Bu-Ali Sina University
Iranian Scientific Archaeological Association
PAZHOHESH-HA-YE BASTANSHENASI IRAN
P. ISSN: 2345-5225 & E. ISSN: 2345-5500
Homepage: https://nbsh.basu.ac.ir/
Vol. 14, No. 41, Summer 2024

An Introduction to the Newly found Paleolithic Landscape of Boulan in the North of the Eyvanekey Alluvial Fan with a focus on Lithic Techno-Typology

Seyyed Milad Hashemi[1], Asqar Nateqi[2], Aliyeh Abdollahi[3], Mir Ahmad Zavvar Mousavi[4]

https://dx.doi.org/10.22084/NB.2024.28685.2642
Received: 2023/12/18; Revised: 2024/04/27; Accepted: 2024/05/13
Type of Article: **Research**
Pp: 7-39

Abstract

The findings gathered from the Northern Iranian Central Desert (NICD) over the past two decades suggest the significance of the region during the Pleistocene, indicating that different and fluctuating environmental conditions governed the region in the past, contrary to the hot and dry conditions of today. From an archaeological perspective, this means that human populations might have been able to live here during milder times. Based on this assumption and the escalating number of Paleolithic localities, the hypothesis of considering the NICD as a significant Pleistocene dispersal corridor was put forward. However, the available information regarding the Pleistocene human populations in the region was limited only to its eastern and western parts. Up until recently, the Pleistocene "plain dwellers" in the more central parts of the NICD (corresponding to the modern-day Alborz, Tehran, and western Semnan provinces) were not known to us. The picture took a turn when Showr-e Qazi, a paleolithic surface lithic scatter, located about 18km southwest of Eyvanekey, came to light. Following this discovery, the authors embarked on a comprehensive investigation of Eyvanekey. Doing so, a systematic intensive pedestrian field survey was conducted in the vicinity of Eyvanekey County to tackle questions regarding the role of the central parts of the NICD for the dispersal of Pleistocene human populations and the degree of connectivity and relatedness of the landscapes, and resultantly, strengthening or weakening the mentioned hypothesis. As a result, extensive Paleolithic surface scatters were recorded using a combined method of proportionate stratified random and adaptive sampling. The lithic assemblage from Boulan, one of these scatters, has been examined here using techno-typological approach. The preliminary results suggest Middle and Upper Paleolithic affinities. In addition, in general terms, the lithic tradition in Boulan is geared toward the expedient and opportunistic end of the spectrum. Lastly, the discovery of extensive Paleolithic localities in the central parts of the NICD provides additional support for the hypothesis of a Northern dispersal corridor.

Keywords: The Northern Central Desert of Iran, Pleistocene Dispersal Corridor, Eyvanekey area, Middle and Upper Paleolithic Periods, Lithic Artifacts.

1. Assistant Professor, Department of Archaeology, Tarbiat Modares University, Tehran, Iran (Corresponding Author).
Email: m.hashemisarvandi@modares.ac.ir
2. M. A. in Archaeology, Department of Archaeology, Faculty of Literature and Humanities, Tehran Central Branch, Islamic Azad University, Tehran, Iran
3. M. A. in Archaeology, Department of Archaeology, Faculty of Literature and Humanities, Tehran Central Branch, Islamic Azad University, Tehran, Iran
4. M. A. in Archaeology, Department of Archaeology, Marlik Institute of Higher Education, Nowshahr, Iran

Citations: Hashemi, S. M., Nateghi, A., Abdollahi, A. & Zavvar Mousavi Niaki, M. A., (2024). "An Introduction to the Newly found Paleolithic Landscape of Boulan in the North of the Eyvanekey Alluvial Fan with a focus on Lithic Techno-Typology". *Pazhoheshha-ye Bastan Shenasi Iran,* 14(41): 7-39. doi: 10.22084/nb.2024.28685.2642
Homepage of this Article: https://nbsh.basu.ac.ir/article_5724.html?lang=en

PAZHOHESH-HA-YE BASTANSHENASI IRAN
Archaeological Researches of Iran
Journal of Department of Archaeology, Faculty of Art and Architecture, Bu-Ali Sina University, Hamadan, Iran.

Introduction

The proximity of the Alborz Mountains to the north and the Central Desert to the south has created an elongated east-west belt on the northern strip of the Iranian Central Desert (NICD). During the Pleistocene, this strip of land was a habitat for various hominin populations and most probably one of the dispersal corridors linking Africa and West Asia to the Central and Inner Asia (Shoaee et al., 2021, 2023; Vahdati Nasab et al., 2013, 2019; Vahdati Nasab & Hashemi 2016). The width of this corridor was variable and depended on climatic fluctuation and its impacts, specifically, the expansion and retreat of the Central Desert (Hashemi et al., 2018; Vahdati Nasab et al., 2013). The strip of NICD (as a subset of the Northern Iranian Central Plateau), is delimited from the pediments of south Alborz at approximately 50.50° longitude near Hashtgerd urban area, at the border of Alborz and Qazvin provinces. Moving eastward, the NICD stretches to around 56° longitude in the eastern part of the Khar Turan National Park, situated between the borders of modern-day Semnan and North Khorasan provinces. With a length of roughly 530 km, the width of this strip varies in different locations, ranging from 25 to nearly 40 km.

The NICD and the surrounding areas have been home to many Paleolithic localities, including Qaleh Kurd Cave in Avaj, Qazvin (Soleymani & Alibeigi 2018; Vahdati Nasab et al., 2024), Tepe Khaleseh in Khorramdarreh, Zanjan (Alibeigi & Khosravi 2009), Sepid Dasht surface scatter in Boein Zahra, Qazvin (Vahdati Nasab et al., 2009), Nargeh surface scatter in Takestan, Qazvin (Biglari 2003b), Zaviyeh surface scatter in Parandak, Markazi (Heydari-Guran et al., 2014), cave and rockshelter complex of Sorheh in Savojbolagh, Alborz (Hariryan et al., 2021), Sefid Ab surface scatter in Kashan (Biglari 2003a), Showr-e Qazi and Sar Darreh surface scatters in the southwest of Eyvaneky (Nateqi et al., 2020), the complex of surface scatters Qaleh Qousheh, Holabad, Niasar, and Arisman in Kashan (Conard et al., 2009; Heydari-Guran & Ghasidian, 2011), Moghanak and Otchounak surface scatters in Damavand (Berillon et al., 2007), the open-air site of Soufi Abad in Sorkheh, Semnan (Vahdati Nasab & Feiz 2014), Anzo Cave in Mehdi Shahr, Semnan (Jayez et al., 2019), the open-air sites of Mirak (Vahdati Nasab et al., 2019) and Delazian in Semnan (Vahdati Nasab & Clark 2014), and finally, Chah-e Jam surface scatter near Damghan (Vahdati Nasab & Hashemi 2016). Out of the various sites mentioned, only Mirak and Qaleh Kurd Cave have been subject to archaeological excavations, whereas the rest have been comparatively dated based on lithic techno-typology. In addition, in more distant areas such as Khorasan in the east, several surface lithic scatters of Paleolithic affinities have recently been reported (Fig. 1; see e.g., Sadraei et al., 2022). It is important to highlight that within the sites listed, Zaviyeh, Sorheh, Moghanak-Othoucnak, Showr-e Qazi, Sar Darreh, Anzo, Mirak, Delazian, Soufi Abad, and Chah-e Jam are situated precisely within the NICD, whereas the remaining sites are situated in the surrounding regions (Fig. 1).

In the years to come, research studies can contribute to the examination of diverse hypotheses regarding the impact of the NICD on the distribution and dispersal of hominin populations. For instance, based on the findings at Mirak Open-air site, it is suggested that there were intermittent occurrences of hominin populations in the NICD throughout the Late Pleistocene (Hashemi et al., 2018; Vahdati Nasab et al., 2019). Insufficient Pleistocene cultural findings with absolute chronology in the NICD hinders the ability to confidently speculate on a dispersal corridor. The consistent utilization of a corridor is contingent upon the relative interconnectedness of its habitats. In simpler terms, any disruptions caused by climatic, environmental, or topographical changes should not hinder this uninterrupted continuity (see Dennell 2020). One way to emphasize landscape continuity in archaeology is to find archaeological evidence that is comparable or roughly contemporaneous in almost all parts of this possible corridor. The Paleolithic localities mentioned above have been found in the eastern and western parts of the NICD while the official reports of more central parts (i.e., the modern provinces of Alborz, Tehran, and the western part of Semnan) are meager. Hence, the evidence is fragmented for a dispersal corridor-to-be. This particular area is referred to as the "central area" of the NICD below (Fig. 1). Whilst the Sorheh Rockshelter and Moghanak-Otchounak are situated within the central parts of the NICD, they pertain to the mountainous and undulating landscapes of the north. It is thus essential to recognize Paleolithic localities in the more southern pediplains which are the major and dominant landforms that characterize the NICD. As a result of this shortage of information from the pediplains, the area corresponding to Eyvanekey County in the central part of the NICD and the western Semnan Province was chosen for field investigation with a hope that conducting such surveys could aid in piecing together the enigma of the Paleolithic Period in the NICD. It should be noted that the scattered findings of Showr-e Qazi and some unofficial reports of sporadic lithic findings near the village of Chandab, both within the Eyvanakey area, prompted the corresponding author to design a research plan for field investigation. Besides the reconnaissance findings, the Eyvanekey area was chosen because extensive human constructions in the plains of Tehran and Karaj hinder effective pedestrian field surveys. Thus, Eyvanekey's proximity to the Tehran Plain may mean that the results could be extended to the latter area.

Based on what has been mentioned, the objectives of this investigation were trying to piece together the jigsaw of the Paleolithic Period in the NICD, determining relative chronology, finding in-situ Paleolithic deposits, examining toolmaking traditions, population interactions, and as such. Furthermore, the results could be utilized as a basis for gauging the area's potential for in-depth research in the years ahead. As a result of conducting the field survey, several Paleolithic localities were recovered. The finds of only one of them, Boulan, is analyzed here within the framework of techno-typology. The others including Yousuf Abad, Chandab, Sangab, Hossein Abad-e Korus, and Korak. The dimensions of each locality range from two kilometers in Korak to eight kilometers in Sangab (Fig. 1). A separate occasion is needed to delve into the discussion of the other surface lithic scatters in Eyvanekey.

Research Questions: The research questions formulated for the fieldwork revolved around the following topics: What is the significance of the central area of the NICD in terms of hominin presence during the Pleistocene? How have the potential sites been distributed, and what does this distribution suggest about the mobility of hominin populations? What is the estimated chronological range of the potential findings? It is important to highlight that these inquiries were crafted prior to the field survey. As a result, they go beyond the scope of this paper which focuses solely on the findings from Boulan. Hence, it is not possible to address these questions adequately in this context. The techno-typological analysis of the lithics from Boulan marks the initial phase in disseminating research related to the Paleolithic Period in Eyvanekey and the central parts of the NICD.

Research Methods: The survey was carried out in 2021 in an area of 891km2, with 65.2km2 being systematically explored. By conducting a comprehensive reconnaissance survey, the area was categorized into four zones in terms of the possibility of yielding lithics based on several factors (judgemental stratification; Fig. 1). These factors included the probability of paleosurface visibility, topography, slopes, estimation of lithic artifact density, identification of deflated areas through satellite imagery, assessment of landscape accessibility, and intensity of human constructions. Zone 1 exhibits the highest potential, whereas zone 4 is characterized by intense human construction, leading to its disregard. The potential of zone 1 resulted in a greater number of grids being selected from that area, while the least were chosen from zone 3 (disproportional stratified sampling; Banning 2002: 116). Within each grid, the sampling was conducted randomly. Furthermore, in cases where a substantial number of lithics were documented in each transect, say 15 artifacts in half square kilometers, its neighboring units were surveyed to identify any potential clusters (Adaptive cluster sampling; e.g., Orton 2000: 34). This combined method allows for the identification of clusters of stone artifacts in open landscapes. It is important to note that zone one encompasses dissected hilly plains located to the south of the mountains and the north of the puffy clay flats in the south (Fig. 1).

