STUDIA ARCHAEOLOGICA

https://doi.org/10.5564/sa.v48i2.4730

Tomus XLVIII 2025 Fasciculus 1

Miroslaw Masojc[1]✉, Gunchinsuren Byambaa[2], Jozef Szykulski[1], Przemysław Bobrowski[3], Maciej Jordeczka[3], Bazargur Dashzeveg[2], Rafał Sikora[7], Grzegorz Michalec[1], Patryk Muntowski[6], Odsuren Davaakhuu[2,5], Marcin Szmit[8], Andrzej Gałas[4], Antoni Wojcik[7], Enkhtaivan Namjilmaa[5,9]

[1]Institute of Archaeology, University of Wrocław, Poland.
[2]Institute of Archaeology, Mongolian Academy of Sciences, Ulaanbaatar, Mongolia.
[3]Institute of Archaeology and Ethnology, Polish Academy of Sciences, Branch Poznań, Poland
[4]Mineral and Energy Economy Research Institute of the Polish Academy of Sciences, Kraków, Poland.
[5]Mongolian National University of Education, Ulaanbaatar, Mongolia.
[6]Scientia et Arte Foundation, Gdańsk, Poland
[7]Polish Geological Institute - National Research Institute, Kraków, Poland.
[8]Gdańsk Archaeological Museum, Poland
[5,9]International University of Ulaanbaatar, Namyangju street, Ulaanbaatar-210644, Mongolia

Stone age societies in the borderland between the Gobi-Altai Mountains and the Gobi Desert, Mongolia

Abstract. This article summarizes the results of research conducted by the Polish-Mongolian 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 Palaeolithic sites and a siliceous rock outcrop with lithic workshops, such as Tsakhiurtyn Hundi (Flint Valley). This research aims 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*

Мирослав Масойч[1]✉, Бямбаагийн Гүнчинсүрэн[2], Йозеф Шикульски[1], Пршемыслав Бобровски[3], Мачей Юрдэчка[3], Дашзэвэгийн Базаргүр[2], Рафал Сикора[7], Гжегож Михалец[1], Патрик Мунтовски[6], Даваахүүгийн Одсүрэн[2,5], Марчин Шмит[8], Анджей Галаш[4], Антони Войцик[7], Намжилмаагийн Энхтайван[5]

[1]Вроцлавын Их сургууль, Археологийн хүрээлэн, Польш.
[2]Шинжлэх Ухааны Академийн Археологийн хүрээлэн, Улаанбаатар, Монгол.
[3]Шинжлэх Ухааны Академийн Познан дахь салбарын Археологи, Угсаатны зүйн хүрээлэн, Польш.
[4]Шинжлэх Ухааны Академийн Эрдэс ба эрчим хүчний эдийн засгийн судалгааны хүрээлэн, Польш.
[5]Монгол Улсын Боловсролын Их сургууль, Улаанбаатар, Монгол.
*[6]*Шинжлэх Ухаан, Урлагийн сан, Гданьск, Польш.
[7]Үндэсний судалгааны хүрээлэн-Геологийн хүрээлэн, Краков, Польш.
[8]Гданьск Археологийн Музей, Польш.

Монголын Говь-Алтайн нуруу, говь цөлийн зааг нутгийн чулуун зэвсгийн үе

Хураангуй. Энэ өгүүлэлд 2016-2025 оны хооронд Говь-Алтайн нурууны өмнөд, төв хэсэгт (Өмнөговь, Өвөрхангай аймгийн зааг нутаг) хийсэн Монгол-Польшийн хамтарсан судалгааны үр дүнг нэгтгэн авч үзжээ. Судалгааг Цахиуртын хөндий (Flint Valley)-ийн палеолитын суурингууд болон цахиур чулууны ордын орчимд байх дархны газруудад голчлон гүйцэтгэсэн байна. Судалгааны зорилго нь сүүлчийн мөстлөгийн үеэс хожуу голоценыг хүртэлх тухайн бүс нутгийн уур амьсгалын нөхцөл, хувьсал өөрчлөлт, хүмүүсийн дасан зохицох үйл явцыг тодруулахад чиглэгджээ.

