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Towards the study of the culture of early nomads of Zhetysu: results of traceological and archaeozoological analysis of materials from the settlement of Sharyn

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Abstract. The article presents the results of archaeological research at the Sharyn settlement in the Sarytogai tract, located within the Sharyn National Park in the Uygur district of Almaty region, which is one of the largest Early Iron Age sites in Zhetysu. The relevance of the study lies in the need to reconstruct the economic and cultural type of the local population and to identify the specifics of cultural contacts between Zhetysu, Central Kazakhstan, and the Altai. The research aimed to determine the economy and way of life of the Sharyn population through the combined use of traditional archaeological methods and interdisciplinary approaches. The objectives included the analysis of the ceramic assemblage, the functional identification of stone tools through use-wear analysis, and the archaeozoological study of animal bone remains. The hypothesis suggested that the population engaged in animal husbandry and agriculture, applied diverse tools in economic and domestic activities, and maintained cultural contacts with neighboring regions, as reflected in the material culture. The results demonstrated that the diversity of ceramic forms and ornamentation indicates active interregional interactions; use-wear analysis of stone tools revealed their application in agriculture, construction, and daily life; and archaeozoological analysis of 692 animal bones established the predominance of small ruminants (50.9%) along with a significant role of cattle and horse breeding. The scientific novelty of the study lies in the first comprehensive application of use-wear and archaeozoological analyses to the materials of the Sharyn settlement, which made it possible to reconstruct economic practices and identify the specific features of local traditions within the broader framework of interregional cultural connections in the Early Iron Age.
Keywords: early iron age; settlement; excavation; ceramics; stone tools; animal bones; traceology; wear

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К изучению культуры ранних кочевников Жетысу: результаты трасологического и археозоологического определение материалов поселения Шарын

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Аннотация. Статья посвящена результатам археологических исследований поселения Шарын в урочище Сарытогай, расположенного на территории Национального парка Шарын в Уйгурском районе Алматинской области, являющегося одним из крупнейших памятников раннего железного века Жетысу. Актуальность работы определяется необходимостью реконструкции хозяйственно-культурного типа населения региона и выявления особенностей культурных связей Жетысу с Центральным Казахстаном и Алтаем. Цель исследования заключалась в определении хозяйства и образа жизни населения Шарына на основе комплексного применения традиционных археологических методов и междисциплинарных подходов. В задачи входили анализ керамического комплекса, функциональное определение каменных орудий труда методом трасологии, а также археозоологическое исследование костных остатков животных. Гипотеза исследования предполагала, что население поселения занималось скотоводством и земледелием, применяло разнообразные орудия в хозяйственной и бытовой деятельности, а культурные контакты с соседними регионами нашли отражение в материальной культуре. Результаты показали, что разнообразие форм и орнаментации керамики указывает на активные межрегиональные взаимодействия, трасологический анализ каменных орудий выявил их использование в земледелии, строительстве и быту, а археозоологический анализ 692 костных остатков позволил определить преобладание мелкого рогатого скота (50,9 %) и значительную роль крупного рогатого скота и лошади в хозяйстве. Научная новизна исследования заключается в первом комплексном привлечении трасологического и археозоологического анализа материалов поселения Шарын, что позволило реконструировать хозяйственную деятельность и выявить специфические черты локальных традиций в контексте межрегиональных культурных связей раннего железного века.

Ключевые слова: ранний железный век; поселение; раскоп; керамика; каменные орудия; кости животных; трасология; износ

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Финансирование. Работа выполнена в рамках программы целевого финансирования Комитета науки Министерства науки и высшего образования Республики Казахстан по теме «Древность и средневековье Алматы: исследование и сохранение археологического наследия», ИРН BR21882346.

Жетісу ерте көшпенділері мәдениетін зерттеу тұрғысында: Шарын қонысы материалдарын трасологиялық және археозоологиялық анықтау

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Аңдатпа. Мақала Алматы облысы, Ұйғыр ауданындағы Шарын ұлттық паркінің аумағында орналасқан Сарытоғай жазығындағы Шарын қонысында жүргізілген археологиялық зерттеулердің нәтижелеріне арналған. Бұл ескерткіш Жетісу аумағындағы ерте темір дәуірінің ең ірі қоныстарының бірі болып табылады. Зерттеудің өзектілігі жергілікті халықтың шаруашылық-мәдени типін қалпына келтіру және Жетісудың Орталық Қазақстан мен Алтай аймақтарымен мәдени байланыстарының ерекшеліктерін айқындау қажеттілігінен туындайды. Зерттеудің мақсаты – дәстүрлі археологиялық әдістерді және трасологиялық, археозоологиялық сияқты пәнаралық әдістерді кешенді қолдану арқылы Шарын қонысы тұрғындарының шаруашылығы мен тұрмысын анықтау. Қыш кешенін талдау, тас құралдарының функцияларын трасологиялық әдіспен айқындау және жануар сүйектерінің археозоологиялық зерттеуі міндеті болып табылады. Зерттеу гипотезасы – қоныс тұрғындары мал шаруашылығымен, егіншілікпен айналысқан, сонымен бірге әртүрлі құралдарды шаруашылық пен тұрмыста қолдана білген, сондай-ақ көрші аймақтармен мәдени байланыстарға түскені материалдық мәдениетте көрініс тапқан. Зерттеу нәтижелері қыш ыдыстарының пішіндік және өрнектік әртүрлілігі аймақаралық байланыстардың белсенді болғанын көрсетеді; тас құралдарының трасологиялық талдауы олардың егіншілікке, құрылысқа және тұрмыстық іс-әрекеттерге пайдаланылғанын анықтады; ал жануар сүйектеріне жасалған археозоологиялық талдау (692 дана) ұсақ мал сүйектерінің басым болғанын (50,9%), сондай-ақ ірі қара мен жылқының шаруашылығында маңызды рөл атқарғанын көрсетті. Зерттеудің ғылыми жаңалығы – Шарын қонысының материалдарына алғаш рет трасологиялық және археозоологиялық зерттеулер кешенді түрде қолданылып, қоныс тұрғындарының шаруашылығы мен тұрмысы қалпына келтірілді және ерте темір дәуіріндегі аймақаралық мәдени байланыстар аясында жергілікті дәстүрлердің ерекшеліктері айқындалды.

Түйін сөздер: ерте темір дәуірі; қоныс; қазба; керамика; тас құралдар; мал сүйектері; трасология; тозу іздері

Introduction

The issue of housing and economy of the population of Kazakhstan in the early Iron Age has long been controversial and has had no clear answer. One, and probably the main reason for the current situation, is the poor study of settlement monuments

The issue of housing and economy of the population of Kazakhstan in the early Iron Age has long been controversial and had no clear answer. One and probably the main reason for the current situation is the poor study of settlement monuments compared to burial and memorial monuments, which mainly characterize the ideological side of society, which was reflected in numerous conclusions about the life of the ancient population based on one-sided material. Today, when more archaeologists have moved on to studying the problem of the life

support system and economic and cultural relations of cattle breeders and farmers in this era, settlements have become a particularly important type of monument, the systematic study of which has allowed us to more fully answer the questions that arose earlier. At the moment, the study of settlement monuments is not complete, as a rule, they are recorded in large quantities on the territory of Central Kazakhstan and Zhetysu. The most difficult in this regard are the areas of semi-desert and desert regions of Kazakhstan, where human activity was inextricably linked with permanent sources of water supply and complicated by difficult climatic conditions.

