

Research Article

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Paleoeological reconstruction of the Late Pleistocene in the lower reaches of the Ural (Zhaiyk) River based on the materials of the Daryinsk Museum Collection

This article presents the results of a comprehensive study of a collection of Pleistocene mammal remains from the M.A. Sholokhov Memorial Museum (Daryinsk settlement, Baiterek District, West Kazakhstan Region). The material was collected from Late Pleistocene alluvial deposits in the lower reaches of the Ural (Zhaiyk) River and remained unidentified for a long time. Morphometric analyses allowed the collection to be documented and introduced into the scientific record for the first time, and enabled clarification of the taxonomic attribution of the large mammal remains. The collection includes skulls of *Bos primigenius* and *Bison priscus*, numerous postcranial elements and teeth of *Mammuthus primigenius*, a tooth of the transitional form *Mammuthus trogontherii chosaricus*, a femur of *Coelodonta antiquitatis* (Blumenbach, 1799), as well as antler beams of *Megaloceros giganteus* and *Cervus elaphus*. Comparative analyses following von den Driesch, Garutt, Dubrovo, and Foronova, together with comparisons with published series from the Ural–Volga–Caspian region, confirm the typical composition of the Pleistocene megafauna of Western Kazakhstan and indicate a broad spectrum of ecosystems, ranging from cold tundra–steppe environments to floodplain meadows. The results are significant for reconstructing Late Pleistocene palaeoeological conditions in the Ural–Caspian Lowland and for assessing environmental dynamics associated with climatic fluctuations.

Keywords: Late Pleistocene, Western Kazakhstan, Ural (Zhaiyk) River; megafauna, paleoeological reconstruction, museum collection, large mammals, Quaternary.

Introduction

The lower reaches of the Ural (Zhaiyk) River represent one of the key regions for the formation of Pleistocene paleofaunal complexes of the Ural–Caspian Lowland. Throughout the 20th century, numerous finds of large mammals from the glacial epochs were recorded in this area; however, a substantial part of the collected material remained outside scientific circulation. Among these collections, the Pleistocene megafaunal remains housed in the M.A. Sholokhov Memorial Museum in Daryinsk settlement (Baiterek District, West Kazakhstan Region) are of particular interest.

The collection consists of specimens gathered at different times from the lower reaches of the Ural (Zhaiyk) River, mainly from alluvial sand–gravel deposits attributed to the Late Pleistocene. A considerable portion of the material has not previously undergone systematic taxonomic identification, which has hindered the incorporation of these data into regional syntheses of Quaternary faunas.

The aim of this study is to conduct a detailed morphometric analysis and to establish the taxonomic composition of the large Pleistocene mammal fauna from this locality.

Experimental

The results of this study correspond to the UN Sustainable Development Goal 15 “Conservation of terrestrial ecosystems”. The studied collection comprises 37 catalogued osteological specimens representing several key taxa of Pleistocene megafauna.

Taxonomic composition of the material

1. Family Bovidae

Bos primigenius (Bojanus, 1825) — two skulls

Bison priscus (Bojanus, 1827) — two skulls

2. Order Proboscidea

Mammuthus primigenius — occipital parts of skulls, vertebrae, pelvic, humeral, tibial and ulnar elements, mandible, teeth, tusks, and a rib

Mammuthus trogontherii chosaricus (Dubrovo, 1966) — one molar tooth

3. Family Rhinocerotidae

Coelodonta antiquitatis (Blumenbach, 1799) — femur

4. Family Cervidae

Megaloceros giganteus — three horn rods

Cervus elaphus — horn rods (Fig. 1)



Figure 1. The museum's paleontological collection

Linear measurements were obtained using a digital caliper (Mitutoyo, Japan; accuracy ± 0.01 mm) and an osteometric board for large skeletal element. The morphometric study of cranial and postcranial remains of mammals was carried out in accordance with the universal osteometric system of A. von den Driesch [1], which ensures the comparability of the results with international reference collections. Specialized methods were used for individual taxonomic groups, adapted to the anatomical and functional specifics of the respective taxa. The study of elephantine remains was based on the classical works of I.V. Dubrovo [2], the methodological schemes of V.E. Garutt and I.V. Foronova [3], and the refined measurement approaches proposed by A.V. Sher and V.E. Garutt [4]. Lamellar frequency was determined on the lateral surface of the crown; in the case of fragmented teeth, the count was made on a standard 5-centimeter section, with subsequent extrapolation to the full length of the crown. The thickness of the enamel was measured on the chewing surface by a series of 5–10 point measurements, averaged for the micron.

For representatives of the *Artiodactyla* order, specialized methodological complexes were used. When studying the *Bovidae* family, systems for measuring skulls and calculating diagnostic indices were used according to V.I. Gromova [5] and B.S. Rusanov [6]. The sex diagnosis of bison skulls was carried out in accordance with Rusanov's criteria, and the determination of Bison morphotypes was carried out using the method of A.A. Khromov [7], which takes into account the combination of braincase proportions and the morphology of horn rods. The measurement of skulls and antlers of the Cervidae family, as well as the calculation of indices, was carried out using the methodological developments of I.A. Vishlobokova [8] and G.G. Boeskorov [9], which allow for the correct assessment of intraspecific and interspecific variability.

