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THE UPPER PALAEOLITHIC LEVALLOIS INDUSTRY FROM HRADSKO (MĚLNÍK DISTRICT, CZECH REPUBLIC)

ABSTRACT: The Aurignacian industry from Hradsko (Mělník district, Czech Republic) has already been statistically compared to assemblages which were somewhat later classified as Bohunician (Vencl 1977). Since that time, this industry has not been given closer attention. The authors performed a technological analysis of the Hradsko collection and compared the production methods applied there with Bohunician assemblages from Moravia. Hradsko currently represents the westernmost territory hitherto described in the Czech Republic with probably Bohunician technology.

KEY WORDS: Bohemia – Aurignacian – Bohunician – Lithic technology – Levallois method – Comparative study

INTRODUCTION

In recent years increasingly greater attention has been devoted to the study of Early Upper Paleolithic technologies in Moravia, in particular the relationship between the Szeletian and the Bohunician, in whose contact zones collections with mixed features have been found, e.g. Mohelno (Škrdla, Plch 1993), Ořechov I (Nerudová 1999a, b). This has led to an attempt to give the most precise possible definition of, in particular, the Levallois method in the individual collections with regard to other features (the presence of bifacial tools, Aurignacian tools, etc.) and thus to determine the meaning of individual technological characteristics, which would in turn allow the mutual relationship between cultures of the EUP complex to be better defined. For this reason, it is essential to thoroughly analyze as many collections as possible in which these technological and typological features are mixed, including those from areas that are relatively remote from the principal territory in Moravia.

In this regard, the collection from Hradsko is an ideal assemblage, for it represents an open-air site with a sufficiently numerous assemblage of chipped industry, which was originally classified as Aurignacian with "Levallois types" (Vencl 1977). This classification indicated a certain analogy with those finds in Moravia showing the use of the Levallois method, but it was necessary to define the nature of the aforementioned "Levallois types" in greater detail. The aim of the present analysis was above all to specify the Levallois and non-Levallois reduction strategy and compare these technological procedures with well-known collections of Moravia.

TECHNOLOGICAL ANALYSIS OF THE HRADSKO COLLECTION

Methodology

The collection was studied from the technological point of view, focusing on reconstructing the method of production (in the case of cores, the mode of exploitation and organization of striking platforms; in the case of debitage, treatment of the talon and possible inclusion in the Levallois or non-Levallois category) and on the metrics of the artifacts. All the features were then observed separately for the various kinds of raw materials used; these were distinguished only macroscopically (Vencl 1977).

The artifacts were classified into one of several metrical

TABLE 1. Relations between platform and raw material. D1 dihedral, D2 dihedral transverse, F1 faceted left, F2 faceted right, F3 „chapeau de gendarme", F4 faceted linear, F5 faceted simple.

	Platforms												
	flat	linear	cortical	pointed	D1	D2	F1	F2	F3	F4	F5	Total	%
"flint"	93	19	8	23	17	13	21	10	24	9	7	244	63.54
%	38.11	7.79	3.28	9.43	6.97	5.33	8.61	4.10	9.84	3.69	2.87	100.00	
tuff	31	12	0	14	8	3	2	6	2	2	2	82	21.35
%	37.80	14.63	0.00	17.07	9.76	3.66	2.44	7.32	2.44	2.44	2.44	100.00	
orhtoquartzite	24	7	7	3	5	0	0	0	0	0	0	46	11.98
%	52.17	15.22	15.22	6.52	10.87	0.00	0.00	0.00	0.00	0.00	0.00	100.00	
chert	1	1	0	4	2	0	0	0	0	0	0	8	2.08
%	12.50	12.50	0.00	50.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	
quartz	1	0	0	0	0	0	0	1	0	0	0	2	0.52
%	50.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00	0.00	0.00	0.00	100.00	
red silicite	0	0	0	0	0	1	0	1	0	0	0	2	0.52
%	0.00	0.00	0.00	0.00	0.00	50.00	0.00	50.00	0.00	0.00	0.00	100.00	
Total	**150**	**39**	**15**	**44**	**32**	**17**	**23**	**18**	**26**	**11**	**9**	**384**	**100.00**

TABLE 2. Relation between metric classes and raw material. A–E cf. section "Methodology".

	Metric classes						
	A	B	C	D	E	Total	%
"flint"	48	89	15	1		153	51.69
tuff	18	58	12	2		90	30.41
orhtoquartzite	2	21	15	5	1	44	14.86
chert	1	3	2			6	2.03
red silicite		2				2	0.68
quartz			1			1	0.34
Total	**69**	**173**	**45**	**8**	**1**	**296**	**100**
%	**20.00**	**64.44**	**13.33**	**2.22**	**0.00**	**100**	

categories with the help of concentric circles with radii at intervals of two cm, inside which the artifacts were placed. The individual categories were designated as follows: A – up to 2 cm, B – 2.1–4 cm, C – 4.1–6 cm, D – 6.1–8 cm, E – 8.1–10 cm.

Classification of the artifacts

As the previously published results indicated, the fact that part of the industry – comprising final blanks and tools – is missing, must be borne in mind when evaluating it; most of the types that have been preserved are negligible (Vencl 1977, 20). This therefore involves a certain negative selection, containing in particular residuals and fragments of cores, a large number of fragments of flakes and blades, defective tools, and some flakes and blades from the preparation and re-preparation stage of core reduction (see section "Debitage").

