is going on more smoothly on the Sinyukha, step by step, but this cannot be noticed against the background of the entire working area. And finally, the drop in both the number of sites and their area on the graphs looks more dramatic than previously thought (Diachenko 2012; Ohlrau 2020). This result reflects, apparently, a new understanding of the chronological position of a number of Kosenovka sites, the recalculation of the area of a number of sites and, perhaps what is more important, consideration of the data on the region of mega-sites separately from the data on the entire zone.

5.5.2 Settlement organisation

Such a large concentration of sites, including giant settlements, in a relatively small area obviously implies a complex system of interactions between them and a multilevel social organisation at individual settlements. Some aspects of the interaction systems and levels of organisation of both individual settlements and groups of them can be traced by, for example, analysing 1) settlement layouts and 2) the evolution of the mega-structure institution. Several recent studies are devoted to these aspects (*e.g.* Kruts *et al.* 2013; Rassmann *et al.* 2014; Chapman *et al.* 2014; Ohlrau 2015; Chapman *et al.* 2016; Müller *et al.* 2016c; Rassmann *et al.* 2016; Nebbia *et al.* 2018; Hofmann *et al.* 2019; Ohlrau and Rud 2019; Ohlrau 2020; Hofmann *et al.* in press). Thus, as a result of the analyses carried out, it could be seen that:

1. In the Cucuteni-Tripolye cultural complex, a number of **settlement layout** types can be distinguished: 'ring-shaped', 'degradated' (Tripolye pattern), 'round?', 'triangular spur', 'rectangular', 'Early Tripolye' (Cucuteni pattern), and hamlet-like (Hofmann *et al.* in press). They are made up of elements, groups of elements and created-space components. For the Sinyukha region, the main one (according to the data available) is the *ring-shaped layout*, with a *ring street* or corridor as its main element.
2. *The ring-shaped type* of layout is currently known only for Tripolye sites. This layout reflects a specific arrangement of houses with multiple 'empty' spaces (created-space components) in which *social interactions* could have taken place. These *places of interaction* are, first of all, the ring street (or corridor) and, for example, 'squares'. These spaces, based on the research, were the most important places in the Tripolye settlements. They were used, apparently, to maintain the functioning of the social system. The emergence and development of this type of building up is directly related to the processes of population agglomeration. This type of layout is typical of all known large sites and giant settlements.
3. An important characteristic of the Tripolye sites is that there are **'special' houses**, so-called 'mega-structures', which differ from other buildings in a) position on the settlement, b) architecture, and c) size (sometimes not all, but one or more, of the factors can be traced). Such buildings follow certain localisation patterns on the site plan and can be found on the 'main' square, ring street (or corridor), on other squares, in passageways and/or at the beginning of 'streets' (these positions can be combined with the last two), as well as in other places (rarely). It is assumed that there are three types of such buildings: the 'main' mega-structure (in the central square), and mega-structures on the ring street and in other (often less prominent) places. The latter ones are usually smaller.
4. Based on the analysis of this category of building, they can be interpreted as *public buildings for integrative interaction* and *decision-making* (or assembly houses). The building in the main square could have served the needs of the entire settlement, while the others could have been used by the population of different parts (neighbourhoods) of a settlement.[51] The evolution of such buildings over time can be traced: so the size of the 'central' mega-structure (together with the square's area) increases, and the number (in accordance with the number of houses on the site) of the rest of such 'mega-structures' decreases. At the same time, the size of use group increases. This can be interpreted as an increase in *hierarchical tendencies* within egalitarian communities, which could have led to the collapse of these mega-settlements (Hofmann *et al.* 2019). In addition, there are differences in mega-structures from region to region: for example, typical of western areas (*e.g.* Northern Moldova) is that there is only one large building of this type (located in the main square); then characteristic of the eastern areas (particulary the sites in the Sinyukha area) are a large number of such buildings which are evenly dispersed on the settlement plan.

51 Calculations of *use group sizes* of mega-structures in Maidanetske show a fairly high number, up to a maximum of around 1,340 individuals (Hofmann *et al.* 2019) and, even if we recalculate the number of individuals for one house, the figure is still extremely high. This may indicate that there were one or more levels of *interactions* between the level of 'mega-structures' and the basic or effective network, that is, usually 20 persons, as assumed by Chapman *et al.*

On the Sinyukha, different settlement layouts are characteristic of different chronological phases, and so:

- for the first phase, the layout in the form of irregular rows of buildings or the so-called ‘Early Tripolye’ layout without any ‘mega-structures’ has been revealed (in Grebenyukiv Yar);
- ring-shaped sites with regularly located ‘mega-structures’ and their evolution are clearly traced during the following phases:[52] the third (Vesely Kut, Chizhivka), the fourth (Nebelivka, Vladimirovka, Fedorovka/Mikhailovka, Valyava 1, Hlybochok, Yampol), the fifth and sixth (Maidanetske, Dobrovody, Talianki, Moshuriv 1, Yatranovka, Sushkovka, Chichirkozovka, Vasilko/Iskrennoye and possibly Olkhovets);
- in the seventh phase, the ‘degraded’ layout replaces the ring shape (Apolianka, Moshuriv 2/Smagliyevy Berega, Rogi), without any ‘mega-structures’;
- also, for the seventh phase, ‘farmsteads’ or hamlet-like layouts consisting of several adjacent buildings (Moshuriv 3) have been revealed;
- the layout of the Kosenovka (phase 6) and Pishchana sites (phase 4) remains not completely clear, although their plans have been made (not published).

Thus it can be concluded that in the Sinyukha area in Tripolye times the residents of different communities (settlements) had a similar/identical *social system*, which can be studied with, among other things, the use of the plans of the Tripolye settlements. The evolution of this system can be traced from the third to the end of the sixth phase. Still complicated is the question of the *connection/relationships between different settlements*.

Traditionally, in Tripolye historiography, it is believed that settlement complexes with similar artefact assemblages, primarily with the same ceramic style, make up ‘local groups’ or types of sites, which in turn are equalised with a kind of ‘mono-ethnic’ population and/or ‘tribe’, and the change (sequence) in ceramic styles is interpreted and explained as a result of migrations (*e.g.* Zakharuk 1964; Movsha 1984a; Ryzhov 2001-2002; Diachenko 2009; Kruts 2012a; Videiko 2018; Chernovol 2019). However, this approach, being within the framework of a cultural-historical model also being outdated, hides, in principle, the possible diversity of prehistoric systems and contradicts the historical and ethnographic data (*e.g.* Wotzka 1993; Tyshkov 2003; Hahn 2005; Mosyn 2013; Shnirelmann 2013; Sokolovsky 2013; Yablonsky 2013).

It is possible to partially understand the relationship between different settlements that functioned synchronously in the same region with the use of, for example, *the rank-size distribution* method. This method, based on Bernbeck (1997), assumes that the settlements of a particular region and settlement system show a regular distribution in size. The rule of ‘perfect’ distribution is the following: the second largest town is 50% of the size of the largest (first), and the third 30%. However, in reality, rank-size distributions may deviate from this rule in three characteristic ways – convex, primo-convex and primate. Different deviations may be due to different reasons for which they arise (economic and political), behind which lie the peculiarities of the organisation of societies in a given territory.

Tripolye sites from each phase of our study region have been analysed with the use of this method. For phases 1 and 2, all the sites of the working area were analysed (as the data from the Sinyukha basin alone were insufficient for the analysis); for the other phases, only settlements from the Sinyukha river basin were included. The diagrams drawn show from phase 2 to phase 6 convex distributions in which the second, third and fourth largest settlements are larger than expected according to ideal rank-size distributions of capitalistic settlement systems (fig. 102). Also, the

52 Sites with the existing archaeomagnetic plan and settlements that are visible from satellite images are included.

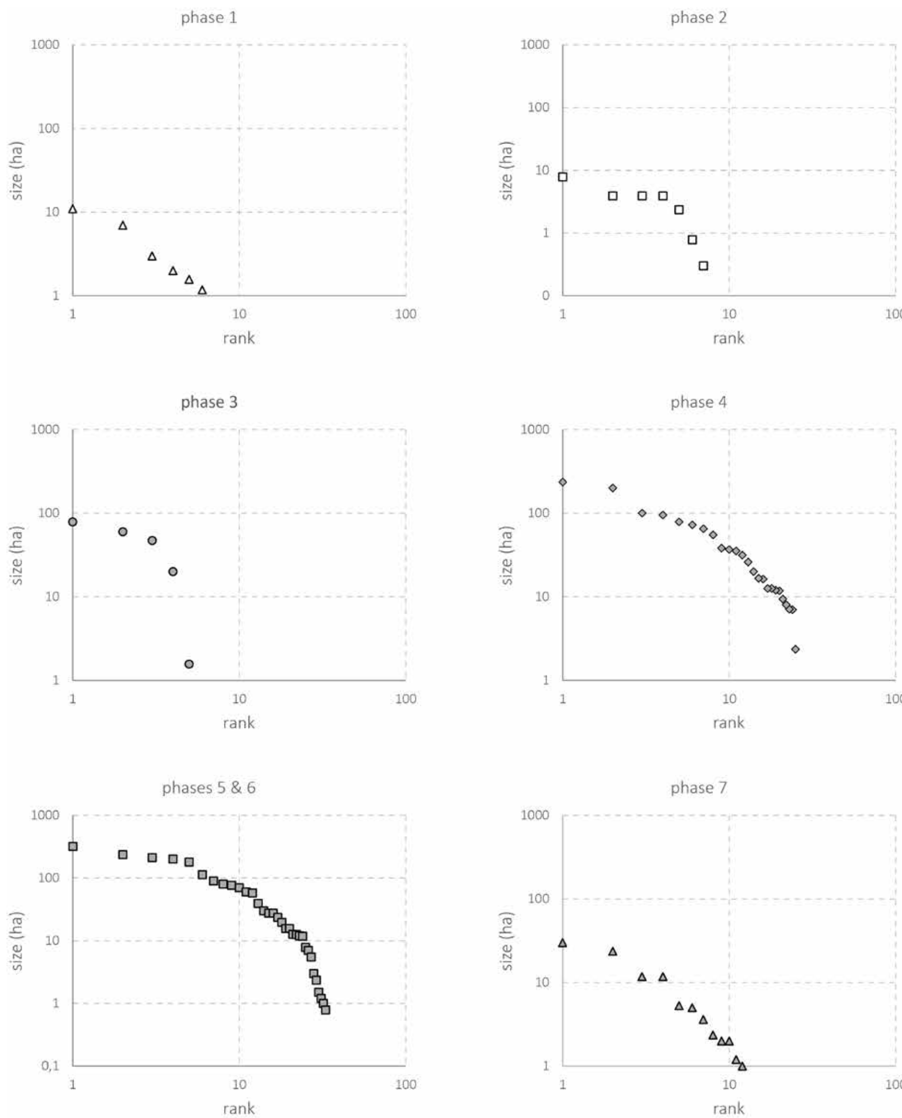


Figure 102. Rank size distributions of Tripolye sites. Phases 1 and 2 – entire working area; phases 3-7 – the Sinyukha River catchment only.

sites of the seventh phase tend towards a convex distribution, while those of the fourth phase have some features of a primo-convex distribution (but here there is not one large site, as this distribution implies, but two).

There are three reasons why settlements are grouped by size as convex and primo-convex deviations (Bernbeck 1997, 175-179). These reasons are not mutually exclusive:

1. When the region selected for the analysis is made up of several microregions (settlements) that are economically independent of each other.
2. When political competition takes place in a given territory between the settlements of the same size (that is, again, they do not directly depend on each other).
3. Due to the limitation of the surplus product, the settlement (town) cannot develop to a large size.
4. The underdevelopment of the urban sector (handicrafts, trade, etc.).

Convex systems of settlement distribution are characteristic of, first of all, societies with a highly developed *agrarian complex* and/or *political fragmentation* and lack of infrastructure (Bernbeck 1997, 175-179).

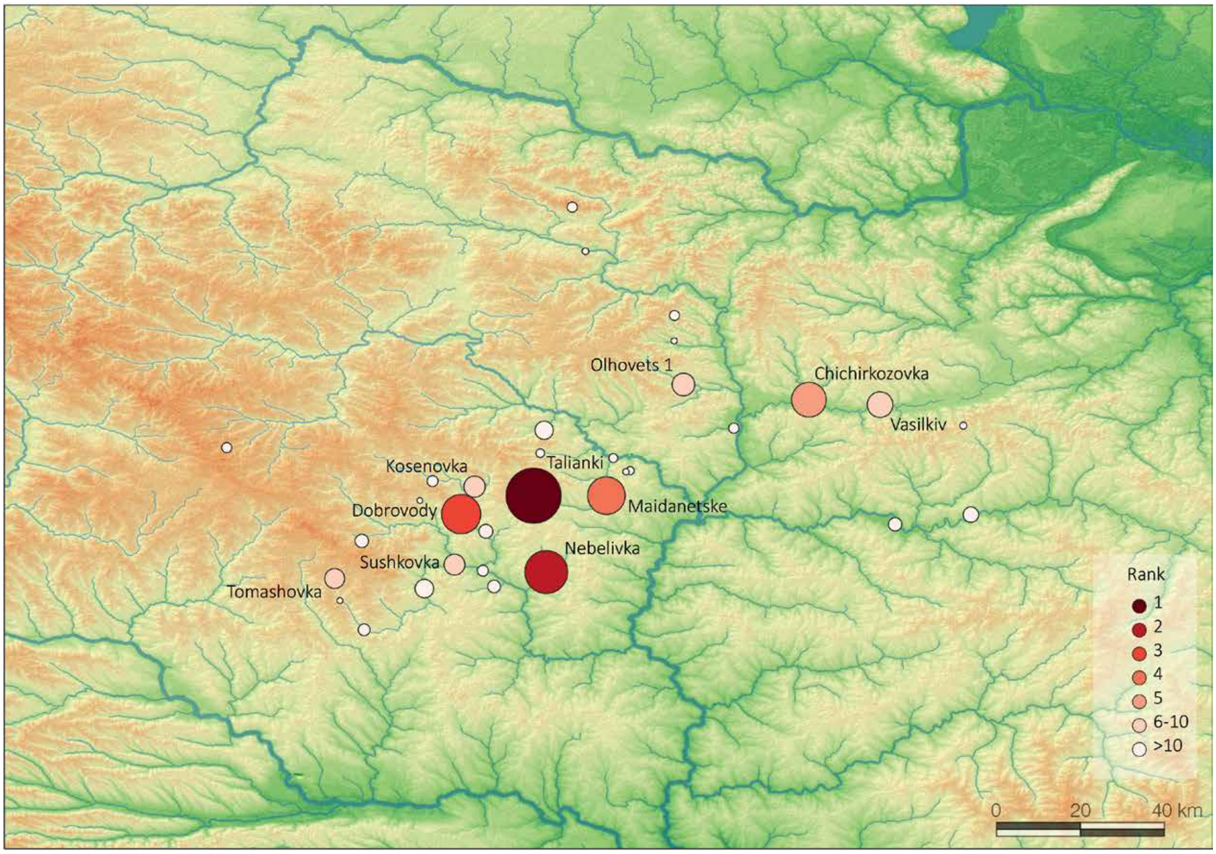


Figure 103. Tripolye sites on the Sinyukha River catchment, mapping the rank size distributions in phases 5 and 6.

It should be noted that the choice of the study region boundaries plays an important role in this analysis. However, the picture obtained for the Tripolye sites in the Sinyukha region seems to be quite indicative, since the largest mega-sites – Talianki-Maidanetske and Dobrovody – are located in close proximity to each other (10-15 km), and there are no smaller synchronous sites between them. This can be demonstrated by mapping the rank-size distribution in phases 5 and 6 (fig. 103). In the case that the choice of the working area would mask some primate distribution the higher rank sites would be distributed equally in the space and not clustered as distributed on the map.

Indeed, the communities that left the Tripolye sites are characterised by an *agrarian economy type* (*e.g.* Videiko and Burdo 2004; Kruts 2008, 36; Kirleis and Dal Corso 2016). The economic and political autonomy of at least mega-sites and most likely of other large settlements can also explain the coexistence (perhaps rather short) of sites with different ceramic styles. With this model, the population of different sites had to be united on some principles other than economic and 'political'.

There is no doubt that settlements with a similar/identical ceramic style had a closer interaction. As can be seen from the work, such ceramic styles are characterised by partial temporal overlap, rather stable development of the traditions of production and decoration of ceramics within one style (Tomashovka, Kosenovka, etc.) and partial territorial grouping of different styles. We can note the rapid spread of innovations; for example, if one feature is noticed on one site with a similar style of ceramics, then it is often noticed on other sites as well (which is most often within one chronological framework). Examples of such innovations are ring streets, pottery kilns, painted dishes, and certain categories of finds – gutuses, biconical vessels, cups, possibly models of sledges.

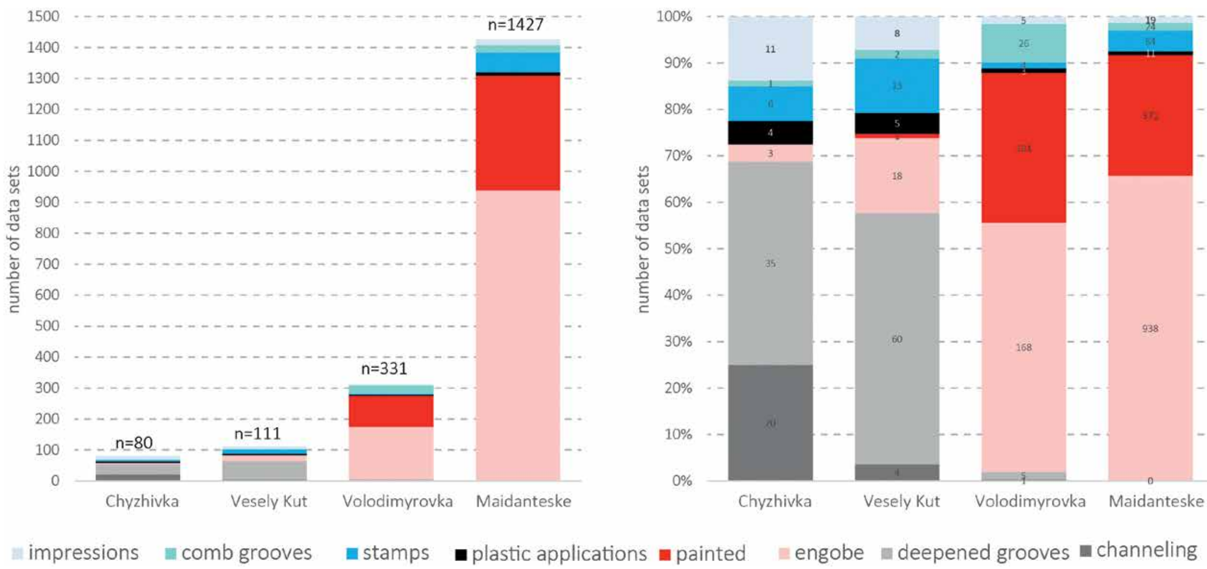


Figure 104. Frequency of decoration techniques at selected key sites.

5.5.3 Pottery styles

Ceramic styles differ from each other in morphological shapes of vessels and ornaments, as well as in different combinations of similar shapes/ornaments. Slightly less dynamic are the changes in the manufacturing technology and surface treatment of vessels. Let's give a brief description of them.

Pottery technology

'Kitchenware' appears, according to the data available for the working zone, in phase 3 (or end of phase 2) and disappears in phase 6. Its characteristic features are some specific temper and decoration techniques (non-typical for the tableware), special firing, a fairly standard form of pots and a small number of bowls (see Part 2). Due to the absence of these features, the ceramics of phase 1 and phase 7 (Kochergintcy-Shulgovka type) are proposed to be called 'coarse ware'. As to the difference in the ratio between it and tableware, the variability is 0-19% in the time between phases 3 and 6, and coarse ware dominant during phase 7.

Manufacturing techniques, in particular the firing atmosphere, then, based on the data (fig. 64) – with the transition from phase three to phase four, almost all tableware was made with the use of oxidative firing – and reducing firing, which had dominated before (phase three), quickly came to naught. This trend might be correlated (and explained by) with the beginning of the use of pottery kilns and the production of painted pottery (Korvin-Piotrovskiy *et al.* 2016a). The innovation is clearly visible after 3950 BC.

Related to this shift to painted pottery in settlements of the Sinyukha region, fundamental changes took place in the decoration technique of ceramics in the last century of the 5th millennium BCE. These changes are illustrated in the Figure 104 based on the inventories from Chyzhovka, Vesely Kut, Vladimirovka and Maidanetske. As explained above, these changes not only concern decoration techniques, but also become more understandable in the context of synchronous changes in firing technology indicated by the shift from dark fired, reduced, to light fired, oxidised fabrics.

In the inventories of the Eastern Tripolye settlements Chyzhovka and Vesely Kut, the majority of pottery is still represented by dark fired fabrics decorated with deepened grooves (fig. 104). In Chyzhovka, besides these deepened grooves, fluted decorations existed that play only a minor role in Vesely Kut (n = 4). In addition to the dark fired wares (that dominate in the sample), light fired fabrics with painting and/or engobe already appear at both sites.

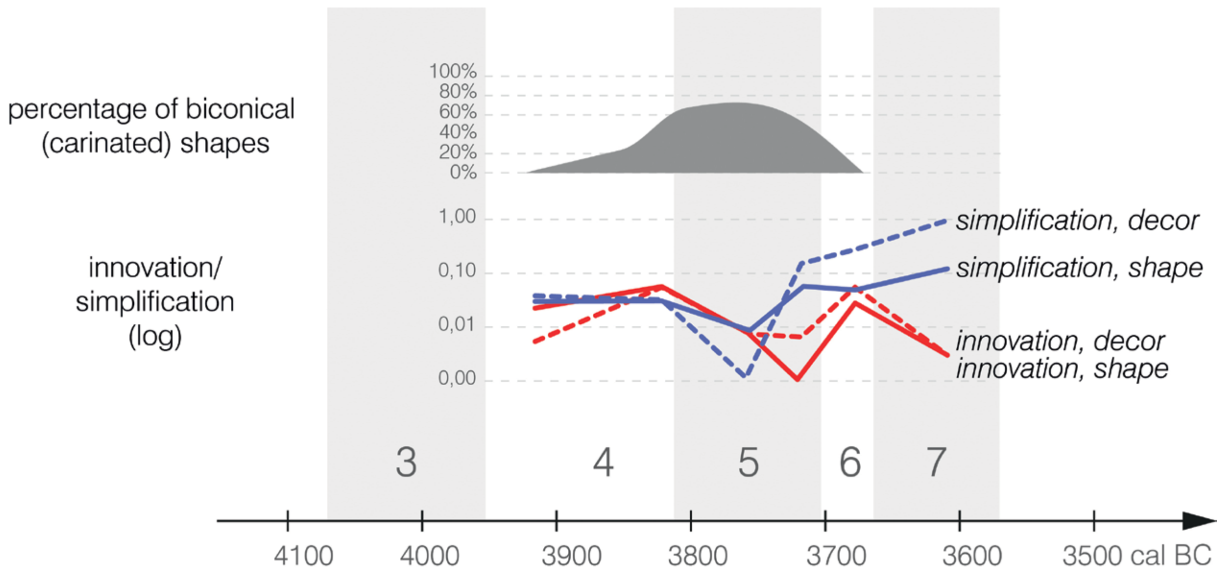


Figure 105. Frequency of carinated vessel shapes and progression of the simplification and innovation index in the sample by Ryzhov (1999).

At the later site Vladimirovka and also even later at the mega-site Maidanetske, most pottery is decorated with engobe and painting, while other decoration techniques are much rarer.

As can be seen, ceramic technologies, with all their diversity, are changing rather slowly; a major breakthrough in firing technologies, fabrics and decoration techniques occurs along with the introduction of two chamber pottery kilns. As the analyses show, morphological types of vessels are more dynamic in development; then follow ornamental designs and schemes.

Dynamics of vessel shape/decoration development

In order to identify, in particular, innovative phases and periods marked by stylistic simplification within the pottery sequence, the attempt was made to quantify newly emerging and disappearing stylistic characteristics (shapes, decoration systems) based on Rhyzov's data set (1999). For that purpose, a formula introduced by Hofmann (2013) was used. The calculation was performed separately for shapes and decoration systems.

Variables of these calculations are the number of characteristics occurring first (N^f), the number of expiring characteristics (N^e), the sample size (N^{samp}), and the length of the period (t):

Innovation quotient = $N^f / N^{samp} / t * 100$

Simplification quotient = $N^e / N^{samp} / t * 100$

Based on the absolute chronology presented in Part 4, assemblages of V1 and N1, T2 and T3 and K1 and K2 were merged. Instead of true sample sizes, the frequency categories, used by Brandstätter, were summed (1, 10, 100), providing actually a maximum sample size. Since the true lifetime of the assemblages can only be roughly estimated, phases of equal length of 57 years (400 years) were used.

Figure 105 displays the results of the calculations: phase 4 is marked by both higher innovation and simplification quotients indicating the replacement of several characteristics by others (accelerated stylistic change). In phase 5, relatively stable assemblages are indicated by medium to low innovation and simplification quotients. Regarding phase 6, we observe again the coincidence of both higher degrees of simplification and innovation related to the emergence of Kosenovka style. Finally, during phase 7 we observe the radical 'pauperisation' of the assemblages, indicated by very low innovation and very high simplification quotients.

Pottery assemblages of the period Tripolye C1 are characterised by particular structured vessel shapes with frequently very sharply profiled biconical bellies. In order to quantify this aspect, the summed (maximum) frequencies of 'rounded' and 'carinated' vessel types are displayed in Figure 105. The diagram shows the strong increase in carinated vessels in phase 4 and their dominance in phase 5. Later carinated vessels disappeared very fast. The process of 'replacing' vessels with a biconical belly with vessels with a more rounded belly was traced for some types of vessels in Talianki (in younger houses).

In addition, let's look at the percentage of different morphological types of vessels (according to Ryzhov's data after being very simplified – see fig. 65). From phase 4 to phase 7, a strong increase in the percentage of *bowls* becomes noticeable. In addition, *cups* appear at Tomashovka sites. The percentage of these morphological types is rapidly increasing, while the relative number of closed and semi-closed tableware is decreasing.

According to functional analysis, Rice showed that bowls and cups can have a serving function (Rice 1987). These functions may indirectly indicate some feasting activities within the societies. The increase in the percentage of cups and bowls can be interpreted as an increased feasting intensity in the settlements. This trend can show some important developments or changes in society. For a better understanding of society *development and organisation,* let's have a closer look at some special finds which to some extent can reflect the *world view* of the ancient population.

5.5.4 'Special finds'

The category 'special finds' includes a number of artefacts from the Tripolye sites of the Bug-Dnieper interfluve the *utility* of which is not yet clear. The ceramic finds of this category are, for example, anthropomorphic and zoomorphic figurines, binoculars and models of objects (vessels, houses, sledges, kilns, etc.). These items are traditionally regarded as related to 'ideology/spiritual culture/world view/religious beliefs/belief systems' (*e.g.* Markevich 1981; Tsvek 1993; Gusev 1996; Yakubenko 1999; Burdo 2004a; Palaguta 2007; Ovchinnikov 2014). In this work, they are discussed with reference to *world view* and *social organisation*. It is assumed that both issues are inseparable, since for a society to be organised according to certain 'norms' or 'rules' a certain system of common beliefs, values, ideals, and the like (that is, a certain *world view model*) is necessary.

For prehistory, it seems more appropriate to reconstruct some *characteristics* of the world view and *general course* of possible practices to maintain the functioning of a certain social model through the archaeological remains, rather than to directly reconstruct 'rituals/cults' and the like. That is, artefacts (in most cases) make it possible to only *indirectly analyse the world view* and, without reflecting direct actions, to be only a characteristic of the functioning/world view model of communities.

For example, with the introduction and development of agriculture, the concept of *space* was being redefined (Binsbergen 1996). This could be reflected in the material culture through the appearance of geometric features in decoration and other objects (Shatilo 2015). The world view of such societies can be characterised as the one which contrasts the 'anthropogenic world' and the world of 'wild nature'. One of the manifestations of this new viewing of the world became the manufacturing models of surrounding objects – houses, ovens, chairs, vessels. Such an indirect interpretation does not assert that in real life the ancient inhabitants opposed themselves and the natural environment, but only describes a possible *characteristic* of such a world view, when objects/practices of an anthropogenic nature were of particular importance. Of course, for a more holistic understanding of the world view, it must be considered in inextricable connection with the social organisation and in the context of the entire complex of findings.

Site	N excavated houses	N house models	N houses per house model	N sledge models	N houses per sledge model	Site size	Phase
Vladimirovka	28	3	9.3	0	0	95	4
Andriyivka	3	2	1.5	0	0	20	4
Pishchana	3	1	3	0	0	16.3	4
Nezamognik	6	0	0	0	0	15.7	4
Kolodiste (1)	6	0	0	0	0	8	4
Popudnya	23	2	11.5	0	0	12	5+6
Stara Buda	7	0	0	0	0	1.2	5+6
Talianki	50	4	12.5	71	1.2	320	5+6
Maidanetske	31	1	31	31	1	200	4+5+6
Talne 2	7	0	0	0	0	7.8	5+6
Dobrovody	4	2	2	4	1	211	5
Sushkovka	'Few'	5	?	1	?	76.6	5+6

Table 56. Frequency of house and sledge models in relation to the number of excavated houses and settlement size.

In this work, 'special finds' from the Sinyukha region will be considered with the aim to track the intensity, territory of distribution and time of use of several categories of such objects (models of buildings, models of sledges, as well as 'signs' on ceramic vessels as one of the manifestations of *symbolic culture*).

It should be noted that these objects and 'signs' can be united by a common idea of '*realism*', that is, a tendency towards the realistic depiction of surrounding objects. Let us discuss how models of sledges and houses developed in the context 1) of seven-phase chronology, 2) in a certain region and/or size groups of settlements, as well as 3) of the frequency of their appearance, and the chronological framework of the appearance of 'signs'.

A list of all models of sledges and houses (in Tripolye) was made for the analyses (Appendix 5 and Appendix 6). When the lists were being made, it turned out that many fragments that had been attributed to models of sledges and models of houses that do not have the distinctive features of these objects (that is, there are no elements of sledges or houses). A *critical analysis* of the sources has significantly reduced the number of these finds.[53]

In our working area, these two types of artefacts are found mainly during phases 4, 5 and 6. For a better understanding of their development trends, let's compile a table 56 based on the data from the table 19 (part 4). It includes all the sites of the Vladimirovka, Nebelivka and Tomashovka groups where more than two houses have been excavated.[54]

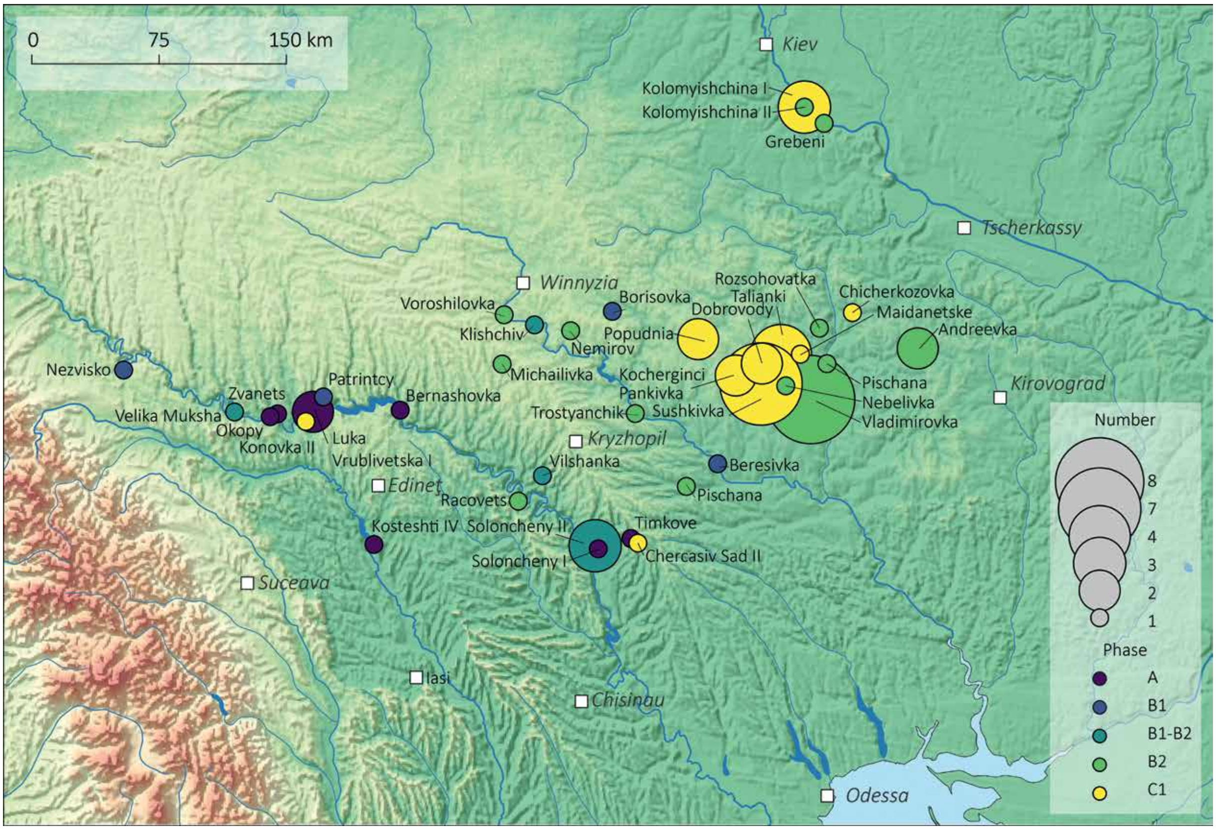
The number of finds of models of sledges and of houses, the phase of the site and its size are set out in the columns. Also, maps of the distribution of such finds have been made (fig. 106-108). For models of houses, two maps have been compiled, on one of which all the known models are shown, and on the other of which only the models left after a critical analysis of this source, that is, only those finds that have elements of houses (fig. 106 and fig. 107).

Figure 106 (above right). Spatial distribution of house models in the area of Tripolye complex and their affiliation to chronological phases. Shown are all artifacts including finds of uncertain character.

Figure 107 (below right). Spatial distribution of house models in the area of Tripolye complex and their affiliation to chronological phases. Only clear identify house models are mapped.

53 At the same time, the lists include all the items with further clarification of what cannot be considered a model and for what reason.

54 This was done in order to trace certain consistent patterns and prevent errors: for example, sometimes models were found in a settlement where only one house was excavated, and there are sites with many objects (mostly houses) excavated, but models of buildings are found there quite rarely.


0 75 150 km
Kiev
Kolomyishchina I
Kolomyishchina II
Grebeni
Tscherkassy
Winnyzia
Voroshilovka
Borisovka
Rozsohovatka
Talianki
Dobrovody
Chicherkozovka
Maidanetske
Klishchiv
Nemirov
Popudnia
Andreevka
Michailivka
Kocherginci
Pankivka
Pischana
Nebelivka
Vladimirovka
Sushkivka
Trostyanchik
Kirovograd
Nezvisko
Zvanets
Patrintcy
Bernashovka
Velika Muksha
Okopy
Konovka II
Luka
Vrublivetska I
Kryzhopil
Vilshanka
Beresivka
Edineț
Racovets
Pischana
Kosteshti IV
Soloncheny II
Soloncheny I
Timkove
Chercasiv Sad II
Suceava
Iasi
Chisinau
Odessa
Number
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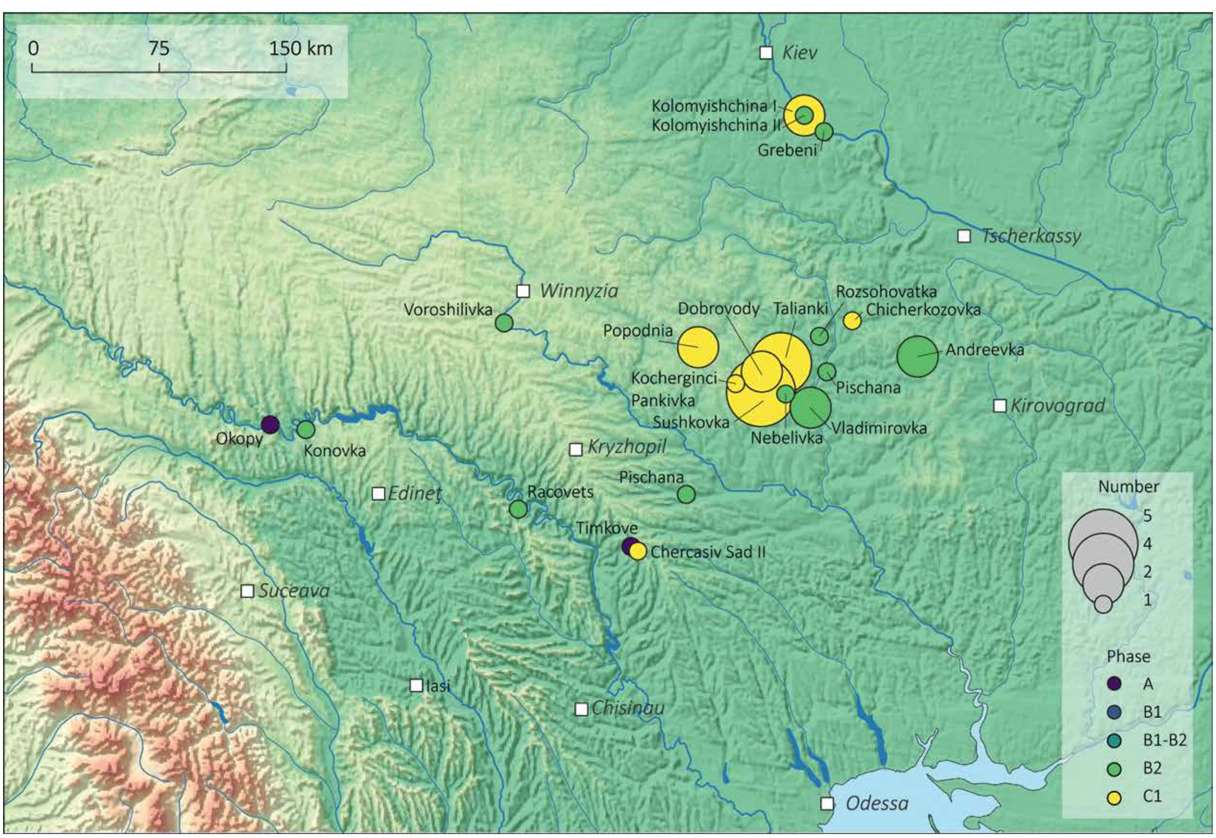
4
3
2
1
Phase
A
B1
B1-B2
B2
C1


0 75 150 km
Kiev
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Kolomyishchina II
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Tscherkassy
Winnyzia
Voroshilivka
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Rozsohovatka
Chicherkozovka
Popodnia
Andreevka
Kocherginci
Pankivka
Sushkovka
Pischana
Nebelivka
Vladimirovka
Kirovograd
Okopy
Konovka
Kryzhopil
Pischana
Edineț
Racovets
Timkove
Chercasiv Sad II
Suceava
Iasi
Chisinau
Odessa
Number
5
4
2
1
Phase
A
B1
B1-B2
B2
C1

A possible error associated with the peculiarities of field research should also be taken into account. For example, the excavations of Popudnya and Sushkovka were carried out at the beginning of the 20th century, and the models of the sledges had not yet been singled out as a category of finds, so their fragments could simply have been ignored and not taken into consideration. As an example, there is a model of a sledge from Sushkovka which was published as a zoomorphic figurine (Kozlovska 1926 fig. 4).

As a result of the analysis, some observations can be drawn:

House models

- In the Sinyukha basin, models were found on the sites of phases 4-6. In other regions, far fewer models were found (with the exception of the sites on the Dnieper); this is particularly visible if we ignore all fragments of 'legs from models', 'platforms from models', and the like, that is, those fragments where there are no actual elements of houses seen. Moreover, even if to take into account all the fragments that have ever been attributed to this type, the dominance of house models in the Sinyukha region in phases 4-6 is also obvious.
- Comparing the number of models found with the number of completely excavated houses (tab. 56), we can see that there are 1.5-3 models per *ploshchadka* where up to four *ploshchadkas* were excavated. At the sites where large-scale studies were carried out and more than 20 *ploshchadkas* were excavated, the number of models found is quite constant (one model per about ten houses examined) and varies within the range of one model per 9-12.5 houses excavated. The site of Maidanetske stands apart, where only one model was found, with 31 *ploshchadkas* that were excavated completely (Müller *et al.* 2017, 34; Ohlrau 2020, 40-34, 87).
- There is no chronological difference between the later and earlier sites in the number of models found (phases 4-6). The dominance of C1 sites on the map is due to the fact that they are better studied.
- Regarding the link of these finds with the size of the settlements, the models were found both on mega-sites and on sites of 90-70 hectares, and on settlements of 12-20 hectares. Yet, these items were not found in very small settlements of 1-7 hectares.

Sledge models

- In contrast, chronologically, sledge models are clearly linked with stage C1 (phases 5-6). Outside the Sinyukha region, there is only one artefact that is definitely dated to an earlier time – an unpublished model of a sledge from Selishche – B2. Models of sledges from Konovka and Nezvysko do not have a clear chronological position, since the publications did not indicate from what period they came on the site where they were found (there are a few sites under the same name see Balabina 2004). But in principle this is almost exclusively a regional phenomenon (Sinyukha); only a few of such artefacts are known from neighbouring territories (fig. 108).
- There is a tendency towards an increase in the number of artefacts of this type. So, at sites whose peak of occupation comes chronologically a little earlier (Maidanetske, Dobrovody), on average, one model is found per completely excavated house, and on a later site (Talianki) 1.2 model for one completely excavated house (13 finds come from the context of a large 'pit'). Nevertheless, this figure and trend may be revised when the circumstances of the finds of models of sledges in Maidanetske are published.
- Based on the data, there is a tendency that these items are found mainly on large sites.

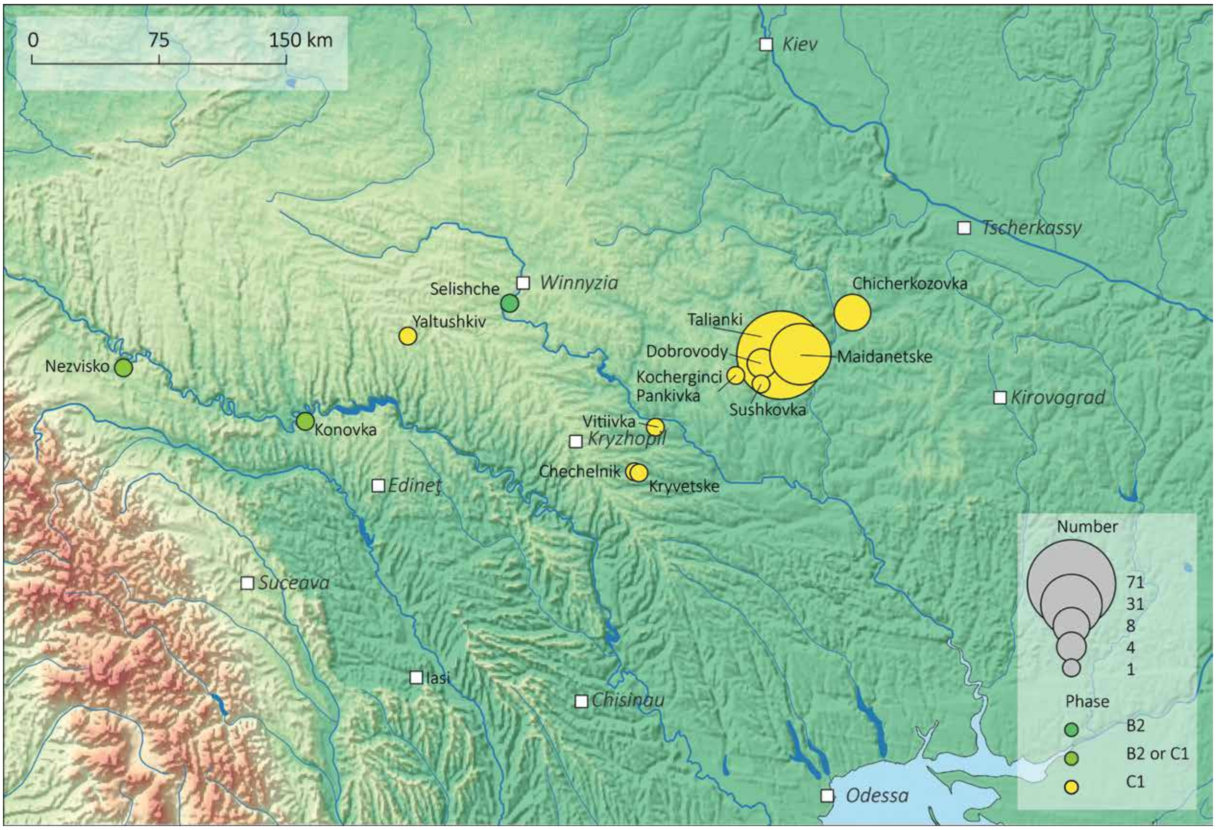


Figure 108. Spatial distribution of sledge models in the distribution area of Tripolye complex and their affiliation to chronological phases.

An important observation is that these finds are *concentrated in the Sinyukha region*. This can hardly be explained by the intensity of investigations of other territories. The chronological framework for the use of these items also appears convincing since sledge models are a 'frequent' category of find (approximately one model per excavated house); the probability of the use of these things before phase 5 seems doubtful. Compared to this 'new' category of finds, house models that are well known since the pre-pottery Neolithic of South West Asia and the Neolithic of South-East Europe are fewer. It looks as if this, a little forgotten type of thing, became 'needed' and popular again and, what is significant, in the Sinyukha region.

Finally, let's have a look at the so-called '*signs*' on Tripolye dishes. They are traditionally considered to be elements of a 'symbolic' or 'spiritual' culture because in contrast to abstract ornamentations they seem to display more concrete objects and subjects (Tkachuk 2004). Here 'icons' are considered as 'signs' (see Part 3). In this topic the main question of interest here is the chronological framework and dynamics of the frequency of the appearance of 'signs'.

Before proceeding to this question, it should be noted that the interpretation of what a 'sign' is (to what extent this or that image is a sign that copies or depicts real objects or phenomena) is often quite subjective. While some Tripolye images (*e.g.* a dog or an animal, a human figure, plant) are more or less obvious, some others (*e.g.* a lenticular oval) have been interpreted in a reasonable way (grain – see Videiko 1989, 47), then the interpretation of the third group (*e.g.* 'rain' and 'stairs') is rather problematic.

The examination of the vessels from Talianki showed that many such 'signs' are incorporated into the ornamental scheme in a specific manner a special 'free' space (for a more 'realistic' sign or another element to be applied). The connection is traced mostly through the metope scheme (characteristic of goblets) and the ornamentation in the form of a narrow frieze, especially a tangent ('craters', 'biconical-sphero-conical' vessels), where the 'signs' are drawn in a special 'empty' zone. Sometimes

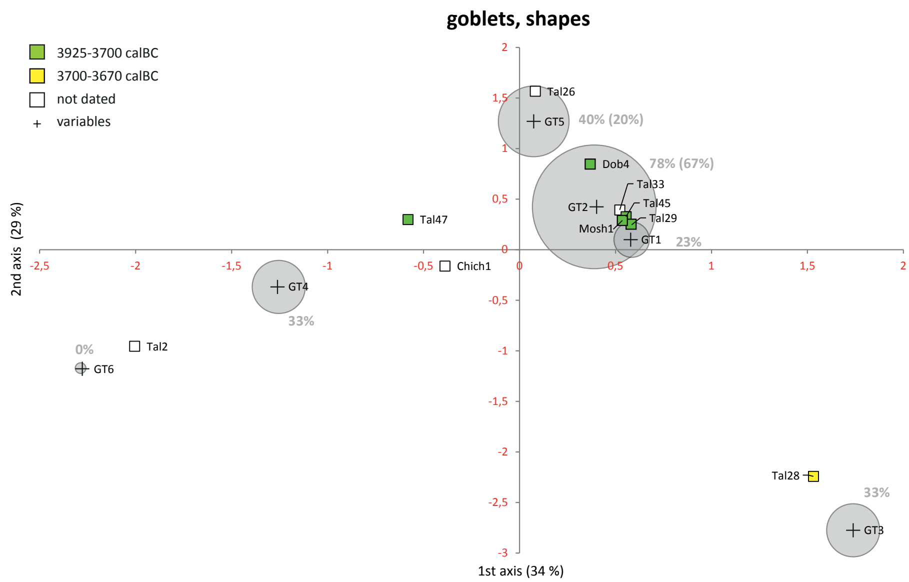


Figure 109. Sinyukha region. Ordination diagram of morphological sub-types of goblets. The grey bubbles size shows relative frequency of the occurrence of 'empty spaces' in the decoration, in which preferably 'signs' of other elements are placed. In brackets the relative frequency of pieces is given, in which empty spaces are filled with 'sign' or another element.

the elements used in 'empty' places are found enclosed by one or another ornamentation, forming part of it, and as a rule they are less realistic ('stairs', 'lenticular oval', 'comet'). That is, the 'signs' are strongly tied to the type of the ornamentation scheme, which, in turn, has a connection with the morphological type of vessel.

The *'free' space* in the decoration, as well as frequent decoration of vessels with a tangential scheme, is characteristic of the Tomashovka ceramic style (mainly during phases 5-6). As for the chronologically older styles – Nebelivka and Vladimirovka (mainly phase 4)[55] – the 'free' zones are clearly traced only on goblets (*e.g.* Appendix 9, pl. 50:3). However, they rarely contain a drawing (mainly only framing horizontal and vertical ovals). Likewise, 'signs' are practically not found in the ceramics of these groups. As for the Kosenovka style (phase 6), at the proper site of Kosenovka, there are clear traces of 'signs' on the goblets (*e.g.* Appendix 9, pl. 55:1). However, no special 'zones' in which they are located have yet been traced. On the Olkhovets site (probably phase 6), there are empty zones on goblets and 'biconical' vessels (Videiko 2020, 77). At the sites of the Kocherzhintsi-Shulgovka type (phase 7), there are no 'signs' or special empty zones.

Thus 'signs' and 'free' spaces in ornamental schemes were represented for the longest time in the morphological type of *goblets* (phases 4-6). On vessels of other morphological types, 'signs' and free spaces are found mainly in phases 5 and 6.

Let's look at the dynamics of the frequency of occurrence of both 'signs' and other elements (in the 'free' zones), as well as 'empty or free zones' in the goblet type. For this, let's take the correspondence analysis (fig. 86), which shows the chronological development of the goblets' shapes. Let's calculate the percentage of 'empty' space and where this space is filled with a sign or other element for each subtype of goblet (fig. 109). As can be seen, the percentage of goblets with empty spaces (filled – see *e.g.* Appendix 9, pl 9: 6; 12:2; 18:10; and not filled – see *e.g.* Appendix 9, pl. 48:5) increases from the earliest sites (37%) to the chronologically later ones (66% and 33%, 71% and 57%). However, the percentage slightly drops (22%, 33%) for the youngest houses.

A similar tendency towards an increase in the number of 'signs' in the Tomashovka group in the course of time was noted by Taras Tkachuk. However, in the category of 'signs', he included a very large number of other ornamentation

55 These observations are made using the catalogue of Tripolye vessels from Sinyukha (Ryzhov 1999).

elements, in addition to ‘signs icons’ (Tkachuk 1993; 1996; 2004). Tkachuk believes that the increase in the use of ‘signs’ is a kind of indicator of an approaching crisis. During the crisis, there is a complete rejection of the previous ‘sign system’ (Tkachuk 1993, 98).

In this work, ‘signs’ are considered one of the manifestations of symbolic culture with features of ‘realism’. They quickly spread to the Tripolye sites during phase 5 and were in use until the end of phase 6.

Thus the consideration of special finds in time and space, as well as their quantification, seems to be a promising direction. Although no special studies have been carried out, it should be noted that the *binocular-like objects* in the Sinyukha region are found from phase 3 to phase 6. Moreover, in phases 5 and 6 they change; some of them do not have through holes. And like models of sledges, house models and ‘signs’ on the ceramics, binoculars disappear with the beginning of phase 7.

5.5.5 In search of a model of social organisation

Based on the above observations, we can come to the conclusion that from the third to the sixth chronological phases a certain *social system* existed and was maintained on the Sinyukha. The settlements of this chronological period are characterised by a layout of the same type, possible economic and political independence, at least at the large settlements, a similar package of finds and other features of material culture.

To explain the functioning of such communities, the model of ‘local groups’, which are interpreted as ‘mono-ethnic’ populations or ‘tribes’ replacing each other as a result of (seemingly non-stop) large and small migrations, can no longer be used. In addition to well-grounded criticism of this approach on the whole and parts of it (*e.g.* Wotzka 1993; Tyshkov 2003; Hahn 2005; Mosyn 2013; Sokolovsky 2013), this exclusively ‘migration’ paradigm cannot explain the increasingly obvious step by step development and continuity from phase to phase.

Similarly, the *Tripolye site duration model* can no longer be applied. Based on the data available today, a Tripolye settlement (especially a large one) could have functioned for a longer period than previously assumed, and it is rather difficult to calculate the ‘average’ settlement lifespan: some settlements could have had a longer lifetime, others a shorter.

The compiled new chronology showed the coexistence in the same time frame of at least the largest sites – giant settlements (albeit with different peaks of occupation). In addition, there are no visible significant differences on such synchronous sites[56] and traces of ‘dependence’ on each other. At the same time, there are some special features. For example, the so-called ‘ditch’ is not an obligatory characteristic of the site, it can be either present or absent, be single or double, or be dug out between the rows of houses. With regard to regional development, the comparative diagram compiled shows (fig. 110) a largely continuous development in the organisation of settlements in phases 3-6, and technological changes in ceramics go along with the introduction of kilns.

The search for a *concept* that could best explain what happened in the Chalcolithic on the Sinyukha, what the system of relationships between the communities from different settlements was, should certainly become the topic of a separate study. In this work, it can only be suggested that the model of ‘***supraregional networks***’ proposed by Trevor Watkins for the Neolithic of South West Asia (2008)

56 So far, except for one of the latest settlements of Talianki, on the plan of which mega-structures in the ring change their position, being located in the same row with houses, their size becomes significantly smaller.

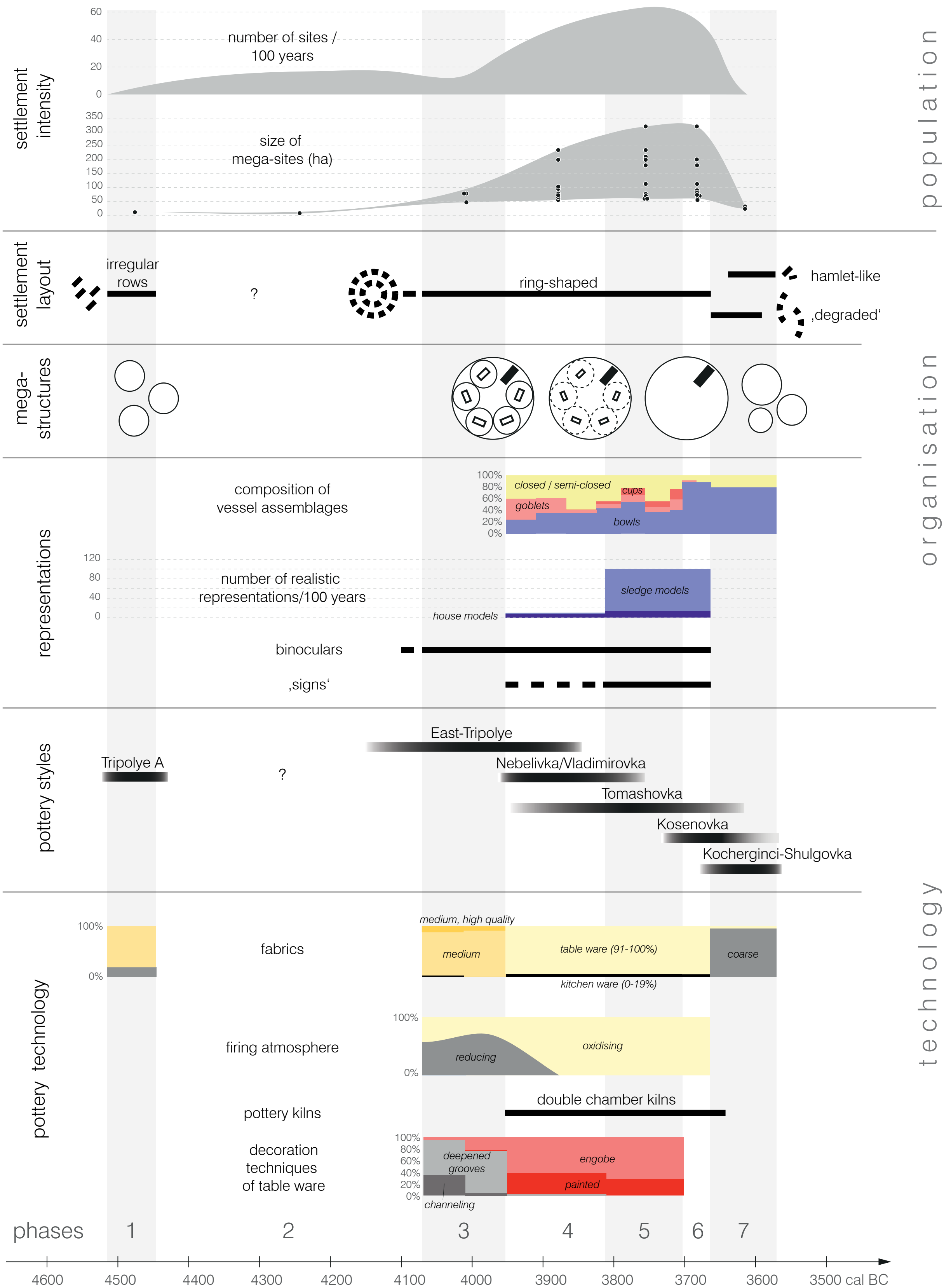


Figure 110. Sinyukha River basin. Comparative diagram showing the dynamics of various aspects of the material culture development and settlement patterns.

as a revised version of the Colin Renfrew's model of ***peer polity interaction*** sphere (Renfrew 1986) could be used as such.

In general, these different versions of essentially the same model (or research approach) suggest revising the *mechanisms of interaction between communities*, both among themselves and at the level of individual sites (within their social levels), which ultimately led to the emergence of zones with similar settlement structures and artefact collections (Child's 'archaeological culture'). This hypothesis tries to explain interactions within both early state and stateless societies.

The original version of Renfrew's model (for early state modules) provides that (Renfrew 1986, 1-18):

- In one geographic region (or wider) there are separate *autonomous* (self-governing, politically independent) *socio-political units* (*polities*) that are located not far from each other.
- These polities are more or less *similar* and have similar status.
- A full range of *interactions* takes place between them (exchange of information and material objects, imitations, competition, etc.).
- Together they make up *networks of groups of interacting polities*.
- Changes, transformations and innovations in these 'spheres' occur at the *regional level*, that is, in the zone of interaction, and not at the level of a separate polity (thus it is difficult to trace 'where' within the interaction zone this or that innovation or change first started).
- The *transformation* process is not the result of internal development, but a *consequence of the interaction between the polities* through
  - competition and emulation
  - symbolic entrainment and transmission of innovation
  - increased exchange of goods and ideas.
- A tendency towards the emergence of *hierarchical structures* in such polities is observed.

Rebuilding this model to analyse the Neolithic sites of South East Asia, Watkins points out the peculiarity of Neolithic polities – they lack traces of social or political elites (that is, hierarchy). Based on this, such polities have their own specifics:

- Considering the relationship between polities, symbolic entrainment matters more than competition in many situations.
- Emulation (competition) could have taken place at the level of entire polities, not elites (as Renfrew described it), and it can be traced through the distribution of certain prestigious goods (*e.g.* arrowheads).
- The element of competition in emulation stimulated an intensification of *exchange* and ever closer convergence in imagery and symbolism spheres.
- Exchange (of information and ideas, common beliefs and generalised symbolic representations) in the Neolithic has a pronounced *cultural* and *social* rather than economic character.

Watkins shows that the interaction of Neolithic communities (represented by different levels of personal networks) occurs through *nested networks* of cultural, social, and economic interactions. These nested networks of interaction spheres of equal polities are represented by *local*, *regional* and *interregional* networks.

Within the individual polities, and between the polities, a *sense (feeling) of community* was maintained through a certain ***common symbolic culture***. That is, the identification of different communities took place through the exchange of symbolic values, and due to these differences were erased. A special symbolic culture was needed to maintain the system where people lived in large villages in order to cope with the scale and complexity of social relations within large groups.

At the same time, the use of the same symbols does not mean that they were given the same meaning.

Within the regional sphere of interactions, over time some changes took place – for example a rapid increase in the number of people within a social group and against this background an *increase in the intensity of rituals*. This ultimately led to the formation of a powerful *supra-regional sphere* of equal polities interaction.

These new cultural processes were the result of a sedentary way of life, where in one settlement, which tended to increase, lived *large communities of people*. The question that remains open is what *motivated* people to live in larger and larger settlements.[57]

One of the advantages of this approach is that the spread of common symbolism, worldview, innovation, and the like is not necessarily or exclusively explained as a result of human migrations.

Let's take a quick look at *Sinyukha's Tripolye sites* through the prism of this research approach:

- Here, in a relatively small region, there is a large concentration of sites that are very similar to each other. These sites, according to the available data, *differ* from each other mainly in the size of settlements (first of all, it's about the sites of a large size above 50 hectares in phases 4-6). At the same time, the rank-size distribution indicates that these settlements, most likely, could be economically and politically *independent* of each other.
- It should be emphasised that there was an almost identical material culture, especially within the framework of phases. Both the ceramic shapes and ornamentation, special finds, settlement layout described in the work, and the issues not covered – the architecture and *ploshchadkas*' interior, funeral rites (no traces of them), figurines, a few tools, and so on have a well-pronounced *general character* in all the settlements. This may indicate a high intensity of *interactions* and *exchange* of symbols, knowledge, technologies and, perhaps, objects between them.
- A characteristic feature of these Tripolye settlements is the *stability in the development* of some elements of material culture. So Tomashovka or Nebelivka pottery styles dominate in the corresponding phases; there are practically no 'transitional' sites where one can see how one style is replaced by another. Within the model of interaction spheres, this could be explained by *rapid changes at the level of the whole region.*[58]
- Some *innovations* have a similar character – for example, painted tableware, with the beginning of phase 4, seems to appear at the same time on different sites; at the same phase, kilns appear and a fairly standard type of mega-structure on the ring street at the sites (Ohlrau and Rud 2019; Hofmann *et al.* 2019); manufacturing models of sledges (which may attest the introduction of such an innovation as a cargo sledge) starts just as rapidly with the beginning of phase 5. Such a rapid spread of these innovations indicates both their wide acceptance and the fact that the population of different villages, which was in close relationships, also *tended to converge* (shown by the speed of the diffusion of innovations – see Watkins 2008).
- *Symbolic entrainment* and intensive exchange between sites can explain both the similar ceramic complex (dishes) and the use of the same types of special objects. It can be noted that over time, more and more 'special' items were added to the

57 In search of an answer to this question, Watkins ponders possible factors, such as a rich cultural environment, the ability to interact with other 'like-minded', people, that is, certain 'cultural' advantages, but he still does not come to a final conclusion.

58 A slightly different picture is observed when changing from the 'Eastern Tripolye' style to 'Western Tripolye', where both styles are found on the site of Garbuzin; further study of this site seems promising.

existing ones. So first there were binoculars, then models of houses, and soon after that models of sledges appeared. In addition, in the course of time so-called 'signs' appeared and increased in number. Thus, in the sphere of 'spiritual' culture, a need for more and more objects of 'symbolic' meaning is observed. Along with this, there was an increase in the number of bowls and the appearance of cups, which can be interpreted as an increase in the intensity of feasting in the communities.

- Indeed, the need for numerous *social interactions* was of an ever-increasing nature, which, in addition to special finds and general symbols (which can be traced, for example, by ornamentation on pots), is demonstrated through multiple *places of interaction*. These places or created space components, firstly a ring street, as well as squares, tended to increase in size over time, the streets became longer, and the squares ('main' ones) larger. When the system of mega-sites and agglomerations collapses in the seventh phase, such places of interaction disappear. Special finds, along with 'signs' and rich ornamentation on ceramics, disappear as well.
- This growing need for social interaction was clearly manifested in phases 5-6. It should also be noted that there was a tendency towards *hierarchisation* during these phases (Hofmann *et al.* 2019).

As in the case of, Neolithic zones of interaction shown by Watkins, on the Sinyukha social and cultural motives for rapprochement, based on the data, were more important than functional or economic ones. The general imagery system and symbols could have been used to maintain a feeling of community and thus to operate this system, which could have been composed of vast networks of diverse exchange. A striking feature of this regional sphere of interaction is the tendency towards ever-larger agglomerations and population concentrations, both in the region as a whole and in individual settlements.

The settlements of this region could have formed part of the more global Tripolye-wide area networks, while the connections between the Sinyukha settlements seem to be more intense. A certain 'crisis' in the interaction spheres can be observed here in the sixth phase, when settlements with Kosenovka-style ceramics appear in the region, which, apparently, did not enter into close all-round interactions with other settlements (of the Tomashovka group). They could be part of another (Brynzeny-Zhvanets) system of interactions (Dniester region).

Summing up, it can be noted that the use of the *supraregional networks model* as a research approach for understanding the Tripolye phenomenon, in particular in the Sinyukha region, is a promising direction. With that, the supraregional networks model cannot yet shed light on the periodic change in microregions of residence, where settlements of new chronological periods were built on uninhabited, or 'free', places (this is discussed below). This feature is characteristic, first of all, of the sites in the Sinyukha basin, and not for the surrounding territories. Often this movement is accompanied by changes in the ceramic style.

5.5.6 Periodisation

Returning to the question of singling out periods postulated at the beginning of this part, based on these data, at least *two periods* in the development of Tripolye can be distinguished in the region:

- The first is *Early Tripolye (A)* (first chronological phase), which should be analysed within a wider territorial framework.
- The second period is the period of '*intensive interaction and population agglomerations*', which began approximately between the second and third chronological

phases. During this period, the formation, development and rapid collapse of the interaction networks between agglomerated and other settlements took place.

Proceeding from the data presented, the first and second periods may not be fully connected. The second period is characterised by:

- the *formation* of the *social organisation model* (third chronological phase). The first mega-sites and mega-structures are built; a threshold is established between the settlements,
- the time of *improvement* of this model (the end of the third to beginning of the fourth phases) – the formation of a ‘classic’ settlement layout with typical elements in its development, diversity of pottery styles, and the like,
- *sustainable development* (phases four and possibly five) – the development of the envisaged before aspects in the settlement layout and ceramic production
- parallel *beginning of gradual crisis* growing (fifth phase),
- and the related *polyvariability* (searching for ways out of the crisis?), which was reflected in some diversity in the settlement layout that was mirrored in changes in mega-structures, world view – an increase in the number of categories of special finds, ceramic production – the existence of several very different pottery styles in neighbouring settlements (sixth chronological phase),
- *crisis* (seventh phase) – rejection of the social organisation model, degradation of the institution of mega-structures, simplification of the entire ceramic complex and replacement of the ceramic style, disappearance of a number of special finds, disintegration, sharp depopulation, lifestyle changes,
- after the crisis, the *collapse* and disappearance of the Tripolye phenomenon in the region.

It seems that it makes no sense to distinguish the seventh chronological phase as a separate period, since this time is directly connected with the sixth phase, and not only with the ceramic style (the few examples of painted ceramics that are found on the sites of the Kochergintcy-Shulgovka type belong to the Kosenovka style of painted vessels), but also geographically (see part below). This, possibly rather short, crisis phase followed immediately after the collapse of agglomerated settlements and is characterised as the last remnants of once large spheres of extensive interactions. This phase has no further continuation.

5.6 Tripolye sites in time and space

This part is devoted to the consideration of the Tripolye sites of the region through the prism of *space* and *time*. Since the geographical position of the Tripolye settlements has some patterns, for their better understanding it is proposed to look at the distribution of settlements in this region in other historical periods. It is suggested to dwell in more detail on:

- the phase-by-phase arrangement of the Tripolye settlements in space
- the specifics of the location of the Tripolye sites in the Sinyukha basin
- characteristic features of the historical development in the Sinyukha region.