This work is the result of a study of the Sharyn settlement in the Sarytogay tract, which is located on the territory of the Sharyn National Park, Uyghur district of Almaty region, 11 km northwest of the district center of Chundzha (Fig. 1). Which vividly represents the methods of adaptation and economic way of life of the local population and is also one of the few monuments of a sedentary way of life in the era of early nomads of the region.

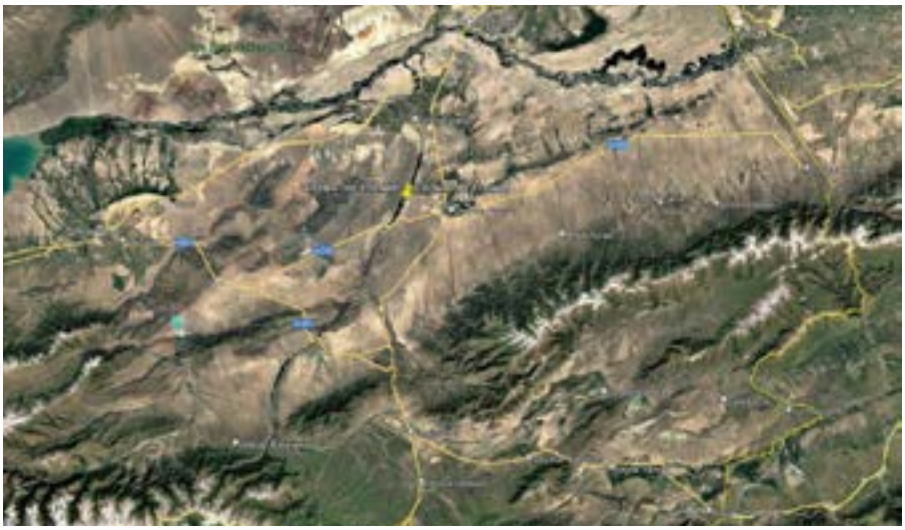


Fig. 1. The Sharyn settlement in the locality of Sarytogai

The aim of this work is to reconstruct the economy and lifestyle of the local population in the Early Iron Age based on both traditional archaeological methods and interdisciplinary approaches such as traceological, archaeozoological, and technical-typological analyses. The subject of the study is the Sharyn settlement, dating back to the era of early nomads in the territory of Zhetysu and the discovered everyday objects, tools, and animal bones.

Materials and methods

The study is interdisciplinary and includes the use of natural science methods to study archaeological sources: stone tools and osteological material. Paleoeconomic research within the framework of a multidisciplinary approach has made it possible to obtain new information on the types of economic activity of the population to analyze the multicomponent life support system of ancient communities. Stone tools are key artifacts in archaeological research, as they not only reflect the technological level of ancient societies but also provide information about everyday life and economic activity. Analysis of tools requires a comprehensive approach, including contextual research. A comprehensive study of the collection was carried out using trace

analysis aimed at identifying the functional features of stone objects. The main methodological principles of such studies are reflected in the works by N. Yu. Kungurova (Kungurova and Varfolomeev 2013) and A. Ye. Yerzhanova (Yerzhanova et al. 2024; Yermolayeva et al. 2024: 178). As a result of the traceological analysis of the stone inventory of the Sharyn settlement, 48 tools were identified. A ZEISS steREO Discovery. V8 microscope with a working magnification of 100 times was used to process the collection. Photographic recording of macro- and micro-traces on the surfaces of the tools was carried out; traces of wear on the artifacts were described and the functions of the tools were determined. In addition, typological and technological methods were used in the study.

Special methods were used to differentiate sheep and goat bones among the remains of small ruminants (Zeder et al. 2010a; Zeder et al. 2010b). A special method of the Laboratory of Natural Science Methods of the Institute of Archaeology of the Russian Academy of Sciences was used to reconstruct the meat diet (Antipina 2013: 139). Mammalian bones that could not be identified to species were divided into two groups: large ones – the size of large ungulates, and medium-sized ones – animals of smaller sizes (no smaller than a hare or marmot).

Literature Review

One of the most important categories of monuments of the early Iron Age of Zhetysu is settlements, discovered to date throughout the entire territory of the region. At this stage, the study of settlement monuments is reaching a new level. Many researchers, understanding the importance, began to rethink the materials from the considered category of monuments, attracting interdisciplinary methods of study.

However, the settlements began to be studied at the end of the 20th century. Not far from the Kazakhfilm studio within the city of Almaty, on a natural hill located to the south between modern Timiryazev and al-Farabi streets in 1984, B.N. Nurmukhanbetov and Yu.I. Trifonov studied a settlement of the 6th-3rd centuries BC. During the excavations, a significant number of grain grinders were found. According to the researchers, the population of this settlement was engaged in agriculture. In addition, based on the remains of the bones of cattle and small ruminants, which were mainly used as food, it was assumed that cattle breeding was the main activity. The ceramic complex from the settlement seems interesting; according to the authors, they are similar to the materials from the settlements of Molaly and Shubarat (Nurmukhanbetov 2016). Another interesting fact is that the settlements of the early Iron Age were located on complexes of earlier periods.

In 1985, the Semerecheye archaeological team under the leadership of K. Akishev and A. Akishev began researching the settlements of Buyen and Ashibulak (Taldy-Kurgan region, Kapal district) (Karabaspakova 2011: 36), which contain cultural layers from the Bronze Age to the Saka-Wusun period. The main finds were ceramics with pearl-shaped ornaments.

Work on identifying and studying settlement sites has continued since the early 2000s. Thus, A.N. Maryashev discovered the settlement of Tasbas-1 in the Bayanzhurek Mountains, where there were also fragments of ceramics with a pearl ornament (Maryashev 2002, Fig. 7). According to A.Z. Beisenov, such an ornament is characteristic of the Early Iron Age. Ceramics with a similar ornament are also found in the Serektas 2 cattle breeders' settlement (Yermolaeva et al. 2024: 190). The mass material originating from the settlement, along with ceramics, includes stone

tools, which are often found, especially among the materials from the settlements located in the Northern foothills of Ile Alatau, such as Butakty-1, Tuzusay, and Taldybulak-2. According to researchers, these sites date back to the 5th–3rd centuries BC chronologically, and their population was primarily engaged in cattle breeding and agriculture (Yerzhanova and ed. 2024: 159).

Settlements were built along the banks of water sources, and the inhabitants ran a complex economy, where agriculture played an important role. The dwellings and their architectural features are also of interest. At the Butakty-1 settlement, on the southeastern outskirts of Almaty, above-ground frame yurt-shaped dwellings and semi-dugouts were discovered (Goryachev 2015: 94). Based on the architecture and structure of the dwellings, it is possible to date them within a certain time frame; for example, dugout-type dwellings and dugouts with a frame-and-post structure date back to the Bronze Age. In the highland zone, settlements were built on the upper sections of gorges, on the tops of plateaus (Goryachev 2011).

