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Prehistoric communities of the Altai and Gobi in the light of Mongolian-Polish research in south-central Mongolia

Abstract: This article summarizes the results of research conducted by the Mongolian-Polish archaeological expedition in south-central Mongolia (Ömnögovĭ and Övorkhangai aimags) in the Gobi-Altai region between 2016 and 2025. The work focused on the complex of Paleolithic sites and a siliceous rock outcrop with lithic workshops, such as Tsakhiurtyn Hundi (Flint Valley). This research aimed to reconstruct the paleoenvironment and human adaptation to climate change in this area from the Last Glacial Period to the late Holocene.

Keywords: *Mongolia, Gobi, Tsakhiurtyn Hundi, Palaeolithic, paleoenvironment, lithic technology, pottery, hunter-gatherers, Late Pleistocene, Holocene.*

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Introduction

Since 2016, a Mongolian-Polish scientific team has been conducting archaeological research in south-central Mongolia, specifically in the area around Tsakhiurtyn Hundi (Flint Valley), the largest complex of prehistoric sites and lithic workshops in Northeast Asia (Derevianko et al. 1997, 2001, 2002; Masojć et al. 2017, 2025). The research focuses on Pleistocene and Holocene communities and their adaptation to changing environmental conditions and various geographical zones, including high mountains and the Lake District, located on the southern foreland of the Arts Bogd massif (Masojć et al. 2018, 2019, 2024). The analyses also aim to determine subsistence strategies, mobility, and technological behaviour, including the exploitation and transport of raw materials from local outcrops.

Research conducted so far has identified over 150 archaeological sites of various types, spanning a broad period from the Middle Paleolithic to the early Iron Age. Archaeological excavations conducted at individual sites have provided researchers with information on the material culture and economy of the societies that historically inhabited this area of present-day Mongolia. The results of the research also enable conclusions regarding environmental changes and their impact on the contemporary population's settlement patterns and economy.

Research area

Fieldwork was conducted in south-central Mongolia, in a vast area situated between the Arts Bogdyn Nuruu mountain range to the north and the Barrun Sahyany Nuruu mountain range to the south. Administratively, the study area encompasses the Bulgan sum, part of the Ömnögovi aymag (u), and the southeastern edge of the Bogd sum, part of the Övorkhangai aymag (u) (Figure 1).

Figure 1. Mongolia; A. Location of the study area, B. Gobi Altai Massifs

A highly diverse terrain characterizes this area. It encompasses both the gently undulating desert-grassland edge of the Gobi Desert, the Altai foothills, and the hills and valleys of the Gobi Altai itself (Figure 2).

Research has been conducted since 2016 in two areas with different topographic features. One is the Arts Bogdy Nuruu mountain range, part of the Gobi Altai. Located on its edge is the aforementioned Tsakhiurtyn Hundi (Flint Valley), where numerous stonemasonry workshops and flint outcrops are scattered across a mesa-like plateau cut by deep gullies (Figure 3). The second area, adjacent to Arts Bogdyn Nuruu to the south, is the Altai foothills and the northern edge of the Gobi Desert.

Within Arts Bogdyn Nuruu, a series of valleys often intersect, cutting through a relatively narrow but steep mountain massif with a maximum elevation of 2,477 m above sea level. The largest of the valleys is Khutul usny, which constitutes a natural communication route between the northern and southern edges of Arts Bogdyn Nuruu (Figure 4).

Figure 2. Massif Arts Bogdan Nuru; southern range of the Gobi Altai and its foothills (photo: Project Archive)

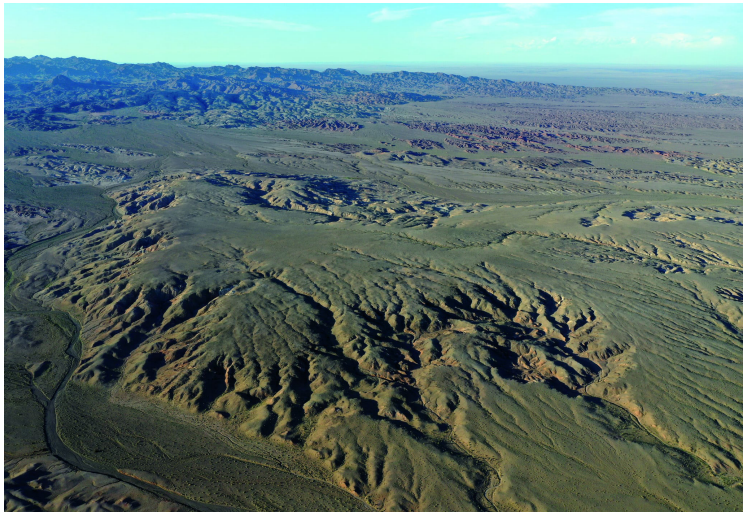

Figure 3. Southern foothills of the Gobi Altai; Tsakhiurtyn Hundi plateau, dissected by valleys (photo: Project Archive)