The comprehensive use of these methods ensured the reliability of the taxonomic identification of the remains and allowed for a comparative morphological analysis with collections from Eastern Europe, Central Asia, and Siberia.

Geographical and geological setting

The paleontological locality is situated in the lower reaches of the Ural (Zhaiyk) River within the territory of the Baiterek District, West Kazakhstan Region. This area belongs to the southeastern part of the

Ural–Caspian Lowland, a vast accumulative plain characterized by thick successions of Quaternary deposits formed under conditions of prolonged fluvial and alluvial—deltaic sedimentation.

The landscape of the region is defined by a combination of floodplain, above-floodplain, and terrace levels, which developed successively under the influence of variations in the discharge of the Ural River, fluctuations of the Caspian Sea level, and climatic reorganizations during the Late Neopleistocene. The lower reaches of the Ural (Zhayyk) River represent a wide alluvial valley with a well-developed system of oxbow lakes, pools, and channels, promoting the accumulation of organic material and the preservation of large mammal remains within sandy—loamy and gravel-sand deposits [10].

The paleontological materials housed in the M.A. Sholokhov Memorial Museum (Daryinsk settlement) were collected from similar Quaternary alluvial horizons. In the lower Ural region, the thickness of Pleistocene deposits reaches several tens of meters and is represented by interbedded sands, sandy loams, gravels, silts, and loams typical of channel, floodplain, and oxbow—lake facies. These sedimentary environments provided optimal conditions for the preservation of large osteological elements, including skulls, long bones, antlers, and tusks [11].

The sedimentary environment of the Late Pleistocene in the region was highly dynamic, involving cyclical changes in the hydrological regime that caused shifts in the Ural River channel, the formation of new terraces, and the accumulation of fresh fluvial deposits. These processes were directly linked to climatic fluctuations, marked by alternations of colder and warmer phases, which are reflected in the paleofaunal composition of the assemblages. The presence in the collection of remains of mammoth (*Mammuthus primigenius*), woolly rhinoceros (*Coelodonta antiquitatis*), steppe bison (*Bison priscus*), and aurochs (*Bos primigenius*) indicates the development of tundra–steppe and steppe landscapes typical of cold phases of the Late Pleistocene [12].

Thus, the geographical and geological position of the locality in the lower reaches of the Ural River determined the conditions of accumulation and preservation of the Pleistocene megafauna represented in the Daryinsk museum collection [13]. The combination of thick fluvial deposits, a dynamic river system, and climatically driven environmental changes provides a unique framework for reconstructing the paleoecological conditions of Western Kazakhstan during the Quaternary (Tab. 1).

Table 1

Stratigraphic correlation and faunal attribution of the Daryinsk section (Lower Ural River)

Layer	Depth (m)	Lithology	Age interpretation	Faunal content	Taphonomic interpretation
1	0–1	Modern floodplain grayish–brown loams with humus interlayers	Holocene	No Pleistocene fauna	Modern floodplain deposition
2	1–4	Light yellow–grey sandy loams with silty interbeds	Late Holocene — Early Neopleistocene	Aquatic microfauna (Planorbis, Lymnaea, Pisidium, Candona, Ilyocypris, Cyprideis)	Calm floodplain — oxbow deposition, minimal reworking
3	4–10	Medium–coarse channel sands with gravel–pebble lenses	Late Neopleistocene (MIS 3–2)	Sporadic reworked Pleistocene remains	High–energy channel transport
4	10–16	Cross-bedded sand — gravel deposits (main paleontological horizon)	Late Pleistocene (correlated with Khvalynian–Khazarian alluvial phases)	Concentration of megafauna (skulls, long bones, tusks, vertebrae)	Rapid burial in channel — nearshore facies; limited reworking of coarse material
5	16–22	Dense sandy loams and loams (oxbow — lacustrine facies)	Late Pleistocene (MIS 5–3 interstadials)	Mollusks and ostracods (Limnocythere postoncava, Candona, Cyprideis, Loxoconcha)	Alternation of fresh-water and slightly brackish conditions
6	>22	Coarse, well-sorted ancient alluvial sands	Early–Middle Pleistocene	Reworked Mammuthus primigenius, Bos primigenius	Basal high–energy alluvial erosion

Layer 1. 0–1 m. Modern floodplain loams. The layer consists of greyish-brown loose loams with thin humus-rich interlayers. The sediment shows weak stratification and contains small inclusions of plant detritus. It was formed under modern floodplain conditions subjected to periodic seasonal flooding and deposition of fine-grained material in a low-energy environment. As the layer is of Holocene age, no remains of Pleistocene fauna were recorded.

Layer 2. 1–4 m. Floodplain sandy loams and silts. This layer is composed of light-yellow to light-grey fine-grained sandy loams with thin silty interbeds and rare lenses of plant detritus. The heterogeneous lenticular-laminated structure reflects alternating phases of quiet inundation and low-energy currents within an expanded floodplain. Lithological characteristics indicate formation during the Late Holocene–Early Neopleistocene. Large bone material is absent; however, aquatic microfauna occurs regularly. The microfaunal assemblage includes freshwater gastropods (*Planorbis* sp., *Lymnaea* sp.), small bivalves (*Pisidium* sp.), and ostracods of the genera *Candona*, *Ilyocypris*, and *Cyprideis*. The good preservation of valves, often found articulated, indicates calm depositional conditions and minimal reworking. The assemblage reflects shallow, weakly flowing floodplain–oxbow water bodies with fresh to slightly mineralized water.