Түлхүүр үг: *Монгол, говь, Цахиуртын хөндий, палеолит, эртний уур амьсгал, чулуун зэвсгийн үйлдвэрлэлийн арга, шавар ваар, анчин-түүвэрлэгч, хожуу плейстоцен, голоцен*

Email: miroslaw.masojc@uwr.edu.pl, https://orcid.org/0000-0001-7779-5014

Introduction

The authors present preliminary results of a research project focusing on the prehistory of the area surrounding a vast flint outcrop, so-called Tsakhiurtyn Hundi in Mongolia (Figure 1). Tsakhiurtyn Hundi (Rus. Кремневая Долина, Eng. Flint Valley), located about 700 km south of Ulaanbaatar, is one of the most extensive prehistoric sites of Central Asia. Discovered by the Mongolian-Russian-American Expedition it owes its name to the presence of abundant flint outcrops and immeasurable number of flint artefacts. During archaeological investigations, a total exceeding 30 thousands implements was collected. The chronology of these lithic assemblages, based on the techno-typological features and abrasion degree of the surface lithics, was affiliated to the Early, Middle and Late Palaeolithic (Derevianko *et al.* 2002). Despite numerous remains of settlements from the Stone Age, only limited archaeological research has been conducted there so far (Derevianko *et al.* 2001; Gunchinsuren 2017; Masojć *at al.* 2017, 2019; Zwyns *et al.* 2014). The aim of the current project is to analyse the nature of long-lasting prehistoric settlement around the Tsakhiurtyn Hundi. Environmental reconstructions, settlement's chronological determinations and raw materials economy are the main goals to obtain the picture of several hundred thousand years of human activity in this area. The findings highlight the significance of the region's archaeological record to expand the understanding of the presence and adaptation strategies used by Pleistocene and early Holocene human groups in the Central Asiatic harsh environments.

Geological settings

The Tsakhiurtyn Hondi (Flint Valley) area is located within the longest-living orogenic belt (from Proterozoic to Jurassic time) in the Earth history: Central Asian Orogenic Belt (CAOB). In Mongolia the CAOB is divided by the Main Mongolian Lineament (MML) into two: southern and northern domains, but newer tectonic synthesis subdivided Mongolian geological basement into 44 terranes (Badarch et al. 2002). The study area is located in the southern domain close to the MML and its basement is a part of the Gobi-Altai Terrane (Badarch et al. 2002).

Research area occupied SE part of the Arts Bogd Mountains and adjacent areas on the south and east. It is eastern margin of the Gobi Altai Mountains. The areas around the Tsakhiurtyn Hondi are characterized by changeable topography and types of landscapes (hamada, bajada and Gobi pavement) shaped by dynamic erosional and deposit processes (fluvial, aeolian) and earth dynamic effects (high amplitudes earthquakes). On the satellite images, the sub-paralell drainage pattern is well visible in the mountain area and the ephemeral river and lake system has been recognized.

The oldest rocks preserved on the study area are represented by Palaeozoic (Silurian) phillites and crystalline limestones (Khanankharsny formation, Togtokh et al. 1985). Mesozoic sequence is built by Lower Cretaceous andesite-basalts (116.6-120.3 Ma, Scheldrick et al. 1998), clastic sedimentary rocks and limestones of the Malnai formation and Khokshir fms and the Upper Cretaceous clastic sediments with gypsum and marbles horizons of the Bombokhol and Baruungoyot Formation (Togtokh et al. 1985). Locally, the lava flows cut through veins of brown-red siliceous rocks – jaspers (Fig. 2A). Lavas and sedimentary rocks also cut through much younger veins of white quartz. Interesting geological profiles were studied in the Tsakhiurtyn Hondi area. The bedrock of the mesas is built by the clays and limestones with cherts and covered by flint pavement; Fig. 2B). Preliminary petrographic studies indicate that these sediments were formed in shallow water reservoirs (subaerial/aerial) as a result of chemical precipitation. Cherts, on the other hand, were formed in several stages of silification.

