44 Good or bad? Raw material procurement criteria in the Carpathian Basin. A diachronic approach

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44.1 INTRODUCTION

One of the basic criteria in selecting raw material samples — for our collection but much more important, for use by prehistoric people — is quality. Simple as it is to say, the more difficult to quantify: what was actually "good" and what was "bad" for the prehistoric inhabitants of the Central Danube Basin, i.e., Hungary. Based on experience with our comparative collection (LITHOTHECA of the Hungarian National Museum) and knowledge of some 400 sites ranging from Lower Palaeolithic till Iron Age, (with emphasis on Neolithic materials) this paper tries to answer this question through basic statistical methods applied to the actual choice of prehistoric people.

Quantifying the choices made by prehistoric people is one of the most challenging tasks of mathematical archaeology. In spite of aspiring an "objective" scope, the field is laid with numerous biases and inherent dead ends. To distinguish between "good" or "bad", i.e., select and reject is one of the key problems of our existence, in everyday practice as well as in the study of the human past. This basic problem is approached here from the point of view of lithic analyses of prehistoric assemblages.

44.2 ANTECEDENTS

In course of a complex petroarchaeological survey in Hungary, raw material source regions, raw material varieties and archaeological sites yielding lithic material are analysed collaterally. As a result of the last few years, most of the lithic raw materials used in prehistoric contexts can be successfully identified and allocated to distinct sources or source regions. At the same time, a systematic comparative collection of potential raw material sources was set in which we made a constant effort for detailed and objective physical description (Biró & Dobosi 1991).

The two main lines of analysis — i.e., description of geological comparative samples and the investigation of archaeological lithic material follow different practices and strategies. In the first case, source regions of potential raw materials are surveyed, sampled and characterised on the basis of *a–priori* geological, archaeological experience. In the second case (i.e., archaeological lithic assemblages) we are aspiring to a more or less objective and meaningful grouping of the lithic material and assign these "raw material type groups" with more or less certainty and conviction to distinct geological sources, or source regions. Data from both aspects of analysis are stored in a relational database (Biró 1990). The attributes registered are confined to basic data.

44.3 SUBJECTIVE JUDGEMENTS ON QUALITY

One of the attributes consequently registered for raw material samples is "quality", which is a mere heuristic classification of what we think the raw material was good for (as regards chipped stone artefacts). Marks are given to each inventory item from 0–5, in an increasing order to indicate how fit (in our view) the sample would be for the production of chipped stone artefacts. So far, 292 potential sources were sampled in

