

BRIDGING THE GAP: NEW PALEOLITHIC EVIDENCE FROM THE MAKRAN CORRIDOR, SOUTHEASTERN IRAN

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Abstract: Recent systematic surveys in the Dashtyari Basin, situated along the northern hinterlands of the Makran coast in southeastern Iran, have yielded the first comprehensive body of evidence for Lower and Middle Paleolithic occupations in this strategically significant region. Five key localities were documented and analyzed through a detailed typo-technological study of 225 lithic artifacts. Raw materials predominantly comprise fine-grained chert and siliceous limestone, complemented by minor occurrences of calcareous sandstone, quartzite, and quartz. Technological analysis, utilizing the chaîne opératoire, identifies distinct cultural and technological signatures that provide valuable context for interpreting the patterns of Pleistocene human activity across the Makran corridor. The results establish southeastern Iran, and the Makran region specifically, as a critical, yet underrecognized corridor that facilitated the broader Pleistocene dispersal of populations moving from the Arabian Peninsula and Levant toward South and East Asia. The newly identified industries fill a major geographic and cultural gap between well-documented Paleolithic sequences west of the Western Pakistan and Indus Valley, and emerging evidence along the Strait of Hormuz. This study demonstrates that Makran was not merely a transit zone but a dynamic cultural landscape occupied by hunter-gatherer groups who exploited local raw materials, established repeated activity loci, and contributed to the technological mosaic of Southwest Asia during the Lower, Middle, and potentially early Upper Paleolithic periods.

Keywords: Southeastern Iran, Makran, Lower Paleolithic, Middle Paleolithic, MP-UP Transition, Pleistocene Dispersal.

چکیده: کاوش‌های روشمند اخیر در حوضه دشتیاری، واقع در نواحی داخلی شمالی ساحل مکران در جنوب شرقی ایران، نخستین مجموعه شواهد جامع از استقرارهای پارینه‌سنگی زیرین و میانی را در این منطقه راهبردی آشکار کرده‌اند. پنج محوطه کلیدی مستندسازی و از طریق مطالعه دقیق تیپو-تکنولوژیک بر روی ۲۲۵ قطعه سنگی تحلیل شدند. مواد خام عمدتاً شامل چرت‌های ریزدانه و آهک سیلیسی بوده و در کنار آن‌ها نمونه‌های اندکی از ماسه‌سنگ آهکی، کوارتزیت و کوارتز نیز شناسایی شد. تحلیل تکنولوژیک با بهره‌گیری از رویکرد زنجیره عملیات (chaîne opératoire)، شاخص‌های فرهنگی و فناوریانه متمایزی را شناسایی می‌کند که زمینه مهمی برای تفسیر الگوهای فعالیت انسان‌های پلیستوسن در پهنه مکران فراهم می‌سازد. نتایج، جنوب شرقی ایران و به‌ویژه منطقه مکران را به‌عنوان یک گذرگاه حیاتی اما کمتر شناخته‌شده معرفی می‌کند که در جابه‌جایی‌های گسترده انسان‌های پلیستوسن از شبه‌جزیره عربستان و لوانت به سوی جنوب و شرق آسیا نقش‌آفرینی کرده است. صنایع تازه‌شناسایی‌شده، شکاف عمده جغرافیایی و فرهنگی میان توالی‌های شناخته‌شده پارینه‌سنگی در غرب پاکستان و دره سند و شواهد نوظهور در تنگه هرمز را پر می‌کنند. این پژوهش نشان می‌دهد که مکران صرفاً یک گذرگاه نبوده، بلکه چشم‌انداز فرهنگی پویایی بوده است که گروه‌های شکارچی-گردآورنده در آن به بهره‌برداری از مواد خام بومی، ایجاد کانون‌های فعالیت مکرر، و مشارکت در تنوع فناوریانه جنوب‌غرب آسیا طی دوره‌های پارینه‌سنگی زیرین، میانی و احتمالاً اوایل پارینه‌سنگی پسین پرداخته‌اند.

کلیدواژه: جنوب شرقی ایران، مکران، پارینه‌سنگی زیرین، پارینه‌سنگی میانی، گذار پارینه‌سنگی میانی به پسین، جابه‌جایی‌های پلیستوسن.

I. Introduction

Understanding the pathways through which Pleistocene hominin populations dispersed across Southwest and South Asia remains one of the central debates in Paleolithic archaeology. Among the routes proposed for the early expansion beyond Africa, the coastal migration pathway—extending from the Bab al-Mandab Strait, along the southern and eastern shores of the Arabian Peninsula, and onward toward the Strait of Hormuz—has gained increasing scholarly attention (Zarei et al., 2013). This so-called “Southern Dispersal Route” is considered a plausible ecological corridor, offering access to freshwater sources, predictable coastal resources, and ecologically stable habitats during

periods of pronounced climatic fluctuation (Field et al., 2007; Petraglia & Rose, 2009; Scerri et al., 2018).

Within this broader framework, the Strait of Hormuz represents a critical geographical nexus, connecting the Arabian Peninsula with the complex mosaic of coastal and terrestrial habitats in southern Iran. This strategic position marks it as a key area for investigating Pleistocene population dynamics and dispersal routes, including movements into the Makran region and beyond to the Indian subcontinent (Dennell & Petraglia, 2012).

A growing body of paleoenvironmental and archaeological research highlights the diversity of ecological niches—including coastal zones, river

networks, and interior basins—that early human groups could exploit (Boivin et al., 2013; Roberts et al., 2024), with the Makran offering a combination of these resources.

Despite the theoretical importance of this corridor, the southeastern regions of the Iranian Plateau—particularly Makran—have remained poorly explored in terms of Paleolithic archaeology. This relative gap has left significant uncertainties regarding the cultural, technological, and demographic processes that shaped human presence along this segment of the northern Indian Ocean rim. Filling this void is essential for reconstructing not only the tempo and direction of hominin dispersals, but also the regional cultural trajectories that unfolded during the Lower, Middle, and early Upper Paleolithic periods.

Recent discoveries of lithic assemblages attributed to the Lower and Middle Paleolithic along the coasts and hinterlands of the Makran region have underscored its significant role during the Pleistocene. Undoubtedly, Makran—situated at the interface of the West and South Asia—served as a key corridor for the dispersal of hominin groups moving from western Asia toward the Indian subcontinent and southern Asia. Its unique coastal position, functioning as a natural bridge between the Iranian Plateau and the subcontinent, combined with the availability of freshwater sources and diverse ecological niches, rendered it one of the most plausible routes associated with the Southern Dispersal Pathway.

The recently documented assemblages, which include diagnostic Paleolithic lithic artifacts recovered from the Makran coastline, further support the hypothesis that this natural corridor hosted mobile hunter-gatherer populations who, in response to Pleistocene climatic fluctuations and in search of subsistence resources, traversed the region while transmitting technological and cultural knowledge into newly occupied landscapes. Consequently, the study of this area not only contributes substantially to reconstructing early migration patterns but also, pending systematic excavation and absolute dating, has the potential to clarify the timing and mechanisms of the initial hominin expansion into South Asia.

Based on current Paleolithic evidence, this region allows for the examination of two major hypotheses: (1) the entry of hominin groups through the Strait of Hormuz and the northern shores of the Persian Gulf, and (2) dispersal from the western Zagros followed by southeastward movement along the mountain range into southeastern Iran. These natural corridors, which would have alternately expanded or contracted in response to sea-level fluctuations, likely functioned as key pathways guiding human movements toward northern Makran. Thus, research in the Makran region not only provides valuable cultural data but also contributes significantly to our broader understanding

of the earliest phases of human occupation across Iran and Asia.

II. Paleolithic Research in Iranian Makran

During geological investigations conducted between 1974 and 1976 along the Makran coast by Vita-Finzi, four archaeological sites were identified. The lithic artifacts collected from these sites—located in the Kuestak, Sadich, and Konarak areas—constitute the earliest evidence of Middle Paleolithic cultural traditions along the southern coast of Iran (Vita-Finzi & Copeland, 1980). Subsequently, in the spring of 1977, a joint French–Iranian expedition led by Thibault and Kadjar conducted geological surveys along the coastal and hinterland areas of the northern shores of the Strait of Hormuz and the Makran Sea. During these investigations, the team identified evidence dating to the Lower and Middle Paleolithic, as well as the Late Paleolithic, in the regions of Hasan-Langi, Roudan, Minab, and Sadich (Thibault, 1977; Zarei, 2021a, b, n.d.).

After nearly three decades without substantial follow-up to the Paleolithic discoveries reported by earlier geological teams in the Makran region, Dashtizadeh identified five Lower and Middle Paleolithic sites around Mount Zendan in the Minab Plain during the winter of 2008 (Dashtizadeh, 2012a). He subsequently recorded an additional five sites of Lower and Middle Paleolithic date in the Rudan Plain (Dashtizadeh, 2012b). In the summer of 2009, archaeological surveys conducted in the central district of Konarak County under the direction of Ali Talash led to the identification of four Lower and Middle Paleolithic sites (Ali Talash, 2012). Saadatian, during archaeological surveys in the Tis region, also documented a Lower–Middle Paleolithic locality situated on a river terrace (Saadatian, 2018). In the autumn of 2019, Zarei reported a Lower-Middle Paleolithic site located in the Sirik hinterlands, in the Shawaz area (Zarei, 2019) (Fig. 1).

III. Study Region

III.1. Natural Setting of Makran Zone

The Iranian Makran region, located along the southeastern coast of Iran and adjoining the northern Indian Ocean, represents a tectonically active margin of exceptional geological complexity. Its geology and geomorphology not only shape the prehistoric settlement landscape but also provide critical context for the Pleistocene human occupations discussed in this study. The Makran coast forms part of the northern segment of the Makran Subduction Zone (MSZ), where the oceanic lithosphere of the Arabian Plate subducts beneath the Eurasian Plate at a rate of approximately 2–4 cm per year (Burg, 2018).

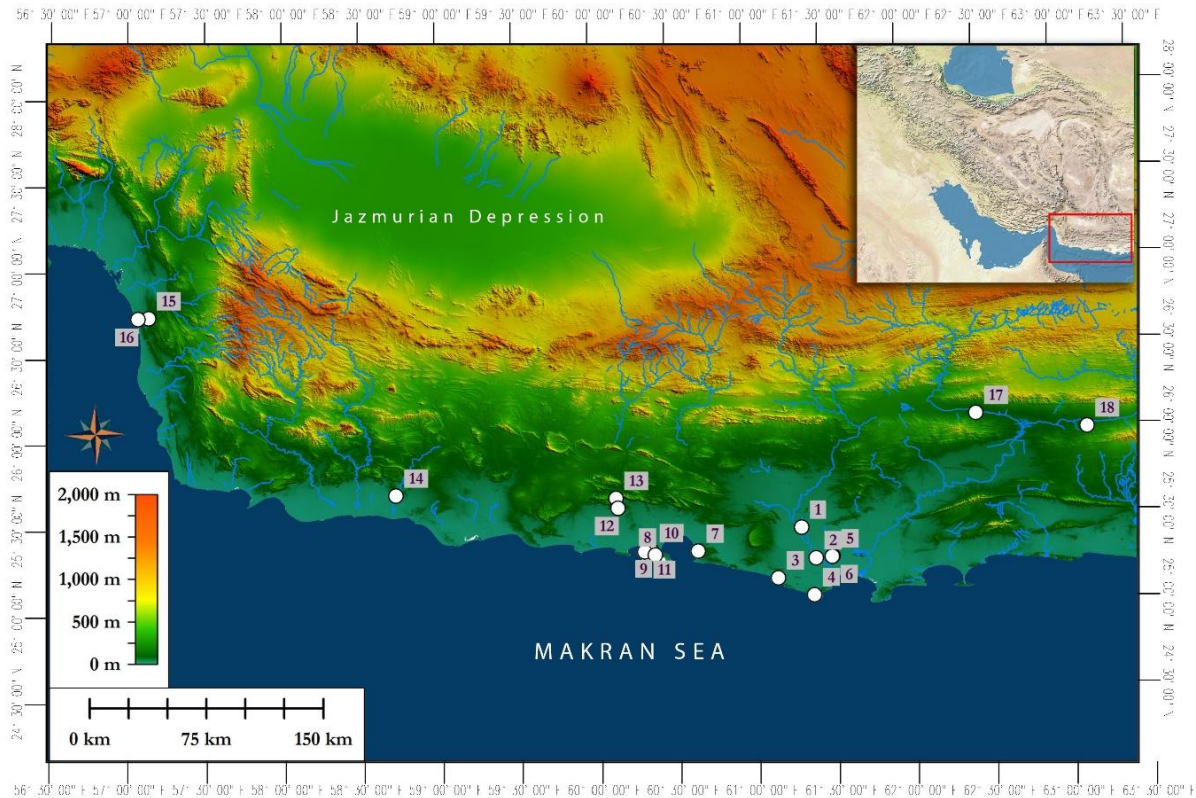


Figure 1: Topographic Map of Southeastern Iran, Coastal Makran Zone, showing Paleolithic Localities; 1) Kolorai, 2) Koulani, 3) Koupal, 4) Poshet, 5) Terap, 6) Terap Tappeh, 7) Siahgar (Tis), 8) SE Konaral, 9) Kuh-e Pazm 3, 10) Kuh-e Pazm 2, 11) NW Konark, 12) Angour Abad, 13) Ziyarat-e Goden 4, 14) Sadich, 15) Shawaz, 16) Kuhestak, 17) Shahi Tumb, 18) Miri Qalat.

