Routledge
Taylor & Francis Group

Lithic Technology

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/ylit20

A New Settlement from the Epi-Palaeolithic Period: The Operational Sequence and Techno-Typology of the Knapped Stone Industry at the Kızılin Site (Antalya, Turkey)

Eşref Erbil , Gizem Kartal & Zeynep Beyza Ağirsoy

To cite this article: Eşref Erbil , Gizem Kartal & Zeynep Beyza Ağirsoy (2021): A New Settlement from the Epi-Palaeolithic Period: The Operational Sequence and Techno-Typology of the Knapped Stone Industry at the Kızılin Site (Antalya, Turkey), Lithic Technology

To link to this article: https://doi.org/10.1080/01977261.2021.1883250

Published online: 10 Feb 2021.

LITHIC TECHNOLOGY
https://doi.org/10.1080/01977261.2021.1883250

Routledge
Taylor & Francis Group

A New Settlement from the Epi-Palaeolithic Period: The Operational Sequence and Techno-Typology of the Knapped Stone Industry at the Kızılin Site (Antalya, Turkey)

Eşref Erbil, Gizem Kartal and Zeynep Beyza Ağirsoy

Department of Prehistory, Ankara University, Ankara, Turkey

ABSTRACT
Kızılin is a cave settlement within the provincial borders of Antalya. The settlement is dated to the Epi-palaeolithic period. Some knapped stone findings were identified during the terrace excavation conducted in this site. This study focuses on examining the knapped stone *chaîne opératoire* of the inhabitants, and on analyzing the knapped stone findings by a techno-typological approach. Our analyses led us to identify all technological phases of knapped stone process practiced at the Kızılin site. Typologically, the knapped stone tool industry was found to consist of microliths and macroliths. It has been observed that the microliths are higher in number compared to the macroliths. In this context, the results obtained were compared with the Epi-palaeolithic layers of Öküzini and Karain settlements where their similarities and differences are revealed.

KEYWORDS
Anatolia; Epi-palaeolithic; knapped stone; techno-typology; macrolith; microlith

Introduction

Kızılin is located 1 km west of Yağca village in Çakmak district, approximately 30 km north-northwest of the Antalya city center (37°3′21.68″N, 30°32′46.44″E) (Kartal, 2009, p. 73) (Figure 1). It was discovered in 1950s during a survey conducted by İ. Kılıç Kökten in the region (Demirel et al., 2019, p. 652.). In 1984, the site was re-visited within the scope of the Western Taurus Palaeolithic Surveys conducted by Işın Yalçınkaya and it was reported that a multitude of knapped stone finds were encountered (Yalçınkaya, 1985, p. 432). In 2017, Metin Kartal undertook the scientific consultancy of Kızılin on behalf of the Antalya Museum Directorate and the groundwork started at Kızılin. The studies in 2017 were mostly concentrated around landscaping, preparing the excavation site to be suitable for scientific excavation, and conducting a systematic survey (Demirel et al., 2019). During the systematic survey, many knapped stone finds were encountered, and the results were published by Gizem Kartal (Kartal, 2019a). The first systematic excavation started on the cave terrace in 2018. The excavation was conducted in 14 different grid squares oriented east–west and north–south (Figure 2). The 2019 excavation continued with the same grid squares.

Today, it is known that Epi-palaeolithic settlements are identified by the density of knapped stone tools called microliths (Kartal, 2009, p. 6). During both systematic survey and excavation, an intense bladelet production was observed at Kızılin.

A date analysis for Kızılin conducted in 2019 resulted in a date from the 9th archaeological level. The TÜBİTAK-837 C14 (conventional) analysis provided an age of 14,956 ± 52 BP (uncal.). When the 2-sigma value calibration (age correction) of this date taken from a freshwater mollusc is made, two different intervals were determined (with an accuracy of 95%) based on various possibilities. One of these is in the range of 16,401–16,031 BC and the other is in the range of 15,948–15,553 BC (Kartal, 2020, in print). The C14 dates obtained and the observed knapped stone techno-typology characterize a typical Epi-palaeolithic period settlement.

Most of our knowledge about the Epi-palaeolithic period of Anatolia is based on the results obtained from the Öküzini (Otte et al., 1995) and Karain B (Taşkıran et al., 2017, 2018; Yalçınkaya et al., 2016) settlements. Both caves contain Epi-palaeolithic layers within a specific archaeological stratigraphy. Direkli Cave, located in close proximity to the Levant region, is another Epi-palaeolithic period settlement in Anatolia (Erek, 2010, 2012, 2014). As a result of the dating studies carried out at Direkli Cave, the settlement has been dated between 10,500–9,000 cal. BC (Arbuckle &

CONTACT Eşref Erbil erbilesref@gmail.com

Figure 1. Location of Kızılin.

Erek, 2012, p. 695). There is another Epi-palaeolithic site in the southern part of Central Anatolia which is Pınarbaşı rock shelter. It was reported that elongated scalene triangular microliths were found at the Pınarbaşı settlement which is geographically not far from Kızılin (Kartal, 2003, p. 37). In the surveys conducted in the region by Douglas Baird, it has been reported that the collected microliths can be placed between 17,000 and 8,000 BC and such finds can be encountered in the Epi-palaeolithic and early Holocene settlements (Baird, 2002, pp. 142–143). During the following years, the dating obtained from the Pınarbaşı settlement has become a center of attention. According to the dating results conducted at the settlement, the levels containing microliths correspond to 16,159–12,897 cal. BP (Baird et al., 2013, pp. 184–185). Researchers working on the Pınarbaşı settlement report that the settlement coincides with the Early Natufian period of the southern Levant (Baird et al., 2013, p. 184). Apart from the mentioned settlements it is not possible to assess exactly which phase of the Epi-palaeolithic period these findings belong, although the findings exhibiting the techno-typological features of the Epi-palaeolithic period have been reached as a result of the studies conducted in the past years and surveys. The Anatolian Epi-palaeolithic which we know only a little about is expected to gain more understanding because of the Kızılin excavation. Evidently, the study in question will contribute greatly to our understanding of the Anatolian Epi-palaeolithic.

Materials and methodology

This article contains the results from the 2018 excavation. As a result of the 2018 Kızılin excavation, rich archaeological data were obtained including many knapped stone artefacts, bones of various animals, and seeds. All the excavated soil was sieved by 5, 3 and 1 millimeters. The flotation technique has been used. The most significant group among the finds is that of the knapped stone artefacts. These include a large number of prismatic blades and bladelet cores, microlith and macrolith tools, technological pieces, flakes, blades and bladelets, and dense debitage (the knapping waste product). In total, 38,334 pieces of knapped stone were found just in the 2018 campaign (Figure 3). Despite the area of excavation being limited, quite a large number of knapped stone finds were revealed. This is significant since it points out the presence of intense human activity.

All knapped stones found during the excavation were analyzed. The conducted analyses consisted of 3 basic stages. The first stage was the classification of knapped stone materials. The purpose of the second stage was to define the typology of the knapped stone tools. And the third step aimed to define the Kızılin knapped stone *chaîne opératoire*, technology, and flaking strategies.

Initially, the cores, end-products, and products with tool characteristics were classified. Then, the types of raw materials of the knapped artefacts were classified.

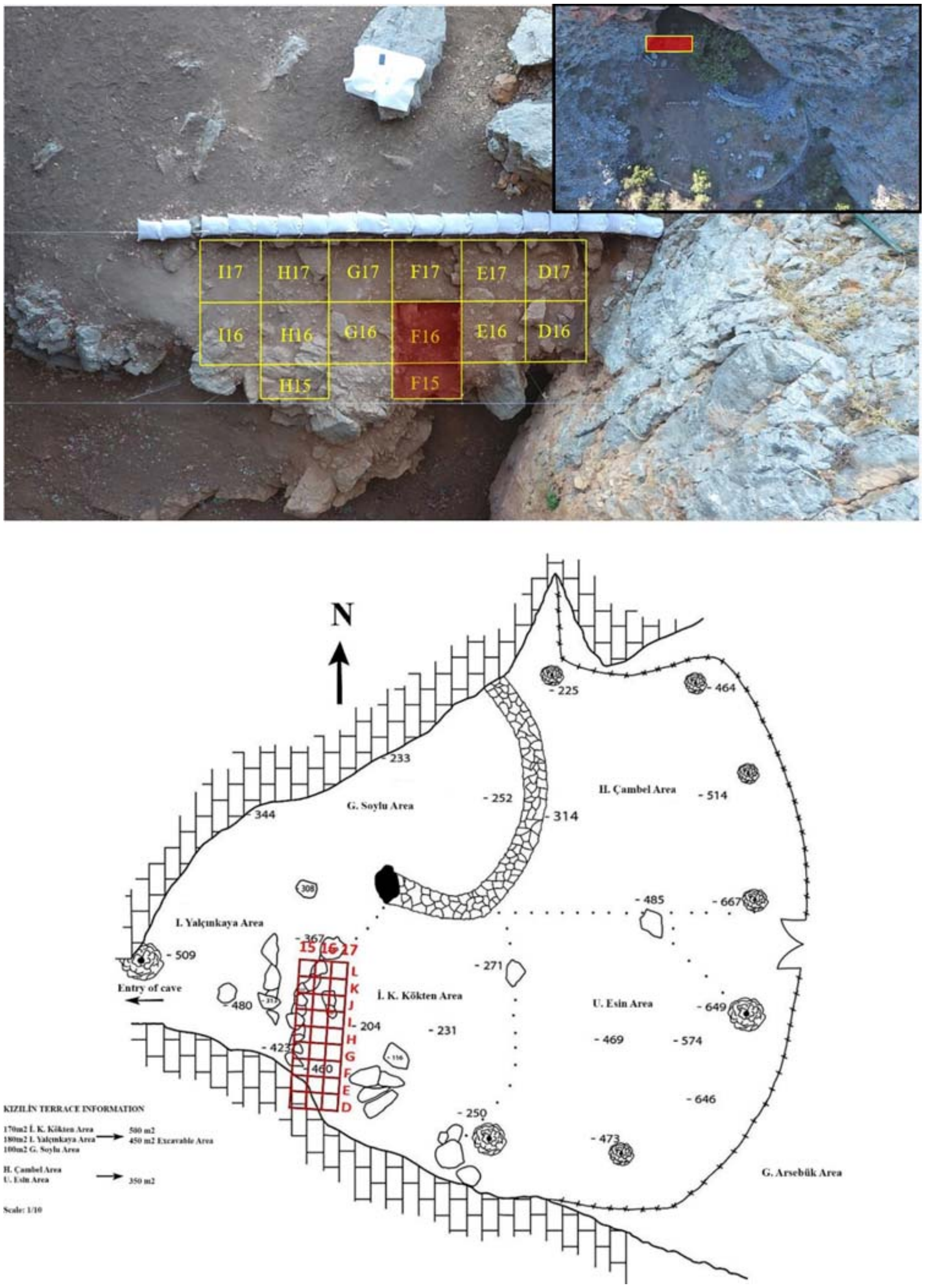

Figure 2. Grid squares excavated at Kızılin in 2018 and 2019 (Demirel et al., 2019, p. 660).

The *Munsell* (Munsell, 2009) rock color chart was used for determining the colors of raw material types. Identification of the raw material types and the color analysis enabled us to make macroscopic comparisons with the raw material sources in the surrounding environment.