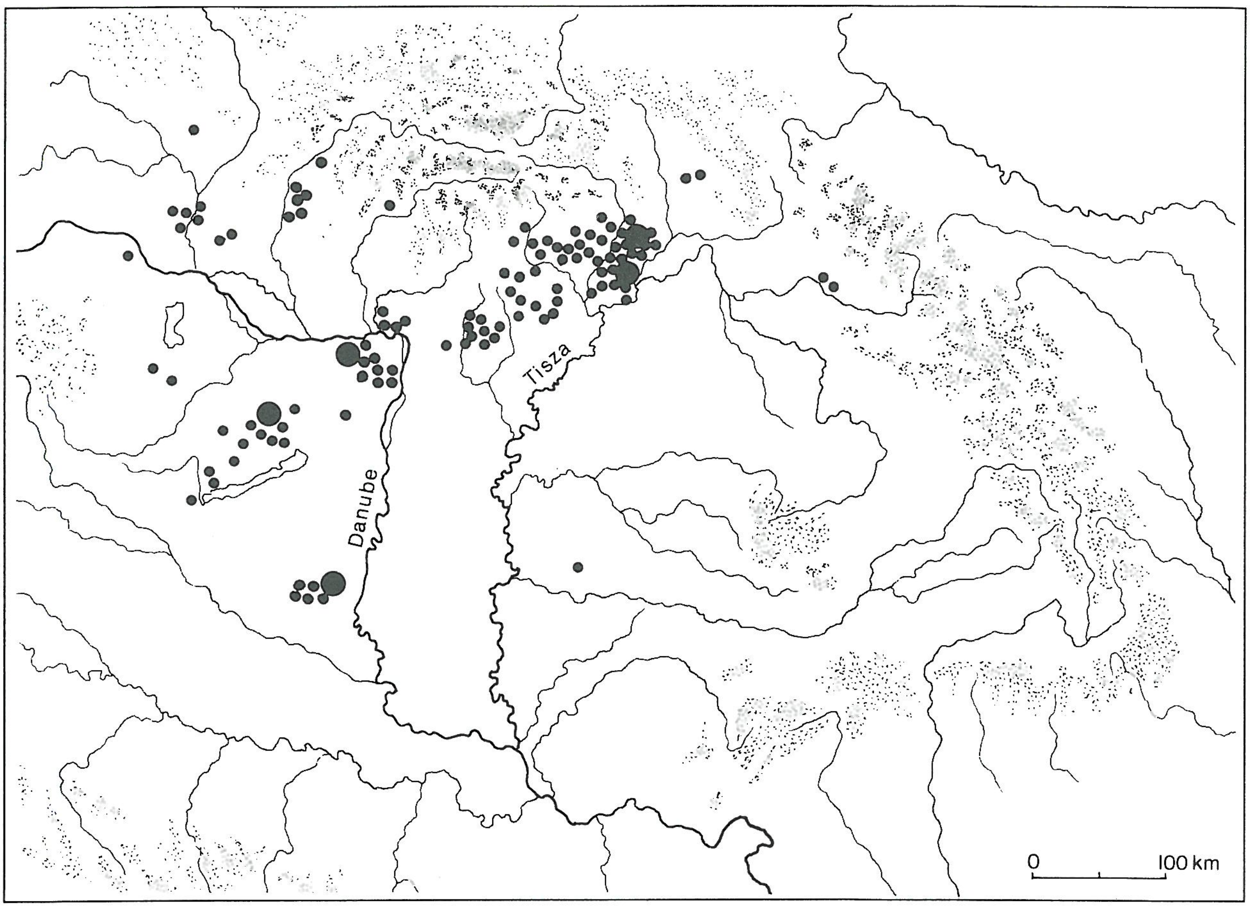

Figure 44.1: Top quality raw materials in the collection of the LITHOTHECA from the territory relevant to the present analysis (Carpathian Basin), based on a heuristic determination. Smaller black dots represent sampling points, "higher quality" sources are marked with larger dots.

Hungary (further some 100 more in the Carpathian Basin and about 300 in a wider context). The distribution of top quality raw materials on a regional scale is presented in Figure 44.1.

Naturally, the more distant sources represented in our collection are typically of higher quality, while a more comprehensive sampling strategy has been adopted for local materials. The classification process however, is very subjective. It involves a lot of inherent knowledge of the raw materials, their supposed merits and biases of *a–priori* knowledge of distribution. Also, some of the raw materials collected from the source region are obviously of inferior quality as compared to samples known from the archaeological record, due to surface weathering and different collecting methods. Is it possible to find more objective criteria with the help of statistical analysis of large collections to find out about the actual choice of prehistoric people — what the concept "good and bad" meant with regard to raw material procurement?

44.4 QUANTIFYING QUALITY — SOME TRIALS OF OBJECTIVITY

44.4.1 Activity around the sources

The very first approach is enough to indicate that not all of the potential raw material sources were used, even fewer were important in large–scale and/or continuous supply. From the aspect of source surveys, this can be indicated by the traces of exploitation and/or traces of stone–working around the source. This impression however, can be misleading. E.g., the largest flint–mine uncovered so far in Hungary, Sümeg–Mogyorósdomb yielded 15,000 m^3 mined matter (data and calculation from Bácskay 1984) whereas on the archaeological sites its contribution to the raw material spectrum is negligible (well under 1 %), Bácskay 1990; Bíró 1991). The other extreme is represented by obsidian; no traces of exploitation, and very rarely can "workshop activity" outside settlements be found at the sources. The typical form of occurrence of the Carpathian obsidians

