RAW MATERIAL EXPLOITATION AT THE MIDDLE PLEISTOCENE SITE OF VÉRTESSZŐLŐS, HUNGARY

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ABSTRACT

The Middle Pleistocene site of Vértesszőlős, northern Hungary, is famous for the small size of the lithics in the assemblage found there. The assemblage has been described as part of a wider phenomenon of Middle Pleistocene microlithic industries in Central and Eastern Europe sometimes referred to as the 'Buda' industrial complex, or more recently the Lower Palaeolithic Microlithic Tradition (LPMT). Central to this question of cultural choice in the manufacture of this lithic assemblage is the size of the raw material available to the hominins for the manufacture of stone tools. This paper explores possible raw material sources and the impact that the size range of these available raw materials would have had on the hominins' behaviour.

Full reference: Fluck, H. & McNabb, J. 2007. Raw material exploitation at the Middle Pleistocene site of Vértesszőlős, Hungary. *Lithics: The Journal of the Lithic Studies Society* 28: 50–64.

Keywords: Middle Pleistocene, Central Europe, raw material, microlithic assemblages, cultural choice

INTRODUCTION

The site of Vértesszőlős is located within travertine deposits that overlie the fifth terrace of the Átalér/Tata River, a tributary of the Danube. The deposits containing the site are believed to correlate with terrace V of the Danube River (Bridgland *et al*. 2006; Pécsi 1990). At Vértesszőlős a travertine deposit of *c*. 8–10m thickness has formed which has been quarried since Roman times. The Pleistocene site was discovered by M. Pécsi in 1962 during a geology field trip for the Eötvös Loránd University of Sciences. When the archaeologist Laslo Vértes first saw the artefacts he thought the material was Middle Palaeolithic in date due to similarities between the tools collected by Pécsi and his students, and the site of Tata, some 10km away, already known to be Mousterian. It was Pécsi's insistence on the antiquity of the site on geological grounds that persuaded Vértes to excavate there, and he subsequently directed excavations at the site from 1963 to 1968 (Kretzoi & Dobosi 1990). Although precise dating of the site is uncertain it is generally believed, on the basis of its faunal assemblage, to date to Marine Isotope Stage 13, *c*. 500,000 years ago (Bridgland *et al*. 2006; Dobosi 2003; Osmond 1990; however see Moncel 2003 for alternative younger dates).

Site location

The travertine outcrops were formed by numerous springs located at the fault line that runs along the Western Gerecse Mountains in Northern Hungary (Pécsi 1990). The presence of

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travertine spring deposits has, in some cases, resulted in the phenomenal preservation of environmental information, for example the imprints of leaves from the trees growing in the area and, in other nearby localities, footprints of animals have also been preserved. The hominins were undoubtedly attracted to the area by the presence of these springs: both by the water and the other animals that were also drawn there. The bowl-like formations created by the springs at these locations would also have afforded shelter for the hominins. At the principal archaeological locality for the lithic assemblage, Vértesszőlős I, Vértes described the site as being within a depression, circumscribed on at least two sides by a wall-like feature of travertine (Figures 1 and 2; Kretzoi & Dobosi 1990). Although, like all of the Vértesszőlős localities, the site was discovered during quarrying, the original spread of archaeological material was quite concentrated, as if in the base of a bowl, restricted by the sides of the depression (Figure 2). There are two other major localities at the site. At Vértesszőlős II a concentration of faunal remains were excavated with few lithics, while at the 'footprint' locality of Vértesszőlős III a number of footprints of animals were preserved in the travertine surface (Kretzoi & Dobosi 1990).

