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Pleistocene hominin exploration of the Gobi Desert and the adjacent Gobi-Altai ranges

Abstract. This article explores a variety of archaeological sites dating back to the Lower Paleolithic period, as well as sites with mixed Lower and Middle Paleolithic assemblages. The sites in the Galba-Öösh Gobi region that include bifacial tools include: Mount Sharil, Mount Baishint, Mount Zurkh, and Khatsavch Hills. Materials from the Mount Yarkh, Yorool Gobi, Nariin gol 17, and Otson Maanit sites are used for comparison. The main task is to consider and compare natural features and climatic conditions existing in the Middle-Upper Pleistocene with the modern situation. The sites in question are abundant in high-quality raw materials suitable for fabricating stone tools. Assemblages include an extensive collection of stone tools and a diverse array of lithic-types used for tool production, qualifying them to be interpreted as workshops. Moreover, ancient river basins, formed by water flow in the past, near the sites, suggests that living conditions during the Pleistocene Epoch were conducive to human habitation.

Keywords. *Gobi, Gobi Altai, biface, lower paleolithic, middle paleolithic, Mongolia, pleistocene, Galba-Oosh, Stratigraphy, stone technology, lithic raw material.*

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Освоение плейстоценовыми гомининами пустыни Гоби и прилегающих хребтов Гоби-Алтая

Аннотация. В статье рассматривается широкий круг памятников, отнесенных их исследователями к нижнему палеолиту, а также смешанные подъемные материалы нижнего и среднего палеолита. Все памятники представляют собой экспонированные местонахождения из региона Галба-Оош Гоби: Шарилын-Уул, Байшинт-Уул, Зурх-Уул и Хацавчийн-Толгод, содержащие бифасиальные орудия. Для проведения корреляций привлекаются материалы памятников Ярх-Уул, Ёроол Гоби, Нарийн гол 17, Оцон Мааньт. Ставится задача рассмотреть и сравнить особенности природно-климатических условий в среднем–верхнем плейстоцене, с современной обстановкой, охарактеризовать геоморфологическую ситуацию в пустыне Гоби и Гобийском Алтае в регионах, где были обнаружены памятники. Местонахождения богаты высококачественным сырьем для производства каменных орудий, относятся к оригинальной коллекции каменного орудия, а также обладают широким ассортиментом орудий и инструментов для их изготовления, что позволяет отнести их к мастерским. Кроме того, остатки древних речных бассейнов, созданные проточной водой в непосредственной близости от памятников, свидетельствуют о том, что в древние времена они создавали благоприятные условия для обитания человека в плейстоцене.

Ключевые слова. *Гоби, Гобийский Алтай, бифас, орудие, нижний палеолит, средний палеолит, Монголия, плейстоцен, Галба-Оош, стратиграфия, каменная технология, сырье.*

Introduction

This article explores the settlement history of the Gobi and Gobi-Altai by ancient hominids during the Pleistocene period. It analyzes the impact of ancient climate on the development of early human cultures of the Lower Paleolithic, drawing upon artifacts found in exhibited complexes, data from archaeological sites, and insights into paleoclimate and the associated natural environment. Additionally, the study aims to uncover the sources of raw materials utilized by early humans, the selection criteria for raw materials in tool production, and establish connections with Lower Paleolithic complexes from adjacent regions.

The Pleistocene is the geological epoch linked to the last major glacial age. Its onset is marked by a global cooling, the appearance of Calabrian mollusks as well as, the Villafranchian fauna, which included elephants, buffalo, and horses [Konikov, 1993]. It was during this period that the earliest hominids appeared in Africa, and Paleolithic archaeological cultures emerged. The beginning of the Pleistocene is determined using potassium-argon and other geochronological methods, dating back approximately 3.5 to 1.3 million years. Towards the end of the period, glaciers gradually receded, eventually reaching their previous position around 8300 BCE.

Stratigraphic sampling, sediment analysis, and dating techniques such as radiocarbon dating and thermoluminescence dating as well as, remote sensing methods such as LiDAR and ground-penetrating radar were used for site detection, mapping, and chronological determinations. Excavation techniques such as troweling, sifting, and hand screening were used to carefully uncover artifacts and features. Artifact analysis was conducted using techniques such as typological classification, material analysis, and technological analysis to understand the production, function, and cultural significance of the artifacts uncovered. Overall, a multidisciplinary and systematic approach was used in the archaeological investigations to accurately interpret and understand the sites and their cultural context. This approach allowed for a detailed understanding of the lithological and geomorphological characteristics of the monument sites and their surroundings, thus providing valuable insights into the geological resources available to ancient humans in Mongolia. By analyzing stratigraphic profiles and creating a comparative geological collection, researchers were able to identify the specific types of sedimentary rocks that were utilized by ancient humans in the region. This information sheds light on the strategies employed by ancient people in selecting and utilizing high-quality raw materials, and offers a more comprehensive understanding of the geological and environmental context of the monument sites

[Rybin et al, 2014, 2015 b, 2016 c, d], Overall, the integration of lithological and morphological methods with archaeological analysis has provided a multidisciplinary approach to studying ancient sites in Mongolia. This approach, enhances our understanding of the geological resources available to ancient humans and their exploitation of these resources for monument construction and other activities.

This paper focuses on an extensive exploration of Lower Paleolithic archaeological sites within the Galba-Öösh Gobi region, highlighting notable locations such as Mount Sharil, Mount Bayshint, Mount Zurkh, and Khatsavch Hills, all distinguished by the presence of bifacial tools in this assemblages. These sites are complemented by materials from Mount Yarkh, Yorool Gobi, Nariin gol 17, and Otson Maanit, facilitating a broader comparative analysis.

The research aims to compare the natural and climatic conditions of the Middle-Upper Pleistocene and the contemporary environment. This involves an in-depth examination of the geomorphological dynamics within the Gobi Desert and Gobi-Altai, especially in areas where these archaeological sites discussed are present. The study integrates various maps and simulations to portray the climatic scenarios, offering a vivid depiction of past landscapes.

Furthermore, the paper seeks to contextualize the findings from the Galba-Öösh Gobi region within the larger framework of Central Asian Paleolithic archaeology. By comparing the Lower Paleolithic materials from this area with those from Kazakhstan, China, India, and the Caucasus, the research aspires to unveil the chronology, techniques, and technologies underpinning the production of stone artifacts, particularly bifaces. Such comparative analysis is crucial for understanding the evolution and dispersion of early human technologies and lifestyles across different geographies.

This approach not only sheds light on the specific archaeological contributions of the Galba-Öösh Gobi region but also enriches our understanding of the broader Paleolithic landscape in Central Asia. By carefully examining these ancient sites and their artifacts, researchers aim to piece together a puzzle of human history, revealing how early humans adapted to and interacted with their environments through the ages.