Raw materials

This petrographic identification of the raw materials is based on the original study (Vencl 1977, 16–20), the category "cherts" not having been more precisely differentiated. Thus our assessment of the technological character of the collection was based on a comparison of the following types of raw materials: siliceous rocks (flints), cherts (not further differentiated), red sillicites (cf. jaspers or radiolarites), tuffs[1], orthoquartzites (including Bečov and Skršín types) and quartzes. The sample observed represents a complete qualitative scale, ranging from easily chipped but fragile materials (Levallois and Upper Palaeolithic types of tools) to materials that were more difficult to chip but also more resistant (choppers, e.g. *Figure 3: 7*).

The most frequently encountered raw material in the Hradsko collection is siliceous flint imported from the northern limits of Bohemia, from moraines or fluvioglacial deposits at a distance of at least 50 km. Its relative frequency with regard to the other groups is somewhat distorted, due to the many small flakes and scales under 2 cm in size which make up more than a third of the collection (of measurable items) (*Table 2, Figure 5*). In terms of dimensions, flakes of 2–4 cm in size are the most abundantly represented, with only one item falling into category D (8 cm).

The second most frequently represented raw material is tuff, which is likewise significantly represented in size

1 tefritic basalt, porcelanite and slate are included into the one category (macroscopically indeterminable)

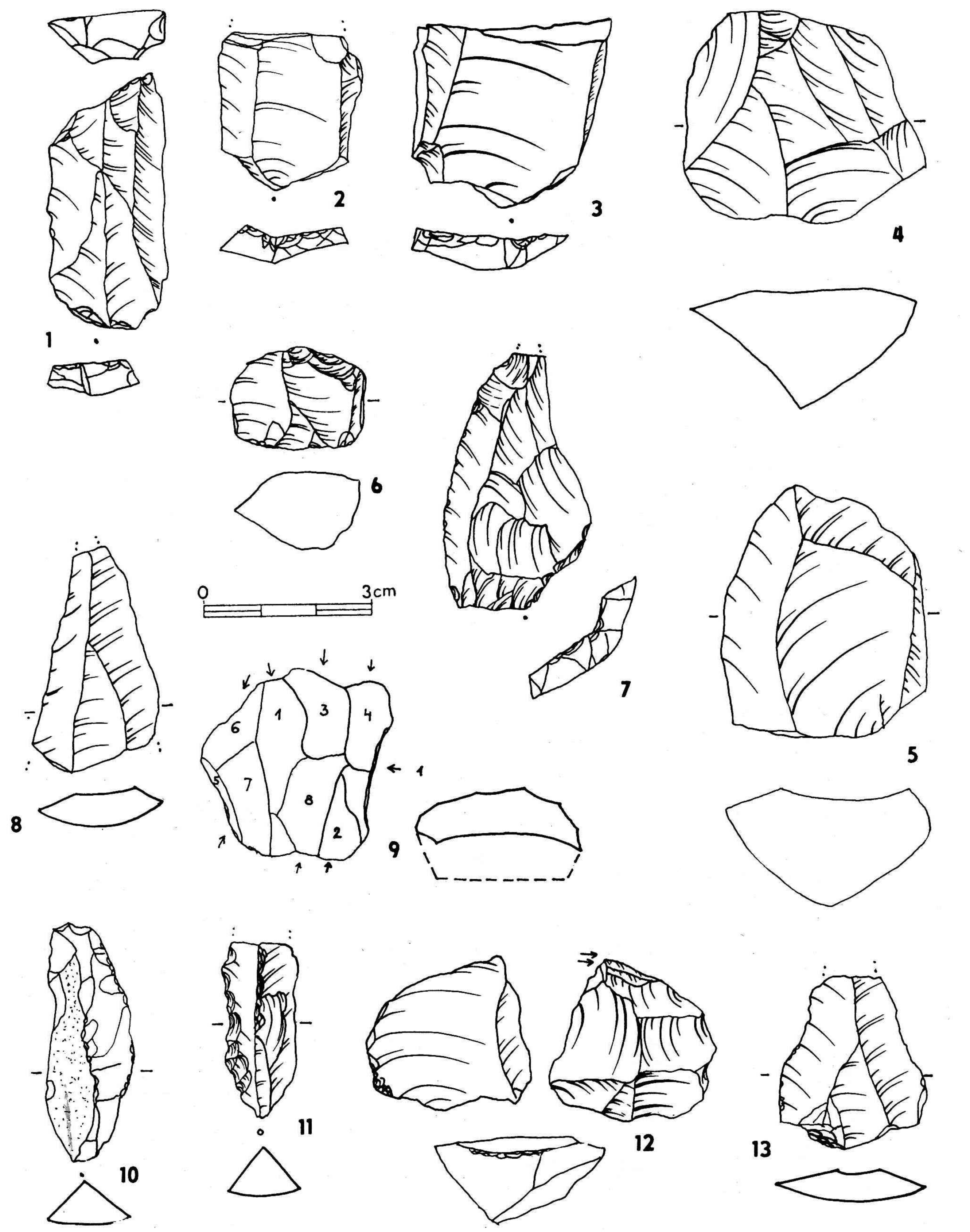

FIGURE 1. Hradsko. 1–3, 7 Levallois blanks; 8, 13 Levallois points; 4, 5 Levallois cores (tuffs); 6 final modification of Levallois core; 9 Levallois core (cf. Vencl 1977, 14:2); 10–11 crest blades (11 laterally retouched), 12 burin on Levallois (?) core.