Interpretation history

Since its discovery in the 1960s, Vértesszőlős has been a key site in the debate surrounding Middle Pleistocene assemblage variation. The pebble tools were widely interpreted as indicative of a separate Middle Pleistocene cultural tradition and comparisons were made with other sites in Central and Eastern Europe (e.g. Kretzoi & Vértes 1965; Valoch 1968; Collins 1969). In 1965 Kretzoi and Vértes suggested that Vértesszőlős was linked to a local Lower Palaeolithic phenomenon, which they named the Buda Industry, after some similar pebble tool artefacts found in terrace deposits in Budapest. It was characterised by the presence of small choppers and chopping tools, which became known as micro-choppers. Subsequently other authors (see Valoch 1968 and responses; Collins 1969; Svoboda 1987, 1989) pursued a cultural interpretation of these assemblages. However in reading Vértes' original works one of us (HF) believes that the excavator was not promoting the type of cultural interpretation that was in *vogue* in the West in the 1960s: namely the hominins were consciously creating cultural identities through their behaviours, in this case *choosing* to manufacture small-sized tools for cultural reasons (as opposed to functional or raw material constraint reasons). Rather his intent was to *describe* similarities and differences in the assemblages of the area but his work/terminology was interpreted as indicating the presence of cultural groups by Western archaeologists. In later years it was realised that the actual frequency of these micro-choppers was much lower than originally believed and the concept of a specific micro-chopper tradition was dropped (e.g. Svoboda 1989). However, the significance of the small size of the remaining artefacts from sites such as Vértesszőlős persisted in the literature. More recently the idea of a culturally defined small tool assemblage type has been revived in the form of the Lower Palaeolithic Microlithic Tradition (LPMT), and Vértesszőlős continues to contribute to this debate. For Vértes and the original excavators, the characteristically small size of the lithic assemblage from the site was a consequence of the small-sized raw material that had been available to the hominins for working (Kretzoi & Vértes 1965; Kretzoi & Dobosi 1990; Dobosi 2003). In this paper we will explicitly explore the extent to which the range of available raw material sizes has influenced the character of the assemblage: whether the characteristically small size of the assemblage is due to the limitations of raw material, or whether larger material may have been available and, if so, whether or not it was used. If this second scenario can be demonstrated to be the case it would suggest that the hominins were either *choosing* the smaller raw material or they were *choosing* to discard smaller stone tools at the site. The possibilities of such choices have not been fully investigated previously, and they have important implications for our understanding of hominin behaviour.

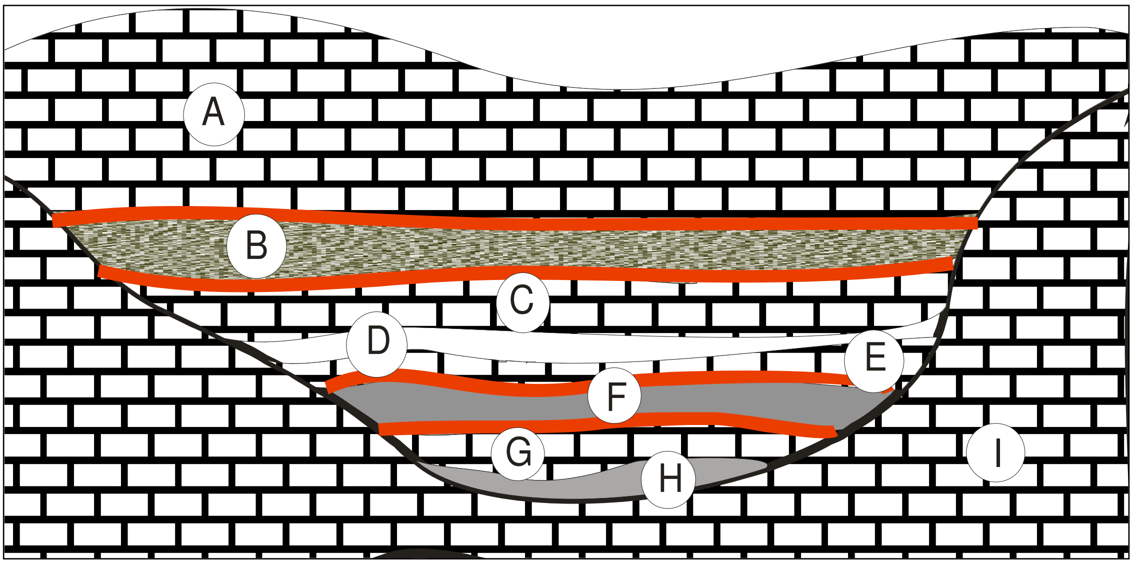

Figure 1: Schematic illustration of the bowl formation and stratigraphy at Vértesszőlős I. Archaeological levels shown in red. A, C, E, G, I – Travertine; B – Loess; D – Sand; F, H – Calcareous silt (Stratigraphic sequence after Pécsi 1990 and Dobosi 2003)