The second step was to define the Kızılin knapped stone tool typology and to create the Kızılin type list. The results of this typological study were evaluated separately for each archaeological level. Thus, we tried to determine whether there are any techno-typological differences between the archaeological levels.

The third step aimed to define knapped stone technology where cores and end-products were evaluated together. Initially, the typological distinctions were made between cores and end-products. Later, analyses were conducted with various criteria to understand the flaking strategies of the cores. We tried to determine the types of hammer stone based on the negative marks on the cores and the bulb properties of the flaking artefacts. A database was created to store the different data and observations obtained during the analysis studies as well as the technological criteria

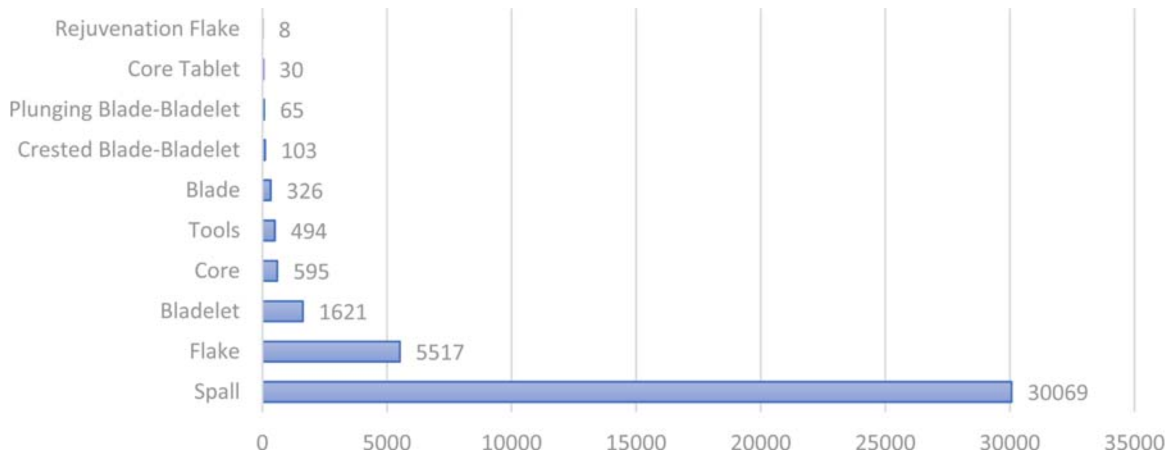

Figure 3. Distribution of knapped stone finds from Kızılin during 2018.

deployed. After the information and observations on the analyzed knapped stone techno-typology were transferred to the digital environment, we have placed the statistical information into various tables and graphics.

Raw material

Studies carried out in the region earlier made it known that raw materials suitable for knapped stone production are present at Kızılin Stream (Figure 4) flowing right in front of Kızılin (Aydın & Brandl, 2019). Previous studies have determined that the pebbles in the lower part of Kızılin Stream towards Çakmaklı District are in smaller pieces due to longer rolling by the stream (Yalçınkaya, 1985, p. 433). Another result obtained by the researches point out that the low-quality outer surfaces of the siliceous stones are worn off due to rolling and dragging along the bed of Kızılin Stream, and as a result massive nodules suitable for flaking remained (Kayan, 1990, p. 18). Based on our macroscopic observations, we can state that Kızılin inhabitants obtain almost all of the raw materials they need for knapped stone production from the bed of Kızılin Stream.

Radiolarite accounts for 95% of the raw materials of all knapped stone products. 4.4% of the lithic raw materials encountered were chert. We encountered a very small percentage of siliceous limestone (0.02%) among the raw material types. Radiolarite and siliceous limestones overlap macroscopically with types of raw material found in the Kızılin Stream. Chert seem to

Figure 4. The view of Kızılin and Kızılin Stream.

have been brought to the settlement from a remote source. However, for each raw material, a source analysis study should be conducted via microscopic analysis. The outcome of such a study will yield healthier results in terms of understanding the origin of the lithic raw materials found at the Kızılin site.

The color distribution of the knapped stone material is quite diverse. As mentioned earlier, the *Munsell* color chart was used for determining colors. 85 different colors were identified. The most dominant color types and their percentages are outlined in Figure 5.

Cores

Cores are quite an important group of finds in terms of identifying knapped stone technology since they are the remains of production processes.

In total, 595 cores were found during the excavation carried out in 14 different grid squares in 2018. Radiolarite was used as the raw material in 95.5% of those cores while chert was used in 4.5%. 91% of the cores displayed cortical faces in various proportions. Detailed data on cortical face distributions can be seen in Figure 6. The cortex ratio is very high, and this suggests that economizing the raw material was not a concern during the knapping process. This can be explained by the fact that the people of Kızılin were close to the source of raw material which made the raw materials easily accessible.

A well-known method of knapped stone production involves heat treating – subjecting the raw material block to heat in order to knap the core easily and more uniformly. Macroscopic observations have been made to understand whether the knappers of Kızılin

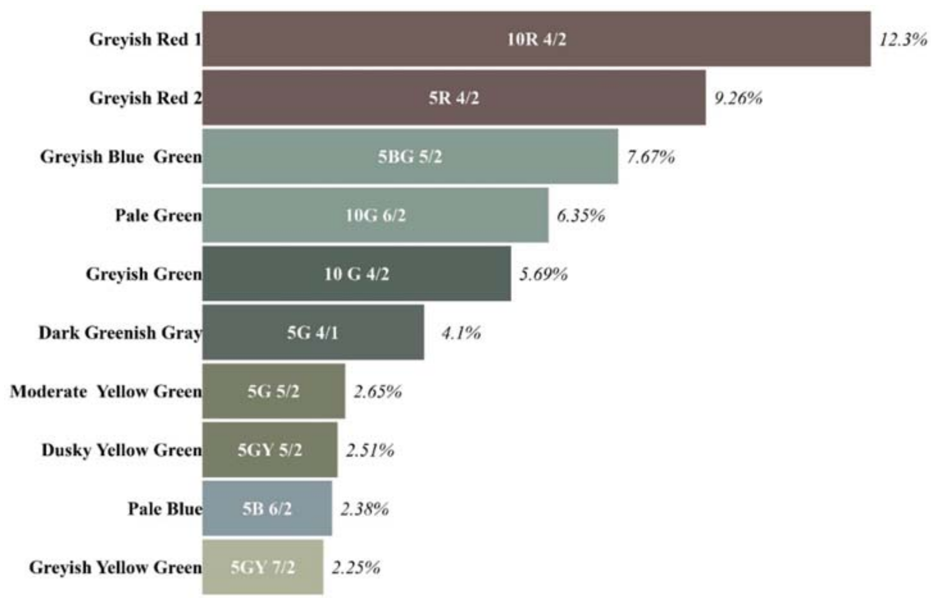

Figure 5. The most dominant color types and percentages of the cores.

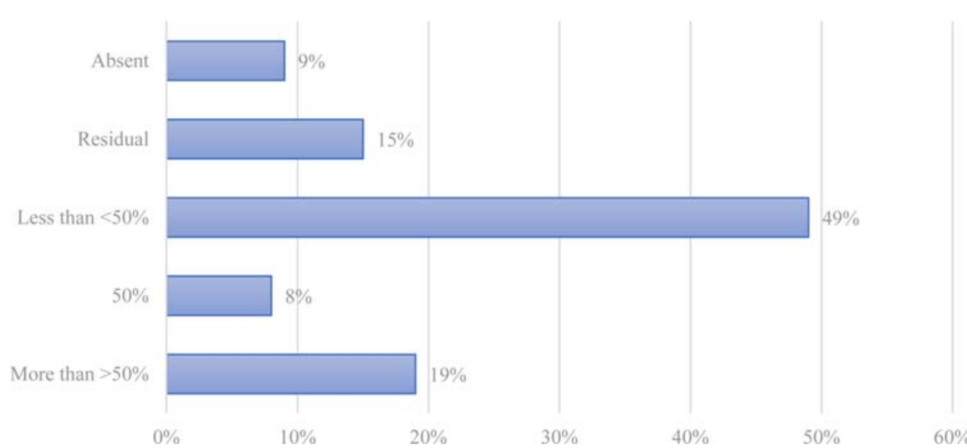

Figure 6. Cortical face distributions of cores.

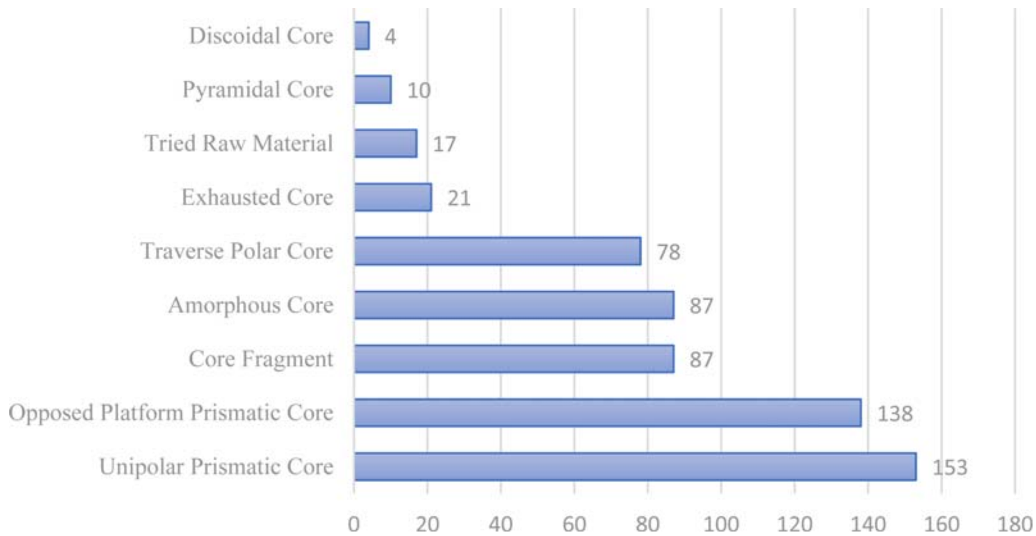

Figure 7. Types of cores from the Kızılin site.

used such a method especially on cores with a cortical face. The observations showed that only 35 of 595 cores presented burn marks. The burn marks observed on 35 cores seem to have occurred as a result of incidental fire exposure rather than reflecting a method related to the knapping process.

It was observed that 381 of the 595 cores (64.03%) went through several preparatory stages. 104 (17.47%) of the cores did not go through preparatory stages. For 110 (18.5%) cores, it could not be determined whether they went through any preparatory stage due to their fractures.

9 different core types were identified based on the analyses of types of cores.

Information on core types are outlined in Figure 7. Accordingly, the most common types of cores are

Figure 8. Unipolar and opposed platform prismatic cores found at the Kızılin site.

unipolar and opposed platform prismatic cores (Figure 8). Out of 595 cores, 158 are unipolar and 138 are opposed platform prismatic cores.

