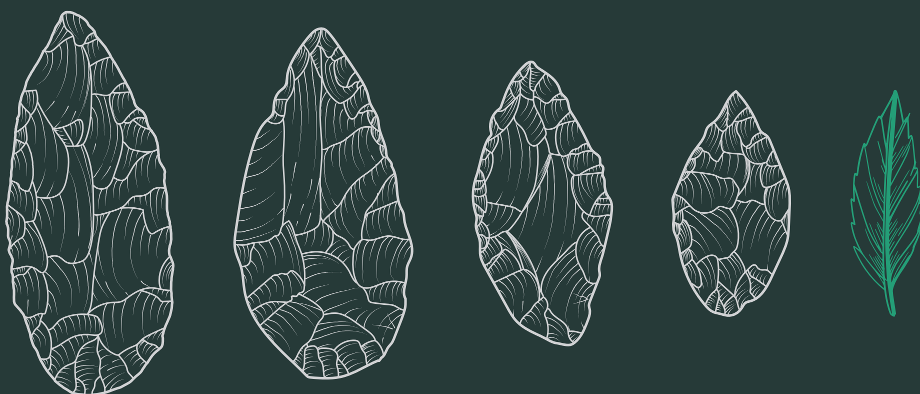
LITIKUM KÖNYVTÁR 2

From tea leaves to leaf-shaped tools

STUDIES
IN HONOUR OF ZSOLT MESTER
ON HIS SIXTIETH BIRTHDAY



EDITED BY
ATTILA KIRÁLY

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Editor:

Attila Király

ELTE
EÖTVÖS LORÁND
UNIVERSITY

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2023

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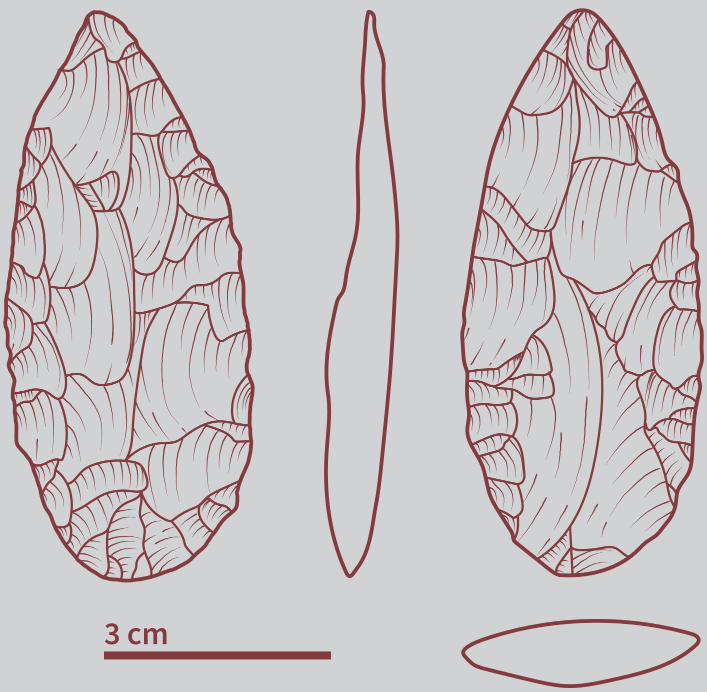
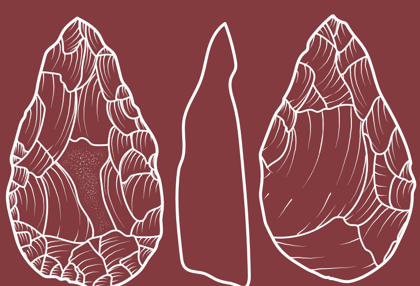


Szeletian leaf-shaped tool.
After Kozłowski *et al.*, 2009, Planche 11.

April 10, 2019, "ΜΟΜΟΣ – XIth Gathering of Researchers in Prehistory – Environment and People" conference. Zsolt Mester, as section president, helps one of the speakers with time management. *Photo: Nóra Szilágyi, BTM; drawing: after Kozłowski et al., 2009.*



10

Complex study of the Acsa-Rovnya endscrapers

SURFACE COLLECTIONS IN THE RECONSTRUCTION OF UPPER PALAEOLITHIC LAND USE

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Abstract. The majority of Upper Palaeolithic sites in Hungary consist of surface artefact scatters with poor chronostratigraphic control. However, the technological, morphometric and taphonomic characteristics of the finds, as well as their geographical location constitute valuable data for regional-scale land use models. The Acsa-Rovnya Early Upper Palaeolithic site is considered an aggregation site or base camp due to its numerous finds, the dominance of endscrapers, and its strategic location. The duration of its occupation and the archaeological-taxonomic identity of its users are yet to be known. I investigated the dominant tool type of the site, endscrapers, to explain their variability by chronological, taxonomic or functional reasons. Based on morphometry and production methods, I classified these tools with the help of hierarchical clustering on principal components (HCPC). The results show that the typologically diverse set can be the result of similar tool production methods and usage. This result confirms the view about the similar function of the site in the landscape through the ages, whether it was used by groups classified into one or more culture-taxonomical units.

Keywords: Upper Palaeolithic, Acsa-Rovnya, Endscrapers, Cluster analysis, Land use

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I expected to think carefully about what Zsolt could have said about the paper's topic. There was no need for this since we had already talked about everything in the two decades of our acquaintance, in the classroom, at conferences, and in the field up the mountain (rarely down). Zsolt listens to you in every situation, considers, talks, teaches and gives advice. Thank you for what you have done so far and I look forward to the rest, God bless you!

1. Introduction

In Hungary, the vast majority of archaeological sites considered to be of Palaeolithic age are open-air and surface occurrences, that is, knapped lithics outside rock cavities or subsurface sediments.[1] As a consequence of several factors, these sites were pushed to the periphery of domestic archaeological research, among which weak chronological control and the possibility of mixing are relevant for this study. The knapped stones lying on the surface surely left their original contexts of deposition under the geomorphological conditions of Hungary. In the absence of material suitable for absolute dating and the spatial conditions that facilitate relative dating, we cannot place such finds within the desired timeframe. Weak chronological control is a frequently mentioned problem in Palaeolithic research, where accuracy would be required often on a millennium scale (Barton & Clark, 2021; Discamps *et al.,* 2015; Douka & Higham, 2017). The so-called palimpsest phenomenon is also a topic often touched upon, that is, the accumulation of material remains deposited at different times at a special point in space and time, in this case in the act of discovering a surface deposit (Bailey, 2007; Clark *et al.,* 2019; Mallol & Hernández, 2016). In such a collection, artefacts whose use is separated by up to tens of thousands of years can be mixed – not to mention the special case of recycling, which further complicates the relationships between co-occurring finds.

Unfortunately, the majority of Hungarian "non-surface" Palaeolithic sites are also characterized by poor chronological control and the possibility of mixing, as many researchers have highlighted in recent years. To list a few examples: the relationship between Upper Palaeolithic radiocarbon dates and the archaeological phenomena to be dated by those has become doubtful in several cases (Lengyel, 2009; Lengyel & Mester, 2012). Revisions of widely known Hungarian cave sites usually contest clichés previously treated as evidence regarding the integrity of their archaeological record (Lengyel *et al.,* 2016; Markó, 2015, 2019; Mester, 2018). Nevertheless, the vast majority of data on the Palaeolithic in Hungary are still provided by surface material, so their detailed study is justified and necessary despite all the difficulties. One obvious way to solve the problems presented here is to take them into account and adapt our questions to the data that surface artefacts can offer (Chu *et al.,* 2018; Fitzsimmons *et al.,* 2020; Holdaway & Davies, 2020; Škrdla *et al.,* 2016). My doctoral research concerns these possibilities, and as part of it, in this study, I examine a specific group of knapped lithic tools: endscrapers.

2. Background: land use, artefact use and endscrapers

In recent years, several studies have dealt with the topography of Upper Palaeolithic settlements in the Carpathian Basin (Péntek & Zandler, 2016; T. Dobosi & Holl, 2013) and their land use (Chu, 2018; Gutay *et al.,* 2019; Hauck *et al.,* 2018; Vörös, 2000), and the issue of site function regularly arise in domestic research as well (Markó, 2017; Péntek, 2016; Simán, 1988). In this study, I attempt a so-

1 The Hungarian version of this paper has been published in 2021. See: Király, 2021.

cio-ecological study of the surface deposits and the surrounding landscape on a regional scale, following studies that examine the interactions of human communities and the natural environment, considering that before food production, these interactions were organized into specific mobile land use strategies (Banks, 2017; Barton *et al.,* 2011; Clark *et al.,* 2019; Fitzhugh *et al.,* 2019; Kuhn & Miller, 2015; Nettle *et al.,* 2013; Robinson & Sellet, 2018). During the Late Pleistocene, resources useful to humans were distributed in space and time in a way that has not been experienced since then (Gamble, 1999). Palaeolithic communities partially offset resource fluctuations through mobility and migration (Bettinger *et al.,* 2015; Binford, 1980; Clark *et al.,* 2019; Kelly, 1995; Picin & Cascalheira, 2020). As a result, one archaeological site only represents a fraction of the land use strategies of these communities, a small slice of the former prey area, while examination on a regional scale reveals a more comprehensive view of the hunter-gatherer landscape (Barton *et al.,* 2011; Kuhn & Miller, 2015; Maher & Conkey, 2019). The partial results collected at individual sites can thus reinforce each other and reveal new relationships on a regional scale.

