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Vác 1 Epigravettian loci at the Danube Bend in North-Central Hungary

Lokalita epigravettienu Vác 1 v ohbí Dunaje v severocentrálním Maďarsku

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KEYWORDS

Eastern Central Europe – Epigravettian – Vác 1 loci and lithic artifact chaîne opératoire analysis

ABSTRACT

In the article, the Vác 1 loci (Danube Bend area in North-Central Hungary) and its surface lithic artifacts systematically collected over the last 20 years have been analyzed. The loci and lithic artifact chaîne opératoire analyses showed that the site served as a hunter-gatherer temporary camp with some base camp characteristics and some similar with lithic artifact primary and secondary treatment processes adding to one another for both rather local and distant raw material types (RMTs). Furthermore, the lithic assemblage data indicate an Early Epigravettian industrial attribution. Likewise, some assemblages' techno-typological data certainly augment some of the more peculiar features for the already known Early Epigravettian variability in the Eastern Central Europe.

1. Introduction

Upper Paleolithic (UP) research in North-Central Hungary has a long and important research history (e.g. Dobosi 2014) and meaning for the entire Eastern Central European UP. First, the region directly adjoins the southern territories of Slovakia and, more significantly, is located at the important triangular section of the Danube River when the river makes the right southern turn into the Pannonian Plain flowing through Transdanubian and North Hungarian Mountains. Accordingly, the triangular-shaped area with the Danube Bend in North-Central Hungary was a key area in Eastern Central Europe allowing easy, radiating access to different Central European territories for various Paleolithic human group moves. Second, indeed, a good series of Late UP sites mostly dated to around the Last Glacial Maximum (LGM) sensu lato (Rasmussen et al. 2014; Clark et al. 2009), c. 26.5–19 kacal BP, have been found on both river's banks and their loess terraces of the Danube Bend within a c. 80 km section from the town of Nyergesújfalu to Budapest. The site series extends from the Mogyorósbánya site to the Budapest-Corvin-tér site for the Danube's right bank and from the Szob site to Vác town for the Danube's left bank.

V. T. Dobosi (2014) reported about 22 sites within the Danube Bend and the site numbers have since increased with some more newly found loci (Fig. 1).

At the moment, the site selected for the present article's analysis, Vác 1 (Sóskúti-dűlő), is the southernmost known loci of the Late UP site series on left bank area of the Danube Bend. Late UP open-air sites are usually located on the low Pleistocene terrace within the Danube alluvial plain, mostly close enough to the river bed, from a few hundred meters up to 3 km. The Vác 1 loci is situated a little further from the Danube, c. 3.7 km away, although it should not be forgotten that the line of the riverbed significantly changed several times during the Upper Pleistocene, so the site could have been closer to the river during its occupation by Late UP humans. Also, the Vác 1 loci is notable for being with some of Pilismarót sites at highest elevation position above the Danube alluvial plain, c. 50–55 m, among the Late UP sites in the area.

Although 100 years have now passed in Late UP site research history since the pioneering Paleolithic explorations of the Danube Bend loess terraces realized by A. János Horváth in the late 1920s, there is still a variety of opinions about the industrial-chronological status of the sites' recovered artifacts (e.g. Dobosi 2014; Lengyel 2016; 2018). From our point of view, the used approaches' studies do, to some extent, overlook a significant industrial variability known for Late UP assemblages. It especially relates to the Early Late UP time period around the LGM when, from the point of view of a team member (Yu. D.), there are no less than two Early Epigravettian industry types of Ságvar

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and Kašov I, in the upper layer in the Eastern Central European in addition to the Epi-Aurignacian with Sagaidak-Muralovka-type microliths/EASMM industry (Mohelno-Plevovce site in Southern Moravia, Rosenburg site in Lower Austria) (Demidenko et al. 2018; 2019) and Badegoulian industry (Kammern-Grubgraben site in Lower Austria) (Demidenko et al. in press; Händel et al. in press). Taking the subject of lithic industry variability into consideration, each well analyzed Late UP lithic assemblage becomes significant and might bring to light some more data and/or help to understand better some previously known data. Therefore, undertaking our study of Vác 1 loci lithics, we have been keeping in mind all the data briefly noted above for the Danube Bend area Late UP in Hungary and implemented our analysis with a detailed study in mind.

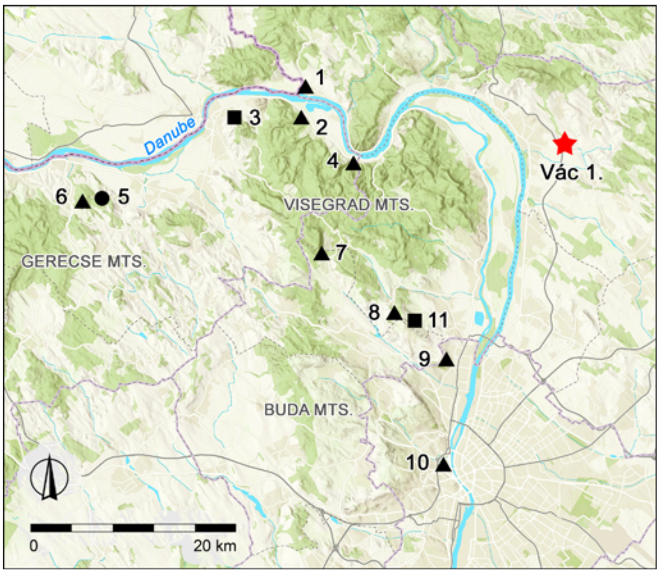

Fig. 1. The Danube Bend area with the most known Epigravettian sites in North--Central Hungary and Vác 1 loci. 1. Szob. 2. Pilismarót site cluster. 3. Esztergom--Gyurgyalag. 4. Dömös. 5. Mogyorósbánya. 6. Jankovich Cave. 7. Pilisszántó Rock-Shelter. 8. Kiskevély Cave. 9. Budapest-Csillaghegy. 10. Budapest-Corvin--tér. 11. Zöld Cave. Circle: Dated Early Epigravettian sites. Quadrate: Dated Late Epigravettian sites. Triangle: Epigravettian sites with no firmly established chronology. Modified after Béres at al. 2020, Fig. 1.

Obr. 1. Nejznámější lokality epigravettienu v ohbí Dunaje v severocentrálním Maďarsku a umístění lokality Vác 1. 1. Szob. 2. Klastr lokalit Pilismarót. 3. Esztergom-Gyurgyalag. 4. Dömös. 5. Mogyorósbánya. 6. Jeskyně Jankovich. 7. Převis Pilisszántó. 8. Jeskyně Kiskevély. 9. Budapest-Csillaghegy. 10. Budapest--Corvin-tér. 11. Jeskyně Zöld. Kruhy: Datované časně epigravettské lokality. Čtverce: Datované lokality mladšího epigravettienu. Trojúhelníky: Epigravettské lokality s nejistou chronologií. Podle Béres et al. 2020, Fig. 1, modifikováno.

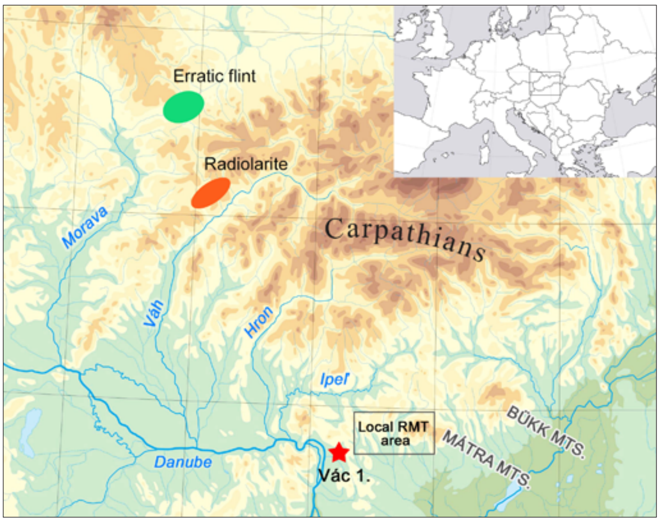

Fig. 2. Study location region in Europe with the Vác 1 loci, outcrops of local raw material types (limnosilicite and gravel flint), radiolarite and erratic flint. After Kozłowski, Pawlikowski 1989, Fig. 1; Plašienka 2018, Fig. 1.

Obr. 2. Studovaný region na mapě Evropy s lokalizací polohy Vác 1, výchozy lokálních surovin (limnosilicit a pazourek ze štěrku), radiolaritu a eratického pazourku. Podle Kozłowski, Pawlikowski 1989, Fig. 1; Plašienka 2018, Fig. 1.

2. Vác 1 site location, discovery and research

The loci is located in the northern part of Pest County, near the south-eastern outskirts of the town of Vác on the left bank area of the Danube River at the coordinates WGS-84: 47.7703333N, 19.1761667E (Fig. 2–5). It is on the western gentle slope of a high terrace at c. 172–175 m a.s.l. dominating to the west over the Danube River alluvial plain, being limited to the south by the valley of the Gombás Stream and to the north-east by the valley of the Cselőte Stream.

The site was discovered by a team member (S. B.) in the summer of 2001, during the observation of a plowed surface at a terrace when a number of lithic artifacts were collected. Basically, the found artifacts formed two clusters. The site's two basic artifact concentration presence was then firmly determined using GPS in 2017 (Fig. 4–5). One of the concentrations, now called the Vác 2 site, is in the northern part of the terrace being characterized by UP and later periods' finds discovered together with the predominance being among the latter items of Neolithic lithic and ceramic pieces. At the same time, the concentration of interest in the present article, the Vác 1 site, was recognized from the beginning of its research by the presence of homogeneous UP lithics, except for only a few distinct Neolithic trapezes and some other items, including some of obsidian, and no ceramics were found there. This is why, of course, the Vác 1 loci was selected for our study aiming at a real research evaluation of the UP materials there. Vác 1 lithic finds occur mainly at the bottom of a humus strip and below it in loess sloping sediments. The density of the surface finds was significantly lower at the height of the terrace indicating redeposition onto the slope of most of the lithics within the terrace.

The loci was surveyed many times between 2002 and 2019 in spring and autumn with no high grass growing at the terrace in order to find as many lithic artifacts as possible. Accordingly, the particular Vác 1 surface find loci can be said to be systematically studied. Moreover, all the lithics were carefully collected understanding the importance of small-sized lithic items and especially backed tools and microliths for a UP site. It was indeed so as not only the noted above some tiny tools were found but also almost a hundred chips as well. All these tiny pieces were found for all the raw material types (RMTs) known for the site's UP lithics (see Tab. 1, 5). As a result, it is possible to say that Vác 1 lithic assemblage contains not just a good series of artifacts in almost 800 pieces but is also characterized by all the basic artifact categories occurrence there. It, of course, allows us detailed RMTs, technological, typological and site type studies for the Vác 1 loci.

3. Lithic assemblage data

Only lithic artifacts (almost 800 pieces) were attributed as UP finds at the Vác 1 loci. Anticipating lithic artifact characteristics, first, some basic RMT data are provided below.

3.1 Raw material data

Vác 1 lithic artifacts have been produced on four different RMTs (Tab. 1). Two RMTs, limnosilicite and gravel flint, can be classified as rather local rocks, whereas radiolarite and erratic flint definitely fall into distant rocks in relation to the site location.

	Limnosilicite & gravel flint	Radiolarite	Erratic flint	TOTAL
CORE-LIKE PIECES	48/78.7%	8/13.1%	5/8.2%	61
CMP	29/63.0%	6/13.0%	11/24.0%	46
DEBITAGE	243/70.4%	30/8.7%	72/20.9%	345
Flakes	151/62.1%	14/46.7%	34/47.2%	199/57.7%
Blades	69/28.4%	13/43.3%	22/30.6%	104/30.1%
Bladelets	17/7.0%	2/6.7%	13/18.1%	32/9.3%
Microblades	6/2.5%	1/3.3%	3/4.1%	10/2.9%
TOOLS	39/56.5%	9/13.1%	21/30.4%	69
WASTE FROM TOOL	4/57.1%	0	3/42.9%	7
PRODUCTION & REJUVENATION				
DEBRIS	222/85.7%	12/4.6%	25/9.7%	259
Chips	81	7	6	94
Uncharacteristic debitage	81	3	18	102
Pieces				
Chunks	60	2	1	63
TOTAL	585/74.3%	65/8.3%	137/17.4%	787

Tab. 1. Vác 1. Artifact totals by raw material types as numbers and percentages of each type.

Tab. 1. *Vác 1. Počty artefaktů podle surovin (počty a procentuální podíly).*

Accordingly, both some similarities and dissimilarities could be traced in the use of these two different sets of RMTs by Late UP human visitors of the site (Fig. 2, 3).

Limnosilicite outcrops are known to the east of the site and the Danube River along the Northern Hungarian Mountains of Cserhát and Mátra. The most significant limnosilicite outcrop in the Cserhát mountain area occurs near Püspökhatvan, c. 15 km from the site (Markó 2005). The Mátra mountain area is characterized by limnosilicite outcrops in the vicinity of Gyöngyöspata, Gyöngyöstarján and Szurdokpüspöki, c. 20–50 km from the site (Mester, Faragó 2013). A significant part of the limnosilicite pieces from the Mátra outcrops becomes easily patinated on a modern surface, which is why it is often impossible to correctly distinguish them within the various archaeological assemblages. Anyway, it is possible to say that there is a dotted meandering line of limnosilicite outcrops within the Cserhát and Mátra mountain areas situated c. 15 to 50 km from the Vác 1 site.