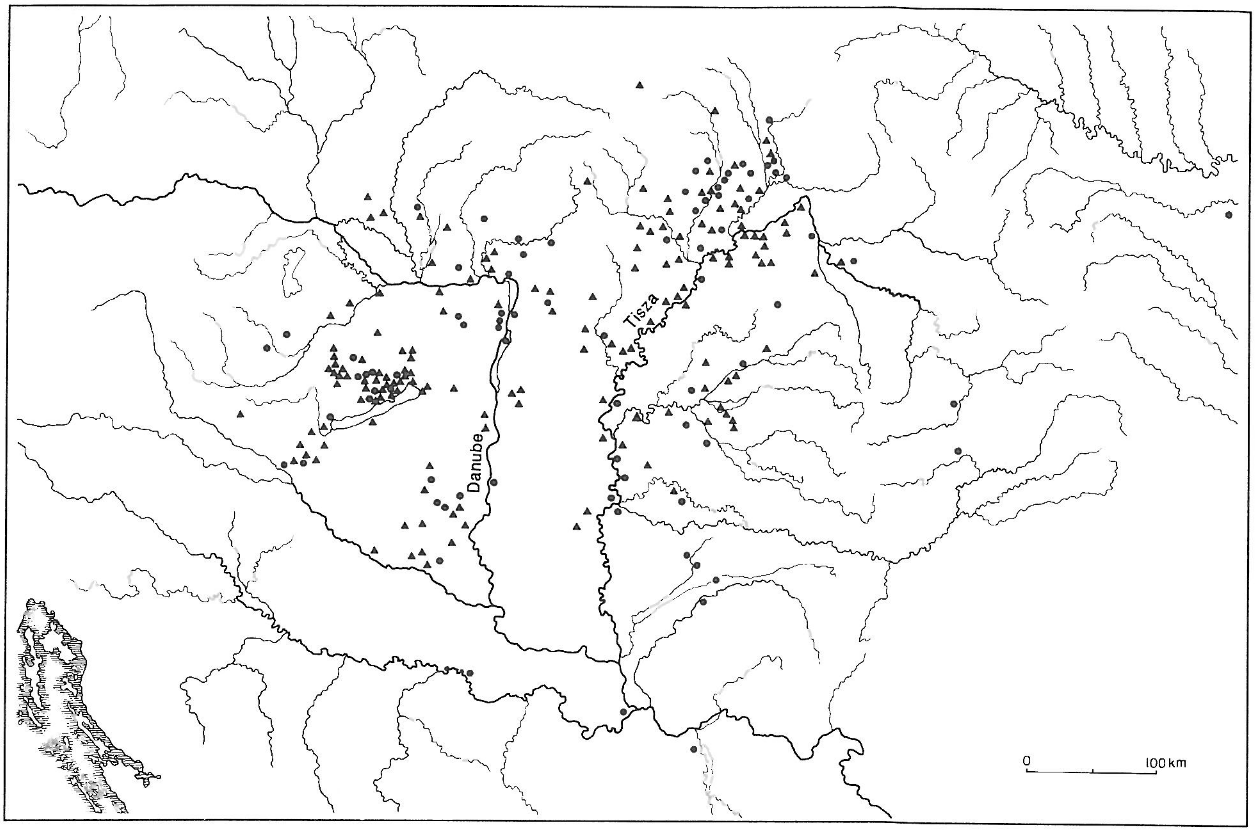

Figure 44.2: Distribution of archaeological sites considered for this analysis (after Biró 1991).

(smaller and bigger pyroclastic lumps) did not necessitate quarrying. The fact that the lumps were preferentially worked in the settlements (i.e., in controlled circumstances) already tells us something about the actual value (and quality) of the material.

44.4.2 Archaeological distribution data

Let us try to look at the problem now from the other side: what was actually used on the archaeological sites? And; how does it reflect quality?

44.4.2.1 Quantity

As for the archaeological material, I am currently working with 80 macroscopically separable raw material type groups (Table 44.1). These raw material type groups can be effectively separated by very simple means (macroscopic analysis), and imply definite source districts within the country or contact relations outside the present borders. (Biró 1991b). The classification system leaves some freedom to express uncertainty in determination (type group numbers started with 9 in the hundred's position) and lack of classification (999). As a first approach, plotting the quantity of the individual raw material types against the number of pieces, we can observe that there are several orders of difference between the "popularity" of certain raw material type groups as might be expected (Figure 44.3). In the following, we can observe the effects of filtering and ordering on the raw data. (Figures 44.4–44.6). The most informative for the sake of the present analysis is ordering (Figure 44.4). It can be observed that in case of a lot of important long– distance materials, the amount of "uncertainly determined" pieces exceed that of "safely determined" ones, which is partly due to subjective determination of these pieces, partly to small size. Typological filtering has obviously great effects on "popularity lists" in case of technologically widely different categories (chipped versus polished artefacts); the difference between more subtle technological filters (cores/flakes/blades/retouched tools) is more related to quality. We can generalise by saying that the quantity per raw material type group is increasing as a function of the higher state of elaboration.

For the sake of a more comprehensive view, the 80 categories of raw material type groups can be contracted into major units according to

