PETR NERUDA · ZDEŇKA NERUDOVÁ

MORAVSKÝ KRUMLOV IV – A NEW MULTILAYER PALAEOLITHIC SITE IN MORAVIA

GEOGRAPHICAL OVERVIEW

The site of Moravský Krumlov IV (MK IV) lies in the Krumlovský Les (Krumlovian Forest) region which is well known as a source of the local chert (Neruda 2009a). This hilly area is situated 40 km southwest of Brno, with its axis running SSW-NNE (**fig. 1**). Most Palaeolithic sites are concentrated on the eastern slopes and they are separated by a series of valleys and distinct ridges facing south-southeast. Quaternary sediments more than 10 m thick are deposited on one of the eastern ribs in the Krumlovian Forest near the prehistoric mining area VI (Oliva / Neruda / Přichystal 1999). The Palaeolithic site of Moravský Krumlov IV was discovered on the edge of a deep Late Pleistocene valley (315-325 m a.s.l.). The first finds which can be linked to the site were recovered in 1999 by M. Oliva on the northern side of the track; they made an interesting assortment of five pre-cores and two flakes (Neruda / Nerudová / Oliva 2004). A partial deforestation of the surrounding area in 2000 resulted in the local erosion of surface sediments and the exposition of patinated artefacts.
Excavations were carried out in several sectors in the years 2000-2004 (**fig. 1C**). Three archaeological layers (1, 2 and 3) were identified in the sector IV-1. Sector IV-2 offered several patinated artefacts mainly re-deposited due to a sunk Hallstatt settlement event. Sector IV-3 touched the edge of sector IV-1. The richest concentration of archaeological layer 0 (the Szeletian) and the underlying layers 1 and 2 with Middle Palaeolithic industries were identified here. Sector IV-4 is situated to the east of the sectors mentioned above (the location of the finds from 1999). Other probes in sectors IV-5, IV-6 and IV-7 were supposed to help determining the extent of the archaeological layers.

STRATIGRAPHY

The stratigraphic situation at Moravský Krumlov IV was affected by many variables. Due to favourable conditions for a sediment accumulation (Roštínský 2009), loess deposits concentrated at the site, reaching a thickness of up to 10 m in sector IV-3. At least three complexes of ancient soils and soil sediments were formed from this parent material. Analyses of profiles, geomorphology and soil micromorphological analysis made by L. Smolíková in 2004 (Smolíková 2009) showed that all layers (samples MK-0, MK-5 and MK-8) consist of redeposited sediments and therefore cannot be used for chronostratigraphic correlations. The negative impact of recent human activities on the preservation of the Quaternary sediments was documented too (Neruda 2009b). Considering the situation, it is not to be expected that the original extent of the site can be determined.

Sector MK IV-1

We gained a basic knowledge of the stratigraphy of the site in sector IV-1. The upper parts were extensively disturbed to a depth of approximately 2 m (**fig. 2**) by a recent hollow way which prevented the corre-

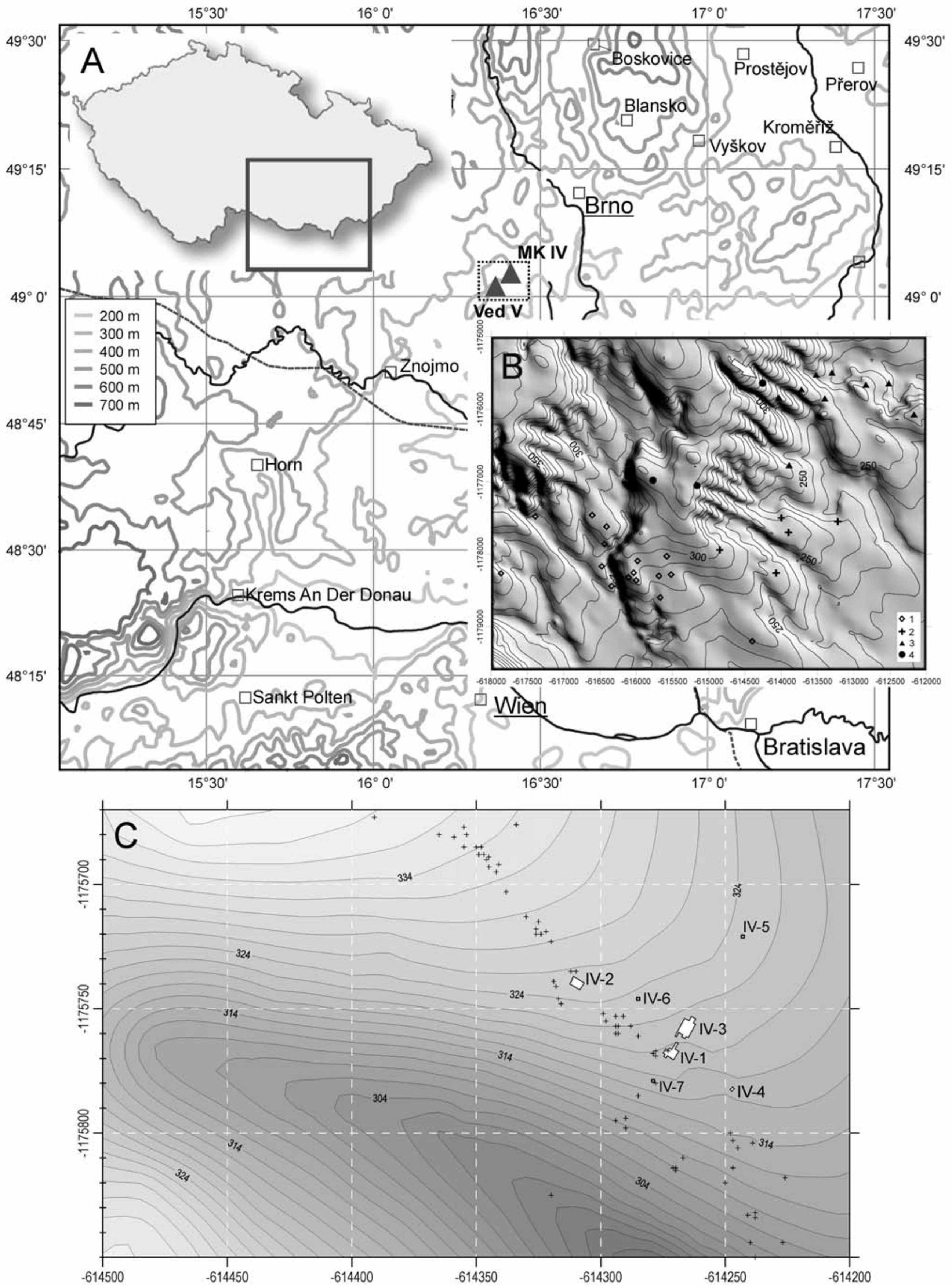


Fig. 1 Position of the site Moravský Krumlov IV: **A** general map of Moravia and Austria. – **B** Map of the Krumlovský Les (Krumlov Forest) region (distance among ticks 500 m) with EUP sites on cadasters: **1** Vedrovice; **2** Jezeřany; **3** Maršovice; **4** Moravský Krumlov (MK IV: white arrow). – **C** Position of the Moravský Krumlov IV sectors (IV-1-4) and the stone industry (+) found on the surface (distance among ticks 50 m). – (A WGS 84; B-C S-JTSK coordinates system).

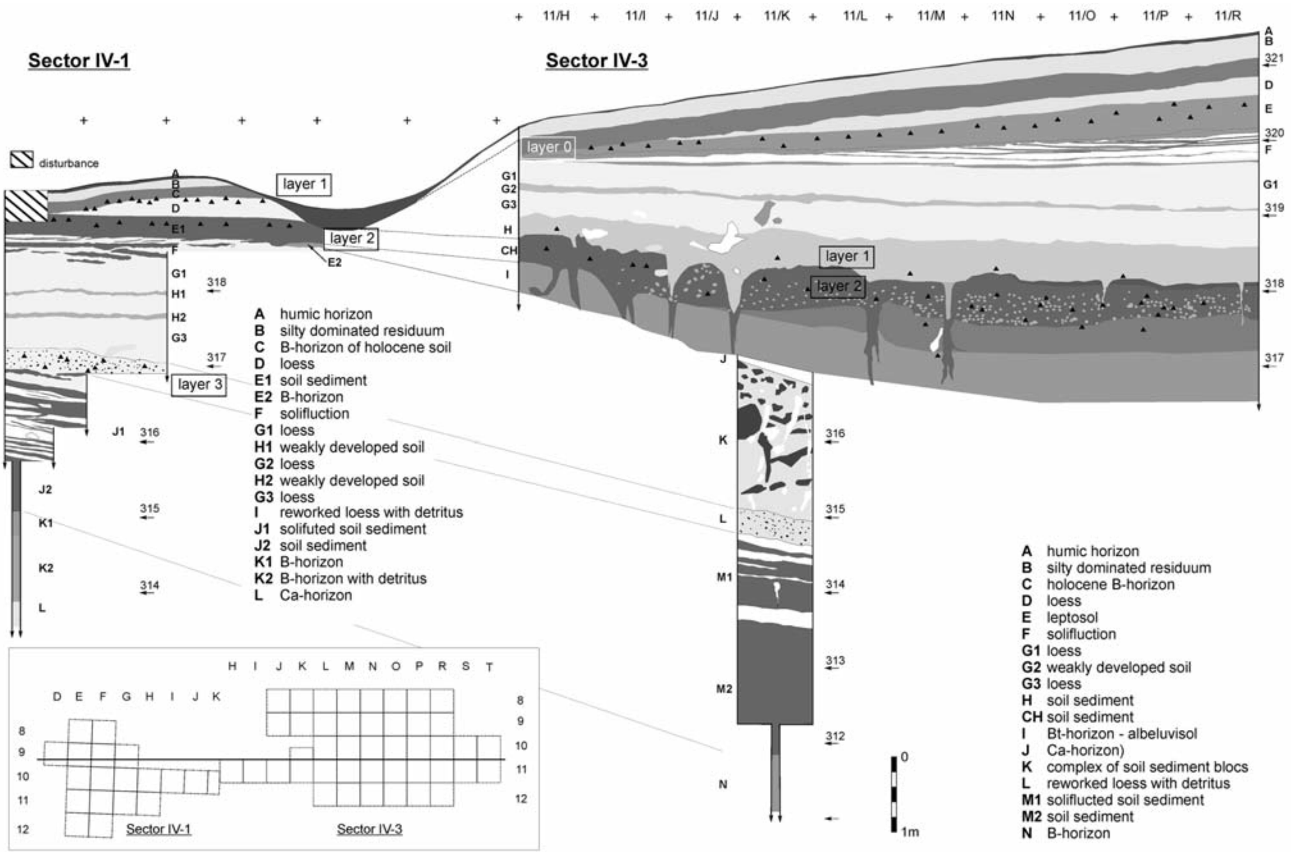


Fig. 2 Moravský Krumlov IV: cross-section between sectors IV-1 and IV-3. Triangles indicate the dispersion of lithics, the numbers above the arrows mark the elevation (a.s.l.).

lation of upper layers between sectors IV-1 and IV-3. The continuity of layers is also affected by the location of the sector between the hollow way and a steep valley slope facing south. As a result, the upper part is only partially preserved in remnants.

