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ARSHALY SETTLEMENT AND DONGAL CULTURE IN NORTHEASTERN KAZAKHSTAN: RESULTS OF INTERDISCIPLINARY RESEARCH*

The article presents the results of a comprehensive study of materials from the Arshaly settlement (Maysky district, Pavlodar region, Republic of Kazakhstan): an analysis of the stratigraphy of the archaeological deposits, a typological and technological study of the ceramic complex, an analysis of the traces of use of stone tools and an archaeozoological study of faunal remains. The application of radiocarbon dating methods in conjunction with the comparative analysis of materials from synchronous sites in the region made it possible to refine the chronological position and cultural classification of the Arshaly settlement in the context of the Dongal cultural tradition. The results of the archaeozoological investigations provided valuable insights into the particularities of the livestock breeding of the ancient population. The significance of the Arshaly settlement lies in its potential for an in-depth study of the processes of cultural genesis and socio-economic changes characteristic of the transitional period between the Late Bronze Age and the Early Iron Age in northeastern Kazakhstan.

Key words: Arshaly settlement, Dongal period, stone tools, trace analysis, animal bones, ceramics.

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АРШАЛЫ — ПОСЕЛЕНИЕ ДОНГАЛЬСКОЙ КУЛЬТУРЫ В СЕВЕРО-ВОСТОЧНОМ КАЗАХСТАНЕ: РЕЗУЛЬТАТЫ МЕЖДИСЦИПЛИНАРНЫХ ИССЛЕДОВАНИЙ

В статье представлены результаты комплексного исследования материалов поселения Аршалы (Майский р-н, Павлодарская обл., РК): анализ стратиграфии культурных слоев, типологическое и технологическое изучение керамического комплекса, трасологический анализ каменных орудий, а также археозоологическое исследование фаунистических остатков. Применение методов радиоуглеродного датирования в сочетании с компаративным анализом материалов синхронных памятников региона позволило уточнить хронологическую позицию и культурную атрибуцию поселения Аршалы в контексте развития донгальской культурной традиции. Результаты археозоологических исследований предоставили ценную информацию о специфике животноводческой деятельности древнего населения.

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Значимость исследования поселения Аршалы заключается в его потенциале для углубленного изучения процессов культурогенеза и социально-экономических изменений, характерных для переходного периода между эпохой финальной бронзы и донгальским периодом в Центральном Казахстане.

Ключевые слова: поселение Аршалы, донгальский период, каменные орудия труда, трасология, кости животных, керамика.

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Introduction. In the archaeology of the early Iron Age in Kazakhstan, the search for and excavation of settlement sites is significant. Settlement material is particularly valuable for the reconstruction of the economic and cultural life of early nomadic societies, which were characterised by an organic balance of specific forms of pastoralism, agriculture, and handicraft production, developed through adaptation to specific natural and climatic conditions and landscape features. At present, these types of settlements are best studied in Central Kazakhstan and Zhetysu. The Arshaly settlement, whose research material is being introduced into the scientific discourse for the first time, is located in northeastern Kazakhstan, a region promising in terms of archaeological research.

The site is located in the Arshaly mountain system, within the county of Jumysker, 1 km west of the Arshaly wintering camp. The topography of the site is characterized by rocky outcrops on the north and south sides, while the west and east sides remain open. The terrain of the settlement slopes gently from south to north, providing a favorable location for the ancient inhabitants. A spring, just 80 meters to the northeast, supplied the inhabitants with water (Utubayev et al. 2024).

The site was discovered in 2021 during planned exploratory work by the Margulan Institute of Archeology (Kasenova et al. 2021: 20). Its approximate area is about 6,000 square meters. The excavations in the Arshaly settlement were conducted during the 2023 field season. The main objectives of the research included determining the cultural attribution of the artifacts and establishing the chronological framework of the settlement using radiocarbon dating methods.

Research methods. The excavation covered the area of the structure known as No. 1. The excavation followed a standard method of dividing the site into 4 × 4-meter squares and removing the soil in 10 cm thick layers. The archaeozoological analysis included the determination of the species composition of the faunal remains, skeletal elements, and age characteristics. A total of 1.787 mammal bones were examined, of which 1.052 (58.8%) could be identified to species level. The majority of the archaeozoological collection consisted of bones from domestic animals (Table 1). Fragmented bones, 735 in total, were categorized as “indeterminate mammals”. The bones of large cattle and sheep were measured according to the method of A. Driesch (von den Driesch 1976). Age composition was determined by analyzing the dental system, tooth eruption and replacement, and epiphyseal fusion (Silver 1969). Meat consumption was reconstructed using a special method of the Laboratory of Scientific Methods, IA RAS (Antipina 2013: 139). Special methods were used to distinguish the bones of sheep and goats from the remains of small ruminants (Zeder, Pilaar 2010; Zeder, Lapham 2010). Coefficients for the talus bone have been used to estimate the approximate height at withers of large and small cattle (Zalkin 1970; Teichert 1975).

The documentation of the site included methods such as photogrammetry and 3D modeling. The trace analysis of 34 stone tools was conducted according to the methods of G.F. Korobkova and V.E. Shchelinsky (1996), using microscopy with up to 200x magnification to detect traces of wear.

The pottery was analyzed on the basis of formal typological and technological approaches. A total of 53 ceramic fragments were examined. Radiocarbon dating was carried out using the AMS method in the Vilnius Radiocarbon Laboratory. Calibration was carried out with OxCal v4.4.4 (Bronk Ramsey 2021).

Structure description. The excavation area totaled 160 square meters and allowed a detailed study of the architectural features of dwelling No. 1. The structure is rectangular, with an additional corridor on the east side. The main room measures 9 × 10 meters. After the turf was removed, the ruined remains of stone walls were uncovered, with fallen sections up to 2 meters wide. Further excavations revealed the foundations of the stone walls, which had been built from large stone slabs. The thickness of the walls ranged from 1 to 1.3 meters. The construction of the walls varied depending on the direction: the southern and western walls were built with two rows of horizontally arranged slabs, while the northern and eastern walls were built with upright stones.

The excavation stratigraphy revealed two archaeological layers. The first layer was 0.15—0.2 meters thick, the second 0.3—0.35 meters. Almost all the pottery fragments and stone tools were found in the second layer. Beneath the lower layer was a 0.05—0.07-meter-thick ash deposit that reached down to the bedrock. This layer was observed only in squares B1 and B2.

A rectangular stone hearth measuring 0.85 meters (W-E) by 1 meter (N-S) was discovered in the central part of the dwelling. The height of the stone slabs forming the hearth was 0.1—0.2 meters. A 0.04-meter-thick layer of burnt ash was preserved inside the hearth, indicating long-term use. Numerous fragments of animal bones and pottery were found around the hearth. Dozens of stone tools, including hammers, whetstones, and polishers, were also discovered. The presence of these tools on the bedrock indicates that the area around the hearth was used for domestic activities.

Two parallel rows of stones 4.1—4.2 meters long were preserved to the south of the northern wall of the dwelling. This could have been the foundation of an inner partition wall. The distance between the parallel rows of stones was 2.3 meters. The stone wall of the dwelling in this area was 0.8—1 meter thick and 0.08—0.1 meter high. It is possible that this was done to keep the heat inside the dwelling in cold weather.