Layer 3. 4–10 m. Channel sands with gravel–pebble lenses. The layer is represented by well-sorted medium — to coarse-grained sands with lenses of gravel and small pebbles [14]. Cross-bedding is common, and locally massive structures typical of high-energy channel flows are observed. Sedimentation occurred under conditions of a powerful and dynamically migrating Ural River channel, corresponding to cold stages of the Late Neopleistocene (MIS 3-2). Pleistocene faunal remains occur sporadically and in reworked condition, often showing traces of abrasion and transport.

Layer 4. 10–16 m. Sand–gravel deposits—main paleontological horizon. This unit includes coarse sands, gravels, and pebbles, partly cemented by iron compounds. Cross-bedded structures, channel infills, and evidence of repeated flood events are well expressed. This layer represents the main concentration horizon of Pleistocene megafauna, yielding skull fragments, long bones, tusks, and vertebrae. Their preservation is related to rapid burial within channel—nearshore facies and minimal reworking of coarse material. Lithological features are comparable with the Khvalynian and Khazarian alluvial horizons of the Caspian region. Microfauna is episodic and represented by reworked ostracods (*Cyprideis*, *Candona*) transported from adjacent oxbow and floodplain facies. Shells are frequently damaged, reflecting high-energy depositional conditions.

Layer 5. 16–22 m. Oxbow and floodplain—lacustrine sandy loams and loams. The deposits consist of dense brownish-yellow and grey sandy loams with silty and thin clay interlayers. The plastic, locally cloddy structure is typical of oxbow, floodplain—lacustrine, and shallow inundated environments [15]. The layer yields diverse mollusks and ostracods (*Limnocythere postoncava*, *Candona* sp., *Cyprideis*, *Loxoconcha*), typical of Late Pleistocene terraces of the Lower Volga and Caspian regions. The microfaunal assemblage reflects alternation of freshwater and slightly brackish conditions: euryhaline forms (*Cyprideis*, *Loxoconcha*) indicate minor influence of Caspian transgressions, whereas freshwater *Candona* and *Ilyocypris* indicate stable continental hydrology. The assemblage corresponds well to interstadial phases of MIS 5-3.

Layer 6. >22 m. Ancient alluvial sands of the Early–Middle Pleistocene. The sands are coarse-grained, well sorted, with gravel admixture and massive structure. These deposits formed under conditions of an ancient, more powerful river channel active during the Early–Middle Pleistocene. Reworked remains of ancient fauna (*Mammuthus primigenius*, *Bos primigenius*) occur, indicating erosion of older strata. Microfauna is extremely poor and represented by single reworked ostracods (*Cyprideis*, *Denticulocythere*) and mollusk fragments. The absence of autochthonous assemblages indicates high-energy flows, erosion, and intense reworking typical of basal alluvial deposits of an ancient channel system (Fig. 2).

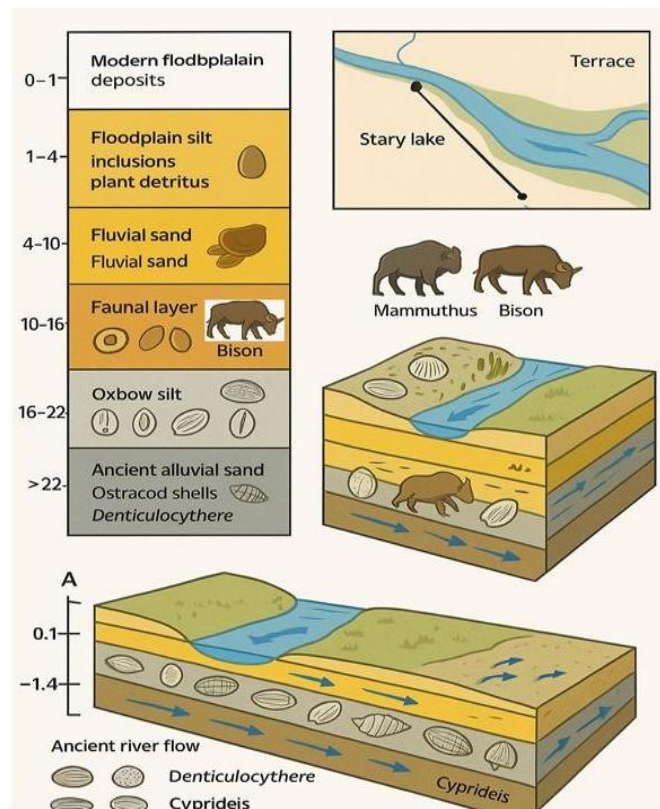


Figure 2. Lithological and stratigraphic scheme of the lower course of the Ural River with the location of layers, paleofauna, and microfauna (ostracods)

Description of osteological remains

The osteological material from the collection of the M.A. Sholokhov Memorial Museum is represented by diverse postcranial elements, teeth, and horn structures of large Late Pleistocene mammals [16; 230]. The preservation of most specimens is satisfactory, allowing detailed morphological analysis and reliable taxonomic identification. The assemblage characterizes a typical megafaunal complex of the alluvial deposits of the lower reaches of the Ural River.