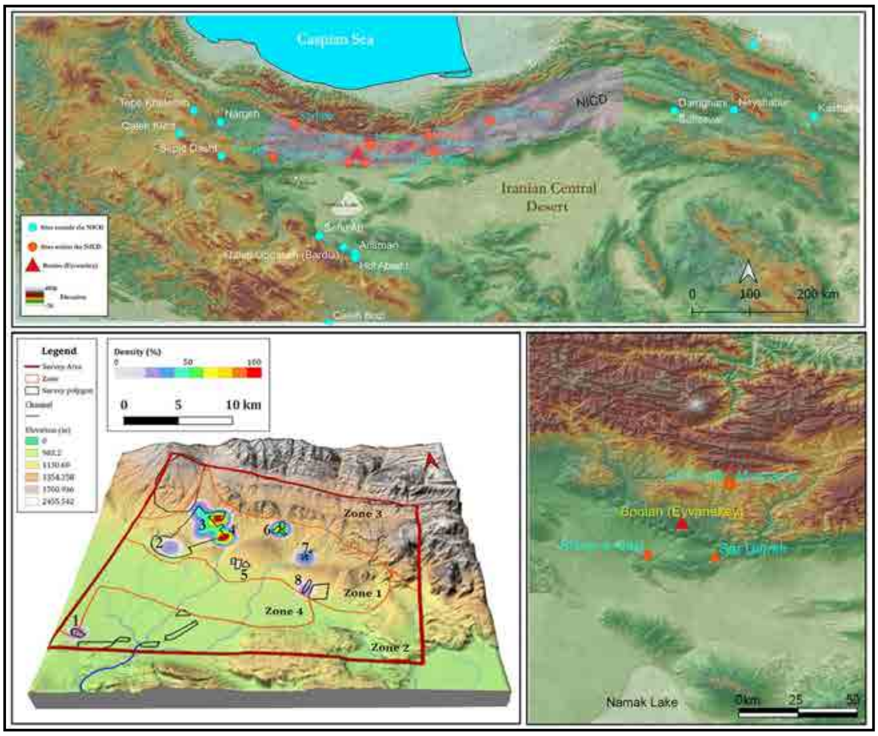


Fig. 1: Above. The location of the NICD, Eyvanekey, and the main Paleolithic sites in the NICD and around the Iranian Central Plateau; Below left. the outlines of surveyed areas (black polygons) within the judgmental zoning system (orange lines) and the Kernel heatmaps based on lithic densities. 1. Yousef Abad; 2. Chandab; 3. Sangab; 4. Hossein Abad-e Korus; 5 and 8. Sporadic scatters in the north of the city of Eyvanekey; 6. Boulan; 7. Korak; Below right. A close-up view illustrating Eyvanekey, the neighboring Paleolithic localities, and Namak Lake (the source of raw DEMs: NASA Shuttle Radar Topography Mission, SRTM (2013). Shuttle Radar Topography Mission (SRTM) Global. Distributed by ©OpenTopography. Doi: https://doi.org/10.5069/G9445JDF. Accessed: 2024-01-29; 3D map in the below left was drawn by: ©Mehdi Alirezazadeh). ▶

Physiography

Boulan exhibits an extensive surface scatter of lithic artifacts, situated on the old and elevated Quaternary terrace of the same name. Positioned in the pediment zone (as part of the foothill or piedmont zone), it is situated approximately 7 km to the north of Eyvanekey City, 5 km to the west of Kilan Road, and 11 km to the south of Boulan Village. With a triangular shape (Fig. 3: 2) and an area about 2 km2, the maximum extent of lithic scatters is 1.7*1.6 km. The geometric center of the locality is at an elevation of about 1280 m asl (Fig. 3: 3) with elevations ranging from 1240 to 1320 m asl. Here, the stone artifacts are recovered on deflated surfaces known as desert pavements (Fig. 2: 1, 3). This Quaternary alluvial terrace covers the upper red formation of the Miocene (units M3C and Unit M_3b^SC; Geological Survey & Mineral Exploration of Iran, Map no. 6460; Fig. 3: 1). The general appearance of Boulan is characterized by arid, mountainous, and undulating terrain, with shallow valleys, elongated hills, and slopes ranging from zero to almost fifty degrees. Vegetation cover is sparse, consisting mainly of small annual halophyte, xerophyte, and psammophyte plants (Fig. 2: 2). Numerous braided channels resulting from surface runoff have carved the surface, following the general slope in a northeast-southwest direction.

◄ **Fig. 2: 1. The view of the undulating landscape related to the Upper Red Formation from the Miocene (unit M3C) as seen from the top of the Boulan terrace; 2. Shallow and denuded valleys on the surface of the Boulan terrace; 3. Deflated desert pavement on the surface of the Boulan terrace (Authors, 2024).**

The average density of lithics is approximately 120 distinct pieces per square kilometer. In this context, "distinct" refers to artifacts that are easily visible on the ground, indicating a high level of obtrusiveness. However, it appears that the actual density of stone artifacts exceeds the calculated value. Due to various factors such as surface covering or erosion, the small size of some lithics (low obtrusiveness compared to the background matrix), and the presence of numerous natural gravels that share a similar color and appearance with the stone artifacts, it would be extremely challenging to document some of the stone artifacts. Taking these factors into account, it can be estimated that there are approximately one to two thousand lithics on the surface, with only a small portion of them being sampled. Lithics are distributed throughout the entire landscape, albeit with varying densities in different areas (see Fig. 4). Furthermore, the majority of lithics (over 90%) are found in the upper hills rather than the valleys (see Fig. 2: 3). It is worth noting that paleo-surfaces and stone artifacts are exclusively found on the deflated desert pavements. In Addition, the rugged terrain and steep slopes may have caused some stone artifacts to be displaced from their original locations during heavy rains and flash floods. Upon examining the deposits incised by waterways and other erosive factors, no Pleistocene cultural deposit was discovered; consequently, the existence of in-situ cultural deposits remains uncertain. The sparse vegetation and progressive aridification contribute to loosening top sediments that are easily eroded by wind. Deflation has played a significant role in the patchy exposure of old Pleistocene surfaces that were previously covered by more recent Holocene sediments. Lastly, the remote location of the Boulan area results in the absence of significant anthropogenic disturbance.

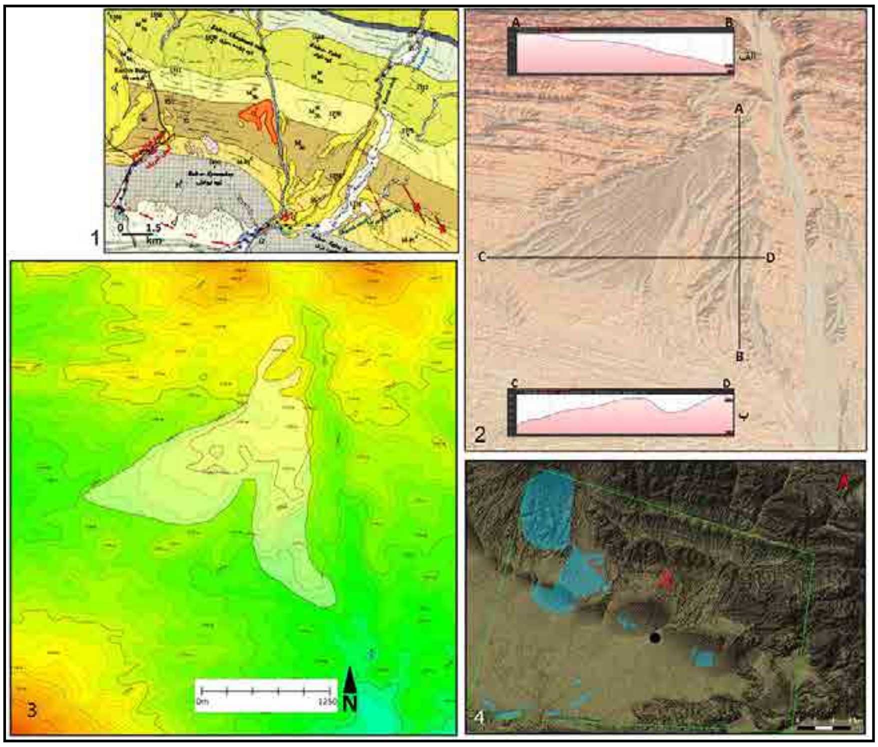
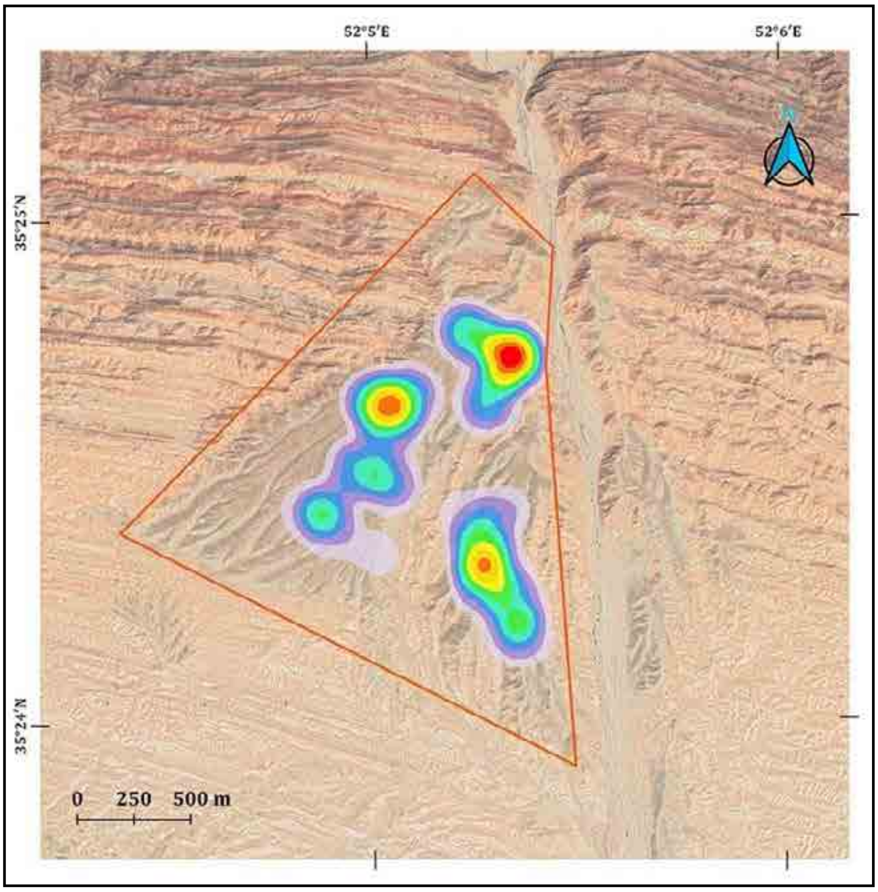


Fig. 3: 1. The position of the Boulan terrace (red polygon in the center of the image) within the major geological formations (1:100,000 geological map); 2. The satellite image of the Boulan Quaternary terrace and the terrain profile along the north-south (A-B) and east-west (C-D) directions; 3. Topographic map of Boulan; 4. The location of Boulan terrace (red area) in the north of the city of Eyvanekey (black dot) compared to the other surveyed areas shown by blue polygons (part 4 is drawn by ©Mehdi Alirezazadeh). ▶

Lithic Techno-Typology at Boulan

A total of 165 stone artifacts were sampled during the field survey. Just over 45% of these lithics are crafted from high-quality chert, while about 52% of them are made from greenish to brownish, light gray volcanic tuff. A very few of them are made of siltstone and limestone. The dimensions of these stone artifacts typically range from medium to large. For example, the average maximum length of the flakes is around 46.2 mm, with an average



◀ **Fig. 4: The colored heat map based on the Kernel density of stone artifacts with warmer colors denoting higher densities (Drawing by ©Mehdi Alirezazadeh).**

maximum width of about 39.9 mm (the coefficient of length variation (CVL): 28.9, the range of length values: 22–87 mm; the coefficient of width variation (CVW): 32.1, range of width values: 18–98 mm). The cores have an average maximum length of 55.62 mm and an average maximum width of 46.42 mm (CVL: 41.81 and length's range: 32.6–119 mm; CVW: 18.18 and width's range: 30.6–67 mm). Primary cortex is recorded only on 11% of the lithics, with most of them covering a small portion of the surface (78% of the cortical pieces show cortex coverages of up to 30%), while only three specimens, two cores, and one flake debitage possess a higher coverage of 50% or more. This suggests that decortication was effectively carried out prior to knapping and may imply a significant difference in dimensions between the procured raw materials and the ready-to-knap cores, as well as the inappropriate shapes of the primary raw materials for prompt flintknapping.