The results of the studies of materials obtained from the settlements of the Saka period allow us to believe that, along with cattle breeding, developed domestic crafts, metallurgy and metalworking, irrigation agriculture was of great importance in the economy of the population of the foothill valleys of Zhetysu towards the end of the 1st millennium BC (Goryachev 2017: 124). The settlement of Sharyn is also located not far from the river and the discovered stone tools and animal bones indicate that the population was mainly engaged in cattle breeding and agriculture.

Results and discussion

The Sarytogay tract, located in the Uyghur district of the Almaty region of Kazakhstan, is an interesting physical and geographical object characterized by complex relief, an active hydrographic network and diverse natural conditions. The territory is located in the foothills of the Zailiysky Alatau and Ketmen ridges, which are part of the Northern Tien Shan, which determines the climatic and hydrographic conditions of the region (Fig. 1). This region is characterized by high rates of geomorphological changes caused by erosion, tectonic processes and climatic factors. In this regard, the life support and adaptation system of the local population in ancient times is of particular interest.

History of the study of the monument. The first studies of monuments in the Sarytogay area were associated with the activities of the Semirechye archaeological expedition of 1956. In 1954, the Institute of History, Archaeology and Ethnography was named after Ch. Valikhanov of the Academy of Sciences of the Kazakh SSR organized the Ili archaeological expedition under the leadership of K. Akishev. The main goal of the expedition was to compile an archaeological map of the Almaty region and identify previously unknown monuments. As part of this work, excavations were carried out at three burial grounds, including the Sarytogay burial ground, located in the valley of the middle reaches of the Charyn River, a left tributary of the Ili River (Akishev 1956).

According to E. Ageeva, the Sarytogay burial ground includes 108 burial mounds with a diameter of 3 to 16 m and a height of 0.1 to 1.2 m. During the research, findings were discovered that indicate that this monument belonged to the Wusun culture (3rd century BC – 4th century AD), which was widespread in the territory of Zhetysu (Semirechye). Ceramic items, metal

objects and remains of ritual food, characteristic of the Wusun, were found in the burials (Ageeva 1961: 35–40).

In 1964, the Kegen team of the Semirechye archaeological expedition led by K. Akishev and B. Nurmukhanbetov carried out excavations of the burial grounds of Sarybulak-I and II near the village of Shonzhy. As a result, valuable materials dating back to the 4th-1st centuries BC were discovered, among which jewelry made in the "animal style" stands out. Based on the data obtained, K. Akishev suggested that at the end of the 4th century BC, the Sakas in the region were replaced by the Yuezhi tribes.[1]

After Kazakhstan gained independence, a new stage of research began. In 1992, the Semirechye cultural and archaeological expedition was organized under the leadership of K.A. Akishev, which surveyed burial grounds and settlements in the Sarytogay tract. A new burial ground was also discovered, located 7 km southwest of the village of Sharyn. It includes about a thousand burial mounds made of pebbles, stretching for 5 km in the east-west direction and 2 km from south to north. The preliminary dating of the monument is the 6th-1st centuries BC[2]. In 2008–2009, the Archaeology Center of the Central State Museum of the Republic of Kazakhstan, under the direction of Kh. Aitkul carried out excavations of a settlement on the right bank of the Sharyn River. The research results were not published and are stored in the museum archive, but some of the finds were presented in the scientific catalog of the Central State Museum of the Republic of Kazakhstan in 2011 (Catalog 2011: 165–174). In 2024, under the direction of Kh. A. Aitkul, employees of the Esik State Historical and Cultural Museum-Reserve conducted archaeological excavations at the Sarytogay I burial and ritual complex. As a result of the excavations, new materials on household items and weapons, as well as on the features of the construction of burial and memorial complexes, were obtained (Tulegenov et al. 2024: 226–227). Thus, archaeological research in the region was carried out intermittently, which led to an uneven study of the monuments. Nevertheless, the materials revealed allowed us to significantly expand our understanding of the cultural and historical development of this region in ancient times.

Landscape. The area, where the monument is located, is a transition zone between the floodplain valley of the Sharyn River and an arid erosional plateau, with clear signs of water and wind erosion. The Sharyn River flows in the northwest, forming a deep valley with floodplain vegetation. The central part is dominated by arid, eroded areas with pronounced ravines and dry beds of temporary streams. The northeast is characterized by an artificial watercourse (aryk), parallel to the road, and sparse vegetation. In the southeast, there is a highly dissected relief with hilly heights and ravines, subject to water and wind erosion. The southwest part is the boundary between the floodplain zone and the arid slopes of the plateau. Due to natural factors, the territory of the settlement was subjected to significant destruction by soil erosion, so during the inspection of the monument, many archaeological finds were discovered on the ground.

Ceramics analysis. To determine the nature of the dwellings and define the boundaries of the settlement, 2 excavations and 1 pit were laid (Fig. 2, 3). During the study of the pit and excavation 2, no structural elements were found; the cultural layer was only 10 cm and was subjected to serious destruction. Only chaotically located clusters of fragments of ceramics and animal bones were preserved. The most massive layer of material was discovered in the area of excavation 3.



Fig. 2. Sharyn settlement. Excavations from 2024.



Fig. 3. Sharyn settlement. Excavation № 3, where remains of a fireplace were discovered.

The analysis of ceramics distinguished several typological groups. In terms of the shape of the vessels, pots with straight or slightly bent rims, jar-shaped, and barrel-shaped predominate. The thickness of the walls varies from 5 to 10 mm, which indicates the development of pottery. On the fragments of ceramics, pitted impressions, notches, pinches and finger impressions in the upper part of the vessels are most common. According to the manufacturing technology, it can be said that talc grit, fireclay and sand were used as admixtures in clay to increase fire resistance. Firing was carried out in above-ground or semi-underground furnaces at a temperature of 600-800°C.

The typological diversity of Sharyn ceramics reflects the complex cultural dynamics of the region in the early Iron Age. The similarity of forms and ornamentation with the ceramics of Central Kazakhstan and Altai indicates active cultural contacts and migration processes. Typological analysis of the early Iron Age ceramics of Sharyn allows us to identify the characteristic features of pottery production in the region, establish cultural ties with neighboring territories and clarify the chronological framework of archaeological sites.

Traceological determination of stone tools. A small collection of Sharyn stone tools was subjected to traceological examination, where, along with various functional groups, earthworking tools were identified, among which were hoes (15), earthmoving tools (3), grain grinders (8), grain-grinding stones (17), pestle (1), and whetstone (1), performing certain functions. The hoes were made of different types of rock. A different arrangement of blades suggests a narrow differentiation of hoes. The hoes were used for loosening dug-up soil, as well as for leveling the walls of dugouts. The earthmoving tools were also made of sandstone and had a conical blade, which was heavily worn. These tools were used for small gardening work.

Hoes. The collection of tools from the settlement contains a significant number of tools of the "hoe" type. They are of various sizes and weights, hand-operated and with a handle. As a result, based solely on typological features, this type of tool can be divided by the shape and cross-section of the blade. The hoes of the Sharyn settlement are divided into four groups: 1. Hoes distinguished by one notch, two-sided and a notch in the upper part of the pointed blade; 2. Hoes with a two-sided notch and a rounded cross-section of the upper part; 3. Hoes with a two-sided notch and a triangular blade shape; 4. Hoes with a twice-repeating two-sided notch and having notches in the upper part.