Gravel flint: Several formations with different types of flint pebbles are known in some places of the Cserhát mountain area (Tertiary deposits) to the east and north-east from the Vác 1 site and the Danube River (Hámor 1985, 265–266). These are gravel flint sources at Vanyarc-Makó-oldal, Debercsény-Mogyorós (Markó, Kázmér 2004), and Erdőkürt-Szedmina, c. 15–20 km from the site (Péntek, Faragó 2012). Like the Mátra limnosilicite, the gravel flints also quickly patinate making the recognition of artifacts on this RMT only through the presence of some primary cortex. This is why non-cortical gravel flint artifacts are almost macroscopically indistinguishable from the above-described limnosilicite artifacts.

Taking into consideration the patina and primary cortex subjects and the rather local setting in about the same areas to the east and north-east from the Vác 1 site for both limnosilicite and gravel flint outcrops and sources, a decision was made to group both the limnosilicite and gravel flint artifacts together for their technological and typological analyses.

Radiolarite is the most visually recognizable distant RMT for Vác 1 assemblage. Radiolarite sources occur across the Western Carpathians in the Klippen Belt formation, Western Slovakia (Plašienka 2018; see also Přichystal 2009, 129–140), although the flaking qualities of different radiolarite items vary. The Vác 1 radiolarite data indicate that the Trenčín area with mainly secondary

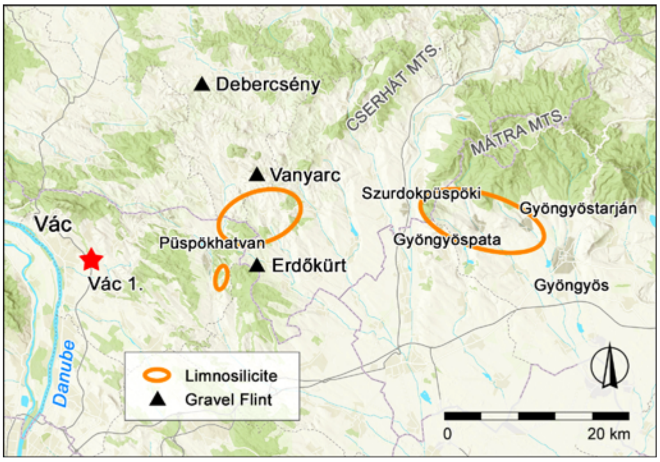

Fig. 3. Detailed location area in North-Central Hungary with Vác 1 loci and outcrops of local raw material types (limnosilicite and gravel flint). After Markó 2005, Fig. 1; Mester, Faragó 2013, Fig. 9.

Obr. 3. *Detailní mapa oblasti v severocentrálním Maďarsku s umístěním polohy Vác 1 a výchozů lokálních surovin (limnosilicit a pazourek ze štěrku). Podle Markó 2005, Fig. 1; Mester, Faragó 2013, Fig. 9.*

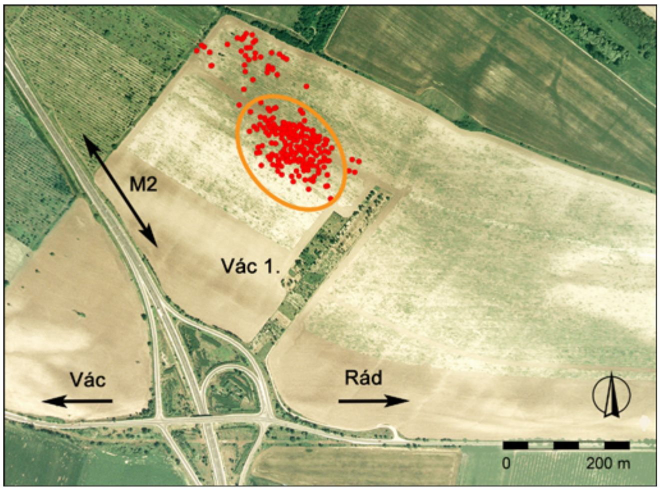

Fig. 4. The Vác 1 and 2 loci areas identified on the basis of 2017 lithic artifact location using GPS. Modified with QGIS and Photoshop by S. Béres and Google Earth Map.

Obr. 4. *Polohy Vác 1 a 2 na základě rozptylu kamenných artefaktů (GPS) v roce 2017. Zdroj: Google Earth Map; v QGIS a Photoshopu modifikoval S. Béres.*

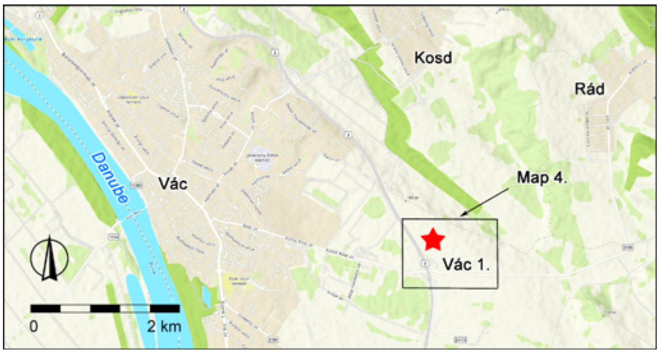

Fig. 5. Vác 1 loci on the modern ground near the Danube River with the map on Fig. 4 of the location. Commercial map of Vác region scanned and modified in Photoshop by S. Béres.

***Obr. 5.** Poloha Vác 1 na moderní mapě okolí Dunaje s vyznačením území zobrazeného na obr. 4. Zdroj: Komerční mapa regionu Vác; ve Photoshopu modifikoval S. Béres.*

radiolarite outcrops in the Váh River valley could be the most probable radiolarite source for the Vác 1 site. At the same time, there is also a rich primary source of high quality radiolarite c. 15 km north from the town of Trenčín in the Vlára River valley. All in all, the Western Slovakian primary radiolarite sources most probably associated with the Vác 1 site radiolarite artifacts are divided by no less than c. 160–170 km straight distance.

The erratic flint is characterized by the most distant original outcrops in relation to the Vác 1 site, c. 250–270 km in direct distance (Kozłowski, Pawlikowski 1989). They are located in the region of Upper Silesia, mostly on the Polish side of today's Czech-Polish border. Despite such distant erratic flint outcrops, it is worth noting the presence on this RMT in all diagnostic Epigravettian core and tool types in the assemblage. The latter RMT – lithic artifact type interconnection will be one of the most important studies for the Vác 1 artifacts.

All in all, the above-described two pairs of rather local and distant RMTs will be used for separate lithic analyses. The limnosilicite and gravel flint items will be grouped together as just one and rather local RMT, while the radiolarite and erratic flint specimens will be studied separately due to their easily visible differences from one another. At the same time, the Vác 1 raw material specificity feature is that the site was not located right at or very close to an outcrop/source basically used for its raw material, which is why the site location probably played a more important role for selecting the loci for its human occupation. It will make the settlement pattern even more intriguing for further considerations.

3.2 Lithic assemblage composition

In total, 787 lithic artifacts have been attributed by us to a Late UP occupation(s) of the Vác 1 loci. The lithics have been subdivided into the following 6 basic categories (see also Tab. 1).

By the above-listed artifact structure, the Vác 1 assemblage looks like a full-fledged UP collection excavated some years ago before thorough dry-sieving/wet-sieving artifact bearing processes were usual field practice as they are today. Therefore, the assemblage can be used for a detailed techno-typological analysis.

The lithic artifacts have been classified basing on principles and methods that were already elaborated and applied by a team member (Yu. D.) for various UP materials (e.g. Demidenko 2012; Demidenko et al. 2017; 2019) while, of course, not forgetting to take into consideration some basic publications on UP lithic artifact classifications (Sonneville-Bordes, Perrot 1954–1956; Tixier 1974; Marks 1976; Demars, Laurent 1989).

3.3 Core-like pieces

The core-like piece sample is composed of 61 examples (Tab. 2). Two groups of these items are seen. There are clear differences between the core-like pieces on very distant RMTs (erratic flint and radiolarite) and rather local RMTs (limnosilicite/gravel flint).

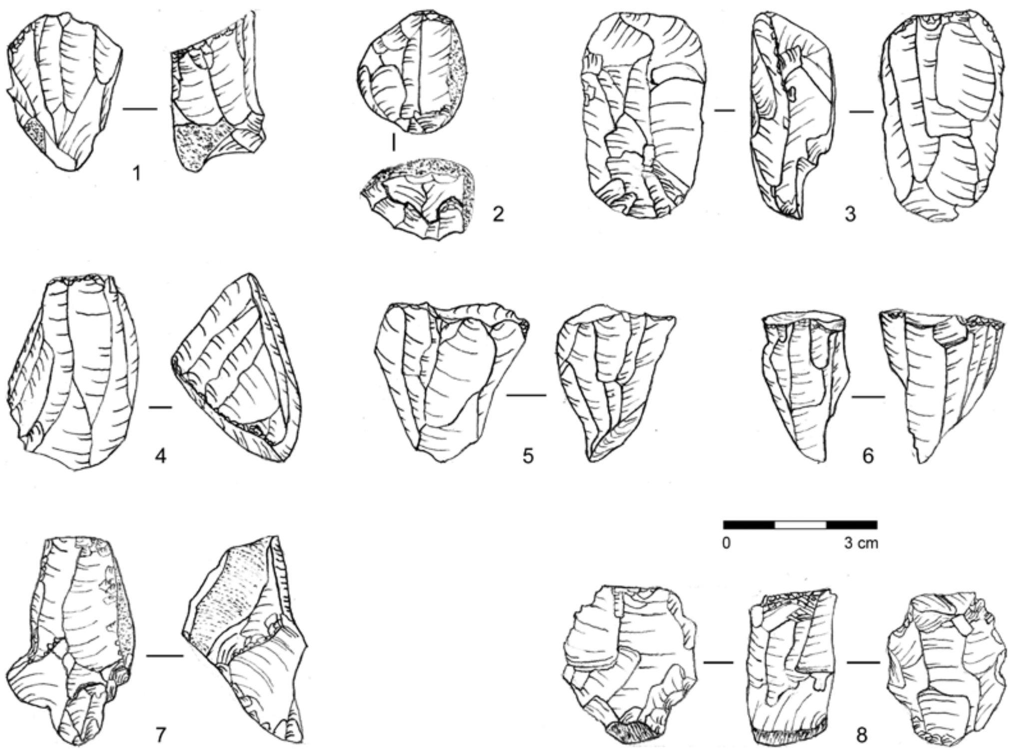

Fig. 6. Vác 1. Cores. 1, 5, 6 – Bladelet single-platform unidirectional sub-pyramidal cores; 2 – bladelet double-platform bidirectional ovoid core; 3 – bladelet double-platform bidirectional-alternate rectangular core; 4 – bladelet double-platform bidirectional-adjacent sub-pyramidal core; 7 – bladelet double-platform bidirectional narrow-flaked core; 8 – bipolar anvil core. 1–4 – Erratic flint; 5–8 – radiolarite. Drawing by S. Béres.

***Obr. 6.** Vác 1. Jádra. 1, 5, 6 – jednopodstavová sub-pyramidální jádra na čepelky; 2 – čepelkové dvoupodstavové oválné jádro na čepelky; 3 – dvoupodstavové biditekcionální (podstavy proti sobě) obdélníkové jádro na čepelky; 4 – dvoupodstavové (protilehlá podstava pootočena) sub-pyramidální jádro na čepelky; 7 – dvoupodstavové (bidirekcionální) úzké jádro na čepelky; 8 – bipolární rozštěpované jádro; 1–4 – eratický pazourek; 5–8 – radiolarit. Kresba S. Béres.*

Groups & types	Limnosilicite & gravel flint	Radiolarite	Erratic flint	TOTAL
TESTED NODULES	**1**			**1**
CORES FREE-HAND	**39**	**5**	**5**	**49**
Flake cores	**5**			**5**
multi-platform cubical	1			
radial (fragmented)	3			
on a thick flake	1			
Flake/blade cores	1			1
single-platform unidirectional sub-cylindrical	1			
Blade/bladelet cores	**10**			**10**
Single-platform	**6**			
unidirectional sub-pyramidal	2			
unidirectional sub-cylindrical	4			
Double-platform	**4**			
bidirectional sub-cylindrical	2			
bidirectional fragmented	1			
bidirectional-adjacent sub-cylindrical	1			
Bladelet cores	**22**	**5**	**5**	**32**
Single-platform	15	3	2	
unidirectional narrow-flaked/burin-core-like	11		1	
unidirectional sub-cylindrical	1			
unidirectional sub-pyramidal	3	3	1	
Double-platform	4	1	3	
bidirectional narrow-flaked/burin-core-like	1	1		
bidirectional ovoid			1	
bidirectional sub-cylindrical	1			
bidirectional cylindrical	1			
bidirectional-adjacent narrow-flaked/burin-core-like	1			
bidirectional-adjacent sub-pyramidal			1	
bidirectional-alternate rectangular			1	
Multi-platform cubical	1	1		
Fragmented	2			
Unidentifiable cores	**1**			**1**
CORES BIPOLAR ANVIL	**1**	**2**		**3**
CORE FRAGMENTS	**7**	**1**		**8**
TOTAL	48	8	5	61

Tab. 2. Vác 1. Core-like pieces classification.