Natural and climatic conditions in the Gobi Desert during the Middle-Upper Pleistocene

The study of early Stone Age sites, including those in the Galba-Öösh Gobi region, entails a multidisciplinary approach that encompasses not only archaeology but also geology, paleoclimatology, and geomor-

phology, among other fields of inquiry. This holistic perspective allows researchers to construct a comprehensive understanding of the environmental context in which ancient humans lived, which in turn sheds light on lifestyles, technologies, and migration patterns. The study of nature, weather, geomorphological surfaces, soil types, and rock composition can inform our understanding of ancient human societies, particularly in the context of the Mongolian Gobi Desert during the Quaternary period: The Gobi Desert's extreme climate and its isolation from maritime influences result in significant temperature fluctuations, low humidity, and scanty precipitation. These factors would have necessitated specific adaptations in terms of water storage, mobility, and the timing of activities to cooler parts of the day or year.

By examining the interplay between these environmental factors and ancient human activities, researchers can reconstruct past lifestyles and migration patterns with greater accuracy. The study of the Galba-Öösh Gobi sites within the broader environmental context of the Mongolian Gobi provides valuable insights into how ancient human populations adapted to and interacted with their surroundings during the early Stone Age. The composition of rocks in the region is crucial for understanding the materials available for tool production. Variations in rock type influence the technologies of production, tool form, and use reflecting adaptations to different environmental conditions and available resources. The transformation of today's Gobi Desert landscape that has occurred over geological epochs illustrates the dynamic nature of Earth's surface and the profound impact of geological processes on the environment. The transition from a seabed to a continental regime, as noted by Dash (2010), underscores several key aspects of Earth's geological and climatic history that are essential for understanding the current shape and characteristics of the Gobi and semi-deserts [Dash, 2010: 59]. As the region uplifted and became increasingly isolated from marine influences, increased evaporation and decreased precipitation led to the aridification of the landscape, gradually transforming it into a desert. Changes in Earth's climate, such as ice ages and warmer interglacial periods, also influenced the available moisture in the region, further shaping its desert character. The geological evolution of the Altai Mountains and surrounding regions, as outlined by Chichagov (2010), provides insight into the dynamic processes that have shaped the landscape of Central Asia over millions of years. This evolution is marked by significant tectonic activity, including uplifts, compression of the Earth's crust, and the joining of the Hindustan lithospheric plate to Asia [Chichagov, 2010 p. 288].

The varied landscapes, shaped by tectonic and

volcanic activities, influenced human migration patterns within and beyond Mongolia. Natural corridors formed by mountain ranges and waterways facilitated these movements, leading to interactions between different groups and the exchange of technologies and genetic material. Alternatively, the same factors could have presented obstacles to interchanges. The study of archaeological sites where ancient people lived provides critical insights into their lifestyles, daily activities, and migration patterns.

The Holocene Gobi Desert

The Gobi Desert, as described by Janz, et al. (2017), is an expansive and ecologically diverse region that straddles the southernmost areas of Mongolia and extends into a significant portion of Northern China. This vast territory encompasses most of the Nei-Mongol Zizhiqu (Inner Mongolia Autonomous Region), parts of northern Gansu, and the northeastern areas of the Xinjiang Uyghur Autonomous Region. The Gobi's extensive coverage reach across these regions makes it one of the largest deserts in the world, characterized by unique landscapes, climate, and biodiversity [Janz.et al., 2017]. The Gobi is not a singular, homogenous landscape but rather a mosaic of different terrains, including rockymountains, vast steppe lands, dunes, dry ephemeral lake basins, and dry riverbeds. These varied landscapes support a diverse array of life adapted to the harsh conditions.

The geographical features of the Galba-Öösh Gobi region have shaped both the landscape and human activities. Settlement patterns, resource utilization, and migration routes of ancient populations were influenced by the presence of oases, fertile valleys, rich stone material sources, and varied ecosystems. Understanding the interactions between prehistoric human societies and their environments provides valuable insights into the adaptive strategies of people in this part of Asia. The study of paleoecology in the Galba-Öösh Gobi, as well as the broader Gobi-Altai region, reveals the sensitivity and dynamism of these ecosystems in response to climate changes. Drawing from the work of researchers like Hartmann (2003), Janz (2012), Herzsuh (2006), and Waheed (2011), we gain insights into how the Gobi Desert's unique positioning relative to major climatic systems such as the Southeast Asian monsoon, the Indian monsoon, and the westerlies has influenced its paleoclimate and paleo vegetation. The intersection of multiple climatic systems, coupled with the region's sensitivity to climatic changes, has led to a complex ecological history of the Gobi Desert. The study of paleoecology, through the analysis of lake sediments and other records, provides a window into the past, revealing how changing climates have shaped the landscape

and its ecosystems over millennia. This research not only enhances our understanding of historical climate patterns but also informs predictions about future ecological responses to climatic shifts. Efforts to understand the climatic history of the Late Pleistocene in northern Mongolia have been extensive, involving a range of studies focused on various geological and biological indicators. These studies, carried out by numerous researchers between 1997 and 2008, have contributed significantly to our knowledge of the region's paleoclimate, particularly regarding lake levels, glacial deposits, aeolian activity, and vegetation distribution [Lehmkuhl, 1997, Lehmkuhl, 1998, Naumann, 1999, Walther, 1999, pp. Grunert et al. 2000, Schultz 2000, Tarasov 2000, Peck et al. 2002, Fowell et al, 2003, Walther et al, 2003, Grunert, Lehmkuhl 2004, Wang et al, 2004, Prokopenko et al. 2007, Gilespeie et al. 2008].

In the Quaternary period, the center, south, and east of the country were characterized by warm paleoclimatic conditions, in which steppes and forests rich in vegetation were widespread. The archaic elephant, camel, buffalo, leopard, deer, mountain goat, and other species of mammals and predators lived here. This also infers favorable natural and geographical conditions for human habitation during the Quaternary [Dorj, 2019].

The area around the South Gobi is located at the junction of the tectonic plates of southern Mongolia and the South Gobi. Paleozoic-Mesozoic volcanic-sedimentary deposits and igneous rocks are widely distributed in the region. The rock formations of the area consist of rocks of the lower and middle Paleozoic metasedimentary island arc of the ophiolite type [Garamjav, 2014].

The IUP industries of the Altai Mountains are replaced by unrelated complexes of the Early Upper Paleolithic (EUP). On the territory of Mongolia, the change of IUP and EUP is evolutionary, and continuity can be traced to the final MIS-3 [Rybin, 2020].

Archaeological evidence of Galba-Öösh site

The Stone Age sites of Khatsavch Hills, Mount Zurkh, and Bayshint are located in Khanbogd soum in Umnugobi aimag. Geomorphologically, they belong to the Dundgobi and Umnugobi Galba-Öösh Gobi subregion [Dash, 2009].

Along with hills, the region is characterized by rugged steppes, depressions of varying sizes, ancient valleys, and mountains. However, the mountains are few, with wide foothills, as in the Gobi Mountains [Tsegmid, 1969].