Three household pits were identified on the inside of the dwelling. One pit, located in square A2, is oval-shaped, 0.5 × 0.65 meters in size and 0.2 meters deep, filled with ash and containing animal bones. The second and third pits, found in square B1, were 0.38 × 0.65 meters in size and 0.22 meters deep. These pits were also located near the north wall of the dwelling and were filled with ash. The nature of the pit filling suggests their use in food preparation and waste disposal.

A corridor extends from the east wall of the dwelling, stretching 4.9 meters to the east, with an external width of 1.8 meters and an internal width of 0.95 meters. The corridor consisted of vertically arranged stone slabs that were 0.5—0.95 meters high, indicating a well-organized space. The interior of the corridor contained a collapse of stone heap. The entrance to the corridor was marked by a 0.56 × 0.4 × 0.21-meter slab, indicating its importance as the main access to the dwelling. Analysis of the architectural features and pottery complex indicates that the site dates to the Dongal period (Loman 1987; Fedoruk 2023).

Research results

Archaeozoological analysis. The majority of the faunal remains come from domestic ungulates (98.2%) (Table 1). Wild animals are represented by only a small number of remains (1.8% or 18 specimens). Among domestic animals, cattle bones dominate (50.8%), followed by small ruminants (35.2%), with sheep being the most common. Horse bones account for 13.4%. Remains of dogs were also found. Among the few bones of wild animals were those of saiga, kulan and roe deer. Among the unidentified bones, fragments of small mammals predominated (73.8%). The hierarchy among

domestic animals shows a dominance of small ruminants in other Late Bronze Age and Early Iron Age settlements in the steppe zone (Shagirbayev, Sakenov 2023; Beisenov et al. 2022). This trend is more pronounced in the southern regions of Kazakhstan (Beisenov et al. 2018: 171). In the settlement of Arshaly, however, cattle were the main source of meat products (Table 4).

Age composition of domestic animals. Cattle: The analysis of the mandibular and maxillary fragments of cattle shows that more than 80% of the specimens come from individuals older than 2.5 years (Table 2). Only a few fragments belonged to younger animals aged six to 24 months.

Small ruminants: The age distribution of the small ruminants was slightly different: nine sheep were slaughtered at over 2 years of age, six animals were 1—2 years old and five were less than one year old, including one newborn lamb.

Horses: The age analysis of the horses revealed that nine animals were slaughtered at the age of 5—12 (15) years, with the bones of two horses belonging to animals older than 15 years. Only three specimens were from younger horses.

Epiphyseal fusion data. Among the cattle bones, a sizable number of metapodial bones (18 specimens) were examined. Based on the state of epiphyseal fusion, 11 individuals were slaughtered after the age of 2.5—3 years, while four were less than 2 years old and two were younger than 1 year. Analysis of epiphyseal fusion in the long bones of small ruminants showed that most were between 2 and 3 years old. In horses, epiphyseal fusion data showed that one individual died before the age of two years, while the rest were slaughtered at over 5 years of age, suggesting that epiphyseal fusion of the metatarsals was complete.

Skeletal composition.

Cattle: All skeletal elements are represented (fig. 1). Only sacral vertebrae and sesamoid bones are missing from the collection. A horn core belonging to a cow was discovered. Among the skeletal elements, bones from the proximal parts of the limbs were most frequently represented. Skull bones and individual teeth were found less frequently. The proportions of distal limb bones and trunk bones were approximately equal (Table 3).

Small ruminants: The skeletal elements of small ruminants were almost completely represented (fig. 1). Only some parts of the skull and small joint bones were missing. The proximal limb bones were the most represented, followed by bones from the trunk and distal limbs (Table 3).

Horse: Horse bones were less numerous (fig. 1). Skeletal elements were dominated by distal and proximal limb bones and numerous isolated teeth (Table 3).

Biometric characteristics of domestic ungulates

Morphometric studies were carried out on suitable bones of large and small cattle.

Cattle: The estimated average height at the withers, calculated from two talus bones, suggests that the average height of cattle in the Arshaly settlement was 123.6 cm. The height of the smallest animal was 117.1 cm, while the largest was 130.2 cm. Overall, the range of height differences in the settlement was quite large.

Small ruminants: The average height at the withers, calculated from the talus bone (7 specimens), for the sheep population in the Arshaly settlement was 75.5 cm. The difference in height between the largest and smallest sheep was 13.5 cm, with withers heights ranging from 67.8 cm to 81.3 cm.

Meat consumption

The faunal remains from the osteological collection of the Arshaly settlement come mainly from the carcasses of three species of domestic ungulates: cattle, small ruminants and horses. Their bones predominate in all excavation sectors. On average, cattle bones make up 51% of the collection, small ruminants 35.4% and horse remains 17.8%.

The calculations of meat consumption show that cattle was the most consumed meat (73.6% on average, Table 4). Most of the meat consumed came from animals aged 2—3 years. Mutton was consumed almost nine times less than beef. About 70% of the small ruminants slaughtered were 2—4 years old.

Ceramic material. The ceramic material was highly fragmented, but certain types of rims were identified and grouped by shape: flat (71%), rounded (8%) and pointed (21%). Neck shapes included straight (56%) concave (25%) and flared (6%), with a mold strip present in 13% of cases. The majority of the ceramics were classified as having weakly profiled vessel walls with straight rims and flattened edges. Pointed rims were more common than rounded ones, and some fragments exhibited thickening, with closed vessels (jars) only occurring in small quantities. The primary features of the pottery decoration included cross-hatching and impressions located along the stripe on the neck. The sherd was formed using a coiling technique and some bases had a coiled base. The surface was smoothed with a bone spatula and fired in a reducing environment (fire firing).

Clays with a medium and low iron content were used to make pottery. The clay of the pottery of the Dongal culture from the Arshaly site is characterized by high concentrations of fine quartz sand. Five main recipes were identified: 1) clay + organics — 31%; 2) clay + gravel + organics — 26%; 3) clay + gravel — 22%; 4) clay + grog + organics — 17%; 5) clay + grog — 4%.

A comparison of the vessel shapes and decorative features of the pottery shows the influence of both the Sargary-Alekseyevka and Dongal cultures. For example, thickened rims and complex ornamental compositions are more typical of the Dongal culture, while simplified forms and impressed patterns could indicate the influence of the Sargary tradition. In addition, the tradition of adding grog predominates in Sargary-Alekseyevka pottery, while Dongal pottery has a mixture of grog and gravel with organic components. This is consistent with the results of research on the transitional processes during this period in central Kazakhstan, which emphasize the cultural adaptation of the population and changes in various areas of life (Loman 1987) associated with the transition from the Late Bronze Age to the Early Iron Age. Interregional connections played a crucial role in these changes and facilitated the adoption of new technologies and external elements of material culture, including new methods of pottery and metallurgy as well as animal husbandry.