Tab. 2. *Vác 1. Klasifikace jádrovitých kusů.*

The cores on the very distant RMTs are represented by exclusively bladelet cores. On the other hand, cores on the rather local RMTs are represented by a tested nodule, flake cores, a flake/blade core, blade/bladelet cores and, finally, also bladelet cores. The latter core type is the most numerically represented among these core-like pieces. Accordingly, it is possible to state that namely the bladelet cores on the entire site's RMTs have been the basic core type, while other core types played supplementary and subordinate roles. The following are core-like piece descriptions, using the already elaborated and applied classification system (Demidenko 2012) with a single addition of subdividing the cores into free-hand and bipolar anvil specimens, separately for each RMT, which describes the on-site and also some off-site core exploitation systems well.

Cores on erratic flint

These are all free-hand 5 bladelet cores.

Two single-platform unidirectional cores on chunks being 1 narrow-flaked piece (4.2 cm long with a semi-acute angled and roughly-prepared striking platform that makes it similar to a burin-core on truncation), and 1 sub-pyramidal one (2.8 cm long, having an acute angled and plain striking platform) (Fig. 6: 1).

Three double-platform cores on nodules represented by 1 bidirectional ovoid (2.4 cm long, with 2 acute angled and roughly-prepared striking platforms) (Fig. 6: 2), 1 bidirectional-alternate rectangular (4.1 cm long, with 2 acute angled and plain striking platforms) (Fig. 6: 3) and 1 bidirectional-adjacent sub-pyramidal (3.9 cm long, with 2 acute angled and plain striking platforms) (Fig. 6: 4) specimens.

The certainly small-sized cores, also morphologically indicating each time a different last reduction phase with not even two cores showing one and the same reduction is why they are typologically different. They indicate their multiple, intensive and exhausted primary flaking characteristics.

Cores on radiolarite

There are 5 free-hand bladelet cores, 2 bipolar anvil cores, and 1 core fragment.

The bladelet cores on radiolarite nodules and their thick fragments are 3 single-platform unidirectional sub-pyramidal pieces (Fig. 6: 5, 6), 1 double-platform bidirectional narrow-flaked item (Fig. 6: 7) and 1 multi-platform cubical piece. The 3 single-platform items are of similar morphology, still small-sized (3.1–3.6 cm long), being straight and acute angled with only plain striking platforms. The double-platform core, 4.0 cm long, with acute angled and plain striking platforms, represents a sort of a "double carinated burin-core". The multi-platform core, 3.7 cm long, with only straight angled and plain striking platforms, shows an exhausted reduction object.

Two bipolar anvil cores, 3.0 cm and 1.8 cm long, have two splitting poles with coming from them short and narrow removal negatives (Fig. 6: 8).

Finally, the morphologically unidentifiable core fragment is notable by its size in 7.3 cm long, 3.9 cm wide and 3.5 cm thick, possibly demonstrating some larger-sized radiolarite cores were brought to the site for more primary reduction there when the cores then became smaller.

So, it is visible that the radiolarite cores are similar to some extent to the erratic cores. They are of a small size, not really exceeding even 4 cm, of a rather variable morphology being still exclusively technologically connected to bladelet production that also relates to the bipolar anvil cores with aiming detachment of microblades that are short and irregular by shape, too.

Core-like pieces on limnosilicite/gravel flint

These lithics are subdivided into four basic categories: tested nodules – 1, free-hand cores – 39, bipolar anvil cores – 1, core fragments – 7.

The only tested nodule is not of a large-size for the rather local RMTs, 3.9 cm long, 5.2 cm wide, and 4.4 cm thick.

The free-hand cores are 5 flakes, 1 flake/blade, 10 blades/bladelets, 22 bladelets, and 1 unidentifiable specimen.

The flake cores are composed of 1 multiplatform, 3 radial and a core on a thick flake. The multiplatform core is a cubical one and this is the largest core in the Vác 1 assemblage, 8.3 cm long, 7.5 cm wide, and 10.5 cm thick. The radial cores are all fragmented but still some flake centripetal removal negatives are clearly visible coming from poorly-prepared striking platforms onto their flaking surface. In spite of the cores' fragmentation, it is why two examples are under 5.0 cm, the third item is one of the largest cores, 9.2 cm long, 7.2 cm wide, and 3.9 cm thick. The last flake core is a core object specific enough for being under 5 cm size, where from an acute angled and roughly-prepared striking platform a single short flake was detached.

The flake/blade core on a pebble demonstrates an initial single-platform unidirectional sub-cylindrical specimen (Fig. 7: 1). It is 6.8 cm long, 5.5 cm wide, 4.6 cm thick, having a straight angled and roughly-prepared striking platform.

The blade/bladelet cores on nodules and chunks are 6 single-platform and 4 double-platform items. The single-platform unidirectional cores are rather uniform morphologically, showing semi-volumetric primary flaking from sub-pyramidal (2) and

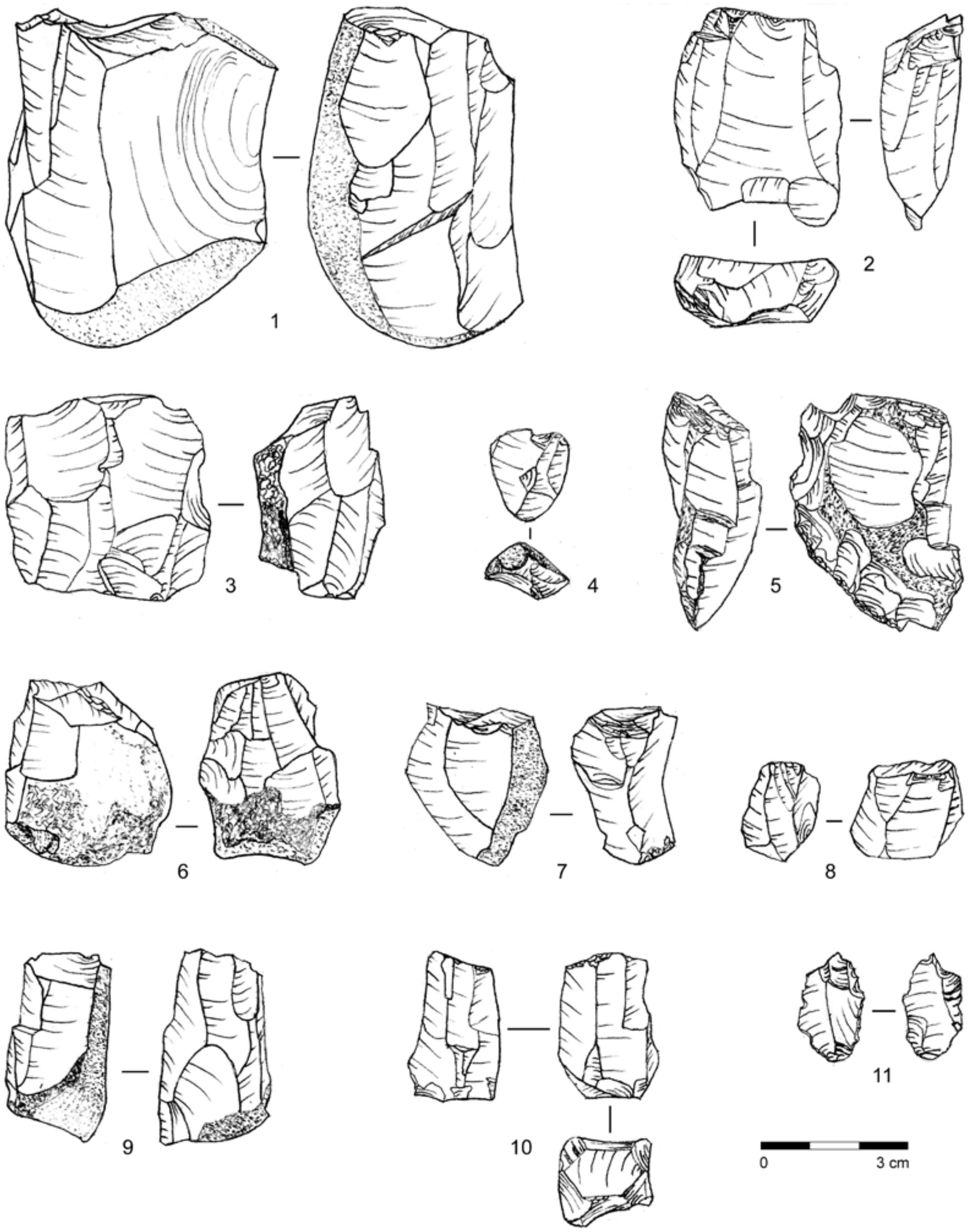

Fig. 7. Vác 1. Cores. 1 – Flake/blade initial single-platform unidirectional sub-cylindrical core; 2 – blade/bladelet single-platform unidirectional sub--cylindrical core; 3 – blade/bladelet double-platform bidirectional sub-cylindrical core; 4–8 – bladelet single-platform unidirectional narrow-flaked cores/burin-core-like pieces; 9 – bladelet single-platform unidirectional sub-cylindrical core; 10 – bladelet single-platform unidirectional cylindrical core; 11 – bipolar anvil core. 1–11 – Limnosilicite and gravel flint. Drawing by S. Béres.

***Obr. 7.** Vác 1. Jádra. 1 – úštěpové/čepelové iniciální jednopodstavové jádro; 2 – čepelové/čepelkové jednopodstavové jádro; 3 – čepelové/čepelkové dvoupodstavové bidirekcionální jádro; 4–8 – jednopodstavová úzká jádra na čepelky/rydlovité kusy; 9, 10 – jednopodstavová jádra na čepelky; 11 – bipolární rozštěpované jádro. 1–11 – Limnosilicit a pazourek ze štěrku. Kresba S. Béres.*

sub-cylindrical (4) (Fig. 7: 2) objects. These cores exclusively have semi-acute angled and plain striking platforms; 4 of them are under 5 cm long, and 2 more items are between 5.0 and 6.0 cm long. Three non-fragmented double-platform cores (under 5 cm length) also have a sub-cylindrical shape, although 2 of them are bidirectional (Fig. 7: 3) and 1 of them is bidirectional-adjacent. The latter core demonstrates the so-called double single-platform reduction on two adjacent but separate flaking surfaces. Probably, the smaller length data and variable morphology indicates more exhausted and reduced data for the double-platform cores. The three double-platform cores' 6 striking platforms are all semi-acute angled, 2 plain and 4 roughly-prepared.

The bladelet cores on nodules/chunks and flakes, the most numerous core category, show a great dominance of single-platform (15) over double-platform (4) and multi-platform (1) specimens, while 2 more pieces are bladelet fragmented cores.

The single-platform cores are characterized by the significant dominance of 11 unidirectional narrow-flaked/burin-core--like pieces (73.3%) (Fig. 7: 4–8) where 5 such specimens are also on thick flakes. In terms of length, all the narrow-flaked cores are under 5 cm in length and 4 of them are even under 3 cm in length. In terms of striking platforms, they have 10 plain and 1 roughly-prepared, 7 semi-acute, 3 straight and 1 acute angled striking platform. The plain and roughly-prepared striking platforms allow us technologically comparing these 11 burin-core-like pieces with carinated burin-cores (10) and burin-cores on truncation (1). Other single-platform unidirectional cores are 1 sub-cylindrical (Fig. 7: 9) and 3 sub-pyramidal specimens, having length data between 3.0 and 4.0 cm but with not even a single core under 3 cm in length. These 4 single-platform cores have 4 plain, 2 straight and 2 semi-acute angled striking platforms.

The much less numerous 4 double-platform bladelet cores, 3 bidirectional and 1 bidirectional-adjacent, are similar to the above-described single-platform cores for the presence of both 2 narrow-flaked/burin-core-like and 2 sub-cylindrical and cylindrical (Fig. 7: 10) cores. In terms of length, the 4 cores are between 3.0 and 4.5 cm. Their 8 striking platform data are 6 plain and 2 roughly-prepared, 6 semi-acute and 2 acute angled ones. One narrow-flaked core has 2 roughly-prepared striking platforms, which is why it is similar to a burin-core on truncation. Another narrow-flaked core has 2 plain striking platforms that are similar to a carinated burin-core.

The single bladelet multi-platform cubical core is an exhausted one with all plain and straight angled striking platforms, 3.7 cm long, 3.4 cm wide, and 3.5 cm thick.

An unidentifiable core completes the free-hand core set's description. It is with a heavily overpassed long and wide flake with a last detached removal negative that actually did not rejuvenate but destroyed the entire core, making it too small and concave for further primary flaking, 3.1 cm long, 2.1 cm wide and 1.5 cm thick. Having such the morphology and metrics, the core is objectively unidentifiable.

Bipolar anvil cores are represented by a single item for the two rather local RMTs. It is a small item with two splitting poles, 3.0 cm long (Fig. 7: 11).

Finally, 7 core fragments (11.5% of all core-like pieces) indicate some intensity of core reduction even for the rather local RMTs.