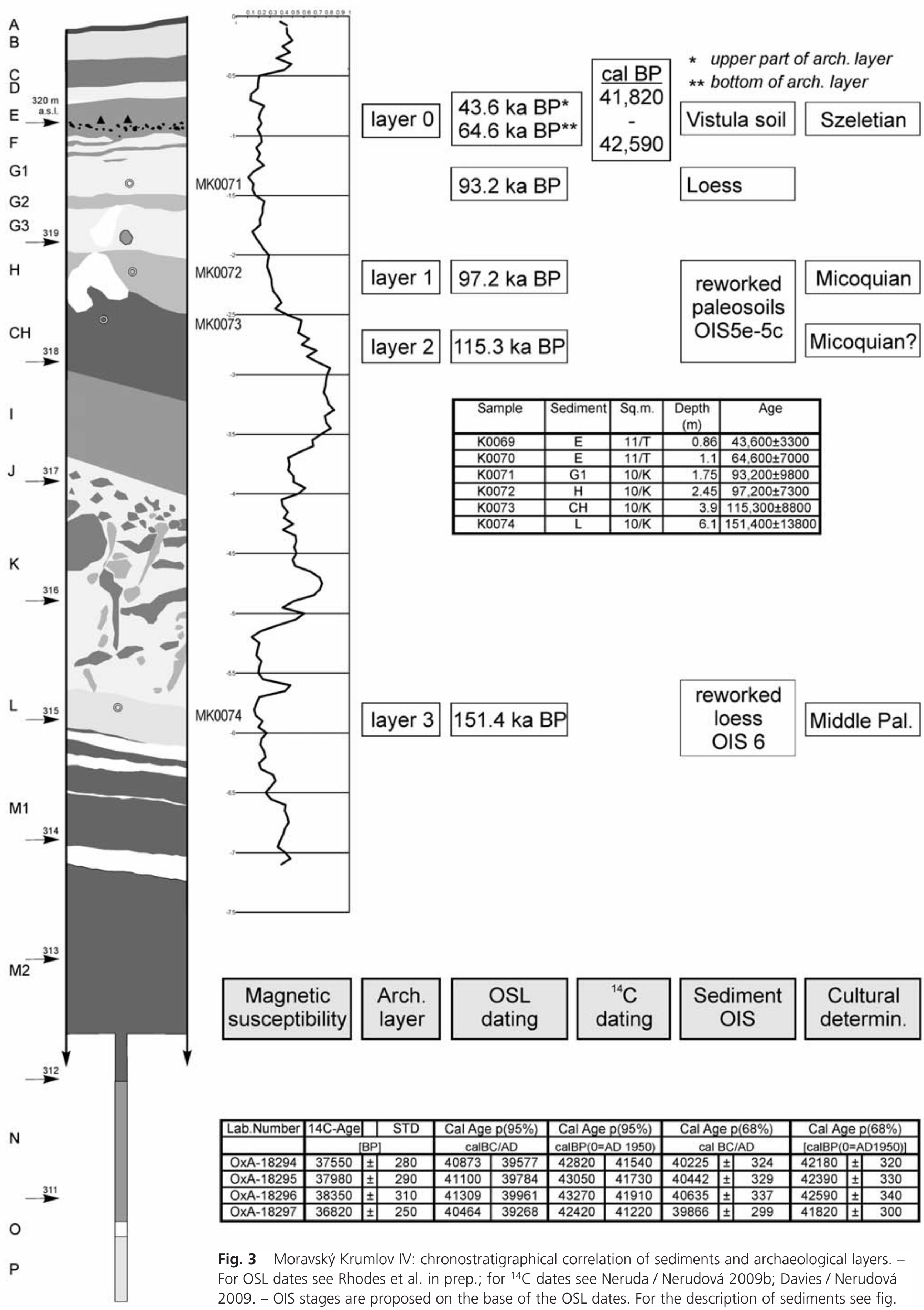
The typical stratigraphic sequence of sector IV-1 consists of several horizons (**fig. 2** left side). A Holocene complex contains an upper humic horizon (A), a silty dominated residuum (B; for determination see Roštínský 2009, 33-34) yielded a non-patinated chipped stone industry and prehistoric potsherds and a Holocene B horizon (C). The first patinated artefacts were found in the transition zone between sediments B and C in the southern part of the sector. The sediments formed the upper part of archaeological layer 1. The underlying loess (D) was preserved only in remnants; it was completely transformed into the Holocene B horizon in the southern part of the sector. The original sediment structure is modified by bioturbation documented by the presence of darker coloured cylinders or knobs (resulting from soil biota) and, in some cases, soil mixing due to root activity. The second archaeological layer is related to a reworked palaeosoil (E1) of a rusty brown colour. The effects of bioturbation are evident through compact cylinders with calcic sinter. In the southern part of the sector the original structure of the sediment is modified by the Holocene pedogenesis process, and the northern part of the sector is partly disturbed by the recent hollow way. A second horizon of fossil soil (E2; B horizon) of a yellow-brown colour was also located. The archaeological layer 3 in sediment I (reworked loess with chert gravel, granodiorite detritus and $CaCO_3$ concretions) was distinguished from the upper part of the profile that contains the soliflucted Ca horizon (F) and a complex of loess (G) divided by two layers of weakly developed soils (H1-2). The lower part of the cross-section is represented by a palaeosoil preserved in several layers (J1-2; K1-2). The bottom of the Quaternary sequence was not excavated.

Sector MK IV-3

Stratigraphic sections of up to 10m in length were gradually assembled, and they became reference profiles for the entire area of Moravský Krumlov IV (**fig. 2** right side). The thickness of the Holocene complex A to C reaches up to 0,60m. The underlying bioturbated loess D gradually shifts into the first fossil soil complex which consists of several horizons in this sector; the horizons are separated by thin slabs of precipitated $CaCO_3$ with an increasing presence of detritus and small chert gravel at the base of each subhorizon. The archaeological layer 0 covered the whole sector in the upper part of this soil between the first detrital layer (in sediment E) and the transitional zone of sediments D and E. A rib of a young mammoth or rhinoceros was found, forming the entire thickness of the archaeological layer (Neruda 2009b, fig. 11). The lower part of this complex consists of a soliflucted horizon (F) with distinctive fragments of a fossil soil penetrating into the lower loess (G1).
The loess complex G is internally separated by a weakly developed soil (G2) differentiated from the loess by its violet hue. The transition between loess G3 and the uppermost level (H) of a second complex of fossil soil sediments is very gradual. The underlying sediment CH (archaeological layer 2) is subdivided into three subhorizons in the northern part of the sector. The uppermost level (CH1), i.e. the underlying sediment H, consists of a dark brown to black soil sediment with chernozem components. It also forms the main substratum of horizon CH2 which is characterized by rusty stains of soil sediment: Albeluvisol (Smolíková 2009). The depositional sequence has not been determined yet. The transition is very gentle, and fossil roots from the base of sediment CH2 cut through both horizons CH/I and I, although macroscopically sediment CH/I is more similar to the superposed sediment CH2.
The underlying sediments were only documented in the deep probe in squares 10-11/K. A Ca horizon (J) is sharply separated from the overlying soil I. Further down it gradually changes to horizon K which is rather difficult to interpret. It consists of soil sediment blocks which are divided by criss-crossing fissures (wedges) filled with calciferous crusts. The number of soil fragments decreases at the base where they merge into the loess. The detrital loess sediment L should represent the equivalent of the macroscopically identical sediment in sector IV-1 which contains artefacts of layer 3. The underlying layers comprise the third fossil soil complex (sediments M1, M2, and N). It is composed of fragments of a soil sediment of a strong brown colour with calciferous crusts separating the layers. The borehole documented a Ca horizon and a loess deeper in the profile, but the base of the Quaternary complex was not reached.

DATING OF HORIZONS

Considering the evidence for human presence, the essential problem we had to face throughout our investigations was the age of particular sediments. Chronological dating of the Quaternary horizons based on a micromorphological soil analysis was inconclusive. Except for the first fossil soil complex in sector IV-3, all other samples were classified as soil sediments (Smolíková 2009) while the time of their redeposition was impossible to determine.
Sediment E in sector IV-3 was dated using several different methods. A sample from the rib of a young mammoth or rhinoceros (GrN-28451) had a low collagen content, so that the real age could only be determined being older than 29,450 uncal. BP. This date was consistent with the general interpretation that the



Sample	Sediment	Sq.m.	Depth (m)	Age
K0069	E	11/T	0.86	43,600±3300
K0070	E	11/T	1.1	64,600±7000
K0071	G1	10/K	1.75	93,200±9800
K0072	H	10/K	2.45	97,200±7300
K0073	CH	10/K	3.9	115,300±8800
K0074	L	10/K	6.1	151,400±13800

Lab.Number	14C-Age		STD	Cal Age p(95%)		Cal Age p(95%)		Cal Age p(68%)			Cal Age p(68%)		
	[BP]			calBC/AD		calBP(0=AD 1950)		cal BC/AD			[calBP(0=AD1950)]		
OxA-18294	37550	±	280	40873	39577	42820	41540	40225	±	324	42180	±	320
OxA-18295	37980	±	290	41100	39784	43050	41730	40442	±	329	42390	±	330
OxA-18296	38350	±	310	41309	39961	43270	41910	40635	±	337	42590	±	340
OxA-18297	36820	±	250	40464	39268	42420	41220	39866	±	299	41820	±	300

Fig. 3 Moravský Krumlov IV: chronostratigraphical correlation of sediments and archaeological layers. – For OSL dates see Rhodes et al. in prep.; for ^{14}C dates see Neruda / Nerudová 2009b; Davies / Nerudová 2009. – OIS stages are proposed on the base of the OSL dates. For the description of sediments see fig. 2, cross-section of the sector IV-3.

recovered artefacts of layer 0 classified as Szeletian belong to the Early Upper Palaeolithic (EUP) complex. The dating of the sediment (the northern profile; Neruda 2009b, fig. 23) by OSL (Optically Stimulated Luminescence; Rhodes et al. in prep.) yielded an age of 43,600 ± 3,300 BP (**fig. 3**), as the age of the upper part of archaeological layer 0, and is consistent with the calibrated radiocarbon data framework we obtained for the Moravský Krumlov IV site (charcoal samples dated in the Oxford Lab; **fig. 3**; Davies / Nerudová 2009) and for the large Szeletian assemblage in Vedrovice V (Valoch et al. 1993). The lower OSL sample (base of archaeological layer 0) was surprisingly much older (64,300 BP), and this may be explained by the probable contamination of the base of this layer by older grains from the underlying sediments (the main part of sediment E had to be older than the Vistula Interpleniglacial). This interpretation may also apply to some of the other EUP sites in Moravia dated by the same method (Rhodes et al. in prep.).
Older redeposited sediments were dated by OSL samples collected in profile 10/K in sector IV-3 (**fig. 3**). The archaeological layer 1 corresponds to a date of 97,200 BP, the archaeological layer 2 was dated around 115,300 BP, and the lowermost archaeological horizon 3 around 151,400 BP. This data also suggests that there was an intensive redeposition process under way during the Eemian interglacial era [1].