The Makran Zone is located south of the Jazmurian Depression. Its western boundary is defined by the Minab Fault, while it is bordered to the south by the northern Indian Ocean and to the east by the Pakistani frontier, although geologically it continues seamlessly into Pakistan with comparable lithological and stratigraphic characteristics. Along the northern margin of the zone, a series of east–west–trending faults and thrust systems mark the structural boundary, among which the Bashkard and Fannuj faults constitute the most prominent tectonic features (McCall, 2002; Burg, 2018).

A portion of the coastal Makran region is composed of Miocene marl units, Miocene–Pliocene marl–sandstone formations, sandy and silty alluvial-fan deposits, and shell-bearing marine sediments. The stratigraphic succession of the study area comprises four principal components: Miocene units, Mio–Pliocene formations, Pliocene deposits, and Quaternary sediments, the latter representing post-Pliocene accumulations that overlie the Pliocene conglomerates in the regional stratigraphic column. The present geological configuration of the Makran is largely the result of tectonic processes associated with the late Tertiary orogeny and the continued development of the Makran accretionary prism (McCall, 2002; Burg, 2018; Aghanabati et al., 2023).

III.2. Dashtyari

The Dashtyari County is located at the southeasternmost extremity of Iran, in the southern coastal part of Baluchestan. It is bordered by Pakistan to the east, the counties of Sarbaz and Nikshahr to the north, Chabahar County to the west, and the southern expanse of the Makran coast.

Dashtyari County is characterized by the presence of coastal zones and extensive hinterland plains stretching from the shores of the Makran Sea to the border with Pakistan. Within this geographical setting, river systems constitute the most prominent natural landforms and consistently represent prime locations for identifying and investigating archaeological settlements.

The hydrological cycle in Dashtyari is governed by the movement and distribution of water originating from several primary sources. Two major rivers—the Bahou, headwater of the well-known Sarbaz River, and the Kajou River arising from the Makran highlands (also referred to as the Shah and Dashtyari highlands)—converge to form the large Mazan-Kawr River. This river ultimately drains into the Gwatar Bay.

IV. 2018-2025 Archaeological Survey

Based on a portion of the survey and documentation project conducted in Dashtyari County, a total of 60 sites—including settlements, fortifications,

archaeological areas, mounds, cemeteries, and an ancient harbor—were identified and recorded. The relative chronology of these sites ranges from the Lower Paleolithic to the Islamic period (Hessari, 2018).

The first phase of the archaeological expedition in Dashtyari was carried out according to the project framework approved by the Provincial Office of Cultural Heritage, Handicrafts, and Tourism of Sistan and Baluchestan. The survey method followed a systematic pedestrian approach, conducted along numbered map transects covering the southeastern sector of the study area, extending across both the Makran coastline and the adjacent hinterlands.

Among the archaeological sites identified during the

survey, five localities were attributed to the Paleolithic period and were subsequently documented in detail (Fig. 2). The study assemblage comprises the Paleolithic occupation sites of Koulani, Kolorai, Terap, Poshet, and Koupal (Fig. 3), all located within Dashtyari County. The lithic industries recovered from these sites were first recorded through systematic technological and typological documentation and were then subjected to analytical, interpretive, and relative chronological assessment based on comparative study. On this basis, the research ultimately proposes the cultural and technological affiliations of the Paleolithic human groups represented in the Makran region.

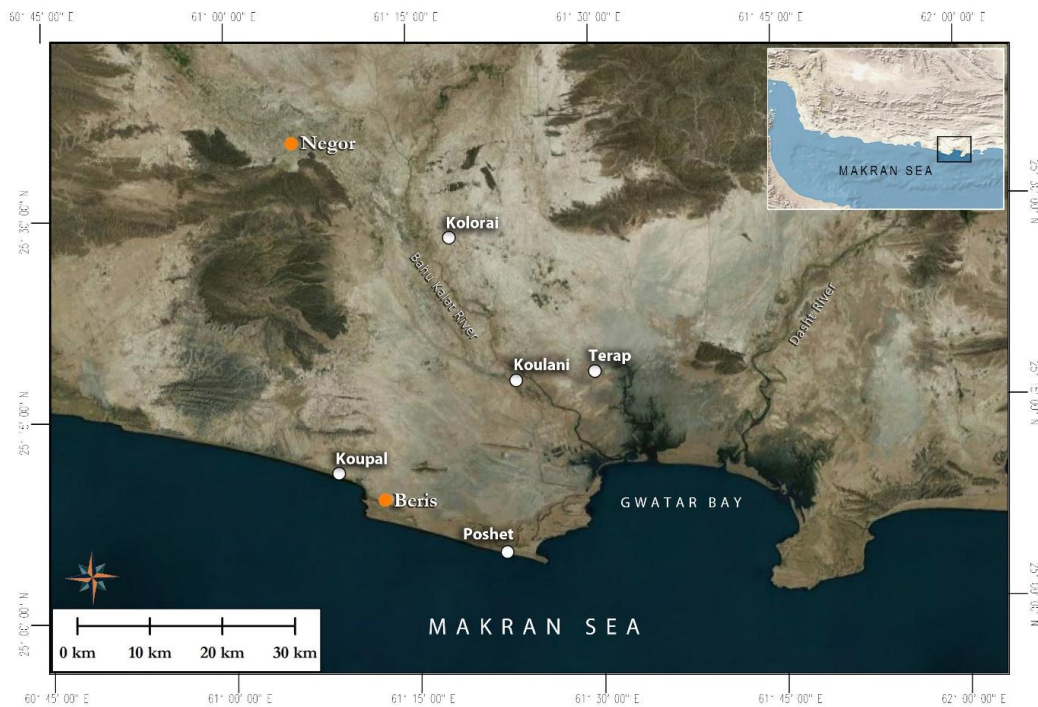


Figure 2: Satellite Image of the Coastal Makran and Paleolithic Localities.

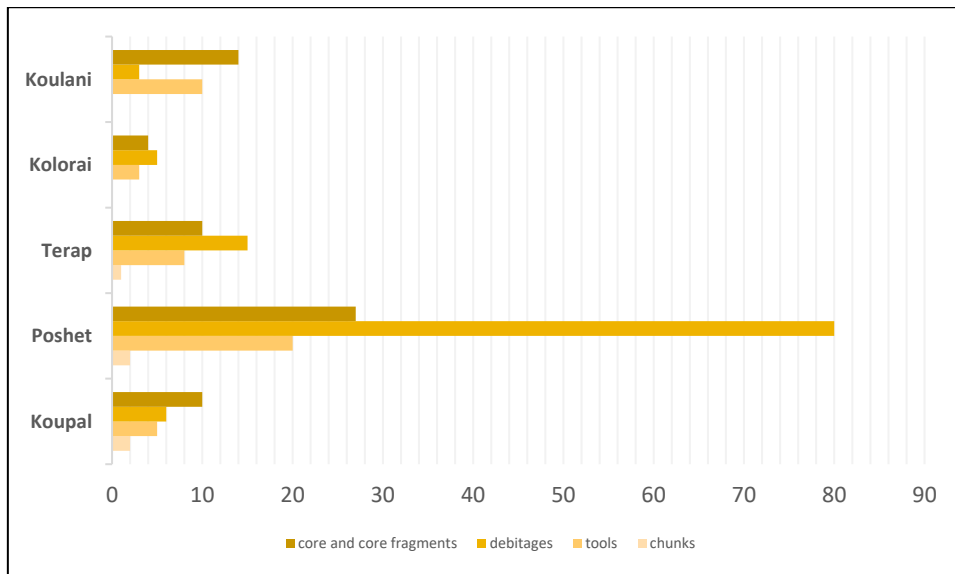


Figure 3: Lithic Assemblages from the Paleolithic Localities.

V. Sites and Findings

V.1. Koulani

The Koulani locality, designated as site no. 02.046, was identified and formally registered during the survey. The site is situated west of the village of Koulani, approximately 200 meters south of the Koulani Fath-e Sepah military post. The occupation area measures roughly 150 meters in length and 40 meters in width, and contains a scatter of lithic artifacts characteristic of the Paleolithic period (Fig. 4). This site is situated on a sedimentary surface, and no local sources of cobbles suitable for the production of the recovered tools are present in its immediate vicinity. At present, gravel and cobble raw materials must be obtained from locations approximately 30 kilometers away. The highest concentration of artifacts occurs in the central portion of the site. This concentration extends across an area of roughly 300 meters.

The Koulani assemblage consists of 27 specimens, all exhibiting a moderate degree of surface patination. The collection comprises 14 cores, 3 debitage pieces, and 10 tools. The raw materials used are predominantly limestone and siliceous limestone, with occasional occurrences of medium- to fine-grained calcareous sandstone, displaying a color spectrum ranging from grey-green and grey-buff to dark grey. Based on the preserved cortical surfaces and unmodified portions on both cores and flakes, the selected raw materials appear to have been rounded or sub-rounded cobbles.

The core assemblage (Fig. 5) comprises 14 specimens, including 13 flake cores and one core-on-flake (Fig. 6:1). All specimens retain cortical surfaces, and 12 of them preserve more than 50% cortex. The general morphology of the cores falls into two principal categories: unifacial cores (8 specimens) and bifacial cores (6 specimens). Based on the type of striking platform and the directionality of flake removals, the cores can be classified into three groups: unidirectional (11 specimens), multi (2 specimens), and one bidirectional-opposed core. One of the single-platform examples exhibits convergent flake removals. The cores were produced on elongated, rounded cobbles. Flaking angles on most specimens range between 80° and 100°, while two cores exhibit additional angles of 30°, 45°, and 60°. The cores measure between 87 and 159 mm in length, with an average weight of approximately 1,497.5 g. Negative flake scars wider than 5 mm—occasionally exceeding 10 removals—are present on several specimens. The core-on-flake was produced on a secondary flake detached from a cobble; approximately

75% of its dorsal surface retains cortex, and the striking platform is likewise cortical. The flake measures 72 mm in length and 58 mm in width, with two removals present—one from the dorsal surface and another along the left margin of the ventral surface.

The debitage consists of three flakes (Fig. 6:2, 7:1). Their lengths range from 34 to 104 mm, and their widths from 42 to 54 mm. All three flakes retain cortex: one specimen is a primary flake, while the other two preserve between 25% and 50% cortex. The primary flake has a linear striking platform, and another example exhibits a partly cortical platform.

The tool component of the assemblage comprises ten specimens: seven core-choppers (Fig. 7:2-3, 8), one heavy-duty scraper, one burin (Fig. 6:3), and one naturally broken piece with alternating retouch. As noted earlier, core-choppers represent the dominant tool type in this assemblage, all of which were produced on cobbles. Between two and seven removals were applied to create functional cutting edges, generally with flake-scar angles of 30–45°, occasionally reaching 60°. The core-choppers range in length from 97 to 165 mm, with an average weight of 1,072.14 g.

The heavy-duty scraper (Fig. 8:4) was manufactured on a cobble measuring 116 × 68 mm and weighing 1,309 g. Approximately 50% of its surface retains cortex. More than ten removals wider than 5 mm were detached from two faces at angles between 30° and 45°. The burin was produced transversely on the distal end of the ventral surface of a primary flake. This flake, with a cortical striking platform, measures 103 mm in length and 88 mm in width. Finally, a naturally broken piece with alternating and scattered retouch was identified; the remaining portion measures 61 mm in length and 49 mm in width.

The dominant technology represented in this assemblage is direct hard-hammer percussion using a hard hammer. In several cases, bipolar anvil technology was also identified, including one bidirectional-opposed core formed through the bipolar anvil technique. Among the striking platforms recorded, two are cortical, one is partly cortical, and one is linear.

The assemblage exhibits two general flaking strategies. The first group includes cores with flake removals executed at an average angle of approximately 90°. The second group includes cores on which removals were carried out at angles between 30° and 45° in order to produce functional working edges; these belong to the category of chopping tools known as core-choppers.



Figure 4: Koulani Paleolithic Settlement; view from the West.