The limnosilicite/gravel flint free-hand cores actually allow us to trace a real *chaîne opératoire* of their reduction. *First*, the absence of any pre-cores and the presence of the single tested nodule clearly say that the site's humans had not been actually "sitting at a raw material outcrop(s)". Accordingly, there was no "ad hoc" use of the RMTs but it had to have been planned to bring these RMT pieces to the site ahead of their use. *Second*, UP humans were not bringing to the site cores that had already been prepared at the raw material outcrops but rather large--sized unprepared and maybe only tested nodules and chunks. This is why the initially exploited on-site cores, flake cores, are present in sufficient number among all free-hand cores, 5/12.8%. The flake cores likely served for thick flake production used then as blanks for bladelet narrow-flaked cores/burin-core-like objects. *Third*, the single flake/blade core on a pebble of an initial primary flaking stage also shows the first "reduction steps" for unprepared nodules and chunks brought to the site. *Fourth*, the absence of blade cores is of a great importance for Vác 1 assemblage epochal attribution recognition within the Central European UP techno-complex–chronological frames. From our point of view, it definitely indicates Late UP status for the analyzed assemblage. *Fifth*, the blade core absence also means that core on nodule/chunk reduction, after the initial preparation stage(s), was systematically centered on blade/bladelet primary flaking processes. The presence of 10 such cores makes it possible to trace their single- and double-platform reduction; the latter one from only opposed-platforms, in a semi-volumetric manner with sub-pyramidal and sub-cylindrical shaped cores. It is high likely that the double-platform reduction was simply double, but in fact multiple, single-platform reduction using one after another striking platforms onto just one or, in a case with the bidirectional-adjacent core, two flaking surfaces. *Sixth*, some of the already flaked blade/bladelet cores, as well as some flakes detached from flake cores were then used for the basic reduction type at the site, the strict bladelet one. The fact that more than half of all free-hand cores were bladelet cores (22/56.4%) testifies to this. Of all the morphologically identifiable 20 bladelet cores, 13 (65%) are narrow-flaked/burin-core-like specimens. In its turn, such specific burin-core-like items are similar to both carinated burin-cores (11) and burin-cores on truncation (2). The most reduced of such specific cores are very likely bidirectional and bidirectional-adjacent ones, showing multiple microblade flaking from two striking platforms. Also, most of the burin--core-like pieces are on flake-blanks with a few of the previously exploited blade/bladelet cores added to them. The rest of the bladelet cores (7/35%) are 4 single-platform, 2 double-platform and 1 multi-platform items, being, most probably, exhausted variants of previous blade/bladelet cores. The blade/bladelet to bladelet core reductions were based upon nodule/chunk-blank use with the basic semi-volumetric sub-pyramidal and sub-cylindrical shape of the cores still often kept continuously.

Furthermore, the single bipolar anvil core simply supplements the above-observed free-hand bladelet core primary flaking processes, once again confirming their dominance here.

Finally, all the traced blade/bladelet and especially bladelet core reduction processes indicate not just a Late UP status but more precisely an Epigravettian and, most likely, an Early Epigravettian one.

Core-like piece chaîne opératoire concluding data

All the above-described core-like pieces and their characteristics for three RMTs allow us to propose a unified *chaîne opératoire* for off-site and on-site core reduction processes.

On one hand, there was a very basic and only on-site free-hand reduction system based upon exploitation of rather local unprepared limnosilicite/gravel flint nodules and chunks brought to the site. Some of them were used for flake production (flake cores) and then the resulting flakes were used as blanks for bladelet serial detachment from narrow-flaked/burin-core-like objects similar to mostly carinated burin-cores and a few more burin-cores on truncation. Accordingly, the first reduction chain is the following: unprepared nodules/chunks – flake cores – bladelet narrow-flaked/burin-core-like objects. Some other nodules and chunks were used for a more complex reduction starting from the preparation and then flaking of blade/bladelet cores when a few of them were further exploited for just bladelet reduction. As a result, another, second reduction chain is: unprepared nodules/chunks – blade/bladelet cores – bladelet mostly semi-volumetric sub-pyramidal/sub-cylindrical cores. The two reduction chains rarely crossed and only in cases when very few blade/bladelet semi-volumetric cores turned out to be bladelet narrow-flaked/burin-core-like objects. Also, the single bipolar anvil core only adds some technological variability to the above-described two free-hand core reduction chains.

On the other hand, there were also primary flaking processes of erratic flint and radiolarite pieces. These two very distant RMTs were, most likely, received not by the site's humans during special trips to the very far away RMTs' outcrops but through some and possibly multiple exchanges with sibling/allied human groups. This is why there is no surprise to see just bladelet cores on these RMTs in the site's assemblage. The total number of the altogether 10 erratic flint and radiolarite free-hand bladelet cores demonstrates the reduction of 5 single-platform, 4 double-platform and 1 multi-platform cores. By all their morphological features, these small-sized cores almost repeat all the data of limnosilicite/gravel flint bladelet semi-volumetric cores on nodules/chunks with a single exceptional erratic single-platform unidirectional narrow-flaked/burin-core-like cores on truncation. This similarity has two implications. First, it again confirms the homogeneous industrial character of the entire Vác 1 lithic assemblage and particularly its core-like piece set. Second, it shows the same way of the exploitation of both very distant and rather local RMTs off-site (probably, mostly blade/bladelet core reduction stage) and on-site (perhaps, mainly bladelet reduction stage). It indicates a real technological tradition for the particular Late UP and probably Early Epigravettian humans where the so-called "cultural traits" seem to be really dominating and not dependent upon the used variable RMTs. Finally, 2 small radiolarite bipolar anvil cores again supplement the free-hand radiolarite bladelet core reductions at the site.

3.4 Core Maintenance Products (CMP)

Although CMP are a little less numerous than core-like pieces (46 pcs : 61 pcs/0.75 : 1 ratio), they still represent a good series of all four possible their types (Tab. 3). Each of the CMP types is described separately and according to their RMTs.

Crested pieces (25/54.4%) are the most numerous CMPs. In terms of RMTs, however, they are absent for radiolarite CMP. It is also important to understand the occurrence of primary and re-crested (the results of some crest formation on the core flaking surfaces already under reduction for their "refreshment" through a new reduction phase) specimens for other RMT crested pieces. All 5 crested pieces on erratic flint (3 crested flakes and 2 crested blades) are re-crested ones. From the technological point of view, it can have the following two explanations. First, all core preparation and initial reduction processes were done with no prepared primary crests and only then, during systematic core reduction with some flaking mistakes having occurred, the so-called re-cresting was used for "repairing" core flaking surfaces. Second, all erratic flint bladelet cores were brought to the site or received through some exchange by the site's human visitors from far away in an advanced blade/bladelet and even more often bladelet reduction stage, which is why only re-cresting was applied for their on-site further reduction. The latter explanation seems to be the most likely one due to the presence of some primary crested pieces on rather local limnosilicite/gravel flint that testifies to some on-site *lame à crête technique* application from the very beginning of core preparation by the site's Epigravettian humans. Adding here the absence of crested pieces on radiolarite, it seems reasonable to state that bladelet cores on the two very distant RMTs (no other core types occur on these RMTs) had mostly been prepared and first flaked off-site during their blade/bladelet reduction stage, while their final blade/bladelet and especially bladelet reduction stage(s) were conducted at the site when the cores were abandoned. The crested pieces on the rather local RMT are peculiar according to some data as well. Three crested flakes are only re-crested ones, allowing us to suggest that the flakes were detached during some final core flaking surfaces' re-preparation. The blades show a great prevalence of primary (7) over re-crested (2) pieces. It indicates some systematic on-site core preparation via *lame à crête technique* and the resulting cores were most likely blade/bladelet ones. Remembering the low number of collected bladelets in the discussed lithic assemblage, there are still 7 crested bladelets within the CMP sample, and one of them is primary and 6 other pieces are re-crested items. Such crested blade and bladelet data perhaps indicate on-site preparation and reduction of blade/bladelet cores and then, with their size and, first of all, length decreasing, their transformation into strictly speaking bladelet cores.

	Limnosilicite & gravel flint	Radiolarite	Erratic flint	TOTAL
CRESTED PIECES	**20**		**5**	**25/54.4%**
Crested flakes	3		3	
re-crested	3		3	
Crested blades	9		2	
primary	7			
re-crested	2		2	
Crested bladelets	8			
primary	1			
re-crested	7			
CORE TABLETS	**3**	**2**	**3**	**8/17.4%**
on flakes	3	2	3	
OVERPASSED PIECES	**3**	**1**	**2**	**6/13.0%**
on flakes		1		
on blades	2		2	
on bladelets	1			
CORE TRIMMING ELEMETS	**3**	**3**	**1**	**7/15.2%**
TOTAL	**29**	**6**	**11**	**46/100.0%**

Tab. 3. Vác 1. Core maintenance products structure.
Tab. 3. *Vác 1. Struktura produktů úpravy jader.*

Core tablets (8/17.4%) are known by 2–3 specimens for all three basic RMTs. All of them are primary specimens on flakes with "tablets" only at the butt areas. It is worth noting the absence of any core tablets on blades and bladelets that were usually removed during bladelet narrow-flaked cores'/carinated burin-cores' striking platform rejuvenation. Keeping in mind the Vác 1 serial bladelet narrow-flaked cores/burin-cores, and namely the dominance of items similar to carinated burin-cores, the only explanation here is a small flake rejuvenation of such cores' striking platforms and also the particular core type can be regarded as a final core reduction version in a long path from blade/bladelet to bladelet core reductions.

Overpassed pieces (6/13.0%) occur in 1–3 items for each of the RMTs. The pieces are the result of a purposefully wide and long removal for a core's flaking surface radical rejuvenation of the already flaked core. Accordingly, the overpassed pieces show a multiple reduction character of some cores. The single such piece on radiolarite is on a flake, whereas the overpassed pieces on limnosilicite/gravel flint and erratic flint are exclusively on blades and even a bladelet. Such 4 complete blade-like pieces with a bidirectional scar pattern demonstrate their detachment from double-platform semi-volumetric bidirectional blade/bladelet and bladelet cores and the pieces' length indicate the cores' length having been between 2.5 and 4.4 cm.

Core trimming elements (7/15.2%) are again noted for each RMT. They are fragmented CMP, which is why it is impossible to morphologically connect them to any particular CMP type, although their mere presence indicates some intensity of core preparation/re-preparation processes at the site.

3.5 Debitage

Debitage pieces have been analyzed through a definition regular for UP studies of 4 basic debitage types, flakes, blades, bladelets, microblades (microblades are *lamelles* with a width of less than 7 mm) with, however, data analyzes that limited their attribute features. Some limitations of the analyzes were caused by time constraints in June of 2019 and, most of all, the lithic assemblage surface find character, which is why it cannot be expected, despite systematic artifact collecting over many years, to have, for example, real numerical data for all the tiny (bladelets and microblades) pieces in the assemblage. Nevertheless, it will be tried to "squeeze" some objective data from the debitage.

As a whole, the site's entire debitage sample is composed of 345 pieces, with 72 on erratic flint (20.9%), 30 on radiolarite (8.7%) and 243 on limnosilicite/gravel flint (70.4%) (Tab. 4a, 4b). There are 199 flakes (57.7%), 104 blades (30.1%), 32 bladelets (9.3%), and 10 microblades (2.9%).

	Limnosilicite & gravel flint	Radiolarite	Erratic flint	TOTAL
FLAKES	151/62.1%	14/46.7%	34/47.2%	199/57.7%
BLADES	69/28.4%	13/43.3%	22/30.6%	104/30.1%
BLADELETS	17/7.0%	2/6.7%	13/18.1%	32/9.3%
MICROBLADES	6/2.5%	1/3.3%	3/4.1%	10/2.9%
DEBITAGE TOTAL	**243/70.4%**	**30/8.7%**	**72/20.9%**	**345/100.0%**

Tab. 4a. Vác 1. Debitage structure.
Tab. 4a. *Vác 1. Struktura debitáže.*

	Limnosilicite & gravel flint	Radiolarite	Erratic flint	TOTAL
BLADES	69/75.0%	13/81.3%	22/35.1%	339/32.5%
BLADELETS	17/18.5%	2/12.5%	13/37.8%	469/45.0%
MICROBLADES	6/6.5%	1/6.2%	3/27.1%	234/22.5%
TOTAL	**92/63.0%**	**16/11.0%**	**38/26.0%**	**146/100.0%**

Tab. 4b. Vác 1. Blade-like debitage structure.
Tab. 4b. *Vác 1. Struktura čepelovité debitáže.*

Debitage on limnosilicite/gravel flint (243 pieces)

These are 151 flakes (62.1%), 69 blades (28.4%), 17 bladelets (7.0%) and 6 microblades (2.5%). A single debitage piece, a blade's medial part on limnosilicite, is burned.

Flakes (76 complete pieces; 38 proximal, 16 medial, 19 distal, and 2 longitudinally fragmented parts), constituting more than a half of the debitage sample, are subdivided into items with some cortex (56/37.1%) and non-cortical items (95/62.9%).

Of the pieces with some cortex, 10 are primary ones bearing on their dorsal surfaces ≥ 75% cortex. Also, only 6 (10.7%) of the 56 cortical specimens are larger than 5 cm with the largest piece being 6.2 cm, while pieces under 3 cm number 39 specimens (69.6%). Two of the primary cortical flakes are longitudinally fragmented "Siret" items, demonstrating a hard hammer technique on their detachment from cores.