When we study the average dimensions of the cores, we find that the average length is 33 mm, width is 25 mm, and thickness is 35 mm. Based on these dimensions and our observations, it can be asserted that Kızılin knappers preferred especially small size nodules for raw material. With the preference for small sized raw materials, much preparation was not necessary, hence an advantage was secured in the production phase. The average number of products taken from the cores is 7 and 63% of the final products taken from the cores are bladelets. Therefore, it can be asserted that the production at Kızılin was focused on a bladelet technology. The small size raw material preference provided advantages in bladelet production.

Most of the cores displayed hinge fracture negatives (Figure 9). The faults which observed in the Kızılin cores are related to the general structure of the raw material rather than an application of excessive force on the cores. Cleavage planes are present in 78% of the Kızılin cores. These cleavage planes prevented the force applied from affecting the entire flaking surface and caused hinge fracture. (Figure 10). Hinge fracture negatives were observed in 72% of the cores with cleavage planes. This also had an impact on the abandonment of the core. It seems that the people at the Kızılin site, who did not have difficulty in acquiring new raw materials, tended to abandon the core when a fault occurred during the flaking process rather than repositioning the core's flaking surface.

52.2% of the cores have a flat striking platform. The proportion of cores having a cortical striking platform is 10.4%. On the other hand, 6.9% of cores are facetted. For 30.5% of the cores the striking platform types could not be determined due to fractures. If the obtained raw material does not have a suitable striking platform for the flaking process, it has been observed that a simple flake is taken with a hard stroke which opens the striking platform and then the flaking process begins. Cores with this type of striking platforms are called "cores with flat striking platforms", and these types of striking platforms are the most common among the Kızılin cores. The angle between the striking platform of the cores and the flaking surfaces is less than 90°, and hard hammering was employed. No evidence of soft hammering has been encountered. No trace of crushing has been observed at the lower ends of the cores and no signs of cores being fixed in place. The flaking process was performed inside the hand, not with the help of a fixed device.

Flaking strategies

As we mentioned above, there was a specific technology at Kızılin for bladelet production. Most of the bladelet production was provided from unipolar and opposed platform prismatic cores as seen from the typological distribution of the cores.

We have identified 4 different flaking strategies for unipolar prismatic cores (Figures 11–14) and 3 different flaking strategies for opposed platform prismatic cores (Figures 15–17).

Unipolar Flaking Strategy No. 1
Unipolar Flaking Strategy No.2
Unipolar Flaking Strategy No.3
Unipolar Flaking Strategy No.4
Opposed Platform Flaking Strategy No.1
Opposed Platform Flaking Strategy No.2
Opposed Platform Flaking Strategy No. 3

Tool typology of knapped stones

In line with the analyses conducted on the tools found among the knapped lithic artefacts, the initial results obtained from stratigraphic layers are very important for understanding the industry.

Table 1. Knapped stone typology list of Kızılin.

MICROLITHS	
Geometric Microliths	
Crescent	12
Isosceles Triangle	7
Short Sclaene Triangle	3
Trapeze	3
Atypical Isosceles Triangle	2
Asymmetrical Trapeze	2
Atypical Trapeze	2
Non-Geometric Microliths	
Backed Bladelet	131
Retouched Bladelet	37
Point	37
Trancated Bladelet	16
Other Microliths	2
Microburin	12
Unidentified Microliths	23
Total	**289**
MACROLITHS	
Burin	38
End Scraper	35
Retouched Blade	31
Retouched Flake	29
Notched Tool	17
Double Tool	13
Piece Esquille	11
Denticulated Tool	9
Truncated Blade	7
Core Tool	6
Unidentified Macroliths	3
Other Macroliths	2
Heavy Duty Tool	1
Perforator	1
Point	1
TOTAL	**205**

Figure 9. Cores displayed hinge fracture negatives.

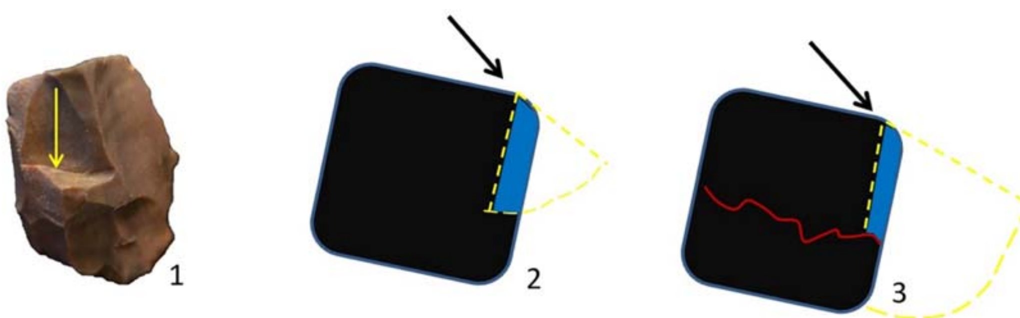

Figure 10. Image 1 shows a hinge fracture negative. In images 2 and 3, the black figure represents the core. The black arrows indicate the striking angle. The yellow lines indicate the area of distribution of energy that occurs during knapping. The parts indicated in blue represent hinge fracture. The red line in image 3 shows the cleavage plane. The blades, bladelets or flakes that are desired to be taken from the whole flaking surface in image no. 2 show the hinge fracture obtained if the impact of the flake applied on the core is insufficient. The situation encountered in the image no. 3 is observed in 72% of the Kızılin cores. Sufficient power is being applied to the flaking surface, but the cleavage plane structure of the raw material caused hinge fracture.

289 (59%) of the 494 knapped tools identified were microliths and 205 (39%) were macroliths (Table 1). Radiolarite is used as raw material for the majority of the knapped tools recovered from Kızılin. Chert artefacts are very few among both microliths and macroliths. Analyses showed that there was an industry based on microlithic tool production at Kızılin which also confirmed the predictions made during previous years (Kartal, 2019b, p.

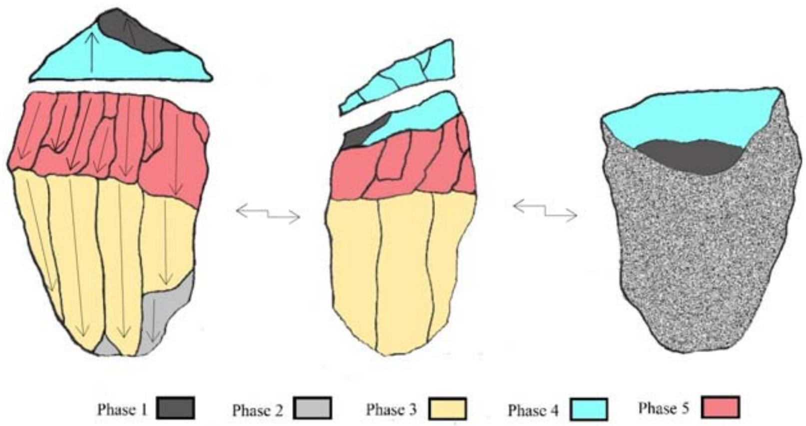

Figure 11. Phase 1; striking platform preparation. Phase 2; primary blank extraction surface. Phase 3; secondary blank extraction surface. Phase 4; striking platform is renewed. Phase 5; after the striking platform is renewed tertiary blank extraction production continues from the same flaking surface and if hinge fracture is obtained the core is abandoned.

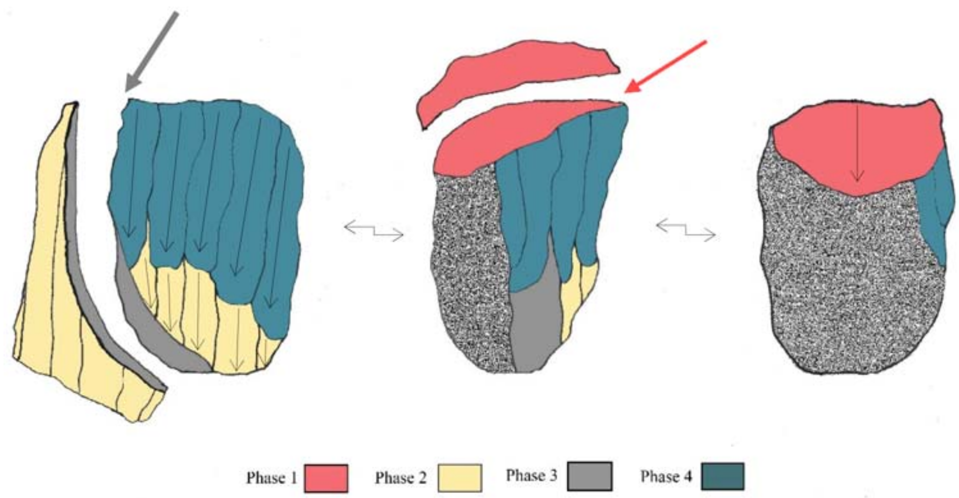

Figure 12. Phase 1; striking platform preparation. Phase 2; primary blank extraction surface. Phase 3; plunging blade is extracted and a new striking platform is created. Phase 4; blank production continues over the secondary flaking surface.

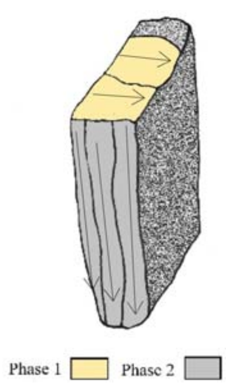

Figure 13. In both flaking strategies, when selecting the raw materials, nodules with a very narrow width are specifically preferred. This preference provides advantage in blade production due to the structure of the raw material nodule. Phase 1; striking platform preparation. Phase 2; bladelet production is carried out without any preparation phase along the narrow side. 3 products are obtained from these core types and then the core is abandoned.

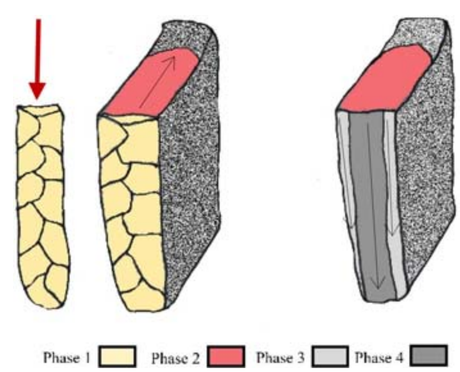

Figure 14. Phase 1; the crest is created along the narrow side of the nodule and a flaking surface is cleared by removing the crest. Phase 2; striking platform preparation. Phase 3 and 4; one product is obtained from each side surface of the flaking surface created in phase 3. These products are preparation products to help the product in phase 4 to be straighter and rhomboidal.

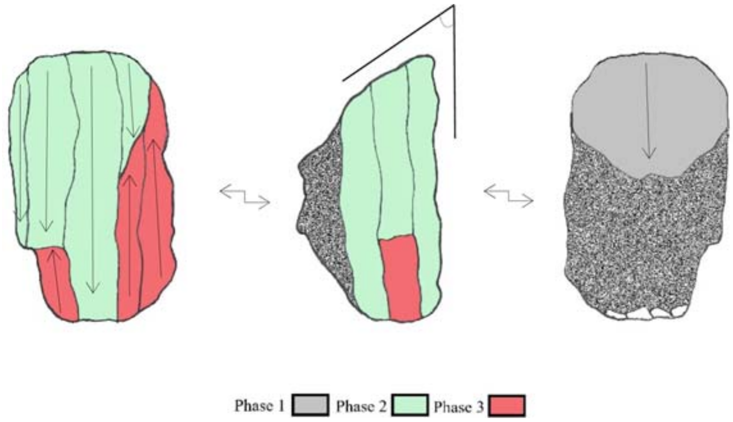

Figure 15. Phase 1; striking platform is prepared so that the angle between the striking platform and the flaking surface is less than 90°. Phase 2; primary blank extraction surface. Phase 3; due to the nature of the raw material at the opposite pole of the core, the angle between the striking platform and the flaking surface is less than 90°. Therefore, there was no need to open any striking platform. In order to obtain more controlled flaking from the second pole, the striking platform was prepared with small facets and the blank production continued from the opposite pole.