5.6.1 Spatial distribution of settlements in diachronic perspective

To begin with, let’s consider the phase-by-phase distribution of the Tripolye settlements in space (from Appendix 1), putting on the map, besides the sites themselves, their area, which is comparable (fig. 111). As in the previous cases, the data for phases five and six are displayed together. However, on the map for this joint phase,

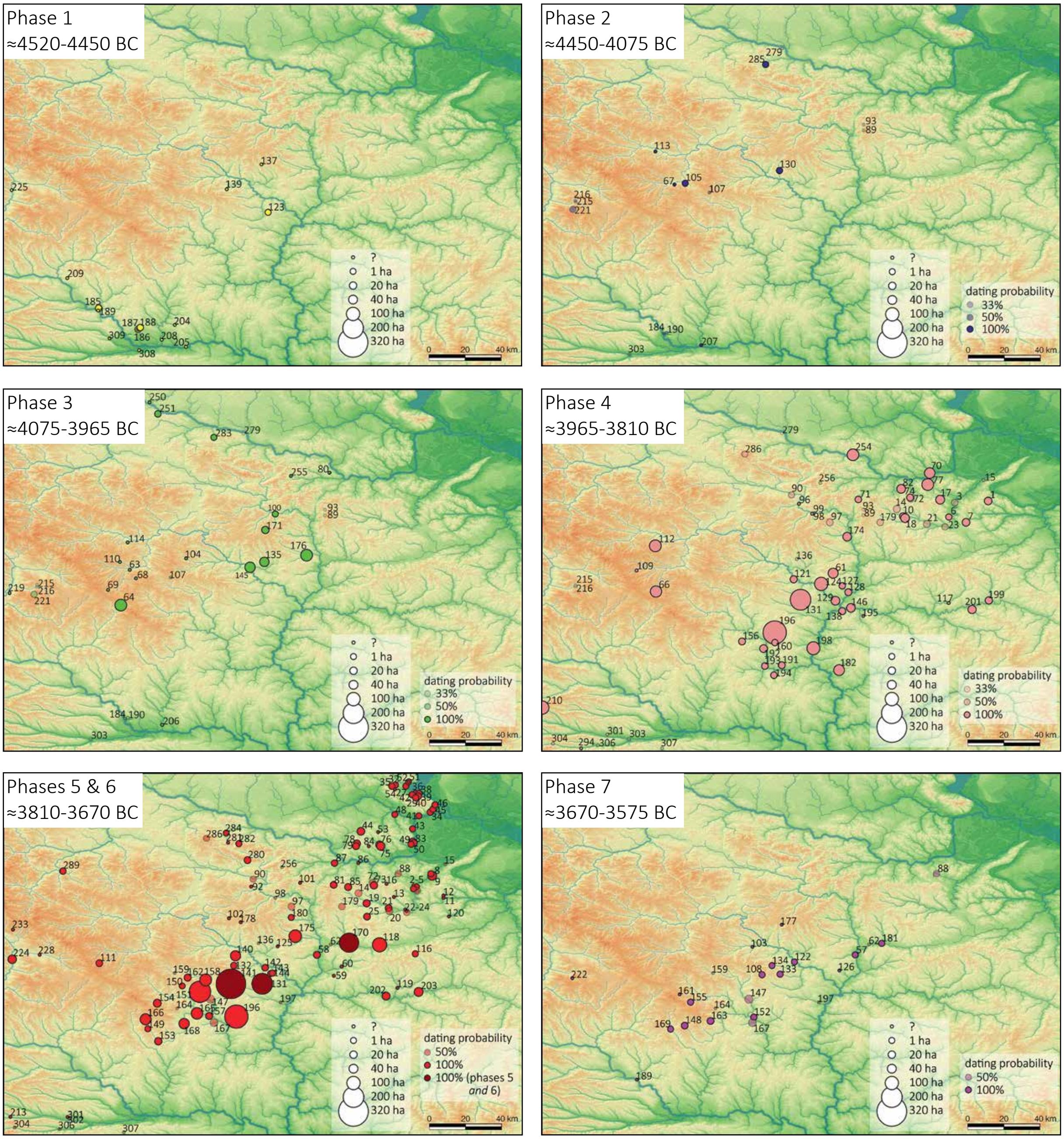


Figure 111. Diachronic distribution of settlements in the study region displayed in bubble diagram with settlement sizes.

the sites that date from both phases are separately indicated. In addition, the probability of dating is indicated on the maps (see the part above), and where the settlement's dating was unclear, the sites are marked with a semi-transparent colour.

So the mapping of the first phase showed that the settlements are concentrated mainly on the Southern Bug and that there are just a few sites on the River Gorny Tikich.

In phase two, this development continues in a certain way, although the number of sites becomes smaller. Several settlements appear in the territory close to the River Ros. It is worth emphasising that these are just separate, small settlements.

In the third phase, significant changes take place. A cluster of large settlements (including Vesely Kut) appears on the rivers and on the interfluve of the Gorny and

Gniloi Tikich, that is, on previously practically uninhabited territories. In addition to them, the sites in the upper Gorny Tikich and its tributaries continue to develop. Also, the large settlement of Bugachevka appears.

It is also worth mentioning another microregion, which is only partially represented on the maps – the sites on the River Sob and its tributaries. This region is mainly located further to the west (the Middle Bug region). On the part which is within our map, it is clear that the several small settlements had existed there all the time from the first to the seventh phase.

In phase four, something incredible happens: the entire central part of the Sinyukha basin is filled with sites, including the ones with a large area and 'super-settlements' of 200 hectares. But this was not the only change. Several sites appear on the middle reaches of the River Bolshaya Vys, and a large number of settlements on the lower reaches of the Ros and on the nearby tributaries of the Dnieper. All these territories had been, according to the data, uninhabited in the previous phase. It should also be pointed out that the lands occupied by large settlements of the third phase (Vesely Kut and others) are becoming deserted, and the cluster on the upper Gorny Tikich continues to exist, and again with large settlements. The previously occupied lands near the Southern Bug are becoming deserted, but some sites appear a little to the south-west on the River Savranka.

Phases five and six, having been mapped, show an even larger picture of the demographic boom taking place on these lands. The development of the previous phase is partly continuing. However, the location of sites that had gravitated towards the middle course of the Sinyukha basin slightly shifted to the west, to the upper Yatran and its tributaries, and the sites located nearby on the lower reaches of the Gorny Tikich continue to develop. Several sites on the River Bolshaya Vys, as well as the sites south of the lower reaches of the Ros (its right bank) and the nearby tributaries of the Dnieper, continue to develop there. At the same time, a large number of settlements appear on the left bank of the Ros, stretching to the banks of the Dnieper. The Shpolka river basin, previously uninhabited, is being populated. Two mega-sites appeared here, one of which, Chichirkozovka, is the fifth largest Tripolye settlement.

Phase seven, marking the end of the Tripolye period in the region, shows a striking depopulation of the land manifested in the reduction of settlement sizes and their number. All the sites, in fact, are located on the lands occupied by the largest mega-sites in the previous phase. All the other territories where 'smaller' sites existed in the previous phases are being abandoned (with very few exceptions).

The mapping of sites showed interesting tendencies in the emergence of mega-sites in phases three and four in practically uninhabited territories. What is more, from start to finish of phase three, it is clear that the settlements are located on a 'strip' of land, somehow making up a kind of wide line, changing its direction (in different phases). The sites from the headwaters of Gorny Tikich, which seem to make up their own small, separate, stable enclave and several sites from the Bolshaya Vys, which are supposed to be associated with flint mining, do not quite fit into this 'strip'.

5.6.2 Density of the sites

To complete the picture of the diachronic distribution of settlements, a *heat map* was compiled for each phase, which took into account not only the density of the sites, but also their area (size), that is, the sites were weighted according to settlement size (in a radius of 20 km). Since the size of sites may indirectly reflect the number of people, this method can visualise the zones and concentrations of the population (fig. 112). As in the previous maps, the data for each phase have the same values, that is, they are comparable.

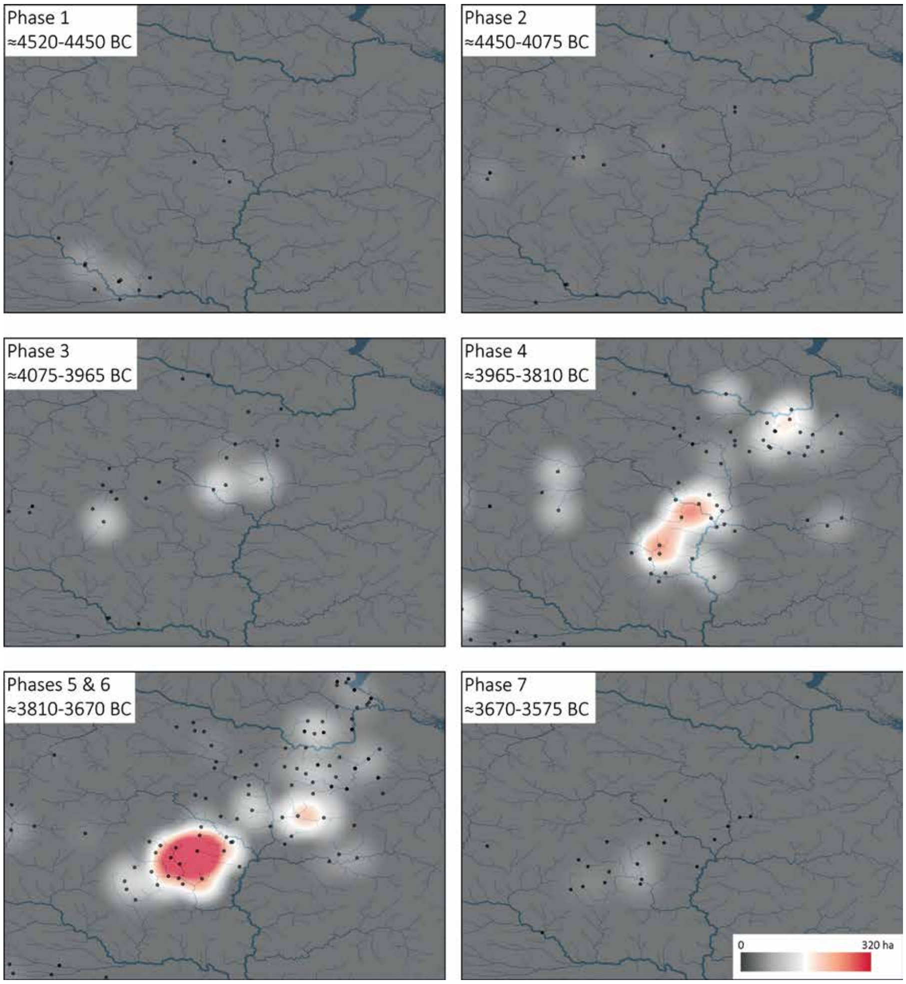


Figure 112. Diachronic distribution of settlements in the study region displayed in a heatmap weighted after settlement size (radius 20, maximum 320 ha, compiled in QGIS v3.8.3 Zanzibar).

The resulting picture is interesting enough. For half of the maps, very low indices were noted (phases one, two and seven). From phase three, there are several clusters of population concentration associated with early mega-sites (the upper Gorny Tikich and the Gorny and Gniloi Tikich interfluve). In the fourth phase, a new large cluster appears on the lower reaches of the Ros, as well as a large cluster in the centre of the Sinyukha basin. This large cluster is the initial stage of the 'supercluster' that appears here during the fifth and sixth phases. Almost the whole population of these phases from our working zone is concentrated there, between the modern towns of Uman and Talne. In addition, another cluster appears on the River Shpolka, which is smaller, but no less impressive, with such settlements as Chichirkozovka and Vasilkov. In the seventh phase, only a small pale cluster is visible on the grounds of the largest sites of the Uman microregion.

The processes of concentration of the population are better seen with the use of this method than by simple mapping. Comparing Figures 111 and 112, one can see, for example, that the numerous sites of the Kaniv group were quite small and practically unconnected with the concentration of the population. Besides, the main densely populated areas are very clearly outlined.

In conclusion, it can be said that the mapping method turned out to be very productive. Examinations have highlighted a number of interesting observations. One of them is the fact that the sites were located on an area of land in the form of a wide strip, which seems to echo the assumptions of a number of authors about the large Tripolye sites situated on the borderland with the steppe (*e.g.* Kruts 1989; Kirleis and

Dreibrodt 2016; Ohlrau 2020). Following this, it would be interesting to look at the development of this territory in other historical periods and at the borderlines of the activity zones in particular.

5.6.3 Comparison of the spatial distribution of Tripolye settlements and Ukrainian villages

A clear geographical distinction between different cultural formations, which differ primarily in types of economy, can be traced back to the Bronze Age in this and neighbouring territories. Since we are dealing with a region where the Tripolye settlements' zone limits are clearly confined, let us have a look at a historically not so distant time, namely the period 900-2000 AD to compare the boundaries of this cultural phenomenon. This example has been chosen for two reasons. Firstly, it was during this period that the territory was inhabited by people who had an agricultural type of economy, and secondly, in the middle of the 20th century, a series of encyclopaedias, *History of Ukrainian towns and villages,* was published, which gave the date of foundation of almost every settlement. In fact, it is a kind of database built on historical sources, which describe and/or record the first mention of a particular settlement.

Having collected the necessary information, two maps have been compiled. The first one (fig. 113) shows the location of the deserted ancient Rus' settlements (9-13 centuries), and the second one (fig. 114) the foundation of settlements in our working area from 900 AD to the present day (including the settlements founded during the ancient Rus' period that have existed continuously since then).

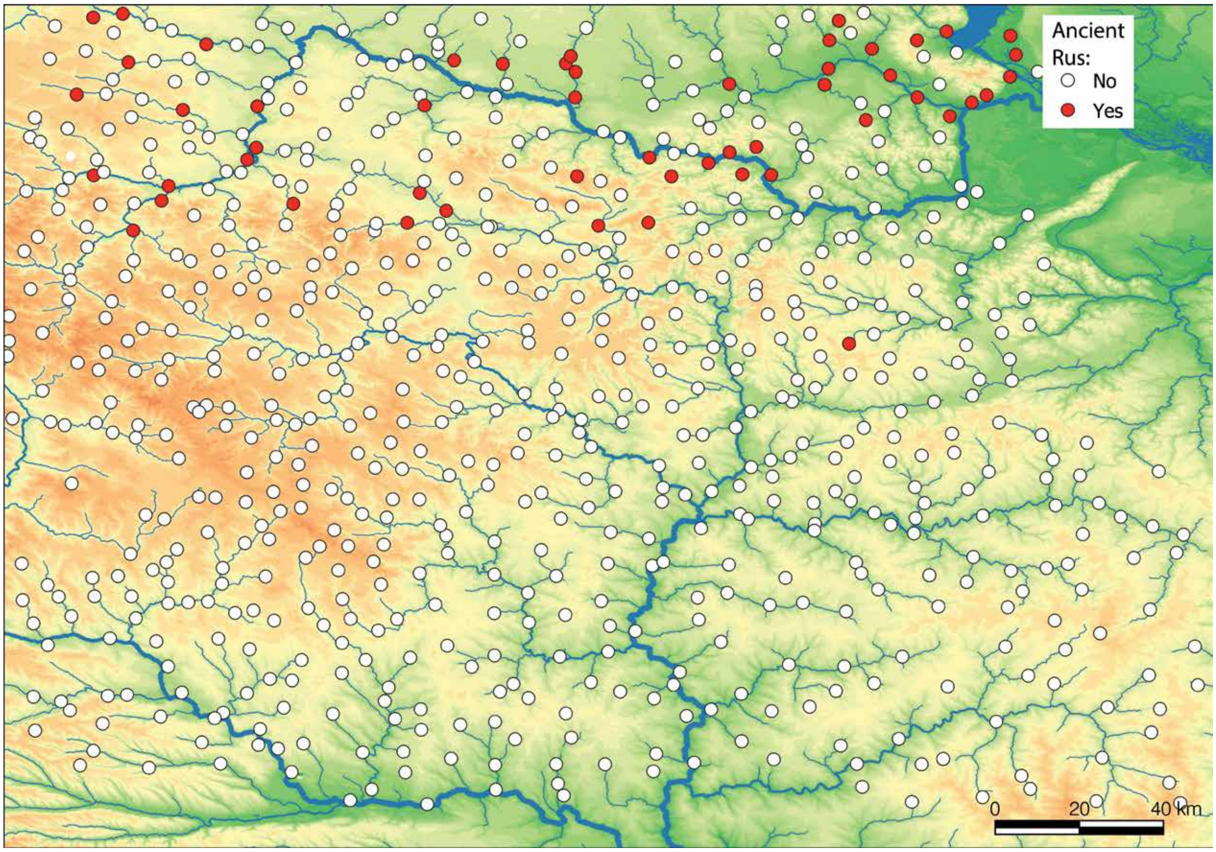
Analysing the maps, especially the second one, we need to keep in mind the historical background, the context in which these or those settlements were founded. In particular, the fact that in the 16th-19th centuries there were the borderlands between the Polish-Lithuanian Commonwealth (Rzeczpospolita), the 'Wild Field', the Zaporizhzhya Army, the Russian Empire and New Serbia. However, the boundaries of these entities, firstly, were not always clearly outlined and, secondly, depended on the type of economy. The resulting picture seems to be quite representative, especially before the 18th century, as after that time the foundation of villages became state policy and also artificial irrigation technologies were actively developed, which made it possible to use the areas that had been too dry before for farming.

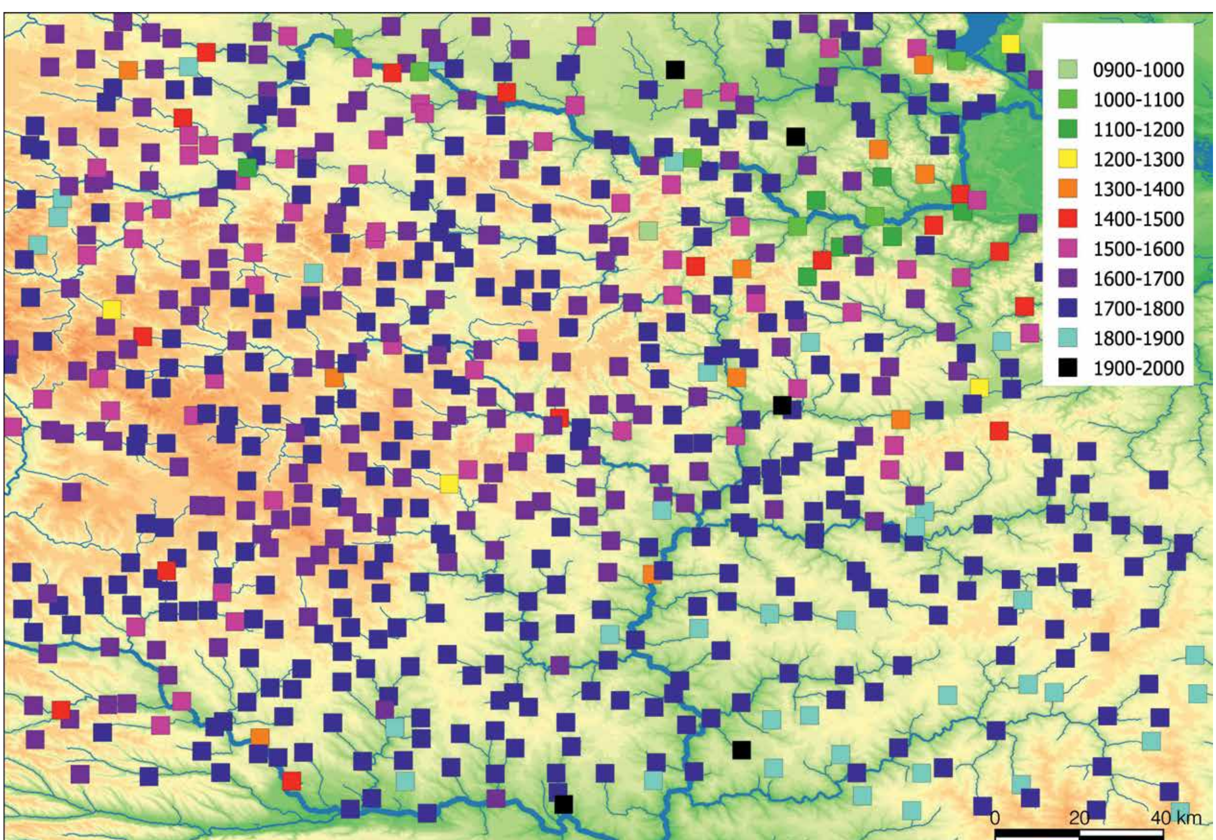
When comparing the second map (fig. 114) and the maps of Tripolye sites' locations, a number of observations have been made:

- The limits of the lands where many villages were founded in the 16th, 17th and 19th centuries are in the shape of an inclined straight line, stretching (with some variations) from south-west to north-east. Tripolye sites have a similar location.
- At the same time, the north-western territories of the working zone (which were practically free in Tripolye time) were more popular than the Sinyukha lands in the historical period.
- The south-eastern limits of the spread of the villages before the 1700s coincide with the distribution boundaries of Tripolye sites, and, in principle, this line runs along the border with the steppe.
- The villages that were founded after 1700 AD beyond this border (*i.e.* in the steppe) are much less dense than on the north-western territories.
- The region of the lower and middle reaches of the Ros was more popular where the continuous development has been observed since 900 AD.
- The Sinyukha basin was populated quite late – a few settlements in the 16th century, and mainly in the 17th-18th centuries.

Figure 113 (above right). Location of abandoned Ancient Rus (9th -13th c. AD) settlements.

Figure 114 (below right). Villages in the working area starting from 900 AD to the present day with foundation date.


Ancient Rus:
No
Yes
0
20
40 km


0900-1000
1000-1100
1100-1200
1200-1300
1300-1400
1400-1500
1500-1600
1600-1700
1700-1800
1800-1900
1900-2000
0
20
40 km

Thus it can be seen that Tripolye sites spread mainly over a narrow territory between the one which has been continuously populated and developed in recorded historical times, and the dry steppe, where agricultural communities practically never settled. These observations on the foundation of the network of modern settlements could be taken into account when studying the spatial distribution of Tripolye sites in this region. Noteworthy is rather late development of this territory; and questions regarding the history of this region as a whole arise. What could be the reasons for settling down in this territory or leaving it? Can understanding the region as a whole help to understand Tripolye sites?

Turning back to the Tripolye sites, it should be noted that in historical terms these large settlements existed for a relatively short time, and the biggest ones became abandoned quite quickly and practically almost at the same time (according to the available data). Moreover, after that, almost no sites are found on this territory. The number of Final Tripolye settlements, which are attributed to the Kochergintcy-Shulgovka type, is quite small. There are only a few of them. They occupied a small area and chronologically, apparently, may have existed between 3690 and 3525 BCE. Shortly after these settlements disappeared, no other sites or 'archaeological cultures' have been recorded on this territory. Kurgans of the Yamnaya Culture, which, according to today's chronology, represented the next chronological layer in the history of the region, appear here only 500 years later. The stratigraphy data on this issue is quite reliable.[59]

What could have caused such a development? Why did the population leave these seemingly favourable living places, which, as it might seem, were a kind of a certain 'centre' in Tripolye times? In search of an answer to these questions, many researchers focus on the topic of the mega-sites' disappearance. Various explanations of this phenomenon have been proposed. In order to move a little away from the 'mega-site-centricity', let's have a look at the historical development of this region as a whole.

5.6.4 The Sinyukha river basin throughout history

For convenience, a chronological table of the development of the region (from the Palaeolithic to the present day) has been compiled – see Appendix 7. The stages are dated according to the data available today; the names and dates of the last two millennia are adapted to a more general chronology. The Bronze Age chronology is given on the basis of Vitaliy Otroshchenko's works (Otroshchenko 2011). Separate columns contain the list of the sites located within a 20 km radius from the mega-settlement Maidanetske which are associated with a certain period and their cultural attribution. Despite the fact that only the sites from the 20 km zone have been included in the table, this picture, based on sources (*e.g.* Ancient History … 1997, 282, 284, 296, 404, 410, 414, 416, 420; Kushtan 2013; Terenozhkin 1961; Steshenko *et al.* 1972), is quite representative of the entire Sinyukha basin. This table visualises the historical development of the region.

The table clearly shows that before Tripolye the region was practically uninhabited. During the Middle and Late Tripolye, the region became covered by a fairly dense network of settlements, but the situation drastically changed in the Bronze Age, when there were only a few scattered kurgans of the *Yamnaya Culture*, with the territory becoming a peripheral zone for this phenomenon. For the *Middle Bronze Age,* several sites of the *Corded Ware Culture* (the density of which is much higher on the territories to the North) are known. For the *transitional period* and the *Late Bronze Age*, practically no sites have been discovered there (which is a totally different situation from the territories located both to the south-east and north-

59 On the sites Dobrovody, Talianki, Maidanetske, and Nebelivka, a number of Yamnaya burial mounds that overlap Tripolye *ploshchadkas* have been excavated. A chronological gap between Tripolye and the first burials were clearly identified during the research: Shmagliy and Videiko 1988; Klochko and Kruts 1999; Buniatian and Nikolova 2010; Ivanova 2015; 2016.

west of the Sinyukha basin). And only during the *Final Bronze Age* in the Yatran catchment area (near Uman) do some sites of the *Belogrudovska culture appear*. The same sluggish picture with only a few sites is also characteristic of the *Early Iron Age*. And it was only during the *late Roman period* that the territory under consideration became covered with a dense network of settlements and burial grounds of the *Chernyakhov culture*, after which the region again became abandoned. Mapping the sites of the times of *ancient Rus'* (see fig. 113) showed that the limit of this state formation was almost along the River Ros (and a little to the south) – that is significantly north of our zone. The Sinyukha river catchment area began to be populated a little later, from the 16th century. At that, most villages were founded only in the 17th-18th centuries AD.

Considering the history of the region, and particularly the maps of the vast territories (Ancient History … 1997; Terenozhkin 1961), several conclusions can be drawn:

- This territory of the Sinyukha catchment area was not very popular for settling and activities of human groups; at least those that are can be recorded archaeologically.
- In principle, there were only three periods when these lands were densely populated – during the times of Tripolye, the Chernyakhov culture and in modern times.
- These occupation periods were not very long (as for the modern period, it is certainly not over yet. However, the foundation of new settlements practically stopped in the 20th century, and the villages that had been founded before are being depopulated; some of them are completely abandoned).
- These periods of settlement 'boom' in many respects are contemporaneous with the processes that took place in neighbouring territories.
- In other historical periods, the Sinyukha catchment area was either uninhabited or represented a 'peripheral' zone gravitating to other regions where the main number of bands of big-density of sites was located.
- Such a situation undoubtedly requires deeper analysis; we can only make assumptions that such '*peripherality*' could be related to the geographical position and the lack of attractive resources.
- Regarding the geographical position, the region was located in the borderland between the steppe and forests, and apparently the Sinyukha area was outside or on the periphery of the traditional routes of movement of both people and goods (which, for example, passed through the neighbouring territories along the Rivers Dnieper and Dniester rivers), neither it was well 'strategically' positioned (like, for example, Budzhak).
- The borderland between the steppe and forests is clearly seen during the mapping of sites of, for example, the Bronze Age or later periods (which is discussed above). Such a border position itself makes this zone very sensitive and responsive to the slightest climatic, environmental (Kirleis and Dreibrodt 2016; Dal Corso *et al.* 2019) and anthropogenic changes (*e.g.* territorial expansion or direct acts of aggression in the form of raids by agricultural or pastoral groups), which do not promote the permanent residence of communities that prefer one specific type of economy.
- As for the attractive resources, there is nothing there that would make these lands essentially diverse from the neighbouring ones and that would serve as an attractive factor for settling, except, perhaps, for the soils, which, by the way, are also rich in all the neighbouring areas.

To sum up, undoubtedly, in search of the reasons for the emergence and collapse of the mega-sites, it is necessary to consider such geographical and historical factors as the **peripheral nature of the region** and its **borderland location**.

Conclusions

At the turn of the fifth and fourth millennia BCE, the Sinyukha river catchment was a densely populated region where large settlements were located close to each other. From that time on, up to the end of the first quarter of the fourth millennium BCE, both the number and size of these settlements were constantly growing. Worthy of attention is that these big settlements differed between themselves only in size, and, consequently, in the number of inhabitants. These unusual giant settlements – or mega-sites – as well as other large settlements for which no specific term has yet been coined, have been the object of study and ongoing discussions since their discovery.

Without doubt, the mere fact that the concentration of a large number of people in these settlements occurred in the absence of both state institutions and cities appears miraculous, given the current belief that despite their resemblance to one another, the sites had neither traces of dependence or hierarchy, nor obvious signs of economic profit and/or direct evidence of aggression between them. What motivated people to build increasingly larger settlements, and what made them decide to live together? Life in large settlements is associated with greatly increased social, ecological, and other stresses than in small ones. What was the attractiveness of this choice that exceeded the negative aspects? Moreover, what seems remarkable is that in the fourth millennium BCE there were not only a few, but a huge network of large settlements built in the Sinyukha basin. How did this system function, how were these sites built, and how long did such large settlements last? What is the nature and circumstances of the collapse of a dense network of agglomerated and other settlements and the final period of Tripolye in the Sinyukha river basin?

One of the keys to understanding these issues, multiple processes that took place here in Tripolye time, and other questions is *the chronology*. And, despite the high level of development of the relative chronology, and the recent introduction of absolute dating schemes, it seems that this topic will be relevant for a long time to come. This study is one of many devoted to the chronology of the Tripolye sites in the Sinyukha basin.

This book has been mainly aimed at checking the existing relative chronology for the region of the mega-sites and modifying it on the basis of radiometric dates and ceramic complexes. Here it is proposed that the chronology be constructed at two spatial levels – those of individual sites and of the entire region.

The territorial limits of the working area were established by taking into account the locations of the following categories of Tripolye sites:

1. Key settlements that have been analysed in this book in more detail. They were chosen based on the availability of sources (ceramic collections from excavations, the availability of settlement plans, etc.) and include Tripolye settlements from different periods, including both mega-sites and smaller settlements.

2. All the mega-sites or giant settlements which exceed 150 hectares in size.
3. Other settlements from the region with ceramics of the same or similar style (belonging to the same 'local groups') as the selected key sites.

In this way, an area of approximately 300 x 200 km was defined, within which the categories of Tripolye settlements listed above are located. All the available Tripolye sites from this working area (provided that there was basic information about their relative chronology) were mapped and used in the analysis (310 in total). Mapping of the sites showed that the settlements were located within of a kind of corridor, which stretches from the middle reaches of the Southern Bug in the Southwest to the middle reaches of the Dnieper near Kaniv. Within this corridor there are three spatial clusters and various smaller groups of settlements, which correspond well to the river catchment areas. A large cluster of settlements in the Southwest is located in the basin of the Southern Bug River, and another group of sites in the Northeast is located in the basin of both the Ros River (a tributary of the Dnieper) and the Dnieper itself. Between these groups, in the basin of the Sinyukha River, the third large cluster of Tripolye settlements stands out. It is the settlements of this zone that became the main object of study in this book.

To understand the basics of the relative chronology of this working zone, several aspects of the development of the general Tripolye type-chronology have been considered. There are two research approaches to arranging the material that determined the modern spatio-temporal understanding of this cultural phenomenon.

The first consists of 'cutting' chronological phases throughout the Tripolye distribution area; most successfully and unsurpassably implemented in Passek's chronology. The second one is singling out territorial groups with different artefact assemblages (primarily ceramics), in which a certain temporary development can be traced (across several chronological phases). These are the so-called 'local groups', suggested by Zakharuk. The type-chronology of the Sinyukha basin sites has been modelled using these two principles.

Despite the intense Tripolye studies carried out both in this region and beyond, there are a number of gaps which affect the chronology, due to both practical issues and theoretical ones; these affect not only 'general Tripolye' chronology but also chronologies related to the Sinyukha region. Among these issues is a certain stagnation in the theoretical grounding for different ceramic styles ('local groups'); understanding and interpretation of the variability of ceramic complexes which have been almost directly associated with the prehistoric population. The cohesiveness and general self-identification of groups living in closer contact zones (*e.g.* in neighbouring sites) and at a considerable distance (in different regions) are apparently overestimated. Among the 'general Tripolye' gaps, most problematic are the different degrees of investigation between regions/periods, the poor development of absolute dating, the huge amount of unpublished material, and others. Regarding the Sinyukha basin region, perhaps one of the most significant shortcomings here is the '*mega-site centricity*'. There is an imbalance between studies of larger and smaller sites; the periods preceding the mega-sites, the period of the emergence and disappearance of agglomerated settlements, and a number of the final settlements have been studied to a much lesser extent than the 'classical' periods at the end of B2 and C1 with their super sites, such as Talianki or Maidanetske. Overcoming such a limited perception will enable significant adjustments, both in chronology and in many narratives related to the development of Tripolye in this region.

There has been a tendency towards overcoming some of these gaps over the last ten years of Tripolye studies, and this is true for the Sinyukha basin region in many respects. The accumulated new data was one of the incentives to draw attention to the chronology of this region once again.

To build the chronology, the analysis of ceramic complexes from the selected key settlements and modelling of absolute dates were performed. The analysis of ceramics was performed on the basis of four main properties: technology, morphology, vessel volume, and decoration.

For a more detailed study of the chronology of the giant settlements, the site of Talianki was chosen because its different parts have been well researched, its ceramic collections have been partially published, and there is a significant collection of absolute dates as well as an archaeo-magnetic map of the settlement.

When constructing the chronology of an individual site, the following conclusions have been made:

- Based on the example of well-studied sites (Talianki, Maidanetske, Nebelivka), it becomes clear that single mega-sites had much more complex biographies than previously imagined.
- The previous models of the development (lifetime, order of housing development, lifetime of houses) of giant settlements (*e.g.* Talianki) could not yet be confirmed. The data show that houses (and other objects) from such large villages are not synchronous, but date from different times.
- The case of Talianki showed that the chronological difference between its ploshchadkas can be traced not to their location in different parts of the layout (for example, outer and inner rings, radial streets, etc.), but within *clusters* (small groups of buildings located in close proximity to each other). At the same time, as the data from Talianki show, the first few houses were built in the outer ring.
- It is assumed that at the initial stage of the settlement development, which, of course, was carried out according to certain planning principles, single houses were built in different parts of the settlement (northern or southern; ring and radial streets etc.), with intentional empty spaces between them which were built up later.
- The common assumption about the extremely short lifespan of Tripolye settlements (50 years) loses support. The obtained data indicate that the lifetime of an individual settlement was most likely longer – over 100+ years – and in some cases over 150+ years.
- At the same time, the duration of different mega sites could have been slightly different – some existed for less time, others longer. It turned out that it is very difficult to establish with accuracy the “average lifetime” of such a site because of the lack of data – magnetic surveys and radiocarbon dating for most of these settlements, the material from different parts of the site for comparison, etc. It might make sense at first glance to investigate one or two objects on some Tripolye sites, but the results of this approach are rather insignificant. Only a large series of radiocarbon dates together with comparison of the ceramic complexes from different parts of the settlement, as well as different houses of the same cluster of buildings, can provide more fruitful results. Analysis of a limited amount of data can only provide a ‘point’ or ‘segment’ on a chronological scale, which may be in the middle, at the beginning, at the end, or elsewhere on the settlement’s time-line.

The construction of the Tripolye chronology of the entire Sinyukha basin region showed that:

- While the basic chronology (‘ABC’) is generally confirmed, finer chronological subdivisions appear to be problematic.
- The overall duration of the Tripolye period of the agglomerated settlements and mega-sites was reduced to 500 years (approximately 4100-3600 BCE), while the total duration of Tripolye in the region was most likely about 900 years (approximately 4500-3600 BCE).

- This suggests at least a partially synchronous existence of large mega-sites (located in a relatively small area). This process is best traced on the sites of the Tomashovka group, where such settlements as Maidanetske, Dobrovody and Talianki coexisted, although population peaks at different times.
- Similar processes can be observed in other regional groups, where, as a rule, the occupation periods of settlements overlap rather than follow each other. For example, the Nebelivka and Vladimirovka groups co-existed at least partially, according to the available data.
- An important result was a slightly different ‘order’ of sites from the C1 period, where Maidanetske was inhabited and abandoned a little earlier, and Talianki a bit later. It also seems that the settlement of Kosenovka already existed during the second half of the lifespan of Talianki.
- One of the results of modelling the absolute dates was detection of a significant chronological gap (about 375 years) between the Early Tripolye settlements and the early mega-sites.

When creating the chronological model of the Tripolye period in the region, seven chronological phases were identified.

During the first phase (4520-4450 BCE), Tripolye settlements were concentrated mainly in the Southern Bug; in the Sinyukha area three sites are known. Small settlements (up to 3 hectares in the Sinyukha basin) were built either according to house rows or unsystematically. The second phase (4450-4075 BCE) is characterised by a probable absence of settlements.

The third phase (4075-3965 BCE) is characterised by a significant agglomeration of the population; the first giant settlements arise in the western and central part of the Sinyukha region. Apparently, we are not dealing with a concentration process within the region, since very large settlements practically existed already from the beginning seemingly without any predecessors. In addition, new complex planning of settlements based on a ring street is observed. The ceramics are characterised by the ‘East Tripolye’ style with incised decoration.

The fourth chronological phase (3965-3810 BCE) is characterised by an increase in the number of sites, their spread from the Yatran to the Ros rivers. Settlement planning: in general, the previous development continues; innovations from this time are the emergence of two-chamber pottery kilns and the associated dominance of painted decorations.

The fifth and sixth phases (3810-3670 BCE) are characterised by the largest number of settlements that reach the maximum size. Against the background of continued development (in settlement structure, pottery, special finds), we can notice the development of certain crisis phenomena that are manifested in slightly different ways of organising settlements, an increase in the number of items that reflect ideology, etc. The main innovation of this time is the spread of cargo sledges.

The last, and seventh, phase (3670-3575 BCE) is characterised by almost complete depopulation of the entire area under consideration, leaving a small (compared to previous phases) number of settlements that do not exceed 30 hectares and which are located only in the areas where the largest Tripolye mega-sites had been. Against the background of complete degradation of the ring settlement structure, the style of ceramics is changes completely.

In this work a ‘technical’ definition of the term ‘mega-site’ has been proposed, based on the understanding of the dimensional differences between larger and smaller sites. It is assumed that this threshold varied, depending on the phase, from 40 to 50 ha; and with a lower limit of 50 hectares, one can distinguish another group of the largest sites, starting at 150 hectares in size. Therefore, a *step-by-step process of increasing the settlement size model, including bi- and polymodal distribution of their area,* is proposed. For phase three, two groups of settlements have been identified, between which the threshold is 40 ha, and three groups with barriers of 50 and 150 ha for phases 4-6.

To understand the dynamics of the history of the Tripolye period in the region better, some aspects of its development were considered on the basis of the proposed seven chronological stages; in particular, the development of ceramics production and decoration techniques; changes in stylistic techniques based on the example of ceramic finds; sequence, innovation or parallel development of different ceramic styles; dynamics of emergence and disappearance of settlements in the working area; the evolution of settlement organisation; the development of some categories of special finds that to some extent may reflect ideology.

The comparative analysis allowed to a periodisation to be constructed that shows the peculiarities of Tripolye development in the region not always reflected in the chronology; which, unlike the periodisation, is based on radiometric data and/or ceramics, and only represents the sequence of events over time. The conducted research made it possible to single out at least two historical periods of Tripolye development in the region. The first is the period of '*Early Tripolye*' (the first chronological phase). The second period identified is the period of '*intensive interaction and population agglomerations*' (third to seventh chronological phases). During this period, the formation, development, and rapid collapse of the interaction networks between agglomerated sites and other settlements took place.

The obtained chronological construction made it possible to re-evaluate some narratives of the region's history in Tripolye times. The data presented in this study indicate a more gradual beginning and a sharper fall in the number of sites in the region in Tripolye times than previously assumed.

There are several factors to consider when explaining the reasons that caused the emergence and disappearance of the mega-sites. Firstly, the builders of the giant settlements, which could have been partially synchronous, used vessels of different pottery styles. The difference between ceramic styles cannot always be explained by, or connected with, the chronology, since according to the data they partially overlap in time. Secondly, the territories selected for the construction of new large settlements were before practically uninhabited or free of settlements (phases three, four, five and six). Finally, the Tripolye sites of the Sinyukha region (similarly to many other regions) were located on a wide strip stretching from the southwest to the northeast, which was also the borderlands with the Steppe. This region, the Sinyukha basin, was a peripheral region, which was rarely settled in the most historical periods.

Unlike most historical periods, in Tripolye times this region can hardly be considered peripheral, and even more, it was here that a large proportion of the population was concentrated for several centuries. For about 500 years, a certain social system with a number of very similar, at least partially coexisting, large and mega-settlements had functioned here. There are no traces of economic or political 'dependence' on each other at these settlements; on the contrary, there is a clearly visible high intensity of interactions and the exchange of symbols, knowledge, and technologies. Various elements of material culture are characterised by stability in their development; innovations appear very quickly throughout the whole region, which indicates both their wide acceptance and the fact that different communities had a close relationship, forming an extensive regional sphere of interaction.

This regional sphere of interaction had a clear tendency to create more and more agglomerations and increase concentration of the population, both in the region as a whole and within individual settlements. The common imagery, symbols, and multiple 'places of interactions' could have been used to maintain a sense of community and, thus support the functioning of this system, which could have consisted of vast networks of diverse forms of exchange. With the collapse of this system and the need for numerous social interactions, the large settlements and most of the small villages disappear first, and after a short time, the entire remaining population is gone.

Резюме

Трипілля – яскравий культурний феномен енеолітичної Європи. Ця назва об'єднує численні сайти зі схожими поселенськими комплексами і колекціями артефактів. Вони, зокрема, характеризуються наявністю специфічної кераміки, статуеток, особливими прийомами житлобудівництва, своєрідним плануванням поселень та мають ряд інших спільних ознак. Кожен із перелічених елементів пройшов тривалу еволюцію, зміни та певні трансформації тривалістю близько 1000 років.

Слід виділити ще одну характеристику цього культурного комплексу: наявність так званих "мега-сайтів" або "поселень-гігантів". Це специфічна група агломерованих поселень великого розміру, які мали складну забудову, в основі якої знаходилася кільцева вулиця (або коридор).Такі поселення стали відомі науковому загалу в 1960-х роках завдяки аерофотознімкам. З тих пір ці «поселення-гіганти» або «великі села», причини їх виникнення і занепаду, їх природа, соціальна організація, демографія, хронологія та ін., стали предметом активного обговорення та доісторичних досліджень.

Трипільські "поселення-гіганти" характерні не для всього ареалу цього культурного явища, але сконцентровані, головним чином, у регіоні між Південним Бугом та Дніпром у басейні річки Синюха. Саме тут можна простежити еволюцію "мега-сайтів" від їх першої появи до досить швидкого зникнення. Незважаючи на довгу історію вивчення цих поселень, їх дослідження все ще залишається актуальним на сьогодні. І, як і півстоліття тому, в час активного складання хронології, розв'язання ключових проблем і питань з цієї теми безпосередньо залежить від хронології. Безумовно, саме хронологія є основою для подальших міркувань, інтерпретацій та висновків. Навіть незначні зміни у хронології можуть призвести до ревізії цілого ряду гіпотез та концепцій. Саме з цієї причини хронологія вимагає постійної уваги, уточнення, оновлення та, по мірі необхідності, перегляду.

Мета та актуальність роботи

Основною метою даної роботи є перегляд та подальша розробка хронології в основній зоні розповсюдження мега-сайтів. Виникає питання, наскільки це актуально, оскільки відносна хронологія Трипілля вважається добре розробленою і часто використовується для вибудови та уточнення хронологій інших культурних явищ (наприклад, сусіднього степового енеоліту). Не не викликає сумнівів, що базові етапи, виділені раніше для Трипілля («ABC»), по суті правильно відображають давні реалії (тобто їх хронологічний порядок). Хронологія мега-сайтів також вважається вже встановленою. Проте, при більш детальному розгляді, ситуація виглядає не настільки бездоганною, як це видається на перший погляд. Цілий ряд факторів роблять дану роботу актуальною.

Практично повна відсутність багатошарових трипільських поселень викликала необхідність розробки детальних типо-хронологічних моделей на основі еволюції кераміки, насамперед посуду. Тривалий час ніякі інші (нетипологічні) аргументи практично не використовувались для побудови цих моделей. З розвитком нових методів перевірки та корекції хронологій моделі на основі кераміки з різних причин не зазнали змін. Зокрема, застосування радіометричного датування розвивалося дуже повільно і не завжди систематично до 2010-х років. Останнім часом така ситуація кардинально змінилася, особливо для регіону так званих «мега-сайтів». Сьогодні існує чимало нових радіовуглецевих дат, які слід використовувати для перевірки та перебудови хронології у вказаному регіоні.

Інший фактор, пов'язаний із вищезазначеним, стосується архео-магнітних планів поселень високої роздільної здатності, що були отримані останнім часом (починаючи з 2009 року), завдяки яким вдалося переглянути, доповнити, уточнити і відкрити важливі аспекти Трипільських поселенських структур. При їх інтерпретації, знову таки, хронологія займає ключові позиції.

Додаткової актуальності робота набуває також завдяки використанню нових та порівняно нових методів дослідження та підходів. Так, досить вдалим виявилось застосування статистичних методів для аналізу керамічних комплексів Трипілля (успішне використання яких почалося ще в 1980-ті рр), зокрема, використання аналізу відповідності (*correspondence analysis)* дозволяє сьогодні отримати більш детальні та незалежні результати, наприклад, для хронологічних побудов окремого поселення та ін.

З іншого боку, і це, можливо, навіть більш суттєво, сьогодні кардинально змінилися підходи до розуміння та інтерпретації археологічного матеріалу, починаючи від трактувань окремих об'єктів і закінчуючи переглядом таких концепцій, як, приміром, «археологічна культура» та інші. Так, інтерпретаційна підоснова ряду фундаментальних підходів до вивчення Трипілля лежала в працях етнографів другої половини 20 століття. Розгром теорії етносу і критика робіт Бромлея ніяк не позначилася на пост радянському Трипіллєзнавстві. Тут, як і раніше, виділяються локальні групи, які асоціюються з «міфічними» етносами, розповсюдження керамічних типів та специфічних елементів (наприклад, статуеток або технологій) пов'язується з розповсюдженням (міграціями) груп людей / населення. Перегляд самих підходів і теорій, на яких базувалися інтерпретації та побудови, є одним із першочергових завдань для Трипільських досліджень. Однак, це питання лише злегка зачіпається в даній роботі.

Розглядаючи дослідницькі підходи попередніх років, хотілося б звернути увагу на те, що для багатьох робіт було характерним вибудовувати хронології та періодизації або для всього Трипільського ареалу, або для його частини, але в контексті всього ареалу поширення (як би втискаючи окремий регіон в загальну хронологію). Як приклад – складаючи хронологію Трипілля на основі часто досить нечисленних радіовуглецевих дат, автора вбачають початок розвитку цього феномена з території Румунії на основі лише кількох дат, і завершують «розвиток культури» датами з сайтів на узбережжі Чорного моря і в районі Києва. Здається, було б доцільним обмежитися рамками меншого регіону і спробувати простежити розвиток від початку появи тут Трипільських елементів до їх зникнення. Особливо це видається актуальним для регіону з мега сайтами, так як на інших територіях це явище не отримало значного поширення.

Джерела

Для перевірки та побудови хронології регіону поселень-гігантів були використані три групи джерел: кераміка, радіометричні датування та список Трипільських сайтів регіону. В список були включені, по можливості, координати поселення, дані стосовно його хронологічної позиції, керамічний стиль, його перерахована площа да інші характеристики. Для роботи було зроблено спробу по можливості максимально використати неінвазивні методи дослідження та опрацьовувати вже накопичений матеріал. Тому тут використано раніше зібрані та опубліковані (передусім кераміка) та деякі нові дані (з розвідок та розкопок останніх років, а також велика колекція нових абсолютних дат).

Структура роботи

Структура роботи обумовлена її метою та завданнями:

У першій частині роботи представлені деякі аспекти з історії створення загальної Трипільської хронології, оскільки саме на цих аргументах та методах ґрунтується хронологія регіону мега-поселень.

У другій частині дослідження звужується до рамок регіону, де сконцентровані мега сайти (басейн річки Синюха). Тут розглядається географія, відносна хронологія регіону, джерела та методи, що використовуються в роботі.

Третя та четверта частини присвячені побудові хронології на двох просторових рівнях – локальному рівні одного поселення-гіганта та регіональному рівні. У цих двох частинах були використані дві групи джерел – кераміка та радіовуглецеві дати.

Результати дослідження, їх можливе тлумачення та зроблені висновки представлені у п’ятій частині. Тут до обговорення включена третя група джерел -список Трипільських поселень.

Географічні рамки

Рамки досліджуваної території були встановлені з урахуванням місць розташування наступних категорій Трипільських пам’яток:

1. Ключові або опорні поселення, які були проаналізовані в роботі більш детально. Вони були обрані зважаючи на наявність джерел (керамічних колекцій з розкопок, наявність планів поселення, тощо) і включають в себе різночасові Трипільські поселення, серед яких є як мега-сайти, так і пункти меншої площі.
2. Всі мега-сайти або поселення гіганти (розмір яких перевищує 150 га).
3. Інші поселення мікрорегіону з керамікою однакового/схожого стилю (належать до тих же “локальних груп”), що і вибрані ключові сайти.

Таким чином, було визначено область розміром приблизно 300x200 км, де у центрі розташовані перелічені категорії Трипільських поселень. Усі наявні Трипільські пам’ятки з цієї робочої зони (за умови наявності базової інформації про їх відносну хронологію) були прокартографовані та залучені до аналізу (всього 310). Картографування пам’яток показало, що поселення розташовані у своєрідному коридорі, який простягається від середнього течії Південного Бугу на південному заході до середнього течії Дніпра поблизу Канева.

У межах згаданого коридору виділяються три просторові кластери та різні менші групи поселень, які дуже добре відповідають зонам водозбору річок. Великий кластер поселень на південному заході знаходиться в басейні річки Південний Буг, інша група пам’яток на північному сході розташована в басейні ріки Рось, приток Дніпра та самого Дніпра. Між цими групами, в басейні ріки Синюха, виділяється третє велике скупчення Трипільських поселень. Саме поселення цієї зони і стали основним предметом дослідження в роботі.

Розгляд географії робочої зони показав, що за останнє тисячоліття природна геосистема зазнала величезних змін. Природні ландшафти були замінені на культурне середовище, яке сьогодні домінує.

Стан досліджень типо-хронології робочої зони

Для кращого розуміння відносної хронології досліджуваної області, були розглянуті різні аспекти з історії досліджень загальної Трипільської хронології. Так, можна виділити два основних підходи у дослідженнях, що сформували сучасне розуміння просторово-часового розвитку Трипільського культурного феномену.

Перший – виділення хронологічних періодів або фаз для всієї території поширення Трипільських пам'яток, найбільш успішний приклад – хронологія Тетяни Пассек, яка використовується до сьогодні. Другий підхід стосується виділення регіональних груп на основі колекцій артефактів (перш за все з подібною керамікою). Цей підхід виділення «локальних груп» був запропонований Юрієм Захаруком, і став загально визнаним методом для впорядкування численних Трипільських поселень, розпорошених на значній території. Типо-хронологія Трипільських поселень в басейні Синюхи також була змодельована з використанням цих двох підходів.

Разом з тим, незважаючи на тривалі та інтенсивні дослідження Трипілля загалом та в регіоні Синюхи зокрема, можна відмітити ряд практичних та теоретичних недоліків, що певною мірою гальмують подальші вивчення.

Так, існує певна стагнація в дискусії щодо теоретичного підґрунтя стилів кераміки («локальних груп») для розуміння та інтерпретації зміни керамічних комплексів, які практично відкрито асоціюються з доісторичним населенням. Єдність та самоідентифікація людей, що проживали у близьких контактних зонах, (наприклад, на сосідніх поселеннях) або групах на більшій відстані (в різних регіонах), явно перебільшується.

Суттєво гальмують Трипільські дослідження різний ступінь вивчення територій/періодів, погана розробка абсолютного датування, величезна купа неопублікованого матеріалу та інші проблеми. Так, одним із основних недоліків у вивченні Трипілля в басейні Синюхи є зосередження досліджень в основному на мега-сайтах. Існує сильний дисбаланс у вивченні великих та малих поселень, группа найпізніших Трипільських поселень та деякі інші періоди вивчалися значно меншою мірою, ніж «класичні» періоди другої половини етапу В2 та С1 із їх супер-поселеннями, такими, як Тальянки і Майданецьке.

Подолання цих перепон (яке розпочалося приблизно з 2010-х рр), можливо, дозволить внести суттєві корективи як у питання хронології, так і у багато наративів стосовно Трипільського розвитку у цьому мікрорегіоні.

Побудова хронології

Для побудови хронології було проведено аналіз керамічних комплексів обраних ключових поселень та моделювання абсолютних дат. Аналізи кераміки були проведені на основі чотирьох основних її властивостей: технології, морфології, об'єму посудин та декору.

Для більш детального вивчення мікрохронології поселень-гігантів був обраний сайт Тальянки, оскільки він добре досліджений в різних частинах, його керамічні колекції були частково опубліковані, крім того, для нього існує значна колекція абсолютних дат, а також археo-магнітна карта поселення.

Хронологія одного поселення-гіганта

Виконана робота дозволила зробити наступні висновки стосовно мікрохронології поселень-гігантів, а саме:

- Приклад добре досліджених поселень (Тальянки, Майданецьке, Небелівка) показав, що вони, як правило, мають набагато складнішу біографію, ніж вважалося раніше;
- Попередні моделі мікрохронології мега-сайтів (наприклад, Тальянки) стосовно тривалості, внутрішнього розвитку та функціонування окремих будівель поки що не знаходять підтвердження;
- Дані показують, що житла та інші об'єкти з таких поселень не є синхронними, але функціонували в різний час;
- Хронологічні відмінності між різними житлами на поселенні простежуються не для різних його частин (наприклад, зовнішніх та внутрішніх кілець, радіальних вулиць, тощо), а всередині кластерів будівель (компактних груп жител);
- Можна припустити, що на початковому етапі розвитку поселення (забудова якого, очевидно, здійснювалася на основі попереднього планування), в різних частинах зводились поодинокі будинки (північна, південна; кільцеві та радіальні вулиці) з "прогалинами" (порожніми місцями) між ними, які були забудовані пізніше. При цьому, як показують дані з Тальянок, найперші нечисленні будинки були побудовані у зовнішньому кільці;
- Загальноприйняте припущення про надзвичайно короткий час існування Трипільських поселень (50 років) втрачає аргументацію. Отримані дані свідчать про те, що період існування окремого поселення, скоріш за все, був більшим – 100+ років, і ймовірно навіть більше – 150+ років. У той же час, тривалість життя різних мега-сайтів могла відрізнятися – одні існували більш короткий проміжок часу, інші – довший.

Виявилося, що доволі важко з точністю встановити "середній час функціонування" подібних поселень, оскільки відсутні необхідні для цього дані, такі як археo-магнітні плани поселень, радіовуглецеві дати, матеріал з різних частин сайту для порівняння тощо. Датування одного або декількох об'єктів на таких поселеннях можуть допомогти в розумінні його хронології лише частково. І тільки велика серія радіовуглецевих дат у поєднанні з порівнянням їх керамічних комплексів з різних частин поселення, і також будівель в межах одного кластеру може дати більш плідні результати. Аналіз обмеженої кількості даних дозволяє встановити лише "сегмент" (точку часу) на хронологічній прямій, який може знаходитися посередині, на початку, в кінці, або в іншому місці періоду функціонування поселення.

Динаміка регіонального розвитку

Опрацювання даних в процесі побудови Трипільської хронології в регіоні басейну Синюхи дозволило дійти наступних висновків:

- На фоні незмінної базової хронології (Трипілля «АВС») більш детальний усталений розподіл на субфази та стадії, в тому числі локальних груп, є проблематичним та викликає певні сумніви.
- Абсолютна тривалість трипільського періоду з мега-сайтами скоротилася до 500 років (приблизно 4100-3600 рр. до н. е.), тоді як загальна тривалість Трипілля, швидше за все, була близько 900 років (приблизно 4500-3600 рр. до н. е.). Це дозволяє припустити хоча б часткове синхронне існування великих поселень (розташованих на відносно невеликій території);

- Найкраще цей процес прослідковується на сайтах Томашівської групи, де такі поселення як Майданецьке, Доброводи та Тальянки співіснували, хоча і з різними часовими піками максимального заселення;
- Схожі процеси можна спостерігати і в інших регіональних группах, де, як правило, періоди функціонування поселень скоріше накладаються один на одного, а не ідуть один за одним. Наприклад, групи Небелівка та Володимирівка, згідно наявних даних, принайні частково існували одночасно;
- Важливим результатом став дещо інший «порядок» сайтів періоду С1, де Майданецьке було заселене і покинуте трохи раніше, а Тальянки – трохи пізніше. При цьому, видається, що поселення Косенівка вже існувало під час другої половини функціонування Тальянок;
- Ще одним результатом моделювання абсолютних даних стало визначення можливого розриву в часі приблизно в 375 років між ранніми поселеннями Трипілля (А) та ранніми мега-сайтами.

При складанні хронологічної моделі розвитку регіону в Трипільський час було виділено сім хронологічних фаз.

Під час першої фази (4520-4450 BC) трипільські поселення зосереджувалися, в основному, на Південому Бузі, в регіоні Синюхи відомо три пункти. Невеликі поселеня (до 3 га в басейні Синюхи) забудовуються рядами будівель (houserows) або безсистемно. Друга фаза (4450-4075 BC) характеризується імовірною відсутністю поселень.

Під час третьої фази (4075-3965 BC) виникають перші поселення-гіганти у західній та центральній частині Синюхи. Крім того, спостерігається нове, складне планування поселень в основі якого лежить кільцева вулиця (або коридор), кераміка характеризується «східнотрипільським» стилем з заглибленим декором.

Четверта хронологічна фаза (3965-3810 BC) характеризується збільшенням кількості сайтів, їх появою від річок Ятрань до Росі. Планування поселень: в цілому продовжується попередній розвиток; інновацією цього часу є поява двоярусних гончарних горнів і (пов'язане з цим) домінування розписного посуду.

П'ята та шоста фази (3810-3670 BC) характеризуються найбільшою кількістю поселень, які досягають максимального розміру. На фоні продовження попередного розвитку (структура поселень, кераміка, спеціальні знахідки), можна прослідкувати появу певних кризових явищ, що проявилися у трохи різних способах організації поселень, зростанні кількості предметів, що віддзеркалюють ідеологію, та ін. Інновація доби – поширення грузових саней.

Остання, сьома фаза (3670-3575 BC) характеризується практично повною депопуляцією всієї робочої зони, незначною (порівняно з попередніми фазами) кількістю поселень, розміри яких не перевищують 30 га, які знаходяться лише виключно на територіях, де раніше були розміщені найбільші трипільські сайти. На фоні повної деградації кільцевої поселенської структури повністю змінюється стиль кераміки.

Визначення поняття «мега-сайт»

В роботі пропонується технічне визначення поняття «мега-сайт» (поселення-гіганти), яке базується на встановленні порогу у розмірах між маленькими та великими поселеннями. Показано, що поріг для великих поселень коливався між 40 і 50 га залежно від фази. З досягненням бар'єру у 50 га, чітко виділяється ще одна група найбільших поселень, які мають розмір від 150 га. Запропоновано модель поступового зростання розмірів поселень з урахуванням бі- та полімодальних розподілів їх площ. Таким чином, для фази три виділено дві групи поселень, між якими бар'єр складає 40 га, а для фаз 4-6 – три групи з бар'єрами в 50 та 150 га.

Періодизація

Для того, щоб краще зрозуміти динаміку історії Трипільського періоду в регіоні, деякі аспекти його розвитку були розглянуті на основі запропонованих семи хронологічних етапів:

- розвиток технологій виробництва кераміки та техніки декорування;
- зміни стилістичних прийомів на прикладі керамічних знахідок;
- послідовність, інновації або паралельний розвиток різних керамічних стилів;
- динаміка виникнення та зникнення поселень у робочій зоні;
- еволюція організації поселень;
- розвиток деякіх категорій спеціальних знахідок, які до певної міри можуть віддзеркалювати ідеологію.

Порівняльний аналіз дозволив створити періодизацію, що показує особливості розвитку Трипілля в даному регіоні, які не завжди відображає хронологія (на відміну від періодизації, вона будується на основі радіометричних даних та / або кераміці і лише представляє послідовність подій у часі).

Проведені дослідження дали змогу виділити щонайменше два історичні періоди розвитку Трипілля в регіоні.

- Перший – період «Раннього Трипілля» (перша хронологічна фаза), його дослідження потребує залучення данних із сусідніх регіонів.
- Другий період – період "інтенсивних взаємодій та агломерацій населення" (третя – сьома хронологічні фази). У цей період відбувалося формування, розвиток та швидкий занепад мереж взаємодії між агломерованими та іншими поселеннями.

Висновки

Досягнута хронологічна побудова дозволила переглянути деякі наративи з історії регіону в Трипільський час. Дані, проаналізовані в роботі, показують поступовий розвиток на початку і значно швидший процес зникнення населених пунктів, ніж це раніше припускалося.

Стосовно причин появи та зникнення мега-сайтів, можна виділити кілька факторів, які слід враховувати при їх поясненні та в процесі їх пошуку. По-перше, мешканці мега-поселень використовували для своїх цілей кераміку з дуже різними стилями, які могли існувати синхронно. Різниця між стилями кераміки не завжди може бути пояснена хронологією, оскільки вони частково перекриваються або є одночасними. По-друге, регіон, обраний для побудови поселень-гігантів, раніше був практично незаселеним (фаза три та, частково чотири) або вільним від інших Трипільських сайтів (фази чотири, пять, шість). Нарешті, поселення Трипілля в регіоні розташовувались у вигляді смуги, що пролягала з південного заходу на північний схід, і була прикордонною зоною до степу як у період Трипілля, так і в більш пізні періоди. Завдяки цій природній географічній межі територія водозбору Синюхи історично була периферійним регіоном, який заселявся лише зрідка (виділено три періоди активної окупації).

На відміну від більшості історичних періодів, цей регіон навряд чи можна вважати периферійним у період існування тут Трипілля, і навіть більше, протягом кількох століть в ньому була зосереджена значна кількість населення. Тут близько 500 років існувала і підтримувалася певна соціальна система, де ряд дуже схожих великих і мега-поселень співіснували, принайльні, частково. Ці поселення не мають слідів економічної або політичної «залежності» один від одного, і навіть навпаки, чітко простежується висока інтенсивність взаємодій та обміну символікою, знаннями і технологіями. Різні елементи матеріальної культури характеризуються стабільністю в розвитку, інновації з'являються дуже швидко по всьому регіону, що свідчить як про їх широке визнання, так і про те, що населення різних селищ перебувало в тісних взаєминах, формуючи потужну регіональну сферу взаємодій.

Ця регіональна сфера взаємодій мала тенденцію як до створення все більших агломерацій, так і до концентрації населення, як в цілому в регіоні, так і на окремих поселеннях. Загальна система образів, символіка і множинні місця суспільних взаємодій могли використовуватися для підтримки почуття спільності і, таким чином, для функціонування цієї системи, яка могла складатися з великих мереж різнопланового обміну. З крахом цієї системи і необхідності в численних громадських взаємодіях спочатку зникають великі поселення і більшість дрібних сіл, а через короткий час і все населення, що залишилося. Сучасні дослідження, засновані на нових концептуальних підходах та методах дослідження, а також на величезному фундаменті попередніх досліджень, допомагають наблизитись до розуміння цих процесів.