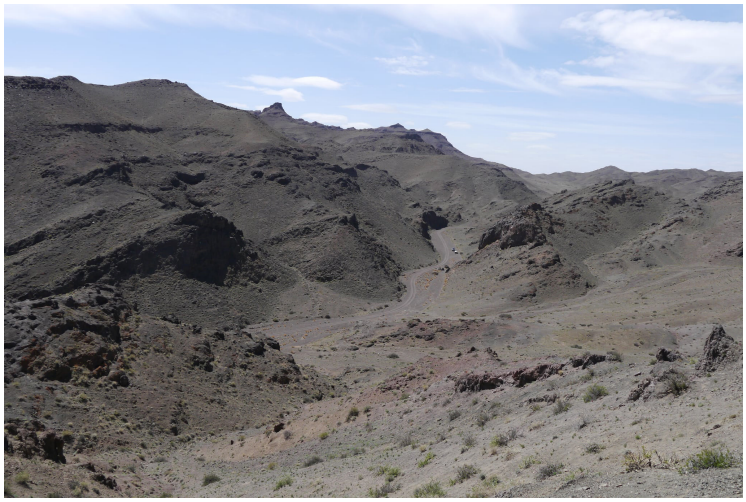

Figure 4. Gobi Altai; Massif Arts Bogdan Nuru, Khutul usny Valey (photo: Project Archive)

The second of these study areas is the highly folded Altai foothill region, which gradually transitions into the relatively flat Gobi Desert. Characteristic of this area is the presence of relatively low hills surrounding basin-like depressions, remnants of paleolakes, whose concentration supports the conclusion that this is a paleolake district. These depressions still fill with water during periods of heavy precipitation (Figure 5). To date, surveys and excavations have been conducted within five paleolakes (Masojć et al. 2024, 2025; Bobrowski et al. 2025). The area also contains wide, often deeply grooved, meandering canyons. Their presence indicates the past existence of numerous watercourses in this area, connecting individual lakes, the Arts Bogdyn Nuruu massif to the north, and the present-day Gobi Desert to the south. Currently, the entire area is covered with vegetation typical of the semi-desert and desert areas of NE Asia (Rachkovaskaya 1993).

Archaeological research in Arts Bogdyn Nuruu

During research conducted in the Arts Bogdyn Nuruu mountain range, a total of 49 archaeological sites were identified, most of which were open-air sites. The first stage of work in this area focused on the 5-kilometer-long, deep Khutul Usna valley, characterized by its steep and heavily eroded slopes (Fig. 4). The shape of the valley floor and the presence of gravel and sand deposits on the surface indicate that water still flows periodically in the area. On the left bank of the valley's escarpment, two caves-previously unrecorded by researchers-were identified (sites: FV8, FV123). These caves formed in Cretaceous lava flows and are now, to a greater or lesser extent, filled with sediment (Masojć et al. 2017, 2024). Above, in the top part of the surrounding hills, approximately 200 m north of the caves, a unique cache consisting of 11 jasper cores was recorded (Masojć et al. 2019).

The cache, marked as site FV10, was situated on a rocky terrace at an altitude of 1,581 m above sea level, approximately 30 m above the valley floor (Figure 6). This site offers a panoramic view of the northern part of Khutul Usny, with two smaller valleys extending into it. The valley's outlet into the steppe is also visible in the distance. Here, year-round springs of water emerge,

Figure 5. Gobi; paleolake (Lake 1) Talingaryn Shal, (photo: Project Archive)

Figure 6. Massif Arts Bogdan Nuru, site FV10; exploration of a jasper deposit discovered in the upper part of Khutul Usny Valley (photo: Project Archive)

Figure 7. Massif Arts Bogdan Nuru, Khutul usny Valey; jasper deposit (photo: Project Archive)

collecting in trough-like depressions surrounded by vegetation.