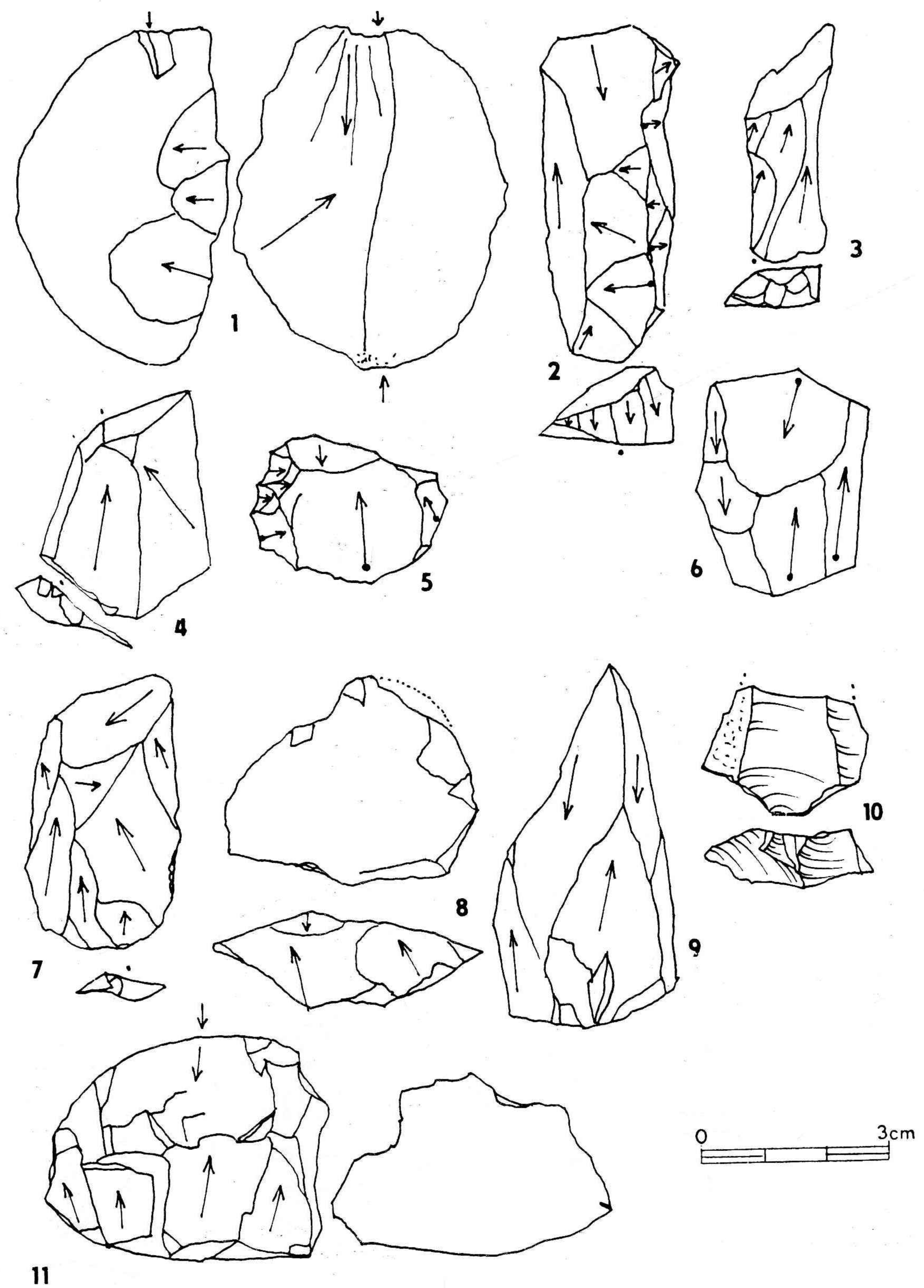

FIGURE 2. 1 Fragment of stone hammer with 3 lateral scars (quartz); 2 lateral Levallois blade; 3–4, 6, 7 Levallois removals; 5, 8 abandoned Levallois cores, 9, 10 Levallois bidirectional points; 11 bidirectional prismatic cores.