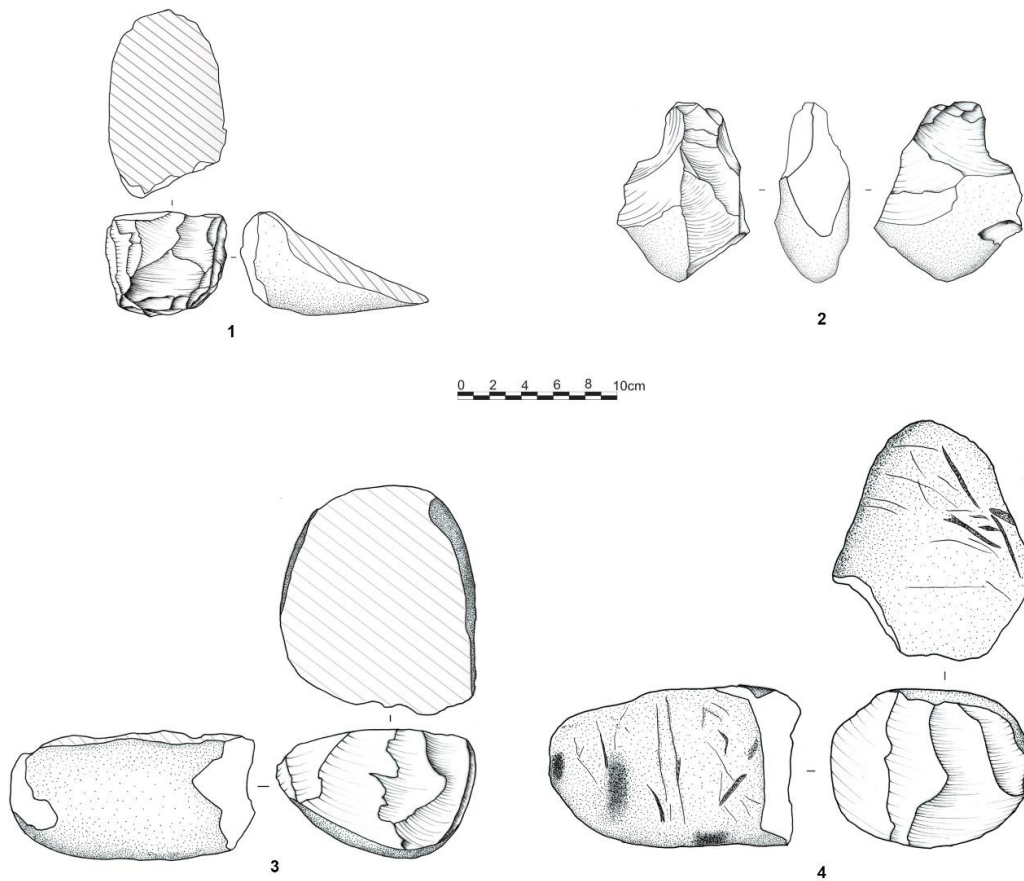


Figure 5: Drawing of Selected Lithic artifacts from the Koulani Assemblage; 1) bipolar anvil core, 2) anvil core, 3,4) unidirectional cores.

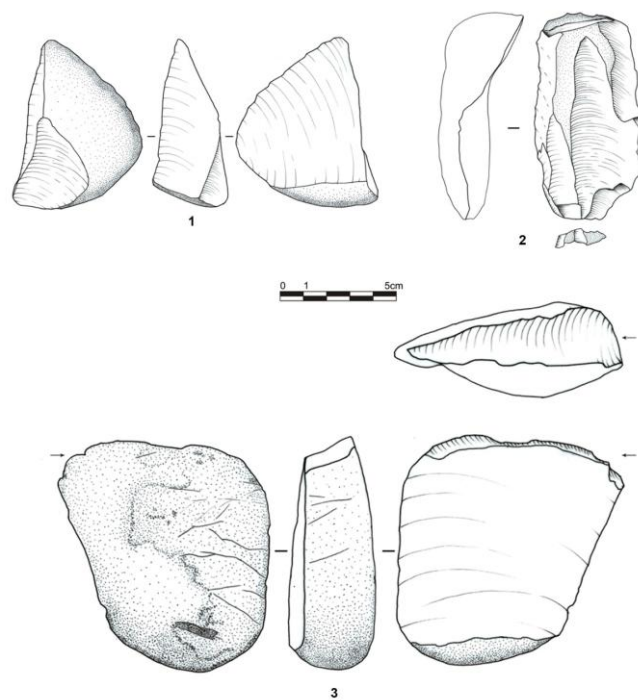


Figure 6: Drawing of Selected Lithic artifacts from the Koulani Assemblage; 1) core-on-flake, 2) cortical flake with partly cortical butt, 3) burin on primary flake.



Figure 7: Selected Lithic artifacts from the Koulani Assemblage; 1) flake with some cortex, 2,3) unifacial core-choppers.

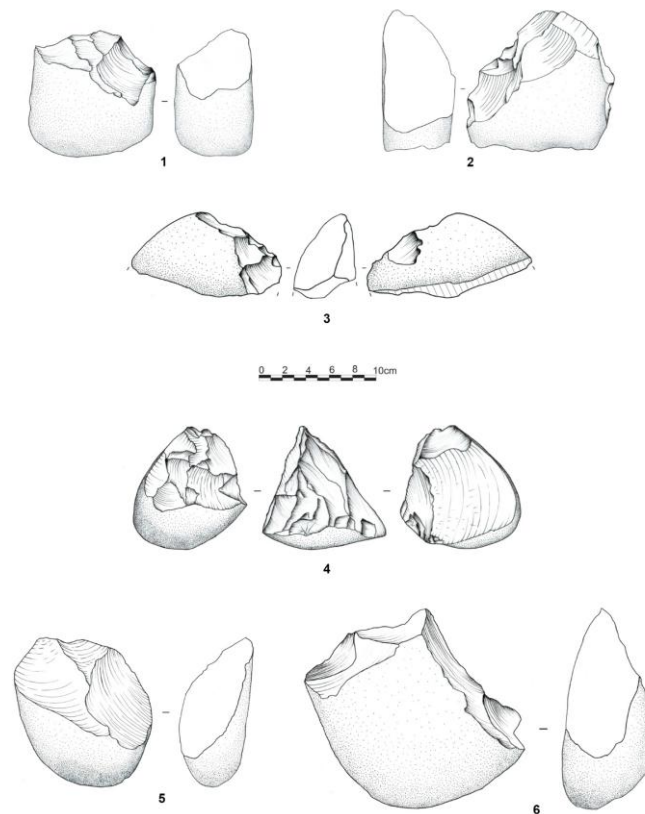


Figure 8: Drawing of Selected Lithic artifacts from the Koulani Assemblage; 1,2,5,6) unifacial core-chopper, 3) bifacial core-chopper, 4) heavy-duty scraper.

V.2. Kolorai

The Kolorai locality (Fig. 9), designated as site no. 02.43, was identified and formally registered during the survey. The Kolorai site lies along the alignment of the Seyyed Bokhari shrine, approximately 1,500 m south of the Rimdan road and 2,000 m east of Kolorai village. It is an extensive archaeological area and, in comparison with other sites in the region, appears considerably larger in size. In the vicinity of this locality, two hutaks are present, both of which are now almost entirely filled with wind-blown sand. The site itself is exceptionally flat and level, forming a smooth, uninterrupted surface.

The Kolorai assemblage consists of 12 specimens, all exhibiting a moderate degree of surface patination. The collection includes 4 cores, 5 debitage, and 3 tools. The raw materials used are predominantly limestone, with occasional specimens made of medium-grained siliceous limestone, displaying color variations from grey-brown to dark grey. Based on the preserved cortical surfaces and unmodified areas on both cores and flakes, the selected raw materials were rounded or sub-rounded cobbles.

The Kolorai core assemblage consists of four specimens, all of which are flake cores. Each specimen retains a cortical surface, and three of them preserve

more than 50% cortex. The overall morphology of the cores can be grouped into two categories: unifacial cores (three specimens) and bifacial cores (one specimen). Based on striking-platform configuration and flake-removal direction, the cores fall into two technological groups: unidirectional (three specimens) and one bidirectional-opposed core. All cores were produced on cobbles ranging from sub-angular to fully rounded forms. The flaking angles on the unifacial cores range between 30°, 45°, and 90°, while the bidirectional core exhibits flaking at approximately 90°. Core lengths range from 68 to 115 mm, with an average weight of 666.75 g. The unidirectional unifacial cores bear two flake scars wider than 5 mm, whereas the bifacial bidirectional core carries six scars exceeding 5 mm in width.

The debitage consists of five flakes. Their lengths range from 36 to 128 mm, and their widths from 43 to 104 mm. Among them, one specimen is a cortical primary flake representing the earliest stage of reduction. A particularly large flake measuring 128 mm long, 104 mm wide, and 45 mm thick is a large flake that weighs 661 g—substantially heavier than the next heaviest flake, which weighs 62 g. The large flake exhibits a flat ventral surface without a pronounced

bulb of percussion, indicating that it was a side-struck flake from a large core (Fig. 10).

The tool component consists of three core-choppers (Fig. 11): two unifacial and one bifacial specimen. Their lengths range from 71 to 132 mm and their widths from 72 to 89 mm, with an average weight of 490 g. The flaking angles range from 30°, and in one case 45°. The number of removals wider than 5 mm varies between one and seven. All three core-choppers were produced

on cobbles, and between 50% and 75% of their surfaces preserve cortex.

The only reduction technology identified in the assemblage is direct percussion using a hard hammer. Among the five recorded striking platforms, three are cortical, one is plain, and one is punctiform. No evidence of core or platform preparation was observed in this assemblage.



Figure 9: Kolorai Paleolithic Settlement; view from the Northwest.



Figure 10: Lithic artifact from the Kolorai Assemblage; a large side-struck flake.

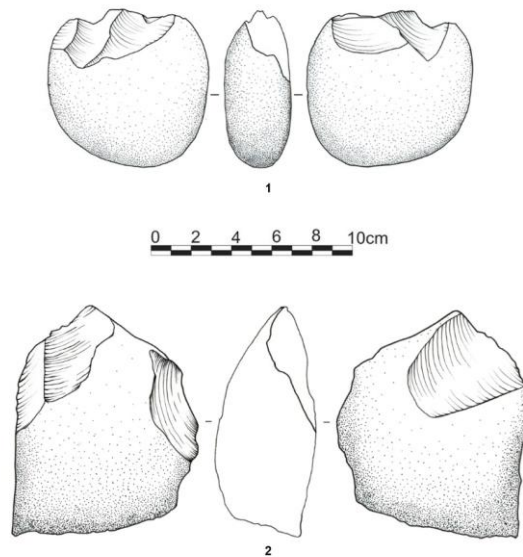


Figure 11: Drawing of Selected Lithic artifacts from the Kolorai Assemblage; 1,2) bifacial core-chopper.

V.3. Terap

The Terap locality (Fig. 12), designated as site no. 02.26, was identified and formally registered during the survey. Terap is situated 17 km from the village of Jowr and approximately 5 km from the left bank of the Bahoukalat (Sarbaz) River. The site lies on a terrace, with an artifact scatter covering an area of roughly 5,000 m² (Fig. 13). The concentration of lithic materials increases in the vicinity of a shelter. In front of the shelter, stands of chesh (*Prosopis cineraria*) and kahur (*Acacia* / *Prosopis*) trees remain green despite prolonged drought, indicating localized ecological resilience. Deposits of fine sand—characteristic of spring-related sediments—are present across the shelter's apron and surrounding area, suggesting the former activity of a natural spring. This spring was likely the primary factor drawing human groups to the locality. It is plausible that the area once supported a small grove or watering place frequented by wild animals, making it an advantageous setting for hunting activities.

The Terap assemblage consists of 34 specimens, all exhibiting varying degrees of patination and desert varnish. The collection includes cores and core fragments (10 specimens), debitage (15 specimens), tools (8 specimens), and one chunk. The dominant raw material is fine-grained, opaque chert in colors ranging from light grey to dark grey and creamy white. The presence of heavy, golden-colored desert varnish is a distinctive feature of the assemblage. Most reduction activities were carried out on rounded pebbles.

The core and core fragments (Fig. 14, 16:9) comprise seven flake cores, one blade-flake core, one core-on-flake (Fig. 15:1), and one core rejuvenation flake (Fig. 15:2). Except for two specimens, all retain cortex, with three examples preserving more than 50% cortex and

four examples between 25–50%. The cores fall into three morphological categories: unifacial (six specimens), bifacial (two specimens), and amorphous (one specimen). Based on platform configuration and flake-removal patterns, they can be classified into unidirectional (seven specimens), one multiple, and one centripetal core. Most cores were produced on rounded to sub-rounded cobbles. The flaking angles on unifacial cores vary between 45°, 60°, and 90°. The cores range from 23 to 47 mm in length, with an average weight of 24.9 g. unidirectional unifacial cores carry 3–8 flake scars wider than 5 mm, while the centripetal core carries seven such scars. One unidirectional unifacial core preserves only a single detached flake. The sole blade-flake core retains less than 25% cortex. It is unidirectional and exhibits flake removal from only one face, with eight identifiable negative scars. This core measures 23 mm in length and 24 mm in width. Given its small size and partial cortical coverage, it is not possible to determine with confidence whether the original blank was a cobble or a stone fragment.

The 15 debitage consist of 14 flakes (Fig. 15:4, 16:5) and one blade. Flake lengths range from 20 to 54 mm, and widths from 17 to 37 mm. Eleven flakes retain cortex, two of which are secondary flakes. Among the cortical flakes, 37.5% preserve more than 75% cortex, 37.5% retain between 50–75%, and 25% less than 25%. One flake exhibits a prepared platform and retains cortex on parts of its dorsal surface; it is a product of Levallois core shaping and was removed in a semi-parallel, single-platform manner (Fig. 16:1).