The primary sources of regional land use strategies in the Palaeolithic are knapped stones, the production, use, maintenance and disposal of which were embedded in the everyday life of the community and distributed over time and space. In contrast to, for example, pottery or metalwork, knapping transforms the (lithic) raw material to a small extent, and it is also a reductive process involving material loss. These two characteristics of the technology make it possible to reconstruct past lithic technological systems by assigning the lithic finds to each other. In this way, we can manage the artefacts of several sites in one system, and in rare cases, we even discover a concrete, physical fit between knapped stones found far from each other. Exploiting the particularities of this

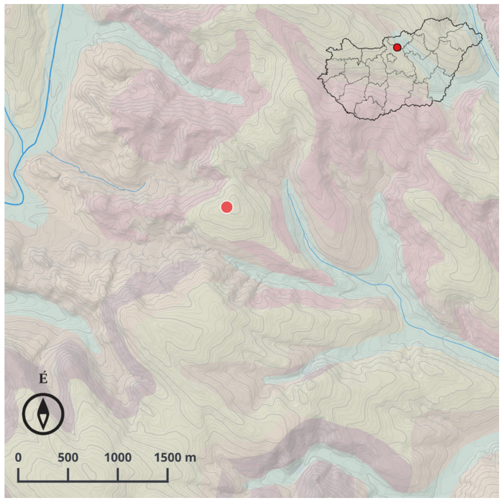

Figure 1. Geographical position and topography of the Acsa-Rovnya site. Data: EOTR 1:10,000. Prepared by the author.

find type, primarily research in the United States outlined connections between the lithics found at the sites and the former functions of those places, in other words: between the tool technology and land use systems of the former communities (Andrefsky, 2009; Bamforth & Bleed, 1997; Barton & Clark, 2021; Brantingham, 2006; Collard *et al.,* 2005; Fitzsimmons *et al.,* 2020; Holdaway & Douglass, 2012; Holdaway & Davies, 2020; Kuhn, 1992; Nelson, 1991; Robinson & Sellet, 2018; M. Shott, 1986; Torrence, 1983).

Endscrapers, as tools with a relatively fixed design, represent a characteristic segment of the exploitation of natural resources (de Sonneville-Bordes & Perrot, 1954). Based on traceological and ethnoarchaeological research, these tools retouched on their distal end, were generally used for processing skin, bone and plant parts (Beyries & Rots, 2008; Domingo *et al.,* 2012; Shott & Weedman, 2007; Weedman & Arthur, 2008).

In the various land use models, they are therefore classified as processing tools, the prominent presence of which indicates the nature of the ac-

Table 1. Acsa-Rovnya. The composition of the knapped lithic find material used for the study by type (rows) and raw material (coloumn). Data: Attila Király.

	Limnosilicite		Flint & chert		Radiolarite		Quartz porphyry		Other		Total	
	pcs	%	pcs	%	pcs	%	pcs	%	pcs	%	pcs	%
Debitage total	2193	78.5	20	0.7	7	0.3	14	0.5	54	1.9	2288	81.9
Chunk	1047	37.5	5	0.2					33	1.2	1085	38.8
Chunklike flake	364	13.0	7	0.3	2	0.1					373	13.3
Flake	649	23.2	5	0.2	4	0.1	13	0.5	19	0.7	690	24.7
Blade	89	3.2	3	0.1	1	0.0	1	0.0	2	0.1	96	3.4
Bladelet	15	0.5									15	0.5
Preparation element	29	1.0									29	1.0
Core	88	3.1	2	0.1					2	0.1	92	3.3
Endscraper	166	5.9	5	0.2	2	0.1			1	0.0	174	6.2
Perforator & combined	15	0.5	1	0.0							16	0.6
Burin	24	0.9									24	0.9
Backed & truncated	33	1.2	1	0.0	1	0.0					35	1.3
Retouched & notched	98	3.5	6	0.2	1	0.0	2	0.1	2	0.1	109	3.9
Bifacial tool	19	0.7					6	0.2			25	0.9
Scaled "retouch"	31	1.1	1	0.0							32	1.1
Total	2667	95.4	36	1.3	11	0.4	22	0.8	59	2.1	2795	100.0

tivities carried out on the site, hence the duration of the occupation and the frequency, or intensity of its visits (Clark *et al.*, 2019). The endscrapers are also suitable for detecting many other features of land use. The retouch intensity, the degree of renewal reveals the curated or opportunistic approach of their users, their mobility, and the duration of site use (Blades, 2003; Morrow, 1997; Shott & Seeman, 2015; Shott & Weedman, 2007). In addition to the endscraper front, other modifications often appear on the supports, which further enriches the evaluation of these tools. Overall, the frequency and formal variability of Upper Palaeolithic endscrapers make the type a promising land use marker even in palimpsest situations. The location of the find and the function of the artefacts are related to each other even in open archaeological contexts encompassing a long period, which provides information about the way a given landscape was used, regardless of cultural-taxonomic issues. I use these advantages when examining the endscrapers of the Acsa-Rovnya site. My questions are whether 1) the technological-morphological variation of the endscrapers found here can be traced back to functional, cultural-chronological, or mixed reasons, and 2) what does the presence of the endscrapers tell us about land use for the period covered by the find material.

3. Material and methods

The Acsa-Rovnya (Fig. 1) site has been known since the late 1990s thanks to the surface collections of Attila Péntek, Sándor Béres and István Homola. Viola T. Dobosi conducted verification excavations here in 2002 and 2004 (T. Dobosi, 2008, 2010, 2013). The material of about 12,000 surface and about 350 excavated artefacts is considered one of the largest Palaeolithic collections in the country. In the absence of adequate absolute dating results, the excavator dated the soil layer containing the finds to the Arcy interstadial period (DO 6–7, 31,500–30,000 BP) based on tool typology and stratigraphic considerations. T. Dobosi interpreted the findings from the surface collections and excavations as a coherent sample and determined it to be younger Aurignacian based on typology. At the same time, she notes that several of the typical Aurignacian tool types are missing, as well as evidence of the Gravettian taxon; in addition, bifacial elements and side-scrapers characteristic of transitional industries are present. T. Dobosi considers these "transitional" elements to be part of the Aurignacian material (T. Dobosi, 2013).

In this study, I included unworked blanks and worked pieces, i.e. tools (1,566 pieces), with the 174 endscrapers that make up the sample (Table 1), from among the Acsa-Rovnya lithics processed so far within the framework of my doctoral research (2,795 pieces).

I separated six groups according to the production technologies of the pieces and the morphology of the supports. For the technological investigation, I used Inizan's work (Inizan *et al.,* 1999) and Mester et al.'s Hungarian-language articles based on it (Holló *et al.,* 2001, Holló *et al.* 2002, 2004). To further investigate the support preferences, I examined the dimensional data of the endscrapers. I assumed, that if size was a prominent aspect in the selection of the endscrapers' supports, then the distribution of their given size characteristics differs significantly from the similar characteristics of other groups in the collection. In the study, I used only the thickness, width and weight data, not the length. Due to the distal formation of the endscrapers and the taphonomic effects and fractures, the latter dimension does not necessarily represent the original length of the supports. The shape change resulting from the processing, use and abandonment of stone tools affects the thickness to the smallest extent (Blades, 2003). In the case of endscrapers, thinning at the point of attachment to a handle may occur, but this action usually affects the proximal and mesial portions of the pieces, so maximum thickness is rarely compromised (Shott, 1995). The metric tests performed on endscrapers usually consider the width value constant. However, most of these tests concerned endscrapers made on regular blades, the width of which changes slightly between support detachment and tool discard (Blades, 2003; Morrow, 1997; Shott & Seeman, 2015). During the production of the "robust" Acsa-Rovnya scrapers (see below), the original width may have decreased, so I treat width-related conclusions with due caution.