The collection includes massive postcranial elements of the woolly mammoth *Mammuthus primigenius*. Tibiae are represented by large specimens reaching up to 1100 mm in length; the shaft is broad, with a minimum transverse diameter of about 140 mm and expansion in the midshaft up to 350 mm, corresponding to the hindlimb proportions of Late Pleistocene mammoths. Humeri are characterized by a well-developed deltoid tuberosity, a massive shaft (minimum diameters of 100–130 mm), and a moderately expanded distal epiphysis. The assemblage also includes cervical and thoracic vertebrae with wide articular surfaces and centrum heights of 160–180 mm; the dimensions of the articular processes and the morphology of the spinous processes correspond to a large representative of the genus *Mammuthus*. Fragments of hemipelves are also present, showing a well-developed acetabulum (140–160 mm in length), a high iliac shaft, and a wide obturator foramen, which is typical of adult individuals.

Among the mammoth dental remains, several molars of varying preservation are distinguished (Tab. 2). Large M3 reach up to 270 mm in length, include up to 20 lamellae, and are characterized by a high crown (up to 140 mm) and thin enamel (0.7–2 mm). Lamellar frequency ranges from 70 to 80 plates per 100 mm, which corresponds to the late form of No. 33, 36, 37 *Mammuthus primigenius*. Smaller teeth show 8–13 lamellae and moderate hypsodonty. The presence in the collection of a tooth with a crown height of 210 mm and lamella length up to 80 mm indicates the occurrence of the Khazarian form No. 34 *Mammuthus trogontherii chosaricus*, reflecting the probable stratigraphic heterogeneity of the reworked alluvial material (Fig. 3).

Table 2

Morphometric parameters of the third molar (M3) of *Mammuthus* from the Darynsk section

Measurements	Crown length, mm	Maximum crown width, mm	Maximum crown height, mm	Total number of plates, pcs	Average length of one plate, mm	Frequency of plates per 10 cm, pcs	Enamel thickness, mm	Degree of erasure	Hypsodon index, (H/W), %	Crown Proportion Index (W/L), %
No.37	135	95	140	8	90	7	2	3	1.5 %	0.7 %
No. 34	140	90	210	8	80	7	0,8	1	2.3 %	0.60 %
No. 36	182	80	120	13	70	8	0,7	3	1.5 %	0.4 %
No. 33	270	80	140	20	10	8	2	2	1.75 %	0.3 %

The woolly rhinoceros *Coelodonta antiquitatis* is represented by a femur 530 mm in length with a massive shaft 160 mm in width. The distal end is expanded (200 mm), and the neck of the femoral head is constricted, fully corresponding to the proportions of the Late Pleistocene woolly rhinoceros. The development of the articular surfaces and the robustness of the shaft indicate an adult individual.

The collection includes substantial material of Bovidae, represented by the steppe bison *Bison priscus* and the aurochs *Bos primigenius*. Fragments of skulls and horn cores are preserved. Aurochs remains are characterized by narrow frontal regions of the skull, intercornual distances of 230 and 240 mm, and distances between horn tips along the curvature of 1300 and 1350 mm. Bison remains show a greater frontal width and massive horn cores with basal diameters of 120 and 140 mm and curvature lengths up to 395 mm, confirming attribution to the Late Pleistocene form *Bison priscus*.

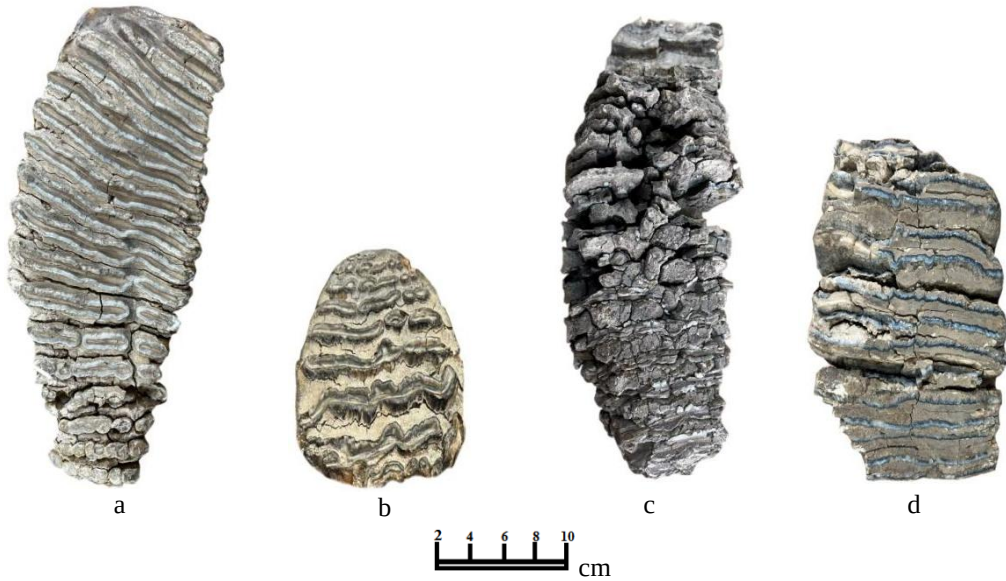


Figure 3. Occlusal view of upper third molars (M3) of *Mammuthus* sp. from the Late Pleistocene deposits of the Lower Ural (Zhaiyk) River (Darynsk locality). (a; c; d) — *Mammuthus primigenius*, (b) — *Mammuthus trogontherii chosaricus*)

Several elements belong to *Megaloceros giganteus*, a large Late Pleistocene deer. The collection includes antler fragments with heights of 530 and 800 mm, corresponding to adult males of this species and indicating its presence in local faunal assemblages.