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Appendices

Appendix 1. List of Tripolye sites in the study region

site		site geography						site size					
id	site	district (rayon)	region (oblast)	latitude	longitude	coordinate accuracy	river system	find scatter measure 1	find scatter measure 2	size ha (raw data)	size ha (corrected)	method of calculation	Magnetic survey
1	Buda Orlovetska	Gorodishche	Cherkasy	49.3003	31.6248	3	4			23.6	23.6	4	
2	Gorodiche 1	Gorodishche	Cherkasy	49.2925	31.4580	3	4			4	3.14	4	
3	Gorodiche 2	Gorodishche	Cherkasy	49.2925	31.4581	3	4			15	11.78	4	
4	Gorodiche 3	Gorodishche	Cherkasy	49.2925	31.4581	3	4						
5	Gorodiche 4	Gorodishche	Cherkasy	49.2925	31.4581	3	4			3	2.36	4	
6	Hlistunivka	Gorodishche	Cherkasy	49.2204	31.4283	3	4			3.9	3.9	4	
7	Ksaverove	Gorodishche	Cherkasy	49.1938	31.5143	3	4			23.6	23.6	4	
8	Mliev 1	Gorodishche	Cherkasy	49.3474	31.5365	3	4			50	39.27	4	
9	Mliev 2	Gorodishche	Cherkasy	49.3474	31.5365	3	4			5	3.93	4	
10	Nezamognik	Gorodishche	Cherkasy	49.2240	31.1995	3	4			15.7	15.7	4	
11	Orlovets 1	Gorodishche	Cherkasy	49.2367	31.5934	3	4						
12	Orlovets 2	Gorodishche	Cherkasy	49.2367	31.5934	3	4						
13	Pertropavlovka	Gorodishche	Cherkasy	49.2415	31.3450	3	4						
14	Petriki 2	Gorodishche	Cherkasy	49.2601	31.1677	3	4			20	15.71	4	
15	Starosillya	Gorodishche	Cherkasy	49.4048	31.6017	3	4						
16	Valiava 2	Gorodishche	Cherkasy	49.3074	31.3083	1	4						
17	Valiava1	Gorodishche	Cherkasy	49.3071	31.3848	1	4			80	40	2	
18	Vilshana 1	Gorodishche	Cherkasy	49.2148	31.2094	3	4			39.3	39.3	4	
19	Vilshana 2	Gorodishche	Cherkasy	49.2097	31.2089	3	4			20	15.71	4	
20	Voronivka 1	Gorodishche	Cherkasy	49.1854	31.3189	3	4			15	11.78	4	
21	Voronivka 2	Gorodishche	Cherkasy	49.1854	31.3189	3	4			20	15.71	4	
22	Vyazivok 1	Gorodishche	Cherkasy	49.1710	31.4093	3	4						
23	Vyazivok 2	Gorodishche	Cherkasy	49.1710	31.4093	3	4			7	5.50	4	
24	Vyazivok 3	Gorodishche	Cherkasy	49.1710	31.4093	3	4						
25	Zelena Dibrova	Gorodishche	Cherkasy	49.1432	31.2107	2	4			13-9.6	11	4	
26	Lubenci	Kamyansky	Cherkasy	49.1888	32.2361	3	4						
27	Bobritsya	Kaniv	Cherkasy	49.7957	31.4053	3	4	150	200	2.4	2.4	4	
28	Buchak	Kaniv	Cherkasy	49.8663	31.4301	3	4						
29	Chmilna	Kaniv	Cherkasy	49.6659	31.5271	3	4			6.3	4.95	4	
30	Dyakove pole	Kaniv	Cherkasy	49.9251	31.4056	3	4						

Column 'Coordinate accuracy': 0 no coordinates; 1 exact location; 2 approximate location according to written descriptions; 3 centre of the modern village or town. Column 'River system': River system: 1 'Sinyukha; 2 Southern Bug; 3 Upper-Middle Ros; 4 Lower Ros-Dniper. Column 'Method of size calculation': 1 archaeo-magnetic map; 2 aerial photographs; 3 maps after surface collections by V. Kruts; 4 calculated as oval area (ellipse) from information about the dimensions of surface find scatter.

existing chronology				revised chronology							
Phase	local group	sub-phase	remarks	phase 1	phase 2	phase 3	phase 4	phase 5	phase 6	phase 5+6	phase 7
B2	Nebelivka	2					1				
C1	Kaniv							0.5	0.5	1	
B2-C1	Kaniv						0.5	0.5		0.5	
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
B2	Nebelivka	2	Kaniv				1				
B2	Nebelivka	2	Kaniv				1				
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
B2	Nebelivka	1	Kaniv				1				
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C1	Kaniv		B2					0.5	0.5	1	
B2-C1	Kaniv		C1				0.5	0.5		0.5	
B2-C1	Kaniv		C1				0.5	0.5		0.5	
C1	Kaniv							0.5	0.5	1	
B2	Kaniv		Nebelivka1				1				
B2	Nebelivka	2	Kaniv				1				
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
B2-C1	Kaniv		C1				0.5	0.5		0.5	
C1	Kaniv		Tomshovka					0.5	0.5	1	
B2-C1	Kaniv		C1				0.5	0.5		0.5	
C1	Kaniv							0.5	0.5	1	
C1	Tomashovka	1						0.5	0.5	1	
C2											1
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	

site		site geography						site size					
id	site	district (rayon)	region (oblast)	latitude	longitude	coordinate accuracy	river system	find scatter measure 1	find scatter measure 2	size ha (raw data)	size ha (corrected)	method of calculation	Magnetic survey
31	Grigorivka, Ignatenkova gora	Kaniv	Cherkasy	49.9251	31.4056	3	4	300	150	3.5	3.5	4	
32	Grishentcy kuzki	Kaniv	Cherkasy	49.8015	31.3523	3	4	230	120	2.2	2.2	4	
33	Hatyche	Kaniv	Cherkasy	49.9251	31.4056	3	4	250	160	3.1	3.1	4	
34	Hutir Chmilna	Kaniv	Cherkasy	49.6803	31.5402	3	4	400	70	2.2	2.2	4	
35	Kamyanka	Kaniv	Cherkasy	49.8015	31.3523	3	4	500	150	5.9	5.9	4	
36	Kaniv BMU5	Kaniv	Cherkasy	49.7530	31.4536	3	4			5	3.93	4	
37	Kaniv Moskovka	Kaniv	Cherkasy	49.7530	31.4536	3	4			1	0.79	4	
38	Kaniv-Gagarina	Kaniv	Cherkasy	49.7530	31.4536	3	4			6	4.71	4	
39	Kaniv-Novoselitsa 1	Kaniv	Cherkasy	49.7530	31.4536	3	4			9	7.07	4	
40	Kaniv-Novoselitsa 2	Kaniv	Cherkasy	49.7530	31.4536	3	4			4	3.14	4	
41	Kononcha	Kaniv	Cherkasy	49.6473	31.4698	3	4	150	50	0.6	0.6	4	
42	Kostyanetskiy yar	Kaniv	Cherkasy	49.7530	31.4536	3	4			6	4.71	4	
43	Luka	Kaniv	Cherkasy	49.5822	31.4387	3	4	300	200	4.7	4.7	4	
44	Novo-Ukrainka	Kaniv	Cherkasy	49.5700	31.1800	3	4			23.6	23.6	4	
45	Pekari 1	Kaniv	Cherkasy	49.7025	31.5514	3	4			3.1	2.43	4	
46	Pekari 2	Kaniv	Cherkasy	49.7025	31.5514	3	4			6	4.71	4	
47	Pilipenkova gora	Kaniv	Cherkasy	49.7530	31.4536	3	4			2	1.57	4	
48	Polstvin	Kaniv	Cherkasy	49.6540	31.3498	3	4			1	0.79	4	
49	Sahnivka 1	Kaniv	Cherkasy	49.5212	31.4397	3	4			2	1.57	4	
50	Sahnivka 2	Kaniv	Cherkasy	49.5212	31.4397	3	4			10	7.85	4	
51	Selishe 1	Kaniv	Cherkasy	49.8173	31.4188	3	4	90	40	0.3	0.3	4	
52	Selishe 2	Kaniv	Cherkasy	49.8173	31.4188	3	4						
53	Tagancha	Kaniv	Cherkasy	49.5662	31.2661	3	4						
54	Trostyanets	Kaniv	Cherkasy	49.7801	31.3507	3	4						
55	Zarubintcy 2	Kaniv	Cherkasy	49.9608	31.4029	3	4	300	150	3.5	3.5	4	
56	Zarubintcy 3	Kaniv	Cherkasy	49.9608	31.4029	3	4	400	250	7.9	7.9	4	
57	Bondarka 1	Katerinopol	Cherkasy	48.9516	30.9596	3	1			1.2	1.2	4	
58	Bondarka 2	Katerinopol	Cherkasy	48.9516	30.9596	3	1			12.6	12.6	4	
59	Gonchariha	Katerinopol	Cherkasy	48.8469	31.0446	3	1						
60	Kaitanivka 1	Katerinopol	Cherkasy	48.8932	31.0836	3	1						
61	Rozsohovatka	Katerinopol	Cherkasy	48.9395	30.8494	2	1			55	55	4	
62	Skalivatka	Katerinopol	Cherkasy	49.0039	31.0294	3	1						
63	Botvinovka	Khristinovka	Cherkasy	48.9574	30.0234	3	1						
64	Bugachevka	Khristinovka	Cherkasy	48.7810	29.9790	3	2			100	78.54	4	
65	Bugachevka1	Khristinovka	Cherkasy	48.7810	29.9790	3	2						
66	Christinovka 1	Khristinovka	Cherkasy	48.8481	29.9631	3	1			72.3	72.3	4	

existing chronology				revised chronology							
Phase	local group	sub-phase	remarks	phase 1	phase 2	phase 3	phase 4	phase 5	phase 6	phase 5+6	phase 7
C1	East Tripolye							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C1	Kaniv		B2				0.5	0.5		0.5	
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C1			C2					0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C1	Tomashovka	2						0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C2	Kosenovka	2	3								1
C1	Tomashovka	4						0.5	0.5	1	
C1	Tomashovka							0.5	0.5	1	
C1	Tomashovka							0.5	0.5	1	
B2	Nebelivka	2					1				
C2	Kosenovka	2							0.5	0.5	0.5
B1-B2	East Tripolye	5				1					
B1-B2	East Tripolye	5				1					
	East Tripolye										
B2	Nebelivka	2	ETC 7				1				

site		site geography						site size					
id	site	district (rayon)	region (oblast)	latitude	longitude	coordinate accuracy	river system	find scatter measure 1	find scatter measure 2	size ha (raw data)	size ha (corrected)	method of calculation	Magnetic survey
67	Greblya	Khristinovka	Cherkasy	48.9590	30.0534	3	1						
68	Lishchinovka	Khristinovka	Cherkasy	48.9147	30.0546	3	1						
69	Shukayvoda	Khristinovka	Cherkasy	48.8570	29.9150	3	1						
70	Garbuzin	Korsun-Shevchenko	Cherkasy	49.4400	31.3327	3	4			80	62.83	4	
71	Komarovka	Korsun-Shevchenko	Cherkasy	49.3080	30.9754	3	3			7.1	7.1	4	
72	Kvitku 2	Korsun-Shevchenko	Cherkasy	49.3121	31.2383	3	4			20	15.71	4	
73	Kvitku 3	Korsun-Shevchenko	Cherkasy	49.3121	31.2383	3	4			25	19.63	4	
74	Kvitky 1	Korsun-Shevchenko	Cherkasy	49.3141	31.2345	3	4			14.1	14.1	4	
75	Kychintcy 1	Korsun-Shevchenko	Cherkasy	49.5026	31.2730	3	4	700	400	22.0	22.0	4	
76	Kychintcy 2	Korsun-Shevchenko	Cherkasy	49.5026	31.2730	3	4			40	31.42	4	
77	Miropolie	Korsun-Shevchenko	Cherkasy	49.3826	31.3228	3	4			100	78.54	4	
78	Morintcy 1	Korsun-Shevchenko	Cherkasy	49.5089	31.1603	3	4			20	15.71	4	
79	Morintcy 2	Korsun-Shevchenko	Cherkasy	49.5089	31.1603	3	4			15	11.78	4	
80	Mykolayivka	Korsun-Shevchenko	Cherkasy	49.4435	31.0227	3	3						
81	Nova Buda	Korsun-Shevchenko	Cherkasy	49.3020	31.0440	3	3	300	500	11.8	11.8	4	
82	Peremogenci	Korsun-Shevchenko	Cherkasy	49.3609	31.1896	1	4			37.7	37.7	4	
83	Sahnivka	Korsun-Shevchenko	Cherkasy	49.5192	31.4393	3	4			2	1.57	4	
84	Sotnyki	Korsun-Shevchenko	Cherkasy	49.4956	31.2192	3	4						
85	Suhni	Korsun-Shevchenko	Cherkasy	49.2912	31.1161	3	4			20	15.71	4	
86	Yablunivka	Korsun-Shevchenko	Cherkasy	49.4119	31.1674	3	4						
87	Zaricha	Korsun-Shevchenko	Cherkasy	49.4105	31.0479	3	3	500	200	7.9	7.9	4	
88	Zavadovka	Korsun-Shevchenko	Cherkasy	49.3578	31.3667	3	4			4.7	4.7	4	
89	Bosivka	Lysyanka	Cherkasy	49.2293	30.6284	3	1						
90	Chaplinka	Lysyanka	Cherkasy	49.3309	30.6412	3	1			3	2.36	4	
91	Dibrivka	Lysyanka	Cherkasy	49.1717	30.7740	3	1	400	300	9.4	9.4	4	
92	Dubina	Lysyanka	Cherkasy	49.2934	30.6310	3	1						
93	Kamyaniy -brid	Lysyanka	Cherkasy	49.2579	30.6873	3	1						

existing chronology				revised chronology							
Phase	local group	sub-phase	remarks	phase 1	phase 2	phase 3	phase 4	phase 5	phase 6	phase 5+6	phase 7
B1	East Tripolye	2			1						
B1-B2	East Tripolye	4				1					
B1-B2	East Tripolye	4				1					
B2	East Tripolye	7					1				
B2	Nebelivka	2	1				1				
C1	Kaniv		B2-C1				0.5	0.5		0.5	
C1	Kaniv							0.5	0.5	1	
B2	Nebelivka	2	Kaniv				1				
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
B2	East Tripolye	6					1				
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
B1-B2	East Tripolye	4				1					
C1	Kaniv							0.5	0.5	1	
B2	Nebelivka	2	Kaniv				1				
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
C2	Kosenovka	2	3						0.5	0.5	0.5
B					0.333	0.333	0.333				
B2-C1							0.5	0.5		0.5	
C1	Tomashovka							0.5	0.5	1	
B					0.333	0.333	0.333				

site		site geography						site size					
id	site	district (rayon)	region (oblast)	latitude	longitude	coordinate accuracy	river system	find scatter measure 1	find scatter measure 2	size ha (raw data)	size ha (corrected)	method of calculation	Magnetic survey
94	Pochapintcy 1	Lysyanka	Cherkasy	49.2722	30.9271	3	1	800	200	12.6	12.6	4	
95	Pochapintcy 2	Lysyanka	Cherkasy	49.2722	30.9271	3	1	800	200	12.6	12.6	4	
96	Semenovka	Lysyanka	Cherkasy	49.2865	30.6785	3	1						
97	Smilchinci	Lysyanka	Cherkasy	49.1933	30.8324	3	1			15	11.78	4	
98	Sotnitske Pole (Buzanka)	Lysyanka	Cherkasy	49.2370	30.7517	3	1						
99	Verbichki (Buzanka)	Lysyanka	Cherkasy	49.2370	30.7517	3	1						
100	Zarichka (in Buzanka)	Lysyanka	Cherkasy	49.2370	30.7517	3	1			2	1.57	4	
101	Zurginci	Lysyanka	Cherkasy	49.3123	30.8757	3	1						
102	Bagva	Mankovka	Cherkasy	49.1351	30.5199	3	1						
103	Ivanki	Mankovka	Cherkasy	48.9920	30.4455	3	1						
104	Kharkivka	Mankovka	Cherkasy	49.0149	30.3056	3	1						
105	Krasnostavka	Mankovka	Cherkasy	48.9653	30.1070	1	1			5	3.93	4	
106	Kyshentci	Mankovka	Cherkasy	49.0319	30.2538	3	1			22	17.28	4	
107	Podibna	Mankovka	Cherkasy	48.9191	30.2286	3	1						
108	Rohy	Mankovka	Cherkasy	48.8522	30.4937	1	1			5.3	5.3	1	CAU Kiel 2016
109	Bachkurino	Monastyrysche	Cherkasy	48.9532	29.8660	3	1						
110	Kopiyuvata	Monastyrysche	Cherkasy	48.9968	29.9742	3	1						
111	Popudnia	Monastyrysche	Cherkasy	48.9099	29.8712	3	1			11.8-15	12	4	
112	Vladislavchik	Monastyrysche	Cherkasy	49.0763	29.9598	3	1			100	78.54	4	
113	Zarubentsy	Monastyrysche	Cherkasy	49.1243	29.9579	3	1						
114	Zyubriha	Monastyrysche	Cherkasy	49.0948	30.0130	3	1						
115	Krimki	Shpola	Cherkasy	48.9277	31.4051	1	1			?	7	3	
116	Lebedyn	Shpola	Cherkasy	48.9570	31.4523	1	1			3	3	4	
117	Maslovo	Shpola	Cherkasy	48.7906	31.4270	3	1						
118	Vasilkiv (Iskrenne)	Shpola	Cherkasy	49.0020	31.2736	1	1			113	113	3	
119	Yaroslavka	Shpola	Cherkasy	48.7867	31.3633	3	1						
120	Nosachev	Smila	Cherkasy	49.1441	31.6204	3	4						
121	Gordashovka1	Talne	Cherkasy	48.9092	30.6519	3	1			16.6	16.6	4	
122	Gordashovka2	Talne	Cherkasy	48.9165	30.6555	3	1			3	2.36	4	
123	Grebenukiv Yar	Talne	Cherkasy	48.8190	30.7178	1	1			3	3	1	CAU Kiel 2014, 2016
124	Hlybochok	Talne	Cherkasy	48.8861	30.7895	1	1			130	100	2	Dudkin 1994-95, CAU Kiel 2016
125	Kobrinove	Talne	Cherkasy	48.9950	30.7638	3	1						
126	Kolodiste	Talne	Cherkasy	48.8737	30.8808	3	1						
127	Kolodiste 1	Talne	Cherkasy	48.8769	30.8950	2	1			8	8	4	
128	Kolodiste2	Talne	Cherkasy	48.8448	30.9256	2	1			12.6	12.6	4	Zagniy ?
129	Krivi Kolina	Talne	Cherkasy	48.8021	30.8608	1	1			38.2	38.2	3	

existing chronology				revised chronology							
Phase	local group	sub-phase	remarks	phase 1	phase 2	phase 3	phase 4	phase 5	phase 6	phase 5+6	phase 7
B2	East Tripolye	7					1				
B2-C1							0.5	0.5		0.5	
B2-C1							0.5	0.5		0.5	
B2							1				
B1-B2	East Tripolye					1					
C1								0.5	0.5	1	
C2	Kosenovka	1							1	1	
C2	Kosenovka	3									1
B1-B2	East Tripolye	5				1					
B1	East Tripolye	2			1						
B1	East Tripolye				0.5	0.5					
C2	Kosenovka	3									1
B2	East Tripolye	6					1				
B1-B2	East Tripolye	5				1					
C1	Tomashovka	1						0.5	0.5	1	
B2	East Tripolye	6	7				1				
B1	East Tripolye	1			1						
B1-B2	East Tripolye	4				1					
?											
C1	Tomashovka	4						0.5	0.5	1	
B2	Vladimirovka	2	?				1				
C1	Tomashovka	3						0.5	0.5	1	
C1								0.5	0.5	1	
C1	Kaniv							0.5	0.5	1	
B2	Vladimirovka-Nebelivka						1				
C2	Kosenovka	3									1
A	Tripolye A			1							
B2	Nebelivka	2					1				
C2	Kosenovka	1							1	1	
C2	Kosenovka	3									1
B2	Nebelivka	2					1				
B2	Nebelivka	2					1				
B2	Nebelivka	1					1				

site		site geography						site size					
id	site	district (rayon)	region (oblast)	latitude	longitude	coordinate accuracy	river system	find scatter measure 1	find scatter measure 2	size ha (raw data)	size ha (corrected)	method of calculation	Magnetic survey
130	Lisowe	Talne	Cherkasy	49.0290	30.5790	3	1			5	3.93	4	
131	Maidanetske	Talne	Cherkasy	48.8070	30.6862	1	1			200	200	1	Dudkin 1971-74, RGK Frankfurt a. M., CAU Kiel 2011-12, 2016
132	Moshurov 1	Talne	Cherkasy	48.8980	30.5442	1	1			7	7	1	Dudkin 1986, CAU Kiel 2016
133	Moshurov 2 (Smaglievi Beregy)	Talne	Cherkasy	48.8550	30.5839	1	1			3.6	3.6	1	CAU Kiel 2016
134	Moshurov 3	Talne	Cherkasy	48.8982	30.5433	1	1			1	1	1	Dudkin 1986, CAU Kiel 2016
135	Onoprievka	Talne	Cherkasy	48.9970	30.6972	1	1			60	47.12	4	
136	Onopriivka 2	Talne	Cherkasy	49.0102	30.6681	3	1						
137	Pavlivka	Talne	Cherkasy	49.0592	30.6848	3	1						
138	Pischana	Talne	Cherkasy	48.7499	30.8947	1	1			16.3	16.3	4	Zagniy ?
139	Romanivka 2	Talne	Cherkasy	48.9344	30.5112	3	1						
140	Romanovka	Talne	Cherkasy	48.9471	30.5526	1	1			57.7	57.7	4	
141	Talianki	Talne	Cherkasy	48.8068	30.5299	1	1			320	320	1	Dudkin 1982-86, RGK Frankfurt a.M. 2011-2012
142	Talne 1	Talne	Cherkasy	48.8875	30.7010	3	1			10	7.85	4	
143	Talne 2	Talne	Cherkasy	48.8582	30.7282	1	1			1.5	1.5	1	Zagniy 1990th
144	Talne 3	Talne	Cherkasy	48.8604	30.7371	1	1			5.5	5.5	1	
145	Vesely kut	Talne	Cherkasy	48.9703	30.6253	1	1			60	60	1	
146	Yampol	Talne	Cherkasy	48.7663	30.9382	1	1			36.7	36.7	2	Dudkin 1995
147	Apolianka	Uman	Cherkasy	48.7305	30.4274	1	1			30	30	1	
148	Cherpovody 1	Uman	Cherkasy	48.5978	30.1069	1	1			12	11.8	4	
149	Cherpovody 2	Uman	Cherkasy	48.5819	30.1142	1	1			1	1	4	
150	Dmytrushki	Uman	Cherkasy	48.7964	30.2858	3	1			1	0.79	4	
151	Dobrovody	Uman	Cherkasy	48.7673	30.3745	1	1			211	211	1	
152	Dubova	Uman	Cherkasy	48.6398	30.4523	1	1			5	5	4	
153	Gorodnitsa	Uman	Cherkasy	48.5193	30.1662	1	1			19.6	19.6	4	
154	Kocherginci Pankivka	Uman	Cherkasy	48.7098	30.1613	2	1			27.5	27.5	4	
155	Kocherginci Shulgivka	Uman	Cherkasy	48.7151	30.1361	2	1			2	2	4	
156	Korgeva-Slobidka	Uman	Cherkasy	48.5984	30.3933	1	1			12.6	12.6	4	
157	Korgova	Uman	Cherkasy	48.6461	30.4211	1	1			15.7	15.7	4	
158	Kosenovka	Uman	Cherkasy	48.8262	30.4033	1	1			100	80	2	Golub ?, CAU Kiel 2016
159	Krasnopilka	Uman	Cherkasy	48.8610	30.2485	3	1						
160	Ostrivets	Uman	Cherkasy	48.5926	30.5580	1	1			7	7	3	
161	Palanka 2	Uman	Cherkasy	48.7546	30.0814	3	1						

existing chronology				revised chronology							
Phase	local group	sub-phase	remarks	phase 1	phase 2	phase 3	phase 4	phase 5	phase 6	phase 5+6	phase 7
B1	East Tripolye	2			1						
C1	Tomashovka	3					1	1	1	2	
C1	Tomashovka	3						1		1	
C2											1
C2	Kosenovka	3									1
B1-B2	East Tripolye	3				1					
B2-C1							0.5	0.5		0.5	
A				1							
B2	Nebelivka	1					1				
A				1							
C1	Tomashovka	3						0.5	0.5	1	
C1	Tomashovka	3						1	1	2	
C1	Tomashovka							0.5	0.5	1	
C1	Tomashovka							0.5	0.5	1	
C1	Tomashovka	2 or 3						1		1	
B1-B2	East Tripolye	5				1					
B2	Nebelivka	2					1				
C2	Kosenovka	1							0.5	0.5	0.5
C2	Kosenovka	3									1
C1	Tomashovka	fin						0.5	0.5	1	
C1	Tomashovka							0.5	0.5	1	
C1	Tomashovka	2						1		1	
C2	Kosenovka	3									1
C1	Tomashovka	4						0.5	0.5	1	
C1	Tomashovka	3						0.5	0.5	1	
C2	Kosenovka	3									1
B2	Nebelivka	2					1				
C2	Kosenovka	1							1	1	
C2	Kosenovka	1							1	1	
C2	Kosenovka	2							0.5	0.5	0.5
B2	Nebelivka	2					1				
C2	Kosenovka	3									1

site		site geography						site size					
id	site	district (rayon)	region (oblast)	latitude	longitude	coordinate accuracy	river system	find scatter measure 1	find scatter measure 2	size ha (raw data)	size ha (corrected)	method of calculation	Magnetic survey
162	Pugachivka	Uman	Cherkasy	48.8381	30.3131	3	1			20	15.71	4	
163	Sharin	Uman	Cherkasy	48.6209	30.2360	1	1			11.8	11.8	4	
164	Sobkivka	Uman	Cherkasy	48.6847	30.2610	3	1						
165	Sushkovka	Uman	Cherkasy	48.6591	30.3601	1	1			76.6	76.6	4	
166	Tomashovka	Uman	Cherkasy	48.6291	30.1029	1	1			117.4	70	3	
167	Vilshana-Slobidka	Uman	Cherkasy	48.6122	30.4450	1	1			23.6	23.6	4	
168	Yatranovka	Uman	Cherkasy	48.6076	30.2955	1	1			60	60	2	Dudkin 1993
169	Yurkivka	Uman	Cherkasy	48.5804	30.0360	1	2			2	2	4	
170	Chicherkozovka	Zvenigorodka	Cherkasy	49.0126	31.1209	1	1			255	130-180	2	
171	Chizovka	Zvenigorodka	Cherkasy	49.1568	30.7021	1	1			20	20	1	
172	Georgievka	Zvenigorodka	Cherkasy	49.0011	31.1762	1	1			?	7	3	
173	Gudzivka	Zvenigorodka	Cherkasy	49.1169	30.9915	3	1			30	23.56	4	
174	Nemorog	Zvenigorodka	Cherkasy	49.1220	30.9193	3	1			35.3	35.3	4	
175	Olhovets 1	Zvenigorodka	Cherkasy	49.0452	30.8515	1	1			117.8	90	1	Dudkin 1993
176	Olhovets 2	Zvenigorodka	Cherkasy	49.0308	30.9082	3	1			100	78.54	4	
177	Rezino	Zvenigorodka	Cherkasy	49.1027	30.5923	3	1						
178	Ryzyne	Zvenigorodka	Cherkasy	49.1154	30.5790	3	1						
179	Shevchenkove	Zvenigorodka	Cherkasy	49.1936	31.0851	3	4			10	7.85	4	
180	Stara Buda	Zvenigorodka	Cherkasy	49.1389	30.8317	3	1			1.2	1.2	4	
181	Urkivka	Zvenigorodka	Cherkasy	49.0094	31.0925	3	1			2	2	4	
182	Fedorovka (Mihailovka)	Dobrovelychika	Kirovohrad	48.455223	30.8792	1	1			122.7	60-65	2	Dudkin 1993
183	Beresivka	Haivoron	Kirovohrad			0				10	7.85	4	
184	Gakchik	Haivoron	Kirovohrad	48.2144	30.0790	3	2						
185	Giavoron	Haivoron	Kirovohrad	48.3389	29.8700	3	2			14	11.00	4	
186	Mogilna 1	Haivoron	Kirovohrad	48.2332	30.0668	3	2						
187	Mogilna 2	Haivoron	Kirovohrad	48.2332	30.0668	1	2			2	2	1	Dudkin 1993
188	Mogilna 3	Haivoron	Kirovohrad	48.2428	30.0787	1	2			7	7	1	Dudkin 1993
189	Solgutiv	Haivoron	Kirovohrad	48.3277	29.8676	3	2						
190	Zavalla	Haivoron	Kirovohrad	48.2175	30.0128	3	2						
191	Leshivka	Holovanivsk	Kirovohrad	48.4799	30.5923	1	1			12	12	4	
192	Peregonovka	Holovanivsk	Kirovohrad	48.5627	30.5013	1	1			35.3	26	2	
193	Poloniste	Holovanivsk	Kirovohrad	48.4756	30.5075	1	1			7.1	7.1	4	
194	Tcurupi	Holovanivsk	Kirovohrad	48.4297	30.5532	1	1			9.4	9.4	4	
195	Kamyaneche	Novoarkhangelsk	Kirovohrad	48.7260	30.6937	3	1						
196	Nebelivka	Novoarkhangelsk	Kirovohrad	48.6432	30.5571	1	1			235	235	1	
197	Sverdlekove	Novoarkhangelsk	Kirovohrad	48.7143	30.7782	3	1						
198	Vladimirovka	Novoarkhangelsk	Kirovohrad	48.5643	30.7506	1	1			95	95	2	

existing chronology				revised chronology							
Phase	local group	sub-phase	remarks	phase 1	phase 2	phase 3	phase 4	phase 5	phase 6	phase 5+6	phase 7
C1	Tomashovka							0.5	0.5	1	
C2	Kosenovka	3									1
C2	Kosenovka	2							0.5	0.5	0.5
C1	Tomashovka	1						0.5	0.5	1	
C1	Tomashovka	fin						0.5	0.5	1	
C2	Kosenovka	2							0.5	0.5	0.5
C1	Tomashovka	2						0.5	0.5	1	
C2	Kosenovka	3									1
C1	Tomashovka	2						1	1	2	
B1-B2	East Tripolye	3				1					
?											
B2	Nebelivka	2					1				
C2	Kosenovka	2	1						1	1	
B1-B2	East Tripolye	5				1					
C2	Kosenovka	3									1
C1	Tomashovka							0.5	0.5	1	
B2-C1							0.5	0.5		0.5	
C1	Tomashovka	1						0.5	0.5	1	
C2	Kosenovka		3								1
B2	Vladimirovka	1					1				
B1	East Tripolye				0.5	0.5					
B1					0.5	0.5					
A				1							
A	Tripolye A			1							
A	Tripolye A			1							
A	Tripolye A			1							
A and C2				1							1
B1					0.5	0.5					
B2	Nebelivka	2					1				
B2	Vladimirovka	3					1				
B2	Vladimirovka	3					1				
B2	Nebelivka	2					1				
B2							1				
B2	Nebelivka	1					1	1		1	
C2	Kosenovka	2							0.5	0.5	0.5
B2	Vladimirovka	2					1				

site		site geography						site size					
id	site	district (rayon)	region (oblast)	latitude	longitude	coordinate accuracy	river system	find scatter measure 1	find scatter measure 2	size ha (raw data)	size ha (corrected)	method of calculation	Magnetic survey
199	Andreevka	Novomyrhorod	Kirovohrad	48.8035	31.6285	1	1			25-15	20	4	
200	Korobchino	Novomyrhorod	Kirovohrad	48.7535	31.4695	3	1						
201	Lekarevo	Novomyrhorod	Kirovohrad	48.7580	31.5445	3	1			40	31.42	4	
202	Petroostriv	Novomyrhorod	Kirovohrad	48.7455	31.3059	3	1			35	27.49	4	
203	Rubaniy Most	Novomyrhorod	Kirovohrad	48.7662	31.4685	3	1			50	39.27	4	
204	Danilova balka	Ulianovka	Kirovohrad	48.2556	30.2508	3	2						
205	Lupulove	Ulianovka	Kirovohrad	48.1457	30.3067	3	2						
206	Melnichna Krucha	Ulianovka	Kirovohrad	48.1819	30.1860	3	2						
207	Sabatinovka 1	Ulianovka	Kirovohrad	48.1559	30.1872	3	2						
208	Sabatinovka 2	Ulianovka	Kirovohrad	48.1819	30.1860	3	2						
209	Chernyatka	Bershad	Vinnytsya	48.4894	29.7134	3	2						
210	Biliy Kamin	Chechelnyk	Vinnytsya	48.2675	29.3947	1	2			97	97	1	
211	Chechelnik	Chechelnyk	Vinnytsya	48.2195	29.3272	1	2			56.5	56.5		
212	Chechlnik Vishenka	Chechelnyk	Vinnytsya	48.2125	29.3460	3	2						
213	Stratiyivka	Chechelnyk	Vinnytsya	48.1413	29.4264	3	2						
214	Bubnivka	Haisyn	Vinnytsya	48.7211	29.3093	3	2						
215	Granove 1	Haisyn	Vinnytsya	48.8720	29.5597	3	2						
216	Granove 2	Haisyn	Vinnytsya	48.8720	29.5597	3	2						
217	Guncha	Haisyn	Vinnytsya	48.6192	29.3311	3	2						
218	Harpachka	Haisyn	Vinnytsya	48.7414	29.2139	3	2	100	150	1.2	1.2	4	
219	Kusliak	Haisyn	Vinnytsya	48.8412	29.4221	3	2						
220	Ladygenski Hutory	Haisyn	Vinnytsya	48.6733	29.3473	3	2						
221	Mihailivka	Haisyn	Vinnytsya	48.8351	29.5447	3	2			5	3.93		
222	Mihailivka 3	Haisyn	Vinnytsya	48.8351	29.5447	3	2						
223	Polove	Haisyn	Vinnytsya			0							
224	Rachni Sobovi	Haisyn	Vinnytsya	48.9299	29.4349	3	2			35.3	35.3	4	
225	Rachni Sobovi	Haisyn	Vinnytsya	48.9299	29.4349	3	2						
226	Borisovka 1	Illintsi	Vinnytsya	49.0722	29.1882	3	2						
227	Borisovka 2	Illintsi	Vinnytsya	49.0722	29.1882	3	2						
228	Chortoruya	Illintsi	Vinnytsya	48.9524	29.5726	3	2						
229	Dankivka	Illintsi	Vinnytsya	49.1039	29.3164	3	2						
230	Dashev	Illintsi	Vinnytsya	49.1234	29.3214	3	2						
231	Ilyintcy	Illintsi	Vinnytsya	49.1051	29.2084	3	2						
232	Kalnyk	Illintsi	Vinnytsya	49.0358	29.3833	3	2						
233	Kantelyna	Illintsi	Vinnytsya	49.0781	29.4388	3	2						
234	Kryshtopovka	Illintsi	Vinnytsya	48.9179	29.3216	3	2	1000	600	47.1	47.1	4	
235	Parievka	Illintsi	Vinnytsya	49.0896	29.2861	3	2						

existing chronology				revised chronology							
Phase	local group	sub-phase	remarks	phase 1	phase 2	phase 3	phase 4	phase 5	phase 6	phase 5+6	phase 7
B2	Vladimirovka	2					1				
	mine, shaft										
B2							1				
C1								0.5	0.5	1	
C1								0.5	0.5	1	
A				1							
A				1							
B1-B2						1					
B1					1						
A				1							
A				1							
C1	Chechelnik						1				
C1	Chechelnik						1				
C1								0.5	0.5	1	
C1								0.5	0.5	1	
B1					0.5	0.5					
B					0.333	0.333	0.333				
B					0.333	0.333	0.333				
A				1							
A				1							
B1-B2						1					
B1					0.5	0.5					
B1					0.5	0.5					
C2											1
C1								0.5	0.5	1	
C1	Tomashovka	4						0.5	0.5	1	
A				1							
B1					0.5	0.5					
C1								0.5	0.5	1	
C1								0.5	0.5	1	
B					0.333	0.333	0.333				
B					0.333	0.333	0.333				
A				1							
B2							1				
C1								0.5	0.5	1	
B2	Nemyrov type						1				
granit											

site		site geography						site size					
id	site	district (rayon)	region (oblast)	latitude	longitude	coordinate accuracy	river system	find scatter measure 1	find scatter measure 2	size ha (raw data)	size ha (corrected)	method of calculation	Magnetic survey
236	Rayki 1	Illintsi	Vinnytsya	49.0859	29.2479	3	2						
237	Rayki 2	Illintsi	Vinnytsya	49.0859	29.2479	3	2						
238	Rayki 3	Illintsi	Vinnytsya	49.0859	29.2479	3	2						
239	Soroki	Illintsi	Vinnytsya	49.0720	29.3553	3	2						
240	Ulanivka	Illintsi	Vinnytsya	49.0938	29.1615	3	2	100	200	1.6	1.6	4	
241	Verbivka 1	Illintsi	Vinnytsya	48.9556	29.3351	3	2	100	150	1.2	1.2	4	
242	Verbivka 2	Illintsi	Vinnytsya	48.9556	29.3351	3	2						
243	Yakubivka	Illintsi	Vinnytsya	49.0922	29.1376	3	2						
244	Plyskiv	Pohrebyshche	Vinnytsya	49.3693	29.2850	3	3						
245	Bililivka	Ruzhyn	Zhytomyr	49.6761	29.0337	3	3						
246	Karabchiev	Ruzhyn	Zhytomyr	49.7729	29.3430	3	3						
247	Revucha	Ruzhyn	Zhytomyr	49.6536	29.3134	3	3						
248	Rugyn	Ruzhyn	Zhytomyr	49.7232	29.2213	3	3						
249	Yagniatyn	Ruzhyn	Zhytomyr	49.7580	29.2977	3	3						
250	Bila Tcerkva	Bila Tserkva	Kiev	49.7961	30.1227	3	3						
251	Shkarovka	Bila Tserkva	Kiev	49.7380	30.1643	3	3			10	7.85	4	
252	Biivtcy	Bohuslav	Kiev	49.4907	30.9772	3	3	450	300	10.6			
253	Biivtcy2	Bohuslav	Kiev	49.4907	30.9772	3	3	200	150	2.4			
254	Deshki	Bohuslav	Kiev	49.5311	30.9484	3	3			100	78.54	4	
255	Guta	Bohuslav	Kiev	49.4272	30.8299	3	3						
256	Medvin 3	Bohuslav	Kiev	49.3901	30.7851	3	3						
257	Medvin1	Bohuslav	Kiev	49.3901	30.7851	3	3	250	150	2.9			
258	Medvin2	Bohuslav	Kiev	49.3901	30.7851	3	3	500	250	9.8			
259	Medvin4	Bohuslav	Kiev	49.3901	30.7851	3	3	100	50	0.4			
260	Medvin5	Bohuslav	Kiev	49.3901	30.7851	3	3	110	200	1.7			
261	Medvin6	Bohuslav	Kiev	49.3901	30.7851	3	3	350	125	3.4			
262	Baliko-Shchuchinka, Gardy	Kaharlyk	Kiev	49.9503	31.1536	3	4						
263	Charkove	Kaharlyk	Kiev	50.0741	30.8943	3	4	600	200	9.4	9.4	4	
264	Chernyhiv	Kaharlyk	Kiev	50.0091	30.7748	3	4	300	150	3.5	3.5	4	
265	Chutir 1	Kaharlyk	Kiev	50.0087	30.9537	3	4			2	1.57	4	
266	Grebeni	Kaharlyk	Kiev	50.0201	30.9722	3	4						
267	Grebeni, Vinogradne	Kaharlyk	Kiev	50.0201	30.9722	3	4	180	180	2.5	2.5	4	Dudkin 1992
268	Honyne	Kaharlyk	Kiev	49.9657	31.0521	3	4	200	220	3.5	3.5	4	
269	Lysytsin yar	Kaharlyk	Kiev	50.0191	30.8825	3	4	250	360	7.1	7.1	4	
270	Panikarcha	Kaharlyk	Kiev	49.9678	30.9801	3	4						
271	Rgychev	Kaharlyk	Kiev	49.9657	31.0521	3	4	180	180	2.5	2.5	4	
272	Ripnytca 1	Kaharlyk	Kiev	49.9657	31.0521	3	4			6	4.71	4	

existing chronology				revised chronology							
Phase	local group	sub-phase	remarks	phase 1	phase 2	phase 3	phase 4	phase 5	phase 6	phase 5+6	phase 7
C1								0.5	0.5	1	
B					0.333	0.333	0.333				
B					0.333	0.333	0.333				
B1					0.5	0.5					
A				1							
B1-B2	Bilikovsky type					1					
B2	Nemyrov type						1				
C1								0.5	0.5	1	
B1					0.5	0.5					
C2											1
C2											1
C2											1
C								0.5	0.5	1	
C								0.5	0.5	1	
B1-B2	East Tripolye					1					
B1-B2	East Tripolye	4				1					
B2	Kolomiyshina 2 (East Tripolye)						1				
B1-B2						1					
B2-C1							0.5	0.5		0.5	
C1								0.5	0.5	1	
C1								0.5	0.5	1	
C1								0.5	0.5	1	
B2							1				
B2	East Tripolye						1				
B2-C1							0.5	0.5		0.5	
C1								0.5	0.5	1	
C1								0.5	0.5	1	
C1								0.5	0.5	1	
B2							1				
C1								0.5	0.5	1	

site		site geography						site size					
id	site	district (rayon)	region (oblast)	latitude	longitude	coordinate accuracy	river system	find scatter measure 1	find scatter measure 2	size ha (raw data)	size ha (corrected)	method of calculation	Magnetic survey
273	Ripnytca 2	Kaharlyk	Kiev	49.9657	31.0521	3	4			4	3.14	4	
274	Ripnytca 6	Kaharlyk	Kiev	49.9657	31.0521	3	4	200	300	4.7	4.7	4	
275	Strytivka	Kaharlyk	Kiev	50.0191	30.8825	3	4	600	200	9.4	9.4	4	
276	Uchki	Kaharlyk	Kiev	50.0087	30.9537	3	4	230	170	3.1	3.1	4	
277	Yancha 1	Kaharlyk	Kiev	50.0201	30.9722	3	4	160	150	1.9	1.9	4	
278	Yancha 2	Kaharlyk	Kiev	50.0201	30.9722	3	4	240	180	3.4	3.4	4	
279	Bushevo	Rokytne	Kiev	49.6381	30.5936	3	3						
280	Kruti Gorbi	Tarashcha	Kiev	49.4255	30.6128	3	1	400	400	12.6	12.6	4	
281	Lisovichi	Tarashcha	Kiev	49.5130	30.5155	3	3						
282	Lukyanivka	Tarashcha	Kiev	49.5080	30.5693	3	3	100	50	0.4	0.4	4	
283	Salicha	Tarashcha	Kiev	49.6203	30.4445	3	3	150	150	1.8	1.8	4	
284	Tarascha 2	Tarashcha	Kiev	49.5611	30.5062	3	3	50	50	0.2	0.2	4	
285	Tarashcha	Tarashcha	Kiev	49.5592	30.5095	3	3			3	2.36	4	
286	Volodymirivka	Tarashcha	Kiev	49.5351	30.4077	3	3	150	150	1.8	1.8	4	
287	Cherepyn	Tetiiv	Kiev	49.4094	29.7919	2	3	350	200	5.5			
288	Koshiv	Tetiiv	Kiev	49.4925	29.5878	3	3	250	150	2.9			
289	Tetiyiv	Tetiiv	Kiev	49.3709	29.6892	3	3	400	200	6.3	6.3	4	
290	Barsuki 2	Balta	Odessa	48.0405	29.4151	3	2			1	0.79	4	
291	Barsuki 3	Balta	Odessa	48.0405	29.4151	3	2			1	0.79	4	
292	Barsuki 4	Balta	Odessa	48.0405	29.4151	3	2			24	18.85	4	
293	Bendzary	Balta	Odessa	47.9279	29.6633	3	2	120	30	0.3	0.3	4	
294	Cherneche	Balta	Odessa	48.0643	29.5884	3	2						
295	Eftodia 1	Balta	Odessa	47.9609	29.4334	3	2	70	50	0.3	0.3	4	
296	Korytne	Balta	Odessa	47.9896	29.6843	3	2						
297	Nemyrivske	Balta	Odessa	47.9232	29.7460	3	2			40	31.42	4	
298	Obgyloe	Balta	Odessa	47.9919	29.3702	3	2						
299	Olenivka 2	Balta	Odessa	47.9529	29.5054	3	2						
300	Perelioty	Balta	Odessa	47.9123	29.7669	3	2						
301	Pischana 2	Balta	Odessa	48.1336	29.7195	3	2						
302	Pischana 3	Balta	Odessa	48.1336	29.7195	3	2						
303	Puzaikove (Shliahova 1)	Balta	Odessa	48.1114	29.8283	3	2						
304	Saraginka	Balta	Odessa	48.0878	29.4474	3	2						
305	Stanislavka	Balta	Odessa	47.9179	29.8300	3	2			4	3.14	4	
306	Uhogany	Balta	Odessa	48.0804	29.6726	3	2						
307	Getmanowka	Savran	Odessa	48.0644	29.9944	3	2						
308	Savran	Savran	Odessa	48.1287	30.0731	3	2						
309	Zavallya 1	Savran	Odessa	48.1882	29.9251	3	2						
310	Grigorivka					0							

existing chronology				revised chronology							
Phase	local group	sub-phase	remarks	phase 1	phase 2	phase 3	phase 4	phase 5	phase 6	phase 5+6	phase 7
C1								0.5	0.5	1	
C1								0.5	0.5	1	
C1								0.5	0.5	1	
B2-C1							0.5	0.5		0.5	
C1								0.5	0.5	1	
C1								0.5	0.5	1	
B					0.333	0.333	0.333				
C1								0.5	0.5	1	
C1								0.5	0.5	1	
C1								0.5	0.5	1	
B1-B2						1					
C1								0.5	0.5	1	
B1	East Tripolye	2			1						
B2-C1							0.5	0.5		0.5	
C1								0.5	0.5	1	
B2-C1							0.5	0.5		0.5	
B					0.333	0.333	0.333				
B2-C1							0.5	0.5		0.5	
B2							1				
B2							1				
B					0.333	0.333	0.333				
B2							1				
B2							1				
B					0.333	0.333	0.333				
B					0.333	0.333	0.333				
B					0.333	0.333	0.333				
B2-C1							0.5	0.5		0.5	
C1								0.5	0.5	1	
B					0.333	0.333	0.333				
B2-C1							0.5	0.5		0.5	
B2							1				
B2-C1							0.5	0.5		0.5	
B2-C1							0.5	0.5		0.5	
A				1							
A				1							
C1	Kaniv							0.5	0.5	1	

Appendix 2. List of ^{14}C dates

site	laboratory-id	14c age	material	context
Chyzhivka	Poz-98155	5240±35	seed/grain, barley	pit, level 6
Chyzhivka	Poz-98166	3765±35	seed/grain, barley	pit, level 5
Chyzhivka	Poz-98224	5210±35	bone, cattle, mandibular, links, age 5/8, 27 g	pit, level 6
Dobrovody	Poz-87457	4975±35	bone, not determined, indet, NISP 3	mega-structure, dates likely the use of the mega-structure
Dobrovody	Poz-87458	5015±35	bone, large mammal, indet, NISP 1	mega-structure, dates likely the use of the mega-structure
Dobrovody	Poz-87459	5035±35	bone, large mammal, long bone, NISP 1	mega-structure, dates likely the use of the mega-structure
Dobrovody	Poz-87478	4985±35	bone, pig, Pelvis, NISP 1, measurements: dex, 23	kiln “A”, backfilling of the channels, bone: terminus ante quem for the use of the kiln
Dobrovody	Poz-87479	4920±30	bone, pig, tibia, NISP 1, measurements, sin, 2, o-	kiln “A”, backfilling of the channels, bone: terminus ante quem for the use of the kiln
Dobrovody	Poz-87480	5015±35	bone, cattle, lower tooth, NISP 1, M1 or M2	kiln “A”, southwestern channel, “under stone”: dates the construction of the kiln
Grebenjukiv	Poz-87462	5680±40	bone, not determined, n=6; 26 g, NISP 5	pit, lowest (earliest) level of the lower pit fill
Grebenjukiv	Poz-87463	5700±35	bone, cattle, n=2, 29 g, distal phalanx post.	pit, upper level of the lower pit fill
Grebenjukiv	Poz-87464	5685±35	bone, cattle, 294 g, metacarpal, GL=206,6; Bp=71,7; SD=40,4; Bd=71,2	pit, upper level of the lower pit fill, 294 g
Grebenjukiv	Poz-87465	-273±22	seed/grain, barley,	pit, upper level of the lower pit fill
Grebenjukiv	Poz-87466	5585±35	bone, cattle, 61 g, pelvis, sin	pit, upper pit fill
Grebenjukiv	Poz-87468	5110±35	bone, cattle, 31 g (with soil), metatarsal	pit, upper pit fill, 31 g with soil
Kosenovka	Poz-109979	4885±35	bone, human, individual 4 = M≥F, adult > 25 years), os parientale LE, fox-id 7	burial in the outdoor area
Kosenovka	Poz-109980	4940±35	bone, human, individual 4 or 5 = 25 -40 years), maxilla RE, fox-id 10	?
Kosenovka	Poz-109981	5010±30	bone, human, individual 4 or 5 = M≥F, 20-40 years), humerus LE, fox-id 8	burial in the outdoor area
Kosenovka	Poz-110084	4970±50	bone, human, individual 2 = indiff, 16/18-21 years), femur RE, fox-id 4	calcified, burial in the house area
Kosenovka	Poz-110086	5280±40	bone, human, individual 3 =subadult), os temporale RE, fox-id 11	calcified, burial in the house area
Kosenovka	Poz-110357	4800±40	bone, human, individual 5 = M=F, 20-35 years), os frontale, fox-id 5	burial in the house area
Kosenovka	Poz-97920	4920±35	bone, cattle, metatarsal, 102 g	under house 6
Kosenovka	Poz-97927	4845±35	bone, wild boar, tibia, 43g	burned house 6
Kosenovka	Poz-97928	4910±40	bone, aurochs, humerus, 120 g	burned house 7
Kosenovka	Poz-97929	4940±40	bone, cattle, metatarsal, 102 g	burned house 8
Kosenovka	Poz-97930	4900±40	bone, cattle, talus (astragalus), 117 g	burned house 9
Kosenovka	Poz-97931	4880±40	bone, cattle, toe forefoot, 55 g	under house 6
Maidanetske	Bln-2087	4890±60	charcoal, not determined,	

context 2	14c_laboratory_remarks	N (%)	C (%)	col (%)
trench: 1000, find-id: 1022, feature-id: 1009, level: 6, quadrat: B1				
trench: 1000, find-id: 1013, feature-id: 1006, level: 5, quadrat: A1				
trench: 1000, find-id: 1023, feature-id: 1009, level: 6, quadrat: A1		1,5	8,4	0,4
trench: 6, find-id: 6004, feature-id: , level: , quadrat: A3	0,9mgC	0,9	4,2	1,8
trench: 6, find-id: 6005, feature-id: , level: , quadrat: A4		1	4,3	1,8
trench: 6, find-id: 6009, feature-id: , level: , quadrat: A9		2,7	8,3	4,8
trench: 5, find-id: 5001, feature-id: , level: , quadrat: Б3		1,6	4,8	4,4
trench: 5, find-id: 5002, feature-id: , level: , quadrat: Б3		1,3	4,6	1
trench: 5, find-id: 5003, feature-id: , level: , quadrat:		1,2	3,5	1,3
trench: 1, find-id: 1200, feature-id: 1008, level: 6, quadrat: D2		0,9	3,8	1,8
trench: 1, find-id: 1146, feature-id: 1007, level: 5, quadrat: D2		1,2	5	4
trench: 1, find-id: 1137, feature-id: 1007, level: 5, quadrat: C2		0,6	2,9	2
trench: 1, find-id: 1125, feature-id: 1007, level: 5, quadrat: D2	103.46 ± 0.28 pMC, modern, Warning! Date probably out of range – -273+/-22			
trench: 1, find-id: 1094, feature-id: 1002, level: 3, quadrat: D1		1	4,4	0,026
trench: 1, find-id: 1203, feature-id: , level: , quadrat: A2	poor!, 0.8mgC	0,6	3,7	0,3
trench: 5, find-id: 5011, feature-id: , level: , quadrat: E4		0,8	3,7	1,4
trench: 5, find-id: 5013, feature-id: , level: , quadrat: B (kyril)2		2,2	5,8	5,8
trench: 5, find-id: 5014, feature-id: , level: , quadrat: Д5		1,5	4	3,8
trench: 5, find-id: 5009, feature-id: , level: , quadrat: Д3	second measurment with more sample material not sucessful	0	0,9	1
trench: 5, find-id: 5010, feature-id: , level: , quadrat: B (kyril)2-3	second measurment with more sample material not sucessful	0	0,7	0,6
trench: 5, find-id: 5012, feature-id: , level: , quadrat: Г4	poor! no stable isotope measurements possibe	0,6	5,4	3
trench: 5, find-id: 5006, feature-id: , level: , quadrat: Г4		1,6	5,8	4,5
trench: 5, find-id: 5001, feature-id: , level: , quadrat: B-Г1-2		2,7	8,9	6
trench: 5, find-id: 5002, feature-id: , level: , quadrat: Б5-6		1,4	6,2	5,8
trench: 5, find-id: 5003, feature-id: , level: , quadrat: Б5		3,1	9,3	6,4
trench: 5, find-id: 5004, feature-id: , level: , quadrat: Д4		2,9	9,1	8,5
trench: 5, find-id: 5005, feature-id: , level: , quadrat: Д5		3,2	10,8	8,2
trench: , find-id: , feature-id: , level: , quadrat:				

site	laboratory-id	14c age	material	context
Maidanetske	Poz-60157	4810±35	bone, cattle	
Maidanetske	Poz-60158	5020±35	bone, sheep	
Maidanetske	Poz-60159	5020±30	bone, cattle	
Maidanetske	Poz-60160	2450±30	bone, cattle	
Maidanetske	Poz-60161	4965±35	bone, pig	
Maidanetske	Poz-60162	5015±35	bone, pig,	
Maidanetske	Poz-60186	5050±35	charcoal, oak,	
Maidanetske	Poz-60187	4980±35	charcoal, oak,	
Maidanetske	Poz-60188	5005±30	charcoal, ash,	
Maidanetske	Poz-60189	5125±35	charcoal, hazel,	
Maidanetske	Poz-60190	5165±35	charcoal, oak,	
Maidanetske	Poz-60191	4970±30	charcoal, oak,	
Maidanetske	Poz-60192	5060±35	charcoal, ash,	
Maidanetske	Poz-60194	4970±35	bone, sheep/goat,	
Maidanetske	Poz-60195	4940±30	bone, pig,	
Maidanetske	Poz-60199	4895±35	bone, medium mammal,	
Maidanetske	Poz-60200	4875±35	bone, sheep/goat,	
Maidanetske	Poz-60201	4450±30	bone, medium mammal,	
Maidanetske	Poz-60295	4920±40	bone, cattle,	
Maidanetske	Poz-60296	4955±35	bone, large mammal,	
Maidanetske	Poz-60298	4290±40	bone, medium mammal,	
Maidanetske	Poz-60347	5125±35	charcoal, oak,	
Maidanetske	Poz-60348	5020±35	bone, large mammal,	
Maidanetske	Poz-60349	4980±35	bone, cattle,	
Maidanetske	Poz-60350	5065±35	bone, cattle,	
Maidanetske	Poz-60351	4710±35	bone, sheep/goat,	
Maidanetske	Poz-60352	4820±30	bone, cattle,	
Maidanetske	Poz-87513	5150±35	bone, medium mammal,	kiln, probably from the backfilling of the southernmost channel of the of the oldest phase of the kiln. terminus ante quem for the construction of the second kiln phase, bone
Maidanetske	Poz-87514	4980±35	bone, cattle,	find scatter around kiln, waste disposed after use of kiln (after phase 3)
Maidanetske	Poz-87516	5080±35	bone, medium mammal,	eastern pit, lower layer
Maidanetske	Poz-87517	5020±35	bone, sheep, zoo-Lab-sample 4914	southern pit(s), shallow pit or depression in the south of the excavation area, upper layer
Maidanetske	Poz-87518	5075±35	seed/grain, triticum sp.,	southern pit(s), shallow pit or depression in the south of the excavation area, waste disposal layer with numerous bones almost at the bottom

context 2	14c_laboratory_remarks	N (%)	C (%)	col (%)
trench: 50, find-id: 50033, feature-id: 50004, level: 2, quadrat: B2		2	4,5	1
trench: 50, find-id: 50130, feature-id: 50008, level: 2, quadrat: C2		2	4,9	1,8
trench: 50, find-id: 50197, feature-id: 50012, level: 4, quadrat: A3		0,8	2,4	0,1
trench: 51, find-id: 51464, feature-id: 51007, level: 4, quadrat: H19		2,4	5,4	2,3
trench: 51, find-id: 51498, feature-id: 51007, level: 4, quadrat: L20		2,6	4,3	1,3
trench: 51, find-id: 51606, feature-id: 51018, level: 4b, quadrat: M11		2,2	5,8	3
trench: 50, find-id: 50038, feature-id: 50004, level: 2, quadrat: A1				
trench: 50, find-id: 50073, feature-id: 50009, level: 3, quadrat: A2				
trench: 50, find-id: 50140, feature-id: 50012, level: 4, quadrat: A3				
trench: 50, find-id: 50140, feature-id: 50012, level: 4, quadrat: A3				
trench: 52, find-id: 52029, feature-id: 52001, level: 1e, quadrat: F29				
trench: 60, find-id: 60132, feature-id: 60006, level: 5, quadrat: B2				
trench: 60, find-id: 60145, feature-id: 60009, level: 6, quadrat: D2				
trench: 77, find-id: 77012, feature-id: 77003, level: 3, quadrat: Q5		1,9	5,7	3,4
trench: 79, find-id: 79001, feature-id: 79003, level: 3, quadrat: 1		1,9	3,7	2,3
trench: 73, find-id: 73041, feature-id: 73005, level: 3, quadrat: 2		2,4	9	3,4
trench: 79, find-id: 79005, feature-id: 79002, level: 2, quadrat: 1		1,1	6,7	
trench: 79, find-id: 79005, feature-id: 79002, level: 2, quadrat: 1		2,5	10,1	
trench: 52, find-id: 52039, feature-id: 52001, level: 1e, quadrat: F29		0,5	1,9	0,1
trench: 52, find-id: 52048, feature-id: 52001, level: 1f, quadrat: H31		0,6	2,2	0,3
trench: 72, find-id: 72029, feature-id: 72005, level: 4, quadrat: 2		1,3	4,2	0,8
trench: 52, find-id: 52042, feature-id: 52001, level: 1f, quadrat: F30				
trench: 60, find-id: 60113, feature-id: 60002, level: 5, quadrat: B22		1,7	3	2,3
trench: 60, find-id: 60167, feature-id: 60009, level: 7, quadrat: D1		1,1	3,4	1,4
trench: 60, find-id: 60189, feature-id: 60009, level: 8, quadrat: D-E1-2		2,5	6	6,2
trench: 73, find-id: 73008, feature-id: 73005, level: 3, quadrat: 2		0,7	3,2	1,2
trench: 75, find-id: 75013, feature-id: 75002, level: 2, quadrat: 1-3		0,7	2,7	3,2
trench: 80, find-id: 80947, feature-id: 80033, level: 4, quadrat: H5		2,6	9,1	5,3
trench: 80, find-id: 80071, feature-id: 80007, level: 2, quadrat: F4		2,9	9,7	4,1
trench: 80, find-id: 80893, feature-id: 80034, level: 5a, quadrat: K7		3,3	10,2	7
trench: 80, find-id: 80323, feature-id: 80013, level: 4, quadrat: H9		2,7	8,7	8,5
trench: 80, find-id: 80487, feature-id: 80028, level: 5, quadrat: H9				

site	laboratory-id	14c age	material	context
Maidanetske	Poz-87519	5115±30	bone, sheep,	southern pit(s), shallow pit or depression in the south of the excavation area, waste disposal layer with numerous bones almost at the bottom, zoo-lab-sample 4917
Maidanetske	Poz-87521	5020±40	bone, pig,	southern pit(s), pit under shallow pit or depression in the south of the excavation area (although the affiliation acc. find-id seems clear the sample could originate from the same layer than the previous ones (other side of profile)
Maidanetske	Poz-87523	5030±35	bone, cattle,	house 54, within daub debris above floor (ploshchadka)
Maidanetske	Poz-87525	5090±40	bone, sheep/goat,	house 54, on floor (ploshchadka)
Maidanetske	Poz-87526	5040±40	bone, sheep/goat,	house 54, on floor (ploshchadka)
Maidanetske	Poz-87527	5035±35	bone, not determined,	house 54, below house
Maidanetske	Poz-87528	5055±35	bone, roe deer,	house 54, below house
Maidanetske	Poz-87529	4960±40	bone, pig,	house (test trench), layer above the daub
Maidanetske	Poz-87531	5000±40	bone, sheep/goat,	house (test trench), between the daub (debris of house)
Maidanetske	Poz-87532	4970±35	bone, medium mammal,	house (test trench), on floor (ploshchadka)
Maidanetske	Poz-87533	4975±35	bone, sheep/goat,	house (test trench), in burnt daub debris
Maidanetske	Poz-87534	5030±40	bone, large mammal,	house (test trench), in burnt daub debris
Maidanetske	Poz-87535	4970±40	bone, pig,	house (test trench), in burnt daub debris
Maidanetske	Poz-87539	5010±35	bone, cattle,	house (test trench), above daub
Maidanetske	Poz-87540	4985±35	bone, not determined,	house (test trench), within daub debris
Maidanetske	Poz-87541	4995±35	bone, not determined,	house (test trench), layer under collapsed wall
Maidanetske	Poz-87542	5010±35	seed/grain, hazel,	house (test trench)
Maidanetske	Poz-87543	4890±40	bone, not determined,	house (test trench), only piece from this trench
Maidanetske	Poz-87545	4910±40	bone, cattle, n=2, 60g	ditch area, directly on the burnt daub debris
Maidanetske	Poz-87546	4850±40	bone, cattle, 8 g	ditch area, in burnt daub debris of the house
Maidanetske	Poz-87547	3370±30	bone, cattle, 3 g	ditch area, gray layer under the house
Maidanetske	Poz-87549	5000±35	bone, sheep/goat, 15 g	ditch area, gray layer under the house
Maidanetske	Poz-87550	4980±40	bone, pig, n=3, 20 g	ditch area, layer 1 in profile – ditch with horizontal daub
Maidanetske	Poz-87551	4955±35	bone, pig, 34 g	ditch area, pit beneath ditch – (check height)
Maidanetske	Poz-87552	4960±40	bone, cattle, 21 g	ditch area, pit beneath ditch – (check height)
Maidanetske	Poz-87553	4910±35	bone, cattle, 3g	ditch area, ditch with horizontal daub
Maidanetske	Poz-87554	5035±35	bone, wild boar, 48 g	ditch area, ditch filling
Maidanetske	Poz-87555	5090±40	bone, cattle, 107 g	ditch area, in chaotic daub concentration
Maidanetske	Poz-87556	5010±35	bone, wild boar, 5 g	ditch area, ditch filling
Maidanetske	Poz-87557	4975±35	bone, large mammal, 9 g	ditch area, ditch filling
Maidanetske	Poz-87559	5030±35	bone, pig, 21 g	ditch area, clay extraction pit of house
Maidanetske	Poz-87560	5090±35	bone, pig, 40 g	ditch area, ditch filling with inverse pottery bottoms
Maidanetske	Poz-87561	5130±30	bone, cattle, 74 g	ditch area, ditch filling with inverse pottery bottoms

context 2	14c_laboratory_remarks	N (%)	C (%)	col (%)
trench: 80, find-id: 80649, feature-id: 80028, level: 5, quadrat: G9		0,8	4,6	3,8
trench: 80, find-id: 80909, feature-id: 80040, level: 5, quadrat: H8		0,9	4,8	2,4
trench: 92, find-id: 92440, feature-id: 92007, level: 5, quadrat: F6		0,9	5	1,6
trench: 92, find-id: 92861, feature-id: 92015, level: 6, quadrat: G4		2,8	9,2	5
trench: 92, find-id: 92561, feature-id: 92009, level: 6, quadrat: H8		1,5	7,8	3,5
trench: 92, find-id: 92710, feature-id: 92023, level: 7, quadrat: D14		3,4	10,9	7
trench: 92, find-id: 92711, feature-id: 92023, level: 7, quadrat: E11		3,9	10,7	2
trench: 93, find-id: 93063, feature-id: 93003, level: 3, quadrat: A1-5		1,9	8,5	4,2
trench: 93, find-id: 93082, feature-id: 93004, level: 4, quadrat: A1		1,1	5,7	1
trench: 93, find-id: 93139, feature-id: 93005, level: 5, quadrat: A6		2,5	8,9	3
trench: 94, find-id: 94019, feature-id: 94003, level: 3, quadrat:		1,3	5,4	1,6
trench: 95, find-id: 95020, feature-id: 95003, level: 3, quadrat: A4		3,3	10,1	7,6
trench: 95, find-id: 95069, feature-id: 95012, level: 5, quadrat: A2		1,4	7,8	6,3
trench: 96, find-id: 96139, feature-id: 96010, level: 3, quadrat: A5		0,8	6,2	0,7
trench: 96, find-id: 96143, feature-id: 96011, level: 3, quadrat: A9		1,1	5,6	5,5
trench: 96, find-id: 96087, feature-id: 96014, level: 3, quadrat: B2		2,7	9,1	7,8
trench: 101, find-id: 101031, feature-id: 101009, level: 5, quadrat: B1				
trench: 102, find-id: 102008, feature-id: , level: 3, quadrat: A2		2,6	9,7	4,7
trench: 110, find-id: 110080, feature-id: 110002, level: 3, quadrat: K22		1,4	7,3	1,9
trench: 110, find-id: 110176, feature-id: 110004, level: 4, quadrat: L18		0,7	4,8	2,3
trench: 110, find-id: 110332, feature-id: 110013, level: 5, quadrat: L20		2,3	8,4	3
trench: 110, find-id: 110339, feature-id: 110013, level: 5, quadrat: K21		1,8	7,5	5,3
trench: 110, find-id: 110417, feature-id: 110016, level: 5, quadrat: I13		1,2	6,1	1,8
trench: 110, find-id: 110306, feature-id: 110016, level: 5, quadrat: I12		2,2	8,7	3,4
trench: 110, find-id: 110358, feature-id: 110016, level: 7, quadrat: H12		1,2	6,3	2
trench: 110, find-id: 110436, feature-id: 110016, level: 5, quadrat: G12		2,4	9,8	3,3
trench: 110, find-id: 110484, feature-id: 110016, level: 1, quadrat: J12		2	8,1	1,9
trench: 110, find-id: 110439, feature-id: 110016, level: 5, quadrat: G12		1,8	7,6	2,7
trench: 110, find-id: 110518, feature-id: 110011, level: 3, quadrat: K11		1,6	6,8	1,9
trench: 110, find-id: 110250, feature-id: 110011, level: Planum 6, quadrat: L12		3,9	12,1	4,7
trench: 110, find-id: 110560, feature-id: 110020, level: Profil, quadrat: L10		2,5	9,9	2,3
trench: 110, find-id: 110385, feature-id: 110009, level: 7, quadrat: A13		3,4	9,9	1,7
trench: 110, find-id: 110452, feature-id: 110009, level: Profil, quadrat: A12		1,5	7,6	2,3

site	laboratory-id	14c age	material	context
Maidanetske	Poz-87598	4990±35	bone, cattle, 30 g	between wall debris of megastructure
Maidanetske	Poz-87599	5010±35	bone, cattle, 136 g	cultural layer under the mega structure
Maidanetske	Poz-87600	4970±30	bone, cattle, 85 g	cultural layer under the mega-structure
Maidanetske	Poz-87601	5020±35	bone, cattle, 54 g	pit 111-1, with daub under floor and cultural layer 111025 (since it was lying on the top of the daub, it could also belong to feature 111025!)
Maidanetske	Poz-87602	4955±30	bone, cattle, 36 g	pit 111-1, with daub under floor and cultural layer 111025 (since it was lying on the top of the daub, it could also belong to feature 111025!)
Maidanetske	Poz-87603	4990±35	bone, cattle, 73 g	pit 111-2, superimposed by the floor of the mega-structure
Maidanetske	Poz-87604	5000±35	bone, cattle, n=5, 73 g	pit 111-3, southwest of the mega-structure, lower level
Maidanetske	Poz-87605	5035±35	bone, cattle, 128 g	pit 111-3, southwest of the mega-structure, lower level (wrong feature-id corrected)
Maidanetske	Poz-87606	5045±35	bone, cattle, n=2, 139 g	ditch area, jar bone connected to the horn in ditch filling with inverse pottery bottoms (articulated)
Maidanetske	Poz-87608	5045±35	bone, cattle, 40 g	ditch area, layer above ditch filling
Maidanetske	Poz-87609	5055±35	bone, cattle, 16 g	layer above megastructure
Maidanetske	Poz-87610	5035±35	bone, pig, 14 g	between wall debris of mega-structure
Maidanetske	Poz-87721	4900±40	bone, cattle, 16 g	layer above megastructure
Moshuriv 1	Poz-109263	4970±35	bone, sheep/goat, 2g	pit, buried soil
Moshuriv 1	Poz-109264	4920±35	bone, cattle, 14g	upper pit filling
Moshuriv 1	Poz-95068	5100±40	bone, not determined,	pit, upper filling
Nebelivka	OxA-261913	5056±33	bone, not determined,	
Nebelivka	OxA-261934	5032±34	bone, not determined,	
Nebelivka	OxA-29345	5150±31	charcoal, oak	
Nebelivka	OxA-29346	5093±30	charcoal, oak,	
Nebelivka	OxA-29347	5041±30	charcoal, ash,	
Nebelivka	OxA-29348	5110±31	charcoal, ash,	
Nebelivka	OxA-29349	5196±31	charcoal, oak,	
Nebelivka	OxA-29439	5085±32	bone, cattle, metacarpa	Mega-structure Phase 3
Nebelivka	OxA-29440	5116±31	bone, cattle, tibia	Mega-structure Phase 3
Nebelivka	OxA-29441	5077±32	bone, cattle, pubis	Outside mega-structure
Nebelivka	OxA-29575	5076±35	bone, cattle, scapula	
Nebelivka	OxA-29576	4991±36	bone, large mammal, vertebra	
Nebelivka	OxA-29577	5033±36	bone, large mammal, vertebra	
Nebelivka	OxA-29578	5069±31	bone, not determined,	
Nebelivka	OxA-29579	5130±34	bone, cattle, humerus shaft	
Nebelivka	OxA-29580	5089±35	bone, medium mammal, thoracic rib	

context 2	14c_laboratory_remarks	N (%)	C (%)	col (%)
trench: 111, find-id: 1110750, feature-id: 111003, level: 3, quadrat: M14		2,9	11	5,9
trench: 111, find-id: 1111565, feature-id: 111025, level: 4a, quadrat: J13		4,5	14,5	3
trench: 111, find-id: 1110981, feature-id: 111025, level: 3, quadrat: L9		2,9	11	2
trench: 111, find-id: 1111294, feature-id: 111026, level: 4e, quadrat: K9		1,8	9,7	2,4
trench: 111, find-id: 1111077, feature-id: 1111026, level: 4, quadrat: J10		1,2	7,9	1,1
trench: 111, find-id: 1111368, feature-id: 111029, level: 4d, quadrat: J5		4,3	13,6	8,2
trench: 111, find-id: 1111542, feature-id: 111033, level: Profil, quadrat: E6		2,4	9,5	3,1
trench: 111, find-id: 1111519, feature-id: 111029, level: Profil, quadrat: E8		2,7	10,9	4,2
trench: 110, find-id: 110363, feature-id: 110009, level: 7, quadrat: A12		3	10,8	1,3
trench: 110, find-id: 110172, feature-id: 110014, level: 4, quadrat: H13		1,9	9	1,8
trench: 111, find-id: 1110085, feature-id: 111002, level: 2, quadrat: L5		2,5	10,4	5,6
trench: 111, find-id: 1110689, feature-id: 111003, level: 3, quadrat: F5		2,5	10,9	4,4
trench: 111, find-id: 1110275, feature-id: 111002, level: 2, quadrat: F9		0,9	7	1
trench: 1, find-id: 1028, feature-id: 1003, level: 3, quadrat: H5		3,6	11,4	8,5
2016, trench: 1, find-id: 1004, feature-id: 1001, level: 2, quadrat: H6	poor	0,4	6	1,8
2016, trench: 1, find-id: 1014, feature-id: 1001, level: 2, quadrat: H4		0,9	4,1	0,6
2014, Test pit 28/2	Lab ID eigentlich OxA-X2619-13		42,7	
2014, Test pit 31/1	Lab ID eigentlich OxA-X2619-34		43,5	
2013, Test pit 1/2			63,9	
2013, Test pit 13/4			60,5	
2013, Test pit 16/2,	replicate of OxA-29348		61,3	
2013, Test pit 16/2	replicate of OxA-29347		61,5	
2013, Test pit 20/1			61,9	
2012			43,1	
2012			44,4	
2012			43,7	
2013, Test pit 1/1			41,6	
2013, Test pit 1/2	replicate of OxA-29577		41,9	
2013, Test pit 1/2	replicate of OxA-29576		42,6	
2013, Test pit 1/4			44	
2013, Test pit 13/2			39,3	
2013, Test pit 13/3			45,3	