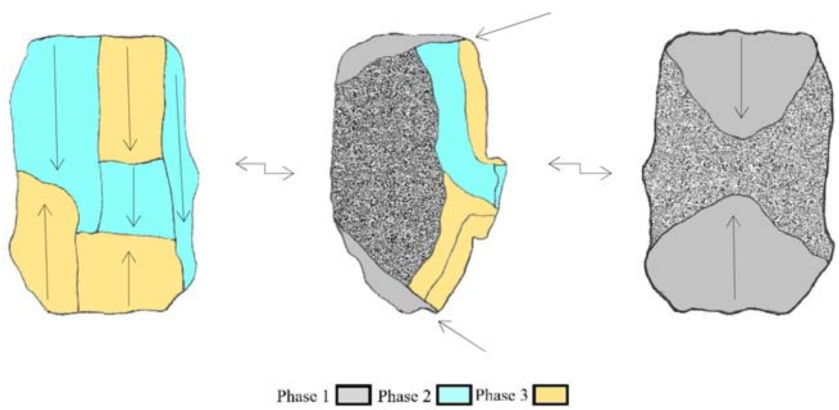

Figure 16. Phase 1; striking platform preparation. Phase 2; primary blank extraction surface. Phase 3; secondary blank extraction surface. If the desired product cannot be knapped during flaking, the flaking process continues to the extent allowed by the core from the opposite pole.

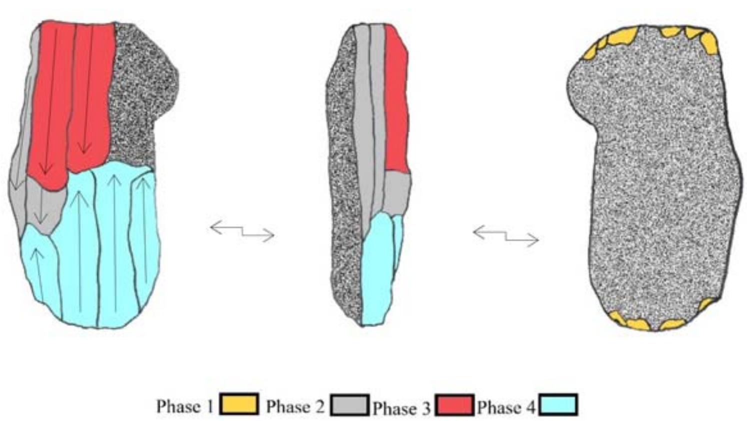

Figure 17. Flat and small sized raw material nodules are preferred in this flaking strategy. Phase 1; striking platform preparation. Phase 2; primary blank removal surface. Phase 3; secondary blank removal surface. Phase 4; tertiary blank removal surface.

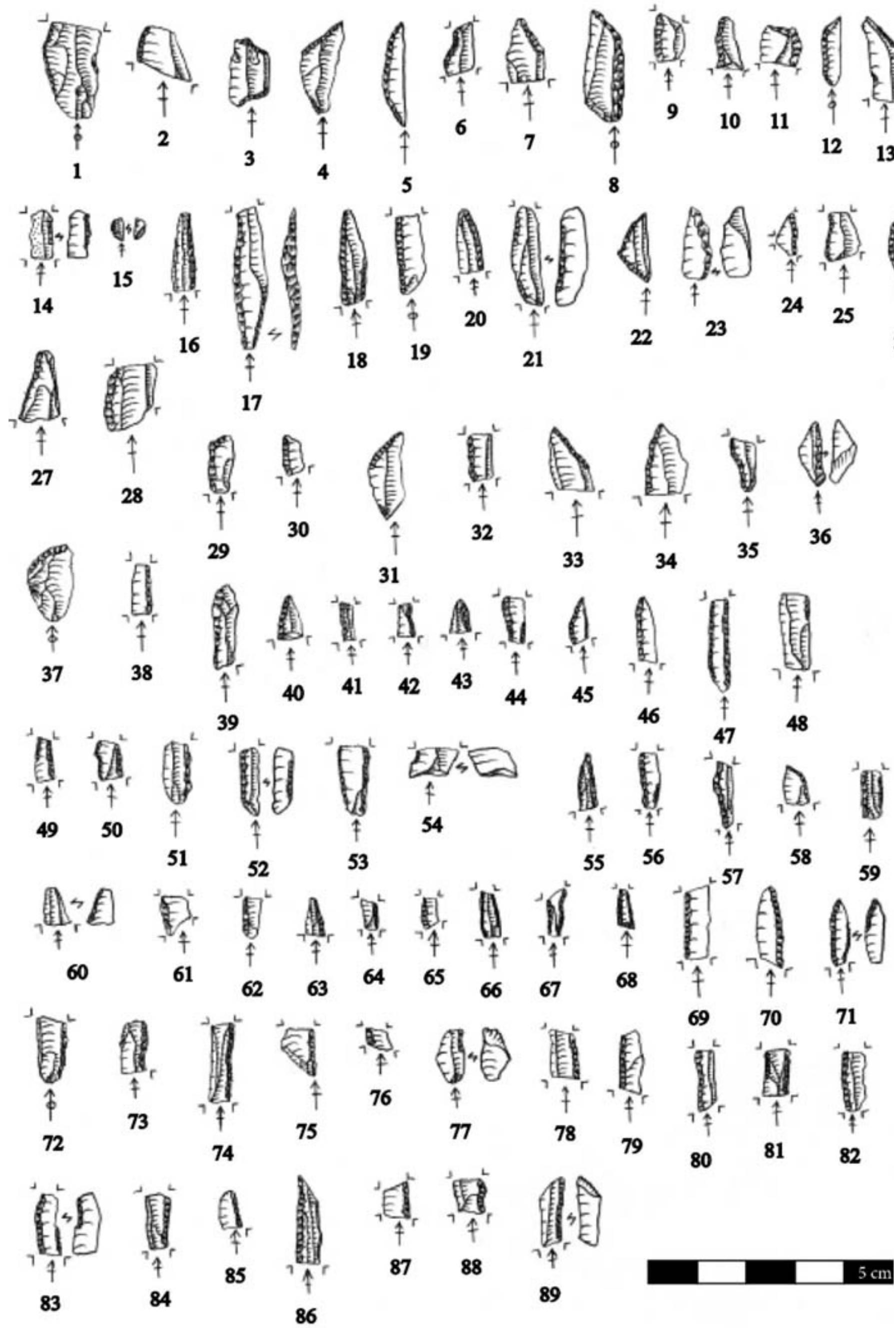

Figure 18. 1, 2, 25: Retouched bladelets and fragments; 3: Trapeze; 4: Partially retouched obliquely truncated bladelet; 5, 26: Crescents; 6, 27: Partially backed bladelets and fragments; 7, 33, 37: Obliquely truncated bladelets and fragments; 8, 11, 58: Obliquely truncated backed bladelets and fragments; 9, 10, 12, 16, 19, 20, 24, 28–30, 32, 34, 35, 38–43, 46, 51, 57, 61–65, 69, 70, 72–76, 78–80, 82, 84–88: Straight backed bladelets and fragments; 13, 48: Partially retouched bladelets; 14, 60: Inverse retouched bladelets and fragments; 15, 23, 36, 77, 89: Krukowski microburins; 17, 18, 44, 55, 71:Microgravet points and fragments; 21: Alternately retouched bladelet; 22: Isosceles triangle; 31: Asymmetrical trapeze; 45, 47, 50, 53, 56, 59, 66: Single-edge-retouched and backed bladelet and fragmentss; 49, 81: Partially retouched (on one edge) and backed bladelets; 52: Inverse retouched backed bladelet; 54: Bladelet with side-blow technique truncation; 67: Retouched bladelet on both edge; 68: Double backed bladelet; 83: Alternately retouched backed bladelet.

309). The number of microlithic tools found during surface survey (Demirel et al., 2019, pp. 657–658) before the start of the excavation was quite low (12%) but this figure increased during the systematic excavations of the *in situ* layers.

The Kızılin knapped stone industry consists of geometrical, non-geometrical and unidentified microliths