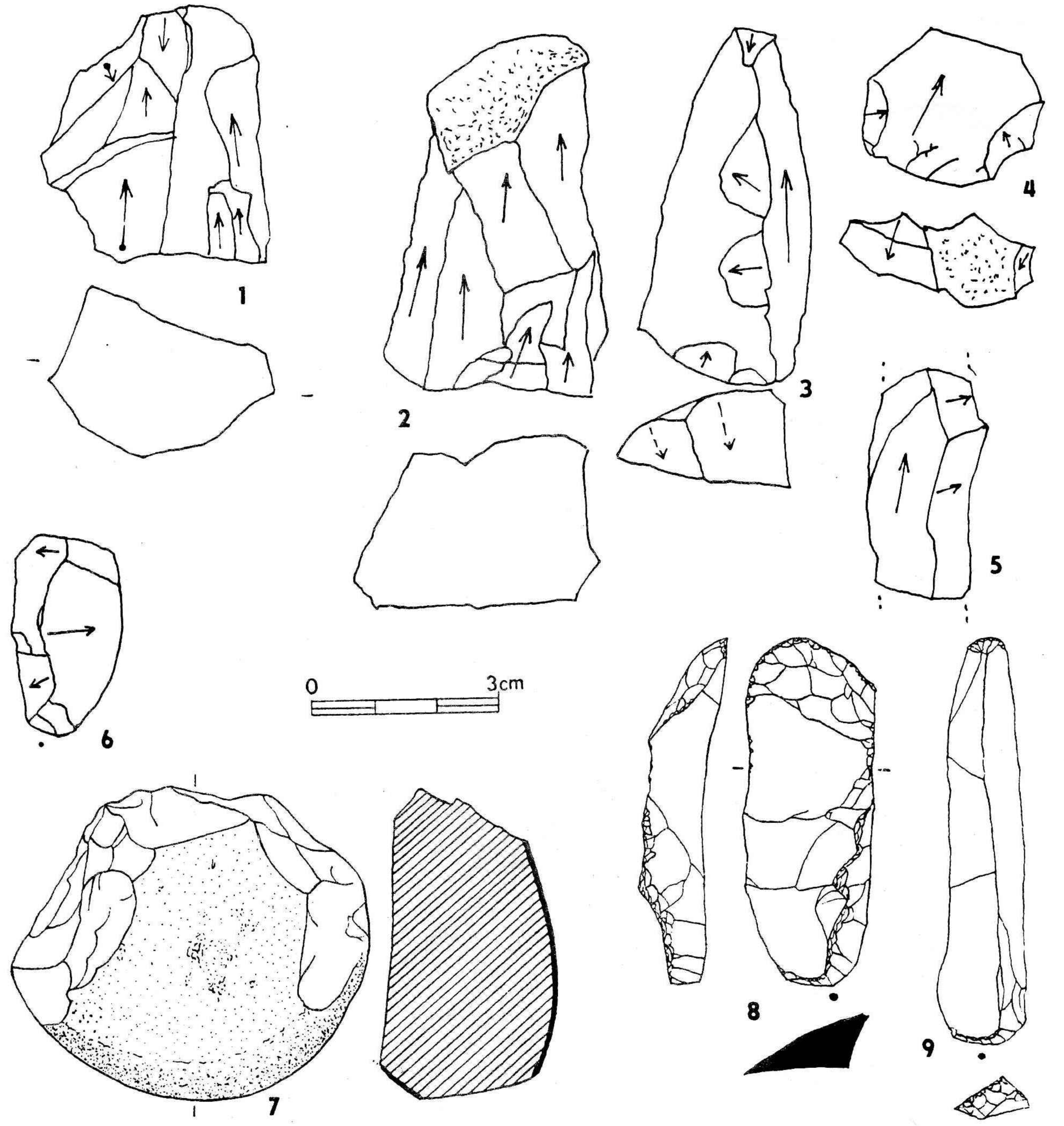

FIGURE 3. 1 Bidirectional prismatic core (orthoquarzite), 2 unidirectional prismatic core (orthoquarzite); 3 crest blade (orthoquarzite); 4 abandoned Levallois cores, 5 undercrested blade; 6 crested removals, 7 chopper (orthoquarzite), 8 scraper on lateral Levallois blade, 9 scraper on Levallois blade; (7–9 after Vencl 1977).

category A (under 2 cm – 20%). As in the case of the flints, the maximum representation of this group is in category B. Somewhat paradoxically, its ascribed use may stem from its current state of preservation. Its surface is very highly corroded, so that traces of scars, retouching and talon modifications have been erased to a considerable degree (compare Vencl 1977, 16). However, some items have been so well preserved as to clearly demonstrate their intentional use, and indicate that the "fresh" raw material was easy to chip, with clear, conchoïdal fractures and a high-quality edge. In qualitative terms, it is closest to the porcelanites. This raw material likewise must have been imported to the locality, specifically from the Bohemian Midlands region.

Chert and redbrown sillicites are represented in the collection by isolated pieces only, not exceeding 6 cm. Likewise, quartz has been positively identified on the basis of a single flake.

Quality orthoquartzite plays an important role in the collection; thanks apparently to its local origin and the original dimensions of the raw material, it demonstrates the greatest size variability (up to 10 cm). But even in this case, the greatest number of flakes are in size category B.