As natural zone it is characterized as desert belt. Exposed stone sites are located in the middle of the low Gobi Mountains, close to mountains rich in hard,

dark brown sedimentary rocks. Medium to large-sized rocks cobbles of this sedimentary material are common in this area. These natural ready-made stone blocks were transformed by ancient people into tools through their knowledge of stone technology. The resulting stone tools were made and used for thousands of years in the places where they were made, used, and eventually discarded. These sites, like most sites in the Gobi Desert, were open settlements.

A common topographical feature of the open-air settlements of Khatsavch Hills, Mount Zurkh, and Bayshint, which we are considering, the presence of ample raw material for the manufacture of stone tools. In addition to raw materials available, there also exist many dry river beds near these sites, which indicates that early people selected locations near freshwater resources. It is no coincidence that the remains of an ancient river basin and dry river beds are located near the study areas. In ancient times there was water there, but nowadays, when there is a lot of rain, there is only temporary flow of water; gradually the water disappears into the desert sediments. The Gobi population still calls such dry riverbeds "rivers". These sites are located at a distance 20-30 km from one another [Margad-Erdene, 2017].

Lithic assemblages from sites in the Gobi region and the Gobi-Altai Mountains

Khatsavch Hills Stone Age settlement (N42° 55' 32.8" E106° 59' 22.4")

The southwestern part of Khanbogd soum is a low-lying multi-row ridge that extends from northeast to southwest and is completely covered with volcanic hard brown rocks. The Stone artifacts at the site were relatively densely distributed over an area of 300 x 500 m at the base of a low mountain with ridges at the top, within a small gorge, on a terrace, and in adjacent mountains.

The stone artifacts are made from dark brown, hard volcanic stone, which is abundant in this area [Gunchinsuren et al. 2014]. Various items were collected, including cores, core-like items, blanks, raw materials with traces of chipping on the cleavage surface, bifaces, double-sided tools, side scrapers, jagged and retouched items, large knife-shaped tools, chopping tools, pointed tools, and unique tools, as well as flakes, blades, and fragments.

Mount Zurkh Stone Age settlement (N42° 45' 44.1" E106° 41' 15.2")

Geologist D. Garamjav first reported ancient man-made stone tools on Mount Zurkh in the western part of Khanbogd soum. Located on the eastern side of Otson-Maanit and is a rocky peak with a conical peak in the middle of continuous low mountains.

At the top of Mount Zurkh is a large volcanic

rock, whose cracked rocks cover the interior of the mountain. Stone tool artifacts are mostly made from this stone. They were collected from the foothills of Mount Zurkh.

We collected 23 stone artifacts at this site: - cores, blanks, bifaces, cutting tools - cleavers, adzes, side scrapers, a large knife, two-sided tools, a pointy point, a fragment with a point, a small flake, and a splinter.

Mount Bayshint Stone Age settlement (N43° 01' 56.6" E107° 09' 34.1")

In the southern part of Khanbogd soum, there are many granite rocks, hills, and a ridge between them, called the high mountain Bayshint. From northeast to southwest, the upper part is covered by dark brown deposits of ancient volcanic sediments that spread into an oval shape. Traces of this natural stone, used by early humans as the main raw material for making stone tools, are clearly visible in rocks at the summit. Stone artifacts are generally concentrated in the mountain's upper part. A large stone with splintered traces, a core, a blank, a biface and its blanks, a two-sided biface, a large flake, a chip, a fragment were recovered, as were. Numerous flakes associated with industrial chip removal.

Mount Sharil Stone Age settlement (N43° 40' 25.6" E108° 09' 01.8")

This site is located in the warmer part of the foothills of Mount Sharil, which is located in front of the Zhiram sands in Mandakh soum, Dornogobi aimag.

Stone artifacts are densely distributed over an area of approximately 30x30 m on the slopes and on the sides of narrow ravines. The stone tools are made from a highly durable brown stone of volcanic origin. It is similar to the Khatsavch Hills and Mount Zurkh sites [Gunchinsuren et al, 2014]. Due to the large number of stone tool artifacts in a relatively small area, researchers randomly selected artifacts to provide site information.

Bifaces, side-scrapers, knives, notched serrated tools, chisel-shaped tools, items with a wavy blade, flakes with a blade, and blanks prepared for tool manufacture are commonly found here [Gunchinsuren et al, 2014].

The main part of the stone tool aggregations is represented by large-scale artifacts that were made chaotically without preliminary preparation.

The above sites were discovered during archaeological reconnaissance and rescue investigations, and were explored in a roundabout way. Although the distribution of stone tools at these sites is small, it is interesting to note that large local artifacts have been discovered, as well as a tool similar to the Biface tool used during the Lower Acheulean period in the Old Stone Age.

The topography of stone tools in Galba-Öösh

Gobi and the raw materials used to make them are similar. This is evidenced by the fact that prehistoric inhabitants used hard volcanic rocks, which were widespread in the region, as the main raw material for stone tools, and they settled in areas where these materials were readily available. The main collection of stone tools in open settlements, as a rule, involved primary flaking of natural raw materials. Random cutting and processing of large oval cores, mainly by transverse cutting, was done to remove flakes. In addition, numerous artifacts dating back to the beginning of the Upper Paleolithic have been found, indicating that these settlements were still inhabited and the tools were made much later.

Sites in the context of the Lower Paleolithic in the Gobi Desert

Of great interest to researchers of Mongolian's Paleolithic era are the finds near the pebble culture sites described above, near Mount Yarkh, on the way from Mandakh soum to Undurshil. Mounth Yarkh is located in Gurvan Saikhan soum, in Dundgobi aimag. Mount Yarkh, stands out from a distance with its majestic dome-shaped peak, composed of limestone [Okladnikov, 1986]. Four kilometers to the west, on the slope of a low hill formed by whitish-gray quartz, many flakes and, pieces of yellow jasper-like rock were processed by Stone Age people. Finished products, are also scattered about.

One of the most important among Mongolian's Paleolithic sites. It is located 53 km north of the town of Mandal Gobi, the regional center of Dundgobi aimag. It lies in a deep depression, bounded on the south and north by steep basalt cliffs [Okladnikov, 1986]. The height of the cliffs reaches 30-40 m above the Valley floor. Scattered along the edges of the cliffs are fragments of gray siliceous rock beaten by humans, as well as finished products made from this rock. Flakes and blades were also found.

A common characteristic of early Paleolithic complexes is the use of pebbles as starting material.

The earliest known are located on the northern coast of the Valley of Lakes, in the Nariin gol basin. The earliest complexes occur on the high (<140 m) terrace of the left bank of the river. Pebbles and boulders of coarse-grained silicified sandstone were used as raw materials. First of all, products with a very strong degree of deflation stand out, when the surface texture of the negatives is similar to the natural crust.