It is important to note that the technological changes in pottery production, such as the use of coils and more controlled firing techniques, also correspond to the characteristics of the later phases of pottery development. The article by Loman (1987) discusses that this period marks the transition from hand-molding to more standardized techniques, reflecting changes in the organization of production and social structure. These changes are characteristic of both Sargary and Dongal pottery but are evident in different details of workmanship and decoration. In the case of the Arshaly settlement, the combination of features from both cultures indicates that it was located at the crossroads of different traditions, making it a key site for the study of the development of ceramic traditions in the region.

Trace analysis. As part of the research, 34 stone tools were analyzed, most of which were made from local rock types such as granite, aleurolite and sandstone. These tools were used in various production processes. Traces of wear were found on the surface of the tools, making it possible to determine their function and how they were used. Based on the morphological characteristics of the tools and the macro- and microscopically observed traces of wear on their working surfaces, four functional groups of tools were identified: those used for metalworking (Zdanovich, Korobkova 1988: 70), fur and leather processing, pottery production and agriculture. Within each of these groups, specific tool types were identified that fulfilled certain functions (Table 6).

The fragment of a hammer (1 unit) was made of arkosic, medium-grained sandstone and was used for crushing ore. The upper part of the hammer, to which the handle was attached, was broken off. Signs of wear traces on the working surface included polishing, indentations and multidirectional grooves, suggesting that the tool was used for crushing hard minerals, possibly to add mineral additives to the clay (Glushkov 1996). Similar tools were found in the Chervonoye Lake I quarry in the Kartamys microregion (Russia), indicating similarities in their functional and morphological features (Zagorodnya 2013: 235). V.V. Kileinikov's trace-analytical study of the materials from the Mosolovo settlement also revealed the use of hammers for breaking ore (Kileinikov 1996).

The grinders (4 units) were made from natural sandstone slabs measuring up to 14.8 × 10.4 × 4 cm. These tools were used to sharpen objects with a flat surface, such as knives. Signs of wear indicate long-term use, as is typical for sharpening metal tools (fig. 6: 1A). Similar tools were found in the Turgen 2 settlement in Zhetysu and Akbauyr 1 in the Kazakh Altai (Yerzhanova et al. 2020; Yerzhanova 2023).

The whetstones (3 units) were made of sandstone and aleurolite and ranged in size from 7 × 3.7 × 1 cm to 8.3 × 1.7 × 1.3 cm. The working surfaces had a metallic sheen and micro-lines, indicating their use for sharpening metal objects (fig. 1: *2A*). Similar whetstones were found in the Akbauyr 1 settlement, and their functional and morphological characteristics are analogous to those from Arshaly (Yerzhanova 2023: 190).

Hammers (3 units) were used to forge metal objects and are made of quartz granite and aleurolite. They have an elongated cylindrical shape, with working surfaces at the ends. Signs of wear include indentations and notches on the working surfaces. One hammer has a transverse groove for attaching a handle, indicating that it was used for specific tasks (fig. 7: *1A*). Similar tools were found in the settlements of Taldysai and Myrzhyk in central Kazakhstan (Yerzhanova 2018: 204).

Polishers for finishing metal objects (3 units) were made of aleurolite and sandstone. Their surfaces are characterized by polishing and fine linear scratches, which indicates their use for polishing metal objects. Such tools are known from the Late Bronze Age and Early Iron Age materials.

Hoes (10 units) were used to loosen the soil. These tools were made of granite, aleurolite and sandstone. Their working edges were shaped using the method of staking and trimming, which indicates their use in agriculture. Similar hoes were found in the settlements of Taldysai, Abilai, Kent and Akbauyr 1 (Beisenov et al. 2021: 185).

A chisel (1 unit) was made from tuff and used for splitting stone. Similar chisels are found among the materials from the Botai settlement and other Early Iron Age sites in northern Kazakhstan (Zaibert 2009: 265).

Leather polishing tools (2 units) have a rectangular shape and typical signs of wear from leather processing, such as soft, multidirectional lines on the surface. Similar tools were found in the Botai settlement in northern Kazakhstan (Zaibert 2011: 331).

A disc stand (1 unit) with a diameter of 8 cm and a thickness of 0.8 cm was made by flaking off the rim. These discs are often used as lids and stands for ceramic vessels, as their functional equivalents in other central Kazakhstan settlements show (Kadirbayev, Kurmankulov 1992: 162—163).

A multifunctional tool (1 unit) made of fine-grained sandstone served both as a lid and as a stand for ceramic vessels, as traces of soot and wear on its surface show (fig. 7: *3A*).

Hoes (5 units) were used to loosen hard soil and to process minerals. These tools were made from local rocks such as sandstone, aleurolite and granite and were equipped with special attachments for the handles.

The typological and trace analysis of the tools from the Arshaly settlement leads to the conclusion that there was a well-developed industry for processing metal, leather, stone tools and pottery here during the Dongal period. Many similar tools used for ore crushing and metalworking have direct counterparts in Late Bronze Age materials in Central Kazakhstan, such as the settlements of Aksu, Myrzhyk, Kent and Taldysai (Kadirbayev, Kurmankulov 1992; Kungurova, Varfolomeyev 2013; Yerzhanova 2018). Hammers, whetstones, hoes, and polishers for metalworking have been in use since the Bronze Age and continued to be used in the Dongal period. Aleurolite, sandstone, granite, tuff and quartz granite were used to make stone tools in the Arshaly settlement. Outcrops of these rocks were found in the vicinity of the settlement, which indicates that local raw materials were used for tool production.

The stone tools found in the settlement of Arshaly and at other sites of the Dongal period, such as Koktas 1 in the northeast of Saryarka, are direct analogs of the artifacts from Arshaly. The technology of their manufacture and the degree of wear are similar, as they were all made from local materials.

Tools with additional traces of surface treatment have equivalents in the materials from the Bronze Age of Central and Northern Kazakhstan (Kadirbayev, Kurmankulov 1992). Stone tools from the Semiozerka 2 settlement (Evdokimov et al. 2016: 32), which were used for leatherworking, show that natural pebbles were used for their manufacture. These tools first appeared in the Neolithic and continued into the Dongal period. The tools found in the Arshaly settlement are morphologically and typologically similar to those from Semiozerka 2 (Evdokimov et al. 2016: 32).

Results of radiocarbon dating. The radiocarbon dates obtained for the lower layer of the settlement indicate the 14th to 13th century BC (Table 5). However, given the dominance of Dongal pottery, it can be assumed that the main period of the Arshaly settlement corresponds to the early phase of the Dongal period. Further research at the Arshaly settlement and comparable sites will help to clarify the chronology and cultural changes in Kazakhstan between Late Bronze Age and Early Iron Age. Particular attention should be paid to the identification of possible early phases of the Dongal period.