Mammoth tusks are also present, measuring 790 and 1120 mm in length. One specimen is characterized by a basal diameter of 230 mm, with diameters of 190 mm at one-third of the length and 160 mm at mid-length, indicating a large individual of *Mammuthus primigenius*. The tusks display typical curvature and moderate mediolateral flattening.

The mammoth mandible is represented by a fragment preserving the ramus and a tooth row 170 and 180 mm in length. The height of the ramus at the level of M3 reaches 150 mm, with a wall thickness of 110 mm; the diastema is long (109 mm), which is characteristic of adult woolly mammoths.

Overall, the osteological remains from the Darynsk museum collection represent a typical Late Pleistocene faunal complex of the Ural–Caspian Lowland, including representatives of the mammoth fauna (*Mammuthus primigenius*, *Coelodonta antiquitatis*, *Bison priscus*, *Bos primigenius*, *Megaloceros giganteus*). The morphometric characteristics of the elements show good correspondence with published data and indicate the high scientific value and informative potential of this collection.

Results and Discussion

The taxonomic structure of the collection reflects a characteristic complex of Eurasian Pleistocene fauna formed under conditions of alternating cold and moderately cold climatic phases. The assembled material documents the wide distribution of different ecological groups of megafauna and allows reconstruction of a diverse paleoenvironment in the lower reaches of the Ural River during the Late Pleistocene.

A significant part of the collection belongs to the mammoth complex. Numerous postcranial elements and isolated teeth of *Mammuthus primigenius* confirm the existence of stable populations of the woolly mammoth in the region. The nature of fossilization and the degree of mechanical modification of the bones indicate their prolonged residence in channel and floodplain environments. Of particular interest is the presence of a tooth of *Mammuthus trogontherii chosaricus*, representing a transitional form between Middle and Late Pleistocene mammoths. This suggests that the collection includes materials of different ages and reflects a long-term occupation of the area by proboscideans [17, 18].

Steppe ungulates constitute another important component of the fauna. Skulls of *Bison priscus* and *Bos primigenius* confirm the wide development of open cold steppe landscapes in the lower Zhaiyk region, in agreement with reconstructions for the Volga–Ural interfluvium. Alongside these taxa, more mesophilous forms are also present. The occurrence of antlers of *Megaloceros giganteus* indicates the existence of local habitats with increased humidity, such as floodplain meadows and areas with more productive herbaceous vegetation.

The presence of remains of the woolly rhinoceros *Coelodonta antiquitatis* further complements this picture. The recovered femur of this taxon is characteristic of cold-steppe, arid landscapes, confirming the alternation of cold and moderately cold phases in the region. Taken together, the taxonomic composition demonstrates a mosaic structure of paleolandscapes, in which tundra-steppe environments were combined with floodplain biotopes and more productive vegetation zones.

The state of preservation of the remains indicates that they were subjected to short-distance transport, deposited under channel and channel–floodplain flow conditions, partially reworked by the fluvial system, and did not undergo prolonged redeposition.

Most large bones (humeri, pelvic bones, tusks, massive skull fragments) are typical of sand–gravel facies of powerful alluvial streams. Horn rods of *Megaloceros giganteus* and fragments of rhinoceros bones may indicate more humid biotopes in close proximity to the main channel facies.

The combination of remains of mammoths (*Mammuthus primigenius*), steppe bison (*Bison priscus*), aurochs (*Bos primigenius*), woolly rhinoceros (*Coelodonta antiquitatis*), and *Megaloceros giganteus* allows reconstruction of: the existence of tundra–steppe landscapes; alternation of cold and moderate climatic phases; well–developed floodplain–meadow vegetation; and a complex system of Late Pleistocene climatic fluctuations [19].

This confirms the highly mosaic nature of Pleistocene landscapes and the strong dynamism of the natural environment. Analysis of morphometric parameters and faunal composition makes it possible to reconstruct episodes of climatic change, which is important for comparison with modern climate dynamics.

Conclusion

The study of the Pleistocene collection from the M.A. Sholokhov Memorial Museum allows us to introduce this significant material into scientific circulation for the first time and significantly expand our understanding of the megafauna of the lower reaches of the Ural River. The established taxonomic composition, which includes *Mammuthus primigenius*, *Mammuthus trogontherii chosaricus*, *Bison priscus*, *Bos primigenius*, *Coelodonta antiquitatis*, *Megaloceros giganteus*, and other forms, reflects the characteristic appearance of the Pleistocene communities in the region and demonstrates a wide range of ecological conditions, from cold tundra–steppe to floodplain–meadow biotopes. The combination of steppe, tundra–steppe, and forest–steppe elements highlights the complex mosaic of natural environments in the Late Pleistocene.