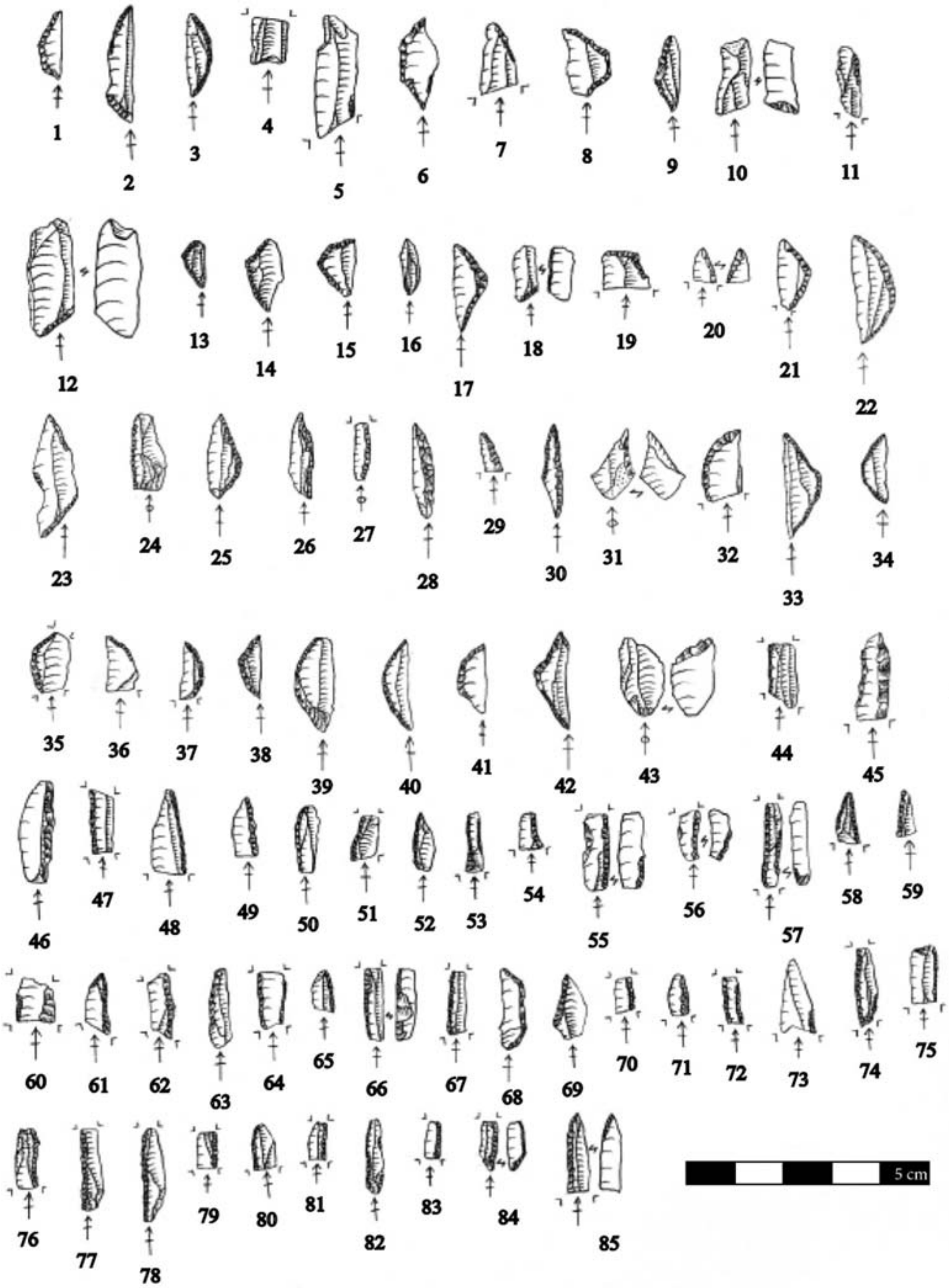

Figure 19. 1, 14: Atypical isosceles triangles; 2: Obliquely double truncated bladelet; 3, 22, 32, 35, 37, 39–41: Crescents; 4, 10, 43: Bladelets with side-blow technique truncations; 5, 7, 11, 16, 73: Partially retouched bladelets; 6, 8: Atypical trapezes; 9, 25: Short scalene triangles; 12: Bladelet with obliquely basal truncation, bladelet with side-blow technique truncation; 13, 15, 17, 21, 33, 38: Isosceles triangles; 18: Partially inverse retouched bladelet with obliquely basal truncation; 19, 69: Other microliths; 20: Alternately retouched bladelet fragments; 23: Asymmetrical trapeze; 24, 44, 48, 50, 75: Retouched bladelets and fragments; 26–29, 46–49, 51, 52, 54, 59, 60, 62, 63, 65, 67, 70, 71, 76–81, 83: Straight backed bladelets and fragments; 30, 45, 55–58, 61, 66, 74, 82, 84, 85: Microgravet points and fragments; 31: Krukowski microburin; 34, 42: Trapezes; 36: Obliquely truncated bladelet fragments; 53, 64, 72: Single-edge-retouched backed bladelets; 68: Obliquely truncated backed bladelet.

(Figures 18 and 19). There are also microburins associated with the microlith production technique. Of these 289 pieces, 31 are geometric, 223 are non-geometric, and 23 are unidentified microliths. There were 12 microburins in total. Considering the Kızılin industry, the production of microlithic tools seems to have been a tradition based on the production of non-geometric microliths.

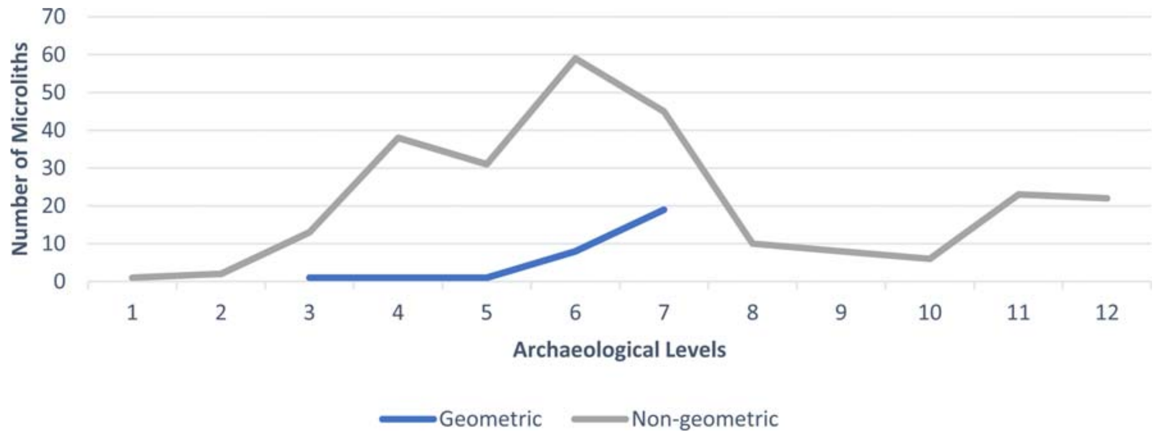

Figure 20. Distribution of geometric and non-geometric microliths between archaeological levels.

In general, geometric microliths consist of crescent, triangle, and trapeze shapes. The most common types are crescent and isosceles triangle. Additionally, there are other types such as short scalene triangle, trapeze, atypical isosceles triangle, atypical trapeze, and asymmetric trapeze. Regarding the distribution of geometric microliths between archaeological levels, they are found in the first 7 levels, which represent the upper levels in the archaeological stratigraphy of Kızılin (Figure 20).

The density of geometric microliths was highest in the 6th and 7th archaeological levels. Almost all crescents are found in the 7th archaeological level (Figure 21). Among the geometric microliths, there were 12 crescent pieces. The majority of these crescents, which are of various sizes, were recovered intact, only the butts of 4 were broken. The isosceles triangles are the second most encountered and are represented by 7 artefacts, one being broken. Other triangular forms include short scalene and atypical isosceles triangles. Only one sample is identified as broken. Seven pieces of trapezes were encountered, and among them are trapezes, atypical trapezes, and asymmetric trapezoidal forms. Two artefacts in this group are broken. To date, the geometric microliths detected at the upper levels and exhibiting late Epipalaeolithic techno-typology have not been observed at the lower levels.

Non-geometric microliths are mostly characterized by subtypes. There are various subtypes of these microliths that we group under the main types such as backed bladelets, retouched bladelets, points, truncated bladelets, and other microliths. Among the non-geometric microliths, the straight backed bladelets are quite dominant, which are grouped under the backed bladelet main type. This is also the most dominant subtype among

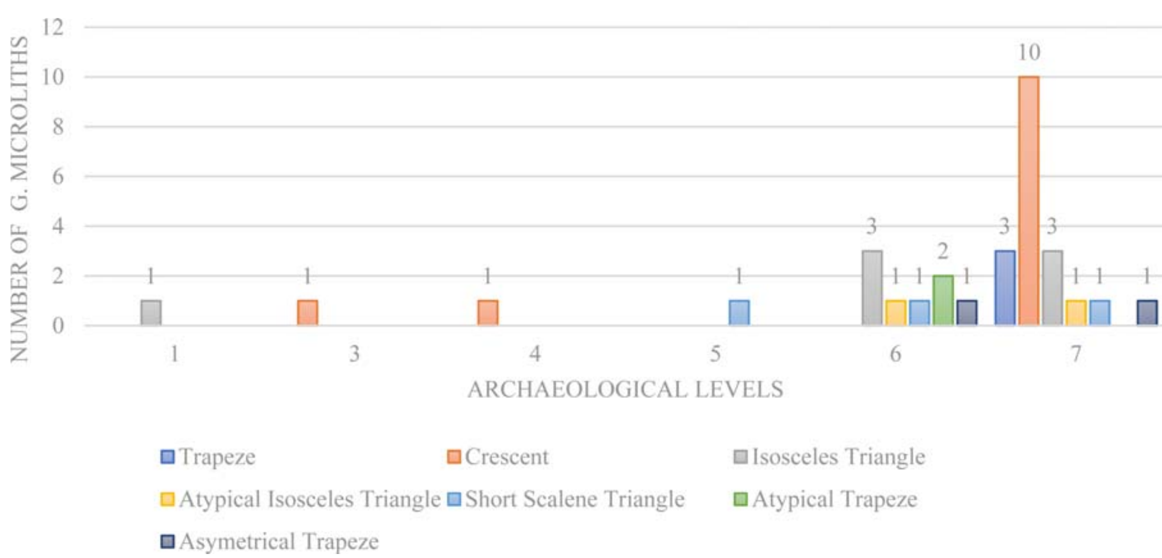

Figure 21. Distribution of geometric microliths between archaeological levels.

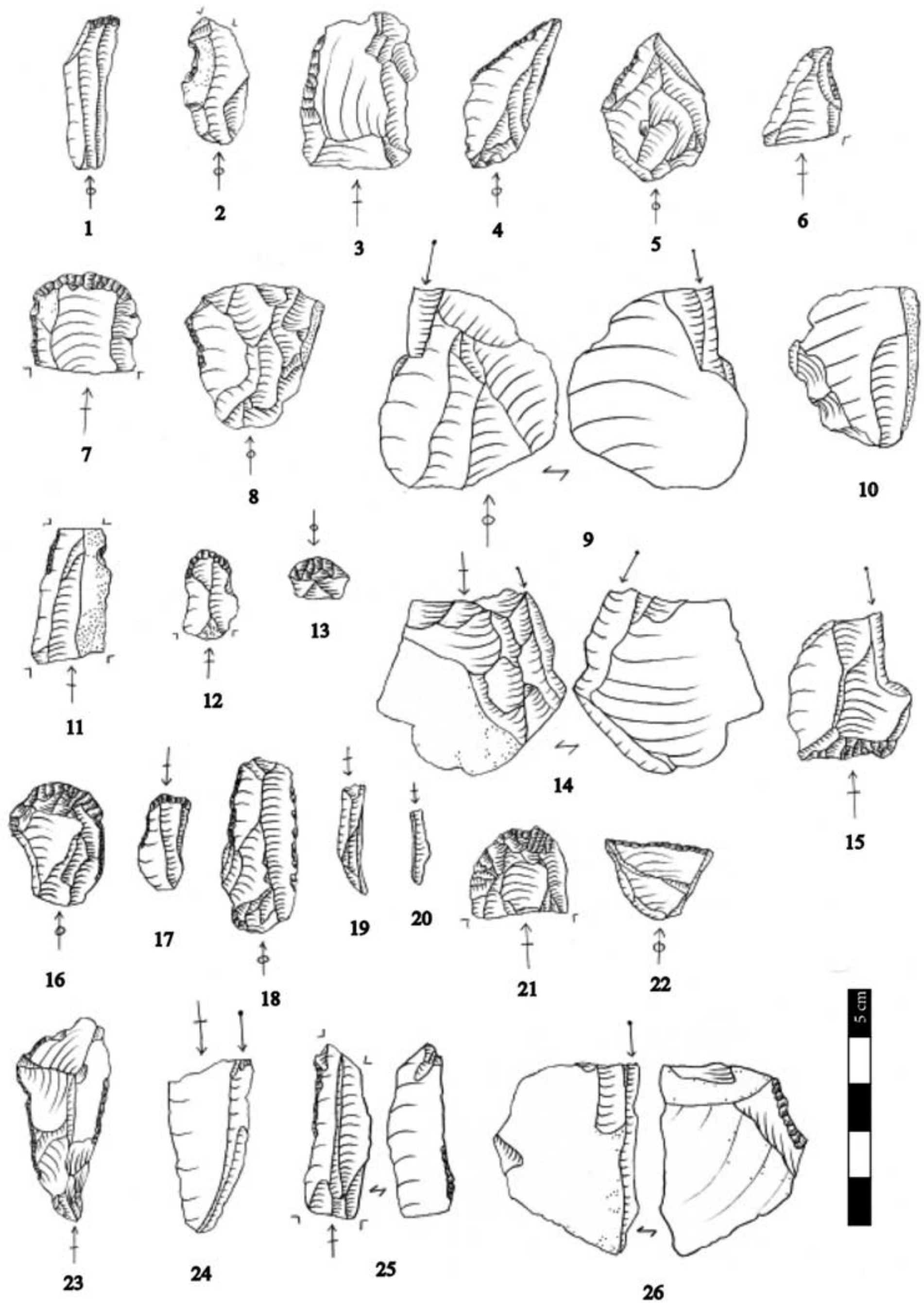

Figure 22. 1: Obliquely truncated blade, 2: Notched tool, 3, 6, 8: Partially retouched flakes, 4, 5, 22, 24: Flakes retouched on one edge, 7: End scraper on retouched blade, 9, 14: Burins on flake, 10:Double notched tool, 11: Partially retouched blade, 12: Micro-end scraper, 13: Micro-end scraper on proximal end, 15: Burin-end scraper, 16: End scraper on flake, 17: End scraper on proximal end, 18: Blade retouched on one edge, 19, 20: Burin spalls, 21: End scraper on blade, 23: Retouched crested blade, 25:Alternating retouched blade, 26: Burin on tabular raw material.