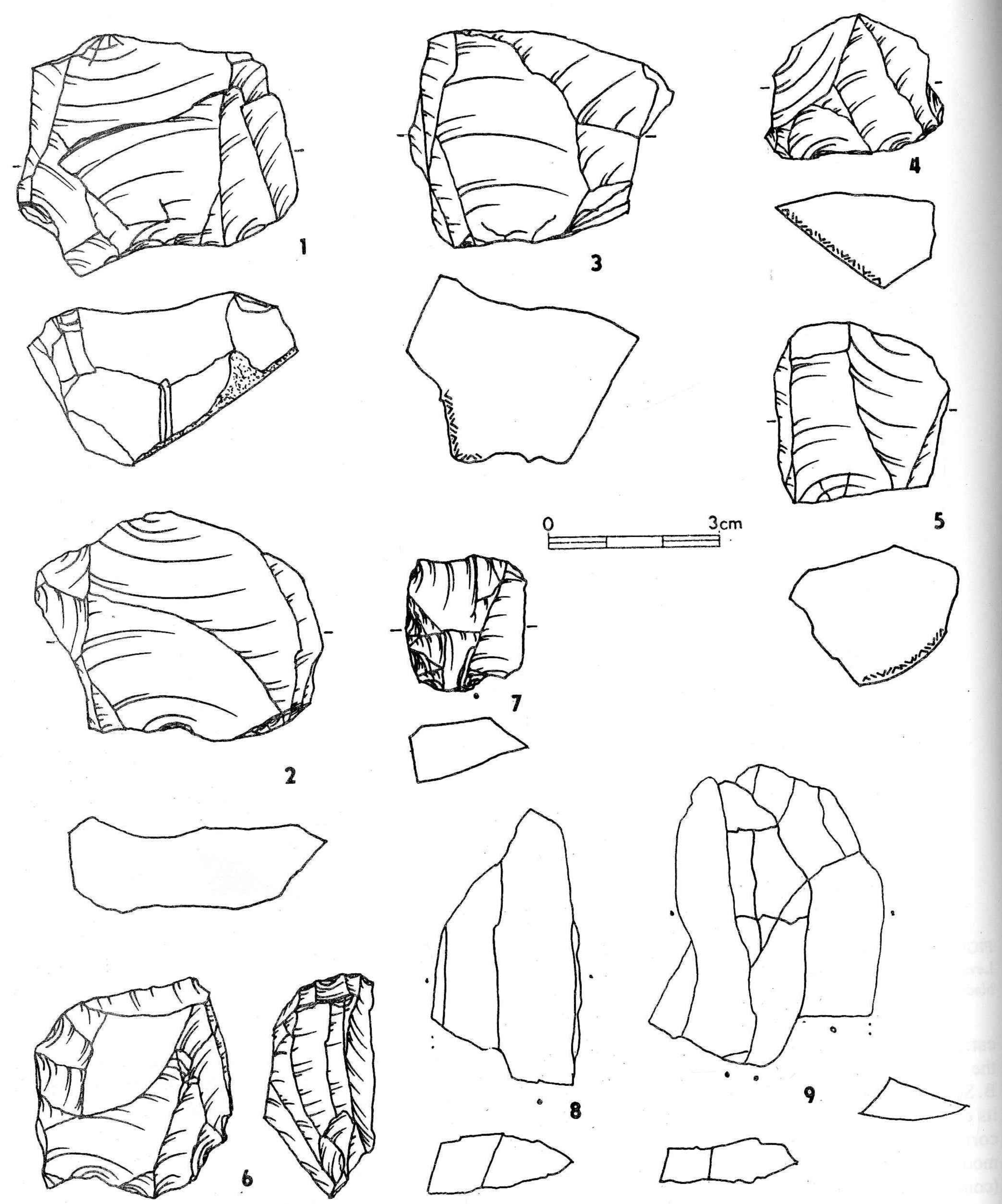

FIGURE 4. Ondratice-Kluče (1–7), Hradsko (8–9). 1–5 Levallois cores, 6 Levallois core with lateral prismatic exploitation of blades, 7 lateral flake, 8, 9 refitting of blanks; 1 radiolarite, 2 chert of Stránská skála, 3, 5 spongolite, 4 chert of Krumlovský les, 6, 7 jurassic chert, 8, 9 tuff.

TABLE 3. Relation between crested and lateral removals and raw materials.

	Types of removals					
	unifacial crest blank	bifacial crest blank	secondary crest blank	prepared lateral removals	natural lateral removals	Total
"flint"	12	4	3	4	2	25
orthoquarzite	1			1		2
rock?		1				1
chert						0
red silicite						0
tuff						0
quartz						0
Total	**13**	**5**	**3**	**5**	**2**	**28**
%	**46.43**	**17.86**	**10.71**	**17.86**	**7.14**	**100.00**

TABLE 4. List of cores.

Cores			%
Precores		4	21.05
Prismatic	unidirectional	2	10.53
	bidirectional	2	10.53
	changed orientation	2	10.53
Levallois core	centripetal	3	15.79
	unidirectional	1	5.26
	bidirectional	4	21.05
Abandoned		1	5.26
Total		**19**	**100.00**

Cores

The cores that have been preserved represent all stages of the reduction strategy (*Table 4*). The initial stage of preparing the core (pre-cores) is represented only rarely. Cores which may be subjectively regarded as exploitable, even though their dimensions are relatively small, are predominant. The process of preparing the cores is supplemented by core fragments and residuals. It can only be speculated as to why the collection contains cores whose maximum length does not even reach 2 cm (*Figure 1:6*).

Differentiation between the cores found here is most marked on the technological level. There is a clear division into two technological procedures – the Upper Paleolithic prismatic core reduction strategy and the "Levallois" core reduction strategy; however, these also occur together in several artifacts. Cores of the Upper Paleolithic type are found in all the raw material groups described, and this represents the sole reduction strategy in the case of the orthoquartzites (*Figures 2:11, 3:2*). Unidirectional cores are predominant (*Figure 3:2*). With regard to their advanced state of exploitation, it is difficult to determine to what degree they were prepared, but the crest blades found here allow to infer that the original raw material had been modified at least into the form of a core with a frontal crest or with parallel edges.

Levallois cores have been preserved mainly in the form of bi-directional cores, but there is also a centripetal core for one pre-determined flake of very small dimensions (*Figures 1:5, 2:5, 8, 3:4*). However, it is known from the refitting at Stránská skála (Škrdla 1994, 1996) that the latter type could also have originated as the residual of a core that originally had two opposite striking platforms, designed for making blades. The dimensions of the core, however, would not permit such a use. Most frequently, the exploitation surface is oval or square in shape (length and width showing similar values). Length predominates only in exceptional cases. In the case of Levallois cores, it is also difficult to reconstruct the preparation stage of the core. Based on the extant indications, it is evident that lateral preparations were very modest. Greater attention was paid to the preparation of the striking platforms.