In addition to descriptive statistics, non-parametric Mann-Whitney U tests were used to compare the size data of different artefact groups. Based on the Kolmogorov-Smirnov normality test, the length, width, thickness and weight data all show a non-normal distribution in the entire sample ($n = 1566$, in each case $df = 1566$, $p < 0.001$; Table 2). The size distribution of the different groups formed from the sample also followed a non-normal distribution (all flakes and blades: $n = 1158$; all intact flakes and blades: $n = 700$; all endscrapers: $n = 174$; all intact endscrapers: $n = 90$; all other tools: $n = 234$), the phenomena following a normal distribution are located at the lower limit of the significance level (endscraper length $df = 174$, $p < 0.2$; intact endscraper length $df = 90$, $p < 0.2$, width of other tools $df = 234$, $p < 0.07$). Except for

Table 2. Acsa-Rovnya, descriptive statistics of the knapped lithic sample and its groups. Data: Attila Király.

Sample	Variable	Mean	Median	Standard deviation	Minimum	Maximum	Skewness	Curtosis	K-S	K-S df	K-S significance
Total sample (n=1566)	Length (unbroken)	31.05	30.00	10.49	7.00	73.10	0.65	0.43	0.04	1566.0	0.00
	Width	26.80	25.10	9.27	0.70	69.00	0.95	1.27	0.08	1566.0	0.00
	Thickness	9.62	9.00	4.02	1.60	26.40	0.74	0.42	0.07	1566.0	0.00
	Mass	9.33	6.40	9.31	0.30	73.30	2.30	7.01	0.17	1566.0	0.00
Flakes (n=1158, unbroken n=700)	Length (unbroken)	31.25	30.00	11.03	10.20	73.10	0.81	0.77	0.05	700.0	0.00
	Width	26.92	25.20	9.67	0.70	67.40	0.86	0.88	0.08	1158.0	0.00
	Thickness	9.41	8.80	4.08	1.60	26.40	0.77	0.52	0.07	1158.0	0.00
	Mass	8.84	5.40	9.50	0.30	73.30	2.44	7.70	0.18	1158.0	0.00
Endscrapers (n=174, unbroken n=90)	Length (unbroken)	29.97	31.00	8.97	12.80	52.00	0.11	-0.50	0.07	90.0	0.20
	Length (all)	34.37	34.65	9.74	11.10	59.00	0.06	-0.03	0.04	174.0	0.20
	Width	24.76	24.10	5.89	8.00	49.60	0.74	1.92	0.08	174.0	0.01
	Thickness	10.48	9.75	3.69	4.00	20.10	0.80	0.09	0.09	174.0	0.00
	Mass	10.10	8.30	7.13	0.90	44.10	1.68	3.84	0.13	174.0	0.00
Other tools (n=234)	Length	29.43	28.90	7.72	10.30	53.50	0.38	-0.11	0.07	234.0	0.01
	Width	26.04	25.40	7.00	11.00	51.40	0.65	0.57	0.06	234.0	0.07
	Thickness	9.79	9.75	3.17	3.00	20.10	0.38	0.02	0.07	234.0	0.00
	Mass	7.43	5.95	4.80	1.30	24.80	1.20	1.24	0.13	234.0	0.00

two groups, the number of cases is over 40, which can justify the use of parametric tests based on the central limit distribution theorem, although most of the variables do not follow a normal distribution. However, the groups did not meet the robustness conditions and variance homogeneity beneficial for parametric paired tests.

I explored the trend-like co-occurrences of the morphological diversity with principal component analysis (PCA) and then grouped the cases along the resulting latent variables with hierarchical clustering on principal components (HCPC). Finally, I compared the clusters with the grouping according to production methods. In the study, I included variables that could be measured in all cases, the data were not distorted by the fragmentary nature of the pieces, met the PCA prerequisites, and are of course relevant to the research.

The use of different HCPC protocols is known in archaeological lithic analysis (Jennings *et al.*, 2015; Seeman *et al.*, 2013), but it is a more common procedure in other scientific fields (Abdulhafedh, 2021; Maugeri *et al.*, 2021). Out of the 174 endscrapers in the collection so far, 150 met all the conditions of the PCHC test. Twelve items could not be included in the study due to data collection deficiencies, and eleven additional items were excluded to increase the coherence of the sample. The latter tools were found a little further away from the main find concentration, in a lower-lying area. Finally, an additional piece differed both in its raw material (andesite) and in its proportions

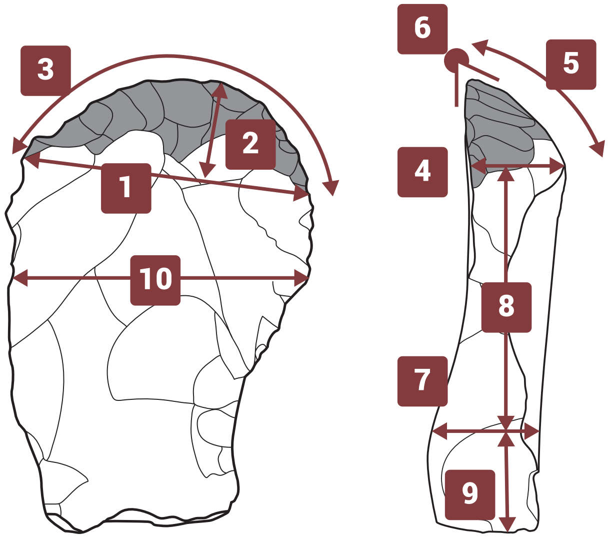

Figure 2. Acsa-Rovnya endscrapers; initial variables used for PCHC analysis on the supports. 1: endscraper front width, 2: endscraper front depth, 3: endscraper front length, 4: retouch height, 5: retouch length, 6: retouch angle, 7: maximum thickness, 8: the distance between the maximum thickness and retouch height, 9: the distance between the maximum thickness and the proximal end, 10: maximum width. Prepared by the author.

from the other endscrapers known so far at the site, perhaps it was used as a bladelet core. Since one of the conditions for the reliability of the PCA is the presence of at least 150 cases, I did not eliminate any additional pieces. Accordingly, many tools with broken edges remained in the sample, and because of these, I could not use the variables affecting the length. During the PCA, I focused primarily on the form and taphonomic properties of the endscraper front, and secondly on the morphological features that can be measured even on the fragmentary pieces, which proved to be significant in the case of support preferences. I established the following ten variables (Fig. 2).

The endscraper front width (1) is the distance between the two endpoints of the retouch in the plane of the dorsal surface, given in millimetres. The endscraper front depth (2) is the length of the section perpendicular to the endscraper front width, expressed in millimetres, which leads to the farthest point of the endscraper front. The endscraper front length (3) is the distance between the two endpoints of the width along the distal edge of the piece, expressed in millimetres. The retouch height (4) is the distance between the ventral and dorsal surfaces at the point of the morphological axis of the piece where the retouch reaches its greatest extent in the direction of the proximal end of the piece. The retouch length (5) is the greatest distance between the proximal and distal ends of the retouch on the dorsal surface, given in millimetres. I gave the retouch angle (6) in degrees by averaging the meeting angles of the dorsal and ventral surfaces measured in three places on the endscraper front. The maximum thickness (7) is the maximum distance between the ventral and dorsal surfaces of the support, expressed in millimetres. The distance between the maximum thickness and retouch height (8) is measured along the morphological axis in millimetres and shows whether the thickest point of the piece is located at the beginning of the endscraper front or not. The distance between the maximum thickness and the proximal end (9) is also measured in millimetres. The maximum width (10) is also measured in millimetres, which can be compared with the width of the endscraper front to give an approximate idea of whether the