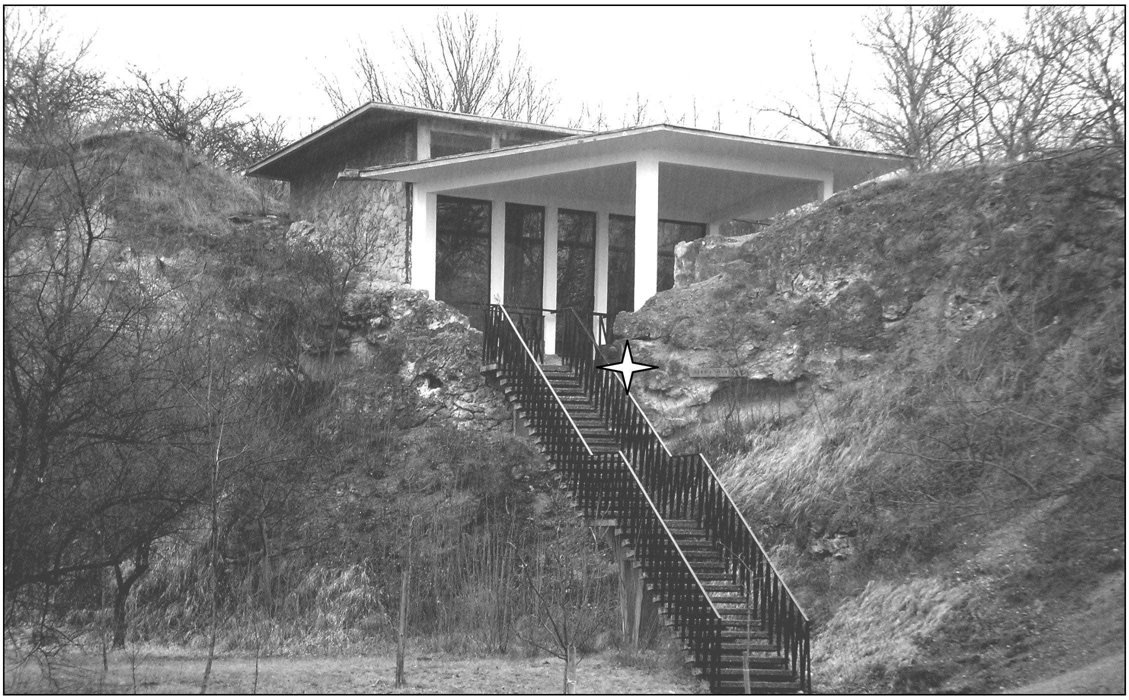

Figure 2: The Vértesszőlős I locality. Note the bowl-like formation in the travertine. The four superimposed archaeological levels within the bowl-like feature at Vértesszőlős I were excavated from sediments that had infilled the shallow depression. The white star shows the findspot for the hominin skull fragment found outside of the main archaeological concentration on the outer slope of the travertine bowl.

Figure 3: Panoramic view showing the location of the Vértesszőlős site (arrow). The slopes in the middle ground represent higher river terraces of the Átalér River. In the background are the Vértes Hills, the southern part of the Western Gerecse Mountains (part of the Transdanubian Mountains).

In spring 2007 a detailed study of the lithic assemblage from level 1, the lowest of four occupational levels at the principal archaeological locality, Vértesszőlős I, was undertaken by Hannah Fluck. A total of 1,916 artefacts were studied, the sample consisting of all of the retouched tools, flakes and cores from that layer, as well as fifty percent of the 'chips and chunks' (fragments without flake scars), a category of artefacts principally composed of knapping debris/waste which actually makes up the majority of the assemblage.

RAW MATERIAL SOURCES

Previous work has always assumed that the material exploited by the hominins came from one source — the Átalér River floodplain gravels. This study has identified a number of other possible sources of raw material that may have been available and exploited by the Vértesszőlős hominins. In this section we will briefly describe the various source locations from which the different raw materials could have been recovered. In the next section we will go on to discuss the use of the individual rock types in more detail. It is important to emphasise that none of the rock types found at the site are native to the travertine. They have all been brought to the site by hominins.

River gravel

The raw materials used by the hominins to make the artefacts found at Vértesszőlős have traditionally been reported as coming from the gravels of the Átalér River as would have been available in the alluvial deposits immediately around the site during its occupation (Collins 1969; Dobosi 2003; Kretzoi & Dobosi 1990; Kretzoi & Vértes 1965). The gravels are believed to be derived from the Oligocene, Eocene and Mesozoic sediments of the adjacent Vértes Mountains and consist of pebbles of a range of different raw material types: limestone, dolomite, quartz, quartzite, radiolarites and shale (Kretzoi & Dobosi 1990). Material would also have been available from the terraces of the Átalér, where pebbles of 20–30mm are found in the sediment (Pésci 1990), if exposed at the time hominins were using the Vértesszőlős site.

However, there are other potential sources of raw material that cannot be ruled out.

Limestone

In addition to the small gravel clasts available along the banks and terrace deposits of the Átalér River, the limestone bedrock in the area would also have provided a potential source of larger raw material.

Flint-like material

Personal observation of the surrounding area has identified a number of locations in the hills behind the site (Figure 3) where large pieces (>250mm) of red radiolarite were weathering out of the limestone bedrock, particularly around the base of trees. A number of other sources of radiolarite (in particular in a dark red and in a green colour) are also known from further afield (András Markó pers. comm.) and the possibility of bringing in material from these distant sources cannot be ruled out. The radiolarite is an extremely fine grained material, excellent for knapping and at source occurs in large blocks embedded in the limestone bedrock (Figure 4).