Ninety-five non-cortical flakes are about the same by size as flakes with some cortex. Eleven items exceed 5 cm (11.6%) and 2 of them reach 9 cm. At the same time, pieces under 3 cm account for 58 of them (61.1%). Accordingly, both cortical and non-cortical flakes are about the same in terms of size. The vast majority of the flakes have mostly unidirectional and sometimes unidirectional-crossed/orthogonal scar patterns. As a result, the limnosilicite/gravel flint flakes basically represent various nodules/chunks, first, decertification and, second, core preparation and re-preparation processes. Additionally, some flakes larger than 5 cm were the result of a purposeful flake core reduction for getting blanks of then bladelet narrow-flaked cores/burin-core--like reduction objects. Furthermore, with no really many primary cortical flakes, it is possible to suggest that the nodules and chunks at raw material outcrops were already tested but not really well prepared for transportation to the Vác 1 site.

The blade samples (7 complete pieces; 25 proximal, 30 medial, and 7 distal parts) do not have any primary cortical items, but contain partially-cortical (12/17.4%) and non-cortical (57/82.6%) pieces. The absence of any primary blades and the presence of few blades with some cortex make it possible to suggest their detachment during the main reduction stages of the core reduction processes. Thirty-two complete blades and proximal parts show such a butt type presence: plain – 17/53.2%, punctiform – 5/15.6%, linear and prepared – 4/12.5% each, cortical and crushed – 1/3.1% each. The dominance of the plain–punctiform–linear butt group (26/81.3%) testifies to a systematic blade reduction. Seven complete blades feature unidirectional and bidirectional (3 each), and unidirectional-crossed/orthogonal (1) scar patterns. Finally, the data on the profile at the midpoint for the blades are as follows: triangular – 24/34.8%, trapezoidal – 37/53.6%, multifaceted – 8/11.6%. All in all, in contrast to the flakes, the blades demonstrate their systematic removal during the main core reduction stages and, probably, they were mostly detached from blade/bladelet cores as the trapezoidal and multifaceted profiles at the midpoint indicate. The "blade/bladelet core suggestion" for blades gets more support with all 69 blades' width data. The mean width index is 1.65 cm. Also, 58 blades (84.1%) have a width less than 2 cm and only 11 blades (15.9) are wider than 2 cm.

The bladelets (1 complete item; 1 proximal part, 10 medial and 5 distal parts) have 2 partially-cortical specimens (11.8%), one complete and one distal fragment, with the other pieces being non-cortical. Two identifiable butts on the complete item and a proximal part are both of the linear type. However, the only informative morphological feature for bladelets is a profile at the midpoint: 7 triangular (41.2%) and 10 trapezoidal (58.8%). The prevalence of trapezoidal profiles, although a multifaceted profile does not occur at all, certainly testifies to a systematic on-site bladelet reduction for both blade/bladelet and just bladelet cores.

Microblades (2 complete specimens; 1 proximal and 3 medial parts) are all non-cortical pieces. Two complete microblades are with a unidirectional scar pattern; 1 plain and 1 linear butt. All 6 microblades' profiles at the midpoint are both triangular and trapezoidal – each 3 examples. The latter morphological feature with the trapezoidal type indicates again an intensive reduction of namely the bladelet cores.

In brief, the debitage data for the above-discussed rather local RMTs, in spite of some certain "numerical gaps", is why flakes and then blades dominate in debitage. An intensive reduction character of bladelets and microblades is still seen. The "target debitage" was already revealed through the core data.

Debitage on erratic flint (72 pieces)

These are 34 flakes (47.2%), 22 blades (30.6%), 13 bladelets (18.1%) and 3 microblades (4.1%).

The flake sample is composed of 25 complete pieces, proximal and distal parts – 4 items each, also added by a specific bipolar anvil reduction flake that is discussed separately. The absence of flakes' medial parts indicates a shortened length and overall metrical proportions of the erratic flint flakes. It is also notable that erratic flint flakes constitute a small but still less than a half of all the debitage pieces on this RMT. It also relates to flakes on radiolarite (see below), while the above-discussed rather local RMTs' limnosilicite/gravel flint debitage assemblage has 62.1% flakes. Always keeping in mind the same collecting methods of the surface finds at Vác 1, the latter flake quantity share might indicate more accents on bladelet/microblade production for erratic cores. Indeed, the bladelet (18.1%) and microblade (4.1%) shares among erratic flint debitage are significantly higher than for limnosilicite/gravel flint (7.0% and 2.5%) tiny blade-like pieces, although the radiolarite respective data (see below) are similar to the limnosilicite/gravel flint data.

Thirteen flakes are with some cortex (39. 4%) and the rest 20 flakes are non-cortical (60.6%). Among the former flakes, 3 pieces are primary cortical ones. Two complete flakes (a primary and partially-cortical one, 3.7 cm and 4.1 cm long) are refitted one onto another, indicating not only bladelet cores but also possibly a few pre-cores were still being brought to the site even for this most distant RMT. The 2 refitted cortical flakes show a sort of opposed-platform decortification process for a small-sized erratic flint pebble and the refit shows the pebble's length to be 4.8 cm. Of all 13 flakes with cortex, only the 2 refitted items are longer than 3 cm. Accordingly, cortical flakes are mainly decortification and preparatory/re-preparatory technological items.

The 20 non-cortical flakes are metrically distributed in the following order: under 3.0 cm – 18 pieces (90%), while the only 2 larger items are 5.8 cm and 4.0 cm of maximum dimension. Thus, both cortical and non-cortical flakes are mostly small-sized debitage pieces. The presence of only unidirectional and orthogonal scar pattern types for flakes again shows their preparatory and re-preparatory technological roles within the core reduction processes.

Finally, one piece of note is a single non-cortical flake (2.4 cm long, 1.3 cm wide, 0.4 cm thick) having no real butt with, however, specific smashing scars coming from its two narrow ends, clearly indicating its splitting from a bipolar anvil core. Observing here the absence of bipolar anvil cores on erratic flint at the Vác 1 lithic assemblage, although they occur on two other RMTs, the particular flake is evidence of on-site bipolar anvil core reduction for all used at the site's RMTs.

The blades (5 proximal, 7 medial and 10 distal parts) do not have any complete item that would make the blade sample on erratic flint of a poor information quality. These 22 fragmented pieces are 3 partially-cortical (13.6%) and 19 non-cortical (86.4%) examples with no one primary cortical item. Five blades' proximal parts have 3 punctiform and 2 crushed butts. All 22 blades' fragments have such profiles at the midpoint: multifaceted – 4 (18.2%); triangular and trapezoidal – 9 each (40.9% each). Also, these 22 blades have a mean width index of 1.53 cm with only a single width example over 2 cm (2.2 cm), while the other 21 blades (95.5%) have a width ≥2 cm. Accordingly, the erratic flint blade data indicate their probable serial detachment from blade/bladelet cores. Moreover, the mean width index of erratic flint blades are lower than the one for limnosilicite/gravel flint blades (1.53 cm vs. 1.65 cm) that is in an accord with the already suggested more intensive reduction character of the distant RMTs.

The bladelets (2 complete items; 5 proximal, 1 medial and 5 distal parts) are characterized by the presence of a single partially-cortical piece (7.7%), that is one of the 2 complete bladelets, while the rest of the bladelets are non-cortical (92.3%). Two complete bladelets have a unidirectional scar pattern. Seven butts of 2 complete items and 5 proximal parts are of the plain (5), linear (1) and crushed (1) types. The profiles at midpoint for all 13 bladelets are 2 triangular, 7 trapezoidal and 4 multifaceted where the two latter types constitute 84.6%. Thus, aside from the numerical fact where erratic flint bladelets outnumber limnosilicite/gravel flint bladelets in c. 2.5 times within the debitage samples, the former most distant RMT shows a higher reduction intensity index seen on profiles at the midpoint type than the rather local RMTs, 84.6% vs. 58.8%, although the multifaceted type is even completely lacking in the latter RMTs bladelets.

The microblades are only represented by 3 non-cortical fragmented pieces: 2 proximal and 1 distal part. The proximal fragments have 2 linear butts. The microblades' profiles at the midpoint are 1 triangular and 2 trapezoidal ones. Once again, the prevalence of the latter trapezoidal type testifies to the intensive character of erratic flint microblade production at the site.

The above-represented erratic flint 4 debitage type data, on one hand, are in an accord with the respective data on limnosilicite/gravel debitage pieces, and, on the other hand, they indicate more intensive bladelet/microblade production at the site for this most distant RMT. Also, a good series of blades testify to on-site erratic flint reduction not only for bladelet cores but also for blade/bladelet cores.

Debitage on radiolarite (30 pieces)

These are 14 flakes (46.7%), 13 blades (43.3%), 2 bladelets (6.7%) and 1 microblade (3.3%).

The flakes are represented by 10 complete items, 2 proximal and 2 distal parts. The absence of flakes' medial parts indicates their overall shortened metrical proportions. Three complete pieces and 1 flake's distal part is longer than 3 cm with the longest complete flake being 5.1 cm. Only the unidirectional scar pattern is noted for the flakes. In terms of cortex data, which show the highest presence of cortical items for all three RMTs, the flakes are 8 non-cortical, 4 primary cortical and 2 partially-cortical specimens. So many small flakes with cortex might indicate the use of rather small-sized radiolarite pebbles as core blanks. Accordingly, as also refitted erratic flint flakes indicate, a few unprepared and probably only tested nodules of the distant RMTs were brought to the site for core reduction processes.

The blades, by condition, are 4 complete pieces; 4 proximal, 3 medial and 2 distal parts. Eight blades (4 complete pieces and 4 proximal parts) have plain (4), as well as punctiform, linear dihedral, crushed (each 1) butts. One complete blade is primary cortical, while all the other blades are non-cortical. Three other complete blades have unidirectional (2) and bidirectional scar patterns (1). Twelve non-cortical blades feature the following profiles at midpoint: 1 triangular, 6 trapezoidal, 4 multifaceted, 1 irregular, showing the great dominance of trapezoidal and multifaceted types when taken together (83.3%). All these morphological data indicate systematic blade detachment at the site. The width data for the blades also point to the direction of their removal from blade/bladelet cores with the mean width index being 1.55 cm and no one blade is wider than 2.0 cm.

The bladelets (2 items) are poorly represented by one partially-cortical and one non-cortical medial part with 1 triangular and 1 multifaceted profile at the midpoint.

The microblade, the sole such piece is a non-cortical item having a linear butt, unidirectional scar pattern, triangular profile at midpoint, and being 1.5 cm long, 0.6 cm wide and 0.1 cm thick.

In spite of almost no data on radiolarite bladelet/microblade on-site production, due to just 3 pieces in total for the two tiny blade-like types, the flakes and blades still allow us making some suggestions. The presence of quite a few flakes with cortex (42.8% of all flakes), including mostly primary ones, indicate that some unprepared/tested radiolarite nodules were also transported to the site. The blades compose 43.3% of the radiolarite debitage sample, the highest blade share among all three RMTs debitage samples, demonstrating intensive on-site blade/bladelet core reduction processes.

Some concluding remarks on the debitage data

It is important to try to match the core-like piece and CMP data with the above-discussed debitage data. In doing so for limnosilicite/gravel flint lithics, it is only possible to add that not only unprepared but also some tested nodules/chunks and initial pre-cores were brought to the site from the respective outcrops. At the same time, for the distant RMTs, i.e. erratic flint and radiolarite, the debitage sample data in addition to still intensive on-site bladelet core reductions also helps to add some blade/bladelet core exploitation at the site. It means that not only bladelet cores were transported to the site but some blade/bladelet ones, too. Finally, the occurrence of a single flake from a bipolar anvil core on erratic flint with the absence of such RMT cores specifies the use of the bipolar anvil core reduction method for all the RMTs used at the site. It again makes no real "cultural" differences in the exploitation of various RMTs at Vác 1 site.