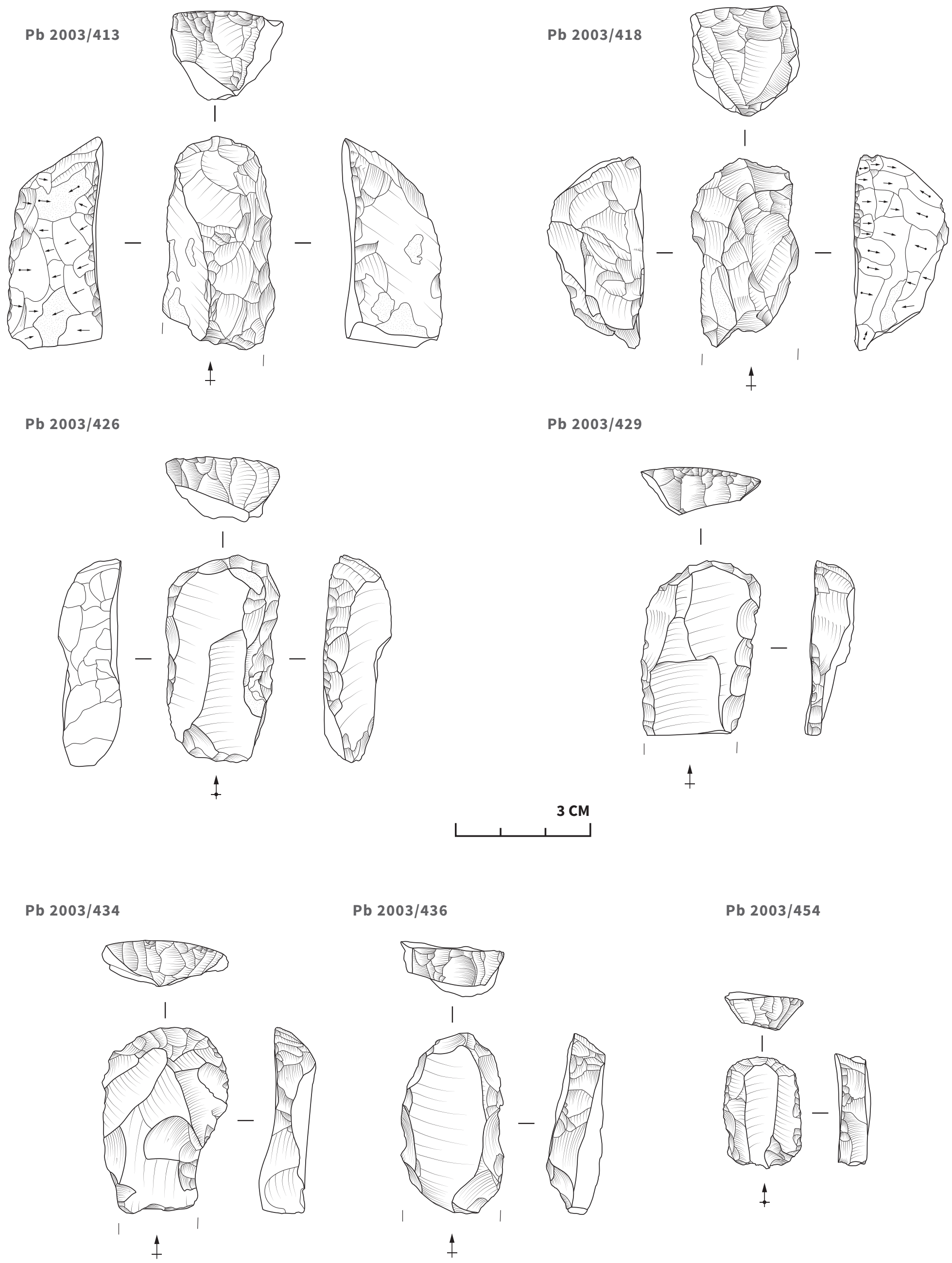

Figure 3. Acsa-Rovnya, endscrapers, and examples of the technical groups discussed in the text. Pb 2003/413 – robust 1 group, Pb 2003/418 – robust 2 group, Pb 2003/426, Pb 2003/429 – thinned group, Pb 2003/434 – other group, Pb 2003/436 – plain group, Pb 2003/454 – parallel group. Prepared by the author, based on pieces stored in the Hungarian National Museum.

shape of the piece widens or narrows in the direction of the endscraper front.

The principal component analysis serves to simplify the multidimensional space designated by the ten initial variables and to discover the relationships between the variables (Hair *et al.*, 2010; Ho, 2013; Jolliffe, 2002; Nguyen & Holmes, 2019; VanPool & Leonard, 2011). The method determines background variables that cannot be directly observed, i.e. factors based on correlations between variables. Among the factor analyses, PCA takes into account the entire variety present in the sample and is not predictive but exploratory. These properties make it suitable for the examination of the Acsa-Rovnya scrapers. On the one hand, I wanted to use the full variability represented by the variables to classify the open-context find material. On the other hand, I do not aim at a general characterization of endscrapers of a given era or culture, but only at a better understanding of the find material. The conditions for using PCA include the appropriate number of cases, the variables measured on an interval or ratio scale, between which there is a correlation of appropriate strength and geometry, and the smallest possible number of outliers in the sample. According to the Kaiser-Meyer-Olkin test, the Acsa-Rovnya sample is suitable for testing, and the obtained factors are reliable (KMO = 0.724). The Bartlett test also indicates that the correlation between the elements is sufficiently strong ($\chi 2$ (df = 45) = 1085.089, $p < 0.000$). There are some excessively strong loadings in the correlation table, but there is no strong multicollinearity based on the value of the determinant (D = 0.001).

Based on the Kolmogorov–Smirnov tests performed on the sample, the distribution of the investigated variables did not meet the prerequisite of normality. However, PCA is a robust enough test to be used in such cases, especially if the purpose of the test is to reduce variables (Jolliffe, 2002, p. 339; Zygmont & Smith, 2014). This was confirmed by the HCPC protocol performed on normalized data, which led to almost identical partial results and final results. In the study, I use standardized data to ensure that the values of all variables included in the study are on the same scale, not in degrees and millimetres. Each of the main components obtained by mathematical transformation has an eigenvalue, which shows how much of the total variability present in the data set is represented by a given factor. For the sake of simplification, I only took into account in the study those factors that carry the largest part of the variation, that is, they have a high eigenvalue. I determined the number of relevant factors based on the Kaiser criterion, the elbow rule, the variance ratio and Horn's parallelism test (Josse & Husson, 2012; Patil *et al.*, 2008). For the sake of easier interpretation, I rotated the factors using the Promax method ($\kappa = 4$), assuming a correlation between the factor axes. Finally, each endscraper received unique values along the factors kept as variables.

I then grouped the sample according to the values obtained for the factors, using hierarchical cluster analysis (Abdulhafedh, 2021; Hair *et al.*, 2010; Husson *et al.*, 2010). This type of study is ideal for samples with a small number of cases, where we do not have prior knowledge of discrete sets. The method treats each case as a separate group and gradually arranges them into higher and higher order sets according to the distance and difference of their given properties from each other. There are several methods for determining the distance. In the case of the Acsa-Rovnya endscrapers, I used the Ward method, which is based on measuring the variance of the resulting cluster, so it is optimal for handling the multidimensional spaces represented by the principal components. I determined the number of clusters used (4) based on the resulting dendrogram. I checked the quality of the clusters with an analysis of variance (ANOVA), supplemented by a Tukey post-hoc test. With these, the degree of separation of the sets was determined along the individual variables, which I formed from the factors.

As the last step of the investigation, I plotted the cases along the axes of the main components, grouped according to the way they belong to the cluster and the way they were formed. I no longer interpreted these complex dot charts using statistical methods, but qualitatively. The data was recorded with a manual calliper and jewellery scale, and with the help of the Fiji morphometric software (Schindelin *et al.,* 2012), for statistics I used the SPSS 25.0 and JASP 0.14.1 software, and in the case of Horn's parallelism test, an R-based web application (Ho, 2013; IBM Corp, 2017; JASP Team, 2021; Patil *et al.,* 2017).

4. Results

4.1. Technological-morphological groups

Almost all of the 174 endscrapers in the sample were made of limnosilicite of local, possibly Mátra origin. I separated them into six groups according to the morphology of their support and their methods of production. The design of the thinned group (group 1, 23 pieces) is characterized by a big detachment negative on the dorsal surface parallel to the morphological axis, initiated from the proximal direction, which thins the body of the tool in a side view (Fig. 3, example Pb 2003/429). The parallel group (group 2, 70 pieces) includes supports with a unidirectional dorsal detachment negative pattern, lacking any other special design, usually with parallel lateral edges (Fig. 3, example Pb 2003/454). A high ridge runs along the morphological axis on the dorsal surface of the stout supports in the "robust 1" group (group 3, 15 pieces). Shaping negatives perpendicular to this ridge starts in the direction of the lateral edges; these negatives are usually deep, and wide, with padded terminations, indicating the application of great force. Similar detachments often start from the direction of the lateral edges towards the central ridges on these pieces (Fig. 3, item Pb 2003/413). The result of this design is similar to the morphology of the maintenance flakes used to remove spent core edges, where the central ridge is the core edge, i.e. the meeting of the detachment and debitage surfaces. An important difference is that on the vast majority of endscrapers belonging to the robust 1 group, the shaping negatives perpendicular to the ridge are complete, that is, they are not necessarily partial negatives of supports detached from the debitage surface of a core. The negatives starting from the spine were created either after the endscraper's support was detached, or before it was detached, but for shaping the blank, and are not traces of core reduction. In the latter case, we cannot rule out that the supports were originally fragments of crested blades or flakes; traces of core reduction, which assumes these products, can be detected in the material of the site (Demidenko & Usik, 1993).

The appearance of the "robust 2" group (group 4, 9 pieces) is similar to the previous group, but in these cases, the shaping negatives from the lateral edges towards the spine dominate the morphology of the pieces (Fig. 3, item Pb 2003/418). If the pieces of the robust 1 group are interpreted as crested flakes or blades, then this fourth group differs from a technological point of view, since the purpose here could have been specifically to shape the support, not the core. On the specimens of the plain group (group 5, 22 pieces), the dorsal surface is defined by one detachment negative, it is plain except for the retouch (Fig. 3, item Pb 2003/436). Finally, the *varia* group (group 6, 35 pieces) includes pieces with a multi-directional dorsal negative pattern and other endscrapers that cannot be included in the above categories (Fig. 3, item Pb 2003/434).