site	laboratory-id	14c age	material	context
Nebelivka	OxA-29581	5062±37	bone, sheep/goat, femur shaft	
Nebelivka	OxA-29582	5103±34	bone, sheep/goat, fragment metapodial	
Nebelivka	OxA-29583	5026±35	bone, medium mammal, rib	
Nebelivka	OxA-29584	5061±35	bone, large mammal, long bone shaft	
Nebelivka	OxA-29585	5076±35	bone, large mammal, long bone shaft	
Nebelivka	OxA-29586	5032±35	bone, not determined,	
Nebelivka	OxA-29587	5119±34	bone, not determined, fragment	
Nebelivka	OxA-29588	5074±34	bone, not determined,	
Nebelivka	OxA-29589	5089±33	bone, large mammal, rib fragment	
Nebelivka	OxA-29590	5050±35	bone, large mammal, rib fragment	
Nebelivka	OxA-29591	5065±34	bone, cattle, radius shaft	
Nebelivka	OxA-29592	5096±35	bone, pig, mandible with incisor	
Nebelivka	OxA-29593	5025±35	bone, cattle, proximal femur	
Nebelivka	OxA-29594	5025±34	bone, large mammal, distal femur	
Nebelivka	OxA-29595	5053±35	bone, large mammal, vertebra fragment	
Nebelivka	OxA-29596	5171±34	bone, cattle, middle phalange	
Nebelivka	OxA-29597	4977±34	bone, not determined,	
Nebelivka	OxA-29598	5046±34	bone, cattle, humerus	B Pit
Nebelivka	OxA-29599	5014±34	bone, sheep/goat, metatarsal fragment	B Pit
Nebelivka	OxA-29600	5044±35	bone, not determined,	House B17
Nebelivka	OxA-29601	5099±34	bone, pig, mandible fragment	House B18
Nebelivka	OxA-29663	5008±32	bone, large mammal, bone fragment	
Nebelivka	OxA-29664	5064±30	bone, cattle, third phalange	
Nebelivka	OxA-29665	5086±30	bone, large mammal, long bone shaft	
Nebelivka	OxA-29666	5114±31	bone, cattle, mandible fragments	
Nebelivka	OxA-29667	5075±32	bone, not determined,	
Nebelivka	OxA-31635	5035±23	bone, not determined,	
Nebelivka	OxA-31636	5078±23	bone, not determined, large ruminant long bone	
Nebelivka	OxA-31637	5067±23	bone, not determined,	
Nebelivka	OxA-31638	5044±23	bone, cattle, horncore shaft fragment	
Nebelivka	OxA-31639	5047±23	bone, not determined, rib	
Nebelivka	OxA-31640	5033±24	bone, cattle, radius	
Nebelivka	OxA-31641	4982±23	bone, large ruminant, long bone	

context 2	14c_laboratory_remarks	N (%)	C (%)	col (%)
2013, Test pit 15/1			45	
2013, Test pit 16/1			43,4	
2013, Test pit 18/1			43,6	
2013, Test pit 18/2	This determination had a lower than ideal collagen yield less than 5 mg collagen. Other parameters measured to determine reliability were acceptable however.		43,6	
2013, Test pit 18/3			44,3	
2013, Test pit 18/4			44,6	
2013, Test pit 19/2			45,4	
2013, Test pit 19/4			43,7	
2013, Test pit 20/3			43	
2013, Test pit 22/1			45,9	
2013, Test pit 22/2			43	
2013, Test pit 22/3			43,4	
2013, Test pit 22/4			44,6	
2013, Test pit 23/1			43,6	
2013, Test pit 23/2			44,2	
2013, Test pit 23/3			43,4	
2013, Test pit 23/4			42,7	
2013			43,2	
2013			43,3	
2013			44,1	
2013			43,7	
2013, Test pit 1/3			43,4	
2013, Test pit 13/4			42,9	
2013, Test pit 13/5			43,2	
2013, Test pit 22/2			43,9	
2013, House B17			44,5	
2014, Test pit 24/2			48,4	
2014, Test pit 24/2			46,2	
2014, Test pit 24/2			46,4	
2014, Test pit 24/3			45,9	
2014, Test pit 24/3			44,9	
2014, Test pit 24/4			43,2	
2014, Test pit 25/1			43,4	

site	laboratory-id	14c age	material	context
Nebelivka	OxA-31642	4980±32	bone, sheep/goat, radius	
Nebelivka	OxA-31663	4969±31	bone, sheep/goat, radius	
Nebelivka	OxA-31664	5047±21	bone, pig, temporal	
Nebelivka	OxA-31665	5029±22	bone, not determined,	
Nebelivka	OxA-31666	5010±22	bone, cattle, femur	
Nebelivka	OxA-31667	5016±24	bone, pig, mandible	
Nebelivka	OxA-31668	5028±22	bone, cattle, cari in fragments	
Nebelivka	OxA-31669	5028±21	bone, not determined,	
Nebelivka	OxA-31670	5025±32	bone, small ruminant, undetermined	
Nebelivka	OxA-31709	5053±25	bone, large ruminant, long bone	
Nebelivka	OxA-31710	5083±26	bone, pig, astragalus	
Nebelivka	OxA-31711	5110±25	bone, large ruminant, rib frag	
Nebelivka	OxA-31712	5109±25	bone, large ruminant, rib frag	
Nebelivka	OxA-31731	3521±29	bone, not determined	
Nebelivka	OxA-31732	5103±23	bone, small ruminant, long bone	
Nebelivka	OxA-31733	5060±23	bone, large ruminant, undetermined	
Nebelivka	OxA-31734	5106±22	bone, large ruminant, undetermined	
Nebelivka	OxA-31735	5070±33	bone, small ruminant, undetermined	
Nebelivka	OxA-31736	5091±23	bone, large ruminant, vertebra	
Nebelivka	OxA-31737	5070±24	bone, large ruminant	
Nebelivka	OxA-31738	5122±24	bone, cattle, femur	
Nebelivka	OxA-31739	5064±23	bone, large ruminant	
Nebelivka	OxA-31740	5083±22	bone, small ruminant, long bone	
Nebelivka	OxA-31741	5121±34	bone, small ruminant, long bone	
Nebelivka	OxA-31742	5063±24	bone, small ruminant, long bone	
Nebelivka	OxA-31743	5058±24	bone, small ruminant, long bone	
Nebelivka	OxA-31744	4986±24	bone, small ruminant,	
Nebelivka	OxA-31745	5021±23	bone, not determined,	Mega-structure Phase 2
Nebelivka	OxA-31754	5088±35	bone, small ruminant, undetermined	
Nebelivka	OxA-31770	5012±31	bone, small ruminant, undetermined	
Nebelivka	Poz-32552	5030±40	seed/grain, cereal	House A9
Nebelivka	Poz-72464	3410±35	bone, horse	Megastructure
Nebelivka	Poz-72467	4960±40	bone, cattle, astragalus GL84.5 DB 53.5	B Pit
Nebelivka	Poz-72469	5020±40	bone, cattle, femur zone 4	Pit next to Kiln

context 2	14c_laboratory_remarks	N (%)	C (%)	col (%)
2014, Test pit 25/3	replicate of OxA-31663		42,9	
2014, Test pit 25/3	replicate of OxA-31642		45,7	
2014, Test pit 25/4			44,4	
2014, Test pit 25/4			44	
2014, Test pit 26/2			43,6	
2014, Test pit 26/2			43,6	
2014, Test pit 26/3			43,8	
2014, Test pit 26/4			44	
2014, Test pit 26/4	replicate of OxA-31754		45,9	
2014, Test pit 26/4			43,8	
2014, Test pit 26/5			43,9	
2014, Test pit 26/6			41,2	
2014, Test pit 26/8			43,9	
2014, Test pit 27/4	low yield		44,3	
2014, Test pit 28/1			44,7	
2014, Test pit 29/1	replicate of OxA-31734		43,6	
2014, Test pit 29/1	replicate of OxA-31733		43,4	
2014, Test pit 29/1	replicate of OxA-31770		44,8	
2014, Test pit 29/1			44	
2014, Test pit 29/1			44	
2014, Test pit 29/3			44,8	
2014, Test pit 30/1			43,5	
2014, Test pit 30/1			43,7	
2014, Test pit 31/2			43,2	
2014, Test pit 32/1			44,4	
2014, Test pit 32/2			43,5	
2014, Test pit 35/1			45,6	
2014			42,6	
2014, Test pit 26/4	replicate of OxA-31670		44,2	
2014, Test pit 29/1	replicate of OxA-31735		43,3	
2009				
2012		1,5	8	2,1
2014		0,8	6,1	0,2
2014		1,3	5,5	0,7

site	laboratory-id	14c age	material	context
Nebelivka	Poz-72470	5180±40	bone, cattle, horncore shaft fragment	
Nebelivka	Poz-72471	4910±35	bone, sheep/goat, radius	
Nebelivka	Poz-72472	4925±35	bone, pig, mandible	
Nebelivka	Poz-72473	4970±40	bone, cattle, cari in fragments	
Nebelivka	Poz-72715	4610±40	bone, sheep/goat, jaw	
Pishchana	Poz-109265	4960±35	bone, cattle, Femur	house 3
Pishchana	Poz-109267	5140±40	bone, cattle, Femur	house 3
Pishchana	Poz-109268	5180±40	bone, cattle, Metacarpus	house 3
Pishchana	Poz-109269	5055±35	bone, cattle, Humerus	house 2
Pishchana	Poz-109271	5130±40	bone, cattle, Mandibula	house 2
Pishchana	Poz-109272	5060±40	bone, sheep/goat, Radius	house 2
Pishchana	Poz-109273	5180±40	bone, not determined, Phalanx1 anterior	house 2, pit 2
Sharin 3	Poz-109274	4745±35	bone, cattle, femur, 60 g	"house 3" = pit with Tripolye vessels, figurines and other obj.
Sharin 3	Poz-109275	4735±35	bone, wild boar, humerus, 26 g	"house 3" = pit with Tripolye ves., fig. and other obj
Sharin 3	Poz-109276	4770±35	bone, cattle, phalanx1 anterior, 33 g	cultural layer or pit N10 (all Tripolye)
Sharin 3	Poz-109293	2910±30	bone, pig, humerus, 6 g	house 4 or area close to it (late Tripolye)
Sharin 3	Poz-109294	2360±30	bone, cattle, femur, 15 g	cultural layer or house 4 (all Tripolye)
Sharin 3	Poz-109295	4950±35	bone, cattle, phalanx1 anterior, 45 g	accumulation (Tripolye cultural layer)
Sharin 3	Poz-109983	3060±30	bone, human, individual 1=M=F, 20-25 years, femur LE	find accumulation with pottery etc. beside the house
Sharin 3	Poz-109984	2980±30	bone, human, individual 2=F≥M, 15-25 years, femur LE	exc. 5, pit number 11 with Tripolye material
Talianki	Ki (KIEV)-15993	4910±70	bone, not determined	2008, house 41, И-10
Talianki	Ki (KIEV)-15994	4550±70	bone, not determined	2008, house 40, К-6
Talianki	Ki (KIEV)-16025	4970±50	bone, not determined	2008, house 41, Б-10
Talianki	Ki (KIEV)-16026	4990±80	bone, not determined	2008, house 40, И-8
Talianki	Ki (KIEV)-6865	4755±50	bone, not determined	1986, house 13/14,
Talianki	Ki (KIEV)-6866	4720±60	bone, not determined	1986, house 13/14,
Talianki	Ki (KIEV)-6867	4810±55	bone, not determined	1986, house 13/14,
Talianki	Ki (KIEV)-6868	4780±60	bone, not determined	1986, house 13/14,
Talianki	OxA-19840	5048±33	charcoal, not determined	2008, house 41, 3-4
Talianki	OxA-22348	5032±31	charcoal, not determined	2009, house 42,
Talianki	OxA-22515	4976±29	charcoal, not determined	2009, house 43, Д-7/Ж-5

context 2	14c_laboratory_remarks	N (%)	C (%)	col (%)
2014, Test pit 24/3		1	4,7	1,5
2014, Test pit 25/3		2,2	7,4	0,4
2014, Test pit 26/2		2	7,8	1,4
2014, Test pit 26/3		1,7	6,8	1,5
2014, Test pit 27/2		1,2	5,8	0,2
trench: , find-id: 2002, feature-id: , level: , quadrat: P6		2,6	8,7	7,4
trench: 2, find-id: 2003, feature-id: , level: , quadrat: Б8		2,3	7,8	3,7
trench: 2, find-id: 2004, feature-id: , level: , quadrat: Д9		3,2	7,8	2,2
trench: 2, find-id: 2006, feature-id: , level: , quadrat: Є5		1,3	6,2	3,4
trench: 2, find-id: 2007, feature-id: , level: , quadrat: Г5		2,4	9,8	8,8
trench: 2, find-id: 2008, feature-id: , level: , quadrat: Б2		2,7	8,7	7,6
trench: 2, find-id: 2009, feature-id: , level: , quadrat: И8		2,3	8,2	3
trench: 4, find-id: 4001, feature-id: , level: , quadrat: Ж3		1,5	6,1	3,3
trench: 4, find-id: 4002, feature-id: , level: , quadrat: Ж3		3,5	10,1	5
trench: 5, find-id: 5001, feature-id: , level: , quadrat: Д7		1,4	5,8	5,2
trench: 5, find-id: 5002, feature-id: , level: , quadrat: Д2		2,3	8	5,8
trench: 5, find-id: 5003, feature-id: , level: , quadrat: Д6		1,2	6	2,4
trench: 5, find-id: 5004, feature-id: , level: , quadrat: Д6		2,2	8	3,7
trench: 4, find-id: 4003, feature-id: , level: , quadrat: E7	no stable isotope measurement possible	1,2	4	1,5
trench: 4, find-id: 4004, feature-id: , level: , quadrat:		1,4	4,6	5,8
trench: , find-id: , feature-id: , level: , quadrat:				
trench: , find-id: , feature-id: , level: , quadrat:				
trench: , find-id: , feature-id: , level: , quadrat:				
trench: , find-id: , feature-id: , level: , quadrat:				
trench: , find-id: , feature-id: , level: , quadrat:				
trench: , find-id: , feature-id: , level: , quadrat:				
trench: , find-id: , feature-id: , level: , quadrat:				
trench: , find-id: , feature-id: , level: , quadrat:				
trench: , find-id: , feature-id: , level: , quadrat:				
trench: , find-id: , feature-id: , level: , quadrat:				
trench: , find-id: , feature-id: , level: , quadrat:				

site	laboratory-id	14c age	material	context
Talianki	Poz-109296	5020±40	bone, horse, femurus	2008, house 40, anteroom or outdoor area
Talianki	Poz-109304	4945±35	bone, cattle, mandibula	2008, house 40, probably close to the house
Talianki	Poz-109306	5005±35	bone, cattle, radius	2009, house 43, outdoor area
Talianki	Poz-109307	4920±40	bone, cattle, tibia	2009, house 43, installation x-area
Talianki	Poz-109308	4975±35	bone, cattle, radius	2009, house 42, outdoor area
Talianki	Poz-109310	5000±40	bone, cattle, mandibula	2009, house 42, outdoor area
Talianki	Poz-109311	4560±40	bone, cattle, thoracalwirbel	2009, house 42, outdoor area
Talianki	Poz-109312	5000±40	bone, cattle, femurus	1990, house 19, no further context information
Talianki	Poz-109313	4975±35	bone, cattle, Tibia	1990, house 19, no further context information
Talianki	Poz-109314	5070±40	bone, cattle, Femur	1990, house 19, no further context information
Talianki	Poz-109315	5020±35	bone, cattle, Tibia	2011, house 45, anteroom
Talianki	Poz-109316	5080±40	bone, cattle, Metatarsus4	2012, house 47, main room, podium area
Talianki	Poz-109317	5045±35	bone, cattle, Phalanx1 anterior	2011, house 46, anteroom
Talianki	Poz-109318	4990±40	bone, cattle, Centrotarsale	2011, house 46, main room
Talianki	Poz-109320	5060±40	bone, cattle, Metacarpus	2012, house 47, “working room” or outdoor area
Talianki	Poz-109321	5060±40	bone, cattle, Humerus	2012, house 47, anteroom
Talianki	Poz-82473	4780±35	bone, goat, adult, mandibula, tooth	1985, house 9,
Talianki	Poz-82474	4940±35	bone, sheep, juvenile, mandibula	2001, house 29, Q 30-8L
Talianki	Poz-82475	4880±35	bone, sheep, adult, mandibula, tooth	2000, house 27,
Talianki	Poz-82476	4950±35	bone, cattle, juvenile, mandibula	2009, house 42, BB-6
Talianki	Poz-82477	4880±35	bone, cattle, adult, PH1	2008, house 41,
Talianki	Poz-82478	4900±50	bone, cattle, adult, talus	2001, house 30,
Talianki	Poz-82479	4630±40	bone, cattle, adult, MC	2013/2014, house 49, E-6
Talianki	Poz-82480	4925±35	bone, cattle, bone 2, adult, femur	2005, house 35,
Talianki	Poz-82481	4875±35	bone, cattle, juvenile, femur	2001, house 28, D-1
Talianki	Poz-82483	4920±35	bone, large mammal, humerus	2006, house 37, K-B/29
Talianki	Poz-82484	4910±30	bone, cattle, juvenile, humerus	2013/2014, house 48, b5
Talianki	Poz-82485	4900±35	bone, large mammal, tibia?	2008, house 40, b*7
Talianki	Poz-87469	4970±30	bone, cattle, mandibula, 2 parts	2015, kiln F, B-6
Talianki	Poz-87482	5065±35	bone, goat, scapula, sin	2015, kiln F, Б-6, т. 0.7 -0.8 m
Talianki	Poz-87483	5060±35	bone, cattle, Bos sp.: femur, head, -o or cattle, metacarpal	2015, kiln F, г-6
Talianki	Poz-87484	5020±35	bone, cattle, Centroquartal bone, dex	2016, house 50, E4/B-6, below floor
Vesely Kut	Poz-97921	2215±30	bone, cattle, tooth (M3li), 19 g	surface find concentration A
Vesely Kut	Poz-97922	5260±35	bone, cattle, mandibula, 8 g	surface find concentration B

context 2	14c_laboratory_remarks	N (%)	C (%)	col (%)
trench: 17, find-id: 17001, feature-id: , level: , quadrat: L7		1,1	5,3	1,8
trench: 17, find-id: 17002, feature-id: , level: , quadrat: ?7		1,4	7	4,3
trench: , find-id: , feature-id: , level: , quadrat:		1,3	5,6	2
trench: , find-id: , feature-id: , level: , quadrat:		2	8,1	2,5
trench: , find-id: , feature-id: , level: , quadrat:		3,5	11,1	9
trench: , find-id: , feature-id: , level: , quadrat:		1,6	6,8	5,2
trench: , find-id: , feature-id: , level: , quadrat:		1	6,2	2,2
trench: , find-id: , feature-id: , level: , quadrat:		2,9	10	9,3
trench: , find-id: , feature-id: , level: , quadrat:		2,5	9,1	7,2
trench: , find-id: , feature-id: , level: , quadrat:		3,6	10	10,5
trench: , find-id: , feature-id: , level: , quadrat:		1,2	5,2	4,3
trench: , find-id: , feature-id: , level: , quadrat:		3,2	9,9	9,1
trench: , find-id: , feature-id: , level: , quadrat:		4,4	12,9	4
trench: , find-id: , feature-id: , level: , quadrat:		3	9,9	4,2
trench: , find-id: , feature-id: , level: , quadrat:		1,4	6,2	2,5
trench: , find-id: , feature-id: , level: , quadrat:		2,8	9,5	2,2
trench: , find-id: , feature-id: , level: , quadrat:		1,2	6,1	4,3
trench: , find-id: , feature-id: , level: , quadrat:		2,2	8,2	5,1
trench: , find-id: , feature-id: , level: , quadrat:		0,9	5	1,4
trench: , find-id: , feature-id: , level: , quadrat:		1,9	6,6	4
trench: , find-id: , feature-id: , level: , quadrat:		3,5	10,2	2
trench: , find-id: , feature-id: , level: , quadrat:		1,2	5,7	4
trench: , find-id: , feature-id: , level: , quadrat:	poor!!!	1,4	6,9	0,4
trench: , find-id: , feature-id: , level: , quadrat:		2,7	10	8
trench: , find-id: , feature-id: , level: , quadrat:		1,4	7,1	3,5
trench: , find-id: , feature-id: , level: , quadrat:		3,4	11,2	1,5
trench: , find-id: , feature-id: , level: , quadrat:		2,1	8,3	5,3
trench: , find-id: , feature-id: , level: , quadrat:		0,8	5,4	2,3
trench: , find-id: , feature-id: , level: , quadrat:		0,9	4,4	3,3
trench: , find-id: , feature-id: , level: , quadrat:		2,2	8,3	6,9
trench: , find-id: , feature-id: , level: , quadrat:	0,3mgC	0,6	3,3	1,1
trench: , find-id: , feature-id: , level: , quadrat:		1	4	2,2
trench: , find-id: 2005, feature-id: , level: , quadrat:		2,6	8	7,7
trench: , find-id: 2004, feature-id: , level: , quadrat:		1,3	5,6	4,1

site	laboratory-id	14c age	material	context
Vesely Kut	Poz-97923	5190±35	bone, cattle, mandibula, 9 g	surface find concentration C
Vesely Kut	Poz-97925	5310±35	bone, cattle, humerus, 71 g	surface find concentration D
Vesely Kut	Poz-97926	5250±40	bone, cattle, talus (astragalus), 60 g	surface find concentration D
Vesely Kut	Poz-98156	5235±35	charcoal, ash	pit
Vesely Kut	Poz-98157	5300±40	charcoal, ash	pit
Vesely Kut	Poz-98225	5295±35	bone, not determined, 1g	pit
Volodimyrovka	Poz-98137	5055±35	bone, cattle, Pat li 65g	pit filling
Volodimyrovka	Poz-98178	5040±40	bone, cattle, P1 29g	pit filling

context 2	14c_laboratory_remarks	N (%)	C (%)	col (%)
trench: , find-id: 2002, feature-id: , level: , quadrat:		1,3	6,5	2
trench: , find-id: 2003, feature-id: , level: , quadrat:		1,1	4,9	4,8
trench: , find-id: 2003, feature-id: , level: , quadrat:		2,4	8,3	8,5
trench: 1000, find-id: 1008, feature-id: 1003, level: 5, quadrat: A1				
trench: 1000, find-id: 1019, feature-id: 1004, level: 6, quadrat: B1				
trench: 1000, find-id: 1007, feature-id: 1002, level: 5, quadrat: B2		1,1	5,1	1,1
trench: 1000, find-id: 1005, feature-id: 1002, level: 2, quadrat: B1		6,2	8,3	6,9
trench: 1000, find-id: 1060, feature-id: 1004, level: 4, quadrat: C1		1,3	5,8	2,1

Appendix 3. Percentages of kitchen and table wares in key-sites of the Sinyukha River Basin

Site	dating	relative dating	phase	house N	kitchen ware %	table ware %	sample size	source
Grebenukiv Yar	4530-4450	A	1	4	17,9	81,1	1848	Shmagliy and Videiko 1982, 5
Grebenukiv Yar	4530-4450	A	1	in total	20,5	79,5	2300	Shmagliy and Videiko 1982, 5
Chyzivka	4050-3990	B1	2					own data
Vesely Kut	4070 -4000	B1-B2	2					own data
Vladimirovka	3920-3800	B2	3	pit	10,5	89,5		own data trench 1
Pischana	3980-3940	B2	3	2	6,8	93,2		Chernovol and Ryzhov 2005, 15-16
Pischana	3980-3940	B2	3	3	5,6	94,4		Chernovol and Ryzhov 2005, 15-16
Dobrovody	3800-3720	C1	4	4	10,8	89,2		Kruts *et al.* 2005, 59-60
Moshurov 1	3850-3700	C1	4	1	5,2	94,8		own data trench 1
Maidanetske	3800-3700	C1-M3	4	44	14,3	85,7		own data trench 51
Maidanetske	3800-3700	C1-M3	4	pit to house 44	5,99	94,01	217	own data trench 52
Maidanetske	3800-3700	C1-M3	4	pit	9,95	90,05	573	own data trench 50
Maidanetske	3700-3640	C1-M4	5	pit	11,98	88,02	192	own data trench 50
Maidanetske	3930-3800	C1-M2	3	pit	16,35	83,65	208	own data trench 60
Maidanetske	3800 -3700	C1-M3	4	pit	5,52	94,48	163	own data trench 60
Maidanetske	3980-3930	C1-M1	3	kiln + pit	2,81	97,19	677	own data trench 80
Maidanetske	3930-3800	C1-M2	3	kiln + pit	3,36	96,64	5563	own data trench 80
Maidanteske	3800-3700	C1-M3	4	kiln end	1,28	98,72	1330	own data trench 80
Maidanetske	3930-3800	C1-M2	3	54	3,31	96,69	2266	own data trench 92
Maidanetske	3800-3700	C1-M3	4	mega-structure 3	5,62	94,38	1601	own data trench 111
Maidanetske	3800-3700	C1-M3	4	1st occupation	18,73	81,27	1057	own data trench 111
Kosenovka	3690-3650	C1-end	5	6	6,3	93,7		Kruts *et al.* 2005, 79-80
Moshurov 3	3680 -3525	C2	5	2	4,6	95,4		Ryzhov and Weimer 1996
Talianki	3775-3650	C1-T1-2	4-5	16	2,2	97,8		Kruts and Ryzhov 1988, 5
Talianki	3775-3650	C1-T1-2	4-5	9 and 10	7	93		Kruts *et al.* 1985, 7
Talianki	3775-3650	C1-T1-2	4-5	11 and 12	5	95		Kruts *et al.* 1985, 18
Talianki	3775-3650	C1-T1-2	4-5	20, 20a, 21, 22, 23	12,5	87,5		Kruts and Ryzhov 1994, 13
Talianki	3775-3650	C1-T1-2	4-5	24	2,5	97,5		Kruts and Ryzhov 1995, 8
Talianki	3775-3650	C1-T1-2	4-5	25, 26	3	98		Kruts *et al.* 2000b, 7
Talianki	3775-3650	C1-T1-2	4-5	28-31	5,5	94,5		Kruts *et al.* 2001, 38, 41
Talianki	3775-3700	C1-T1-2	4-5	32	4,5	95,5		Kruts *et al.* 2005, 12
Talianki	3775-3650	C1-T1-2	4-5	33	4	96		Kruts *et al.* 2005, 12
Talianki	3775-3650	C1-T1-2	4-5	34	8,6	91,4		Kruts *et al.* 2006a, 14-15
Talianki	3775-3650	C1-T1-2	4-5	35	7,5	92,5		Kruts *et al.* 2006a, 14-15
Talianki	3700-3650	C1-T1-2	4-5	36	4,3	95,7		Kruts *et al.* 2006b, 12-14
Talianki	3700-3650	C1-T2	5	37	4,8	95,2		Kruts *et al.* 2006b, 12-14

Site	dating	relative dating	phase	house N	kitchen ware %	table ware %	sample size	source
Talianki	3775-3650	C1-T1-2	4-5	40	2,7	97,5		Kruts *et al.* 2008, 37
Talianki	3700-3650	C1-T2	5	41	4,8	95,8		Kruts *et al.* 2008, 37
Talianki	3775-3700	C1-T1	4	42	1,9	98,1		Kruts *et al.* 2009, 38
Talianki	3775-3700	C1-T1	4	43	5,8	94,8		Kruts *et al.* 2009, 42
Talianki	3775-3650	C1-T1	4	45	3,8	96,2		Kruts *et al.* 2011, 37-38
Talianki	3775-3650	C1-T1-2	4-5	46	3,8	96,2		Kruts *et al.* 2011, 43
Talianki	3775-3650	C1-T1	4	47	8,7	91,3		Kruts *et al.* 2013, 40
Talianki	3700-3650	C1-T2	5	48	7,3	92,7		own data
Talianki	3775-3650	C1-T1-2	4-5	49	3,8	96,2		own data
Talianki	3775-3650	C1-T1-2	4-5	2	17,3	82,7		Ryzhov 2008, 134
Talianki	3775-3650	C1-T1-2	4-5	21	0,2	99,8		Ryzhov 2008, 134
Talianki	3700-3650	C1-T2	5	27	0	100		Ryzhov 2008, 134

Appendix 4. Capacity and dimensions of vessels from key sites in the Sinyukha River Basin

Context			Vessel description							Source
Site	House	Excavation on areas	Type	Volume (l)	Rim diameter (cm)	Belly diameter (cm)	Bottom diameter (cm)	Height (cm)	Preservation state	Reference
Dobrovody	4		Kitchen pot	8,5	41,0	60,4	20,0	25,8	Intact	Kruts *et al.* 2005, Fig. 41.1
Dobrovody	4		Kitchen pot	4,6	20,4		9,8	18,9	Connection between top and bottom is missing	Kruts *et al.* 2005, Fig. 41.4
Dobrovody	4		Kitchen pot	19,6	30,6	38,8	15,0	32,0	Intact	Kruts *et al.* 2005, Fig. 41.5
Dobrovody	4		Kitchen pot	3,8	20,8	23,0	9,0		Intact	Kruts *et al.* 2005, Fig. 41.6
Dobrovody	4		Kitchen pot	5,2	21,2	25,1	10,5	19,6	Intact	Kruts *et al.* 2005, Fig. 41.7
Dobrovody	4		Bowl	10,1	39,6		13,4	18,5	Bottom is missing	Kruts *et al.* 2005, Fig. 42.1
Dobrovody	4		Bowl	1,3	20,9		8,2	8,0	Intact	Kruts *et al.* 2005, Fig. 42.3
Dobrovody	4		Bowl	0,1	10,6		3,0	3,6	Intact	Kruts *et al.* 2005, Fig. 42.4
Dobrovody	4		Bowl	3,8	30,0		9,7	12,5	Intact	Kruts *et al.* 2005, Fig. 42.5
Dobrovody	4		Bowl	0,0	5,8		1,9	3,5	Intact	Kruts *et al.* 2005, Fig. 42.6
Dobrovody	4		Bowl	0,8	14,0		4,6	8,4	Intact	Kruts *et al.* 2005, Fig. 42.7
Dobrovody	4		Bowl	0,6	12,4			7,6	Bottom is missing	Kruts *et al.* 2005, Fig. 42.8
Dobrovody	4		Bowl	0,1	11,6		5,3		Intact	Kruts *et al.* 2005, Fig. 42.9
Dobrovody	4		Cup	0,1	5,3	8,8	2,3	7,6	Intact	Kruts *et al.* 2005, Fig. 43.1
Dobrovody	4		Goblet	0,3	7,6	11,3	3,0	9,2	Intact	Kruts *et al.* 2005, Fig. 43.1
Dobrovody	4		Cup	0,2	6,0	9,6	3,2	8,1	Intact	Kruts *et al.* 2005, Fig. 43.2
Dobrovody	4		Goblet	0,2	5,4	9,7	2,5	7,0	Intact	Kruts *et al.* 2005, Fig. 43.3
Dobrovody	4		Cup	0,1	4,6	7,6	2,6	4,9	Intact	Kruts *et al.* 2005, Fig. 43.4
Dobrovody	4		Cup	0,0	3,9	5,8	2,0	4,6	Intact	Kruts *et al.* 2005, Fig. 43.5
Dobrovody	4		Cup	0,1	4,2	8,8	2,9	6,0	Intact	Kruts *et al.* 2005, Fig. 43.6
Dobrovody	4		Goblet	0,4	7,0	12,3	3,3	9,8	Intact	Kruts *et al.* 2005, Fig. 43.7
Dobrovody	4		Goblet	1,0	11,0	15,3	4,6	13,7	Intact	Kruts *et al.* 2005, Fig. 43.9
Dobrovody	4		Bi-/sphero-conical	2,8	11,8	23,1	6,7	18,9	Segment of lower part is missing	Kruts *et al.* 2005, Fig. 44.1
Dobrovody	4		Bi-/sphero-conical	1,0	7,6	14,9	5,7	16,0	Segment of lower part is missing	Kruts *et al.* 2005, Fig. 44.2
Dobrovody	4		Bi-/sphero-conical	1,7	7,0	17,9	6,0	17,6	Top is missing	Kruts *et al.* 2005, Fig. 44.4
Dobrovody	4		Bi-/sphero-conical	5,1	11,6	28,4	9,3		Intact	Kruts *et al.* 2005, Fig. 44.6
Dobrovody	4		Bi-/sphero-conical	5,1	11,4	25,8	9,7	27,2	Intact	Kruts *et al.* 2005, Fig. 45.1
Dobrovody	4		Bi-/sphero-conical	5,3	13,3	26,4	8,7	23,8	Segment of lower part is missing	Kruts *et al.* 2005, Fig. 45.2
Dobrovody	4		Bi-/sphero-conical	19,3	11,5	17,4	7,1	20,3	Intact	Kruts *et al.* 2005, Fig. 45.4
Dobrovody	4		Bi-/sphero-conical	6,4	20,0	25,8	9,0	23,9	Segment of lower part is missing	Kruts *et al.* 2005, Fig. 45.5
Dobrovody	4		Bi-/sphero-conical	6,7	14,0	27,2	10,2	27,7	Intact	Kruts *et al.* 2005, Fig. 45.6
Dobrovody	4		Lid	0,3	14,0		6,2	4,7	Intact	Kruts *et al.* 2005, Fig. 46.2

Context			Vessel description							Source
Site	House	Excavation on areas	Type	Volume (l)	Rim diameter (cm)	Belly diameter (cm)	Bottom diameter (cm)	Height (cm)	Preservation state	Reference
Dobrovody	4		Lid	0,1	10,1		4,6	5,5	Connection between top and bottom is missing	Kruts *et al.* 2005, Fig. 46.3
Dobrovody	4		Lid	1,2	22,6		6,0	9,1	Intact	Kruts *et al.* 2005, Fig. 46.5
Dobrovody	4		Pear-shaped	14,4	5,2	18,3	6,5	17,3	Intact	Kruts *et al.* 2005, Fig. 46.6
Dobrovody	4		Crater shaped	13,5	31,2	32,6	13,2	27,5	Intact	Kruts *et al.* 2005, Fig. 46.7
Dobrovody	4		Crater shaped	7,8	24,8	27,8	10,7	22,7	Intact	Kruts *et al.* 2005, Fig. 47.2
Kosenivka	6		Bowl	2,5	23,3		8,8	11,9	Intact	Kruts *et al.* 2005, Fig. 58.1
Kosenivka	6		Bowl	11,9	46,8		17,0	19,1	Intact	Kruts *et al.* 2005, Fig. 58.8
Kosenivka	6		Bowl	0,7	18,2		5,9	6,0	Intact	Kruts *et al.* 2005, Fig. 59.1
Kosenivka	6		Goblet	0,2	6,3	8,9	4,0	9,5	Intact	Kruts *et al.* 2005, Fig. 59.1
Kosenivka	6		Goblet	1,4	9,8	16,7	4,3	18,5	Top is missing	Kruts *et al.* 2005, Fig. 59.11
Kosenivka	6		Bowl	1,1	17,2		5,7	8,4	Bottom is missing	Kruts *et al.* 2005, Fig. 59.2
Kosenivka	6		Bowl	10,7	39,0		23,0	17,6	Intact	Kruts *et al.* 2005, Fig. 59.5
Kosenivka	6		Goblet	0,1	3,8	7,2	3,5	8,1	Intact	Kruts *et al.* 2005, Fig. 59.7
Kosenivka	6		Goblet	0,2	5,9	8,1	3,0	10,2	Intact	Kruts *et al.* 2005, Fig. 59.8
Kosenivka	6		Pot	0,3	6,5	8,6	3,9	9,4	Intact	Kruts *et al.* 2005, Fig. 60.1
Kosenivka	6		Bi-/sphero-conical	10,4		16,6	5,5	16,0	Segment of upper part and top is missing	Kruts *et al.* 2005, Fig. 60.2
Kosenivka	6		Pot	0,3	5,7	9,8	9,8	8,8	Intact	Kruts *et al.* 2005, Fig. 60.5
Kosenivka	6		Crater shaped	1,9	10,8	16,9	5,4	16,7	Intact	Kruts *et al.* 2005, Fig. 61.1
Kosenivka	6		Crater shaped	2,7		21,1	7,1	16,9	Top is missing	Kruts *et al.* 2005, Fig. 61.2
Kosenivka	6		Pot	2,4	15,2	19,0	8,1	16,0	Intact	Kruts *et al.* 2005, Fig. 61.5
Kosenivka	6		Pot	1,3	10,9	16,2	7,8	13,4	Intact	Kruts *et al.* 2005, Fig. 61.6
Kosenivka	6		Pot	0,4		10,5	5,4	8,7	Top is missing	Kruts *et al.* 2005, Fig. 61.7
Kosenivka			Goblet	0,9	34,8		10,8	13,0	Intact	Ryzhov 2012a
Kosenivka			Goblet	2,0	11,6	17,6	7,0	22,5	Intact	Ryzhov 1999, Fig. 34.13
Kosenivka			Goblet	0,9	8,2	13,0	5,0	14,0	Intact	Ryzhov 1999, Fig. 34.14
Kosenivka			Goblet	0,5	6,3	10,0	5,0	13,1	Intact	Ryzhov 1999, Fig. 34.15
Kosenivka			Pot	2,5	8,8	19,0	7,0	20,9	Intact	Ryzhov 1999, Fig. 34.16
Kosenivka			Goblet	0,8	7,3	12,2	4,5	13,2	Intact	Ryzhov 1999, Fig. 34.17
Kosenivka			Bowl	0,3	15,3		4,4	6,2	Intact	Ryzhov 1999, Fig. 34.7
Kosenivka			Bowl	1,0	15,4	15,8	6,2	8,2	Intact	Ryzhov 1999, Fig. 34.8
Maidanetske	12		Kitchen pot	9,9	18,8	23,9		19,4	Bottom is missing	Brandtstätter 2017, Fig. 19.1
Maidanetske	12		Kitchen pot	6,1	20,2	28,5	12,3	19,6	Intact	Brandtstätter 2017, Fig. 20.1
Maidanetske	12		Kitchen pot	9,8	19,6	29,0	18,2	22,2	Intact	Brandtstätter 2017, Fig. 21.1
Maidanetske	12		Kitchen pot	2,3	14,6	18,6	7,6	15,8	Intact	Brandtstätter 2017, Fig. 22.1
Maidanetske	12		Goblet	0,7	8,6	14,7	3,5	11,3	Intact	Brandtstätter 2017, Fig. 26.1
Maidanetske	12		Cup	0,2	5,3	9,4	2,1	7,4	Intact	Brandtstätter 2017, Fig. 27.1
Maidanetske	12		Cup	0,0	3,3		7,0	3,6	Intact	Brandtstätter 2017, Fig. 28.1

Context			Vessel description							Source
Site	House	Excavation on areas	Type	Volume (l)	Rim diameter (cm)	Belly diameter (cm)	Bottom diameter (cm)	Height (cm)	Preservation state	Reference
Maidanetske	12		Bi-/sphero-conical	1,0	8,0	16,2	4,9	15,0	Intact	Brandtstätter 2017, Fig. 29.1
Maidanetske	12		Bi-/sphero-conical	8,6	15,6	33,0	9,6	31,2	Intact	Brandtstätter 2017, Fig. 30.1
Maidanetske	12				11,6	32,6			Lower Part and bottom are missing	Brandtstätter 2017, Fig. 31.1
Maidanetske	12		Kitchen pot	2,9	17,6	20,3	8,4	15,5	Intact	Brandtstätter 2017, Fig. 22.2
Maidanetske	12		Kitchen pot	1,0	12,4	14,6	6,4	10,8	Intact	Brandtstätter 2017, Fig. 23.2
Maidanetske	12		Kitchen pot	0,7	10,1	12,8	6,7	11,4	Intact	Brandtstätter 2017, Fig. 24.2
Maidanetske	12		Goblet	0,7	8,4	13,9	2,8	13,9	Intact	Brandtstätter 2017, Fig. 26.2
Maidanetske	12		Cup	0,1	5,1	9,2	2,8	6,4	Intact	Brandtstätter 2017, Fig. 27.2
Maidanetske	12		Cup	0,0	4,2	9,0	1,5	4,9	Intact	Brandtstätter 2017, Fig. 28.2
Maidanetske	12		Kitchen pot	1,9	12,8	18,1	6,7	14,7	Intact	Brandtstätter 2017, Fig. 24.3
Maidanetske	12				14,0	17,1			Bottom is missing	Brandtstätter 2017, Fig. 25.3
Maidanetske	12		Cup	0,1	4,5	8,3	2,8	5,6	Intact	Brandtstätter 2017, Fig. 27.3
Maidanetske	12		Cup	0,1	5,6	8,4	2,3	6,1	Intact	Brandtstätter 2017, Fig. 28.3
Maidanetske	12		Bi-/sphero-conical	11,9	12,8	32,0	12,2	36,2	Intact	Brandtstätter 2017, Fig. 31.3
Maidanetske	12		Kitchen pot	2,0	14,4	19,3	8,1	13,2	Intact	Brandtstätter 2017, Fig. 25.4
Maidanetske	12		Cup	0,2	5,4	10,2	2,1	7,0	Intact	Brandtstätter 2017, Fig. 28.4
Maidanetske	12		Cup	0,1	4,2	8,3	2,5	5,3	Intact	Brandtstätter 2017, Fig. 27.5
Maidanetske	12		Cup	0,1	5,1	7,9	2,9	6,8	Intact	Brandtstätter 2017, Fig. 28.5
Maidanetske	12		Cup	0,0	2,8	5,5	1,0	4,0	Intact	Brandtstätter 2017, Fig. 27.6
Maidanetske	12		Cup	0,1	5,4	8,5	2,3	6,7	Intact	Brandtstätter 2017, Fig. 28.6
Maidanetske	12		Cup	0,1	3,3	7,6	0,9	5,2	Intact	Brandtstätter 2017, Fig. 27.7
Maidanetske	12		Cup	0,7	4,4	8,4	2,3	5,7	Intact	Brandtstätter 2017, Fig. 28.9
Maidanetske	12		Bi-/sphero-conical	7,4	12,6	28,6	10,0	31,4	Intact	Brandtstätter 2017, Fig. 31.2
Maidanetske	12				19,6	36,6			Lower Part and bottom are missing	Brandtstätter 2017, Fig. 32.1
Maidanetske	12		Bi-/sphero-conical	74,2	31,6	49,2	22,8	61,2	Intact	Brandtstätter 2017, Fig. 32.2
Maidanetske	12		Bi-/sphero-conical	6,2	13,8	26,2	9,4	28,2	Intact	Brandtstätter 2017, Fig. 33.1
Maidanetske	12		Bi-/sphero-conical	13,6	16,6	34,0			Bottom is missing	Brandtstätter 2017, Fig. 33.2
Maidanetske	12				14,2	36,0			Lower Part and bottom are missing	Brandtstätter 2017, Fig. 34.1
Maidanetske	12		Bi-/sphero-conical	9,8	12,8	36,2	10,8	36,4	Connection between top and bottom is missing	Brandtstätter 2017, Fig. 34.2
Maidanetske	12		Bi-/sphero-conical	18,4	13,6	36,8	14,0	42,4	Intact	Brandtstätter 2017, Fig. 35.3
Maidanetske	12				8,6	15,7			Lower Part and bottom are missing	Brandtstätter 2017, Fig. 36.1
Maidanetske	12		Bi-/sphero-conical	1,0	7,9	14,9	4,5	15,2	Intact	Brandtstätter 2017, Fig. 36.2
Maidanetske	12		Bi-/sphero-conical	40,6	19,6	53,6	11,2	52,8	Intact	Brandtstätter 2017, Fig. 37.1
Maidanetske	12				10,5	20,2			Lower Part and bottom are missing	Brandtstätter 2017, Fig. 37.2
Maidanetske	12				14,2	24,3			Lower Part and bottom are missing	Brandtstätter 2017, Fig. 38.1

Context			Vessel description							Source
Site	House	Excavation on areas	Type	Volume (l)	Rim diameter (cm)	Belly diameter (cm)	Bottom diameter (cm)	Height (cm)	Preservation state	Reference
Maidanetske	12		Bi-/sphero-conical	4,0	11,2	17,0	8,4	21,8	Intact	Brandtstätter 2017, Fig. 38.2
Maidanetske	12		Bi-/sphero-conical	2,9	6,0	22,0	7,8	22,6	Intact	Brandtstätter 2017, Fig. 39.1
Maidanetske	12		Bi-/sphero-conical	28,1	13,2	45,6	11,2	43,6	Intact	Brandtstätter 2017, Fig. 40.1
Maidanetske	12		Bi-/sphero-conical	9,7	11,4	22,1	12,6	26,6	Connection between top and bottom is missing	Brandtstätter 2017, Fig. 41.1
Maidanetske	12		Bi-/sphero-conical	8,9		32,4		34,2	Edge, lower part and bottom are missing	Brandtstätter 2017, Fig. 42.1
Maidanetske	12		Bi-/sphero-conical	9,7		34,2	11,0	33,8	Edge and right side of lower part are missing	Brandtstätter 2017, Fig. 43.1
Maidanetske	12		Bowl	13,8					Intact	Brandtstätter 2017, Fig. 44.1
Maidanetske	12		Bowl	14,7	39,0		15,0	19,6	Intact	Brandtstätter 2017, Fig. 44.2
Maidanetske	12		Bowl	12,4	37,7		14,0	18,0	Intact	Brandtstätter 2017, Fig. 45.1
Maidanetske	12		Bowl	20,4	54,6		15,4	23,4	Intact	Brandtstätter 2017, Fig. 46.1
Maidanetske	12		Bowl	1,3					Bottom is missing	Brandtstätter 2017, Fig. 47.1
Maidanetske	12		Bowl	7,2	39,6		10,0	17,6	Intact	Brandtstätter 2017, Fig. 48.1
Maidanetske	12		Bowl	0,6	19,0		5,1	8,1	Intact	Brandtstätter 2017, Fig. 48.2
Maidanetske	12		Bowl	12,4	49,6		14,4	18,8	Intact	Brandtstätter 2017, Fig. 48.3
Maidanetske	12		Bowl	15,6	50,2		13,2	21,2	Intact	Brandtstätter 2017, Fig. 48.4
Maidanetske	12		Pear-shaped	4,0	9,0	24,2	8,0	21,2	Intact	Brandtstätter 2017, Fig. 49.1
Maidanetske	12		Amphora	1,1	11,2	16,2	4,8	14,1	Intact	Brandtstätter 2017, Fig. 50.1
Maidanetske	12				13,8				Lower Part and bottom are missing	Brandtstätter 2017, Fig. 50.2
Maidanetske	12		Lid	0,3	10,8		23,3	9,5	Intact	Brandtstätter 2017, Fig. 51.1
Maidanetske	12		Crater shaped	1,1	11,8	16,2	4,7	12,5	Intact	Brandtstätter 2017, Fig. 52.1
Maidanetske	12		Crater shaped	4,6	20,2	24,0	10,0	20,0	Intact	Brandtstätter 2017, Fig. 52.2
Maidanetske	12		Crater shaped	12,9	54,4	59,0	25,8	42,8	Intact	Brandtstätter 2017, Fig. 53.1
Maidanetske	12				69,2	77,6			Lower Part and bottom are missing	Brandtstätter 2017, Fig. 53.2
Maidanetske	12		Crater shaped	0,4	9,1	10,7	3,3	10,2	Intact	Brandtstätter 2017, Fig. 54.1
Maidanetske	12		Crater shaped	36,5	40,6	48,6	22,6	39,2	Intact	Brandtstätter 2017, Fig. 55.1
Maidanetske	12		Crater shaped	0,6	9,8	12,5	4,8	9,4	Intact	Brandtstätter 2017, Fig. 56.1
Maidanetske	12		Crater shaped	3,1	16,9	23,7	7,6	18,4	Intact	Brandtstätter 2017, Fig. 57.1
Maidanetske	12		Crater shaped	0,5	9,8	12,2	4,6	9,6	Intact	Brandtstätter 2017, Fig. 59.1
Maidanetske	12		Crater shaped	0,8	11,0	15,1	5,1	8,5	Intact	Brandtstätter 2017, Fig. 59.2
Maidanetske	12		Crater shaped	5,2	18,5	27,4	8,4	16,1	Intact	Brandtstätter 2017, Fig. 60.1
Maidanetske	12		Crater shaped	2,2	11,7	21,8	7,1	17,2	Intact	Brandtstätter 2017, Fig. 61.1
Maidanetske	12		Crater shaped	11,4	28,6	34,0	10,4	26,0	Intact	Brandtstätter 2017, Fig. 62.1
Pishana	1		Kitchen pot	0,4	8,9	10,1	5,0	9,5	Intact	Ryzhov 1999, Fig. 45.8
Pishana	1		Bowl	1,0	20,9		7,0	8,2	Intact	Ryzhov 1999, Fig. 54.1
Pishana	1		Kitchen pot	12,8	19,6	32,0	11,6	24,4	Intact	Ryzhov 1999, Fig. 54.10
Pishana	1		Kitchen pot	7,8	26,8	30,0	15,2	20,2	Intact	Ryzhov 1999, Fig. 54.13

Context			Vessel description							Source
Site	House	Excavation on areas	Type	Volume (l)	Rim diameter (cm)	Belly diameter (cm)	Bottom diameter (cm)	Height (cm)	Preservation state	Reference
Pishana	1		Kitchen pot	29,8	77,2	48,0	21,8	28,6	Intact	Ryzhov 1999, Fig. 54.14
Pishana	1		Bowl	0,5	14,7		6,8	6,7	Intact	Ryzhov 1999, Fig. 54.2
Pishana	1		Kitchen pot	3,3	19,9	20,0	9,4	17,8	Intact	Ryzhov 1999, Fig. 54.3
Pishana	1		Kitchen pot	9,2	28,0	30,0	13,2	23,6	Segment of lower part is missing	Ryzhov 1999, Fig. 54.4
Pishana	1		Kitchen pot	11,3	31,0	33,0	11,8	24,0	Intact	Ryzhov 1999, Fig. 54.6
Pishana	1		Kitchen pot	10,0	27,2	30,0	11,4	25,2	Segment of lower part is missing	Ryzhov 1999, Fig. 54.9
Pishana	1		Bowl	3,2	29,0		9,6	12,0	Intact	Ryzhov 1999, Fig. 55.1
Pishana	1		Bowl	0,8	16,0		7,4	7,4	Intact	Ryzhov 1999, Fig. 55.11
Pishana	1		Bowl	1,0	19,7		9,4		Intact	Ryzhov 1999, Fig. 55.14
Pishana	1		Bowl	1,3	26,8		13,3	7,2	Intact	Ryzhov 1999, Fig. 55.15
Pishana	1		Bowl	0,2	9,8		5,8	4,5	Intact	Ryzhov 1999, Fig. 55.17
Pishana	1		Bowl	0,8	19,8		5,9	6,9	Intact	Ryzhov 1999, Fig. 55.2
Pishana	1		Goblet	0,8	9,1	13,2	4,5	11,7	Intact	Ryzhov 1999, Fig. 55.20
Pishana	1		Goblet	0,5	9,4	11,8	4,6	10,1	Intact	Ryzhov 1999, Fig. 55.21
Pishana	1		Goblet	0,3	7,8	10,7	4,3	8,9	Intact	Ryzhov 1999, Fig. 55.22
Pishana	1		Goblet	0,9	9,8	14,0	5,8	12,4	Intact	Ryzhov 1999, Fig. 55.25
Pishana	1		Goblet	0,7	9,4	13,9	6,0	13,1	Intact	Ryzhov 1999, Fig. 55.26
Pishana	1		Goblet	1,6	11,5	18,5	6,1	14,2	Intact	Ryzhov 1999, Fig. 55.28
Pishana	1		Bowl	3,2	29,4		10,0	5,2	Intact	Ryzhov 1999, Fig. 55.3
Pishana	1		Bowl	0,7	20,9		7,4	6,0	Intact	Ryzhov 1999, Fig. 55.4
Pishana	1		Bowl	0,2	13,3		3,6	4,2	Intact	Ryzhov 1999, Fig. 55.5
Pishana	1		Bowl	0,4	15,3		4,0	4,1	Intact	Ryzhov 1999, Fig. 55.6
Pishana	1		Bowl	0,5	15,2		4,0	6,5	Intact	Ryzhov 1999, Fig. 55.7
Pishana	1		Bi-/sphero-conical	5,6	12,4	25,4	8,6	29,8	Intact	Ryzhov 1999, Fig. 56.11
Pishana	1		Bi-/sphero-conical	1,4	9,5	18,1	6,0	17,1	Intact	Ryzhov 1999, Fig. 56.13
Pishana	1		Bi-/sphero-conical	36,8	23,0	26,0	16,8	45,0	Intact	Ryzhov 1999, Fig. 56.14
Pishana	1		Bi-/sphero-conical	71,6	25,8	30,9	19,8	67,2	Intact	Ryzhov 1999, Fig. 56.16
Pishana	1		Bi-/sphero-conical	0,3	6,1	10,2	4,1	10,2	Intact	Ryzhov 1999, Fig. 56.17
Pishana	1		Bi-/sphero-conical	0,5	6,4	13,0	5,3	11,0	Intact	Ryzhov 1999, Fig. 56.18
Pishana	1		Bi-/sphero-conical	5,1	14,0	23,6	9,8	27,7	Intact	Ryzhov 1999, Fig. 56.19
Pishana	1		Bi-/sphero-conical	0,6	8,6	10,9	4,6	13,4	Intact	Ryzhov 1999, Fig. 56.5
Pishana	1		Pear-shaped	26,7	11,4	44,0	16,4	46,8	intact	Ryzhov 1999, Fig. 57.11
Pishana	1		Pear-shaped	13,4	11,0	37,2	13,6	34,4	intact	Ryzhov 1999, Fig. 57.12
Pishana	1		Lid	0,5	14,8		2,8	5,5	Intact	Ryzhov 1999, Fig. 57.14
Pishana	1		Lid	0,3	13,1		4,7	5,2	Intact	Ryzhov 1999, Fig. 57.17
Pishana	1		Amphora	36,0	34,4	44,8	15,0	45,4	Intact	Ryzhov 1999, Fig. 57.5
Pishana	1		Amphora	1,3	7,5	16,8	6,9	14,7	Intact	Ryzhov 1999, Fig. 57.7
Pishana	1		Amphora	1,6	10,0	16,2	6,2	15,8	Intact	Ryzhov 1999, Fig. 57.8

Context			Vessel description							Source
Site	House	Excavation on areas	Type	Volume (l)	Rim diameter (cm)	Belly diameter (cm)	Bottom diameter (cm)	Height (cm)	Preservation state	Reference
Pishana	1		Crater	3,8	22,8		8,2	26,4	Intact	Ryzhov 1999, Fig. 58.3
Pishana	1		Crater	8,8	31,6		10,8	34,0	Intact	Ryzhov 1999, Fig. 58.4
Pishana	1		Crater	7,2	29,0		10,0	28,2	Intact	Ryzhov 1999, Fig. 58.5
Pishana	1		Pot crater	2,2	16,3	16,8	7,8	15,7	Connection between top and bottom is missing	Ryzhov 1999, Fig. 58.9
Sharin			Bowl	0,2	9,8		3,7	4,8	Intact	Kushtan 2015, Fig. 3.1
Sharin			Kitchen pot	0,4	7,8	10,5	4,9	8,4	Intact	Kushtan 2015, Fig. 1.3
Sharin			Bowl	0,1	9,3				Bottom is missing	Kushtan 2015, Fig. 3.3
Sharin			Bowl	0,1	8,8				Bottom is missing	Kushtan 2015, Fig. 3.4
Sharin			Kitchen pot	1,5	12,3	15,7			Bottom is missing	Kushtan 2015, Fig. 1.5
Sharin			Bowl	0,1	7,8				Bottom is missing	Kushtan 2015, Fig. 3.5
Sharin			Crater shaped	0,1	2,9	6,3	2,1	7,3	Intact	Kushtan 2015, Fig. 4.5
Sharin			Bowl	0,0	6,8		3,1	2,9	Intact	Kushtan 2015, Fig. 3.6
Sharin			Kitchen pot	0,3	7,5	9,1	5,0	7,9	Intact	Kushtan 2015, Fig. 1.7
Sharin			Bowl	0,2	11,3				Bottom is missing	Kushtan 2015, Fig. 3.7
Sharin			Kitchen pot	1,1	11,8		5,7	12,0	Connection between top and bottom is missing	Kushtan 2015, Fig. 1.8
Sharin			Pot	0,3		8,9	3,7		Top is missing	Kushtan 2015, Fig. 2.8
Sharin			Bowl	0,4	12,0		5,0	7,0	Intact	Kushtan 2015, Fig. 3.8
Sharin			Bowl	0,3	11,0		5,0	5,6	Intact	Kushtan 2015, Fig. 3.9
Sharin			Bowl	0,6	12,0		5,4	8,1	Connection between top and bottom is missing	Kushtan 2015, Fig. 3.10
Talianki	24	XIII	Cup	0,2	4,6	8,6	2,6	7,6	Intact	Kruts and Ryzhov 1994, Fig. 13.8
Talianki	28	XV	Bowl	0,5	16,2		4,9	6,3	Intact	Kruts *et al.* 2001, Fig. 28.1
Talianki	28	XV	Bowl	0,7	16,6			7,5	Bottom is missing	Kruts *et al.* 2001, Fig. 28.2
Talianki	28	XV	Bowl	3,3	8,0			3,4	Bottom is missing	Kruts *et al.* 2001, Fig. 28.5
Talianki	28	XV	Bowl	0,1	12,0		5,9	5,1	Intact	Kruts *et al.* 2001, Fig. 28.8
Talianki	28	XV	Kitchen pot	3,0	18,8	22,2	8,8	16,4	Intact	Kruts *et al.* 2001, Fig. 27.9
Talianki	28	XV	Bowl	7,2	38,8		11,2	16,4	Intact	Kruts *et al.* 2001, Fig. 28.9
Talianki	28	XV	Bowl	0,3					Intact	Kruts *et al.* 2001, Fig. 28.11
Talianki	28	XV	Goblet	0,2	5,8	9,7	2,8	7,2	Intact	Kruts *et al.* 2001, Fig. 26.16
Talianki	28	XV	Goblet	0,9	7,2	14,5	4,0	14,7	Intact	Kruts *et al.* 2001, Fig. 29.17
Talianki	28	XV	Bi-/sphero-conical	10,0	11,2	32,4	12,0	35,2	Intact	Kruts *et al.* 2001, Fig. 40.4
Talianki	28	XV	Bi-/sphero-conical	4,9	11,4	26,4	9,4	25,0	Intact	Kruts *et al.* 2001, Fig. 41.1
Talianki	28	XV	Bi-/sphero-conical	2,4	7,8	20,2	7,4	19,2	Intact	Kruts *et al.* 2001, Fig. 41.4
Talianki	28	XV	Amphora	2,6	11,2	21,0	7,4	20,2	Intact	Kruts *et al.* 2001, Fig. 42.2
Talianki	28	XV	Pear-shaped	4,7	8,6	15,0	7,0	26,8	Intact	Kruts *et al.* 2001, Fig. 42.6
Talianki	28	XV	Crater	41,1	47,6	49,6		33,6	Bottom is missing	Kruts *et al.* 2001, Fig. 43.1
Talianki	28	XV	Crater shaped pot	0,5	9,4	12,2	4,6	9,6	Intact	Kruts *et al.* 2001, Fig. 43.3
Talianki	28	XV	Crater shaped pot	0,5	10,8	12,4		8,4	Bottom is missing	Kruts *et al.* 2001, Fig. 43.4

Context			Vessel description							Source
Site	House	Excavation on areas	Type	Volume (l)	Rim diameter (cm)	Belly diameter (cm)	Bottom diameter (cm)	Height (cm)	Preservation state	Reference
Talianki	28	XV	Crater shaped pot	0,9	11,0	14,0		10,2	Bottom is missing	Kruts *et al.* 2001, Fig. 43.5
Talianki	29	XV	Bowl	1,0	20,6		7,6	7,4	Intact	Kruts *et al.* 2001, Fig. 27.1
Talianki	29	XV	Kitchen pot	3,6	20,0	24,0	8,2	16,2	Intact	Kruts *et al.* 2001, Fig. 27.2
Talianki	29	XV	Bowl	3,3	30,6		8,6	12,0	Intact	Kruts *et al.* 2001, Fig. 28.3
Talianki	29	XV	Kitchen pot	7,6	26,8	30,4	15,4	18,6	Intact	Kruts *et al.* 2001, Fig. 27.4
Talianki	29	XV	Bowl	0,1	8,6		3,3	4,4	Intact	Kruts *et al.* 2001, Fig. 28.4
Talianki	29	XV	Kitchen pot	52,4	42,8	56,8	28,6	38,8	Intact	Kruts *et al.* 2001, Fig. 27.5
Talianki	29	XV	Bi-/sphero-conical	26,3	16,8	47,2		38,4	Bottom is missing	Kruts *et al.* 2001, Fig. 40.1
Talianki	29	XV	Bi-/sphero-conical	3,7	12,0	23,2	8,0	22,8	Intact	Kruts *et al.* 2001, Fig. 40.2
Talianki	29	XV	Bi-/sphero-conical	8,6		33,2	9,2	28,8	Top is missing	Kruts *et al.* 2001, Fig. 40.6
Talianki	29	XV	Bi-/sphero-conical	27,6	30,8	42,4	15,6	43,6	Intact	Kruts *et al.* 2001, Fig. 41.5
Talianki	29	XV	Crater	20,9	32,0	40,8	13,2	33,2	Segment of lower part is missing	Kruts *et al.* 2001, Fig. 42.1
Talianki	29	XV	Crater	54,2	45,2	52,8	23,6	44,0	Intact	Kruts *et al.* 2001, Fig. 43.2
Talianki	30	XVI	Kitchen pot	0,6	9,6	5,8	3,4	10,4	Intact	Kruts *et al.* 2001, Fig. 27.8
Talianki	30	XVI	Bi-/sphero-conical	9,4	15,6	30,8	9,2	32,0	Intact	Kruts *et al.* 2001, Fig. 40.3
Talianki	30	XVI	Bi-/sphero-conical	0,2	5,8	10,0	3,8	9,4	Intact	Kruts *et al.* 2001, Fig. 40.5
Talianki	30	XVI	Bi-/sphero-conical	8,2	14,6	31,0	11,6	29,4	Intact	Kruts *et al.* 2001, Fig. 41.2
Talianki	30	XVI	Bi-/sphero-conical	6,6	15,0	28,4	8,6	30,2	Intact	Kruts *et al.* 2001, Fig. 41.3
Talianki	31	XVI	Kitchen pot	0,2	7,2	8,4	3,8	6,2	Intact	Kruts *et al.* 2001, Fig. 27.10
Talianki	31	XVI	Amphora	6,6	16,2	28,2		27,0	Bottom is missing	Kruts *et al.* 2001, Fig. 42.3
Talianki	31	XVI	Pear-shaped	0,7	7,0	15,0	5,6	11,6	Connection between top and bottom is missing	Kruts *et al.* 2001, Fig. 42.4
Talianki	32	XVI	Kitchen pot	2,8	20,4	20,4	10,0	13,8	Connection between top and bottom is missing	Kruts *et al.* 2005, Fig. 6.1
Talianki	32	XVI	Bowl	0,3	14,1		4,9	5,3	Intact	Kruts *et al.* 2005, Fig. 8.1
Talianki	32	XVI	Crater shaped pot	2,7	18,6	22,0	7,6	15,0	Intact	Kruts *et al.* 2005, Fig. 15.1
Talianki	32	XVI	Crater shaped pot	6,1	20,4	29,4	10,2	20,6	Intact	Kruts *et al.* 2005, Fig. 15.3
Talianki	32	XVI	Kitchen pot	3,3	16,4	22,2	9,0	18,4	Intact	Kruts *et al.* 2005, Fig. 6.4
Talianki	32	XVI	Cup	0,1	5,0	8,4	2,4	5,6	Intact	Kruts *et al.* 2005, Fig. 10.4
Talianki	32	XVI	Bi-/sphero-conical	2,1		20,4		17,4	Top is missing	Kruts *et al.* 2005, Fig. 13.4
Talianki	32	XVI	Crater shaped pot	0,4	18,6	24,4	7,8	17,8	Bottom is missing	Kruts *et al.* 2005, Fig. 15.4
Talianki	32	XVI	Bowl	0,3	13,5		4,1	5,3	Intact	Kruts *et al.* 2005, Fig. 8.5
Talianki	32	XVI	Cup	0,2	6,1	9,5	2,9	7,0	Intact	Kruts *et al.* 2005, Fig. 10.5
Talianki	32	XVI	Bowl	0,7	15,4		6,0	6,5	Intact	Kruts *et al.* 2005, Fig. 9.6
Talianki	33	XVI	Kitchen pot	5,9	23,8	28,6	12,0	18,4	Connection between top and bottom is missing	Kruts *et al.* 2005, Fig. 7.1
Talianki	33	XVI	Bowl	4,3			9,6	14,2	Top is missing	Kruts *et al.* 2005, Fig. 9.1
Talianki	33	XVI	Bowl	0,8	15,3		5,6	7,8	Intact	Kruts *et al.* 2005, Fig. 10.1
Talianki	33	XVI	Bi-/sphero-conical	5,5		26,0		25,6	Top and bottom is missing	Kruts *et al.* 2005, Fig. 12.1
Talianki	33	XVI	Bi-/sphero-conical	8,9	13,6	32,2	11,0	29,0	Intact	Kruts *et al.* 2005, Fig. 13.1
Talianki	33	XVI	Kitchen pot	4,7	20,6	23,6	11,0	16,8	Intact	Kruts *et al.* 2005, Fig. 6.2
Talianki	33	XVI	Kitchen pot	3,2	19,2	23,6	7,0	14,4	Intact	Kruts *et al.* 2005, Fig. 7.2
Talianki	33	XVI	Bowl	0,2	11,3		3,8	4,3	Intact	Kruts *et al.* 2005, Fig. 8.2
Talianki	33	XVI	Bi-/sphero-conical	4,9	11,6	28,2	8,6	23,6	Intact	Kruts *et al.* 2005, Fig. 12.2
Talianki	33	XVI	Bi-/sphero-conical	3,9	9,2	23,6	7,6	24,2	Intact	Kruts *et al.* 2005, Fig. 13.2
Talianki	33	XVI	Crater shaped pot	1,9	12,6	20,2	5,6	16,3	Intact	Kruts *et al.* 2005, Fig. 14.2
Talianki	33	XVI	Crater	16,2	31,2	36,6	15,4	28,2	Segment of lower part is missing	Kruts *et al.* 2005, Fig. 15.2