Six jasper cores were recorded at the surface of site FV10, and five others were recovered during excavations. The artifacts were made from blocks and flakes of jasper with the same structure and color, indicating that they were retrieved from a single outcrop (Figure 7). Surface examination of the artifacts revealed traces of use and meat processing on most of them. Technological analysis suggests that the find is associated with communities from the transitional period between the Middle and Upper Paleolithic, or possibly with the Early Upper Paleolithic, placing the discovered materials within a time range of 45,000-35,000 years (Masojć et al. 2019, 2024).

It should be noted that the field survey did not confirm the presence of jasper outcrops in the vicinity of the site. However, intensive archaeological survey conducted in 2024 throughout the Arts Bogdyn Nuruu massif revealed several sites with jasper outcrops and initial processing sites within 5–8 km of the deposit (Figure 8). The reconnaissance also documented outcrops of greenish and milky quartz and dark chalcedony, the raw materials from which, alongside flint and jasper, tools were made, found both at the sites recorded within Arts Bogdyn Nuruu and in the remaining adjacent study area. It should be emphasized, however, that despite the presence of jasper and other siliceous rocks, the dominant stone raw material in recorded archaeological contexts throughout the region is grayish flint, the main outcrops of which are located in Tsakhiurtyn Hundi, also known as the Flint Valley.

It should be emphasized that the Jasper deposit from the FV10 site in the Arts Bogdyn Nuruu Mountains is the only find of its kind documented in the Gobi Desert. Its discovery is significant for discussions regarding the specifics of stone raw material extraction and processing, settlement dynamics, and hunting strategies employed in the Altai region and the adjacent steppe-desert area. At the same time, the deposit's location-on a rocky ledge overlooking both the valley and the vast steppe opening at its end, with its water sources-suggests a deliberate placement and symbolic

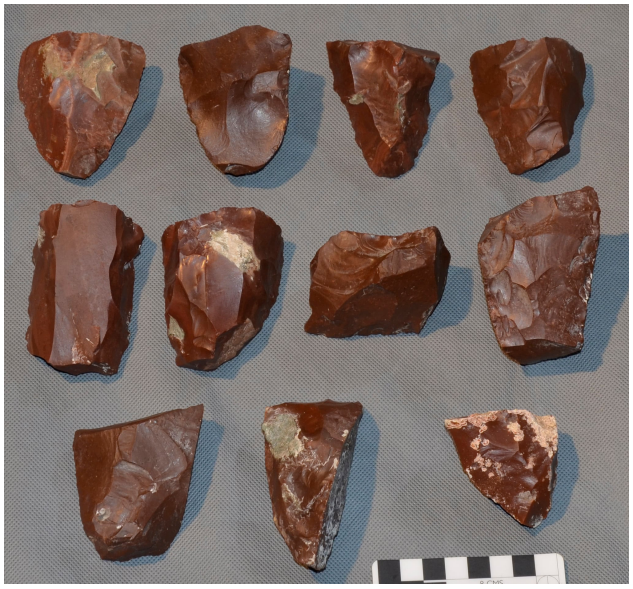

Figure 8. Gobi Altasi; outcrop and jasper processing site discovered at Massif Arts Bogdan Nuru (photo: Project Archive)

significance of the discovered materials, which provides grounds for consideration of the beliefs of the region's Paleolithic communities.

During the research conducted within the Khutul Usna Valley, a test excavation was also carried out in the largest cave in the region, designated site FV8 (Figure 9). The excavation reached a depth of 3.6 m, but did not reach the basement layer. Documentation and analysis of the discovered layers allowed for the identification of six archaeological horizons (occupation episodes), defined as layers II-VII (Figure 10). Within each horizon, stone artifacts and animal bone fragments were recorded. It is worth noting that numerous bone beads were also discovered in the lowest layer, layer VII.