1	Carpathian 1 obsidian	41	other limnic quartzite
2	Carpathian 2 E obsidian	42	Magyarkút hydroquartzite–silicified volcanite
3	Carpathian 2 T obsidian	43	Csesztve silex
4	Carpathian radiolarite — "blue silex"	44	T3 hornstone, Buda env.
5	Carpathian radiolarite , marbly dark red	45	T3 hornstone Balaton–Highlands
6	Carpathian radiolarite, dark brownish–red	46	other T3 hornstone
7	Carpathian radiolarite, grey	47	basalt
8	Carpathian radiolarite other	48	amphibol–andesite
9	Transdanubian radiolarite — Szentgál flint	49	greenschist–amphibolite
10	Transdanubian radiolarite — Urkut-Eplény flint	50	fine sandstone
11	Transdanubian radiolarite — Hárskut flint	51	medium sandstone
12	Transdanubian radiolarite — Tata type flint	52	rough sandstone
13	Transdanubian radiolarite, reddish brown	53	quartzite
14	Transdanubian radiolarite — Sümeg flint	54	quartzose conglomerate
15	Transdanubian radiolarite, others	55	gabbro
16	Mecsek radiolarite, dark red	56	white–grey piroxenite?
17	Mecsek radiolarite, grey	57	other volcanite
18	Mecsek radiolarite, others	58	unspec. pebble mat.
19	Transdanubian radiolarite, Gerecse	59	mineral paints
20	Bükk radiolarite	60	lengyel quartzite
21	unspec. radiolarite	61	grey flint with small light grey spots (moravian?)
22	Tevel flint	62	grey flint matt light grey patterns (moravian?)
23	Jurassic Cracow flint	63	Csabdi silex
24	Volhynian flint	64	Mezőzombor type silex
25	Erratic baltic flint	65	"menilitovy rohovec" black, dark gray silex from E–Slovakia
26	Chocholate flint	66	Humenne radiolarite (?) striped grey–pink–orange–brown
27	Banat flint	67	Szeletian felsitic porphyry
28	J1 Bakony flint	68	black (Agostyán) radiolarite
29	translucent limnic quartzite, yellow–brownish	69	nephrite
30	translucent limnic quartzite, light yellow — white	70	Central banat flint (75) yellow, with rectangular Mn pattern
31	non–transparent limnic quartzite, yellow–white with molluscs	71	Volhynian var. Szeghalom dotted flint (43) brownish grey, transp., with 1–2 mm light dots
32	Ércelő type limnic quartzite	72	Szurdokpüspöki–Fony hydroquartzite–limnic quartzite transp.– transluc., rose–orange waxy shine
33	banded varicoloured Mátra limnic quartzite	73	Balkan flint
34	varicoloured jasper	74	Vitroclastic tuff
35	red jasper	75	Central Banat Flint
36	cinopel	76	dull dark brown silex with orange tint on fractures
37	lilac–white nontransp. Mátra limnic quartzite	77	Gorzsa brown silex, var. 2.
38	grey spotted porcelanish opal	78	Cornean
39	Mátraháza–Felnémet opal		
40	other opals		

Table 44.1: Categories of raw material types used - based on macroscopic analyses

source regions (Bíró 1991). Individual type groups were combined into the following units:

I. obsidian
II. limnic quartzite
III. Transdanubian radiolarite
IV. Mecsek radiolarite
V. Northern "import" flint
VI. Southern "import" flint

These categories seem to be meaningful in the context of Hungarian petroarchaeology. Altogether, they represent 82 % of the material investigated (91 % of chipped stone tools). For an estimation of the relative importance of these raw material type groups, Figure 44.12. give an overall impression on the contribution of these units to the Neolithic raw material stock, based on the analysis of current data (Biró 1991b). Their importance is even more striking if we consider that most of the "others" represent mainly polished stone tools and other utensils.

The actual amount of lithic materials on archaeological sites certainly tells quite a lot about quality. Once a raw material is **not** present in archaeological context around the sources, it is certain that it is of inferior quality. The mere scarcity of one type, however, does not necessarily mean inferior quality; some rare occurrences of distant material may signify very high quality. The problem here is rooted in the regional aspect of the analyses; the values presented are valid in the study region, but do not reflect a more "global" aspect.

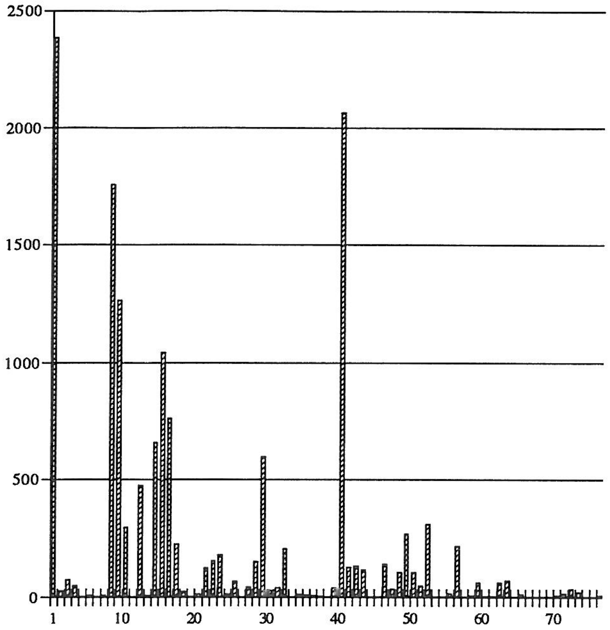

Figure 44.3: Amount of different raw material type groups on archaeological sites by number of pieces in order of raw material codes.