The collection has a high potential for subsequent comparative studies and reconstructions of paleoecological conditions, as it includes both massive elements of the postcranial skeleton and diagnostically valuable teeth and horns. The material demonstrates the dynamics of the natural environment and its response to climatic fluctuations, making it particularly important for analyzing long-term changes in the region's ecosystems. Thus, the collection from Darynsk is a valuable source of information about the Quaternary fauna of Western Kazakhstan and opens up broad prospects for further paleontological and paleoecological research.

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Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

The manuscript was written through contributions of all authors. All authors have given approval to the final version of the manuscript. CRediT: **Berliguzhin M.T.** — conceptualization, investigation, data curation, methodology, formal analysis, visualization, writing — original draft. **Akhmedenov K.M.** — supervision, methodology, validation, writing — review & editing, project administration. **Yakupova J.B.** — investigation, data curation, resources, visualization, writing — review & editing.

References

- 1 Driesch A. A guide to the measurement of animal bones from archaeological sites / A. Driesch // Peabody Museum Bulletin. — 1976. — № 1. — 136 p.
- 2 Дуброво И.А. Систематическое положение слона Хазарского фаунистического комплекса / И.А. Дуброво // Бюллетень комиссии по изучению четвертичного периода. — 1966. — № 32. — С. 63–74
- 3 Гарутт В.Е. Исследования зубов вымерших слонов: методические рекомендации / В.Е. Гарутт, И.В. Форонова. — Новосибирск: Наука, 1976. — 35 с.
- 4 Шер А.В. О методике определения генерации коренных зубов вымерших слонов / А.В. Шер, В.Е. Гарутт // Труды Зоологического института АН СССР. — 1985. — Т. 131. — С. 93–103.
- 5 Громова В.И. Первобытный бык или тур (*Bos primigenius* Voj.) в СССР / В.И. Громова // Ежегодник Зоологического музея АН СССР. — 1931. — Т. 32. — С. 293–364.
- 6 Русанов Б.С. Ископаемые бизоны Якутии / Б.С. Рувсанов. — Якутск: Якутское книжное издательство, 1975. — 143 с.
- 7 Хромов А.А. Эволюция рода *Bison* и морфологические адаптации первобытных бизонов *Bison prisca* Bojanus из неоплейстоцена Поволжья / А.А. Хромов // Труды университета «Дубна». Экология и науки о Земле. — 2004. — Вып. 1. — С. 195–208
- 8 Вислобокова И.А. Ископаемые олени Евразии / И.А. Вислобокова // Труды ПИН АН СССР. — 1990. — Т. 240. — 208 с.
- 9 Боесков Г.Г. К систематике и распространению баранов рода *Ovis* (Artiodactyla, Bovidae) в плейстоцене и голоцене Сибири и Дальнего Востока / Г.Г. Боесков // Зоологический журнал. — 2001. — Т. 80, № 2. — С. 243–256.
- 10 Titov V. Data on elephants from Middle–Upper Pleistocene sediments of Astrakhan Volga area (Astrakhan Region, Russia) / V. Titov, M. Golovachev // VI International Conference on Mammoths and their Relatives. — Thessaloniki, 2014. — P. 200.
- 11 Larramendi A. Shoulder height, body mass and shape of proboscideans / A. Larramendi // Acta Palaeontologica Polonica. — 2016. — Vol. 61, No. 3. — P. 537–574.
- 12 Obada T. Mammuthus cf. chosaricus (Dubrovo, 1966) from Duruitoarea Veche, Republic of Moldova / T. Obada, A. David // Structura și funcționarea ecosistemelor în zona de interferență biogeografică. — Chișinău, 2008. — P. 209–211.
- 13 Яхимович В.Л. Плейстоцен нижнего течения р. Урал / В.Л. Яхимович и др. — Уфа, 1986. — 135 с.
- 14 Шкатова В.К. Значение нижеуральского опорного разреза для стратиграфии и палеогеографии плейстоцена Западного Казахстана / В.К. Шкатович // Бюллетень комиссии по изучению четвертичного периода. — 1976. — № 45. — С. 73–82.

- 15 Якупова Д.Б. История изучения ископаемых позвоночных кайнозоя и мезозоя Западного Казахстана / Д.Б. Якупова, М.Т. Берлигужин, К.М. Ахмеденов // Материалы Международной научно-практической конференции «Биоразнообразие животного мира Казахстана». — Алматы, 2021. — С. 138.
- 16 Местонахождения ископаемых позвоночных фанерозоя Казахстана: справочник для палеонтологов, геологов и биологов / отв. ред. П.А. Глеубердина. — Алматы, 2017. — 300 с.
- 17 Кожамкулова Б.С. Вымершие животные Казахстана (палеогеография позднего кайнозоя) / Б.С. Кожамкулова, Н.Н. Костенко. — Алма-Ата: Наука, 1984. — 104 с.
- 18 Labe B. Réhabilitation de *Mammuthus intermedius* (Jourdan, 1861), un mammouth (Mammalia, Elephantidae) du Pléistocène moyen récent d'Europe / B. Labe, C. Guérin // Comptes Rendus Palevol. — 2005. — Vol. 4. — P. 235–242.
- 19 Kahlke R.D. The origin of Eurasian Mammoth Faunas (*Mammuthus-Coelodonta* Faunal Complex) / R.D. Kahlke // Quaternary Science Reviews. — 2014. — Vol. 96. — P. 32–49.