The groups can be divided into two sets, which is also reflected in the width and thickness values of the supports (Fig. 4). The specimens of the first, second, and fifth groups are generally thinner,

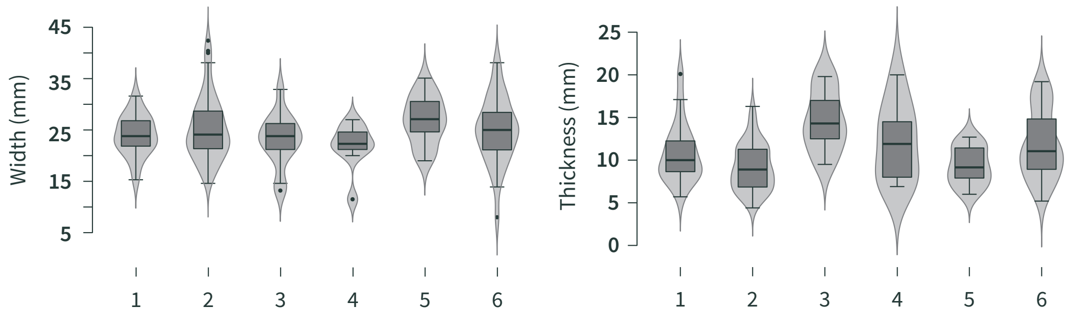

Figure 4. Acsa-Rovnya, violin and box diagrams of the width and thickness data of the knapped stones. Boxplots show median, second quartile, fourth quartile, and outliers (points). Left: width data of the endscraper technical groups. 1: thinned group (23 pcs); 2: parallel group (70 units); 3: robust 1 group (15 pcs); 4: robust 2 group (9 pcs); 5: plain group (22 pieces); 6: other group (35 pcs). Right: thickness data of the endscraper technical groups, in the same breakdown as the previous figure segment. Prepared by the author.

concerning the pattern of their dorsal negatives, they were produced in more advanced phases of debitage, and the debitage mostly occurred from one direction and resulted in flakes with parallel edges ("gracile set"). The set comprising the third and fourth groups consists of more robust scrapers ("robust set"). Compared to the first set, the width data in these cases are slightly more narrowly defined, although they hardly differ from the values of the first set. The thickness values, on the other hand, are scattered within larger limits and are generally larger than those of the first set. Specimens of groups 3–4 usually bear strong traces of the shaping of the support, short and wide, scaled, often stepped negatives, fissures and cracks. The blank morphology also affects the endscraper fronts, which are usually higher, and further retouching occurs less often on these pieces.

4.2. Principal component and cluster analyses

PCA identified three principal components that explain more than three-quarters of the variation present in the sample ($n = 150$). The three components were loaded with variables of a distinctly different nature, so the components are well separated from each other, which was also supported by post hoc analysis of variance (for all three components, $p < 0.000$) (Table 3 and Fig. 5).

The length (0.967), width (0.914), and depth (0.885) of the endscraper front, and width of the piece (0.801) accounted for the first component to a large extent, these variables played almost no role in the variance represented by the other components (their value < 0.0). The correlation between width-related variables is not surprising, but the depth of the endscraper front does not necessarily change together with the other parameters. If the length and width of the endscraper front are large, but the depth is small, then the shape of the endscraper front is almost straight in dorsal view, and the retouch is probably abrupt. If the depth is large, the endscraper front is strongly curved or pointed. The close correlation of the parameters suggests that the producers paid special attention to the shape of the endscraper front, even during possible resharpening. The correlation between the maximum width of the scratch-

Table 3. Acsa-Rovnya endscrapers, loadings of the principal components on the initial variables. Data: Attila Király.

Variable	PC1	PC2	PC3
Endscraper front length (bl)	**0.967**	-0.054	0.006
Endscraper front width (bw)	**0.914**	0.028	0.027
Endscraper front depth (bd)	**0.885**	-0.096	-0.089
Maximum width (w)	**0.801**	0.033	0.009
Maximum thickness (t)	0.042	**0.916**	-0.161
Retouch height (rh)	0.030	**0.914**	0.115
Retouch length (rl)	0.093	**0.855**	0.118
Retouch angle (ra)	-0.234	**0.555**	-0.134
(t) - (rh) distance	0.014	0.267	**-0.909**
(t) - proxi end distance	-0.037	0.224	**0.803**

PCA factor exctraction, Promax rotation with Kaiser normalization, the function converges in 4 iterations.

ing front and the support allows us to conclude that the silhouette of the tools is fixed.

The second component combines properties related to the thickness of the endscrapers, such as the thickness of the support (0.916), the length of the retouch (0.855), its height (0.914) and, to a lesser extent, the retouch angle (0.555). There is a clear correlation between the height of the retouch and the thickness, but the retouch length varies depending on the retouch angle: an abrupt retouch tends to be shorter, and a less steep one tends to be longer.

The third component contains the variables referring to the length since thickness was measured along the morphological axis. These variables are intended to show where the thickest part of the tools is located: it supports the working edge or rather it participates in the fixation (hafting or prehension) of the proximal part. Although the sample includes pieces that are broken along their width, i.e. shortened, the variables are still capable of characterizing the location of the thickest part, since the supports thicken either at the endscraper front or necessarily in the proximal direction from the working edge. Finally, the component revealed a strong inverse relationship: if the distance between the maximum thickness of the support and retouch height (-0.909) is small, then the place of the maximum thickness is relatively far from the proximal end of the artefact (0.803). If the thickness of the supports were relatively constant throughout their length, such a relationship would not be observed. The Acsa-Rovnya scrapers are thicker toward their distal or proximal end, which undoubtedly plays a role in the proximal thinning observed in many cases.

The cluster analysis resulted in the establishment of four significantly different sets (Fig. 6). The cases of the cluster marked in blue are typically pieces made on a thicker support, the shape and extent of the endscraper front, and other dimensions of the support are less important parameters. The cluster marked in red encompasses the opposite trends, it contains the thinner supports, where the endscraper front is relatively long and deep, and usually falls further from the thickest part of the support. Along the first principal component, the yellow cluster forms a third distinct group in contrast to the blue and red elements: it includes less thick, less wide pieces with a shorter endscraper front, which is located closer to the thickest section of the support. The elements of the fourth, green cluster are distributed relatively evenly along the first and second main components, but in the case of the third main component they are located in a negative direction, that is, the thickness of the pieces can be relatively uniform along their entire length. A particularly interesting result is that the instances of the technological groups are not strongly separated even according to the clusters. Weak trends are that the pieces of the robust group are more likely to be in the blue and green sets, and the

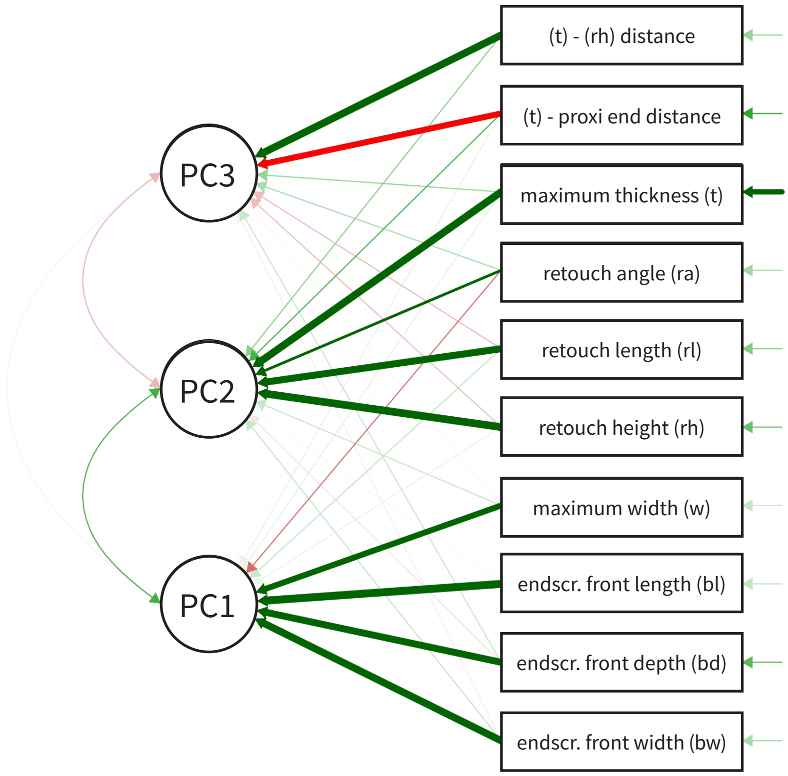

Figure 5. Path diagram depicting the results of the principal component analysis. Green lines indicate positive correlation, red lines indicate negative correlation, and the thickness of the lines indicates the strength of the correlation. Prepared by the author.

thinned, parallel and plain pieces are more likely to belong to the yellow or red sets.