Context			Vessel description							Source
Site	House	Excavation on areas	Type	Volume (l)	Rim diameter (cm)	Belly diameter (cm)	Bottom diameter (cm)	Height (cm)	Preservation state	Reference
Talianki	33	XVI	Kitchen pot	31,1	41,0	48,8	20,6	30,6	Intact	Kruts *et al.* 2005, Fig. 6.3
Talianki	33	XVI	Kitchen pot	5,6	20,2	24,8	11,4	20,2	Segment of lower part is missing	Kruts *et al.* 2005, Fig. 7.3
Talianki	33	XVI	Bowl	0,8	20,2			7,6	Bottom is missing	Kruts *et al.* 2005, Fig. 8.3
Talianki	33	XVI	Bi-/sphero-conical	2,8	9,2	21,6		22,4	Bottom is missing	Kruts *et al.* 2005, Fig. 12.3
Talianki	33	XVI	Bi-/sphero-conical	7,9		31,0	10,6	28,8	Top is missing	Kruts *et al.* 2005, Fig. 13.3
Talianki	33	XVI	Crater	11,7	25,4	35,8	10,2	28,2	Intact	Kruts *et al.* 2005, Fig. 14.3
Talianki	33	XVI	Bowl	0,2	12,9		3,5	3,6	Intact	Kruts *et al.* 2005, Fig. 8.4
Talianki	33	XVI	Bi-/sphero-conical	1,2		17,2		15,6	Top and bottom is missing	Kruts *et al.* 2005, Fig. 12.4
Talianki	33	XVI	Kitchen pot	3,4	17,2	23,2	7,4	18,2	Intact	Kruts *et al.* 2005, Fig. 6.5
Talianki	33	XVI	Bi-/sphero-conical	3,0	7,2	21,0	6,6	22,2	Segment of lower part is missing	Kruts *et al.* 2005, Fig. 13.5
Talianki	33	XVI	Pear-shaped	3,8	7,4	24,2		20,2	Bottom is missing	Kruts *et al.* 2005, Fig. 14.5
Talianki	33	XVI	Crater shaped pot	1,0	22,6	31,8		22,8	Bottom is missing	Kruts *et al.* 2005, Fig. 15.5
Talianki	33	XVI	Bowl	0,2	12,2		4,2	4,2	Intact	Kruts *et al.* 2005, Fig. 8.6
Talianki	33	XVI	Bi-/sphero-conical	13,4	23,2	33,0	10,2	34,4	Intact	Kruts *et al.* 2005, Fig. 12.6
Talianki	33	XVI	Crater shaped pot	0,8	10,7	13,8		11,0	Bottom is missing	Kruts *et al.* 2005, Fig. 14.6
Talianki	33	XVI	Kitchen pot	7,0	25,2	28,6	12,0	20,4	Intact	Kruts *et al.* 2005, Fig. 6.7
Talianki	33	XVI	Bowl	0,1	10,4		5,5	2,8	Intact	Kruts *et al.* 2005, Fig. 8.7
Talianki	33	XVI	Bowl	1,1	17,9			8,4	Bottom is missing	Kruts *et al.* 2005, Fig. 9.7
Talianki	33	XVI	Cup	0,2	7,0	10,5	2,7	7,9	Intact	Kruts *et al.* 2005, Fig. 10.7
Talianki	33	XVI	Bi-/sphero-conical	19,6	24,2	36,4	14,0	40,2	Intact	Kruts *et al.* 2005, Fig. 12.7
Talianki	33	XVI	Bowl	0,4	16,5		4,5	6,2	Intact	Kruts *et al.* 2005, Fig. 8.8
Talianki	33	XVI	Bowl	0,1	8,1	8,6	2,7	5,1	Intact	Kruts *et al.* 2005, Fig. 9.8
Talianki	33	XVI	Goblet	0,2		10,3	2,3	8,2	Top is missing	Kruts *et al.* 2005, Fig. 10.8
Talianki	33	XVI	Goblet	0,2	5,9	10,6	2,5	8,5	Intact	Kruts *et al.* 2005, Fig. 10.9
Talianki	33	XVI	Goblet	0,8	9,2	15,9		13,1	Bottom is missing	Kruts *et al.* 2005, Fig. 10.10
Talianki	34	XV	Bowl	0,6	18,7		6,9	5,4	Intact	Korvin-Pietrovskiy and Menotti 2008, Fig. 3.1
Talianki	34	XV	Goblet	0,5	7,5	12,7	3,7	24,2	Intact	Korvin-Pietrovskiy and Menotti 2008, Fig. 4.1
Talianki	34	XV	Bi-/sphero-conical	0,4	5,8	12,2		10,4	Bottom is missing	Korvin-Pietrovskiy and Menotti 2008, Fig. 5.1
Talianki	34	XV	Bowl	1,6	21,1			8,5	Bottom is missing	Kruts *et al.* 2006a, Fig. 13.1
Talianki	34	XV	Bowl	0,4	15,0		6,5	5,3	Intact	Korvin-Pietrovskiy and Menotti 2008, Fig. 3.2
Talianki	34	XV	Bi-/sphero-conical	10,9	16,0	35,2	13,4	30,8	Segment of lower part is missing	Korvin-Pietrovskiy and Menotti 2008, Fig. 4.3
Talianki	34	XV	Amphora	0,6	7,9	13,5	4,8	10,9	Intact	Korvin-Pietrovskiy and Menotti 2008, Fig. 5.3
Talianki	34	XV	Crater shaped pot	0,1	4,9	7,2	2,8	6,3	Intact	Kruts *et al.* 2006a, Fig. 16.3
Talianki	34	XV	Bowl	0,1	11,5		7,5	2,0	Intact	Korvin-Pietrovskiy and Menotti 2008, Fig. 3.4
Talianki	34	XV	Crater shaped pot	2,6	14,0	22,8	6,0	19,4	Intact	Korvin-Pietrovskiy and Menotti 2008, Fig. 5.4
Talianki	34	XV	Bi-/sphero-conical	11,4	14,8	34,4	10,4	33,8	Intact	Korvin-Pietrovskiy and Menotti 2008, Fig. 4.5
Talianki	34	XV	Crater	5,9		27,4	11,0	27,8	Top is missing	Korvin-Pietrovskiy and Menotti 2008, Fig. 5.5
Talianki	34	XV	Cup							Kruts *et al.* 2006a, Fig. 19.5
Talianki	34	XV	Bi-/sphero-conical	8,4	16,6	32,6	9,8	29,2	Segment of lower part is missing	Korvin-Pietrovskiy and Menotti 2008, Fig. 4.6

Context			Vessel description							Source
Site	House	Excavation on areas	Type	Volume (l)	Rim diameter (cm)	Belly diameter (cm)	Bottom diameter (cm)	Height (cm)	Preservation state	Reference
Talianki	34	XV	Cup	0,1	5,0	7,1	2,3	5,4	Intact	Kruts *et al.* 2006a, Fig. 13.6
Talianki	34	XV	Cup							Kruts *et al.* 2006a, Fig. 19.6
Talianki	34	XV	Cup	0,1	4,6	7,4	1,6	6,0	Intact	Kruts *et al.* 2006a, Fig. 13.7
Talianki	34	XV	Cup							Kruts *et al.* 2006a, Fig. 19.8
Talianki	34	XV	Cup	0,1	5,1	8,9	2,6	6,1	Intact	Kruts *et al.* 2006a, Fig. 13.10
Talianki	35	XV	Crater		15,1	17,7			Intact	Kruts *et al.* 2006a, Fig. 16.1
Talianki	35	XV	Goblet	0,9	18,2	15,3	4,1	12,8	Intact	Korvin-Pietrovskiy and Menotti 2008, Fig. 4.2
Talianki	35	XV	Amphora	1,1	10,4	16,5		13,4	Bottom is missing	Korvin-Pietrovskiy and Menotti 2008, Fig. 5.2
Talianki	35	XV	Crater shaped pot	0,5	9,1	12,4		9,2	Intact	Kruts *et al.* 2006a, Fig. 16.2
Talianki	35	XV	Bowl	3,7	34,4		9,2	11,8	Intact	Korvin-Pietrovskiy and Menotti 2008, Fig. 3.3
Talianki	35	XV	Bowl	0,6	16,7		7,0	7,3	Intact	Kruts *et al.* 2006a, Fig. 13.3
Talianki	35	XV	Bi-/sphero-conical	7,0	13,0	32,2	10,0	24,8	Segment of lower part is missing	Korvin-Pietrovskiy and Menotti 2008, Fig. 4.4
Talianki	35	XV	Bowl	0,7	20,4		4,3	9,2	Intact	Korvin-Pietrovskiy and Menotti 2008, Fig. 3.5
Talianki	35	XV	Bowl	1,6	15,0	18,7	7,7	10,0	Intact	Kruts *et al.* 2006a, Fig. 13.5
Talianki	35	XV	Bowl	1,4	24,4			10,6	Bottom is missing	Korvin-Pietrovskiy and Menotti 2008, Fig. 3.6
Talianki	35	XV	Lid	0,3	16,4		6,9	8,6	Intact	Korvin-Pietrovskiy and Menotti 2008, Fig. 5.6
Talianki	35	XV	Pear-shaped	16,2	10,4	40,8		15,9	Bottom is missing	Korvin-Pietrovskiy and Menotti 2008, Fig. 5.7
Talianki	36	XV	Pear-shaped	3,8	8,6	24,0			Bottom and lower part are missing	Kruts *et al.* 2006b, Fig. 31.1
Talianki	36	XV	Cup	0,1	4,5	9,4	2,2	6,2	Intact	Kruts *et al.* 2006b; Korvin-Pietrovskiy and Menotti 2008, Fig. 17.3
Talianki	36	XV	Amphora	0,3	6,9	10,2		10,3	Bottom is missing	Kruts *et al.* 2006b; Korvin-Pietrovskiy and Menotti 2008, Fig. 18.3
Talianki	36	XV	Bowl	0,1	6,5				Lower Part and bottom are missing	Kruts *et al.* 2006b, Fig. 27.7
Talianki	37	XV	Cup	0,1	6,7	9,5	2,3	6,8	Intact	Korvin-Pietrovskiy and Menotti 2008, Fig. 17.1
Talianki	37	XV	Bi-/sphero-conical	11,0	13,8	37,6	10,8	32,2	Intact	Korvin-Pietrovskiy and Menotti 2008, Fig. 18.1
Talianki	37	XV	Bowl	0,2	11,9		3,1	4,5	Intact	Kruts *et al.* 2006b, Fig. 28.1
Talianki	37	XV	Cup	0,1	5,0	9,0	2,0	5,4	Intact	Korvin-Pietrovskiy and Menotti 2008, Fig. 17.2
Talianki	37	XV	Bi-/sphero-conical	14,6	15,8	39,0	13,4	34,0	Segment of lower part is missing	Korvin-Pietrovskiy and Menotti 2008, Fig. 18.2
Talianki	37	XV	Bowl							Kruts *et al.* 2006b, Fig. 28.2
Talianki	37	XV	Crater shaped pot	0,2	6,4	9,0	2,5	7,7	Intact	Kruts *et al.* 2006b, Fig. 31.3
Talianki	37	XV	Goblet	0,4	7,8	12,0	3,1	9,8	Intact	Korvin-Pietrovskiy and Menotti 2008, Fig. 17.4

Context			Vessel description							Source
Site	House	Excavation on areas	Type	Volume (l)	Rim diameter (cm)	Belly diameter (cm)	Bottom diameter (cm)	Height (cm)	Preservation state	Reference
Talianki	37	XV	Amphora	1,3	9,8	17,7	5,8	14,8	Intact	Korvin-Pietrovskiy and Menotti 2008, Fig. 18.4
Talianki	37	XV	Bowl	6,2	36,6		11,8	15,8	Intact	Kruts *et al.* 2006b, Fig. 28.4
Talianki	37	XV	Bowl	0,2	17,4		8,4	4,7	Intact	Kruts *et al.* 2006b, Fig. 28.5
Talianki	37	XV	Bi-/sphero-conical	19,9	11,6	36,8	10,4	40,0	Segment of lower part is missing	Korvin-Pietrovskiy and Menotti 2008, Fig. 17.6
Talianki	37	XV	Bowl	0,2	14,8		6,0	3,7	Intact	Kruts *et al.* 2006b, Fig. 28.6
Talianki	37	XV	Bowl	0,1	4,8	7,1	2,2	3,6	Intact	Kruts *et al.* 2006b, Fig. 28.7
Talianki	37	XV	Bowl	1,3	16,6		9,3	8,4		Kruts *et al.* 2006b, Fig. 28.8
Talianki	37	XV	Bowl	0,2	12,0		6,0	3,8	Intact	Kruts *et al.* 2006b, Fig. 28.9
Talianki	37	XV	Bowl	0,2	10,1		2,5	6,9	Intact	Kruts *et al.* 2006b, Fig. 28.10
Talianki	37	XV	Crater shaped pot	0,6	9,5	13,3	4,0	10,1	Intact	Kruts *et al.* 2006b, Fig. 31.4
Talianki	37	XV	Bowl	2,2	26,9		11,0	9,5	Intact	Kruts *et al.* 2006b, Fig. 82.3
Talianki	38	XV	Bowl	0,6	16,9		6,8	6,0	Intact	Korvin-Pietrovskiy and Menotti 2008, Fig. 4.1
Talianki	38	XV	Crater shaped	1,1	9,8	18,0	4,8	13,0	Intact	Korvin-Pietrovskiy and Menotti 2008, Fig. 5.4
Talianki	38	XV	Pot	1,6	14,2	17,8	4,6	12,8	Intact	Korvin-Pietrovskiy and Menotti 2008, Fig. 5.7
Talianki	39	XV	Bi-/sphero-conical	14,7	20,4	34,2	14,0	37,0	Intact	Korvin-Pietrovskiy and Menotti 2008, Fig. 5.1
Talianki	39	XV	Bowl	1,1	18,0			9,2	Bottom is missing	Korvin-Pietrovskiy and Menotti 2008, Fig. 4.2
Talianki	39	XV	Bi-/sphero-conical	7,0	17,2	28,0		13,5	Bottom is missing	Korvin-Pietrovskiy and Menotti 2008, Fig. 5.2
Talianki	39	XV	Bi-/sphero-conical	4,0	10,2	19,0	7,6	21,8	Bottom is missing	Korvin-Pietrovskiy and Menotti 2008, Fig. 5.3
Talianki	39	XV	Crater	15,8	31,6	38,8	14,0	28,4	Segment of lower part is missing	Korvin-Pietrovskiy and Menotti 2008, Fig. 5.5
Talianki	39	XV	Lid	0,3	20,0		6,4	11,0	Intact	Korvin-Pietrovskiy and Menotti 2008, Fig. 5.6
Talianki	40	XVII	Kitchen pot	5,3	19,4	26,8	11,6	18,2	Intact	Kruts *et al.* 2008, Fig. 35.3
Talianki	40	XVII	Bowl	1,1	9,3		3,7	4,3	Intact	Kruts *et al.* 2008, Fig. 36.1
Talianki	40	XVII	Bowl	5,9	18,1		4,9	7,1	Intact	Kruts *et al.* 2008, Fig. 36.2
Talianki	40	XVII	Bowl	1,1	11,6		3,8	4,0	Intact	Kruts *et al.* 2008, Fig. 36.4
Talianki	40	XVII	Bowl	0,7	8,0		3,0	4,0	Intact	Kruts *et al.* 2008, Fig. 36.5
Talianki	40	XVII	Bi-/sphero-conical	13,7	13,8	38,8		33,0	Bottom is missing	Kruts *et al.* 2008, Fig. 38.1
Talianki	40	XVII	Bi-/sphero-conical	17,8	27,8	37,2		35,6	Bottom is missing	Kruts *et al.* 2008, Fig. 38.2
Talianki	40	XVII	Bi-/sphero-conical	10,3	15,8	32,4	12,8	33,2	Intact	Kruts *et al.* 2008, Fig. 38.3
Talianki	40	XVII	Bi-/sphero-conical	0,4	8,0	13,4	4,4	10,4	Intact	Kruts *et al.* 2008, Fig. 38.5
Talianki	40	XVII	Bi-/sphero-conical	0,5	7,8	14,0	3,4	11,4	Intact	Kruts *et al.* 2008, Fig. 38.6
Talianki	40	XVII	Crater shaped pot	1,5	12,0	18,8		15,2	Bottom is missing	Kruts *et al.* 2008, Fig. 39.3
Talianki	40	XVII	Crater	48,7	48,8	52,0	20,0	42,4	Intact	Kruts *et al.* 2008, Fig. 39.4
Talianki	40	XVII	Crater shaped pot	0,1	5,0	6,6	2,4	6,0	Intact	Kruts *et al.* 2008, Fig. 39.5
Talianki	41	XVII	Kitchen pot	2,3	13,0	18,6	8,4	14,6	Intact	Kruts *et al.* 2008, Fig. 35.5
Talianki	41	XVII	Kitchen pot	5,7	23,4	26,6	11,8	17,0	Intact	Kruts *et al.* 2008, Fig. 35.6
Talianki	41	XVII	Kitchen pot	7,3	21,8	29,4	11,0	24,2	Intact	Kruts *et al.* 2008, Fig. 35.7

Context			Vessel description							Source
Site	House	Excavation on areas	Type	Volume (l)	Rim diameter (cm)	Belly diameter (cm)	Bottom diameter (cm)	Height (cm)	Preservation state	Reference
Talianki	41	XVII	Bowl	3,0	29,0		8,8	5,7	Intact	Kruts *et al.* 2008, Fig. 36.3
Talianki	41	XVII	Bowl	0,4	9,5		5,3	2,4	Intact	Kruts *et al.* 2008, Fig. 36.7
Talianki	41	XVII	Bi-/sphero-conical	16,9	25,6	34,6		33,4	Bottom is missing	Kruts *et al.* 2008, Fig. 38.4
Talianki	41	XVII	Amphora	1,5	11,2	17,8	6,8	16,2	Intact	Kruts *et al.* 2008, Fig. 39.1
Talianki	41	XVII	Lid	0,3	6,6		14,2	8,2	Intact	Kruts *et al.* 2008, Fig. 39.2
Talianki	41	XVII	Crater shaped pot	6,9	22,2	14,8		21,8	Bottom is missing	Kruts *et al.* 2008, Fig. 39.6
Talianki	42	XVIII	Kitchen pot	1,6	17,2	20,4	10,8	9,4	Segment of lower part is missing	Kruts *et al.* 2009, Fig. 1.1
Talianki	42	XVIII	Goblet	0,5	8,4	13,8	3,6	10,4	Intact	Kruts *et al.* 2009, Fig. 2.1
Talianki	42	XVIII	Bi-/sphero-conical	18,3	19,2	42,0	15,0	32,2	Intact	Kruts *et al.* 2009, Fig. 3.1
Talianki	42	XVIII	Bowl	4,7	33,0		10,6	13,4	Connection between top and bottom is missing	Kruts *et al.* 2009, Fig. 1.2
Talianki	42	XVIII	Bi-/sphero-conical	0,7	9,0	14,6	5,8	11,4	Intact	Kruts *et al.* 2009, Fig. 2.2
Talianki	42	XVIII	Bowl	0,2	11,0		3,4	4,8	Intact	Kruts *et al.* 2009, Fig. 1.3
Talianki	42	XVIII	Bi-/sphero-conical	5,9	12,4	27,7	9,0	28,6	Intact	Kruts *et al.* 2009, Fig. 2.3
Talianki	42	XVIII	Bowl	1,0	18,0		4,6	7,6	Intact	Kruts *et al.* 2009, Fig. 1.4
Talianki	42	XVIII	Bi-/sphero-conical	2,4	10,0	21,8	6,4	22,2	Intact	Kruts *et al.* 2009, Fig. 2.4
Talianki	42	XVIII	Cup	0,1	2,4	8,4	1,5	3,5	Intact	Kruts *et al.* 2009, Fig. 1.5
Talianki	42	XVIII	Pear-shaped	1,2	6,6	18,4		12,0	Bottom is missing	Kruts *et al.* 2009, Fig. 2.5
Talianki	42	XVIII	Cup	0,2	3,4	5,2	1,3	3,7	Intact	Kruts *et al.* 2009, Fig. 1.6
Talianki	42	XVIII	Crater shaped pot	1,5	11,4	18,2	6,0	14,4	Intact	Kruts *et al.* 2009, Fig. 2.6
Talianki	42	XVIII	Cup	0,2	4,8	9,0	3,0	8,8	Intact	Kruts *et al.* 2009, Fig. 1.7
Talianki	42	XVIII	Cup	0,1	4,2	7,6	2,2	4,8	Intact	Kruts *et al.* 2009, Fig. 1.8
Talianki	43	XIX	Kitchen pot	5,5	27,0	29,8		17,0	Bottom is missing	Kruts *et al.* 2009, Fig. 4.1
Talianki	43	XIX	Bowl	2,3	18,6		8,4	7,2	Intact	Kruts *et al.* 2009, Fig. 4.2
Talianki	43	XIX	Bowl	0,6	15,5		5,6	6,0	Intact	Kruts *et al.* 2009, Fig. 4.3
Talianki	43	XIX	Bowl	1,1	18,6			8,4	Bottom is missing	Kruts *et al.* 2009, Fig. 4.4
Talianki	43	XIX	Cup	0,1	4,8	6,4	2,2	4,8	Intact	Kruts *et al.* 2009, Fig. 4.5
Talianki	43	XIX	Bi-/sphero-conical	5,7	10,4	28,2		24,8	Bottom is missing	Kruts *et al.* 2009, Fig. 4.6
Talianki	43	XIX	Crater shaped pot	4,9	19,0	25,0	8,4	21,2	Connection between top and bottom is missing	Kruts *et al.* 2009, Fig. 4.7
Talianki	45	XX	Bi-/sphero-conical	0,4	7,2	12,4		9,2	Bottom is missing	Kruts *et al.* 2011, Fig. 46.1
Talianki	45	XX	Kitchen pot	0,5	10,6	12,0	5,4	7,4	Intact	Kruts *et al.* 2011, Fig. 46.10
Talianki	45	XX	Bowl	0,3	14,0		4,0	5,8	Intact	Kruts *et al.* 2011, Fig. 46.3
Talianki	45	XX	Cup	0,1	5,0	8,2	2,6	6,0	Intact	Kruts *et al.* 2011, Fig. 46.4
Talianki	45	XX	Cup	0,0	3,8	6,4	2,0	5,8	Intact	Kruts *et al.* 2011, Fig. 46.5
Talianki	45	XX	Miniature	0,0	3,4	5,8	2,0	6,0	Intact	Kruts *et al.* 2011, Fig. 46.6
Talianki	45	XX	Cup	0,0	2,6	4,0	1,2	3,4	Intact	Kruts *et al.* 2011, Fig. 46.7
Talianki	45	XX	Goblet	0,5	7,6	14,2	3,8	12,6	Intact	Kruts *et al.* 2011, Fig. 46.8
Talianki	45	XX	Goblet	0,5	8,8	13,8	3,6	11,0	Intact	Kruts *et al.* 2011, Fig. 46.9
Talianki	45	XX	Bi-/sphero-conical	7,8	11,6	31,8	10,4	30,4	Intact	Kruts *et al.* 2011, Fig. 47.1
Talianki	45	XX	Bi-/sphero-conical	5,2	11,2	26,2	8,0	28,4	Intact	Kruts *et al.* 2011, Fig. 47.2
Talianki	45	XX	Amphora	2,8	17,8	22,4	8,2	16,8	Intact	Kruts *et al.* 2011, Fig. 47.3
Talianki	45	XX	Lid	0,1	4,4		8,6	3,2	Intact	Kruts *et al.* 2011, Fig. 47.4
Talianki	45	XX	Pear-shaped	2,1	11,0	22,0	7,6	15,6	Intact	Kruts *et al.* 2011, Fig. 47.5
Talianki	45	XX	Crater	13,7	26,8	38,6		30,0	Bottom is missing	Kruts *et al.* 2011, Fig. 47.6

Context			Vessel description							Source
Site	House	Excavation on areas	Type	Volume (l)	Rim diameter (cm)	Belly diameter (cm)	Bottom diameter (cm)	Height (cm)	Preservation state	Reference
Talianki	46	XX	Kitchen pot	2,2	16,8	20,6	8,2	12,0	Intact	Kruts *et al.* 2011, Fig. 48.1
Talianki	46	XX	Bi-/sphero-conical	0,8	9,4	15,2	3,8	13,2	Intact	Kruts *et al.* 2011, Fig. 48.10
Talianki	46	XX	Bowl	0,3	15,0		4,6	5,4	Intact	Kruts *et al.* 2011, Fig. 48.2
Talianki	46	XX	Bowl	0,2	14,2		6,4	3,0	Intact	Kruts *et al.* 2011, Fig. 48.3
Talianki	46	XX	Cup	0,1					Intact	Kruts *et al.* 2011, Fig. 48.4
Talianki	46	XX	Cup	0,2	4,6	9,2	2,4	8,4	Intact	Kruts *et al.* 2011, Fig. 48.5
Talianki	46	XX	Cup	0,1	4,8	8,6	3,0	7,0	Intact	Kruts *et al.* 2011, Fig. 48.6
Talianki	46	XX	Cup	0,1	6,0	9,2	2,4	15,6	Intact	Kruts *et al.* 2011, Fig. 48.7
Talianki	46	XX	Cup	0,1	6,0	8,4	2,2	5,6	Intact	Kruts *et al.* 2011, Fig. 48.8
Talianki	46	XX	Goblet	1,0	10,8	16,4	5,8	12,6	Intact	Kruts *et al.* 2011, Fig. 48.9
Talianki	46	XX	Bi-/sphero-conical	7,8		31,0		30,4	Bottom is missing	Kruts *et al.* 2011, Fig. 49.1
Talianki	47	XX	Bowl	0,0	8,6		5,2	3,4	Intact	Kruts *et al.* 2013, Fig. 38.1
Talianki	47	XX	Bowl	0,0	4,0		1,3	1,4	Intact	Kruts *et al.* 2013, Fig. 38.10
Talianki	47	XX	Bowl	0,0	3,0		1,5	1,3	Intact	Kruts *et al.* 2013, Fig. 38.3
Talianki	47	XX	Bowl	0,0	5,4		1,8	2,5	Intact	Kruts *et al.* 2013, Fig. 38.4
Talianki	47	XX	Bowl	0,6	22,1		5,3	7,4	Intact	Kruts *et al.* 2013, Fig. 38.5
Talianki	47	XX	Bowl	0,0	8,1		2,4	2,5	Intact	Kruts *et al.* 2013, Fig. 38.6
Talianki	47	XX	Bowl	0,2	11,3		3,9	4,7	Intact	Kruts *et al.* 2013, Fig. 38.8
Talianki	47	XX	Bowl	0,0	7,6		2,4	2,0	Intact	Kruts *et al.* 2013, Fig. 38.9
Talianki	47	XX	Bi-/sphero-conical	2,0	11,2	18,3	5,1	19,1	Intact	Kruts *et al.* 2013, Fig. 47.1
Talianki	47	XX	Bi-/sphero-conical	1,6	6,8	17,9	5,7	17,7	Intact	Kruts *et al.* 2013, Fig. 47.2
Talianki	47	XX	Bi-/sphero-conical	0,1	3,3	7,2	2,8	8,2	Intact	Kruts *et al.* 2013, Fig. 47.4
Talianki	47	XX	Bi-/sphero-conical	1,2	6,4	14,4	6,0	18,3	Intact	Kruts *et al.* 2013, Fig. 47.6
Talianki	47	XX	Bi-/sphero-conical	2,2	8,2	18,6	8,6	22,2	Intact	Kruts *et al.* 2013, Fig. 47.7
Talianki	47	XX	Bi-/sphero-conical	1,5	9,2	16,9	6,0	17,6	Intact	Kruts *et al.* 2013, Fig. 49.1
Talianki	47	XX	Bi-/sphero-conical	1,7	8,9	21,6	5,3	19,7	Intact	Kruts *et al.* 2013, Fig. 49.2
Talianki	47	XX	Bi-/sphero-conical	2,6	8,6	22,4	3,2	21,2	Intact	Kruts *et al.* 2013, Fig. 49.3
Talianki	47	XX	Bi-/sphero-conical	0,1	4,3	7,8	2,7	8,1	Intact	Kruts *et al.* 2013, Fig. 49.4
Talianki	47	XX	Crater shaped pot	1,2	6,0	7,2	2,6	6,0	Intact	Kruts *et al.* 2013, Fig. 51.1
Talianki	47	XX	Crater	13,2	30,8	32,3	11,8	34,0	Intact	Kruts *et al.* 2013, Fig. 51.4
Talianki	47	XX	Crater shaped pot	0,9	11,2	15,2	6,4	11,6	Intact	Kruts *et al.* 2013, Fig. 51.5
Talianki			Pear-shaped	3,2	7,6	22,6	9,0	22,6	Intact	Kruts *et al.* 2001, Fig. 42.5

Appendix 5. List of Tripolye house models

site information						certainty of identification			
Site	Sinyukha site-id	Settlement size ha	Tripolye phase	local group	type	clearly house model	uncertain (in tendency no)	uncertain (in tendency yes)	uncertain (no picture)
Andreevka 1	199	20	B2	Vladimirovka	A	1			
Andreevka 2	199	20	B2	Vladimirovka	A	1			
Baliki			C1						1
Beresivka	183	7.85	B1	East Tripolye	A			1	
Bernashovka			A						1
Borisovka I	226		B1	East Tripolye	A				1
Chercasiv Sad II			C1	Chechenik	B	1			
Chicherkozovka	170	180	C1	Tomashovka	B	1			
Dobrovody 1	151	211	C1	Tomashovka	B	1			
Dobrovody 2	151	211	C1	Tomashovka	B	1			
Grebeni			B2	Kolomyishchina II	A	1			
Klishchiv			B1-B2	Klishchiv			1		
Kocherginci Pankivka	154	27.5	C1	Tomashovka	A	1			
Kocherginci Pankivka	154	27.5	C1	Tomashovka					1
Kolomyishchina I, 1			C1	Kolomyishchina I	A	1			
Kolomyishchina I, 2			C1	Kolomyishchina I			1		
Kolomyishchina I, 3			C1	Kolomyishchina I	B	1			
Kolomyishchina II			B2	Kolomyishchina II	A	1			
Konovka I			B2	Petreni	B	1			
Konovka II			C1	Badrag					1
Kosteshti IV			C1-C2	Brinzeni	A			1	
Luka Vrublivetska 1			A					1	
Luka Vrublivetska 2			A				1		
Maidanetske	131	200	C1	Tomashovka					1
Michailivka			B2		B			1	
Nebelivka	196	235	B2	Nebelivka	A	1			
Nemirov			B2	Nemirov	B				1
Nezvisko			B1		A			1	
Okopy			A		A	1			
Patrintcy			B1					1	
Pischana 1	138	16.3	B2		A	1			
Pischana 2	138	16.3	B2	Nebelivka	A	1			
Popudnia 1	111	12	C1	Tomashovka	B	1			
Popudnia 2	111	12	C1	Tomashovka	B	1			
Racovets			B2	Racovets		1			
Rozsohovatka	61	55	B2	Nebelivka	A	1			
Soloncheny I			A				1		
Soloncheny II 1			B1-B2				1		
Soloncheny II 2			B1-B2				1		
Soloncheny II 3			B1-B2				1		
Sushkovka 1	165	76.6	C1	Tomashovka	B	1			
Sushkovka 2	165	76.6	C1	Tomashovka	B	1			

dating probability								
phase 1	phase 2	phase 3	phase 4	phase 5	phase 6	phase 5+6	phase 7	Source
			1					Shatilo 2005
			1					Shatilo 2005
								Shatilo 2005
	0.5	0.5						Gusev 1996
								Zbenovich 1980
	0.5	0.5						Yakubenko 1999
								Patakova *et al.* 1989
				1	1	2		Passek 1949
				1		1		Kolesnikov 1984
				1		1		Kolesnikov 1984
								Bibikov *et al.* 1960
								Zaets 1974
				0.5	0.5	1		Yakubenko 1999
				0.5	0.5	1		Kozlovska 1926
								Movsha 1964
								Movsha 1964
								Movsha 1964
								Passek and Bezvenglinsky 1939
								Shmagliy *et al.* 1978
								Gusev 1996
								Markevich 1981
								Bibikov 1953
								Bibikov 1953
			1	1	1	2		Shmagliy and Videiko 1987
								Gusev 1996
			1	1		1		Videiko and Burdo 2015
								Shatilo 2005
								Cehak 1933
								Zbenovich 1989
								Shatilo 2005
								Gusev 1996
			1					Diachenko and Chernovol 2007
				0.5	0.5	1		Himner 1933
				0.5	0.5	1		Himner 1933
								Popova 1989
			1					Tsvek 1971
								Passek 1961
								Movsha 1964
								Yakubenko 1999
								Yakubenko 1999
				0.5	0.5	1		Kozlovska 1926
				0.5	0.5	1		Kozlovska 1926

site information						certainty of identification			
Site	Sinyukha site-id	Settlement size ha	Tripolye phase	local group	type	clearly house model	uncertain (in tendency no)	uncertain (in tendency yes)	uncertain (no picture)
Sushkovka 3	165	76.6	C1	Tomashovka	A	1			
Sushkovka 4	165	76.6	C1	Tomashovka			1		
Sushkovka 5	165	76.6	C1	Tomashovka			1		
Sushkovka 6	165	76.6	C1	Tomashovka	B	1			
Sushkovka 7	165	76.6	C1	Tomashovka	B	1			
Talianki 1	141	320	C1	Tomashovka		1			
Talianki 2	141	320	C1	Tomashovka	B	1			
Talianki 3	141	320	C1	Tomashovka	B	1			
Talianki 4	141	320	C1	Tomashovka	B	1			
Timkove			A		B	1			
Trostyanchik			B2	Racovets	B				1
Uman area 1			B2/C1		B	1			
Uman area 2			B2/C1		B	1			
Uman area 3			B2/C1				1		
Uman area 4			B2/C1				1		
Uman area 5			B2/C1				1		
Uman area 6			B2/C1				1		
Uman area 7			B2/C1				1		
Uman area 8			B2/C1				1		
Uman area 9			B2/C1				1		
Velika Muksha			B1-B2						1
Vilshanka			B1-B2		B			1	
Vladimirovka 1	198	95	B2	Vladimirovka	B	1			
Vladimirovka 2	198	95	B2	Vladimirovka				1	
Vladimirovka 3	198	95	B2	Vladimirovka			1		
Vladimirovka 4	198	95	B2	Vladimirovka			1		
Vladimirovka 5	198	95	B2	Vladimirovka			1		
Vladimirovka 6	198	95	B2	Vladimirovka		1			
Vladimirovka 7	198	95	B2	Vladimirovka			1		
Vladimirovka 8	198	95	B2	Vladimirovka			1		
Voroshilovka			B2	Voroshilovka	A	1			
Zvanets			A						1

Notes:

Concerning the 'Certainty of the identification': During the work, a critical analysis of house models was made. All fragments of such objects that belong to this type, but which do not have elements of the house (for example, door sill, window, roof, etc.) were designated as uncertain and divided into three categories – 1) with a tendency rather not – mostly in descriptions appear as "legs from models", 2) those for which there is no drawing or photograph and 3) those that, according to a number of characteristics, can be models of houses (in tendency yes) – have a similar platform, walls, etc., but they also do not have house elements. This division seems significant, since it is the presence of parts that copy buildings that make these objects models of houses.

dating probability								
phase 1	phase 2	phase 3	phase 4	phase 5	phase 6	phase 5+6	phase 7	Source
				0.5	0.5	1		Yakubenko 1999
				0.5	0.5	1		Yakubenko 1999
				0.5	0.5	1		Yakubenko 1999
				0.5	0.5	1		Yakubenko 1999
				0.5	0.5	1		Yakubenko 1999
				1	1	2		Shatilo 2005
				1	1	2		Kruts *et al.* 2005
				1	1	2		Korvin-Piotrovskiy and Menotti 2008
				1	1	2		Korvin-Piotrovskiy and Ovchinnikov 2020
								Patakova *et al.* 1989
								Shatilo 2005
								Passek 1949
								Passek 1949
								Yakubenko 1999
								Yakubenko 1999
								Yakubenko 1999
								Yakubenko 1999
								Yakubenko 1999
								Yakubenko 1999
								Yakubenko 1999
								Gusev 1996
								Gusev 1996
			1					Passek 1938
			1					Movsha 1964
			1					Movsha 1964
			1					Movsha 1964
			1					Yakubenko 1999
			1					Yakubenko 1999
			1					Yakubenko 1999
			1					Yakubenko 1999
								Zaets and Gusev 1992
								Yakubenko 1999

Concerning the ‘Type’ of house models: The simplified typology includes type A – models with a roof (“closed”) and type B – without a roof (“open”).

Concerning finds from the ‘Uman area’: Finds from surveys of the first half of the 20th century, site and context are not known.

Appendix 6. List of Tripolye sledge models

site information						dating probability				
site	Sinyukha site-id	Settlement size (ha)	Phase	local group	Number of models	phase 4	phase 5	phase 6	phase 5+6	Source
Chechelnik	211	56.5	C1	Chechelnik	1	1	1			Ryzhov 1988; Gusev 1998
Chicherkozovka	170	180	C1	Tomashovka	8		1	1	2	Balabina 2004
Dobrovody	151	211	C1	Tomashovka	4		1		1	Kruts *et al.* 2005, Information: *Legedzyne museum*
Kocherginci Pankivka	154	27.5	C1	Tomashovka	1		0.5	0.5	1	Information: *Legedzyne museum*
Konovka			B2 or C1	Petreny	1					Balabina 2004
Kryvetske		20	C1	Chechelnik	1		1			Rud 2018
Maidanetske	131	200	C1	Tomashovka	31	1	1	1	2	Burdo 2003; Balabina 2004
Nezvisko			B2-C1		1					Kravets 1951
Selishche			B2	Vorochilovka	1	1				Ryzhov 1988; Gusev 1998
Sushkovka	165	76.6	C1	Tomashovka	1		0.5	0.5	1	Kozlovska 1926
Talianki	141	320	C1	Tomashovka	80		1	1	2	Kruts *et al.* (see notes)
Viitivka		49.4	C1	Chechelnik or Tomashovka	1			1		Information: *Vitali Rud*
Yaltushkiv		55	C1	Petreny	1		0.5	0.5		Ryzhov 1993b

Notes:

Concerning the column 'Site': The list does not include the artefact from Gorodnitsa-Gorodishche, since it is not a sledge model (Balabina 2004: 180).

Concerning the sledge models from Legedzyne museum: The artefacts are stored in the museum of Tripolye culture in the village Legedzine and are not published.

Concerning the sledge model from Konovka: It is not clear from what site exactly the model of sledge since there are two sites "Konovka": one from B2 and the other from C1 phases located close to each other.
Concerning the sledge model from Nezvisko: It is not clear from which site the model originates, since in this area there are several Tripolye settlements from different periods and the documentation was lost in the first half of the 20th century. Based on the figurines, originating apparently from the same context, Balabina proposed to date the sledge to the periods "B2-C1"(2004).

Concerning the sledge models from Talianki: Of the 80 Talianki sledge models that have been found, at least 13 come from the context of a large pit for clay extraction ("kotlovan" – excavated in 2004-2006), the others come from different houses. From the context of houses, 9 finds have no characteristics of sledge models (there are no elements of sledges), mostly fragments of "model walls". Most of the models were published in books and reports: Kruts *et al.* 1982; Kruts *et al.* 1986; Kruts *et al.* 1987; Kruts and Ryzhov 1991; Kruts and Ryzhov 1994; Kruts and Ryzhov 1995; Kruts *et al.* 2000; Kruts *et al.* 2001; Balabina 2004; Kruts *et al.* 2005; Kruts *et al.* 2006a; Kruts *et al.* 2006b; Kruts *et al.* 2008; Korvin-Piotrovskiy and Menotti 2008; Kruts *et al.* 2009; Kruts *et al.* 2011; Kruts *et al.* 2013; part of the information was obtained while working in the museum of Tripolye culture in the village Legedzine.

Appendix 7. Diachronic land use history in the 20 km catchment of Maidanetske from the Palaeolithic to modern times: periods, sites and cultural classifications

period	dating and futher division	archaeological sites in the micro-region black=20 km radius from Maidanetske red=cultural affiliation/dating not clear	material culture	reference
Paleolithic	Lower (until **150 000 BP**)	NO		
	Middle (until **35 000 BP**)	NO?		
	Upper (untill **10 000 BP**)	Gordashovka, Lashova (?)		Shidlovsky *et al.* 2004, 364
Mesolithic	**8000 – 6000 BC**	Dobryanka 1	Kukrek	Neradenko 2011 Zalizniak *et al.* 2005
Neolithic	**6000 – 4800 BC**	Dobryanka 3	Buh-Dniester culture	Zalizniak *et al.* 2005
Chalcolithic	Early (Tripolye A) **4600 – 4500 BC**	Grebenukiv Yar Romanovka	Tripolye Sites of other cultural formations that are simultaneous to Tripolye ones are not found in this area	
	Middle (Tripolye B) **4500 – 3800 BC**	Onoprievka Vesely Kut Gordashovka 1 Hlybochok Rozsohovatka Kolodyste 1 Krivi kolina Pischana Sverdlikove Nebelivka	Tripolye	
	Late (Tripolye C) **3800 – 3650 BC**	Kobrinovo Romanovka Moshurov 1 Moshurov 2 Moshurov 3 Gordashovka 2 Talne 1, 2 and 3? Rohy Talianki Kamyaneche Kolodyste Maidanetske	Tripolye	
Bronze age	Early Bronze Age **3000 – 2500 BC**	Kurgans near Legedzyne, Maidanetske, Dobrovody Settlements Maidanetske (Shirokiy bereg), Belashki (Oksanichev yar), Vishnopil, Talne (3), Rohy, Moshurov	Yamnaya culture, kurgans The territory of the former mega sites is included in the peripheral zone of distribution of sites of Yamnaya culture (first of all kurgans). They are not very intensively represented here.	Ivanova 2016, 273-290; Kruts *et al.* 1981: 4; Ancient History … 1997
	Middle Bronze Age **2600 – 2200 BC**	NO	near the northern border of the area was the southern border of the site distribution of corded ware culture	Ancient History … 1997, 404
	Transitional period **2200 – 1700 BC**	NO	Based on the data available, in this micro zone there are no sites of this time. There are sites of the Babino cultural circle from the southeast and northeast of our zone (in the region of the Dnieper and the lower Southern Bug).	Ancient History … 1997, 410; Kushtan 2013, 84
	Late Bronze Age **1700 – 1300 BC**	Legedzyne 2 (?)	Based on the data available, there are no sites of this time.	Magomedov and Didenko 2009, 56; Kushtan 2013, 84; Ancient History … 1997
	Final Bronze Age **1300 – 900 BC**	No sites in 20 km radius known	This micro region is partly occupied by sites of Bilogrudivska culture	Ancient History … 1997, 416; Kushtan 2013, 84

period	dating and futher division	archaeological sites in the micro-region black=20 km radius from Maidanetske red=cultural affiliation/dating not clear	material culture	reference
Early Iron age	Pre Scythian time **9 c. – mid 7 c. – BC**	NO		Terenozhkin 1961
	Scythian time **mid 7 c. – 3rd c. BC**	Kurgans close to Legedzyne Kurgan in Kolodiste Belashki (settelment) and Moshurov – „early Iron age"	Scythian, kurgans	Kruts *et al.* 1981, 4
	Sarmatian time **3-2 c. BC – 4 c. AD**	Kurgan in Kolodiste		
Late Roman time	**Mid of 3rd – first half of 5 cent. AD**	Legedgzyne 1 and 2 Legedzyne graveyard Maydanetske Sverdlikove (burials) Kobrinovo Belashki (4?) Glibochok 1 and 2? Vesely Kut Potash Papuzentci Pavlivka 1 Zelenkiv Gordashivka 1, 2 and 3 Vishnopil (2) Talne Rohy Oksanine 1 and2 Kolodiste *and much more.*	Chernyakhov culture	Magomedov and Didenko 2009, 56; Kruts *et al.* 1981, 4
Middle Ages	Early middle Age **5-10 cent. AD**	Moshurov Pishana (Penkovska culture)		Chernovol and Ryzhov 2005
	High Middle Ages **Mid.10 c. – 1250**	NO?		
	Late middle age **From 1250(?) – 1500**	2 villages		Steshenko *et al.* 1972
Early modern period	**1500 – 2nd half of 18 c.**	+32 villages		Steshenko *et al.* 1972
Late modern period	**2nd half of 18c. – beginning of 20 c.**	+8 villages		Steshenko *et al.* 1972
Contemporary history		Total – 42 villages		

Appendix 8. Typology of vessel shapes

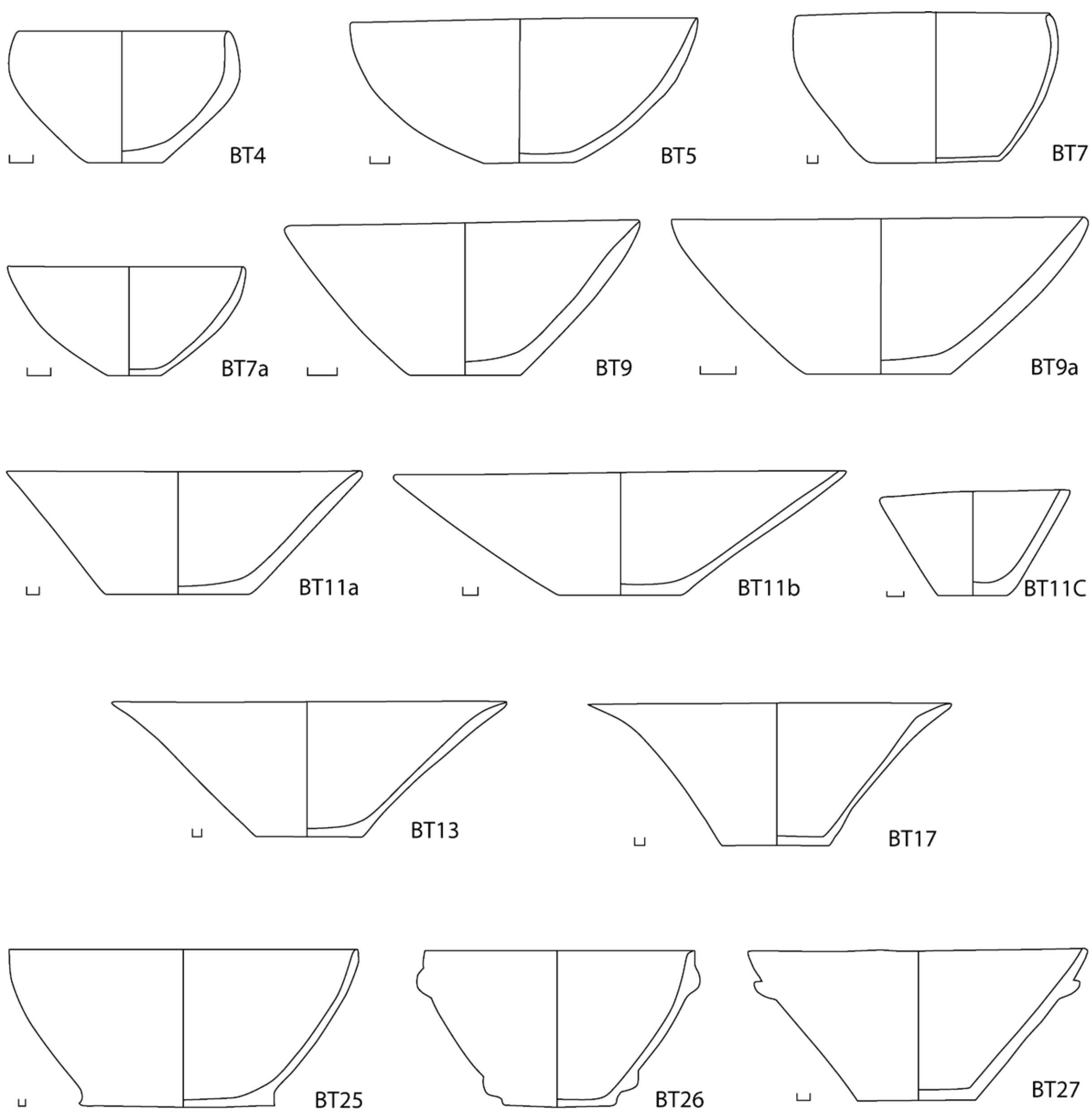


Plate 1. Morphological subtypes of bowls.

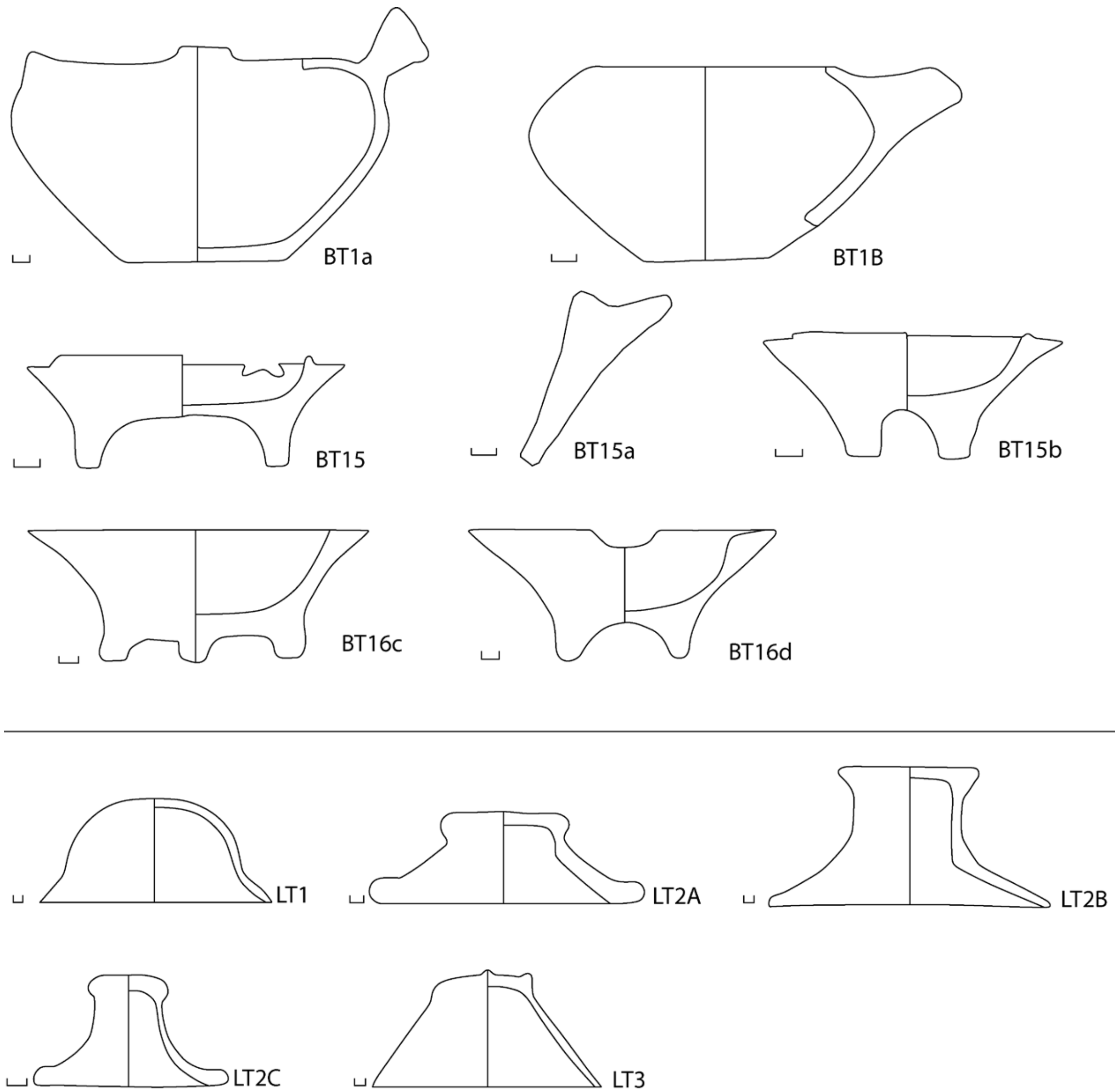


Plate 2. Morphological subtypes of bowls (BT) and lids (LT).

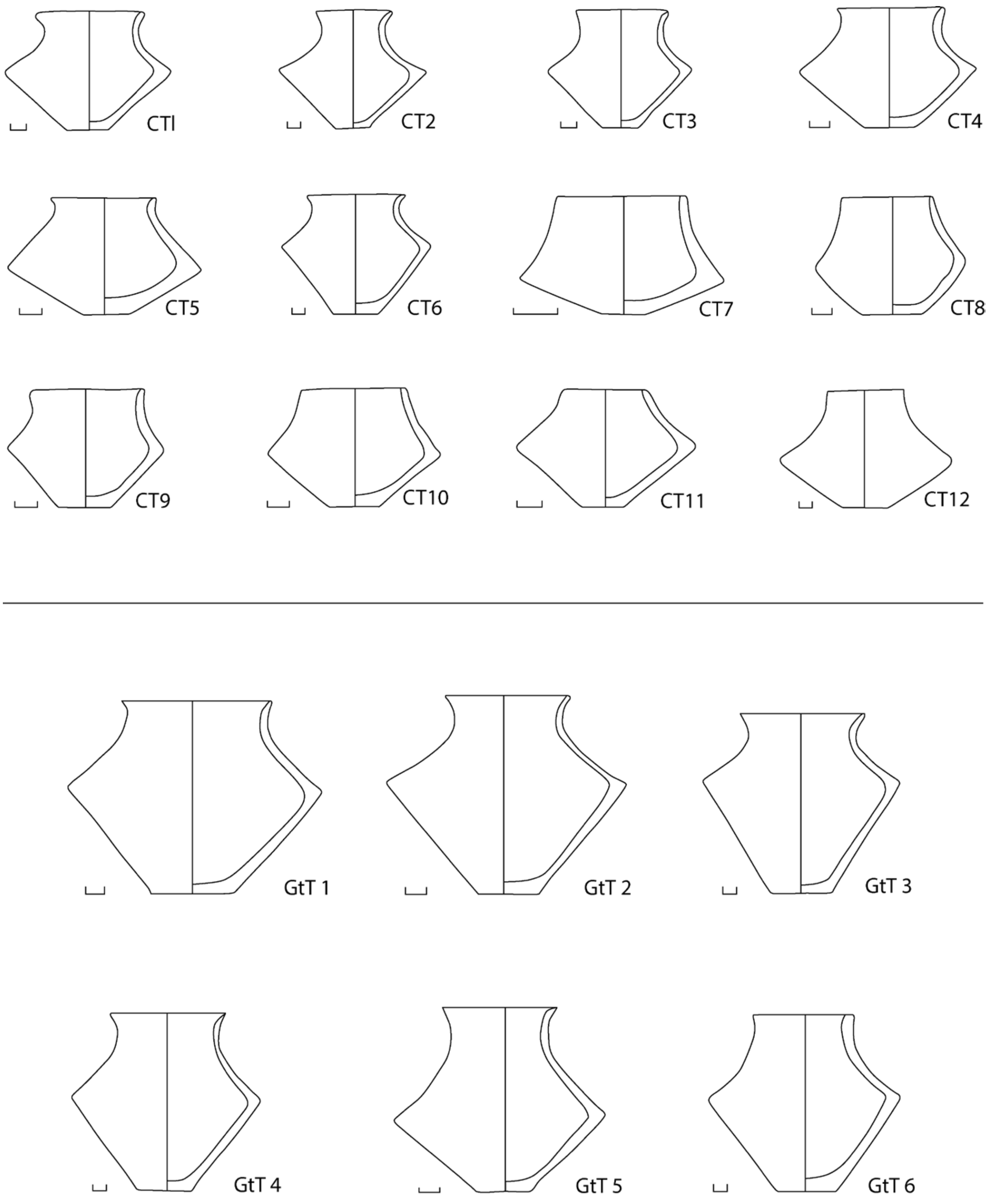


Plate 3. Morphological subtypes of cups (CT) and goblets (GtT).

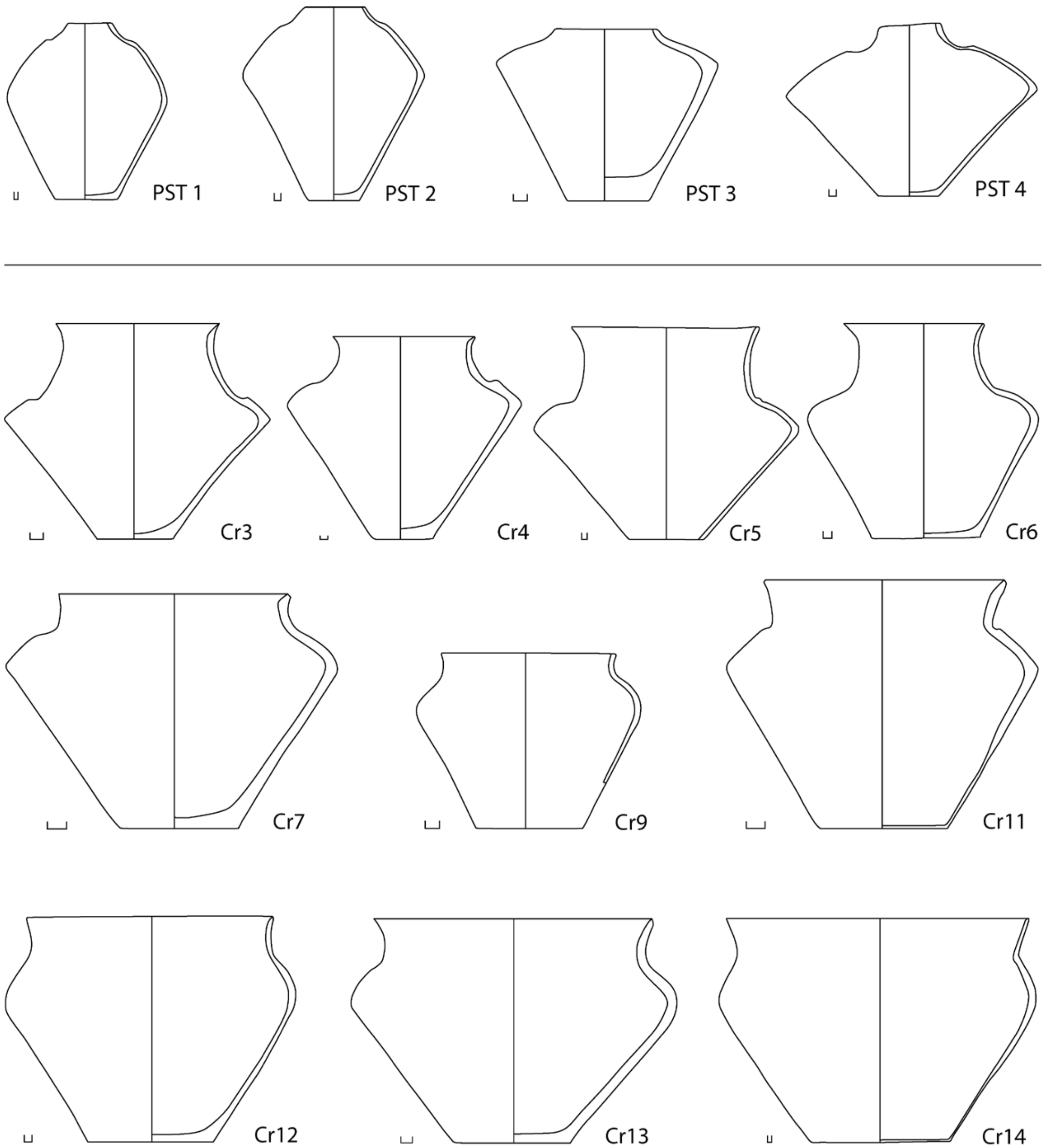


Plate 4. Morphological subtypes of pear-shaped vessels (PST) and 'craters/crater-like vessels/pots' (Cr).

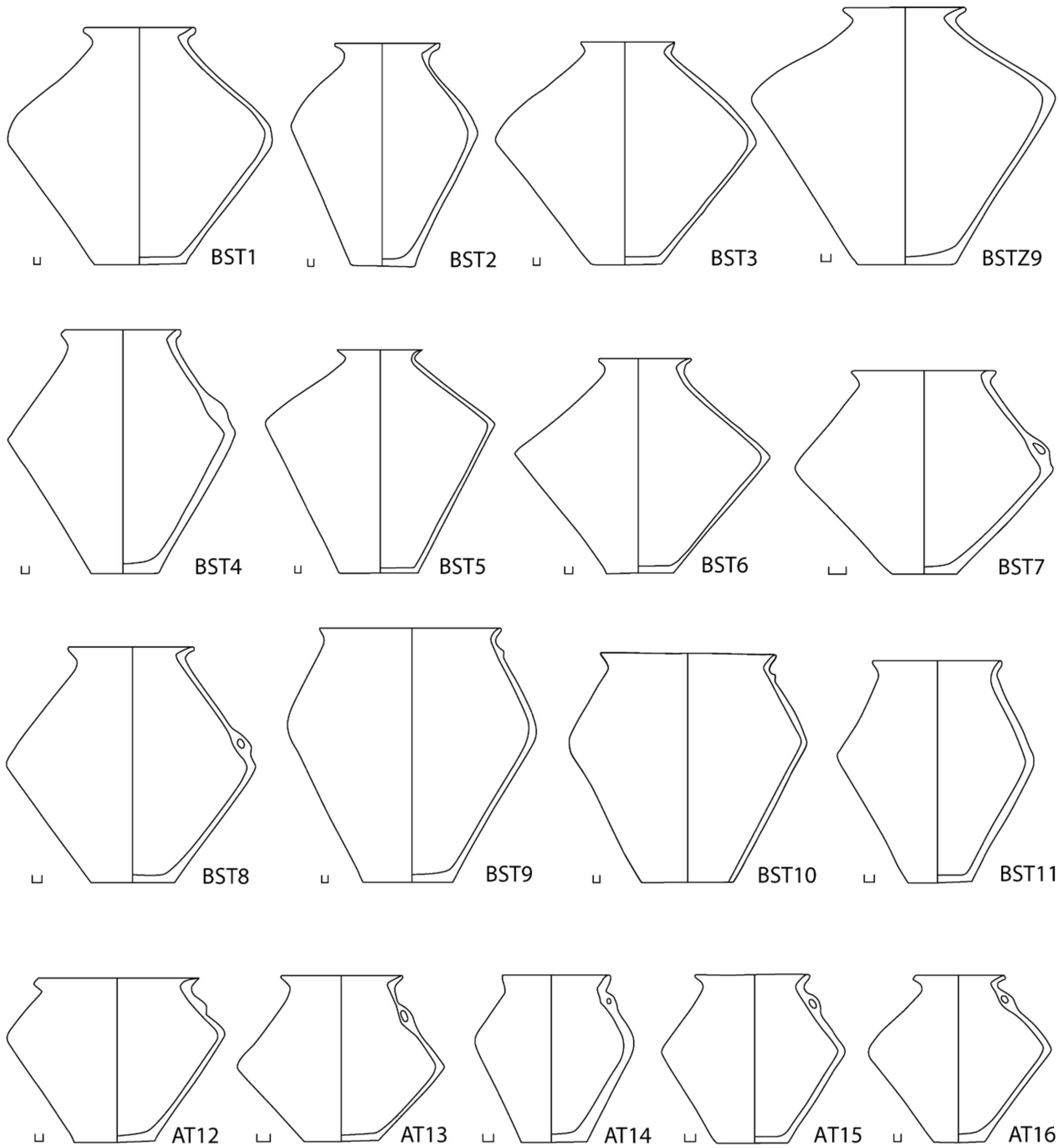


Plate 5. Morphological subtypes of 'biconical/sphero-conical vessels/amphorae'.

Appendix 9. Drawings of ceramic vessels in house inventories from key sites of the Sinyukha River Basin

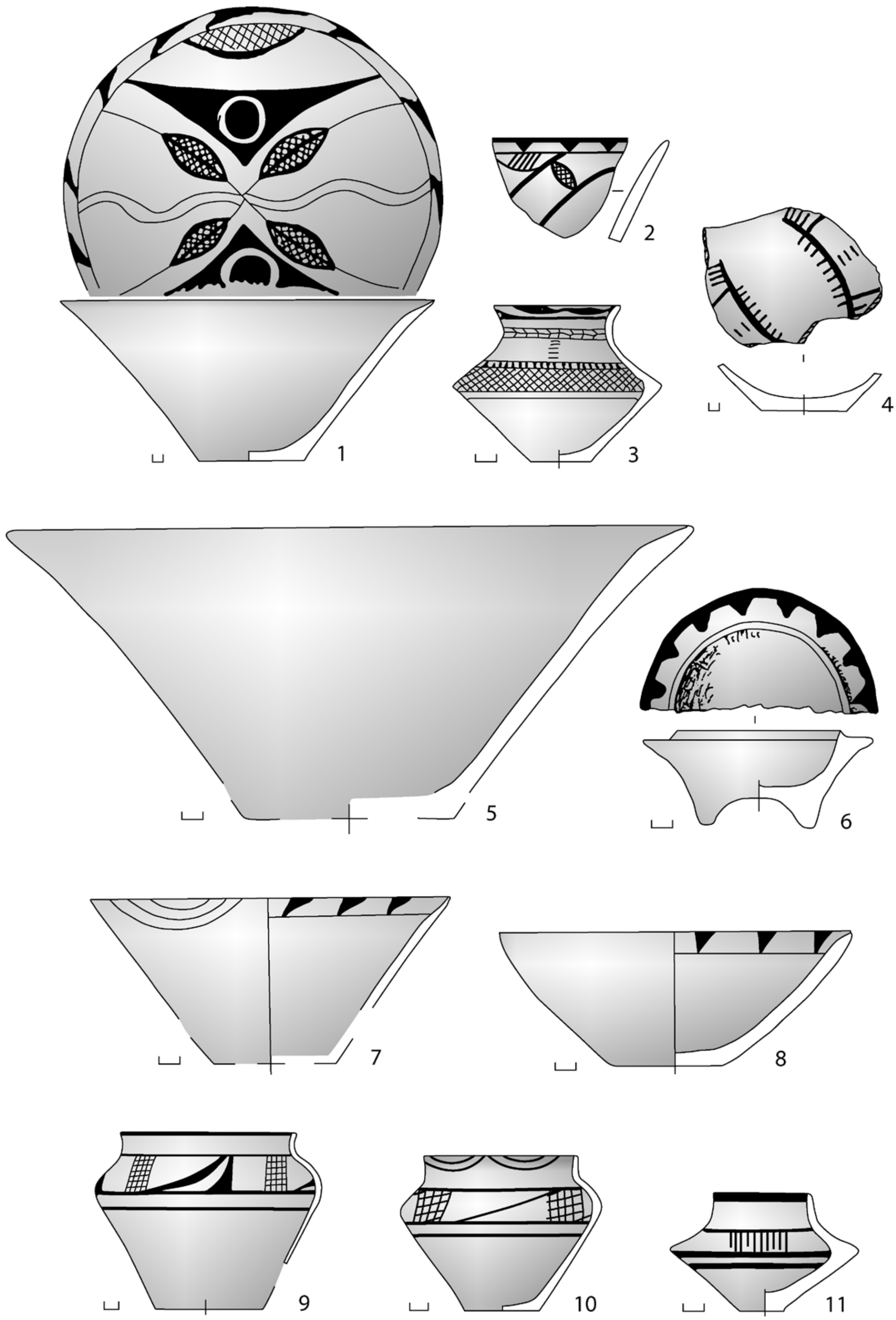


Plate 6. Talianki, house 28. Pottery types: bowls: 1-2, 4-8; goblet: 3; 'craters/crater-like vessels/pots' (henceforth 'craters'): 9-10; cup: 11 (after Kruts et al. 2001, fig. 28: 1-2, 5-9; fig. 29: 2, 16; fig. 43: 3, 5).

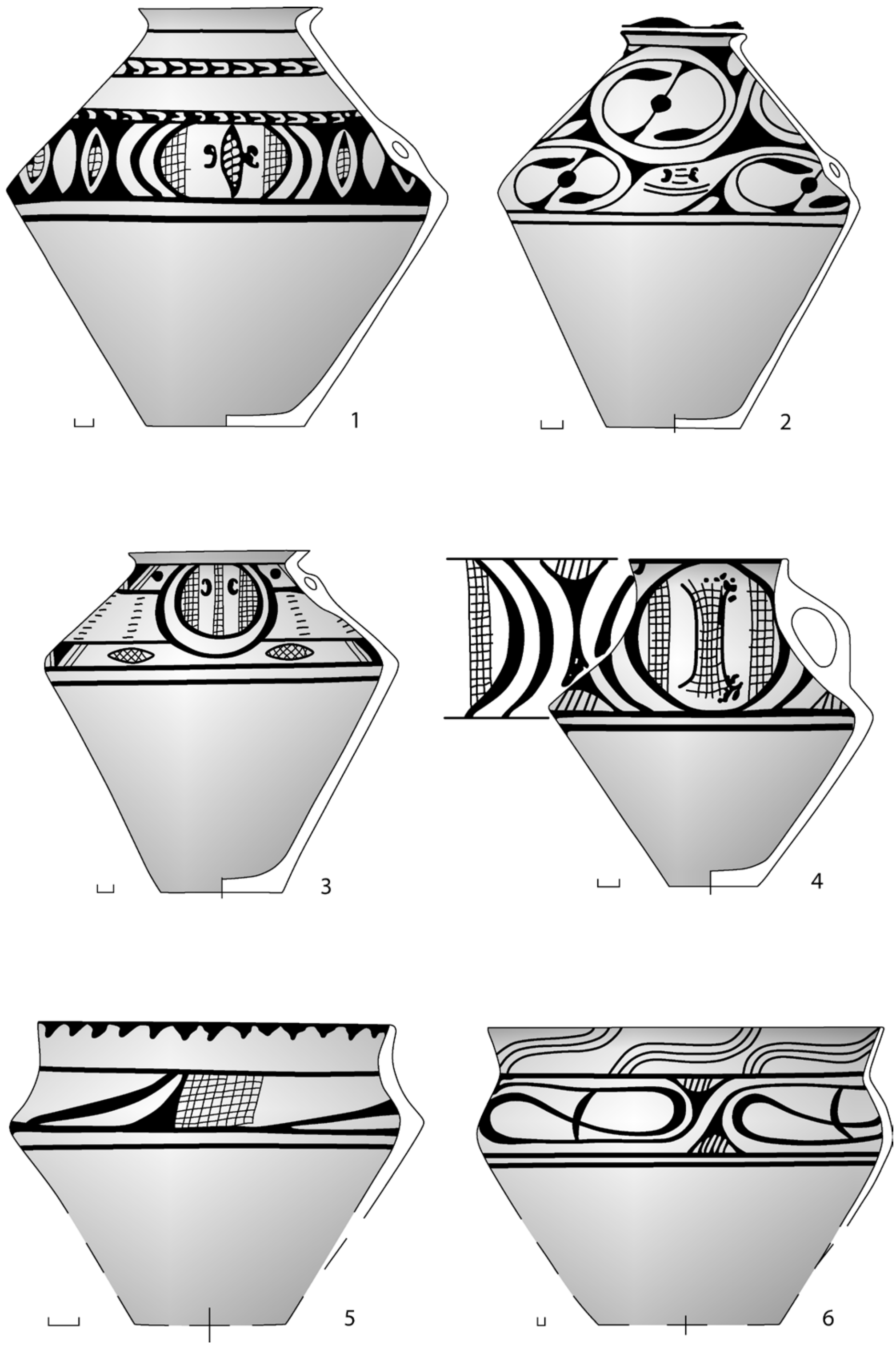


Plate 7. Talianki, house 28. Pottery types: 'biconical/sphero-conical vessels/amphorae' (henceforth 'biconical…' vessels): 1-3; goblet: 4; 'craters/crater-like vessels/pots': 5-6 (after Kruts et al. 2001, fig. 29: 17; fig. 40: 4; fig. 41: 1; fig. 42: 2; fig. 43: 1, 4).