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Дарьинск ауылы музей коллекциясының материалдары бойынша Орал (Жайық) өзенінің төменгі ағысы кеш плейстоценін палеоэкологиялық реконструкциялау

Мақалада М.А. Шолохов мемориалдық музейінің (Дарьинск ауылы, Бәйтерек ауданы, Батыс Қазақстан облысы) қорынан плейстоцендік сүтқоректілердің палеонтологиялық коллекциясын кешенді зерттеу нәтижелері ұсынылған. Материал кеш плейстоцен жасындағы аллювиалды шөгінділерден Жайық өзенінің төменгі ағысынан жиналған және ұзақ уақыт бойы анықталмаған. Жүргізілген морфометриялық зерттеулер коллекцияны алғаш рет ғылыми айналымға енгізуге және ірі сүтқоректілердің қалдықтарының таксономиялық байланысын нақтылауға мүмкіндік берді. Коллекцияға *Bos primigenius* және *Bison priscus* бас сүйектері, көптеген посткраниальды элементтер және *Mammuthus primigenius*, *Mammuthus trogontherii chosaricus* тістері, ортан жілік (*Coelodonta antiquitatis* (Blumenbach, 1799)) және мүйіз қалдықтары (*Megaloceros giganteus*, *Cervus elaphus*) кіреді. Салыстырмалы әдістерді қолдану (von den Driesch, Гарутт, Дуброво, Форонова) және Орал-Еділ-Каспий маңы аймақтарының жарияланған ғылыми мақалаларымен салыстыру Батыс Қазақстанның плейстоцендік мегафаунасының сипаттамалық келбетін растауға және суық далалық тундрадан жайылмалы-шалғынды биотоптарға дейінгі экожүйелердің кең спектрін анықтауға мүмкіндік берді. Алынған нәтижелер кеш плейстоцендегі Орал-Каспий ойпатының палеоэкологиялық жағдайларын қайта құру және климаттық ауытқуларға байланысты табиғи жағдайлардың динамикасын бағалау үшін маңызды. Материал плейстоцен кешенінің типтік құрылымын және дала, ылғалды орманды дала элементтерінің болуын көрсетеді. Бұл жинақты ғылыми айналымға енгізу аймақтың төрттік фаунасы туралы мәліметтер базасын кеңейтеді және одан әрі салыстырмалы, палеобиогеографиялық және палеоэкологиялық зерттеулерге, сондай-ақ қазіргі экожүйелердің ықтимал өзгеру тенденцияларын модельдеуге негіз жасайды.

Кілт сөздер: кеш плейстоцен, Батыс Қазақстан, Орал (Жайық) өзені, мегафауна, палеоэкологиялық реконструкциялау, музей коллекциясы, ірі сүтқоректілер, төрттік кезең.

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Палеоэкологическая реконструкция позднего плейстоцена нижнего течения реки Урал (Жайык) по материалам музейной коллекции п. Дарьинск

В работе представлены результаты комплексного изучения палеонтологической коллекции плейстоценовых млекопитающих из фондов Мемориального музея М.А. Шолохова (п. Дарьинск, район Бәйтерек, Западно-Казахстанская область). Материал был собран в нижнем течении реки Урал (Жайык) из аллювиальных отложений позднеплейстоценового возраста и на протяжении длительного времени оставался неопределённым. Проведённые нами морфометрические исследования позволили впервые ввести коллекцию в научный оборот и уточнить таксономическую принадлежность остатков крупных млекопитающих. Коллекция включает черепа *Bos primigenius* и *Bison priscus*, многочисленные посткраниальные элементы и зубы *Mammuthus primigenius*, зуб переходной формы *Mammuthus trogontherii chosaricus*, бедренную кость (*Coelodonta antiquitatis* (Blumenbach, 1799)), а также рога *Megaloceros giganteus* и *Cervus elaphus*. Использование сравнительных методик (von den Driesch, Гарутт, Дуброво, Форонова) и сопоставление с опубликованными сериями из регионов Урал — Волга — Прикаспий позволили подтвердить характерный облик плейстоценовой мегафауны Западного Казах-

стана и выявить широкий спектр экосистем — от холодных тундростепей до пойменно-луговых биотопов. Полученные результаты важны для реконструкции палеоэкологических условий Урало-Каспийской низменности в позднем плейстоцене и для оценки динамики окружающей среды, связанной с климатическими колебаниями.

Ключевые слова: поздний плейстоцен, Западный Казахстан, река Урал (Жайык), мегафауна, палеоэкологическая реконструкция, музейная коллекция, крупные млекопитающие, четвертичный период.