4.3. Support preferences based on size data

I compared the dimensional data of the endscrapers, other tools and other unworked flakes of the collection to infer preferences within the site regarding the design of the tools (Table 4 and Fig. 7). A comparison of endscrapers and unworked flakes reveals that narrower and thicker supports are preferred for scrapers. The width of the scrapers (24.76 mm) is significantly less than that of the unworked flakes (26.92 mm), U = 91,726, Z = -1.907, p = 0.028 (one-sided), and the thickness of the endscrapers (10.48 mm) is significantly greater than the unworked flake data (9.41 mm), U = 83,373, Z = -3.675, p < 0.000 (one-tailed). The width of endscrapers (24.76 mm) is significantly smaller than that of other processing tools (28.31 mm), U = 14,956, Z = -3.598, p < 0.000 (one-tailed); however, there is no significant difference between their thicknesses (10.48 and 10.16 mm, U = 17,995, Z = -0.871, p = 0.185 (one-sided)).

The size differences between the endscrapers and the armatures are clearly visible. The width of the scrapers is significantly greater than that of the armatures (20.1 mm), U = 781, Z = -2.903, p = 0.001 (one-sided), their thickness is also significantly greater (armatures: 7.82 mm, U = 798, Z = -2.822, p = 0.002 (one-tailed)). The size relationships between all the tools and the unworked flakes are gentler, which is partly caused by the significantly smaller average size of the armatures. There is no significant difference between unworked flake and tool widths (26.92 vs. 26.47 mm), U = 235,351, Z = -0.112, p = 0.455 (one-tailed).

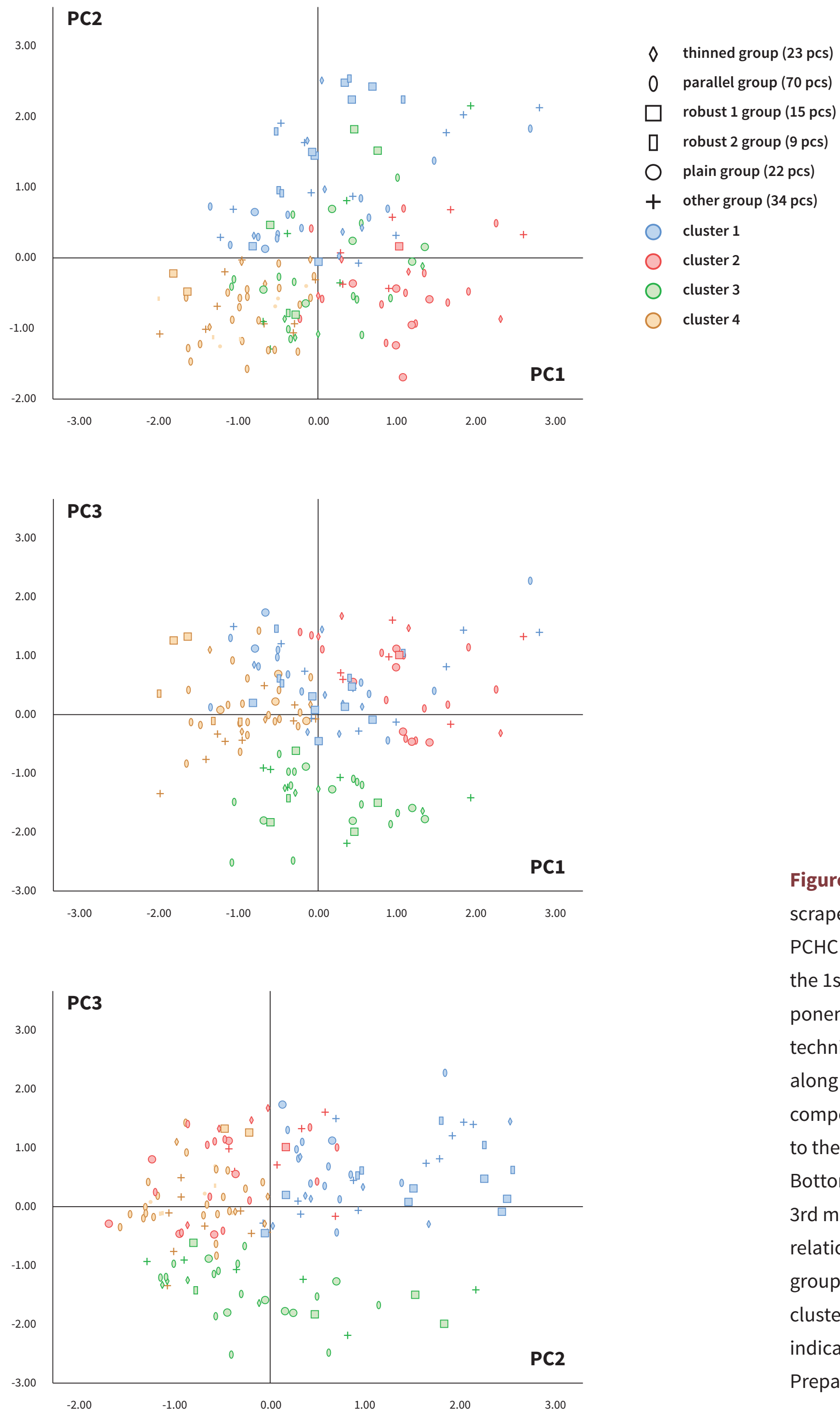

Figure 6. Acsa-Rovnya endscrapers, the result of the PCHC analysis. Top: along the 1st and 2nd main components, in relation to the technical groups. Middle: along the 1st and 3rd main components, in relation to the technical groups. Bottom: along the 2nd and 3rd main components, in relation to the technical groups. Colours indicate clusters and shapes indicate technical groups. Prepared by the author.

However, the thickness of the unworked flakes is still significantly lower than that of the tools (9.41 mm and 10.21 mm), U = 206,382, Z = -3.800, $p < 0.000$ (one-sided). Concerning dimension data, the group of endscrapers is distinguished by their well-defined width of 20–35 mm from other processing tools, armatures, and other blanks optimal for tool making. In terms of thickness, the gracile armatures differ from the average, the other artefact categories are similar in this respect. I did not evaluate the length data because of the fragmentation.

5. Discussion

The supports and design of the endscrapers classified into the “robust” and “gracile” technology sets differ from each other, but their blanks may be the products of a single core reduction method (see e.g., Bataille & Conard, 2018). The chunky flakes bearing traces of shaping correspond to the initial processing phase of the cores, while the thinner pieces with a regular silhouette, and unipolar dorsal pattern are the products of the debitage phase of core reduction. This connection is also indicated by the use of raw materials. The lower-quality outer sections of the limnosilicite blocks with voids, inclusions and cortex are more the raw material for robust scrapers, the more finely worked pieces usually have better quality raw material with fewer inhomogeneities. Other features of debitage do not differ greatly between groups: when it is observable, the vast majority of butts are plain, and the angle of detachment is right-angled or slightly obtuse.

The width and thickness data support the robust-gracile dichotomy and also show small differences. Although the length data were excluded from the statistical analysis, it is worth mentioning that the average length of the intact endscrapers (n = 76) is 40.3 mm, the intentionally snapped pieces (n = 23) 28.7 mm, the broken ones (n = 61) 28.9 mm, while that of the double scrapers worked on both the distal and proximal ends (n = 14) is 35.4 mm. The average length of processing tools (n = 218) is 34.5 mm, that of intact unworked flakes (n = 700) is 31.2 mm, and that of all flakes (n = 1,158) is 29.9 mm. From this we can draw the preliminary conclusion that longer-than-average supports were chosen to form endscrapers, but shorter fragments were also used, as shown by the double endscrapers worked on both the proximal and distal sections. Double endscrapers occurred more often in the gracile technological groups, similarly to another retouch (e.g. retouched lateral edge), which may indicate a longer period of use of these pieces. Subsequent research should deal with the issue of recycling and resharpening the Acsa-Rovnya endscrapers.

The principal component analysis confirmed the expected correlations between the metric variables. The first main component connected the extension and course of the endscraper front with the width of the support. Based on the second principal component, the steepness and depth of the endscraper front are mostly a function of the thickness of the support. The third principal component established an inverse relationship between the proximal and distal end (endscraper front) regarding the location of the thickest section of the support. Although it is not a rule for these two parameters to change together, the endscraper front occupies often the thickest part of the support and is therefore located far from the proximal end. That is why the green group of the cluster analysis is interesting, where this relation did not have a very strong charge, based on which the thickness of these supports can be said to be relatively uniform.