Discussion. The dating of the archaeological complex was based on materials from the Pottery with roller application culture (Valikovaya culture) that developed in the Eurasian steppes, including Kazakhstan, in the 13th to 7th centuries BC (Krivtsova-Grakova 1947: 163; Zdanovich 1984). In the 1980s, it was believed that the Valikovayaculture in central and northern Kazakhstan was connected to the Sargary and Begazy-Dandybai cultures. However, new research at the beginning of the 21st century led to the conclusion that the Begazy-Dandybai and Sargary-Alekseyevka cultures were synchronous (Beisenov et al. 2014). Cultural features were initially examined based on the ceramic complex. However, A.Z. Beisenov argued that this approach was not entirely correct (Beisenov et al. 2014: 185). In the following years, the Sargary culture was considered not only as an analog of the Begazy-Dandybai culture, but also as its integral part. Nevertheless, there are still many contradictory opinions about the delimitation of the cultural groups of the Late Bronze Age in the Eurasian steppe. The antiquities of Sargary-Alekseyevka and Begazy-Dandybai are dated to the 13th to 9th centuries BC. A.A. Tkachev proposed to date the sites of Sargary-Alekseyevka to the 13th century BC (Tkachev 2002: 2016). Today, the chronological age of the sites can be determined by radiocarbon dating. Overall, these results indicate that both samples from the Arshaly settlement fall within the Late Bronze Age, likely between the 14th and 13th centuries BC, with higher probability extending into the 12th century BC (Table 5). It is noteworthy that all the ceramic material represented by Sargary-style pottery was found near the wall of the dwelling and in the bedrock. From this it can be concluded that the settlement was reused by the inhabitants during the Dongal period.

The presence of two cultural layers in one and the same settlement is a common situation for many Late Bronze Age sites in central Kazakhstan. Late Bronze Age pottery was found in the lower cultural layer of settlements such as Buguly 1, Bakibulak and Karatal-2, while the upper layer contained pottery from the Dongal period. In the Bakibulak settlement, the lower cultural layer contained roller-pottery from the Nurinsk culture, while the upper layer contained pottery fragments from the Dongal period.

The tradition of recolonization of the same site in different historical periods can also be observed in the Edirey-2 settlement, where materials from both the Dongal period and the Early Iron Age were found (Beisenov, Loman 2007: 156). The burial sites from the Dongal period are dated to the transition from the Dongal period to the Early Iron Age (Beisenov et al. 2013). The presence of Sargary and Dongal antiquities has been demonstrated in the large settlement of Kent (Beisenov et al. 2014). Prior to this, Dongal settlements such as Dongal (Loman 1987), Tagibaybulak (Margulan 1979: 225—233) and Edirey-2 (Beisenov, Loman 2009), among others, have been investigated. It is worth noting that the Tagibaybulak settlement is the closest to the Arshaly settlement.

In the late 20th century, there were various opinions about considering the Dongal period as an independent culture (Evdokimov 1988). However, due to a lack of radiocarbon analyses and a lack of research results for this period, changes were made to the chronology (Evdokimov 2000).

Researchers of Dongal antiquities have identified early and late phases in the formation of this culture (Kasenalin 2017: 207). So far, results have been obtained on the periodization of Dongal period sites in general. It is clear that the problem of dating contemporary sites can only be solved through interdisciplinary research (Beisenov 2016).

Research into the Dongal culture in Kazakhstan continues to generate lively academic debate. In clarifying the issues of identifying the transitional phase between the Late Bronze Age and the Early Iron Age, the identification of a complete set of features characteristic of different types of archaeological site is crucial. The resolution of these questions requires a comprehensive study of key or "marker" sites that can shed light on aspects of the transition process. Of particular importance is the identification of sites from the transition period (Sviridov, Traiber 2013).

The study of such sites can contribute to a better understanding of the cultural and social changes in the region, including the interregional connections that played a significant role in the adoption of technologies and elements of material culture. The materials from the Arshaly settlement show a complex interweaving of cultural traditions, reflecting the transitional nature of this sites between the Late Bronze Age and the Dongal period.

Conclusion. It is important to note the significant similarities between the settlements of Dongal and Arshaly, which are evident in several key aspects. Both sites belong to the transitional period from the Bronze Age to the Early Iron Age, which is reflected in their material culture and chronology. The architectural features share common characteristics, including rectangular dwellings with stone walls and central hearths.

An analysis of the typological and trace features of the stone tools from the Arshaly settlement indicates the existence of a developed industry for processing metal, leather, and pottery during the Dongal period. Numerous similar tools found in Late Bronze Age settlements such as Aksu, Myrzhyk, Kent and Taldysai (Kadirbayev, Kurmankulov 1992; Kungurova, Varfolomeyev 2013) indicate the continuity of technological traditions in the region. In the Arshaly settlement, mainly local raw materials were used for tool production, which confirms the independence of local production and adaptation to local conditions. The ceramic complexes of both settlements are characterized by a combination of cultural elements from Sargary-Alekseyevka with new features typical of the Dongal type.

Analysis of the species composition of the faunal remains shows that animal husbandry played a dominant role in the settlement's economy. Livestock breeding was the main source of meat and dairy products.

The cultural attribution of both sites indicates that they belong to a particular kind of transitional period, reflecting the processes of transformation in material culture and socio-economic relations. Their geographical location allows us to consider Dongal and Arshaly as key sites for understanding the regional processes of cultural genesis at the boundary between the Bronze and Iron Ages. A comparative analysis of these settlements therefore provides important data for the reconstruction of cultural and historical processes in the Eurasian steppe in the late 2nd and early 1st millennium BC.

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Table 1. **Arshaly Settlement. Taxonomic composition of the osteological collection**

Species composition		Number of bones		Number of bones, %		Number of individuals	
Domestic animals							
Cattle — *Bos taurus*		520		50,8		21	
Small cattle — *Ovis* et *Capra*		343	361	32,9	35,2	18	21
Sheep — *Ovis aries*		17		1,6		2	
Goat — *Capra hircus*		1		0,1		1	
Horse — *Equus caballus*		138		13,4		14	
Dog — *Canis familiaris*		4		0,4		1	
Total pets		1023		100,0		57	
Wild animals							
Kulan — *Equus caballus*		4		22,2		2	
Roe deer — *Capreolus pygargus*		1		5,5		1	
Saiga — *Saiga tatarica*		13		72,3		5	
Total wild animals		18		100		8	
Total		1041		100		65	
Mammals	Large animals	193		26,2		735	
	Small animals	553		73,8			
Total bones		1787					

Table 2. **Arshaly settlement. Age composition of the domestic animals**

Condition of teeth in the lower jaw	Age, month	Number of individuals	%
Cattle			
P4 present	Over 34 months	7	33,3
m3 present	Over 28 months	11	52,4
m2 present, m3 absent	18—28 months	1	4,8
m1 present, m2 absent	6—18 months	2	9,5
Всего		21	100
Sheep and Goats			
m3 present	Over 24 months	9	42,9
m2 present, m3 absent	12—24 months	6	28,6
m1 present, m2 absent	3—12 months	5	23,8
m1 absent	Up to 3 months	1	4,8
Total		21	100
Horse			
Old animals	Older than 15 years	2	14,3
Adult animals	5—12 (15) years	9	64,3
Sub-adult animals	2—5 years	1	7,1
Young animals	Up to 2 years	2	14,3
Всего		14	100

Table 3. **Arshaly settlement. Number and composition of skeletal elements of domestic animals**

