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A Technological and Typological Analysis of the Lithic Assemblage from Velem, Hezarjarib, Behshahr, Mazandaran

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Abstract

The large assemblage of lithic artifacts deriving from the first season of excavations at Velem in 2021 was subjected to counting by the NAS approach. Typologically, the assemblage split into retouched tools, various types of scrapers (both side- and end-), hand axes, and a Levallois-type arrowhead. The recovered tools tended to be shaped on blades. Among the debitages, flakes proved to be the most recurrent. The meager attestations of cores compared to debitages and the lack of flakes with cortex raised the possibility that part of the core preparation process took place outside the site. With regard to technology, flakes were mostly separated from the core through direct percussion, while indirect percussion or soft hammer direct percussion was used to fashion the blades and bladelets. The entire assemblage was made of chert, of which Behshahr ranks among the leading sources in Iran. While its mysterious, disturbed and intermingled archaeological context excluded a precise chronology, a tentative date between the late Neolithic and the Chalcolithic period was offered for the lithic assemblage from Velem in light of the attested technology and typology.

Keywords: Lithic Assemblage, Velem Site, Behshahr Mazandaran, Chalcolithic and Bronze Ages.

Article Type: Research Article

Introduction

Stone stands among the earliest materials ever used by human in tool manufacturing, and have continued to serve this purpose from 2 million years ago up to the present. For the Lower Paleolithic and Middle Paleolithic groups, it represented the sole material for tool manufacturing. While bone tools would begin to supplement the contemporary toolkits in the Late Paleolithic, the lithic artifacts still remained in popular use. By the post-Paleolithic times (see Ramazanpour *et al*, 2021), the lithic industry was to a great extent overshadowed by the introduction of pottery and discovery of metals (Inizan *et al*, 1992), , but it did not pass into complete oblivion. For this reason, and given their resistance to erosion and destructive factors, chipped stones are among the most abundant finds in prehistoric deposits. At the end of the Late Paleolithic period (Upper Paleolithic) between 18,000 and 12,000 years ago, climate changes prompted transformations in subsistence patterns, social life, and technology of human communities. The timespan is variously labeled as the Mesolithic and the Epipaleolithic period, which is also described as a period of tremendous transformations (Mussi, 2001). Apart from the changes in subsistence patterns, the period marked remarkable alterations in lithic technology.

The pioneering archaeological work in the southern Caspian littoral is credited to Jacques de Morgan and, later, Carlton Stanley Coon (Vahdtinasab 2010). On the authority of Coon's reports, the cultural deposits at the Kamarband Cave represent four periods (Coon, 1952: 231). The most distinctive tools of the aceramic Neolithic are the backed blades, blade cores, and conical bladelet cores, which also occur at Hotu Cave (Dupree, 1952: 254). While chipped stones dating to the Mesolithic through the Neolithic period are also attested at Komishan Cave, given the disturbance of the upper strata of its Mesolithic-

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Neolithic transition, the respective assemblage still awaits precise identification and publication (Vahdati Nasab and Nikzad 2015). The upper strata at Komishan have produced a mixed assemblage of cultural material relating to several different periods, the most notable being the Neolithic stone tools. The lower strata represent an *in situ* Mesolithic deposit, wherein the lithic assemblage is dominated by flakes and debris (Vahdati Nasab and Jayez 2011). The recent excavations of Touq Tepe in Neka have yielded a series of stone tools from the Neolithic period. In terms of technology and typology, the recovered assemblage includes several tool types such as blade, bladelet, and flake. With respect to manufacturing methods, indirect percussion/punch technique, and direct percussion are evident (Abbasnejad Seresti, 2020: 179). The eastern part of Mazandaran is characterized by the three terrain types of lowlands, midlands, and highlands. Excavations and investigations dealing with lithic tools in the region have focused on its lowlands or plains, while serious studies in the middle and highland areas are still pending.

Geography and Archaeology of Velem

Velem is a village lying at an altitude of 840 m in Central District of Behshahr County in an area by the name of Hezarjarib in eastern Mazandaran Province. Panj Hezareh Rural District, to which the village is a dependency, lies on the borderline between the two counties of Neka and Behshahr. Next to the village of Velem lies the Gelvard Dam, built on the Nekarud River, 42 km southeast of Neka County (Figure. 1). The archaeological site of Velem perches on a natural hump (Figure. 2).

The road construction operation upstream of the Gelvard Dam exposed indications of an ancient cemetery and a spouted pottery vessel, possibly belonging to the Iron Age III, a discovery that put the construction project to a transient halt until archaeological field research was conducted. The subsequent salvage excavation brought to light a number of Parthian tombs as well as Iron Age burials. Concomitantly, 6 soundings were completed to delimit the cemetery.