Mount Yarkh. There was a huge workshop at which pieces of rock raised from the surface or broken out of vein outcrops were processed. Among the remains of the production of stone products, primary blanks predominate; these preserve, as a rule, a large-spongy and porous nodular crust. The latter was

removed with several blows from one or two edges of the nodule. There are also flakes without crust. The plates are relatively rare. The most interesting of them have a relatively regular elongated triangular shape, a more or less convex striking tubercle on the body, and two, less often three, facets on the back. Among the tool blanks one can see cores, sometimes large, with a platform characteristically beveled with the long axis of the item, always single-sided (blades and flakes were removed from only one side). Such cores can be called proto-Levallois since they do not yet have consistently developed techniques for decorating cores characteristic of the Levallois, technique. Particularly noteworthy are the blanks of tools processed on both sides with large chips - bifaces. They are mostly oval, less often heart-shaped or subtriangular. As a rule, such bifaces are decorated with wide facets of chips from the edges; on the sides, their blades are wavy or zigzag [Okladnikov, 1986]. Large bifaces predominate; there are massive ones and small, relatively thin ones; flattened items such as these can be called hand-made points. The opening of a workshop in which bifaces of Acheulean appearance were made came as a big surprise.

Yorool Gobi. Finished products are represented by bifaces of three types: a) almond-shaped, b) heart-shaped-subtriangular, c) relatively thin wide blades, decorated on both sides with wide flattening edges. Along with these, bifaces were found that were decorated more sparingly, with chips on both sides. Their working edge is processed with wide transverse chips. They resemble cleavers and have characteristic blades transverse to the long axis. At the Yorool Gobi site, disc-shaped cores were discovered, as well as those that can be called primitive Levallois [Okladnikov, 1986]. All these objects are made of gray siliceous rock. Its origin is associated with basalt outcrops. Special mention should be made of the numerous chipped pieces of white chalcedony scattered along the road to Mandalgobi that runs along the southern slope of the depression. Chalcedony also comes from the basalts on the southern edge of the basin. Products made from it can be conditionally attributed to the Neolithic or Mesolithic.

Nariin gol 17. Another large monument of the Lower Paleolithic in Mongolia are the Paleolithic settlements in the Nariin gol valley near Mount Uran-Khairkhan in Ulziit soum, Bayankhongor aimag. Forty-seven Lower, Middle, and Upper Paleolithic settlements have been discovered, 12 of which are Lower Paleolithic and four are workshops. The oldest of these is the Nariin gol 17 workshop, where researchers noted that the surface of 212 stone objects made of green-gray gravel is very old and has an ancient character [Tseveendorj, Bayar, 2003]. Among

these stone tools, a slightly greater number of remains of tools and blades were found, taken from the impact site and cut on several sides. These types of lithics are rare and have characteristics intermediate to those of the Levallois type. It is important to note that the features of the ancient part of this collection, dating back to the Lower Paleolithic period, are associated with the main activity of technology and raw materials.

Otson Maanit. The next largest Acheulian settlement discovered in Mongolia, is located near the southern border of UmmuGobi aimag [Tseveendorj, Bayar, 2003].

In 1971, 1972 the crew of a paleolithic study, that was part of the Joint Mongolian Soviet Historical and Cultural expedition discovered Middle Paleolithic stone tools. The raw lithic materials are the same as those used for the production of artifacts at Arts Bogd (red jasper) [Margad-Erdene, 2015]. The round and oblong lithics at Otson Maanit are very ancient, such lithics are common in Europe, South Asia, and Africa during the transition from the Lower to the Middle Paleolithic. From the remains of an oblong shape, a long oval triangular plate with a straight edge and a convex back was cut out with a light blow. This indicates that ancient stonemasons who lived in this region of the country moved to the Acheulian without any interaction with each other [Tseveendorj et al, 2003].

How are artifacts from Galba-Öösh similar to materials from other Lower Paleolithic sites?

Cores from the collections of early Stone Age sites can be divided into several groups according to type, but most of them contain scars of flake. An elongated oval cross-section from both sides towards the center with large traces of gravel (Fig. 1) was discovered at Khatsavch Hills. Okladnikov published his discovery of the second monument of Yorool-Gobi [Okladnikov, 1986: 14, table. CXLV. 3, 4].

Many researchers believe that the following artifacts were used in the Lower and Middle Paleolithic periods: discoid cores of the Levallois type, various bifaces, double-sided bifaces, and cleavers found at the Yorool Gobi sites. [Okladnikov, 1986: 14].

Artifacts similar to those we described in the Tsakhiurt Valley settlement between the Arts Bogd and Gurvansaikhan Mountain ranges in the Gobi-Altai have also been discovered. For example, in the area of the Tsakhiurt Valley excavation site No. 1, in a heavily deflated part of the assemblage of artifacts discovered on the surface, there is an artifact similar in shape, size and assemblage method to this artifact, which we con-

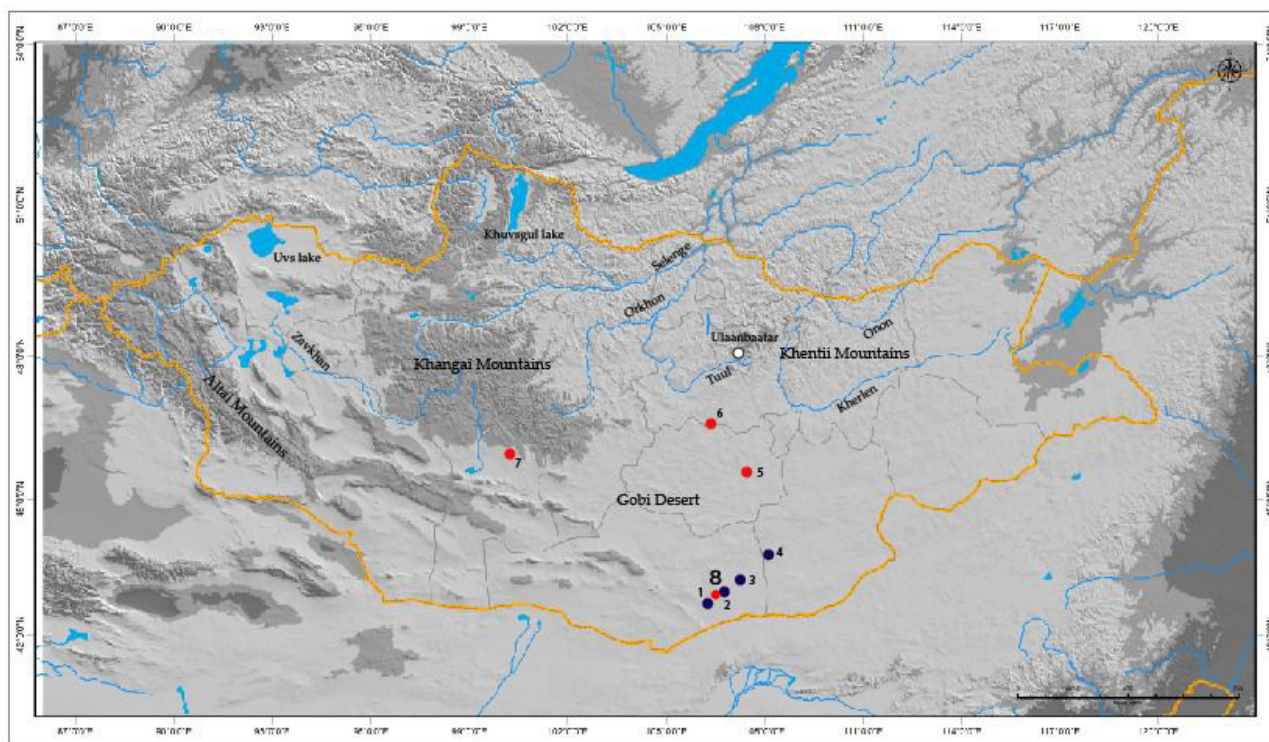
sider our cores. This long oval, cut from edge to center, is an interesting artifact [Derevianko et al, 2002: 49, fig. 92-5] notes it is a rather interesting weapon. However, we believe that this item could have been used both as a core and as an artifact. It should also be noted that the weakly deflated core group of artifacts collected in the surveyed zone, as well as the cores discovered in other parts of the Tsakhiurt Valley, are not identical to these fossils, but are similar in terms of removal methods. Researchers in the Tsakhiurt Valley believe that methods and patterns of production of highly deflated artifacts can be traced back to the Middle Paleolithic, in comparison with the monuments of the neighboring valley Nariin-gol, Yarkh Mount, Yorool Gobi, Uench-1, and other regions [Derevianko et al, 2002: 63 -67].