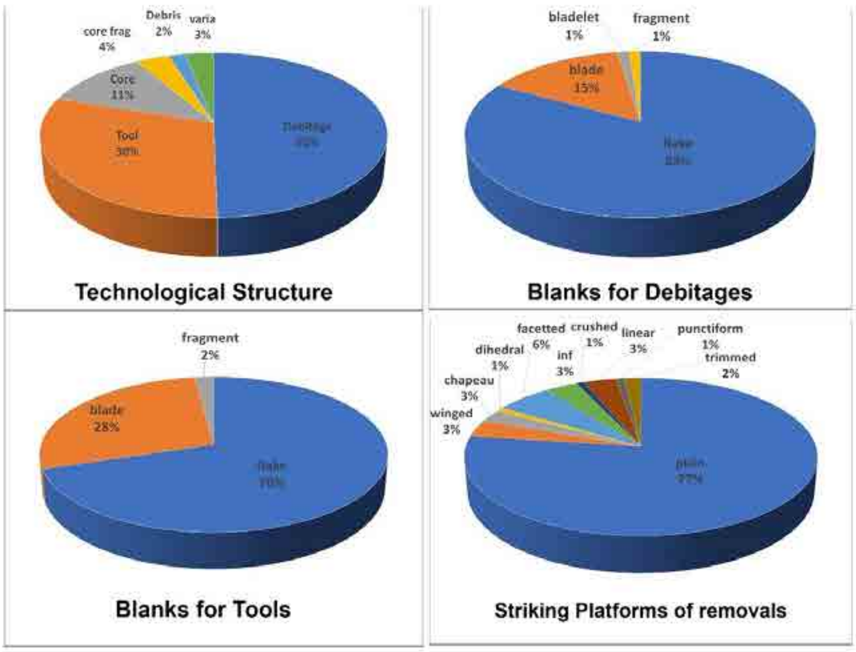
Almost all the stone artifacts have a shiny to dull coating of desert varnish in light to dark brown colors (Fig. 6–8), which seems to be the result of a combination of subsurface processes as well as exposure to the surface elements (see e.g. Glauberman & Thorson 2012). In terms of breakage, the lithic artifacts are not in a good condition, which may be related to surface exposure and taphonomic processes. Generally, 22.5% of the collection displays signs of breakage, with partial fractures making up a larger proportion at 65% compared to major breakage at 35%. The data indicates that typologically-defined retouched tools make up 54.2% of the pieces displaying partial breakage while only 15.4% of the pieces possessing significant breakage are tools. This finding suggests a potential relationship between the intensity of tool use and the occurrence of partial fractures, while major breakages are more commonly associated with physico-chemical taphonomic processes. It is important to highlight that breakage is observed solely in the removals (debitages and tools).

In terms of technological composition, slightly less than half of the lithics are categorized as unretouched debitage, while tools account for just over 30% of the assemblage. Moreover, approximately 15.2% of the lithics consist of cores and the associated pieces. The remaining percentage is divided between debrises (1.8%) and indeterminates (3%) (Fig. 5 and Table 1). Among the unretouched debitage, the majority consists of flakes, making up around 82.9% of the category. Blades, on the other hand, represent approximately 14.6% of the debitage, while the share of bladelets, if they can be accurately identified as true bladelet, is only 1.2% (Fig. 5 and Table 1). Furthermore, the prevalence of flakes is evident in the tool category, where 70% of the tools are fashioned from flakes. In contrast, 28% of the tools are made from blades, and no bladelet tools were documented (Fig. 5 and Table 1). In general, approximately 38% of the removals have been converted into typologically-defined tools, suggesting a moderate toolmaking intensity.

Table 1. General lithic techno-typological information from Boulan (Authors, 2024). ▼

Technological Structure			Debitage			Tool		
Type	No.	%	Type	No.	%	Type	No.	%
Debitage	82	49.70	**Flake**	68	82.93	**Flake**	35	70
Tool	50	30.30	**Blade**	12	14.63	**Blade**	14	28
Core	19	11.52	**Bladelet**	1	1.22	**Fragments**	1	2
Core Frag.	6	3.64	**Fragments**	1	1.22			
Debris	3	1.82						
Indeterminate	5	3.03						
Total	165	100	**Total**	82	100	**Total**	50	100

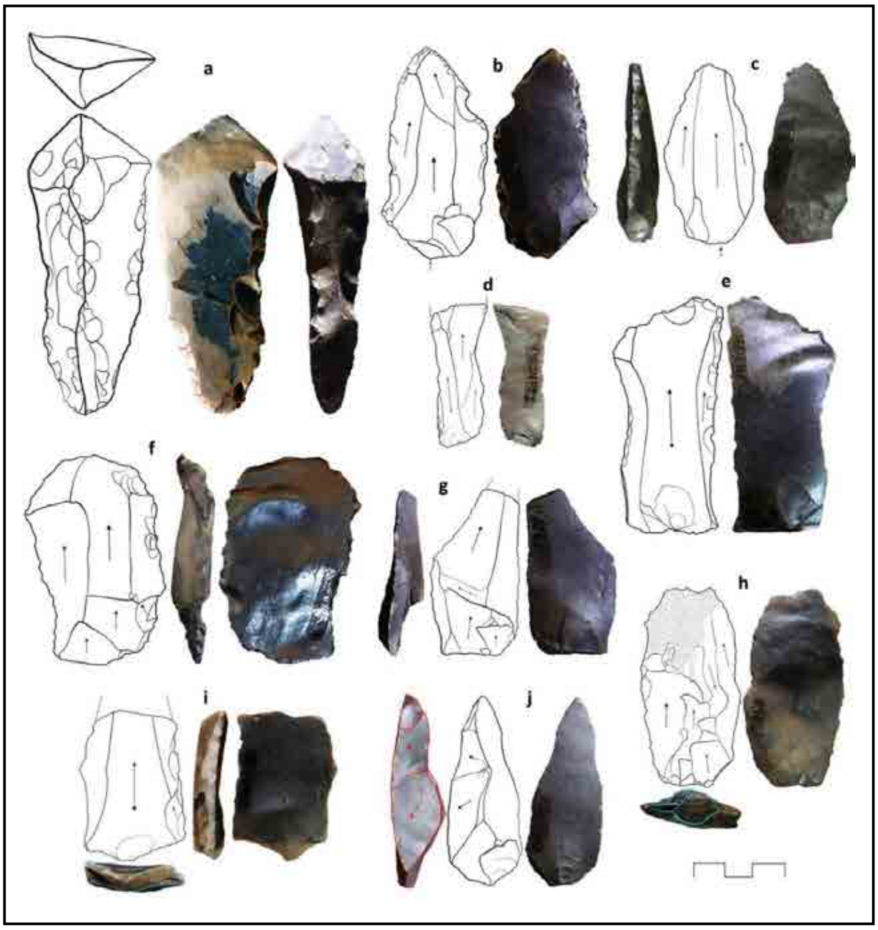
It is crucial to bear in mind that classifying some artifacts into plain unretouched "debitage" category does not automatically imply that they were not utilized as tools. Use-wear/functional studies has consistently emphasized this point since the early 1970s, cautioning researchers against conflating typologically-defined standard tools with specimens that were genuinely employed as tools (Semenov 1970). The use of crude and unretouched flakes as tools, especially in expedient and opportunistic industries have been common, as evidenced by archaeological findings (e.g., Claud et al., 2019; Fuentes et al., 2019; Knutsson et al., 2015; Marreiros et al., 2020) and ethnographic accounts (e.g., Andrefsky 2014; Hayden 1977; Shott & Sillitoe 2005). Experimental archaeology has also demonstrated the effectiveness of using unretouched flakes as tools (e.g., Clarkson et al., 2015; Jones 1980). Functional analysis is crucial in understanding the significance of unretouched flakes in Boulan. However, conducting such analysis is presently unattainable due to several reasons. Firstly, these findings are superficial and susceptible to taphonomic factors that alter or obliterate the evidence found on the edges. Secondly, a substantial number of these artifacts are coated with desert varnish, which conceals or eradicates any traces of use.



◄ **Fig. 5: The pie charts for some of the techno-typological features mentioned in the text (Authors, 2024).**

According to Table 2, the majority of tools, 58%, are crafted on flakes, with 20% made on blades. The tools discovered in Boulan showcase a diverse range but are not particularly abundant. Thus, the emphasis of toolmaking activities has predominantly been on flakes. From a typological viewpoint, the highest percentage belongs to simple side-retouched flakes and nibbled flakes (Fig. 6: a, b, f; 7: g), possibly indicating a preference for creating informal tools and potential discarding in the initial stages and hence, low reduction intensity (for the relationship between retouch intensity and reduction, see e.g., Blades 2008; Eren et al., 2005). Scrapers rank as the second most prevalent tool type, with side scrapers having a larger share compared to convergent types (Fig. 6: b, c, e; 7: c). Only one end scraper has been discovered. Denticulated and notched pieces collectively represent 8% of the tools, with only one instance of burin and one retouched Levallois point identified (Fig. 6: i). Additionally, two backed pieces are included in the tool assemblage. It is important to note that three truncated pieces are also recorded (Table 2). Moreover, ten tools were expediently produced on cores, core fragments, or non-debitage pieces, as outlined in Table 2. They are classified under categories such as cores, core fragments, or indeterminate in Table 1. One bifacial knife or keilmesser (Fig. 8: b) is also recorded, which is reminiscent of the types uncovered in later Middle Paleolithic contexts of Central or Eastern Europe, particularly within the Micoquian tradition (Weiss 2020). The scarcity of retouched points and convergent scrapers (Fig. 6: b, c, i; 7: c) is an intriguing aspect to consider. However, the sub-triangular morphologies with converging or pointed lateral edges and distal ends, regardless of whether they have retouched edges or not, make up approximately 13% of the total removals (17 pieces; Fig. 6: g, j; 7: b, f). This ratio is quite significant and suggests that perhaps the convergence of the edges alone, without the aid of retouching, was sufficient for utilizing these fragments as points (Douze et al., 2020; Timbrell et al., 2022). The basal and proximal trimming of certain triangular pieces, which may be aided for hafting purposes, provides additional support for this argument (Fig. 6: g, j; 7: b, f). Generally, the tools display an opportunistic and informal appearance; nonetheless, a few formal examples bear resemblance to the common types found in the Middle Paleolithic (Bordes 1961; Debénath & Dibble 1994; Geneste 1985) and the Zagros Mousterian tradition (e.g., Baumler & Speth 1993; Dibble 1984, 1991; Dibble & Holdaway 1993) or Middle Paleolithic in the NICD (e.g., Heydari-Guran et al., 2014; Vahdati Nasab & Hashemi 2016; Vahdati Nasab et al., 2019).

A few lithic artifacts at Boulan could be considered as core-tools, an example of which is the mentioned keilmesser (Fig. 8: b). In addition, there is another sub-symmetrical biface with 28 negative scars, some of which exhibit characteristics of retouch. The shaping of this particular piece resulted in a symmetric amygdaloid-lanceate shape, a form described by Bordes (1961). Notably, there are no soft-hammer finishing retouches visible on this artifact. With a length of around 10 cm, this specimen falls towards the lower end of the hand axe spectrum. It could be loosely categorized as a hard hammer hand axe or symmetrical core-flake.