Eight specimens of ***the first group of hoes*** were found; they were made from rounded flat pebbles of elongated proportions (Fig. 4). The dimensions vary in length: 15.8-12.2 cm, width: 10-7.5 cm, thickness: 2.6-1.7 cm, weight: 350-400 g. They are made of rounded pebbles of natural shape; the back and both sides have preserved their natural surfaces. The working edge is convex, uneven with large and small creases. It is processed by the knocking down method. In the center of the side edges, small chips have produced light recesses for gripping with a depth of 1.6-1.8 cm, the length of the notches for fastening the handle is 5.6-2.3 cm. The working end part on the outside has traces of intensive wear in the form of strong smoothing and polishing, on which traces with deep cuts located perpendicularly are noted. The working edge extends onto the tool plane. The blade was renewed due to its complete chipping and blunting. The facets of the last correction have dimensions of 30.2 x 38.4 mm. The sharpening angle of the edge is 30 degrees. The tool was intensively used for working on soil with solid inclusions. The blade is asymmetrical in terms of grip width.

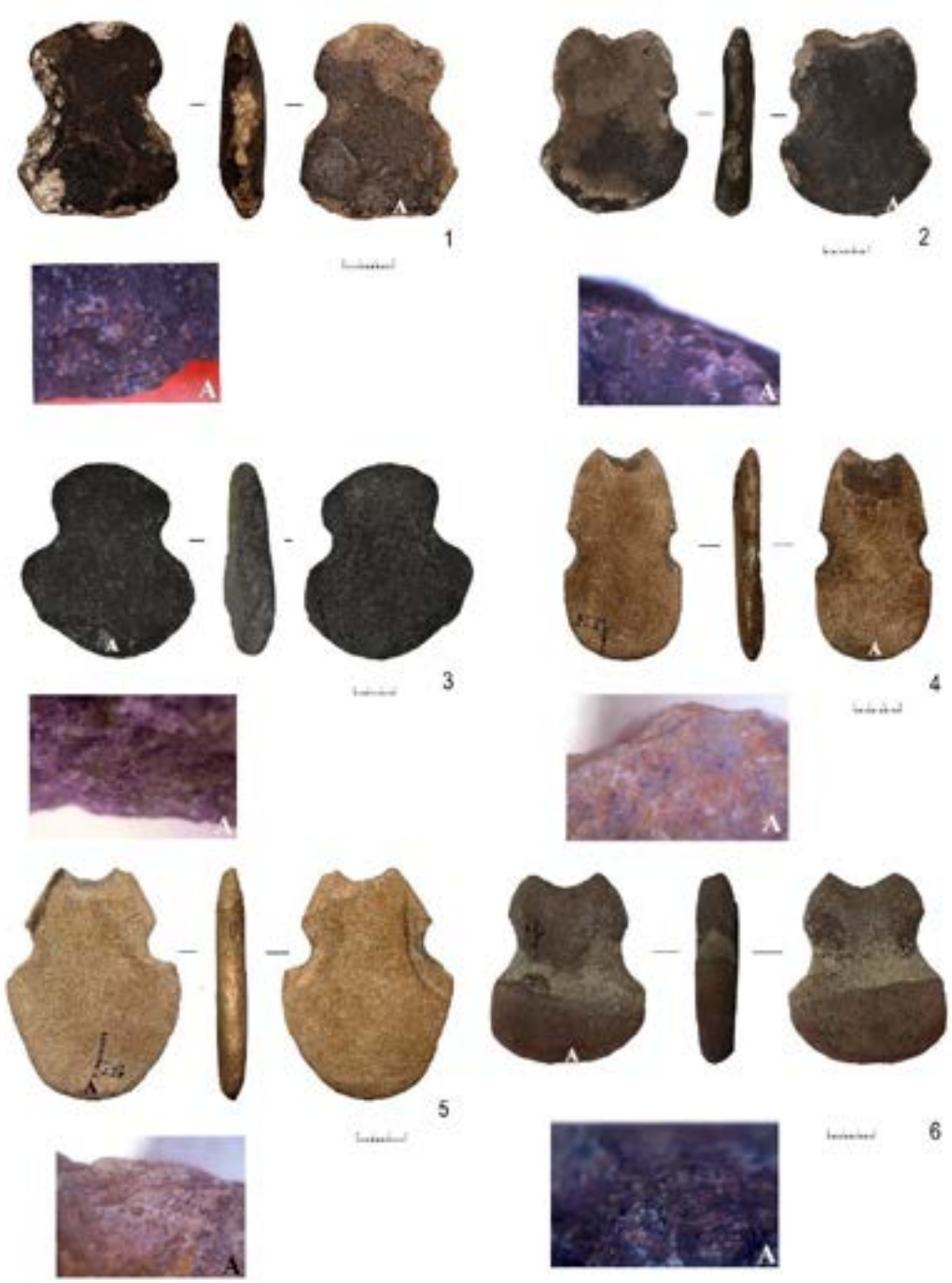


Fig. 4. Sharyn settlement. Hoes: 1-6) Group 1 with microphotographs of blade wear at 100x magnification.

Hoes of the second group (five specimens) are made of fine-grained dark-grey sandstone of natural rock (Fig. 5). They were used for loosening soft soil, are distinguished by a small angle of sharpening of the edge (27 degrees). The length is 13-11.2 cm, the thickness is 3-2.6 cm, and the width of the working part is 6.8-4.9 cm. On the end parts, there are notches 4.5-3 cm long, 1.6-1.1 cm deep for fastening a wooden handle. In plan, it has trapezoid outlines. The longitudinal

section is rectangular, and the transverse one is triangular. The interceptions and the edge are marked with small facets (up to 10 mm in diameter) of double-sided knockout. The working blade is heavily crumbled, has stepped fractures that formed in the process of loosening the soil. The upper part of the second type of hoes has a rounded shape; the working blades are crescent-shaped and have retouching. On the middle part, traces of abrasion from the touch of a wooden handle are recorded.



Fig. 5. Sharyn settlement. Hoes: 1-5) Group 2 with photomicrographs of blade wear at 100x magnification.

The third group of hoes, three specimens, made of rounded pebble slabs, has an oval outline in plan (Fig. 6, 1-3). It is used in works on soft ground with a small sharpening angle of 27 degrees of the edge. The length of the hoe is 13.2-10.6 cm, the width is 7-5.5 cm, and the thickness is 3-2 cm. The longitudinal section is rectangular, and the transverse is triangular. The grips and the edge are marked with small facets up to 10 mm in diameter of double-sided knockout. The retouch is double-sided, the edges on the point of the facet reach the dimensions of 20 x 21.3

mm. The angle of retouching is 40-30 degrees. The sharpening angle of the blade is 35 degrees. The grip is decorated with large facets over 30 mm in length and 35 mm in width of a double-sided knockout. After which, they are processed with pecking, and the final product is sanded with a fine abrasive.