Upper part of the geological profile of the study

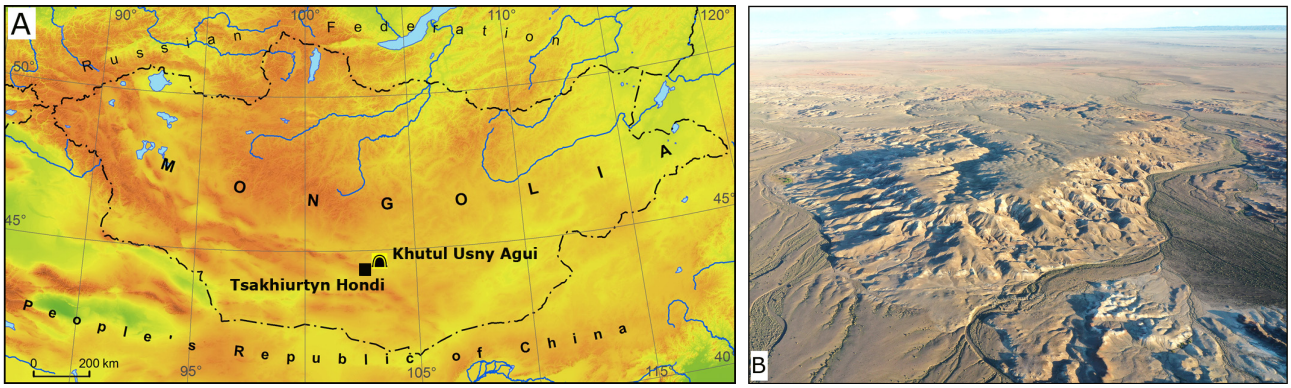

Figure 1. Location of Tsakhiurtyn Hundi and Khutul Usny cave (A) in the southern edges of the Arts Bogdyn Nuruu massif (B); Tsakhiurtyn Hundi mesa-like plateau (figure by the authors).

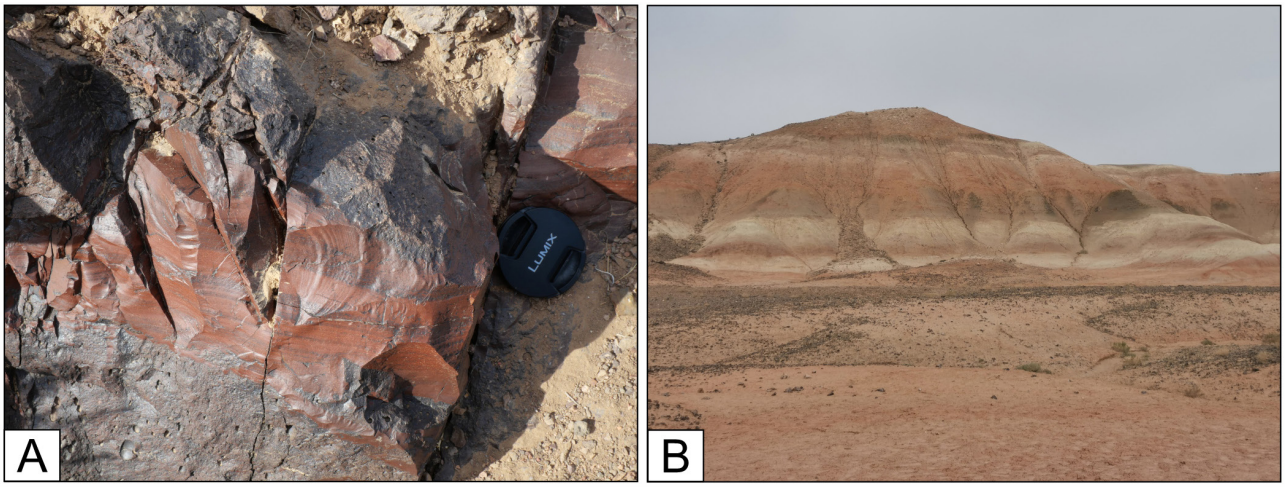

Fig. 2. Brown-red jasper vein cutting the Lower Cretaceous volcanics rocks of the Malnai Fm (A) and view on the sedimentary rocks profile of the Khokhshir Fm in the Flint Valley (B).) (Photo A: A. Gałaś, B: R. Sikora).

area is represented by alluvial, deluvial, proluvial, lacustrine and aeolian Quaternary sediments (Togtokh et al. 1985). The variable lithological profiles of Quaternary deposits of the study area highlighted by alluvial and lacustrine deposits has been confirmed by detailed analyses of sediments obtained as a result of hand drilling. Preliminary results of analyses of lake areas suggest the high changeable of dynamic of sedimentation from the Pleistocene time – from high energy regime (gravels and sands) to low energy deposition (clays). The oldest lacustrine sediments has been dated by OSL method as ca. 140 000 BP. On the other hand, in some paleolakes, sedimentation conditions were stable and studies profiles are dominated by clays. High concentrate of Fe (Fe-rich red clays) and carbonate and evaporate horizons with results of palynological analyses (pollen test) confirmed strongly arid climate in the study area in the past, which is related to the Arid Central Asia (ACA) condition.