◀ **Fig. 6. Some of the tools which were made on elongated blanks. a. Retouched piece made on a non-debitage trihedral fragment; b. Basally-trimmed retouched point made on a Levallois flake; c. Convergent scraper with short continuous retouch; d. Blade with nibbling edges; e. Side scraper on a broad blade; f. Basally-trimmed side-retouched flake; g. Basally-trimmed convergent flake; h. Basally-trimmed broad cortical blade; i. Retouched Levallois point (?); j. Basally-trimmed crested blade with convergent lateral edges (Authors, 2024).**

◀ **Table 2. Tool typology at Boulan. *: other here means tools made on non-debitage pieces. FTs and BTs denote flake tools and blade tools, respectively. (Authors, 2024).**

On Flake blanks	No.	% in FTs	% in Tools	On Blade blanks	No.	% in BTs	% in Tools
Side Scraper	2	5.71	3.33	Side Scraper	2	25	5
Nibbling	10	28.57	16.67	Nibbling	2	16.67	3.33
Side-retouched	8	22.86	13.33	Side-retouched	1	8.33	1.67
Convergent scraper	3	8.57	5	Denticulate	1	8.33	1.67
End scraper	1	2.86	1.67	Backed	1	8.33	1.67
Backed piece	1	2.86	1.67	Naturally Backed	1	8.33	1.67
Retouched Levallois point	1	2.86	1.67	Burin	1	8.33	1.67
Notch	3	8.57	5	Core-on-Blade	1	8.33	1.67
Pseudo-Levallois point	1	2.86	1.67	Multiple tool	1	8.33	1.67
Core-on-flake	1	2.86	1.67	Total	12	100	20
Multiple tool	1	2.86	1.67	Nibbling Bladelet	2		3.33
Truncation	3	8.57	5	Retouched Bladelet	1		1.67
Total	35	100	58.33	Other*	10		16.67

Within the findings, there is one Levallois core exhibiting limited surface and platform preparation and two consecutive preferential removals (bidirectional opposed removals; Fig. 9: a). This specimen shares similarities with early Levallois cores discovered in Lower Paleolithic contexts elsewhere (see e.g., Centi & Zaidner 2021; Rosenberg-Yefet et al., 2022). However, it is worth noting that only a single specimen of this kind has been found in Boulan, which does not aid in determining

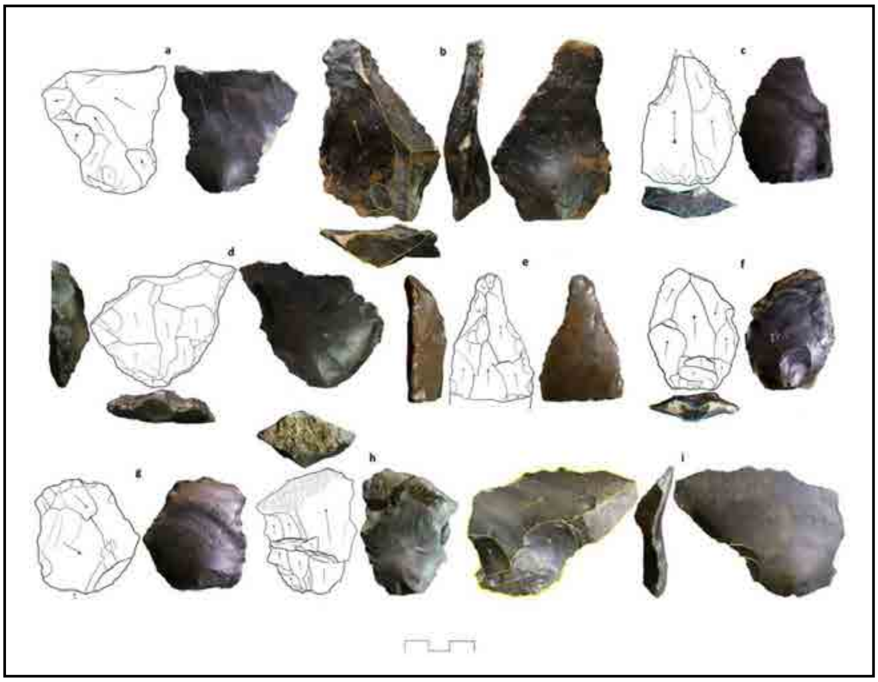
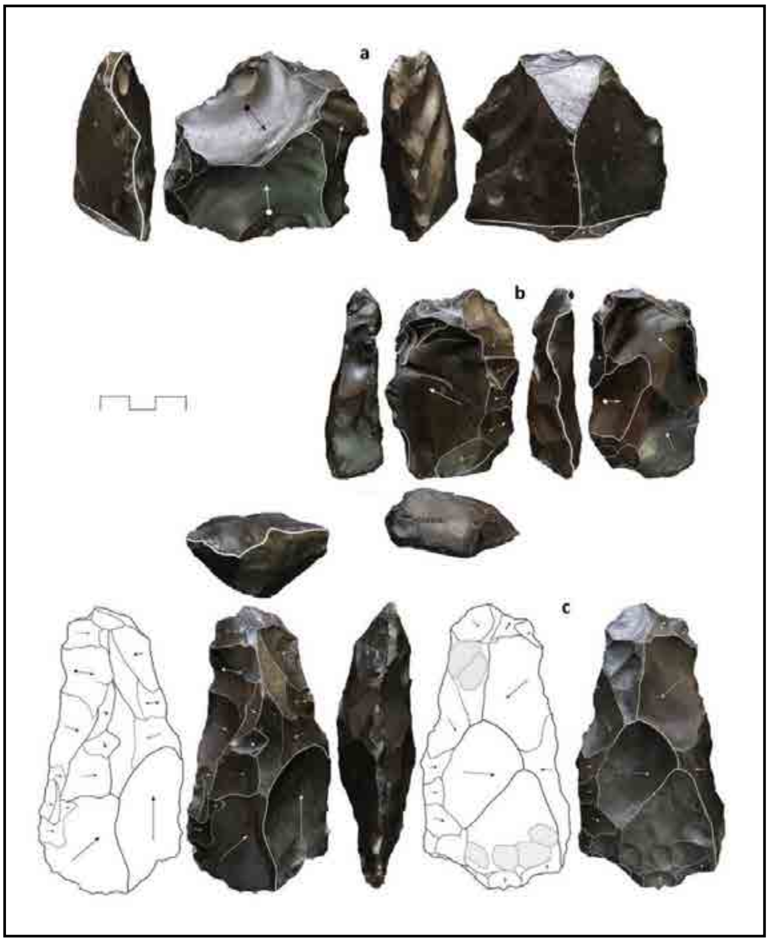


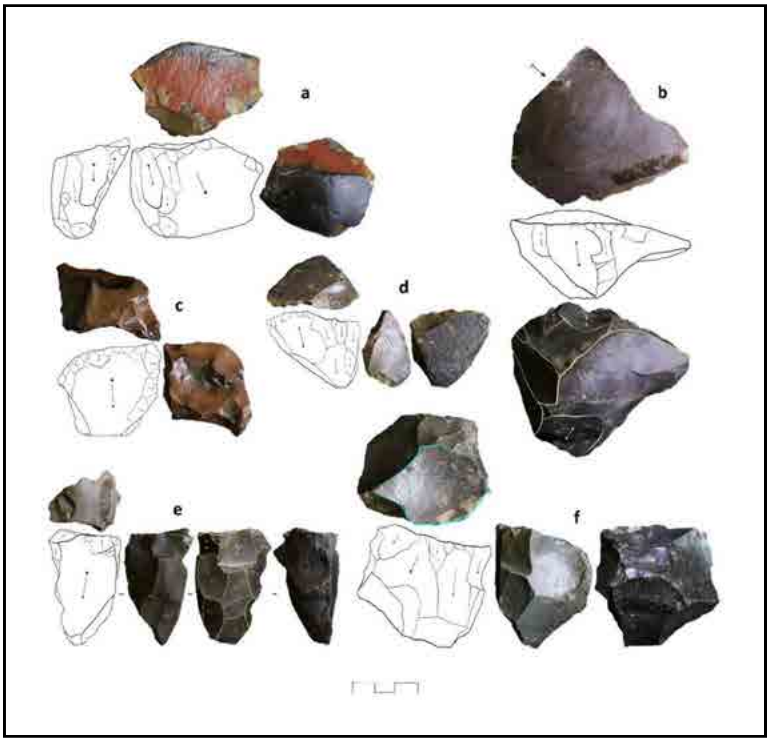
Fig. 7: Some of the lithic specimens made on nono-elongated flakes. a. Divergent flake with basal trimming; b. Convergent flake with basal trimming; c. Retouched point; d. Dejeté/side scraper; e. Retouched point with proximal breakage; f. Levallois flake with basal modifications; g. Side-retouched piece with alternating retouch; h. Divergent plunging flake with distal cortex (blade/ bladelet core rejuvenation element); i. Atypical core-trimming element (?) with hinge termination (Authors, 2024). ►

relative chronology. The platform-type cores (Conard et al., 2004) show limited variation. They possess one distinct platform formed by a single blow, often with minimal preparation. Knapping activities have resulted in removals on both narrow (Fig. 9: a) and broad (Fig. 9: c and d) faces of the cores. At times, both faces are utilized (Fig. 9: a), while in other instances, distinguishing between narrow and broad faces proves challenging due to morphological characteristics (Fig. 9: e & f). Furthermore, in one specimen (Fig. 9: b), the core is made on a thick flake, with its ventral part serving as the platform. Negative scars typically range from small flakes to blade and non-elongated bladelets, often with a sub-parallel arrangement. The majority of knapping activities were conducted using hard hammer technique, although evidence of using soft hammers could be observed in certain cases (e.g., Fig. 9: a & d). Most of the cores display irregular and informal morphologies, with only a few exceptions that can be formally grouped, such as one sub-pyramidal prismatic core (Fig. 9: e). In summary, both surficial and volumetric exploitations have been documented.

Complete flakes (both blanks and tools) exhibit considerable diversity in terms of morphology. Approximately 14.5% of them display sub-triangular shapes with converging and pointed ends (12.5% of blades show converging or pointed ends). Among these pieces, there are two examples that show evidence of basal trimming, suggesting possible functions for hafting. Overall, 14 blanks (including two blades and twelve flakes) exhibit indications of proximal/basal modifications. These treatments



◀ **Fig. 8. Surficial (parallel: Conard et al., 2004) cores and bifaces from Boulan. a. Levallois flake core; b. Bifacial knife (keilmesser); c. Diminutive hard hammer handaxe or bifacial small flake core (Authors, 2024).**



◀ **Fig. 9: Platform cores recovered from Boulan. a. Narrow- and broad-fronted single-platform mixed blade/bladelet core; b. Single platform flake core made on a thick flake; c. Broad-faced flake core with facetted platform; d. Broad-fronted single-platform bladelet core with cortical platform; e. Sub-pyramidal single-platform small flake/blade core with signs of modification using cresting; f. Multidirectional polyhedral small flake core with a one preferred platform (Authors, 2024).**

involved various techniques such as chipping the dorsal part for thinning, removing small chips, notching, creating relatively deep retouches, and even micro-chipping resembling burin shapes. In addition to sub-triangular blanks, sub-circular and sub-oval morphologies are also commonly found, comprising approximately 9.6% of complete flakes. However, a substantial majority of flakes (around 61%) exhibit irregular shapes, suggesting a lack of standardization in Boulan (Pargeter & Groucutt 2023). It is important to consider the viewpoint of scholars like Shea (2023), who contend that the search for standardization in the Paleolithic period is futile and primarily influenced by artificial classification frameworks established by researchers.

In addition to what has been mentioned, small flake scars have been the dominant type of negative scars on the dorsal face of flakes (65% of the scars) while blade/bladelet scars make up approximately 23% of the total, and mixed scars make up the remaining 12%. Unidirectional scars represent 77.3% of the total, with bidirectional scars making up 18.2%, and multidirectional scars comprising only 4.5%. It is worth noting that all unidirectional scars display a sub-parallel arrangement. The prevalence of unidirectional sub-parallel scars, in conjunction with volumetric single-platform unidirectional cores and sub-prismatic core morphologies (Fig. 8), may suggest the chronologies inclined to the Upper Paleolithic Period.