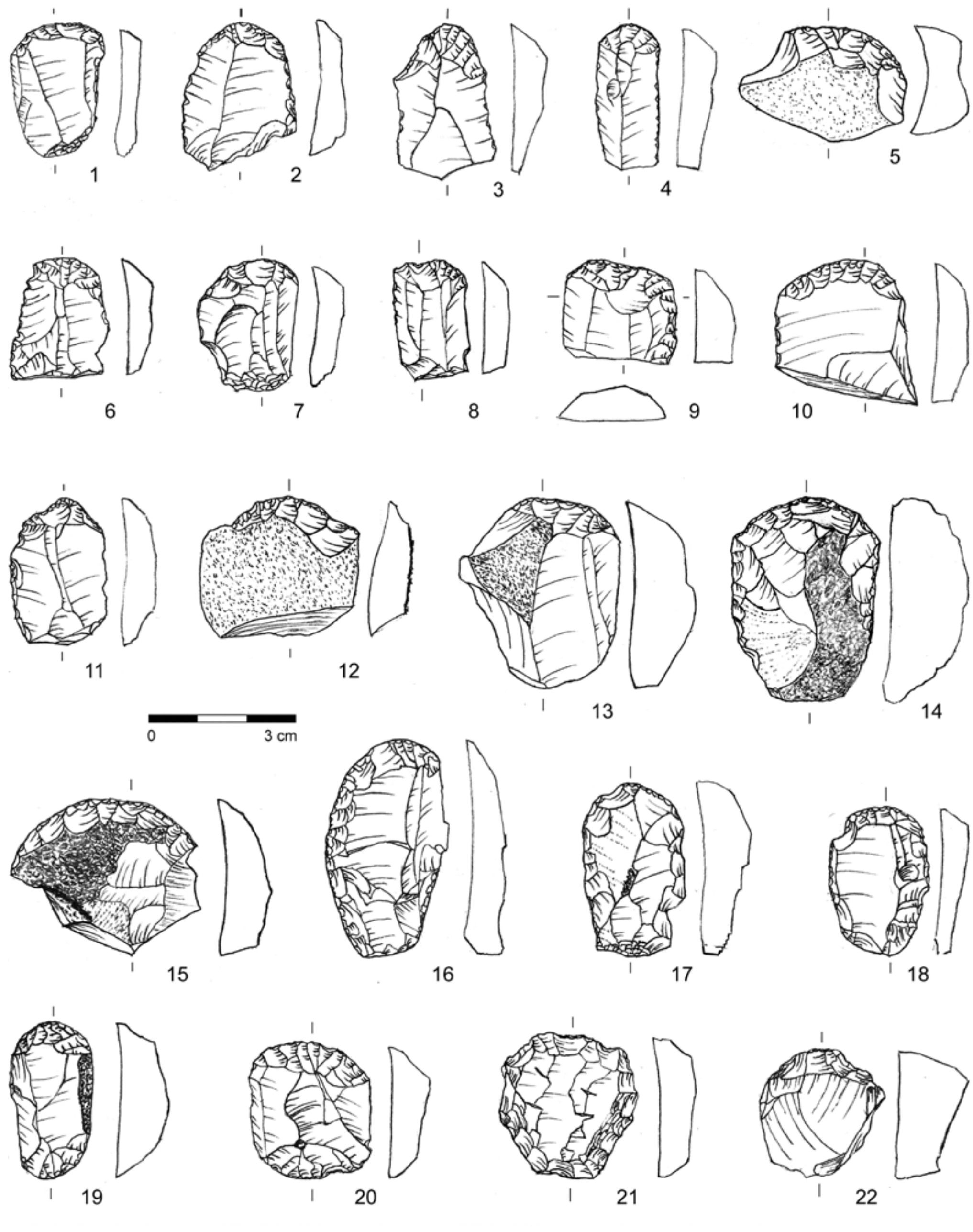

Fig. 8. Vác 1. Tools. Endscrapers. 1–15 – Shortened; 16–18 – shortened on bilaterally retouched flakes; 19, 20 – double shortened on flakes; 21 – circular on a flake; 22 – carinated on a flake. 1–4, 8, 10, 11, 13, 15, 16, 21, 22 – Limnosilicite and gravel flint; 6, 7, 9, 12, 5, 19, 20 – erratic flint; 14, 17, 18 – radiolarite. Drawing by S. Béres.

Obr. 8. *Vác 1. Nástroje. Škrabadla. 1–15 – Krátká; 16–18 – krátká na bilaterálně retušovaných úštěpech; 19, 20 – dvojitá, krátká na úštěpech; 21 – kruhové na úštěpu; 22 – karenoidální na úštěpu. 1–4, 8, 10, 11, 13, 15, 16, 21, 22 – Limnosilicit a pazourek ze štěrku; 6, 7, 9, 12, 5, 19, 20 – eratický pazourek; 14, 17, 18 – radiolarit. Kresba S. Béres.*

	Limnosilicite & gravel flint		Radiolarite		Erratic flint		TOTAL	
Groups & types			N	%	N	%	N	%
INDICATIVE UPPER PALEOLITHIC TOOL TYPES	**33**	**84.6%**	**5**	**55.5%**	**15**	**71.4%**	**53**	**76.8%**
ENDSCRAPERS	18	46.2%	3	33.3%	13	61.9%	34	49.3%
Shortened on flake	7				4		11	
Shortened on flake fr-t	2						2	
Shortened on blade fr-t	5				4		9	
Shortened on laterally retouched flake			1				1	
Shortened on bilaterally retouched flake	1		2				3	
Double shortened on flake					4		4	
Double shortened on blade fr-t					1		1	
Circular on flake	1						1	
Carinated on flake fr-t	1						1	
Unidentifiable	1						1	
BURINS	8	20.5%	2	22.2%	2	9.5%	12	17.4%
Angle	1				1		2	
Angle double					1		1	
Dihedral symmetrical	2						2	
Dihedral asymmetrical	1						1	
Dihedral angle			1				1	
Dihedral double angle			1				1	
On convex truncation	1						1	
Transversal on lateral preparation	2						2	
Unidentifiable	1						1	
TRUNCATIONS	3	7.7%					3	4.3%
Truncated blade	2							
Truncated bladelet	1							
RETOUCHED BLADES	4	10.2%					4	5.8%
BACKED PIECES	**1**	**2.6%**	**1**	**11.1%**	**5**	**23.8%**	**7**	**10.1%**
Backed point on blade					1		1	
Backed blade (medial part) with a bipolar on anvil backed retouch			1				1	
Backed blade (medial part)	1				1		2	
Backed bladelet					2		2	
Backed bladelet with a truncated distal end (rectangle fr-t)					1		1	
COMPOSITE TOOLS			**1**	**11.1%**			**1**	**1.4%**
Shortened endscraper + burin on concave truncation on flake			1					
“NEUTRAL” TOOL TYPES	**1**	**2.6%**			**1**	**4.8%**	**2**	**2.9%**
DENTICULATED PIECES	1							
NOTCHED PIECES					1			
RETOUCHED PIECES			**2**	**22.2%**			**2**	**2.9%**
HEAVY DUTY TOOLS	**4**	**10.2%**					**4**	**5.8%**
SCRAPERS	3							
Simple	2							
Double	1							
PIÈCES À MACHURES	1							
TOTAL	39	100.0%	9	99.9%	21	100.0%	69	99.9%

Tab. 5. Vác 1. Tools classification.
Tab. 5. *Vác 1. Klasifikace nástrojů.*

3.6 Tool-kit

Tools (69 items) are unevenly numerically distributed within the three RMTs (Tab. 5) when more than a half of them were made on limnosilicite/gravel flint (56.5%), a little more than a third was on erratic flint (30.5%) and relatively few were produced on radiolarite (13.0%).

At the same time, in terms of inner structure, tool class and type representation, 3 RMTs tool-kits are similar enough to one another, although a few reservations should be stated. First, it should again be remembered that Vác 1 tools were collected, albeit systematically, on a modern surface, which is why finding many tiny pieces cannot be expected, and, especially, backed tools and especially microliths, although some of them have been found. Second, the redeposited character of the site's lithics also means damage of quite a few items, leading primarily to a great caution of retouch piece recognition. It especially relates to artifacts on the rather local RMTs where some “negligence” in their primary and secondary treatment had taken place. Accordingly, there were two choices for retouch piece identification during the artifact classification process. On one hand, it could be possible to define any “slightly retouched” piece as a retouched flake/blade/bladelet, which, however, makes these tools the most numerous tool classes in the discussed assemblage. On the other hand, understanding the Vác 1 "lithic taphonomy", it was decided not to define retouched pieces and only 2 such items on erratic flint were still classified thus, due to the really good retouch presence on them.

The overall tool-kit characteristics are as follows.

The **so-called indicative UP tool types** are composed of 53 pieces (76.8%).

Endscrapers (34 items/49.3% of all tools) (Fig. 8: 1–22) are the most numerous tools, numbering between 33.3% for radiolarite and 46.2 for limnosilicite/gravel flint to 61.9% for erratic flint. The endscrapers' basic typological feature for all three RMTs (33 specimens, not taking into account for inner share an unidentifiable and recently too damaged piece on limnosilicite/gravel flint) is the most often occurrence of a simple shortened type (22/66.7%) (Fig. 8: 1–15) produced on short (never longer than 5 cm) complete flakes (11/33.3%) and flake fragments (2/6.1%), blade fragments (9/27.3%). The common shortened endscrapers' metrical proportions also well seen through the absence of any such endscraper manufactured on a complete blade. These endscrapers are further added by also shortened pieces on complete flakes with laterally (1/3.0%) and bilaterally (3/9.1%) (Fig. 8: 16–18) retouched edges. Finally, 5 double endscrapers also of shortened proportions, 4 on flakes (12.1%) (Fig. 8: 19–20) and a blade fragment (3.0%) complete the shortened endscraper type variability. Only two other endscrapers have been recognized: a circular piece on a 2.9 cm long and wide flake (Fig. 8: 21) and a typical carinated endscraper-core on a complete flake (2.4 cm long, 2.7 cm wide and 1.6 cm thick) with a 2.6 cm wide working edge/flaking front from which no less than 10 lamellar removal negatives (Fig. 8: 22).

These seemingly still only 33 endscrapers in total also allow us to see some of their type/sub-type different occurrences, regarding the particular RMT. The overwhelming majority of the 17 typologically recognizable endscrapers of rather local limnosilicite/gravel flint feature the simple shortened type – 14/82.4%. Three other types (simple shortened but on a bilaterally retouched flake, circular and carinated ones) are represented by only a single piece each. Moreover, in terms of the intensive character on the simple shortened endscraper type reshaping/rejuvenation, there is only a single piece on a bilaterally retouched flake vs. 14 pieces on debitage blanks with unretouched lateral edges that is a 1 : 14 ratio. It is worth noting the absence of any double shortened endscrapers on this RMT, the endscraper type, which could be considered as representing a multiple reduction of the simple shortened endscraper type. Thus, endscrapers on limnosilicite/gravel flint, constituting almost a half of all the tool-kit's endscrapers, demonstrate low levels of multiple re-shaping/rejuvenation processes, although the presence of single circular and carinated pieces is noteworthy. The latter carinated endscraper-core type sometimes occurs within Epigravettian assemblages and especially in Early Epigravettian ones (e.g. Mogyorósbánya, Dobosi 2016; Kašov I, upper layer – Bánesz et al. 1992), which is why it could serve as an Early Epigravettian typological indicator for the Vác 1 lithic assemblage. At the same time, all 3 radiolarite endscrapers are simple shortened ones on laterally/bilaterally retouched flakes, and 5 of all 13 endscrapers on erratic flint (38.5%) are double ones. Accordingly, it is possible to argue that all endscrapers on radiolarite and a part of endscrapers on erratic flint have been produced off-site, somewhere before humans brought them to the Vác 1 site, and then these endscrapers were rejuvenated/re-shaped on-site during their probable multiple use. Accordingly, the endscraper data show clear differences in endscraper exploitation for the rather local and distant RMTs, where the former RMTs for endscraper data look very local with their easy availability for the site's human visitors.

The burins (12 specimens/17.4% of all tools) are almost three times less frequent than endscrapers in the tool-kit. It is an unusual feature for the Early Epigravettian in Hungary which always has a significant share of burins among the tools (e.g. Szolyák et al. 2019–2020, Tables 19 and 20). The absence of multifaceted burins allows the suggestion of the presence of exclusively burins sensu stricto (burin-tools) with no burin-cores here. In terms of types, all the main UP burin types have been noted among 11 typologically identifiable pieces: 3 angle (Fig. 9: 1–2), 5 dihedral (Fig. 9: 3–6), 1 on truncation (Fig. 9: 7) and 2 transversal on lateral retouch burins (Fig. 9: 8). Only two double burins are present and both of them were manufactured on distant RMTs: an angled piece on erratic flint (Fig. 9: 2) and a dihedral item on radiolarite (Fig. 9: 6). Also, it is notable the presence of just angled burins for erratic flint and dihedral burins on radiolarite, although each of the types is represented by only 2 specimens for each of these two RMTs. At the same time, all the above-noted burin types occur on limnosilicite/gravel flint. All in all, it is possible to suggest the entire burin typological variety was manufactured on-site on the rather local RMTs and, at the same time, the presence of a couple of distinct burin types for each distant RMT. As a result, burins do not represent a real predominance of any special burins and their types that might help for an industrial attribution of the Vác 1 assemblage.

The truncations (3 items and 4.3% of all tools) are only recognized on the rather local RMTs, which is why their ad hoc on-site manufacture and then use can be argued. Two truncations on blades are on partially-cortical blades, a complete and a distal part with truncated working edges at the blade-blanks' distal ends. The complete blade (3.5 cm long and 1.3 cm wide) has an oblique truncation. The fragmented blade (2.4 cm wide) features a straight truncation. One more truncation is a truncated bladelet (1.1 cm wide) on a non-cortical bladelet's distal part with its distal end transformed into an oblique truncation. All the truncations are characterized by scalar and steep retouch.

Retouched blades (4 pieces and 5.8% of all tools), like the truncations, exclusively occur on limnosilicite/gravel flint and again were probably made and used at the site for some local particular purposes. In terms of condition, however, all 4 are fragmented specimens, 3 non-cortical medial and 1 partially-cortical distal parts, having in 3 cases a width between 1.2 and 1.7 cm, and in only one more case wider than 2 cm, namely 2.2 cm. At the same time, these pieces are so-called well-retouched blades with scalar and semi-steep retouch, forming 2 bilaterally retouched and 2 laterally retouched tools.