DEFINING ARCHAEOLOGICAL HORIZONS

Interdisciplinary analyses determine four archaeological layers and several hints of human presence in further layers. Burnt bones were determined in soil sediment M2 in squares 10-11/K (sector IV-3). Their chronostratigraphic position is older than 150 kyr BP. The reworked sediment J/K in squares 10-11/K (sector IV-3) also contains 23 small fragments of burnt bone (Novák 2009, tab. 1).

Archaeological layer 3

The oldest archaeological horizon (layer 3) was defined on the presence of chipped lithics in reworked loess identified for the first time in sector IV1. It was just here where 43 classifiable and anthropic handled objects and redeposited rock pieces were found in an area of 8 m^2. Unfortunately it is not possible to assess even contingent spatial structures in such a small area. The occurrence of findings was not high in layer 3 – it does not usually exceed ten artefacts per square metre. The find horizon was approximately 0,75 m thick, but most artefacts were found in a horizon of only 0,35 m (Neruda 2009c, fig. 1). In the industry waste quantitatively dominates over determinated blanks; cores are also present in a significant number (**tab. 1**). Tools were identified as culturally undiagnostic items, as they are various types of denticulates and locally worn-out flakes. All artefacts are made of the local chert of the Krumlovský Les type. Blank production was based on extracting flakes from cores that show traces of two contradictory reduction strategies: discoid and Levallois (**fig. 4**) [2].
Based on the associated OSL result (**fig. 3**), layer 3 was deposited during OIS (Oxygen Isotope Stage) 6, probably during its later stages. Very few assemblages from this period have been recovered in Moravia. Most of the sites along the eastern hillside of Krumlovský Les are found on the surface [3].
A horizon penecontemporaneous with layer 3 from Moravský Krumlov IV was located at Vedrovice IIIb in test pit 1 (sediment H2; Smolíková in Neruda / Nerudová / Oliva 2004). Surface findings from Vedrovice VII, situated almost 100m to the west of Vedrovice IIIb (Neruda / Nerudová / Oliva 2004; Valoch 2006), are similar – on the level of artefact surface preservation – to those found in layer H2 of the nearby site IIIb, or layer 3 at Moravský Krumlov IV. An industry found in a brickyard near Moravský Krumlov (Moravský Krumlov I) is chronostratigraphically commensurate. The assemblage was classified as an independent

	raw materials								
	Kr	G	Qr	Sp	Ra	R?	?	Σ	%
layer 0									
tested raw material	14							14	0.23
cores	52							52	0.87
tools	76							76	1.27
blanks	899							899	14.97
waste	4952							4952	82.44
ground tools	14							14	0.23
Σ	6007							6007	100
layer 1									
tested raw material	45							45	4.16
cores	30						1	31	2.93
tools	41			1				42	3.97
blanks	269							269	24.98
waste	639		39		3	1		682	63.58
ground tools	4							4	0.38
Σ	1028	0	39	1	3	1	1	1073	100
layer 2									
tested raw material	31		2					33	3.5
cores	58						1	59	6.2
tools	46			2			1	49	5.2
blanks	224							224	23.7
waste	562		5					567	59.9
ground tools	11	4						15	1.6
Σ	932	4	7	2			2	947	100
layer 3									
tested raw material	1	1						2	4.44
cores	8							8	17.78
tools	5							5	11.11
blanks	8							8	17.78
waste	20							20	44.44
ground tools	2							2	4.44
Σ	44	1						45	100

Tab. 1 Moravský Krumlov IV: composition of the lithic assemblages. – Kr = chert of Krumlovský Les type; G = local rock; Qr = quartz; Sp = spongolite; Ra = radiolarite; R? = undetermined chert; ? = undetermined rock.

group denominated as the »Krumlovian«. The position is based on a flake collected in a B horizon of the last interglacial which dates the finding to the end of OIS 6 (Dvořák / Valoch 1956; Valoch 1971). The collection is non-Levallois, and most of the cores have no clearly organized exploitation. The subprismatic method is represented by a core of local coarse-grained rock flaked from its narrower edge. The assemblage also contains a side scraper combined with a notch, a large quartz flake, flakes from hammerstones, a hammerstone and blocks of raw material.

Vedrovice Ia is a site where the Levallois method was used for blank production (Oliva 1993). The small assemblage with Krumlovský Les and Cretaceous chert is noteworthy due to the presence of a possible Levallois point (proximal part is preserved) with a characteristic striking platform of the Chapeau de Gendarme type. M. Oliva argues that this industry dates to the early Würm period (Oliva 1993; 2005), but given the stratigraphy and recent observations, we are inclined to place it into the OIS 6 glacial.

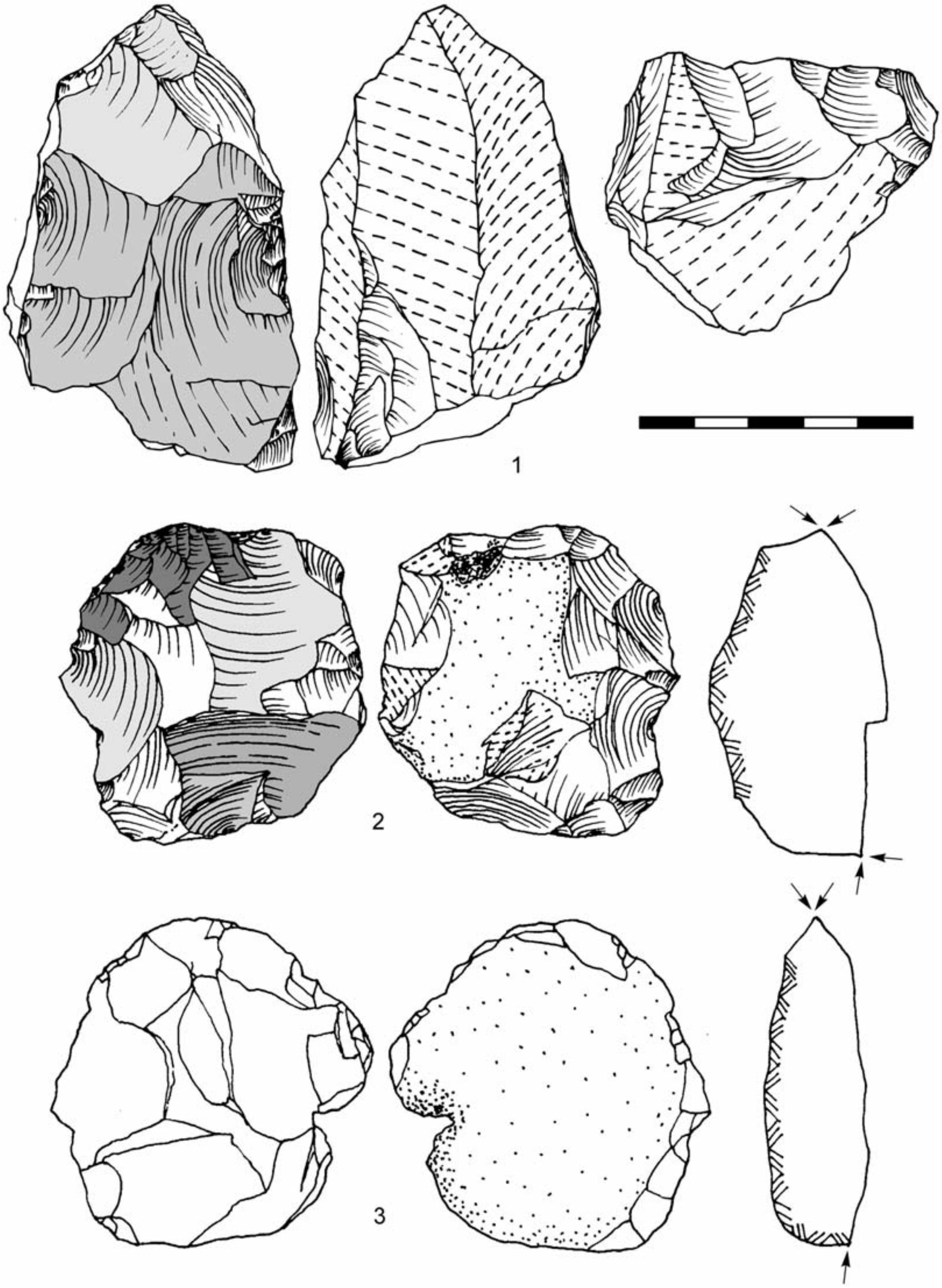


Fig. 4 Moravský Krumlov IV, sector IV-1, layer 3, cores: **1** volumetric core on a chert frost bloc. – **2-3** Cores with mixed features of both the Levallois recurrent centripetal and discoid method. – (Drawing P. Neruda).

Within the wider geographic context of Moravia, evidence of Saalian glacial sites is rare. The only stratified and statistically significant assemblage comes from layer 14 of Kůlna Cave (Valoch 1970; 1988; Neruda 2003). The volume concept is mainly represented by subprismatic (Neruda 2009c, fig. 5, 1) and discoid or polyedric cores (ibid. fig. 5, 3). The surface concept is represented by three cores, morphologically resembling Levallois cores (ibid. fig. 5, 5), and sufficient debitage (ibid. fig. 5, 6).

Archaeological layer 2

Archaeological layer 2 was identified in sectors IV-1 (sediment E), IV-3 and IV-4 (both in sediment CH). On the basis of the OSL data 115,300 ± 8,800 BP we correlate this horizon with a redeposition of sediments during the OIS 5e period (Rhodes et al. in prep.). Vegetation remains contain *Pinus sylvestris*, *Pinus cembra*, *Polypodiaceae*, *Quercus*, *Frangula*, *Picea/Larix*, *Salix*, *Pomoid/Sorbus*, *Juniperus* and *Rhamnus* (Novák 2009; Doláková 2009).