A number of depressions associated with cultural material were identified and excavated at a corner of the site (Figure. 3). They did not appear to be ordinary pits, but were more probably natural holes or features of uncertain nature formed as a result of such natural processes as erosion or flooding, and in which cultural materials were amassed. Therefore, neither the nature of the depressions nor the ways in which the cultural materials were accumulated can be explained at the moment. Future studies might provide answers to these questions. The depressions contained a mixed pottery assemblage dating to the transitional Chalcolithic and the Chalcolithic, particularly the later phase of the period (corresponding to Sialk III6–7 and Hissar

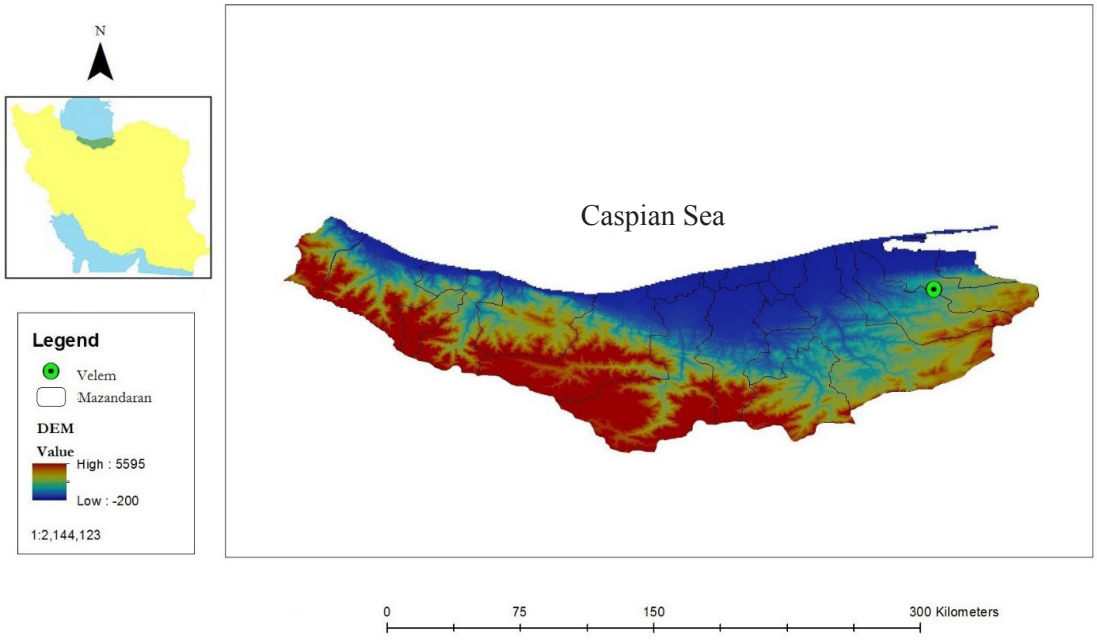


Figure. 1: *Geographic location of the Archaeological Site of Velem in Mazandaran province, northern Iran.*



Figure. 2: *The location of the site on the natural hump A: View from above B: front view C: West view (After: Abbasnejad Seresti 2021).*

I), Bronze and Iron periods (Figures. 4, 5). They were also associated with a profusion of stone tools (Abbasnejad Seresti 2021).

The excavation produced a total of 168 lithic artifacts, which were counted using the NAS (Number of Artifactual Specimen) method. The method involves enumerating all existing individual pieces, regardless of their intact or fragmentary nature (Jayez and Vahdati Nasab 2015). The lithic assemblage consists of 31 tools, 115 debitages, 8 cores, and 14 tool debris (Figure. 6).

Findings of the Study

Raw Material

As a most resilient and reachable material, stone was available to human since antiquity. Of the various types of stones, chert is a type that breaks with a conchoidal fracture thanks to its high silica content and density. Hence, it is one of the few types that can be broken in a controlled manner to obtain sharp yet durable edges. This property made chert as an ideal raw material for the production of cutting tools or flakes. A region with rich sources



Figure. 3: *A: Velem: The first area of Velem and the excavated parts, B: Western view of the trench A , C: South view of the trench A (After: Abbasnejad Seresti, 2021).*