In total, the so-called indicative UP tool types allow us to conclude their Late UP industrial character and the simple shortened endscrapers are the main "attribution indicator" here for that. Trying to understand more precisely the place of these Vác 1 tools within the Late UP time period, just a single tool deserves more attention. The presence of a sufficiently typical carinated endscraper-core rather indicates an Early Epigravettian affinity due to some occurrence of such a specific core-tool type for the respective industries in the East of Central Europe. At the same time, the presence of numerous endscrapers, some burins and especially an exclusively local (sic!) manufacture and then use of truncations and well-retouched blades definitely say something about the Vác 1 site's "living settlement characteristics" where the site appears to have a great deal of "domestic activity" features.

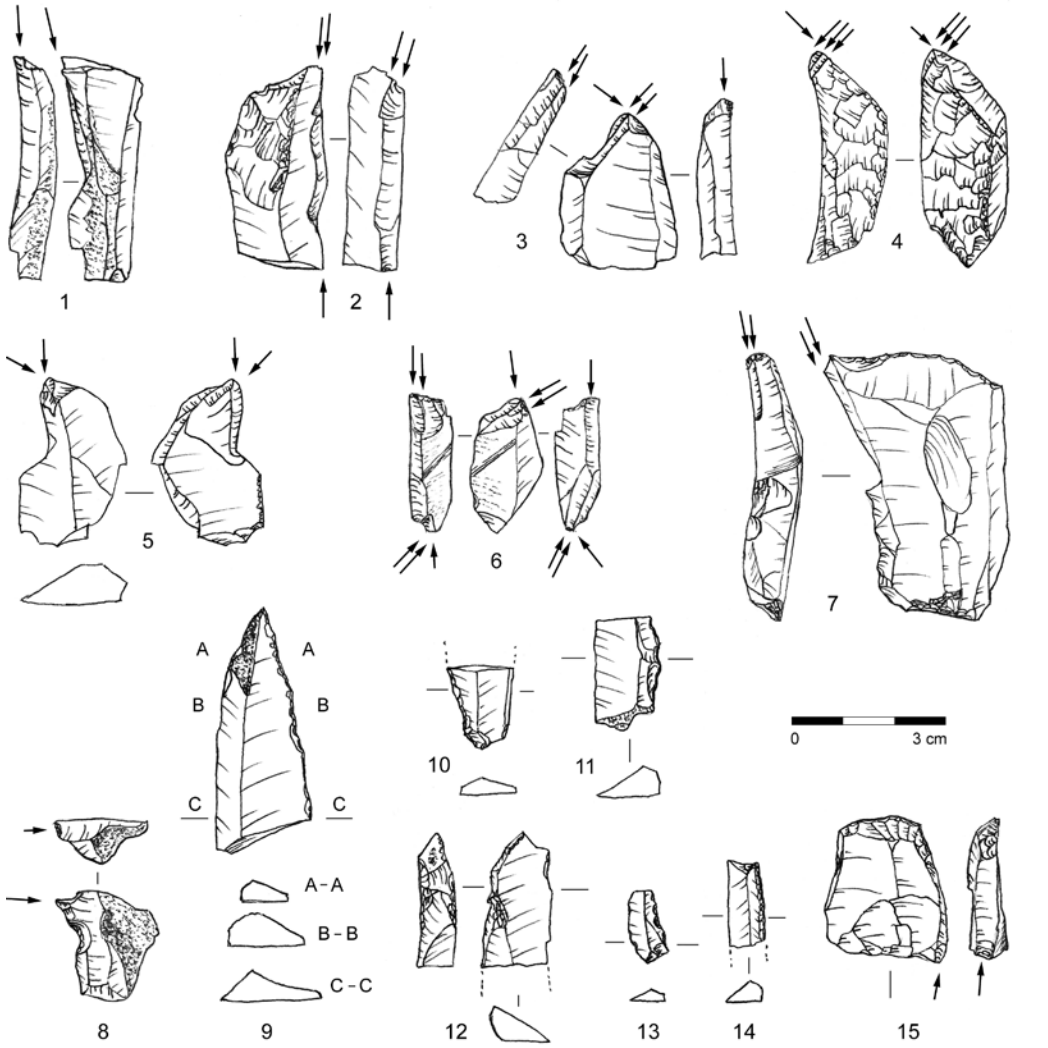

Fig. 9. Vác 1. Tools. 1 – Angle burin; 2 – double angle burin; 3–4 – dihedral symmetrical burins; 5 – dihedral angle burin; 6 – double dihedral angle burin; 7 – burin on a convex truncation; 8 – transversal burin on lateral retouch; 9 – backed point on a blade; 10–12 – backed blades (medial fragments); 13 – backed bladelet (medial fragment); 14 – backed bladelet with a truncated distal end/ probably a broken rectangle; 15 – composite tool: a simple shortened endscraper + burin on a concave truncation. 1–2, 9–10, 13–14 – Erratic flint; 3–4, 7–8, 11 – limnosilicite and gravel flint; 5–6, 12, 15 – radiolarite. Drawing by S. Béres.

Obr. 9. *Vác 1. Nástroje. 1 – Hranové rydlo; 2 – dvojité hranové rydlo; 3–4 – klínová symetrická rydla; 5 – klínové rydlo; 6 – dvojité klínové rydlo; 7 – rydlo na vyklenuté retuši; 8 – příčné rydlo na laterální retuši; 9 – hrot s otupující retuší na čepeli; 10–12 – čepele s otupeným bokem (středové zlomky); 13 – čepelka s otupeným bokem (středový zlomek); 14 – čepelka s otupeným bokem s příčnou retuší na distálním konci/ pravděpodobně zlomek obdélníku; 15 – kombinovaný nástroj: jednoduché krátké škrabadlo + rydlo na vkleslé retuši. 1–2, 9–10, 13–14 – Eratický pazourek; 3–4, 7–8, 11 – limnosilicit a pazourek ze štěrku; 5–6, 12, 15 – radiolarit. Kresba S. Béres.*

The backed pieces. These 7 tools, representing lithic inserts into the organic points of UP hunting projectile weaponry, usually serve as a good indicator of particular UP techno-complexes, industry types and their phases. However, it is not easy to deal with the Vác 1 backed items collected on a surface, understandably taking into account their numerically poor data and mostly very fragmented conditions. In terms of RMT representation, the backed pieces are very different from the above-analyzed indicative UP tool types. Most of them (5 of all 7 specimens/71.4%) are on erratic flint, while radiolarite and limnosilicite/gravel flint are represented by only a single backed piece each. It points out a special manufacture and use of these inserts off-site and on-site. Not one of the pieces bears convincing projectile diagnostic impact fractures (DIF), although all the backed pieces are heavily fragmented, which is why DIF traces could be objectively missing.

The backed pieces' type representation is as follows: 1 backed point on a blade, 3 backed blades, 2 backed bladelets, and 1 backed bladelet with a truncated distal end (rectangle fragment). Surely, some numerical predominance of items on the blades over the ones on bladelets (4 vs. 3) should be simply explained through the more frequent finding of larger-sized pieces on a surface.

The single backed point on limnosilicite/gravel flint (Fig. 9: 9) is a non-cortical blade's distal part (4.4 cm long and 1.9 cm wide). The pointed end is bilaterally formed by a continuous c. 2 mm thick steep retouch along the entire piece's right lateral edge and the same c. 2 mm thick but partial steep retouch mostly near the distal tip at the left lateral edge.

The 3 backed blades are non-cortical medial parts on limnosilicite/gravel flint, erratic flint and radiolarite. The 2 flint items (Fig. 9: 10–11) are both 1.3 cm wide, bearing a continuous c. 2 mm thick steep retouch along the items' one lateral edge. The latter radiolarite piece (Fig. 9: 12) is also narrow at 1.3 cm wide though with a different steep retouch treatment at one of its lateral edges. It is definitely a bipolar retouch on anvil c. 2 mm thick but being still irregular and partially steep. Of all the toolkit's backed implements, this is the only item with a bipolar retouch on anvil. Its presence and some irregularities could be explained by some stage re-shaping and rejuvenation during probable "long life usage" of this distant RMT piece.

The 2 backed bladelets are only on erratic flint and bear a continuous steep (c. 2 and 3 mm thick) retouch at one of the pieces' lateral edges. The microliths are non-cortical proximal (1.1 cm wide) and medial (0.7 cm wide) (Fig. 9: 13) bladelet fragments.

The backed bladelet with a truncated distal end (Fig. 9: 14) is a non-cortical medial fragment (1.7 cm long and 0.7 cm wide) of erratic flint. The bladelet's right lateral edge bears a continuous (c. 3 mm thick) steep retouch, as well as a truncation (c. 4 mm thick) at the distal end. Due to the microlith's fragmentation, it is probably a broken rectangle but it is not clear if it was broken during its manufacture or during use in hunting projectile weaponry.

Summarizing the backed pieces' description, it is possible to conclude that most of them (on the distant RMTs) were probably brought to the site already produced somewhere and partially used at the site for some possible domestic purposes and namely these pieces with no projectile DIF are high likely present in the assemblage. Some other backed pieces, however, were also probably used around the site for hunting and these pieces with projectile DIF are missing in the assemblage. Also, the presence of just one backed piece among the 39 recognized tools on limnosilicite/gravel flint might be evidence of the preferable use of these rather local RMTs for domestic use in a view of various indicative UP tool types. Regarding the "cultural/industrial meaning" of the discussed backed pieces, there is almost nothing special about them and even the rectangle does not even much help, as the tool type is so widely distributed among various Epigravettian and also Gravettian industry types in Europe and only appears indicative for some Late Epigravettian industries in Eastern Europe when it really serially numerically occurs (Nuzhnyi 2015). Matching only the backed tools with simple shortened endscrapers together, it then becomes obvious that the former pieces do not contradict the latter pieces, which already brought us to the basic Epigravettian industrial attribution.

Composite tool. It is combination of a simple shortened endscraper and burin on a concave truncation (Fig. 9: 15) produced on a complete non-cortical small radiolarite flake (2.8 cm long and 2.4 cm wide). The burin termination was formed at the flake's proximal (butt) area, while the endscraper's front is at the flake's distal end. At first sight, it looks like a "numerical nonsense", keeping in mind the often rather serial composite tool presence in Epigravettian assemblages (e.g. Nuzhnyi 2015), although taking into account particularly the Early Epigravettian record in Hungary (Szolyák et al. 2019–2020, Tab. 20) and Eastern Slovakia (Bánesz et al. 1992, 15), the presence of just a few composite tools is clearly seen, which is why it could be a good typological indicator for Early Epigravettian in Eastern Central Europe. At the same time, the occurrence of the single combined tool on a small imported radiolarite flake and the absence of such tools on the rather local RMTs can once again indicate an easy availability of limnosilicite and gravel flint pieces for the site's inhabitants, thus explaining why not much tool re-shaping/rejuvenation occurred on these RMTs' tools.

"Neutral" tool types. These are 1 denticulated and 1 notched piece. The denticulated piece is on a limnosilicite/gravel flint partially-cortical complete flake (3.8 cm long and 4.0 cm wide) with a transversal convex dorsal working edge treated by a scalar and steep retouch. The notched piece is on an erratic flint non-cortical flake (3.9 cm long and 2.9 cm wide) bearing a single scalar and steep retouched dorsal notch at the piece's distal end. These pieces are again domestic activity tools.

Retouched pieces. Due to the above-mentioned "site taphonomy problems" with often some edge damage of the surface-collected lithics, only 2 such tools were defined on the well-preserved radiolarite flakes. Both of them bear some irregular and steep dorsal retouch at the distal ends of the flakes. One flake is a partially-cortical complete one, 2.9 cm long and 4.4. cm wide. The other flake is the distal part of a partially-cortical core trimming flake, 3.2 cm long and 2.3 cm wide. These pieces can be related to ad hoc domestic tools, too.

Heavy duty tools. Dealing with the Late UP and namely Epigravettian finds of the Vác 1 site, it was decided to put a few defined side-scrapers and a *pièce à machure* into such a tool group, not calling them as, for example, Middle Paleolithic tool types. The occurrence of some "archaic-looking" tools in the Late UP context should be again understood as reflecting an ad hoc domestic activity when a few large-sized debitage pieces on local raw material(s) for some special tasks were selected for use (see also Bánesz et al. 1992, Tab. VI – Kašov I, upper layer Early Epigravettian with a few side-scrapers and choppers). Such Vác 1 pieces on only limnosilicite/flint gravel are indeed of that sort.

Three side-scrapers are 2 simple convex-concave dorsal pieces and 1 double straight-concave dorsal specimen. The latter double side-scraper with scalar and steep retouch is on the large medial part of a partially-cortical flake, 5.3 cm long, 4.8 cm wide, 2.2 cm thick. The former 2 simple side-scrapers feature scalar and semi-steep retouch treatment. At the same time, one of them is on the largest complete non-cortical flake in the assemblage, 13.0 cm long, 7.1 cm wide, 2.4 cm thick, while another one is the medial part of a non-cortical blade, 5.3 cm long, 3.3 cm wide, and 1.7 cm thick.

The only defined *pièce à machure* is a large complete non-cortical flake (9.4 cm long, 10.2 cm wide, 2.8 cm thick) with intensive bifacial battering macro-traves at its left lateral edge, evidence of a chopping-like use for the piece.