The tool assemblage includes two retouched pieces, two notched–denticulated pieces, two scrapers, one core-chopper, and one truncated piece (Fig. 16). Other than the core-chopper and a Levallois flake with alternating retouch, all tools were made on simple

flakes. Tool lengths range from 28 to 62 mm, and widths from 22 to 51 mm. The retouched pieces consist of a broken retouched flake and a Levallois flake with alternating retouch. The notched–denticulated category includes one denticulate flake and one notched-denticulate flake. One flake was truncated at the distal end with fine retouch. Retouch is generally complete along the edges, short, parallel, and semi-abrupt. The scrapers include a double-side scraper and a sub-round scraper (Fig. 15:3), both made on flakes with long, direct retouch.

The only identified reduction technique is direct percussion using a hard hammer. Among the 18

recorded striking platforms, six are plain, four partly cortical, three faceted, two cortical, one dihedral, one winged, and one punctiform. Most bulbs of percussion are prominent and rounded; bulb scarring was observed on two flakes. Flake-removal direction on the flakes is either unidirectional convergent, or unidirectional non-parallel.

Approximately 74% of the lithic pieces in the Terap assemblage retain cortex, indicating that part of the early stages of the reduction sequence were performed at the site. The size of the flakes and the degree of cortical coverage suggest that rounded and sub-rounded cobbles were used as the primary raw material source.



Figure 12: Aerial View of Terap Paleolithic Settlement; view from the Northwest.

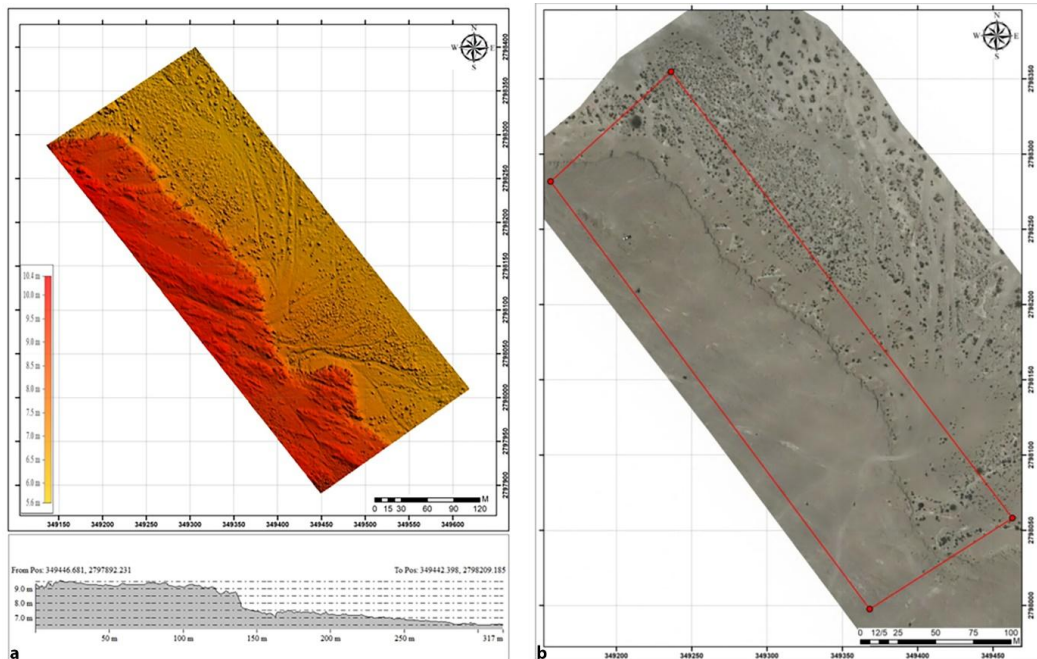


Figure 13: Topographic Map (a) and Extent of the Terap Paleolithic Settlement (b).



Figure 14: Lithic artifacts from the Terap Assemblage; 1,3) unidirectional core, 2) sub-centripetal core.

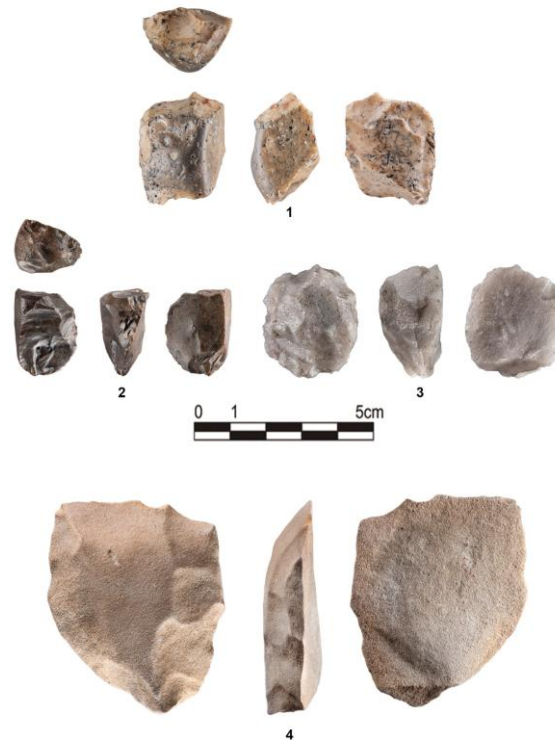


Figure 15: Selected Lithic artifacts from the Terap Assemblage; 1) core-on-thick flake, 2) core rejuvenation flake, 3) sub-round scraper, 4) unretouched flake (Levallois?).

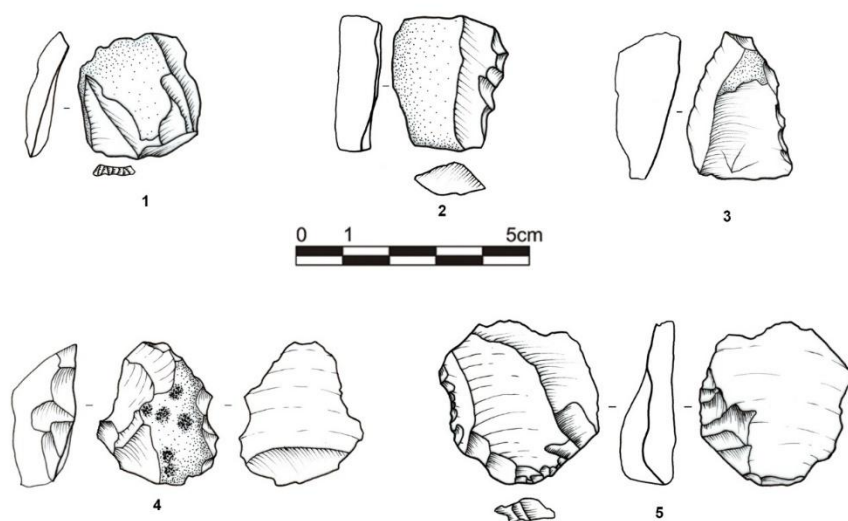


Figure 16: Drawing of Selected Lithic artifacts from the Terap Assemblage; 1) cortical flake from Levallois core shaping, 2) notch-denticulate, 3) flake with some cortex and edge damage, 4) double notch-denticulate, 5) Levallois flake with alternate retouch.

V.4. Poshet

The Poshet locality (Fig. 17), situated north of the Pasabandar–Beris Road and adjacent to a series of wooden power-transmission poles, was identified through the presence of a dispersed scatter of lithic artifacts and was registered as site no. 02.02. The distribution of lithic materials at an altitude of 29 m above sea level extends across an area approximately 200 m in length and 100 m in width (Fig. 18). The surface of the site resembles an open plain but is characterized by a markedly stony and uneven substrate.

The Poshet assemblage consists of 129 specimens, all exhibiting varying degrees of patination and desert varnish. The collection comprises 27 cores, 80 debitage, 20 tools, and 2 chunks. The dominant raw material is fine-grained, opaque chert in colors ranging from light to dark grey, creamy white, and reddish-brown. Based on the preserved cortical surfaces—particularly on primary and secondary flakes—the majority of specimens were produced from small pebbles. A heavy, golden-colored desert varnish is a characteristic feature of the assemblage. A small number of artifacts also indicate the use of small quartz pebbles.

The 27 cores (Fig. 19-21) include 16 flake cores, five blade cores, two blade-flake cores, two bladelet cores, one Levallois core (Fig. 19:5, 21:2), and one exhausted core. Cortex is present on 83% of the cores, with half retaining less than 25% cortical coverage and the other half between 25% and 50%. Core morphology falls into six categories: unifacial (16 specimens), sub-pyramidal (5 specimens), pyramidal (3 specimens), bifacial (1 specimen), semi-cylindrical (1 specimen), and amorphous (1 specimen). Based on striking-platform type and flake-removal patterns, the cores are classified

into four technological groups: unidirectional (18 specimens) (Fig. 19: 1-2, 20:1,3), bidirectional (5 specimens) (Fig. 21:3), multiple (2 specimens), and centripetal (Fig. 19:6, 21:1). All cores were manufactured on pebbles, as indicated by their dimensions and cortical surfaces. Evidence of platform preparation is visible on several specimens.

The 80 debitage (Fig. 22) consist of 69 flakes, 8 blades, 2 bladelets, and 1 elongated flake. Approximately 70% of the flakes are complete, with lengths ranging from 17 to 67 mm and widths from 14 to 49 mm. About 74% of the flakes retain cortex, including 7 primary flakes and 12 secondary flakes. The pattern of cortical primary flakes indicates the use of small local pebbles. Nearly half of the cortical flakes preserve more than 50% cortex. Most flakes display prominent or rounded bulbs of percussion. Half of the blades are complete, while the others exhibit breakage. Six blades have triangular cross-sections and two trapezoid. Three blades retain cortex: two with less than 25% and one with more than 50%. Blade lengths range from 28 to 47 mm, and widths from 19 to 22 mm. Of the two bladelets, one has a triangular cross-section and the other trapezoid; the triangular specimen retains less than 25% cortex. Only the medial portion of the bladelet with triangular cross-section is preserved; the trapezoid cross-section bladelet measures 30 mm in length and 11 mm in width. The elongated flake is broken at its distal end.

The tool assemblage (Fig. 23) consists of 20 items: retouched pieces (7), notched-denticulated (5), scrapers (4), burins (3), and one bec. Most were made on flakes, except for three specimens made on blades and one scraper that appears to have been produced on a

bladelet core and ultimately shaped into an end-scraper. Half of the tools retain cortex—typically between 25% and 50%. Among the retouched pieces, four show inverse retouch, two direct retouch, and one alternating retouch. Retouch is generally short, parallel, and of low angle. The notched–denticulated tools include three direct, one inverse, and one alternating retouch. This group includes two notched pieces, two denticulates, and one double notched–denticulated tool. The alignment of the notches on the latter suggests intentional shaping for hafting. One inversely retouched denticulate flake appears to derive from radial flake removals on a Middle Paleolithic core. The scraper category includes one convergent scraper created on a secondary flake with long, parallel, semi-abrupt retouch on the ventral surface (Fig. 24). The remaining scrapers are all end-scrapers with long, direct, parallel retouch ranging from semi-abrupt to abrupt. Two of the burins were produced by removing a transverse burin spall from the ventral surface, while the third example is a straight, slightly convex variant. All burins were made on the proximal end of flakes. The bec was created with four short, parallel inverse retouches on a secondary flake retaining 25–50% cortex and bearing a plain platform.

The dominant reduction technique is direct hard-hammer percussion; however, two instances of soft-hammer use were observed: one on a blade–flake core and one on a bladelet core. Evidence of bipolar and anvil techniques is present among the flakes. Nearly 70% of the assemblage retains cortex, including 7 primary flakes and 12 secondary flakes, as well as one secondary blade. The high proportion of cortical pieces—particularly the 83% cortical coverage among cores—suggests that significant portions of the early reduction sequence, including initial decortication, were performed at the site. Among the identified striking platforms, 51 are plain, 19 cortical, 2 partly cortical, 4 dihedral, 2 winged, and 1 faceted. Evidence of platform preparation, faceting, and removal of platform protrusions was observed.

Two technological industries were identified within the Poshet assemblage: 1) a flake-base industry, characterized by predominantly unidirectional flake removals, with occasional bidirectional cores. Evidence of centripetal flaking and Levallois techniques is also present, and 2) a blade and bladelet industry, in which blade and bladelet removals are exclusively single-platform.



Figure 17: Aerial View of Poshet; view from the West (a) and the North (b).