The artefact distribution in sector IV-1 probably reflects the southward dipping of the geological layer as the findings seem to peter out in the southwestern corner. Finds are more common in squares 9-12/E-H, but there are no obvious concentrations (Neruda 2009c, fig. 6). The analysis of the spatial layout of sector IV-3 is interesting concerning its vertical distribution. The vertical extent of the artefact distribution is much greater than in layer 0, or the Middle Palaeolithic findings in sector IV-1. In some places, the maximum vertical difference between artefacts reaches up to 0,80 m. This is mainly caused by the redeposition of fossil soil (Smolíková 2009; Neruda 2009b), and it may also be caused by wedge structures cutting through layer CH. At the same time, the surface extent of some refittings is less than 0,5 m (northern part of square 10/R; vertical distribution less than 10cm), while the connecting lines of other refittings exceed 2 m. It is also interesting to compare artefact orientations between sectors (Neruda 2009c, fig. 5): Objects found in sector IV-1 probably lie in an autochthonous or para-autochthonous setting because flat-lying flakes predominate (over 60%), while the flakes in sector IV-3 were oriented at different angles. Spatial analysis and refitting patterns in sector IV-3 then suggest that some artefacts are reoriented while others (cf. refittings in square 10/R) experienced minimal movement. This can be explained by a repeated human occupation over a longer time period, with numerous episodes of fossil soil redeposition[4].

The recovered stone industry is quite similar in all three sectors, so that we can assess the technology of stone raw material processing as a single unit (**tab. 1**). In all sectors, waste is a dominant component (chips, fragments of flakes and pieces of raw material), exceeding 50% of the set. Almost one fourth of the collection is represented by various blanks while the most common pieces were simple flakes with cortex remains of different size on their surface and flakes without cortex. Cores are significantly present mainly in sector IV-1, making up to 16,9%. Several pieces were even documented as hammerstones in sectors IV-1 and IV-3, and there were bigger pieces of raw material with or without traces of testing. The overall composition of the industry covers all technological groups and demonstrates an *in situ* processing of the local chert raw material.

The technological analysis of cores may identify two leading production methods within a volumetric concept of support exploitation. The first one is the discoid method in several variations. Two cases allowed to document the existence of discoid cores *sensu stricto* (**fig. 5, 1**). Subdiscoid cores are more common where we can unambiguously describe striking and reduction surfaces (**fig. 5, 2**). The unifacial variety utilizes the natural convexity of a pebble (**fig. 5, 3**). Correctly organized exploitation enables the reduction of such cores almost without preparation to the form of a small residue (**fig. 5, 4**).

The second volumetric concept is represented by subprismatic cores with the simple striking platform used for the simple parallel extraction of flakes/blades (**fig. 5, 5**). The naturally rounded form of the pebbles rather defined both the longitudinal and transveral convexities.

The extant range of tools is not very large and renders the cultural classification difficult. Side scrapers form a dominant part of the set, exceeding 57% (without fragments and blanks with traces of using). Beside simple types (**fig. 6, 6-7**) there are also déjeté (**fig. 6, 2. 5**), double and bifacial side scrapers (**fig. 6, 1**). The mentioned bifacial side scrapers resemble side scrapers from the Micoquian collection of the Kůlna Cave

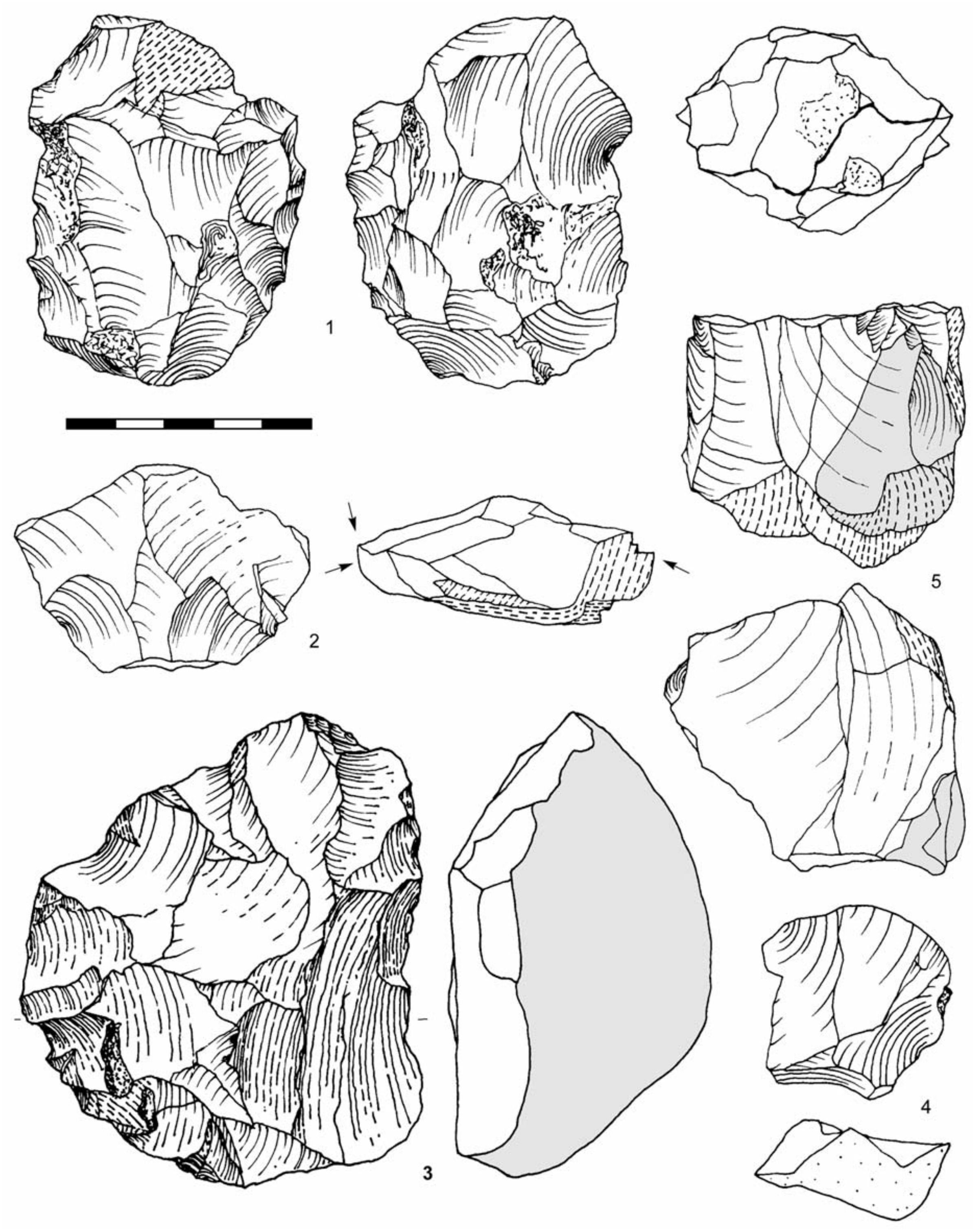


Fig. 5 Moravský Krumlov IV, sector IV-1 (3), IV-3 (2. 5) and IV-4 (1. 4), layer 2: **1** discoid core *sensu stricto*. – **2** Subdiscoid core with hierarchical surfaces (prepared striking platform). – **3-4** Subdiscoid core with hierarchical surfaces (unifacial). – **5** Subprismatic core. – (Drawing P. Neruda).

with a combination of various morphological features – e.g. a bifacial edge together with a thinned back (Neruda 2005). An interesting point is the fact that two of these side scrapers are made of Cretaceous chert (spongolite), originating probably in the Bořitov region where a Micoquian occupation dominates. The region is part of the Svitava valley and situated 45km northeast of Moravský Krumlov.

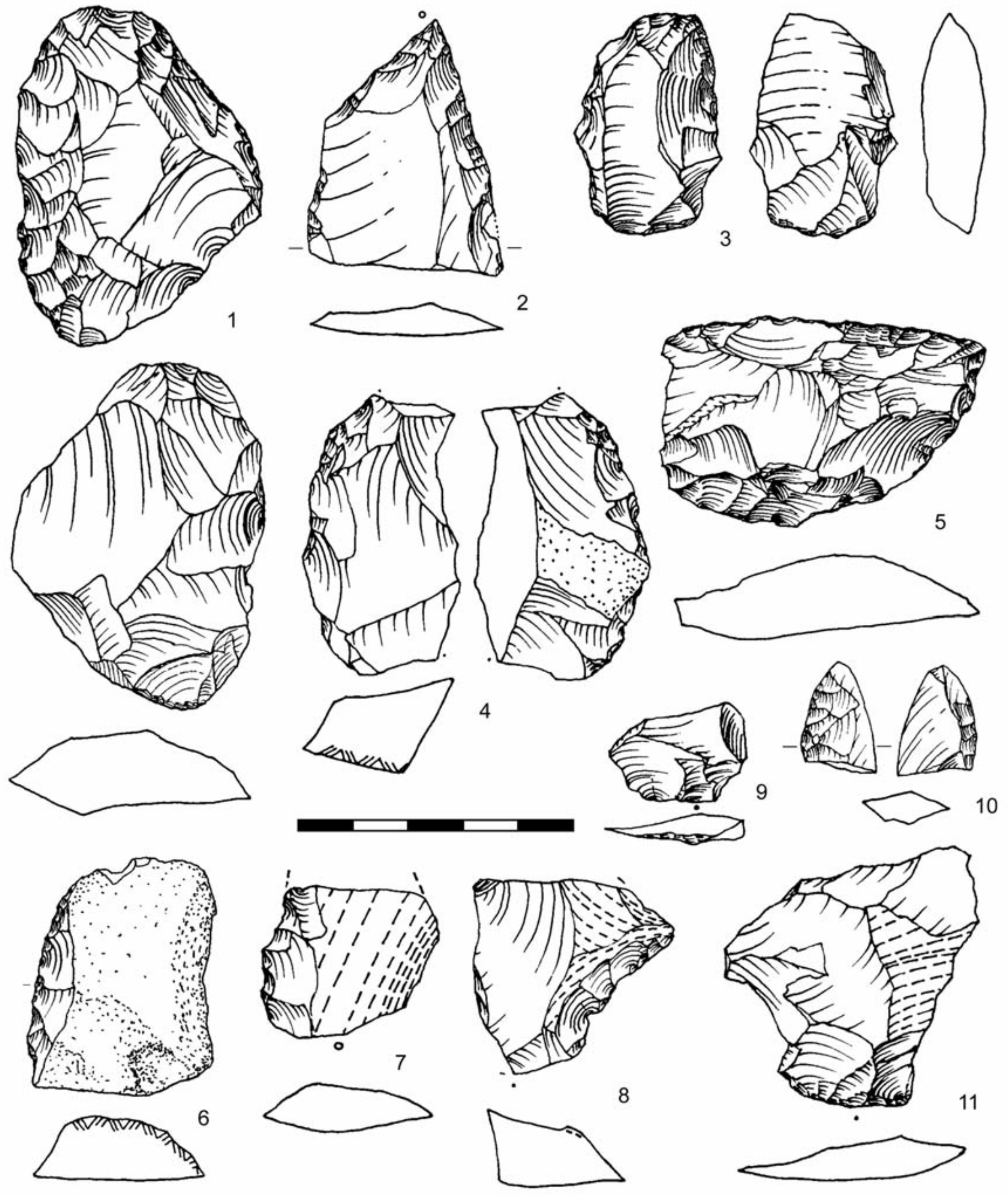


Fig. 6 Moravský Krumlov IV, sector IV-1 (3-4. 6-9. 11), IV-3 (1-2. 10) and IV-4 (5), layer 2: **1** bifacial side scraper. – **2. 5** Déjeté scraper. – **3** Side scraper with thinned back. – **4. 10** Bifacial tool fragment. – **6-7** Simple side scraper. – **8** Notch. – **9. 11** Flakes from bifaces. – (Drawing P. Neruda).