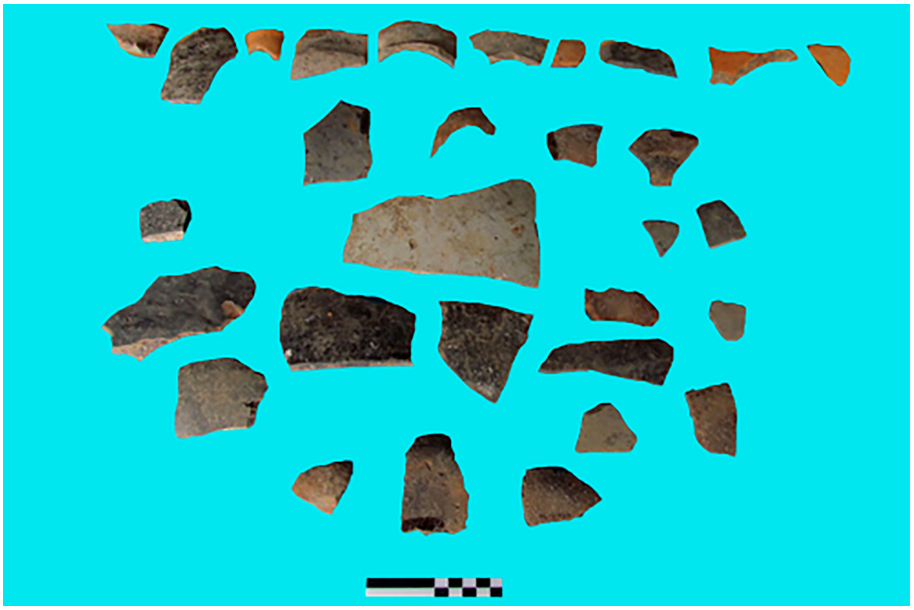


Figure. 4: *Velem: Pottery from Test Trench 4 (After: Abbasnejad Seresti, 2021).*

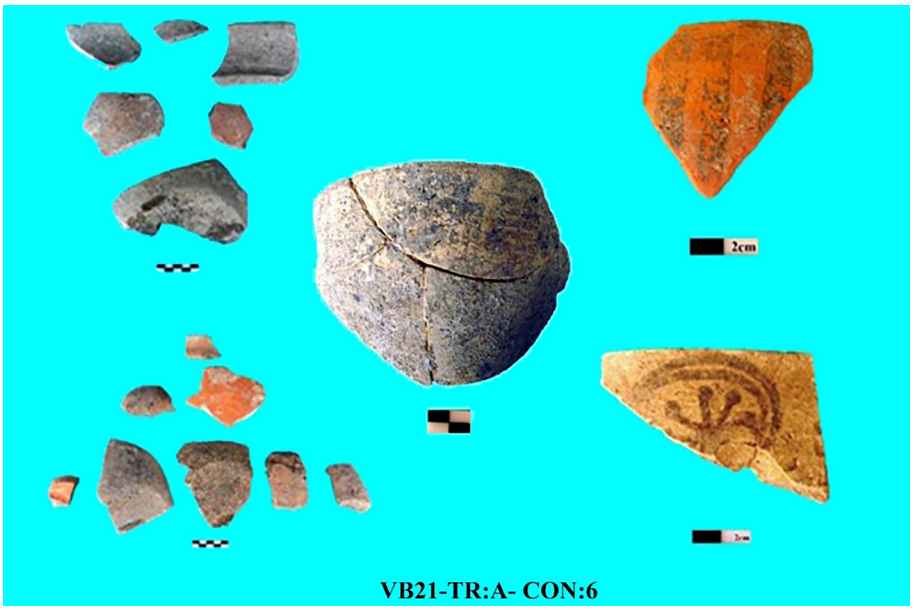


Figure. 5: *Velem: Pottery from Trench A, Context 6 (After: Abbasnejad Seresti, 2021).*

of chert in Iran is Behshahr in the eastern part of the northern flank of Central Alborz. The chert deposits in Behshahr occur within the Jurassic limestone belt. Carlton S. Coon (1952) was the first to mention the city's chert. In Behshahr, the related deposits are found as consistent, dense sheets with 5 to 25 cm thick lenses alternating with limestone strata. In the Hotokash Mountains between Neka and Galugah, they consist of a thrust mass and Cretaceous limestone running a length of 46 km west to east with an average width of 12 km, at an altitude of about 800 to 1200 m. Usually, the chert deposits occur either as embedded in the limestone bed or in the form of rock blocks, and belong to different geological periods. Severe weathering of these rocks over time has led to the detachment of boulders, which fall down the slopes and are attested on the valley floors after being eroded by seasonal or permanent streams. The raw material is collected by human either from their original context or from the river beds (Heydari 2004).