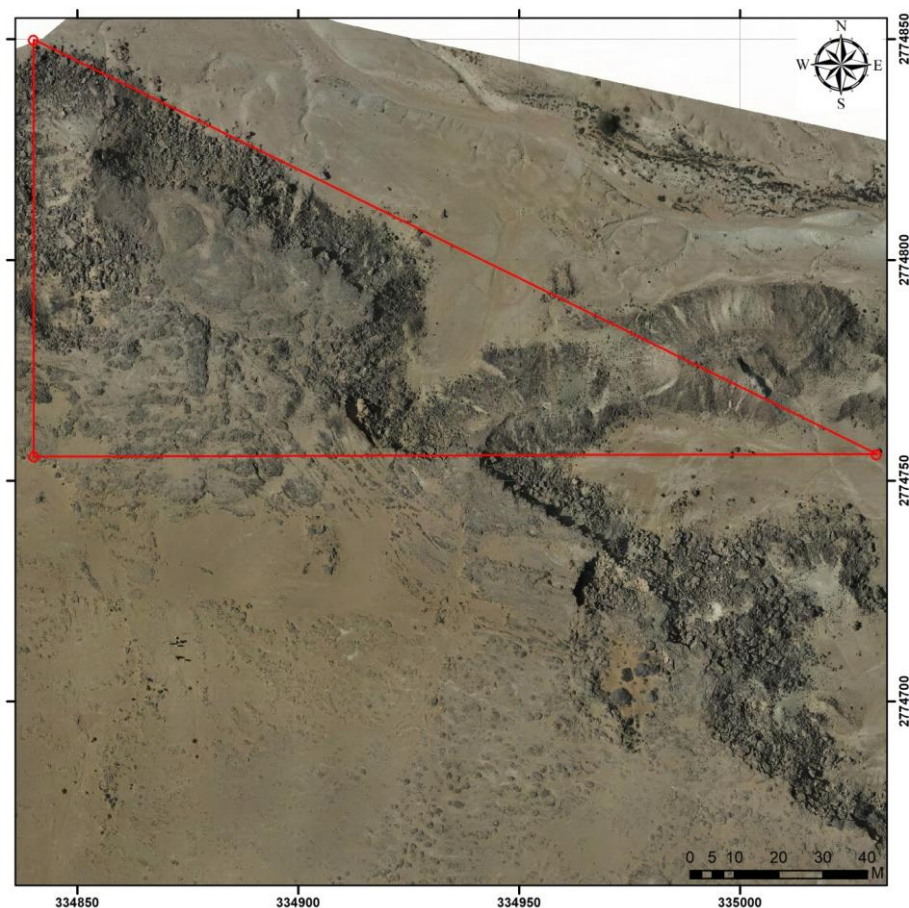


Figure 18: Main Distribution Area of Lithic Scatters at the Poshet Paleolithic locality.

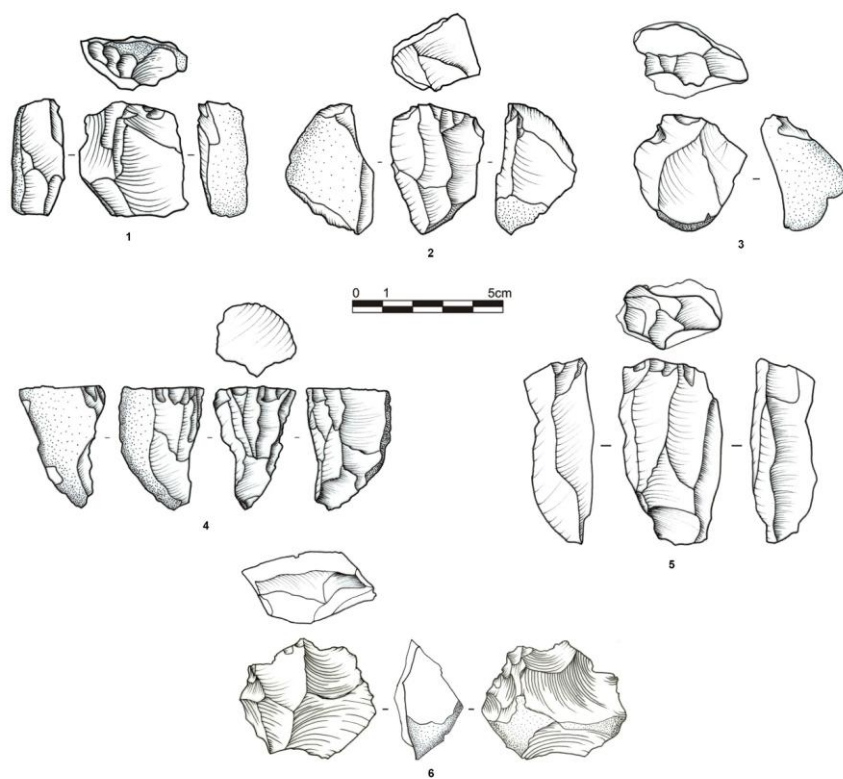


Figure 19: Drawing of Selected Lithic artifacts from the Poshet Assemblage; 1,2) unidirectional blade cores, 3) unidirectional flake core, 4) sub-pyramidal blade-bladelet core, 5) Levallois bidirectional-opposed core, 6) discoid centripetal core.

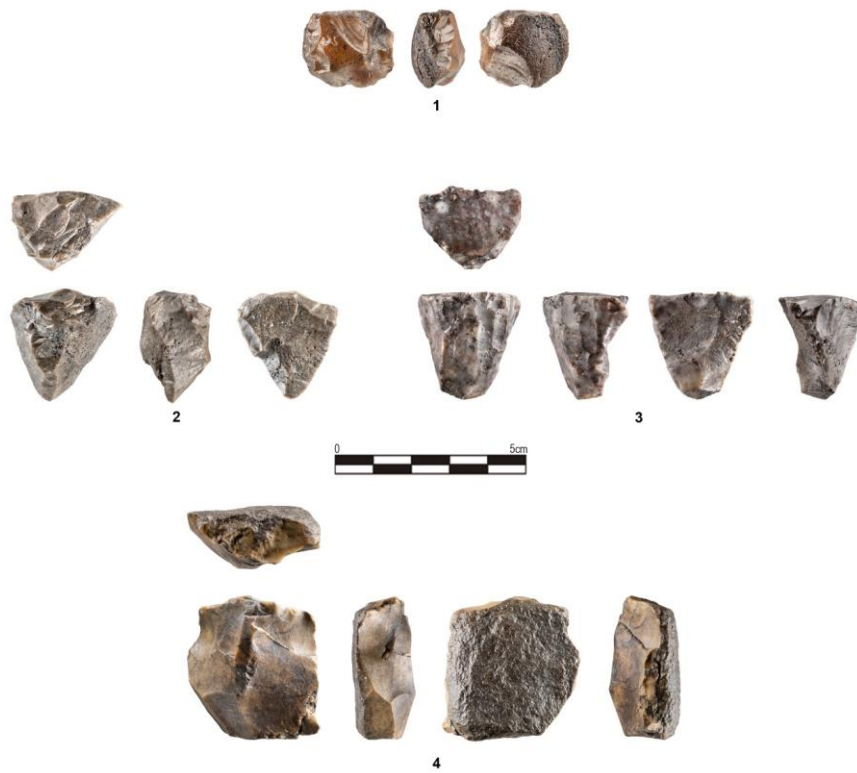


Figure 20: Selected Lithic artifacts from the Poshet Assemblage; 1) unidirectional core, 2) multiple platform core, 3) unidirectional bladelet core, 4) unidirectional flake/blade core.



Figure 21: Selected Lithic artifacts from the Poshet Assemblage; 1) discoïd centripetal core, 2) Levallois bidirectional-opposed core, 3) bidirectional flake core.

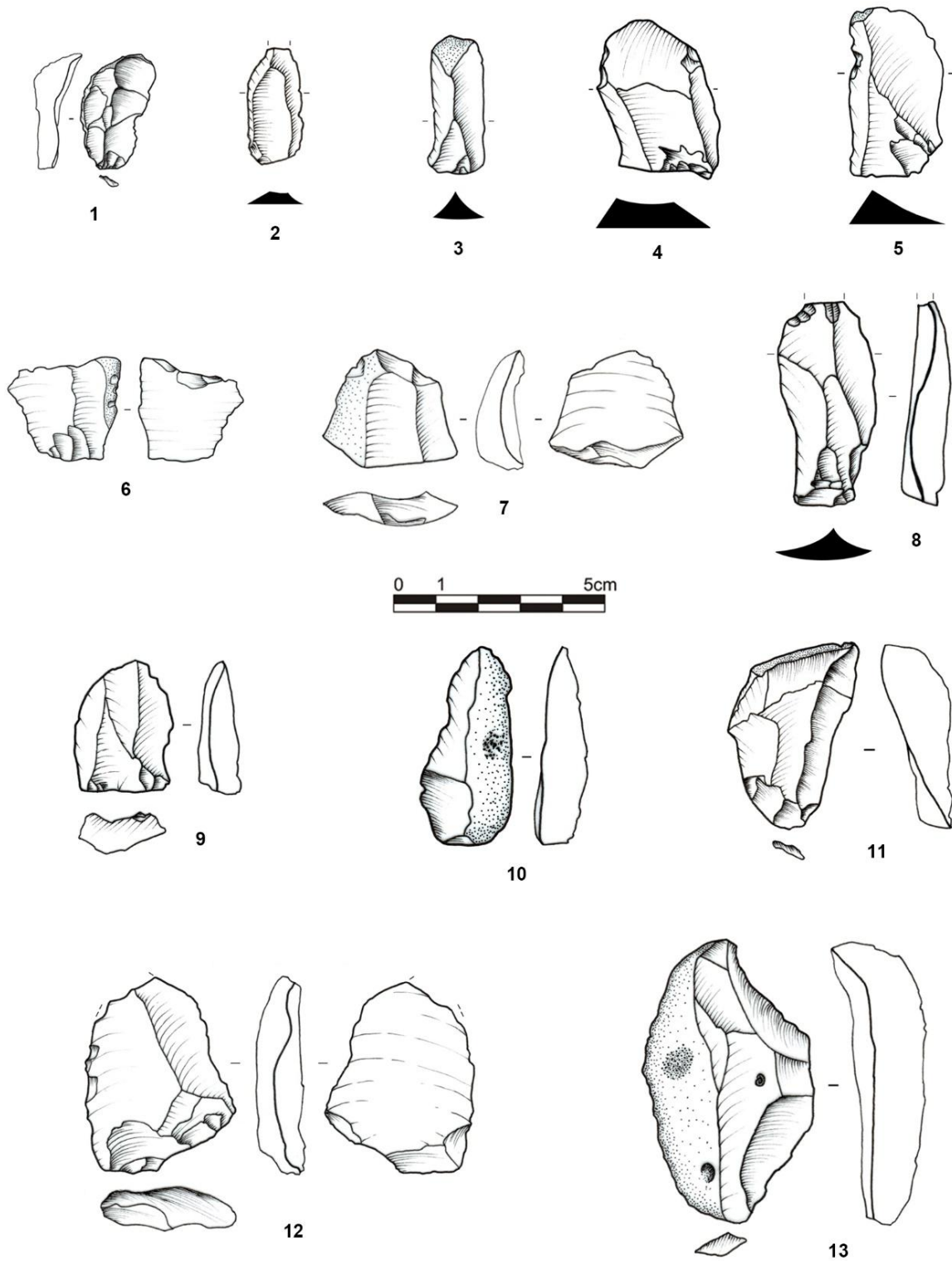


Figure 22: Drawing of Selected Lithic artifacts from the Poshet Assemblage; 1) flake with cortex on distal end, 2) bladelet with broken distal tip, 3) bladelet with triangular cross-section and cortex on distal end, 4) blade with trapezoid cross-section, 5) flake with triangular cross-section and edge damage, 6) blade? with some cortex and edge damage, 7) flake with some cortex and dihedral butt, 8) elongated flake with broken tip, 9) flake with plain butt, 10) secondary elongated flake, 11) flake with some cortex on distal end and small plain butt, 12) flake with atypical dihedral butt, 13) Thermally altered (?) cortical flake with small plain butt.