Dealing with the issue of the bifacial method of artefact production, tool fragments are also interesting. Beside bifacial retouched side scrapers, there were also two fragments documenting the presence of a bifacial edge in layer 2 (**fig. 6, 4.10**). It is difficult to say if they are side scrapers or remains of other bifacial tools like e.g. a bifacial backed knife. This kind of tool manufacture is also supported by the presence of flakes obtained from bifaces (**fig. 6, 9.11**) and the existence of a bifacial preform (Neruda 2009c, fig. 18). The tool set includes various types of notches (**fig. 6, 8**) and denticulates, blanks with traces of use.

Searching for analogue collections, we again find that stratified and statistically significant collections are lacking. As we mentioned above: the Krumlovian industry, originally linked to the last interglacial, should be contemporaneous with the OIS 6 glacial.

Interdisciplinary analyses link the penecontemporaneous Kůlna Cave Taubachian assemblages (layer 11) to this period (Valoch 1988; 2002). Small-sized stone tools are typical for the Taubachian; it is classified as a microlithic industry (Valoch 1984)[5]. The artefact sizes in layer 2 are somewhat greater, but not to a big extent (Neruda 2009c, tab. 16. 18). The Taubachian of th Kůlna Cave differs from layer 2 of the Moravský Krumlov IV site mainly in typological aspects, in the absence of intricately retouched complex side scrapers and in the morphology of other bifacial items. In this regard, the layer 2 tools are more similar to the Micoquian inventory from the Kůlna Cave whose oldest Micoquian horizon (layer 9b) probably dates to OIS 5a (Valoch 2002).

Archaeological layer 2 is an interesting contribution to the current discussion of the problem of Middle Palaeolithic facies in Moravia. The coexistence of discoid and subprismatic methods with infrequent occurrence of the direct shaping method of tool reduction is a typical feature. Apart from the lack of fassonage and insufficiency of significant Micoquian types we find a closer relation to the Moravian Micoquian assemblages than to the microlithic industries of the Taubachian type. A fruitful direction for future studies will be to refine the age of this industry, as it could become an example of the oldest Micoquian in Central Europe.

Archaeological layer 1

Finds from the archaeological layer 1 (especially in the sector IV-1) probably represent a Micoquian workshop dated by OSL to 97,200 ± 7,300 BP (Rhodes et al. in prep.). Its possible chronological position is OIS 5c (**fig. 3**). Charcoals (*Quercus*) and pollen (*Pinus sylvestris*, *Pinus cembra*, *Betula*, *Salix*, *Ulmus*, *Asteraceae*, *Ranunculaceae*, *Galium*, *Poaceae*, *Plantago*, *Thalictrum*, *Cyperaceae*, *Saxifraga*, *Artemisia*, *Chenopodiaceae*, *Daucaceae*, *Sedum*, *Ephedra*) contain both moderate and cold species (Doláková 2009; Novák 2009).

Spatial relations of stone artefacts can be observed in sector IV-1. The sediment H in sector IV-3 could be the continuation of layer 1, but the small number of artefacts may be indicating that this is the northern periphery of the artefact scatter zone. If we correctly correlate layer 1, sector IV-1, with sediment H in sector IV-3 (see **fig. 2**), then the occupation zone should not exceed 300 m^2. There is a distinct concentration of artefacts in squares 9-11/F-G, sector IV-1 (Neruda 2009c, fig. 22). Cores, debitage and tools overlay one another, and most of the refittings originate here. Both the position and orientation of the artefacts were recorded during the excavation. An intensive bioturbation observed in sediment D suggests admixing which may have caused vertical changes in the artefact deposition – however, the refitting connection lines and spatial analysis of the artefact orientation do not support vertical shifts. Most of the objects were found in a horizontal position (> 55 %), only a few at different angles. This suggests that the artefacts in layer 1 were deposited in relatively autochthonous or para-autochthonous positions.

The technological analysis is primarily based on the evaluation of the artefacts from sector IV-1. The analysed industry contained almost all technological categories that indicate the reduction of the local chert directly on site (**tab. 1**). Beside cores, blanks and tools, also chips, chunks and blank fragments are abundantly present. Pieces of raw material and hammerstones were also documented in the cultural layer. The percentage of cores is not significant (2.93 %). On the spot of the mentioned concentration of tools, the shaping and use of blanks for unspecified activities took place (blanks with traces of using). Their number even slightly exceeds the core figure.

The recovered industry clearly describes two essential methods of support production: discoid and subprismatic. There are 41 pieces of preserved tools on which various local retouches and blanks with traces of

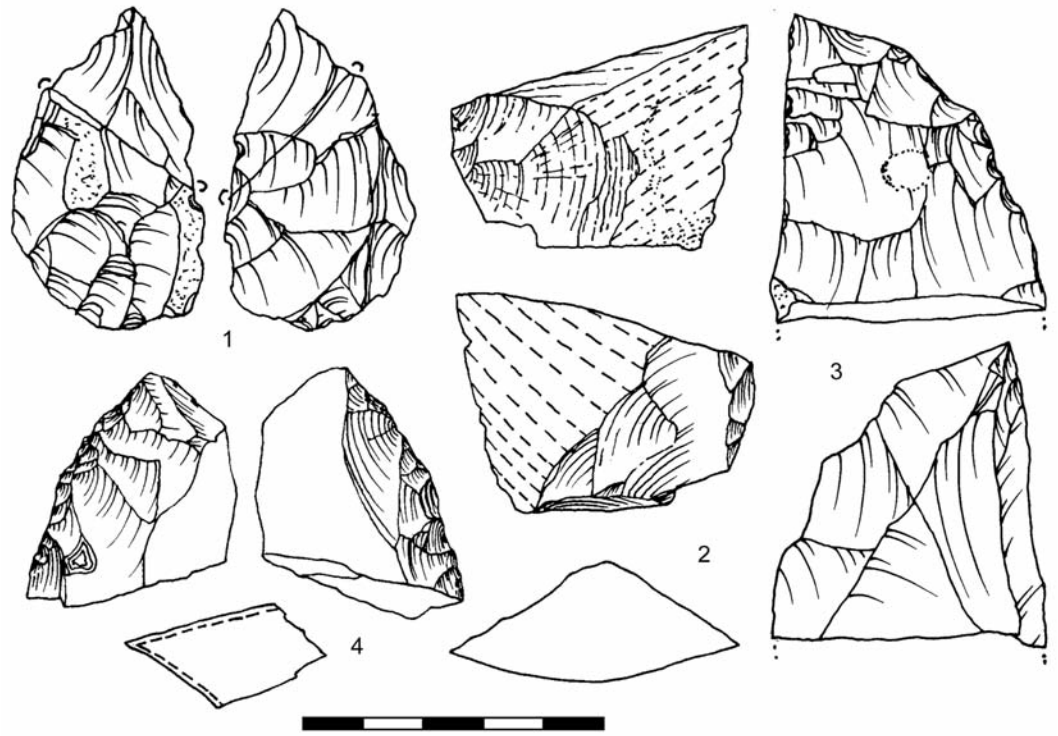


Fig. 7 Moravský Krumlov IV, sector IV-1, layer 1: **1** preform of a biface. – **2-4** Fragments of bifaces. – (Drawing P. Neruda).

using or fragments or retouched tool prevail. Beside bifacial preforms (Neruda 2009c, fig. 31) and formal tools (**fig. 7**), there are simple side scrapers and various notches and denticulates. No specific supports were preferred to produce a tool. Natural fragments of raw material even dominate in the case of side scrapers. Blanks with traces of use are found on cortical blanks in most cases.

Analogies for the archaeological layer 1 are also difficult to find due to the lack of absolute dates and surface surveys of Moravian Middle Palaeolithic sites. One problem is to date the findings from layer 1 in sector IV-1 which is done based on a correlation with sediment H in sector IV-3, dated by OSL to 97,200 kyr BP, i.e. the Brørup interstadial (OIS 5c). Another problem is to find the analogical industries themselves. Despite the extensive test pitting in Krumlovský Les, we do not really have a collection which could be stratigraphically correlated with the Moravský Krumlov layer 1 findings. Only Jezeřany IV (test pit 4-4) has yielded a cortical flake with a faceted platform found in a grey-brown soil, which is assumed to be underlying a Vistula interpleniglacial soil and stratigraphically corresponds to the lower Vistula glacial (Neruda / Nerudová / Oliva 2004; Neruda / Nerudová 2006).

The best-preserved stratigraphic sequence covering the period of the end of the Eemian interglacial and the beginning of the Vistula glacial is found in Kůlna Cave, Moravian Karst. Based on absolute dates, the industry of the Micoquian layer 9b was believed to correspond to the Brørup interstadial based on an earlier understanding (Valoch 1988, Abb. 38). The dating of osteological material with ESR (Electron Spin Resonance) (Rink et al. 1996) considerably changed the chronological understanding of the Kůlna profile. The oldest Micoquian assemblage (layer 9b) was dated to 69 ± 8 ka (LU [linear uptake age]) and 71 ± 6 ka (RU [recent uptake age]). If this is correct, the findings from layer 1 in Moravský Krumlov would probably temporally correspond to the Taubachian horizons 11a or 10 in Kůlna Cave.