The Mesolithic and Neolithic artifacts from the Komishan Cave, most notably the cores, demonstrate that human has utilized chert since the

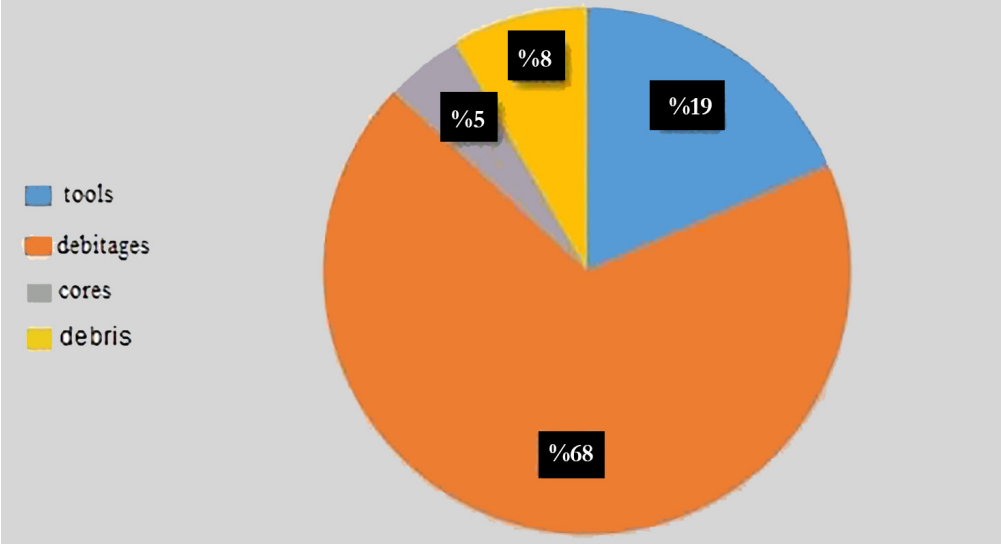


Figure. 6: *Frequency of stone artifacts at Velem*

remote past. They either extracted raw materials from their original context or collected them from river beds. At many Neolithic sites across the Behshahr plain, such as Gohar Tepe (Mahfrozi 2002), chert was at time used as grinding stone. A large number of known Neolithic sites are located next to geological events. This has contributed to a more facilitated extraction of raw materials and a higher quality production. Since the sample considered in this paper is invariably in chert, the artifacts have been classified by their color (Figure .7) so as to provenance the different deposits from which their raw material was procured.

As seen in Figure 7, the most frequent pieces in the assemblage are those ranging in color from brown and grayish-brown to gray. A main reason was potentially the availability of chert deposits in this color range in the local landscape. There are 2 heat-affected chert stones among the debris. Heating will make chert turn to two different colors: bluish-gray, and crimsonish brown. In both cases, the stone will develop damages due to exposure to heat, such as errailures in the form of small round scales. It is also noteworthy that it is practically impossible to distinguish the type of chert stones prior to heating (Jayez, 2012: 88).

Typology

The lithic collection from Velem exhibits retouched tools made on blades, flakes, bladelets, side-scrapers, end-scrapers, and celts/axes. In the tools subassemblage, the retouched variety is the most frequent, made up of 16 blades, 6 flakes, and

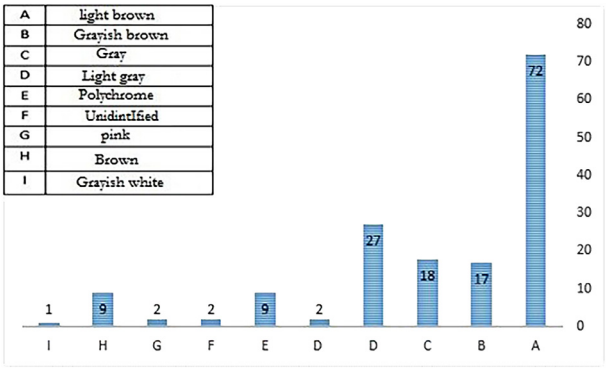


Figure .7: *Frequency of chert types by color .*

a single bladelet. Retouched varieties are among the tools that do not require any predesigning and are rather manufactured on an ad hoc basis. Such tools most likely characterize human groups with less need to anticipate their desiderata because of their mobile lifestyle (Bleed 1986; Shott 1986). At Velem, side-scrapers and end-scrapers are all made on flakes, mainly large flakes, including 4 side-scrapers and 2 end-scrapers (Table. 1). In one case, the flake was turned into a side-scraper through retouching the core (Figure. 8).