One feature analogous to the Levallois cores from Stránská skála is the orientation of the scars in bi-directional Levallois cores. The scars display "rotary" coils along their axial surfaces. This phenomenon has been observed in the case of small cores from which flakes were struck off along both striking platforms, with an orientation towards the right lateral relative to the striking platform used. It may be supposed that such an orientation is connected with the final stage of reduction.

As in the Bohunician, some Levallois cores were reoriented towards the side edge, which was subsequently used as a crest blade typical of the Upper Paleolithic reduction strategy (*Figure 3:1*). Such attempts to exploit pieces of raw material to the maximum did not, however, have the best results, and most of these pieces were abandoned following feathered or hinge termination of removals.

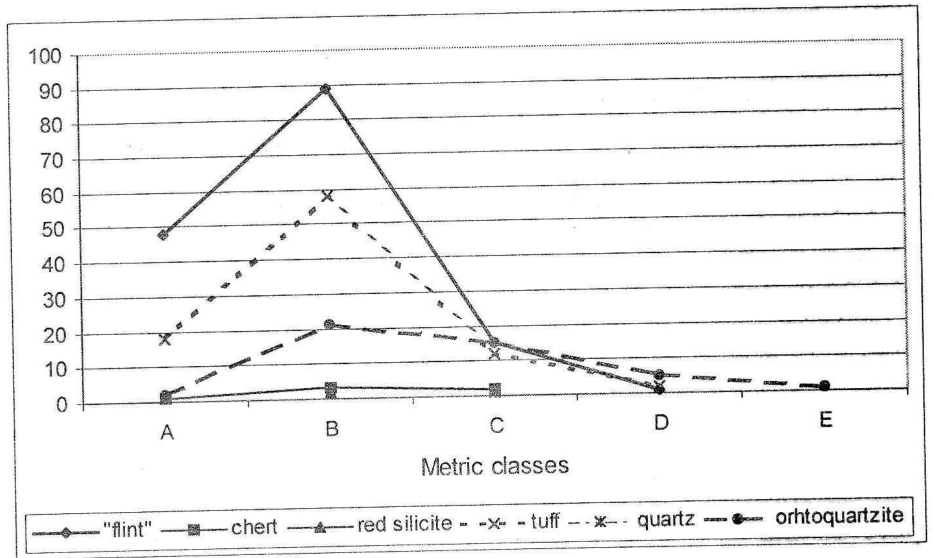

FIGURE 5. Relation between metric class and raw material (A–E cf. section "Methodology").

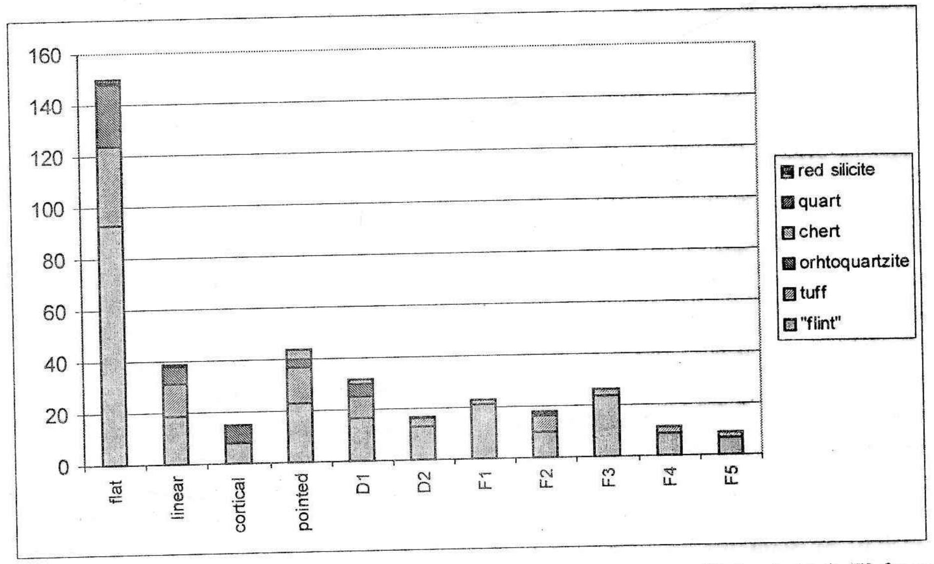

FIGURE 6. Relation between platform and raw material. D1 dihedral, D2 dihedral transverse, F1 faceted left, F2 faceted right, F3 "chapeau de gendarme", F4 faceted linear, F5 faceted simple.