A small stone tool assemblage from layer 1 in sector IV-1 has affinities with the Central European Micoquian – therefore assemblages from layer 1 and 2 could demonstrate the existence of this cultural complex at the end of the Eemian period and the beginning of the Vistula glacial. The time span of the Micoquian was probably much bigger than we have been able to show, which is consistent with what has been argued considering other parts of Europe.

If we consider layer 2 in Moravský Krumlov IV as Micoquian and take into account the petrographic analyses of the lithic assemblages (Neruda 2001; 2009c) and new finds from Southern Moravia (e.g. Pravlov IV, lower layer; Neruda / Nerudová 2006), it seems plausible that two industrial trends were present in the Moravian region during the end of the Eemian and the beginning of the Vistula glacial: the small-sized Taubachian and the bifacial Micoquian.

Archaeological layer 0

The archaeological layer 0 was only detected in sectors IV-3 and IV-4. Besides numerous chipped stone pieces, we also found some bone fragments and charcoals. The ^{14}C dating of *Picea/Larix* charcoals places this horizon between 36,820 and 38,350 uncal. BP (Davies / Nerudová 2009). The analysis of stone artefacts obtained from sector IV-3 during the 2000-2004 campaign allowed to correlate them with the Szeletian.

Two resp. three concentrations of lithic artefacts were found in the excavated area. These places indicate a location where a prehistoric knapper was sitting and processing lithic raw material (**fig. 8**, squares 10-11/N-O; 10-11/R-S). Although the most common refitting sequences are objects broken into two pieces found within a single square, one representation of a refitted core is noteworthy because its components were deposited in a line of five squares, giving the impression that the piece moved from place to place. A part of another refitting, distributed in a similar way, is associated with an artefact accumulation located in square 11/R and its surroundings (Neruda 2009a).

The total number of the lithic artefacts is 6,007 (**tab. 1**). The composition of the preserved lithic industry corresponds to the site character where the majority of the debitage is represented by trimming flakes often coming from the fassonage of bifacial tools. Flake fragments (78%) are the most common technological category. Cores and core fragments account for 0.39% of the assemblage. Some pebbles were used as hammerstones and retouchers (0.14% with use-wear marks) while others probably prepresent raw materials (0.14%). Pseudo-blades (flakes with parallel edges, similar to blades but metrically flakes) are represented minimally (only 19 pieces, i.e. 0.3%). Retouched tools account for 1.2% of the assemblage (**tab. 2**). Besides leaf points (**fig. 9, 6-9**), other types (totalling 33 pieces), include endscrapers, sidescrapers and various notches and denticulates (**fig. 9, 1-5**). Use-wear traces identified by use-wear analysis suggest that domestic tasks may have taken place (Šajnerová-Dušková 2009).

The cores from layer 0 are very similar to those of layer 1 or 2. The technology (Neruda / Nerudová 2005) is based on using flakes from both subprismatic (Nerudová 2009, fig. 15) and discoid cores (ibid. fig. 13). Concerning subprismatic cores, the rounded form of the raw material was exploited for the natural convexity of the exploitation surface. Therefore the parallel extraction of blanks was possible without the need for core preparation. The

tool type	Σ	%
endscraper	2	2.6
straight side scraper	3	3.9
déjeté side scraper	1	1.3
side scraper on ventral face	2	2.6
side scraper with bifacial retouch	3	3.9
notch	11	14.5
denticulate	3	3.9
piece with local retouch or use-wear	18	23.7
leaf point	6	7.9
preform of leaf point	21	27.6
fragment of leaf point	6	7.9
Σ	76	100

Tab. 2 Moravský Krumlov IV: list of tool types of the archaeological layer 0.

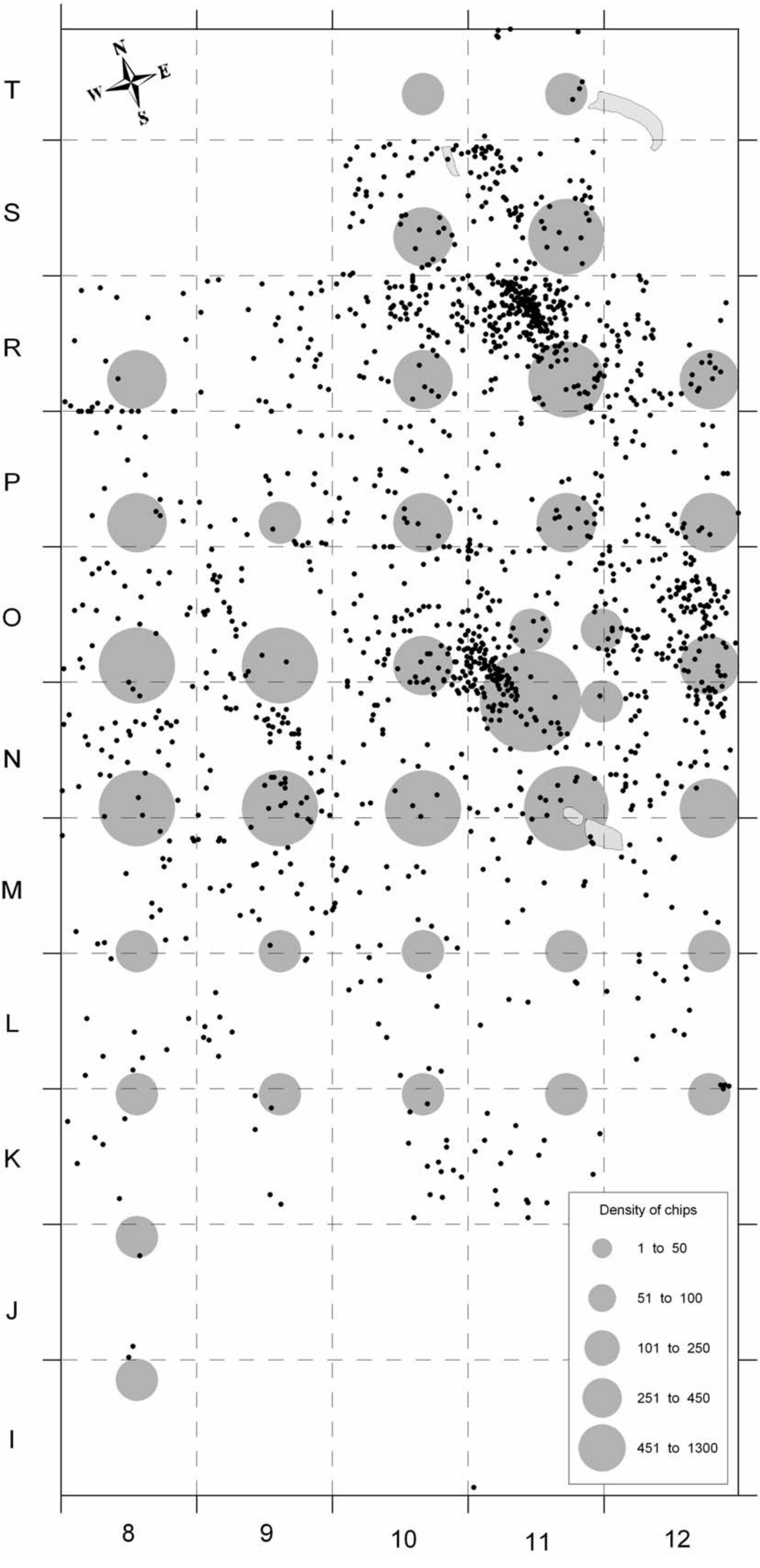


Fig. 8 Moravský Krumlov IV: spatial distribution of layer 0 artefacts in sector IV-1.

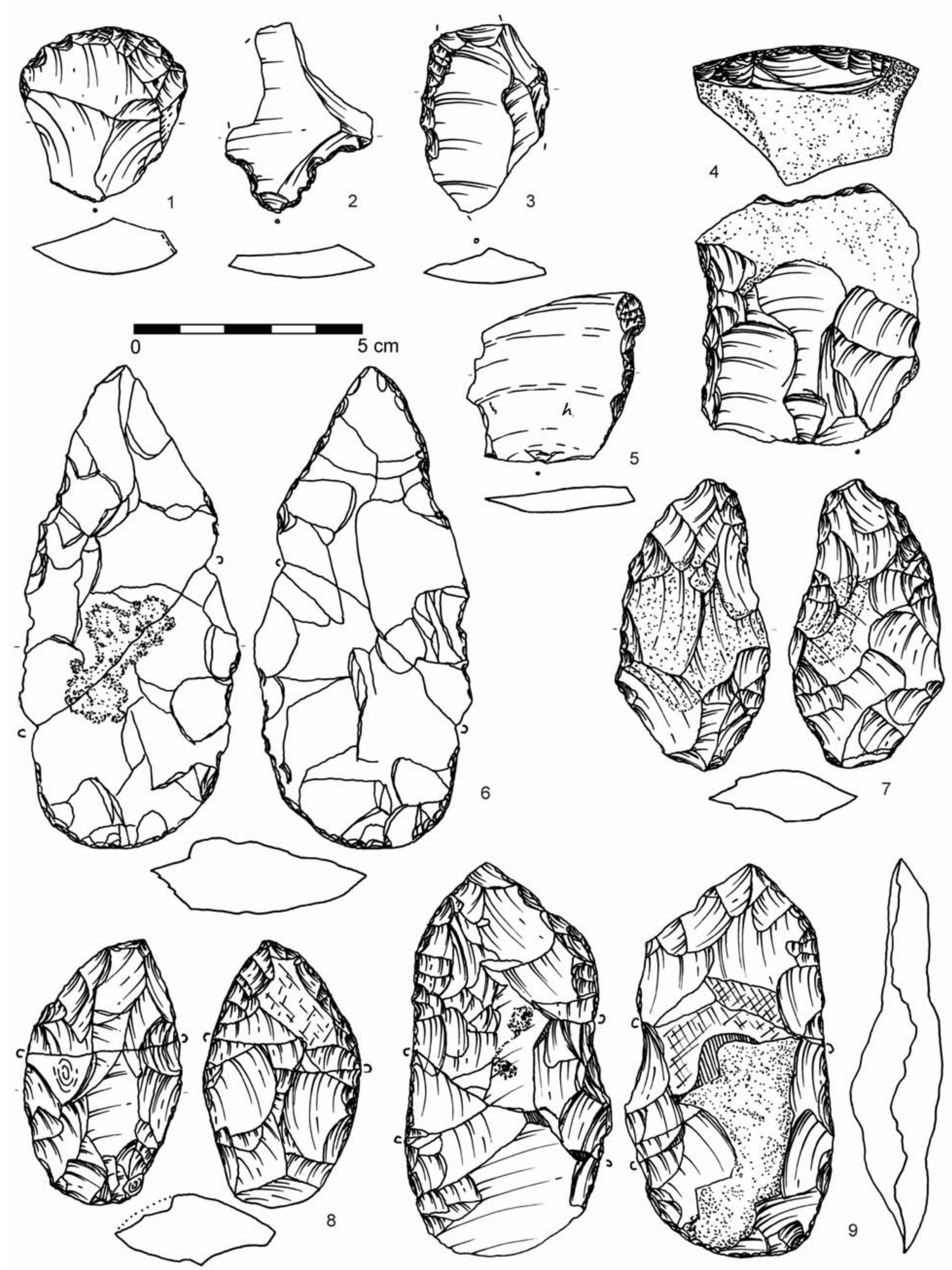


Fig. 9 Moravský Krumlov IV, sector IV-3, layer 0: **1** end scraper. – **2** Notches. – **3. 5** Side scraper. – **4** Notch/side scraper. – **6-9** Leaf point. – (Drawing Z. Nerudová).