There are very few objects similar in method and style to the core collection mentioned above in the available materials. Based on comparisons with artifacts from the Yorool-Gobi settlement and the Tsakhiurt Valley settlement, this type of artifact is believed to belong to the Late Paleolithic. It is also assumed that it was used not only as a core but also as a tool. Another item from the Khatsavch Hills stone tool collection is a rectangular flake with a straight cut and a long blade removed along one side of the face. The impact area is slightly inclined.

It is believed that an attempt was made to knap this type of material, which retains much of the stone's surface, using a form of natural stone that has not been fully processed. Similar artifacts come from the Olon Nuur-1 settlement in the upper part of the Mongolian Altai [Derevianko et al, 1990: 230-237. Table. XLVI, 2]. Derevianko et al., published a collection of stone tools found in the southern part of the Mongolian Altai, a mountain range designated Altai-4 [Derevianko et al, 1990: 421-525. table CXXXII, 13].

Based on the parallel removal methods found in the Olon Nuur-1 and Levallois-type cores, as well as in the secondary processed tool, they suggest that it belongs to the late Moustier period [Derevianko et al, 1990: 237]. It seems that the workshop of the Altai-4 settlement was later connected.

Significant remains, comparable in type and removal methods, were discovered at Mount Zurkh. Foremost is a long, oblong single-platform core with large cross-sections from the lateral edges. Its base was also sharpened and an attempt was reportedly made to remove the large blade by cutting it straight out of the impact area. Similar artifacts are marked as 17a in the Narin-gol valley [Tserendagva et al., 2017: 35-40, fig. 13], found in settlements such as Olon Nuur-1 in the upper part of the Mongolian Altai [Derevianko et al, 1990: 233, Table. XLV, 4]. It should also be not-



Localities yielding bifacial tools in Mongolia
 (1. Mount Zurkh, 2. Khatsavch Hills, 3. Mount Bayshint, 4. Mount Sharil,
 5. Mount Yarkh, 6. Yorool Gobi, 7. Nariin gol, 8. Oton Maanit)

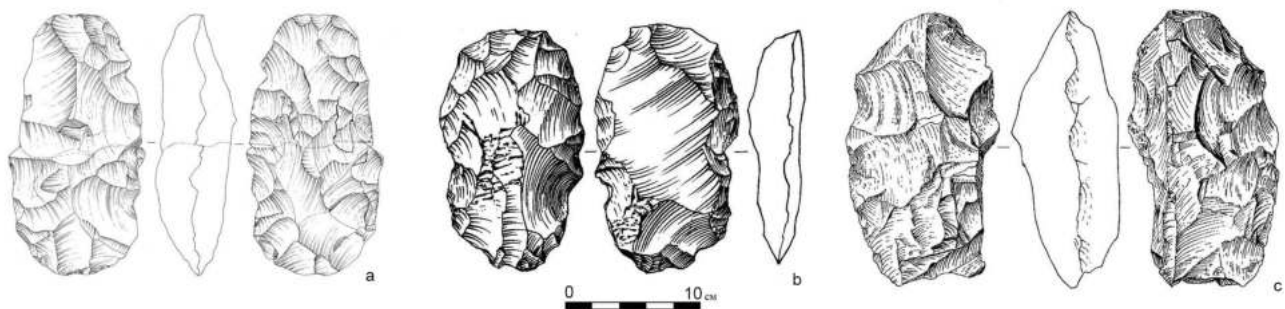


Fig. 1. a-Khatsavch Hills-core, b-Yorool Gobi- levallois, c-Tsahiurt Valley- core.

ed that similar artifacts have been discovered at early Stone Age sites along the Barlag and Uench rivers. Based on the production and collection methods of the Nariin gol 17a stone tools, those researchers “do not doubt that the relatively early stone cutting methods and tools are quite early Paleolithic, and the basic production methods of the Lower Paleolithic are clear. In addition, most of these stone tools date to the Moustier period, and some objects, such as the remains of a wedge, date back to the Late Paleolithic [Tserendagva, 2017: 40]. However, as noted above, some researchers believe that the date of the Olon Nuur 1 site is associated with the late Moustiers period. Another core in the Mount Zurkh collection is a fragment of the base of an ovoid nucleus. The front part is convex and the back part is flat. Crosscuts were made on the front and back of the two side edges to create sharp edges. The base is slightly rounded and trimmed

The base is slightly rounded and trimmed on both sides (Fig. 2). Similar artifacts were discovered in a settlement designated as Orog Nuur-1 in Bayan-Undur soum, Bayankhongor aimag [Derevianko et al, 2000: 177-178, table. CCVII, 7].

The finds from Orog Nuur-1 and its comparison with other sites across Eurasia illustrate the technological sophistication and widespread nature of the Mousterian and Levallois traditions during the Middle Paleolithic. These insights contribute to our understanding of prehistoric human behaviors, technological advancements, and the spread of cultures across Eurasia. Furthermore, the connections between settlements across vast geographical expanses highlight the importance of interregional studies in piecing together the complex puzzle of human prehistory. The work of researchers like Derevianko and Tserendagva provides a crucial foundation for further exploration and understanding of these significant periods in human history [Tserendagva, 2017: 211-213].

The primary collection of stone tools at the Mount Sharil site, considered in this study, is represented by the remains of artifacts with a random and parallel collection. A find resembling cores with traces removed from the impact surface and parallel to the impact zone (Fig. 3). It was discovered in a settlement designated Bayan-Ulgii-6b, near the center of Bayan-Ulgii aimag.