Skeletal section	Cattle		Sheep and Goats		Horse	
	Абс.	%	Абс.	%	Абс.	%
Head (maxilla, mandible)	19	3,7	29	8,1	6	4,3
Teeth	21	4,0	8	2,2	28	20,3
Trunk (vertebrae, sacrum, costae)	91	17,5	103	28,3	26	18,8
Proximal limb sections (scapula, pelvis, long tubular bones)	288	55,4	129	35,8	34	24,6
Distal limb sections (short tubular bones, basipodium bones)	101	19,4	92	25,6	44	31,9
Number of bones, exemplar	520	100	361	100	138	100

Table 4. **Arshaly settlement. Calculation of the relative (%) amounts of meat consumed from domestic animals**

Indicator	Cattle	Sheep and Goats	Horse	Total
Osteological spectrum, %	51.0	35.4	13.5	1019 bones
The weight ratio of large domestic animal carcasses to one sheep carcass	6	1	5.5	—
Volume of meat products in conventional units	306.0	35.4	74.2	415,4
Ratio of meat product volumes, %	73.6	8.5	17.8	100

Table 5. **Results of the radiocarbon dating**

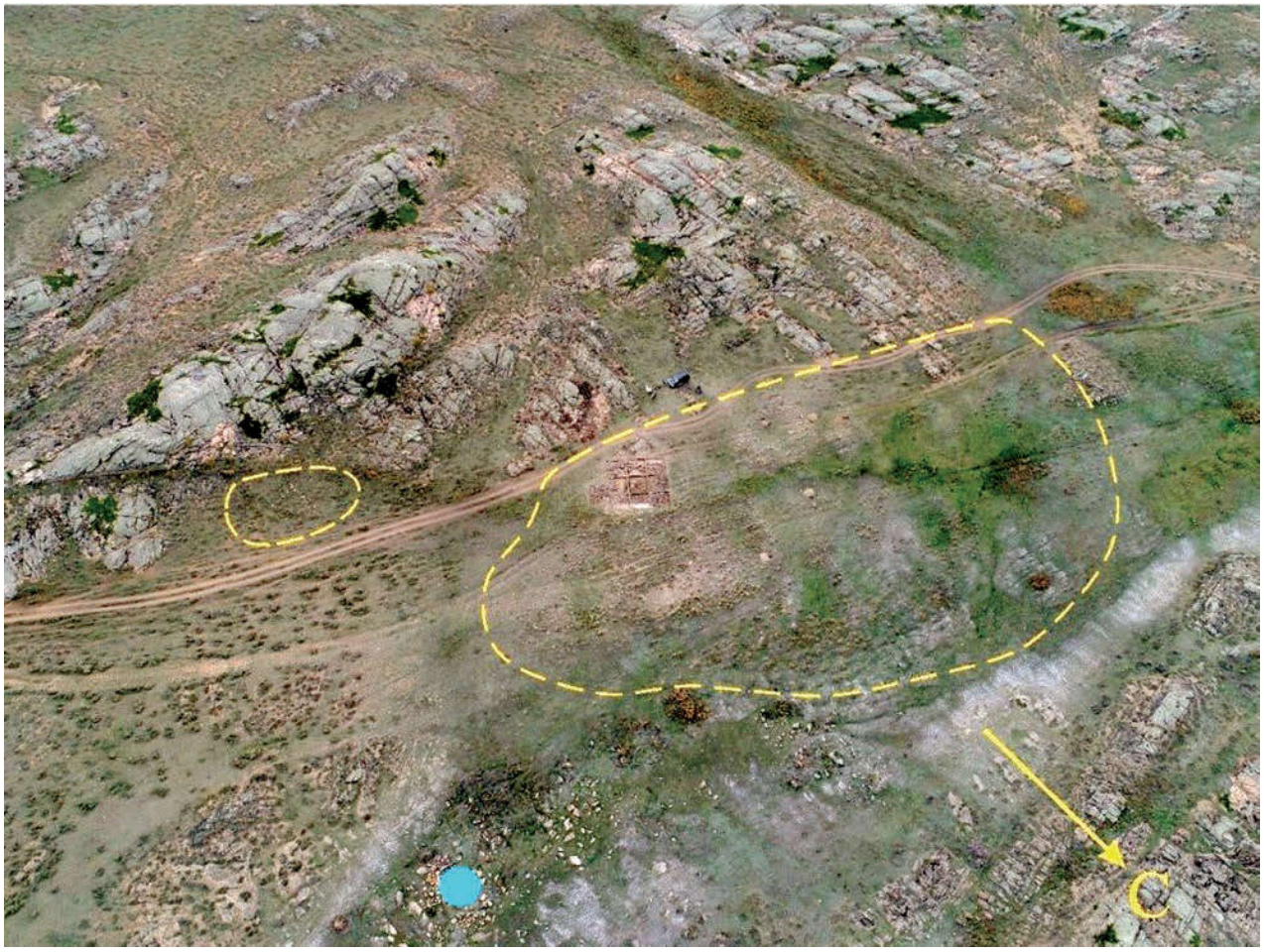
№	Laboratory Number	Site Name	Sample Type	^{14}C BP	Calibrated Date (σ)
	FTMC-SF12-52R	Arshaly Settlement, Hearth	Animal Bones	3040±29	4.6% 1242 — 1233 cal BC 95,4% 1401— 1206 cal BC
	FTMC-SF12-15R	Arshaly Settlement, Utility Pit No. 1	Animal Bones	3058±35	34.1% 1390 — 1336 cal BC 34.2% 1723 1323 — 1267 cal BC 95.4% 1413 — 1224 cal BC