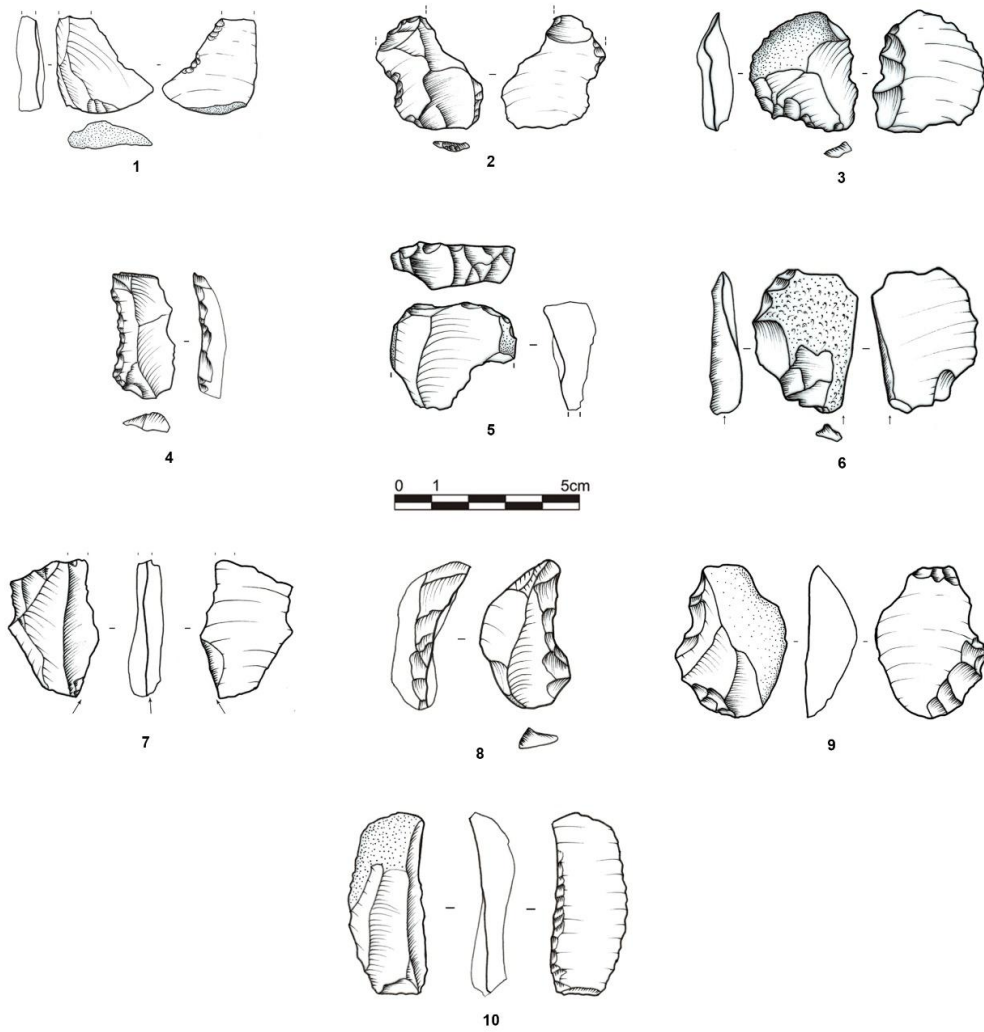


Figure 23: Drawing of Selected Lithic artifacts from the Poshet Assemblage; 1) inversely retouched flake with cortical butt, 2) notched flake with faceted butt, 3) inversely denticulated flake, 4) denticulated blade with some cortex on distal end and dihedral butt, 5) end-scraper, 6) burin on retouched flake, 7) burin, 8) flake with concave retouch, 9) double notches-denticulate with inverse retouch, 10) blade with some cortex and inverse retouch along one edge.



Figure 24: Lithic artifact from the Poshet; inversely retouched convergent scraper.

V.5. Koupal

The Koupal locality (Fig. 25), designated as site no. 02.14, was identified and formally registered during the survey. Residents refer to this area as the “Koupal Cemetery”. The site is located downslope from the Beris asphalt road, approximately 1 km east of the Chankhor outpost and at the foot of Mount Koupal. The area has sustained visible damage as a result of road construction and electrical infrastructure development (Fig. 26).

The Koupal assemblage consists of 23 specimens, all exhibiting varying degrees of patination and desert varnish. The collection includes core and core fragments (10 specimens), debitage (6 specimens), tools (5 specimens), and two chunks. The raw materials represented in this assemblage encompass a diverse range, including siliceous limestone, calcareous sandstone, quartzite, quartz, and fine-grained chert.

The group of core and core fragments (10 specimens) comprises five flake cores, two core-on-flake specimens, two rejuvenation flakes, and one core fragment (Fig. 27). Cortex is present on 90% of the cores, with half retaining less than 50% cortex and the other half more than 50%. The cores fall into two morphological categories: unifacial cores (three specimens) and bifacial cores (two specimens). Based on striking-platform configuration and flake-removal patterns, the cores can be classified into two groups: unidirectional (three specimens) and semi-centripetal (two specimens). No evidence of platform preparation was observed on either cores or flakes.

All six debitage are flakes (Fig. 28:1-2). Each flake is complete and unbroken, with lengths ranging from 33 to 101 mm and widths from 29 to 67 mm. All flakes retain cortex: two are primary flakes, and one is a secondary flake. Most flakes exhibit prominent or rounded bulbs of percussion, and one specimen bears evidence of bulb scarring.

The tool assemblage consists of five specimens: two notched–denticulated pieces, two core-choppers, and one bec (Fig. 28:3). More than half of the tools retain cortex, generally between 75% and 100% of their surface. The notched–denticulated group includes one notched made on a broken retouched flake and one denticulate flake. The notched tool was produced with long, abrupt retouch along the right margin of the proximal end of a broken flake. The flake has a cortical striking platform and retains evidence of platform overhang removal at its proximal end. The dorsal surface also shows bulb-scarring. The denticulate tool was shaped with long, abrupt, parallel retouch on a primary flake whose left side had fractured due to internal impurities. The retouch is bifacial and located along the right margin (Fig. 28:4). The core-chopper group includes one core-chopper and one denticulated core-chopper. The core-chopper was produced through

two unifacial, single-platform removals struck at a 45° angle from a pebble measuring 94 mm in length, 88 mm in width, 49 mm in thickness, and weighing 488 g. The denticulated core-chopper was manufactured on a cobble, likely quartzite. One edge was shaped through long, parallel, semi-abrupt removals, while a series of small removals along the opposite part of the same edge produced an eight notch-denticulated margin. This specimen measures 94 mm in length, 66 mm in width, 34 mm in thickness, and weighs 251 g (Fig. 28:5).

The dominant reduction technique in this assemblage is direct hard-hammer percussion. Nearly 90% of the assemblage retains cortex, including three primary flakes and one secondary flake. The high proportion of cortical pieces—especially the cortical coverage on cores—suggests that a substantial portion of the early stages of the reduction sequence, including initial decortication, took place at the site. Among the recorded striking platforms, seven are cortical and two are plain. Aside from two instances of overhang removal on cores, no evidence of platform preparation or faceting was identified.

The lithic industry identified at the Koupal is predominantly flake-based, with additional use of naturally broken pieces as tool blanks. Flake removals are chiefly single-platform, with two specimens exhibiting semi-centripetal scar patterns. Among the debitage, one simple flake with a cortical distal end and a plain striking platform shows at least four earlier flake removals on its dorsal surface. The entire specimen is coated with heavy desert varnish and patination. A recent break along its edge reveals that the original raw material was light grey in color. Given the presence of desert varnish, the technological traits, and the use of hard-hammer percussion, this specimen most likely belongs to the Paleolithic, although assigning it to a specific phase is not possible.

Another simple flake retains extensive natural cortex on its dorsal surface and exhibits pronounced surface weathering and desert varnish. The striking platform is fully cortical, and the prominent percussion bulb indicates the use of a hard hammer during flaking. This specimen appears to have been removed during the earliest stages of core shaping. Based on its technological features and heavy desert varnish, it also likely belongs to the Paleolithic. The presence of core-choppers and denticulated core-choppers is noteworthy, as similar implements have been reported from Lower and Middle Paleolithic assemblages of the northern Persian Gulf region, such as Minab (Thibault, 1977) and Bangelayan (Zarei, 2019), the Makran coast (Vita-Finzi & Copeland, 1980), and the Qeshm island of the Strait of Hormuz (Dashtizadeh, 2010; Rahmati & Dashtizadeh, 2019). Although the production of core-choppers continues sporadically into the late prehistoric period—particularly during the Neolithic and Bronze

Age—the occurrence of notched–denticulated tools and a bec further strengthens the possibility that the

Koupal assemblage may be attributable to the Middle Paleolithic.



Figure 25: Aerial View of Portions of the Koupal Paleolithic Settlement.

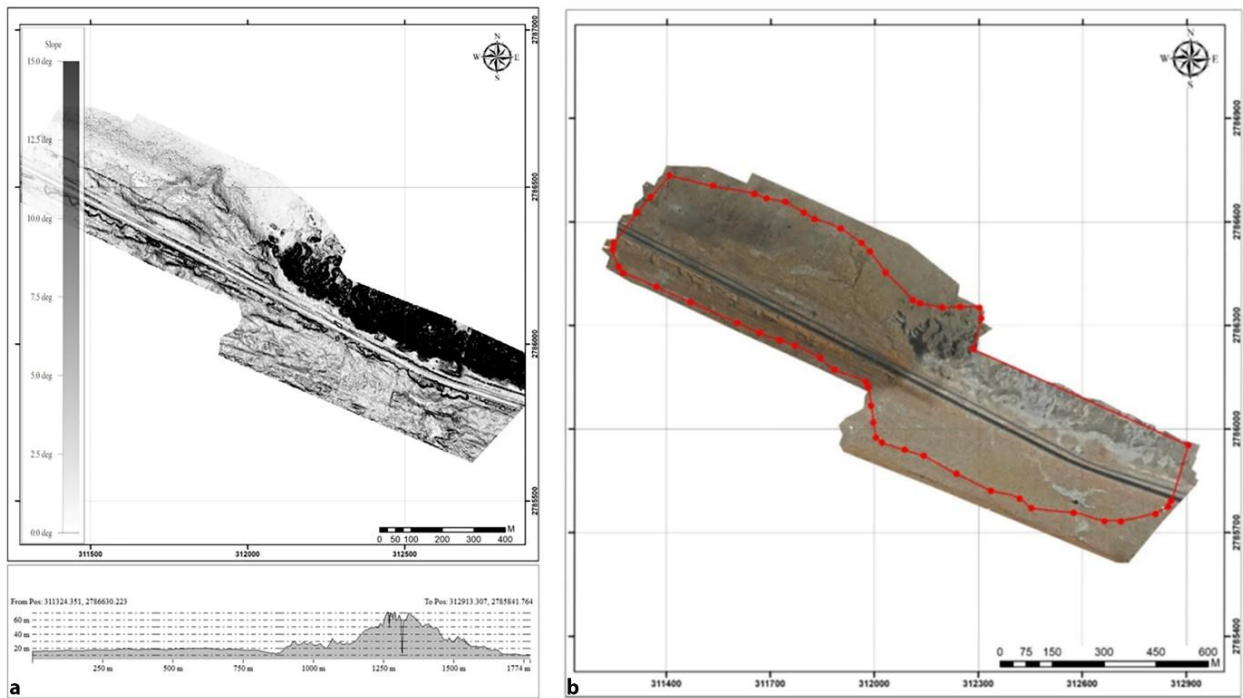


Figure 26: 3D Topographic Model (a) and Extent of the Koupal Paleolithic locality (b).



Figure 27: Selected Lithic artifacts from the Koupal Assemblage; 1) blade/baldelet core fragment, 2,3) semi-centripetal core.

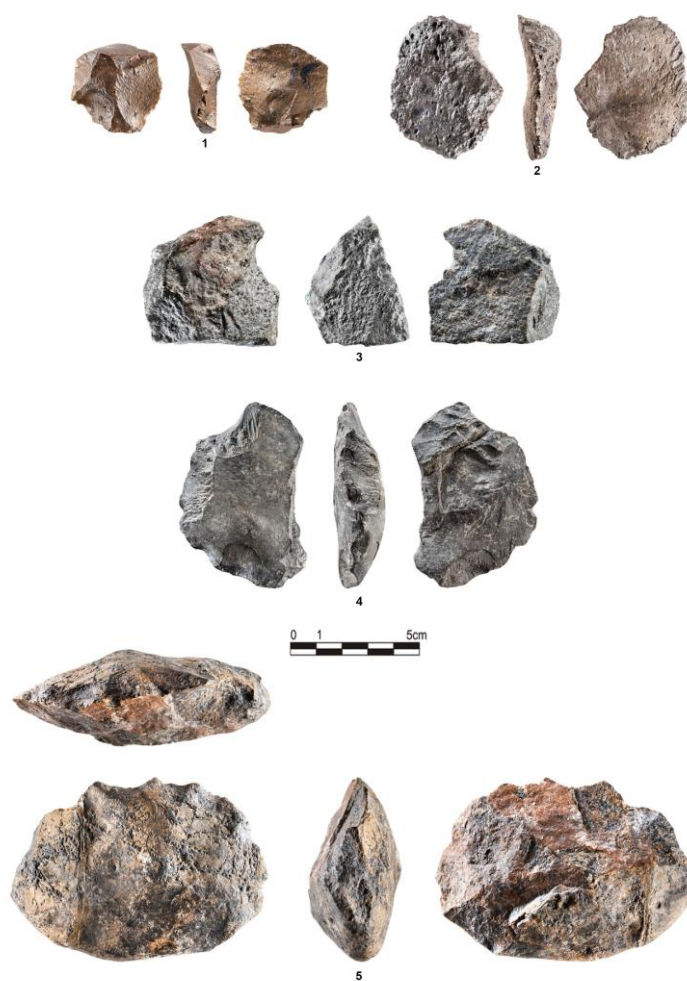


Figure 28: Selected Lithic artifacts from the Koupal Assemblage; 1) flake with some cortex on the distal end, 2) simple flake with cortex covering most of the dorsal surface, 3) bec on natural flake, 4) denticulate on primary flake, 5) denticulated core-chopper.