Stone age finds from the Orkhon River valley in central Mongolia, particularly at the excavation site in the Orkhon-7 cultural layer, underscore the complexity and sophistication of tool-making techniques during the Upper Paleolithic. According to Derevianko et al. (1990, 2010), artifacts observed at this site, including several residues with parallel grooves found on the plate, are indicative of advanced stone tool production methods. These methods include the process of cutting plates, a technique that demonstrates a high level of skill and understanding of lithic materials [Derevianko et al, 1990: 197-211-178, table. XXXV, 6], and [Derevianko et al, 2010: 110-111].

The results of a laboratory chronological study conducted during the third layer of the second excavations of the Orkhon-7 settlement yield 39970 ± 819 (SOAN-2884) years ago. This indicates a connection in the Early Upper Paleolithic [Derevianko et al, 2010: 32, table. 1]. Based on the results of the above-mentioned open settlement and cultural-stratigraphic study, the remains found in this Mount Sharil settlement can be considered to belong to this chronological circle. According to studies of related sites in Mongolia and neighboring regions such as southern Siberia, the Altai Mountains, and northern China in the Upper Levallois, slabs and disks have been in use for approximately 45,000 years. The cores used for this method are rectangular and oval. However, this method is gradually being replaced by the plate-cutting method which involves parallel cutting. Therefore, we believe that the method of parallel collection of remains is consistent with the Early Upper Paleolithic.

The Khatsavch Hills, Mount Zurkh, Mount Bayshint and Mount Sharil sites are large, and their sphere of influence is very wide and, quite ancient, as evidenced by the fact that the primary excavations, as a rule, were made of large, unprepared stone.

Dorj noted that similar monuments were found in large numbers in monuments discovered near the soum center of Bogd (formerly Khovd) soum in Uvurkhangai aimag. They are associated with the Middle Paleolithic [Dorj, 1991: 72-73] and are based on Levallois-type fossils, which are the main expression of the middle Stone Age. The main collection of stone tools from the settlements of Khatsavch Hills, Mount Zurkh, Mount Bayshint and Sharil, is based on the use of natural stone as a raw material. Based on cutting processing, it was aimed at removing flakes. Several artifacts dating back to the Early Upper Paleolithic have been found, indicating that these sites were still inhabited and used for tool making.

It is hypothesized that the primary collection technology for stone artifact production dates back to the Lower Paleolithic, Middle Paleolithic, and Upper Paleolithic. This is based on comparisons with other previously studied sites and localities in adjacent regions.

Correlation of materials with Lower Paleolithic complexes of neighboring regions

The discovery and study of bifacial tools across Europe, Africa, Central Asia, and notably within regions such as the northern Galba-Öösh Gobi and neighboring Shanxi Province in China, highlight the widespread use and significance of these tools

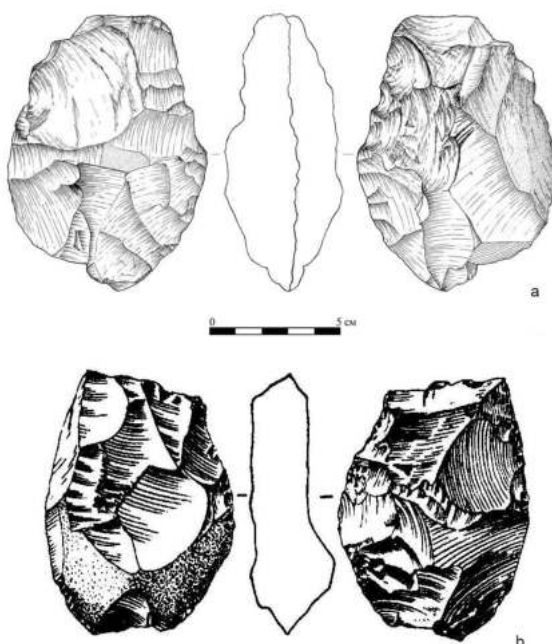


Fig. 2. a-Mount Zurkh- core, b-Orog Nuur 1- core

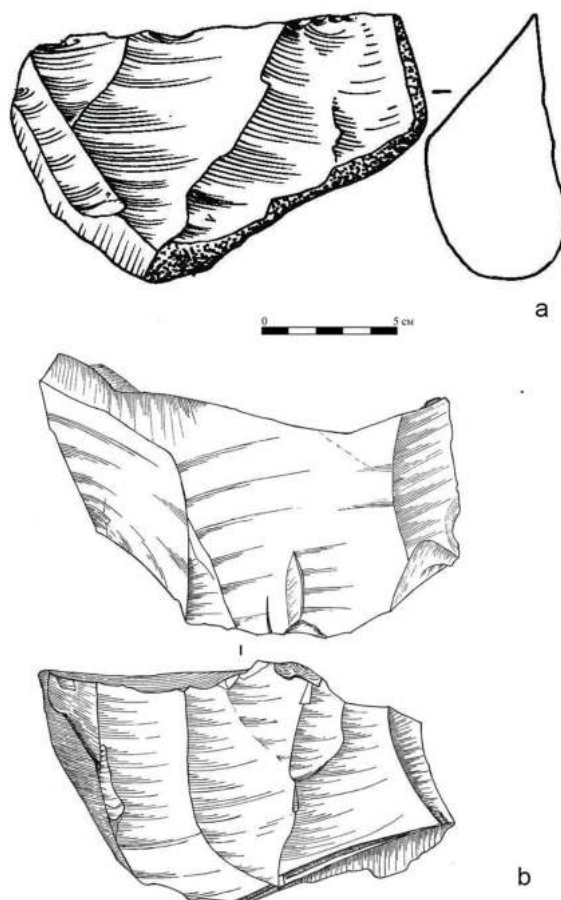


Fig. 3. a-Bayn-Ulgii 6b- core, b-Sharil Mountain-core

throughout human prehistory. Bifacial tools, characterized by their worked edges on both faces, have been fundamental in various daily and survival activities, including hunting, processing materials, and potentially in combat as spearheads. The presence of bifacial tools from the lower Paleolithic to the Middle Paleolithic across continents underscores their enduring utility and adaptability across vastly different cultures and environments. Sites like Khatsavch Hills, Mount Zurkh, Mount Bayshint, and Mount Sharil, alongside the Daguduishan Mountain Stone Age site, demonstrate the geographical spread of these tools.

A chronological comparison of bifacial tool production methods in Central Asia and China, as suggested by the research of S.Kuchera (1996) and others, offers insights into the technological evolution and sophistication of early human societies. The ability to produce such tools requires knowledge of material properties and skilled craftsmanship [Kuchera, 1996: 228-232]. Similarities in tool design and production techniques across vast regions suggest possible cultural connections or convergent technological evolution among disparate human populations. Understanding these connections can provide insights into human migration patterns, trade, and the exchange of

ideas. The dating of bifacial tools and the sites where they are found helps build a chronological framework for prehistoric human activity in these regions. Such a framework is crucial for understanding the development and spread of early human societies. The study of bifacial tools and their production methods offers a window into the daily lives, social organization, and technological capabilities of prehistoric peoples. These tools were not only functional but also represented the ingenuity and adaptability of early societies (Fig. 4).