A single Levallois-type arrowhead is attested among the tools from Velem (Figure. 9). Such flakes were produced by centripetal reductions. The technology responsible for the production of these pieces cannot be described as an adaptation from the Levallois technique and as a testimony to the persistence of the latter technique from the Middle Paleolithic period to the later times. This event is utterly contingent upon the type of the raw material

Table. 1: *Scrapers*

ID	Tool Type	Blank	Fragment	Retouched Type	Used Edges
VB21-A-6-4	end scraper	flake	complete	sawy	distal end
VB21-A-6-17	end scraper	flake	complete	denticulated	distal end
VB21-A-6-14	side scraper	flake	complete	denticulated	left
VB21-A-6-20	side scraper	flake	distal	denticulated	left
VB21-A-6-72	side scraper	flake	proximal	denticulated	left
VB21-TT2-2-3	side scraper	flake	complete	denticulated	right

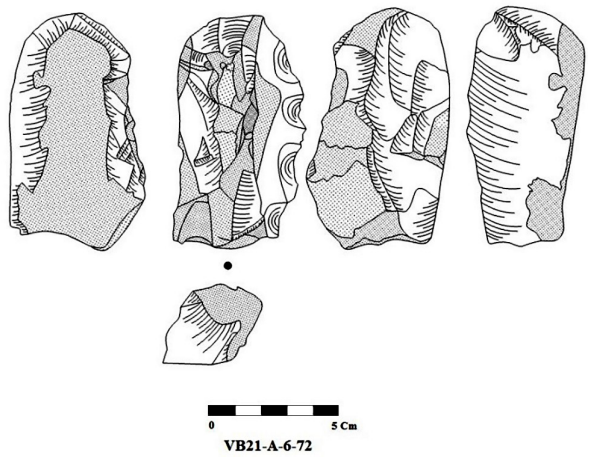


Figure. 8:*Side-scraper on a core*



Figure. 9: *An Interesting Flake (After: Abbasnejad Seresti 2021).*

and rather represents an unconscious behavior. Levallois-type reduction from core had continued well into the Iron Age in Mazandaran at such sites as Panj Barar (Ramazanpour *et al*, 2021).

Also attested in the assemblage from Velem is a single piece of celt/axe (Figure. 10). Neolithic axes were made by the two techniques of flaking and polishing.

The typology of handaxes/celts mainly rests upon stone axes. The concomitant handaxes fall into the following three classes:

1)Axes with a width of 4 to 2.5 cm and a thickness of less than half of it

2)Axes with a width of 2.2 cm and a thickness of above 2.3 cm

3)Axes with round and very thin and narrow edges (Shea 2013).

The piece in our assemblage is of the first class. This bipartite, polished, and triangular axe/celt is 8 cm long, 5 cm wide, and 2.2 cm thick. It represents a hallmark of the Neolithic lithic tools attested throughout the contemporary Levant (Shea 2013). The piece finds parallels at most of the Neolithic and post-Neolithic sites across Iran and the Fertile Crescent, among them being Tappeh Sang-e Chakhmaq, Kamarband Cave (Figure. 11), Tall-e Atashi (Figure. 12), Tappeh Valiki (Nemati Lujandi 2021), Touq Tepe (Abbasnejad Seresti 2020) and the early and middle phases of Jeitun (Figure. 11).