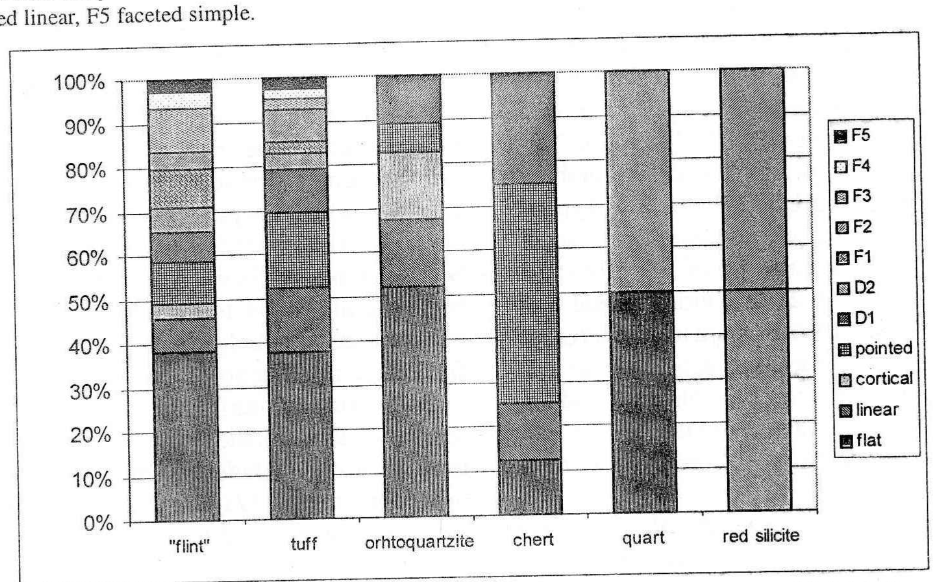

FIGURE 7. Relation between raw material and platform. D1 dihedral, D2 dihedral transverse, F1 faceted left, F2 faceted right, F3 "chapeau de gendarme", F4 faceted linear, F5 faceted simple.

Debitage

Any overall characteristics of the debitage from the given site must be somewhat distorted by its incompleteness. Most of the final products are evidently missing here, whether we regard these as blanks used as tools or as blanks (blades) without cortex (see classification of the artifacts above). The artifacts that have been preserved allow to set forth several facts which add to the overall picture of production in the chipped industry.

The collection contains products derived from both Levallois and non-Levallois core reduction strategies. Strict differentiation between them is often difficult, and so we will limit ourselves to simply confirming the presence of these two methods. Only blanks with a faceted talon, or those artifacts designated as Levallois points, may be more easily distinguished (*Figures 1:1–3, 7, 8, 13, 2: 2–4,7, 10*). The latter are represented in the collection by only several items, but a comparison of scars on the core would seem to indicate that Levallois points represented a significant final product comparable to points from the Moravian Bohunician (*Figures 1:8, 13, 2:10;* cf. also Levallois blade *Figures 1:1, 3: 5, 9*). Faceted platforms are most highly represented in the case of siliceous flints and tuffs (*Table 1, Figures 6–7*). This would suggest a link between the Levallois method and higher quality, soft-grained raw materials. However, such a conclusion is hindered by the presence of siliceous artifacts with other kinds of talons than faceted ones (flat, linear, pointed, dihedral). In terms of percentages, such instances occur even more frequently, indicating that the exploitation of siliceous cores was also conceived in a non-Levallois manner (prismatic cores). This was confirmed by a comparison based on analysis of the cores, which showed that the production methods employed were not predetermined by the type of raw material used. Orthoquarzite is somewhat an exception to this conclusion, showing a high percentage of flat talons and no faceted ones, and thus suggesting a dependency on a non-Levallois reduction strategy.

One major problem concerning the EUP industry is the classification and mutual differentiation of frontal ridges (*Figures 1: 10, 11, 3: 6*) and Levallois blades from the lateral part of the core (*Figures 2: 2, 3, 3: 8*). The symmetry of the central (formed) crest with the axis of the object and the position of the striking point has been defined as the criterion for such a differentiation. This differentiation criterion has been verified by comparing these features in the case of blanks with faceted talons. In such instances, the given features have been shifted outside the axis, and we consider this a typical feature of Levallois lateral removals. An overview of the classification of blanks of these types yields a rather surprising discovery (*Table 3*). They are significantly represented only in the case of siliceous flints, while they are represented among the other raw materials only in the case of orthoquartzite and an unidentified rock. Considering that this does not, for the most part, involve successful pieces with parallel edges or larger dimensions, we may suppose that frontal ridges and lateral blanks were also removed from the site together with the "final debitage".

The almost complete absence of tablets of the Upper Paleolithic type is rather surprising. Treatment of the striking platform apparently took place in some manner other than by chipping off a flake which re-prepared the entire striking platform.

Refittings

Although the tuff part of the industry was the most damaged, the authors have been able to refit several blades (*Figures 4:8, 9*) which offer proof of serial production. Among other things, this reconstruction provides evidence of the authenticity of the tuff industry, as well as the possibility of continuing with such refitting work.

Reconstruction of production methods

A relatively diverse range of raw materials were worked at this site; however, its economic foundation was formed by siliceous flints, orthoquartzites and tuffs. In processing these, both the Upper Paleolithic blade methods of making blanks from a prismatic core with a frontal ridge and the Levallois method of making blades (flakes) or points from bi-directional cores were used. Considering the high degree of exploitation, it is not possible to determine the mutual relationship between the two methods. In some cases, the Levallois core reduction strategy was completed by reorienting the core onto its edge, with a subsequent attempt at reduction using the Upper Paleolithic method. This phenomenon may not be generalized to apply to all Levallois cores, as we have evidence of highly worked pieces which show traces of the Levallois method of hammering exploitation.

Nor may these methods be differentiated from the point of view of the raw materials used. Both siliceous flint and tuff were worked using the same process. The sole exception constitutes the quartzes which, based on the pieces that have survived, were chipped using exclusively the Upper Paleolithic method.