Figure 4: An example of a radiolarite seam embedded in limestone bedrock, near Tata, Hungary

Table 1 provides a frequency breakdown of the various artefact classes and rock types in which they occur in the sample studied by Hannah Fluck from level 1, the earliest level at Vértesszőlős I, the principle archaeological locality.

Total		***Core***	***Flake***	***Retouch flake***	***Retouch core***	***Retouch chunks***	***Chips/ chunks***
(1) Other flint-like	***410***	*100 (33.0%)*	*138 (45.6%)*	*55 (18.2%)*	*9 (3.0%)*	*1 (0.3%)*	*107*
(2) Red radiolarite	***201***	*44 (31.2%)*	*61 (43.3%)*	*27 (19.1%)*	*9 (6.4%)*	*0*	*60*
Flint-like (1+2)	**611**	144 (32.5%)	199 (44.7%)	82 (18.5%)	18 (4.1%)	1 (0.2%)	167
Limestone	**227**	33 (37.5%)	40 (45.5%)	13 (14.8%)	2 (2.3%)	0	139
Quartzite	**1043**	199 (47.7%)	159 (38.1%)	52 (12.5%)	3 (0.8%)	4 (1.0%)	626
Other	**35**	8 (44.4%)	8 (44.4%)	2 (11.1%)	0	0	17
Total	**1916**	**384**	**406**	**149**	**23**	**5**	**949**

Table 1: Totals for different raw materials from level 1, Vértesszőlős I with respect to different artefact types. The frequencies in brackets represent percentages calculated on the line totals but excluding chips and chunks. The 'flint-like' row is a combination of the 'other flint' category and the 'red radiolarite' category. The final row/total is calculated using the flint-like row (1+2).

SIZES OF RAW MATERIAL

The key question at Vértesszőlős has always been whether the small size of the tools was a consequence of the restricted size of available raw material, or whether the smaller material was deliberately selected — a cultural preference. A number of studies of the assemblage (e.g. Dobosi 2003; Kretzoi & Dobosi 1990), our own included, have concluded that the majority of the artefacts are made on material gathered from the alluvial Átalér gravels, on the basis of the type of cortex and lithology. However, our study has identified a number of additional potential raw material sources and, in the light of this, it is therefore important to investigate the question of available raw material size in more detail. Each of the raw material types will be looked at in turn with an assessment of the range of raw material sizes available and used. The key raw materials identified in the assembalge fall into four main categories:

- Quartz and quartzite (considered together because of the very low frequency of quartz)
- Flint-like rocks (including radiolarites)
- Limestone
- Other rocks (largely shale)

In order to investigate the size ranges of these different raw material types the total range of recorded artefact sizes (11–77mm; Figure 5) was divided into three to give three equal size categories: 'small' (11–33mm), 'medium' (34–55mm), and 'large' (56–77mm). This tripartite division was calculated by defining the total size range in millimetres for the entire lithic assemblage (minimum–maximum) and then dividing this into three equal groups. The rationale for division into small, medium and large groups was to allow us to explore in more detail the differences in the size range between individual rock types. The mean, maximum, minimum, and standard deviation was calculated for each of the size groups and each of the raw material categories. These data are presented in Table 2. The tripartite division also offered the opportunity to compare frequency of artefact occurrence in each of the categories.

River material

From the four categories of raw materials identified at Vértesszőlős I, two have their origin exclusively in the alluvial gravels: the quartz/quartzites and the category designated as other rocks (as noted above these were mostly shale). It is these raw materials that therefore provide us with the best information regarding the size of the pebbles present in the river's bed load. The quartzite data is also used as a proxy for the pebbles of any other raw materials that were present as clasts in the alluvial gravels.

As can be seen in Table 2 the quartzite artefacts range in size from 14mm to 51mm. Unfortunately, there were relatively few unworked clasts/manuports in the collections. The data for those that were identified in the recorded sample are presented in Table 3. The unworked quartzite pebbles are not that much larger than the artefacts, they range from 28mm to 70mm (Table 3). The mean size of the quartzite artefacts in the 'small' category is 24.2mm, and in the 'medium' size category is 39.3mm, but the majority of the quartzite artefacts clearly fall within the 'small' size range (371 artefacts in the 'small' size category vs. 45 in the 'medium' sized category).