The profiles in the Tsakhiurtyn Hondi contains several important tectonic structures: compressional (reverse faults) and extensional (normal faults). These structures documented that the study area were

Figure 3. Area under investigations. FV – Tsakhiurtyn Hondi (Flint Valley), Paleolakes: 1 - Talingaryn Shal; 2 – Chavgantsyn Shal; 3 - Zhun Khuree; 4 - Luulityn Toirom; 5 - Baruun Khuree. Two symbols indicating caves - FV 8 and FV 123.

Figure 4. Selected paleolakes (A: Talingaryn Shal; B: Zuun Khuree); (figure by the authors).

tectonically active in the past and in present time is prone to earthquakes. Probably the earthquakes had influence for preserve of caves in the Arts Bogd mountains. Detailed analysis of mineral and sedimentary composition of cave deposits shows changeable of cave environment after collapse of cave ceiling in result of ancient earthquake. Break of the rock massif is also documented by slope deposits related to the rockfalls and development of cracks along joints surfaces.

Prehistoric settlement around paleolakes in the Gobi desert

Several paleolakes registered south of Tsakhiurtyn Hundi with traces of human activities were selected for archaeological survey and paleoenvironmental research (Figure 3, 4). Archaeological evidence supports the presence of both Pleistocene hunter-gatherers using Levallois core reduction methods and early Holocene societies using micro-blade production with microliths. The dominant raw material here is flint, found in Tsakhiurtyn Hondi, although jasper, chalcedony and quartz are also common. Remains of prehistoric settlements have been recorded in the vicinity of each of them, with the main site cluster located around the shoreline of the largest paleolake - Talingaryn Shal (Lake I). So far only one site - FV 118 was excavated there in the limited scale. It is characterized by inventory made on patinated greyish flint, which closely corresponds to the series of lightly