References

- 1 Driesch, A. (1976). A guide to the measurement of animal bones from archaeological sites. *Peabody Museum Bulletin*, 1, 136.
- 2 Dubrovo, I. A. (1966). Sistematischeskoe polozhenie slona Khazarskogo faunisticheskogo kompleksa [Systematic position of the elephant of the Khazar faunal complex]. *Biulleten Komissii po izucheniiu chetvertichnogo perioda — Bulletin of the Commission on Quaternary Studies*, 32, 63–74 [in Russian].
- 3 Garutt, V. E., & Foronova, I. V. (1976). *Issledovaniia zubov vymershih slonov: metodicheskie rekomendatsii* [Studies of teeth of extinct elephants: methodological recommendations]. Novosibirsk: Nauka [in Russian].
- 4 Sher, A. V., & Garutt, V. E. (1985). O metodike opredeleniia generatsii korennykh zubov vymershih slonov [Methodology for determining molar generations in extinct elephants]. *Trudy Zoologicheskogo instituta Akademii Nauk SSSR — Proceedings of the Zoological Institute of the USSR Academy of Sciences*, 131, 93–103 [in Russian].
- 5 Gromova, V. I. (1931). Pervobytnyi byk ili tur (*Bos primigenius* Boj.) v SSSR [The aurochs (*Bos primigenius* Boj.) in the USSR]. *Ezhegodnik Zoologicheskogo muzeia Akademii Nauk SSSR — Yearbook of Zoological Museum of the Academy of Sciences of the USSR*, 32, 293–364 [in Russian].
- 6 Rusanov, B. S. (1975). *Iskopaemye bizony Yakutii* [Fossil bisons of Yakutia]. Yakutsk: Yakutskoe knizhnoe izdatelstvo [in Russian].
- 7 Khromov, A. A. (2004). Evoliutsiia roda Bison i morfologicheskie adaptatsii pervobytnykh bizonov *Bison priscus* Bojanus iz neopleistotsena Povolzhia [Evolution of the genus Bison and morphological adaptations of primitive bison]. *Trudy universiteta «Dubna». Ekologiya i nauki o Zemle — Proceedings of Dubna University, series Ecology and Earth Science*, 1, 195–208 [in Russian].
- 8 Vislobokova, I. A. (1990). Iskopaemye oleni Evrazii [Fossil deer of Eurasia]. *Trudy Paleontologicheskogo instituta Akademii Nauk SSSR — Proceedings of the Paleontological Institute of the USSR Academy of Sciences*, 240, 208 [in Russian].
- 9 Boeskorov, G. G. (2001). K sistematike i rasprostraneniui baranov roda *Ovis* (Artiodactyla, Bovidae) v pleistotsene i golotsene Sibiri i Dalnego Vostoka [To systematics and distribution of sheep of the genus *Ovis* (Artiodactyla, Bovidae) in the Pleistocene and Holocene of Siberia and the Far East]. *Zoologicheskii Zhurnal — Zoological Journal*, 80(2), 243–256 [in Russian].
- 10 Titov, V., & Golovachev, M. (2014). Data on elephants from Middle–Upper Pleistocene sediments of Astrakhan Volga area (Astrakhan Region, Russia). *VI International Conference on Mammoths and their Relatives*, 200. Thessaloniki.
- 11 Larramendi, A. (2016). Shoulder height, body mass and shape of proboscideans. *Acta Palaeontologica Polonica*, 61(3), 537–574.
- 12 Obada, T., & David, A. (2008). *Mammuthus cf. chosaricus* (Dubrovo, 1966) from Duruitoarea Veche, Republic of Moldova. *Structura și funcționarea ecosistemelor în zona de interferență biogeografică*, 209–211. Chisinau: Stiinta.
- 13 Yakhimovich, V. L. et al. (1986). *Pleistotsen nizhnego techeniia reki Ural* [Pleistocene of the Lower Ural River]. Ufa [in Russian].
- 14 Shkatova, V. K. (1976). Znachenie nizhneuralskogo opornogo razreza dlia stratigrafii i paleogeografii pleistotsena Zapadnogo Kazakhstana [Significance of the Lower Ural reference section for stratigraphy and paleogeography of the Pleistocene of Western Kazakhstan]. *Biulleten komissii po izucheniiu chetvertichnogo perioda — Quaternary Commission Bulletin*, 45, 73–82 [in Russian].
- 15 Yakupova, D. B., Berliguzhin, M. T., & Akhmedenov, K. M. (2021). *Istoriia izucheniia iskopaemykh pozvonochnykh kainozoia i mezozoia Zapadnogo Kazakhstana* [History of study of fossil vertebrates of Western Kazakhstan]. Almaty [in Russian].
- 16 Tleuberdina, P. A. (Ed.). (2017). *Mestonakhozhdeniia iskopaemykh pozvonochnykh fanerozoia Kazakhstan: spravochnik dlia paleontologov, geologov i biologov* [Locations of fossil vertebrates of the Phanerozoic of Kazakhstan]. Almaty [in Russian].
- 17 Kozhamkulova, B. S., & Kostenko, N. N. (1984). *Vymershie zhivotnye Kazakhstan (paleogeografiia pozdnego kainozoia)* [Extinct animals of Kazakhstan (Paleogeography of the Late Cenozoic)]. Alma-Ata: Nauka [in Russian].
- 18 Labe, B., & Guérin, C. (2005). Réhabilitation de *Mammuthus intermedius* (Jourdan, 1861), un mammoth (Mammalia, Elephantidae) du Pléistocène moyen récent d'Europe. *Comptes Rendus Palevol*, 4, 235–242.
- 19 Kahlke, R. D. (2014). The origin of Eurasian mammoth faunas (*Mammuthus-Coelodonta* Faunal Complex). *Quaternary Science Reviews*, 96, 32–49.

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