all microliths. It has been observed that the butts of the majority of the straight backed bladelets are broken. 7 pieces of straight backed bladelets are not broken. Straight backed bladelets are followed by single-edge-retouched backed bladelets, obliquely truncated backed bladelets, inverse retouched backed bladelets, alternately retouched backed bladelets, partially backed bladelets, partially retouched (on one edge) and backed bladelets, backed bladelets with side-blow technique truncation, double backed bladelets, and various backed bladelets. Backed bladelets are encountered more frequently in layers 4 and 6. Among the retouched bladelets, the most frequently encountered subtype is that of bladelets retouched on one edge. Some additional bladelet subtypes are partially retouched bladelets, inverse retouched bladelets,

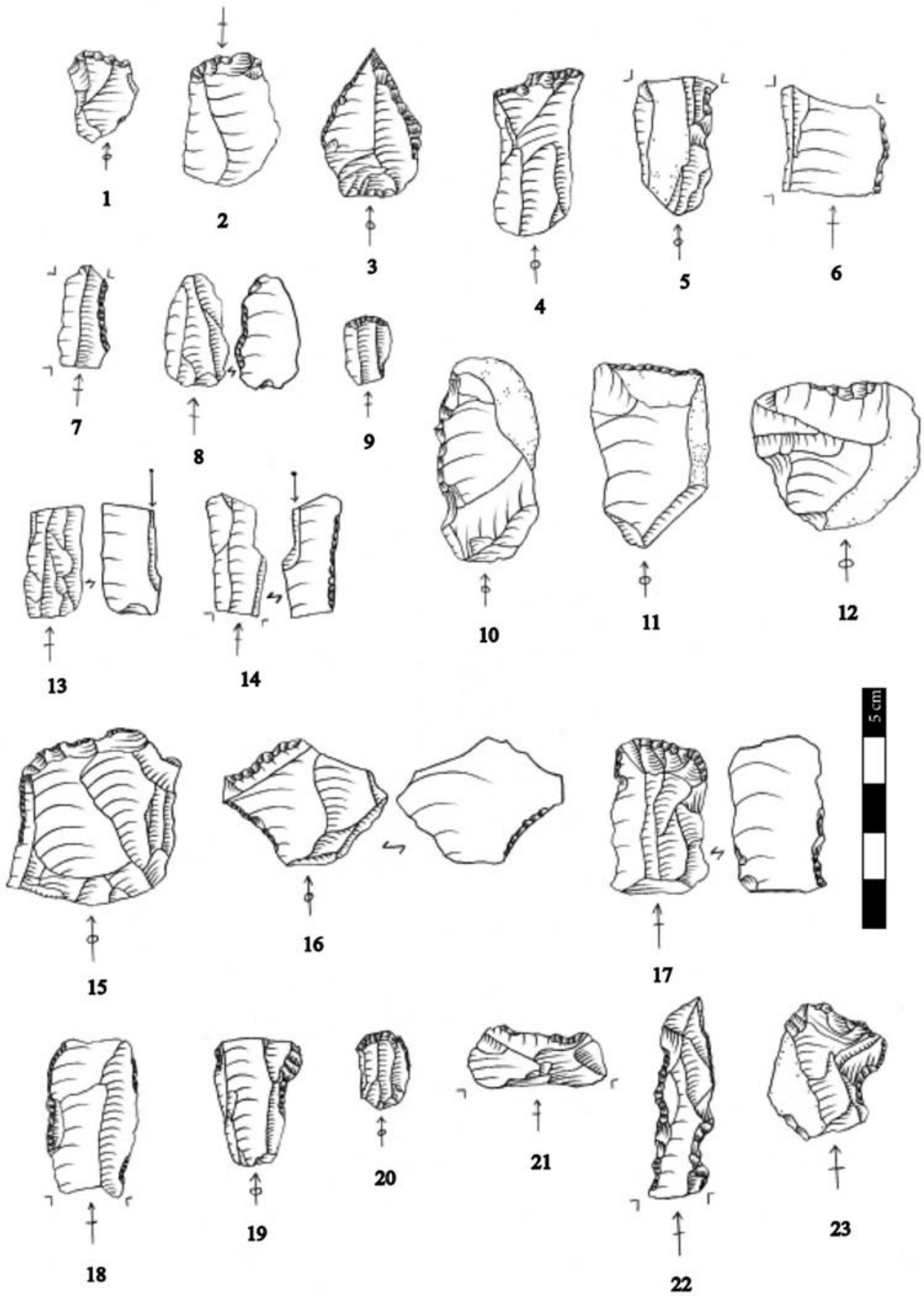

Figure 23. 1: Micro-denticulated tool; 2: End scraper on proximal edge; 3: Point; 4, 11: Flakes retouched on one edge; 5, 18, 19: Partially retouched blades; 6, 7, 10: Blades retouched on one edge; 8: Inverse retouched blade; 9, 20: Micro-end scrapers; 12: Piece esquille; 13: Burin on blade; 14: Burin-scraper; 15, 21:Partially retouched flakes; 16: Other macrolith; 17: End scraper on inverse retouched flake; 22: Denticulated tool on blade; 23: Notched tool.

alternately retouched bladelets, retouched bladelets on both edges, partially inverse retouched crested bladelets, retouched crested bladelets, and notched bladelets. Again, there are very few intact bladelets, many of them having distal or proximal fractures. The retouched bladelets were found mostly in the 7th archaeological level. Among the truncated bladelets, the obliquely truncated bladelets are the most frequently encountered, followed by bladelets with side-blow technique truncation, partially retouched obliquely truncated bladelets, bladelets with straight basal truncation, partially inverse retouched bladelets with obliquely basal truncation, inverse retouched bladelets with oblique truncation, obliquely double truncated bladelets, and bladelets with obliquely basal truncation-bladelets with side-blow technique truncation. The truncated bladelets are

Figure 24. Samples of burins on cores.

found between the 4th and 11th archaeological levels and were most common between the 6th and 7th archaeological levels. Among the points, microgravette points were the most frequently encountered. These points (Kartal, 2019, p. 30) characterize the Early Epi-palaeolithic period and are retouched on the upper or lower parts of the inner surfaces, which are formed into a backed shape on their upper faces. Only 3 of these pieces are complete with fractures at distal or proximal parts. Additionally, there are micropoints and narrow micropoints classified under the main type. The points are encountered more frequently in layers 4 and 6.

Geometric microliths are found between the 1st and 7th archaeological levels, but not between the 8th and 12th. Layers with geometric microliths typologically pointing to the later stages of the Epi-palaeolithic coincide with a date range earlier than 16,000–15,000 based on the date obtained from the 9th archaeological level.

We find *krukowski* microburins and microburins under the main classification of microburin which is a product of the microlith production technique (Figure 19). These are recovered from all levels between the 2nd and 12th archaeological levels. Microburins belonging to this technique, which is generally applied to produce geometric microliths, were recovered more frequently from the 6th and 7th archaeological layers where the geometric microliths are dense, but a microburin was found from each of the 10th, 11th, and 12th layers which did not present any geometrical microliths; this fact suggests that this technique was also used in the production of non-geometrial microliths. Among the microliths uncovered, none bearing the microburin negative trace was detected.

Unidentified microliths consist of broken retouched fragments that cannot be classified typologically. There are 23 such undefined artefacts.

Looking into the Kızılin macroliths, a variety of tools characterized by a large number of subtypes is noticeable (Figures 22 and 23). Burins are the most frequently encountered artefacts, followed by end scrapers which are classified into various subtypes. These two main groups are followed by retouched blades and flakes, notched tools, double tools, *pieces esquilles*, denticulated tools, and truncated blades. Tool groups other than the above are encountered quite rarely.

Burins are the most frequently encountered group of artefacts among the Kızılin macroliths. Among the burins (38 in total, of which 18.36% are macroliths), burins on cores are the most common (19 specimens). Among these burins, those made from unipolar prismatic cores are the most common (Figure 24). There are also burins on opposed platform cores and burins on core fragments. Burins are encountered more frequently in archaeological levels 6, 7, 8, 11, and 12 than in other archaeological levels. The results indicate that the burins were needed and used both in the late and early stages of the Epi-palaeolithic. Apart from burins on core, burins on flake ($n = 9$), and burin spalls ($n = 3$) were among the other subtypes frequently encountered. Additionally, burins on core fragment ($n = 3$), burins on tabular raw material (3 pieces), and a burin on a blade ($n = 1$) were also identified. Considering the industries of other Epi-palaeolithic settlements in the region, is seen that burins are rare among macroliths at both Öküzini and Karain B (Kösem, 2002; Özçelik, 2011). The fact that there are so many burins at Kızılin stands out as a feature unique to Kızılin, and distinguishes Kızılin from other settlements. It was reported that burins, especially burins on cores, were also found in large numbers during the surface surveys, and therefore the usage of the artefacts can be determined (Kartal, 2019b, pp. 310–311). Two stone human figurines and an engraved stone (Kartal, 2018, p. 394) recovered in the 2018 excavation confirmed this point of view.