Table 6. **Typology of Tools from the Arshaly Settlement**

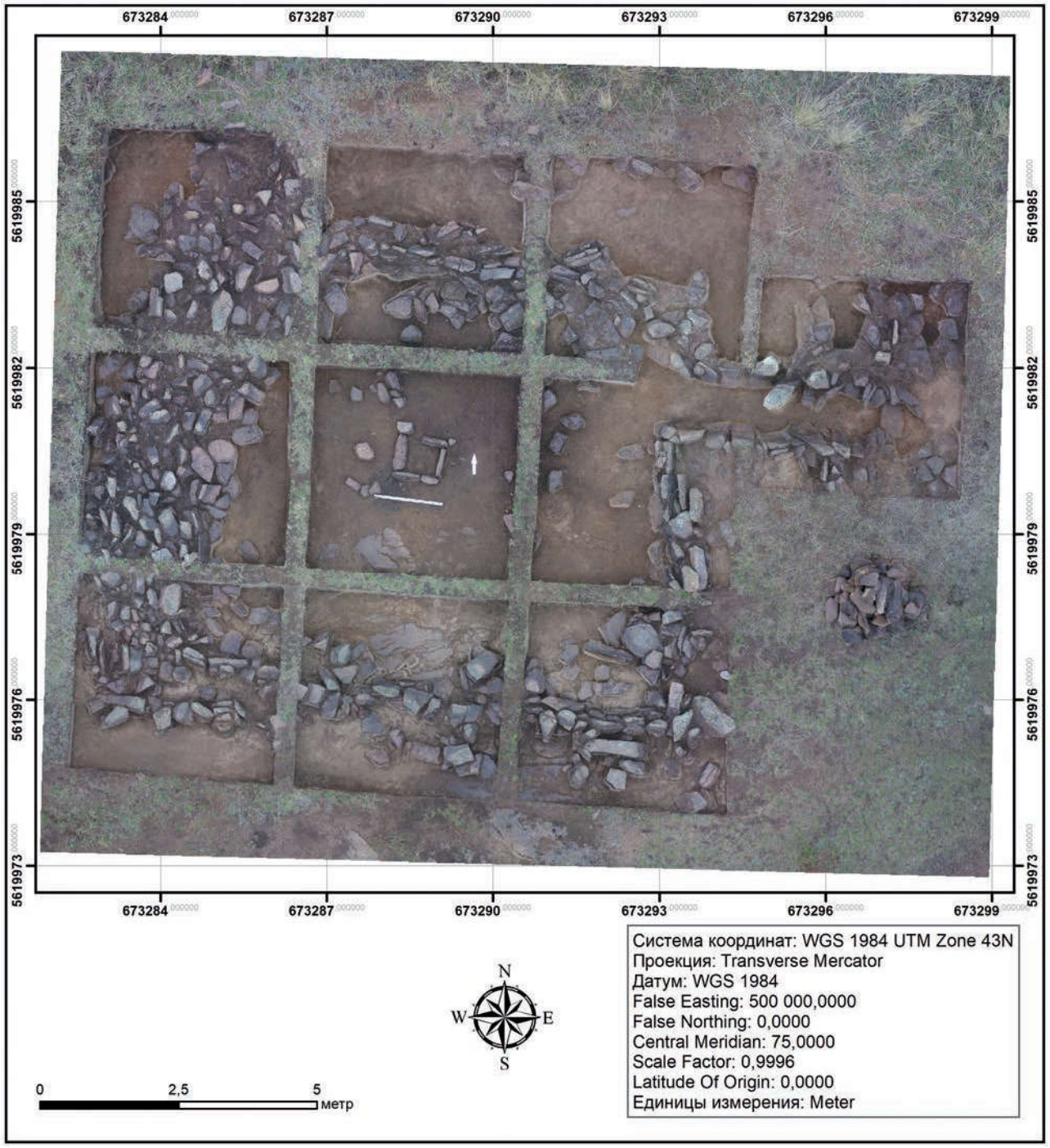
Category	Types	Quantity
Metalworking Tools	Hammer Abraders Whetstones Small Hammers Metal Polishers Mineral Hoe	1 4 3 3 3 10
Tool Processing	Chisel	1
Hide and Leather Processing	Leather Polishers	2
Pottery Production	Disc-Stand Multifunctional Tool	1 1
Agriculture	Hoe	5
	Total:	34



Fig. 1. Location of the settlement of Arshaly on the map of Kazakhstan. ©Google Earth.
Performer: Z. Utubayev.



1



2

Fig. 2. The settlement of Arshaly: *1* — boundaries of the site; *2* — the excavation.
Performers: Z. Utubayev, K. Assylbekov

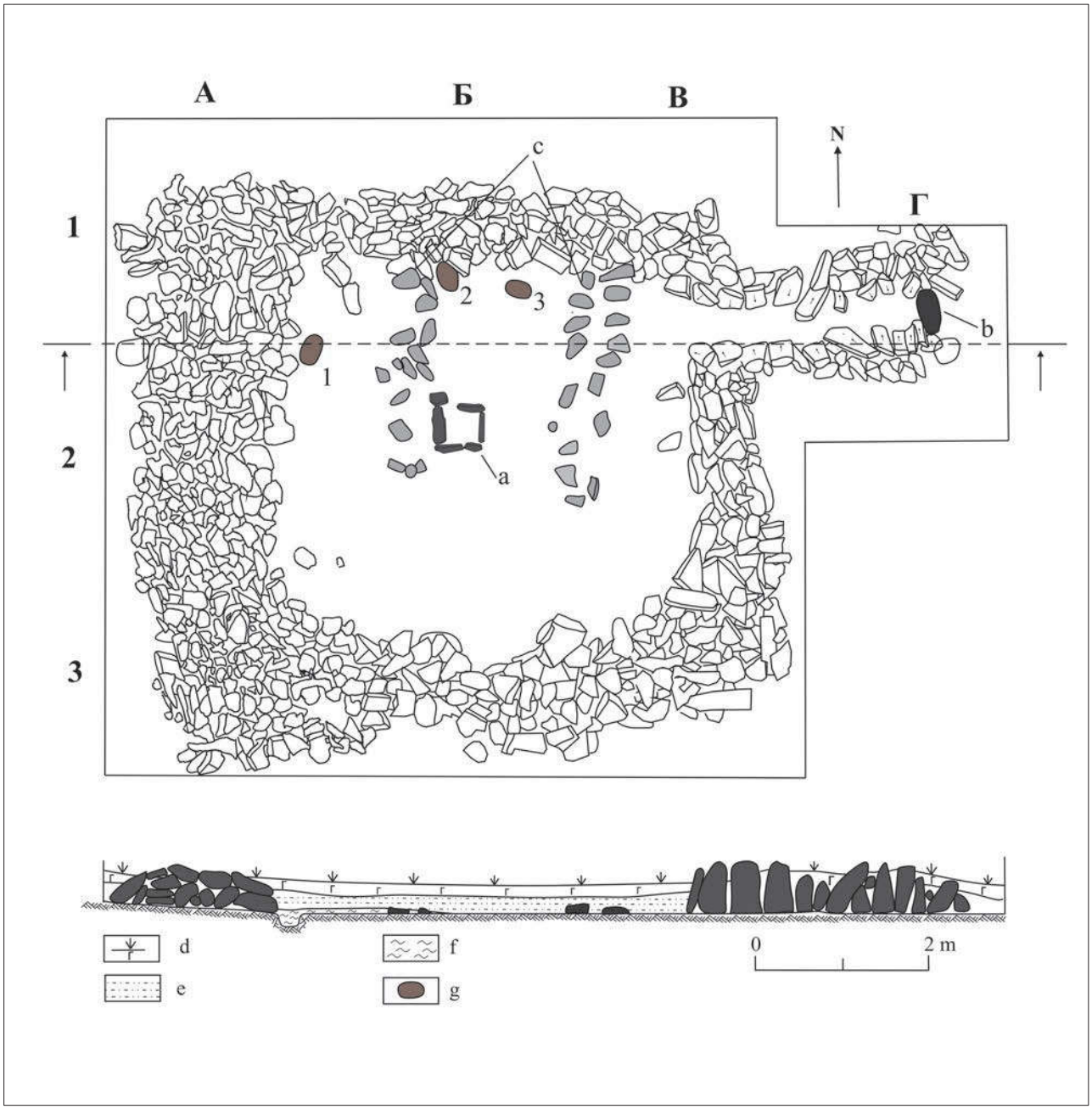


Fig. 3. The settlement of Arshaly. Plan and section: *a* — stone hearth; *b* — stone threshold; *c* — remains of stone foundations. Symbols: *d* — peat; *e* — gray-brown layer; *f* — ash layer; *g* — utility pit (*1*—*3*). Performer: D. Duisenbay.