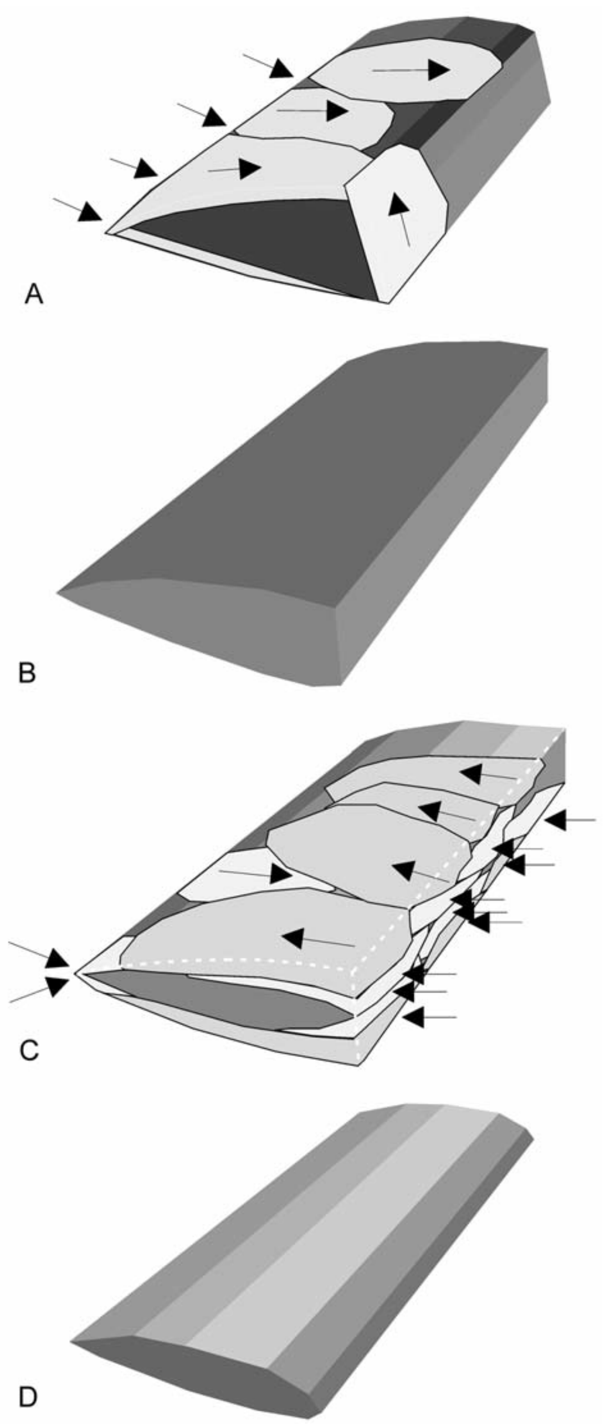


Fig. 10 Moravský Krumlov IV: reconstruction of the Szeletian leaf point production.

third concept is represented by the bifacial production. Refittings of leaf points of layer 0 helped us to determine the specific way of leaf point production (**fig. 10**). Massive flakes were usually used as a support because the local cherts naturally have the form of a pebble. The dimension (length and width) was relatively small to apply the standard »zig-zag« (alternated) method, and it was necessary to reduce only the thickness but not the other dimensions. A massive flake was reduced from the suitable edge, and the back was perpendicularly prepared as a striking platform (A). Most of the leaf point thickness was thinned from the back, and technical errors were repaired from the opposite edge. The morphology of the unfinished pieces is the same as at the Micoquian backed knife (B). Consequently, it was possible to reduce the thickness (C) to the symmetrical biconvex cross-section (D). It is important to note that such a method is found on all major Micoquian and Szeletian sites in Moravia.

CONCLUSIONS

The importance of the Moravský Krumlov IV site is approved on several levels. We attested the presence of assemblages with traces of both discoid and Levallois features during OIS 6 in Moravia. Only future research may judge whether they can be called »Krumlovian« or not because the eponymous site (Moravský Krumlov I) did not bear the significant features. We find the possible coexistence of the Micoquian and the Taubachian during the Eemian interglacial and the beginning of last glacial to be very important. The most important fact may be the codification of the lower Szeletian in Moravia. The dating of layer 0 suits Vedrovice V, both resembling the oldest proof of the Szeletian in Central Europe (considering the quality of samples).

Based on technotypological analyses we propose a model of cultural development during OIS 3 in Moravia (Neruda / Nerudová 2009b, fig. 6). Similarities between both the Szeletian and the Micoquian archaeological cultures suggest a close relationship which has been highlighted in recent publications (e.g. Allsworth-Jones 1986; Oliva 1991; 2005; Svoboda 2004; Valoch 1990; 1996). In our opinion, this relationship is to be defined more precisely: we understand the Szeletian as a final phase of the Micoquian which developed independently in Central Europe.

During the early phase of the EUP, the EUP cultures retained their territorial exclusiveness (Neruda / Nerudová 2009b, fig. 7A). The upper Micoquian and early Szeletian settlement of Southern Moravia spatially respects the Bohunician enclave in the Brno region. On the other hand, the early Aurignacian is not documented here; it was probably present in the Danubian area which was not used by the Neanderthals. There is an interesting relationship between the Szeletian and the Micoquian occupation in Austria, where only several isolated leaf points are documented (Trnka 1990); there is also only one significant Micoquian assemblage in the Gudenushöhle (Derndarsky 2001). This situation probably means that the region of Niederösterreich was relatively uninhabited and thus opened the way for an early Aurignacian colonisation (cf. ^{14}C data for Austria and Moravia). A similar phenomenon is also described in the Brno region where the Szeletian sites respect the Aurignacian and Bohunician territories. Around 35 kyr uncal. BP (Neruda / Nerudová 2009b, fig. 7B), the Aurignacians spread from the Austrian Danubian territory to Moravia where they inhabited ecosystems with no evidence of a Middle Palaeolithic or Szeletian settlement (e.g. Napajedelská Brána). Gradually, there was contact between the anatomically modern humans and the Neanderthals who survived in refugia (e.g. Krumlovský Les or Northern Moravia). The indigenous populations were probably driven out of their territories which resulted in the predominance of the Aurignacian (Neruda / Nerudová 2009b, fig. 7C). Unfortunately, only a few absolutely dated sites support this theory. Our presumption of possible contacts between the Szeletian and the Aurignacian is based on a typological analysis and the raw material distribution of assemblages from the eastern part of Drahanská Vrchovina (Oliva 1991).

Within this concept, the Szeletian should be understood as an autochthonous independent evolution of the Micoquian during the Early Upper Palaeolithic whose bearers had to be the Neanderthals. We can presume contacts with anatomically modern humans, but rather during a later phase of the EUP complex.

The Aurignacian in Moravia is consistent with the presence of »modern behaviour« during OIS 3. Technology, typology, raw material economy, land use, and symbolic aspects differ from other EUP cultures. But the degree of coexistence is not yet clear, and this question should be pursued further. The main problem are issues regarding the early Aurignacian in the territory of Moravia.

Unfortunately, stratigraphic sequences comparable to those in Germany are not available. The only exception is the superposition of the Bohunician and the Aurignacian at the Stránská Skála sites (Svoboda / Bar-Yosef 2003). In our opinion, the possibility that the Aurignacian settlement unit spatially respected the Szeletian (or the late Micoquian) during the beginnning of the EUP is to be tested. Contacts between both the Szeletian and the Bohunician are still being discussed.

Acknowledgements

This article was supported by the grant projects no. DE 07P04OMG011 and MK 00009486202 of the Ministerstvo kultury České republiky.

Notes

1) The second and third complex of palaeosols show characteristics typical for Intersaalian and Holstein interglacials, but they are reworked soils, and it is not possible to determine the period of their redeposition through micromorphology (Smolíková 2009). On the other hand, resedimentation explains the presence of an industry with Middle Palaeolithic features in the context of these sediments.

2) Levallois components were presented only during the OIS 6 in Moravia, and the new occurrence we correlate with the Bohunician occupation in the frame of the EUP complex. Therefore the presence of Levallois features in the Saalian glacial should be tested as a tool for the chronological determination.

3) Stratified artefacts were found during test pitting carried out by us in the frame of the grant project of the Ministerstvo kultury České republiky no. RK04P03OMG012 in 2000-2003 (Neruda / Nerudová / Oliva 2004).

4) Detail analyses of sedimentation processes which affected the archaeological situation are still in progress.

5) Concerning the Moravian Taubachien, it is clear that the small dimension of so-called Taubachien assemblages is the result of a human preference and not affected by the dimension of available raw materials.

References

Allsworth-Jones 1986: P. Allsworth-Jones, The Szeletian and the transition from Middle to Upper Palaeolithic in Central Europe (Oxford 1986).

Davies / Nerudová 2009: W. Davies / Z. Nerudová, Moravský Krumlov IV. Its chronological place in a wider arena. In: Neruda / Nerudová 2009a, 84-90.

Derndarsky 2001: M. Derndarsky, Die Forschungen in und zu der Gudenushöhle. In: F. Daim / T. Kühtreiber (eds), Sinn und Sein. Burg und Mensch. Katalog des Niederösterreichischen Landesmuseums N.F. 434 (St. Pölten 2001) 224-226.

Doláková 2009: N. Doláková, Palynologická analýza vzorků z Moravského Krumlova IV (Pollen Analysis of Moravský Krumlov IV Samples). In: Neruda / Nerudová 2009a, 49-53.

Dvořák / Valoch 1956: J. Dvořák / K. Valoch, Staropaleolitické nálezy z okolí Moravského Krumlova. Archeologické Rozhledy 8, 1956, 145-195.

Neruda 2001: P. Neruda, La distribution des matières premières au Taubachien à la grotte Kůlna. In: Préhistoire et approche expérimentale. Préhistoires 5 (Montagnac 2001) 349-362.