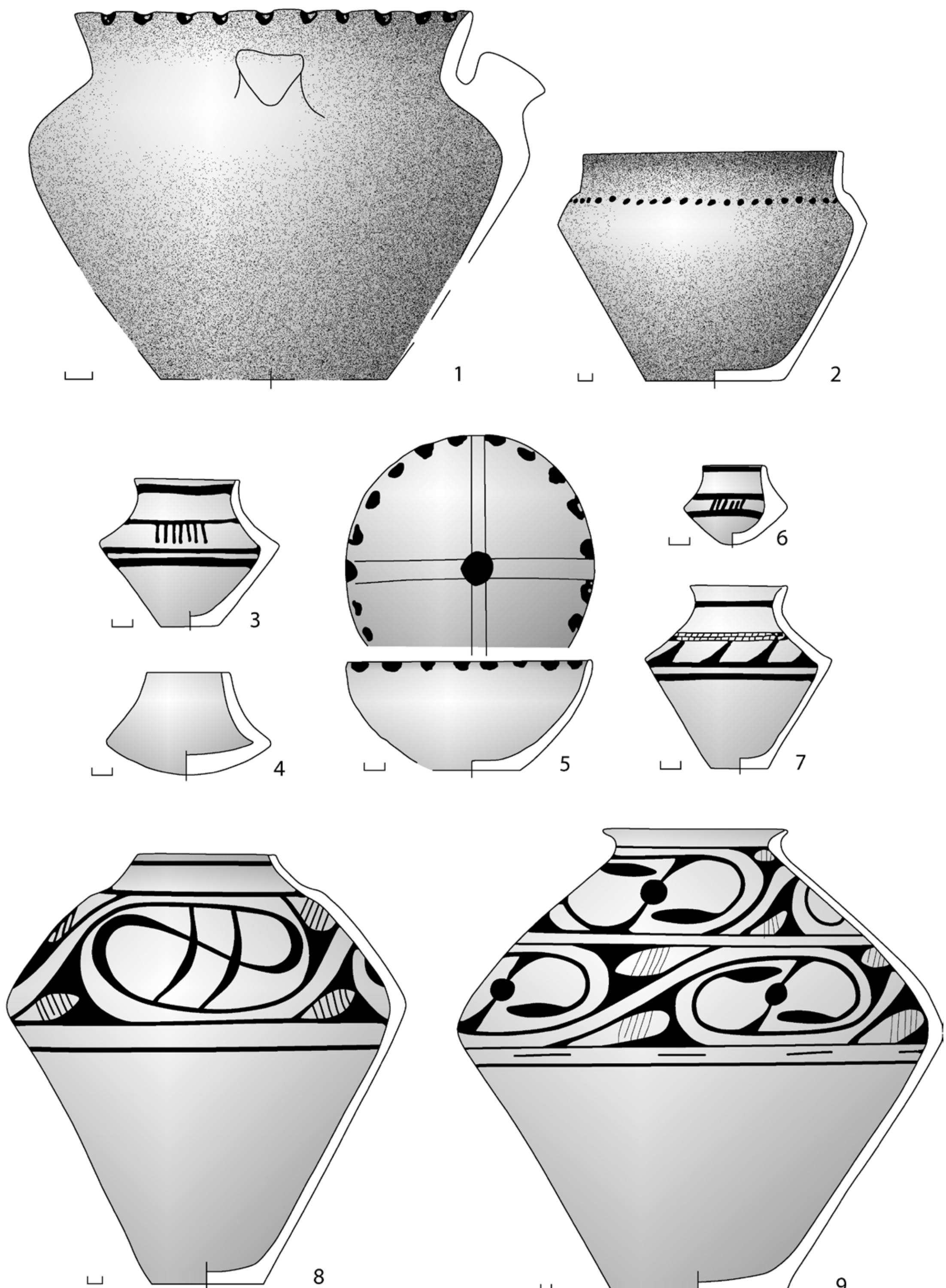


Plate 8. Talianki, house 28. Pottery types: 'kitchen' pots: 1-2; cups: 3-4, 6; bowl: 5; goblet: 7; pear-shaped vessel: 8; 'biconical...' vessel: 9 (after Kruts et al. 2001, fig. 27: 7, 9; fig. 28: 11; fig. 29: 2, 5, 9, 13; fig. 41: 4; fig. 42: 6).

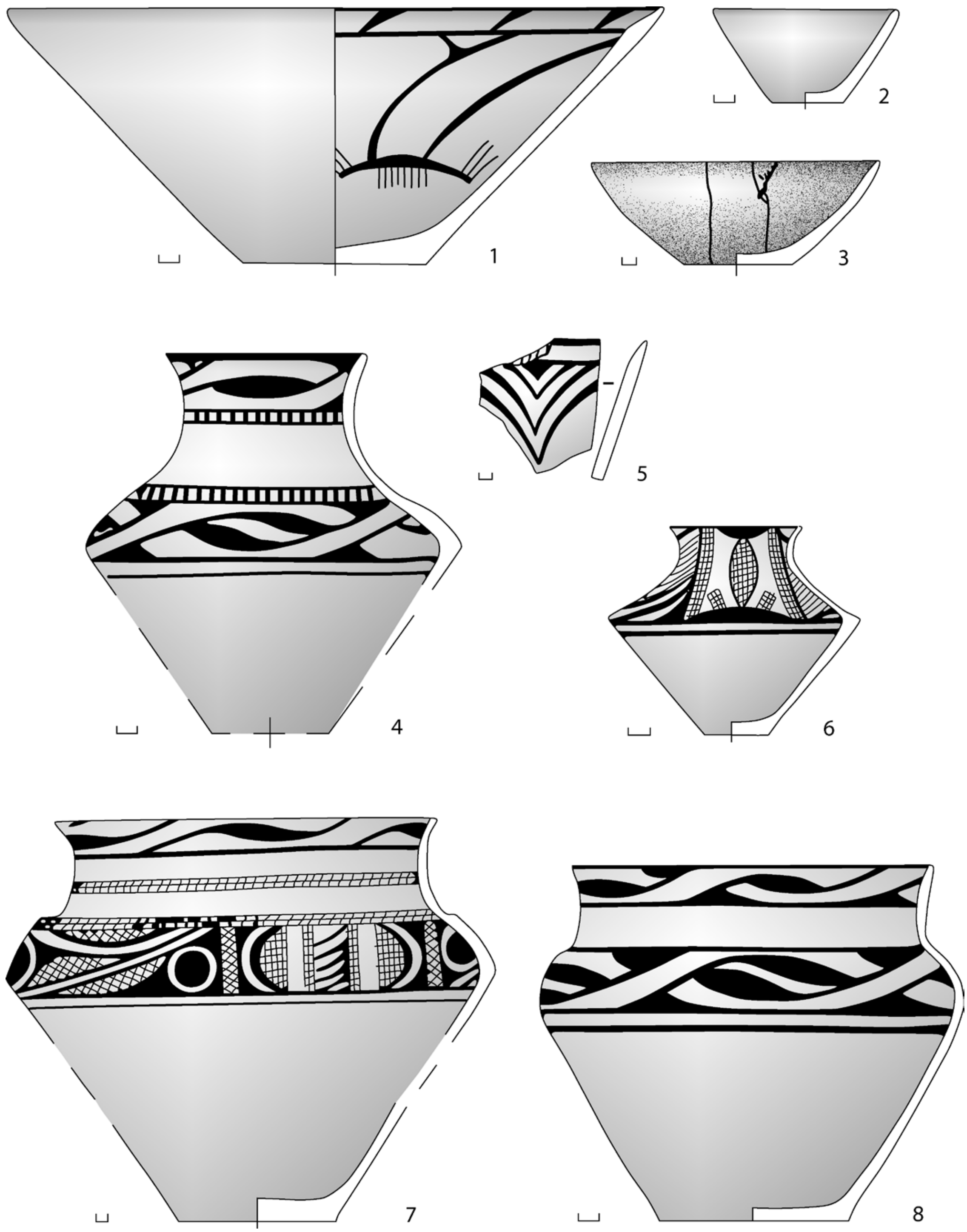


Plate 9. Talianki, house 29. Pottery types: bowls: 1-3, 5; goblets: 4, 6; 'craters': 7-8 (after Kruts et al. 2001, fig. 27: 1; fig. 28: 3-4, 10; fig. 29: 11, 15; fig. 42: 1; fig. 43: 2).

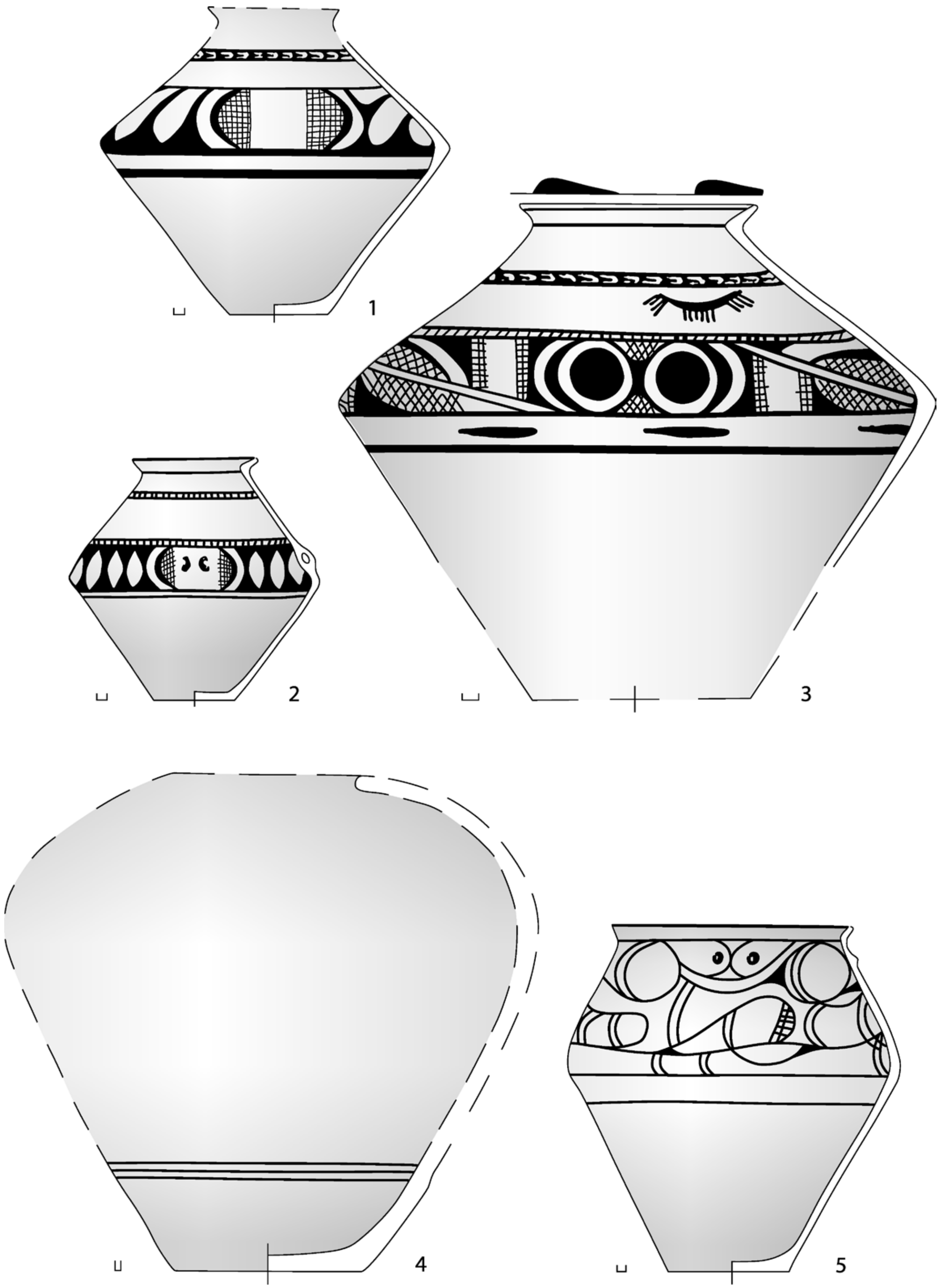


Plate 10. Talianki, house 29. Pottery types: 'biconical...' vessels: 1-3, 5; pithos: 4 (after Kruts et al. 2001, fig. 40: 1-2, 6; fig. 41: 5; fig. 43: 6).

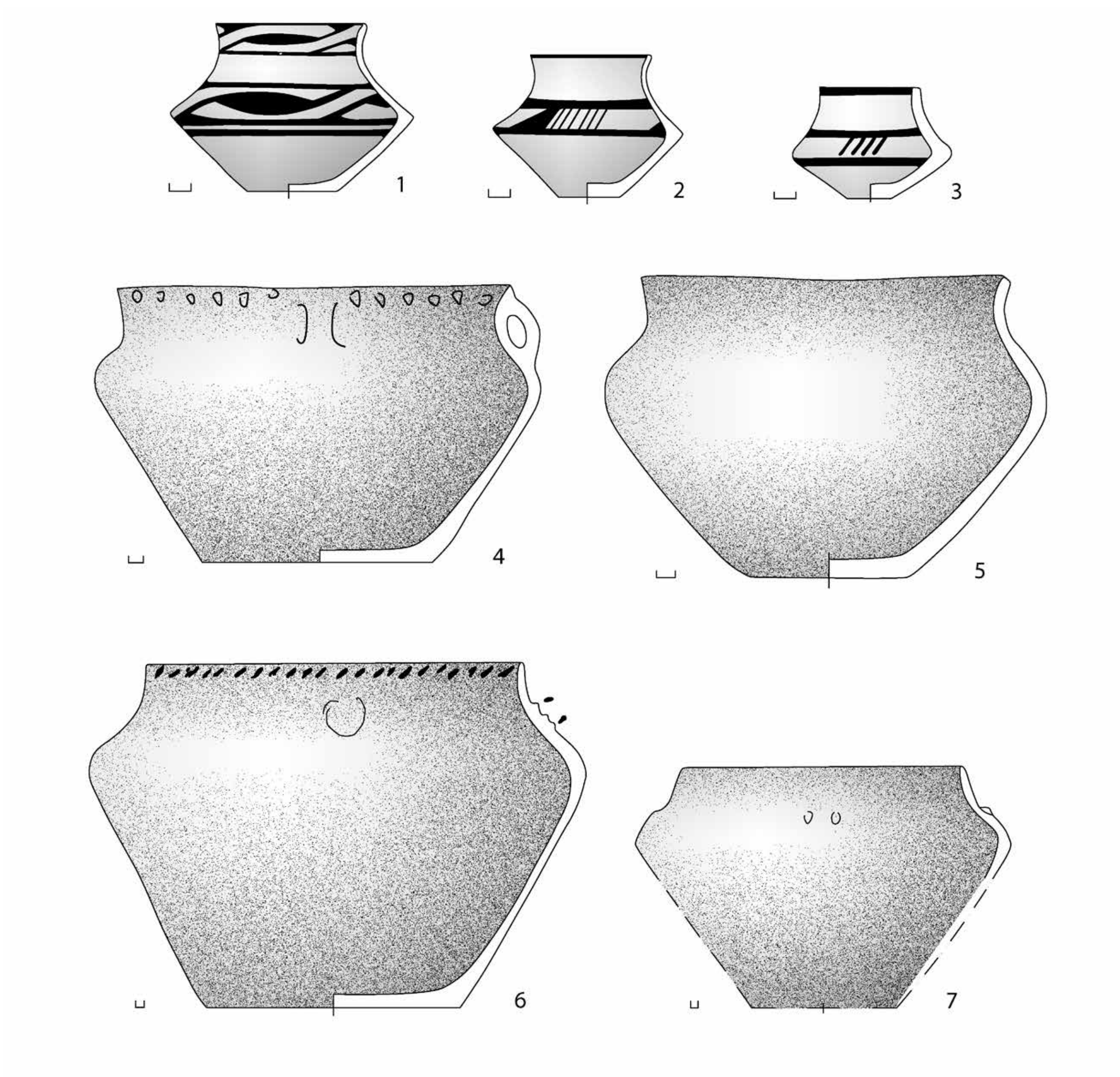


Plate 11. Talianki, house 29. Pottery types: goblet: 1; cups: 2-3; 'kitchen' pots: 4-7 (after Kruts et al. 2001, fig. 27: 2-5; fig. 29: 1, 4, 12).

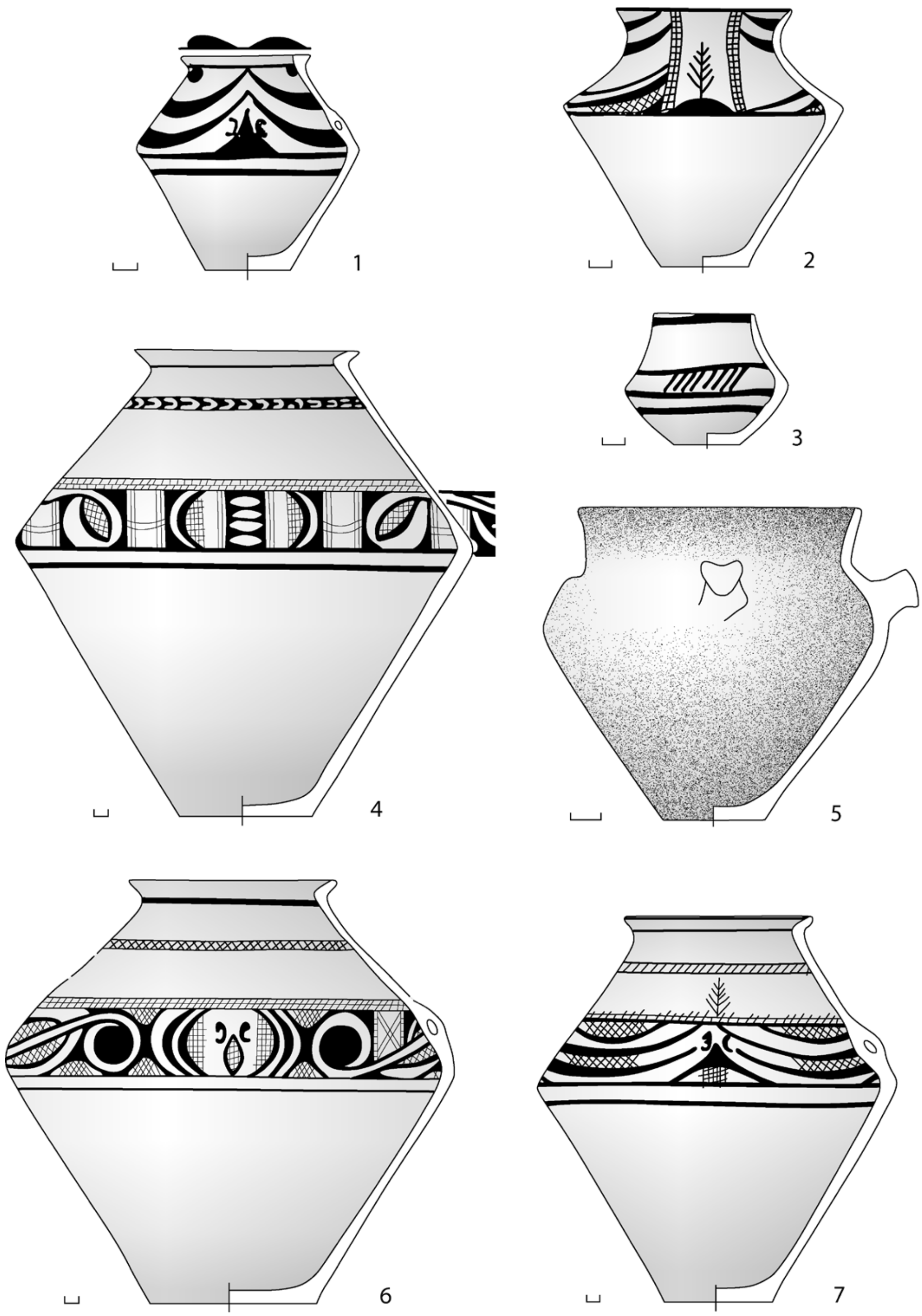


Plate 12. Talianki, house 30. Pottery types: 'biconical…' vessels: 1, 4, 6-7; goblet: 2; cup: 3; 'kitchen' pot: 5 (after Kruts et al. 2001, fig. 27: 8; fig. 28: 8, 14; fig. 40: 3, 5; fig. 41: 2-3).

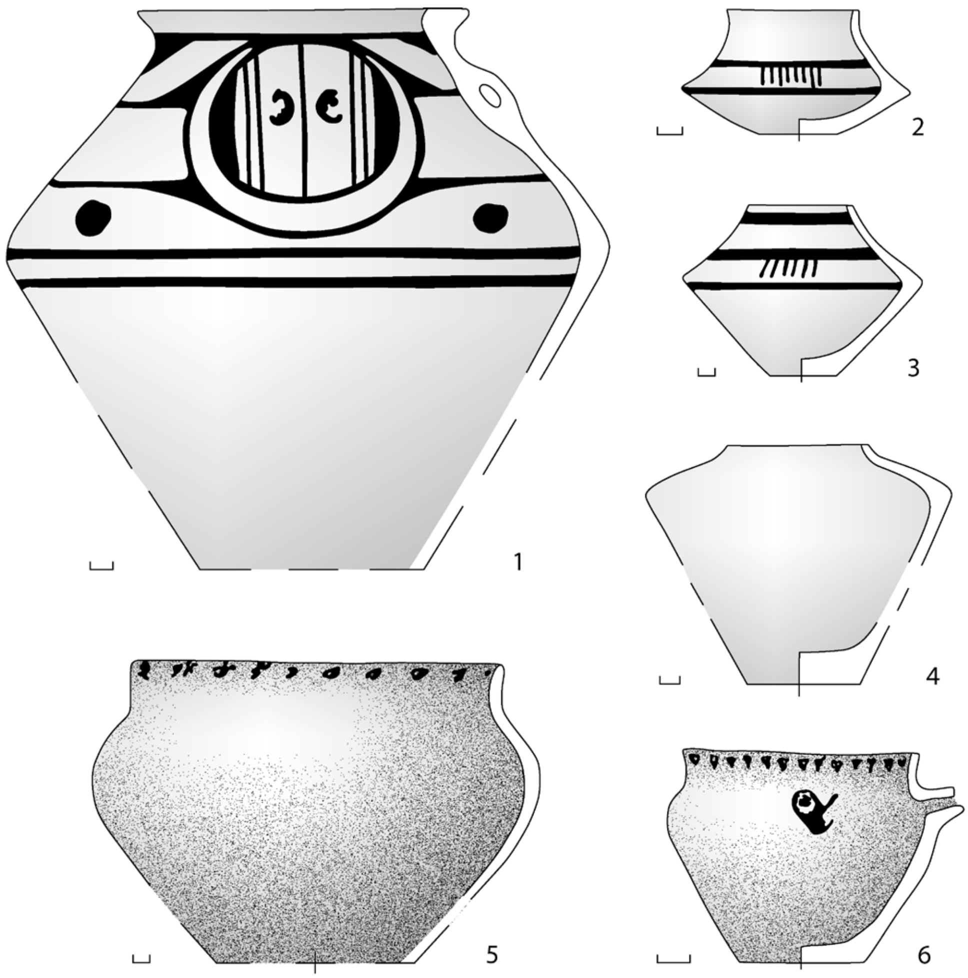


Plate 13. Talianki, house 31. Pottery types: 'biconical…' vessel: 1; cups: 2-3; pear-shaped vessel: 4; 'kitchen' pots: 5-6 (after Kruts et al. 2001, fig. 27: 6, 10; fig. 29: 6, 10; fig. 42: 3, 4).

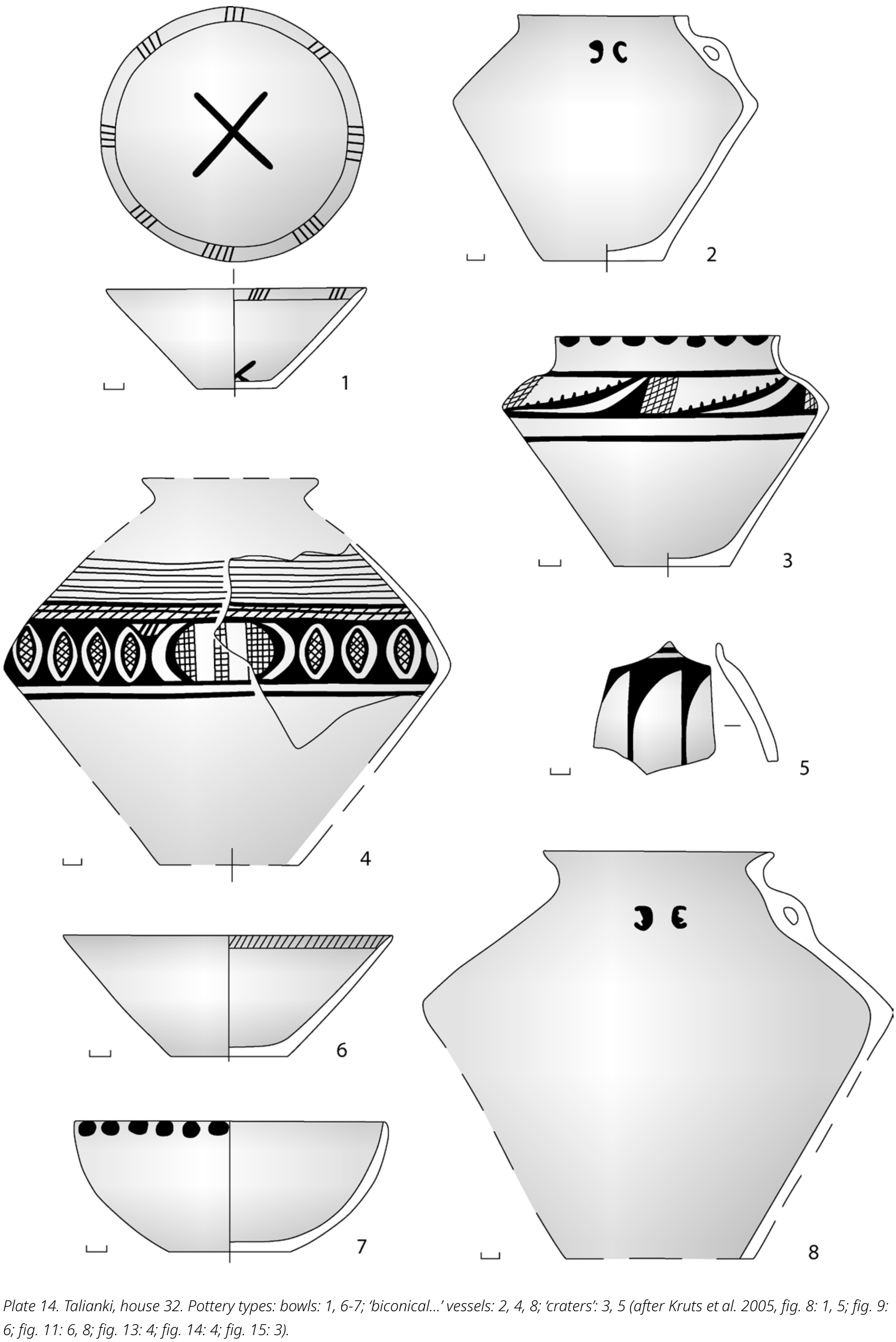


Plate 14. Talianki, house 32. Pottery types: bowls: 1, 6-7; 'biconical…' vessels: 2, 4, 8; 'craters': 3, 5 (after Kruts et al. 2005, fig. 8: 1, 5; fig. 9: 6; fig. 11: 6, 8; fig. 13: 4; fig. 14: 4; fig. 15: 3).

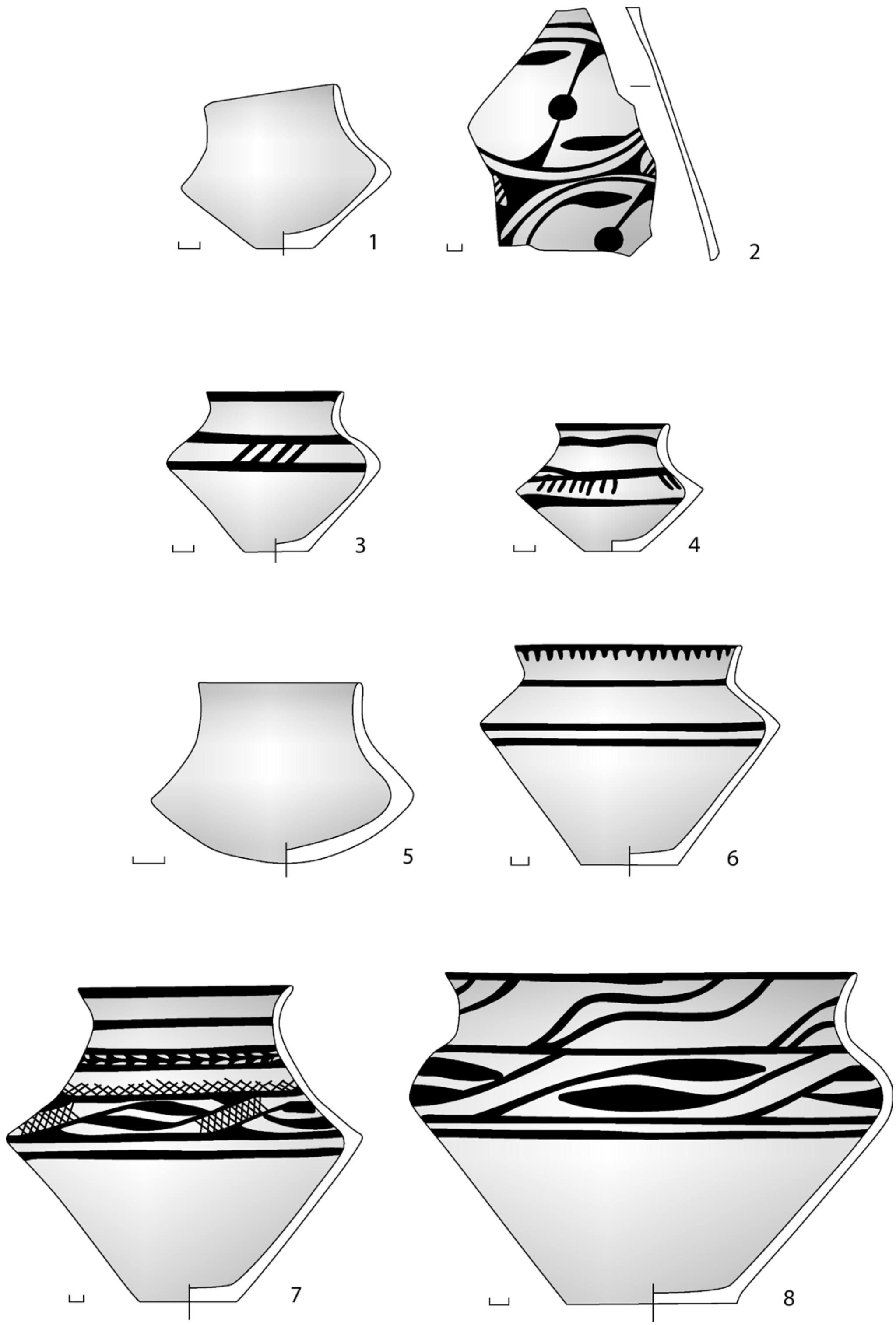


Plate 15. Talianki, house 32. Pottery types: cups: 1, 3-5; 'biconical...' vessel: 2; 'craters': 6-8; goblet: 7 (after Kruts et al. 2005, fig. 10: 3-6; fig. 11: 3; fig. 12: 5; fig. 15: 4).

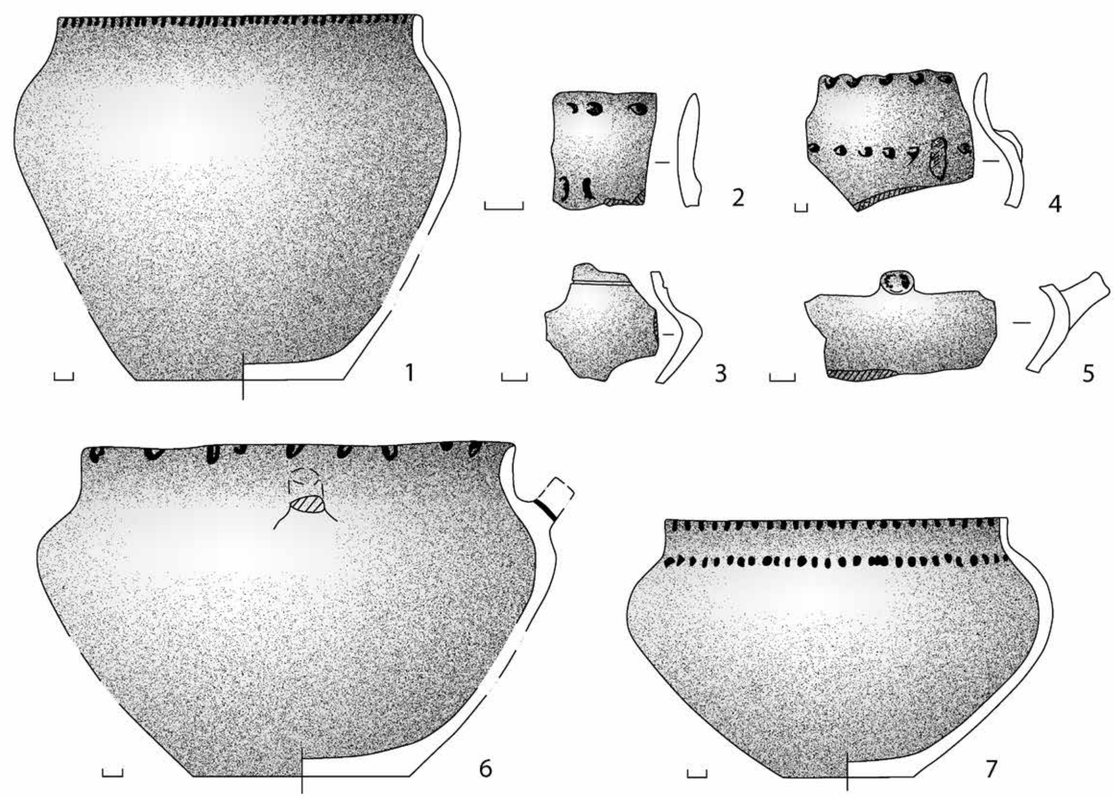


Plate 16. Talianki, house 33 (1-2, 4, 6-7) and house 32 (3, 5). Pottery types: 'kitchen' pots: 1-7 (after Kruts et al. 2005, fig. 7: 1-7).

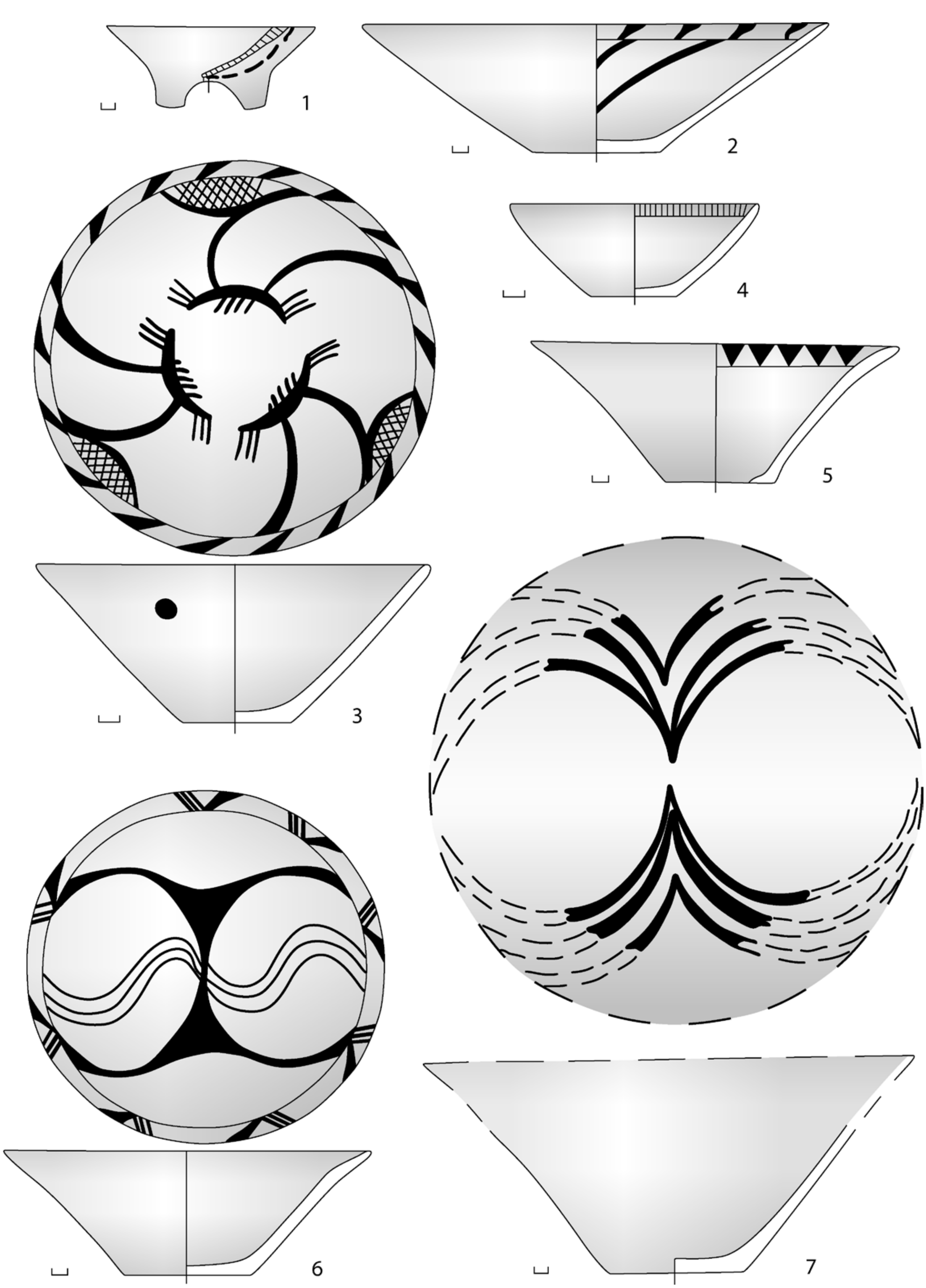


Plate 17. Talianki, house 33. Pottery types: bowls: 1-7 (after Kruts et al. 2005, fig. 8: 2-4, 6-8; fig. 9: 1).

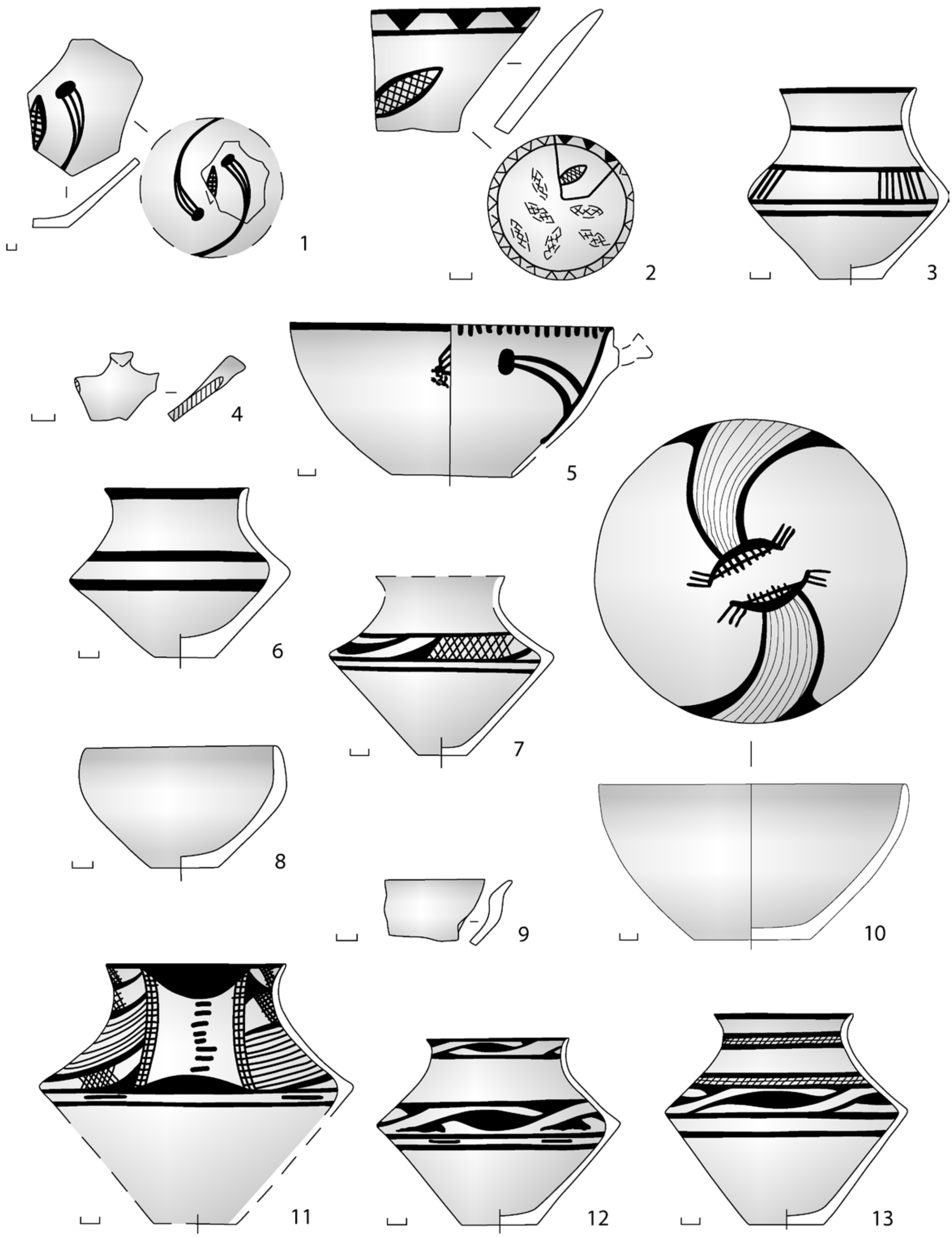


Plate 18. Talianki, house 33. Pottery types: bowls: 1-4, 7-9; cups: 5-6; goblets: 10-12 (after Kruts et al. 2005, fig. 9: 2-5, 7-8; fig. 10: 1, 7-8, 10; fig. 11: 1-2, 5).

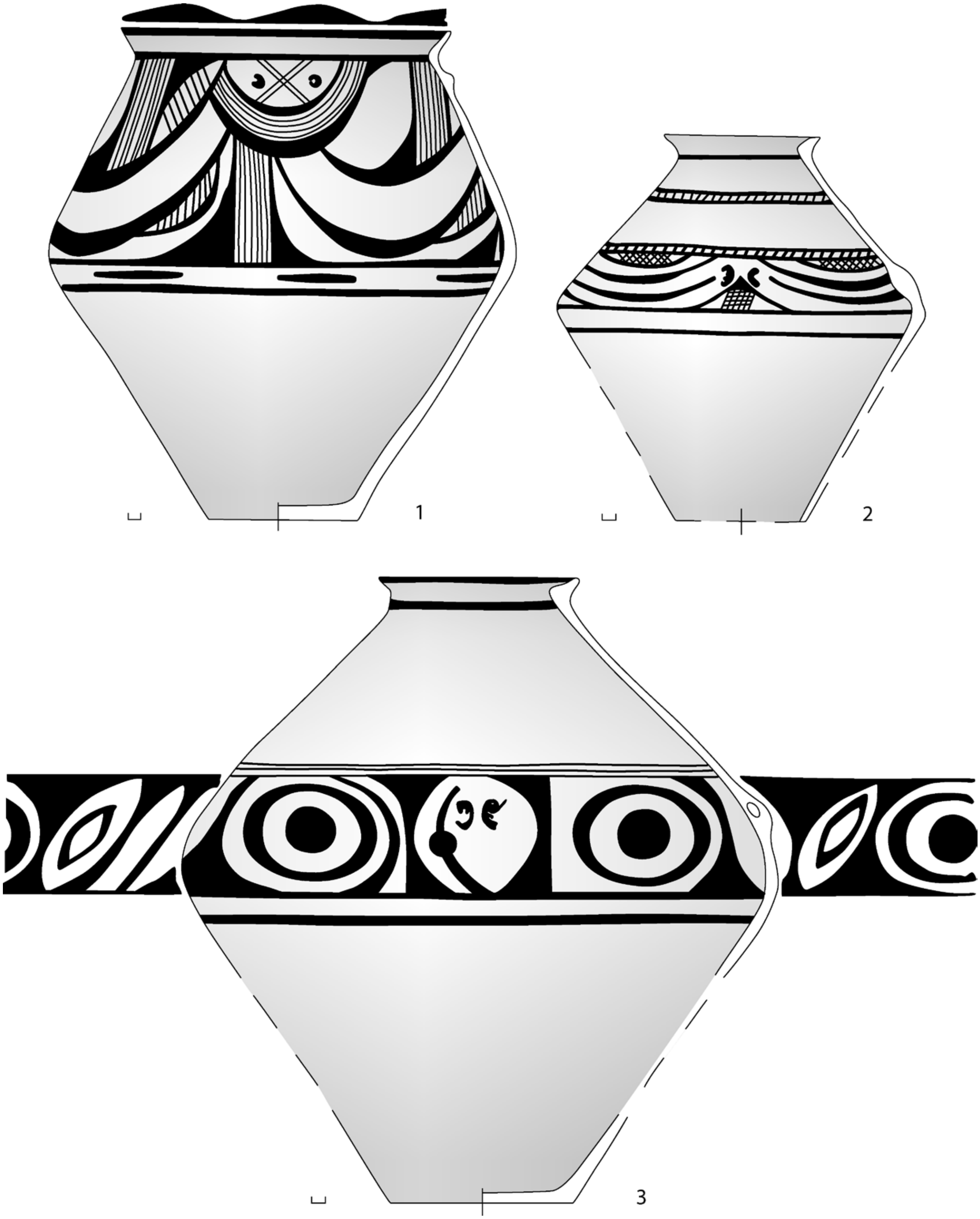


Plate 19. Talianki, house 33. Pottery types: 'biconical...' vessels: 1-3 (after Kruts et al. 2005, fig. 12: 3, 6; fig. 13: 5).

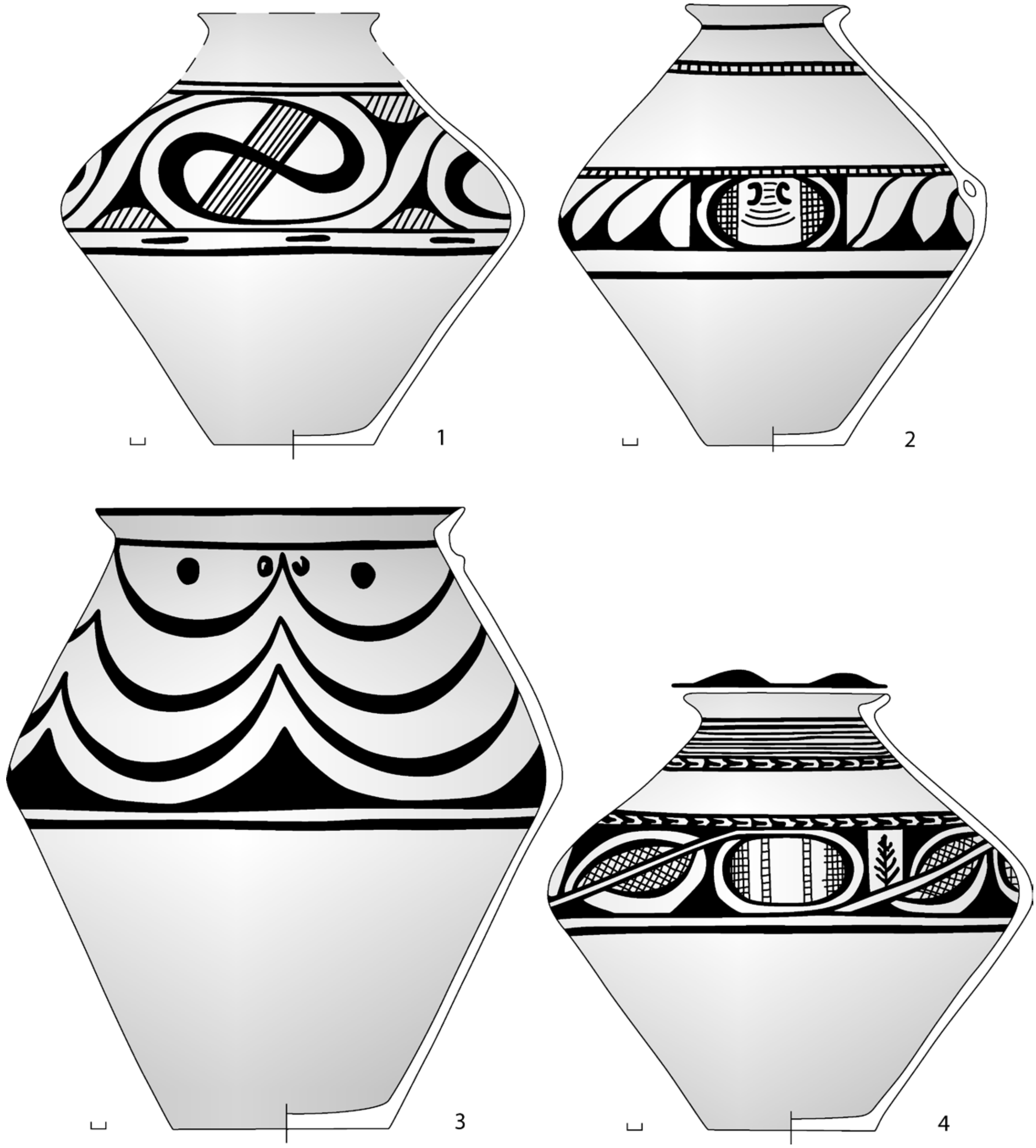


Plate 20. Talianki, house 33. Pottery types: 'biconical…' vessels: 1-4 (after Kruts et al. 2005, fig. 12: 7; fig. 13: 1-3).

Plate 21. Talianki, house 33. Pottery types: 'biconical...' vessels: 1, 3-5; pear-shaped vessel: 2 (after Kruts et al. 2005, fig. 11: 7; fig. 12: 1-2, 4; fig. 14: 5).

Plate 22. Talianki, house 33. Pottery types: goblet: 1; 'craters': 2-7 (after Kruts et al. 2005, fig. 11: 4; fig. 14: 1-3, 6; fig. 15: 2, 5, fig. 11: 4; fig. 14: 1-3, 6; fig. 15: 2, 5).

Plate 23. Talianki, house 34. Pottery types: 'biconical…' vessels: 1-3, 8, 11; bowls: 4-5, 7; goblet: 6; 'craters': 9-10 (after Korvin-Piotrovskiy and Menotti 2008, 90-92, fig. 3: 1-2, 4; fig. 4: 1, 3, 5-6; fig. 5: 1, 3-5).

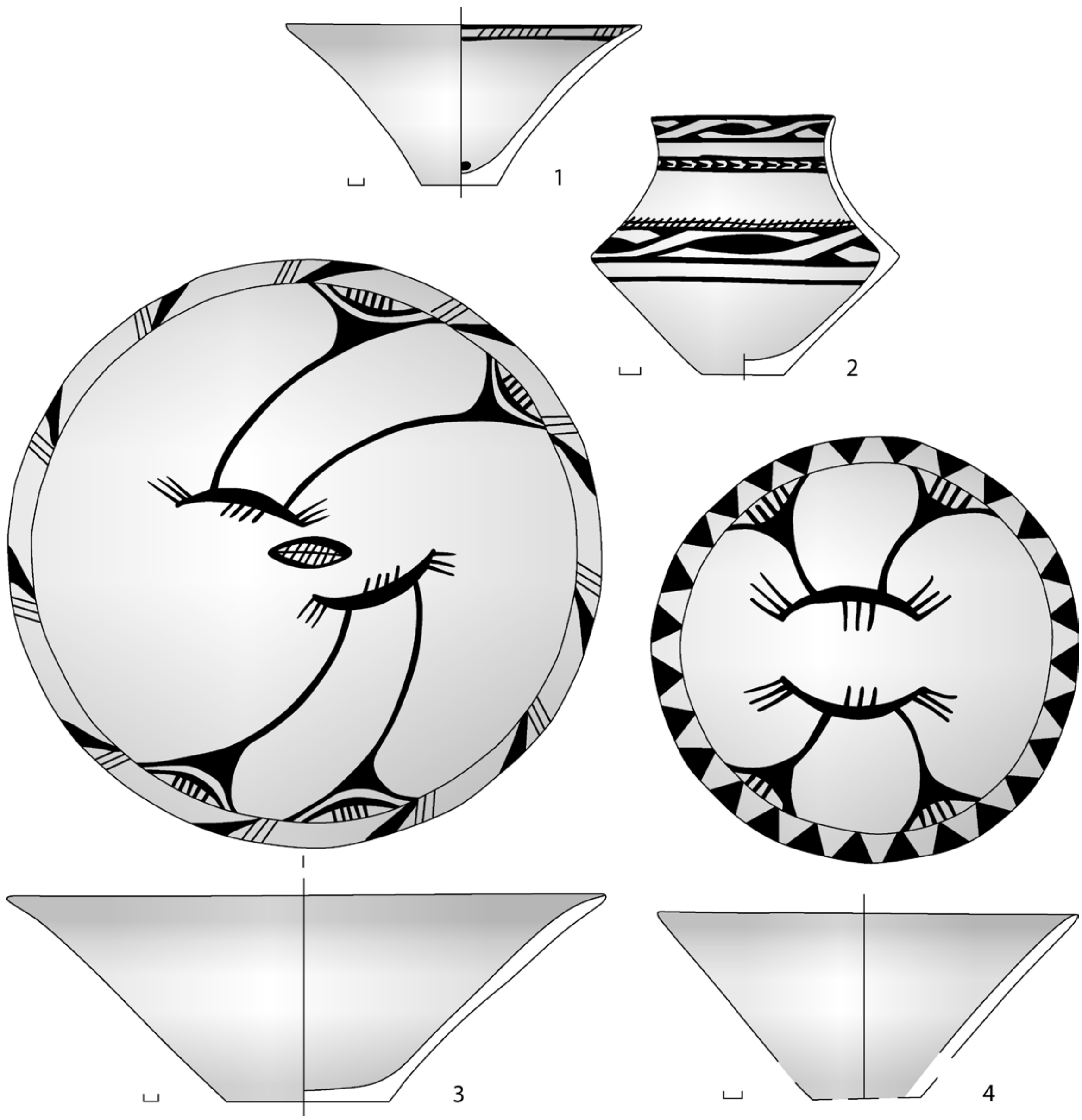


Plate 24. Talianki, house 35. Pottery types: bowls: 1, 3-4; goblet: 2 (after Korvin-Piotrovskiy and Menotti 2008, 90-91, fig. 3: 3, 5-6; fig. 4: 2).

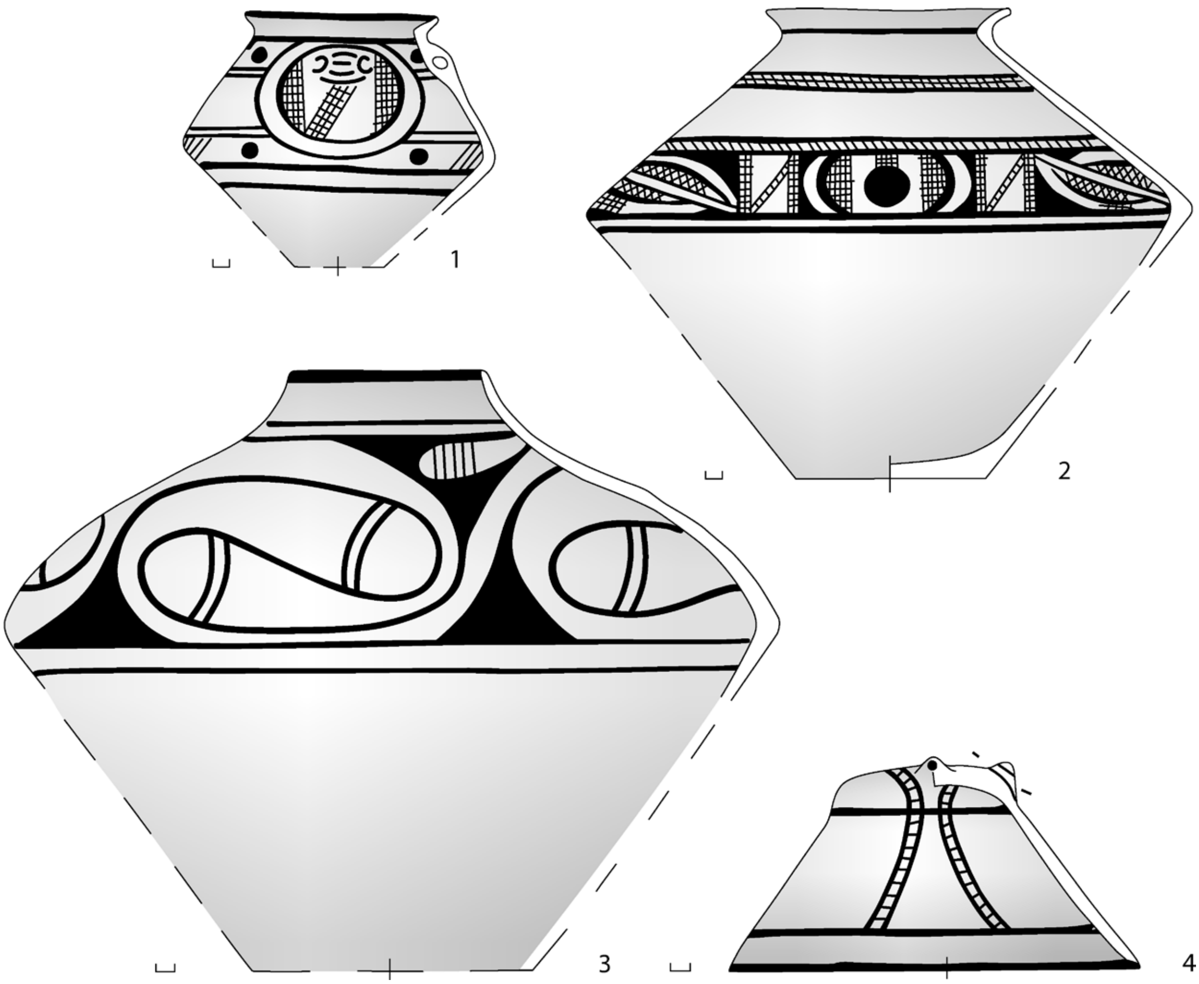


Plate 25. Talianki, house 35. Pottery types: 'biconical...' vessels: 1-2; pear-shaped vessel: 3; lid: 4 (after Korvin-Piotrovskiy and Menotti 2008, 91-92, fig. 4: 4; fig. 5: 2, 6-7).

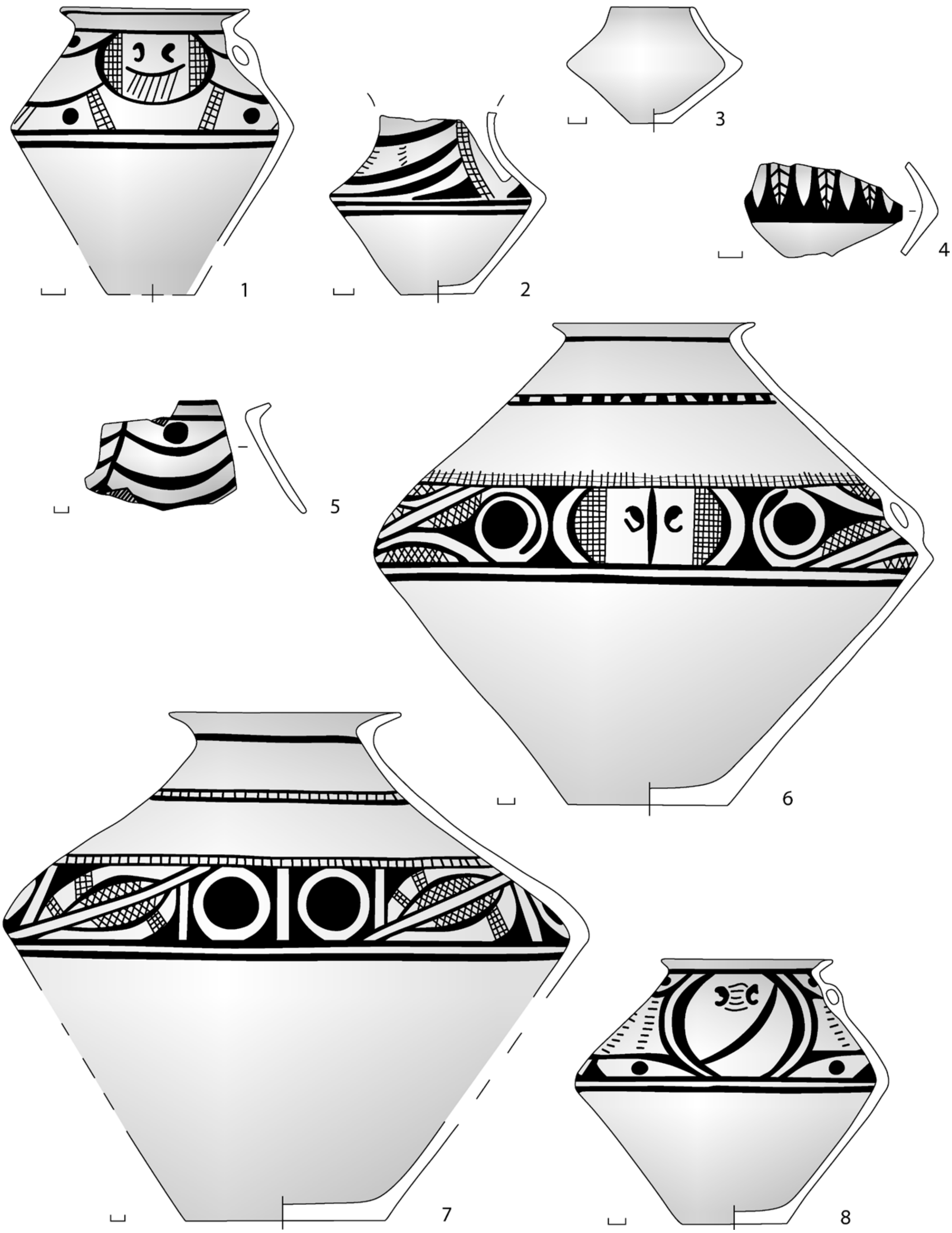


Plate 26. Talianki, house 36 (1-4) and house 37 (5-8). Pottery types: 'biconical...' vessels: 1, 4-8; goblet: 2; cup: 3 (after Korvin-Piotrovskiy and Menotti 2008, 103-104, fig. 17: 2, 5, 7-8; fig. 18: 1-4).

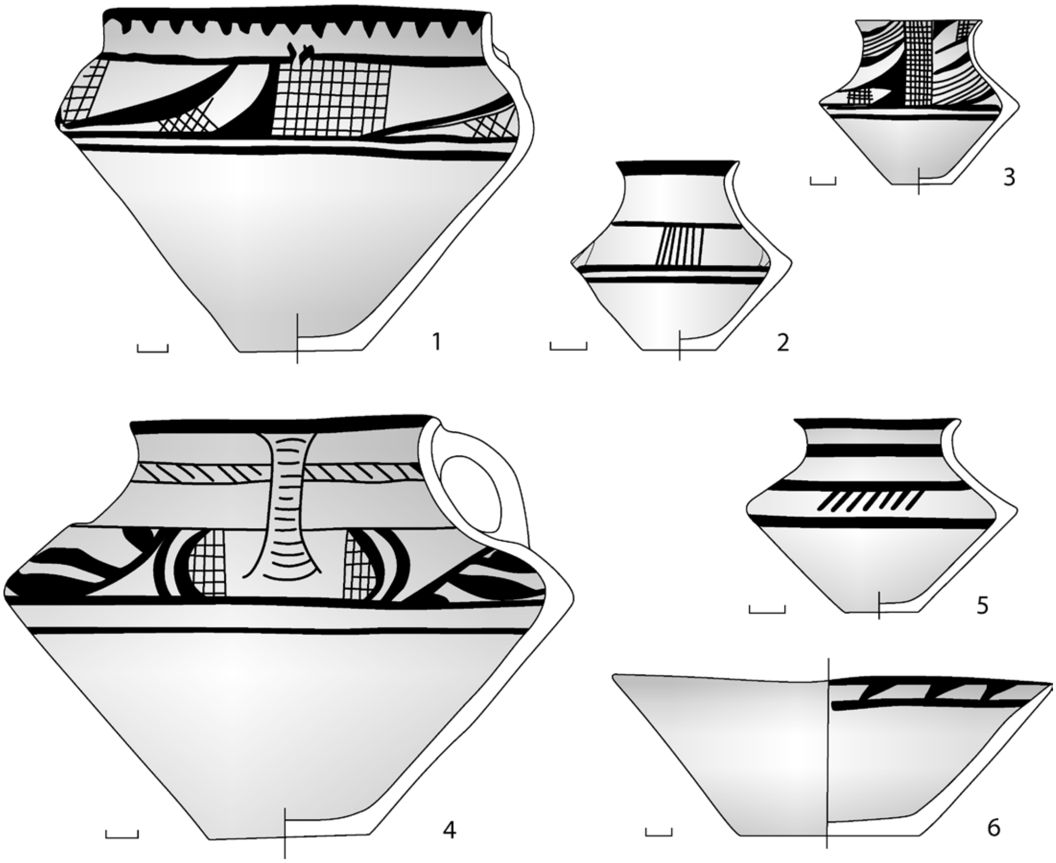


Plate 27. Talianki, house 38. Pottery types: 'crater': 1, 4; cups: 2, 5; goblet: 3; bowl: 6 (after Korvin-Piotrovskiy and Menotti 2008, 122-123, fig. 4: 1, 5-6, 8; fig. 5: 4, 7).