At the current stage of research, we only have 14C dating for layers IV and VI, which indicate that the four oldest occupation horizons/episodes (IV–VII) should be associated with the Last Glacial Maximum, i.e., the Upper Paleolithic (Figure 10). This chronological position of the layers is also supported by lithic material, in the form of two large blades buried within layers VI and VII. However, the remaining stone artifacts excavated from the layers of cave FV8, due to their technical and typological characteristics, should be classified as simple debitage, unidirectionally reduced flake cores, single endscrapers, and retouched flakes. Among the animal bones found in the layers of the cave, the presence of Mongolian gazelle, argali, wild camel (Camelus ferus), and wild ass (kalun) was identified, as well as cervids and canids (Masojć et al. 2024)

Figure 9. Massif Arts Bogdan Nuru; 9A – location of the FV8 cave site in Khutul usny Valey, 9B, 9C – excavations in the FV8 cave (photo: Project Archive)

Geological research

Research in this area focused on the area adjacent to the Arts Bogdyn Nuruu massif, as well as within the river paleovalleys and around the former shoreline of the region's numerous paleolakes, where the highest concentration of finds related to prehistoric communities was recorded. A total of 105 archaeological sites were documented throughout the area. Furthermore, in the zone directly adjacent to the Gobi Altai massif, active and currently active water sources were also noted, as well as layers of ancient peat bogs, indicating a significantly different hydrological situation in the past.

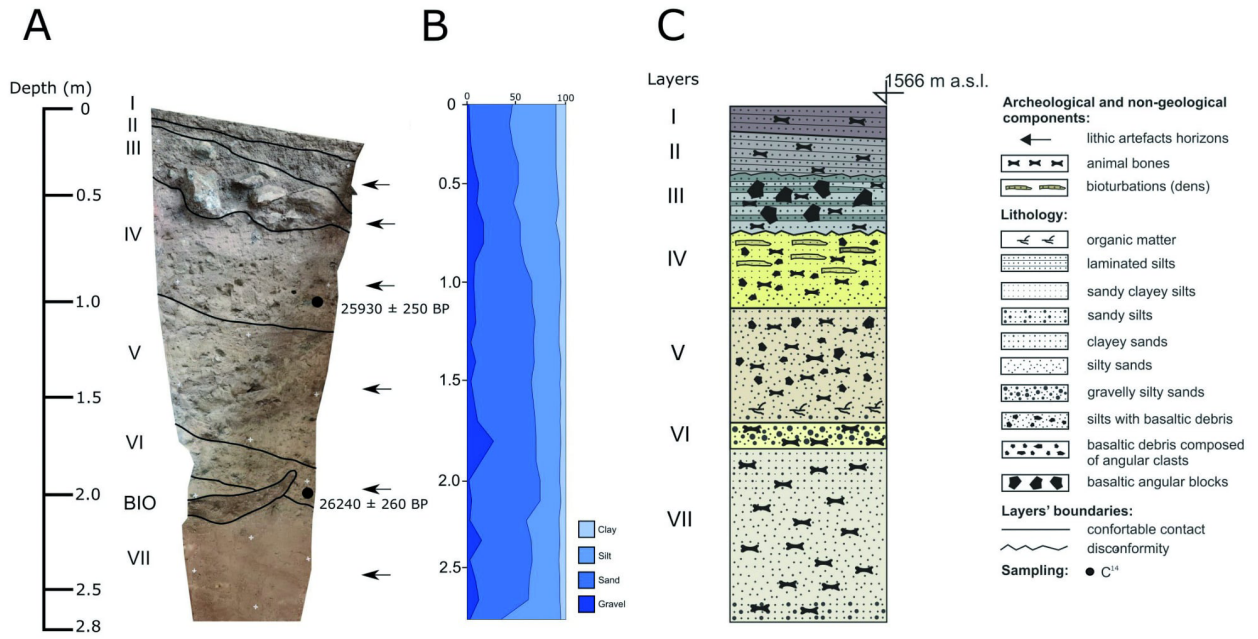

Figure 10. Khutul usny Valey; stratigraphic situation and chronology at the FV8 site. A) Photogrammetric model of the eastern profile and C14 dating results of two samples from levels IV and VI - depth in meters; B) results of granulometry analysis with depths in meters; C) geological description of the stratigraphic situation at the site.

In the study area, most of the discovered sites were located on the shores of now-vanished reservoirs. Their greatest concentration occurred around Talingaryn Shal (Lake 1), the remains of the region's largest paleolake (Figure 5). Along the former southern shoreline, clusters of stone artifacts were recorded, indicating the existence of camps associated with the Upper Paleolithic, Mesolithic, and Neolithic periods. Strong vertical and horizontal redeposition of artifacts is observed at the sites, resulting in the coexistence of Paleolithic and Neolithic artifacts, often intermixed, on eroded surfaces. According to the paleoenvironmental study, the chronology of the former Talingaryn Shal (Lake 1) water body dates back nearly 140,000 years. For the clay, silt, and sand deposits occurring here, which reach depths of up to 6 m below ground level, optically stimulated luminescence (OSL) dating was employed, yielding a result of 138,000 years (Masojc et al. 2024).