Approximately 75% of the platforms found in flakes are plain, with 8 (10.6%) of them being lipped platforms. The presence of lips is often associated with striking the platforms with specific angles and forces or utilizing the soft hammer technique (Driscoll & García-Rojas 2014; Koch & Schindler 2012). Among the pieces with lipped platforms, some exhibit diffuse bulbs of percussion, while others completely lack such bulbs. This could potentially strengthen the use of soft hammerstones (Ohnuma & Bergman 1982). Simple facetted platforms account for nearly 10% of the platforms, while chapeau de gendarme variety makes up about 3% of the butts. It is important to note that these “prepared” platforms are generally less complex compared to the typical examples found in the Levallois method. The remaining percentage is distributed among various types of platforms, including winged, linear, punctiform, crushed, and dihedral platforms.

Discussion

Based on the explanation provided, it appears that Boulan’s landscape exhibits a combination of two cultural traditions commonly found in the

Middle and Upper Paleolithic periods. It is important to highlight that, in a broad sense, the Middle Paleolithic traditions are more prominently represented. The key techno-typological characteristics observed in Boulan include a flake-oriented assemblage featuring flakes of medium to large dimensions in various morphologies, a notable presence of broad and non-elongated blades, a high proportion of thick and massive flakes with distinct bulbs of percussion, a preference for the direct hard hammer technique over the soft hammer technique, limited utilization of the Levallois method with minimal preparation prior to removal, diverse surficial and volumetric core types with an emphasis on the latter, sporadic indications of core-tool concept in bifaces, scattered discontinuous retouching on the edges of some cores, indeterminates, and even ecofacts in an expedient manner to use them as tools, the significant presence of informal tools, a relatively straightforward simple reduction scheme with an overall expedient appearance, the predominance of unidirectional sub-parallel scheme with much fewer signs of bidirectional reduction and the absence of radial centripetal preparation or reduction, indirect evidence of laminar reduction sequence through negative scars of bladelets on the flakes' dorsal faces, and surprisingly, the rarity of bladelet removals themselves as a direct indicator of bladelet reduction. Furthermore, notwithstanding its expedient appearance, the tool list depicts inclination toward Middle Paleolithic Period, from a typological perspective. The predominant retouching tradition commonly observed at Boulan appears to involve scattered, direct, and short retouches that were typically executed at low angles. It is worth mentioning that a significant number of the artifacts, often showing converging edges, were probably mounted on handles, and used for daily activities.

The techno-typological characteristics mentioned above, as well as those observed generally in the Eyvanekey area (Hashemi et al., 2024), do not seem to correspond with the evidence found in the eastern parts of the NICD. Notably, sites like Mirak, Soufi Abad, Delazian, and Chah-e Jam (Vahdati Nasab & Clark 2014; Vahdati Nasab & Feiz 2014; Vahdati Nasab & Hashemi 2016; Vahdati Nasab et al., 2019) exhibit different characteristics. Similarly, in the westernmost parts of the Central Plateau, such as at Qaleh Kurd Cave (Vahdati-Nasab et al., 2024), distinct features are observed. This discrepancy can have implications for the complexities and population diversity within the NICD. In addition, it could stem from varying chronologies, subsistence-adaptive strategies in response to diverse environmental characteristics and different spatio-temporal patterns of resource distribution. While there is a lack of overall techno-typological homogeneity at the intra-regional level, sites clustered near Semnan (Mirak, Delazian, and Soufi Abad) display more internal homogeneity (Hashemi et al., 2018) compared to those near Eyvanekey. The toolmaking traditions of the NICD also differ from the Zagros Mousterian (Hashemi et al., 2018, 2021), suggesting distinct regional variations. While the Zagros Mousterian has been regarded as a non-coherent entity by Nymark (2021), it remains uncertain whether the sites within the NICD adhere to this pattern. In order to gain a comprehensive understanding of the clustering of traditions in the NICD, further comparative studies are necessary in the future.

The identification of Paleolithic evidence in Eyvanekey, as detailed by Hashemi et al., (2024), has the potential to significantly enhance the comprehension of archaeological findings in the region. These findings may help bridge the fragmented evidence of Pleistocene hominin populations in the NICD and establish a stronger spatial connection between Paleolithic landscapes in the area. While each identified landscape could potentially address some of the chronological gaps in the region, the scarcity of sites with absolute chronology currently hinders the ability to verify this claim. Nonetheless, the unearthing of any new Pleistocene landscape in the NICD could bolster the notion of a continuous yet intermittent presence of hominin in the NICD (see Hashemi et al., 2018) during the Pleistocene epoch. The vertical mobility of the NICD hominin populations during the Pleistocene is another subject begging to be addressed. Essentially, during this era, human populations inhabited various altitudes and latitudes of the NICD, ranging from piedmont and high-elevations sites such as Qaleh Kurd Cave, Sorheh Rockshelter, and Moghanek-Otchunk surface scatters to low-lying downstream floodplain and discharge zone sites (such as Mirak, Delazian, and Soufi Abad open-air sites and Chah-e Jam and Showr-e Qazi surface scatters) as well as the intermediate pediplain and alluvial fan zone sites in the case of Eyvanekey or Zaviyeh surface scatters. This suggests that these populations were relatively well-adapted to life in the region, as evidenced by their widespread presence. Notably, their ability to thrive in high and mountainous landscapes, such as Qaleh Kurd Cave, Sorheh, and Moghanak-Otchounak indicates the high adaptability of human populations in the NICD.

The Boulan area, like other Paleolithic landscapes within the Eyvanekey area (Nateqi et al., 2020; Hashemi et al., 2024), as well as certain sites located in the NICD (such as Chah-e Jam; Vahdati Nasab & Hashemi 2016), displays a wide distribution but a limited concentration of stone artifacts. The low density of surface lithic artifacts can be attributed to various factors, including erosion, post-depositional processes, and the burial of stone artifacts beneath very recent (late Holocene) deposits. In essence, it is plausible that a significant proportion of the Eyvanekey stone artifacts remain buried beneath relatively recent sediments. As time progresses, and with the intensification of aridity and erosive forces, particularly aeolian deflation, the lithics gradually resurface and reveal again in a patchy fashion. Fortunately, the level of contemporary anthropogenic destruction at Boulan is insignificant. However, it appears that severe wind erosion plays a crucial role in the absence or destruction of cultural deposits over time. As mentioned earlier, aeolian activity is the primary factor responsible for the removal of Holocene sediments and unearthing of lithics in a desert pavement setting. It is important to note that in wind erosion, areas with higher wind exposure tend to reveal old surfaces and form desert pavements, providing potential locations to discover stone artifacts. It is important to acknowledge that alongside wind erosion, the occurrence of wind deposition can be observed in certain parts of the landscape. This implies that the sediments that are eroded from one location by the wind gather in another location, leading to the formation of surface coverings. Consequently, in this manner, the aeolian processes might have a notable impact on the uneven dispersion of surface lithic artifacts. Water erosion has led to the creation of a sequence of elongated linear crestlines distinguished by gentle sinusoidal undulations, where the ridges are more prone to aeolian deflation and consequently smoothed out. Elsewhere in the landscape, the collaboration between wind, water, and tectonic activity has given rise to the creation of low-altitude mounds where finer-grained sediments are deposited atop by wind (erg) while the adjacent shallow valleys retain coarser-grained sediments (reg) that may contain lithics. The intricate interplay of these forces presents difficulties in accurately delineating the boundaries of Paleolithic surface scatters in the Eyvanekey area.

Desert ecosystems have the potential to support substantial human populations, provided there is a reliable supply of water resources, since water availability is a crucial determinant in desert and semi-desert regions (Marshall 1976: 76; Yellen & Lee 1976). Precipitation in these areas is not only limited in quantity but also highly unpredictable and erratic, exhibiting significant spatio-temporal fluctuations (Noy-Meir 1973; Yellen 1977: 264). Furthermore, deserts are characterized by intense sunlight and high daytime temperatures, substantial temperature differentials between day and night, chilly nights, rapid evapotranspiration rates, sparse vegetation cover, and the prevalence of strong winds. Moreover, providing shelter during the daytime is a necessity (Moran 2022: 164, 173). The combination of warm dusty winds and solar radiation plays a pivotal role in hastening dehydration (e.g., Briggs 1975: 97). The spatio-temporal fluctuation in water and moisture availability in arid and semi-arid biomes lead to heterogeneous distribution of vegetation (Yang et al., 2016). Consequently, the presence of large herbivorous mammals also exhibits fluctuations across space and time, as discussed by Hitchcock & Ebert (1984: 331). Additionally, many desert-dwelling animals, apart from birds, are nocturnal and remain hidden during daylight hours, while some species hibernate in the summer (Moran 2022: 167) or form smaller groups during the dry season. These behavioral patterns make hunting more challenging for human populations. Overall, deserts are characterized by limited food resources, particularly during the drier seasons. As a result, hunter-gatherer groups tend to split into smaller units during these periods, residing near water sources such as tributaries or freshwater reservoirs, and in proximity to spots rich with resources suitable for starting fires (Allaby 2006: 159).

Hence, the key attributes of the hunter-gatherer communities found in desert regions, in response to the aforementioned characteristics, encompass residing in small groups, maintaining a low population density, and exhibiting flexibility in group composition (Lee & DeVore 1968: 7–11). From a settlement pattern perspective, it is advantageous to concentrate activities in a central location that serves as the approximate gravitational center of the surrounding environment, particularly when resources are sporadic, mobile, and heterogeneously dispersed across the landscape (Horn 1968: Fig. 5). This strategy ensures that proximity to one potential resource location does not result in a significant distance from other resources (Clarkson 2007: 10). The selection of these central places is primarily influenced by the availability of water sources (Kelly 2013: 90). In such scenarios, the mobility strategy typically leans towards the logistical end of the spectrum, whereby specialized groups are dispatched from the central hub to engage in hunting and resource acquisition (including lithic raw materials), subsequently returning to this central location once again. In this given case, there is no simultaneous mobilization of all members within the group. This approach will persist until the costs associated with gathering and utilizing resources from the surrounding landscape reach or surpass the level of benefit. Consequently, the central location will be relocated, resulting in residential mobility (Beck et al., 2002:

485; Clarkson 2007: 10; Habu & Fitzhugh 2002: 1, 2; Kelly 2013: 78). As a result, the range of desert-dwelling human populations tends to be relatively extensive. The adoption of high mobility and the occupation of a large territory serve as strategies to effectively cope with risks in desert environments, thereby increasing the likelihood of encountering resources. Furthermore, heightened levels of mobility contribute to a deeper knowledge of the surrounding environment, including its seasonal, annual, and time to time fluctuations (Clarkson 2007: 12; Kelly 2013: 103). Additionally, risk mitigation strategies in such landscapes encompass group foraging, diversification, intensification, and resource sharing (Halstead & O'Shea 1989: 3). In general, due to optimality principle (Hashemi 2016) and due to the spatio-temporal fluctuations, diversification of the diet (vegetable-animal) is prevalent in these landscapes, which in turn, leads to an increase in the size of habitats (Hitchcock & Ebert 1984: 332; Kelly 2013: 93). Thus, the reason behind the similarity in tool-making practices and the scarcity of lithic artifacts across the Eyvanekey area might be attributed to the expansive territories, diet diversification, high mobility, and flexibility in group composition. Furthermore, the absence of a high density of stone artifacts in any part of the area may indicate either the absence of central places or severe erosion over time.