The discovery of ancient artillery artifacts in the mountainous region of the Caucasus, specifically within Armenia at sites like Lori, Karakhach, Aynikab-1, Mukhkay-1, and Darvagchay-1, marks a significant find in the field of archaeology and human prehistory. According to Derevianko (2015), these artifacts date back to an astonishing 1.7 million years ago, placing them firmly within the Early Pleistocene era. This period is crucial for understanding the early spread of hominids ancestral humans and their relatives beyond Africa and into Eurasia [Derevianko, 2015: 309].

Dashtadem-3 was discovered in northwestern Armenia. Many tools of various shapes were found at the site. Some have considered this in connection with post-Acheul [Eugen, Kolpakov, 2009: 3-31]. The bifacial tools of the Dashtadem-3 site, especially the triangular bifaces, are very similar in type and method to the projectiles found at the Khatsavch Hills, Mount Zurkh, and Bayshint sites. Similar weapons are found in Armenia, in Metsavana, Jarabera, and Kudaro-1 in Inner Ossetia, at Indian Chirki, Kenyan Olorgesayli [Belyaeva, Lyubin, 2011: 82-96], and Israeli Geshen Benot Yaakov [Goren-Inbar, Saragusti, 1996: 15-30]. The dates of these settlements are associated with the

Lower Paleolithic Acheulian.

In both Turkmenistan and Kazakhstan, tools have been discovered at sites dating to the late and middle Paleolithic. An Acheulian-type artifact was discovered at the Yangaja-Karatengirsko site in Turkmenistan. Lyubin and Vishnyatsky date this to ca. 300,000 years BP [Lyubin, 1984: 26-45; Lyubin, Vishnyatsky, 1985: 22-23].

More than 10 settlements with lithic artifacts were found in the northwestern parts of Kazakhstan. The most interesting is the settlement of Mount Mugodzhary in the upper reaches of the Emba River. Eighty-five bifaces were found on both sides of the river, which were flaked from both sides. They can be classified into several types. The chronology dates back to 250,000-300,000 years BP [Derevianko, 2015: 310].

As we noted earlier, many artifacts were found in China. A good example is the biface found in the lower part of the settlement designated Pinglian and Chenjiawo, on the Gangwangling Plateau (Fig. 5).

It dates back more than 1 million years [Derevianko, 2015: 326]. In addition, in the Lower Stone Age settlements of Kehe (Fig. 6) and Laochihe, a chopper, and a scraped projectile were discovered along with a biface, from which they were removed from both sides. They date to 1–0.6 million years BP [Jia Lanpo., 1984: 194-201].

Also, more than 20 settlements (caves and cultural layers) with tools from the northwestern and southern parts of Europe, in England, France and Italy, were studied. They belong to the middle to final stage of the Pleistocene [Moncel, M.-H et al. 2016].

A unique tool called a cleaver, one of the main types of Acheulian stone tools, was found in the site at Mount Zurkh. The artifact has a triangular shape

with two longitudinal edges and sharp edges on the wide part. Another type of tool is the scraper. Made using a flake and chip, the longitudinal edge and slightly longer edge are sharpened with a continuous blade. Such tools were used for scraping, stripping and cutting, and were common throughout the Stone Age. Another interesting product is a large knife. A long, oblong flat stone was used as a blank, and a sharp edge was created by trimming a large one-sided edge on both sides. The blade's thin side is fine to

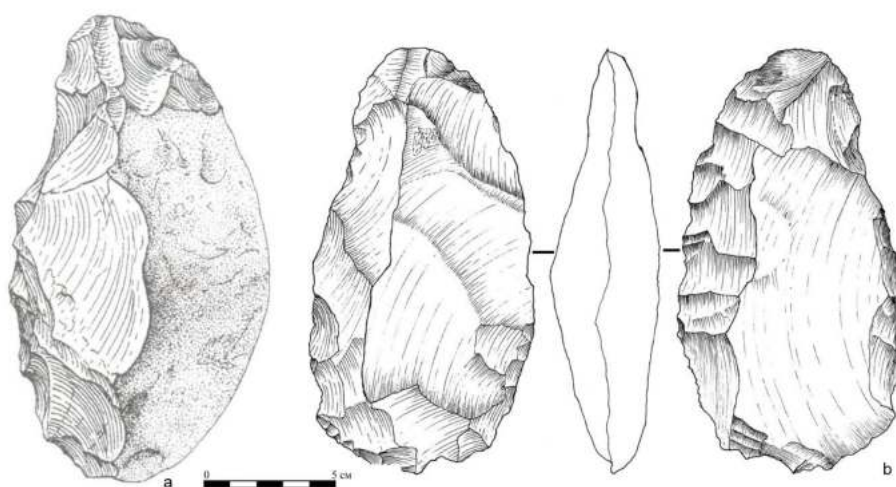


Fig. 4. a-Baise Valley-biface, b-Mount Zurkh-biface

drip on one side. The opposite side has a straight back and is thinned to make it easier to hold. This tool was used for chopping and breaking like an axe.

The fact that the edges of the serrated tool are very worn indicates that they were connected at an early stage. The knife tool is moderately worn. It is designed for cutting and slicing objects. Several objects for cutting with a wave-shaped blade were also found. The high number of such artifacts is due to their easy manufacture, the raw materials were sharpened at hand, and they were widely used in the daily life of the people. Such a tool is not uncommon in the Lower Paleolithic in Europe and Africa, it is often carefully worked with large pebbles.

One of the most interesting artifacts found at Mount Zurkh is a well-designed adze-shaped tool, well-processed on both sides. The material we have does not contain the same find, but its preparation is similar to that of a double-edged weapon. However, it is quite long, with indentations at one end, and appears to be attached to a stem.

In lithics research, sharp-edged tools known as sharpeners were used for piercing hides, digging holes in trees, and digging in the ground. Other types of tools have a scraper, a notched tool, a retouched flake, a chip, and a small number of fragments.

The stone artifacts at the settlement are relatively

large, which is one of the features of the local stone tool industry [Margad-Erdene, 2017].

Mount Yarkh. After all, it was common to think that in East Asia and, in Mongolia, pebble tools and the corresponding stone processing technology dominated. In this region, there was a pronounced production of bifaces of Acheulean appearance. Judging by the shapes of these items, they do not belong to the late, but rather to the Middle Acheulean period. Such dating does not contradict the shapes of the cores of proto-Levallois appearance, with features of not-yet-matured Levallois technology [Okladnikov, 1986, Margad-Erdene, 2023].

Yorool Gobi. Stone artifacts, which in appearance can be attributed to the Paleolithic and later times, were also found on a small hill to the southeast of the main location [Okladnikov, 1986].