In the case of both Talingaryn Shal and other paleolakes in the region, lithic inventories with homogeneous features have also been documented, which should be associated with Late Paleolithic and Neolithic communities. Their relatively good state of preservation stems from the fact that Holocene climatic changes caused the shrinking of the former lakes' surface area. This resulted in the appearance of contemporaneous materials along the new shoreline, already associated with human presence after the LGM.

This phenomenon is best illustrated by the results of work conducted within Lake Baruun Khuree (Lake 5), located in the southwestern part of the study area, where more than a dozen sites (camps) were recorded along the shoreline and on sandy-clay banks that originally protruded from the lake waters (Figure 11). Excavations at sites FV133, FV134, and FV139 yielded a large amount of archaeological material, evidence of the activity of early Holocene hunter-gatherer societies. Well-preserved remains of hearths and pits containing characteristic stone tools, as well as debitage in the form of bladelets and flake fragments, were unearthed. The technological features of the discovered stone assemblages are characterized by the use of pressure techniques to reduce microblade cores, as well as the production of small retouched tools, including geometric microliths. A very large number of chalcedony, quartz, and red jasper artifacts were also documented within the hearths explored at sites FV134 and FV139. During the excavations, stone grinders and pottery made of relatively well-fired clay were also discovered at the sites (Figure 12). The oval vessels were ornamented with incised and punctured designs. Finds of particular significance included ornaments made from ostrich eggshells, such as pendants and decorated beads (Szykulski et al. 2024; Bobrowski et al. 2025).

Figure 11. Baruun Khuree (Lake 5); Excavations at site FV139 (photo: Project Archive)

Figure 12. Baruun Khuree (Lake 5); Holocene materials recovered from site FV139 (photo: Project Archive)

Charcoal samples were collected from the explored hearths, and laboratory analyses were conducted (Bobrowski et al., 2025). The results of the studies indicate a period of ca. 9300–9800 BP (median point ca. 11.225–10.535 cal yr BP), although within this time range two chronological horizons can be distinguished: a younger horizon ca. 9300–9400 BP (ca. 10,620–10,535 cal BP) and an older horizon ca. 9500–9600 BP (11,100–10,685 cal BP). Both horizons belong to the so-called Oasis 1 phase, on a three-phase scale (Oasis 1 – Oasis 3), as defined for this part of Asia by L. Janz (Janz 2012; Janz et al. 2015, 2017).

In light of these results, sites from the Lake Baruun Khuree area are among the earliest traces of post-LGM human presence in the Gobi Desert. Chronologically, this corresponds to the results of radiocarbon analyses from the Chikhen Agui cave in the Gobi Altai, where traces of post-LGM human presence are dated to the period 13,400–8,700 cal BP, with most dates obtained from hearths falling within the time range 10,000–9,000 cal BP (Derevianko et al. 2003; Khatsenovich et al. 2023). At the same time, analyzing the pottery from site FV139, we can conclude that we are dealing with several distinct vessels, clearly different from previously published Mongolian early pottery materials (Gladyshev et al. 2013; Iizuka et al. 2018). In the context of the current findings regarding the chronological attribution of these finds, it can be assumed that the pottery from Baruun Khuree (Lake 5) is currently the oldest of this type discovered in Mongolia (Bobrowski et al. 2025).

Bronze and Iron Age sites

During research conducted in the Altai foothills, prehistoric relics related to the Bronze Age and Iron Age were also recorded. This includes a relatively large number of stone structures of a sepulchral or ritual nature. Archaeological work on this group of finds largely focused on photographic documentation and measurements of structures that had previously been described, or at least mentioned, in publications on this region (Kvaerne 1995; Iderkhangai et al. 2017; Andreeva and Atwood 2018; Byamba-Ochir and Bat-Erdene 2020; Szykulski and Masojć 2022; Szykulski et al. in press). During archaeological reconnaissance at the mouth of the Khutul Usna valley, four stone burial structures were recorded. One is a rectangular structure covered with cobblestones. The remaining ones are relatively small barrows, also covered with cobblestones (Figure 13). It is worth mentioning that fragments of an iron cauldron, typical of nomadic communities, were found on one of the barrows. It is assumed that structures of this type are characteristic of nomadic peoples of the Bronze and Iron Ages (Eregzen 2016; Jacobson-Tepfer 2023).