Figure. 10: *Handaxes/celts from Velem (After: Abbasnejad Seresti, 2021).*

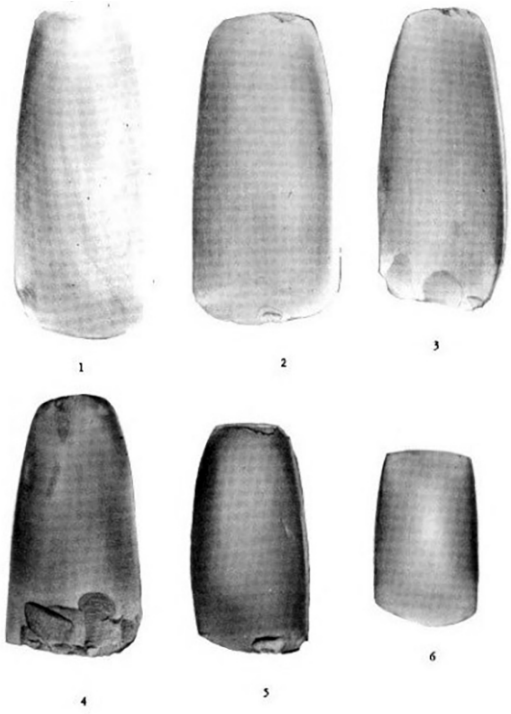


Figure. 11*: Handaxes from Kamarband Cave (After:Coon, 1952).*

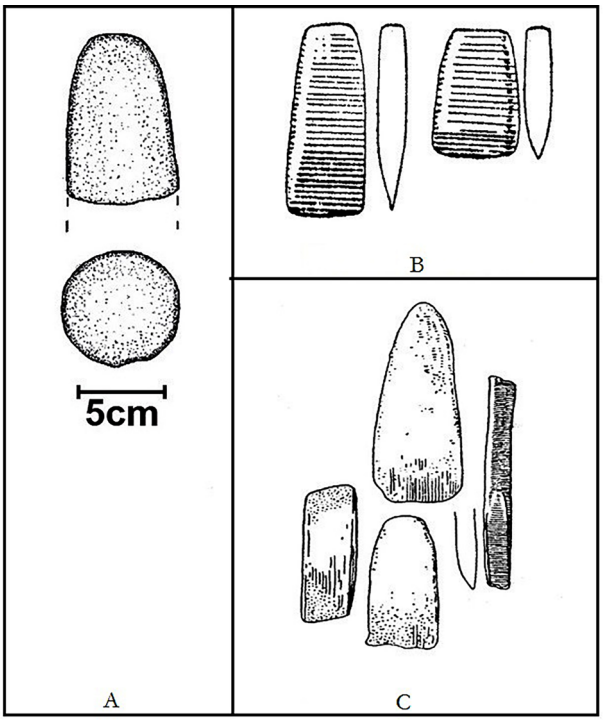


Figure. 12: *A: Handaxes from Tall-e Atashi (After: Jayez and Garazhian, 2013), B: Jeitun I, C: Jeitun II (After: Coolidge, 2005).*

As debitage encompasses any pieces separated from a core (Haririyan *et al*, 2021: 7–27), it is among the most frequent lithic types in most chipped stone assemblages. The collection from Velem not being an exception, the multiple existing debitaes are typologically divided between 79 flakes, 35 blades, and a single bladelet.

Cores are rather scant, simply represented by 8 specimens. In terms of typology, they include 6 flake cores and 2 unidirectional blade cores (Figure .13). Comparable cores occur at Panj Barar together with the gray and red ceramics of the Iron Age (Figure. 14) and Tappeh Abbasi. The negative bulbs of percussion on these cores are deeper than those on the bullet cores, and the blank edges are not smooth as is the case with the bullet cores.



Figure. 13: *The core of a unidirectional blade from Velem (After: Abbasnejad Seresti, 2021).*

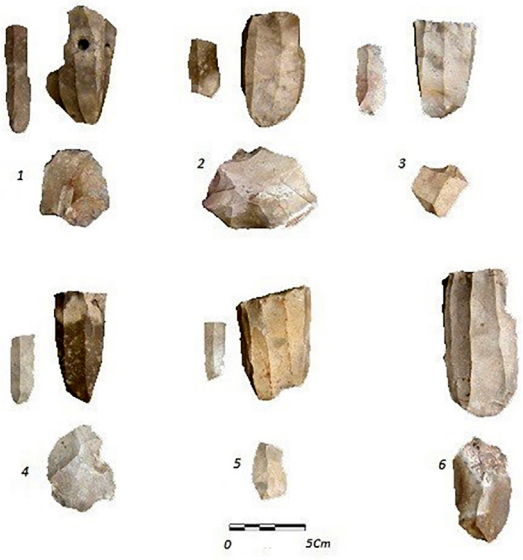


Figure. 14: *Unidirectional blade core from Panj Barar (After: Ramazanpur et al., 2021).*

A most notable feature characterizing the lithic assemblage from Velem is the focus on long and wide blades. Also, blades with sickle shine are absolutely absent.

A most important class of data playing a pivotal role in the analysis of artifacts from any site concerns debris. Morphologically, the debris are small flakes with all the characteristics of complete flakes, but are very smaller in size and are actually by-products of blank manufacturing or were created to perform retouching. The higher the representation of the debris in a collection, the higher the possibility that the tool manufacturing occurred locally (Jayez ,2012: 105). At Velem, the debris fall into two size groups: 0–5 mm, and above 5 mm. The first group was designated as chips and the second as chunk, each represented by 2 and 12 examples, respectively.