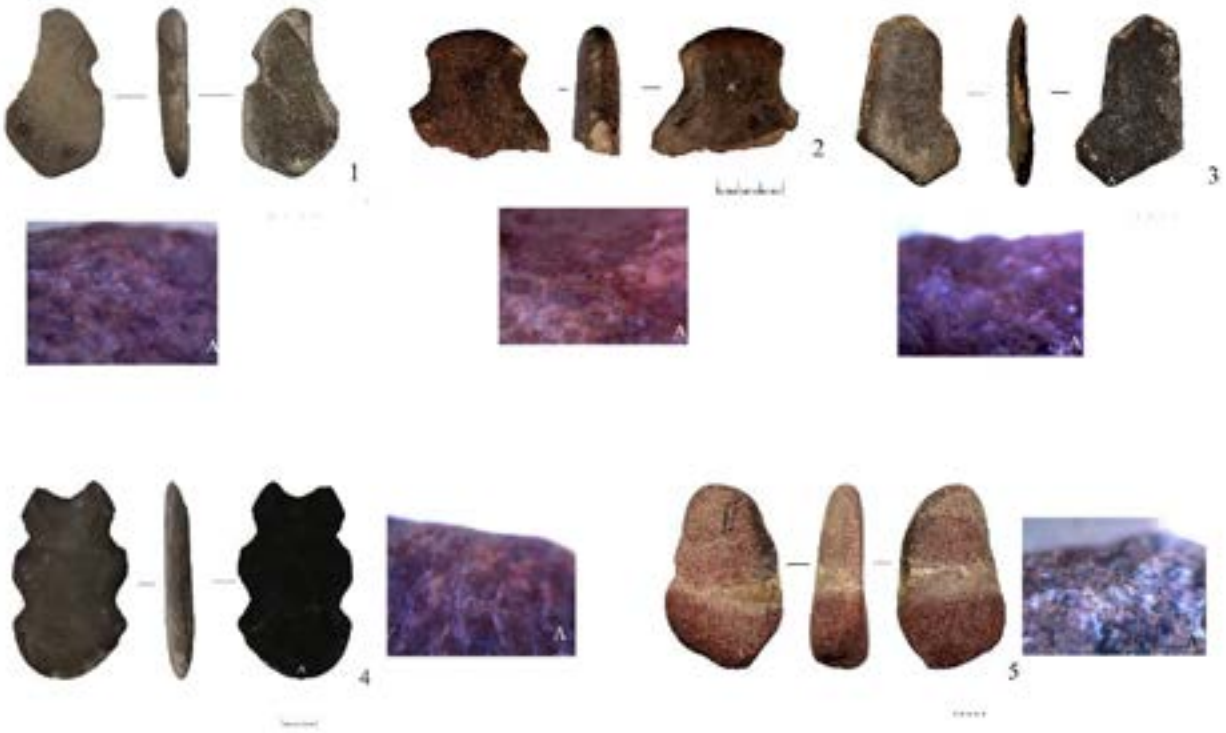


Fig. 6. Sharyn settlement. Hoes: 1-3) Group 3 with photomicrographs of blade wear at 100x magnification; 4-5) Group 4 with photomicrographs of blade wear at 100x magnification.

There are currently two examples of ***the fourth group of hoes*** (Fig. 6, 4-5). One of them is made of fine-grained dark sandstone, the second of granite. The interest of these objects is that they have two notches for gripping on the side edge and one in the upper part. The length of the notches on the side part is 7.5-6.7 cm, 1.6-1.1 cm deep. The notch on the upper part is 5.5 cm long, 1.8-1.5 cm deep. The cross-section is an oval trapezoid. The angle of sharpening of the blade is 48 degrees. The blade is made by double-sided knocking with facets measuring 22 mm on one side and up to 15 mm on the other. In the recesses of the grip, abrasions from the tying with a rope greased with fat, which tied the stone tool to the wooden handle, are visible. The wear recorded on the blade of the tool is a double-sided chipping. There is no polishing; it is replaced by rough grinding, where linear traces are visible.

The above-mentioned types of hoes were previously studied in settlements in the Almaty region and Zhetysu, at sites such as Turgen and Butakty (Yerzhanova and ed. 2024: 157).

In addition, *stone earth diggers (*three specimens) were found in the settlement. The tools were made of fine-grained sandstone tiles, processed by chipping and grinding (Fig. 8, 1-3). On the wide surfaces, intentional chips are traced to provide a hand rest. The working surfaces are wide and flat, and the blades are sharpened. Traces of use are expressed in creases, abrasions

and polishing. In shape, they had the same dimensions of the handle and base, respectively. The handle smoothly tapered from the place of articulation with the sole to the top; their end was formed by a barely distinguishable pit, and the base is smooth and flat. The upper part has a cylindrical handle, the length of the handle is 14.3-13.4 cm, and the diameter is 9.1-8 cm. The length of the tools varies from 28-26.7 cm, the width of the working part is 13.7 to 12.5 cm, and the thickness of the blade is 2.4 to 1.8 cm. Linear traces in the form of short grooves and scratches are directed along the long axis of the base. The appearance and direction of the traces indicate that the blade served as a digger (as a shovel) with transverse and reciprocating movements. Such tools were used for small gardening work.

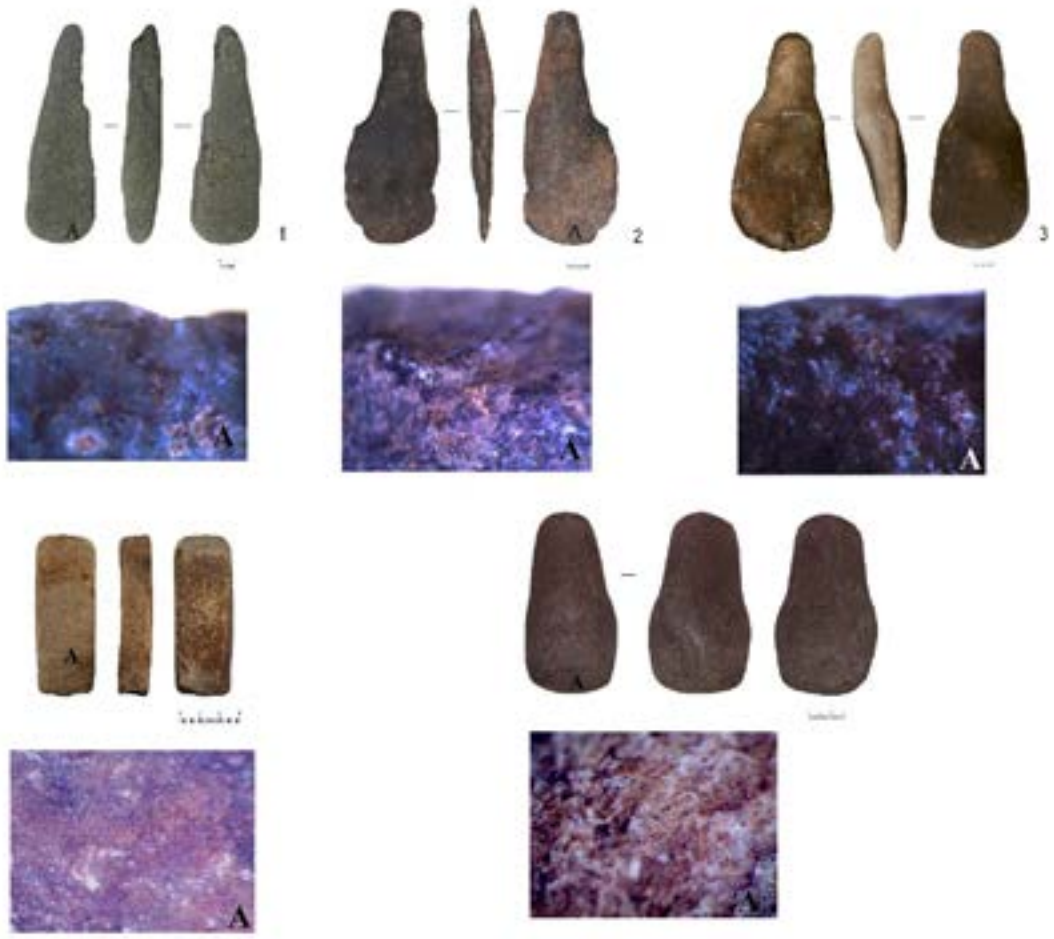


Fig. 8. Sharyn settlement. Quern stones (curants): 1-4) Types of grinding stones with microwear traces at 100x magnification.