Figure 13. Massif Arts Bogdan Nuru; Bronze Age burial structure recorded at the mouth of the Khutul Usny Valley (photo: Project Archive)

Other, and far more numerous, prehistoric stone structures are found in the Gurvan Saykhan Nuruu massif, where numerous rock blocks with petroglyphs are found around the peak of Bogino Khyar, known as the Khavtsgait site. Twenty-eight stone burial structures have been documented around them to date. Among them are seven figure-shaped structures (shorgooljin), six kheregsuur, three slab graves, ten circular structures (dugui daraastai), and two other structures whose state of preservation does not allow for a definitive determination of their form (Iderkhangai et al. 2017; Andreeva and Atwood 2018). The form of the structures themselves, the artifacts found, the depictions of animals and humans in the petroglyphs, and the representations of their material culture allow these finds to be attributed to the Bronze and Iron Ages (Andreeva and Atwood 2018).

The same temporal position is also indicated by most of the stone structures recorded in 2023 during archaeological reconnaissance conducted within the Khar Tolgoi (Хар Толгой) mountain; see Black Head (Szykulski et al., in press). During documentation work at its southern foot, mounds, stone pavements, and slab graves were recorded (Figure 14). A platform with a central stone mound and a boulder enclosure was also documented halfway up the slope. Structures of this type, referred to as kheregsuur/khirgisüür, are an element of the nomadic burial rites of the late Bronze Age (Lymer 2015; Jacobson-Tepfer 2023).

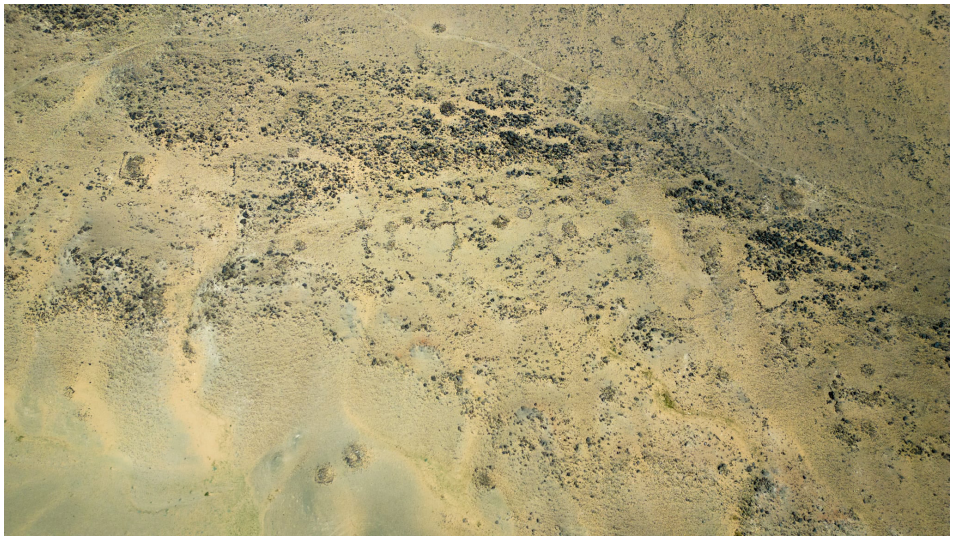

Figure 14. Khar Tolgoi (Хар Толгой); stone structures located at the foot of the southern slope (photo: Project Archive)