The expedient nature of lithic asseblages in Boulan and Eyvanekey, as discussed by Hashemi et al., (2024), poses challenges in establishing a relative chronology. Traditionally, lithic analysts indicated that informal assemblages resembling those found in Boulan, characterized by a significant proportion of unretouched flakes and informal tools falling outside the definition of formal retouched tools (Bordes 1961), were indicative of an opportunistic strategy involving the rapid production of non-standardized stone tools based on immediate needs. However, alternative explanations for this behavior include the availability of high-quality raw materials and low mobility (Andrefsky 1994; Bamforth 1986; Parry & Kelly 1987; See Railey 2010 for the counterargument against the correlation between expedient lithic assemblages and low mobility). Furthermore, this expediency has been associated with what Kuhn (1995) calls "provisioning of places" and Binford's (1980) logistical mobility. The Eyvanekey area is characterized by the availability of high-quality lithic raw material. Within various parts of this area, one can come across substantial pieces of tuff and chert, displaying weathered exteriors. Occasionally, these fragments have undergone testing by hominin populations to assess their quality, evidence of which is negative marks of a single removal and minimal effort for preparation. Among these potentially tested specimens, four samples were discovered in Boulan, albeit relatively small, with the largest measuring a maximum of eight centimeters. Nonetheless, in a few kilometers to the north of Boulan or in neighboring paleolithic landscapes such as Chandab, situated approximately ten kilometers southwest of Boulan (Hashemi et al., 2024), large, tested fragments and cores of considerable size, measuring between 15 and 30 centimeters, have been recovered and thus substantiating the authors' claim. It is worth noting that the interconnection between the various Paleolithic landscapes in Eyvanekey has yet to be explored, leaving it as a topic for future investigation by the authors of this study. It is important to acknowledge that the mere presence of expedient industries does not solely rely on the availability of high-quality raw materials. The utilization of unretouched flakes as tools is often driven by the desire to maximize the ratio between the sharp edge and the overall mass of the flake, as well as to optimize the rate at which each flake is used (Douglass 2010; Withrow 1983). Additionally, it seems that informal tools can fulfill a variety of needs and livelihood activities, like formal tools, while being simpler and faster to construct (Downey 2010: 78). Consequently, it can be inferred that the increased usefulness, efficient (optimal) production, and favorable edge ratio are also the case in this context (Lin et al., 2013).

The absence of large flake cores at Boulan, in contrast to their existence at neighboring sites, may suggest the implementation of a provisioning of place strategy. This approach entails the accumulation of larger raw material pieces outside the primary camp, and when required, designated groups are dispatched to these locations. These groups subsequently fashion their tools through knapping, and exclusively transport the flakes while intentionally leaving the cores behind. Additional support for this behavior can be found in the limited presence of cortex within the Boulan's assemblage.

Conclusion

The field survey carried out in the Eyvanekey area revealed several Paleolithic surface scatters, demonstrating that hominin populations utilized the central and western parts of the NICD. These findings suggest that the presence of these populations was more than just transient, as evidenced by the recovery of stone artifacts from a vast area despite significant challenges like severe erosion, thick Holocene surface covers, and modern human constructions. Therefore, this research strengthens the hypothesis that the NICD functioned as a large-scale corridor.

The distribution pattern of sites in Eyvanekey reveals a non-clustered arrangement across the landscape, and the sites are found where construction activities are minimal and where there is either no Holocene surface cover, or it is displaced by erosion. In such parts, lithic remains with low density can be recorded. Furthermore, it should be noted that the boundaries set for each Paleolithic landscape in Eyvanekey do not possess any behavioral significance. The presence of stone artifacts in the eroded parts is solely a result of natural factors and does not bear implications for the systemic context or human behavior. The distribution of artifacts within Boulan does not exhibit a distinct pattern; rather, they are found sparsely across the landscape. However, it may be feasible to identify focal points through manual delineation aided by kernel density analysis. Nevertheless, it is important to acknowledge that taphonomic factors greatly influence this analysis.

The spatial distribution of Paleolithic sites and lithics within a wide expanse could be attributed to the high mobility displayed by hominin populations. In general, the most fundamental trait of hunter-gatherers inhabiting deserts and open landscapes is their high degree of mobility. Furthermore, it is probable that the mobility in Boulan and Eyvanekey, in general, inclined towards the logistical spectrum of mobility. Drawing upon archaeological findings, it is evident that the immobility of central places necessitated the dispatch of specialized groups to various spots of the landscape for resource procurement, followed by their return to the central hub.

Moreover, the techno-typological investigations conducted on the lithics discovered in Boulan provide additional evidence that this particular landscape was utilized by hominin communities during the Middle and Upper Paleolithic periods. It appears that the strategies employed for adaptation in Boulan, as well as in Eyvanekey more broadly, differed from those observed at Paleolithic sites located in the central and eastern regions of Semnan Province (such as Mirak, Delazian, Soufi Abad, and Chah-e Jam). While the latter sites predominantly exhibit formal tools within their lithic assemblages, with Chah-e Jam being particularly notable in this regard, the former landscape is characterized by a clear emphasis on expediency. It is important to note that this distinction does not necessarily indicate varying levels of complexity among human groups, the levels of compatibility with the environment, or their cognitive capacities. Instead, it could be interpreted as a manifestation of distinct toolmaking traditions that arose in response to different environmental conditions, diverse subsistence strategies and modes of mobility, the presence of distinct population groups within the NICD with different life histories, or adherence to the principles of optimality. In addition to the formal-informal duality, one of the prominent features of the sites found in the NICD from the west in Qaleh Kurd Cave to the east in Chah-e Jam is the presence of high number of points and convergent scrapers that may imply the importance of hunting. Despite the limited quantity of retouched points, convergent scrapers, and Levallois points at Boulan, it is important to highlight the substantial presence of sub-triangular unretouched or minimally retouched flakes. A considerable number of them exhibit modifications near their proximal or basal ends, indicating a potential purpose of being affixed to wooden handles. Consequently, it is reasonable to speculate that these artifacts were utilized as hunting gear, irrespective of whether they were retouched or not.

Acknowledgements

This article has been produced as a result of a field survey project authorized by the Iranian Center for Archaeological Research (ICAR) under permission number 40035209 and directed by the corresponding author. The research was funded by the Iran National Science Foundation (INSF) under research project no. 4002243 granted to the corresponding author. The field survey could not have been conducted without the generous assistance of numerous individuals. The authors wish to extend their gratitude to Dr. Mosayyeb Amiri, the former director of the Research Institute for Cultural Heritage and Tourism, and Dr. Mohammad Mortezaei, the former head of the ICAR, for granting the necessary permits. We would like to extend our gratitude to Mr. Hassan Ramezani, the permit official at the ICAR. The support provided by Mr. Hamidreza Doust-Mohammadi, the former director of the General Directorate of Cultural Heritage, Tourism and Handicrafts of Semnan Province, is also greatly appreciated. We are indebted to him and his team, which includes Mr. Soroush Hashemi, Mr. Yaghmaian, Mr. Jamshidi-Far, Mr. Shojaei, and Mrs. Hemmati, for their unwavering assistance and dedication. It is undeniable that any scientific accomplishments are a result of their invaluable support. We express our deep gratitude for the invaluable assistance provided by Mrs. Kamali, the former head of the Garmsar County Cultural Heritage Organization, and the former governor of Eyvanekey, Mr. Klich. The guidance of Dr. Hamed Vahdati Nasab, professor of archaeology at Tarbiat Modares University, was instrumental in the implementation of this research. The authors express their gratitude to Dr. Mehdi Alirezazadeh for creating the 3D map depicted in Fig. 1, Fig. 3:4, and Fig. 4 as well.

Observation Contribution

Seyyed Milad Hashemi: Head of the field mission, data gathering, data analysis, developing ideas, illustrations, writing the manuscript. Asghar Nateqi: Data gathering, field mission. Aliyeh Abdollahi: Data gathering, field mission, database preparation. Ahmad Zavvar Mousavi: Data gathering, field mission, GIS.

Conflict of Interest

All authors declare that they have no conflicts of interest.

References

- Allaby, M., (2006). *Deserts (Biomes of the Earth).* Facts on File.

- Alibeigi, S. & Khosravi, S. (2009). "Tepeh Khaleseh: A New Neolithic and Palaeolithic site in the Abharrud Basin in north-western Iran". *Antiquity,* 83(319). Project Gallery.

- Andrefsky, W., (1994). "Raw material availability and the organization of technology". American Antiquity, 59: 21–34. https://doi.org/10.2307/3085499

- Andrefsky, W., (2014). "Debris, Debitage, or Tools: Unmodified Flakes and Cutting Efficiency". In: *Lithics in the West: Using Lithic Analysis to Solve Archeological Problems in Western North America*, D.H. MacDonald, W. Andrefsky & P.-L. Yu (eds.): 4–16. Missoula, MT, UM Press Open Access Books, 1. https://scholarworks.umt.edu/umpress-oabooks/1/

- Bamforth, D. B., (1986). "Technological efficiency and tool curation". *American Antiquity*, 51: 38–50. https://doi.org/10.2307/280392

- Banning, E. B., (2002). *Archaeological Survey.* New York: Springer. https://doi.org/10.1007/978-1-4615-0769-7

- Baumler, M. F. & Speth, J. D., (1993). "A Middle Paleolithic Assemblage from Kunji Cave, Iran". In: *The Paleolithic Prehistory of Zagros-Taurus,* D. I. Olszewski & H. L. Dibble (eds.): 1–73. Philadelphia, The University Museum, University of Pennsylvania.

- Beck, C., Taylor, A.K., Jones, G.T. et al., (2002). "Rocks are heavy: transport costs and Paleoarchaic quarry behavior in the Great Basin". *Journal of Anthropological Archaeology,* 21: 481–507. https://doi.org/10.1016/S0278-4165(02)00007-7

- Berillon, G., Asgari Khaneghah, A., Antoine, P., et al., (2007). "Discovery of New Open-air Paleolithic Localities in Central Alborz, Northern Iran". *Journal of Human Evolution,* 52: 380–387. https://doi.org/10.1016/j.jhevol.2006.10.004

- Biglari, F., (2003a). "Preliminary report of field investigations in Kashan's Paleolithic sites". In: S., Malek Shahmirzadi & H. Fahimi (ed.), *The Silversmiths of Sialk:* 151–168. ICAR, The Organization of Cultural Heritage, Tourism and Handicrafts (in Persian).

- Biglari, F., (2003b). "Nargeh, the first evidence of Middle Paleolithic Period in Qazvin Plain, Northwest of Central Plateau". *Archaeological Reports* 2: 165–171. ICAR, The Organization of Cultural Heritage, Tourism and Handicrafts (in Persian).

- Binford, L. R., (1980). "Willow Smoke and Dog's Tails: Hunter-Gatherer settlement systems and archaeological site formation". *American Antiquity,* 45: 4–20. https://doi.org/10.2307/279653

- Blades, B. S., (2008). "Reduction and Retouch as Independent Measures of Intensity". In: *Lithic Technology: Measures of Production, Use and Curation,* W. Andrefky Jr. (ed.): 136–149. Cambridge University Press. https://doi.org/10.1017/CBO9780511499661.007

- Bordes, F., (1961). *Typologie du Paléolithique ancien et moyen*. Bordeaux: Impriméries Delmas.

- Briggs, L. C., (1975). "Environment and Human Adaptation in the Sahara". In: *Physiological Anthropology,* A. Damon (ed.). New York: Oxford University Press.

- Centi, L. & Zaidner, Y., (2021). "The Levallois Flaking System in Nesher Ramla Upper Sequence". *Journal of Paleolithic Archaeology,* 4(9). https://doi.org/10.1007/s41982-021-00088-3

- Clarkson, C., (2007). *Lithics in the Land of the Lightning Brothers: The Archaeology of Wardaman Country, Northern Territory.* Terra Australis 25. Canberra: ANU Press. https://doi.org/10.26530/OAPEN_459360

- Clarkson, C., Haslam, M. & Harris, C., (2015). "When to Retouch, Haft, or Discard? Modeling Optimal Use/Maintenance Schedules in Lithic Tool Use". In: *Lithic Technological systems and Evolutionary theory,* W. Andrefsky Jr. & N. Goodale (eds.): 117–138, New York, NY, Cambridge University Press. https://doi.org/10.1017/CBO9781139207775.011

- Claud, É., Thiébaut, C. et al., (2019). "The use-wear studies on the lithic industries". *Palethnologie,* 10: 285–315. https://doi.org/10.4000/palethnologie.4137

- Conard, N. J., Soressi, M., Parkington, J. E., Wurz, S. & Yates, R., (2004). "A Unified Lithic Taxonomy Based on Patterns of Core Reduction". *South African Archaeological Bulletin,* 59: 13–17. https://doi.org/10.2307/3889318

- Conard, N. J., Ghasidian, E. & Heydari-Guran, S., (2009). "The Open-Air late Paleolithic Site of Bardia and the Paleolithic Occupation of the Qaleh Gusheh Sand Dunes, Esfahan Province, Iran". In: M. Otte, F. Biglari & J. Jaubert (Eds.), *Iran Paleolithic, Le Paléolithique d'Iran*, 141–154, Oxford, Archeopress, BAR International Series. https://www.barpublishing.com/iran-palaeolithic-le-paleolithique-diran.html

- Debénath, A. & Dibble, H. L., (1994). *Handbook of Paleolithic Typology,* vol. 1: Lower and Middle Paleolithic of Europe. Philadelphia: University of Pennsylvania Press.