The processing of agricultural products was carried out using grain grinders, mortars and pestles, which are often found in the settlement. Unfortunately, microanalysis and statistical counting of them were not carried out. Morphologically, grain grinders are divided into three groups: oval grain grinders with two flat processed surfaces; oval grain grinders with one flat processed surface and boat-shaped grain grinders (Yerzhanova and ed. 2024: 159). The latter constitute a small number. Their working surface is heavily worn; the ends are sharply raised

in the form of sides. Such grain grinders become characteristic of the settlement, starting from the Late Bronze Age to the Middle Ages. All grain grinders are associated with the processing of plant products.

The first group of grain grinders is represented by fragments of 5 tools (Goryachev et al. 2024: 100). The grain grinders are rectangular in shape with a preserved length of 21.5-16.4 cm, a width of 15-11.2 cm, and a thickness of 3.5-2.2 cm (Fig. 7, 1; 4). The working surfaces are heavily worn and thinned, which led to their breakage. The surfaces of the tools were processed using the pecking technique. The working surface was also periodically corrected by pecking. Traces of wear on the surface are intense. However, not only grain but also other plant products were subject to abrasion, leaving specific signs of wear (polishing areas, unidirectional linear traces). Linear traces of impact and smoothing action were recorded on their slightly convex surface.

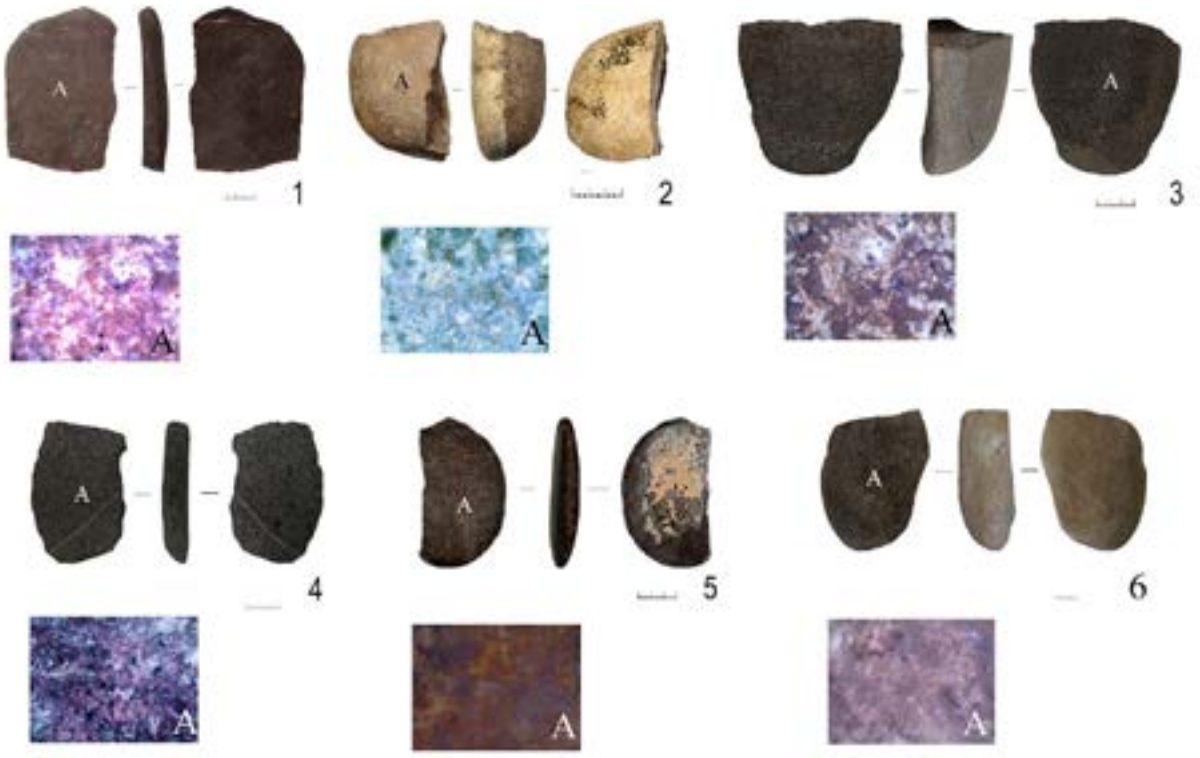


Fig. 7. Sharyn settlement. Querns stones: 1-6) types of grinding stones with microwear traces at 100x magnification.

Grain grinder of the second group, one item, is oval-shaped with two flat processed surfaces. The side edges are chipped (Fig. 7, 5), then polished with a fine abrasive. The lower part also has a notched depression; the working surface is smooth, and a shallow notch is visible in the middle part. The length of the object is 15.4 cm, the width is 13 cm, and the thickness is 2.9 cm. On the working surface, thin linear traces are recorded in the form of short grooves; the scratches are directed along the length of the base. Closer to the edges, the scratches are more pronounced, which is apparently due to increased pressure on the tool in these areas. Based on the appearance and direction of the traces, it is determined that the movements are not circular, but transverse, reciprocating.

The third group of grain grinders is represented by two specimens, unfortunately, both are fragments (Fig. 7, 2; 6). The tools are made of fine-grained sandstone; the lower part of one of the tools is completely covered with patina. The working surface of the tools is flat, and the lower part is slightly convex. When using such grain grinders, they were squeezed between the knees. The surviving length of the tools varies from 13.7 to 12.3 cm, the width is 11.2 to 10.9 cm, and the thickness is 7.1 to 6.9 cm. Small macro and micro linear traces of grain grinding are recorded on the working surface. Starch residues are recorded on one of the grain grinders.

Seventeen examples of ***grain grinding stones*** were also found at the Sharyn settlement (Fig. 9). Of these, nine were whole and eight were fragments. The upper half of the grain grinders, the grinding stone, was made smaller and had a small projection-stop at the ends so that it would not slip off during work. For better grinding of grains, special chips were applied to the working surfaces with a sharp tool. Traces of wear in the form of macro and micro linear traces and chips were recorded on the working surface of the tools. The grains of the working surface of the mineral were heavily worn down to a flat plane from intensive use. Scratches left by reciprocating movements are visible on it, oriented along and across the long axis of the working surface. Obviously, the position of the tool changed during work. Perhaps it was not only used to crush grains, but also to bring them to a powder form.