The cluster analysis showed that there is no special association between a technology group and a cluster, the instances of the technology groups are almost equally scattered in the four established clusters. This phenomenon can be evaluated in several ways, the first of which is that I in-

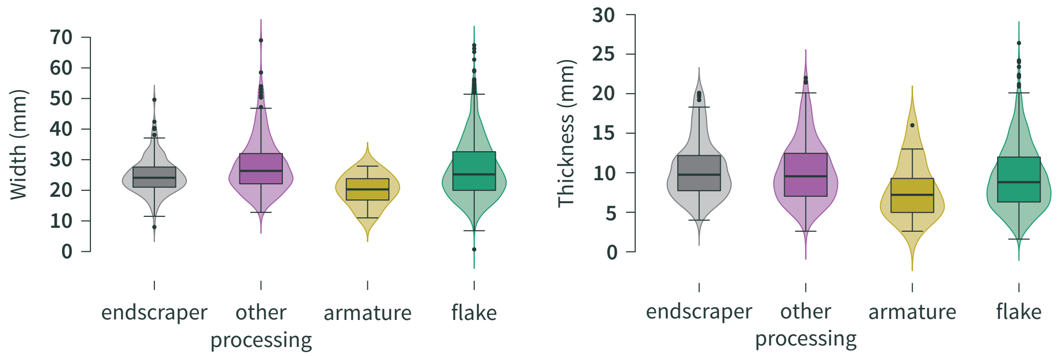

Figure 7. Acsa-Rovnya, violin and box diagrams of the width and thickness data of the knapped stones. Boxplots show median, second quartile, fourth quartile, and outliers (points). Left: width data of the examined sample (n = 1,566): endscrapers (n = 174), other processing tools (n = 218), armature (n = 16), unworked flakes (n = 1,158). Right: thickness data of the examined sample, in the same breakdown as the previous figure segment. Prepared by the author.

correctly established the grouping variables when planning the technological and statistical study. A further possible interpretation is that the combinations of morphological characteristics taken into account during the HCPC analysis are equally valid for the scrapers of the gracile and robust technology groups. Constraints arising from the lithic raw material and the dimensions of the supports are the cause of the homogeneous scattering, for example, the thickness of a flake determines the steepness or depth of the endscraper retouch. In addition to these constraints, the morphological similarities and the narrow size spectrum of the endscrapers suggest that the endscrapers belonging to different technological groups may be products of similar core reduction processes, obeyed similar support preferences, and the spectrum of their use overlapped. Without an analysis of use-wear, we can only assume the functional differences of the various endscraper forms, i.e., technological groups. Pieces with thinned bases may have been included in handles, and intentionally broken and double scrapers may have been recycled specimens.

Based on the results, it cannot be decided with certainty whether the differences in the production methods of the endscrapers can be traced back to temporal, archaeological taxonomic ("cultural") or functional reasons. In any case, scrapers belonging to different technological groups cannot be said to be tools of different industries, since they could have been products of the same core reduction process, their dimensions are similar, and their function is the same according to our current knowledge. In the case of high endscrapers, the possibility may arise that the artefact served as a microblade core. There is no evidence of the detachment of lamellae of adequate length and regular shape on any tool defined as an endscraper, I have classified such specimens as cores. The function of the scrapers can thus be the scraping mentioned in the name.

From the comparison of the endscrapers and other elements of the examined Acsa-Rovnya collection, we can draw several conclusions indicating the function of the site. The amount of finds is exceptionally high by Hungarian standards, which indicates the important role of the site in land use, whether it is the result of longer or several shorter

Table 4. Acsa-Rovnya, pairwise comparison of different segments and variables of the sample using the Mann-Whitney U test. Data: Attila Király.

Group 1	n	Group 2	n	Variable	Mann-Whitney U	Asymp. sig. (2-tailed)	MC sig. (2-tailed)	MC sig. (1-tailed)	r (effect size)
Endscrapers, all	174	Flakes, all	1158	Width	91726.000	0.057	0.057	0.028	-0.052
Endscrapers, all	174	Flakes, all	1158	Thickness	83373.500	**0.000**	0.000	0.000	-0.101
Endscrapers, all	174	Armatures	16	Width	781.000	**0.004**	0.004	0.001	-0.211
Endscrapers, all	174	Armatures	16	Thickness	798.000	**0.005**	0.004	0.002	-0.205
Endscrapers, all	174	Processing tools	218	Width	14956.000	**0.000**	0.000	0.000	-0.182
Endscrapers, all	174	Processing tools	218	Thickness	17995.500	0.384	0.379	0.185	-0.044
Flakes, all	1158	Tools, all	408	Width	235351.500	0.911	0.915	0.455	-0.003
Flakes, all	1158	Tools, all	408	Thickness	206382.000	**0.000**	0.000	0.000	-0.096

Monte Carlo simulation is based on 10000 sampled tables.

occupations (Barton *et al.,* 2011; Clark *et al.,* 2019). The proportion of retouched tools within the collection is low, according to T. Dobosi (T. Dobosi, 2013), 537 (7.3%) out of 7,390 examined pieces. The few tools are a function of the large amount of blocks and pieces from the local raw material source. Areas rich in raw materials are usually characterized by a lack of curated technologies involving several retouched tools since the acquisition of newer and newer supports does not involve a significant energy investment (Kuhn & Miller, 2015). However, the presence of double scrapers and combined tools indicates a kind of economical approach, which can be traced back to the poor quality of the local raw material. Pieces with a homogeneous texture, free of inclusions, and therefore easier to knap, were subjected to intensive processing. According to all calculations, the proportion of endscrapers among tools is high in Acsa: 327 pieces (60.9%) in T. Dobosi's sample (T. Dobosi, 2013), 174 pieces (42.6% of the 408 tools) in the sample examined here. Taking other processing tools into account, armatures are in the absolute minority in the collection. This distribution indicates the nature of the activities carried out at the site. According to our current knowledge, it may be a base camp, where the processing and consumption of resources took place (e.g., Domingo *et al.,* 2012).

Based on technological and typological arguments, the excavator determined the presence of an archaeological taxon, the Aurignacian, at the Acsa-Rovnya site (T. Dobosi, 2013). According to the current status of the revision of the site, Gravettian elements do not occur in the Acsa-Rovnya material, but traces of several early Upper Palaeolithic taxa may be present. Whether the collection represents groups belonging to one or more archaeological cultures, the material residue of their activities remained similar on Acsa-Rovnya, which indicates a similar land use during the Early Upper Palaeolithic, and a similar status of abandonment in the later stages of the Upper Palaeolithic. The site is located on a hilltop at 260–270 meters above sea level, at a relative height of 106 meters. Considering the taxon defined by Dobosi, during the Arcy interstadial, the settlement fell on the Galga valley with mixed

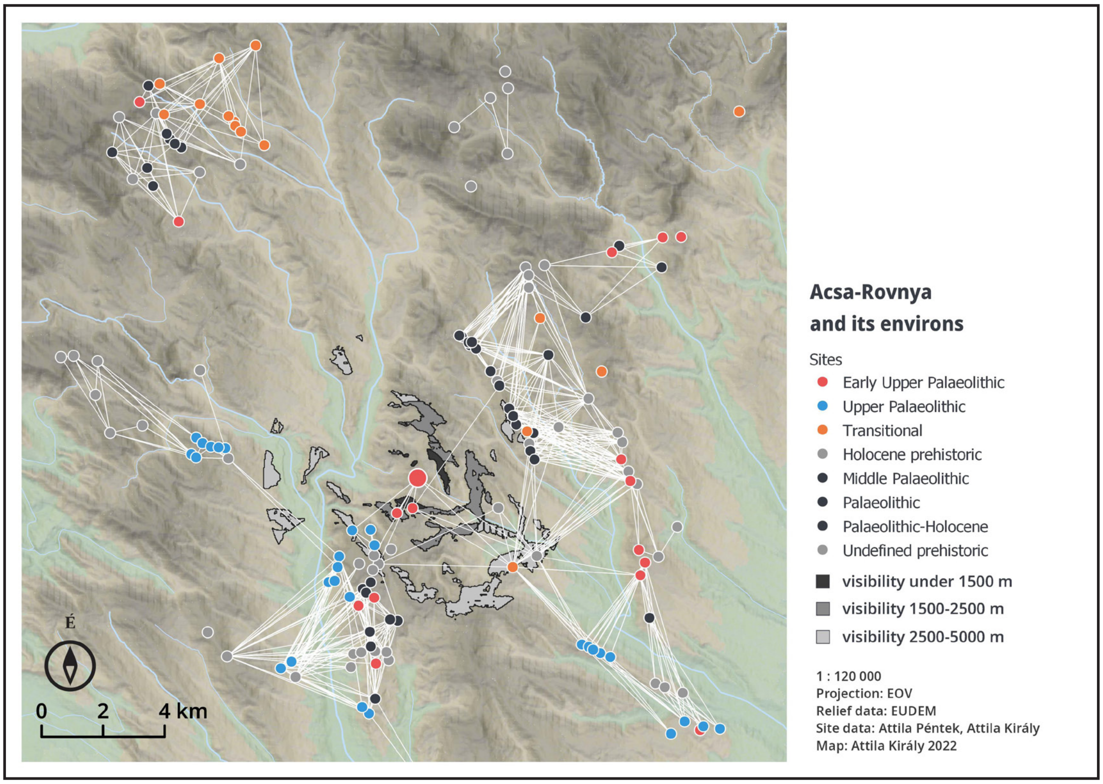

Figure 8. Acsa-Rovnya and its surroundings. The white lines express the visual connection between the studied sites. Acsa-Rovnya, marked with a large red dot, is surrounded by the visibility areas marked with grey: the identity of a person can be recognized in the dark grey area; it is possible to recognize that it is a person in the middle-shaded area; movement can be detected in the light grey area, this is the limit of visibility. Prepared by the author.

taiga forests and the Rovnya hill with spruce-steppe vegetation, based on paleoecological research conducted on similar landscape units (e.g., Feurdean *et al.*, 2014; Sümegi, 2014; Sümegi *et al.*, 2019).