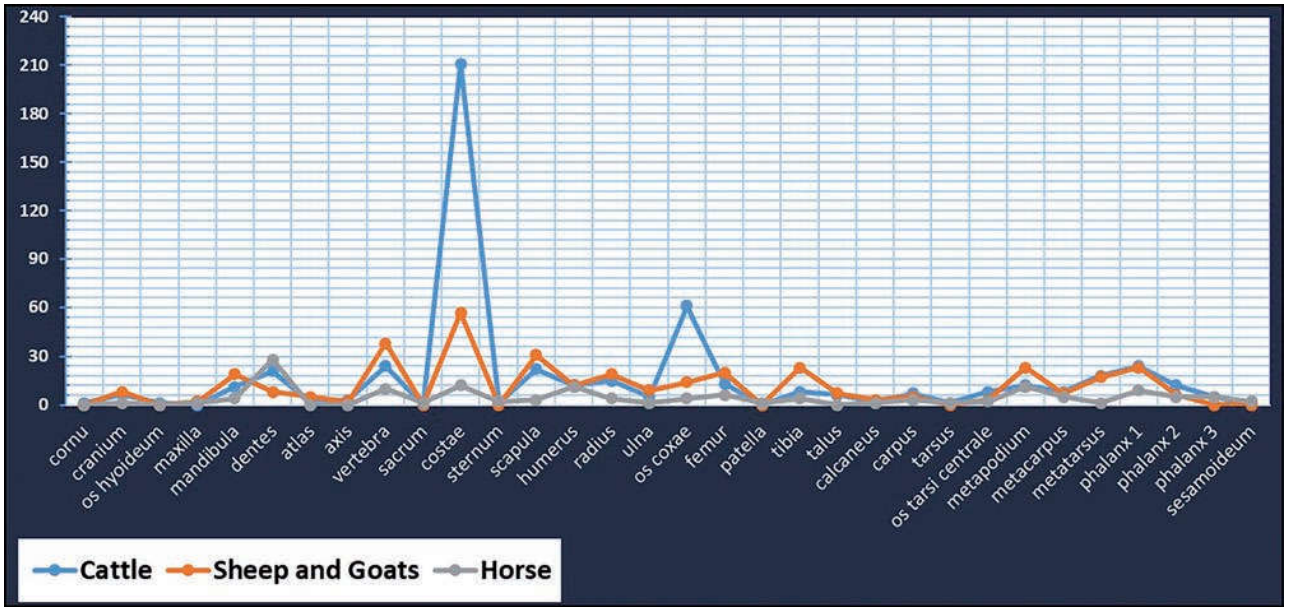


Fig. 4. The settlement of Arshaly. Number and composition of skeletal elements of domestic animals. Performer: M. Shagirbayev.

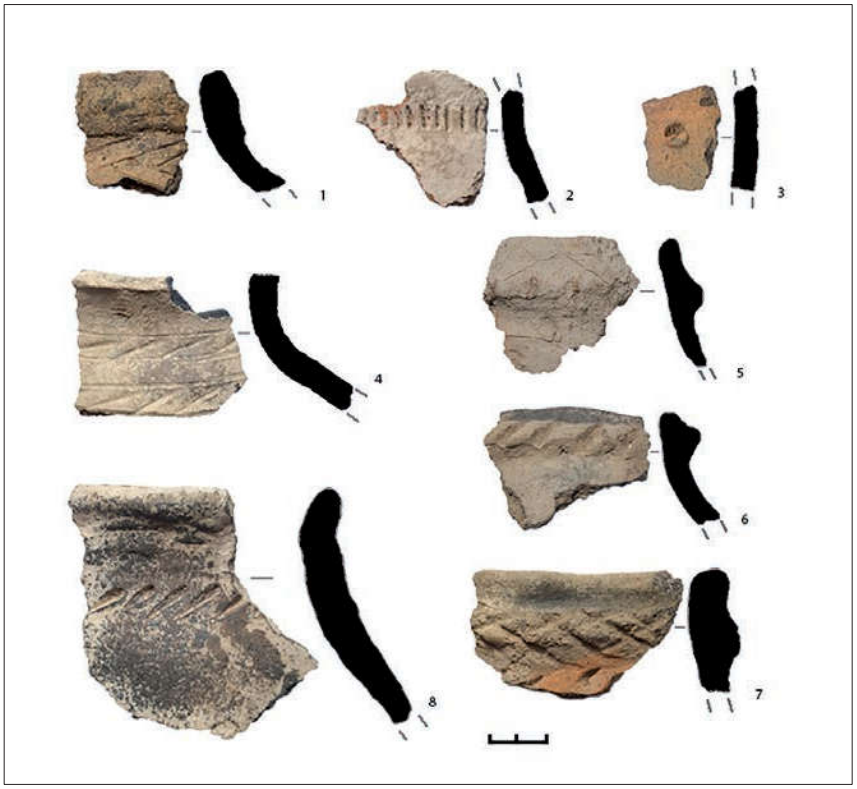


Fig. 5. Arshaly settlement. Ceramic complex. Performer: Ye. Dubyagina.