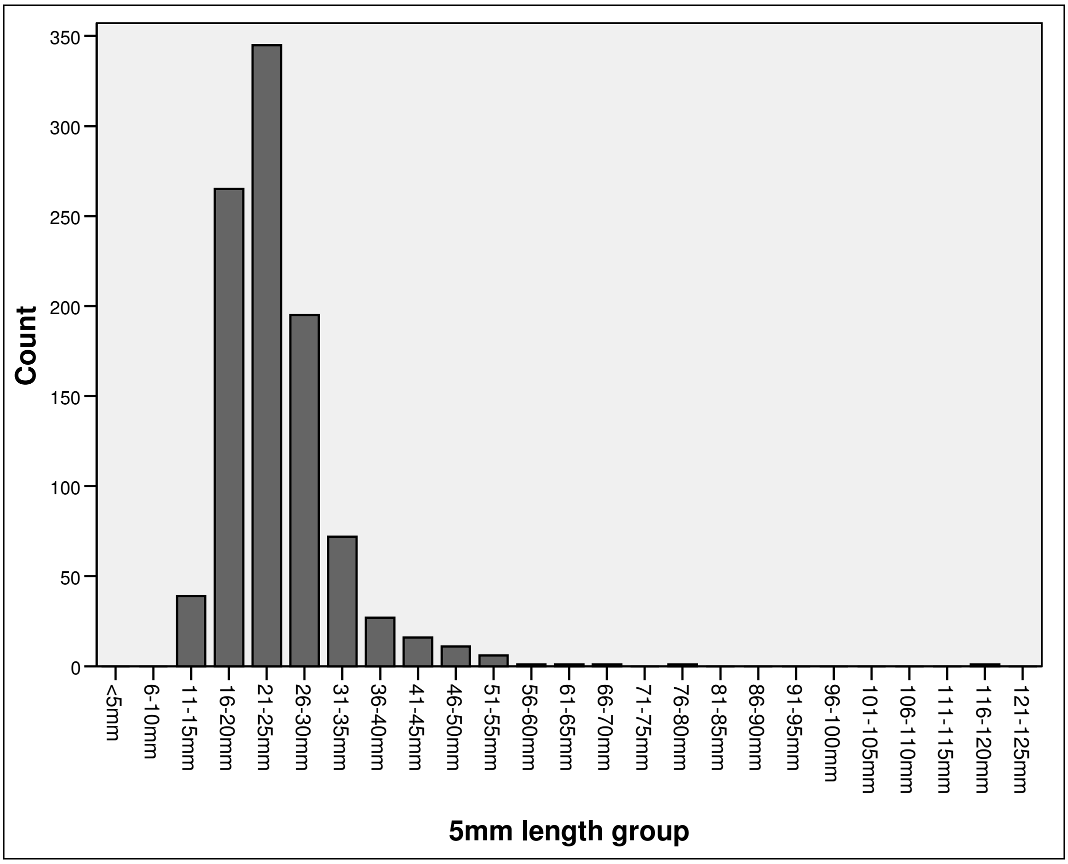

Figure 5: The distribution of artefact lengths for all raw materials and artefact groups from Table 2. Chips and chunks not included.

The lithologies in the other raw materials category represent less than 2% of the total assemblage and have a 'small' size category mean of 22.1mm and a 'medium' size category mean of 40mm. Overall the other rocks group ranges in size from 13mm to 47mm (Table 2), and again the vast majority of artefacts fall into the 'smaller' size category.

On river pebbles then, there is no evidence of worked artefacts larger than 51mm, with a mean of less than 40mm. Although the largest piece of unworked quartzite was 70mm, this is exceptional; the majority fall within the 'medium' length category with a mean of just over 43mm. For all river gravel materials the artefacts at the higher end of the length range are in the minority. So an estimate of mean clast length for the gravel material used, prior to knapping, of *c*. 50–70mm would not be unreasonable. Pécsi notes an observed clast size for later Átalér terraces that is even smaller, *c*. 20–30mm (Pécsi 1990: 31).

Limestone

The limestone, although it makes up only 11.8% of the total material in the assemblage, may have derived from a number of different sources in the local area. Undoubtedly, limestone pebbles were present in the Átalér River alluvial gravels, but in addition to this source they may also have come either from the gravels within terrace V on which the site is located, or from exposures of the local limestone bedrock. It seems reasonable to assume that limestone from the alluvial gravels would have been of a similar size to the other materials from those gravels discussed above. This leaves the limestone bedrock as a potential source of uncertain size.