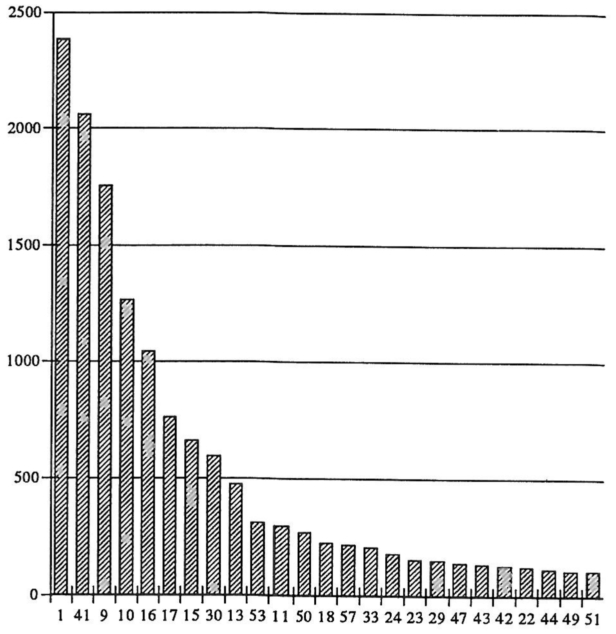

Figure 44.5: Most popular raw material types for retouched tools.

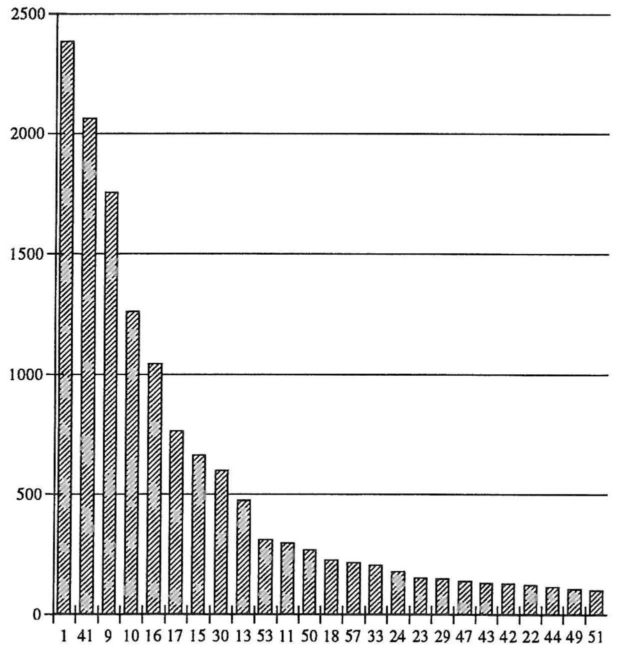

Figure 44.4: The most popular raw material type groups.

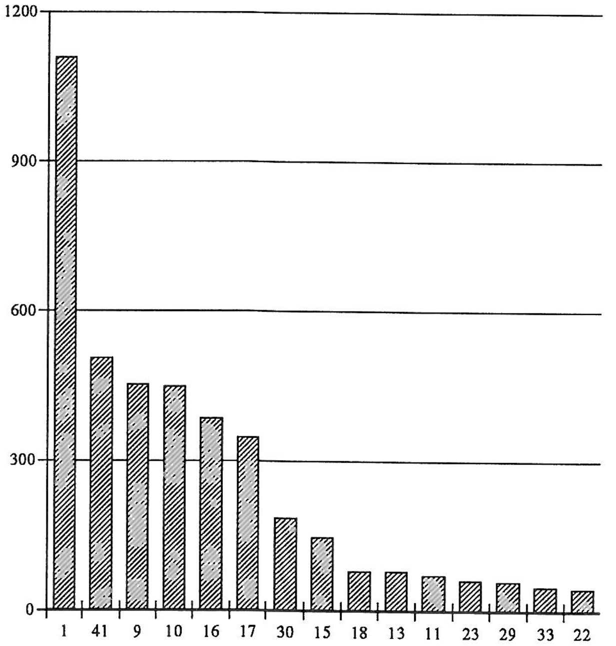

Figure 44.6: Most popular raw material types for blades.

44.4.2.2. Distance

The investigation of the actual values of distance from the sources is more problematic than mechanically plotting macroscopic "raw material type groups" against quantity. Not all of the sources are located precisely (or meaningfully), and quite a few raw material type groups could be assigned to a range of sources. The graph presented here is more an estimation than reality (Figure 44.7). With a more developed source identification and an effective GIS approach, the distribution radius will be possibly more reliable.