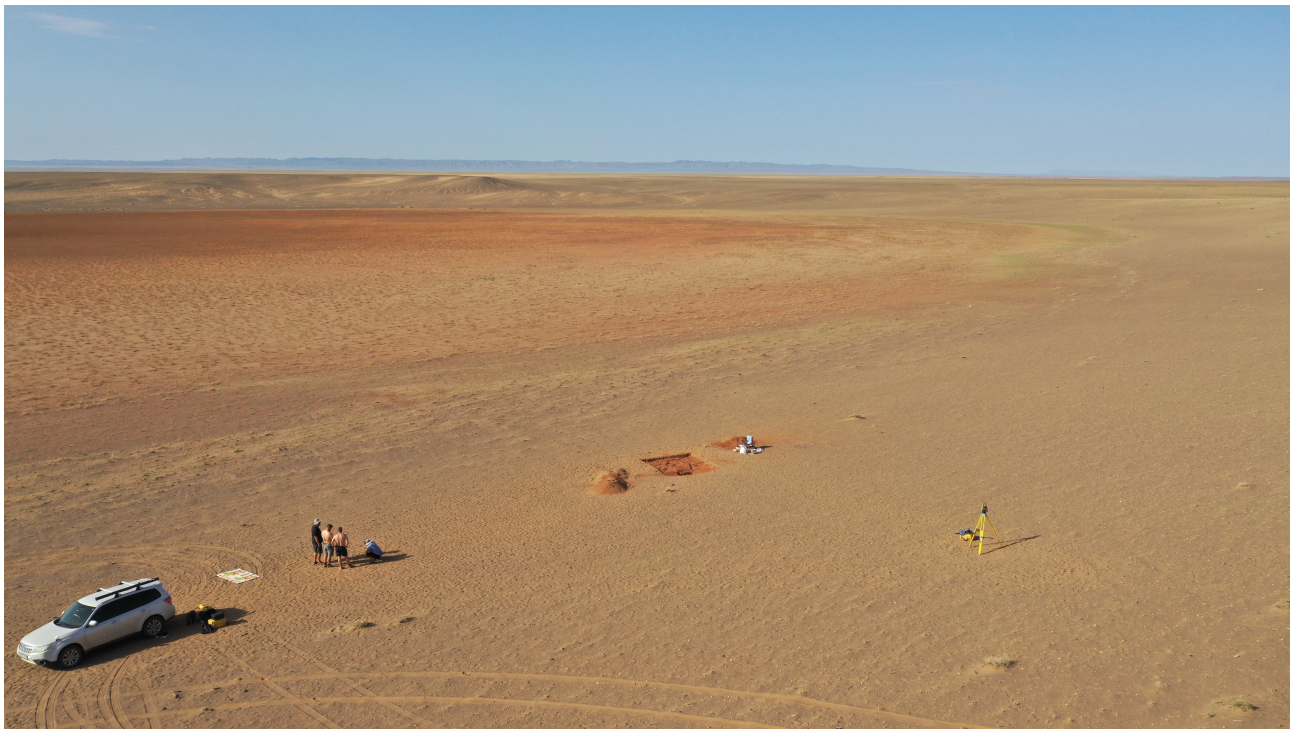

Fig. 5. View of paleolake Zhun Khuree (Lake III) and site FV 39 during exploration (Photo M. Szmit).

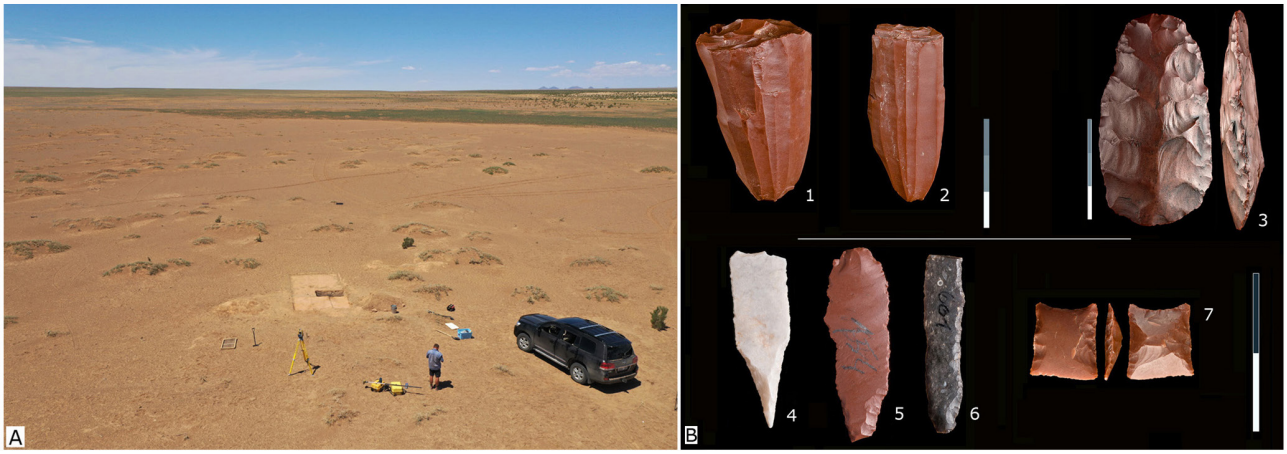

Figure 6. Site FV92 (A), artefact's selection from FV92 (B) (figure by the authors).

abraded artefacts from Tsakhiurtyn Hondi affiliated to the initial stages of the Upper Palaeolithic.

On the shore of the lake called Zhun Khuree (Lake III), on a terrace slightly sloping towards the south, site FV 39 was investigated (Figure 5). In the trench with an area of 12 m^2, archaeological material was present on the surface and in the layer transitional, lying above a strongly consolidated rock. No traces of permanent objects were found, but bioturbations were clearly visible on the bed rock surface. Despite the observed strong deflation and mixing of historic material, the homogeneous, "productive" character of the site was clearly visible. A preliminary analysis of 6,000 artefacts showed a preference for processing chalcedony and quartz, with a much smaller share of jasper. The assemblage was dominated by debitage, both flake and blade, with a very high percentage of technical forms and a small number of cores and tools. Among the latter, there were both simple retouched forms as well as single endscrapers and perforators. Special finds at this site include several fragments of pottery (scraped), individual fragments of animal bones and ostrich egg shells.

Site FV92 is located on the SE bank of the lake Luulityn Toirom (Lake IV). Excavations were carried out at the site in 2021, and the trench, which covers 18 square meters, was opened in the places of a large cluster of artefacts visible on the surface. Lithic assemblage counts 2726 objects buried only within the top stratigraphical unit of aeolian sediment. No remains of hearts were discovered in the trench (Figure 6). Moreover, one small size bead made from ostrich eggshell was discovered here. In the case of analysis of the raw material in the lithic assemblage, the most numerous artefacts are made of jasper (51%), less numerous represented are chalcedony (46%) and flint (3%), and only individual artefacts were made of opal and quartzite.