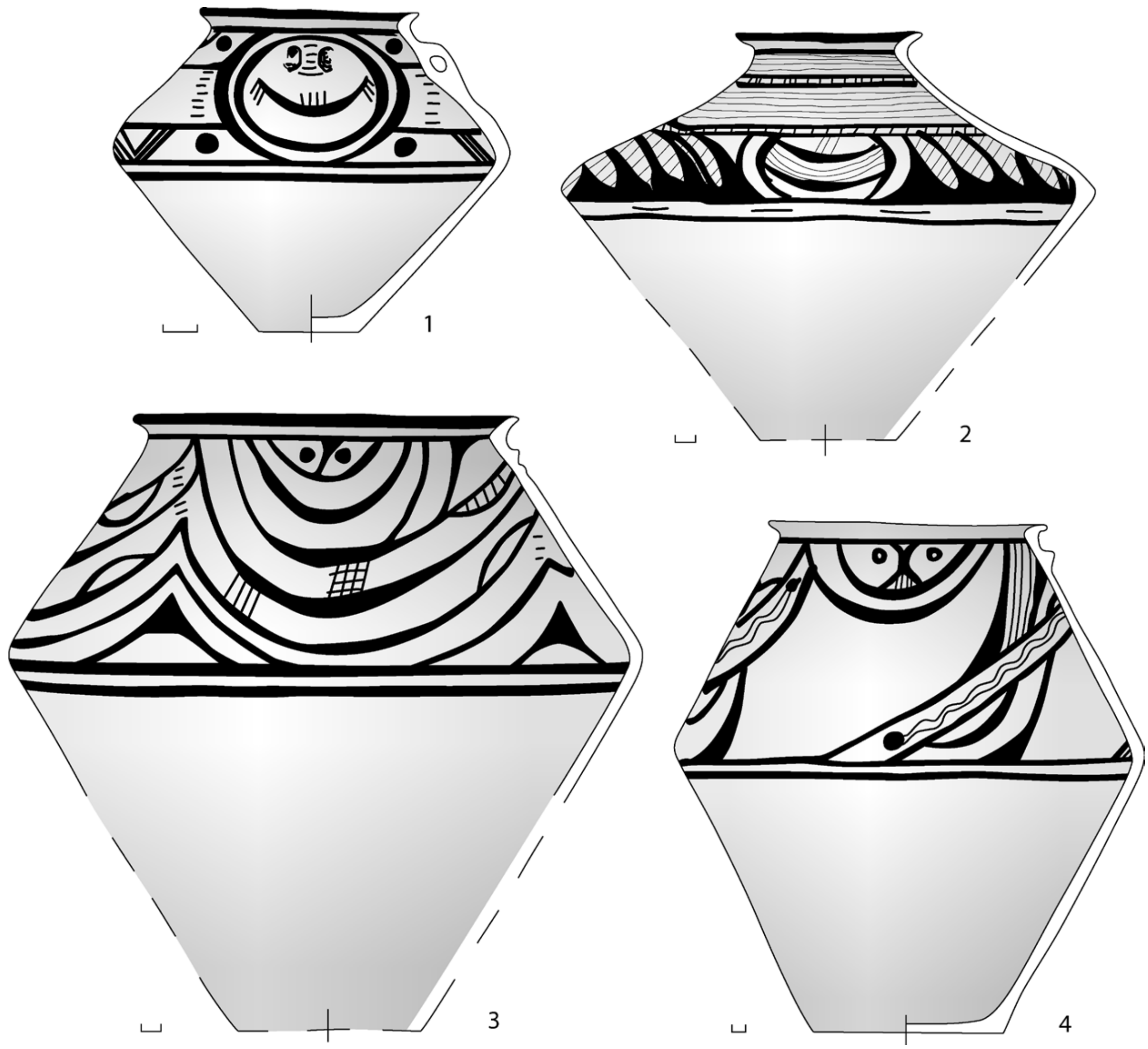


Plate 28. Talianki, house 39. Pottery types: 'biconical...' vessels: 1-4 (after Korvin-Piotrovskiy and Menotti 2008, 122-123, fig. 4: 9; fig. 5: 1-3).

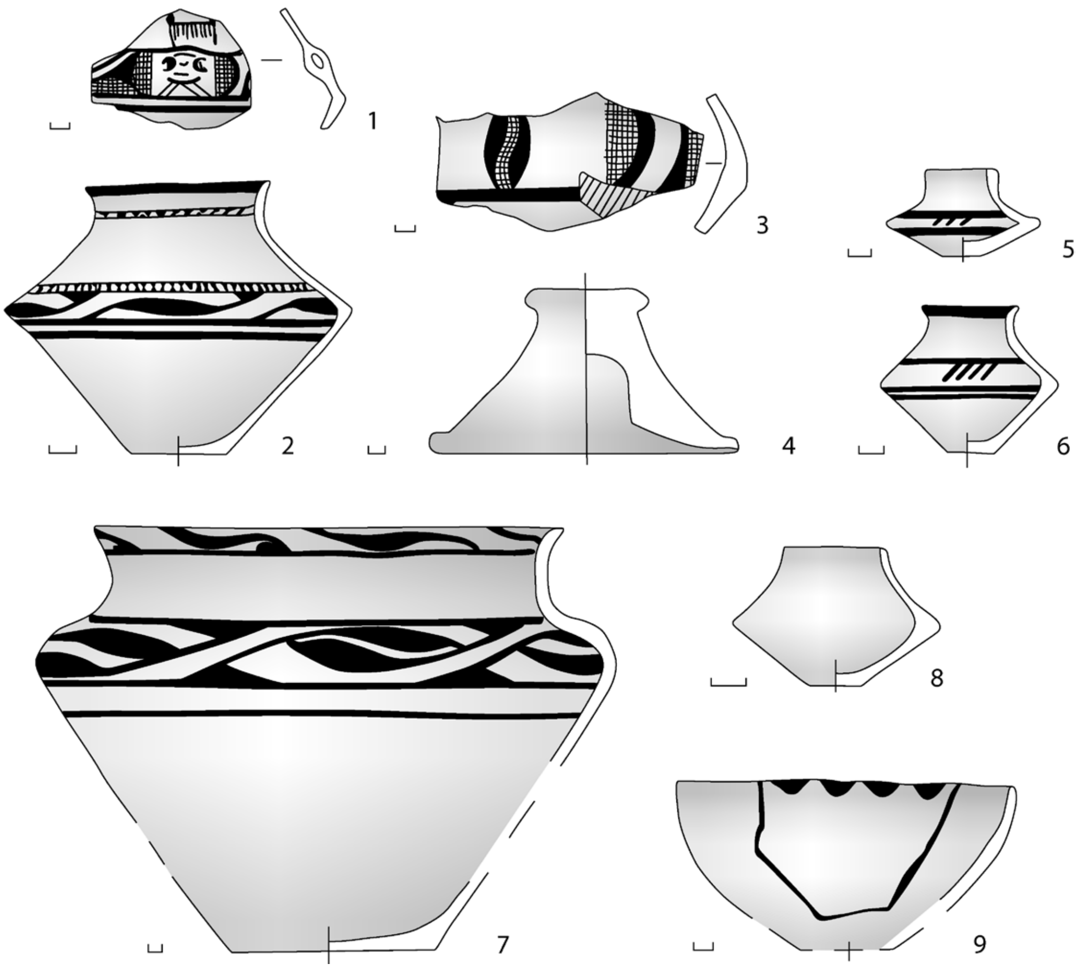


Plate 29. Talianki, house 39. Pottery types: 'biconical…' vessels: 1,3; goblet: 2; lid: 4; cups: 5-6, 8; 'crater': 7; bowl: 9 (after Korvin-Piotrovskiy and Menotti 2008, 122-123, fig. 4: 2-4, 7, 10-12; fig. 5: 5).

Plate 30. Talianki, house 40. Pottery types: bowls: 1-2, 7-8, 12; goblets: 1-4, 13; 'biconical…' vessel: 5; 'craters': 6, 9, 11; cup: 10 (after Kruts et al. 2008, fig. 35: 1; fig. 36: 1-2, 4-5; fig- 37: 4, 7, 10-11; fig. 38: 6; fig. 39: 3-5).

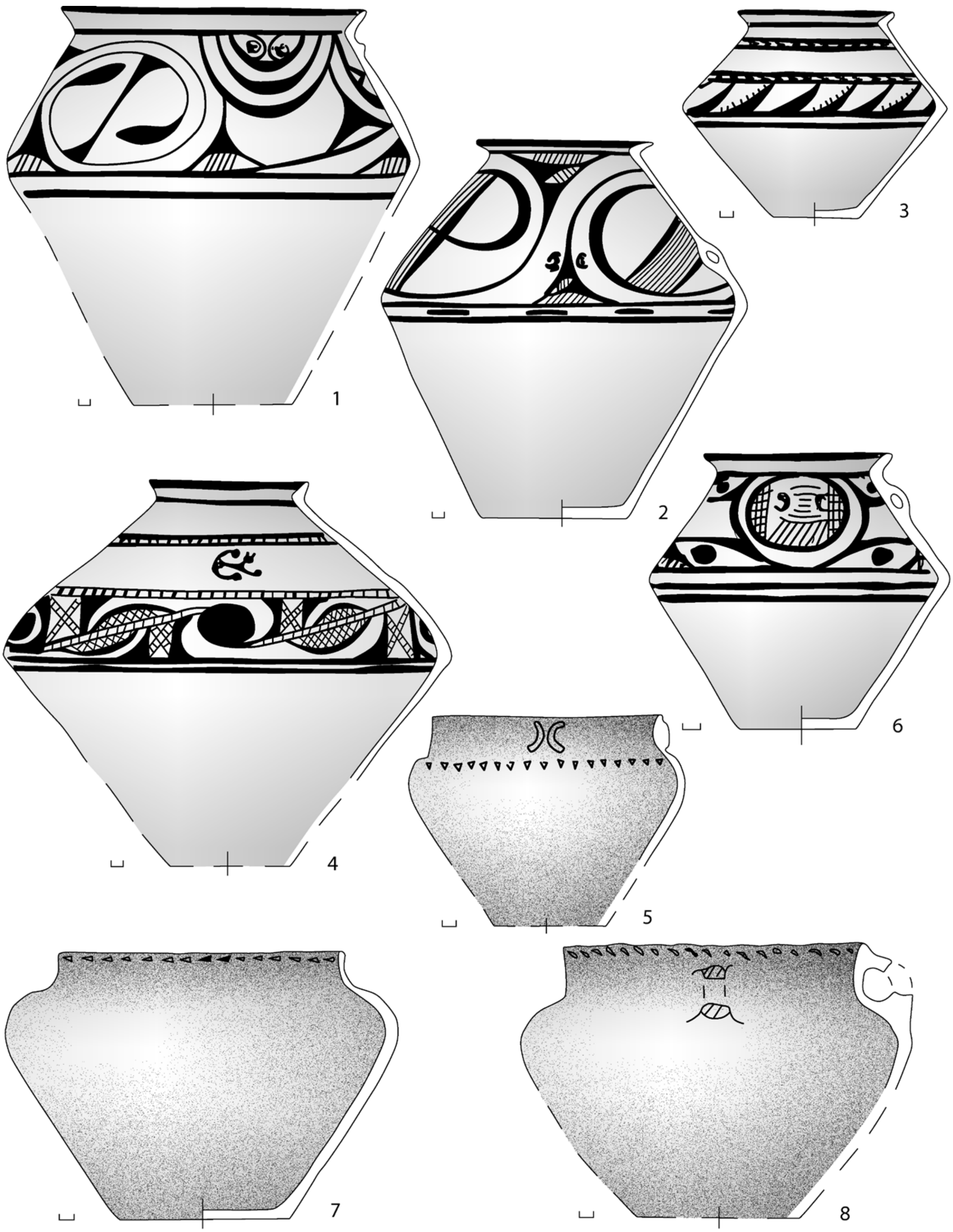


Plate 31. Talianki, house 40. Pottery types: 'biconical…' vessels: 1-4, 6; 'kitchen' pots: 5, 7-8 (after Kruts et al. 2008, fig. 35: 2-3, 8; fig. 38: 1-3, 5; fig. 39: 1).

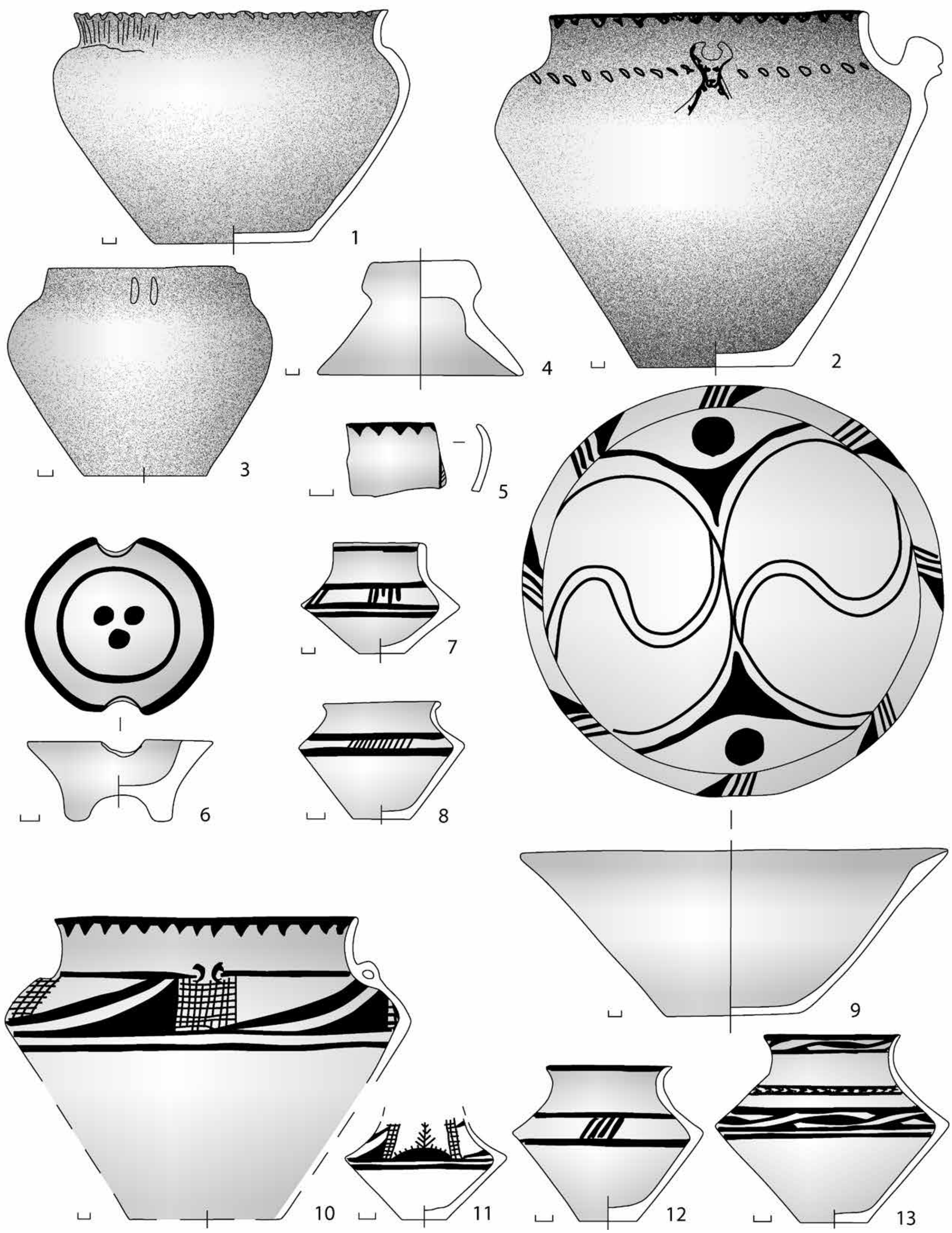


Plate 32. Talianki, house 41. Pottery types: 'kitchen' pots: 1-3; lid: 4; bowls: 5-6, 9; cups: 7-8, 12; 'crater': 10; goblets: 11, 13 (after Kruts et al. 2008, fig. 35: 5-7; fig- 36: 3, 6-7; fg. 37: 1-3, 8-9; fig. 39: 2, 6).

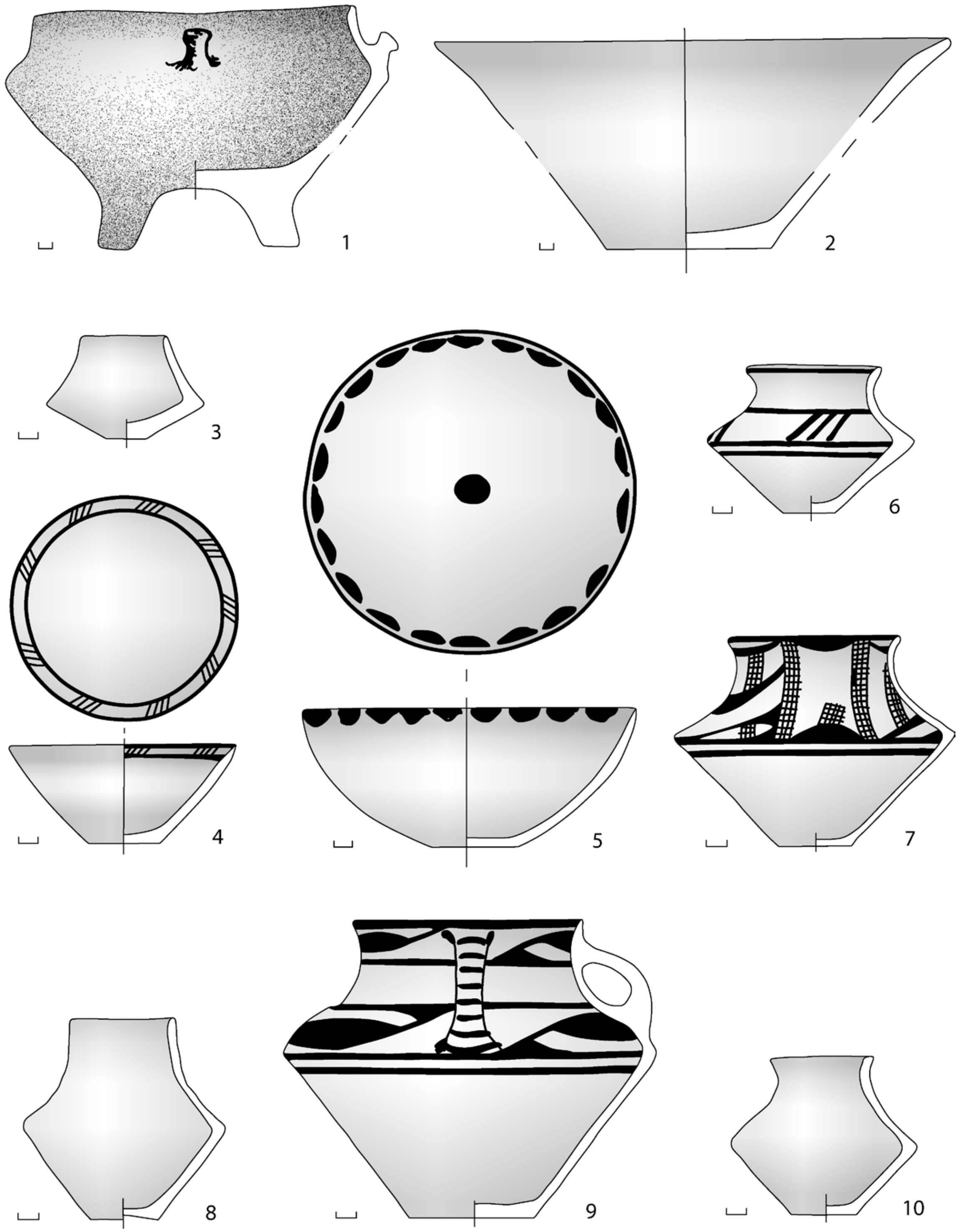


Plate 33. Talianki, house 42. Pottery types: 'kitchen' pot: 1; bowls: 2, 4-5; cups: 3, 6, 8, 10; goblet: 7; 'crater': 9 (after Kruts et al. 2009, fig. 1: 1-8; fig. 2: 1, 6).

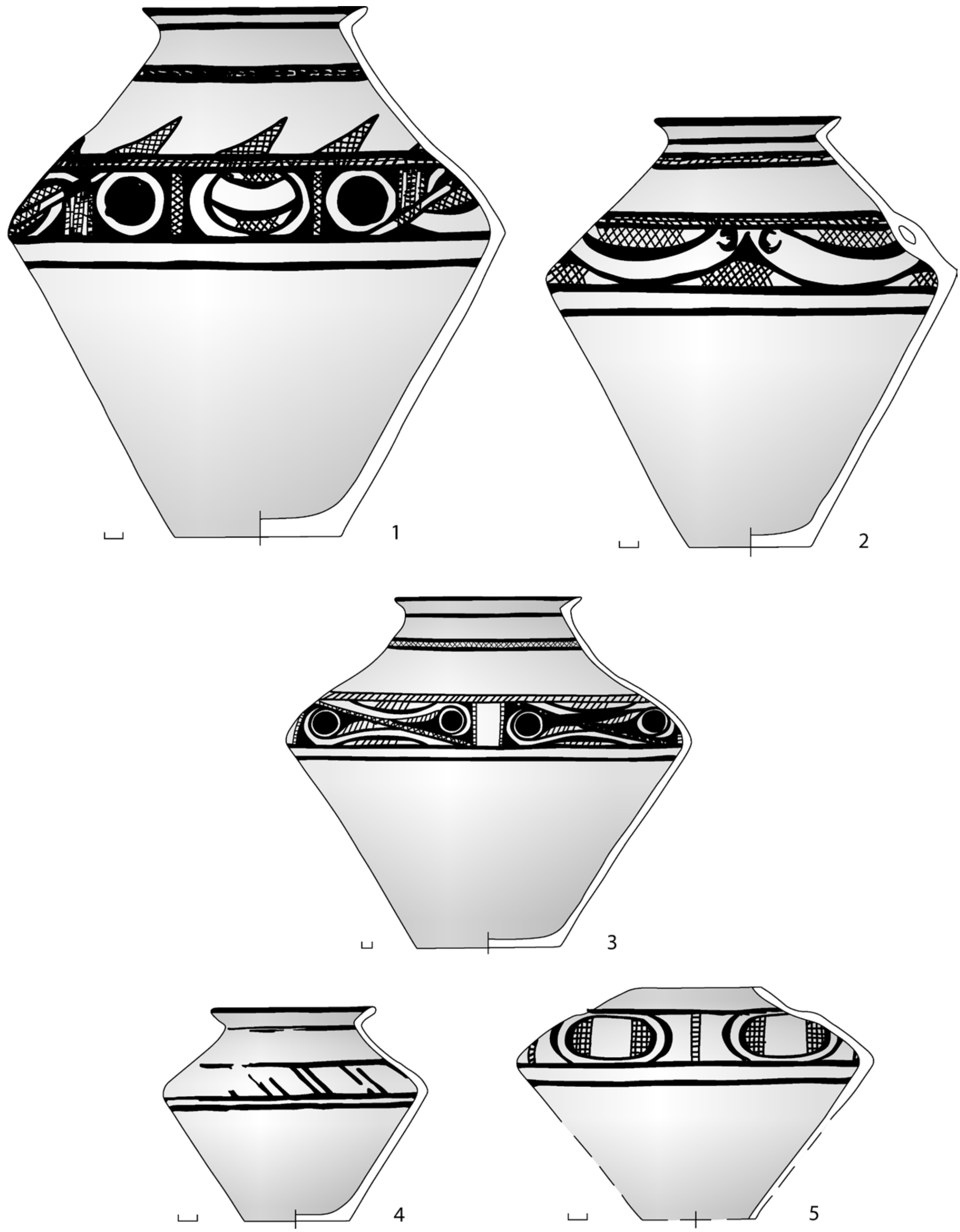


Plate 34. Talianki, house 42. Pottery types: 'biconical…' vessels: 1-4; pear-shaped vessel: 5 (after Kruts et al. 2009, fig. 2: 2-5; fig. 3: 1).

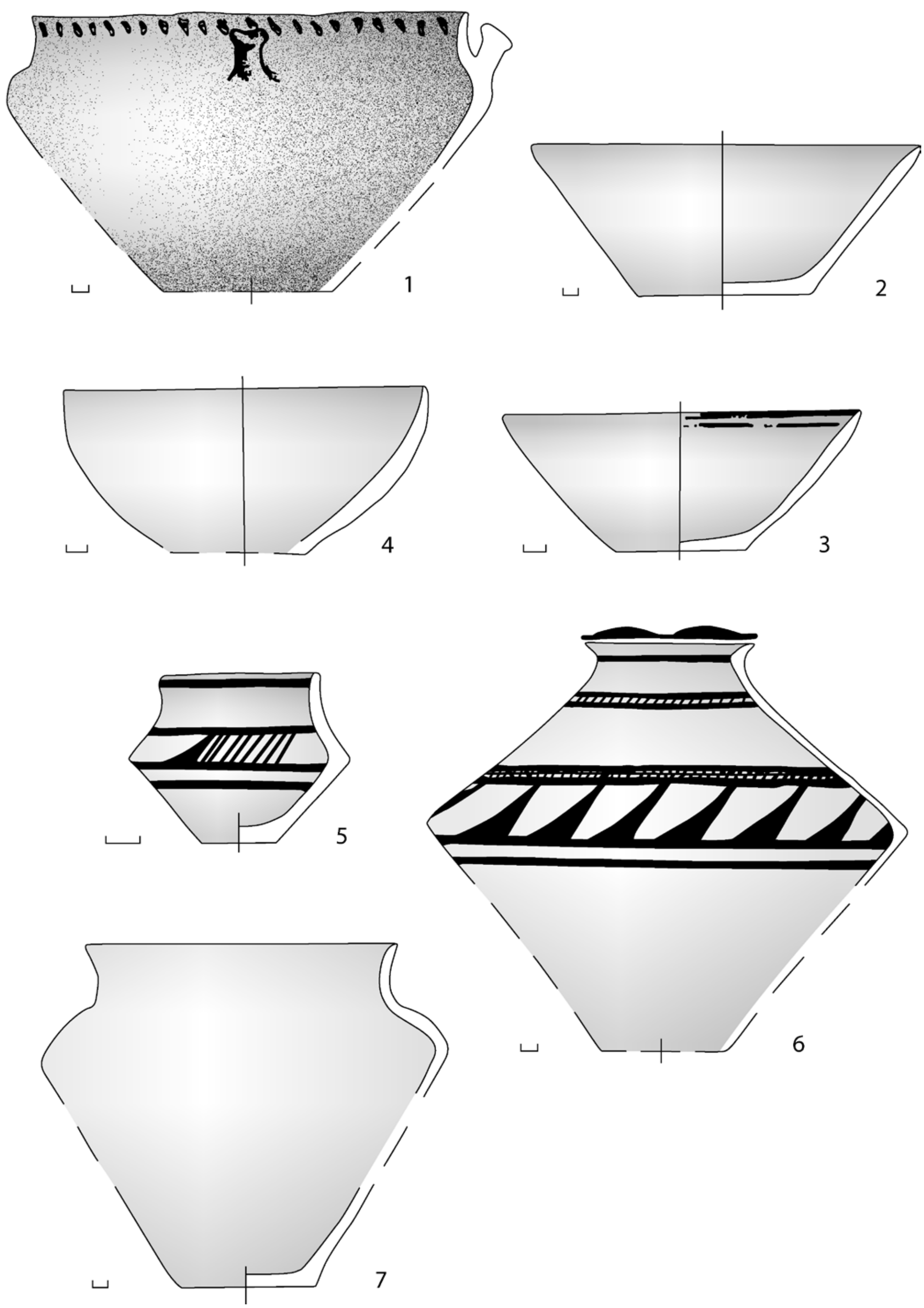


Plate 35. Talianki, house 43. Pottery types: 'kitchen' pot: 1; bowls: 2-4; cup: 5; 'biconical…' vessel: 6; 'crater': 7 (after Kruts et al. 2009, fig. 4: 1-7).

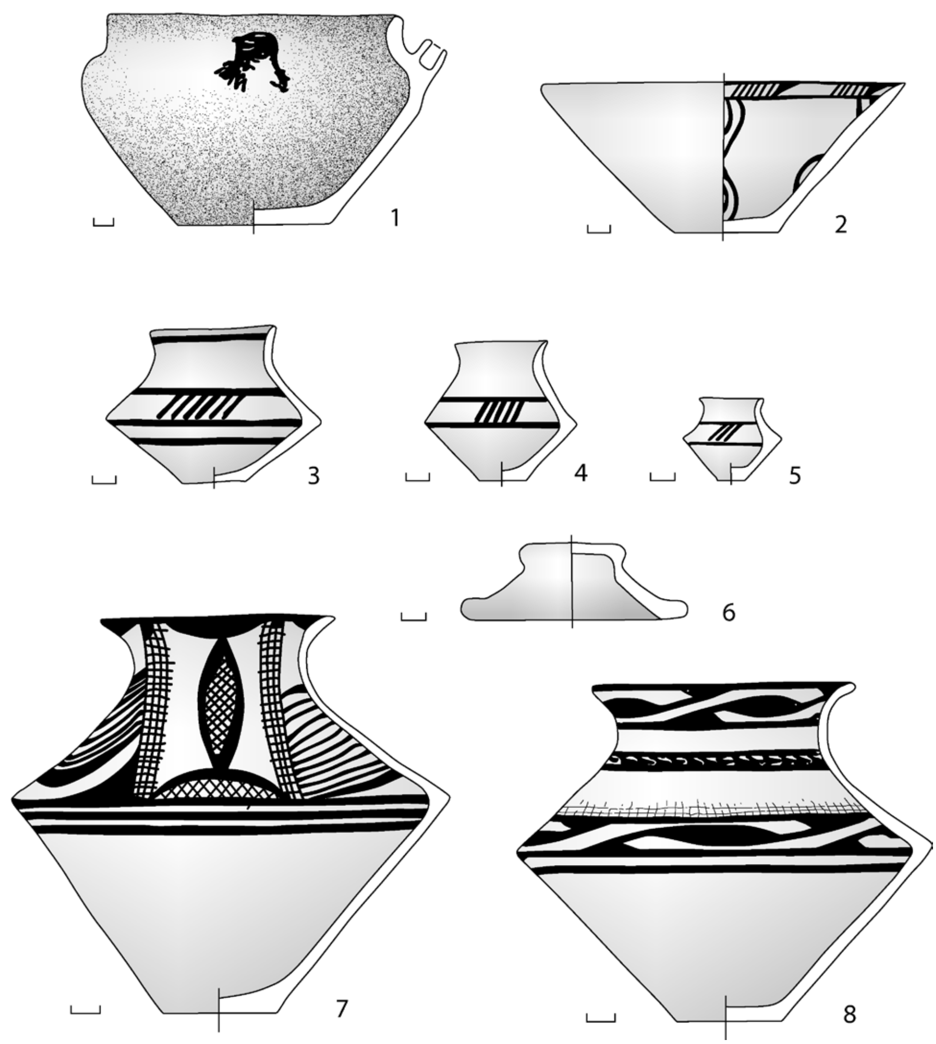


Plate 36. Talianki, house 45. Pottery types: 'kitchen' pot: 1; bowl: 2; cups: 3-5; lid: 6; goblets: 7-8 (after Kruts et al. 2011, fig. 46: 1, 3-5, 8-9; fig. 47: 4).

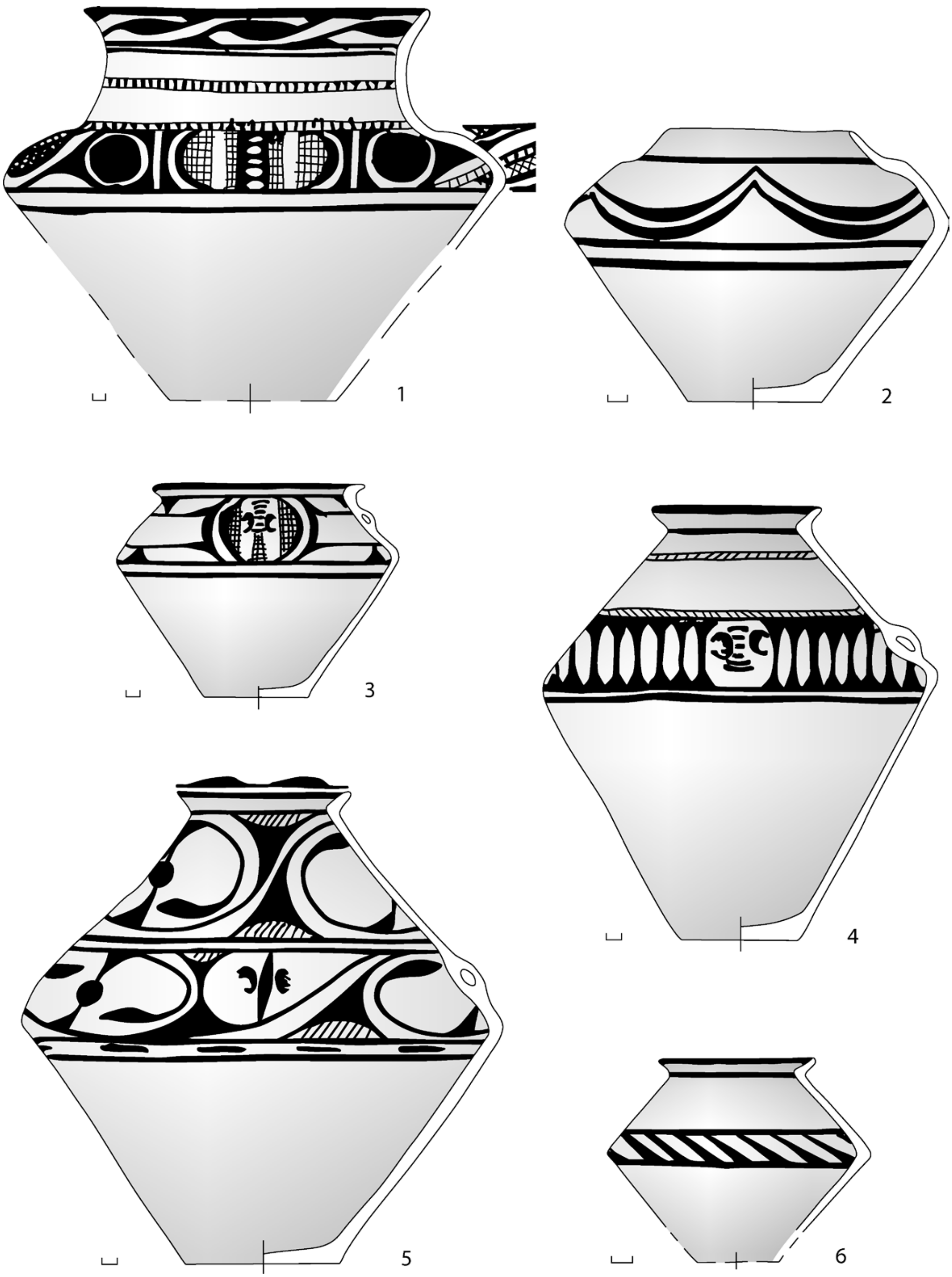


Plate 37. Talianki, house 45. Pottery types: 'crater': 1; pear-shaped Bessel: 2; 'biconical...' vessels: 3-6 (after Kruts et al. 2011, fig. 46: 10; fig. 47: 1-3, 5-6).

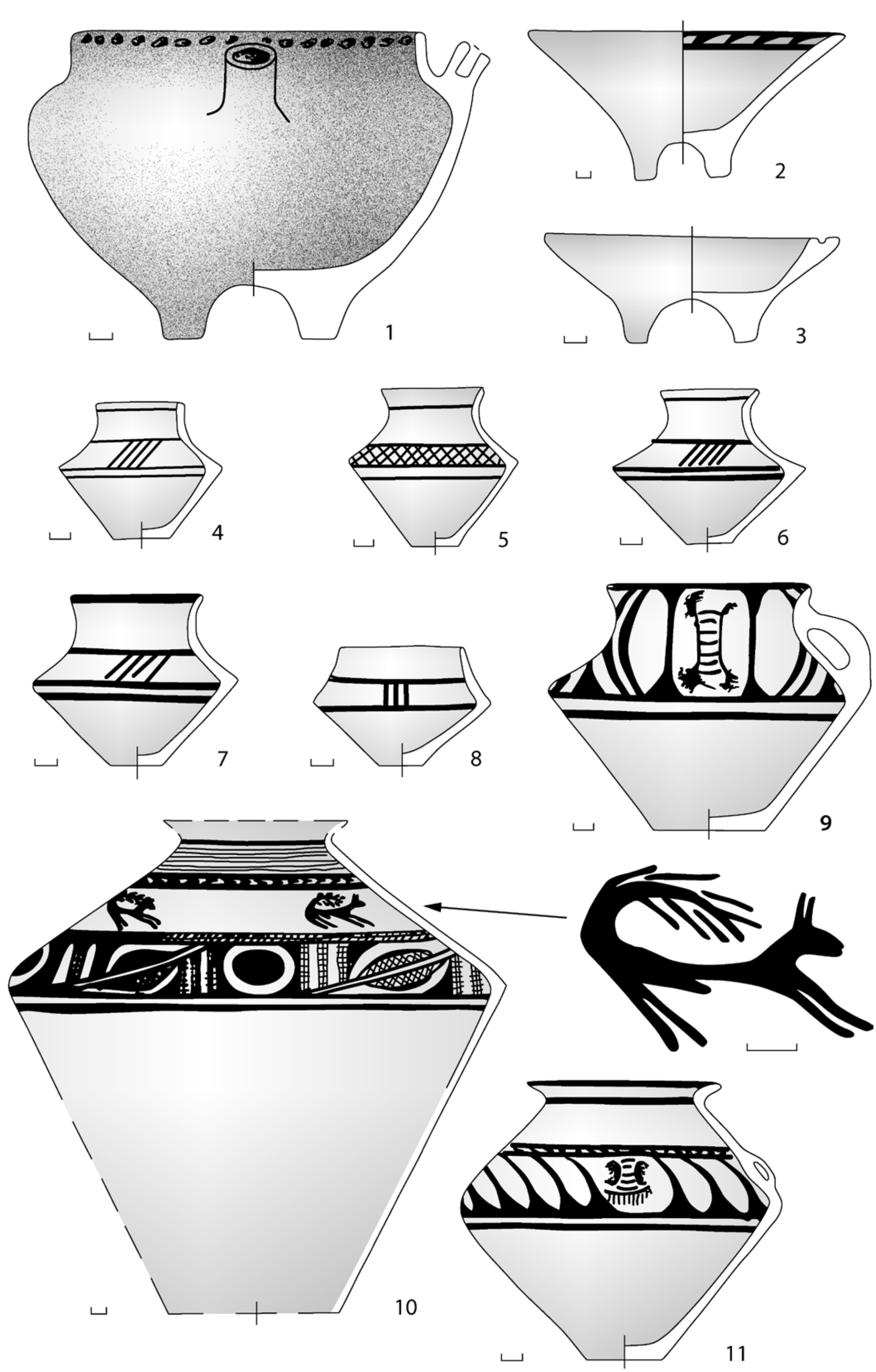


Plate 38. Talianki, house 46. Pottery types: 'kitchen' pot: 1; bowls: 2-3; cups: 4-8; goblet: 9; 'biconical...' vessels: 10-11 (after Kruts et al. 2011, fig. 48: 1-10; fig. 49: 1).

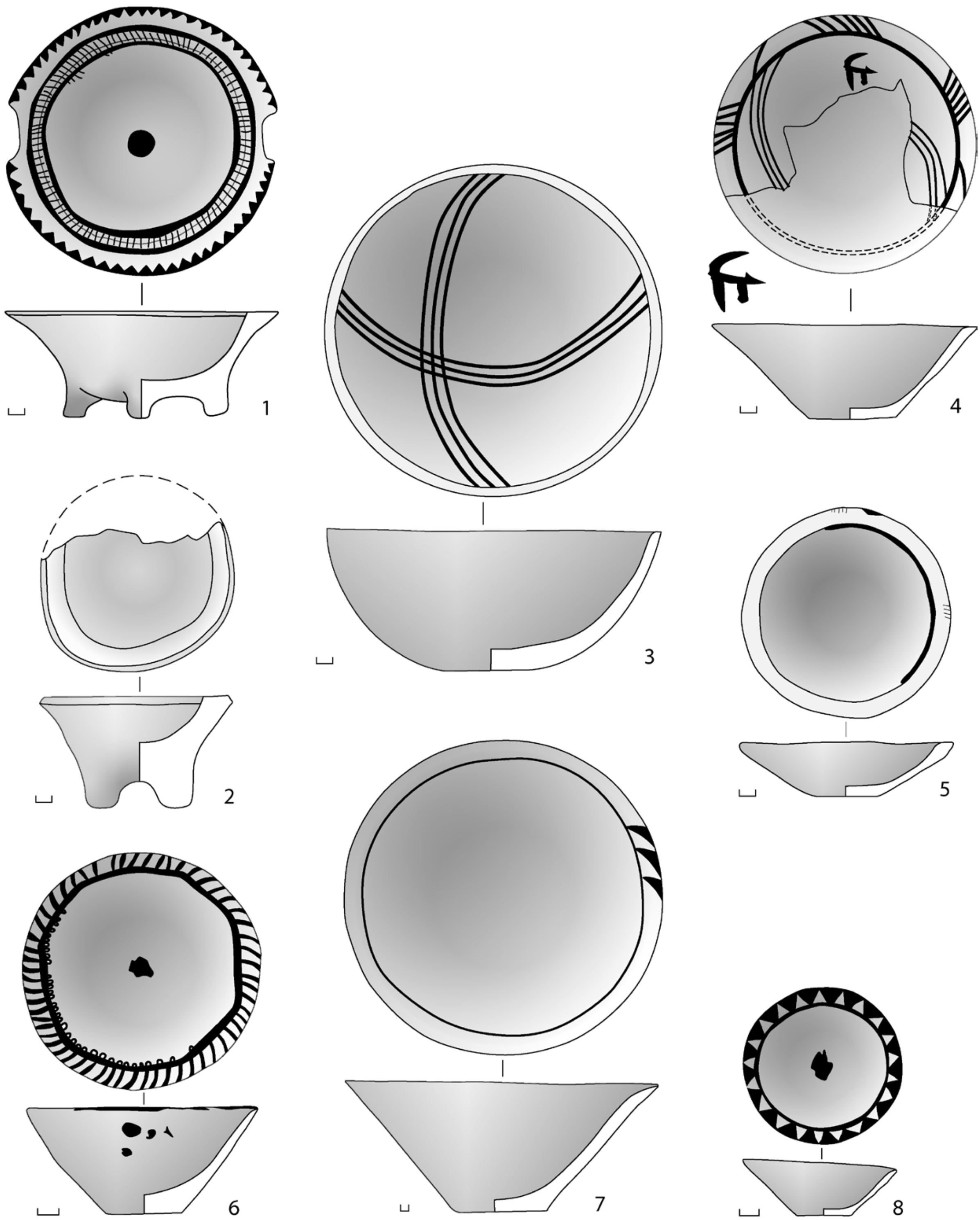


Plate 39. Talianki, house 47. Pottery types: bowls: 1-8 (after Kruts et al. 2013, fig. 38: 1, 3-6, 8-10).

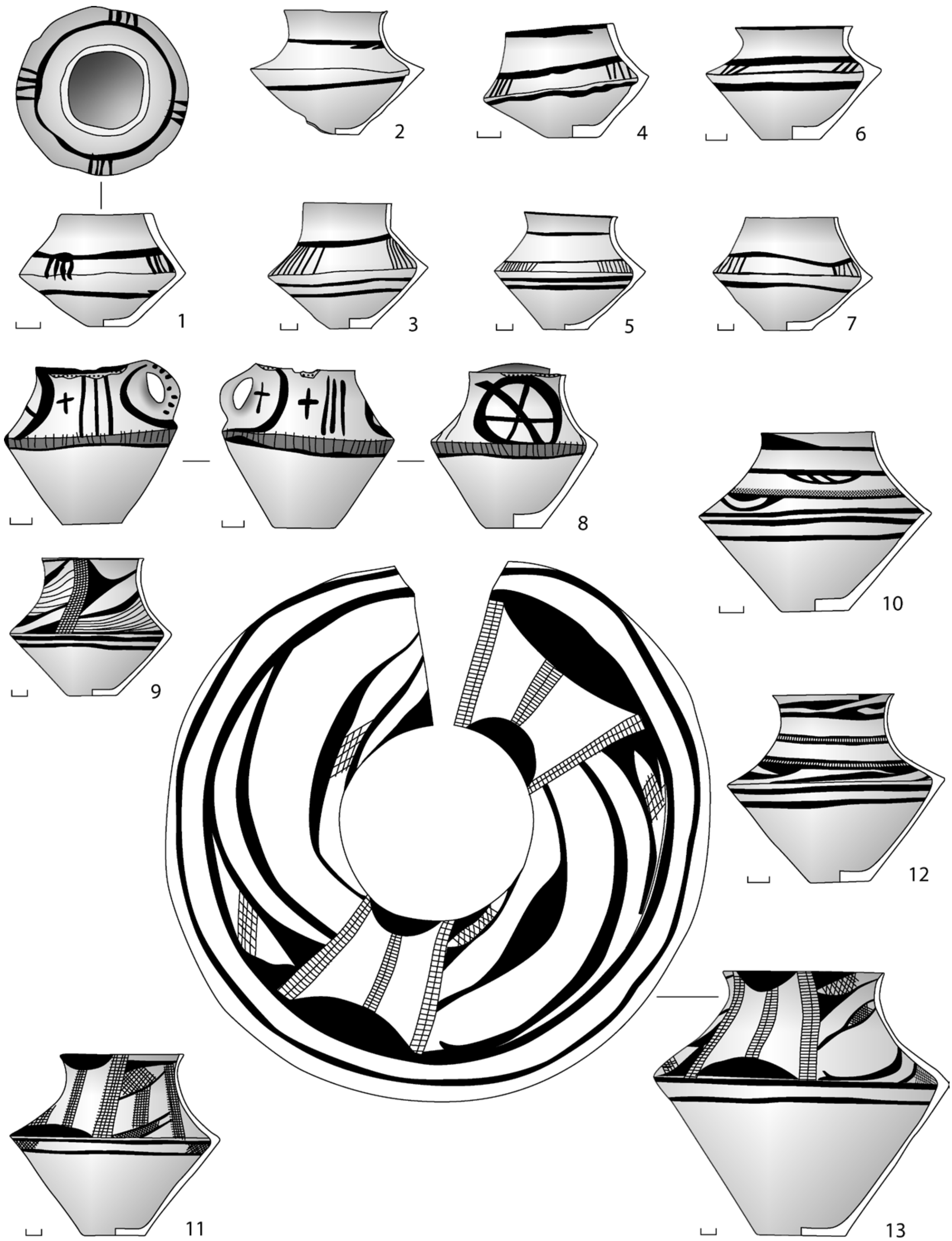


Plate 40. Talianki, house 47. Pottery types: cups: 1-7; goblets: 8-13 (after Kruts et al. 2013, fig. 40: 2-5, 7, 10, 12; fig. 42: 1-5; fig. 43).

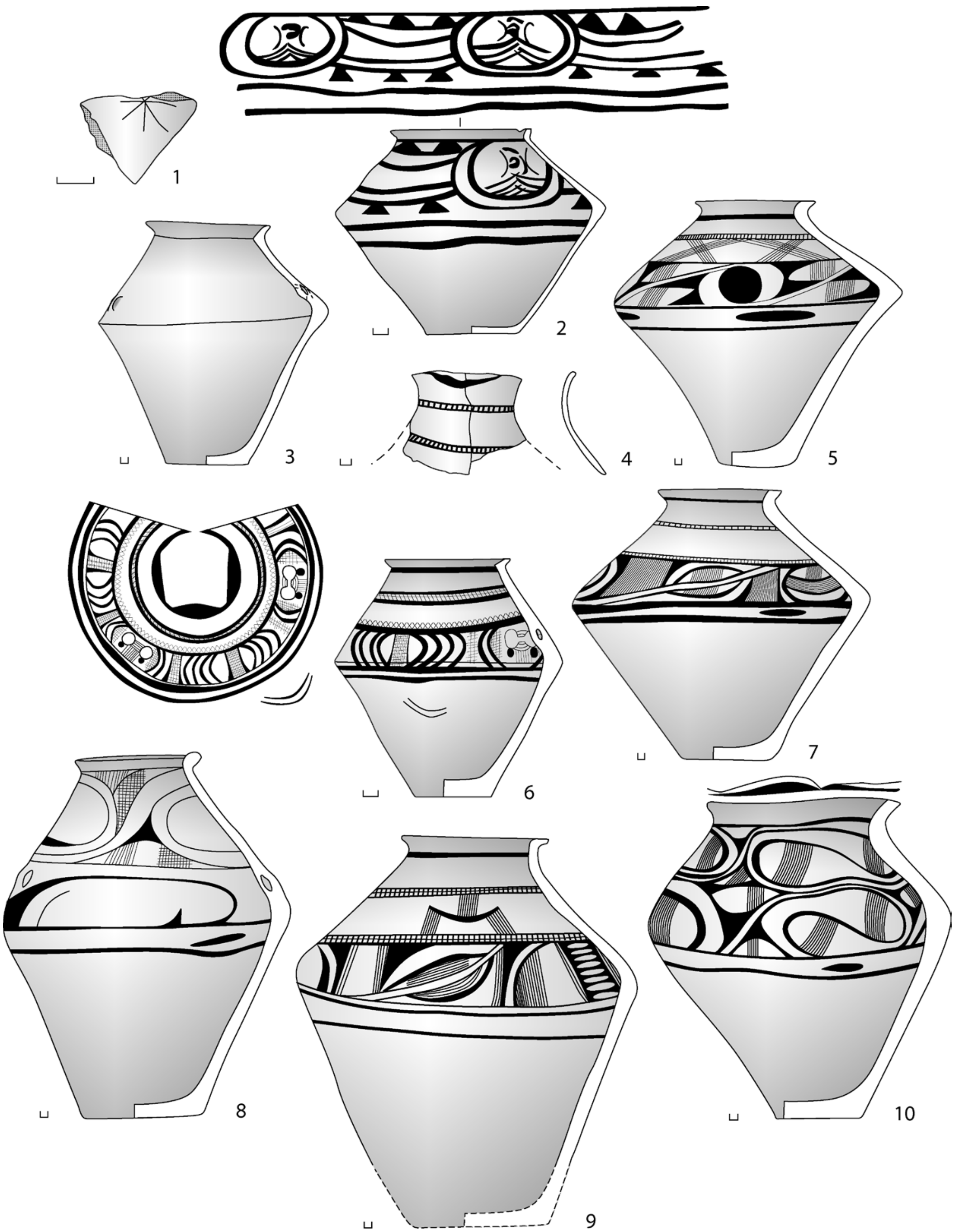


Plate 41. Talianki, house 47. Pottery types: 'biconical…' vessels: 1-10 (after Kruts et al. 2013, fig. 45: 1; fig. 47: 1, 3, 5-7; fig. 49: 1-4).

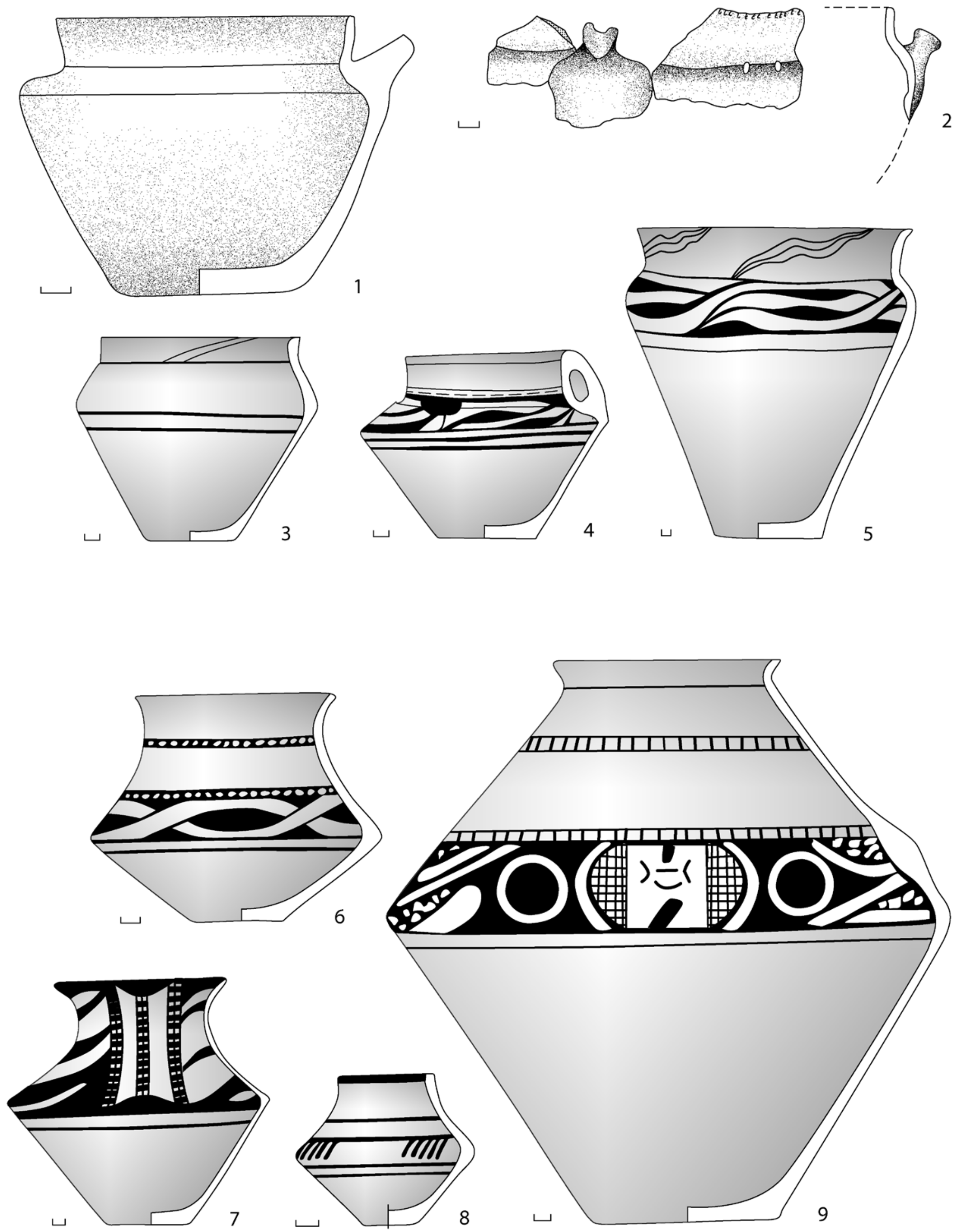


Plate 42. Talianki, house 47 (1-5, after Kruts et al. 2013, fig. 51: 1-5) and Moshuriv 1 (6-9, after Ryzhov 2012, fig. 4.8: 8-10; fig. 6.5: 17). Pottery types: 'kitchen' pots: 1-2; 'craters': 3-5; goblets: 6-7; cup: 8; 'biconical...' vessel: 9.

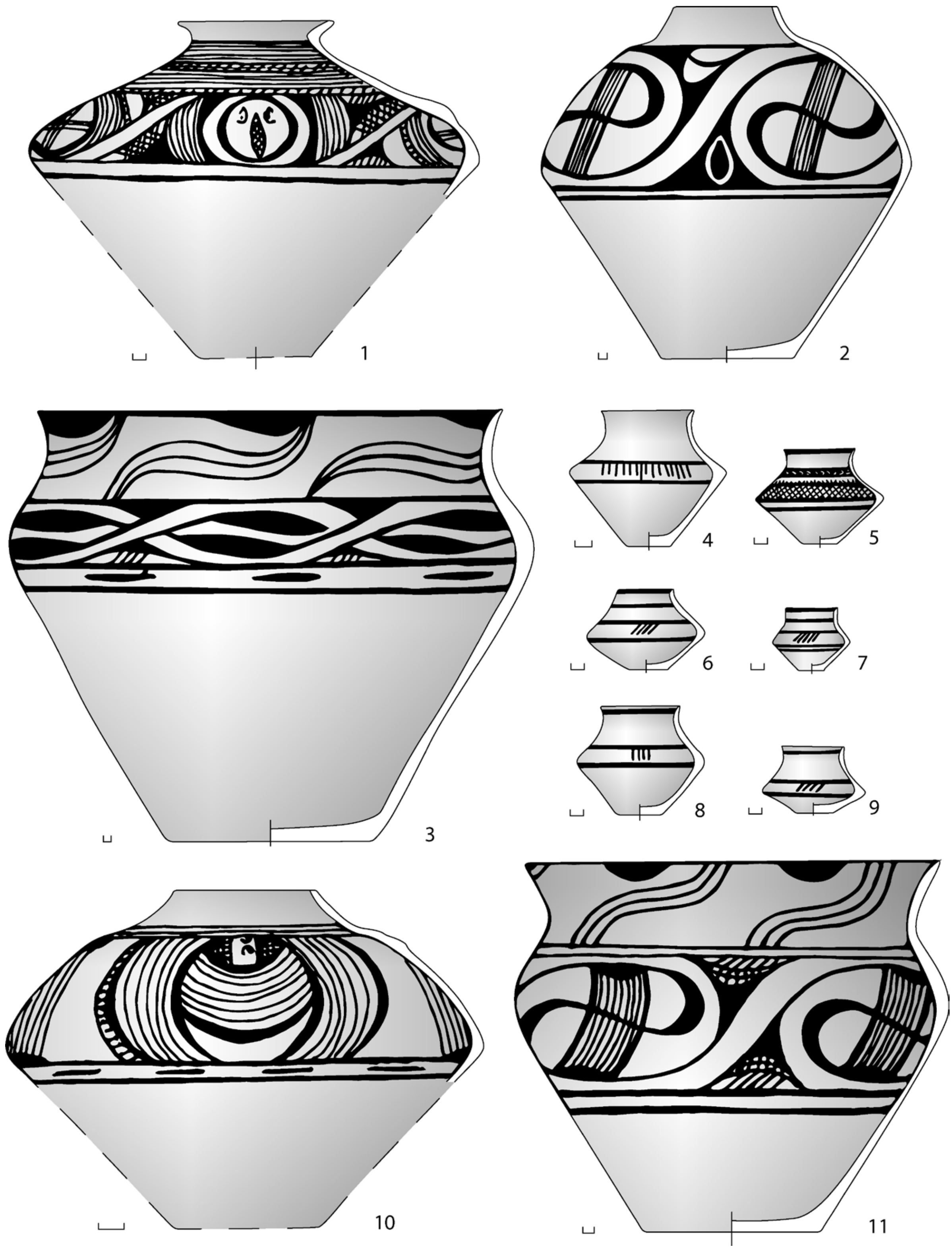


Plate 43. Dobrovody, house 4. Pottery types: 'biconical…' vessel: 1; pear-shaped vessels: 2,10; 'craters': 3, 11; cups: 4-9 (after Kruts et al. 2005, fig. 43: 1-6; fig. 44: 3; fig. 46: 4, 6-7; fig. 47: 2).

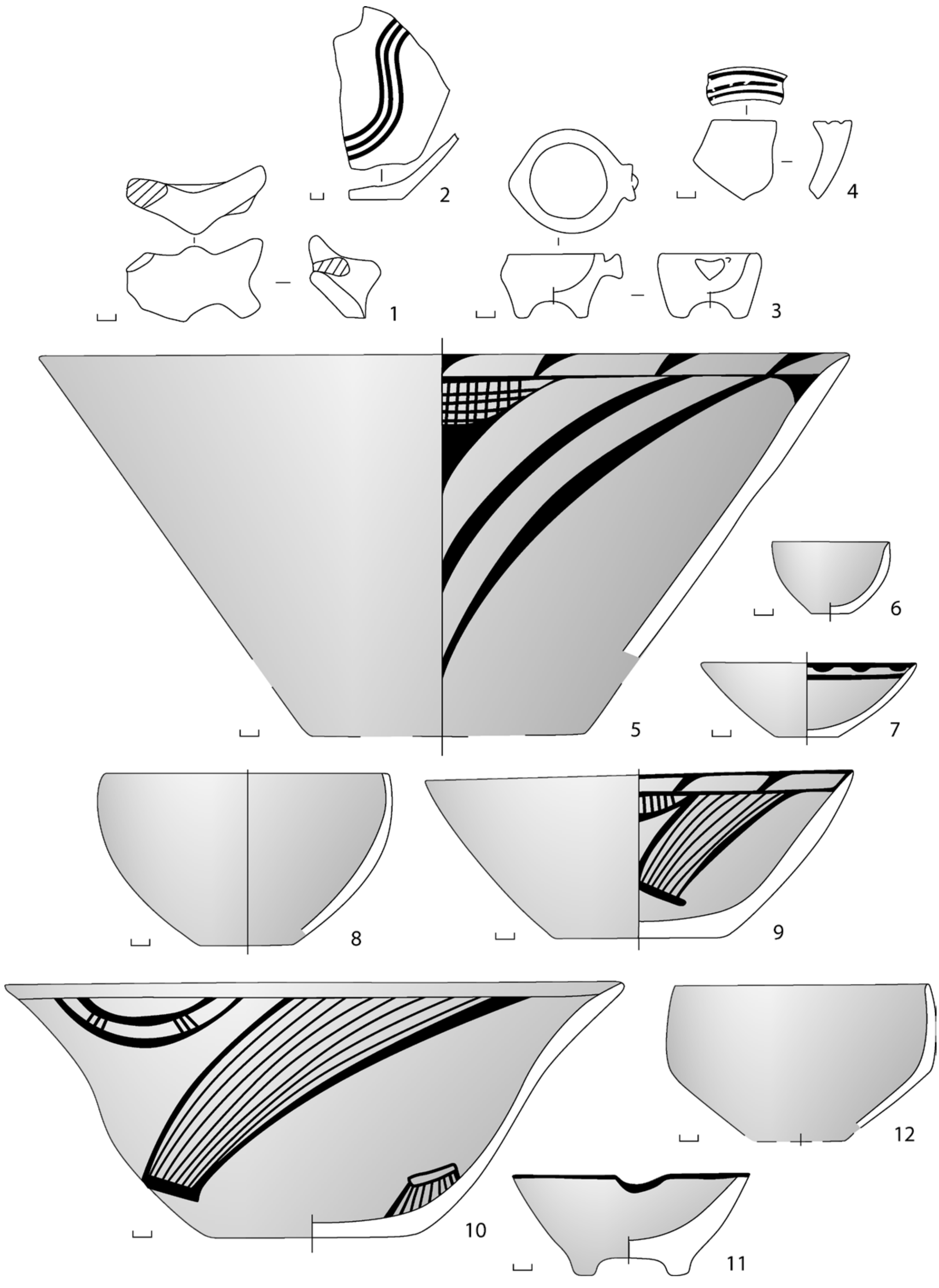


Plate 44. Dobrovody, house 4. Pottery types: bowls: 1-12 (after Kruts et al. 2005, fig. 42: 1-12).

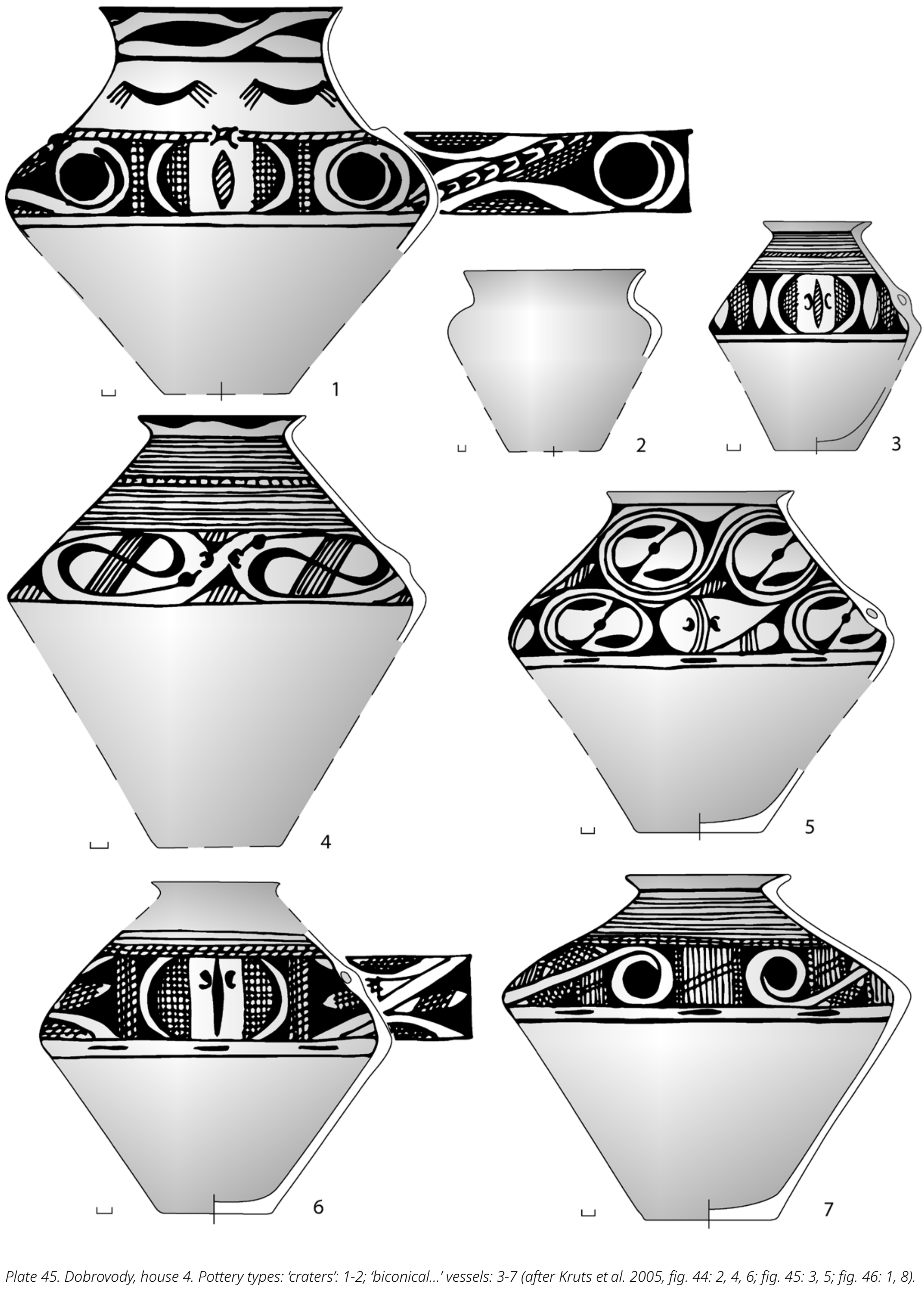


Plate 45. Dobrovody, house 4. Pottery types: 'craters': 1-2; 'biconical…' vessels: 3-7 (after Kruts et al. 2005, fig. 44: 2, 4, 6; fig. 45: 3, 5; fig. 46: 1, 8).

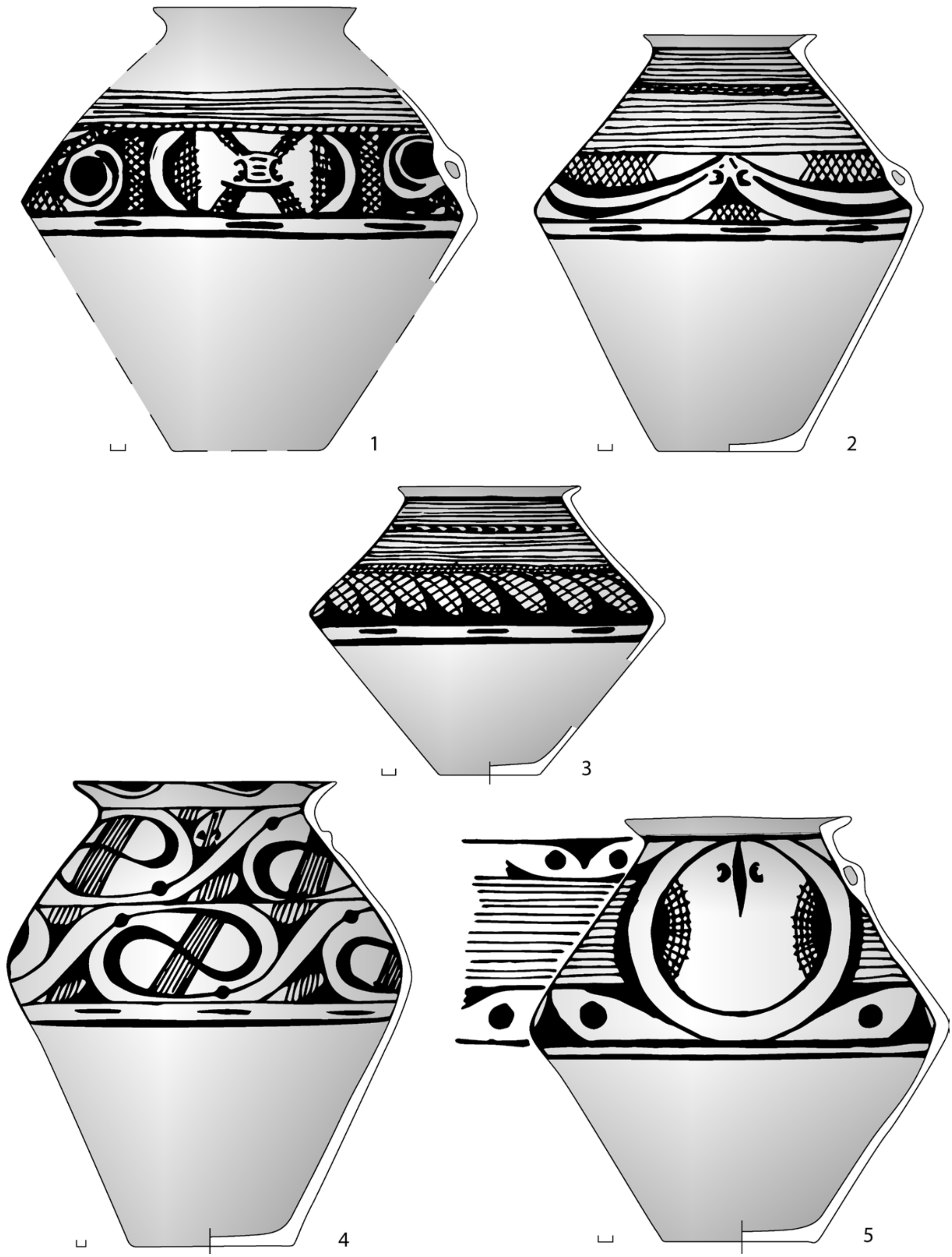


Plate 46. Dobrovody, house 4. Pottery types: 'biconical...' vessels: 1-5 (after Kruts et al. 2005, fig. 44: 1, 5; fig. 45: 1, 4, 6).