		Length Categories														
		'Small' size group 11–33mm					'Medium' size group 34–55mm					'Large' size group 56–77mm				
		Mean	**N**	**Max**	**Min**	**St dev**	**Mean**	**N**	**Max**	**Min**	**St dev**	**Mean**	**N**	**Max**	**Min**	**St dev**
Flint-like (1+2)	**Core**	**21.7**	14	33	11	4.1	**39.7**	3	49	34	8.1	-	-	-	-	-
	Flake	**20.5**	19	33	13	4.7	**36.0**	2	37	35	1.0	-	-	-	-	-
	Ret. flake	**22.5**	76	32	15	3.8	**37.2**	6	41	34	3.1	-	-	-	-	-
	Ret. core	**23.3**	19	32	17	3.6	**-**	-	-	-	-	-	-	-	-	-
	Total	**21.3**	**43**	**33**	**11**	**4.4**	**37.6**	**11**	**49**	**34**	**4.5**					
Quartzite	**Core**	**24.8**	16	33	15	3.9	**39.9**	29	51	34	4.8	-	-	-	-	-
	Flake	**23.7**	14	33	14	4.3	**36.9**	9	45	34	3.4	-	-	-	-	-
	Ret. flake	**23.9**	46	31	16	4.0	**40.7**	6	50	35	5.7	-	-	-	-	-
	Ret. core	**27.5**	2	24	21	2.1	**36.0**	1	36	36	-	-	-	-	-	-
	Total	**24.2**	**37**	**33**	**14**	**4.1**	**39.3**	**45**	**51**	**34**	**4.7**					
Limestone	**Core**	**24.6**	24	31	17	4.5	**40.0**	5	54	34	8.2	**65.3**	3	77	58	10.2
	Flake	**23.6**	31	32	15	4.9	**43.3**	9	53	34	7.3	-	-	-	-	-
	Ret. flake	**26.3**	10	31	21	3.6	**42.3**	3	49	35	7.0	-	-	-	-	-
	Ret. Core	**21.5**	2	23	20	2.1	**-**	-	-	-	-	-	-	-	-	-
	Total	**24.2**	**67**	**32**	**15**	**4.7**	**42.2**	**17**	**54**	**34**	**7.2**	**65.3**	**3**	**77**	**58**	**10.2**
Other	**Core**	**25.5**	6	33	21	4.5	**45.4**	2	47	44	2.1	-	-	-	-	-
	Flake	**20.0**	7	29	13	5.6	**35.0**	1	35	35	-	-	-	-	-	-
	Ret. flake	**16.0**	1	16	16	-	**34.0**	1	34	34	-	-	-	-	-	-
	Ret. core	-	-	-	-	-	-	-	-	-	- -		-	-	-	-
	Total	**22.1**	**14**	**33**	**13**	**5.7**	**40.0**	**4**	**47**	**34**	**6.4**	**65.3**	**3**	**77**	**58**	**10.2**

Table 2. Mean, maximum and minimum lengths for different artefact types and different raw materials. The artefact lengths were divided into three categories ('small', 'medium' and 'large') of equal range.

	Length categories														
	'Small' sized group data					**'Medium' sized group data**					**'Large' sized group data**				
	Mean	***Max***	***Min***	***N***	***St Dev***	***Mean***	***Max***	***Min***	***N***	***St Dev***	***Mean***	***Max***	***Min***	***N***	***St Dev***
Flint-like				0					0					0	
Limestone				0					0		120	120	120	1	
Quartzite	30.8	33	28	4	2.2	43.7	55	34	6	9.6	70	70	70	1	
Other				0		42.0	48	36	2	8.5				0	

Table 3. Mean, minimum, maximum, standard deviation and number of the manuports for the three length range categories and different raw materials

The limestone is on average the biggest raw material represented at the site with a length range of 15mm to 77mm (Table 2) and one unworked fragment of 120mm (Table 3). The mean in the 'smaller' length category is 24.2mm and in the 'medium' category 42.2mm. The limestone is also the only category to have worked artefacts in the 'largest' category with a mean of 65.3mm. The larger length of the limestone artefacts does suggest that an additional source of limestone was being used that provided bigger knapping blanks than were available in the local alluvial gravels. However, the infrequency of these bigger limestone pieces in the assemblage indicates that this source was not exploited in a consistent manner. Why might this be? While some of the limestone is quite fine grained and suitable for knapping it is much more brittle than the other raw materials used, a fact that is reflected in the high number of broken artefacts and fragments observed in this raw material group — 74% of limestone artefacts are broken. This may be why, while there are larger pieces of worked limestone present at the site, it was clearly not the material of choice; on Table 1 limestone accounts for only 9% of the rock types (calculated without the totals for chips and chunks). The hominins preferred the smaller sized, but more durable quartzite pebbles and flint-like material.