Techno-typological studies of lithic assemblage showed the usage of bladelet prismatic core technology based on the pressure flaking technique. Most of the cores were discarded in the residual form at the last stage of exploration, and only one bears scars from the initial series of detachment bladelets. Rejuvenation of striking platforms was made with a series of centripetal or perpendicular detachments of small flakes. The flaking surface of cores bears regular negatives of bladelets with faintly outlined traces of percussion bulbs. Thirty-three tools were found at the site, including domestic tools (endscrapers, perforators, simple retouched flakes and bladelets) and implements of hunting weapons – truncations and trapezes made on bladelets (Figure 6:B). One bifacial tool adze-like was also excavated (Figure 6B:3).

The subsequent area of excavation was the northern shore of the lake Baruun Khuree (Lake V). Research work was carried out at three sites, differing in relative height and distance from the paleolake basin. The northernmost and highest site was FV 133, which was the isolated remains of a small camp. Several fragments of stone inventory was collected from the surface, consisting mainly of small flakes, chips and chalcedony chunks. During the exploration of the trench (with an area of approximately 10 m^2) including the hills visible on the surface, the remains of four hearths (approximately 20 cm in diameter and up to 10 cm thick), some of which had stone surrounds, were discovered. A regular blade was found in the filling of one of the fires.

Site FV 134, located slightly further to the SE, had a similar character, where several isolated concentrations of artefacts were recorded on the surface of a flat terrace, of which two were selected for research. Small trenches with an area of 4 m^2 each were created. In one of the studied clusters (C), the artefacts remained only on the surface. Several dozen artifacts made of chalcedony, quartz and red jasper were recorded. Bladelet debitage was the most represented. In addition, three distinctive cores for bladelets, reduced using the pressure technique and only two less characteristic

tools were found. Several dozen specimens of debitage (both blades and flakes) made of chalcedony and red jasper were also collected from the surface of the second cluster. During the exploration, the remains of six hearths were observed (up to 50 cm in diameter and up to 20 cm thick), the fillings of which were heavily saturated with charcoal and ash. Numerous burnt stone artifacts were found in the largest hearth.

The southernmost site was FV 139, located on a flat terrace resulting from the retreat of the paleolake shoreline. Numerous isolated clusters of stone material were recorded here, concentrating around fires, taking the form of small mounds on the surface. Excavations examined three such concentrations, mainly based on the artefacts observed on the surface, including: ornamented ostrich egg shell pendant (trench A) and numerous ornamented pottery from clusters B and C on the surface. Within cluster 139A, in a trench with an area of 12 m^2, the remains of a large hearth (over 1 m in diameter) were uncovered and its cleaning zones were observed. About 3,000 artefacts were collected here, mainly from chalcedony, quartz and jasper. The cores (single and opposite platform with an all-round flaking surface) and debitage indicate that the main purpose of processing was the production of blades using the pressure technique (Fig. 7D). The tools included numerous endscrapers and burins, denticulated tools and blades with flat edge retouching also on the underside. Noteworthy is the significant share of characteristic "inserts" with square proportions with flat surface retouching on the upper side, probably used as arrowheads. Unique artefacts include the above-mentioned pendant and beads made of ostrich egg shells (Fig. 7A).

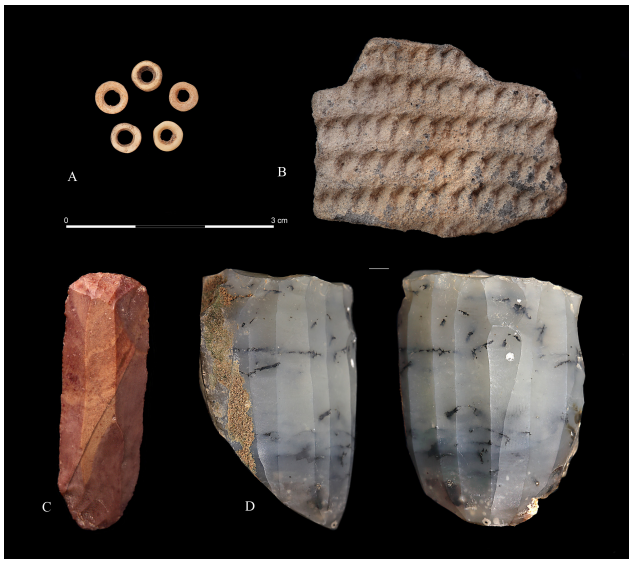

*Fig. 7. Paleo*lake Baruun Khuree (Lake V). *Artefacts from site 139A: A – ostrich eggshell beads; D – microblade chalcedony core. Artefacts from site 139B: B – fragment of decorated pottery; C – jasper endscraper (Photo M. Jórdeczka).*