2003: P. Neruda, Střední paleolit v moravských jeskyních [unpubl. diss., Masaryk University Brno 2003].

2005: P. Neruda, Technologie micoquienu v jeskyni Kůlně. Micoquian Technology from Kůlna Cave (Sloup, South Moravia). Acta Musei Moraviae, Scientiae Sociales 90, 2005, 23-78.

2009a: P. Neruda, Experimentální analýza rohovců z Krumlovského lesa (Experimental Analysis of Cherts from Krumlovský Les Region). In: Neruda / Nerudová 2009a, 91-98.

2009b: P. Neruda, Stratigrafie sedimentů v Moravském Krumlově IV (Stratigraphy of Sediments from Moravský Krumlov IV). In: Neruda / Nerudová 2009a, 59-83.

2009c: P. Neruda, Archeologie středopaleolitického souvrství 1-3 v Moravském Krumlově IV (Archaeology of Middle Palaeolithic Layers 1-3 from Moravský Krumlov IV). In: Neruda / Nerudová 2009a, 99-144.

Neruda / Nerudová 2005: P. Neruda / Z. Nerudová, The development of the production of lithic industry in the Early Upper Palaeolithic of Moravia. Archeologické Rozhledy 57, 2005, 263-292.

2006: P. Neruda / Z. Nerudová, Výzkumy stratifikovaných paleolitických stanic u Dolních Kounic a Pravlova v roce 2006. Acta Musei Moraviae, Scientiae Sociales 91, 2006, 51-64.

2009a: P. Neruda / Z. Nerudová (eds), Moravský Krumlov IV. Multilayer Middle and Early Upper Palaeolithic Site in Moravia. Anthropos 29 = N.S. 21 (Brno 2009).

2009b: P. Neruda / Z. Nerudová, Postavení lokality Moravský Krumlov IV v kontextu střední Evropy (Moravský Krumlov IV Open-Air Site in the Context of Central Europe). In: Neruda / Nerudová 2009a, 178-213.

Neruda / Nerudová / Oliva 2004: P. Neruda / Z. Nerudová / M. Oliva, Stratigrafie paleolitických lokalit v oblasti Krumlovského lesa (okr. Znojmo). Acta Musei Moraviae, Scientiae Sociales 89, 2004, 3-58.

Nerudová 2009: Z. Nerudová, Archeologie szeletienské vrstvy 0 z Moravského Krumlova IV (Archaeology of Szeletian Layer 0 from Moravský Krumlov IV). In: Neruda / Nerudová 2009a, 148-173.

Novák 2009: J. Novák, Antrakologická analýza vzorků z Moravského Krumlova IV (Antracological Analysis of Moravský Krumlov IV Samples). In: Neruda / Nerudová 2009a, 43-48.

Oliva 1991: M. Oliva, The Szeletian in Czechoslovakia. Antiquity 65, 1991, 318-325.

1993: M. Oliva, Zahájení výzkumu paleolitické stanice Vedrovice Ia. Acta Musei Moraviae, Scientiae Sociales 77, 1993, 11-22.

2005: M. Oliva, Civilizace moravského paleolitu a mezolitu. Moravské Zemské Muzeum (Brno 2005).

Oliva / Neruda / Přichystal 1999: M. Oliva / P. Neruda / A. Přichystal, Paradoxy těžby a distribuce rohovce z Krumlovského lesa. Památky Archeologické 90, 1999, 229-318.

Rhodes et al. in prep.: E. Rhodes / L. Nejman / R. Grün / P. Škrdla / G. Tostevin / P. Neruda / Z. Nerudová / K. Valoch / M. Oliva / L. Kaminská / J. A. Svoboda, Chronological Review of the Middle to Upper Palaeolithic Transition in the Czech Republic and Slovakia: New Optically Stimulated Luminescence results. Archeometry, Manuscript ID ARCH-02-0014-2010 (in prep.).

Rink et al. 1996: W. J. Rink / H. P. Schwarcz / K. Valoch / L. Seitl / C. B. Stringer, ESR Dating of Micoquian Industry and Neanderthal Remains at Kůlna Cave, Czech Republic. Journal of Archaeological Science 23, 1996, 889-901.

Roštínský 2009: P. Roštínský, Geomorfologická charakteristika okolí archeologické lokality Moravský Krumlov IV. Geomorphological Characteristic of the Archaeological Site Moravský Krumlov IV Surrounding. In: Neruda / Nerudová 2009a, 26-42.

Šajnerová-Dušková 2009: A. Šajnerová-Dušková, Traseologická analýza szeletienských artefaktů z Moravy (Use-Wear Analysis of Szeletian Artefacts from Morava Region). In: Neruda / Nerudová 2009a, 174-177.

Smolíková 2009: L. Smolíková, Mikromorfologie fosilních půd z Moravského Krumlova IV (Micromorphology of Fossil Soils from Moravský Krumlov IV). In: Neruda / Nerudová 2009a, 54-58.

Svoboda 2004: J. Svoboda, Neandertálci versus anatomicky moderní lidé. K aktuálnímu stavu výzkumu ve středním Podunají. Přehled Výzkumů 45, 2004, 13-21.

Svoboda / Bar-Yosef 2003: J. Svoboda / O. Bar-Yosef (eds), Stránská skála. Origins of the Upper Paleolithic in the Brno Basin, Moravia, Czech Republic. American School of Prehistoric Research Bulletin 47 (Cambridge 2003).

Trnka 1990: G. Trnka, Ein neuer paläolithischer Blattspitzenfund aus Schletz in Niederösterreich. Archäologie Österreichs 1, 1990, 20-4.

Valoch 1970: K. Valoch, Early Middle Palaeolithic (Stratum 14) in the Kůlna Cave near Sloup in the Moravian Karst. World Archaeology 2, 1970, 28-38.

1971: K. Valoch, Eine mittelpaläolithische Industrie von Maršovice in Südmähren. Anthropologie (Brno) 9, 1971, 29-47.

1984: K. Valoch, Le Taubachien, sa géochronologie, paléoécologie et paléoethnologie. Anthropologie (Paris) 88, 1984, 193-208.

1988: K. Valoch, Die Erforschung der Kůlna-Höhle 1961-1976. Anthropos 24 = N.S. 16 (Brno 1988).

1990: K. Valoch, Le Szélétien en Moravie. In: J. Kozłowski (ed.), Feuilles de pierre. Les industries à pointes folliacées du Paléolithique Supérieur européen. ERAUL 42 (Liège 1990) 213-221.

1996: K. Valoch, Le Paléolithique en Tchéquie et en Slovaquie. Préhistoire d'Europe 3 (Grenoble 1996).

2002: K. Valoch, Eine Notgrabung in der Kůlna-Höhle im mährischen Karst. Acta Musei Moraviae, Scientiae Sociales 87, 2002, 3-34.

2006: K. Valoch, Středopaleolitické industrie v oblasti Krumlovského lesa na jižní Moravě. Acta Musei Moraviae, Scientiae Sociales 91, 2006, 3-28.

Valoch et al. 1993: K. Valoch / A. Kočí / W. G. Mook / E. Opravil / J. van der Plicht / L. Smolíková / Z. Weber, Vedrovice V, eine Siedlung des Szeletien in Südmähren. Quartär 43/44, 1993, 7-93.

Zusammenfassung / Abstract / Résumé

Moravský Krumlov IV – ein neuer mehrperiodiger Fundplatz des Paläolithikum in Mähren

Der Fundplatz Moravský Krumlov IV liegt in der Region des Krumlov-Waldes (Krumlovský Les), der für seine Hornsteinvorkommen bekannt ist. Ausgrabungen wurden 2000-2004 in verschiedenen Sektoren durchgeführt; hierbei konnten vier paläolithische Fundhorizonte erkannt werden. Der unterste Horizont (Fundschicht 3) gehört noch in OIS 6 und offenbart die Nutzung von Levallois- und diskoiden Abbaukonzepten. Die Fundschichten 2 und 1 konnten von OIS 5e bis OIS 5c datiert werden. Die Steinartefakte werden als Belege für ein sehr frühes Micoquien gewertet. Der hangende Fundhorizont 0 gehört zum Szeletien, als eine Variante der frühjungpaläolithischen Technokomplexe. Dessen Steinindustrie wird detailliert beschrieben. Die Analyse der Zusammensetzungen mit Blattspitzen erhellen eine besondere Variante der Geräteherstellung. *M. Baales*

Moravský Krumlov IV – a new multilayer Palaeolithic site in Moravia

The site of Moravský Krumlov IV is situated in the Krumlovský Les (Krumlovian Forest) region well known as a source of the local chert. In 2000-2004 excavations were carried out in several sectors, and four archaeological layers were documented. The lowest layer 3 is dated to the period of OIS 6 and contains features of both discoid and Levallois core reduction. The archaeological layers 2 and 1 date between OIS 5e and OIS 5c, and artefacts are attributed to a very early Micoquian type industry. The uppermost layer 0 dates to the Early Upper Palaeolithic complex, representing a Szeletian type industry. The lithic industry of the Szeletian workshop is described, and refittings of leaf points allow the definition of a specific way of tool production.

Moravský Krumlov IV – un nouveau gisement paléolithique multi-période en Moravie

Moravský Krumlov IV se situe dans la région de la forêt de Krumlov (Krumlovský Les) qui est connue pour ses gisements de silex. Différents secteurs ont fait l'objet de fouilles entre 2000 et 2004, quatre horizons paléolithiques ont pu être reconnus. L'horizon le plus bas (US3) appartient encore à l'OIS 6 et présente l'utilisation de techniques de débitement levallois et discoïdes. Les US 2 et 1 ont pu être datées du OIS 5e au OIS 5c. Les artefacts lithiques permettent d'interprêter ces niveaux comme un Micoquien très ancien. Le dernier niveau, US 0, appartien au Szélétien, daté du Paléolithique récent. L'industrie lithique associée fait l'objet d'une description détaillée. L'analyse des remontages des feuilles de laurier permet d'identifier un mode de production spécifique. *L. B.*

Schlüsselwörter / Keywords / Mots clés

Tschechische Republik / Mähren / mehrperiodiger Freilandfundplatz / Mittelpaläolithikum / frühes Jungpaläolithikum
Czech Republic / Moravia / multilayer open air site / Middle Palaeolithic / Early Upper Palaeolithic
République tchèque / Moravie / station de plein air multi-période / Paléolithique moyen / Paléolithique supérior ancien

Petr Neruda
Zdeňka Nerudová
Ústav Anthropos
Moravské Zemské Muzeum
Zelný trh 6
CZ - Brno 659 37
pneruda@mzm.cz
znerudova@mzm.cz