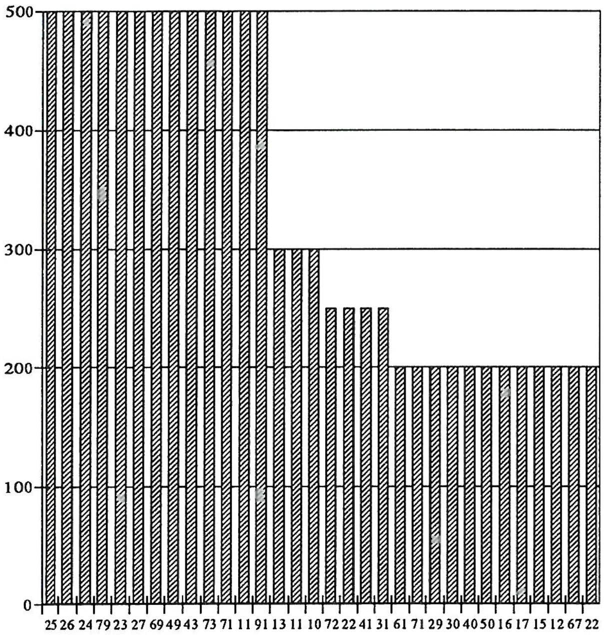

Figure 44.7: Distribution of individual raw material type groups according to maximal distance from the source (estimated values only).

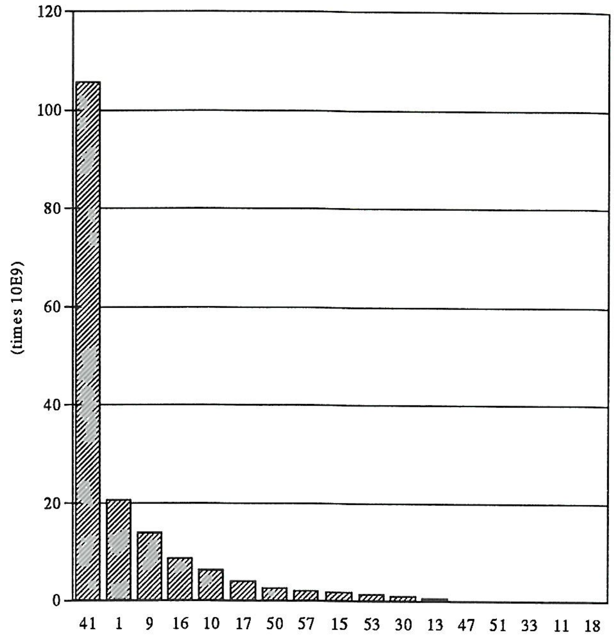

Figure 44.9: Most popular raw material types by volume.

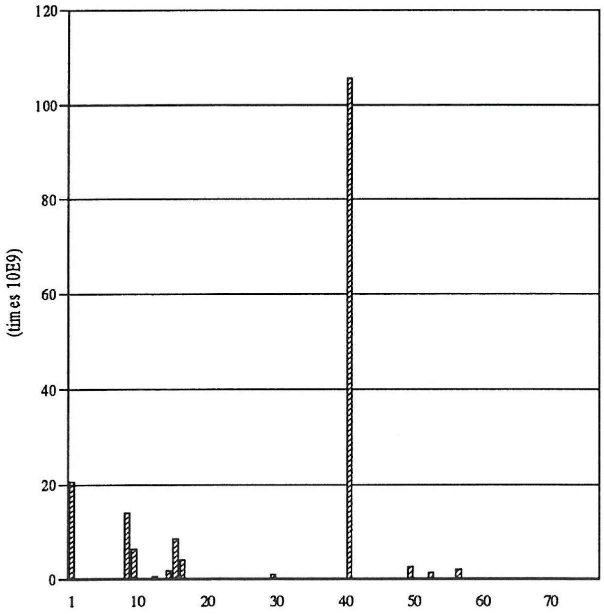

Figure 44.8: Volume of individual raw material types on archaeological sources, in order of raw material type codes.