Its localization corresponds to the typical Aurignacian settlement pattern, a foothill environment between 150 and 300 meters, from which several biomes are easily accessible (Hauck *et al.*, 2018). In the form of the Galga, the permanent water source was also nearby (2,090 m distance), and the raw materials needed for knapping were also available locally. The visibility tests show an interesting position for the site (Fig. 8). The visibility of Acsa-Rovnya is particularly poor from the sites of different ages in the investigated area. Compared to other areas of the region, especially the areas along the streams, the hill itself is less visible. Acsa-Rovnya can only be seen from a few sites, and vice versa, these are: Püspökhatvan-Takács-hegy, Acsa-Provosznya, Erdőkürt-Cigány-part, Erdőkürt-Szedmina. The latter is a Holocene site, the rest are all considered Early Upper Palaeolithic, but currently unpublished finds (Péntek & Zandler, 2016). Taking these data into account, the Rovnya hilltop was less suitable for hunting during the Early Upper Palaeolithic, because it was located further from the river valley that allowed the migration of presumed prey animals. It was less suitable for collecting limnosilicite raw material, since the outcrops were available about two kilometres to the southwest, also on the hillsides located on the edge of the Galga Valley. Its position could have been optimal from a strategic point of view, within arm's reach of the mentioned resources, yet in a protected place, presumably with a view of camps of the same age, and directly above an erosion valley in a NW-SE direction, which cut through the Ecskendi Ridge and provided a connection between the Galga and Zagyva river valleys. The size and composition of the find material and the function suggested by the endscrapers harmonize with this paleoecological and settlement scenario.

Compared to other find materials in Hungary determined to be Aurignacian, the proportion of endscrapers compared to the other elements of the toolkit is high at Acsa-Rovnya, but the group of armatures is strongly underrepresented at all such sites except for the upper culture layer of Istállós-kői cave (Table 5). The relative proportions of processing tools and armatures require further explanation. In the case of the Aurignacian *sensu lato* industries, the research considers various lamellae as elements of hunting weapons (Teyssandier *et al.,* 2010). The Hungarian sites also include various retouched points, possibly truncated pieces, which could have been parts of hand-held hunting weapons (Shea & Sisk, 2010). The underrepresentation of armatures does not necessarily reflect the roles of former occupations in regional land use strategies. Microblades are less likely to be found during surface collection, and the large-scale methods of the early excavations. We cannot rule out the possibility of misinterpretation either, since in the absence of use-wear analyses, pieces with a pointed morphology are classified as armatures, and a simple flake is usually classified as debitage. In addition, the experiment of Gravel-Miguel and his colleagues convincingly demonstrates that the armatures are usually discarded in places that have a negligible chance of being discovered by archaeological research (Gravel-Miguel *et al.,* 2021).

The interpretation is further nuanced by artefacts made of organic material since one of the hallmark finds of the Early Aurignacian is the antler tips, which are usually interpreted as parts of hunting weapons (Doyon, 2020; Tartar, 2015). In addition, other tools, such as scrapers, were surely made of bone and other organic materials (Tartar, 2012). Due to taphonomic reasons, the vast majority of our open-air Early Upper Palaeolithic sites have no remains of organic material at all, including potential hunting weapons (e.g., Chu *et al.,* 2018). On the other hand, a large number of antler artefacts are known at the Istállós-kői cave, among them at least 23 points with split bases and 9 points with other bases from the lower find layer (Markó, 2017; T. Dobosi, 2002). Markó described the cavity as a temporary hunting site based on its isolated topographical position, its periodic visits, the small amount of knapped lithic finds, including the small amount of waste indicating tool making, and the presence of points (Markó, 2017). In terms of land use, this definition forms an excellent counterpoint to the Acsa-Rovnya site, treating with reservations the lack of armature in the compared sites.

6. Conclusions

In this study, the principal component and cluster analyses considered the morphological and typological features of the Acsa-Rovnya endscrapers, which are usually used to characterize this type of tool. The components of the factors established during the principal component analysis are morphometric variables that are largely allometrically related to each other. The cluster analysis thus separated sets primarily based on the thickness of the endscrapers and the location of the thickest section of the support, as well as the resulting properties of the retouch. The technical groups established based on support preferences and tool-making methods did not align with these clusters. The difference between the more robust, more roughly made and the more carefully formed, gracile tools is caused more by the different raw material quality of the supports and the different roles of these blanks in core reduction. The former may have been created in the preparatory or initial phases of reduction, and their material is usually of lower quality and contains inclusions. The latter are usually made from the more homogeneous raw material products of the debitage phase of the reduction, so their design is also more regular, with fewer knapping errors. According to the metric data, these technological groups consist of similar-sized tools, which, according to the HCPC study, were affected in a relatively uniform manner by the morphological changes associated with use, such as fractures or changes in the shape of the retouch. Compared with the rest of the find material, it can also be seen that the supports of the endscrapers are generally narrower and thicker than the other processing tools and the unworked flakes. However, their size range is narrow, and there are no outstanding differences, except for the armatures.

The study did not provide a straight answer to the first question of the paper, the reasons for the variation in the endscrapers in Acsa-Rovnya, but according to the most economical explanation, the reasons are more functional than cultural or historical. Endscrapers appear in large quantities from the Upper Palaeolithic onwards in the European archaeological record, so we can rightly assume this maximum age here as well. Due to the complete absence of tools and knapping methods typical of the Gravettian, the lower age limit of the Acsa-Rovnya find can be placed at the end of the Early Upper Palaeolithic. Within this period, we currently know the Aurignacian (Chu *et al.,* 2020), an unidentified Early Upper Palaeolithic industry (Budek *et al.,* 2013), and the Szeleta transitional industry (Mester, 2018) in our country, their exact chronological relationship however, is still controversial. Endscrapers made on stout blades and flakes are known in the collections of all three mentioned taxa, which show great typological diversity even from one site to another. The Acsa-Rovnya find material can even be classified into several taxa - this is currently the subject of a revision – but the uniform raw material, dimensions and technological groups that complement each other in terms of core reduction do not justify the division of the sample along supposed cultural or aesthetic arguments, they simply do not contradict such a division. The functional-taphonomic evaluation of different endscraper designs is the subject of subsequent research.

Consistency can also be observed in the land use characteristics of the Acsa-Rovnya site. The large amount of knapped stones indicates intensive use of the site in the Early Upper Palaeolithic, which means frequent visits, longer stays, or both. Only a small part of the collection is a formal tool (currently 7.3%), which can be caused by both the abundance of local raw materials and their poor quality for knapping. In the case of abundant raw material supply, opportunistic tool management is often observed instead of careful preparation and retouching, and more waste is more likely to be generated from raw material pieces that are difficult to process (Király, 2020). In any case, the large amount of waste and debitage points to the fact that the tools were made locally. The vast majority of stone tools are endscrapers (currently 60.9%), usually used for processing organic materials; armatures account for only 2.4% of stone tools.

The amount and composition of the find material indicate the consumption and transformation of resources, and the geographical position of the site is also a little far from the assumed sources of procurement. The limnosilicite outcrops are situated about two kilometres away, and the Gravettian settlements can already be found here; the biome suitable for prey animals, the Galga Valley, is also further away. On the other hand, the Rovnya hilltop could have been a great strategic point, with a view of the camps of the same age in the area, as well as the erosional trench connecting the Galga and Zagyva river valleys at the foot of the hill.

Based on all these features, communities belonging either to one or more archaeological cultures settled on the hill, they left us traces of a very similar repertoire of land use: that of a frequently visited base camp, where primarily stone and organic material tools were made, skins were prepared and resources were consumed.

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