Flint-like rocks

Perhaps the most intriguing raw material used at the site is the extremely fine grained flint-like material that makes up the greatest percentage of the artefacts (45.9%). For the most part these comprised various groups of differently coloured radiolarites (in particular red and green). These artefacts are consistently smaller than those in the remaining raw material groups with a 'small' category mean of 21.3mm and a 'medium' category mean of 37.6mm. The artefact range length is smaller too with a minimum of 11mm and a maximum of 49mm (Table 2). Unlike all the other rock types there are no un-worked pieces of flint-like material present in the collection (Table 3).

The flint-like raw material is particularly good for knapping and its fine-grain makes it extremely suitable for retouched tools. As a result the flint-like material is more intensively worked in comparison to the other raw materials. This is evident in the absence of un-worked pieces of the flint-like material from the assemblage, reduced size, and the lower percentage of cortical pieces (63.1% compared to 88.7% for quartzite — Table 4.). In addition a greater percentage of the retouched tools are manufactured in the flint-like material: of the 177 retouched pieces in Table 1 (flakes, cores and chunks) the flint-like materials represent just over 57% of the total compared to 8% for limestone and 33% for quartzite.

Possibility of the use of larger raw material for the flint-like group

While undoubtedly some of the flint-like material may have come from the river gravels, we cannot rule out other potential sources. These include the hills behind the site, and other known radiolarite sources further afield. Material from these other sources could potentially be larger in size than the river gravel, but using the artefacts to distinguish between these raw material sources is not easy.

As stated above, the quartzite data can be used as a proxy for the potential size range of other raw materials available as clasts in the river. We also know that the quartzite was transported into the site — see above. Table 1 shows that the quartzite core element (here taken to be cores, retouched cores) occur in roughly the same proportions as the flake element (here taken to be flakes and retouched flakes), just over 49% for the former, and a little over 50% for the latter (these totals were calculated by omitting the frequency for chips and chunks — Table

1). Table 1 also shows that the quartzite material excavated from the site contains a considerably greater percentage of chips and chunks than any other raw material type, 65% as compared to 17% for the flint-like rocks (total N=949, Table 1). While the lack of clear marks of anthropogenic working are absent from these chips and chunks, the travertine nature of the site, and the higher incidence of chips and chunks, clearly suggests *in situ* knapping of the quartzite river pebbles after they had been brought up from the river.

How then do we explain the roughly equal numbers of quartzite cores and flakes when undisturbed *in situ* knapping would require a dominance of the latter over the former? There are two possibilities:

- Either the larger flakes were taken away after knapping
- Or many cores were brought to the site already knapped

Given that the presence of knapping debris suggests on-site working, and that the source of the quartzite pebbles was immediately local, then the most parsimonious alternative is the first one. Quartzite pebbles were brought up from the river, knapped, and then the larger flakes were removed for use elsewhere. Tentatively, we suggest this was the case for all the local alluvial pebbles irrespective of their lithology.

With this in mind we may now turn to the flint-like rock types. However, when we look at the breakdown of artefact types for the flint-like raw materials we see a different pattern emerging. The flint-like material has a greater percentage of flakes (63%) to cores (36%). This would be expected if *in situ* knapping was occurring on the site and all the artefacts were left as they were. However, the evidence for *in situ* knapping, as suggested by the quantity of knapping debris, is poorer (Table 1). But on the other hand we also know that the flint-like raw materials were the most intensively worked and the smallest of the flaked lithologies at the site.

These contradictions raise three possibilities:

- Either that large flakes of flint-like material were brought into the site and then knapped
- Or pre-flaked cores were brought to the site, minimally knapped, and then taken away
- What is left at the site is the end-trajectory of a complicated set of transport behaviours whose precise signal is not clearly evident in the data — a number of different transport behaviours, specific to individual rock types, are overprinting each other and making the identification of lithology-specific transport behaviours difficult to read

Choosing between these alternatives is difficult. Here we must turn to the evidence of cortex to help us decide.

Table 4 provides the cortical presence/absence data. The data for quartzite is entirely consistent with the interpretation presented above, that local pebbles are being knapped on the spot, hence the high percentage of cortical pieces. At first glance the flint-like raw materials would also suggest a high percentage of cortical artefacts, possibly indicating local flint-like pebbles from the stream were being knapped. However, when we separate out the red radiolarite, from the other radiolarites/other flint-like raw materials, as in Table 4, a different pattern emerges. Far less of the red radiolarite is cortical, indeed this lithology has the lowest percentage of cortex than any of the other rock types in Table 4. The difference between the red radiolarite and the other flint-like raw materials, as expressed in the cortex presence/absence data in Table 4, is statistically significant (X^2 two sample test; X^2= 12.041, d.f.=1, p=0.01, reject null hypothesis of similarity at p=<0.05).