In trench 139B (9m^2), the remains of a large hearth (H1) and fragments of two others located at its southern border were observed (Figure 8). In the floor of H1, 16 depressions of various diameters and basin-shaped cross-sections were discovered, which are probably the remains of "potholes". The hearth was heavily filled with charcoals and ash, there were many decorated pottery (Figure 7B) and flint artefacts (about 5,000 artefacts – Figure 7C), but also beads made from ostrich egg shells. The preliminary analysis showed the homogeneity of the assemblage and at the same time a strong similarity, both in terms of raw materials and technological and techno-typological aspects, to the material from trench 139A; only the frequency of endscrapers was greater and the share of rectangular "inserts" was smaller.

Cluster 139C had a similar character, where the remains of a large bonfire were also recorded, as well as a small pit located in its immediate vicinity (probably a deposit) filled with artefacts, mainly debitage, but also tools and fragments of pottery. In terms of raw materials, technology and typology, the inventory of approximately 1,600 artefacts collected from an area of 4 m^2 refers to the previously mentioned concentrations 139A and 139 B. Only a smaller frequency of isolated forms, both tools and cores, is noticeable. In all the mentioned concentrations, the presence of animal bone fragments was also recorded, and numerous macroremains were observed in the fillings of the hearths.

Fig. 8. Paleolake V, Site 139B. A view of two hearths during exploration (Photo P. Muntowski).

Figure 9. Pleistocene finds from Gobi-Altai area. Bifacial foliate (1), Moustierian point (2), flake from a centripetal Levallois core (3), (Photo A. Klyuev).

Figure 10. Khutul Usny valley (A) with caves location (B) and cave FV8 (C), (figure by the authors).

Khutul Usny cave with Pleistocene occupational sequence

Significant discoveries were made during the survey within the mountainous area of the Arts Bogdyn massif surrounding Tsakhiurtyn Hundi from the north. Dozens of open-air Palaeolithic sites were found within the valleys, bearing not only flint but also other raw materials, like greenish quartzite (Figure 9:1), reddish jasper (Figure 9:2) or blackish flint (Figure 9:3). Three caves in Cretaceous lavas were discovered, unmarked on previous maps (Masojć at al. 2017). Test trenching of FV8 site, the biggest cave, reached the depth of 3, meters (Figure 10). Six archaeological horizons have been documented so far (layers II-VII). Each documented horizon contains lithic artefacts and animal remains, and few bone beads have been discovered within layer VII. The C14 dating results for layer IV (28952 – 27854 cal BC with 95.4% probability - Poz-161672) indicate that the four oldest horizons are connected with the Upper Palaeolithic. This is also confirmed by the presence of two large blades in layers VI and VII. However, the techno-typological features of the remaining lithics discovered in the cave are non-diagnostic and include simple debitage, cores, single endscarpers, and retouched flakes. Among animal bones (i.e., Mongolian gazelle, argali, camel, wild ass, and animals from families: Cervidae, Canidae), there are 36 cracked open diaphysis and bone pointy flakes showing X-shaped fracture planes from small oval-shaped impact marks on the so-punctured, opposing edges of the bone. The closest analogy to this newly discovered cave site is Tsagaan Agui Cave, located west of the Arts Bogdyn Nuruu (Khatsenovich et al. 2022).

Conclusions

Preliminary results of the project confirm that the surrounding of the flint outcrops, known as a Tsakhiurtyn Hundi, was densely inhabited. Two stone raw materials played a key role here during the Pleistocene and Holocene settlement in this area. In addition to Tsakhiurtyn Hundi flint, commonly used especially in the lowland, around paleolakes areas, yellowish and reddish jasper was commonly used. Its outcrops were discovered in Arts Bogdyn massif, north from Tsakhiurtyn Hundi. It is common on mountainous sites, including the cave but also present in the lowland, e.g. the early Holocene jasper microlithic inventory of the site FV92.