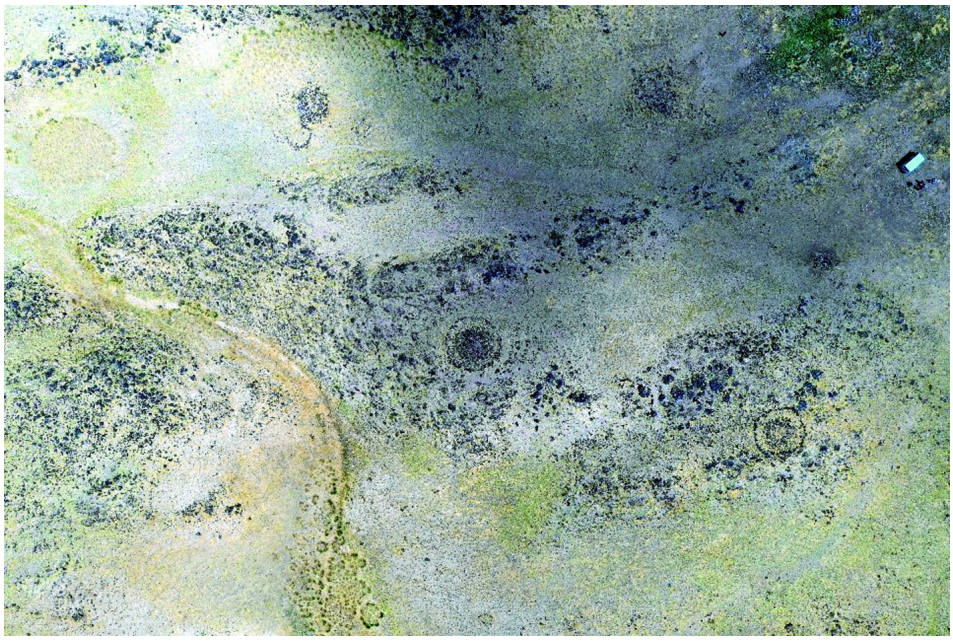

Figure 15. Paaluu site (sum Guchin Us, aimag Uvurkhangai); stone structures from the Bronze and Iron Ages (photo: Project Archive)

It should be noted that structures of a similar nature were also recorded at the Paaluu site (sum Guchin Us, aimag Uvurkhangai), located northwest of the study area, where rectangular and oval stone structures, walls, and stone paths were observed on the flat terrain surrounding the foot of the mountain (Szykulski and Masojć 2022). These structures are attributed to the Bronze and Iron Ages (Figure 15). In later periods, this site also held particular cultic significance, as evidenced by the presence of stone piles (so-called owoo/obo) and phrases in the Uyghur alphabet carved on the boulder. Numerous metal objects associated with the Middle Ages and the period of the Mongol Empire's formation were also recorded at Paaluu (Fig. 16; Szykulski and Masojć 2022; Szykulski et al. in press).

Figure 16. Paaluu site (sum Guchin Us, aimag Uvurkhangai); iron artifacts found by local nomads from the period of the formation of the Mongol Empire (ca. 12th/13th century)

Conclusions

The Mongolian-Polish research conducted in south-central Mongolia from 2016 to 2025, covering part of the Gobi Altai and the adjacent area of the Gobi Desert, allows for the presentation of preliminary conclusions regarding the history of settlement of this region by prehistoric and historical communities.

It should be emphasized that no materials were recorded at the studied sites that could be undoubtedly associated with the Early Paleolithic. While such a chronology has been postulated for some materials recovered in the late 20th century from Tsakhiurtyn Hundi (Flint Valley), their temporal position was determined based on the rather controversial criterion of the state of preservation of stone artifacts, combined with their technotypological features (Derevianko et al. 2002). Although individual bifacial tools were also found at the sites explored between 2016 and 2024 around the paleolakes, their co-occurrence with Levallois materials suggests that these materials belong to the Middle Paleolithic.

Therefore, based on technotypological features, the lithic inventories recorded in the study area can be associated with the period spanning the Middle Paleolithic to the Neolithic. For the Middle Paleolithic, a distinctive element is the occurrence of bifacial artifacts and the use of the Levalloisian method. The Upper Paleolithic artifacts, on the other hand, are core-like forms, represented by bidirectional blade cores with two opposing platforms. The use of microlithic technology in tool production should be considered a marker of the Late Paleolithic. Moreover, the appearance in the recorded inventories, in addition to microlithic artifacts, also of stone grinders and pottery, as observed in the case of sites from Lake Baruun Khuree (Lake 5), is an indicator of early Holocene Neolithic communities.

The presence of Bronze Age and Iron Age communities in the study area is evidenced by sepulchral stone structures found, among others, at the mouth of the Khutul Usny valley, as well as at other sites located on the outskirts of the Arts Bogdyn Nuruu massif. Similar sepulchral and ritual structures are also found at the southern mountain site of Khavtsgait (Andreeva and Atwood 2018), where, in addition to stone structures attributed to the Bronze and Iron Ages, numerous petroglyphs depicting narrative scenes and the material culture of nomads from the late Iron Age are also present. This period witnessed the expansion of the Xiongnu steppe people into this part of Asia, followed by other political entities, culminating in the formation of the Genghis Khan Empire.

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