- Dennell, R. W., (2020). *From Arabia to the Pacific: How our species colonised Asia.* Routledge. https://doi.org/10.4324/9781003038788

- Dibble, H. L., (1984). "The Mousterian Industry from Bisitun Cave (Iran)". *Paléorient,* 10(2): 23–34. https://doi.org/10.3406/paleo.1984.937

- Dibble, H. L., (1991). "Mousterian Assemblage Variability on an Interregional Scale". *Journal of Anthropological Research,* 47(2): 239–257. https://doi.org/10.1086/jar.47.2.3630327

- Dibble, H. L. & Holdaway, S. J., (1993). "The Middle Paleolithic Industries of Warwasi". In: *The Paleolithic Prehistory of the Zagros-Taurus,* D. Olszewski and H.L. Dibble (eds.): 75–100. University of Pennsylvania Museum of Archaeology and Anthropology.

- Douglass, M. J., (2010). "The Archaeological potential of informal lithic technologies: A case study of assemblage variability in western New South Wales, Australia". Unpublished PhD dissertation Auckland, Department of Anthropology, University of Auckland.

- Douze, K., Igreja, M., Rots, V., Cnuts, D. & Porraz, G., (2020). "Technology and function of middle stone age points, Insights from a combined approach at bushman rock shelter, South Africa". In: *Culture History and Convergent Evolution: Can We Detect Populations in Prehistory?* H.S. Groucutt (ed.): 127–141, Springer International. https://doi.org/10.1007/978-3-030-46126-3_7

- Downey, J. T., (2010). "Working With Expedient Lithic Technologies in the Northern Highlands of Peru". *vis-à-vis: Explorations in Anthropology,* 10(2): 77–95. https://vav.library.utoronto.ca/index.php/vav/article/view/12341

- Driscoll, K. & García-Rojas, M., (2014). “Their lips are sealed: identifying hard stone, soft stone, and antler hammer direct percussion in Palaeolithic prismatic blade production”. *Journal of Archaeological Science,* 47: 134–141. https://doi.org/10.1016/j.jas.2014.04.008

- Eren, M. I., Dominguez-Rodrigo, M., Kuhn, S. L. et al., (2005). “Defining and Measuring Reduction in Unifacial Stone Tools”. *Journal of Archaeological Science,* 32: 1190–1206. https://doi.org/10.1016/j.jas.2005.03.003

- Fuentes, R., Ono, R., Nakajima, N. et al., (2019). “Technological and behavioural complexity in expedient industries: The importance of use-wear analysis for understanding flake assemblages”. *Journal of Archaeological Science,* 112: 105031. https://doi.org/10.1016/j.jas.2019.105031

- Geneste, J.-M., (1985). “Analyse lithique d’industries moustériennes du Périgord: approche technologique du comportement des groupes humaine au Paléolithique moyen”. PhD thesis, Université de Bordeaux.

- Glauberman, P. J. & Thorson, R. M., (2012). “Flint Patina as an Aspect of “flaked stone taphonomy”: A case study from the Loess terrain of the Netherlands and Belgium”. *Journal of Taphonomy,* 10(1): 21–43. https://journaltaphonomy.com/volumen-10-issue-1-year-2012/

- Habu, J. & Fitzhugh, B., (2002). “Introduction”. In: *Beyond Foraging and Collecting: Evolutionary Change in Hunter-Gatherer Settlement Systems,* B. Fitzhugh & J. Habu (eds.): 1-11. Kluwer Academic/Plenum Publishers. https://doi.org/10.1016/S1569-9056(02)00145-8

- Halstead, P. & O’Shea, J., (1989). “Introduction”. In: *Bad Year Economics: Cultural Responses to Risk and Uncertainty*, P. Halstead & J. O’Shea (eds): 1–7. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511521218.002

- Hariryan, H., Heydari-Guran, S., Motarjem, A. & Ghasidian, E., (2021). “New Evidence of a Late Pleistocene Occupation on the Southern Slopes of the Alborz Mountains”. *Lithic Technology,* 46(2): 104–110. https://doi.org/10.1080/01977261.2020.1860350

- Hashemi, S. M., (2016). “Hunter-Gatherers’ Adaptive Strategies in different Biomes during Pleistocene”. *Quaternary Journal of Iran,* 2(7): 271–304 (in Persian). https://doi.org/10.22034/irqua.2016.701943

- Hashemi, S. M., Vahdati Nasab, H., Berillon, G., et al., (2018). “The Late Pleistocene in the Northern fringes of Iranian Central Desert and the Formation of Archaeological Sites; Case Study: Mirak, Semnan”. *Quaternary Journal of Iran,* 3(4): 405–430 (in Persian). https://doi.

org/10.22034/irqua.2018.701924

- Hashemi, S. M., Vahdati Nasab, H., Berillon, G. & Oryat, M., (2021). "An investigation of the flake-based lithic tool morphology using 3D geometric morphometrics: A case study from the Mirak Paleolithic Site, Iran". *Journal of Archaeological Science: Reports* 37: 102948. https://doi.org/10.1016/j.jasrep.2021.102948

- Hashemi, S. M., Nateqi, A., Abdollahi, A., et al., (2024). "Evidence of Pleistocene hominin landscapes in Eyvanekey, Iran, and implications for the Northern Dispersal Corridor". *Antiquity, Project Gallery,* 98(399): e14. https://doi.org/10.15184/aqy.2024.53

- Hayden, B., (1977). "Stone Tool Functions in the Western Desert". In: *Stone Tools as Cultural Markers: Change, Evolution, and Complexity,* R.V.S. Wright (ed.): 178–188. Canberra, Australian Institute of Aboriginal Studies.

- Heydari-Guran, S. & Ghasidian, E., (2011). "Paleolithic survey in the Arisman Region, Western Central Iranian Plateau". In: A. Vatandoust, H. Parzinger & B. Helwing (Eds.), *early mining and metallurgy on the Western Central Iranian Plateau*: 484–498. *AMIT* 9. Mainz, Verlag Philipp Von Zabern.

- Heydari-Guran, S., Ghasidian, E. & Conard, N., (2014). "Middle Paleolithic Settlements on the Iranian Central Plateau". In: N. Conard & A. Delagnes (Eds.), *Settlement Dynamics of the Middle Paleolithic and Middle Stone Age,* IV: 171–203, Tübingen Publication in Prehistory. https://kernsverlag.com/en/book/settlement-dynamics-of-the-middle-paleolithic-and-middle-stone-age-volume-iv/

- Hitchcock, R. K. & Ebert, J. I., (1984). "Foraging and food production among Kalahari hunter-gatherers". In: *From Hunters to Farmers: The Causes and Consequences of Food Production in Africa*, J. D. Clark & S. A. Brandt (eds.): 328–348. University of California Press. https://doi.org/10.1525/9780520407213-034

- Horn, H. S., (1968). "The adaptive significance of colonial nesting in the Brewer's Blackbird (Euphagus cyanocephalus)". *Ecology,* 49: 682–694. https://doi.org/10.2307/1935532

- Jayez, M., Hashemi, S. M., Nateghi, A. et al., (2019). "Anzo: The First Evidence of Paleolithic Cave Sites in the Northern Margin of the Iranian Central Desert, Semnan, Iran". *Archaeology,* 7(1): 1–5. http://article.sapub.org/10.5923.j.archaeology.20190701.01.html

- Jones, P. R., (1980). "Experimental Butchery with Modern Stone

Tools and Its Relevance for Palaeolithic Archaeology". *World Archaeology,* 12: 153–165. https://doi.org/10.1080/00438243.1980.9979789

- Kelly, R. L., (2013). *The Lifeways of Hunter-gatherers: the foraging spectrum.* 2nd ed. Cambridge University Press. https://doi.org/10.1017/CBO9781139176132

- Knutsson, H., Knutsson, K., Taipale, N., Tallavaara, M. & Darmark, K., (2015). "How shattered flakes were used: Micro-wear analysis of quartz flake fragments". *Journal of Archaeological Science: Reports* 2: 517–531. https://doi.org/10.1016/j.jasrep.2015.04.008

- Koch, J. & Schindler, B., (2012). "Flakes Giving you Lip? Let them Speak: An Examination of the Relationship Between Percussor Type and Lipped Platforms". *Archaeology of Eastern North America,* 40: 99–106. https://www.jstor.org/stable/23265137

- Kuhn, S. L. (1995). *Mousterian Lithic Technology: An Ecological Perspective.* Princeton, Princeton University Press. https://doi.org/10.1515/9781400864034

- Lee, R. B. & DeVore, I., (1968). *Man the Hunter.* New York: Routledge.

- Lin, S. C., Rezek, Z., Braun, D. & Dibble, H. L., (2013). "On the Utility and Economization of Unretouched Flakes: The Effects of Exterior Platform Angle and Platform Depth". *American Antiquity,* 78(4): 724–745. https://doi.org/10.7183/0002-7316.78.4.724

- Marreiros, J., Calandra, I., Gneisinger, W. et al., (2020). "Rethinking Use-Wear Analysis and Experimentation as Applied to the Study of Past Hominin Tool Use". *Journal of Paleolithic archaeology,* 3: 475–502. https://doi.org/10.1007/s41982-020-00058-1

- Marshall, L., (1976). *The !Kung of Nyae Nyae*. MA, Cambridge: Harvard University Press. https://doi.org/10.4159/harvard.9780674180574

- Moran, E. F., (2022). *Human Adaptability: An Introduction to Ecological Anthropology.* 4th ed. New York: Routledge.

- Nateqi, A., Hashemi, S. M., Abdollahi, A. et al., (2020). "Quaternary Deposits and the Paleolithic Sites on the Northern Edge of Iranian Central Desert: Introduction of the Newly-found Paleolithic Sites of Shour-e Qazi and Sar-Darreh". *Quaternary Journal of Iran,* 6(5): 153-183 (in Persian). https://doi.org/10.22034/irqua.2020.702363

- Noy-Meir, I., (1973). "Desert Ecosystems: Environment and Procedures". *Annual Review of Ecology and Systematics,* 4: 25-51. https://doi.org/10.1146/annurev.es.04.110173.000325

- Nymark, A., (2021). "Middle Palaeolithic technological adaptation in Montane Southwest Asia: a test of the Zagros Mousterian "Summer adaptation hypothesis". PhD thesis, Birkbeck, University of London (Unpublished; Defended in 2018).

- Ohnuma K. & Bergman C. A., (1982). "Experimental studies in the determination of flaking mode". *Bulletin of the Institute of Archaeology,* 19: 161–170.

- Orton, C., (2000). *Sampling in Archaeology.* Cambridge University Press. https://doi.org/10.1017/CBO9781139163996

- Pargeter, J. & Groucutt, H., (2023). "Variable Perspectives on 'Standardization in the Stone Age'". *Lithic Technology,* 48(4): 327–332. https://doi.org/10.1080/01977261.2023.2267386

- Parry, W. J. & Kelly, R. L., (1987). "Expedient Core Technology and Sedentism". In: *The Organization of Core Technology,* J. K. Johnson and C.A. Morrow (ed.): 285–304. Boulder, Westview Press.