End scrapers (16.91%), the second most encountered artefacts among the Kızılin macroliths, are represented by a wide variety of subtypes. Among these, micro-end scrapers and end scrapers on flakes are the most common accounting for 7 artefacts each. Micro-end scrapers are very small in size and display fine workmanship. Most of the end scrapers were uncovered in the 6th archaeological level. The subtypes identified are represented by smaller quantities. Among these subtypes are the following: End scrapers on blades ($n = 4$), end scrapers on proximal ends ($n = 2$), double end scrapers ($n = 2$), carinated end scrapers on cores ($n = 2$), end scrapers on retouched blades ($n = 2$), end scrapers on inverse retouched flakes ($n = 2$), a carinated end scraper ($n = 1$), an inverse end scraper ($n = 1$), a micro-end scraper on proximal end ($n = 1$), an end scraper on a core ($n = 1$), a carinated micro-end scraper ($n = 1$), and an end scraper on a retouched flake. The end scrapers are macroliths which are the most encountered artefacts in both the Öküzini and Karain B settlements, and among the Epi-palaeolithic sites of the region (Kösem, 2002; Özçelik, 2011). Among the macroliths, the third most common tool group consists of 31 retouched blades (14.98%). Among these are the following subtypes in the order of frequency: Partially retouched blades ($n = 10$), blades retouched on one edge ($n = 7$), retouched crested blades ($n = 3$), inverse retouched plunging blades ($n = 2$), partially retouched blades ($n = 2$), alternating retouched blades ($n = 2$), and those which appeared only once; partially inverse retouched blade, retouched plunging blade, alternately retouched blade, inverse retouched blade, and alternately retouched crested blade. The vast majority of retouched blades were recovered from the 7th archaeological level. Retouched flakes are the 4th most common (14.01%) and include the following subtypes in order of most to least common; flakes retouched on one edge ($n = 12$), partially retouched flakes ($n = 9$), alternately retouched flakes ($n = 2$), and an inverse retouched flake. It appears that archaeological levels 4, 6, and 7 are rich in retouched flakes. Notched tools, represented by 8.21% of the macroliths, appeared in 4 subtypes. These are classified as notched tools ($n = 9$), inverse notched tools ($n = 4$), wide notched tools ($n = 3$), and a double notched tool ($n = 1$). When we concentrate on the double tools that make up the 6th macrolith tool group, we see the presence of burins in 5 of the 8 subtypes detected. Among those tools the following subtypes are identified: Burins-end scrapers ($n = 3$), burins-carinated end scrapers ($n = 2$), burins-*pieces esquilles* ($n = 2$), as well as the following which are represented with one example each; burin-core tool, burin-scraper, end scraper-perforator, notched tool-retouched flake, and notched tool-retouched blade. *Pieces esquilles*, which are used extensively in bone tool production and have an important place in bone tool technology, have also been encountered in the Kızılin industry. This find group, represented by 11 pieces, has intense notches due to usage. A few bone tool fragments were found, but these finds are important since they suggest that bone tools could be unearthed in later excavations. Most of the denticulated tools are denticulated tool on blades ($n = 7$). Additionally, there is an alternating denticulated tool and a micro-denticulated tool represented by 1 example each. Among truncated blades there are concave truncated blades, obliquely truncated blades, and a single example each of a blade with obliquely basal truncation and a straight truncated blade. Tools other than these four main groups appear in fewer numbers. Other macroliths identified at Kızılin are core tools ($n = 7$), unidentified macroliths ($n = 3$), other macroliths ($n = 2$), and heavy-duty tool ($n = 1$). These include a point directly associated with hunting activities and a perforator used in the drilling process. The relationship between the results of the studies conducted on the faunal remains encounterd and these points, which are likely to diversify and increase in the coming years, will be outlined in more detail. The perforator, whose working part is broken, was likely related to opening holes in objects other than beads, since it is too large to be used on beads. The numerical increase of such finds in future excavations and finding objects made using these tools will clarify their usage better.

Conclusions

As a result of the detailed analysis we have conducted, all stages of the Kızılin knapped stone *chaîne opératoire* have been identified. It is observed that the raw materials obtained from Kızılin Stream were transported to the settlement and all production activities were carried out in the settlement. In this context, the cores are the most informative artefacts of the Kızılin lithic finds. The morphologies of the cores were analyzed, and all formation stages of the knapped stone finds group were traced. After obtaining the raw material, as part of the flaking strategy, the striking platforms and flaking surfaces were prepared by a simple shaping process. As a part of the flaking technology, two different operational behaviors were observed depending on the nature of the core and the production target. The first is the use of a wide and single surface linearly and sequentially. The second is based on the use of narrow edges. The use of the narrow edges of the core allowed knappers to obtain products with smoother parallel edges. The flaking technique applied to narrow edges, also provided an advantage of being able to control the width of the product to be obtained. The only disadvantage of this preference is that a much smaller product was obtained from the core. In both flaking strategies, it was observed that only one face was preferred as the flaking surface, resulting in a longer edge. Some variations in flaking strategies can be noticed based on the structural properties of the raw material type. For example, some raw material types have a cleavage plane on their preferred flaking face. Knapping was carried out after removing this back. The exposed flaking surface became more symmetrical and increased the potential to obtain products with parallel edges. It has been observed that mass production was carried out in each of the knapping stages and the process continued on the same surfaces. When the quality of the core was good for knapping and no problems were encountered during knapping, the knapping process continued with the regeneration of the flaking surface. The average size of the cores was around 30–40 mm. The core dimensions are not small as a result of knapping. This is related to the fact that the knappers of Kızılin preferred especially small sized raw materials. The same preference can also be seen at the Öküzini site, an Epi-palaeolithic settlement 4 km from Kızılin. The Öküzini cores are small in size just like the Kızılin cores (Taşkıran, 1993, p. 53). Both these communities, who probably used the same raw material resources, acted with similar production concerns. Bladelet production was intense at both settlements. Another settlement that displays similar cores to the Kızılin cores is Pınarbaşı, in Central Anatolia. The majority of the knapped stone industry of this settlement consists of obsidian raw material. The bladelet production at this settlement was also dense. Based on the analyses conducted, it was determined that the ratio of the cores within the industry was low, and their dimensions were small. Half of the cores are represented by unipolar samples (Baird et al., 2013, p. 186).

The knapped stone tools obtained at Kızılin also show characteristics similar to those of the Epi-palaeolithic well-known finds from Öküzini and Karain B. This could be explained by the fact that all three settlements were located in the same ecological zone. The knapped stone finds obtained from these settlements were produced from the same raw material; this is another reason for similarities in techno-typological practices. Non-geometric microliths characterize the knapped stone industry of the Karain B Epi-palaeolithic. Based on the techno-typological characteristics of the knapped stone industry, it was reported that an early phase of the Epi-palaeolithic period was observed at Karain B (Özçelik, 2011, p. 219). It was also reported that these levels, which are represented by non-geometric microliths with intense backed bladelets, present similarities to those in the lower levels of Öküzini (Kartal, 2009, p. 39). From the perspective of non-geometric microliths, the dominance of backed bladelets in both industries appears to be a common typological feature. The two industries differ in geometric microliths due to the relatively higher number of geometric microliths obtained from the top levels at Kızılin. The most dominant group among the Karain B macroliths are the end scrapers which are various. The other macroliths are denticulated tools, notched tools, retouched blades, and double tools. Burins are fewer compared to other macroliths (Özçelik, 2011, p. 217). We can assert that many macroliths seen in the Epi-palaeolithic levels of Karain are also encountered at Kızılin. The fact that the burins, which are among the macroliths of these levels, are fewer compared to others, differs from the industry at Kızılin.

Although the geometrical and non-geometrical microliths in Öküzini coexist throughout the entire stratigraphy, it was reported that the lower layers (I-II) are characterized by non-geometrical microliths, and the upper layers (III-IV) by geometrical microliths (Kartal, 2002, p. 239). The upper layers at Kızılin, which are characterized by crescents, display similarities with Öküzini units III and IV which are represented by geometrical microliths. Non-geometric microliths were recovered from every level detected at Kızılin. Among the Öküzini macroliths, end scrapers are the most common in terms of quality and quantity (Kösem, 1998, p. 188). These are followed by retouched blades, denticulated tools, and double tools. Burins are fewer than other macroliths (Kösem, 2002). We suggest that the macroliths encountered in the Epi-palaeolithic levels of Öküzini are also encountered at Kızılin. However, the low number of burins among Öküzini macroliths compared to others shows the difference between the two industries.

On the other hand, in the Pınarbaşı industry, microliths represent 25% of the artefacts. Crescents are the dominant type of microliths (Baird et al., 2013, p. 187). In terms of crescents, the situation is similar to the upper layers at Kızılin. The microburin technique, which was frequently used to produce geometric microliths at the Pınarbaşı settlement, was observed on a small number of samples. The second most common tool group found at the settlement was scrapers. These tools have various forms (Baird et al., 2013, p. 187). Tools recovered from this settlement bear typological similarities with the Kızılin examples. However, since the raw material they are made from is obsidian, they were likely subjected to different production techniques than those at Kızılin. Although different types of raw materials were used at the Kızılin and Pınarbaşı settlements, typologically similar products have been observed. From this perspective, the examples mentioned are very important in terms of showing a certain standardization in Epi-palaeolithic period knapped stone technologies.

At Kızılin, which has taken its place as a new Epipalaeolithic settlement in the region, cores make up 1.5% of the entire industry. Core renewal elements are quite rare. This is related to the proximity to the raw material source and easy accessibility. The flaking process took place inside the settlement. Flaking strategies vary depending on the condition of the raw material. Bladelet production is assumed to be the primary target in almost all cores. When evaluated typologically, the excess number of burins and the difference in the artworks found at other settlements stand out as important findings specific to Kızılin. Until now, the geometric microliths have only been found in the upper layers and not in the lower levels; this signifies the late stages of the Epi-palaeolithic techno-typology. In addition, microgravet points (Kartal, 2019, p. 30), which characterize the early Epi-palaeolithic period, also show the existence of the early stages of the Epi-palaeolithic. The microlithic tools of Kızılin show, typologically, finds from both the early and late stages of the Epi-palaeolithic.

Acknowledgement

We would like to thank to Prof. Dr. Metin Kartal, who is head of Kızılin excavation, for all his support and permitting us to publish this article. We would also like to thank to Otis Crandell, who has read and corrected this article, for his proofreading.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Knapped stone typology list

(A) MICROLITHS
  (1) **GEOMETRIC MICROLITHS**
(1) Crescent
(2) Isosceles Triangle
(3) Short Scalene Triangle
(4) Trapeze
(5) Atypical Isosceles Triangle
(6) Asymmetrical Trapeze
(7) Atypical Trapeze
(2) **NON-GEOMETRIC MICROLITHS**
(A) BACKED BLADELET
  (1) Straight Backed Bladelet
  (2) Single-edge-retouched Backed Bladelet
  (3) Obliquely Truncated Backed Bladelet
  (4) Inverse Retouched Backed Bladelet
  (5) Alternately Retouched Backed Bladelet
  (6) Partially Backed Bladelet
  (7) Partially Retouched (on One Edge) and Backed Bladelet
  (8) Backed Bladelet with Side-Blow Technique Truncation
  (9) Double Backed Bladelet
  (10) Various Backed Bladelet
(B) **RETOUCHED BLADELET**
  (1) Retouched Bladelet
  (2) Partially Retouched Bladelet
  (3) Inverse Retouched Bladelet

(4) Alternately Retouched Bladelet
(5) Retouched Bladelet on Both Edges
(6) Partially Inverse Retouched Crested Bladelet
(7) Retouched Crested Bladelet
(8) Notched Bladelet

(C) **POINT**
(1) Microgravette Point
(2) Micro Point
(3) Narrow Micropoint

(D) **TRANCATED BLADELET**
(1) Obliquely Truncated Bladelet
(2) Bladelet with Side-Blow Technique Truncation
(3) Partially Retouched Obliquely Truncated Bladelet
(4) Bladelet with Straight Basal Truncation
(5) Partially Inverse Retouched Bladelet with Obliquely Basal Truncation
(6) Inverse Retouched Bladelet with Oblique Truncation
(7) Obliquely Double Truncated Bladelet
(8) Bladelet with Obliquely Basal Truncation, Bladelet with Side-Blow Technique Truncation