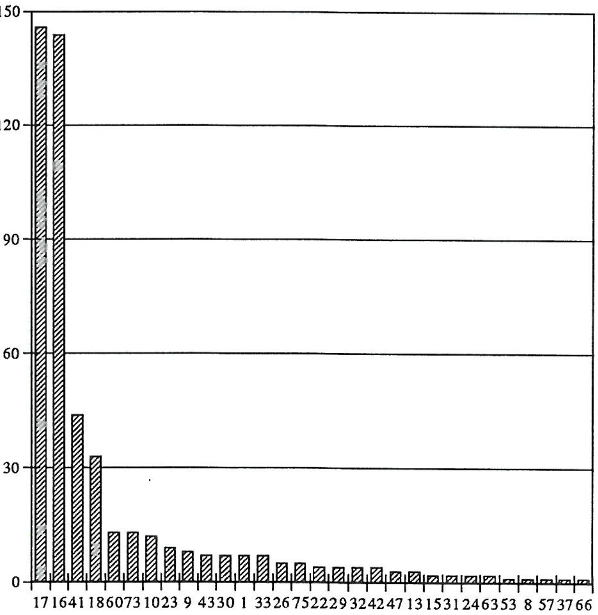

Figure 44.10: Number of blades over 50 mm.

44.4.2.3. Volume

Theoretically speaking, the actual importance of a raw material variety would be best reflected by the total amount of material used, probably taking into consideration the number of sources (exploitation sites) as well (Figures 44.8, 44.9). The values of volume would be most sensitive to typological filtering as well. Regional relevance of the analysis is also biasing these results. As the scope of analysis is restricted to the Carpathian Basin, the raw materials coming from beyond the Carpathians, undoubtedly high quality, "long dis-

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
length/width																				
- total, with uncertainly determined pieces	906	73	7	911	66	17	60	907	962	913	943	961	950	16	939	918	79	62	8	46
- total, without uncertainly determined pieces	73	7	66	17	60	16	79	62	8	46	18	25	75	43	49	26	21	1	22	61
- n>50, with uncertainly determined pieces	17	60	18	916	43	49	922	26	1	22	10	23	999	926	63	4	29	24	9	924
- n>50, without uncertainly determined pieces	17	60	18	43	49	26	1	22	10	23	63	4	29	24	9	3	11	47	64	15
length/height																				
- total, with uncertainly determined pieces	73	7	79	66	911	25	43	961	939	60	918	17	26	922	62	971	916	22	16	907
- total, without uncertainly determined pieces	73	7	79	66	25	43	60	17	26	62	22	16	1	23	18	61	75	8	71	24
- n>50, with uncertainly determined pieces	43	60	17	26	922	916	22	16	1	23	18	924	24	63	926	10	4	923	9	999
- n>50, without uncertainly determined pieces	43	60	17	26	22	16	1	23	18	24	63	10	4	9	29	3	64	11	49	30
length/width (for blades and related forms only)																				
- total, with uncertainly determined pieces	913	907	21	17	916	918	16	60	915	964	73	8	943	18	62	901	911	6	36	66
- total, without uncertainly determined pieces	21	17	16	60	73	8	18	62	6	36	66	26	4	10	43	2	11	75	31	61
- n>30, with uncertainly determined pieces	17	16	60	18	10	43	11	23	1	22	9	999	29	13	924	922	15	941	33	41
- n>30, without uncertainly determined pieces	17	16	60	18	10	43	11	23	1	22	9	29	13	15	33	41	42	30	-	-
length/height (for blades and related forms only)																				
- total, with uncertainly determined pieces	73	6	918	916	21	911	907	26	24	8	943	913	17	25	43	18	16	22	60	2
- total, without uncertainly determined pieces	73	6	21	26	24	8	17	25	43	18	16	22	60	2	4	23	1	10	11	66
- n>30, with uncertainly determined pieces	17	43	18	16	22	60	924	23	1	922	10	11	9	999	923	13	29	941	15	41
- n>30, without uncertainly determined pieces	17	43	18	16	22	60	23	1	10	11	9	13	29	15	41	30	33	42	-	-

Table 44.2: Technological indices. Highest values in descending order for the individual raw material codes.

tance" materials, appear as low values because the study area is only marginal with respect to their distribution (Figure 44.2).

44.4.3. Technological indices

Distribution data on the archaeological sites certainly have some implications concerning quality. At the same time, this feature does not directly reflect technical merit and aesthetic requirements, and one can argue that availability is more important in distribution frequencies than quality. Let us go further then in our prehistoric quality test.

As indices of the work potentials, the following criteria were tested:

- length/width (also for n>50)
- length/height (also for n>50)
- length/width (for blades and related forms only; also for n>?50)
- length/height (for blades and related forms only; also for n>50)
- maximal length according to main type groups
- minimal length according to main type groups
- maximal length of blades