Nariin-gol. The workshop exposed in the topsoil, which has no cultural layers, an important dating tool. Therefore, researchers determined its chronology by 500.000 years in comparison with the monuments of that time already known to science. However, recent research indicates that the stone artifacts from this settlement are similar in method, distribution, and style to the stone tools of the Xihodu site in north-west China. Compared to the Xihodu settlement, some believe that Nariin gol-17 may be dated to the Lower Pleistocene, 800.000 years ago, or even earlier [Tseveendorj, Bayar, 2003].

The Khatsavch Hills, Mount Zurkh, and Mount Bayshint stone artifacts discussed in this study are located in the form of open surface settlements. It is not possible to determine an absolute date for them. Therefore, we will make a chronological correlation based on the primary cleavage of the stone tool set and tool type. The Mount Yarkh, Nariin gol 17, Yorool Gobi, Otson Maanit, and Mount Sharil sites, which were chronologically studied within the territory of Mongolia, represent the Acheulean culture. This culture can be considered to belonging to the Middle and Late Paleolithic of or the Lower Paleolithic when compared with the biface found in such sites as Dashtadem-3 in Armenia, Olorgesailie in Kenya, Chirki in India, Metsavana, and Jarabera in Inner Ossetia, and Kudaro-1 and Gesher Benot, and Yaakov in Israel.

The shape of the oval parallel cores of Uench-1 and Barlag's river from the Paleolithic can be attributed to the Early and Middle Paleolithic in comparison with the settlements.

Conclusions

The archaeological sites in the northern part of the Galba Öösh Gobi offer compelling insights into the lives and technological capabilities of its ancient in-

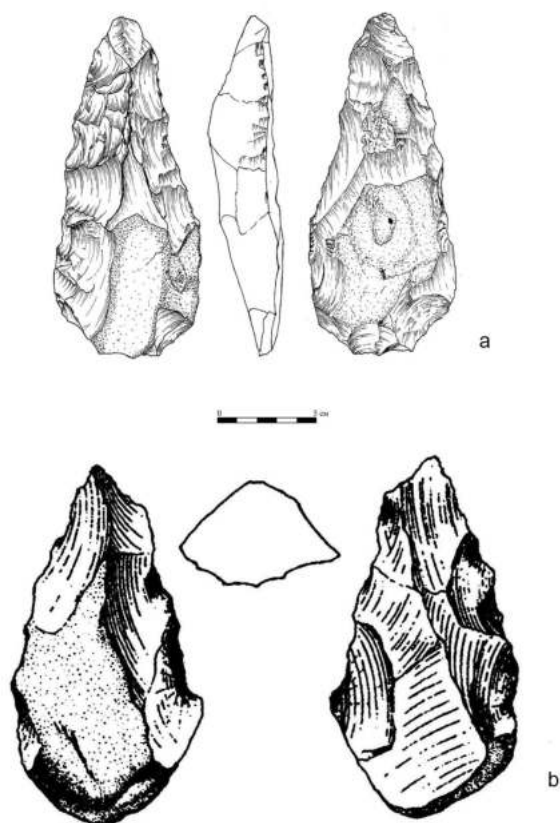


Fig. 5. a-Khatsavch Hills-biface, b- Chenjiawo-biface

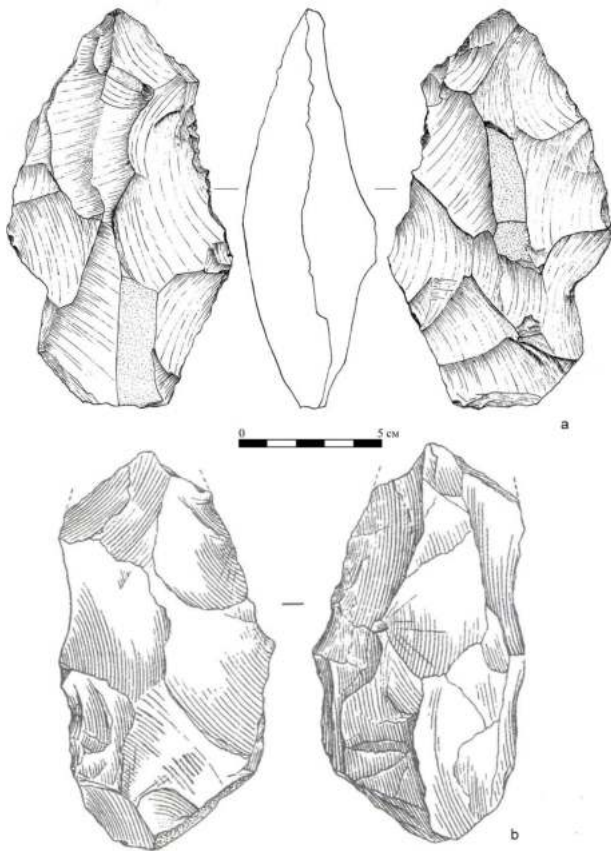


Fig. 6. a-Mount Zurkh-biface, b-Kehe-biface

habitants during the Pleistocene. The presence of specific-style tools and the evidence of stone tool production workshops indicate a sophisticated level of skill and an understanding of the local geological resources. These findings not only illuminate the daily lives and technological advancements of these early human communities but also provide a vital link in the broader network of Paleolithic cultures across Eurasia.

The tools discovered at these sites are characterized by their specific styles and purposes, tailored to meet the daily needs of ancient inhabitants. The variety of tools suggests a broad range of activities, from hunting and food preparation to crafting and construction.

The proximity to high-quality raw materials for stone tool production indicates a deep knowledge of the local geology and the strategic selection of sites for settlement. This access to suitable stone not only facilitated toolmaking but also suggested a level of permanence and investment in the location.

The findings of pre-pressed primary cleavage cores, blanks, and tools made during production, along with secondary processing tools, suggest that these sites functioned as workshops. This indicates a complex organization of labor and knowledge transmission related to tool production.

The remains of ancient river basins in the vicini-

ty of the sites underscore the importance of water resources in site selection. These resources would have provided not only for the basic needs of the inhabitants but also potentially influenced the location of workshops and the processing of materials.

The similarity of tools and production methods with sites in northern China, Kazakhstan, and the Middle East highlights a widespread distribution of biface tool culture across Europe, the Middle East, Central, and East Asia. This suggests movements of peoples, exchange of knowledge, and possibly shared cultural practices across vast distances.

Our ability to trace sites from the Lower-Paleolithic to the Middle Paleolithic through similarities in specimens and collection methods provides valuable insights into the evolution of tool production techniques and cultural developments over time.

The archaeological sites in the Galba-Öösh and the Gobi regions represent an important chapter in the prehistory of the human population of Central Asia. The use of local materials for tool production and the strategic selection of settlement locations based on proximity to water and raw materials suggest a complex and adaptive human presence in the Pleistocene. Furthermore, the connections between these sites and others across Eurasia highlight the interconnectivity of early human cultures and the spread of technological innovations. These findings enhance our understanding of early human adaptation, technology, and the diffusion of cultures across ancient landscapes.

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