	Other flint-like (1)		*Red radiolarite (2)*		*Flint-like (1+2)*		*Limestone*		*Quartz/ quartzite*		*Other*	
	Cortex		*Cortex*		*Cortex*		*Cortex*		*Cortex*		*Cortex*	
	Yes	*No*	*Yes*	*No*	*Yes*	*No*	*Yes*	*No*	*Yes*	*No*	*Yes*	*No*
N	280	133	105	92	385	225	127	99	926	118	31	3
%	67.8	32.2	53.3	46.7	63.1	36.9	56.2	43.8	88.7	17.3	91.2	8.8

Table 4: Percentage of artefacts with and without cortex for different raw materials. The figures in the column 'flint-like' include the two columns to the left 'red radiolarite' and 'other flint-like'. The 'Red radiolarite' refers to the flint-like material with a distinctive red colour that may possibly have originated from the hills behind the site.

If we combine this with what we already know about the flint-like group as a whole (more intensively worked, smaller, preferentially selected for retouching, not so intensively knapped on-site), we may reasonably postulate that the red radiolarite represents a source of raw material which gave access to larger sized blanks, some of which were knapped away from the site, and were brought to the site to be further flaked and/or transformed into tools. Larger flakes and/or cores may have been selectively removed. Unfortunately deciding between the first two alternatives outlined above (cores vs. flakes) as the best explanation for the radiolarite transport hypothesis is not possible. Table 2 indicates that the flint-like cores and flakes were less than 5cm in maximum length, with the overwhelming majority of these less than 3.5cm. The core vs. flake data does not really help us either, since there is only a few millimetres difference between the cores and flakes in average size in the 'small' sized group.

So, the third option in the list is, tentatively, our favoured interpretation, and we believe the red radiolarite is the most likely candidate for a primary source of larger flint-like raw material.

The only other material to display a similar pattern is the limestone which was the largest raw material available (Tables 2 and 3) and so not exclusively obtained from the alluvial gravels (though as noted above its more brittle character precluded all but its occasional use, Table 1). It too has a low cortical index (Table 4)

CONCLUSION

The raw material available and being exploited by the hominins at Vértesszőlős was not necessarily restricted to the river gravels. It does appear that the river gravels themselves were size restricted, rarely exceeding 50mm. These immediately available local river pebbles were worked *in situ* at the site to form simple cores and flakes, and it is possible that the larger flakes from river gravel cores were removed from the site by the hominins when they left. The hominins also exploited, although not extensively, the locally available non-alluvial limestone bedrock which provided a larger size raw material source, but the brittle nature of the limestone probably made it unsuitable for use most of the time.

Most interesting though is the pattern observed in the flint-like materials. It appears that while some of this came from the river gravels, the hominins were also exploiting other sources which provided larger pieces for knapping. One such potential locally available source was identified by us in the hills behind the site so at least some of the red radiolarite might have come from the slopes of the neighbouring limestone hills. That the hominins were exploiting a source that offered larger radiolarite blanks is supported by the differences in the distributions of artefact types and cortical pieces compared to those from the purely river gravel material. Patterning within the red radiolarite data suggests that a non-local source may have been available to the hominins, possibly in the hills behind the site, or from much further away. Limiting factors in the transport of raw material to the site were size and distance to be travelled. The small size of the flint-like artefacts at the site is more a reflection of transport behaviour, to and from the site, rather than a cultural choice; the small artefacts were the pieces that the hominins chose to leave behind.

INTERPRETATION

The site of Vértesszőlős I represents repeated short-lived hominin occupations at a very particular type of location in the landscape. The bowl-like depressions associated with the springs would have provided the hominins with water and shelter at localities which would also have afforded good views of the river valley and the low-lying plains beyond (Figure 3). These were good vantage points from which to begin or end a hunt. The hominins were using the local river gravels, principally quartzite and flint-like rocks, to make simple flake and core tools. Trying to make handaxes on such rock types would have been pointless. However, the finer grained flint-like radiolarites were the favoured raw material. It seems likely that sources of this radiolarite other than the Átalér River gravels were exploited. Although the hominins may have been exploiting larger pieces of this radiolarite, it was intensively worked and reused, with larger pieces being curated and removed from the site: only the smallest pieces that could no longer be reworked were left behind. Our overall impression of the assemblage from locality I at Vértesszőlős is that it reflects less of a culturally imposed set of choices, than a terrain-conditioned behavioural adaptation by hominin groups moving across variable landscapes.

ACKNOWLEDGEMENTS

Our thanks to the staff at the Hungarian National Museum in Budapest, in particular Dr Viola Dobosi and András Markó for their help with the collections of Vértesszőlős.

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