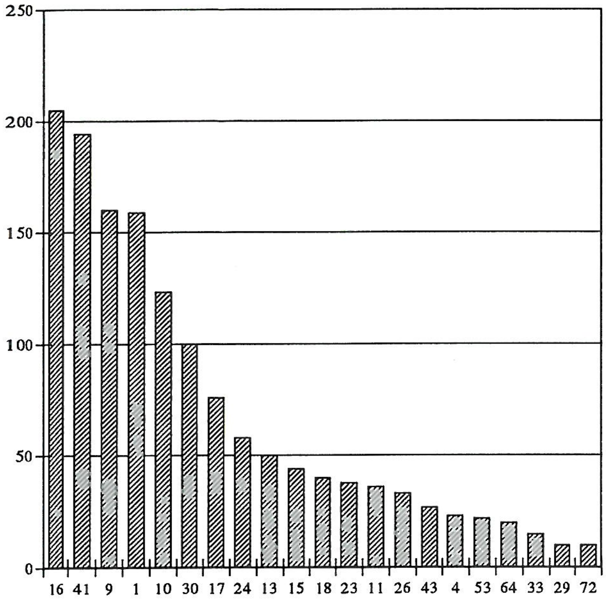

Figure 44.11: Number of retouched tools under 30 mm.

- minimal length of retouched tools

The range for the total assemblage for length/ width is typically 3.3 — 1.1, very seldom under 1, with mean value of 1.7. The same values for length/height range between 9.9 — 1.9, with mean value of 5.2. In table 2, the individual raw material type groups are ranked in descending order. Filtering out uncertain determinations (codes over 900) and casual finds (less than 50 pieces), the values seem to get more and more meaningful. Filtering on typological categories (in this case, blades) helps even more to find out about the technological merits of the raw material.

In general we can say that technological indices are very much dependent on typological filtering and state of use; also, in spite of the relatively large sample size, the number of items in individual raw material categories can be very low. The results of technological tests are summarised on Table 44.2 and Figures 44.10 and 44.11.

44.4.4 Aesthetics

The choices of prehistoric people were obviously influenced by aesthetic factors as well. Raw material varieties of seemingly identical geological and mechanical features are not used equally, especially not at the long–distance level. This is reflected, within the material studied, in the preferential use of transparent–translucent (Carpathian 1 type) obsidian compared to less popular obsidian types (Carpathian 2T and Carpathian 2E, respectively) or the preferential use of vivid red "Szentgál type" radiolarite within the radiolarites in general. This latter effect was studied in detail in connection of the distribution of Szentgál radiolarite and other radiolarites (Biró–Regenye 1991, esp. figs. 8–9).

44.4.5 Temporal changes

Quality, or better the choices of prehistoric people are also dynamically changed with time. As for the temporal changes, the tendencies are fairly clear, but due to the randomness associated with sampling it is not possible to give good quantitative estimations among raw material varieties. Some raw material types, however, are known to have been restricted to certain periods (e.g., Szeletian felsitic porphyry to Middle and Early Palaeolithic, Tevel flint to Late Middle Neolithic — Early Late Neolithic. Short range changes in "popularity" seem to indicate historical influences rather than changes in quality concepts.

44.5 CONCLUSIONS

The above factors did not unambiguously furnish us with data on quality. Frequency at archaeological sources, and suitability for certain functions seems to add considerable information. The best indirect marker, in all probability, is distance

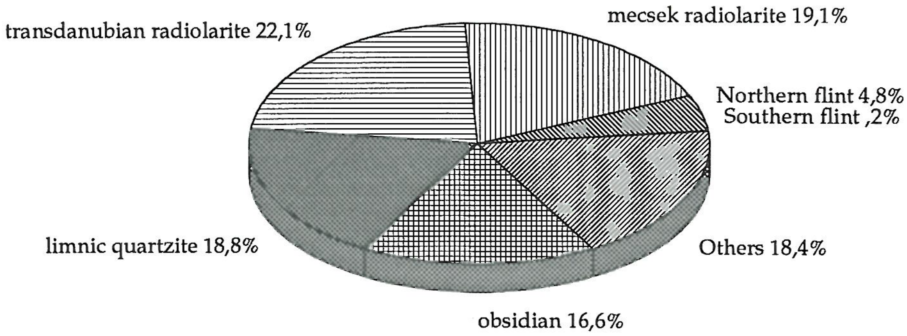

Figure 44.12: Contribution of raw material type groups to the lithic raw material supply (1: obsidian, 2: limnic quartzite, 3: Transdanubian radiolarite, 4: Mecsek radiolarite, 5: Northern "import" flint, 6: Southern "import" flint).

from sources. Unevenness of sampling and the limits of the geographical frame also hinder final conclusions. Still it is evident that prehistoric people had a very clear notion about the quality of raw materials, and selected them preferentially for the bulk of the lithic artefacts produced.

The problem we were concerned about in this study was what was considered good and bad in the lithic raw material at the disposal of prehistoric people. We ended up with a "qualification table" according to our analysis, but did not make much effort to answer "why?". This is a question to be answered after more detailed physical, petrological and statistical analyses.

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