- Railey, J. A., (2010). "Reduced mobility or the bow and arrow? Another look at "expedient" technologies and sedentism". *American Antiquity,* 75(2): 259–286. https://doi.org/10.7183/0002-7316.75.2.259

- Rosenberg-Yefet, T., Shemer, M. & Barkai, R., (2022). "Lower Paleolithic Winds of Change: Prepared Core Technologies and the Onset of the Levallois Method in the Levantine Late Acheulian". *Frontiers in Earth Science,* 10: 847358. https://doi.org/10.3389/feart.2022.847358

- Sadraei, A., Farjami, M., Zafaranlou, R. & Vahedi, H., (2022). "An Introduction to the Late Pleistocene Lithic Industries in the East of the Iranian Plateau in Light of the New Findings from Sarbisheh Plain". *Lithic Technology,* 47(4): 340–353. https://doi.org/10.1080/01977261.2022.2082028

- Semenov, S. A., (1970). "The Forms and Functions of the Oldest Tools: A Reply to Prof. F. Bordes". *Quartär,* 21: 1–20.

- Shea, J. J. (2023). "Chasing Mirages: Seeking Standardization among Prehistoric Stone Tools". *Lithic Technology,* 48(3): 270–277. https://doi.org/10.1080/01977261.2022.2136419

- Shoaee, M.-J., Vahdati Nasab, H. & Petraglia, M. D., (2021). "The Paleolithic of the Iranian Plateau: Hominin occupation history and implications for human dispersals across southern Asia". *Journal of Anthropological Archaeology,* 62: 101292. https://doi.org/10.1016/j.jaa.2021.101292

- Shoaee, M. J., Breeze, P. S., Drake, N. A., Hashemi, S. M. et al., (2023). "Defining paleoclimatic routes and opportunities for hominin dispersals across Iran". *PlosOne,* 18(3): e0281872. https://doi.org/10.1371/journal.pone.0281872

- Shott, M. J. & Sillitoe, P., (2005). "Use life and curation in New Guinea: experimental used rakes". *Journal of Archaeological Science,* 32: 653–663. https://doi.org/10.1016/j.jas.2004.11.012

- Soleymani, S. & Alibaigi, S., (2018). "Qaleh Kurd Cave: A Middle Paleolithic site on the western borders of the Iranian Central Plateau. Al-Rāfidān". *Journal of Western Asiatic Studies,* 39: 43–54.

- Timbrell, L., de la Peña, P., Way, A. et al., (2022). "Technological and geometric morphometric analysis of 'post-Howiesons Poort points' from Border Cave, KwaZulu-Natal, South Africa". *Quaternary Science Reviews,* 297: 107813. https://doi.org/10.1016/j.quascirev.2022.107813

- Vahdati Nasab, H. & Feiz, Z., (2014). "Reconnaissance survey in the Northern margins of Iranian Central Desert between Semnan and Sorkheh". *Proceedings of the twelfth Annual Meeting of Archaeology,* 465–468 (in Persian).

- Vahdati Nasab, H. & Clark, G. A., (2014). "The Upper Paleolithic of the Iranian Central Desert: the Delazian Site, a Case Study". *AMIT,* Band 46: 1–20.

- Vahdati Nasab, H. & Hashemi, M., (2016). "Playas and Middle Paleolithic settlement of the Iranian Central Desert: The discovery of the Chah-e Jam Middle Paleolithic site". *Quaternary International,* 408(B): 140–152. https://doi.org/10.1016/j.quaint.2015.11.117

- Vahdati Nasab, H., Mollasalehi, H., Saeedpour, M. & Jamshidi, N., (2009). "Paleolithic Levalloisian assemblages from Boeen Zahra in the Qazvin Plain (Iran)". *Antiquity,* 83(320), Project Gallery.

- Vahdati Nasab, H., Clark, G. A. & Torkamandi, S., (2013). "Late Pleistocene dispersal corridors across the Iranian Plateau: a case study from Mirak, a Middle Paleolithic site on the northern edge of the Iranian Central Desert (Dasht-e Kavir)". *Quaternary International,* 300: 267–281. https://doi.org/10.1016/j.quaint.2012.11.028

- Vahdati Nasab, H., Berillon, G., Jamet, G., Hashemi, M. et al., (2019). "The Open-Air Paleolithic Site of Mirak, Northern Edge of the Iranian Central Desert (Semnan, IRAN): Evidence of repeated human occupations during the late Pleistocene". *Comptes Rendus Palevol,* 18(4): 465–478. https://doi.org/10.1016/j.crpv.2019.02.005

- Vahdati Nasab, H., Berillon, Hashemi, S. M. et al., (2024). "Qaleh Kurd Cave (Qazvin, Iran): Oldest Evidence of Middle Pleistocene Hominin

Occupations and a Human Deciduous Tooth in the Iranian Central Plateau”. *Journal of Paleolithic Archaeology,* 7(16): https://doi.org/10.1007/s41982-024-00180-4

- Weiss, M., (2020). “The Lichtenberg Keilmesser: it’s all about the angle”. *PLoS ONE,* 15(10): e0239718. https://doi.org/10.1371/journal.pone.0239718

- Withrow, R. M., (1983). “An analysis of Lithic Resource Selection and Processing at the Valley View site (47 LC 34)”. Unpublished Master’s thesis. Department of Anthropology, University of Minnesota.

- Yang, X., Liu, S., Yang, T. et al., (2016). “Spatial-temporal dynamics of desert vegetation and its responses to climatic variations over the last three decades: a case study of Hexi region in Northwest China”. *Journal of Arid Land,* 8(4): 556–568. https://doi.org/10.1007/s40333-016-0046-3

- Yellen, J .E., (1977). “Long term hunter-gatherer adaptation to desert environments: a biogeographical perspective”. *World Archaeology,* 8(3): 262–274. https://doi.org/10.1080/00438243.1977.9979672

- Yellen, J. E. & Lee, R. B., (1976). “The Dobe-/Du/Da environment: background to a hunting and gathering way of life”. In: *Kalahari Hunter-Gatherers: Studies of the !Kung San and their neighbors,* R.B. Lee & I. DeVore (eds.): 27–46. MA, Cambridge: Harvard University Press. https://doi.org/10.4159/harvard.9780674430600.c4

پژوهش‌های باستان‌شناسی ایران
فصلنامهٔ علمی پژوهش‌های باستان‌شناسی ایران
P. ISSN: 2345-5225 & E. ISSN: 2345-5500
نشانی پایگاه نشریه: https://nbsh.basu.ac.ir
شمـــارهٔ ۴۱، دورهٔ چهاردهـــم، تابستان ۱۴۰۳

معرفی چشم‌انداز نویافتهٔ پارینه‌سنگی بولان در شمال مخروط‌افکنهٔ ایوانکی با تمرکز بر تحلیل گونه-فن‌شناسی

سید میلاد هاشمی‌سروندی[I]، اصغر ناطقی[II]، عالیه عبداللهی[III]، میراحمد زوارموسوی‌نیاکی[IV]

شناسهٔ دیجیتال (DOI): https://dx.doi.org/10.22084/NB.2024.28685.2642
تاریخ دریافت: ۱۴۰۲/۰۹/۲۷، تاریخ بازنگری: ۱۴۰۳/۰۲/۰۸، تاریخ پذیرش: ۱۴۰۳/۰۲/۲۴
نوع مقاله: پژوهشی
صص: ۳۹-۷

چکیده

یافته‌های دو دههٔ اخیر در شمال دشت کویر، اهمیت این پهنه را در دوران پلیئستوسن نشان می‌دهد و پیشنهاد می‌کند که این بخش از فلات ایران به‌دلیل نوسانات اقلیمی-محیطی در گذشته، شرایط متفاوتی با امروز داشته است؛ بدین‌گونه که در بُرهه‌های زمانی با شرایط مناسب، پذیرای جمعیت‌های انسانی بوده است. برهمین‌اساس، فرضیهٔ گذرگاهِ پراکنشیِ حاشیهٔ شمالی دشت کویر مطرح شد. با این‌وجود، اطلاعات در دسترس از جمعیت‌های انسانی دوران پلیئستوسن در این پهنهٔ اندک و محدود به بخش‌های شرقی و غربی آن است و اطلاعات چندانی از بخش مرکزی، منطبق با استان‌های البرز، تهران و بخش غربی از استان سمنان امروزی، به‌جز چند محوطهٔ بالادست در بخش‌های ناهموار شمالی در دست نیست. شواهد پایین‌دست هم به چشم‌انداز شورقاضی محدود می‌شود. به‌همین‌دلیل، بررسی پیمایشیِ پارینه‌سنگی در پهنهٔ کوچکی از بخش مرکزی در محدودهٔ شهرستان امروزی ایوانکی با اهداف اصلی مشخص کردن وضعیت این بخش از گذرگاه شمالی در دوران پلیئستوسن و بررسی درجهٔ پیوستگی و حضور چشم‌اندازهای پارینه‌سنگی در این گذرگاه و در نتیجه، تقویت یا تضعیف فرضیهٔ مطرح‌شده، انجام شد. در نتیجهٔ انجام بررسی پیمایشی فشرده با پای پیاده و نمونه‌برداری به روش ترکیبیِ طبقه‌بندی‌شدهٔ متناسب (اتفاقی) و روش سازشی، پراکنش‌های گسترده‌ای از دست‌ساخته‌های سنگی ثبت شدند. در اینجا، یکی از این پراکنش‌های سطحی، -محوطهٔ بولان- معرفی شده و مجموعهٔ دست‌ساخته‌های سنگی آن مورد بررسی قرار گرفته است. نتایج مقدماتی پیشنهاد می‌دهد که براساس روش تحلیل گونه-فن‌شناسی و گاهنگاری مقایسه‌ای، می‌توان حضور جمعیت‌های انسانی در دوره‌های پارینه‌سنگی میانی و جدید با دو سنت ابزارسازی متفاوت، اما درهم‌آمیخته را در اینجا تشخیص داد. علاوه‌بر آن، به‌طورکلی، سنت ابزارسازی در بولان به‌صورت ابزارسازی غیررسمی و فرصت‌طلبانه بوده است. درنهایت، یافت‌شدن چشم‌اندازهای وسیع پارینه‌سنگی در بخش مرکزی از شمال دشت کویر به تقویت فرضیهٔ گذرگاه شمالی در دل فلات ایران انجامید.

کلیدواژگان: بخش شمالی از دشت کویر مرکزی، گذرگاه پراکنش در دوران پلیئستوسن، پهنهٔ ایوانکی، دوران پارینه‌سنگی میانی و جدید، دست‌ساخته‌های سنگی.

I. استادیار گروه باستان‌شناسی، دانشکدهٔ علوم انسانی، دانشگاه تربیت مدرس، تهران، ایران (نویسندهٔ مسئول).
Email: m.hashemisarvandi@modares.ac.ir
II. دانش‌آموختهٔ کارشناسی‌ارشد باستان‌شناسی، گروه باستان‌شناسی، دانشکدهٔ ادبیات و علوم انسانی واحد تهران مرکز، دانشگاه آزاد اسلامی، تهران، ایران.
III. دانش‌آموختهٔ کارشناسی‌ارشد باستان‌شناسی، گروه باستان‌شناسی، دانشکدهٔ ادبیات و علوم انسانی واحد تهران مرکز، دانشگاه آزاد اسلامی، تهران، ایران.
IV. دانش‌آموختهٔ کارشناسی ارشد باستان‌شناسی، گروه باستان‌شناسی، مؤسسهٔ آموزش عالی مارلیک، نوشهر، ایران.

ارجاع به مقاله: هاشمی، سید میلاد؛ ناطقی، اصغر؛ عبداللهی، عالیه؛ و زوارموسوی‌نیاکی، میراحمد، (۱۴۰۳). «معرفی چشم‌انداز نویافتهٔ پارینه‌سنگی بولان در شمال مخروط‌افکنهٔ ایوانکی با تمرکز بر تحلیل گونه-فن‌شناسی». پژوهش‌های باستان‌شناسی ایران، ۱۴(۴۱): ۷-۳۹. doi: 10.22084/nb.2024.28685.2642

صفحهٔ اصلی مقاله در سامانهٔ نشریه:
https://nbsh.basu.ac.ir/article_5724.html?lang=fa

فصلنامهٔ علمی گروه باستان‌شناسی دانشکدهٔ هنر و معماری، دانشگاه بوعلی‌سینا، همدان، ایران.