VI. Discussion

Systematic archaeological surveys in the Dashtyari region, together with the study of lithic industries from five key localities—Koulani, Kolorai, Terap, Poshet, and Koupal—represent a significant step toward filling the existing gaps in our understanding of the role of the Makran coastline as a strategic corridor in Pleistocene hominin dispersal. The data analysis in this research provides not only clear evidence for the early and sustained presence of hunter-gatherer communities in this area, but also reveals complex technological patterns and an important cultural sequence.

VI.1. Chronology and Technological Traditions

A detailed comparative study of the lithic assemblages has led to the identification of two major cultural phases within the Paleolithic sequence of the region:

a. Lower Paleolithic

The lithic assemblages from Koulani and Kolorai exhibit a coherent and technologically conservative suite of characteristics that strongly align them with early core-flake traditions of an Oldowan-like nature. The dominance of hard-hammer direct percussion, the prevalence of large and heavy-duty core-chopper tools, and the complete absence of prepared platform technologies collectively indicate a technological system rooted in simple, unifacial core exploitation (de la Torre, 2011). Equally significant is the lack of any evidence for Levallois or other hierarchical volumetric core-reduction methods, which are typically associated with more advanced technological organization and Middle Paleolithic cognitive planning (Boëda, 1995; Shea, 2016).

The absence of retouched tool categories—particularly formal scrapers—and the total lack of bifacial implements, such as handaxes and cleavers, further differentiates these industries from the Acheulean technocomplex. Instead, the assemblages resemble early simple core-flake systems widely documented in East Africa, the Arabian Peninsula, and parts of early Pleistocene southwestern Asia, where expedient strategies, limited standardization, and minimal platform preparation are recognized as hallmarks of very early hominin occupations (Petraglia & Alsharekh, 2003; Dennell, 2009; Pappu et al., 2011). Such technological simplicity, combined with the presence of heavy-duty choppers, suggests that the Koulani and Kolorai localities occupy a position within the earliest phases of hominin technological behavior in southeastern Iran. These findings may reflect a dispersal episode predating the emergence of Acheulean bifacial technologies in the region, or alternatively, represent populations employing an archaic technological repertoire that persisted into later periods due to

ecological stability or raw-material constraints.

From a broader regional perspective, the Makran littoral has long been proposed as a potential passageway for early hominin movements along the northern Indian Ocean rim (Petraglia & Rose, 2009). The distinctly simple technological signature of Koulani and Kolorai, therefore, may represent some of the earliest waves of hominin presence in this coastal corridor, possibly linked with early dispersals out of Africa or with localized populations maintaining conservative reduction strategies over extended periods (Dennell & Petraglia, 2012). In this context, the Koulani and Kolorai assemblages stand as key evidence for reconstructing the earliest phases of human occupation in southeastern Iran. Their Oldowan-like characteristics provide a rare glimpse into technological behaviors preceding, or existing in parallel with, more advanced Acheulean and later Middle Paleolithic traditions elsewhere in the region.

b. Middle Paleolithic

In contrast, the assemblages from Terap and parts of the Poshet collection exhibit a more complex and structurally organized technological system that is characteristic of the Middle Paleolithic. The deliberate and recurrent use of the Levallois method—expressed through preferential and recurrent centripetal core reduction, faceted striking platforms, and carefully managed core convexities—indicates a high degree of planning depth and volumetric conceptualization in core exploitation (Boëda, 1995; Shea, 2016). The presence of double-sided and convergent scrapers further underlines a techno-typological emphasis on formalized retouched tools, consistent with Mousterian assemblages documented across the Levant, the Zagros, and adjacent regions of Southwest Asia (Dibble & Bar-Yosef 1995).

Equally significant is the high frequency of retouched tools, particularly notched and denticulated types. While this could reflect a curated toolkit adapted to a range of subsistence activities—including woodworking, carcass processing, and hide working (Shea, 2016)—the influence of post-depositional factors such as erosion or trampling on surface assemblages cannot be ruled out. The occurrence of discoid cores with centripetal removals fits within a broader spectrum of Middle Paleolithic reduction strategies, where Levallois and discoid systems often co-occur as flexible, complementary responses to raw-material morphology and specific functional needs (Boëda, 1995).

Taken together, these features point to a well-structured Mousterian techno-complex in this part of the Makran region, closely comparable to Middle Paleolithic industries known from the greater Zagros zone and the northern Arabian–Iranian interface (e.g., Biglari, 2001; Biglari et al., 2009; Jaubert et al., 2009;

Biglari & Shidrang, 2019). This alignment suggests that southeastern Iran participated in a wider Middle Paleolithic cultural sphere, in which shared technological concepts—particularly Levallois core management, standardized scraper production, and discoid core exploitation—circulated across interconnected landscapes. In this context, the Terap and Posht assemblages contribute crucial evidence for reconstructing the spatial extent and internal variability of Mousterian traditions along the northern Indian Ocean margin, and for assessing the role of the Makran corridor in facilitating the movement and interaction of Middle Paleolithic hominin populations (Pappu et al., 2011; Dennell & Petraglia, 2012).

VI.2. Cultural Transition at the Posht Locality

The Posht assemblage presents a highly complex yet critically important chronological and cultural configuration within the Paleolithic sequence of southeastern Iran. The simultaneous and intertwined occurrence of diagnostic Middle Paleolithic features—such as classic Levallois cores, recurrent centripetal reduction sequences, and convergent scrapers—together with unequivocal Upper Paleolithic elements, including pyramidal and sub-pyramidal blade and bladelet cores, end-scrapers, and burins, offers compelling evidence for a transitional techno-complex occupying the sensitive interval between the Middle and Upper Paleolithic. This coexistence of technological systems implies a mosaic pattern of behavior that is widely recognized as a hallmark of transitional contexts, where hominin populations adopted new volumetric and reduction concepts while maintaining elements of earlier core-management traditions (Kuhn, 2003; Bar-Yosef & Belfer-Cohen, 2013; Shidrang, 2014).

This pattern at Posht aligns with broader debates concerning the tempo, processes, and regional variability of the Middle to Upper Paleolithic transition across western and southern Asia. In many regions, mixed or “transitional” assemblages have been interpreted as the archaeological signature of demographic interaction, the coexistence of modern humans and regional Neanderthal populations, the diffusion of technological concepts, or locally driven evolutionary trajectories that produced hybrid technological outcomes (Kuhn & Zwyns, 2014; Shidrang, 2014; Hublin, 2015). The technological overlap observed at Posht—particularly the juxtaposition of Levallois flaking with systematic blade and bladelet production—closely parallels transitional sequences documented in the Levant, the Zagros, Anatolia, and Central Asia (Kuhn & Zwyns, 2014; Shidrang, 2014). Such convergence strongly suggests that the Makran region participated in broader cultural and demographic dynamics shaping hominin behavior during this pivotal period.

The Makran corridor has been proposed as a major pathway linking Arabia, southern Iran, and South Asia, potentially facilitating early expansions of modern human populations into the subcontinent (Petraglia & Rose, 2009; Dennell & Petraglia, 2012). A transitional assemblage in this region is therefore not merely a local phenomenon—it has direct implications for reconstructing regional-scale interactions between migrating populations and long-resident groups, as well as for assessing the timing and mechanism of cultural transmission across Southwest and South Asia (Shidrang, 2014; Hublin, 2015).

Despite this strong interpretive potential, confirming the transitional nature of Posht with certainty requires systematic, stratified excavations capable of recovering *in situ* artifacts and establishing robust chronological frameworks. Absolute dating methods—such as OSL, ESR, and radiocarbon where applicable—are essential for situating the assemblage within the broader chronology of the Middle to Upper Paleolithic transition. Moreover, detailed *chaîne opératoire* studies, refitting programs, and comparative statistical analyses of toolkit composition are necessary to evaluate the technological coherence of the assemblage and clarify whether the observed mixture reflects a single transitional cultural phase or palimpsest processes produced by repeated occupations.

Taken together, the Posht assemblage emerges as one of the most promising candidates for documenting the elusive Middle to Upper Paleolithic transition in southeastern Iran. Its mosaic technological signature, coupled with its strategic location within the Makran coastal corridor, offers a rare opportunity to illuminate regional contributions to this question. With further excavation and chronological resolution, Posht has the potential to serve as a key reference point for understanding the cultural and demographic transformations that accompanied the emergence and spread of modern human behavior across western and southern Asia.

VI.3. Settlement and Subsistence Patterns

The *chaîne opératoire* analysis of the lithic assemblages yields critical insights into the organization of settlement and subsistence strategies across the Dashtyari region. The high frequencies of cortical flakes, early-stage debitage, and multidirectional core fragments at sites such as Terap, Posht, and Koupal indicate that these localities served as primary reduction zones, where the initial phases of lithic production—particularly the testing, roughing-out, and early shaping of locally available cobbles—were carried out. Such signatures are consistent with workshop or task-specific knapping locales documented in Lower and Middle Paleolithic contexts elsewhere in Southwest Asia (Bar-Yosef & Van Peer, 2009).

In contrast, the assemblages from Koulani and Kolorai, which contain disproportionately high numbers of heavy-duty implements such as core-choppers and other expedient tools with minimal debitage, reflect the archaeological characteristics of short-term residential or specialized activity stations. These assemblages closely parallel ethnographically and archaeologically documented “field camps” or “task camps” where specific subsistence-related activities—such as carcass processing or heavy-duty chopping tasks—were carried out away from major workshop locales (Binford, 1980; Kuhn, 1995). The predominance of large, immediately functional implements suggests that these sites were likely positioned within a logistical subsistence framework, in which mobile hunter-gatherer groups transported selected tools or curated implements to resource-rich patches.

Taken together, these technological and spatial patterns signal a mobile yet strategically organized settlement system in the Makran region. Hominin groups appear to have relied on localized raw materials for early-stage reduction while reserving particular locales for specialized tasks associated with subsistence provisioning. This combination of mobile residential behavior and strategic logistical mobility is consistent with broader Pleistocene adaptations documented in both coastal and inland ecosystems of Southwest and South Asia (Dennell, 2009).

In this context, the Dashtyari datasets highlight the role of Makran not only as a migration corridor but also as a dynamic settlement landscape where hominin groups structured their technological and subsistence practices in response to both environmental opportunity and cultural tradition. The evidence points to a pattern of resource-use logistics that reflects broader behavioral strategies characteristic of Pleistocene hunter-gatherers across interconnected regions spanning the Iranian Plateau, Arabia, and the northwestern Indian subcontinent.

VI.4. Makran on Pleistocene Migration Routes: An Analytical Perspective

The results of this research provide the first systematically documented confirmation of Lower and Middle Paleolithic occupations within the Dashtyari region, thereby establishing a secure archaeological foundation for the early human presence along the Makran coast. These findings provide the first empirical support for earlier hypotheses that identify Makran as a key dispersal corridor for hominin populations moving

from Southwest Asia into the Indian subcontinent and East Asia. (Petraglia & Rose, 2009; Dennell & Petraglia, 2012). The presence of early lithic industries—ranging from Oldowan-like simple core-flake traditions to technologically structured Mousterian assemblages—demonstrates that Makran was not merely a transient corridor, but a landscape repeatedly settled and utilized by Pleistocene hunter-gatherer groups.

From a wider paleoanthropological perspective, the recognition of firmly stratified Paleolithic occupations in southeastern Iran (Dashtizadeh, 2010; Rahmati & Dashtizadeh, 2019; Zarei, 2019, 2021c, 2022; Biglari et al., 2023) aligns with models emphasizing the importance of coastal and peri-coastal ecotones in facilitating long-distance hominin movements along the northern Indian Ocean rim (Dennell & Petraglia, 2012; Scerri et al., 2018). The combination of freshwater availability, diverse ecological niches, and access to marine and terrestrial resources would have rendered Makran an attractive and ecologically stable habitat during intervals of climatic fluctuation in the Pleistocene (Field et al., 2007). The archaeological record revealed in this study, therefore, indicates that human groups did not merely pass through the region: they settled, adapted to its landscapes, and engaged in culturally structured technological practices consistent with their broader behavioral repertoires (Shea, 2016).

Furthermore, the presence of multiple technological traditions—ranging from simple core exploitation to structured Levallois and discoid methods—suggests that Makran played an active role in the cultural and technological dynamics of this part of Asia. Such technological diversity is consistent with patterns observed across dispersal-related regions, where variability signals demographic turnover, local innovation, or population interaction. Makran thus emerges as a pivotal corridor connecting the technological spheres of the Zagros, Arabia, and the northwestern Indian subcontinent. Taken together, the evidence demonstrates that Pleistocene hominins did not merely traverse Makran as part of broader dispersal trajectories but established enduring occupations, exploited local raw materials, and actively contributed to shaping the cultural and technological landscape of southeastern Iran. As such, Makran must be regarded as an integral component of the early human dispersal system across Eurasia—a region whose archaeological potential remains underexplored yet central to understanding the deep-time history of human movement, adaptation, and cultural evolution.