3.7 Waste from the production and rejuvenation of tools

The tool-kit is added by 7 tools' waste products. They were not found for radiolarite pieces but occur for limnosilicite/flint gravel (4 items) and erratic flint (3 items) (Tab. 1). These are 6 burin spalls and 1 endscraper working front's rejuvenation flake.

The limnosilicite/gravel flint tool treatment pieces are all burin spalls: 3 primary ones with no crest (2 complete and 1 distal fragment) and 1 secondary complete one.

The erratic flint tool treatment pieces are 2 primary burin spalls with a crest (1 complete and 1 distal fragment) and the single in the assemblage endscraper working front's rejuvenation flake. The latter piece (1.9 cm long, 1.3 cm wide, 0.6 cm thick) bears a characteristic retouch at an intersection between the dorsal surface and a large plain butt (1.3 × 0.6 cm) with the butt's acute angle almost lying on the ventral surface.

These "tool waste" data are just a small found on the surface fraction of these tiny pieces and they confirm on-site production and rejuvenation processes after some use of the burins and endscrapers.

3.8 Some summarizing remarks on the tool-kit and its waste production and rejuvenation pieces

The above-represented information on tools and their waste treatment items demonstrate a variety of lithics' secondary production, use and rejuvenation data. On the one hand, aside from 3 endscrapers on radiolarite and 5 endscrapers on erratic flint, local production, use and rejuvenation processes on "domestic activity" are predominantly demonstrated by the 45 indicative UP tool types. The same activity can be also traced through 4 heavy duty tools on limnosilicite/gravel flint, 2 retouched pieces on radiolarite, 2 denticulated and notched pieces on limnosilicite/gravel flint and erratic flint. Surprisingly enough, a small series of backed tools does not show any projectile DIF that might indicate their use again for a domestic activity, although all these 7 items are fragmented. Also, the presence of just a single backed piece on limnosilicite/gravel flint might point out a preferential use of these rather local RMTs for other tool type production and use aimed at various domestic activities. On the other hand, 5 erratic flint and 1 radiolarite backed tools might indeed indicate mostly use of the distant RMTs for the production of the lithic inserts of hunting projectile organic points that had been carried from one site to another.

Additionally, it is worth remembering a much higher possible level of re-shaping and rejuvenation for tools produced on distant

RMTs in comparison to the ones on the rather local RMTs. These data allow us to say that the Vác 1 tool-kit is almost clearly separated into two parts, regarding the RMTs.

Finally, the good tool data on domestic activity provide the Vác 1 site with some special base-camp characteristics and this is an especially interesting feature for a site not located at and/or very close to raw material outcrop(s).

3.9 Debris

It is the numerically second most frequent artifact category in the assemblage (Tab. 1) usually with 3 sub-categories defined – chips (small-sized complete flakey pieces and non-lamellar debitage fragments under 1.5 cm in maximum size), uncharacteristic debitage pieces (too fragmented debitage items over 1.5 cm for any certain attribution to distinct debitage types) and chunks (too fragmented debitage piece chatters or just natural lithic fragments). The fourth item traditionally included in the debris sub-category of heavily burnt flints is not defined here due to both a scarcity of such pieces in the Vác 1 lithic assemblage and these pieces also possible attribution to later periods, e.g. Late Neolithic.

Debris pieces on limnosilicite/gravel flint (222 specimens)

These are 81 chips (13 with some cortex), 81 uncharacteristic debitage pieces (17 having some cortex and 9 being over 3 cm but no more 5 cm in maximum size), and 60 chunks (45 with some cortex and 32 under 3 cm and the largest piece being 7.5 cm in maximum size). It is worth remembering that numerous uncharacteristic debitage pieces and chunks on these rather local RMTs are evidence of some intensity of the RMTs' reduction at the site. Also, the frequent presence of some cortex on the chunks is again evidence of unprepared nodules/chunks and tested/initial pre-cores being brought to the site.

Debris pieces on radiolarite (12 items)

There are 7 chips (2 with some cortex), 3 uncharacteristic debitage pieces (1 having some cortex and with the largest piece in 1.8 cm in maximum size), 2 chunks (1 – partially-cortical piece, 4.2 cm in maximum size; 1 – primary cortical item, 2.9 cm in maximum size). Similar to the limnosilicite/gravel flint chunks, the radiolarite chunks demonstrate cortex presence, which is again evidence of transport to the site of some not fully decortificated cores.

Debris pieces on erratic flint (25 specimens)

These are 6 non-cortical chips, 18 uncharacteristic debitage pieces (2 with some cortex and all being under 3 cm in maximum size, although one of them is a probable fragment of longitudinally fragmented "Siret flake"), 1 non-cortical chunk, 2.9 cm in maximum size; 1 – primary cortical item, 2.9 cm maximum dimension). Although only a single chunk occurs here, the numerous uncharacteristic debitage pieces again demonstrate an intensive on-site core reduction for this most distant RMT.

4. Vác 1 site seen through its location and lithic artifacts

Trying to sum up the loci's lithic data, it is, of course, necessary to look at them from the point of view of the site's function even for an assemblage having no animal bones and organic artifacts. Here, however, it is first needed to look again at the site location. Situated within the Danube Bend area at the high terrace with a good view to the west at the Danube River alluvial valley and ungulate herds there as hunting objects, being also limited at other sides by small valleys with streams there providing easy access to water supply nearby, the Vác 1 site certainly had been a good locus for some Late UP human group stays. At the same time, the collected pieces during almost 20 years of lithic collection only approaches a number of c. 800, indicating that not much lithic primary and secondary processes had occurred there and, respectively, also implying rather short stays there. Such short human occupations at such well situated loci were most likely caused by the lack of close proximity to raw material outcrops and sources with the closest ones of limnosilicite and gravel flint no less than 15 km away in straight direction from the loci. However, the presence in the items collected from the surface of all basic lithic artifact categories with certainly two main lithic exploitation strategies involved for the rather local RMTs (limnosilicite and gravel flint) and the very distant RMTs (radiolarite and erratic flint) with the notable absence of so-called regional RMTs for a c. 20–50 km straight distance from the site definitely speaks about the human groups having planned well ahead before actually coming to the loci as evidenced by their actions and lithic treatment and use at the site. These people really knew what to do with the two sets of RMTs.

Taking all these data into consideration, our suggestion is the Vác 1 site served as a sort of temporary camp for Late UP hunter-gatherers. Keeping in mind the presence of mostly domestic activity tools, it is possible to suggest both hunted ungulate carcass dismembering and plant processing labor actions at the site. In addition, on-site intensive bladelet core reductions mainly for getting bladelets/microblades for most likely still on-site production of basically inserts for hunting projectile weaponry clearly points to hunting activity as well. Thus, Vác 1 was probably one of the Late UP hunter-gatherer temporary camps with base camp characteristics located at the key area in Northern Hungary at the Danube Bend, although a real base camp has to be situated at or near a raw material outcrop/source.

5. Vác 1 site lithic assemblage industrial attribution

Summing up all the detailed lithic analysis done in the present article, the artifacts' Early Epigravettian affiliation is clear. The affiliation's features can be shortly summarized as follows. Above all, it is needed to substantiate a fundamental Late UP status for the Vác 1 lithics. First, bladelet core reduction that was the dominant for the rather local RMTs and the only present for the distant RMTs primary flaking method certainly indicates a Late UP attribution. Bladelet and microblade numerous trapezoidal and multifaceted profiles at midpoint do confirm an intensive character of the on-site bladelet reduction. Second, the great prevalence of simple shortened endscrapers is also in a good accordance with the Late UP status. After establishing the Late UP character for the Vác 1 artifacts, the presence of still not numerous but typologically indicative true backed blades and bladelets with a steep retouch and even a broken rectangle on a bladelet with a steep retouch treatment of both a lateral edge and distal end make the Late UP attribution more concrete in favor of Epigravettian techno-complex. Indeed, this is the main technological (bladelet core reduction) and typological (backed pieces) interconnected lithic artifact feature allowing an Epigravettian attribution for Late UP assemblages. Finally, an Early Epigravettian status is proposed. For that it is useful to pay attention to some variability of Early Epigravettian assemblages in Eastern Central Europe. At least two Early Epigravettian industry types, Ságvár and Kašov I ones, are recognized so far for this part of Central Europe by a team member (Yu. D.). Both of them are characterized by some peculiar techno-typological features that usually do not occur in more "industrially stable" Late

Epigravettian assemblages. On the one hand, Kašov I, upper layer industry type bladelet/microblade production was not solely based on flaking of bladelet cores sensu stricto on nodules/pebbles/chunks but was also considerably supplemented by some carinated and dihedral burin-cores and a few carinated end-scraper-core reductions, still having backed pieces as the main "hunting equipment" type. On the other hand, Ságvár bladelet cores sensu stricto on nodules/pebbles/chunks are well added by various burin-cores (see Markó 2019), although carinated ones are absent there, while backed bladelets/microblades are "components" of "hunting equipment", too. Keeping this Early Epigravettian variability in mind, the presence of serial bladelet narrow-flaked/burin-core-like pieces and a few bladelet narrow-flaked/burin-core-like on truncation pieces among the Vác 1 cores are noteworthy in this regard. Additionally, a single composite tool within the Vác 1 tool-kit also corresponds to the known rarity of tool combinations for Early Epigravettian in the region. Further comparison, more detailed ones with particular assemblages, will surely lead to more concrete considerations for the Vác 1 industrial evaluation within the regional Early Epigravettian, although it is already suggested that, for example, the Mogyorósbánya assemblage of the Ságvár industry type (see Dobosi 2016) has many similar features, opening good perspectives for more research in this regard.

Finally, Vác 1 lithic data enables us to connect the Early Epigravettian records of the Carpathian Basin with the Middle Dniester region. In addition to the well-known Molodova V and Cosautsi sites, the recently investigated Korman' 9 site (Kulakovska et al. in press) shows the same basic assemblage features for the Eastern European sites as Vác 1. This is through the presence of numerous bladelet narrow-flaked/burin-core-like primary reduction objects, simple backed bladelets and blades with no micro-Gravette points, single backed points on blades and the absence or a subordinate position of burins on truncation. The absence of the bipolar anvil core technology in the Dniester sites is explained by the high quality and easy access of local Turonian and Cenomanian flint nodules for the sites' Late UP humans. Thus, Vác 1 also plays a role in the study of the connection of Early Epigravettian human groups in Central and Eastern Europe, which was geographically separated by the Eastern Carpathians.

6. Short concluding notes

The conducted research of the Vác 1 site location and lithic artifact data studies made it possible to see and show that even lithic artifacts collected on the surface can be used for some serious and useful analyses and considerations. Of course, the collected lithics should be gathered systematically, thoroughly in trying to uncover as many possible finds of all artifact categories, including tiny pieces as well. Such a surface find spot also has to be analyzed considering the loci's regional location and topography, using RMT data and their original outcrop/source information, attempting then to construct an entire *chaîne opératoire* on what Late UP humans had been doing at the site, involving data for some of their off-site activity, too. In doing so, it happened to be that all the above-enumerated scientific goals were actually realized for the Vác 1 site and its finds. Accordingly, the loci, located at the Danube Bend in North-Central Hungary, is defined as a hunter-gatherer temporary camp with clear base camp characteristics and similar with some lithic artifact primary and secondary treatment processes adding to one another for both rather local and distant RMTs. The lithic assemblage features allowed the proposal of its Early Epigravettian industrial attribution.

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Resumé

Příspěvek předkládá analýzu souboru kamenných artefaktů, který byl shromážděn v průběhu posledních 20 let z povrchové lokality Vác 1 (Sóskúti-dűlő), která je situována v ohbí Dunaje v severocentrálním Maďarsku. Analýza umístění polohy Vác 1 a operačního řetězce kamenných artefaktů naznačuje, že lokalita sloužila jako dočasné tábořiště lovců a sběračů s některými charakteristikami základního tábora. Kamenné artefakty vykazují jisté doplňující primární a sekundární úpravy, které se uplatnily jak na lokálních surovinách, tak na surovinách transportovaných z větší vzdálenosti. Kamenná industrie, která vykazuje příslušnost ke staršímu epigravettienu, je z technologického a typologického pohledu charakterizována následovně: čepelková produkce převažovala v případě lokálních surovin, zatímco pouze přítomna je v případě vzdálených surovin. Trapézové a mnohofasetové profily ve středu čepelek a mikročepelek ukazují na intenzivní místní čepelkovou redukci. Mezi nástroji převažují jednoduchá krátká škrabadla. Pozoruhodná je přítomnost ne příliš častých, ale zato typologicky signifikantních čepelí a čepelek s otupenými boky a dokonce i zlomeného obdélníku se strmou retuší laterální hrany a příčnou retuší na distálním konci. Taktéž jádra s úzkými čepelkovitými negativy (jádra-rydla a několik jader-rydel na příčné retuši), stejně tak jako ojedinělý kombinovaný nástroj (jednoduché krátké škrabadlo + rydlo na vkleslé retuši) dokládají časně epigravettský status souboru. Z výše uvedených důvodů technologicko-typologická data z lokality Vác 1 umožňují diskusi nad variabilitou časně epigravettských industrií ve východní části střední Evropy.

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