Technology

In technological studies, there are two oft-used basic concepts of method and technique. Tixier was the first to distinguish between these concepts in stone artifacts analysis. In his definition, method concerns the nature and sequence of consecutive steps involved in the preparation of a natural stone for flake reduction, while technique is the way in which the flake is reduced. Simply put, technique deals with the force applied on a core to reduce a blank (Jayez and Vahdati Nasab 2019). It comprises three basic principles: how the force is applied (direct, indirect, pressure), the material and type of applied tools (stone or organic hammer; wooden or bone punch; long or short crutch with a bone, metal or wooden tip), body's posture while knapping, how the stone is held, etc. From different impressions left by different techniques on the blanks or the cores it is possible to pin down to some extent the original technique used in the reduction process (Inizan *et al,* 1995: 30–32).

In order to recognize the percussing technique, two groups of blank attributes are to be considered:
1.Flakes' morphological attributes (thickness/ thinness, smoothness/longitudinal curvature, consistency, termination form);
2.Attributes of the striking platform and reduction impressions (ring crack, crushed platform, platform's inner line regularity, ripples on the bulb of percussion, etc. (Pelegrin and Inizan, 2013: 82).

Another concept central to the identification of the role of technology and, consequently, stone artifacts and raw materials in cultures and their differences is the optimization model. Optimal models are used to explicate some behavioral aspects pertinent to resource exploitation (Jochim ,1983: 157), which is usually underpinned by the minimum cost. Therefore, it is necessary to identify the provenances of all stone artifacts from raw stone procurement up to the eventual disposal of the tool, which is described as chaîne opératoire. The operational sequence was an innovative hypothesis advanced by Leroi-Gourhan. The hypothesis indicates how man has used the raw stone, and places individual artifacts in their technical manufacturing context (Inizan *et al,* 1992).

Diversity of Striking Platform

Figure 15 shows the distribution of striking platform type in different blank types. In all the 3 blanks types (flake, blade and bladelet), the plain platform shows the highest frequency. The chapeau de gendarme occurs on 8 flakes and a single blade. This striking platform tends to occur on the flakes of the so-called Clactonian notch technique, which refers to a technology applied to modify transversal convexity (cintrage) and the proximal of nose-scrapers (Inizan *et al*, 1992). Crushed platform, a sign of hard hammer direct percussion, is simply attested on 2 flakes and a single blade. Dihedral striking platform, signifying two previous reductions separated by a line, occurs on a single flake and 2 blades. Facetted striking platform, exhibiting indications of a series of small preparation flakes, is seen on a single flake. A single attestation of punctiform striking platform is also present. This latter platform is generally associated with reductions using indirect percussion with a punch (Debénath and Dibble, 1994: 23).

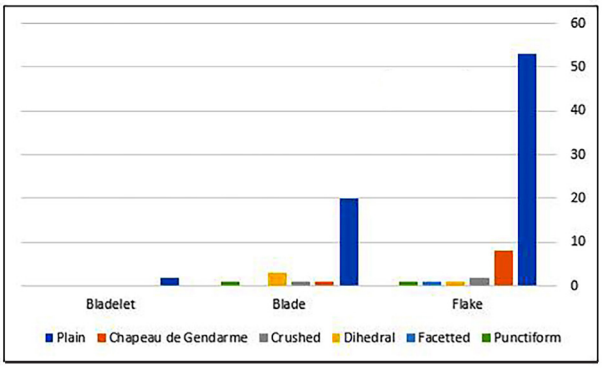


Figure. 15: *Distribution of the striking platform in different blank types*

Correlation of Platform Type and Percussion Bulb Diameter with Errailure Scar

Errailure scar results from the percussive force. In case of an excessive force the flake often rebounds it, resulting in the removal of an extra small flake. Therefore, errailure or bulbar scar follows from techniques in which a lot of force is applied and returns quickly, such as a direct or indirect percussion. But it is noteworthy that the percussion bubble in itself is not enough to indicate the involved technique, because it is the striking platform that has a greater impact on the percussion bulb's size (Debenath and Dibble, 1994: 22). In the assemblage from Velem, errailure scars are most frequent on the flakes, followed by the blades, and then the microblades.

As shown in Table 2, in the flake subassemblage 80.3% of the striking platforms are of the plain, 12.2% of the chapeau de gendarme, 3.03% of the crushed, 1.51% of the gihedral, 51.1% of the facetted, and 51.1% of the punctiform type.

The flakes with plain platforms averaging 27.15 mm long, 14.57 mm wide and a striking bubble of 27 mm as well as all flakes with striking platforms above these averages exhibit errailure scars. The distribution of the blanks with errailure scars does not reveal a specific pattern with respect to striking platforms in the flakes, as is also the case with the blades and bladelets subassemblages. (Table. 2, 3, 4).