In the paleolakes area, located south of Tsakhiurtyn Hundi, there are nearly a hundred of Pleistocene and early Holocene settlement remains. The lakes themselves bear deep sediments confirming more than 100ky preferable conditions for human settlement. The intensive exploration of the mountainous territory is confirmed by more than fifty surface lithic

clusters. Khutul Usny cave shows the sequence with the stratigraphy reached up to 3.6 m deep so far. Chronology established for the layer IV confirms human sheltering in the cave from the extreme climatic conditions around the beginning of last glacial maximum (LGM). Those two environments, the lakeland in the lowlands and the mountainous valleys including the caves, could possibly be used in the different parts of the seasons and periods. Lakeland area was surely intensively exploited during the early Holocene while the mountainous area bears more traces of human activities from the Pleistocene. The palaeogeographical results, chronology determinations and archaeozoological analyses will help expand on those issues.

Funding statement

Project funded by the National Science Centre, Poland (NCN2019/33/B/HS3/01113). The research is supported by the Institute of Archaeology, Mongolian Academy of Science and Mongolian National University of Education. Project's web site: www.archeo.mongolia.uwr.edu.pl

Acknowledgements

We thank the Government of Mongolia for authorising our work (Permit 22-13).

REFERENCES

Badarch G., Cunningham D. W., Windley F.B. 2002. A new terrane subdivision for Mongolia: implications for the Phanerozoic crustal growth of Central Asia. J. Asia Sc., 21: 87-110.

Derevianko, A.P., Krivoshapkin, A.I., Larichev, V.E., Petrin, V.T. 2001. The Paleolithic of Eastern Foothills of Arts-Bogdo (Southern Gobi). Institute of Archaeology and Ethnography SBRAS. Novosibirsk.

Derevianko, A.P., Zenin, A.N., Olsen, J.W., Petrin, V.T., Tsevendorj, D. 2002. The Stone Age of Mongolia: Paleolithic assemblages from Flint Valley (Gobi-Altai). Institute of Archaeology and Ethnography SBRAS. Novosibirsk.

Gunchinsuren, B. 2017. The development of prehistoric archaeology in Mongolia. In: Habu, J., Lape, P.V., Olsen, J.W. (Eds.), Handbook of Southeast Asian Archaeology. Springer, 293–308.

Khatsenovich, A., Tserendagva, Y., Bazargur, D., Marchenko, D., Rybin, E., Klementiev, A., Shelepaev, R.A., Gunchinsuren, B., Olsen, J.W. Derevianko, A. 2022. Shelter in an extreme environment: The Pleistocene occupation of Tsagaan Agui Cave in the Gobi Desert. Antiquity, *96*(388), 989-997. doi:10.15184/aqy.2022.51

Masojć, M., Szykulski, J., Gunchinsuren, B., Odsuren, D., Szmit, M., Gankhuyag, O., Namjilmaa, E. 2017. Around the Flint Valley. Surveying the Stone Age of the borderland area between the Altai Mountains and the Gobi Desert in Mongolia, Eurasian Prehist. 14, 3–22.

Masojć, M., Szykulski, J., Gunchinsuren, B., Odsuren, D., Winiarska–Kabacińska, M., Szmit, M. 2019, A Levalloisian jasper cache from the Arts Bogdyn Nuruu massif in the Gobi Altai Mountains, southern Mongolia, Comptes Rendus Palevol 18: 479-491. doi.org/10.1016/j.crpv.2019.02.003

Scheldrick, T.T., Barry, T.L., Van Hinsbergen, D.J.J., Kempton, P.D. 2018. Constraining lithospheric removal and asthenospheric input to melts in Central Asia: A geochemical study of Triassic to Cretaceous magmatic rocks in the Gobi Altai (Mongolia). Lithos, 296: 297-315.

Togtokh D., Lhundeb S., Baatar C., Bomboroo G., Tooruul N., Burentogs Z., Bam-Olzin D., Tomortsogot C. 1985 – Bajan Uul, Geological Map L-48-XXXI, scale: 1:200 000. Mongolian Ministry of Geology.

Zwyns, N., Gladyshev, N., Tabarev, A., Gunchinsuren, B. 2014. Mongolia: Palaeolithic (in:) C. Smith (ed.) Encyclopaedia of Global Archaeology, New York: Springer, 5025-5032.