In general, both reduction strategies were aimed at producing blade-type products (in metrical terms, sometimes flakes) and points, very few of which have survived, however, since quality pieces were apparently removed from the locality. These two methods involved a very intensive method of production, as is evidenced by the very small core remnants.

Such detailed working of the core does not represent a cultural phenomenon, as it also occurs, for example, in the Taubachian and Micoquian levels of Kůlna (Neruda, *in press*) and is also fairly common in Szeletian localities, e.g. Ořechov I, II (Nerudová 1999b) and Drysice III, IV, V (Nerudová *in press*).

CLASSIFICATION OF THIS INDUSTRY IN THE CONTEXT OF THE EUP INDUSTRY

We can seek analogies in, e.g. the industry from Mohelno, which also has a very high Ilty index (Oliva 1986, Škrdla 1998). Here the Levallois component is tied not only to chert from Stránská skála, but to other raw materials as well, in the same percentage ratio. The dominant raw material here is chert of the Krumlovský les type, together with radiolarite and Moravian Jurassic cherts (Škrdla, Plch 1993).

A raw materials economy similar to the one in Hradsko may also be found, for example, in the Early Upper Paleolithic ensembles around Ondratice (Ondratice I, III, IV, V, VII, Svoboda 1980, Drysice III, IV, V, Nerudová *in press b*, Valoch 1967, 1983; *Figure 4: 1–7*). There was abundant exploitation of local orthoquartzites in this area, while local chert and a chalcedony-like material of opal-jasper consistency from the near vicinity were also used (Nerudová 1995, based on determination by Přichystal), as was imported radiolarite (in the most varied colour types, which may indicate diverse sources), flint (likewise of varied provenience) and spongolite from more remote locations. Chert of the Krumlovský les and Stránská skála type was used as well. The orthoquartzite industry forms an essential part of the operational scheme in Ondratice (not only at position I, but also at all others where orthoquartzites were used), thus representing a specific industry akin to the collection from Hradsko. However, while in Hradsko the basic raw materials are in the same size categories, in Ondratice (at any position) the orthoquartzite artifacts logically fall into the category with the largest overall dimensions, while the siliceous industry differs by its smaller dimensions and, as J. Svoboda points out, the lower number of examples of the Levallois technique (Svoboda 1980, 1994, 102; Nerudová, *in press b*).

Vencl places the Hradsko industry in the middle phase of the Aurignacian: "... the Hradsko industry is closest to the assemblages from Stránská skála and in particular Podstránská, to which it is likewise connected by the abundant use of modifications of the striking platforms of blades and flakes" (Vencl 1977, 34). The objects discovered here demonstrate a number of features in common with Bohunician material from Moravia. The principles of reducing Levallois cores are basically identical, with all their technological finesses. Compared to Stránská skála III, the Upper Paleolithic processing of the raw material using prismatic cores with a frontal ridge is more developed here, and is comparable to the Aurignacian ensembles, whereas this is evidenced at Stránská skála III only by several less conclusive objects. This feature, however, would seem to have a diminished value as evidence, since the re-assembly of Bohunician material from adjacent positions indicates the presence of an advanced Upper Paleolithic method in the Bohunician context, even in some sort of symbiosis with the Levallois method.

The typological composition of the industry is not particularly conclusive. Aurignacian types are not especially numerous, and may have occurred in common with other types in the Bohunician context as well. If we do not know the precise age of the industry, we cannot rule out the possibility of its assimilation to the Aurignacian. However, the way in which the technological phenomenon of the Levallois method arrived and was codified in an Early Upper Paleolithic environment in Bohemia, cannot be specified. Neither is the question of the origin of this method in Bohemia any clearer, for here, in contrast to Moravia, the Levallois method of hammering may be found in the Middle Paleolithic.

One rather distinguishing feature of the Hradsko collection is the predominance of imported raw materials. In the context of the EUP complex, such a model of distribution is more familiar from the Aurignacian than the Bohunician or Szeletian, where the processing of local raw materials is more prevalent. This would then confirm the original classification.

From the technological point of view, the Hradsko collection may be classified rather as a Bohunician than a Szeletian Levallois technology. Cultural classification with the Bohunician is, however, more problematic (Nerudová, *in press a*). It remains a question whether the presence of the Levallois method, indicating a different "cultural" classification in a typological context (Aurignacian, Szeletian), is sufficient for classifying the collection with the Bohunician. We could say that, at present, Hradsko represents the westernmost territory of the Levallois technology of the EUP complex in the Czech Republic. It is most likely an Upper Paleolithic industry with a very strong Levallois component, which is most similar to the Bohunician of Stránská skála III–1 (Valoch, Neruda, Nerudová 2000) or Brno-Bohunice (Valoch 1976).

CONCLUSION

The Bohunician reduction strategy was not exclusively tied to the Brno Basin region and Jurassic chert from Stránská skála, but flexibly adapted itself to other quality raw materials, in rare instances also appearing, in unaltered form, in regions that were very distant from each other. In other locations than those near Brno it appears in the context of Early Upper Paleolithic cultures, in Moravia most frequently the Szeletian, in Bohemia probably the Aurignacian. The fact that the Bohunician method appears, in rare instances, in all EUP industries in surprisingly unaltered form makes the actual classification of individual cultural relationships between representatives of the given cultural traditions more difficult.

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