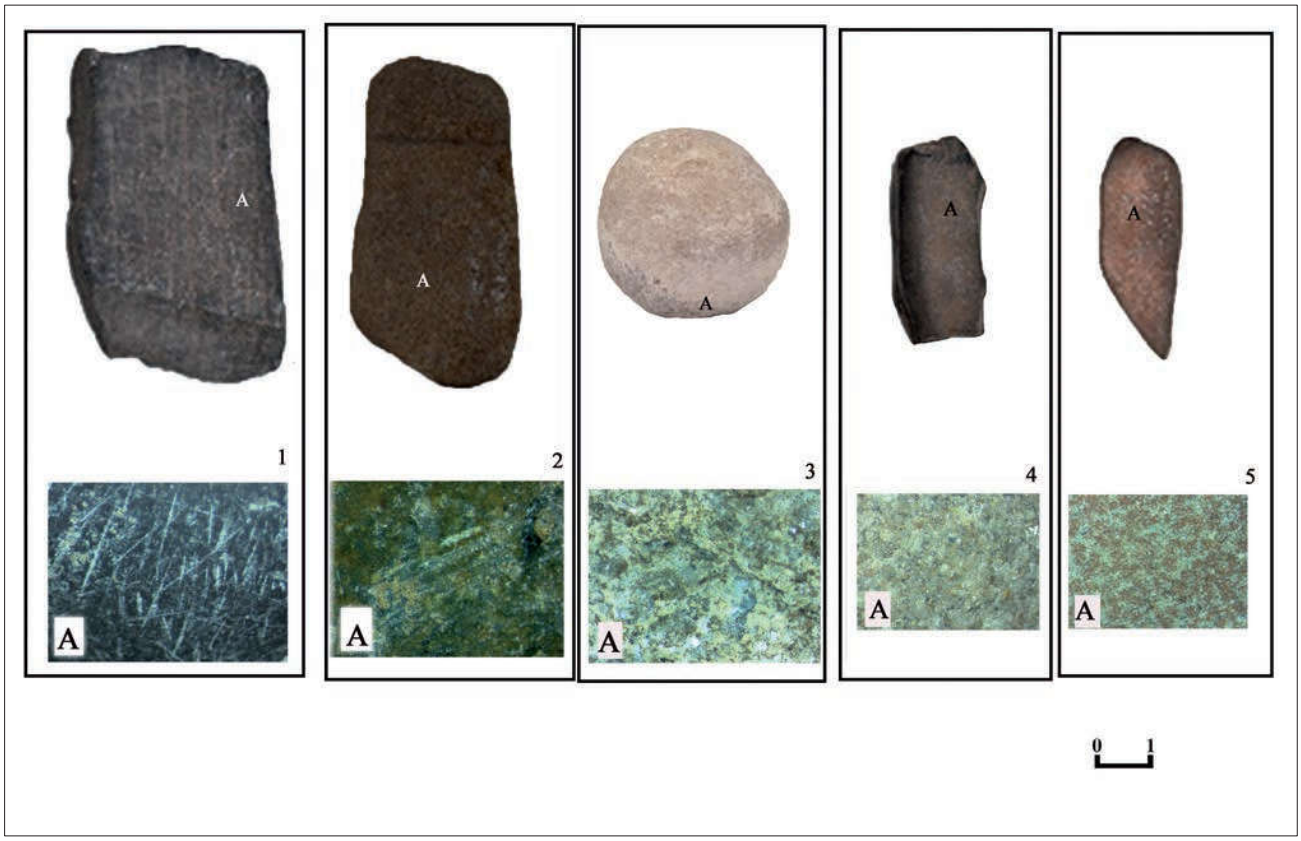


Fig. 6. Arshaly settlement. Stone tools: *1A* — grinding stone; *2A* — whetstone; *3A* — hammerstone; *4A* — ceramic burnisher; *5A* — bone artifact burnisher. Performer: A. Yerzhanova.

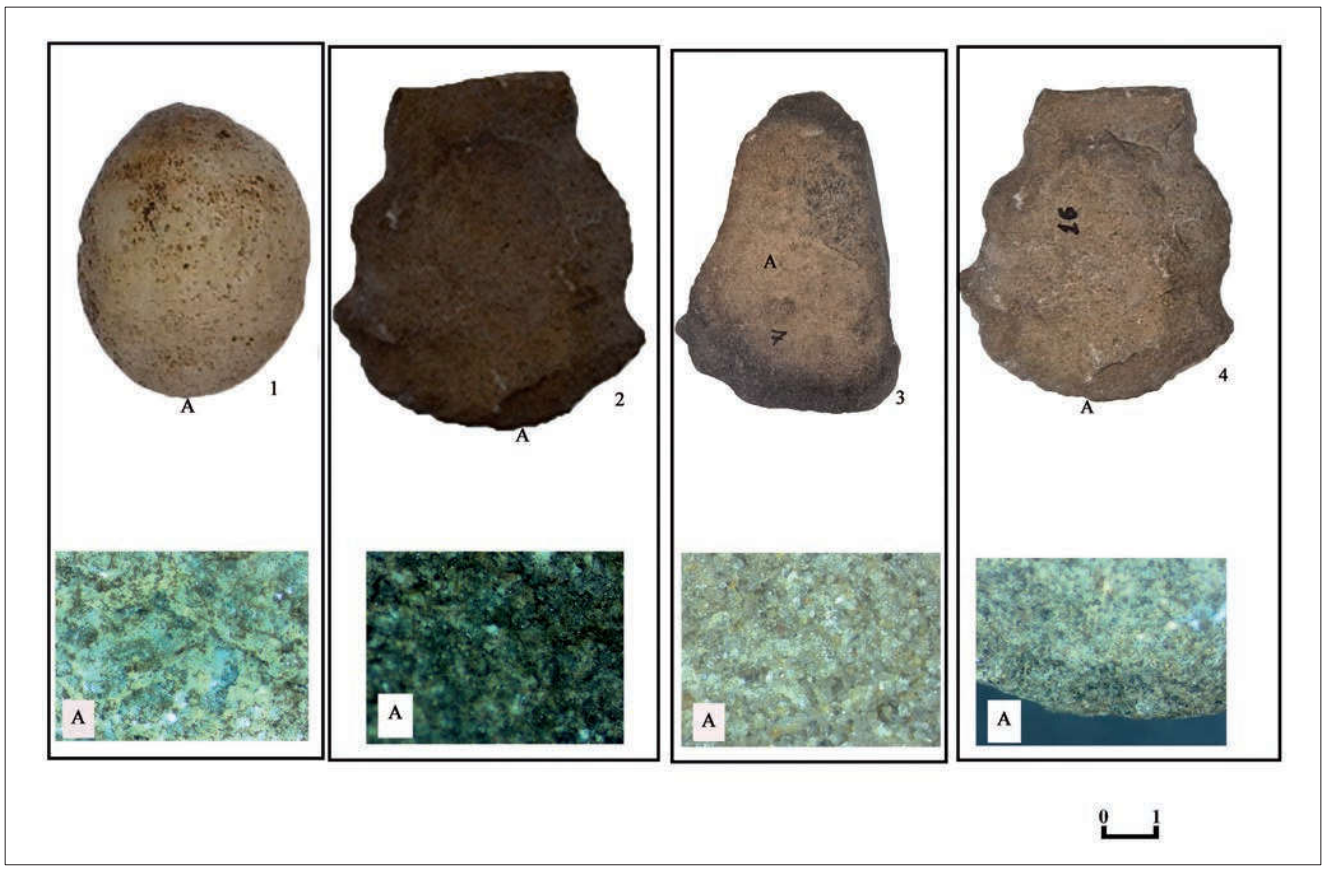


Fig. 7. Arshaly settlement. Stone tools: *1A* — ovoid hammer; *2A, 4A* — hoes; *3A* — multifunction tool. Performer: A. Yerzhanova.

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КОМПЛЕКТ БРОНЗОВЫХ ИЗДЕЛИЙ РАННЕСАКСКОГО ВРЕМЕНИ ДЛЯ КОНСКОГО СНАРЯЖЕНИЯ ИЗ ГОРНОЙ МАЕВКИ (КЫРГЫЗСТАН)*

Конское снаряжение по праву считается одной из основных категорий так называемой скифской триады и является ключевым элементом всаднической культуры, материальная база которой существенно пополнилась в ходе исследований последних десятилетий. Соответственно, на повестке дня — осмысление собранных данных, анализ проблем эволюции и трансформации конской амуниции раннего железного века с основой на типологический метод научного познания. Объектом данного исследования является уздечный и седельный комплексы и его составные элементы, развитие которых берёт своё начало в эпоху бронзы и уже в раннем железном веке характеризуется поиском наиболее оптимальных в функциональном отношении вариаций использования. В статье вводятся в научный оборот материалы, обнаруженные на окраине с. Горная Маевка (Кыргызстан). Уникальность их заключается в новом способе соединения удил и псалиев. При сравнительно-типологическом анализе всех находок выявлен круг наиболее близких по морфологическим и техническим характеристикам аналогий, анализ которых в определённой степени указывает на принадлежность к раннесакскому обществу. Авторы также представили типологию способов соединения удил и псалиев. На основе приведённых хронологических показателей этот комплекс предварительно датирован в рамках VIII—VII вв. до н.э.

Ключевые слова: археология, ранний железный век, раннесакское время, конское снаряжение, удила, псалий, рентгенофлюоресцентный анализ.

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