(E) **OTHER MICROLITHS**

(3) **MICROBURIN**
(1) Krukowski Microburin
(2) Microburin

(4) **UNIDENTIFIED MICROLITHS**

(B) **MACROLITHS**

(1) **BURIN**
(1) Burin on Core
(2) Burin on Flake
(3) Burin on Core Fragment
(4) Burin Spall
(5) Burin on Tabular Raw Material
(6) Burin on Blade

(2) **END SCRAPER**
(1) Micro-End Scraper
(2) End Scraper on Flake
(3) End Scraper on Blade
(4) End Scraper on Proximal End
(5) Double End Scraper
(6) Carinated End Scraper on Core
(7) End Scraper on Retouched Blade
(8) End Scraper on Inverse Retouched Flake
(9) Carinated End Scraper
(10) Inverse End Scraper
(11) Micro-End Scraper on Proximal End
(12) End Scraper on Core
(13) Carinated Micro-End Scraper
(14) End Scraper on Retouched Flake

(3) **RETOUCHED BLADE**
(1) Partially Retouched Blade
(2) Blade Retouched on One Edge
(3) Retouched Crested Blade
(4) Inverse Retouched Plunging Blade
(5) Partially Retouched Plunging Blade
(6) Alternating Retouched Blade
(7) Partially Inverse Retouched Blade
(8) Retouched Plunging Blade
(9) Alternately Retouched Blade
(10) Inverse Retouched Blade
(11) Alternately Retouched Crested Blade

(4) **RETOUCHED FLAKE**
(1) Retouched Flake on One Edge
(2) Partially Retouched Flake
(3) Alternately Retouched Flake
(4) Inverse Retouched Flake

(5) **NOTCHED TOOL**
(1) Notched Tool
(2) Inverse Notched Tool
(3) Wide Notched Tool
(4) Double Notched Tool

(6) **DOUBLE TOOL**
(1) Burin-End Scraper
(2) Burin-Carinated End Scraper
(3) Burin-Piece Esquille
(4) Burin-Core Tool
(5) Burin-Scraper
(6) End Scraper-Perforator
(7) Notched Tool-Retouched Flake
(8) Notched Tool-Retouched Blade

(7) **PIECE ESQUILLE**

(8) **DENTICULATED TOOL**
(1) Denticulated Tool on Blade
(2) Alternating Denticulated Tool
(3) Micro-Denticulated Tool

(9) **TRUNCATED BLADE**
(1) Concave Truncated Blade
(2) Obliquely Truncated Blade
(3) Blade with Obliquely Basal Truncation
(4) Straight Truncated Blade

(10) **CORE TOOL**

(11) **UNIDENTIFIED MACROLITHS**

(12) **OTHER MACROLITHS**

(13) **HEAVY DUTY TOOL**

(14) **PERFORATOR**

(15) **POINT**

Notes on contributors

Eşref Erbil is a research assistant at the Department of Prehistory, Ankara University.

Gizem Kartal is an assistant professor at the Department of Prehistory, Ankara University.

Zeynep Beyza Ağırsoy is a PhD Student at the Department of Archaeology (Prehistory), Ankara University, Graduate School of Social Science.

ORCID

Eşref Erbil http://orcid.org/0000-0003-3446-8245
Gizem Kartal http://orcid.org/0000-0002-5080-7772
Zeynep Beyza Ağirsoy http://orcid.org/0000-0003-1557-3218

References

Arbuckle, B. S., & Erek, M. C. (2012). Late epipaleolithic hunters of the Central Taurus: Faunal remains from Direkli cave, Kahramanmaraş, Turkey. *International Journal of Osteoarchaeology*, *22*(6), 694–707. https://doi.org/10.1002/oa.1230

Aydın, Y., & Brandl, M. (2019). Karain Mağarası Alt Paleolitik Dönem Yontmataş Endüstrisinin Hammadde Analizleri: Preliminer Sonuçlar. *Ankara Üniversitesi Dil ve Tarih-Coğrafya Fakültesi Dergisi*, *59*(1), 646–661. https://doi.org/10.33171/dtcfjournal.2019.59.1.32

Baird, D. (2002). Early Holocene settlement in Central Anatolia: Problems and prospects as seen from the Konya Plain. In F. Gerard, & L. Thissen (Eds.), *The Neolithic of Central Anatolia*. Central Anatolian Neolithic e-Workshop (pp. 139–152). Ege Yayınları.

Baird, D., Asouti, E., Astruc, L., Baysal, A., Baysal, E., Carruthers, D., Fairbairn, A., Kabukcu, C., Jenkins, E., Lorentz, K., Middleton, C., Pearson, J., & Pirie, A. (2013). Juniper smoke, skulls and wolves' tails. The Epipalaeolithic of the Anatolian plateau in its South-west Asian context; insights from Pınarbaşı. *Levant*, *45*(2), 175–209. https://doi.org/10.1179/0075891413Z.00000000024

Demirel, M., Kartal, G., Aydın, Y., Erbil, E., & Kartal, M. (2019). Kızılin Kazıları (I) 2017 Sezonu. *Kazı Sonuçları Toplantısı*, *40*(2), 651–666.

Erek, C. M. (2010). A new Epi-paleolithic site in the Northeast Mediterranean region: Direkli Cave (Kahramanmaras, Turkey). *Adalya*, (13), 1–17.

Erek, C. M. (2012). Güneybatı Asya ekolojik nişi içinde Direkli Mağarası Epi-paleolitik buluntularının değerlendirilmesi. *Anadolu/ Anatolia*, (38), 53–66. https://doi.org/10.1501/andl_0000000393

Erek, C. M. (2014). Direkli Cave: The significance of fire and female figurines in the paleo-landscape during the Epi-paleolithic period. *Seleucia ad Calycadnum*, (4), 151–163.

Kartal, G. (2019a). 2017 yüzey Buluntuları Işığında Kızılin Yontmataş Endüstrisinin Tekno-Tipolojisi. *Ankara Üniversitesi Dil ve Tarih-Coğrafya Fakültesi Dergisi*, *59*(1), 398–427. https://doi.org/10.33171/dtcfjournal.2019.59.1.21

Kartal, G. (2019b). Kızılin Yontmataş Endüstrisinin Tekno-Tipolojik Analizi (İlk Sonuçlar-2017). *Arkeometri Sonuçları Toplantısı*, *34*, 305–322.

Kartal, M. (2002). The Microliths of Öküzini Cave. In I. Yalçınkaya, M. Otte, J. Kozlowski, & O. Bar-Yosef (Eds.), *La Grotte d'Öküzini: Evolution du Paléolithique final du sud-ouest de l'Anatolie / Öküzini: Final Paleolithic evolution in southwest Anatolia* Etudes et recherches archéologiques de l'Université de Liège, 96 (pp. 235–252). Université de Liège.

Kartal, M. (2003). Anadolu'nun Epi-Paleolitik Dönem Buluntu Toplulukları: Sorunlar, Öneriler, Değerlendirmeler ve Çeşitli Yaklaşımlar/ Anatolian Epi-paleolithic Period Assemblages: Problems, Suggestions, Evaluations and Various Approaches. *Anadolu/ Anatolia*, (24), 35–61.

Kartal, M. (2009). *Epi-paleolitik Dönem Türkiye'de Son Avcı Toplayıcılar: Konar-Göçerlikten Yerleşik Yaşama Geçiş*. Arkeoloji ve Sanat Yayınları.

Kartal, M. (2018). Ankara Üniversitesi Dil ve Tarih – Coğrafya Fakültesi Arkeoloji Bölümü 2018 Yılı Kazı ve Yüzey Araştırmaları. *Anadolu/ Anatolia*, (44), 394.

Kartal, M. (2019). *Taş Çağlarında Yontmataş Uçlar*. Bilgin Kültür Sanat Yayınları.

Kartal, M. (2020). Batı Toroslar'da Paleolitik Sanat Tasvirleri, Sembolizm ve Yeni Bulgular. *Anadolu Prehistorya Araştırmaları Dergisi*, (6), 103–122.

Kayan, İ. (1990). Tarih Öncesi Yerleşme Yerleri Olarak Antalya Mağaralarının Jeomorfolojik Özellikleri. *Ege Coğrafya Dergisi*, *5*(1), 11–26.

Kösem, M. B. (1998). Öküzini Mağarası Ön Kazıyıcılarının Tipolojik Gözlemi. *Dil ve Tarih-Coğrafya Fakültesi Dergisi*, *38*(2), 187–203.

Kösem, M. B. (2002). The Macrolithic industry of Öküzini Cave. In I. Yalçınkaya, M. Otte, J. Kozlowski, & O. Bar-Yosef (Eds.), *La Grotte d'Öküzini: Evolution du Paléolithique final du sud-ouest de l'Anatolie / Öküzini: Final Paleolithic evolution in southwest Anatolia*. Etudes et recherches archéologiques de l'Université de Liège, 96 (pp. 253–273). Université de Liège.

Munsell, C. (2009). *Geological Rock-Color Chart with genuine Munsell color chips*.

Otte, M., Yalçınkaya, I., Leotard, J.-M., Kartal, M., Bar-Yosef, O., Kozlowski, J., Bayón, I. L., & Marshack, A. (1995). The Epi-palaeolithic of Öküzini cave (SW Anatolia) and its mobiliary art. *Antiquity*, *69*(266), 931–944. https://doi.org/10.1017/S0003598X00082478

Özçelik, K. (2011). Karain Mağarası B Gözü Epi-Paleolitik Dönem Yontmataş Endüstrisi. In H. Taşkıran, M. Kartal, K. Özçelik, M. B. Kösem, & G. Kartal (Eds.), *Işın Yalçınkaya'ya Armağan/ studies in Honour of Işın Yalçınkaya* (pp. 213–233). Bilgin Kültür Sanat Yayınları.

Taşkıran, H., Özçelik, K., Kartal, G., Aydın, Y., Fındık, B., Bulut, H., & Kösem, M. B. (2017). 2015 yılı Karain Mağarası Kazıları. *Kazı Sonuçları Toplantısı*, *38*(1), 521–538.

Taşkıran, H., Özçelik, K., Kösem, M. B., Kartal, G., Aydın, Y., Fındık, B., & Erbil, E. (2018). 2016 yılı Karain Mağarası Kazıları. *Kazı Sonuçları Toplantısı*, *39*(1), 285–304.

Taşkıran, Z. F. (1993). *Öküzini Mağarası Çekirdeklerinin Tekno-Tipoljik Açıdan İncelenmesi* (Unpublished Master Thesis). Ankara Üniversitesi, Ankara.

Yalçınkaya, I. (1985). Batı Toroslarda Paleolitik Çağ Yüzey Araştırmaları 1984. *Araştırma Sonuçları Toplantısı*, *III*, 429–447.

Yalçınkaya, I., Taşkıran, H., Kartal, M., Özçelik, K., Kartal, G., Aydın, Y., & Erbil, E. (2016). 2014 yılı Karain Mağarası Kazıları. *Kazı Sonuçları Toplantısı*, *37*(1), 235–252.