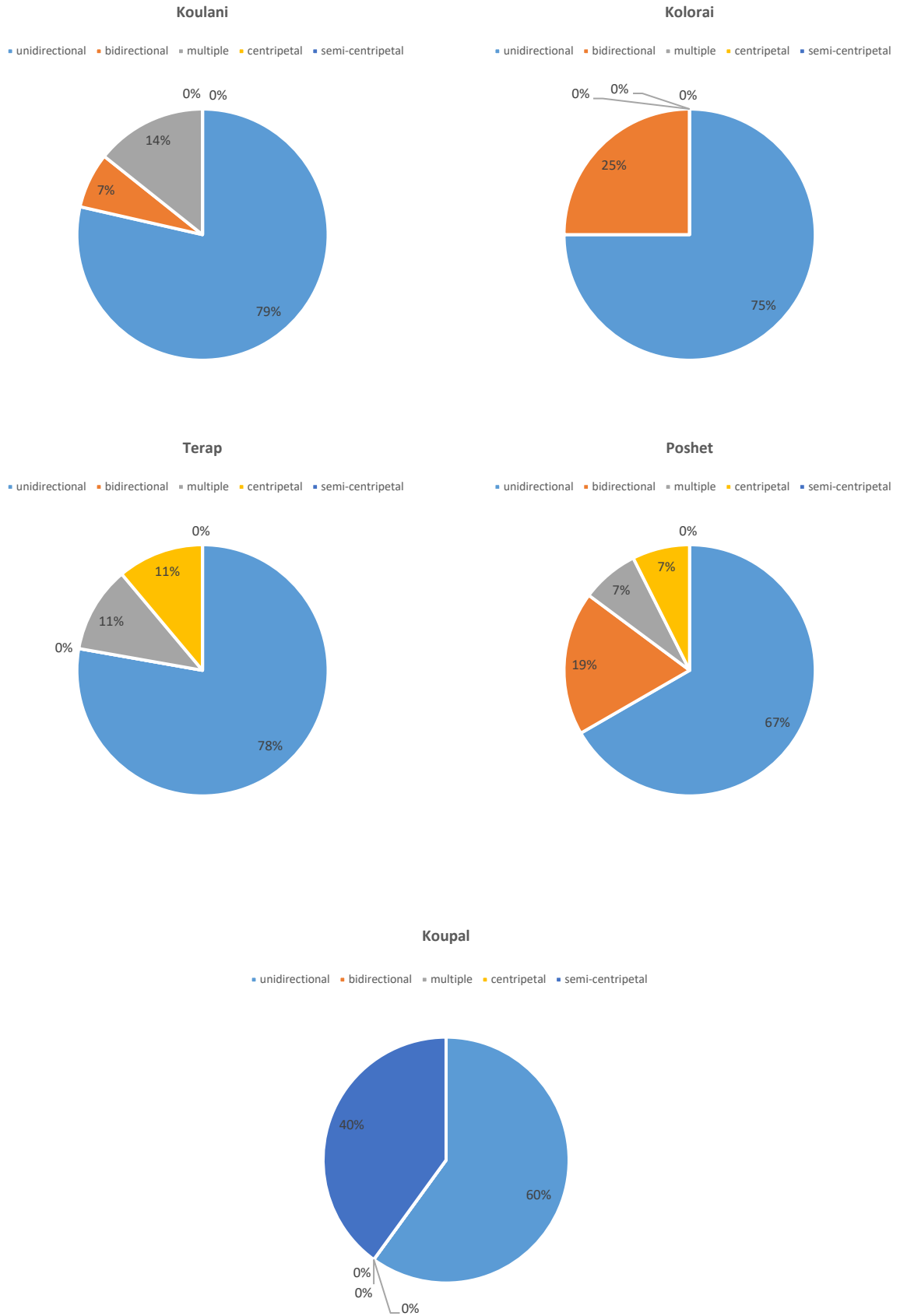


Figure 29: Core categories and flake-removal directions.

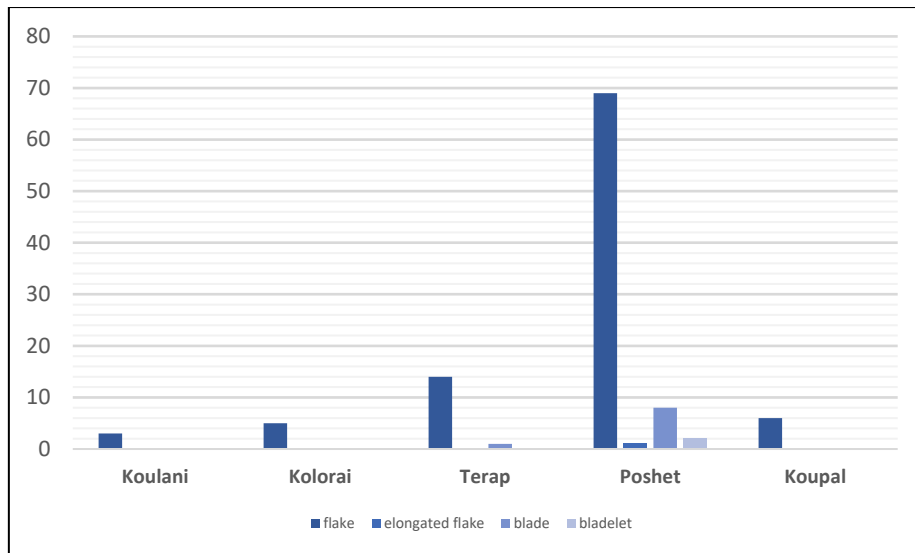


Figure 30: Debitage groups within each assemblage.

Table 1: Major tool types of each assemblage.

Major Tool Types	Koulani	Kolorai	Terap	Poshet	Koupal	Total
Core-chopper	7	3	1	-	2	13
Retouched	1	-	2	7	-	10
Notched-denticulated	-	-	2	5	2	9
Scraper	1	-	2	4	-	7
Burin	1	-	-	3	-	4
Bec	-	-	-	1	1	2
Truncated	-	-	1	-	-	1
Total	10	3	8	20	5	46

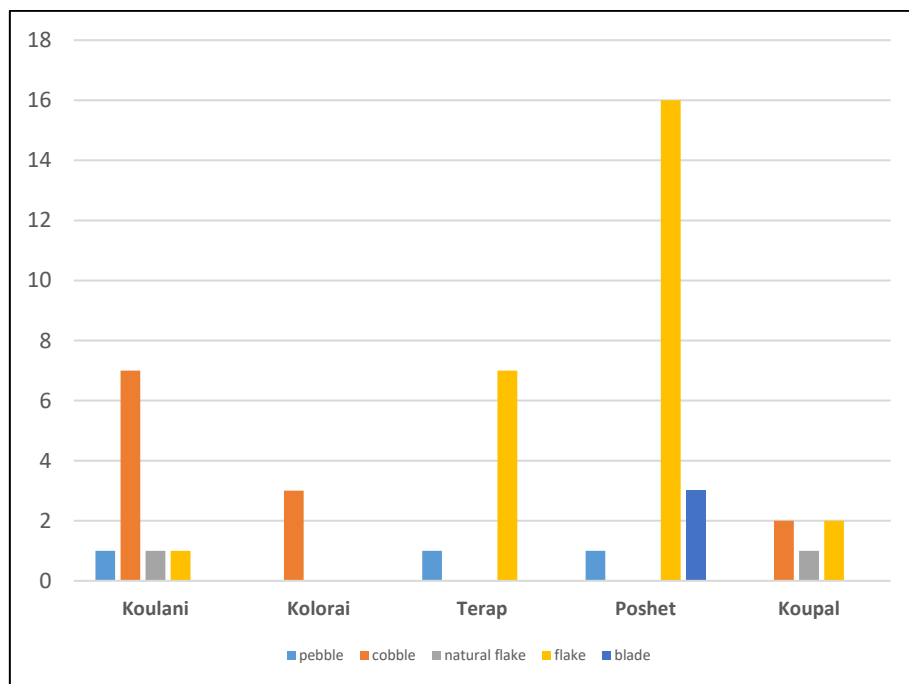


Figure 31: Tool blanks in each assemblage.

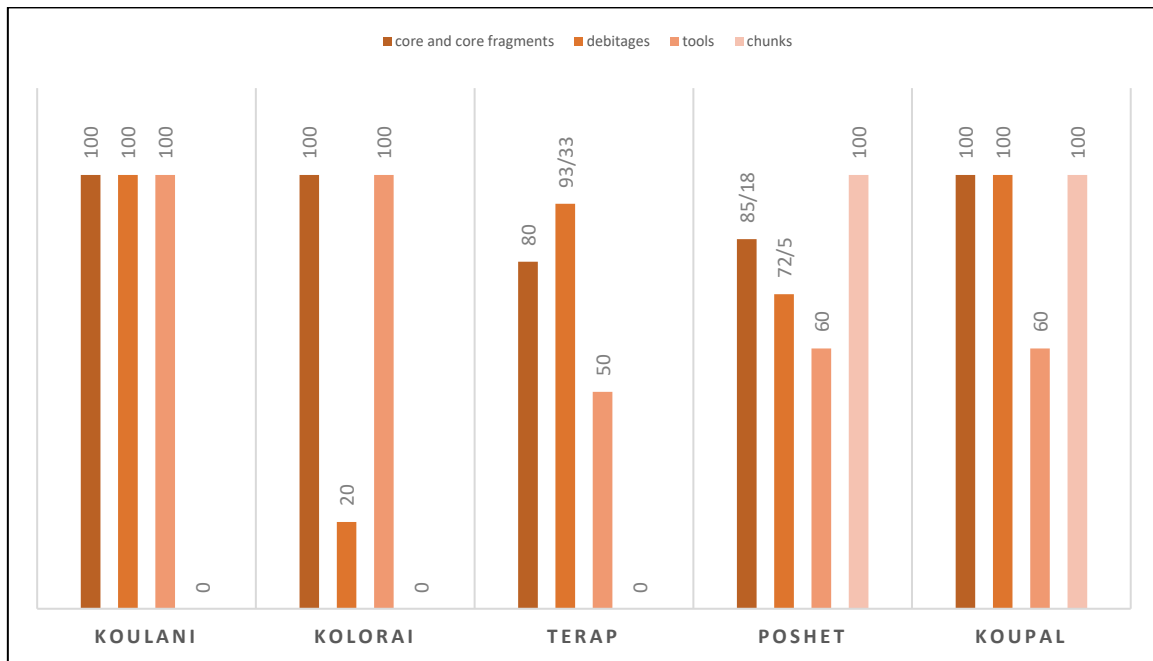


Figure 32: Percentage of cortical pieces in each assemblage.

VII. Conclusion

The Paleolithic evidence documented across the Dashtyari region significantly reshapes our understanding of cultural, technological, and settlement dynamics in southeastern Iran during the Pleistocene. The identification of Oldowan-like simple core-flake industries at Koulani and Kolorai, alongside the presence of technologically structured Middle Paleolithic assemblages at Terap and Koupal, reveals a cultural sequence marked by both continuity and variability. These findings demonstrate that Makran was not an archaeological void but a region repeatedly occupied by hominin groups deploying diverse technological strategies shaped by environmental opportunities and cultural tradition.

The Poshet assemblage, with its mosaic combination of Levallois-based Middle Paleolithic features and blade/bladelet production strategies characteristic of the Upper Paleolithic, stands out as one of the most compelling candidates for documenting the Middle to Upper Paleolithic transition in southeastern Iran. This technological overlap mirrors transitional complexes across the Levant, the Zagros, Anatolia, and Central Asia, suggesting that Makran was deeply embedded in the broader cultural and demographic processes accompanying the expansion of *Homo sapiens* across western and southern Asia.

Chaîne opératoire analyses of the lithic assemblages reveal persistent land-use and subsistence strategies among Paleolithic groups in the region. The recurring presence of early-stage knapping workshops (e.g., Terap, Poshet, Koupal) alongside specialized localities

dominated by heavy-duty implements (e.g., Koulani, Kolorai) reflects a mobile and strategically organized approach to landscape use that characterized Pleistocene hunter-gatherer economies across different chronological periods.

Nevertheless, this study should be regarded only as an initial step toward a comprehensive understanding of the deep-time human occupations in this region. Several lines of future research are essential for completing this archaeological framework:

- (1) precise stratigraphic excavations at key sites such as Poshet to establish absolute chronologies and clarify cultural sequences;
- (2) expanded and intensified field surveys in adjacent basins to identify additional sites and refine settlement and dispersal patterns;
- (3) specialized analyses of lithic industries, potential biotic remains (if recovered), and functional use-wear studies;
- (4) geomorphological and paleoenvironmental investigations to reconstruct past coastal landscapes and assess their influence on hominin land use.

Taken together, the evidence demonstrates that southeastern Iran—and Makran in particular—was not a marginal periphery but an active, dynamic arena of cultural developments during the Paleolithic. The Dashtyari evidence documents a deep and variable Paleolithic sequence, integrating Makran into the broader narrative of hominin dispersal and the establishment of *Homo sapiens* across western and southern Asia.

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