Our analysis of the sample reveals that soft/organic hammer direct percussion and indirect percussion are the prevalent techniques responsible for the manufacture of the flakes at Velem. Blades and bladelets tend to display non-parallel edges, plain striking platforms, and large diameter percussion bulbs, of which 44% contain and the remaining 56% lack bulbar scars. Thus, most of the blades and bladelets were fashioned through indirect percussion. Reduction through soft hammer direct percussion or indirect percussion was popular in Mazandaran during a protracted period spanning the Paleolithic to the Iron Age, as is evidenced in the assemblages from Komishan Cave (Jayez, 2012: 96), Touq Tepe (Abbasnejad Seresti 2020), (Tavakoli Zaniani, 2022: 148), Tappeh Abbasi (Abbasnejad Seresti 2008), Tappeh Valiki (Nemati Lojandi 2021; Abbasnejad Seresti and Nemati Lujandi 2022), Panj Barar (Ramazanpour *et al*, 2021). This reduction technique might be regarded as a regional tradition if future investigations provide further assemblages of chipped stone tools from other sites.

In the blade subassemblage, the fading compression waves and parallel edges in a few cases evince the use of compression technique, but the fact that the respective pieces belong to the middle part of the blades makes their further analysis impractical. Of the total of 8 cores discernible in the entire assemblage from Velem, 6 are flaking cores and 2 are unidirectional blade cores. The paucity of cores compared to the blanks and the lack of flakes with cortex give rise to the possibility that parts of the core preparation work were carried out afield (Abolfathi *et al,* 2014). As the flakes are the most abundant among the blanks and most attestations of the cortex occur on their dorsal surface, they certainly were removed from the core in the early stages and were not intended as the main purpose of the reduction work, but rather represented by-products.

Table. 2: *Distribution of errailure scar in different types of striking platforms in flakes*

	Plain	Chapeau de Gendarme	Crushed	Dihedral	Facetted	Punctiform
Yes	36	5	1	0	0	1
No	15	3	1	1	1	0

Table. 3: *Distribution of errailure scar in different types of striking platforms in blades*

	Plain	Chapeau de Gendarme	Crushed	Dihedral	Facetted	Punctiform
Yes	7	1	0	1	0	0
No	10	0	0	2	0	1

Table .4: *Distribution of errailure scar in different types of striking platforms in bladelets*

	Plain	Chapeau de Gendarme	Crushed	Dihedral	Facetted	Punctiform
Yes	1	0	0	0	0	0
No	1	0	0	0	0	0

Conclusions

Based on the discussions outlined above, the assemblage of lithic tools from Velem are made of chert, which was accessible in the surrounding environment. From the lower frequency of cores compared to flakes, the scarcity of primary flakes, cortical blanks, and the paucity of blade cores one may assume that the knapping work was partially done outside the site, and the reduced fragments were transported into the settlement as ready-made blanks. The situation might be explained by such factors as unavailability of raw material, a remote deposit of desirable raw material, and the pattern of mobility and sedentarism.

Velem's lithic assemblage breaks down typologically into side-scrapers, end-scrapers, retouched tools, a Levallois-type arrowhead, and a handaxe/celt akin to the Neolithic and post-Neolithic examples. Among the scrapers, the side variety is the most common. Scrapers were mostly made on large flakes, and generally exhibit a jagged retouching. One piece gives impression of a saw, probably used to cut and peel hard objects such as wood and bone or to scrape wood and straw. The knapping industry at Velem is characterized by a tendency towards long blades, a hypothesis substantiated by two blade cores. Simple blank flakes by far outnumber those formed into tools. The tools tend to be made on blades and are mostly retouched.

Flakes with plain striking platform measuring an average length of above 27.15 mm, average width of 14.57 mm, and average percussion bulb diameter of 27 mm, contain bulbar scars on the percussion bulb. Judging from the extent of the striking platform and the percussion bulb as well the presence of errailure scar, the flakes were probably removed using direct percussion. The reduction technique in most blanks is soft hammer direct percussion or indirect percussion, techniques that were popular in Mazandaran from the Mesolithic to the Iron Age.

The unknown character of the excavated depressions and their disturbed and multi-period (Chalcolithic, Bronze and Iron periods) archaeological context make it difficult to propose a reliable chronology for the considered tools. Yet, the involved technology relying on direct percussion with a soft hammer or an indirect percussion, and the morphology of the tools and cores point to a tentative date between the late Neolithic and the Chalcolithic period for the lithic assemblage from Velem.

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