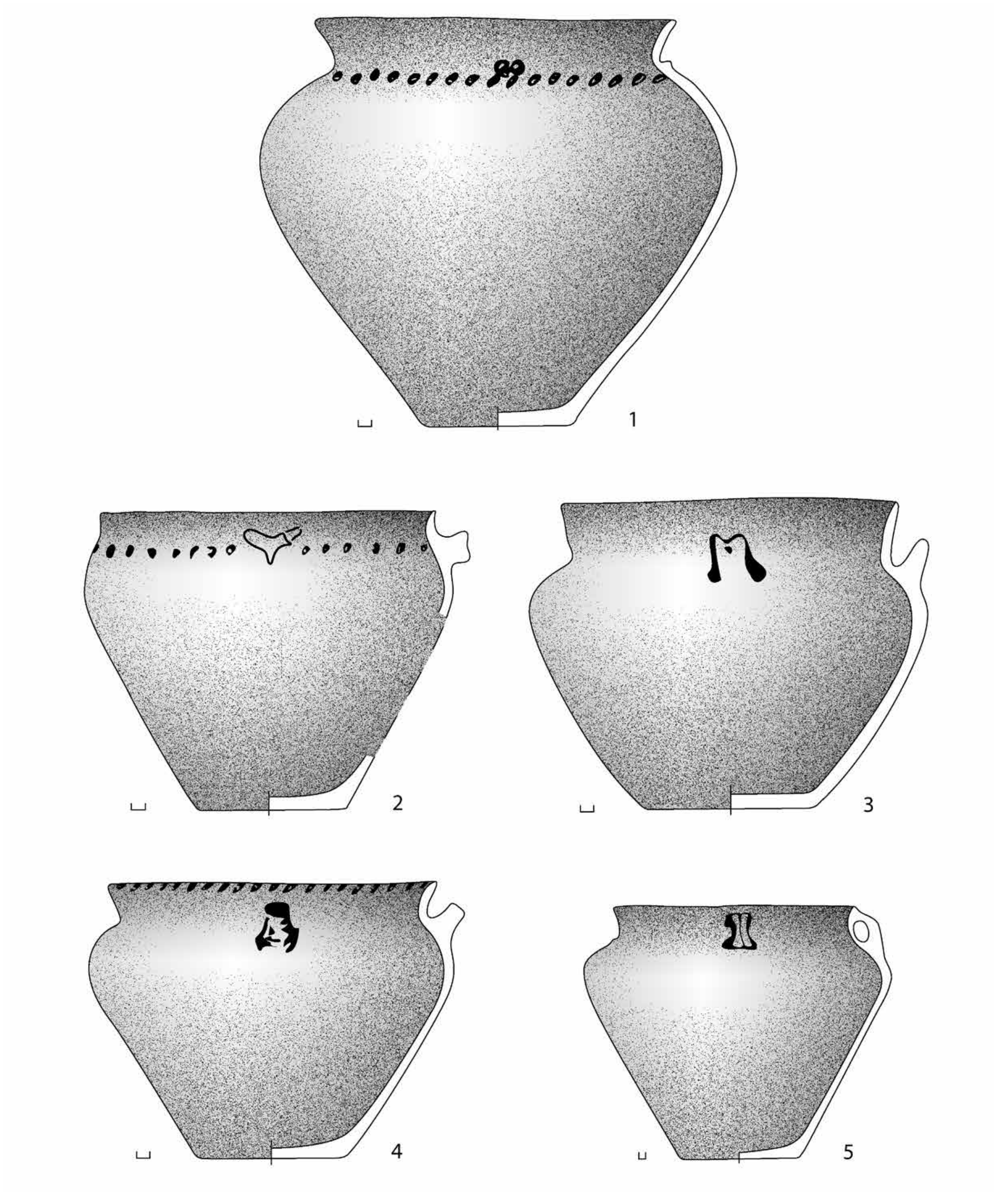


Plate 47. Dobrovody, house 4. Pottery types: 'kitchen' pots (after Kruts et al. 2005, fig. 41: 1, 4-7).

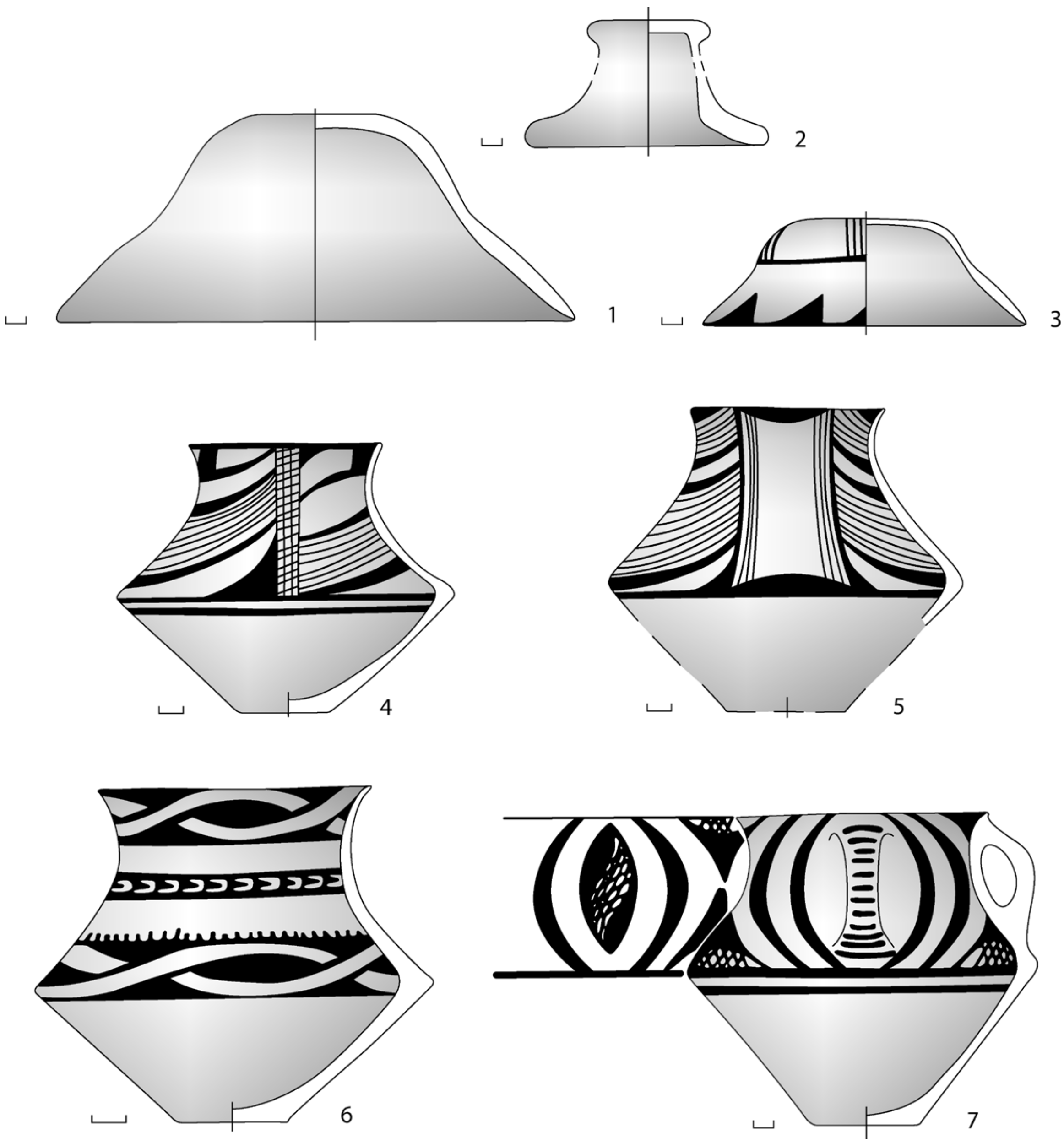


Plate 48. Dobrovody, house 4. Pottery types: lids: 1-3; goblets: 4-7 (after Kruts et al. 2005, fig. 43: 7-10; fig. 46: 2-3, 5).

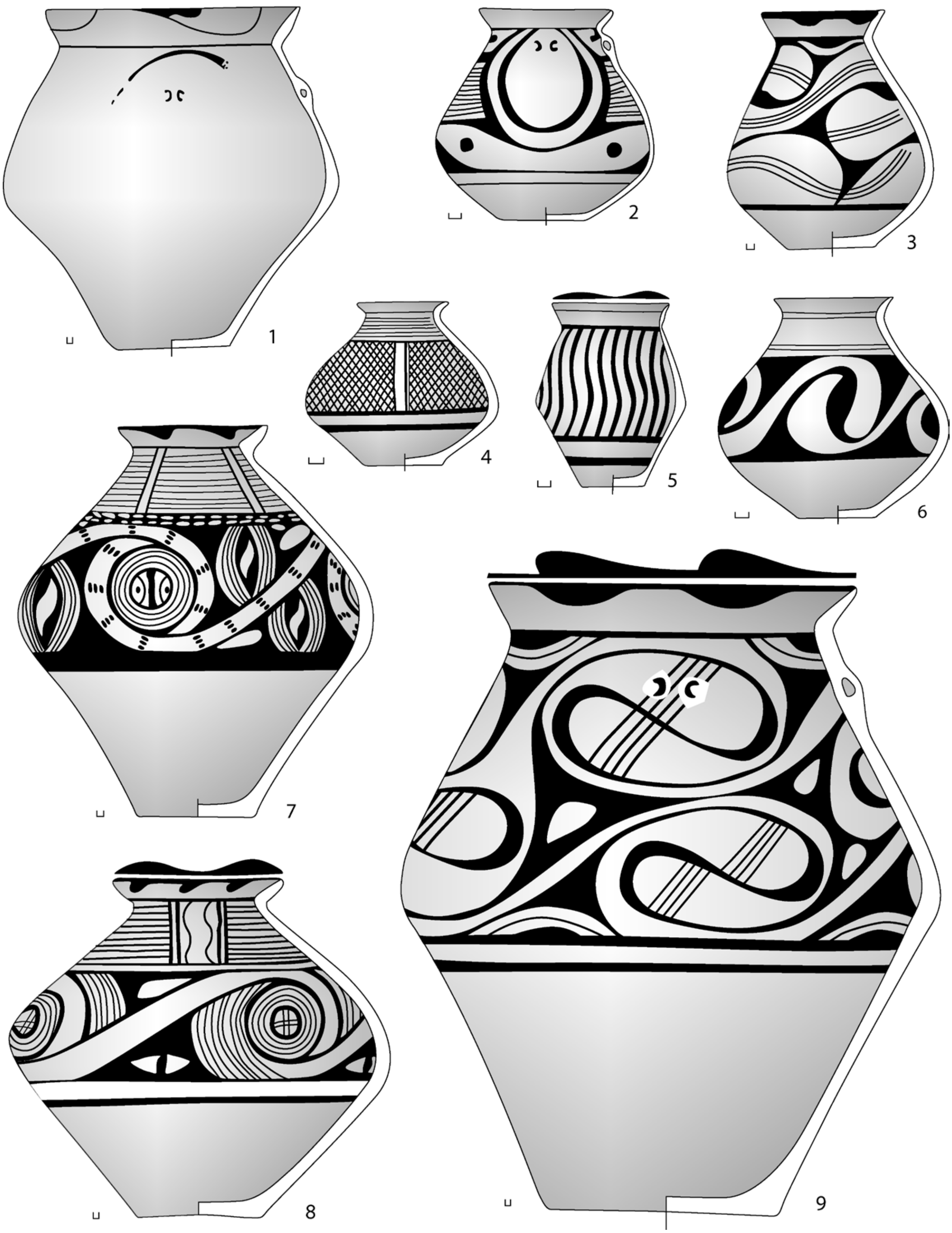


Plate 49. Pishchana. Pottery types: 'biconical...' vessels: 1-9 (1 after Kruts and Ryzhov 1988, fig. 17: 4; 2, 6 after Ryzhov 2012, fig. 4.6: 17; fig. 6.5: 37; 3-4, 7, 9 after Ryzhov 1993a, fig. 2; 5, 8 after Ryzhov 2002, fig. 27: 3, 5).

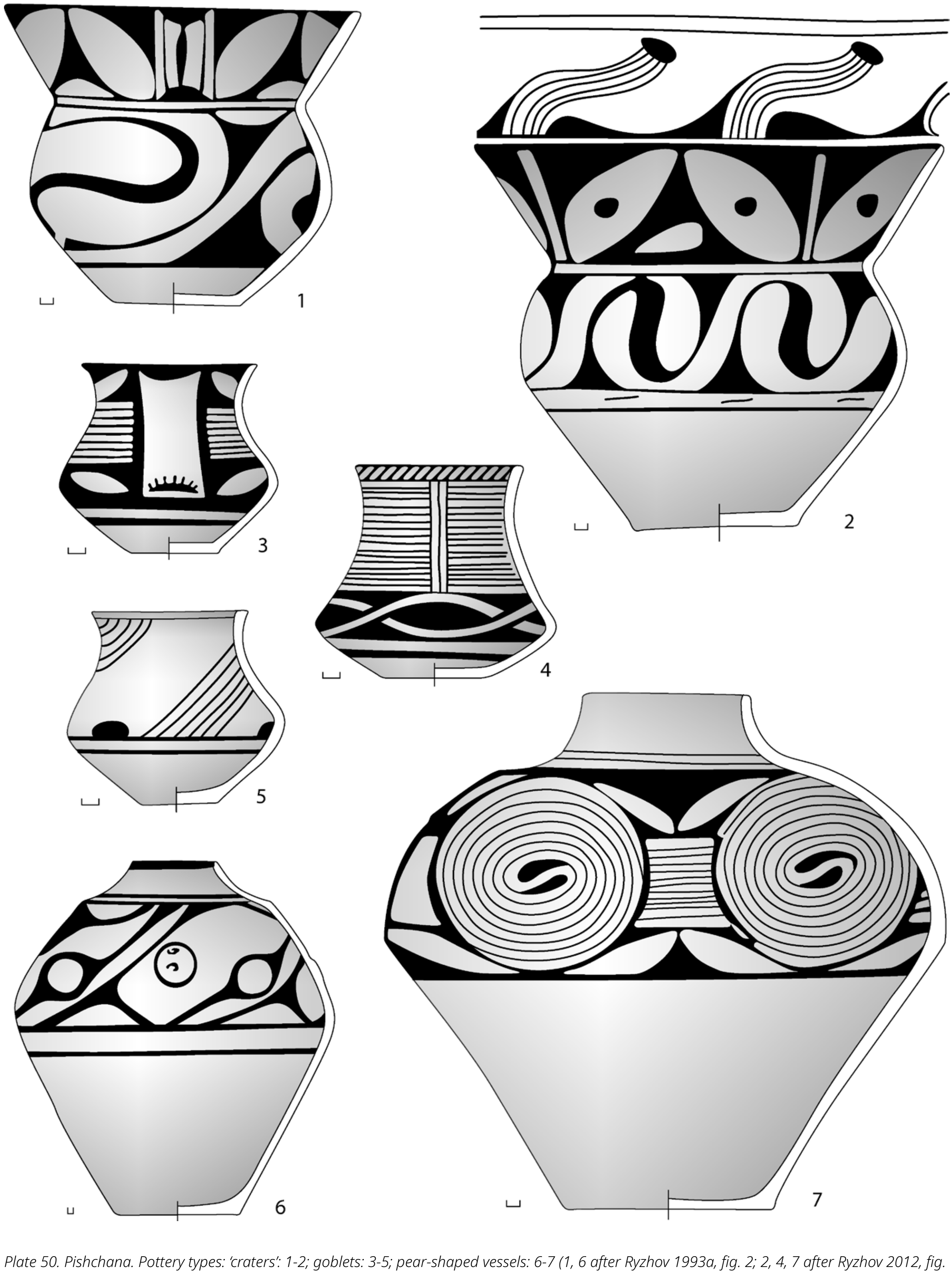


Plate 50. Pishchana. Pottery types: 'craters': 1-2; goblets: 3-5; pear-shaped vessels: 6-7 (1, 6 after Ryzhov 1993a, fig. 2; 2, 4, 7 after Ryzhov 2012, fig. 4.6: 11; fig. 6.5: 57, 60; 3 after Kruts and Ryzhov 1988, fig. 16: 16; 5 after Ryzhov 2002, fig. 26: 5).

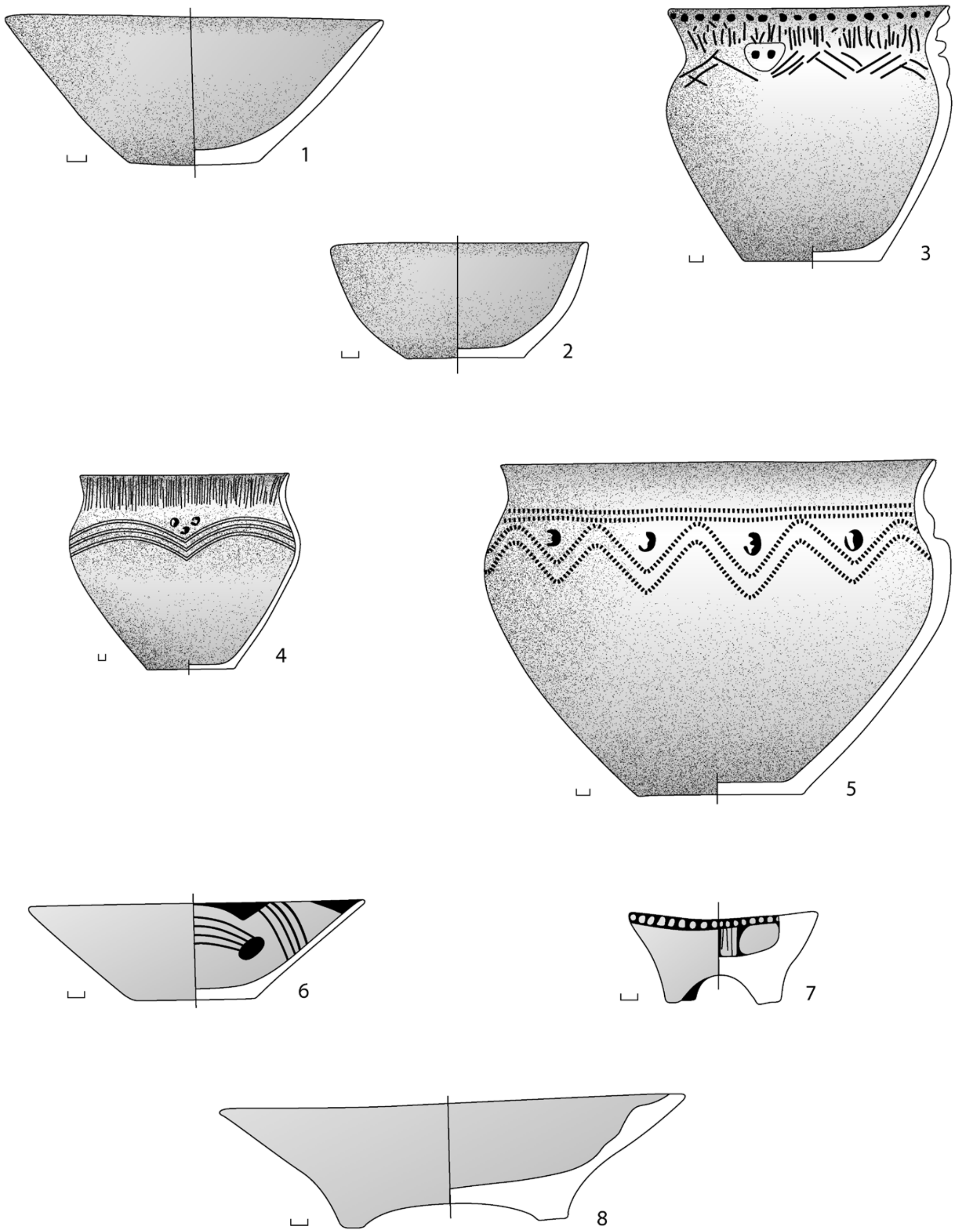


Plate 51. Pishchana. Pottery types: bowls: 1, 3, 6-8; 'kitchen' pots: 2, 4-5 (1, 4 after Ryzhov 2012, fig. 6.4: 3; 2, 5-7 after Ryzhov 2002, fig. 7: 25, 27; fig. 23: 14-15; 3, 8 after Ryzhov 1993a, fig. 2).

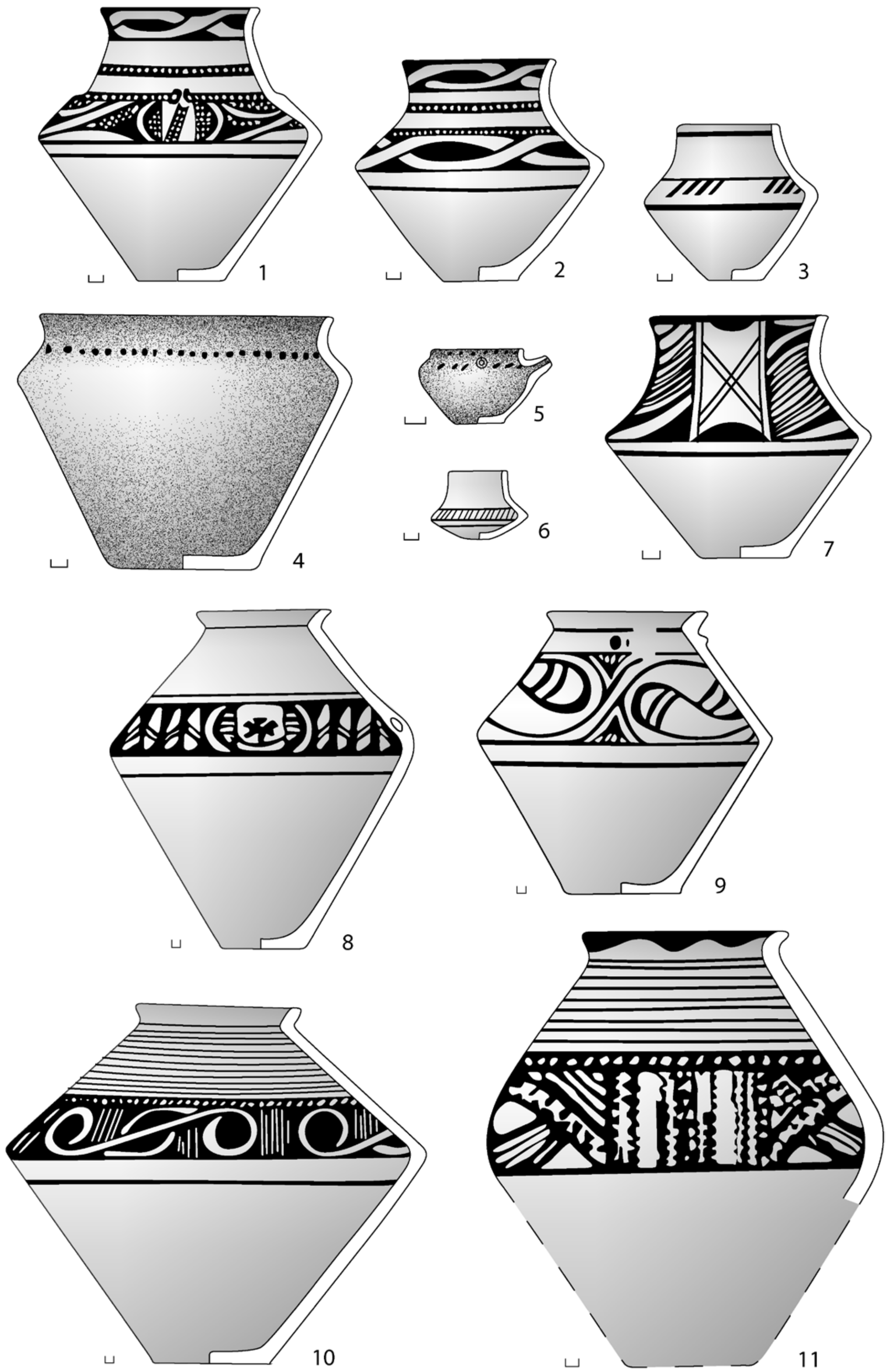


Plate 52. Chichirkozivka. Pottery types: 'crater': 1; goblets: 2, 7; cups: 3, 6; 'kitchen' pots: 4-5; 'biconical…' vessels: 8-11 (after Ryzhov 2012, fig. 4.8: 21; fig. 6.4: 8, 12, 57, 61, 68-69; fig. 6.5: 6-8, 28).

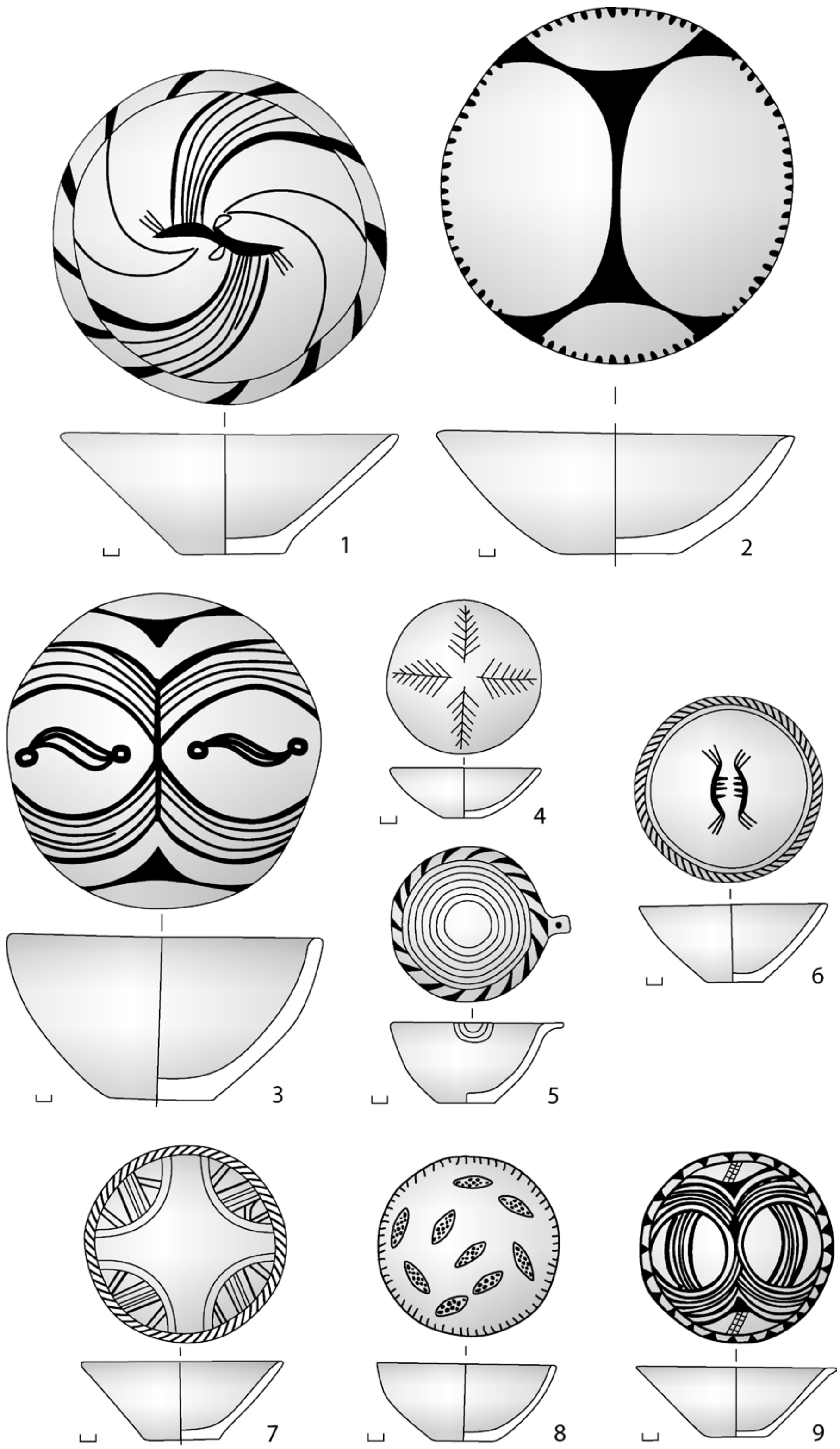


Plate 53. Chichirkozivka. Pottery types: bowls: 1-9 (after Ryzhov 2001, fig. 24: 3, 5; 2012, fig. 6.4: 24, 35, 38, 41, 46, 51, 54).

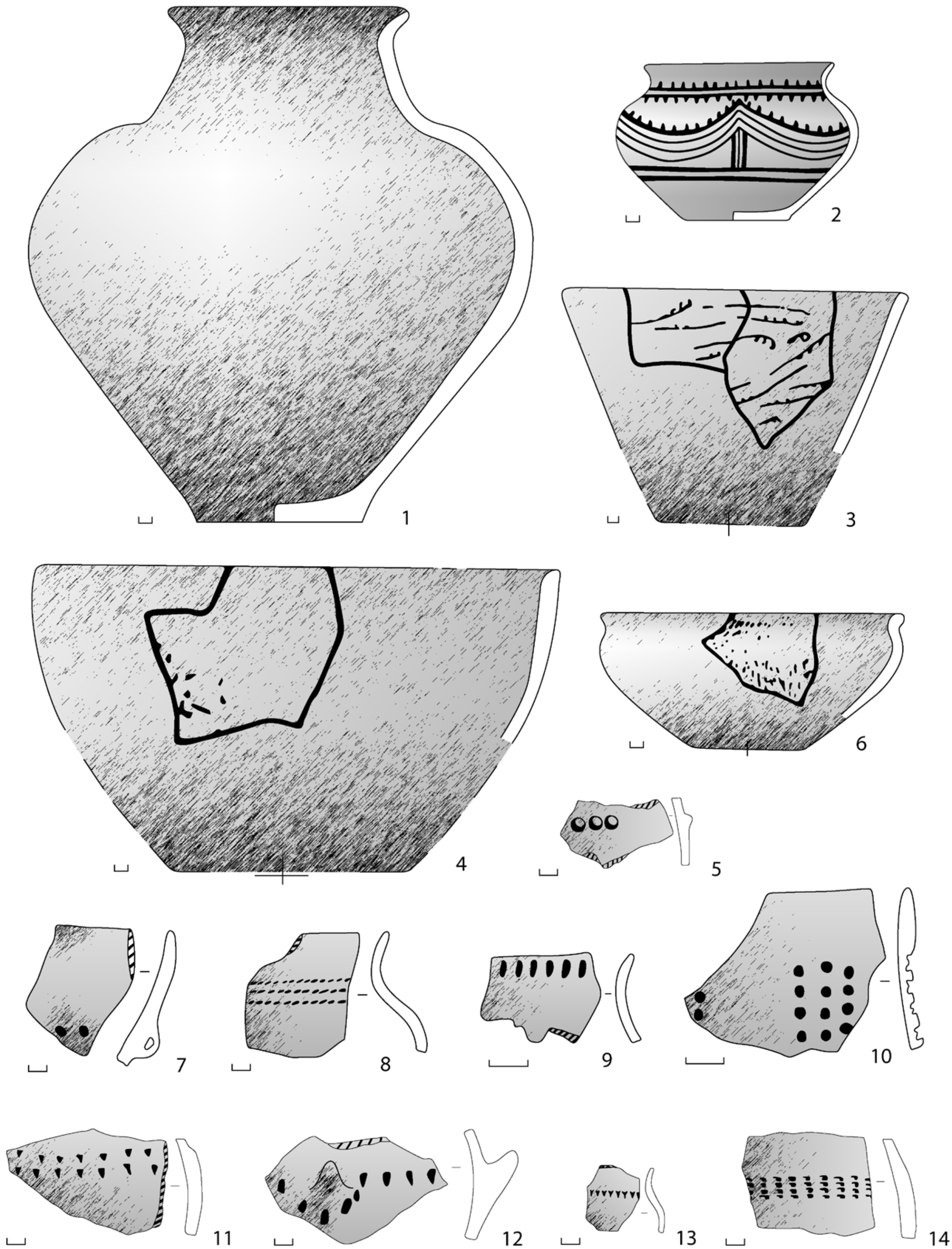


Plate 54. Moshuriv 3. Pottery types: pots: 1-2, 5, 7-14; bowls: 3, 4, 6 (after Ryzhov 2001-2002, fig. 2: 11; fig. 3: 1, 4-5, 7; fig. 4: 1-7).

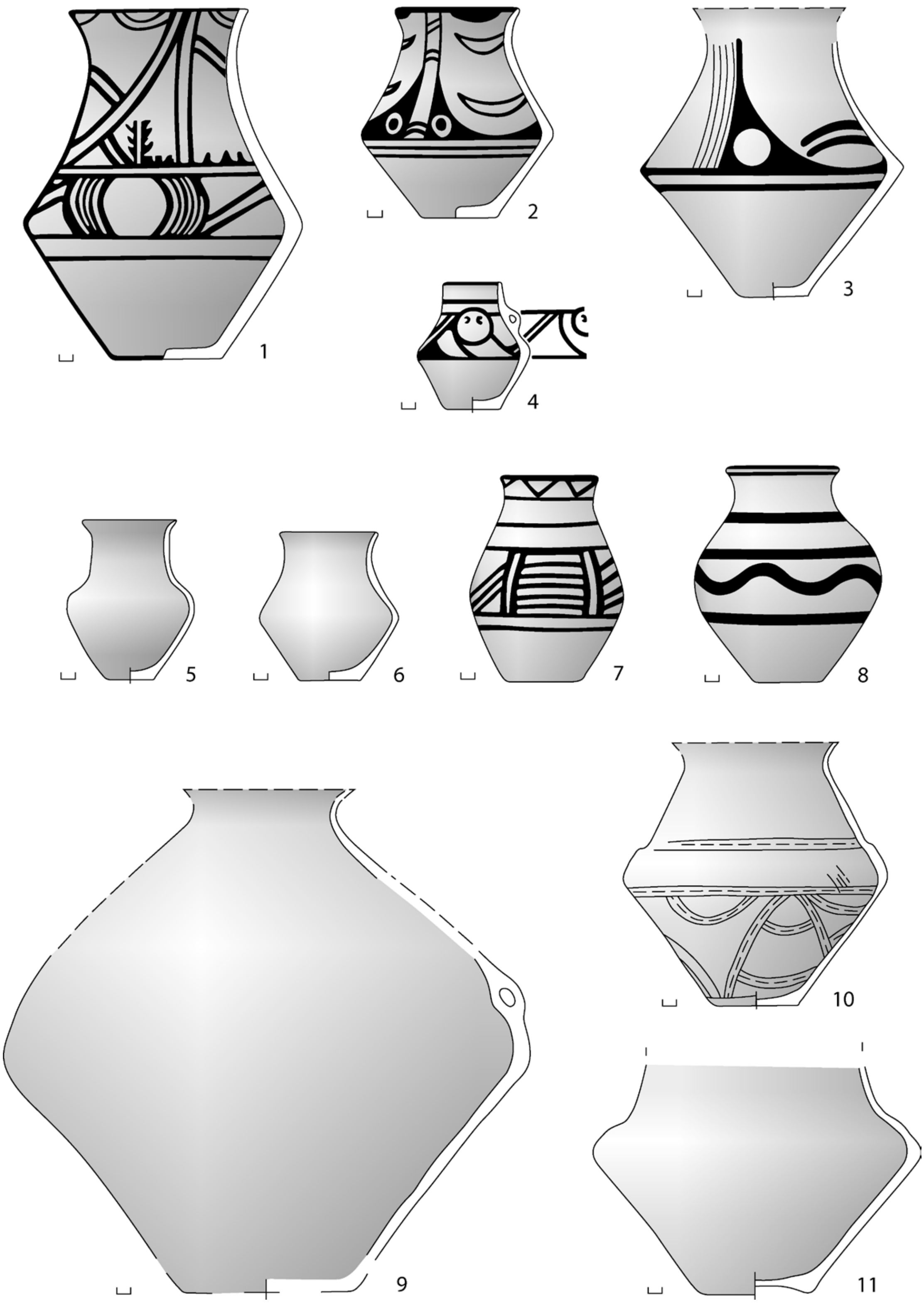


Plate 55. Kosenovka. Pottery types: goblets: 1-8; 'biconical...' vessel: 9; 'craters': 10-11 (1-2, 7-8 after Ryzhov 2012, fig. 4.10: 5-6, 13-14; 3-6, 9-11 after Kruts et al. 2005, fig. 59: 7-8, 10-11; fig. 60: 2; fig. 61: 1-2).

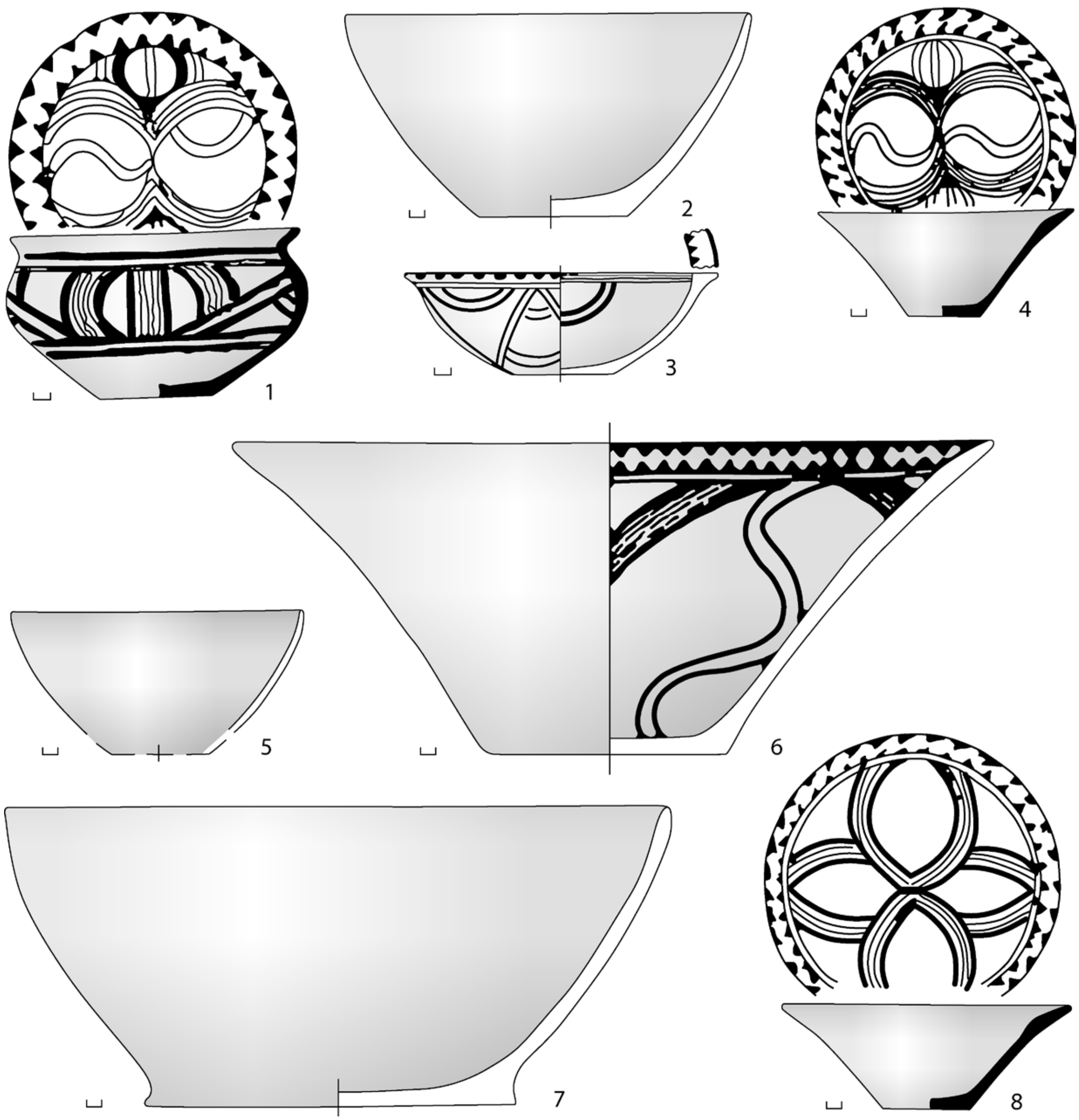


Plate 56. Kosenovka. Pottery types: bowls: 1-8 (1, 4, 8 after Ryzhov 2012, fig. 4.10: 2-4; 2-3, 5-7 after Kruts et al. 2005, fig. 58: 1, 8; fig. 59: 1-2, 5).

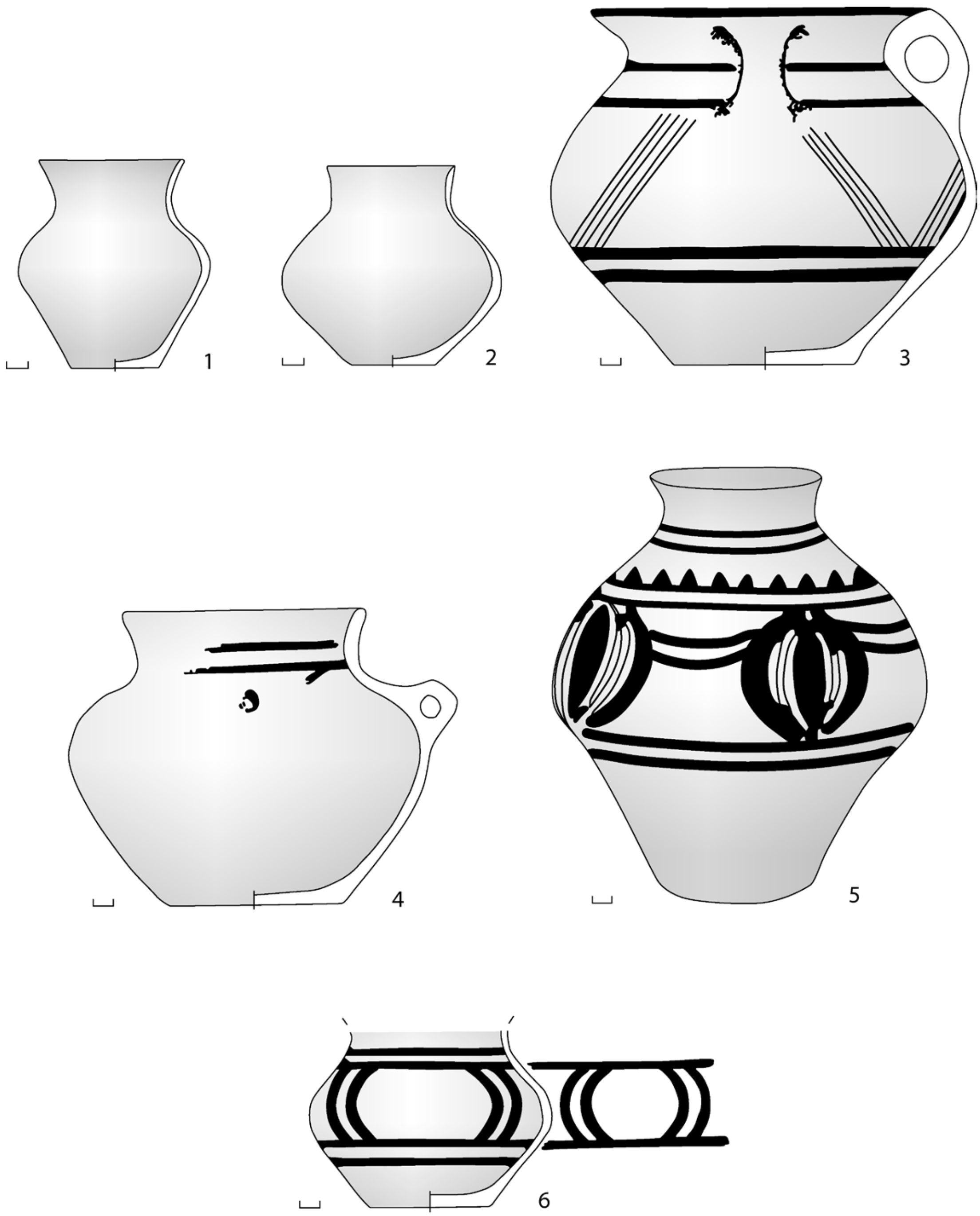


Plate 57. Kosenovka. Pottery types: 'closed' pots: 1-6 (1-4, 6 after Kruts et al. 2005, fig. 60: 1, 5; fig. 61: 5-7; 5 after Ryzhov 2012, fig. 4.10: 12).

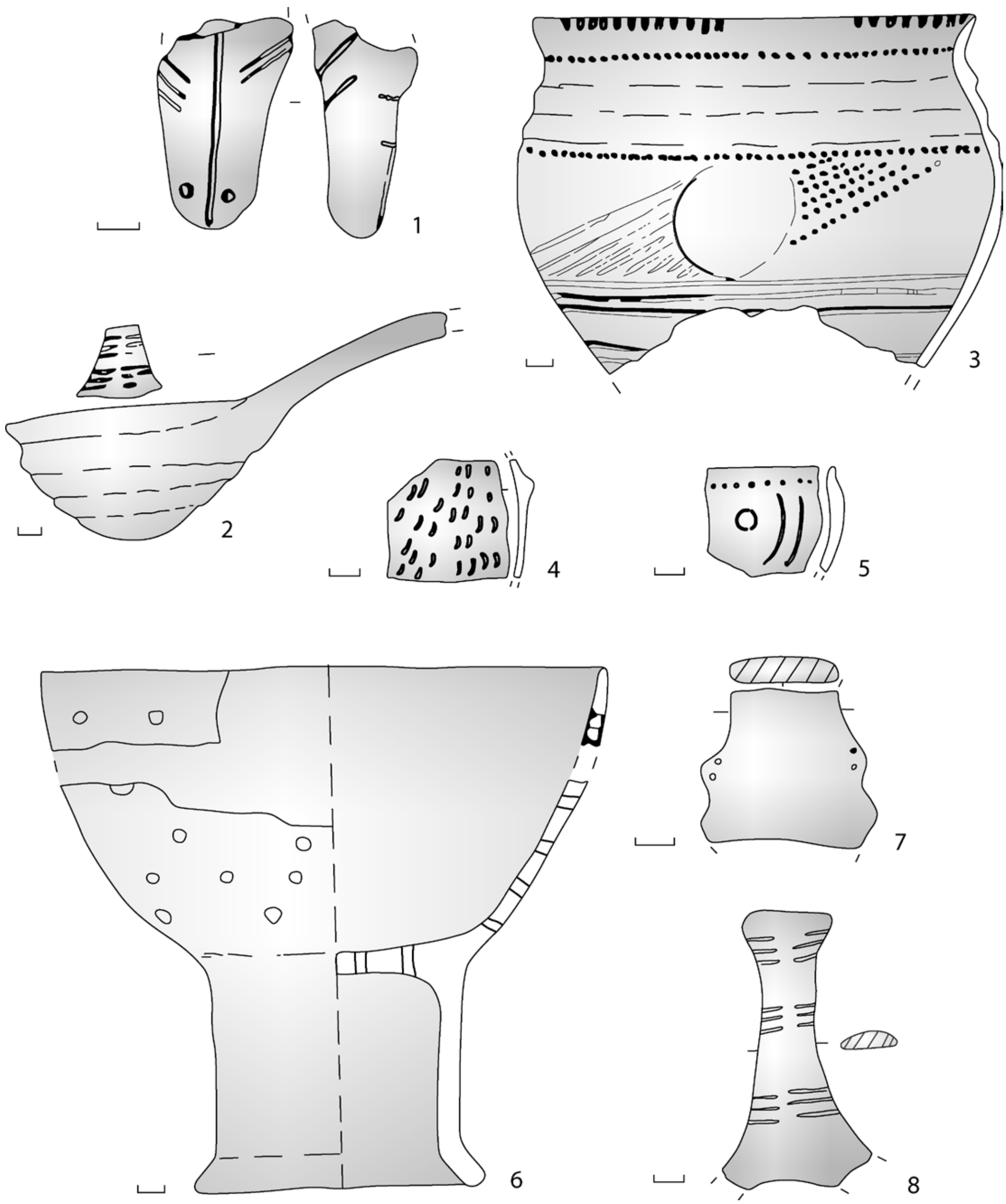


Plate 58. Grebenyukiv Yar. Pottery vessels (2-8) and anthropomorphic figurine: 1 (after Burdo 1990, fig. 1: 8; fig. 2: 1-7).

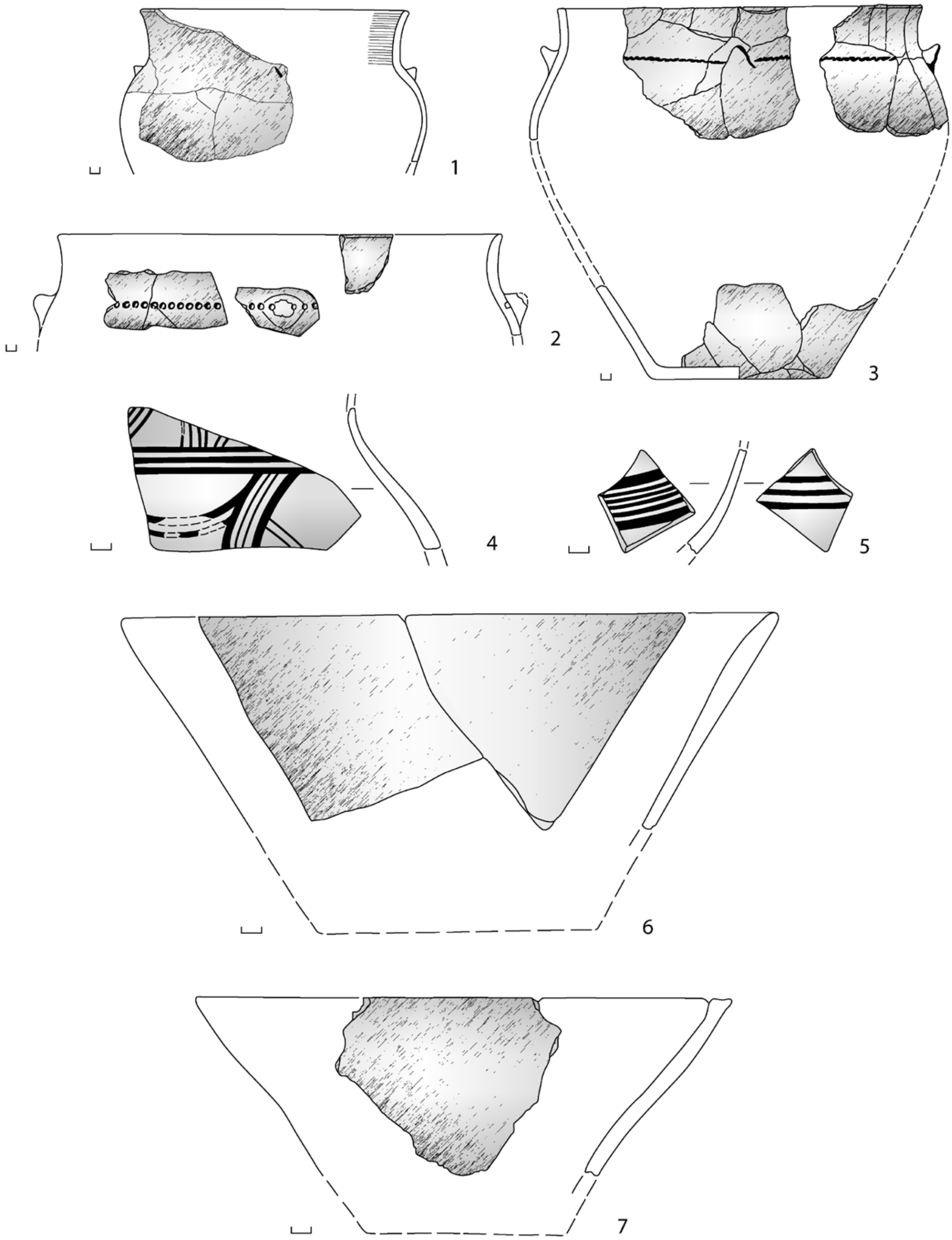


Plate 59. Sharin 3. Coarse ware pots (1-3), bowls (6-7); table ware pot (4), bowl (5), after Kushtan 2015, fig. 1: 2, 8; fig. 2: 1; fig. 3: 4; fig. 4: 7, 10, 11.

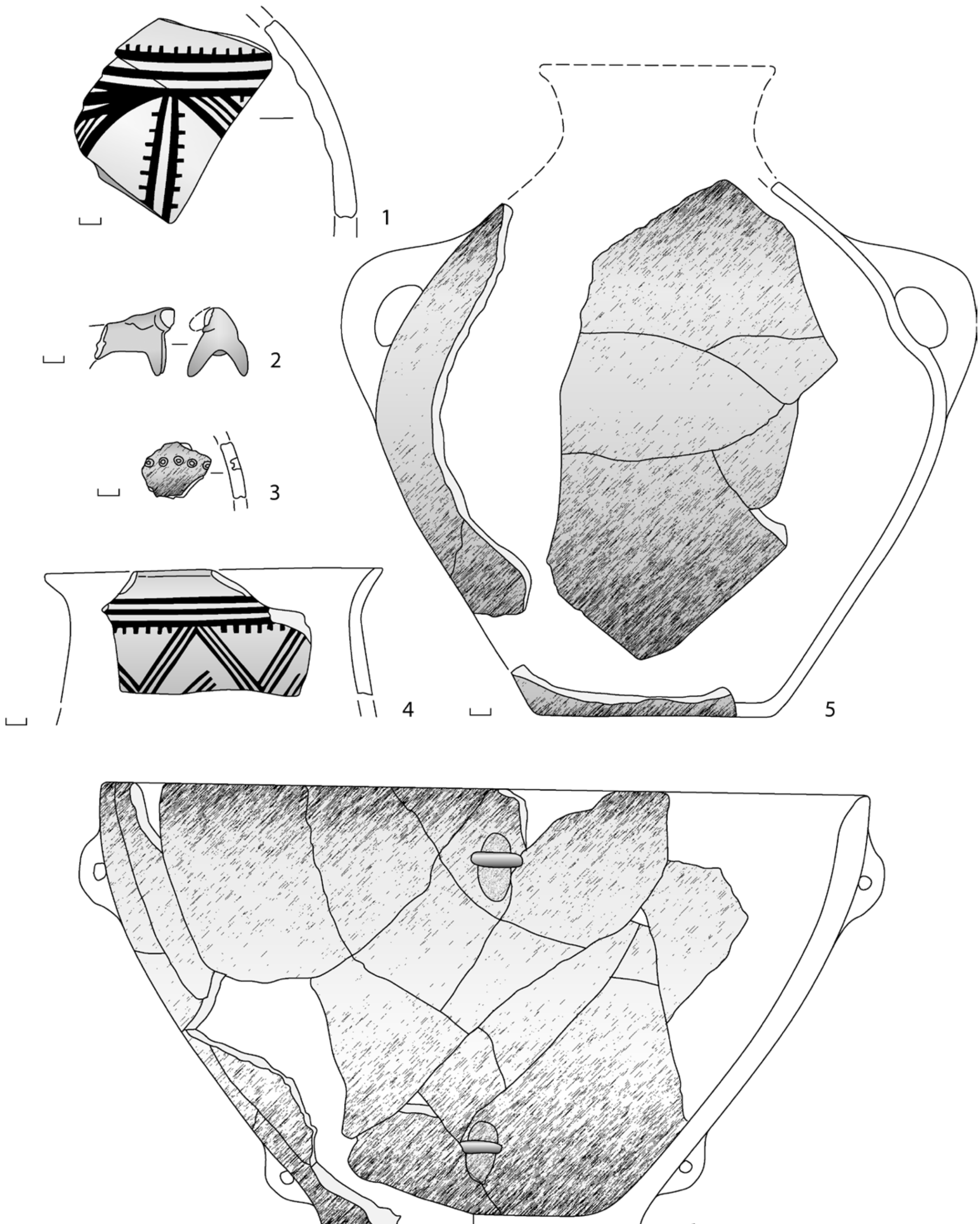
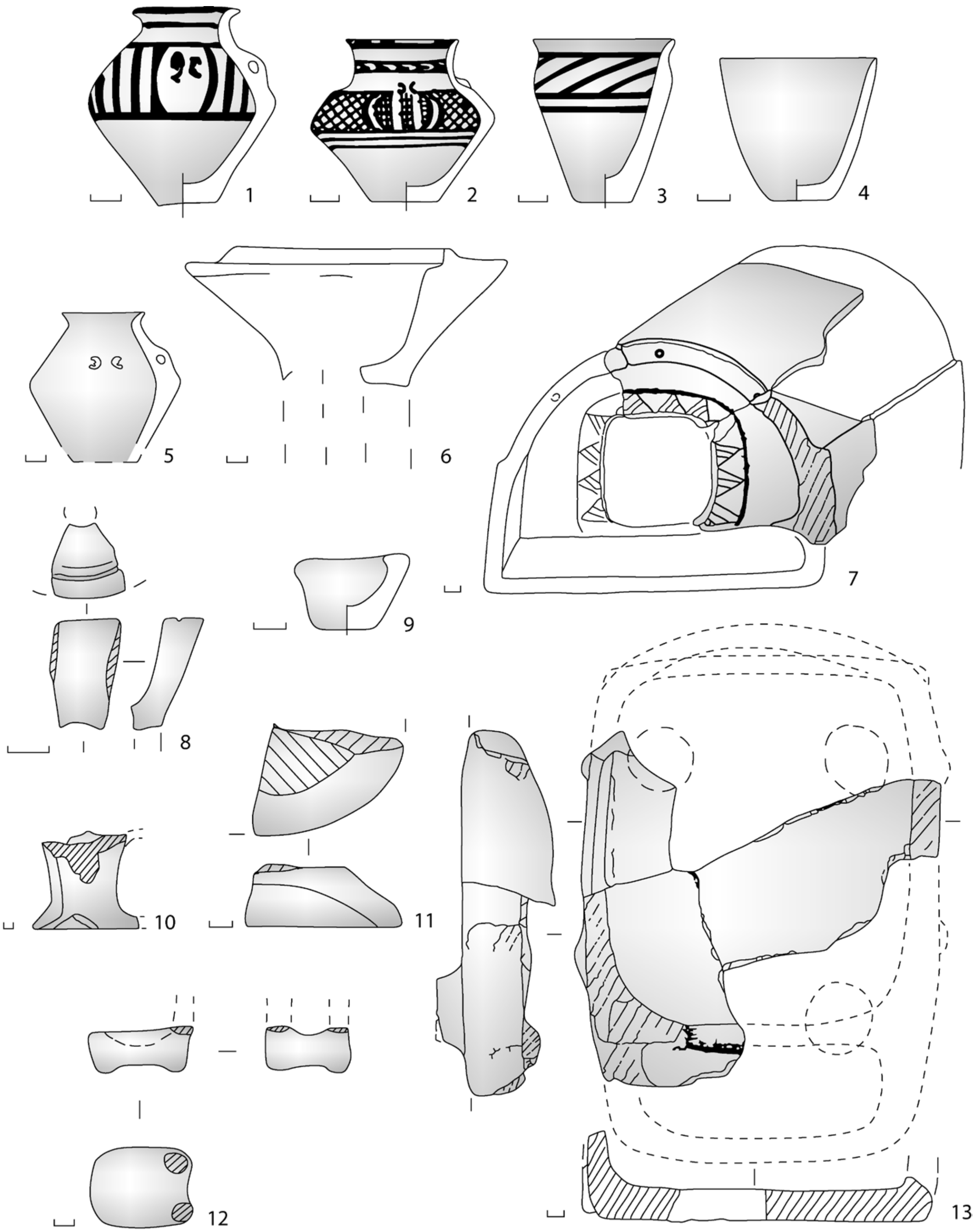


Plate 60. Sharin 3. Coarse ware pots (3, 5), bowl (6); table ware pots (1, 4); zoomorphic figurine (2), after Kushtan 2015, fig. 2: 5, 8; fig. 3: 8; fig. 4: 6, 9; fig. 5: 16.



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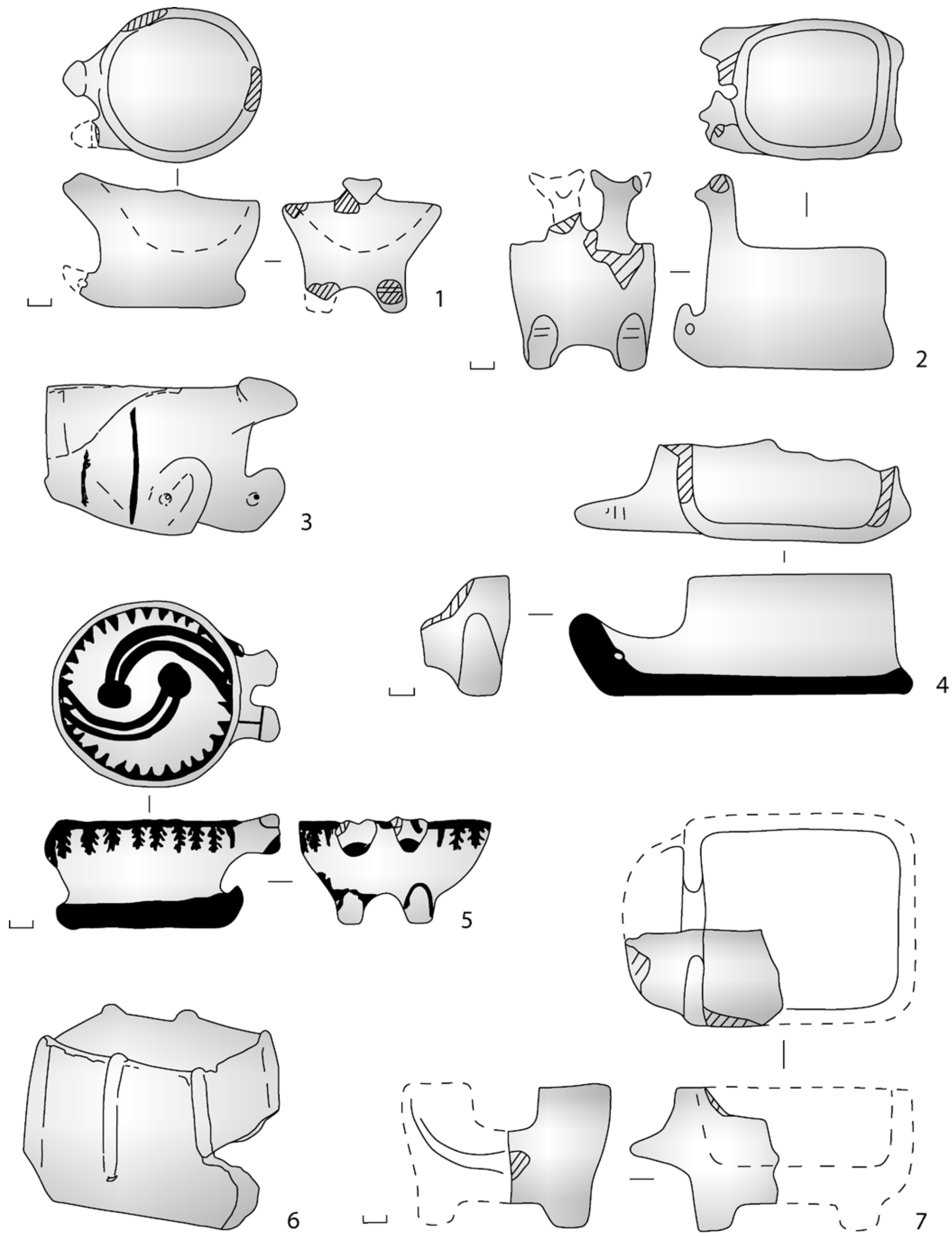

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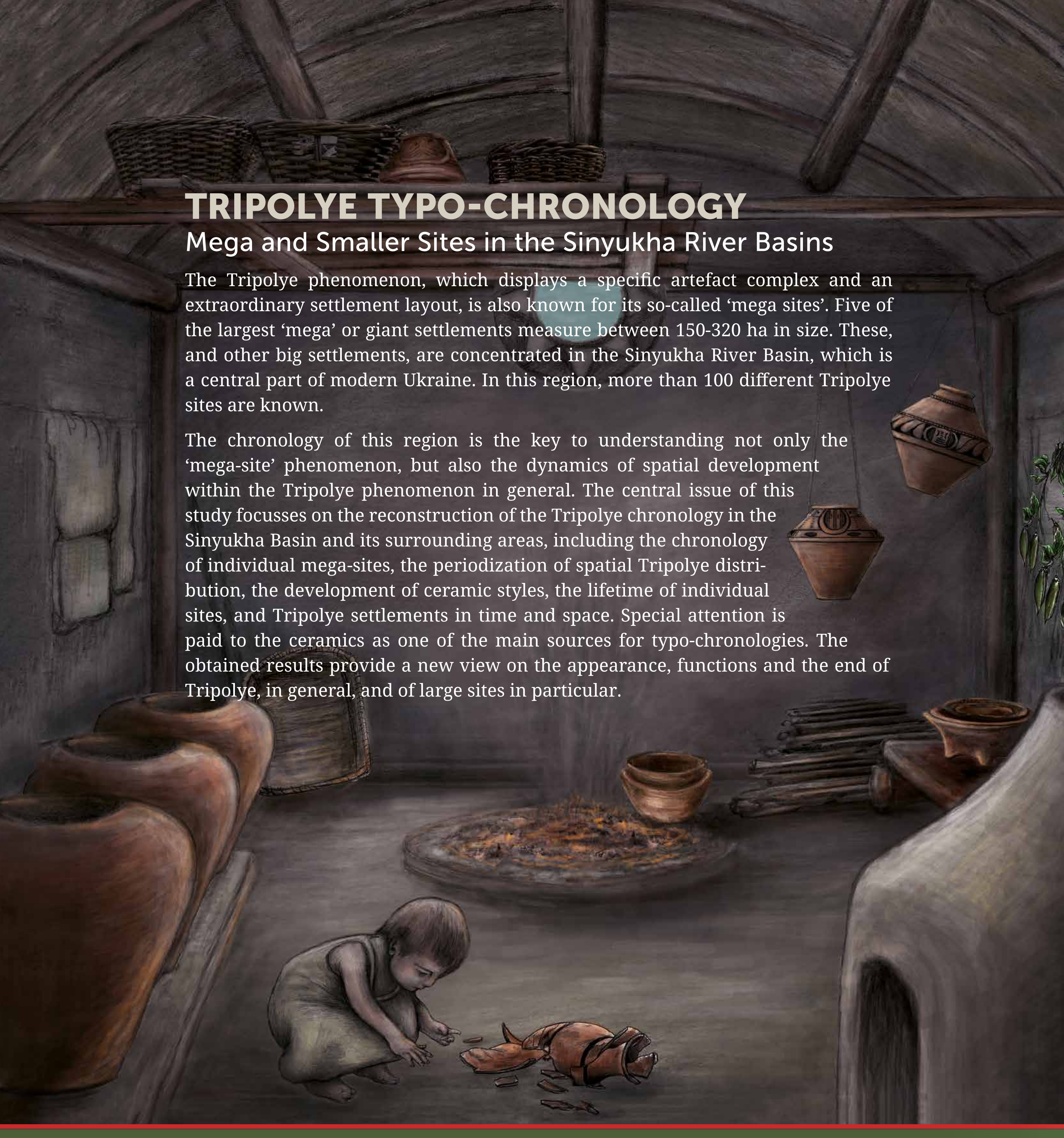

TRIPOLYE TYPO-CHRONOLOGY

Mega and Smaller Sites in the Sinyukha River Basins

The Tripolye phenomenon, which displays a specific artefact complex and an extraordinary settlement layout, is also known for its so-called 'mega sites'. Five of the largest 'mega' or giant settlements measure between 150-320 ha in size. These, and other big settlements, are concentrated in the Sinyukha River Basin, which is a central part of modern Ukraine. In this region, more than 100 different Tripolye sites are known.

The chronology of this region is the key to understanding not only the 'mega-site' phenomenon, but also the dynamics of spatial development within the Tripolye phenomenon in general. The central issue of this study focusses on the reconstruction of the Tripolye chronology in the Sinyukha Basin and its surrounding areas, including the chronology of individual mega-sites, the periodization of spatial Tripolye distribution, the development of ceramic styles, the lifetime of individual sites, and Tripolye settlements in time and space. Special attention is paid to the ceramics as one of the main sources for typo-chronologies. The obtained results provide a new view on the appearance, functions and the end of Tripolye, in general, and of large sites in particular.

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