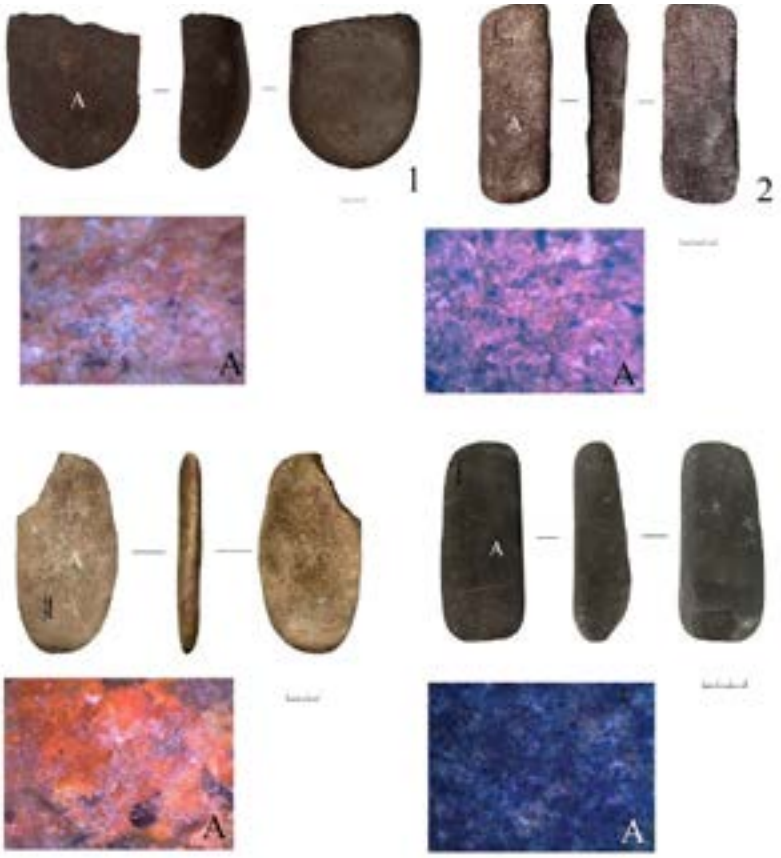


Fig. 9. Sharyn settlement. Digging tools, whetstone, and pestle: 1-3) digging tools with microwear marks at 100x magnification; 4) whetstone with microwear traces at 100x magnification; 5) pestle with microwear traces at 100x magnification.

A pestle made of dark brown sandstone with a fine-grained structure (Fig. 8, 5). It consists of a nearly vertical cylindrical handle and an elongated rectangular base adjacent to it. The handle is round in cross-section, slightly widening from the top to the point of articulation with the rectangular base (height 6 cm, width 5.7 cm, thickness 4.5 cm). The working part of the tool is sub-rectangular in plan (length 7.5 cm, width 10 cm), the corners are rounded, the cross-section is asymmetrical - flattened at the bottom and convex at the top. The pestle is processed using the pecking technique, and the potholes are clear, especially noticeable on non-working surfaces. The pestle is adapted to be gripped by hand for striking with the end. These parts have large chips that have lost the qualities inherent in the fresh destruction of the surface. The tool had been used for quite a long time after the chips had formed, and these surfaces had been partly polished. The vertically positioned handle showed smoothed protruding grains of the rock, as well as a characteristic greasy and dull shine on the surface, which usually appears as a result of prolonged contact of the stone with the skin of the hands. The top of the handle was smoothed less intensively, and there was a small chipping on the upper end.

Among the agricultural tools***, a whetstone*** was found. A flat 3.5 cm thick tile with a polished surface was used as a whetstone (Fig. 8, 4). The surface of the tool was processed mainly by the picketing technique, and the side edges were polished. On one of the sections of the working surface, there are traces of translational movement obtained during the sharpening of a metal object. The whetstone was used specifically for sharpening the blades of metal objects. On the polished surface, threadlike microtraces from the processing of metal tools are clearly visible.

A large number of these tools, as well as careful maintenance of their working surface, expressed in the presence of tools for correcting the blades, suggests the existence of specialized agriculture. In any case, this is the most likely hypothesis explaining such a number of hoes in the settlement materials. Another important, although seemingly specialized issue, is associated with the features of wear of the settlement tools. It touches upon the peculiarities of the formation of traces on a tool depending on various soil characteristics. This issue needs to be investigated in the future using an experiment recording wear traces at the initial stage of formation.

Archaeozoological analysis of finds. During the analysis of zooarchaeological material, 692 animal bone remains were studied, among which both remains of domestic species and unidentified mammals. The total number of domestic animal bones was 377 specimens, which is 54.5% of the total number of finds. Among them, the bones of small ruminants (sheep and goats - Ovis et Capra) predominate, their number was 192 specimens or 50.9% of all domestic animals. In second place are cattle (Bos taurus) with 97 bones (25.7%). Third place is occupied by horses (Equus caballus) with 83 specimens (22.0%). The remains of a donkey (Equus asinus) are insignificant – 5 bones (1.4%). Thus, the structure of domestic animals is dominated by small ruminants, which is probably due to their universal economic value and prevalence in the economy of the studied time.

Undefined mammal bones (Mammalia indet) are represented by 315 specimens, which is 45.5% of the total number of finds. Of these, large bones make up 52 specimens (16.5%), and small bones – 263 specimens (83.5%) (Table 1).

Table 1. Settlement Sharyn. Excavation – 2024. Species composition based on mammal bone remains

	Number of bones	%	Number of animals	
Small ruminants – Ovis et Capra	192	50.9	15	
Cattle – Bos taurus	97	25.7	7	
Horse – Equus caballus	83	22.0	5	
Donkey – Equus asinus	5	1.4	2	
Total of domestic species	377	100	29	
		Bone size	Number of bones	%
Mammals – Mammalia indet	315	Large	52	16.5
		Small	263	83.5
Total	692			

The largest share of remains in all species are elements of the proximal parts of the legs (humerus, femur, tibia, scapula and pelvic bones): small ruminants – 31.8%, cattle – 28.9%, horses – 28.9%. This is due to the fact that these elements are larger in size, stronger in structure and are more often preserved in archaeological conditions. Isolated teeth are next in number: small ruminants – 28.1%, cattle – 25.8%, horses – 30.1%. Due to their high density, teeth are better preserved and are found both inside skulls and in isolation. Distal parts of the legs (metacarpals, metatarsals, phalanges and other small bones of the limbs) are in third place: small ruminants - 18.2%, cattle - 19.6%, horses - 25.3%. This may indicate economic traditions, when small limb bones remained in places of cutting or secondary use. The bones of trunk (vertebrae, ribs, sternum) are presented relatively evenly: small ruminants – 10.4%, cattle – 9.3%, horses – 9.6%. The head bones (cranial bones and jaws without teeth) are less common: small ruminants – 11.5%, cattle – 15.5%, horses – 6.0%. This may reflect the peculiarities of slaughter, cutting of carcasses or utilization of skulls. Analysis of the ratio of skeletal sections showed that in all three animal species the following dominate: proximal parts of the limbs, which is explained by their large size and good preservation, and isolated teeth, as some of the most resistant to destruction elements. A relatively low proportion of head and trunk elements may be associated with both the specific economic use of these parts and different degrees of preservation of the material. The ratios of the number of bones remains from different parts of the skeleton reflect the specifics of slaughter and cutting practices, as well as the economic and household use of individual parts of animal carcasses.

Age-related characteristics of domestic animals

During the zooarchaeological study, an analysis of the bone remains of domestic animals was conducted based on the degree of fusion of the epiphyses, which made it possible to establish the approximate age of the animals at the time of death or slaughter (Table 2).

Table 2. Settlement Sharyn. Excavation – 2024. Quantitative ratio of age groups of domestic ungulates based on the state of the epiphyses

Age range by epiphyseal fusion, years	**Total number of bones, pcs.**	**%%**	**Fused epiphysis**	Unfused epiphysis
Cattle				
Up to 6 months	**1**	**6.7**	**0**	1
1–1.5	**3**	**20.0**	**0**	3
2–3	**5**	**33.3**	**0**	5
3–4	**6**	**40.0**	**6**	0
Total	**15**	**100**	**6**	9
Small ruminants				
0.5–1	6	23.1	2	4
1.5–2	10	38.5	0	10
2.5–3	5	19.2	4	1
3–3.5	5	19.2	4	1
Total	26	100	10	16
Horse				
1–1.5	3	30,0	1	2
1.5–2	1	10,0	0	1
3–3.5	6	60,0	0	6
Total	10	100,0	1	9

Cattle (Bos taurus). A total of 15 bones were analyzed. Distribution by age categories shows that young animals up to 3 years old are represented by a significant number of bones: up to 6 months – 6.7%; 1 to 1.5 years – 20.0%; 2 to 3 years – 33.3%. Fully fused epiphyses were recorded only in animals aged 3–4 years (6 specimens, 40.0%). In all younger age groups, the epiphyses remained unfused. Most of the animals were slaughtered or died before the age of 3, which may indicate the meat orientation of the farm or the peculiarities of livestock management.

Small ruminants (Ovis et Capra).

A total of 26 bones were examined. Distribution by age categories: from 0.5 to 2 years old – 61.6% (of which the epiphyses are mostly not fused). Over 2.5 years old – 38.4%. Complete fusion of the epiphyses is observed in 4 bones in the 2.5–3-year-old group and in 4 bones in the 3–3.5-year-old group. In younger age groups (up to 2 years old), almost all epiphyses remain unfused. The majority of the small ruminant's livestock was culled before reaching the age of 2–2.5 years. However, the presence of species over 2.5–3 years old with fused epiphyses may indicate that part of the herd is kept for productive or breeding purposes.

Horse (Equus caballus). A total of 10 bones were analyzed, including: 1 to 1.5 years old – 30.0%; 1.5 to 2 years old – 10.0%; 3 to 3.5 years old – 60.0%. The only case of a fused epiphyseal was recorded in an animal in the 1–1.5-year-old group. In all other age groups, including the

older one (3–3.5 years), the epiphyses remained unfused. Among horses, species under 3.5 years of age dominate. The low percentage of fused epiphyses, even in the older age group may be associated with the peculiarities of animal selection for slaughter. Analysis of the age composition of domestic animals showed that the predominance of young animals among cattle and small ruminants. A significant number of animals were slaughtered before reaching physiological maturity. Some of the livestock (especially small ruminants) lived to the age of 2.5–3.5 years, which may indicate breeding for wool, milk or breeding purposes. Horses are mainly represented by young species.

Bone modifications

During the zooarchaeological analysis, various types of modifications were identified on the bones of domestic animals (Table 3). A total of 12 bones with modifications were recorded, which is of particular interest for the interpretation of household activities, animal handling, and natural impacts after their death. The largest share of modifications are traces of chopping and gnawing by dogs (33.3% each). This indicates both the active use of bones in cutting up carcasses and the presence of animals that had access to bone remains. The presence of traces of fire indicates culinary or, possibly, ritual practice using fire. The fact that a bone with a round hole was found may indicate secondary use of bones in households or rituals. The detection of a pathological change (malocclusion) demonstrates the possibility of identifying anatomical features and diseases of domestic animals.

Table 3. Settlement Sharyn. Excavation – 2024. Ratio of different types of modified bones

Type of modification	Number, pcs.	%
Exposure to high temperatures	2	16.7
Traces of cutting, notching, and nicking	4	33.3
Round hole	1	8.3
Bitten by a dog	4	33.3
Malocclusion	1	8.3
Total modified	12	100

Calculation of meat consumption

Bone (kitchen) remains in the osteological collection of the Sharyn settlement reliably originate mainly from the carcasses of three forms of domestic ungulates: cattle, small ruminants, and horses. Their bones predominate in the bone collection from the excavation. Despite the numerical predominance of small ruminants in the osteological spectrum (51.6%), the largest contribution to the total volume of meat products came from cattle (47.3%), which is explained by the significantly greater mass of carcasses of this species. The horse occupied the second place in terms of the volume of meat resources - 37.1%, which indicates its use not only as a transport and economic animal, but also as a food resource (Table 4). Thus, the structure of meat consumption at the site had a meat focus with a predominance of cattle in terms of weight and small ruminants in terms of the number of species.

Table 4. Settlements of Sharyn. Excavation – 2024. Calculation of relative volumes of consumption of meat of domestic ungulates, (%)

Indicator	Small ruminants	Cattle	Horse	Total
Osteological spectrum (all horizons), %	51.6	26.1	22.3	372
The ratio of the weight of large ungulate carcasses to one sheep carcass	1	6	5.5	–
Volume of meat products in conventional units	51.6	156.6	122.6	330.8
Ratio of meat products volumes, %	15.6	47.3	37.1	100

Conclusion

Of great interest among the settled agricultural monuments of Zhetysu is the unique single-layer settlement of Sharyn. As a result of excavations in 2024, extensive archaeological material was obtained that allows us to trace the evolution of the productive economy. Using tools as one of the mass and main sources for restoring the economy of the settlement and studying them using trace analysis, it became possible to most objectively judge the main branches of the economy, household production and those production changes that occurred in the economy. Further development of the leading industries determined the specialization of agriculture and animal husbandry, which led to noticeable progress in the evolution of tools used in these industries, the improvement of manufacturing techniques, and an increase in their productivity and efficiency. Thus, as agriculture develops, this is observed in agricultural tools. The latter undergo certain changes in the improvement of tool parts, in their processing and fastening methods and in the emergence of new types.

Thus, the traceological and archaeozoological analysis of the production inventory and animal bone remains of the Sharyn settlement allows us to specify the nature of the economic activity of its inhabitants. The basis of the economy was, undoubtedly, agriculture and closely related cattle breeding. In this regard, the data documenting the high level of developed hoe agriculture is indicative. First of all, the set of agricultural tools (hoes, shovels, etc.), and also taking into account favorable paleogeographic data, we can make a convincing conclusion about the developed form of agriculture of the population of the Sarytogay tract and on the territory of Zhetysu as a whole at the end of the 1st millennium BC.

Acknowledgements

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Notes

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